AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been broken down into sections.

EDMC#:	0025845
SECTION:	6 of 8
DOCUMENT #:	DOE/RL-92-67, DRAFT A
TITLE:	Final RI/FS Report for 1100-EM-1 OU, Hanford

APPENDIX V

UPTAKE/BIOKINETIC MODEL FOR LEAD

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1100-3 UBK Results for Default Parameters Assuming a Soil Lead Concentration of 26.4 (mg/kg)

ABSORPTION METHODOLOGY: Non-Linear Active-Passive

AIR CONCENTRATION: 0.200 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	26.4	27.4
1-2	26.4	27.4
2-3	26.4	27.4
3-4	26.4	27.4
4-5	26.4	27.4
5-6	26.4	27.4
6-7	26.4	27.4

Additional Dust Sources: None DEFAULT
Soil contribution conversion factor: 0.28
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 7.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	1.81	4.19	0.81
1-2:	1.48	4.84	0.81
2-3:	1.49	5.37	0.81
3-4:	1.53	5.29	0.81
4-5:	1.57	5.22	0.81
5-6:	1.60	5.53	0.81
6-7:	1.66	5.92	0.81

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.94	0.40	0.00	0.04
1-2:	2.96	1.00	0.00	0.07
2-3:	3.40	1.04	0.00	0.12
3-4:	3.29	1.06	0.00	0.13
4-5:	3.18	1.10	0.00	0.13
5-6:	3.38	1.16	0.00	0.19
6-7:	3.74	1.18	0.00	0.19

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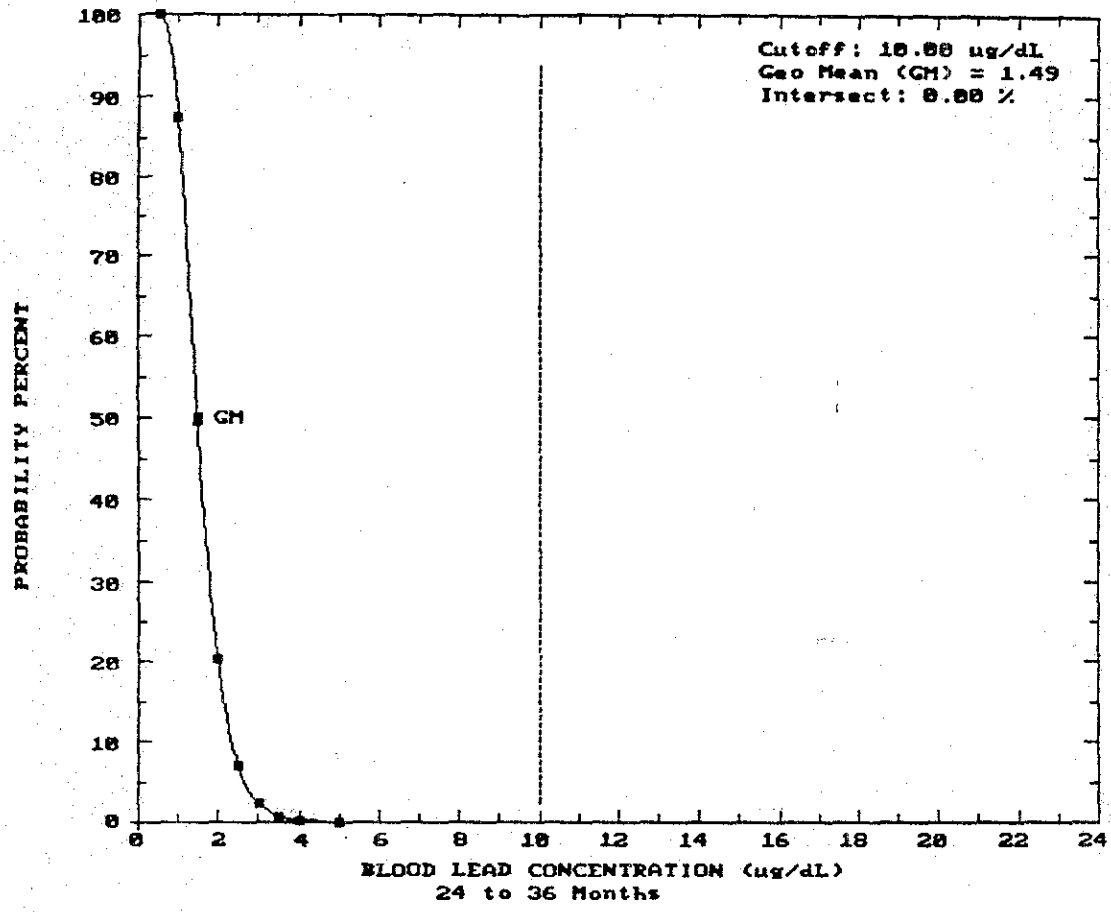
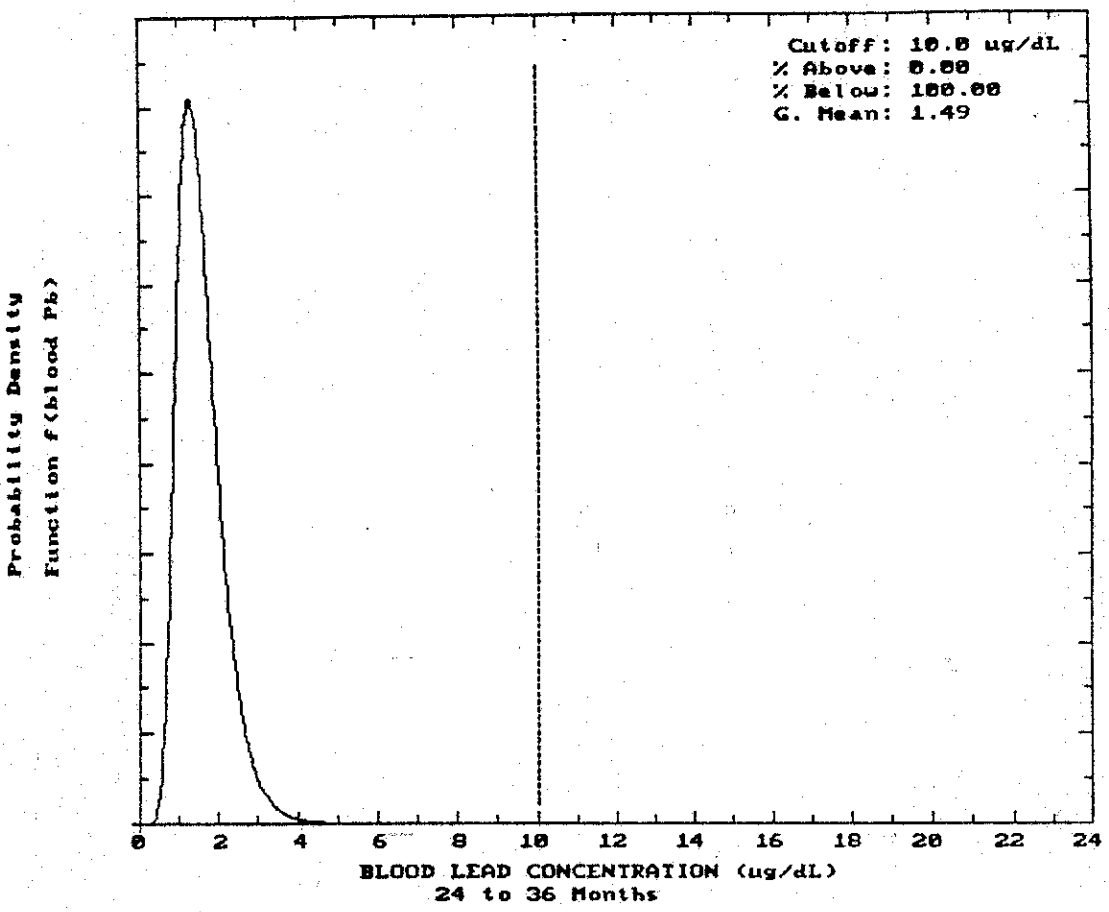


1100-3 UBK Results for Default Parameters Assuming a Soil Lead Concentration of 26.4 (mg/kg)



1100-3 UBK Results for Default Parameters Assuming a Soil Lead Concentration of 26.4 (mg/kg)

1100-3: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old

ABSORPTION METHODOLOGY: Non-Linear Active-Passive

AIR CONCENTRATION: 0.200 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: daily Pb consumption by year as follows:

0-1:	5.88	ug Pb/day
1-2:	5.92	ug Pb/day
2-3:	7.16	ug Pb/day
3-4:	6.57	ug Pb/day
4-5:	6.36	ug Pb/day
5-6:	6.75	ug Pb/day
6-7:	7.48	ug Pb/day

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	26.4	27.4
1-2	26.4	27.4
2-3	26.4	27.4
3-4	26.4	27.4
4-5	26.4	27.4
5-6	26.4	27.4
6-7	26.4	27.4

Additional Dust Sources: None DEFAULT
Soil contribution conversion factor: 0.28
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

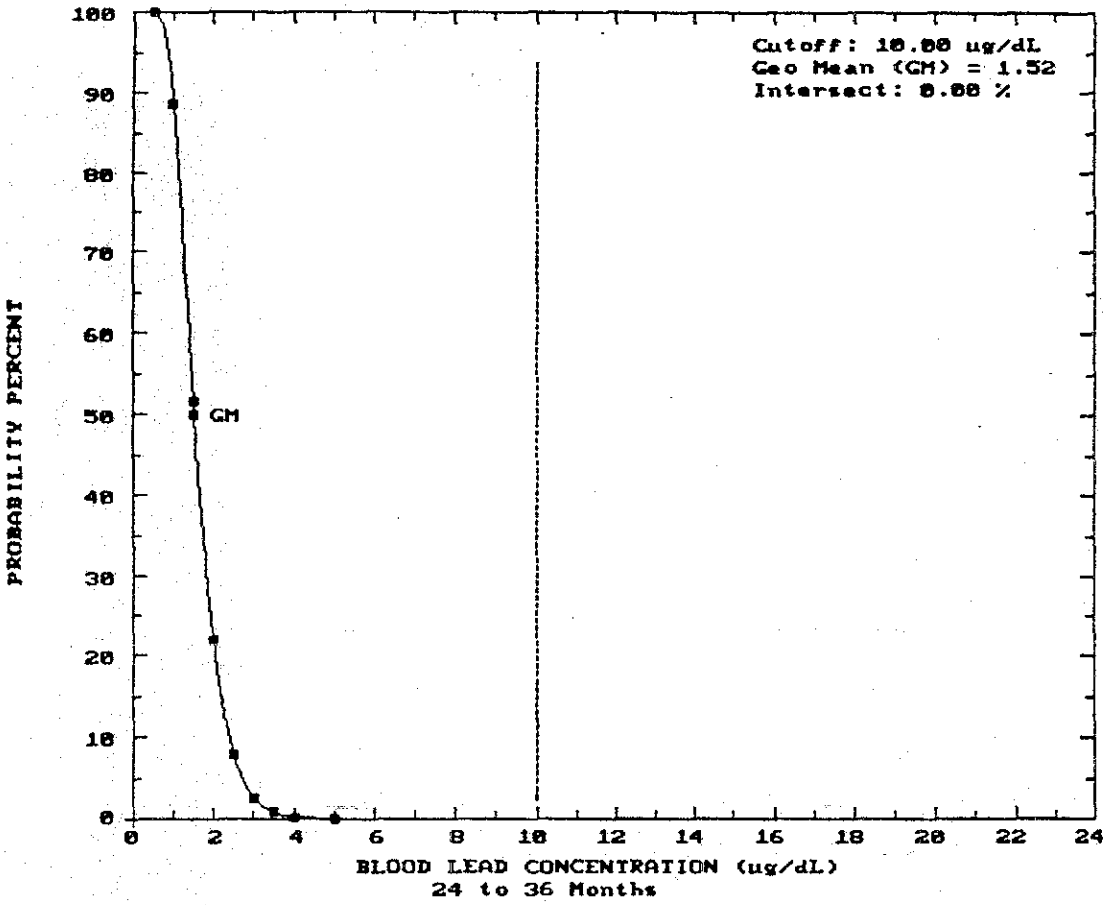
MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 7.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

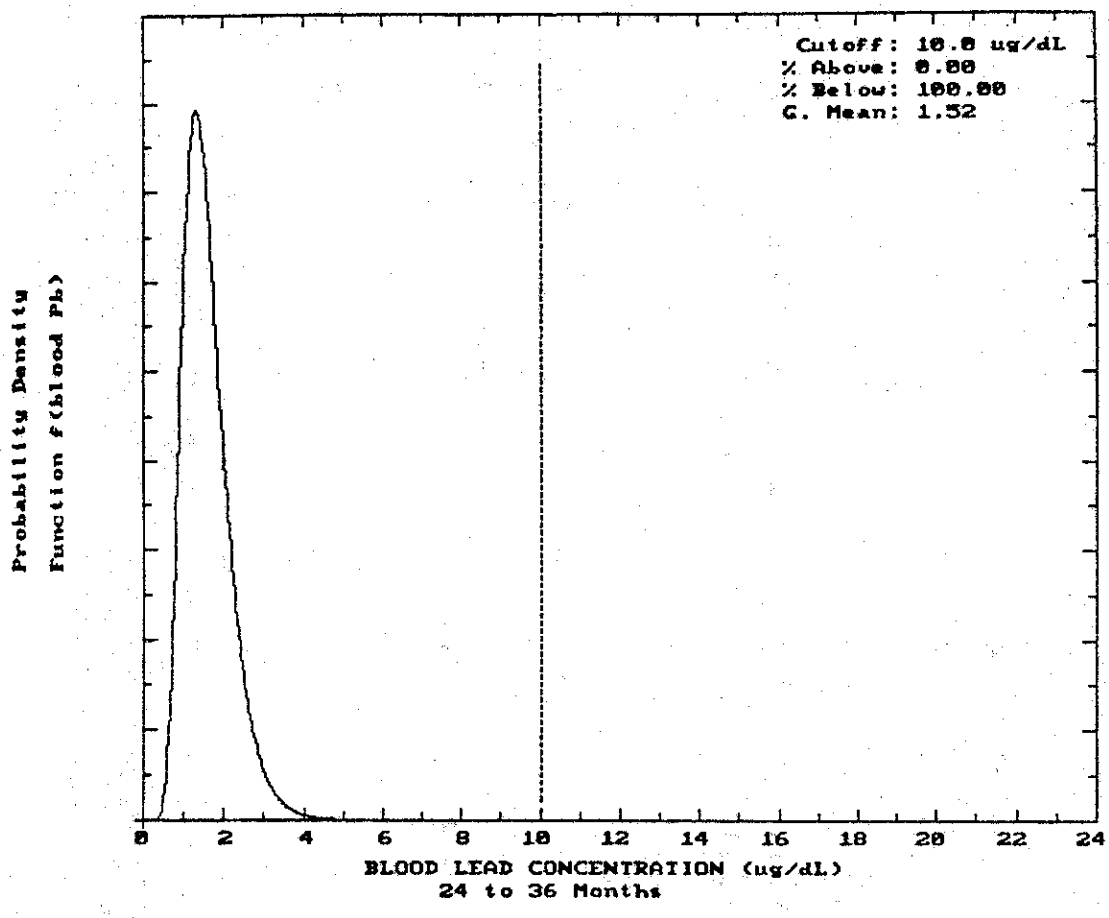
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	1.81	4.19	0.81
1-2:	1.48	4.84	0.81
2-3:	1.52	5.55	0.81
3-4:	1.55	5.29	0.81
4-5:	1.58	5.22	0.81
5-6:	1.60	5.53	0.81
6-7:	1.66	5.92	0.81

1100-3: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
).5-1:	2.94	0.40	0.00	0.04
1-2:	2.96	1.00	0.00	0.07
2-3:	3.58	1.04	0.00	0.12
3-4:	3.29	1.06	0.00	0.13
4-5:	3.18	1.10	0.00	0.13
5-6:	3.38	1.16	0.00	0.19
6-7:	3.74	1.18	0.00	0.19



1100-3: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old



1100-3: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old

HORN RAPIDS LANDFILL: UBK Results for Default Parameters
Assuming a Soil Lead Concentration of 854 (mg/kg)

ABSORPTION METHODOLOGY: Non-Linear Active-Passive

AIR CONCENTRATION: 0.200 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	854.0	259.1
1-2	854.0	259.1
2-3	854.0	259.1
3-4	854.0	259.1
4-5	854.0	259.1
5-6	854.0	259.1
6-7	854.0	259.1

Additional Dust Sources: None DEFAULT
Soil contribution conversion factor: 0.28
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 7.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	6.13	19.19	15.80
1-2:	5.90	19.83	15.80
2-3:	5.80	20.36	15.80
3-4:	5.88	20.28	15.80
4-5:	6.06	20.22	15.80
5-6:	6.07	20.53	15.80
6-7:	6.07	20.91	15.80

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.94	0.40	0.00	0.04
1-2:	2.96	1.00	0.00	0.07
2-3:	3.40	1.04	0.00	0.12
3-4:	3.29	1.06	0.00	0.13
4-5:	3.18	1.10	0.00	0.13
5-6:	3.38	1.16	0.00	0.19
6-7:	3.74	1.18	0.00	0.19

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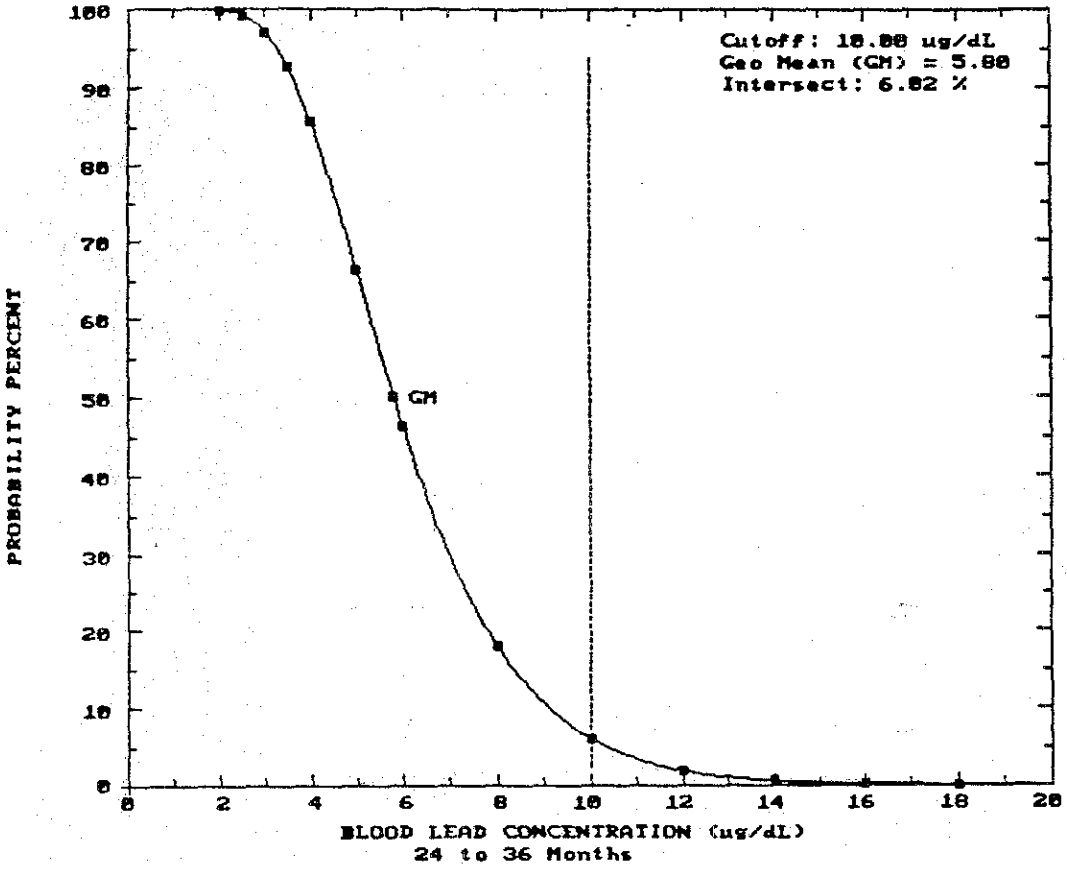
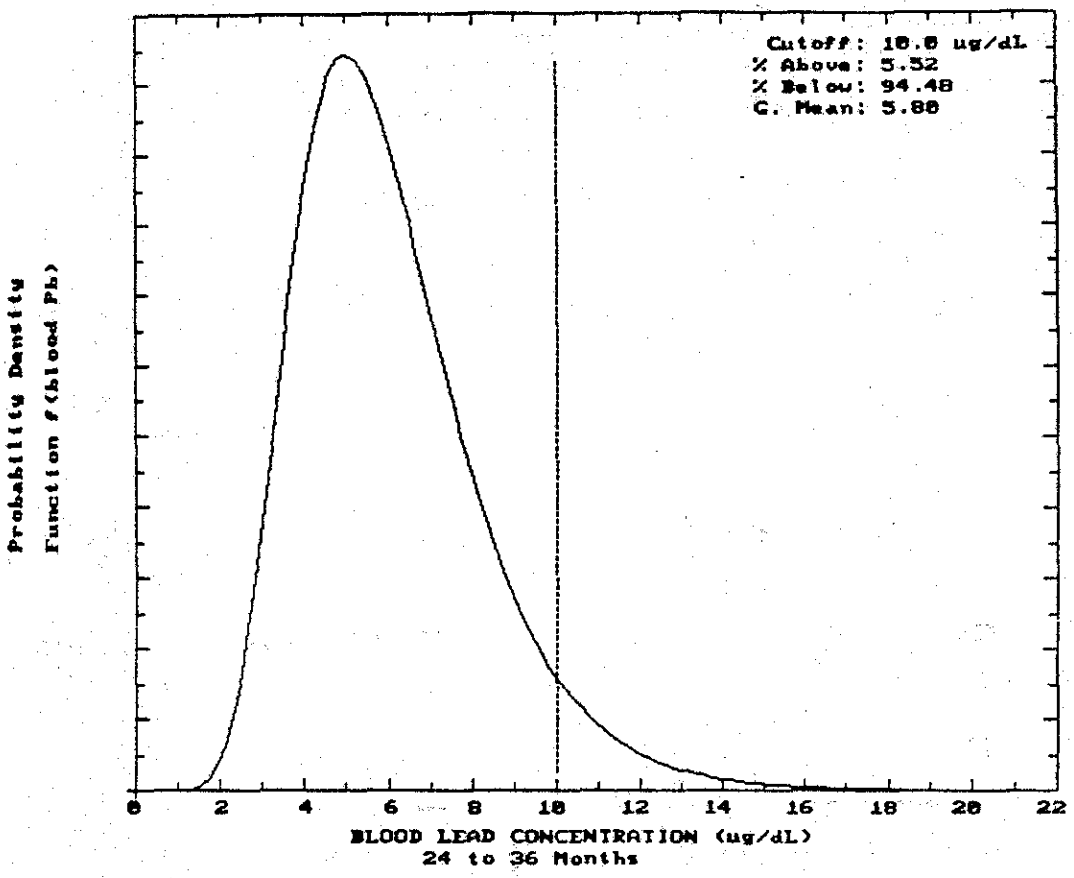


HORN RAPIDS LANDFILL: UBK Results for Default Parameters
Assuming a Soil Lead Concentration of 854 (mg/kg)



HORN RAPIDS LANDFILL: UBK Results for Default Parameters
Assuming a Soil Lead Concentration of 854 (mg/kg)

HORN RAPIDS LANDFILL: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old

ABSORPTION METHODOLOGY: Non-Linear Active-Passive

AIR CONCENTRATION: 0.200 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: daily Pb consumption by year as follows:

0-1:	5.88	ug Pb/day
1-2:	5.92	ug Pb/day
2-3:	21.39	ug Pb/day
3-4:	6.57	ug Pb/day
4-5:	6.36	ug Pb/day
5-6:	6.75	ug Pb/day
6-7:	7.48	ug Pb/day

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	854.0	259.1
1-2	854.0	259.1
2-3	854.0	259.1
3-4	854.0	259.1
4-5	854.0	259.1
5-6	854.0	259.1
6-7	854.0	259.1

Additional Dust Sources: None DEFAULT
Soil contribution conversion factor: 0.28
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

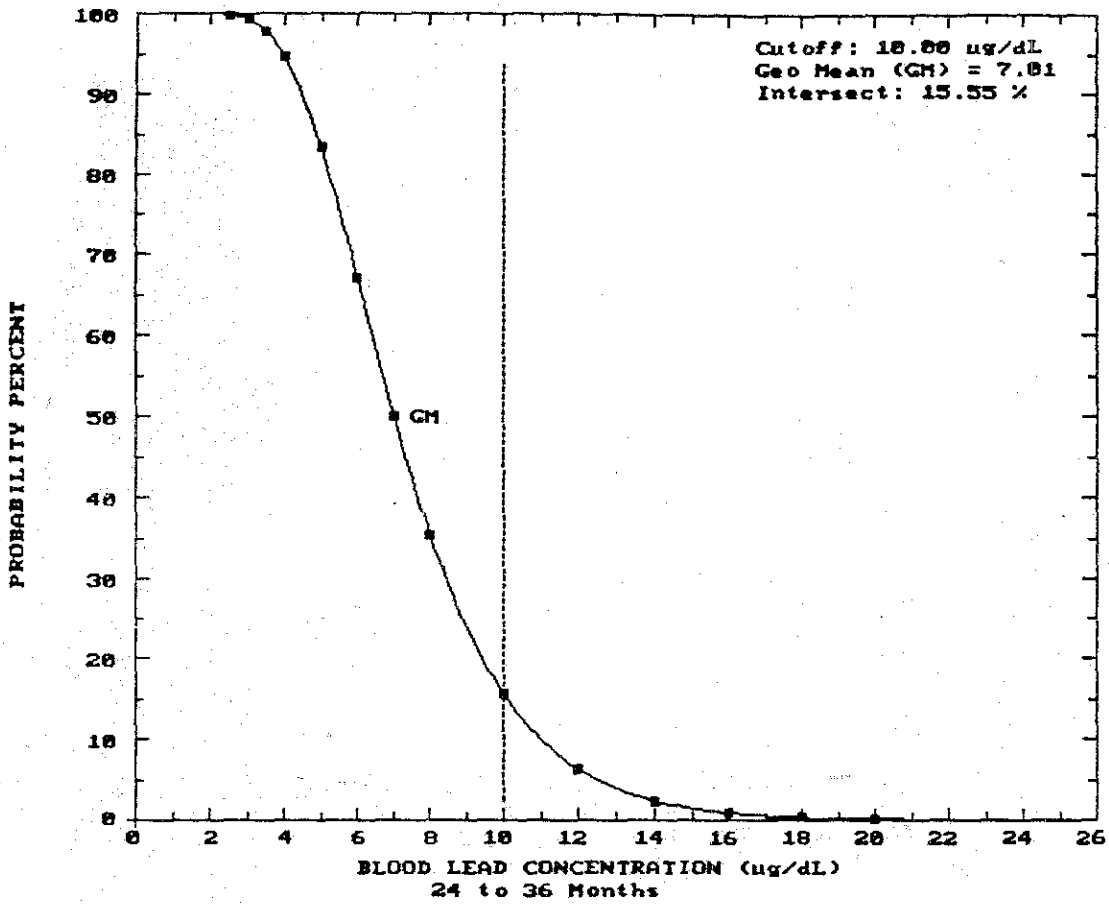
MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 7.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

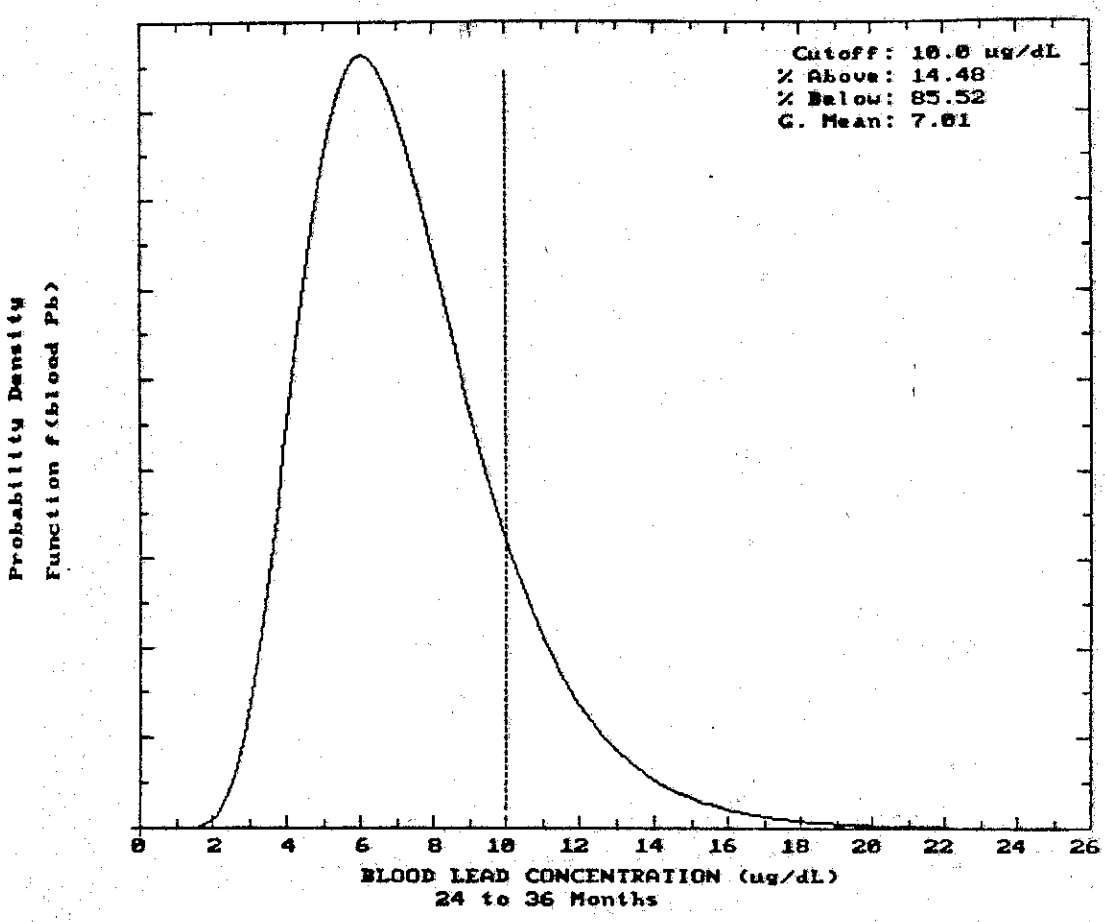
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	6.13	19.19	15.80
1-2:	5.90	19.83	15.80
2-3:	7.01	27.66	15.80
3-4:	6.66	20.28	15.80
4-5:	6.25	20.22	15.80
5-6:	6.14	20.53	15.80
6-7:	6.09	20.91	15.80

HORN RAPIDS LANDFILL: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.94	0.40	0.00	0.04
1-2:	2.96	1.00	0.00	0.07
2-3:	10.69	1.04	0.00	0.12
3-4:	3.29	1.06	0.00	0.13
4-5:	3.18	1.10	0.00	0.13
5-6:	3.38	1.16	0.00	0.19
6-7:	3.74	1.18	0.00	0.19



HORN RAPIDS LANDFILL: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old



HORN RAPIDS LANDFILL: UBK Results for Default Parameters with Ingestion of Homegrown Vegetables for a 2-Year Old

APPENDIX L

ECOLOGICAL RISK ASSESSMENT FOR THE 1100-EM-1 OPERABLE UNIT

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APPENDIX L CONTENTS

TABLES

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1.0 PURPOSE AND SCOPE OF THE BASELINE ENVIRONMENTAL RISK ASSESSMENT

The objective of the environmental assessment is to provide an evaluation of the site specific ecological risks. An environmental assessment was provided in the Phase I RI report (DOE/RL 90-18) for the 1100-EM-1 operable unit. Presentation of an ecological risk assessment for the Phase II RI/FS is a voluntary effort that includes Phase II RI data in a manner that follows guidelines outlined in the Hanford site baseline risk assessment methodology (HSBRAM) (DOE/RL 91-45).

This assessment includes a problem definition, analysis, and risk characterization. The problem definition identifies stressor characteristics (*i.e.*, contaminants of potential concern), ecosystems potentially at risk, and ecological effects. These discussions lead to the selection of assessment and measurement endpoints. Assessment endpoints are those "specific properties of each habitat of interest used to evaluate the state, or change in the state, of the ecological system" (DOE/RL 91-45). Measurement endpoints are "those used to approximate, represent, or lead to an assessment endpoint" (DOE/RL 91-45). An analysis was performed by characterizing exposure and ecological effects. Risk characterization was performed by integrating exposure and toxicity, discussing uncertainty, and interpreting ecological risk.

It should be noted that, with the lack of better data, this assessment is a qualitative examination of the baseline ecological conditions. Conclusions are based on many estimations and assumptions that provide large uncertainties in the calculated results.

2.0 PROBLEM DEFINITION

The following paragraphs describe the stressor characteristics, ecosystems potentially at risk, ecological effects, and selection of endpoints. Previously conducted studies of the Hanford site ecology and data collected during the phase I and II Remedial Investigation (RI) for 1100-EM-1 were used in this assessment.

2.1 ECOSYSTEMS POTENTIALLY AT RISK

Potentially sensitive habitats chosen for the 1100-EM-1 site are habitats known to be frequented by designated or proposed, endangered or threatened species. In determining ecosystems potentially at risk at 1100-EM-1, only terrestrial organisms are considered. Aquatic species are not addressed, since it has been demonstrated, with groundwater modeling, that contaminants in the groundwater will not reach the river above drinking water standards. The following sections present the species expected to be found at the site, and the state or federal designation (*e.g.*, threatened or endangered) for these species.

2.1.1 Terrestrial Flora

The dominant plant species at the 1100 site are sagebrush-bitterbrush and cheatgrass. In addition, the following plants may exist at the operable unit (Franklin and Dyrness 1988, DOE, 1987):

- Medium shrubs--
  - Tall Green Rabbitbrush (*Chrysothamnus viscidiflorus*)
- Low shrubs--
  - Longleaf Phlox (*Phlox longifolia*)
  - Threadleaf Fleabane (*Erigeron filifolius*)
- Perennial grasses--
  - Cusick Bluegrass (*Poa cusickii*)
  - Needle and Thread (*Stipa comata*)
- Perennial forbs--
  - Spalding's Milkvetch (*Astragalus spaldingii*)
  - False Agoseris (*Microseris troximoides*)
  - Green-banded Miraposa Lily (*Calachortus macrocarpus*)
- Annuals--
  - Indianwheat (*Plantago patagonica*)
  - Nuttall's Fescue (*Festuca microstachys*)
  - Cheatgrass Brome (*Bromus tectorum*)
  - Pinnate Tansymustard (*Descurainia pinnata*)
  - Vernal Draba (*Draba verna*)
  - Thompson's Sandwort (*Arenaria franklinii va. thompsonii*), designated a monitored species (DNR, 1990)

2.1.2 Terrestrial Fauna

Table L-1 is a list of mammals, birds, reptiles, amphibians, and insects that may inhabit the 1100 site. Of the birds listed, the peregrine falcon and ferruginous hawk are endangered and threatened, respectively. The swainson's hawk, golden eagle, and prairie falcon are candidate species and the long-billed curlew is a monitored species. No endangered or threatened species of mammals, reptiles, amphibians, or insects are expected to inhabit the 1100 site. However, the grasshopper mouse and sagebrush vole are monitored and the pocket gopher and striped whipsnake are candidate species.

2.2 STRESSOR CHARACTERISTICS

Chemical contamination is the only stressor addressed for this site. Contaminants of potential concern (COPC), determined in the Baseline Industrial Scenario Risk Assessment (BISRA) for 1100-EM-1, were used in the analysis and risk characterization as recommended by HSBRAM (DOE/RL, 1992). Table L-2 includes the contaminants of potential concern from the sub-units of the 1100-EM-1 operable unit. The maximum concentration of a COPC

for the entire operable unit was used in this risk assessment. All maximum contaminant values reported in the table were found at HRL except bis (2-ethylhexyl) phthalate (BEHP), Chlordane and Heptachlor, which were found at UN-1100-6. The COPC were reported for the other subunits in the BISRA, but at levels lower than for HRL and UN-1100-6.

2.3 ECOLOGICAL EFFECTS

No toxicological studies were performed on species inhabiting 1100-EM-1 during the Phase I or Phase II RI's. The toxicological effects on species exposed to the COPC are assumed to be those addressed in the derivation of parameters such as the No Observed Adverse Effect Level (NOAEL). These parameters are used in the analysis and characterization sections.

Phase I field observations of the ecology of 1100-EM-1 (DOE/RL 91-45) showed that there was no evidence of adverse impacts from the COPC to the flora and fauna inhabiting any of the subunits, except for UN-1100-6. Except for a clump of grass, there is no vegetation growing in the depression of the UN-1100-6 subunit. The only evidence of ecological damage at the operable unit is this apparent lack of vegetative growth at this subunit.

2.4 SELECTION OF ASSESSMENT AND MEASUREMENT ENDPOINTS

As noted above, assessment endpoints are the properties of habitats of potential concern used to assess the state of an ecosystem. These endpoints "must be of ecological importance and of direct management relevance..." (DOE/RL 91-45). Terrestrial organisms have been designated as having habitats of potential concern for this site and the ferruginous hawk and peregrine falcon are threatened and endangered, respectively. From these considerations, adverse effects on these raptors have been chosen as assessment endpoints in this risk assessment. Without better data, it is impossible to be more specific about the assessment endpoints (*i.e.*, to specify, for example, abundance, mortality, or ecosystem productive capability).

A measurement endpoint is defined "to approximate, represent, or lead to an assessment endpoint" (DOE/RL 91-45). For this risk assessment, adverse effects on the swainson's hawk and long-billed curlew are used as measurement endpoint. These birds were chosen since they can be considered analog species, they are designated as candidate and monitored species (hawk and curlew, respectively), and data used for the exposure assessments were readily available.

Table L-1. TERRESTRIAL FAUNA INHABITING 1100-EM-1

Organism Name		Frequency	State Designation	Source[3]
Common Name	Scientific Name	F/O/I/U[1]	E/T/S/C/M[2]	
MAMMALS:				
Mule deer	*Odocoileus hemionus*	F		1,2
Badgers	*Taxidea taxus*	F		1,2
Coyotes	*Canis latrans*	F		1,2
Blacktail jackrabbbits	*Lepus califonicus*	F		1,2
Townsend ground squirrels	*Spermophilus townsendii*	F		1,2
Great Basin Pocket mice	*Perognathus parvus*	F		1,2
Pocket gophers	*Thomomys talpoides*	F	C	1,2,3
Deer mice	*Peromyscus maniculatus*	F		1,2
Western Harvest mouse	*Reithrodontomys megalotis*	O		1,2
Grasshopper		O		1,2
Mice	*Onychomys leucogaster*	O	M	1,2,3
Skunks	*Mephitis mephitis*	I		1,2
Raccoons	*procyon lotor*	I		1,2
Weasels	*Mustella spp.*	I		1,2
Porcupines	*Erethizon dorsatum*	I		1,2
Bobcats	*Lynx rufus*	I		1,2
Sagebrush vole		I	M	2
Vagrant shrew		O		2
Muskrat		I		2
BIRDS:				
Starlings	*Sturnus vulgaris*	F		1,2
Horned larks	*Eremophila alpestris*	F		1,2
Western meadowlarks	*Sturnella neglecta*	F		1,2
Western Kingbirds	*Tyranus virticalis*	F		1
Black-billed magpies	*Pica pica*	F		1
Ravens	*Corvus corax*	F		1,2
sage sparrows		O		2
Ring-necked pheasants	*Phasianus colchicus*	O		1,2
Mourning dove	*Zenaida macrora*	F		1,2
Sage sparrows	*Amphispiza belli*	F	C	1,2

Table L-1. TERRESTRIAL FAUNA INHABITING 1100-EM-1 (continued)

Organism Name		Frequency	State Designation	Source[3]
Common Name	Scientific Name	F/O/I/U[1]	E/T/S/C/M[2]	
Raptors:				
American kestrel	*Falco sparvarius*	F		1,2
Red-tailed hawk	*Buteo jamaicensis*	F		1,2
Swainson's hawks	*Buteo sainsoni*	F	C	1,2,3
Golden eagles	*Aquila chrysaetos*	O	C	1,2,3
Peregrine falcon	*Falco peregrinus*	I/U	E	1,2,3
Long-billed curlews	*Numenius americanus*	F	M	2,3
Ferruginous hawk	*Buteo regalis*	I	T	1,2,3
Prairie falcons	*Falco mexicanus*	O	C	1,2,3
REPTILES AND AMPHIBIANS:				
Gopher snakes	*Pituophis melanoleucus*	F		2
Sideblotched lizards	*Uta stannsburiana*	F		2
Sagebrush lizards	*Sceloporus graciosus*	I		1
Yellow-bellied racer	*Coluber constrictor*	I		1
Pacific rattlesnake	*Crotalus viridis*	I/rocks		2
Striped whipsnake	*Masticophis taeniatus*	I	C	1,2,3
INSECTS:				
Darkling beetles		F		2
Grasshopers	*Ornithoptera*	F		2
Harvester ants		F		1
Bees		O		1
Butterflies		O		1
Scarab beetles		O		1

Table L-1. TERRESTRIAL FAUNA INHABITING 1100-EM-1 (continued)

Definitions of abbreviations and terms:

[1]F-Frequent visitor to site.
[1]O-Occasional visitor to site.
[1]I-Infrequent visitor to site.
[1]U-Unlikely that species visits site.

[2]E-Endangered species.
[2]T-Threatened species.
[2]S-Sensitive species.
[2]C-Candidate species
[2]M-Monitor species

Endangered Species: Wildlife species native to the state of Washington that are seriously threatened with extinction throughout all or a significant portion of their range within the state. Endangered species are legally designated in WAC 232-12-014.

Threatened Species: Wildlife species native to the state of Washington that are likely to become an endangered species within the foreseeable future throughout a significant portion of their range within the state without cooperative management or removal of threats. Threatened species are legally designated in WAC 232-12-0111.

Sensitive Species: Wildlife species native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened in a significant portion of their range within the state without cooperative management or removal of threats. Sensitive species are legally designated in WAC 232-12-0111.

Candidate species: Wildlife species native to the state of Washington that the Department of Wildlife will review for possible listing as endangered, threatened, or sensitive. Candidate species are designated in Wildlife Policy 4802.

Monitor species: Wildlife species native to the state of Washington that are of special interest because: 1) they were at one time classified as endangered, threatened, or sensitive; 2) they require habitat that had limited availability during some portion of their life cycle; 3) they are indicators of environmental quality; 4) further field investigations are required to determine their population status; 5) there are unresolved taxonomic problems which may bear upon their status classification; 6) they may be competing with and impacting other species of concern; or 7) they have significant popular appeal. Monitor species are designated in Wildlife Policy 4803.

SOURCES[3]:

[1] DOE/RL-92-05, *B Plant Source Aggregate Area Management Study Report*, Department of Energy, Richland Operation Office, Richland, Washington.

[2] DOE/RL-1987, *Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, EIS-0113 (Vol. 1 of 5)*, Department of Energy, Richland Operation Office, Richland, Washington.

[3] Washington Department of Wildlife, *Species of Conern List,* Nongame Program, Wildlife Management Division, Washinton Department of Wildlife, 600 Capital Way, Olympia 98501-1091.

3.0 ANALYSIS

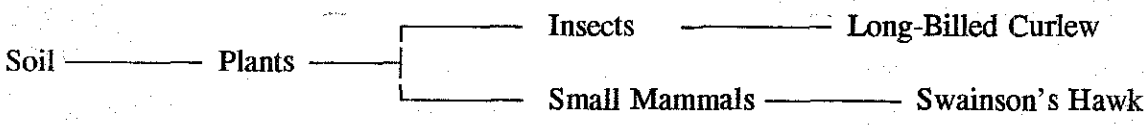
The following analysis involved performing an exposure and toxicity assessment. In paragraph 3.1, the exposure to the COPC for the long-billed curlew and swainson's hawk is addressed. Paragraph 3.2 reports toxicological parameters (*e.g.*, NOAEL) for the COPC, choosing parameters taken from the most appropriate studies (*i.e.*, preferably birds).

3.1 EXPOSURE ASSESSMENT

The following is a discussion of, and calculations for the exposure assessment at 1100-EM-1. This involved first identifying the exposure pathways and, secondly, calculating intake rates for the receptor population (swainson's hawk and long-billed curlew).

3.1.1 Exposure Pathways

The primary diet of long-billed curlews and ferruginous hawks has been estimated to be insects and small mammals, respectively (Terres,1980). These birds may actually be exposed to contaminants via several other pathways. These include dust inhalation, dermal contact, and soil ingestion by the birds and their prey. For the purpose of this risk assessment and for simplicity, it was assumed that the exposure to contaminants via prey ingestion is the major route of exposure. As a result of this assumption, intake rates may underestimate exposure. However, whenever possible, conservative assumptions are made for other parameters. A simplified contaminant biological transport pathway can be represented as:



3.1.2 Uptake Rate Calculations for Receptor Population

The maximum contaminant concentration detected to 2 feet was considered the concentration in the soil over the entire subunit where the contaminant was found. This method is conservative and reflects the availability of contaminants to plant roots. Contaminant concentration in plants was determined and used to calculate contaminant concentration in insects and mammals. These values were then used in the uptake rate calculations for the long-billed curlew and ferruginous hawk.

Table L-2 lists maximum contaminant concentrations and plant and small mammal uptake factors used in uptake calculations. When available, unitless, dry weight uptake factors were used for small mammals. In the absence of this data, uptake factors were used that required an alternate calculation method as described below. The results of the uptake calculations are reported in table L-3. The methods used and assumptions made in determining uptake rates are described below.

The following are abbreviations used for plant, insect, and small mammal uptake calculations:

C_s = Contaminant concentration in soil (maximum concentration), mg/kg
UF_p = Plant uptake factor as dry weight (dw), unitless
C_p = Contaminant concentration in plants, mg/kg dw
UF_i = Insect uptake factor as dry weight, unitless
C_i = Contaminant concentration in insects, mg/kg dw
UF_m = Uptake factor for small mammals, unitless or d/kg as indicated
IR_m = Ingestion rate of vegetation for small mammals, kg/d
C_m = Contaminant concentration in small mammals, mg/kg dw

Plant and small mammal uptake factors were not readily available for thallium, beta-HCH and BEHP. The UF_p and UF_m for thallium was conservatively estimated to be that of mercury. UF_p and UF_m for PCB was used as a surrogate for BEHP and beta-HCH. Since PCB has a higher bioconcentration factor for fish than BEHP and beta-HCH (USAF,1989) this is also a conservative estimate.

Plants

Plant uptake was calculated as:

$$C_p = C_s \times UF_p$$

Insects

It was assumed that insects only eat plants therefore the insect uptake was calculated as:

$$C_i = C_p \times UF_i$$

Insect uptake factors were not available for the contaminants of potential concern, however, one study suggests an uptake factor of one for Dioxin (Paustenbach, 1989), which is used for the uptake calculations. Insect uptakes are therefore the same as plant uptakes.

Table L-2. Values used in Uptake Calculations

Contaminant	Maximum Concentration, mg/kg	Plant Uptake Factor, unitless	Small Mammal Uptake Factor, unitless
Antimony	15.6	0.01[b]	0.002[c]
Arsenic	3.6	0.04[a]	0.002[c]
Barium	1320	0.001[b]	0.001[c]
Beryllium	1.3	0.43[a]	0.001[c]
Chromium	17.1	0.2[a]	0.0092[c]
Copper	58.6	0.3[a]	0.15[a]
Lead	482	0.008[a]	0.0004[c]
Nickel	174	0.09[a]	0.002[c]
Thallium	0.42	0.5[b]	0.02[a]
Vanadium	87.3	0.04[b]	0.0092[c]
Zinc	408	0.80[a]	1.1[a]
BEHP	24000	0.38[a]	5.5[a]
Beta-HCH	0.094	0.38[a]	15.6[a]
Chlordane	1.86	0.05[a]	5.5[a]
DDT	2.0	0.11[a]	5.7[a]
Heptachlor	0.065	0.02[a]	14.2[a]
PCB's	100	0.38[a]	5.5[a]

[a] Values from EPA 1986 mg/g tissue DW (mg/g soil DW)-1
[b] Values from Kabatus-Pendias and Pendias, mg/g tissue DW (mg/g soil DW)-1
[c] Values from Clement Assoc., 1988, d/kg

Table L-3. Results of Uptake Calculations

Contaminant	Plant Uptake mg/kg	Insect Uptake mg/kg	Small Mammal Uptake mg/kg	Swainson's Hawk Uptake Rate mg/kg-d	Long-Billed Curlew Uptake Rate mg/kg-d
Antimony	0.16	0.16	1.2E-6	1.6E-8	1.1E-3
Arsenic	0.14	0.14	1.1E-6	1.4E-8	0.00079
Barium	1.32	1.32	5.2E-6	6.2E-8	0.0072
Beryllium	0.56	0.56	2.2E-6	2.8E-8	0.0031
Chromium	3.42	3.42	1.2E-4	1.5E-6	0.019
Copper	17.6	17.6	2.5	0.032	0.096
Lead	3.85	3.85	6.0E-6	7.4E-8	0.021
Nickel	15.7	15.7	1.2E-4	1.6E-6	0.086
Thallium	0.21	0.21	4.2E-3	5.2E-5	0.0011
Vanadium	3.5	3.5	1.3E-4	1.5E-6	0.019
Zinc	326	326	360	4.4	1.8
BEHP	9100	9100	50000	0.12	1.0
Beta-HCH	0.035	0.035	0.56	0.0069	2.0E-4
Chlordane	0.093	0.093	0.51	1.3E-6	1.0E-5
DDT	0.22	0.22	1.3	0.015	0.0012
Heptachlor	0.0013	0.0013	0.018	4.4E-8	1.4E-7
PCB's	38	38	210	2.5	0.2

Small Mammals

Small mammals are assumed to reside entirely within the operable unit boundaries and consume only plants. Small mammal uptake was calculated as:

$$C_m = C_p \text{ X } UF_m$$

This equation was used where the unitless, dry weight uptake factors were available. If these values were unavailable, the following equation was used:

$$C_m = C_p \text{ X } UF_m \text{ X } IR_m$$

For this calculation, UF_m has units of d/kg and IRm was estimated from a mouse study to be 0.0039 kg/d (Clements Assoc., 1988).

Swainson's Hawk and Long-Billed Curlew

The average annual uptake rates for the swainson's hawk and long-billed curlew were calculated using the following equation (EPA, 1989):

$$\text{Uptake rate (mg/kg/d)} = \frac{(CB)(IR)(FI)(EF)(ED)}{(BW)(AT)}$$

Where:
- CB = concentration of contaminant in the food source, C_i or C_m (mg/kg)
- IR = ingestion rate (kg/d)
- FI = fraction ingested from the contaminant site
- EF = exposure frequency (d/yr)
- ED = exposure duration (yr)
- BW = body weight (kg)
- AT = averaging time (d)

For both birds, the FI is conservatively assumed to be 100 percent for the contaminants from HRL. Since the contaminants of potential concern at 1100-UN-6 cover a relatively small area, the FI for these contaminants was estimated to be the area of 1100-UN-6 divided by the bird's foraging range. The maximum territory size expected for a long-billed curlew at Hanford is 8 hectares (ha) (Allen, 1980). The average male swainson's hawk territory is 910 ha (9.1E + 6 m^3) (Fitzner, 1980). Since the area of UN-1100-6 is approximately 0.16 ha (1,600 m^3) the FI for the contaminants at this subunit for the long-billed curlew and swainson's hawk were calculated as 2 and 0.02 percent, respectively. The exposure duration and averaging time are both estimated to be the lifetime of the organisms. Given that the average weights of the swainson's hawk and long-billed curlew are approximately 0.5 and 1.0 kg, respectively (Terres, 1980), and assuming that birds weighing over 0.1 kg consume 20 percent of their body weight per day (Paustenbach, 1989), the respective IR's for the swainson's hawk and long-billed curlew are 100,000 and 200,000 mg

wet weight per day. Conservatively assuming that 80 percent of the birds' diet is water (Driver, 1990) the IR was calculated as 4 percent of body weight per day. IR for the swainson's hawk is, therefore, 0.020 kg/d and the IR for the long-billed curlew is 0.040 kg/d. Respectively, swainson's hawks and long-billed curlews spend approximately 5 months per year (Fitzner, 1980) and 2 months per year (Allen, 1980) in the area. The EF's are therefore 150 days per year for the swainson's hawk and 60 days per year for the long-billed curlew.

The following is an example calculation for the uptake rate of copper for the swainson's hawk:

C_s = 58.6 mg/kg
$C_p = UF_p \times C_s$ = 0.3 X 58.6 mg/kg = 17.6 mg/kg
$C_m = CB = UF_m \times C_p$ = 0.15 X 17.6 mg/kg = 2.6 mg/kg

Uptake Rate =

$$\frac{(2.6\ \text{mg/kg})(0.015\ \text{kg/d})(1)(150\ \text{d/yr})(*\text{yr})}{(0.5\ \text{kg})(*\text{d} \times 365)} = 0.032\ \text{mg/kg/d}$$

*Since the exposure duration and averaging time were taken as the same, only the units and conversion factor of 365 are given in this equation for these parameters.

3.2 TOXICITY ASSESSMENT

Intake rates for measurement endpoints were compared to toxicological values in table L-4. Values for birds were used whenever possible. When these were not available, values for small mammals were reported. The most conservative parameters were used where available (*e.g.*, NOAEL as opposed to LOAEL). For copper and PCB's, the most conservative dose value (TDLo) was reported. Limited information for beta-hexachlorocyclohexane (beta-HCH), was available and, therefore, the NOAEL for gamma-HCH, an isomer of HCH, was used instead.

4.0 RISK CHARACTERIZATION

The following sections qualitatively discuss risk characterization. Given the uncertainty in information available, it was not practical to perform risk calculations for this evaluation. Ecological risk was estimated by comparing exposure to the contaminant toxicity. Additionally, the uncertainties in calculations and the ecological implications of contamination were discussed.

Table L-4. Toxicological Values

Contaminant	Toxicity	Toxicity Parameter	Organism	Comments
Antimony	0.35 mg/kg bw/d	LOAEL	Rat	Chronic Oral
Arsenic	0.014 mg/kg/d	LOAEL	Human	Chronic Oral
Barium	0.21 mg/kg/d	NOAEL	Human	Chronic drinking
Beryllium	0.54 mg/kg bw/d	NOAEL	Rat	Chronic Oral
Chromium	2.4 mg/kg bw/d	NOAEL	Rat	1 year drinking
Copper	152 mg/kg	TDLo	Rat	Chronic Oral
Lead	4.3 mg/kg/d	LOAEL	Hawk	Subchronic Oral
Nickel	5 mg/kg/d	NOAEL	Rat	Chronic Oral
Thallium	0.7 mg/kg/d	LOAEL	Rat	Chronic Oral
Vanadium	0.89 mg/kg/d	NOAEL	Rat	Chronic Oral
Zinc	96 mg/kg/d	NOAEL	Mouse	Drinking water
BEHP	19 mg/kg bw/d	LOAEL	Guinea Pig	Chronic Oral
Beta-HCH	0.33 mg/kg/d	NOAEL	Rat	Subchronic Oral
Chlordane	0.055 mg/kg/day	NOEL	Rat	30 mo Oral
DDT	0.49 mg/kg/d	NOAEL	Hawk	Lifetime dosing
Heptachlor	0.15 mg/kg/day	NOEL	Rat	2-year Oral
PCB's	325 mg/kg	TDLo	Mammals	Subchronic Oral

LOAEL = Lowest Observed Adverse Effect Level
NOAEL = No Observed Adverse Effect Level
TDLo = Toxic Dose Low
NOEL = No Observed Effect Level

4.1 COMPARISON OF TOXICITY TO EXPOSURE

None of the uptake rates in table L-2 exceed the toxicologic values in table L-3. For the swainson's hawk uptake rates for zinc, BEHP, beta-HCH, DDT, and PCB were between 10 and 80 times lower than the corresponding toxicological value. Uptake rates for Copper, thallium and Chlordane were between 2,000 and 20,000 times lower, and the remaining uptake rates were more than 300,000 times below toxicological values. For the long-billed curlew, arsenic, barium, nickel, vanadium, zinc and BEHP had uptake rates 20 to 100 times less than toxicological values. The other contaminants were more than 100 times less than toxicological values.

4.2 UNCERTAINTY ANALYSIS

There are many sources of uncertainty in the exposure assessment and risk characterization for the ecological evaluation of 1100-EM-1. All information regarding the presence and behavior of species at the site, the exposure to contaminants, and toxicity of contaminants is estimated and extrapolated from information available from previous studies. Limited ecological data were taken from the site, therefore, the most conservative and simple models were used to determine the ecological impact. Thus, the exposure assessment represents the worst case scenario and the comparison of toxicity to exposure is highly conservative.

Since limited field observations were made, a search was performed to identify all terrestrial organisms expected to inhabit the Hanford site. Of these, organisms that seemed likely to exist at 1100-EM-1 were reported in table L-1. This list excluded organisms, such as amphibians, not likely to be found at 1100-EM-1. It is probable that many of the organisms listed in table L-1 do not actually inhabit the site, but they were addressed in order to ensure that important species were identified.

Stressor characteristics chosen for the site are also a source of uncertainty. COPC from the BISRA were used. This is expected to be a highly conservative assumption, since these contaminants were chosen by performing conservative risk-based screening that used exposure parameters for humans. The slope factors and reference doses used in these calculations are derived from animal studies (*e.g.*, NOAEL) that are usually modified by orders of magnitude. Offsite sources of stressors are not addressed for this assessment. Since organisms do not necessarily inhabit 1100 alone, they would be exposed to offsite contamination. It was not in the scope of this assessment to address these exposures. It is possible, however, that the contamination outside 1100 would probably be much more significant offsite than that identified at 1100-EM-1. In addition, this assessment did not address possible synergistic or indirect effects.

When selecting assessment endpoints, it is preferable to chose specific cases (such as reduced population size), however, with the lack of data regarding the effects of contaminants at the site on organisms known to inhabit the site, this was not possible. Therefore, adverse effects that generate the toxicological parameters (NOAEL, *etc.*) on

important species (*i.e.*, the ferruginous hawk and peregrine falcon) were considered assessment endpoints. It would be preferable to use effects on these species as measurement endpoints, but data for the analog species was more readily available.

The simplified exposure routes introduce uncertainty that may underestimate exposure. Only ingestion of contaminated food is addressed, where other sources of contamination, such as soil ingestion, would contribute to exposure. The use of uptake factors for plants, insects, and small mammals are also a source of uncertainty. These include the following examples: extrapolation of UF's for leafy vegetables to plants that insects and small mammals consume; extrapolating UF's for species such as cattle to UF's for small mammals; and using UF's for the uptake of dioxin by insects for all insect UF's. Wherever possible, the most appropriate values were used. For example, when available, UF's reported for rats were used as UF's for small mammals. All parameters for the exposure calculations were taken from previously conducted studies, or conservatively estimated values were used. For example, it was assumed that the hawk and curlew consumed 100 percent of their contaminated diet from the HRL. Additionally, the exposure duration and averaging time were conservatively estimated to be the lifetime of the organisms.

Toxicological parameters reported in table L-2 are a source of uncertainty. Only two values were derived from studies on hawks. Values for small mammals were chosen if values for birds were not available. There is probably little confidence in this extrapolation, however, the most conservative data available are presented. For example, NOAEL is used over LOAEL, and TDLo is used over LD50.

The conclusion that impacts to the ecology of the site would not be distinguishable from background is probably sound. Even though there are significant uncertainties in this assessment, there has been little evidence of ecological damage at the site, and most of the approximations made here are highly conservative.

4.3 ECOLOGICAL IMPLICATIONS

Using highly conservative assumptions and models, no uptake rates for the long-billed curlew or the swainson's hawk exceeded toxicity values, therefore, it is unlikely that contaminants of potential concern at 1100-EM-1 would have an impact on these birds that is distinguishable from background conditions. In addition, the annual reoccurrence of both migratory species suggests that they have a historically stable population. However, this evaluation is simplistic and far from conclusive.

Contaminants with uptake rates that were closest to toxicity values were zinc for the swainson's hawk and BEHP for the long-billed curlew, which were approximately 10 and 20 times less than toxicity values, respectively. If any adverse impacts on these organisms were to be suspected, zinc (HRL) or BEHP (UN-1100-6) toxicity would be most likely. However, as previously noted, the many assumptions used in this assessment are highly conservative.

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APPENDIX M

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

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APPENDIX M CONTENTS

TABLES

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1.0 ARAR OVERVIEW

In accordance with section 121 (d) of CERCLA and the Tri-Party Agreement, applicable or relevant and appropriate requirements under other laws (ARAR's) are used to establish final cleanup or operating standards that must be met by the remedial alternative(s) selected. In general, cleanup levels are set by reasonably applying standards from Federal, state, or public health laws. In the process of attaining these standards, remedial actions must also comply with ARAR's.

Applicable requirements are those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated by law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those standards identified by a state in a timely manner and that are more stringent than Federal requirements are applicable. "Applicability" implies that the remedial action or the circumstances at the site satisfy all of the jurisdictional prerequisites of a requirement (EPA, 1987).

Relevant and appropriate requirements are those standards that address problems or situations sufficiently similar to those encountered at a CERCLA site; their use is well suited to the site in question. To determine relevance a comparison must be made between the action, location, or chemicals covered by the requirement and those encountered or anticipated at the specific site. To be determined appropriate, further comparison is made to establish if the requirement is well suited to the nature of the substances, the characteristics of the site, the circumstances of the release, or the proposed remedial action. Only those requirements that are both relevant and appropriate must be complied with (EPA, 1987).

Other materials such as nonpromulgated advisories or guidance issued by various agencies that are not legally binding and do not have status as ARARs, are to be considered. These materials are to be used on an "as appropriate" basis, however, they do not carry the same weight as ARARs and cannot be considered as required cleanup standards.

2.0 TYPES OF ARAR'S

There are three types of ARAR's applicable to CERCLA response actions. A description of each follows:

Ambient or chemical specific requirements which specify health or risked based exposure limits or ranges for contaminants in various media. An example would be the Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCL's) or non-zero Maximum Contaminant Level Goals (MCLG's). Also, these could restrict the level of discharge of certain contaminants during remedial activities (*i.e.*, air emission standards). As is the case with all ARAR's, if a chemical has more than one applicable ARAR, the more stringent ARAR must be complied with.

Location specific ARAR's limit activities based on the sites siting or environmental characteristics. The Endangered Species Act is an example.

Action specific ARAR's regulate the activities related to the management, treatment, and disposal of hazardous substances at the site. The Resource Conservation and Recovery Act (RCRA) regulations would be an example of these.

Only substantive requirements such as effluent discharge standards must be complied with for on-site remedial actions and not administrative requirements such as permitting and administrative review. This allows the remedial action to proceed in an expeditious manner without potential delays, which may be encountered during a permitting or review process.

In certain instances compliance with an ARAR may be waived by the regulatory agencies. As specified in the current guidance, waivers may be granted only under the following situations:

- Cases in which compliance with an ARAR will result in a greater risk to human health and the environment than an alternative option.

- Cases in which compliance with an ARAR is technically impracticable from an engineering standpoint.

- Cases in which alternative treatment methods to those specified as ARAR's have been shown to result in equivalent standards of performance.

- With respect to a State standard, requirement, criteria, or limitation, the State has not consistently applied procedures to establish a standard, requirement or criteria or demonstrated the intention to consistently apply the standard, requirement, criteria, or limitation in similar circumstances for other remedial actions.

The TPA specifies that the lead regulatory agency (EPA) will prepare the final list and prepare the rationale for the selection of ARAR's as part of the Record of Decision. Until that time, the ARAR's included here shall only be considered as "potential" ARAR's. These ARAR's were first developed and presented in the Phase I and II FS (DOE/RL-90-32). They were based on the contaminants of concern in soils and groundwater, the site specific environmental concerns, and the proposed remedial actions identified in the Phase I and II FS. The ARAR's presented in this document consist of those ARAR's updated to incorporate comments from EPA and Ecology. New ARAR's have been added and others reevaluated to specifically address the contaminants of concern identified by the Phase II RI and the Baseline Industrial Site Risk Assessment (appendix K), and to address the specific remedial actions identified in the main body of this report. The resulting list is the potential ARAR's that are specific to the cleanup of the 1100-EM-1 Operable Unit. The rationale for the inclusion of these ARAR's in this report follows. A summary table is provided at the end of this discussion.

3.0 AMBIENT OR CHEMICAL SPECIFIC ARAR's

The ambient and chemical specific ARAR's identified in the following sections are based on the contaminants of concern, with respect to the risks to human health, identified for each operable subunit in appendix K. There are no contaminants of concern which pose unacceptable risks to other ecological receptors (appendix M). The contaminants of concern are:

Operable Subunit	Contaminant
UN-1100-6 (Discolored Soil Site)	BEHP
Ephemeral Pool	PCBs
HRL	PCB's
Groundwater	TCE Nitrate

Appendix K also identifies chromium as a contaminant of concern at the HRL due to risks associated with the fugitive dust pathway. However, a reevaluation of the chromium sampling results for near surface soils (from 0 to 2 feet) has shown that these risk are on the order of 10^{-7}; chromium has been dropped as a contaminant of concern. This is discussed further in section 4 of the main body of this report.

3.1 DRINKING WATER STANDARDS (40 CFR 141 and 143, WAC 246-290-310)

Drinking water standards must be attained for any present or potential sources of drinking water. The contaminants of concern identified in the groundwater risk assessment (appendix L) are TCE and nitrates. The primary MCL's for these contaminants are 5 μg/l for TCE and 10 mg/l for nitrates as nitrogen. MCLGs for TCE and nitrate as nitrogen are 0 μg/l and 10 mg/l respectively. Therefore, the MCL's are considered "relevant and appropriate" requirements.

In addition to these primary standards, secondary standards have been set to control the contaminants in drinking water that effect its aesthetic qualities. These standards are not enforceable, but are intended as guidelines, and they relate to the public acceptance of the drinking water. These standards are "to be considered," however, groundwater analyses to date have indicated that groundwater quality currently meets these secondary standards. Anticipated remedial actions will not degrade the current quality of the groundwater.

3.2 PROTECTION OF SURFACE WATERS (33 U.S.C. 1251, 40 CFR 116 and 117, WAC 173-201 and Quality Criteria for Water)

The ambient water quality of the Columbia River and the groundwater aquifer must be preserved to ensure the health and welfare of all aquatic plant and animal life, and to maintain the aesthetic and recreational value of the Columbia's shoreline and beaches. The Federal Water Pollution Control Act (Clean Water Act (CWA), 33 U.S.C. 1251) requires the EPA to publish and periodically update ambient water quality criteria. These values are published in the "Gold Book" (EPA 1986) and are intended to provide scientific data and guidance on the environmental effects of specific contaminants. These criteria are not regulatory cleanup levels; rather, they are used to derive regulatory requirements based on water quality impacts. However, Ecology has adopted this criteria (WAC 173-201) and for Class A waters (the Columbia) concentrations of contaminants shall be below those published in the "Gold Book." Releases of hazardous substances to groundwaters shall not directly or indirectly cause violations of surface water quality. The fresh water acute criteria for TCE is 45,000 μg/l, and the chronic criteria is 21,900 μg/l as published in the "Gold Book." No criteria exists for nitrate.

Hazardous substances are designated under the CWA (40 CFR 116) and the discharge of these contaminants to surface or groundwaters shall not exceed the reportable quantity (RQ) specified (40 CFR 117). For the 1100-EM-1 Operable Unit, the potential contaminants of concern designated as hazardous and the reportable discharge quantity of each are PCB's with a RQ of one pound, and TCE with an RQ of 100 pounds. These requirements are "applicable."

3.3 ACTION AND CLEANUP LEVELS (40 CFR 300.43, OSWER 9355.4-01, and WAC 173-340-745 MTCA)

The NCP provides general guidance for the establishment of acceptable exposure levels for the protection of human health and the environment. Cleanup requirements shall be based on applicable or relevant and appropriate requirements if available. In the absence of these, cleanup standards shall be based on the potential risks to receptors. For systemic toxicants, cleanup levels are set below the concentration that would adversely impact the human population over a lifetime, incorporating an adequate margin of safety. For carcinogens, cleanup levels are set below the concentration that represents an upper bound lifetime cancer risk of between 10^{-4} to 10^{-6}. The 10^{-6} risk level shall be used as the point of departure for determining remediation goals when ARAR's are not available or sufficiently protective. For ground and surface waters, contaminant cleanup should be at or below MCL's if the water is a source or potential source of drinking water. For soil, remediation would be consistent with plausible future land use. These rules are "applicable" to the remediation of contaminants at this site.

PCB's action levels are provided in OSWER Directives 9355.4-01. The action level for industrial sites should be in the range of 10 to 25 parts per million. The actual level chosen is dependent on the site specific exposure assumptions. This directive is guidance and is "to be considered."

Ecology's MTCA contains promulgated cleanup regulations that are "applicable" to the contaminants of concern at the site. Cleanup levels prescribed are based on the designated land use. Three basic methods are provided for the establishment of cleanup levels. They are:

- Method A--Method A tables have been established providing cleanup standards for several hazardous contaminants in various media. Cleanup levels shall attain these concentrations for listed contaminants, or meet established state and Federal requirements for those not listed. Use of Method A is allowed for cleanup of sites that have relatively few hazardous substances.

- Method B--Cleanup levels are established for all media of concern using applicable state and Federal laws or by using the risk equations specified in WAC 173-340-720 through 173-340-750. For individual carcinogens, the upper bound of the incremental cancer risk is set at one in one million; for noncarcinogens, cleanup levels are established at levels which are not anticipated to have adverse acute or chronic effects on human health or the environment. For sites with multiple contaminants, the total excess lifetime cancer risk for a site shall not exceed one in a hundred thousand and the hazard index for substances with similar noncarcinogenic toxic effects shall not exceed one.

- Method C--When cleanup to Method A or B standards is impossible to achieve or may cause greater environmental harm, or when the site is determined to be an industrial site meeting the criteria of WAC 173-340-745, the use of Method C is allowed. The upper bound of the estimated cancer risk is one in one hundred thousand for individual carcinogens under Method C cleanup levels. For individual noncarcinogens, cleanup levels are set at concentrations that are anticipated to have no acute or chronic toxic effects on human health or the environment. Cleanup levels shall not exceed applicable state or Federal requirements. As in Method B, the total excess lifetime cancer risk for all contaminants at the site shall not exceed one in one hundred thousand and the hazard index for substances with similar noncarcinogenic toxic effects shall not exceed one.

Under WAC 173-340-360 all cleanup actions shall comply with the above cleanup standards, shall comply with applicable state and Federal laws (other ARAR's), shall provide for compliance monitoring, and shall be protective of human health and the environment (meet the overall goals for site risk). Consideration is also given to additional factors in selecting cleanup actions (WAC 173-340-360 and 173-340-700(2)(a)). Application of these factors may in some instances result in the selection of MTCA cleanup actions that do not achieve the otherwise applicable cleanup standards. For example, although permanent solutions are to be selected to the maximum extent practicable, if achieving cleanup standards is not technically possible or if the incremental cost of the cleanup action is substantial and disproportionate to the incremental degree of protection it would achieve over a lower preference cleanup action, then permanent solutions achieving cleanup standards may not be

required. In that event, alternatives such as containment or institutional controls may be considered.

The current land use and long range-planning for the 1100-EM-1 (appendix J) is for an industrial type use. In addition, the current zoning and long-range planning by the City of Richland for property adjacent to the 1100-EM-1 is industrial and commercial in nature. WAC 173-340-745 sets forth criteria which can be used to determine if the site land use is industrial. These criteria and a discussion of how each is met by the 1100-EM-1 Operable Unit follows:

I) **The site is zoned or has been otherwise officially designated for industrial use.** The 1100-EM-1 Operable Unit lies within the eastern half of the 1100 Area, which is designated for heavy industrial use in the Benton County Comprehensive Land Use Plan. The western half of the 1100 Area falls within the city limits of Richland. The city of Richland zoning map shows this area as being zoned for heavy industrial use. *The Hanford Site Development Plan* (DOE/RL-92-20) designates the northern portion of the 1100 Area for research and development activities and the southern portion for operation support activities (both activities are consistent with industrial types of land use).

II) **The site is currently used for industrial purposes or has a history of use for industrial purposes.** Industrial facilities consist of central warehousing, vehicle maintenance, and transportation distribution in support of the Hanford Site operations. The contaminated sites of the 1100-EM-1 Operable Unit are associated with these activities.

III) **Adjacent properties are currently used or designated for use for industrial purposes.** Properties adjacent to the 1100-EM-1 Operable Unit are administered by the city of Richland and are currently used or reserved for medium or heavy industrial use. Areas to the east, adjacent to the Columbia River, are designated for heavy industrial use. To the north, the operable unit is bounded by other lands within the Hanford Site that are also designated for heavy industrial use.

IV) **The site is expected to be used for industrial purposes for the foreseeable future due to site zoning, statutory or regulatory restrictions, comprehensive plans, adjacent land use, and other relevant factors.** As stated in the Phase I RI, in conversations with county, city, and Hanford Site planning officials, they indicated that the current land use status of this area will remain unchanged as long as the Hanford Site exists. These conversations are summarized in the issue paper *Future Land Use Assumptions for the 1100-EM-1 Operable Unit* (Golder,1990). If control of the site is relinquished by the Government, land use in the vicinity of the Operable Unit would remain unchanged due to the presence of established commercial and industrial facilities that could be readily utilized by the private sector.

Additionally, several recently published planning documents confirm that the proposed future land use in and adjacent to the 1100 Area will be industrial. The *Hanford Site Development Plan* (DOE/RL-92-20) shows that the 1100 Area will be used for operational support to include warehousing, vehicle maintenance, and office operations. The *Hanford 300 Area Development Plan* (DOE/RL-91-09) shows that the area north of Horn Rapids Road and east of Stevens Drive, which is downgradient of HRL, will be used for industrial uses. This area will be the site of office facilities and the proposed Environmental Molecular Science Laboratory. Heavier industrial operations will occupy the northern 300 Area. Also, the 600 Area, which includes areas north of HRL, is designated for use by research and development facilities, which can be associated with light to medium industrial use.

V) **The clean up action provides for institutional controls implemented in accordance with WAC 173-340-440.** Both Ecology and DOE have institutional controls in place that protect against human exposure from the contaminated groundwater. Within the Hanford Works Boundary, access and development are closely controlled by DOE. Ecology controls exposure to the groundwater by means of water well permits.

Based on the five criteria above, the 1100-EM-1 Operable Unit is an industrial site. WAC 173-340-745(1)(c) states that "the department expects that only sites located within a limited number of large industrial areas will qualify for industrial soil cleanup levels." The operable unit is within the larger area known as the Tri-Cities Science and Technology Park, which is zoned for industrial use. All areas adjacent to the park are also currently zoned for industrial use. This land use is anticipated to continue as industrial with a high degree of certainty through the period of time required for the remediation of the groundwater or attenuation to MCL's, thereby allowing this operable unit to completely fulfill the industrial definition requirement.

Method C standards for soil cleanup of industrial sites are first considered. Additional requirements are that all practicable methods of remediation are used and that institutional controls be implemented in accordance with WAC 173-340-440. Practicability of technologies available for the remediation of the operable subunits are briefly summarized below. Detailed discussions of the practicability of processes and remedial alternatives are included in sections 6 through 8 of the main report.

- UN-1100-6 (Discolored Soil Site)--Soils at the Discolored Soil Site are easily accessed and can readily be excavated and treated without substantial risk to remediation workers. Treatment process options are available which can achieve BEHP destruction efficiencies of as high as 99.9999 percent. Cleanup to requirements more stringent than Method C is practicable and the Method B criteria is proposed as the ARAR for this operable subunit with the possibility of attaining clean closure.

- Ephemeral Pool--Technology process options to destroy or remove PCB's from contaminated soils are available with efficiencies as high as 99.9999

percent. Remedial work at the site should not pose a substantial risk to remediation workers and the contaminated soils can be easily accessed and processed. Cleanup to levels more stringent than Method C is practicable. Because the only subunit contaminant of concern is PCB's, the Method A criteria is proposed as the ARAR. Attaining clean closure is also a possibility at this site.

- HRL--As stated above technology is available for the efficient removal or destruction of PCB's. Remediation of the PCB's hot spot in the HRL will pose considerable risk to remediation workers and may pose increased risk to the environment. The migration of asbestos containing fugitive dust is the primary concern to on site workers. To prevent dust migration the site must be thoroughly wetted. The saturation of the soil horizon in this area may provide a potential migration pathway for vadose zone contaminants to the groundwater. Any active remedial measures taken at the HRL that would require excavation of soils will pose these risks. Cleanup to levels more stringent than Method C criteria is practicable but the associated risks to human health and the environment are also greater. Method C is proposed as the ARAR for the HRL.

Soil cleanup levels for the contaminants of concern are shown in table M-1. MTCA states that where there is a potential for migration of contaminants from soil to groundwater, these values must be at least as stringent as 100 times the groundwater cleanup level. Preliminary modeling of the vadose zone for the Phase II RI has shown that there is minimal recharge of the aquifer directly below the contaminated soil sites from precipitation. Therefore, there is adequate evidence to rule out this contaminant migration pathway and to base cleanup levels solely on the appropriate method for soil cleanup.

For groundwaters, cleanup levels must be set at safe drinking water levels unless it is shown that there is no current or potential use of the groundwater as a drinking water source. While it is very difficult to predict the long-term future use of the aquifer, it is not very likely that the groundwater will be used as a drinking water source in the near future (next 25 years) due to the site's current land use. To disqualify the groundwater as a drinking water source several MTCA criteria must be met. These criteria and a discussion of each as it pertains to the 1100-EM-1 Operable Unit are:

I) **The groundwater does not serve as a current source of drinking water.** The groundwater hydraulically downgradient, and within .5 miles upgradient of the HRL plume, does not currently serve as a drinking water source. Existing industrial facilities in the 1100 and 300 Areas obtain domestic water from the city of Richland water supply system. Existing domestic wells in the vicinity of these areas are used either for irrigation or for domestic heat pumps.

II) **The groundwater is not a potential source of drinking water.** Areas downgradient of the HRL plume are within the Hanford Site boundary and are strictly controlled by the DOE. Directly upgradient, the land falls within the city limits of Richland and is designated as in industrial area. Both the DOE and the city of

Richland have institutional controls in place that would restrict the installation of wells for the consumption of water. Additionally, these groundwaters are hard and not suited to industrial or domestic use. Because the city's distribution system serves this area, all water for domestic consumption is anticipated to be supplied by the city.

III) **The department determines that it is unlikely that hazardous substances will be transported from the contaminated groundwater to groundwater that is a current or potential future source of drinking water at concentrations that exceed groundwater quality criteria.** The only wells that are used as a drinking water source are those operated by the city of Richland at their well field. The well field is approximately 2.0 miles southeast of the HRL plume and hydraulically at the same gradient. The city uses the well field to filter Columbia River water, which is softer than the groundwater. The city uses a recharge/withdrawal ratio of approximately 2 or 3 to 1. This maintains a hydraulic gradient sloping away from the well field. This has been confirmed by monitoring the groundwater elevations throughout the Phase II RI investigation. It is inconceivable that the contaminants from the HRL plume could be transported to this area.

Groundwater cleanup to Method C standards is considered for this site. Under this method groundwater must be returned to its most beneficial use. While the short term use of this groundwater is nonexistent, the most beneficial use in the long term would be as a drinking water source. Cleanup concentrations shall be based on the most stringent requirement of applicable state or Federal law. Standards derived from the Method C equations are 39.8 μg/l for TCE and 56 mg/l for nitrate as nitrogen. These values are substantially higher than established SDWA MCL's and the MCL's will be used as the ARAR's for groundwater cleanup and are shown in table M-1.

Table M-1. Summary Of Cleanup Standards

Operable Subunit	Media	Contaminant	ARAR	Cleanup Standard
UN-1100-6	Soil	BEHP	MTCA B	71 mg/kg
Ephemeral Pool	Soil	PCB's	MTCA A	1 mg/kg
HRL	Soil	PCB's	MTCA C	17 mg/kg
HRL	Groundwater	TCE	SDWA MCL	5 μg/l
HRL	Groundwater	Nitrate	SDWA MCL	10 mg/l as N

For onsite groundwater remedies, WAC 173-340-720(6)(c) allows conditional points of compliance which shall be as close as practicable to the source of the hazardous substances, not to exceed the property boundary. At sites where the affected groundwater flows into nearby surface water, if certain treatment and water quality criteria are met, the cleanup level may be based on the protection of surface water. At such sites, the conditional

point of compliance may be where the groundwater flows into the surface water. Conditional points of compliance may be considered when applying MTCA cleanup standards.

3.4 DANGEROUS WASTE REGULATIONS (WAC 173-303)

Dangerous Wastes (DW) and Extremely Hazardous Wastes (EHW) are defined by WAC 173-303-081. A waste is hazardous if it is designated as such or if it exhibits the hazardous characteristics of reactivity, ignitability, corrosivity, or EP toxicity. These regulations also consider the toxicity, persistence and carcinogenicity of the waste. Contaminated soils on site which exhibit DW or EHW characteristics must be transported, treated, and disposed of in accordance with these "applicable" regulations.

Toxicity is determined by applying the formula given in WAC 173-303-101 and by utilizing the toxicity designations of WAC 173-303-9903 to develop an equivalent concentration. For the contaminants of concern in soils, only BEHP - toxic category not determined, is listed. For the discolored soil site BEHP at a concentration of 25,046 ppm gives an equivalent concentration of 0.0025 percent based on a toxic category D for BEHP. Based on this equivalent concentration, the contaminated soil would not be designated as either DW or EHW for toxicity.

The soil contaminants of concern have no persistent characteristics, but do have carcinogenic characteristics in that they contain BEHP and PCB's. Wastes with concentrations of carcinogenic contaminants in excess of 1 percent are classified as EHW. A DW designation is given to wastes containing carcinogenic contaminants in excess of 0.01 percent. For the discolored soil site BEHP is present in soil at a concentration of 2.5 percent, which gives a EHW designation. For the Ephemeral Pool and the Horn Rapids Landfill, maximum PCB's concentrations are 0.004 percent [42,225 parts per billion (ppb)] and 0.01 percent (100,000 ppb), respectively. Therefore, soils at these sites are not classified as either EHW or DW.

3.5 AIR QUALITY (40 CFR 50, 40 CFR 58, 40 CFR 61, WAC 173-400, WAC 173-403, WAC 173-434, WAC 173-470, WAC 173-474, WAC 173-475, and WAC 173-480)

The EPA, state of Washington, and Tri-City Air Pollution Control Authority have set air pollution standards for the Hanford Reservation. Through the use of best available technologies (BAT), these standards are technically feasible and reasonably attainable. General standards for maximum emissions are outlined in WAC 173-400 and 40 CFR 50. Air emissions generated from handling of soils and treatment actions are subject to these and other applicable regional air quality standards in order to control or prevent the emission of air contaminants. These standards are considered "applicable." Specific guidance are listed and referenced below.

(1) Sulfur Dioxide

1-hour average (not more than once/year)	0.4 ppm
1-hour twice per week	0.25 ppm
24-hour average	0.10 ppm
Annual average	0.02 ppm

Reference: WAC 173-474

(2) Nitrogen Dioxide

Annual arithmetic mean	100 $\mu g/m^3$

Reference: WAC 173-475

(3) Suspended Particulates

The annual mean concentration shall not exceed 60 $\mu g/m^3$. If the annual mean background concentration exceeds 20 $\mu g/m^3$ due to rural fugitive dust, the standard becomes 40 $\mu g/m^3$ plus the background concentration. Maximum 24-hour concentrations of 150 $\mu g/m^3$ of air are not to be exceeded more than once a year. If the background concentration exceeds 30 $\mu g/m^3$ due to rural fugitive dust, the standard becomes 120 $\mu g/m^3$ plus the background concentration.

Reference: WAC 173-470

(4) Carbon Monoxide

Average concentrations over 8 hours shall not exceed 10 mg/m^3 more than once a year. Further, a concentration of 40 mg/m^3 averaged over a 1-hour period shall not be exceeded more than once a year.

Reference: WAC 173-475

(5) Ozone

Maximum hourly concentrations shall not exceed 0.12 ppm (235 $\mu g/m^3$) hourly concentration on more than 1.0 days per calendar year.

Reference: WAC 173-475

(6) Radionuclides

The maximum accumulated dose due to air emissions shall not exceed 25 mrems/yr to the whole body or 75 mrems/yr to a critical organ of any member of the public.

Reference: WAC 173-480

"Relevant and appropriate" procedures for the implementation of these regulations are set forth in WAC 173-403. After construction of the facility, air quality shall be monitored and reported in accordance with "applicable" requirements of 40 CFR 58. Monitoring stations will be required to ensure that air quality is preserved. Monitoring will be required for all contaminants listed above.

Specific regulations pertaining to solid waste incineration facilities are contained in WAC 173-434. These define the emission standards for the design and operation of such facilities and are considered to be "relevant and appropriate."

Fugitive dust from HRL may contain asbestos and, therefore, is a threat to air quality. Standards for inactive waste disposal sites containing asbestos are provided in 40 CFR 61 and are "relevant and appropriate." Asbestos containing waste shall be covered with non-asbestos containing material and compacted. These sites shall be fenced and signed to deter public access.

4.0 LOCATION SPECIFIC ARAR's

4.1 THREATENED AND ENDANGERED SPECIES (50 CFR 17, WAC 232-12-011, and WAC 232-12-014)

The Hanford Reservation is known to be a nesting site for the swainson's hawk and the long-billed curlew, two bird species that are designated as sensitive by the Washington Department of Wildlife. Additionally, the Columbia River is in the migratory flyway of several species that are state or Federally listed including the bald eagle, American white pelican, falcon, Aleutian Canada goose, ferruginous hawk, and sandhill crane. These regulations are "to be considered" before remedial action is undertaken to ensure that the habitat of these species is preserved.

4.2 PRESERVATION OF CULTURAL AND HISTORIC ARTIFACTS (16 U.S.C. 469, 16 U.S.C. 461, 16 U.S.C. 470, Executive Order 11593)

Requirements are in place to recover and preserve artifacts, preserve historic sites, buildings or objects of national significance, and prohibit impacts to cultural resources that may be disturbed, harmed, lost, or destroyed during remedial actions. These "applicable" requirements must be considered prior to undertaking remedial actions.

4.3 FLOODPLAINS, WETLANDS AND SHORELINES (10 CFR 1022 and RCW 90.58)

Any remedial action with the potential to adversely impact natural wetlands, or which may cause adverse effects associated with indirect or direct development of floodplains or shorelines is restricted under these "applicable" requirements. Every effort must be made to avoid these potential impacts.

5.0 ACTION SPECIFIC ARAR's

5.1 WATER QUALITY (40 CFR 122, 40 CFR 131, 40 CFR 141.13, WAC 173-216)

Remedial actions requiring point source discharges to surface waters shall meet "applicable" state and federal standards for water quality. The National Pollution Discharge Elimination System (NPDES) Program (40 CFR 122) requires that a permit be acquired for facilities discharging to surface waters. Discharges shall meet the water quality standards of the body of water based on its use or uses. Water quality data and information on discharges will be reviewed by the state to identify toxic pollutants that may adversely affect the water quality and its designated use (40 CFR 131). Because the Hanford Site is a Federal facility, the NPDES permit will be administered by the EPA.

Point source discharges from remedial actions may effect the turbidity standards of the Columbia River. For cities using the Columbia River as a source of drinking water, the MCL for turbidity at the entry point is 1 turbidity unit (TU) as determined by a monthly average. If turbidity does not interfere with disinfection or the maintenance of disinfecting agents, or interfere with the microbiological determination, up to 5 TU's may be allowed. Effluent water quality must meet these "relevant and appropriate" turbidity standards.

The state regulates the discharge of waste materials from industrial and commercial operations not covered by the NPDES Program into ground and surface waters of the state (WAC 173-216). These "applicable" regulations are intended to set pretreatment requirements to comply with the CWA.

5.2 GROUNDWATER QUALITY (WAC 173-154, WAC 173-160, WAC 173-162 and WAC 173-218)

The groundwater aquifer underlying the 1100-EM-1 Operable Unit supplies wells for domestic, municipal, and industrial use. Municipal wells at the Richland Well Field , located east of the 1100 Area, draw water from the unconfined aquifer, which is recharged with water from the Columbia River, to supply the municipality with a total output capacity of 15,000 to 23,000 m^3/day (4.0 to 6.1 MGD)(DOE-RL 1990). The well field is currently used to supplement the city water supply during times of peak seasonal demand. WAC 173-154 establishes policies and procedures in regard to the protection of the occurrence and availability of groundwater within the upper aquifers or upper aquifer zones of a multiple

aquifer system. These regulations protect the aquifers from depletion, excessive water level declines or reductions in water quality, and are considered to be "relevant and appropriate."

Requirements for the operation of well drilling equipment and the construction of groundwater monitoring wells are set forth in WAC 173-160 and WAC 173-162. Wells shall be constructed in accordance with these regulations to prevent the degradation of the aquifer from current and future activities. When establishing a well in known or potential areas of contamination, procedures shall be in place to decontaminate the drilling equipment prior to and after drilling the well. Completed wells shall be protected and shall be tamper proof. Construction of the well shall be under the supervision of a Washington state licensed well driller. These requirements are considered "relevant and appropriate."

If the remedial alternative selected requires the reinjection of treated effluent into the aquifer, the effluent shall meet cleanup standards in order to preserve the aquifer for existing and future beneficial uses. Requirements for reinjection wells are provided in WAC 173-218 and are "applicable."

5.3 HAZARDOUS WASTE GENERATION (40 CFR 262)

Remedial actions having hazardous waste as a secondary waste stream shall meet the "applicable" standards for hazardous waste generators outlined in 40 CFR 262. The secondary waste stream must first be identified as hazardous or not. If the waste is hazardous, an EPA identification number must be obtained in order to store, treat, or dispose of the waste. Shipping records shall be kept for 3 years after the waste is transported offsite.

5.4 HAZARDOUS WASTE TRANSPORTATION (49 CFR Subchapter C, 40 CFR 263, and WAC 446-50)

Transportation of hazardous waste is regulated by the Federal government through 49 CFR, subchapter C, and by the state through WAC 446-50. These regulations prohibit the transportation of hazardous materials in commerce unless the material is properly classed, described, packaged, labeled, and in a suitable condition for handling and shipment. The EPA has adopted these requirements as part of RCRA (40 CFR 263) to protect human health and the environment. These transportation requirements are "applicable" if wastes are to be transported offsite.

5.5 GENERAL STORAGE AND TREATMENT OF HAZARDOUS WASTE (40 CFR 264, 42 U.S.C. 6901, and WAC 173-303)

A hazardous waste must be a analyzed and identified before an owner or operator of a storage, treatment, or disposal facility can handle it. If wastes are to be stored or disposed of as part of a remedial alternative these regulations would be "applicable." Owners of hazardous waste storage and treatment facilities must comply with RCRA (42 U.S.C. 6901) and 40 CFR 264 when handling these hazardous wastes. Ecology's dangerous waste

regulations (WAC 173-303) also apply to storers or treaters of hazardous waste. Dangerous or extremely hazardous waste (as previously identified) to be disposed of through incineration, land treatment, or in a landfill are covered by this "applicable" regulation.

5.6 TREATMENT OF WASTEWATER (WAC 173-240 and Richland City Ordinance 35-84)

Plans and specifications for groundwater treatment systems constructed as part of a remedial action that will discharge to surface or ground waters, or to a POTW, will be subject to the substantive requirements of state regulations (WAC 173-240) and shall comply with the submittal requirements of the TPA. These requirements are "relevant and appropriate." Additionally, if the wastewater from any remedial process is sent to the Richland sewage treatment plant for final disposal, it must meet the pretreatment standards set forth by City Ordinance 35 through 84. These standards should be considered "applicable" for treatment options requiring discharge to the POTW.

5.7 LAND TREATMENT (40 CFR 264.271)

If land treatment is selected as an alternative technology it must be demonstrated that the application of wastes containing the hazardous constituents can be treated. The treatment method must ensure that these constituents can be degraded, transformed, or immobilized within the treatment zone. The maximum depth of the treatment zone allowable is no more than 5 feet, and the zone must be at least 3 feet above the seasonal high water table in order to satisfy this "applicable" requirement.

5.8 LANDFILLING (40 CFR 264, 40 CFR 268 and WAC 173-304)

Remedial actions requiring the excavation of hazardous waste with ultimate disposal in an off site chemical waste landfill are subject to the "applicable" requirements of 40 CFR 264 and 268 under RCRA. Land disposal restrictions are in place for certain RCRA listed wastes. Contaminated soil and debris containing these listed wastes are subject to treatment standards prior to their disposal, although RCRA rules provide an opportunity for variances from the treatment standards (40 CFR 268.8 and OSWER Directive 9347.3-06FS). Of the contaminants of concern, a pretreatment standard of 28 mg/kg for BEHP must be attained prior to landfilling. Landfilling requirements for PCB's will be discussed later. Additionally, groundwater monitoring will be required under the "applicable" provisions of 40 CFR 264.90-109, which addresses the release of contaminants from solid waste management units.

"Applicable" requirements for the design, maintenance, and closure of solid waste handling facilities such as landfills are contained in WAC 173-304. If landfills are constructed on site for ultimate disposal of the contaminated soil and debris, these regulations would apply. Additionally, groundwater monitoring will be required under the "applicable"

provisions of 40 CFR 264.90-109, which address the release of contaminants from solid waste management units.

5.9 CLOSURE AND POST-CLOSURE (40 CFR 264.111, 40 CFR, 40 CFR 264.228, 40 CFR 264.258, 40 CFR 264.310, and WAC 173-304)

RCRA closure requirements for land disposal facilities will be triggered if the hazardous waste is consolidated and moved to an off site land disposal facility, or if the waste is excavated and removed from the operable unit, treated on site, and then redeposited. These closure requirements are set forth in 40 CFR 264.111 and 264.228 and are "applicable" to remediation alternatives requiring land disposal. Caps must be designed to provide long-term minimization of the infiltration of rainfall. Also, they must function with the minimum of maintenance, promote drainage, minimize abrasion or erosion of the cover, accommodate settling and subsidence, and have a permeability of less than 10^{-7} cm/sec.

Because of the arid climate of the Hanford Reservation, an alternate cap consisting of a geomembrane of at least 50 mil thickness is allowed under the "applicable" regulations of WAC 173-304. The geomembrane must be covered by a minimum of 6-inches of topsoil and seeded to dryland grass or other shallow rooted vegetation.

5.10 REQUIREMENTS FOR PCB'S (40 CFR 761)

"Applicable" requirements for the storage, treatment, and disposal of PCB's under the Toxic Substances Control Act are provided in 40 CFR 761. In general, concentrations of PCB's greater than 50 ppm present an unreasonable risk to human health and the environment for controlled access sites, while concentrations exceeding 25 ppm present unreasonable risk at uncontrolled access sites. Disposal of PCB's with concentrations from 50-500 ppm is allowed in chemical waste landfills or by incineration. For concentrations greater than 500 ppm, incineration is the only disposal alternative. Chemical waste landfills must meet specific requirements for soils, geomembranes, hydrologic conditions, flood protection, topography and monitoring systems as outlined in 40 CFR 761.75. Incinerators must meet the combustion and monitoring requirements of 40 CFR 761.70.

Regulations that cover the cleanup of PCB's spilled or leaked to the environment are "to be considered" and are found in 40 CFR 761.120. Items covered include the disposal of debris and materials used in the cleanup and the statistical sampling required to determine the completeness of the cleanup.

5.11 INCINERATION OF SOILS (40 CFR 264, Subpart O)

Incinerators used for the treatment of contaminated soil and debris are subject to the "applicable" requirements of 40 CFR 264, Subpart O. Contaminated waste feeds must be analyzed for characteristic RCRA wastes. Contaminated ash and residue must be properly disposed of. Destruction removal efficiencies for principal organic hazardous constituents

and for PCB's and dioxins shall be 99.99 percent and 99.9999 percent respectively. Emissions of hydrogen chloride (HCl) gases shall not exceed 1.0 kg/hr or 1 percent of the HCl in the stack gases prior to entering any pollution control device. Provisions for monitoring combustion temperature, waste feed rate, combustion gas, and carbon dioxide formation shall be in place. Particulate emissions are not to exceed 0.08 grains/dry standard cubic foot. For the incineration of PCB contaminated soils, incineration requirements shall comply with requirements in 40 CFR 761.

5.12 OPERATION OF FACILITIES (WAC 173-300)

WAC 173-300 sets forth requirements that are "applicable" to operators of landfills and incinerators. In general, operators must meet certain standards before they are certified to operate these facilities.

5.13 NONROUTINE RELEASES (40 CFR 302)

Any nonroutine release of hazardous substances in the process of a remedial investigation or action, shall be reported. Nonroutine releases are not to exceed CERCLA/SARA/Ecology release limits and could be derived from a spill or discharge via liquid effluent stream. Permits are based on DOE and EPA requirements that set Environmental Control Limits. These regulations are "relevant and appropriate" to activities that will take place at the site.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
1.0 Chemical Specific				
1.1 Drinking Water Standards				
1.1.1 Safe Drinking Water Act (SDWA) 42 U.S.C. 300 (f) 40 CFR part 141		x		Drinking water standards must be attained for any potential or future sources of drinking water. These sources must be protected against groundwater contamination from the 1100-EM-1 Operable Unit. Established maximum contaminant levels (MCL's) for the contaminants of concern are: TCE 5 µg/l nitrate (as N) 10 mg/l
1.1.2 40 CFR 143.3 Secondary Maximum Contaminant Levels for Drinking Water			x	National secondary drinking water standards are intended to control contaminants in drinking water that primarily effect the aesthetic qualities relating to the public acceptance of drinking water. The regulations are not federally enforceable, but are intended as guidelines for the state. Groundwater at the site currently meets these standards and remedial actions are not expected to degrade the quality of the groundwater.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
1.2 Protection of Surface Waters				
1.2.1 Clean Water Act (CWA) 33 U.S.C. 1251, and WAC 173-201		x		The ambient water quality of the Columbia River must be preserved for the protection of aquatic life. The Columbia is classified as a Class A water. The State has adopted the EPA's Federal Water Quality Criteria and concentrations of contaminants in Class A waters shall be below the following to prevent acute and chronic toxicity to freshwater organisms: Chemical — Acute Criteria — Chronic Criteria Nitrate (as N)[1] — -- — -- TCE — 45,000 µg/l — 21,900 µg/l [1] Nitrate-Nitrogen concentrations below 90 mg/l are reported to have no adverse impact on warm water fish.
1.2.2 40 CFR 116 and 40 CFR 117 Designation of Hazardous Substances	x			The following contaminants of concern are listed as hazardous substances: trichloroethylene (TCE), and polychlorinated biphenyls (PCB's). Discharge of these contaminants to surface or ground waters shall not exceed reportable quantities of 100 lbs for TCE, and 1 lb for PCB's.
1.3 Action and Cleanup Levels				
1.3.1 40 CFR 300.43 National Contingency Plan	x			Direction is given for basing cleanup levels on ARARs, or on potential risk in the absence of ARARs.
1.3.2 EPA Directive 9355.4 - FS 1990 A Guide on Remedial Actions at Superfund Sites With PCB Contamination			x	Recommended soil action levels for PCB's at an industrial site are from 10 to 25 mg/kg. The appropriate action level within the range will depend on site-specific factors affecting the exposure assumptions.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.
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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
1.3.3 WAC 173-340-745 Model Toxic Control Act (MTCA) Cleanup Regulations		x		Ecology's Model Toxic Control Act (MTCA) contains promulgated cleanup regulations for the contaminants of concern at the site. Three methods to determine cleanup are provided. Use of a specific method considers the specific contaminant, the presence of other contaminants, land use, the practicability of cleanup, and the risk to human health and the environment. These methods provide cleanup levels that reduce cancer risks to less than 1 in 100,000 for carcinogens, and will have no chronic or acute effects on human health or the environment. Contaminant migration to surface or groundwaters is not viable pathway and has not been considered when determining these levels. Groundwater cleanup will be to SDWA MCLs at a designated point of compliance. Cleanup levels for the contaminants of concern in their respective medias are: Media / Subunit / Contaminant / Cleanup Level / Method Soil / UN-1100-6 / BEHP / 71 mg/kg / MTCA B Ephemeral Pool / PCBs / 1 mg/kg / MTCA A HRL / PCBs / 17 mg/kg / MTCA C Ground Water / HRL / TCE / 5 µg/l / MCL Nitrates / 10 mg/l / MCL

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
1.4 Dangerous Waste Regulations				
1.4.1 WAC 173-303 Dangerous Waste Regulations	x			Hazardous wastes may be characterized as Dangerous Waste (DW) or Extremely Hazardous Waste (EHW). Additional characteristics based on persistence, carcinogenicity, mutagenicity, teratogenicity, the concentration of certain compounds, and toxicity is required. Contaminated soils on site which exhibit DW or EHW characteristics must be transported, treated, and disposed of in accordance with these regulations. For the discolored soil site, soils contaminated with BEHP are classified as EHW based on carcinogenicity. For the HRL, assuming a worst case in which all carcinogenic contaminants of concern are present, soils are given a DW designation.
1.5 Air Quality				
1.5.1 40 CFR 50 National Primary and Secondary Air Quality Standards WAC 173-400 General Regulations for Air Pollution Sources WAC 173-403 Implementation of Regulations for Air Contaminant Sources WAC 173-470 Ambient Air Quality Standards for Particulate Matter WAC 173-474 Ambient Air Quality Standards for Sulfur Oxide	x			EPA, State of Washington, and Tri-County Air Pollution Control Authority have set air pollution WAC standards at Hanford. These standards are technically feasible and reasonably attainable. Air emissions generated from handling of soils and treatment actions are subject to the applicable regional air quality standards in order to control or prevent the emission of air contaminants. (1) Sulfur dioxide 1-hr average: 0.4 ppm (not more than once a year) 1-hr twice per week 0.25 ppm 24-hr average: 0.1 ppm Annual average: 0.02 ppm Reference: WAC 173-474

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.
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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
1.5.1 (Continued) WAC 173-475 Ambient Air Quality Standards for Carbon Monoxide, Ozone and Nitrogen Dioxide WAC 173-480 Ambient Air Quality Standards and Emission Limits for Radionuclides WAC 173-490 Emission Standards and Controls for Sources Emitting Volatile Organic Compounds (VOC) Regional Air Quality Standards				(2) Nitrogen dioxide Annual arithmetic mean 100 $\mu g/m^3$ Reference: WAC 173-475 (3) Suspended Particulates Annual mean concentration shall not exceed 60 $\mu g/m^3$. If the annual mean background concentration exceeds 20 $\mu g/m^3$ due to rural fugitive dust, the standard becomes 40 $\mu g/m^3$ plus the background concentration. Maximum 24-hr concentrations of 150 $\mu g/m^3$ of air are not to be exceeded more than once a year. If the background concentration exceeds 30 $\mu g/m^3$ due to rural fugitive dust, the standard becomes 120 $\mu g/m^3$ plus the background concentration. Reference: WAC 173-470 (4) Carbon monoxide Average concentrations over 8 hours shall not exceed 10 mg/m^3 more than once a year. Further, a concentration of 40 mg/m^3 averaged over a 1-hour period shall not be exceeded more than once a year. Reference: WAC 173-475

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
1.5.1 (Continued)				(5) Ozone 0.12 ppm (235 $\mu g/m^3$) where the expected number of days with maximum hourly average concentrations above 0.12 ppm is equal to or less than 1. Reference: WAC 173-475 (6) Radionuclides Maximum accumulated dose due to air emissions shall not exceed 25 mrem/yr to the whole body or 75 mrem/yr to a critical organ of any member of the public.
1.5.2 40 CFR 58 Ambient Air Quality Surveillance	x			Surveillance of ambient air quality includes requirements for monitoring and reporting of data. An owner or operator of a proposed emission source that could affect air quality is required to operate a sampling station for purposes of prevention of significant deterioration. Monitoring is required for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, and particulate matter.
1.5.3 40 CFR 60 New Source Performance Standards (NSPS)		x		Emission standards for municipal incinerators are set for the following: (1) Sulphur dioxide and hydrogen chloride shall not exceed 50 ppm, corrected to 7% oxygen for an hourly average. (2) Total carbon monoxide, ozone, and nitrogen dioxide from combustion shall not exceed 100 ppm at stack exit, after volumes are corrected to 7% oxygen. (3) Particulate matter 0.23 gr/m^3 at standard condition (0.1 grain/dscf) or 0.46 gr/m^3 at standard condition (0.2 gr/dscf).

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
1.5.4 40 CFR 61 National Emission Standards for Hazardous Air Pollutants		x		Fugitive dust containing asbestos may pose a threat to air quality. Asbestos containing waste shall be covered with a non-asbestos containing material and compacted. These sites shall be fenced and signed to deter public access.
1.5.5 WAC 173-400 General Regulations for Air Pollution	x			This chapter implements RCW 70.94 of the Washington Clean Air Act and establishes standards that are technically feasible and reasonably attainable for air pollution sources.
1.5.6 WAC 173-403 Supplementation of Regulations for Air Contaminant Sources		x		This section states the policy of the Department of Ecology under the authority of RCW Chapter 43.21.A to provide control of air pollution, where needed, and to establish procedures for the implementation of air quality rules and regulations.
1.5.7 WAC 173-434 Solid Waste Incinerator Facilities		x		Emission standards for design and operation of solid waste incineration facilities are defined by this regulation.
2.0 Location Specific				
2.1 Threatened and Endangered Species				
2.1.1 WAC 232-12-011 Wildlife classified as protected wildlife			x	The Swainson's hawk and long-billed curlew are proposed by the Department of Wildlife as sensitive, but are not formally protected as an endangered or threatened species. They are federally-designated candidate species.
2.1.2 Endangered Species Act 50 CFR 17 WAC 232-12-014 Wildlife classified as endangered species			x	The bald eagle, American white pelican, falcon, Aleutian Canada goose, ferruginous hawk, and sandhill crane are federal- and/or state- listed species. They are common migrants along the Columbia River and modifications of their habitat should be avoided.
2.2 Preservation of Cultural and Historic Artifacts				
2.2.1 16 U.S.C. 469 Archaeological and Historic Preservation Act	x			In areas where activity may cause irreparable harm, loss, or destruction of significant artifacts, action must be taken to recover and preserve the artifacts.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
2.2.2 16 U.S.C. 461 Historic Sites, Buildings, and Antiquities Act	x			Historic sites, buildings, or objects of national significance must be preserved from undesirable impacts.
2.2.3 16 U.S.C. 470 et seq National Historic Preservation Act	x			Impacts to cultural resources are prohibited. In cases where impacts are unavoidable, appropriate mitigation shall occur.
2.2.4 Executive Order 11593 Protection and Enhancement of the Cultural Environment			x	Federal agencies are directed to preserve, restore, and maintain cultural resources.
2.3 Floodplains, Wetlands, and Shorelines				
2.3.1 10 CFR 1022 Floodplains/Wetlands Environmental Review			x	An evaluation of the potential adverse impacts of development within a floodplain or the destruction of wetlands must be made for remedial actions which may effect these areas.
2.3.2 RCW 90.58 Shoreline Management Act	x			Establishes requirements which restrict activities associated with development in floodplains, wetlands, or historical areas.
3.0 Action Specific				
3.1 Water Quality				
3.1.1 40 CFR 122 Discharge of Treated Effluent	x			Applicable federal and state standards for water quality must be complied with if use of best available technology requires point-source discharge to surface waters of the United States. An application for new discharge must be made 180 days before discharge actually begins. Because Hanford is a federal facility, the NPDES Program will be administered by the EPA.
3.1.2 40 CFR 131 Water Quality Standards	x			Water quality standards designate the use or uses to be made of the water, and enforcement criteria. Water quality data and information on discharges will be reviewed by the state to identify toxic pollutants that may adversely affect water quality and its designated use.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.1.3 40 CFR 141.13 Maximum Contaminant Levels for Turbidity		x		Treatment systems may discharge water into the Columbia River and affect turbidity standards. The MCL for turbidity in a water system used for drinking water, measured at the entry point, is 1 turbidity unit (TU) as determined by a monthly average. Up to five TU's may be allowed if higher turbidity does not: (1) interfere with disinfection; (2) prevent maintenance of the disinfectant agents; (3) interfere with microbiological determinations.
3.1.4 WAC 173-216-010 State Waste Discharge Permit Program	x			Implements RCW 90.48 water pollution control and RCW 90.52 Pollution Disclosure Act for the state permit program, applicable to the discharge of waste materials from industrial and commercial operations not covered under the NPDES Program into ground and surface waters of the state.
3.2 Groundwater Quality				
3.2.1 WAC 173-154-020 Protection of Upper Aquifer Zones		x		Policies and procedures are outlined for the protection of groundwater within the upper aquifers or upper aquifer zones where there are multiple aquifer systems. In the 1100-EM-1 Operable Unit, groundwater volumes are discharged to water supply wells used for domestic, municipal, and industrial purposes. Municipal wells at the Richland Well Field, located east of the 1100 Area, draw water from the unconfined aquifer for municipal supply with a total output capacity of 15,000 to 23,000 m^3/day (4.0 to 6.1 million gallons/day) (DOE-RL 1990). The well field is currently used to supplement the city water supply during times of peak seasonal demand.
3.2.2 WAC 173-160 and 162 Ground Water Protection		x		Requirements are established for monitoring of groundwater to prevent degradation from current and future activities, and monitoring of clean-up activity. Groundwater monitoring wells shall be constructed in accordance with WAC 173-160 and WAC 173-162. Groundwater monitoring wells shall be operated in accordance with WAC 173-162 and 173-160 for resource protection wells.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.2.3 WAC 173-218 Underground Injection Control Program	x			Groundwater may be used as a source of drinking water. Effluent from the treatment system should meet cleanup standards before being reinjected into the aquifer.
3.3 Hazardous Waste Generation				
3.3.1 40 CFR 262 Standards for Generators of Hazardous Waste	x			A generator who generates, treats, stores, or disposes of hazardous waste on-site must comply with the following sections: Section 262.11 Determine whether or not waste is hazardous; Section 262.12 Obtain an EPA identification number for the accumulation of hazardous waste; and Section 262.40 Record keeping. (c) and (d)
3.4 Hazardous Waste Transportation				
3.4.1 CFR, subchapter C Transportation of Hazardous Materials WAC 446-50 Transport of Hazardous Material	x x			No person may transport a hazardous material in commerce unless the material is properly classed, described, packaged, labeled and in condition for handling and shipment in accordance with 49 CFR subchapter C; Hazardous Materials Regulations: Part 171, General information Part 172, Hazardous materials tables and hazardous materials communications regulations Part 173, General requirements for shipments and packages Part 174, Carriage by rail Part 175, Carriage by vessel Part 177, Carriage by highway
3.4.2 40 CFR 263 Standards Applicable to Transporters of Hazardous Waste	x			EPA has adopted certain regulations from the Department of Transportation governing the transport of hazardous material. These regulations concern labeling, marking, placarding,record keeping, containers and reporting discharges. These regulations are adopted to protect human health and the environment.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.5 General Storage and Treatment of Hazardous Waste				
3.5.1 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities 42 U.S.C. 6901 Resource Conservation and Recovery Act	x			Hazardous waste must be analyzed before an owner or operator can treat, store, or dispose of it. Hazardous waste storage must be in compliance with RCRA under 40 CFR part 264, subpart I (Storage Containers), subpart J (Storage Tanks), subpart K (Surface Impoundments), and subpart L (Waste Piles).
3.5.2 WAC 173-303 Dangerous Waste Regulation	x			This regulation implements chapter 70.105 of the Revised Code of Washington (RCW) and regulates those solid wastes that are dangerous or extremely hazardous to the public health and environment. Dangerous or Extremely Hazardous waste to be disposed of through incineration, land treatment, or in a landfill is governed by these regulations.
3.6 Treatment of Wastewater				
3.6.1 WAC 173-240 Submission of Plans and Reports for Construction of Wastewater Facilities		x		Plans, reports, and specifications for wastewater treatment systems which discharge to POTW, surface or ground waters shall be submitted to Ecology for review under these regulations.
3.6.2 Richland City Ordinance 35-84 Publicly-Owned Treatment Works			x	Discharge of any liquid effluent to Richland's publicly owned treatment works must be in accordance with City Ordinance 35-84. Specific limits are set for chromium (1.41 mg/l) and nickel (0.31 mg/l). The contaminant of concern that is specifically banned is dieldrin. Limits on discharge are given to prevent damage to maintenance and operation of the facility.
3.7 Land Treatment				

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.7.1 40 CFR 264.271 Land Treatment	x			Prior to land treatment, the waste must be treated to best demonstrated available technology (BDAT) levels or meet no migration standard. Treatment must ensure that hazardous constituents are degraded, transformed or immobilized within the treatment zone. The maximum depth of the treatment zone is no more than 5 feet from the soil surface and 3 feet above the seasonal high water table.
3.8 Landfilling				
3.8.1 40 CFR 264.300-317 Landfills	x			Contaminated soil that is excavated and placed in a landfill is subject to land disposal restrictions if the soil contains RCRA hazardous waste.
3.8.2 40 CFR 268.44 Land Disposal Restrictions	x			BEHP will be subject to land disposal treatment standards if excavated material is moved to a new location and placed into a landfill, and if residue from a treatment option is to be land disposed. The contaminated material consists of soil and debris that contain these RCRA hazardous wastes. Pretreatment standards of 28 mg/kg BEHP must be met prior to land disposal. A variance to this treatment standard may be petitioned for under RCRA.
3.8.3 WAC 173-304 Minimum Functional Standards for Solid Waste Handling	x			This chapter implements RCW 70.95 regulations pertaining to solid waste handling facilities such as municipal landfills. Contains provisions for facility design, maintenance, and closure.
3.8.4 40 CFR 264.90-109 Releases from Solid Waste Management Units		x		Groundwater monitoring will be required if a new landfill is constructed to treat, store, or dispose of contaminated soils as part of a remedial action.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.9 Closure and Post-Closure				
3.9.1 40 CFR 264.111-120, 264.228 (D), 264.258 and 264.310 Closure and Post-Closure Care	x			Land disposal closure requirements under RCRA will apply if: (1) the waste at the contaminated site is consolidated and moved to another outside location for disposal; or (2) the waste is picked up from the unit and treated within the area of contamination, then redeposited into the unit. Closure of surface impoundment, waste pile, or landfill will require a cap or final cover designed to provide long-term minimization of the migration of liquids through the closure structure, function with minimum maintenance, promote drainage and minimize erosion or abrasion of the final cover, accommodate settling and subsidence, and have a permeability less than or equal to the permeability of a bottom-liner system or natural subsoils present. Specific restrictions are listed in subparts 264.228(a) surface impoundments, 264.258(b) waste piles and 310(a) landfills.
3.9.2 WAC 173-304 Minimum Functional Standards for Solid Waste Handling	x			This section provides for an alternate cap because of the arid climate of the Hanford Reservation. The cap shall consist of a geomembrane liner of at least 50-mil thickness covered by 6-inches of topsoil and seeded to dryland grass.
3.10 Requirements for PCB's				
3.10.1 40 CFR 761.30 PCB's Storage and Disposal 40 CFR 761.60 Alternative Technology to Incineration 40 CFR 761.70 Chemical Waste Landfill	x			Restrictions on the disposal of PCB's are established pursuant to section 6(e)(1) of Toxic Control Act. PCB concentration over 50 ppm presents an unreasonable risk of injury to health at controlled access sites and 25 ppm at uncontrolled access sites. PCB's at concentrations greater than 50 but less than 500 ppm must be disposed of in an incinerator or chemical waste landfill. Incinerators must comply with 40 CFR 761.70, and chemical waste landfills must comply with 761.75. PCB wastes containing greater than 500 ppm must be incinerated in accordance with the technical requirements in 40 CFR 761.70

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.

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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.10.2 40 CFR 761.75 Chemical Waste Landfills	x			A chemical landfill used for the disposal of PCB's must meet specific requirements for soils, synthetic membrane liners, hydrologic conditions, flood protection, topography, and monitoring systems.
3.10.3 40 CFR 761.120 Requirement for PCB Spill Cleanup			x	Regulations provide for the proper corrective actions for cleanup of all spilled or leaked PCB's.
3.11 Incineration of Soils				
3.11.1 40 CFR 264 Subpart O Incineration of Soils	x			Soils treated through incineration are subject to specific requirements: (1) analyze waste feed for RCRA hazardous waste; (2) dispose of all hazardous waste and residue; (3) achieve a destruction removal efficiency of 99.99% for each principal organic hazardous constituent and 99.9999% for PCB's and dioxins; (4) reduce hydrogen chloride (HCL) emissions to 1.0 kg/hr or 1% of the HCl in stack gases before entering any pollution control devise; (5) monitor combustion temperature, waste-feed rate, combustion gas and carbon dioxide; (6) keep particulate matter to no more than 0.08 grains/dry standard cubic foot; and (7) follow special performance standards for PCB's in 40 CFR 761.70.
3.12 Operation of Facilities				
3.12.1 WAC 173-300 Certification of Operators of Solid Waste Incinerator and Landfill Facilities		x		This regulation sets forth certification requirements for operators of landfills and incinerators.

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.
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ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.13 Non-Routine Releases				
3.13.1 40 CFR 302 EPA Designation, Reportable Quantities Notification Requirements for Hazardous Substances Under CERCLA		x		Environmental Control Limits (ECL's) requirements are based on permit limits as derived from DOE and EPA requirements. Any non-routine release of hazardous material must be reported. A release could be from a spill or discharge via liquid effluent stream. Non-routine releases are not to exceed CERCLA/SARA/Ecology release limits.

APPENDIX N

EVALUATION OF REMEDIAL PROCESS OPTIONS

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APPENDIX N CONTENTS

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1.0 GENERAL

Soil and groundwater remedial process options remaining after the initial screening discussed in paragraphs 7.4.1 and 7.4.2 of the main report are further evaluated here based on effectiveness, implementability and cost. Summaries of this evaluation are presented in paragraph 7.5 of the main report.

2.0 SOIL PROCESS OPTIONS EVALUATION

Remaining process options for the remediation of contaminated soils are evaluated in the following sections.

2.1 NO ACTION

This alternative is required under the National Contingency Plan and is retained for comparison with other alternatives. Under this alternative, the site soils will not be disturbed and groundwater monitoring of existing wells in the Horn Rapids Landfill (HRL) would be continued to determine if potential downward percolation of soil contaminants is affecting groundwater quality. Groundwater monitoring is considered an "institutional control."

This alternative would not be effective in reducing the short- and long-term risks to human health and the environment. Risks would remain the same as those identified in the baseline risk assessments. Implementation of the plan would be difficult because applicable or relevant and appropriate requirements would not be achieved thus creating resistance from both regulatory agencies and the public. The cost of this alternative would be low.

2.2 INSTITUTIONAL CONTROLS

Institutional controls are actions which protect human health and the environment and assure continued effectiveness of a response action. These actions would prevent exposure to contaminated soils for onsite workers and would ensure that the contaminants are not migrating offsite. Access restrictions and long-term monitoring are the institutional controls considered.

2.2.1 Access Restrictions

Access controls are measures that would restrict the access to or activity in the contaminated areas. Administrative controls such as land use zoning could be utilized to restrict the use of the land. Currently, the 1100-EM-1 Operable Unit is zoned for industrial use and this land use is anticipated to continue for at least the next 20 years (appendix J). Administrative controls are retained as an option for at least the near-term future.

Restrictions limiting land use could be attached to deeds if and when the Department of Energy (DOE) relinquished ownership of parts or all of the sites. Similarly, excavation restrictions would prevent future land owners from engaging in construction activities that would disturb the sites. These restrictions are usually not effective because they are difficult to enforce. Also, they are not implementable because it is the policy of the Federal government to dispose of only those properties which have unrestricted use. Therefore, each operable subunit must be fully remediated before it can be disposed of and the need for deed restrictions would be eliminated. For this reason, deed and excavation restrictions are not considered further.

Perimeter fencing at the sites would be effective in restricting public access and reducing the potential for exposure. Fencing is readily implementable with moderate capital and low operation and maintenance (O&M) costs. Fencing is a viable process option which may be used in combination with other alternatives and is retained for consideration.

2.2.2 Monitoring

Monitoring of groundwater may be required whether or not remedial actions are taken. This option is used in combination with all remedial alternatives for which contaminants remain onsite and is carried forward to be evaluated in the alternative selection process.

2.3 CONTAINMENT

Capping is the only containment option which is retained after initial screening. A final capping system is used to minimize the long-term migration of liquids (leaching potential) through the contaminated soil site and also to prevent direct contact with soils and emissions of fugitive dust.

The Resource Conservation and Recovery Act (RCRA) cap requirement (EPA, 1989) is a multi-layered system consisting of:

- A top layer of at least 60 cm (2 ft) of soil, either vegetated or armored at the surface;
- A granular or geosynthetic drainage layer with a hydraulic transmissivity of no less than $3x10^{-5}$ cm^2/sec (0.0209 gal/day. ft); and,
- A two-component low-permeability layer comprised of 1) a flexible membrane liner installed directly on 2) a compacted soil component with an hydraulic conductivity no greater than $1x10^{-7}$ cm/sec (0.003 ft/day).

The Washington Administrative Code (WAC) allows a municipal solid waste landfill (MSWLF) cap of reduced design for installations in arid regions such as Hanford [< 18 cm (7 inches) rainfall per year]. This cap would consist of:

- A top layer of at least 15 cm (6 inches) of soil;
- An impermeable layer consisting of a 50 mil thick geomembrane.

Installation of either cap would be effective in minimizing infiltration. The RCRA cap also provides a means for collecting water that was able to penetrate the cap. The potential for leaching of contaminants to the groundwater would be minimal for either option. However, the contaminants of concern at the UN-1100-6 [for bis (2-ethylhexyl) phthalate (BEHP)], Ephemeral Pool [for polychlorinated biphenyls (PCB's)] and the HRL (for PCB's) are insoluble and are tightly bound to the soil. Vadose zone modeling (section 6.0) has shown that there is minimal recharge at these sites to the groundwater aquifer and there is no potential for contaminant migration. This is confirmed by the fact that no soil contaminants of concern have been detected at elevated levels in groundwater at the site. Caps designed to limit infiltration are not a remedial action objective. Of these two caps, only the MSWLF cap is retained for further evaluation in the alternative selection process.

Reducing emission of fugitive dust containing asbestos from the HRL is a remedial action objective. For inactive disposal sites containing asbestos, minimum cap requirements are either:

(1) A compacted 15 cm (6-inch), non-asbestos-containing soil cover with an established and maintained vegetative cover;

(2) A compacted 60 cm (2-foot), non-asbestos-containing soil cover maintained to prevent exposure to asbestos-containing soil; or

(3) A compacted 15 cm (6-inch), non-asbestos-containing soil cover with an additional 3-inch layer of non-asbestos-containing crushed rock to prevent erosion.

All the above options would be effective in minimizing fugitive dust emission. Option (1) would not be implementable because of the desert environment. Options (2) and (3) are both implementable with the cost of each being comparable and moderate. To simplify future alternative evaluations, option (2) will be carried forward.

2.4 EXCAVATION/TREATMENT/DISPOSAL

The excavation/treatment/disposal general response action encompasses all process options to remediate the contaminated soil sites ex situ. These are discussed in the following sections.

2.4.1 Excavation

Excavation of soils for processing will be done using conventional earthmoving equipment (backhoes, front-end loaders, dump trucks). This method is effective and implementable. A key consideration will be the control of fugitive dust during these operations to prevent short-term risks to onsite remediation workers. Safety precautions, such as the use of respirators, protective clothing and the misting of soil for dust control, may be required. The cost of the operations may increase substantially based on the level of protection determined to be protective of human health. This option is retained for further consideration.

2.4.2 Thermal Treatment

Thermal treatment processes use high temperatures to thermally destroy organic contaminants. Four thermal process, three of which are incinerators, were retained after initial screening and are discussed further in the following paragraphs.

2.4.2.1 Incineration. Rotary kiln incinerators are slightly inclined, refractory-lined cylinders used for the controlled combustion of organic waste under net oxidizing conditions [Environmental Protection Agency (EPA), 1991, and EPA, 1990]. Wastes and auxiliary fuel are fed into the high end of the kiln and passed through the combustion zone by gravity. Turbulence is created by the rotation of the combustion chamber and improves burnout of the solids. Organics which may volatilize and reside in the gases are destroyed in a secondary combustion chamber. Residuals from this process include ash, flue gases, and brine solution from the ash quench, and wet scrubber.

Infrared processing systems use electrical resistance heating elements or indirect fuel-fired radiant U-tubes to generate thermal radiation beyond the red end of the visible spectrum (EPA, 1990 and EPA, 1991). Waste is fed into the combustion chamber by conveyor belt and exposed to the radiant heat. Exhaust gases are passed through a secondary combustion chamber. Residuals are the same as those for the rotary kiln incinerator.

Circulating fluidized bed incinerators use high air velocities to suspend and circulate fuel/waste particles in a refractory-lined combustion vessel (EPA, 1990 and EPA, 1991). Fluidized beds can be operated at lower temperatures than other incinerators because the increased turbulence aids combustion. Flue gas is separated from heavier particles in a solids separation cyclone. Limestone is used to capture acid gases, thus eliminating wet scrubbers and one of the residual process waste streams.

The effectiveness of each of these incinerators in destroying organic contaminants is demonstrated by removal efficiencies of greater than 99.9 percent (EPA, 1991). Based on the 95 percent upper tolerance limit concentrations of 18,000 mg/kg BEHP at UN-1100-6, 15 mg/kg PCB's at the Ephemeral Pool, and 38 mg/kg PCB's at the HRL, residual concentrations in incinerator ash would be 18, < 0.1, and < 0.1 mg/kg, respectively, for each operable subunit. These concentrations are well below the remedial action objectives.

Rotary kiln incineration is readily implementable. Soil feed size up to 12 inches in diameter can readily be handled (EPA, 1991). Size reduction would be required for both the fluidized bed and infrared units as they require waste feed material to be less than 2 inches in diameter (EPA, 1991). Soils at the operable subunits typically contain gravels greater than 2 inches in diameter. All processes being equally effective, only the rotary kiln incinerator is retained because it does not require special handling of feed soils. Because of the small volume of contaminated material onsite, a small mobile incineration unit is required. Units which process five tons per day are available at moderate mobilization and O&M costs.

Additional costs may be required for permitting, compliance monitoring and for the disposal of residuals. Also, the public tends to take a negative view of incineration and may not accept this process option. The process is carried forward to be incorporated into alternatives, however, because it is proven effective in destroying the organic contaminants of concern.

2.4.2.2 Vitrification. A Joule heated ceramic melter is used to vitrify soils at temperatures up to 1500° C (2700° F). Organic contaminants present in the feed stream are destroyed by pyrolysis and/or combustion at these high operating temperatures (PNL, 1988). Final system design can assure effective destruction of BEHP and PCB's in the soil. Any inorganic contaminants in soils from the HRL would be incorporated into the glass matrix of the final product and isolated from the environment upon final disposal.

Waste materials and glass frit are fed into a high-temperature furnace where the organics decompose and any residual oxides and ash material melt to form a glass product. The glass frit typically consists of silica, soda ash, and lime. Contaminated soils are fed either on top of or below the molten glass surface of the melter. Waste particles undergo pyrolysis and organics are thermally degraded. Off gases are readily burned in the plenum space or in a secondary combustion chamber. The molten mixture is discharged into disposal containers or quenched in water to produce a granular product for bulk disposal (PNL, 1988).

The process is not readily implementable because the technology is not yet mobile. Pacific Northwest Laboratories (PNL) had planned to construct a mobile unit that could process five tons of contaminated soils per day but the project was suspended (PNL, 1992). An engineering scale vitrification plant is planned in the 300 Area, which will process 250 kg/day. This system will be permitted to process up to 1,000 kg of waste from any source. This facility could possibly be used to process a small quantity of these contaminated soils as a demonstration of the effectiveness of the technology.

If a fixed vitrification plant were operating and readily available, the cost of treatment would be moderate. However, because the technology is not yet on-line, this process option is not considered further. Vitrification should be revisited in the design phase if the DOE decides to proceed with a site-wide vitrification plant for the treatment of hazardous waste.

2.4.3 Chemical Treatment--Dechlorination and stabilization/solidification were the chemical treatment processes retained after initial screening and are evaluated further here.

2.4.3.1 Dechlorination. Chemical dechlorination is the process by which hazardous chlorinated wastes are destroyed or detoxified by substitution of the contaminant chlorine atoms with other atoms (predominantly hydrogen). This process is potentially effective for the treatment of PCB's. Contaminated soils are heated and mixed with an alkali metal hydroxide-based polyethylene glycol reagent in a mobile batch reactor (EPA, 1991).

Soils are first processed by screening to remove the large rocks and debris in order to avoid jamming of the reactor mixer blades. Reagent is then mixed well with the soil in the reactor to obtain efficient treatment. The mixture is heated to between 100° and 180° C and reactions are carried out for 1 to 5 hours depending on the type, quantity, and concentration of the contaminants. The treated mixture is then processed in a separator where the reagent is removed and recycled (EPA, 1990).

Vaporized water resulting from the reaction is condensed and collected for further treatment or recycled through the washing process. Carbon filters are used to capture volatile organics that are not condensed. The treated soil is washed and neutralized by the addition of acid, dewatered, and then disposed of onsite if regulatory requirements are met.

A key process residual that may effect the overall cost of the treatment is the waste washwater. Typically, this residual contains only trace amounts of contaminants and reagents, and is expected to meet discharge standards that would allow it to be discharged to a publicly-owned treatment works. If the washwater does require treatment, typical methods are carbon adsorption, chemical oxidation, biodegradation and/or precipitation.

Field performance data suggests that dechlorination is effective in reducing PCB concentrations to below 2 parts per million (ppm) in treated soil (EPA, 1991 and EPA, 1990). Initial soil concentrations cited were much higher than the PCB concentrations at the 1100-EM-1 Operable Unit. It is expected that by adjusting batch mixing time, temperature, and reagent ratio, soils can be treated to below the 1 ppm level.

The process is readily implementable with a number of vendors able to provide treatment units. Costs are moderate in comparison to other technologies which treat PCB's (*i.e.*, incineration). However, information from one vendor suggests that these systems are cost effective only when at least 10,000 tons of soil are processed (Galson, 1992). Because of the limited amount of material to be processed at the site, dechlorination as an innovative and cost-effective technology is not carried forward in the evaluation process.

2.4.3.2 Stabilization/Solidification. Stabilization and solidification processes achieve one or more of the following results (EPA, 1986):

- Improve the handling and physical characteristics of the waste;
- Decrease the surface area of the waste mass across which transfer or loss of contaminants can occur; and/or,
- Limit the solubility of any hazardous constituents of the waste such as by pH adjustment or sorption phenomena.

Stabilization limits the solubility or mobility of the contaminants without necessarily changing the physical characteristic of the waste. The process usually involves the addition of a reagent that maintains the hazardous contaminant in its least mobile or toxic form.

Solidification produces a solid block of waste material with high structural integrity. The contaminants are mechanically locked in the solidified matrix. Migration of the contaminant is limited by the reduction of surface area exposed to the environment and/or by isolating the contaminants by microencapsulation.

Typically, portland cement and pozzolan materials (*e.g.*, fly ash) are blended with contaminated soils to produce a stronger waste/concrete composite. Contaminants are contained in the concrete matrix by microencapsulation. Other reagents are also used; however, most reagents have been found to be ineffective in immobilizing organic constituents (EPA, 1990). A 1988 evaluation of a proprietary reagent gave inconclusive evidence on its ability to immobilize PCB's (EPA, 1991).

While this process option is readily implementable at a moderate cost, its effectiveness in stabilizing the organic soil contaminants is questionable. The process is proven to be effective in immobilizing metals. Because leaching of contaminants to the groundwater aquifer at the HRL is not a pathway of concern at this site, stabilization/ solidification methods are not pursued further.

2.4.4 Physical Treatment

Physical treatment processes involve the separation of the contaminant from the soil. Three process options were retained after initial screening and each is evaluated further here.

2.4.4.1 Solvent Extraction. In this process, hazardous contaminants are extracted from soils using an organic solvent. A solvent, which preferentially removes organic contaminants, is mixed with contaminated media, and transfer of the contaminants from the media to the solvent phase occurs. A change in temperature or pressure is then used to separate the contaminant from the solvent. This process is one of waste reduction; contaminants are not destroyed but are concentrated in their liquid forms. This concentrate will require further treatment. Processed soils can be redeposited onsite if they meet regulatory criteria.

The process has demonstrated effectiveness in removing PCB's from sediments at an efficiency rate of between 84 to 98 percent (EPA, 1991). It should be noted that removal efficiencies increased with the increase in number of passes made through the reactor. It is reasonable to expect that 99 percent removal efficiencies can be achieved; however, the costs associated with this level of treatment will be comparatively high. The effectiveness of the process on BEHP removal is not proven, but the process is demonstrated to be effective on nonhalogenated semivolatile compounds.

The process is readily implementable with a number of vendors who are able to provide treatment units. Special material handling is required because units can only process materials 1/8 to 1 inch in diameter.

Because of the many passes required to increase removal efficiencies, the material handling considerations, and the requirement for post treatment of the extract, the cost of solvent extraction relative to other treatments for the small amount of contaminated soil is high. For these reasons, solvent extraction is not considered further.

2.4.4.2 Supercritical CO_2 Extraction. This extraction process uses supercritical carbon dioxide as the solvent to extract organic constituents from soils. The process operates at the critical temperature and pressure of carbon dioxide. At these conditions, carbon dioxide is at its critical density. The process is extractive and further treatment of the extract is required to destroy hazardous contaminants.

Near the critical point, the density of a supercritical fluid is typically 10^2 to 10^3 times greater than that of the gas at ambient temperatures. By increasing the density, the solvent strength of the supercritical fluid increases. Because carbon dioxide has a low critical temperature (31.1°C), extractions are performed at thermally mild conditions and the soil structure is not destroyed. Also, because carbon dioxide is a gas at room temperature, concentration of the extract is simplified.

Supercritical fluids have higher solute diffusivities than solvents used in conventional extraction techniques. Thus, removal efficiency is increased. This eliminates the multiple passes required in conventional systems.

The Westinghouse Hanford Corporation (WHC) has recently completed initial bench scale studies evaluating this process (WHC, 1992). In these studies, contaminated soils from the UN-1100-6 and from the HRL were used. Preliminary results indicate that BEHP can be extracted from the UN-1100-6 soil at efficiencies of about 97 percent. While this is not sufficient enough to remediate soils to meet Model Toxics Control Act levels, these results are encouraging. Further bench scale studies that alter either the pressure or temperature under which the reactions are carried out will be conducted to determine optimal removal efficiencies. Removal efficiencies for the HRL soils containing PCB's were greater than 99 percent.

Although this technology is not yet available on a full scale for soil remediation, it is carried forward to the next step in the process because it is an innovative technology.

2.4.4.3 Soil Washing. Soil washing is a volume reduction process used for pretreatment. The process is applicable to contaminants that are concentrated in the fine fraction of the soil (silt, clay, and soil organic matter) and to contaminants associated with the coarse soil fraction (sand and gravel), which are surficial. The goal of this separation process is to concentrate the contaminants in a smaller volume of material separate from a washed soil product. The washed product will meet cleanup standards and can be redeposited at the cleanup site.

Many of the unit processes are common to that of the mineral processing industry. Soils are first screened to remove the large debris (> 2 inches). Process steps can include mixing trommels, pug mills, vibrating screens, froth flotation cells, attrition scrubbing machines, hydrocyclones, screw classifiers, and various dewatering operations (Biotrol, 1992). The soils are mixed with washwaters to remove contaminants from the soil. Sometimes, organic solvents, chelating compounds, surfactants, acids, or bases are used to enhance the extraction of the contaminant from the soil. The soil and washwater are then separated, and the soil is rinsed with clean water resulting in a clean soil as a product. Suspended soil particles in the washwater are recovered as a sludge by discrete settling using gravity or by flocculation through the use of a polymer. This sludge consists of the fine fraction of the original soil and should contain most of the contaminants. The sludge is dewatered and then sent on for further treatment to destroy the contaminants. Processed washwater is usually recycled after biological or physical treatment.

The soil washing process has proven to be effective in reducing the volume of soils contaminated with PCB's. Although not directly cited in literature, its effectiveness for BEHP removal should be similar. Destruction of these contaminants would require additional treatment.

Soil washing would be readily implementable for the soils at the 1100-EM-1 sites. The technology is available from various vendors, and the process is seen as favorable by the public.

For sites with a small volume of contaminated soil, the costs of soil washing are high. One vendor reports that for sites with less than 10,000 tons of contaminated soils, the process is not cost effective (Biotrol, 1992). These high costs are only associated with volume reduction of the soils and do not take into account added costs for treatment and destruction of the contaminant. For these reasons, soil washing is deemed not to be cost effective at this site and is not carried forward for further consideration.

2.4.5 Disposal

Both onsite and offsite disposal options were retained after initial screening and are evaluated further in the following sections.

2.4.5.1 Onsite Disposal. Onsite disposal is considered for all soils treated by onsite process options. These soils will be subject to the RCRA Land Disposal Restrictions that require treatment of wastes to the best demonstrated available technology (BDAT) levels prior to land disposal. The ability to meet these requirements is dependent on the treatment process option chosen. In some instances, as in the use of innovative technologies, alternative treatment levels may be selected if a treatability variance establishing these levels is obtained.

The site remediation goal is to meet BDAT levels and redeposit treated soils at the respective subunits. The treated soils would then be capped with 2 feet of random fill material and regraded. This process is effective in handling treated soils and should not

increase risks to human health or the environment. It is easily implementable, has a relatively low cost, and will be considered for inclusion in the remedial action alternatives.

2.4.5.2 Offsite Disposal. The use of a Toxic Substance Control Act (TSCA)-approved disposal facility is considered for disposal of untreated PCB soils. Under TSCA, PCB-contaminated soils with concentrations up to 500 ppm may be disposed of in a licensed hazardous waste landfill.

This method is not effective in destroying the contaminant. PCB's are immobilized by containerization and the containers are deposited in the landfill. The landfill is built to specific requirements that prevent future migration of the contaminant. This disposal method is implementable with an approved facility within 180 miles of the site. The cost of this disposal option is moderate. This process option will be used in the development of alternatives.

2.5 IN-SITU TREATMENT

Stabilization/Solidification is the only in-situ process option retained after initial screening. This process is similar to the ex-situ process except that soil cutting and mixing blades are used to blend soils in situ while stabilizing agents are being injected. Soils to depths of 9 m (30 ft) can easily be stabilized. The process is proven for the immobilization of metal soil contaminants; its effectiveness on organic contaminants is not well documented and treatability studies would be required to determine its ability to immobilize PCB's and BEHP.

Deep soil mixing augers and pressurized slurry-injection systems specifically built for this type of work are readily available. This equipment is most effective where there are sandy, relatively dry soils. Buried debris and concrete rubble, as might be encountered at the HRL, significantly hamper the process and may make the use of this technology infeasible for this site. The cost of the process is moderate.

This process is not carried on for further consideration because it may not easily be implemented at the HRL and its effectiveness on organic contaminants is uncertain. Additionally, contaminant migration from the vadose zone to the groundwater has been dismissed as an operative pathway making further immobilization of the contaminants unwarranted.

2.6 BIOLOGICAL TREATMENT

Biological treatment refers to the use of microorganisms to decompose contaminants. This occurs under both aerobic conditions (in the presence of oxygen) and anaerobic conditions (devoid of oxygen), depending on the nature of the microbes. Sometimes decomposition is direct (the microbe consumes the contaminant as a source of carbon or other nutrient needed for growth) or the microbe may produce enzymes that catalyze a chemical change in the contaminant (cometabolism). The presence of existing microbes in

the soil, suited to the decomposition of the contaminant, is beneficial. Otherwise, the microbes that are needed can be genetically derived or isolated in the laboratory. Regardless of the microbial origin, treatability studies are conducted to be sure that the desired decomposition of the contaminant can be achieved without the production of hazardous byproducts.

In order to stimulate the growth of the decomposing organisms, air and nutrients (aerobic biodegradation) or methane and nutrients (anaerobic biodegradation), must be supplied. The quantities of these inducers are determined stoichiometrically.

Contaminated soil can be treated in place or excavated and treated at a remote location. In-situ treatment of contaminated soil promotes and accelerates the natural biodegradation process in the undisturbed soil. Generally, it consists of a water recirculation system with above-groundwater treatment and conditioning of the infiltration water with nutrients and an oxygen source. The system is usually designed to allow uncontaminated groundwater to enter the zone of contamination, but prevents groundwater from leaving the contaminated zone (EPA, October 1991).

Ex-situ biological treatment of contaminated soil includes three general technologies: 1) slurry phase, 2) land treatment, and 3) contained land solid phase. In the slurry phase, the soil is excavated, mixed with water, and slurried to the bioreactor where the biological conversion takes place. Once treated, the soil is dewatered and disposed.

Land treatment is also called land farming. Using this method, the soil is excavated and placed in a prepared, lined treatment bed. Using standard farm equipment, a large area can be treated.

Contained solid phase generally refers to above-ground composting of the soil with appropriate soil amendments to stimulate microbial decomposition of the contaminant.

There is some evidence that in-situ bioremediation of BEHP may be possible. Waste Stream Technology (WST) has reported that they have isolated a microbe that can obtain energy for growth from BEHP. WST has also reported that BEHP was among several contaminants biotreated in situ at the Pittsburgh Airport in Allegheny County, Pennsylvania. During construction of the Pittsburgh Airport expansion project, an abandoned garbage dump was discovered. BEHP was among the contaminants of concern at the site. The concentrations of BEHP were on the order of 1,000 to 2,000 mg/kg. After biotreatment, the concentrations of BEHP were below the target levels.

The potential effectiveness of biotreatment on the BEHP at this Pennsylvania site is unclear. There is reason to suggest that dilution by mixing, rather than biotreatment may explain the reduced concentrations in post treatment samples. The dump area was excavated and placed in a temporary stockpile where it was biologically treated. Since only isolated samples taken at the dump site contained concentrations of BEHP, it is possible that the BEHP was diluted during excavation, transport, and placement in the stockpile.

The fact that microbes have been isolated that utilize BEHP as their energy source is encouraging. A treatability study would be required to confirm that in-situ biotreatment of BEHP is feasible at the UN-1100-6 site. Bioremediation of BEHP is carried forward as an innovative technology.

Biodegradation of PCB's in both aerobic and anaerobic realms has been investigated. Positive results have been achieved in bench scale testing of the biotreatability of PCB's. In a series of studies, soil from New York State contaminated with Aroclor 1242 (similar to Aroclor 1248) was sampled for biodegradation testing. Resting cell studies using the contaminated soil have shown substantial PCB biodegradation (Unterman *et al.*, 1988). There has also been work on genetically engineered bacteria designed specifically for biodegradation of Aroclor 1242-contaminated soil. Unterman *et al.* have also isolated PCB-degrading bacteria.

Dechlorination of Aroclor 1242 under anaerobic conditions has been attempted. At a project on the upper Hudson River, New York, PCB- (Aroclor 1242) contaminated sediments were dechlorinated by microorganisms under anaerobic conditions in a bench scale test (ATTIC-RM00468, 1992). Dechlorination occurred primarily from the para and meta positions; congeners that were substituted only in the ortho positions were accumulated (ATTIC-RM00468, 1992). These dechlorination products are both less toxic and more readily degraded by aerobic bacteria (ATTIC-RM00468, 1992). Again, treatability studies would be required to confirm biodegradation of PCB's at the 1100 sites is possible.

Successful PCB degradation in field studies has not been documented in the literature surveyed. To date, degradation has only been demonstrated in bench scale studies where input variables were closely controlled. Although bioremediation of PCB's in the field is an emerging technology, it has not been demonstrated and its use is not considered further.

3.0 GROUNDWATER PROCESS OPTIONS

Groundwater process options remaining after initial screening are evaluated further in the following sections.

3.1 NO ACTION

Under this scenario, no remedial action would be taken on the HRL groundwater and contaminant levels would be naturally attenuated by dispersion, diffusion, and dilution. This alternative is required under the National Contingency Plan to establish a baseline condition to compare to other alternatives and will be considered in the development of alternatives.

Currently, there is no use of this groundwater as a drinking water source. Domestic water is supplied through the City of Richland distribution network. Therefore, there is no current risk to human health or the environment. This alternative still may not be acceptable to regulators or the public because contaminants are left in place and are not actively remediated.

3.2 INSTITUTIONAL CONTROLS

Institutional controls are actions that reduce the exposure of receptors to contaminated groundwater and that monitor the spread and level of contamination. Process options were retained after initial screening in the four technology types and are evaluated here.

3.2.1 Alternate Water Supplies and Point of Entry/Point of Use Treatment

For domestic consumption, alternate water supplies would be provided through the City of Richland's distribution network or by commercially supplied (bottled) water. The City's distribution network already serves the current industrial user in the area and can be readily accessed at low cost. It is the only alternate water supply that will be carried forward.

Point of entry/point of use treatment would be used by domestic consumers to purify water prior to ingestion. These systems would require maintenance and monitoring to ensure their effectiveness. Again, since the city's distribution network is available, these types of process options are not considered further.

3.2.2 Access Restrictions

Access restrictions are actions that would prevent consumption of the contaminated water until it is remediated. Administrative controls would consist of regulations that would require owners to abandon wells or prevent the use of these wells. These controls are usually difficult to implement. There are currently no domestic consumers downgradient of the contaminated plume and the need for these restrictions is nonexistent. Deed restrictions could be imposed that would prohibit development of wells by new owners, upon disposal of the land by DOE. If this land would come under private ownership, deed restrictions would be difficult to implement. Deed restrictions are not pursued further.

Future use and the development of new wells can be controlled by both DOE, who owns the land, and Ecology, through which water well permits must be attained. These administrative controls are easily implementable and should be used until the groundwater is remediated. The cost of this alternative is low.

3.2.3 Monitoring

Monitoring wells are valuable in identifying the extent, spread, and concentration of contaminants. Additionally, they are used to evaluate the effectiveness of the remedial activity. Installation of wells involves standard practices. Initial capital costs, O&M costs, and sampling and analytical costs are high when compared to other institutional controls. Monitoring is carried forward to the development of alternatives.

3.3 EXTRACTION/TREATMENT/DISCHARGE

This is the group of active remediation scenarios that would withdraw and treat contaminants prior to discharge. Extraction is by the use of a variety of wells and well configurations. Treatment includes physical, chemical, and biological processes. Also several discharge scenarios are evaluated.

3.3.1 Extraction

Deep well pumps have their impellers close enough to the water surface to avoid cavitation. The motor may be at ground level with a long shaft connecting it to the impellers, or it may be at the bottom of the well, below and directly adjacent to the impellers. These pumps efficiently move large volumes of water and are effective in aquifers with high hydraulic conductivities. Ejector well pumps are primarily used in aquifers with low hydraulic conductivity. They are designed to be operated intermittently and generally have lower efficiencies than deep well pumps. The HRL aquifer has a high hydraulic conductivity and the use of deep well pumps is most appropriate. This extraction method will be used for the development of alternatives.

Installation of well casing and pumps is readily implementable. Initial capital costs and O&M costs for a deep well pumping system are relatively low.

Enhanced extraction is the process where water is discharged to the aquifer in order to increase its hydraulic gradient and, thus, increase its capacity to flush contaminants. This procedure is most appropriately used where there is a known source area. The contaminants at HRL are widely dispersed and the benefits of this method would be minimal. Its use is not considered further.

3.3.2 Physical Treatment

Physical processes involve the separation of the contaminant from the groundwater. These processes exploit various physicochemical phenomena to remove the undesirable constituents. Five physical processes were retained following initial screening. Each is described and evaluated here. Viable physical processes are compared against each other in paragraph 2.3.2.6.

3.3.2.1 Adsorption. Organics that are refractory and that are difficult to remove by conventional biological treatment processes are frequently removed by adsorption onto an active solid surface. Activated carbon is the most widely used adsorbent in these processes (Eckenfelder, 1989).

The underlying principle of adsorption is the mass transfer of an organic molecule from a liquid onto a solid surface. Adsorption occurs because there are forces that attract the organics to the solid surface from solution. In the case of activated carbon, the porous structure of the carbon attracts and holds (adsorbs) the organic contaminant. The

contaminants are attracted either because: 1) they have a low solubility in the water; 2) they have a greater affinity for the carbon than for the water; or 3) a combination of the two (GII, 1991).

The carbon adsorption process usually consists of a series of columns that are packed with carbon. The contaminated water is passed through the vertical beds with either an upward or downward flow. The contaminants are most rapidly and effectively adsorbed by the carbon closest to the inlet of the bed. This carbon is in contact with the highest concentrations of the contaminated water. As treatment progresses, these carbon sites lose their adsorptive capacity and the adsorption zone progresses up or down the column. As this zone approaches the end of the carbon bed, effluent concentration approaches that of the influent. This is termed breakthrough. At this point the carbon bed is spent and no additional removal of the contaminant occurs. The carbon bed is then taken off line and the carbon is regenerated by thermal methods or replaced.

Carbon adsorption is demonstrated to reduce trichloroethene (TCE) concentrations in contaminated waters to below 1 μg/L. Systems to handle the range of flows anticipated for this site are available from several vendors. Initial capital costs and annual O&M costs are typically high for these systems when compared to other physical processes.

3.3.2.2 Air Stripping. Air stripping is the physical process of transferring a volatile organic contaminant (VOC) from water into the air. This is normally done by passing water through a packed column countercurrent to a flow of air. The packing is usually an open structured, chemically inert material (plastic) that is selected to provide high surface areas that facilitate mass transfer of the contaminant from the water to the gas phase. This process is affected by the contact area, the solubility of the contaminant, the diffusivity of the contaminant in air and water, and the temperature (Eckenfelder, 1989). Besides the diffusivity and temperature, these parameters are dependent on the air- and water-flow rates and the packing media selected. The efficiency of the process in removing a contaminant is directly related to the Henry's Law constant of the organic compound and the mass transfer coefficient of the packing.

TCE has a Henry's Law constant of 0.01 atm·m^3/gmole. Air stripping is usually applicable to contaminants with Henry's Law constants greater than 0.003 atm·m^3/gmole. Generally the greater the Henry's Law constant, the easier the contaminant is removed from the liquid phase.

Typically a process unit consists of a cylindrical tower containing packing which disrupts the flow of the liquid thus renewing the air and water interface. Water is pumped to the top of the unit and flows countercurrent to a forced draft provided by a blower. The system is characterized by high interfacial area compared to the volume of water in the column. Principal design parameters are the volumetric air flow ratio, the packing type, size and depth, column diameter, water and air loading rates, and the gas pressure drop.

One consideration with stripping towers is the emission of the stripped VOC's to the atmosphere. VOCs are designated air pollutants whose emissions are controlled. However,

because of the low concentration of TCE at the site, attaining air quality standards is not anticipated to be a problem.

Air stripping technology is readily available from multiple vendors. The process has been proven to remove TCE to below maximum contaminant levels (MCL's). The capital and O&M costs of a stripping system are moderate compared to other physical processes.

3.3.2.3 Steam Stripping. Steam stripping is generally used to increase the efficiency of a stripping process. Heating of the contaminated water raises the Henry's Law constant of the contaminant thus making it more strippable. TCE is readily stripped at temperatures of 20° C. Steam stripping is an energy intensive process that would not be of great benefit for use at this site. This process is not considered further.

3.3.2.4 Reverse Osmosis. Reverse osmosis (RO) is a membrane process in which hydrostatic pressure is used to drive the feedwater through a semipermeable membrane while a major portion of the contaminant remains behind and is discharged as waste (reject). The process has shown some promise in removing VOC's, however, removal efficiencies for TCE were found to be between 30 and 69 percent (Clark *et al.*, 1984). New membranes are being developed that may increase these removal efficiencies.

RO is also applicable to the removal of nitrates. The development of tin filmed composite spiral wound membranes have made this process cost effective. Additionally, the reject can be flash evaporated leaving behind a solid residual that can easily be handled and disposed. This has advantages over other nitrate removal processes that have treatment residuals that are costly to treat (Culligan, 1992). RO is retained for further consideration for these reasons.

3.3.2.5 Electrodialysis. Electrodialysis (ED) is a membrane process that is used to transfer ions from the contaminated water through the membrane, leaving behind a purified water. Use of ED for removal of organics is not documented in the literature; there is little documentation on its use solely for nitrate removal. ED processes remove nitrate-nitrogen at efficiencies of less than 50 percent (Sorg, 1978). Costs for ED processes are typically high compared to other nitrate removal options. ED is not considered further.

3.3.2.6 Comparison of Physical Processes for TCE Removal. The remaining physical processes are carbon adsorption and air stripping. Both processes have demonstrated high removal efficiencies from 90 to 99 percent. For the removal of TCE only, air stripping has proven to be far more economical over a wide range of influent concentrations and treatment flows (Clark *et al.*, 1984). As treatment flows increase, the difference in capital costs between the two processes gets larger because the carbon-adsorption system must operate under high pressures that require special pressure vessels for the carbon beds (Westates Carbon, 1992). While these systems provide equivalent treatment, air stripping is carried forward because of the economics.

3.3.3 Chemical Treatment

Four chemical treatment processes for the treatment of TCE or nitrates in groundwater were retained after initial screening and are evaluated in greater detail here.

3.3.3.1 Chemical Oxidation and Ultraviolet (UV) Radiation. In this process oxidants are added to contaminated groundwater to oxidize pollutants to terminal end products or to intermediate products that are more readily biodegradable or more readily removed by adsorption. Common oxidants used are chlorine, ozone, hydrogen peroxide, and potassium permanganate. Of these, only ozone and hydrogen peroxide are reported to oxidize refractory organic compounds. However, under normal conditions, complete degradation of these compounds does not occur; and, research has shown that using an additional energy source in conjunction with these oxidants (*i.e.*, UV radiation) readily decomposes these refractory compounds (Eckenfelder, 1989). It is believed that the UV activates the oxidant molecule and that it may also activate the organic substrate. The processes described below use UV in conjunction with either ozone or hydrogen peroxide or both.

Ozone is usually generated onsite from dry air or oxygen by a high-voltage electric discharge. Oxygen usually yields twice the ozone concentration (0.5 to 10 wt percent) as air. Ozone oxidation systems typically mix ozone with the contaminated water in a reaction chamber. At the same time, the mixture is exposed to UV radiation. Ozone off gases are treated in a catalytic ozone decomposer and released to the air. The terminal end products of this reaction are CO_2 and H_2O. Similarly, hydrogen peroxide is mixed with the contaminated water in a reactor and irradiated with UV light.

In a third oxidation process, ozone and hydrogen peroxide are added to the contaminated water in a reactor and the water is subjected to UV light. This process was demonstrated in the field in 1989 as part of the Superfund Innovative Technology Evaluation (SITE) program. Results from this demonstration showed that the process removed 98 to 99 percent of the TCE present in the influent groundwater (EPA, 1990). Some of the TCE removal was due to stripping (10 percent).

Of the three oxidation processes, the ozone, hydrogen peroxide and UV system will be considered further. The system is available at moderate capital cost. O&M for the system is high.

3.3.3.2 Irradiation. Irradiation as a means of chemically decomposing organic compounds has been found to require longer reaction times and by itself, has not been demonstrated with high efficiencies. Irradiation is not considered further.

3.3.3.3 Ion Exchange. Ion exchange systems are commonly used in municipal water treatment systems for the removal of nitrates. In this process, negatively charged nitrate anions are removed by an insoluble, strong base resin, which exchanges other like charged anions into the solution. This exchange occurs with no structural changes in the resin. The nitrates in solution rapidly diffuse into the network of the resin where exchange occurs. The exchanged ions proceed by the same path into solution. At some point an ion exchange equilibrium is reached and the resin must be regenerated (Benefield *et al.*, 1982).

Various operational modes of ion exchange systems exist. The fixed-bed system is the most common of these. The operating cycle for a fixed-bed system consists of four steps: service, backwash, regeneration, and rinse.

Fixed-bed systems for nitrate removal by strong base resins are operated in the upflow or downflow mode for service, and vice versa for regeneration. This is known as countercurrent operation. Typically for these systems the resin has a high affinity for the exchanged ion and requires a considerable excess of regenerant to regenerate the resin bed. The column typically experiences leakage at the start of the next service run (Benefield *et al.*, 1982).

Ion exchange systems are readily available from a number of water treatment equipment vendors and are an effective treatment method for nitrate removal. The operational requirements for handling the strong base regenerant (NaOH), and the column rinsate are great, which make the O&M costs for these systems high. Based on a comparative study for treatment of site groundwater for nitrate, reverse osmosis was determined to be the most economical method (Culligan, 1992). While both methods are equal in effectiveness, ion exchange is dropped from further consideration because of its higher cost.

3.3.5 Discharge

Three discharge alternatives were retained and are evaluated below.

3.3.5.1 Surface Water. Discharge to the Columbia River would entail the construction of a 1.61 km (1 mile) pipeline. Installation of a gravity-driven system would require extensive excavation. A pumped system would reduce excavation, but increase O&M costs. This system would have high initial capital costs when compared to other discharge systems and is not considered further.

3.3.5.2 Reuse/Recycle. After treatment, the water will meet MCL's and would be available for reuse or recycle. However, there currently is no demand for water and there is no expected future demand. Therefore, this discharge option is not pursued.

3.3.5.3 Recharge. Subsurface drains consist of perforated distribution pipes placed in a trench and surrounded by clean sand. Treated groundwater would by gravity fed or pumped to the pipes and the system would be sized to ensure that the flow out of each orifice would be equal to assure even distribution of the discharge. After being discharged, the effluent would percolate through site gravels and eventually would return to the aquifer. This system is readily implementable and very effective in homogenous aquifers with high permeability such as found at the site. The cost of this system is low compared to other discharge systems and is retained for consideration.

3.4 IN-SITU TREATMENT

Two physical in-situ treatments were retained after initial screening and are discussed below. In-situ biological methods are discussed in paragraph 3.5.

3.4.1 Aeration

In-situ aeration involves the pumping of air into the aquifer to induce the mass transfer of volatile organics to the gas phase. Typically this is done in vertical wells that are used as air strippers. Horizontal wells have been used to strip air in situ along a leaking pipeline. These systems can only treat limited areas of the plume (source or hot spots) efficiently. As the areal extent of the plume gets larger and the contaminant more dispersed, the number of wells required to effectively treat the area would be cost prohibitive. For these reasons this process option is not considered further.

3.4.2 Heating

In-situ heating would involve the injection of steam and air into the aquifer, again to induce the mass transfer of the organic contaminant into the gas phase. The principal here is that the contaminant is more readily strippable at higher temperatures. TCE is readily strippable without heating. This process option is dropped from consideration for the same reason as was in-situ aeration, which is that the areal extent of the plume is too great to economically employ this process.

3.5 BIOLOGICAL TREATMENT

Biological treatment refers to the use of microorganisms to decompose contaminants. This occurs both under aerobic conditions (in the presence of oxygen) and anaerobic or anoxic conditions (devoid of oxygen), depending on the nature of the microbes. Sometimes decomposition is direct, in that the microbe consumes the contaminant as a source of carbon, or other nutrient needed for growth. Or the microbe may produce enzymes that catalyze a chemical change in the contaminant (cometabolism). It is beneficial if the microbes needed for decomposition already exist in the aquifer (indigenous). Otherwise the microbes that are needed can be genetically derived or isolated in the laboratory. Regardless of the microbial origin, treatability studies are almost always conducted to be sure that the desired decomposition of the contaminant can be achieved without the production of hazardous byproducts.

In order to stimulate the growth of the decomposing organisms, air and nutrients (aerobic) or methane and nutrients (anaerobic), must be supplied. The quantities of these inducers are determined stoichiometrically. When biological treatment is conducted in situ, these materials are injected into the aquifer. A dilemma that is almost always faced in in-situ treatment is the potential for fouling the injection well. The microorganisms tend to flourish at the injection point resulting in clogged injectors and/or aquifer pores. Another problem

encountered is that the contaminant is forced away from the injection point, as the aquifer makes room for the injected materials.

Ex situ treatment requires that the aquifer be pumped, treated and then re-injected. Ex situ biological treatment is performed in a bioreactor. Similar to in-situ treatment, the inducers are injected into the reactor, which provides adequate mixing and detention time for decomposition of the contaminant to occur. Sludge is produced in the process. Consequently sludge handling facilities must be considered in the ex situ scenario.

In-situ biological treatment of TCE under aerobic conditions shows some promise. Research has determined that TCE can be completely mineralized to carbon dioxide, water, and chlorine in an aerobic environment. Aerobic processes require the presence of an inducing compound (an aromatic compound such as toluene or phenol), which may not be present. TCE is epoxidated by the enzyme methane monooxygenase, emitted by methylotrophic bacteria as they consume methane for energy (Russell *et al.*, 1992). Epoxidated TCE is very unstable, so hydrolization to various by-products is rapid (half life = 12 seconds in phosphate buffer with pH 7.7) (Miller and Guengerich, 1982).

One concern in an aerobic in-situ scenario is that the methane needed to stimulate the methylotrophs may be inhibitory to the TCE epoxidation (Russell *et al.*, 1992). Potentially, only a portion of the TCE would be epoxidated before being transported away in a flow situation.

Decomposition of TCE under anaerobic conditions is described as reductive dehalogenation. Under anaerobic conditions, TCE can function as an electron sink and is readily reduced by electrons (or reducing equivalents) formed as a result of the metabolism (oxidation) of the organic electron donors by members of the methanogenic consortia (Russell *et al.*, 1990/91). By introducing electron donors into the contaminated environment, TCE can be reduced. However, in the absence of adequate oxidizable organic compounds (*e.g.*, toluene), there is the potential to produce dichloroethylene and vinyl chloride (Bouwer and McCarty, 1983, and Bouwer *et al.*, 1981). Dichloroethylene is a suspected carcinogen and vinyl chloride is a known carcinogen. Therefore, if in-situ biological treatment in the anaerobic realm was selected, careful monitoring would be required to ensure that these compounds, particularly vinyl chloride are not produced.

Based on the discussion above, biologically treating TCE is not recommended at this time. Although evidence indicates that TCE can be biologically destroyed (cometabolized in an aerobic environment; reduced in an anaerobic environment), the practicality of providing the needed nutrients and inducers necessary for biological treatment in an in-situ environment is uncertain. Further, the inducers necessary for biological treatment, such as toluene or phenol in an aerobic environment, and toluene or acetone in an anaerobic environment, are themselves toxic. These organic contaminants are not present in the groundwater at this site, and injecting them for removal of TCE is not recommended. Also, in the anaerobic environment, there is potential to produce dichloroethylene and vinyl chloride as by-products (Russell *et al.*, 1990/91; Bouwer and McCarty, 1983; Bouwer *et al.*, 1981). As noted above, dichloroethylene is a suspected carcinogen and vinyl chloride is a known carcinogen.

Nitrate is reduced by a process known as denitrification. Denitrification is accomplished by facultative anaerobic microorganisms in an anoxic environment (Metcalf and Eddy, 1991). Denitrification is a two step process: 1) the conversion of nitrate to nitrite, and 2) production of nitric oxide, nitrous oxide and nitrogen gas. The last three compounds are gaseous compounds that can be released to the atmosphere.

An ex situ demonstration project at Hanford was performed to investigate denitrification of nitrates (Broun *et al.*, 1991). Both a continuous stirred-tank bioreactor and a fluidized bed bioreactor were used in the pilot scale test. Results of the study indicate that microorganisms native to the Hanford site are capable of reducing nitrates to below the drinking water standard when supplied with an electron donor such as acetate (Broun, *et al.*, 1991). In-situ denitrification is being investigated. A pilot scale study has been initiated at Hanford but no results have been reported to date.

The use of biological treatment for in-situ treatment of nitrates is still experimental. An organic inducer would be required to stimulate denitrification. Ex situ treatment has been investigated with positive results. Should the aquifer be treated ex situ, bioremediation of nitrate may be possible. A pilot test has been completed at Hanford using both continuous stirred tank and fluidized bed reactors (Broun *et al.*, 1991). Both reactors were able to reduce the influent nitrate concentration to below the drinking water standard (10 mg/L), with the fluidized bed reactor showing the best results. However, biological denitrification has several undesirable features. First, the process requires careful control to prevent bacterial and organic inducer breakthrough. Commonly the inducer itself is a hazardous chemical and even though low concentrations would be needed, system failure could result in the discharge of this substance to the environment. Secondly, the biological mass takes considerable time to develop and stabilize; system upsets in which this mass is lost would cause extended shutdowns of the system. For these reasons, biological nitrate removal is not considered further.

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APPENDIX O

INSTITUTIONAL CONTROLS ASSESSMENT

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APPENDIX O CONTENTS

TABLE

FIGURE

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1.0 INTRODUCTION

Controlling public access to and preventing development of hazardous waste sites are important institutional control issues. The types of controls that are appropriate for hazardous waste sites are commonly practiced at Hanford. Security at Hanford provides for the protection of Government property in accordance with Department of Energy (DOE) DOE Order 5632.6. Additionally, each site is closely investigated and reviewed prior to selection for development. In the event that DOE should release this property, Federal regulations require removal/cleanup of any remaining wastes or restrictions on the use of the land to avoid any Government liability associated with the wastes (41 CFR, 101-47-401-4, Federal Property Management Regulation).

In addition to the institutional controls at Hanford, the City of Richland has an ordinance (promulgated in 1985) that requires a permit for all wells. The City of Richland will not issue a permit for wells providing water for human consumption. The intent of this ordinance is to ensure that all human consumption of water within the city would be from the city's water supply system. This ordinance works to prevent human exposure to contaminated groundwater by requiring residents to utilize the city water system. There are no known contaminated groundwater plumes emanating from waste sites in the 1100-EM-1 Operable Unit which threaten residential areas. In the event that changes to the ownership and use of land in the 1100 Area occurred at some point in the future, city ordinances would play a part in institutional controls.

2.0 SECURITY AT HANFORD

Protection of DOE property in accordance with DOE Order 5632.6, requires a site security plan and includes provisions for access control, physical barriers, and intrusion detection. This order is not specific to hazardous waste sites, but many of the provisions can be adapted to the institutional controls needed for these sites. Fencing, posting of trespassing signs, and including the gate lock (and associated keys) in the security accountability system are performed in accordance with the security procedures at Hanford. Additionally, any unauthorized intrusion into DOE property protected by a fence exposes the trespasser to prosecution of a misdemeanor and may be subject to fines or imprisonment under Title 42, United States Code section 2278 (a) and Title 18, United States Code section 3571.

3.0 CONTROL OF SITE DEVELOPMENT

3.1 GENERAL

There are three control measures currently in place at Hanford that would preclude the inappropriate development of a hazardous waste site within the Hanford Reservation. These measures include the investigation and evaluation of a potential development site and the development of a Site Evaluation Report; a review of that report by the Site Selection Team; and the review of controlled maps showing the location of hazardous areas. These control measures are described in more detail in the following sections.

3.2 SITE EVALUATION REPORT

The DOE-RL Order 4320.2C, Site Selection Process for Hanford Facilities, requires that all land developments, disturbances, or improvements be evaluated. The existing process that implements this order is shown on figure O-1 and requires an investigation and report for each site. In the case of simple sites, an evaluation letter may be issued that would eliminate the full scale report requirement. The site evaluation format has been established and requires evaluation of safety concerns and utility provisions. This investigation and reporting process should preclude development of a site contaminated with hazardous wastes.

3.3 SITE SELECTION TEAM

Each site evaluation report or letter is reviewed by a multidisciplinary review board having a wide range of knowledge and expertise. This board reviews the adequacy of the investigation and the process of evaluating the site. The team members represent a cross section of organizations (see list of current board members in table O-1). The wide range of disciplines and backgrounds represented by the review board helps ensure that an adequate investigation of the site is conducted.

3.4 CONTROLLED MAPS OF HAZARDOUS AREAS

Maps of hazardous areas are maintained and held on record at the Westinghouse Hanford Company Design Engineering Services office. Records and maps are maintained in groups such as burial grounds, tank farms, grout facilities, buildings, *etc*. The burial ground maps are maintained as part of the Resource Conservation and Recovery Act (RCRA), Part A and Part B permits for the site, and any changes to or deletion of information on the maps is accomplished through a formal system of review and approval process controlled by the Waste Management office. Changes to these burial ground drawings require coordination with Ecology. It is possible that information on hazardous waste sites could be included on these drawings and any changes controlled through this existing system. If the hazardous waste sites are not included with the RCRA drawings, then the current system for controlling other drawings consists of restrictions on persons having authority to change drawings and an automatic system of recording and tracking any changes made to a drawing. Either of these systems would provide an easily accessible record showing the location of hazardous waste sites, thereby reducing the opportunity for constructing a facility in a hazardous waste area. Selected members of the Site Selection Team have access to the drawings and may receive automatic, weekly updates.

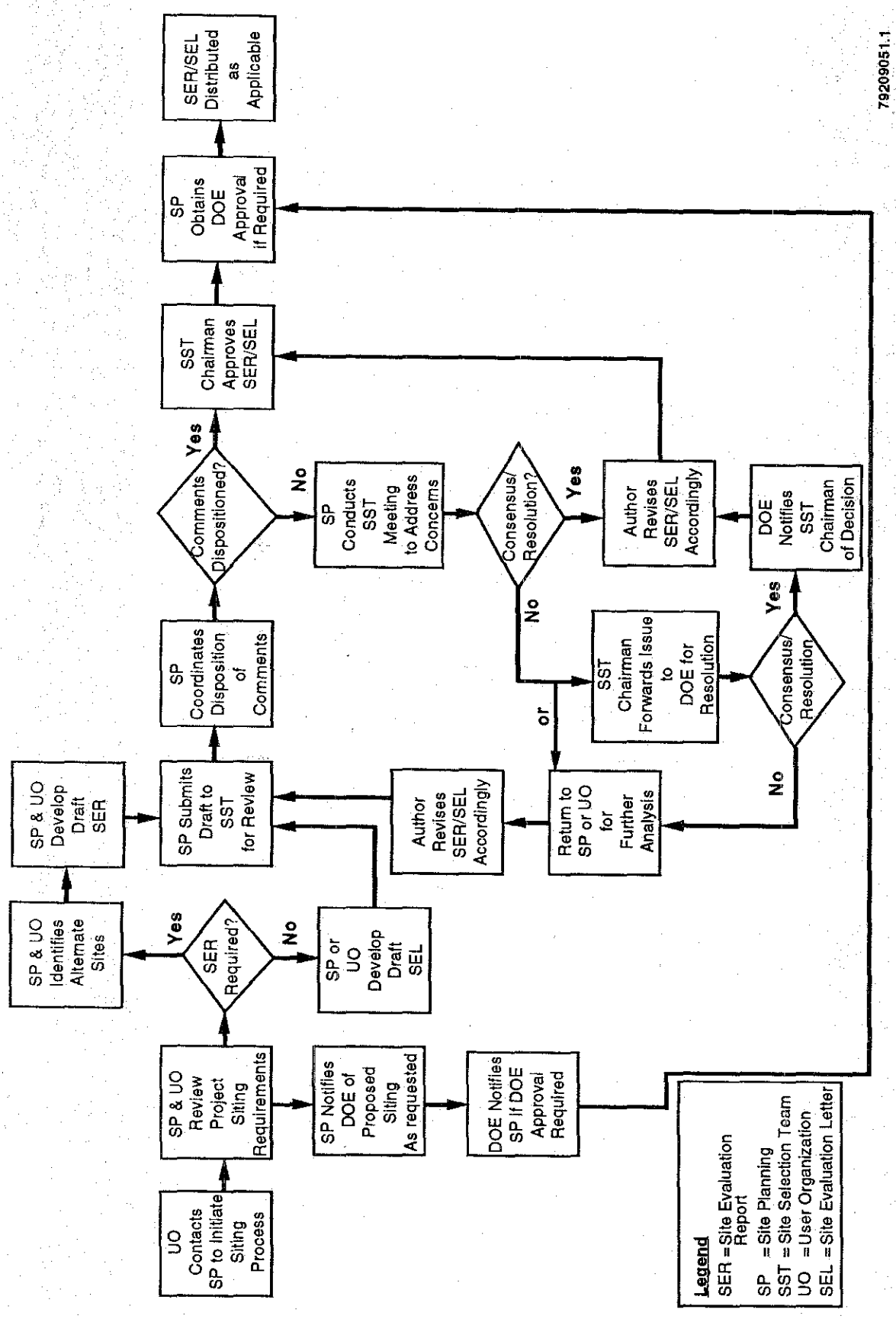

Figure 0-1. Site Development Review and Selection System

Table O-1. Hanford Facilities Site Selection Board Members List as of October 1992

NAME	ORGANIZATION
	Organizational Representatives
G. F. Brazil	Kaiser Engineers Hanford
T. W. Campbell	Operations Support Services (OSS) (Safeguards and Security)
G. L. Crawford	Tank Waste Remediation
J. J. Dorian	Environment, Safety, Health & QA (Environmental - Assurance, Waste Tank, System & Audit Integration)
T. E. Gates	Engineered Applications
J. C. Hail	Battelle
W. F. Heine	Restoration and Remediation
C. M. Kronvall	Facility Operations
R. D. Lichfield	Environment, Safety, Health & QA (Fire Protection Program)
R. C. Roos	Restoration & Remediation
H. H. Yoshikawa	Resource Planning & Program Integration
	Infrastructure Representatives
F. R. Buck	Boeing Computer Services Richland/Information Resource Management - Telecommunications
J. M. Hache	WHC/OSS - Electrical Utilities
F. D. Howald	WHC/OSS - Fire Department
D. A. Rohl	WHC/OSS - Water Utilities
J. S. Stair	WHC/OSS - Sanitary Sewer Systems
G. L. Wiggins	WHC/OSS - Roads and Transportation

Note: Positions on the Team frequently change. The list above serves as an example of the type of persons and positions on the Team.

4.0 CITY OF RICHLAND WATER WELL CONTROL

4.1 GENERAL

The City of Richland's institutional control of the water supply system has limited applicability in the evaluation of the 1100-EM-1 Operable Unit because no 1100-EM-1 waste sites are located upgradient of residential areas. Only if DOE surplused portions of the 1100-EM-1 Operable Unit containing wastes, and if residences were then constructed (in an industrial-zoned area) downgradient of the wastes, would the city's control of the water supply system become important.

4.2 EFFECTIVENESS OF CITY CONTROLS

The intent of the city of Richland's water well permit system is to require all residents to connect to the city water supply system for human consumption of water. During the Phase II Remedial Investigation, a survey was conducted (WHC, 1991) to determine the number of private wells and how the water from these wells was utilized. Of a potential 42 residential wells that are suspected to exist in the North Richland area, 16 wells were not permitted [2 of the wells were abandoned or unused and 14 were installed prior to 1985 (promulgation of city ordinance)]. Of these wells, no more than four may be used for domestic purposes. This indicates that, currently, there is little exposure to the natural groundwater and that the city's well permit system provides an additional safeguard against exposure to groundwater contamination.

5.0 EFFECTIVENESS OF INSTITUTIONAL CONTROLS

The current controls in place at Hanford should effectively prevent human exposure in the event that contaminants remain in place at hazardous waste sites. Access control to the waste sites can be accomplished in accordance with the available security procedures at Hanford. As an added safety factor, the City of Richland ordinance requires wells to be permitted. The city's control of the groundwater is an additional safety measure that can be considered if property ownership and land use changes radically in the future.

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APPENDIX P

ALTERNATIVE COST ESTIMATES

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APPENDIX P CONTENTS

Alternative cost estimates for:

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EPHEMERAL POOL
OFFSITE DISPOSAL

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HANFORD: REMEDIATION
1.4.10.1.1.23.01.2
1100-EM-1 OPERABLE UNIT
EPHEMERAL POOL
OFF-SITE DISPOSAL

Designed By: CENPW-EN-EE
Estimated By: NPW COST ENGR

Prepared By: NPW COST ENGINEERING BRANCH
LARRY CHENEY, CHIEF, COST ENGR

Date: 10/13/92

HANFORD: 1.4.10.1.1.23.01.2 1100-EM-1 OU Baseline Estimate

This is the structure for the Subproject and Operable Unit remediation cost estimates. The Work Breakdown Structure (WBS) is based on the DOE-HQ WBS and a site specific remediation WBS being developed for Hanford.

"1.4.10.1.1" DOE, Richland Operations, Hanford Environmental Restoration, Remedial Action

".23" is the Subproject (ie. 1100-EM)

".01" is the Operable Unit

".2" is Remediation

In this MCACES estimate project breakdown, the first level, "06", represent Remedial Action. The numbers for the next three levels (2nd thru 4th) are from the Hanford Remedial Action WBS. The fifth thru seventh levels are user defined, the fifth level being used for "Bid Items".

The Price Level for the estimate dollars is 1 Oct 93. See Contingency Notes for explanation of Contingency percentages. S & A is estimated at 15%. See Detail notes (pg. 1) for explanation of overhead percentages used.

This estimate covers the Off-site Disposal alternative for the PCB soils in the Ephemeral Pool area. Assuming off-site disposal will be at the Arlington, OR, site.

1. Contingency is based on uncertainty of amount of time required to do the work represented in the estimate,etc.

2. Contingency is based on the uncertainty of the quantites presented.

3. Contingency based on the unit costs obatained by Vendor and therefore may be different by the time work will actually be accomplished.

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SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

DETAILED ESTIMATE DETAIL PAGE

BACKUP REPORTS BACKUP PAGE

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U.S. Army Corps of Engineers
PROJECT EPHOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, EPHEMERAL POOL OFF-SITE DISPOSAL
** PROJECT OWNER SUMMARY - LEVEL 5 (Rounded to 10's) **

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06	REMEDIAL ACTION							
06 01	MOBILIZATION AND PREPATORY WORK							
06 01 01	MOB OF EQUIPMENT & PERSONNEL							
06 01 01 1	TRANSPORTATION							
06 01 01 1 01-	Ph I, Equip Mob, Detailed List		2,710	410	620	3,730		
06 01 01 1 02-	Ph II, Equip Mob, Detailed List		2,710	410	620	3,730		
	TRANSPORTATION		5,410	810	1,240	7,470		
	MOB OF EQUIPMENT & PERSONNEL		5,410	810	1,240	7,470		
06 01 03	SETUP/CONSTRUCT TEMP FACILITIES							
06 01 03 01	TRAILERS AND BUILDINGS							
06 01 03 01 01	Ph I, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
06 01 03 01 02	Ph II, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
	TRAILERS AND BUILDINGS		7,580	1,140	1,740	10,460		
06 01 03 02	DECONTAMINATION FACILITIES							
06 01 03 02 03	Ph I, Trailers - assbly/setup	120.00 HR	4,550	680	1,050	6,270	52.28	
06 01 03 02 04	Ph II, Trailers - assbly/setup	120.00 HR	4,550	680	1,050	6,270	52.28	
	DECONTAMINATION FACILITIES		9,090	1,360	2,090	12,550		
	SETUP/CONSTRUCT TEMP FACILITIES		16,670	2,500	3,830	23,000		
	MOBILIZATION AND PREPATORY WORK		22,080	3,310	5,080	30,470		
06 02	MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 06	SAMPLING SOIL, SED & SOLID WASTE							
06 02 06 01	SURFACE SOIL							
06 02 06 01 01	PHASE I, Soil Sample	60.00 EA	43,470	6,520	10,000	59,980	999.74	
06 02 06 01 02	PHASE II, Soil Sample	60.00 EA	53,440	8,020	12,290	73,740	1229.03	
	SURFACE SOIL		96,900	14,540	22,290	133,730		
	SAMPLING SOIL, SED & SOLID WASTE		96,900	14,540	22,290	133,730		

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	MONITOR, SAMPLE, TEST, ANALYSIS		96,900	14,540	22,290	133,730		
06 03	SITE WORK							
06 03 05	FENCING							
06 03 05 03	FENCING							
06 03 05 03 01	Temporary Fencing	750.00 LF	24,920	3,740	5,730	34,390	45.86	
	FENCING		24,920	3,740	5,730	34,390		
	FENCING		24,920	3,740	5,730	34,390		
	SITE WORK		24,920	3,740	5,730	34,390		
06 08	SOLID WASTE COLLECT/CONTAINMENT							
06 08 01	EXCAVATION							
06 08 01 03	CONTAMINATED SOIL							
06 08 01 03 01	PHASE I, Excavate/Load PCB Soils	230.00 CY	86,890	13,030	25,280	125,210	544.38	
06 08 01 03 02	PHASE II,Excavate/Load PCB Soils	110.00 CY	42,070	6,310	12,240	60,620	551.09	
06 08 01 03 03	Post Removal		1,740	260	500	2,500		
06 08 01 03 91	Safety and Quality Assurance	3.00 WK	20,740	3,110	4,770	28,620	9538.78	
	CONTAMINATED SOIL		151,440	22,720	42,790	216,940		
	EXCAVATION		151,440	22,720	42,790	216,940		
	SOLID WASTE COLLECT/CONTAINMENT		151,440	22,720	42,790	216,940		
06 21	DEMOBILIZATION							
06 21 04	DEMOB OF EQUIPMENT & PERSONNEL							
06 21 04 01	TRANSPORTATION							
06 21 04 01 01	PH I, Demob and take down		8,060	1,210	1,850	11,130		
06 21 04 01 02	PH II, Demob and Take down		8,060	1,210	1,850	11,130		
	TRANSPORTATION		16,120	2,420	3,710	22,250		
	DEMOB OF EQUIPMENT & PERSONNEL		16,120	2,420	3,710	22,250		
	DEMOBILIZATION		16,120	2,420	3,710	22,250		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
REMEDIAL ACTION		311,460	46,720	79,600	437,780		
HANFORD: REMEDIATION		311,460	46,720	79,600	437,780		

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06	REMEDIAL ACTION							
06 01	MOBILIZATION AND PREPATORY WORK							
06 01 01	MOB OF EQUIPMENT & PERSONNEL							
06 01 01 1	TRANSPORTATION							
06 01 01 1 01-	Ph I, Equip Mob, Detailed List							
	Ph I, Equip Mob, Detailed List		2,710	410	620	3,730		
06 01 01 1 02-	Ph II, Equip Mob, Detailed List							
	Ph II, Equip Mob, Detailed List		2,710	410	620	3,730		
	TRANSPORTATION		5,410	810	1,240	7,470		
	MOB OF EQUIPMENT & PERSONNEL		5,410	810	1,240	7,470		
06 01 03	SETUP/CONSTRUCT TEMP FACILITIES							
06 01 03 01	TRAILERS AND BUILDINGS							
06 01 03 01 01	Ph I, Office Trailers - setup							
	Ph I, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
06 01 03 01 02	Ph II, Office Trailers - setup							
	Ph II, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
	TRAILERS AND BUILDINGS		7,580	1,140	1,740	10,460		
06 01 03 02	DECONTAMINATION FACILITIES							
06 01 03 02 01	Personnel Decon Facilities							
06 01 03 02 02	Equip/Vehicle Decon Facilities							
06 01 03 02 03	Ph I, Trailers - assbly/setup							

		QUANTITY	UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	Ph I, Trailers - assbly/setup	120.00	HR	4,550	680	1,050	6,270	52.28	
06 01 03 02 04	Ph II, Trailers - assbly/setup								
	Ph II, Trailers - assbly/setup	120.00	HR	4,550	680	1,050	6,270	52.28	
	DECONTAMINATION FACILITIES			9,090	1,360	2,090	12,550		
	SETUP/CONSTRUCT TEMP FACILITIES			16,670	2,500	3,830	23,000		
	MOBILIZATION AND PREPATORY WORK			22,080	3,310	5,080	30,470		
06 02	MONITOR, SAMPLE, TEST, ANALYSIS								
06 02 06	SAMPLING SOIL, SED & SOLID WASTE								
06 02 06 01	SURFACE SOIL								
06 02 06 01 01	PHASE I, Soil Sample								
06 02 06 01 01 01	Soil Sampling	60.00	EA	39,880	5,980	9,170	55,030	917.19	1
06 02 06 01 01 02	QA Report			3,590	540	830	4,950		1
	PHASE I, Soil Sample	60.00	EA	43,470	6,520	10,000	59,980	999.74	
06 02 06 01 02	PHASE II, Soil Sample								
06 02 06 01 02 01	Soil Sampling	60.00	EA	49,850	7,480	11,460	68,790	1146.49	1
06 02 06 01 02 02	QA Report			3,590	540	830	4,950		1
	PHASE II, Soil Sample	60.00	EA	53,440	8,020	12,290	73,740	1229.03	
	SURFACE SOIL			96,900	14,540	22,290	133,730		
	SAMPLING SOIL, SED & SOLID WASTE			96,900	14,540	22,290	133,730		
	MONITOR, SAMPLE, TEST, ANALYSIS			96,900	14,540	22,290	133,730		
06 03	SITE WORK								
06 03 05	FENCING								
06 03 05 03	FENCING								
06 03 05 03 01	Temporary Fencing								

		QUANTITY	UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06 03 05 03 01 01	Temporary Fencing - 6' Security	750.00	LF	24,920	3,740	5,730	34,390	45.86	
	Temporary Fencing	750.00	LF	24,920	3,740	5,730	34,390	45.86	
	FENCING			24,920	3,740	5,730	34,390		
	FENCING			24,920	3,740	5,730	34,390		
	SITE WORK			24,920	3,740	5,730	34,390		
06 08 SOLID WASTE COLLECT/CONTAINMENT									
06 08 01 EXCAVATION									
06 08 01 03 CONTAMINATED SOIL									
06 08 01 03 01 PHASE I, Excavate/Load PCB Soils									
06 08 01 03 01 01	Excavate/Load PCB Soils	230.00	CY	1,760	260	810	2,830	12.30	2
06 08 01 03 01 02	Transport PCB Soils - Arlington	230.00	CY	83,610	12,540	24,040	120,180	522.54	2,3
06 08 01 03 01 03	PPEquip, Class D	3.00	DAY	1,530	230	440	2,200	731.67	1
	PHASE I, Excavate/Load PCB Soils	230.00	CY	86,890	13,030	25,280	125,210	544.38	
06 08 01 03 02 PHASE II,Excavate/Load PCB Soils									
06 08 01 03 02 01	Excavate/Load PCB Soils	110.00	CY	840	130	390	1,350	12.30	1,2
06 08 01 03 02 02	Transport PCB Soils - Arlington	110.00	CY	40,210	6,030	11,560	57,800	525.48	2,3
06 08 01 03 02 03	PPEquip, Class D	2.00	DAY	1,020	150	290	1,460	731.67	1
	PHASE II,Excavate/Load PCB Soils	110.00	CY	42,070	6,310	12,240	60,620	551.09	
06 08 01 03 03 Post Removal									
06 08 01 03 03 01	Excavate/Load Crew	1.00	DAY	1,230	180	350	1,770	1769.02	1
06 08 01 03 03 02	PPEquip, Class D	1.00	DAY	510	80	150	730	731.67	1
	Post Removal			1,740	260	500	2,500		
06 08 01 03 91 Safety and Quality Assurance									
	Safety and Quality Assurance	3.00	WK	20,740	3,110	4,770	28,620	9538.78	
	CONTAMINATED SOIL			151,440	22,720	42,790	216,940		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
EXCAVATION		151,440	22,720	42,790	216,940		
SOLID WASTE COLLECT/CONTAINMENT		151,440	22,720	42,790	216,940		
06 21 DEMOBILIZATION							
06 21 04 DEMOB OF EQUIPMENT & PERSONNEL							
06 21 04 01 TRANSPORTATION							
06 21 04 01 01 PH I, Demob and take down							
PH I, Demob and take down		8,060	1,210	1,850	11,130		
06 21 04 01 02 PH II, Demob and Take down							
PH II, Demob and Take down		8,060	1,210	1,850	11,130		
TRANSPORTATION		16,120	2,420	3,710	22,250		
DEMOB OF EQUIPMENT & PERSONNEL		16,120	2,420	3,710	22,250		
DEMOBILIZATION		16,120	2,420	3,710	22,250		
REMEDIAL ACTION		311,460	46,720	79,600	437,780		
HANFORD: REMEDIATION		311,460	46,720	79,600	437,780		

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 REMEDIAL ACTION									
06 01 MOBILIZATION AND PREPATORY WORK									
06 01 01 MOB OF EQUIPMENT & PERSONNEL									
06 01 01 1 TRANSPORTATION									
06 01 01 1 01- Ph I, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
06 01 01 1 02- Ph II, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
TRANSPORTATION		4,070	610	230	390	50	50	5,410	
MOB OF EQUIPMENT & PERSONNEL		4,070	610	230	390	50	50	5,410	
06 01 03 SETUP/CONSTRUCT TEMP FACILITIES									
06 01 03 01 TRAILERS AND BUILDINGS									
06 01 03 01 01 Ph I, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
06 01 03 01 02 Ph II, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
TRAILERS AND BUILDINGS		5,700	860	330	550	70	80	7,580	
06 01 03 02 DECONTAMINATION FACILITIES									
06 01 03 02 03 Ph I, Trailers - assbly/setup	120.00 HR	3,420	510	200	330	40	50	4,550	37.88
06 01 03 02 04 Ph II, Trailers - assbly/setup	120.00 HR	3,420	510	200	330	40	50	4,550	37.88
DECONTAMINATION FACILITIES		6,840	1,030	390	660	80	90	9,090	
SETUP/CONSTRUCT TEMP FACILITIES		12,540	1,880	720	1,210	150	170	16,670	
MOBILIZATION AND PREPATORY WORK		16,610	2,490	960	1,600	200	220	22,080	
06 02 MONITOR, SAMPLE, TEST, ANALYSIS									
06 02 06 SAMPLING SOIL, SED & SOLID WASTE									
06 02 06 01 SURFACE SOIL									
06 02 06 01 01 PHASE I, Soil Sample	60.00 EA	32,700	4,910	1,880	3,160	390	430	43,470	724.45
06 02 06 01 02 PHASE II, Soil Sample	60.00 EA	40,200	6,030	2,310	3,880	480	530	53,440	890.60
SURFACE SOIL		72,900	10,940	4,190	7,040	870	960	96,900	
SAMPLING SOIL, SED & SOLID WASTE		72,900	10,940	4,190	7,040	870	960	96,900	

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	MONITOR, SAMPLE, TEST, ANALYSIS		72,900	10,940	4,190	7,040	870	960	96,900	
06 03	SITE WORK									
06 03 05	FENCING									
06 03 05 03	FENCING									
06 03 05 03 01	Temporary Fencing	750.00 LF	18,750	2,810	1,080	1,810	230	250	24,920	33.23
	FENCING		18,750	2,810	1,080	1,810	230	250	24,920	
	FENCING		18,750	2,810	1,080	1,810	230	250	24,920	
	SITE WORK		18,750	2,810	1,080	1,810	230	250	24,920	
06 08	SOLID WASTE COLLECT/CONTAINMENT									
06 08 01	EXCAVATION									
06 08 01 03	CONTAMINATED SOIL									
06 08 01 03 01	PHASE I, Excavate/Load PCB Soils	230.00 CY	65,370	9,810	3,760	6,310	780	860	86,890	377.78
06 08 01 03 02	PHASE II,Excavate/Load PCB Soils	110.00 CY	31,650	4,750	1,820	3,060	380	420	42,070	382.45
06 08 01 03 03	Post Removal		1,310	200	80	130	20	20	1,740	
06 08 01 03 91	Safety and Quality Assurance	3.00 WK	15,600	2,340	900	1,510	190	210	20,740	6912.16
	CONTAMINATED SOIL		113,920	17,090	6,550	11,010	1,370	1,500	151,440	
	EXCAVATION		113,920	17,090	6,550	11,010	1,370	1,500	151,440	
	SOLID WASTE COLLECT/CONTAINMENT		113,920	17,090	6,550	11,010	1,370	1,500	151,440	
06 21	DEMOBILIZATION									
06 21 04	DEMOB OF EQUIPMENT & PERSONNEL									
06 21 04 01	TRANSPORTATION									
06 21 04 01 01	PH I, Demob and take down		6,070	910	350	590	70	80	8,060	
06 21 04 01 02	PH II, Demob and Take down		6,070	910	350	590	70	80	8,060	
	TRANSPORTATION		12,130	1,820	700	1,170	150	160	16,120	
	DEMOB OF EQUIPMENT & PERSONNEL		12,130	1,820	700	1,170	150	160	16,120	
	DEMOBILIZATION		12,130	1,820	700	1,170	150	160	16,120	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
REMEDIAL ACTION		234,310	35,150	13,470	22,630	2,810	3,080	311,460	
HANFORD: REMEDIATION		234,310	35,150	13,470	22,630	2,810	3,080	311,460	
S & A								46,720	
SUBTOTAL								358,180	
CONTINGENCY								79,600	
TOTAL INCL OWNER COSTS								437,780	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 REMEDIAL ACTION									
06 01 MOBILIZATION AND PREPATORY WORK									
06 01 01 MOB OF EQUIPMENT & PERSONNEL									
06 01 01 1 TRANSPORTATION									
06 01 01 1 01- Ph I, Equip Mob, Detailed List									
Ph I, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
06 01 01 1 02- Ph II, Equip Mob, Detailed List									
Ph II, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
TRANSPORTATION		4,070	610	230	390	50	50	5,410	
MOB OF EQUIPMENT & PERSONNEL		4,070	610	230	390	50	50	5,410	
06 01 03 SETUP/CONSTRUCT TEMP FACILITIES									
06 01 03 01 TRAILERS AND BUILDINGS									
06 01 03 01 01 Ph I, Office Trailers - setup									
Ph I, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
06 01 03 01 02 Ph II, Office Trailers - setup									
Ph II, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
TRAILERS AND BUILDINGS		5,700	860	330	550	70	80	7,580	
06 01 03 02 DECONTAMINATION FACILITIES									
06 01 03 02 01 Personnel Decon Facilities									
06 01 03 02 02 Equip/Vehicle Decon Facilities									
06 01 03 02 03 Ph I, Trailers - assbly/setup									

		QUANTITY	UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	Ph I, Trailers - assbly/setup	120.00	HR	3,420	510	200	330	40	50	4,550	37.88
06 01 03 02 04	Ph II, Trailers - assbly/setup										
	Ph II, Trailers - assbly/setup	120.00	HR	3,420	510	200	330	40	50	4,550	37.88
	DECONTAMINATION FACILITIES			6,840	1,030	390	660	80	90	9,090	
	SETUP/CONSTRUCT TEMP FACILITIES			12,540	1,880	720	1,210	150	170	16,670	
	MOBILIZATION AND PREPATORY WORK			16,610	2,490	960	1,600	200	220	22,080	
06 02	MONITOR, SAMPLE, TEST, ANALYSIS										
06 02 06	SAMPLING SOIL, SED & SOLID WASTE										
06 02 06 01	SURFACE SOIL										
06 02 06 01 01	PHASE I, Soil Sample										
06 02 06 01 01 01	Soil Sampling	60.00	EA	30,000	4,500	1,720	2,900	360	390	39,880	664.63
06 02 06 01 01 02	QA Report			2,700	410	160	260	30	40	3,590	
	PHASE I, Soil Sample	60.00	EA	32,700	4,910	1,880	3,160	390	430	43,470	724.45
06 02 06 01 02	PHASE II, Soil Sample										
06 02 06 01 02 01	Soil Sampling	60.00	EA	37,500	5,630	2,160	3,620	450	490	49,850	830.79
06 02 06 01 02 02	QA Report			2,700	410	160	260	30	40	3,590	
	PHASE II, Soil Sample	60.00	EA	40,200	6,030	2,310	3,880	480	530	53,440	890.60
	SURFACE SOIL			72,900	10,940	4,190	7,040	870	960	96,900	
	SAMPLING SOIL, SED & SOLID WASTE			72,900	10,940	4,190	7,040	870	960	96,900	
	MONITOR, SAMPLE, TEST, ANALYSIS			72,900	10,940	4,190	7,040	870	960	96,900	
06 03	SITE WORK										
06 03 05	FENCING										
06 03 05 03	FENCING										
06 03 05 03 01	Temporary Fencing										

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 03 05 03 01 01	Temporary Fencing - 6' Security	750.00 LF	18,750	2,810	1,080	1,810	230	250	24,920	33.23
	Temporary Fencing	750.00 LF	18,750	2,810	1,080	1,810	230	250	24,920	33.23
	FENCING		18,750	2,810	1,080	1,810	230	250	24,920	
	FENCING		18,750	2,810	1,080	1,810	230	250	24,920	
	SITE WORK		18,750	2,810	1,080	1,810	230	250	24,920	
06 08 SOLID WASTE COLLECT/CONTAINMENT										
06 08 01 EXCAVATION										
06 08 01 03 CONTAMINATED SOIL										
06 08 01 03 01 PHASE I, Excavate/Load PCB Soils										
06 08 01 03 01 01	Excavate/Load PCB Soils	230.00 CY	1,320	200	80	130	20	20	1,760	7.64
06 08 01 03 01 02	Transport PCB Soils - Arlington	230.00 CY	62,900	9,430	3,620	6,080	750	830	83,610	363.50
06 08 01 03 01 03	PPEquip, Class D	3.00 DAY	1,150	170	70	110	10	20	1,530	508.99
	PHASE I, Excavate/Load PCB Soils	230.00 CY	65,370	9,810	3,760	6,310	780	860	86,890	377.78
06 08 01 03 02 PHASE II,Excavate/Load PCB Soils										
06 08 01 03 02 01	Excavate/Load PCB Soils	110.00 CY	630	90	40	60	10	10	840	7.64
06 08 01 03 02 02	Transport PCB Soils - Arlington	110.00 CY	30,250	4,540	1,740	2,920	360	400	40,210	365.55
06 08 01 03 02 03	PPEquip, Class D	2.00 DAY	770	110	40	70	10	10	1,020	508.99
	PHASE II,Excavate/Load PCB Soils	110.00 CY	31,650	4,750	1,820	3,060	380	420	42,070	382.45
06 08 01 03 03 Post Removal										
06 08 01 03 03 01	Excavate/Load Crew	1.00 DAY	930	140	50	90	10	10	1,230	1230.62
06 08 01 03 03 02	PPEquip, Class D	1.00 DAY	380	60	20	40	0	10	510	508.99
	Post Removal		1,310	200	80	130	20	20	1,740	
06 08 01 03 91 Safety and Quality Assurance										
	Safety and Quality Assurance	3.00 WK	15,600	2,340	900	1,510	190	210	20,740	6912.16
	CONTAMINATED SOIL		113,920	17,090	6,550	11,010	1,370	1,500	151,440	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
EXCAVATION		113,920	17,090	6,550	11,010	1,370	1,500	151,440	
SOLID WASTE COLLECT/CONTAINMENT		113,920	17,090	6,550	11,010	1,370	1,500	151,440	
06 21 DEMOBILIZATION									
06 21 04 DEMOB OF EQUIPMENT & PERSONNEL									
06 21 04 01 TRANSPORTATION									
06 21 04 01 01 PH I, Demob and take down									
PH I, Demob and take down		6,070	910	350	590	70	80	8,060	
06 21 04 01 02 PH II, Demob and Take down									
PH II, Demob and Take down		6,070	910	350	590	70	80	8,060	
TRANSPORTATION		12,130	1,820	700	1,170	150	160	16,120	
DEMOB OF EQUIPMENT & PERSONNEL		12,130	1,820	700	1,170	150	160	16,120	
DEMOBILIZATION		12,130	1,820	700	1,170	150	160	16,120	
REMEDIAL ACTION		234,310	35,150	13,470	22,630	2,810	3,080	311,460	
HANFORD: REMEDIATION		234,310	35,150	13,470	22,630	2,810	3,080	311,460	
S & A								46,720	
SUBTOTAL								358,180	
CONTINGENCY								79,600	
TOTAL INCL OWNER COSTS								437,780	

0 AA. REMEDIAL GENERAL CONTRACTOR	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
0 AA. REMEDIAL GENERAL CONTRACTOR											
Overhead Percentage Explanation:											
Field office Overhead (FOOH): Normal is 10%, using 15% to allow for extra safety and Hanford related items.											
Home office Overhead (HOOH): 4-5% is normal for this size of job.											
PROFIT: 7-8% is normal for this size of job. However, PROFIT may be calculated separately for each job using the Weighted-Guide Line Method.											
BOND: Calculated per dollar amount of job using B Bond rates by GOLD.											
B&O TAX: 1% covers the 0.5% WA State B&O tax, and the 0.5% TARO tax.											
06. REMEDIAL ACTION											
06 01. MOBILIZATION AND PREPATORY WORK											
06 01 01. MOB OF EQUIPMENT & PERSONNEL											
06 01 01 1. TRANSPORTATION											
06 01 01 1 01-. Ph I, Equip Mob, Detailed List											
This item covers the Mobilization of the equipment and misc. items as detailed below. A 100-mi radius mob is assumed.											
USR AA <01505 3235 > Mob, FEnd Ldr, wheel 1-1/2-3 cy Atriculated Fr, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 6115 > Mob, Dozer, Crawler, 50-100 hp w/blade, incl set up 100 mi radius	1.00	EA		0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 7131 > Mob, Water Tank, 3,000 Gal, Mtd/FT800 Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	150.00 150	0.00 0	0.00 0	150.00 150	150.00
USR AA <01505 8921 > Mob, Decontamination Trailer w/25,000 GVW Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	135.00 135	0.00 0	0.00 0	135.00 135	135.00
USR AA <01505 1101 > Mob - Field Office Trailer	1.00	EA		0.00	0.00 0	0.00 0	250.00 250	0.00 0	0.00 0	250.00 250	250.00
Ph I, Equip Mob, Detailed List					0	0	2,035	0	0	2,035	

06 01. MOBILIZATION AND PREPATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 01 1 02-. Ph II, Equip Mob, Detailed List This item covers the Mobilization of the equipment and misc. items as detailed below. A 100-mi radius mob is assumed.											
USR AA <01505 3235 > Mob, FEnd Ldr, wheel 1-1/2-3 cy Atriculated Fr, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 6115 > Mob, Dozer, Crawler, 50-100 hp w/blade, incl set up 100 mi radius	1.00	EA		0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 7131 > Mob, Water Tank, 3,000 Gal, Mtd/FT800 Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	150.00 150	0.00 0	0.00 0	150.00 150	150.00
USR AA <01505 8921 > Mob, Decontamination Trailer w/25,000 GVW Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	135.00 135	0.00 0	0.00 0	135.00 135	135.00
USR AA <01505 1101 > Mob - Field Office Trailer	1.00	EA		0.00	0.00 0	0.00 0	250.00 250	0.00 0	0.00 0	250.00 250	250.00
Ph II, Equip Mob, Detailed List					0	0	2,035	0	0	2,035	
TRANSPORTATION					0	0	4,070	0	0	4,070	

06 01. MOBILIZATION AND PREPATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 03. SETUP/CONSTRUCT TEMP FACILITIES											
06 01 03 01. TRAILERS AND BUILDINGS											
06 01 03 01 01. Ph I, Office Trailers - setup											
Allow 100mhrs for setup of contractor's trailer and equipment and site layout. An allowance for some equipment and material has been added.											
Ph I, Office Trailers - setup	100.00	HR			0	2,500	250	100	0	2,850	28.50
06 01 03 01 02. Ph II, Office Trailers - setup											
Allow 100mhrs for setup of contractor's trailer and equipment and site layout. An allowance for some equipment and material has been added.											
Ph II, Office Trailers - setup	100.00	HR			0	2,500	250	100	0	2,850	28.50
TRAILERS AND BUILDINGS					0	5,000	500	200	0	5,700	

06 01. MOBILIZATION AND PREPATORY WORK	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 03 02. DECONTAMINATION FACILITIES									
06 01 03 02 01. Personnel Decon Facilities									
Personnel Decon Facilities			0	0	0	0	0	0	
06 01 03 02 02. Equip/Vehicle Decon Facilities									
Equip/Vehicle Decon Facilities			0	0	0	0	0	0	
06 01 03 02 03. Ph I, Trailers - assbly/setup									
Allow 100mhrs for setup of decontaminatio trailer and equipment and site layout. An allowance for some equipment and material has been added.									
Ph I, Trailers - assbly/setup	120.00 HR		0	3,000	300	120	0	3,420	28.50
06 01 03 02 04. Ph II, Trailers - assbly/setup									
Allow 100mhrs for setup of decontaminatio trailer and equipment and site layout. An allowance for some equipment and material has been added.									
Ph II, Trailers - assbly/setup	120.00 HR		0	3,000	300	120	0	3,420	28.50
DECONTAMINATION FACILITIES			0	6,000	600	240	0	6,840	

06 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 02. MONITOR, SAMPLE, TEST, ANALYSIS											
06 02 06. SAMPLING SOIL, SED & SOLID WASTE											
06 02 06 01. SURFACE SOIL											
06 02 06 01 01. PHASE I, Soil Sample											
After the top 12" of soil is removed, soil samples will be taken.											
06 02 06 01 01 01. Soil Sampling											
Sample on 15'x15' grid (50 samples) with analysis at off site lab for BEHP only, with 14-day turnaround. Method 8270. Add 10 QA samples.											
Soil Sampling	60.00	EA			0	0	0	0	30,000	30,000	500.00
QA Report					0	0	0	0	2,700	2,700	
PHASE I, Soil Sample	60.00	EA			0	0	0	0	32,700	32,700	545.00

06 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 02 06 01 02. PHASE II, Soil Sample Another set of soil samples will be taken after the next 6" soil layer is excavated.											
06 02 06 01 02 01. Soil Sampling Same as Phase I, except with 7-day turnaround, add 25%.											
Soil Sampling	60.00	EA			0	0	0	0	37,500	37,500	625.00
QA Report					0	0	0	0	2,700	2,700	
PHASE II, Soil Sample	60.00	EA			0	0	0	0	40,200	40,200	670.00
SURFACE SOIL					0	0	0	0	72,900	72,900	

06 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 03. SITE WORK											
06 03 05. FENCING											
06 03 05 03. FENCING											
06 03 05 03 01. Temporary Fencing											
06 03 05 03 01 01. Temporary Fencing - 6' Security A 6' Security fence will be required during the duration of the cleanup activities around the work site. Cost taken from recent bid quotes. "Other" cost for removal.											
Temporary Fencing - 6' Security	750.00	LF			0	3,750	1,875	9,375	3,750	18,750	25.00
Temporary Fencing	750.00	LF			0	3,750	1,875	9,375	3,750	18,750	25.00
FENCING					0	3,750	1,875	9,375	3,750	18,750	

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08. SOLID WASTE COLLECT/CONTAINMENT											
06 08 01. EXCAVATION											
06 08 01 03. CONTAMINATED SOIL											
06 08 01 03 01. PHASE I, Excavate/Load PCB Soils											
06 08 01 03 01 01. Excavate/Load PCB Soils											
L USR AA <02220 0000 > Excavate top 12-inches of soil	230.00	CY	XXQNA	28.75	0.06 14	1.59 365	0.54 125	0.00 0	0.00 0	2.13 490	2.13
USR AA <02220 0000 > Load excavated/stockpiled soil load in 28-ton dump trucks - DOT approved hazardeous waste hauler. assume 3,100lb/bcy	230.00	CY	XXQMG	28.75	0.03 8	0.94 217	0.95 219	0.00 0	0.00 0	1.90 436	1.90
USR AA <02220 0000 > Water tank/Soil wet down crew	230.00	CY	XTRHC	28.75	0.03 8	0.92 211	0.80 185	0.00 0	0.00 0	1.72 396	1.72
Excavate/Load PCB Soils	230.00	CY			30	793	529	0	0	1,322	5.75
06 08 01 03 01 02. Transport PCB Soils - Arlington											
USR AA <02220 0000 > Transport soil to Arlington, OR 230 cy x 3,100lb/cy / 2000lb/ton = 356.5 tons @ 28 tons/truck = 12.73 trucks use 13 trucks	13.00	TRK		0.00	0.00 0	0.00 0	0.00 0	0.00 0	400.00 5,200	400.00 5,200	400.00
USR AA <02220 0000 > Disposal of soil in landfill	356.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	134.00 47,771	134.00 47,771	134.00
USR AA <02220 0000 > Oregon state environmental tax	356.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	27.00 9,626	27.00 9,626	27.00
USR AA <02220 0000 > Soil profile fee	1.00	EA		0.00	0.00 0	0.00 0	0.00 0	0.00 0	300.00 300	300.00 300	300.00
Transport PCB Soils - Arlington	230.00	CY			0	0	0	0	62,897	62,897	273.46
06 08 01 03 01 03. PPEquip, Class D Assume workers in Class D PPE during excavation and hauling to site. Included also is a decon shower, and equipment decon equipment. This item covers 4 personnel.											
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)	12.00	EA	N/A	0.00	0.00 0	0.00 0	11.50 138	0.00 0	0.00 0	11.50 138	11.50

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
M HTW AA <01951 5204 > Coveralls, Tyvek	12.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	7.55 91	0.00 0	7.55 91	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves	12.00	PR	N/A	0.00	0.00 0	0.00 0	2.30 28	0.00 0	0.00 0	2.30 28	2.30
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)	3.00	DAY	ULABA	0.13	10.00 30	234.30 703	1.45 4	34.83 104	0.00 0	270.58 812	270.58
M HTW AA <01957 4301 > 8 Ft x 36 Ft, 2 Showers, 2 Wall Fans (Monthly Rental)	3.00	DAY	N/A	0.00	0.00 0	0.00 0	0.00 0	26.95 81	0.00 0	26.95 81	26.95
PPEquip, Class D	3.00	DAY			30	703	170	276	0	1,149	382.91
PHASE I, Excavate/Load PCB Soils	230.00	CY			60	1,496	699	276	62,897	65,367	284.20

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 01 03 02. PHASE II,Excavate/Load PCB Soils											
06 08 01 03 02 01. Excavate/Load PCB Soils											
L USR AA <02220 0000 > Excavate next 6-inches of soil	110.00	CY	XXQNA	28.75	0.06 7	1.59 175	0.54 60	0.00 0	0.00 0	2.13 234	2.13
USR AA <02220 0000 > Load excavated/stockpiled soil load in 28-ton dump trucks - DOT approved hazardeous waste hauler. assume 3,100lb/bcy	110.00	CY	XXQMG	28.75	0.03 4	0.94 104	0.95 105	0.00 0	0.00 0	1.90 209	1.90
USR AA <02220 0000 > Water tank/Soil wet down crew	110.00	CY	XTRHC	28.75	0.03 4	0.92 101	0.80 88	0.00 0	0.00 0	1.72 189	1.72
Excavate/Load PCB Soils	110.00	CY			14	379	253	0	0	632	5.75
06 08 01 03 02 02. Transport PCB Soils - Arlington											
USR AA <02220 0000 > Transport soil to Arlington, OR 110 cy x 3,100lb/cy / 2000lb/ton = 170.5 tons @ 28 tons/truck = 6.1 trucks use 7 trucks	7.00	TRK		0.00	0.00 0	0.00 0	0.00 0	0.00 0	400.00 2,800	400.00 2,800	400.00
USR AA <02220 0000 > Disposal of soil in landfill	170.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	134.00 22,847	134.00 22,847	134.00
USR AA <02220 0000 > Oregon state environmental tax	170.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	27.00 4,604	27.00 4,604	27.00
Transport PCB Soils - Arlington	110.00	CY			0	0	0	0	30,251	30,251	275.00
06 08 01 03 02 03. PPEquip, Class D Assume workers in Class D PPE during excavation and hauling to site. Included also is a decon shower, and equipment decon equipment. This item covers 4 personnel.											
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)	8.00	EA	N/A	0.00	0.00 0	0.00 0	11.50 92	0.00 0	0.00 0	11.50 92	11.50
M HTW AA <01951 5204 > Coveralls, Tyvek	8.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	7.55 60	0.00 0	7.55 60	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves	8.00	PR	N/A	0.00	0.00 0	0.00 0	2.30 18	0.00 0	0.00 0	2.30 18	2.30

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)	2.00	DAY	ULABA	0.13	10.00 20	234.30 469	1.45 3	34.83 70	0.00 0	270.58 541	270.58
M HTW AA <01957 4301 > 8 Ft x 36 Ft, 2 Showers, 2 Wall Fans (Monthly Rental)	2.00	DAY	N/A	0.00	0.00 0	0.00 0	0.00 0	26.95 54	0.00 0	26.95 54	26.95
PPEquip, Class D	2.00	DAY			20	469	113	184	0	766	382.91
PHASE II,Excavate/Load PCB Soils	110.00	CY			34	848	366	184	30,251	31,649	287.71

U.S. Army Corps of Engineers
PROJECT EPHOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, EPHEMERAL POOL OFF-SITE DISPOSAL
06. REMEDIAL ACTION

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 01 03 03. Post Removal									
06 08 01 03 03 01. Excavate/Load Crew									
L USR AA <02220 0000 > Excavation crew	1.00 DAY XXQNA	0.13	14.00 14	365.22 365	124.54 125	0.00 0	0.00 0	489.76 490	489.76
USR AA <02220 0000 > Load crew load in 28-ton dump trucks - DOT approved hazardeous waste hauler. assume 3,100lb/bcy	1.00 DAY XXQMG	0.13	8.00 8	216.72 217	219.31 219	0.00 0	0.00 0	436.03 436	436.03
Excavate/Load Crew	1.00 DAY		22	582	344	0	0	926	925.80
06 08 01 03 03 02. PPEquip, Class D Assume workers in Class D PPE during excavation and hauling to site. Included also is a decon shower, and equipment decon equipment. This item covers 4 personnel.									
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)	4.00 EA N/A	0.00	0.00 0	0.00 0	11.50 46	0.00 0	0.00 0	11.50 46	11.50
M HTW AA <01951 5204 > Coveralls, Tyvek	4.00 EA N/A	0.00	0.00 0	0.00 0	0.00 0	7.55 30	0.00 0	7.55 30	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves	4.00 PR N/A	0.00	0.00 0	0.00 0	2.30 9	0.00 0	0.00 0	2.30 9	2.30
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)	1.00 DAY ULABA	0.13	10.00 10	234.30 234	1.45 1	34.83 35	0.00 0	270.58 271	270.58
M HTW AA <01957 4301 > 8 Ft x 36 Ft, 2 Showers, 2 Wall Fans (Monthly Rental)	1.00 DAY N/A	0.00	0.00 0	0.00 0	0.00 0	26.95 27	0.00 0	26.95 27	26.95
PPEquip, Class D	1.00 DAY		10	234	57	92	0	383	382.91
Post Removal			32	816	401	92	0	1,309	

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 01 03 91. Safety and Quality Assurance											
Safety/QA crew:											
WHC HPT: $50/hr x 40hrs = $2,000											
Safety: $70/hr x 40hrs = $2,800											
Special Assistance to QA: $50/hr x 8 hrs = $ 400											
Total cost/week $5,200											
Safety and Quality Assurance	3.00	WK			0	15,600	0	0	0	15,600	5200.00
CONTAMINATED SOIL					126	18,760	1,465	552	93,147	113,924	

06 21. DEMOBILIZATION	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 21. DEMOBILIZATION											
06 21 04. DEMOB OF EQUIPMENT & PERSONNEL											
06 21 04 01. TRANSPORTATION											
06 21 04 01 01. PH I, Demob and take down Allow 75% of mobilization and setup costs. PH I, Demob and take down					0	4,125	1,940	0	0	6,065	
06 21 04 01 02. PH II, Demob and Take down Allow 75% of mobilization and setup costs. PH II, Demob and Take down					0	4,125	1,940	0	0	6,065	
TRANSPORTATION					0	8,250	3,880	0	0	12,130	
HANFORD: REMEDIATION					126	41,760	12,390	10,367	169,797	234,314	

Fri 23 Oct 1992

U.S. Army Corps of Engineers
PROJECT EPHOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, EPHEMERAL POOL OFF-SITE DISPOSAL
** CREW BACKUP **

TIME 09:21:02

BACKUP PAGE 1

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
	ULABA	1 B-laborer + Small Tools				PROD = 100%			CREW HOURS =	96
MIL	B-LABORER F	Laborer (Semi-Skilled)	0.25	HR	23.83	0.25	5.96			5.96
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	23.33	1.00	23.33			23.33
MIL	XMIXX020 E	Small Tools	0.13	HR	1.39			0.13	0.18	0.18
	TOTAL					1.25	29.29	0.13	0.18	29.47
	XTRHC	1 X-trkdvrhv + 1 Truck 3ax, W/3000 Gal Water Tnk				PROD = 100%			CREW HOURS =	24
MIL	T40XX033 E	WATER TANK, 3000 GAL (ADD TRUCK	1.00	HR	3.15			1.00	3.15	3.15
MIL	T50GM016 E	TRK, HWY, 3 AXLE, 41000 GVW, 6X	1.00	HR	19.97			1.00	19.97	19.97
MIL	X-TRKDVRHVL	Outside Truck Dr. Heavy	1.00	HR	26.39	1.00	26.39			26.39
	TOTAL					1.00	26.39	2.00	23.12	49.51
	XXQMG	1 X-eqoprmed + 1 Front End Ldr, 2-1/2 Cy, Wheel				PROD = 100%			CREW HOURS =	40
MIL	L40CA004 E	LDR,FE,WH, 2-1/2CY, ARTIC, 936E	1.00	HR	27.41			1.00	27.41	27.41
MIL	X-EQOPRMEDL	Outside Equip. Op. Medium	1.00	HR	27.09	1.00	27.09			27.09
	TOTAL					1.00	27.09	1.00	27.41	54.50
	XXQNA	1 X-eqoprmed + 1 Dozer, Cat D-38, 65 Hp				PROD = 100%			CREW HOURS =	40
MIL	T10CA001 E	BLADE,POWER ANGLE TILT,FOR D3	1.00	HR	1.87			1.00	1.87	1.87
MIL	T15CA003 E	DOZER,CWLR,D-3C,PS,(ADD BLADE)	1.00	HR	13.70			1.00	13.70	13.70
MIL	X-LABORER L	Outside Laborer	0.50	HR	23.33	0.50	11.67			11.67
MIL	X-EQOPRMEDL	Outside Equip. Op. Medium	1.00	HR	27.09	1.00	27.09			27.09
MIL	X-EQOPRMEDF	Outside Equip. Op. Medium	0.25	HR	27.59	0.25	6.90			6.90
	TOTAL					1.75	45.65	2.00	15.57	61.22

SRC LABOR ID	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	UOM	UPDATE	**** TOTAL **** DEFAULT	HOURS
MIL B-LABORER	Laborer/Helper	23.33	0.0%	0.0%	0.00	0.00	23.33	HR	10/15/92	22.36	120
MIL X-EQOPRMED	Outside Equipment Oper. Medium	27.09	0.0%	0.0%	0.00	0.00	27.09	HR	10/15/92	25.84	89
MIL X-LABORER	Outside Laborer	23.33	0.0%	0.0%	0.00	0.00	23.33	HR	10/15/92	22.36	20
MIL X-TRKDVRHV	Outside Truck Driver, Heavy	26.39	0.0%	0.0%	0.00	0.00	26.39	HR	10/15/92	25.61	24

SRC EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	** TOTAL ** TOTAL	UOM	HOURS
MIL L40CA004	LDR,FE,WH, 2-1/2CY, ARTIC, 936E	8.03	2.79	3.99	1.6	8.34	2.26	0.34	27.41	HR	40
MIL T10CA001	BLADE,POWER ANGLE TILT,FOR D3	0.75	0.22		0.0	0.82			1.87	HR	40
MIL T15CA003	DOZER,CWLR,D-3C,PS,(ADD BLADE)	3.51	1.14	2.14	0.7	6.14			13.70	HR	40
MIL T40XX033	WATER TANK, 3000 GAL (ADD TRUCK)	1.52	0.37			1.26			3.15	HR	24
MIL T50GM016	TRK, HWY, 3 AXLE, 41000 GVW, 6X4	4.17	1.08	7.46	2.0	3.69	1.29	0.19	19.97	HR	24
MIL XMIXX020	Small Tools	0.46	0.17	0.13	0.0	0.57			1.39	HR	12

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Fri 23 Oct 1992 U.S. Army Corps of Engineers TIME 09:21:02

ERROR REPORT PROJECT EPHOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2 ERROR PAGE 1

1100-EM-1, EPHEMERAL POOL OFF-SITE DISPOSAL

No errors detected...

* * * END OF ERROR REPORT * * *

LABOR ID: 1100EM EQUIP ID: NAT92A Currency in DOLLARS CREW ID: NAT92A UPB ID: NAT92A

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** PROJECT SETTINGS **

ESTIMATE TYPE : A-Crews with Auto Reprice

SALES TAX : 7.80%

DATE OF ESCALATION SCHEDULE : 10/07/92

PROJECT DIRECT COST COLUMNS

Col Type	H	L	E	M	U
Rep Width	8	10	10	12	10
Title	MHRS	LABR	EQUIP	MAT	OTHER

PROJECT INDIRECT COST COLUMNS

Col Type	O	U	P	B	U
Rep Width	9	9	9	9	9
Title	FOOH	HOOH	PROF	BOND	B&O TAX

PROJECT OWNER COST COLUMNS

Col Type	U	U	X	X	X
Rep Width	12	12	0	0	0
Title	S & A	CONTG	(Unused)	(Unused)	(Unused)

PROJECT BREAKDOWN

PROJECT ID	Length	Trail Sep	Level Title	2nd View Order
Level 1 ID :	2		Des/Actn	0
Level 2 ID :	2		Feature	0
Level 3 ID :	2		SubFeat	0
Level 4 ID :	2		System	0
Level 5 ID :	4		Bid Item	0
Level 6 ID :	4	-	Task	0

Owner Cost Level : 1

2ND VIEW COLUMNS
Quantity Column Width : 10

Col Type	X	X	X	X	X
Rep Width	0	0	0	0	0
Title	(Unused)	(Unused)	(Unused)	(Unused)	(Unused)
Shadow	X	X	X	X	X

DETAIL REPORT FORMATTING

PAGE OPTIONS
Page Break Levels : 5
Table of Contents Levels : 6

0 1 2 3 4 5 6 7

ROW OPTIONS
Print Titles at Levels : Y Y Y Y Y Y
Print Totals at Levels : N N N Y Y Y
Print Notes at Levels : Y Y Y Y Y Y Y Y
Print Unit Cost Row : Y
Print Page Footer : Y
Show Cost Codes : Y

COLUMNS OPTIONS
Print Crew Id : Y
Crew Output : Y
Unit Cost : Y

UPB TITLES
No. of Levels to Print : 0
Bracket Titles With : - :
Include titles Notes : Y

OTHER REPORT FORMATTING

COLUMN TITLES FOR SUMMARY REPORTS

Column 1 FOOH	: JOB OFFICE OVERHEAD
Column 2 HOOH	: HOME OFFICE OVERHEAD
Column 3 PROF	: PROFIT
Column 4 BOND	: PERFORMANCE BOND
Column 5 B&O TAX	: B & O AND OTHER TAXES
Column 1 S & A	: S & A
Column 2 CONTG	: CONTINGENCY
Column 3 (Unused)	:
Column 4 (Unused)	:
Column 5 (Unused)	:

STANDARD COLUMN WIDTHS		SUMMARY FEATURES	
Quantity Columns	: 10	Round Totals Column	: T-Tens
Total cost Columns	: 12	Contingency Notes	: Yes
Unit Cost Columns	: 12	Show Project Totals	: Yes

REPORT SELECTION

Project Settings	: Y
Contractor Settings	: Y
Link Listing	: N

Measurement Units : Original

	REPORT FORMAT TYPE			FOR LEVEL (S)						
	Direct	Indirect	Owner	0	1	2	3	4	5	6
Detail :	Y									
Project :	N	Y	Y		N	N	N	N	Y	Y
Contractor :	N	N		N	N	N	N	N	N	N
Division :	N	N	N	Y	N	N	N	N	N	N
System :	N	N	N	Y	N	N	N	N	N	N
2nd View :	N									
Crew :	Y			Y	N	N	N	N	N	N
Labor :	Y									
Equipment :	Y									

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
Project Information Record							
06 REMEDIAL ACTION							
	S & A	P	15.00				
	CONTINGENCY	P	0.00				
06 01 MOBILIZATION AND PREPATORY WORK							
06 01 01 MOB OF EQUIPMENT & PERSONNEL							
06 01 01 1 TRANSPORTATION							
06 01 01 1 01- Ph I, Equip Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 01 1 02- Ph II, Equip Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
06 01 03 01 TRAILERS AND BUILDINGS							
06 01 03 01 01 Ph I, Office Trailers - setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 01 02 Ph II, Office Trailers - setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 DECONTAMINATION FACILITIES							
06 01 03 02 01 Personnel Decon Facilities							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 02 Equip/Vehicle Decon Facilities							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 03 Ph I, Trailers - assbly/setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 04 Ph II, Trailers - assbly/setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 02 MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 06 SAMPLING SOIL, SED & SOLID WASTE							
06 02 06 01 SURFACE SOIL							
06 02 06 01 01 PHASE I, Soil Sample							
06 02 06 01 01 01 Soil Sampling							
	S & A	O					
	CONTINGENCY	P	20.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
06 02 06 01 01 02 QA Report							
	S & A	O					
	CONTINGENCY	P	20.00				
06 02 06 01 02 PHASE II, Soil Sample							
06 02 06 01 02 01 Soil Sampling							
	S & A	O					
	CONTINGENCY	P	20.00				
06 02 06 01 02 02 QA Report							
	S & A	O					
	CONTINGENCY	P	20.00				
06 03 SITE WORK							
06 03 05 FENCING							
06 03 05 03 FENCING							
06 03 05 03 01 Temporary Fencing							
06 03 05 03 01 01 Temporary Fencing - 6' Security							
	S & A	O					
	CONTINGENCY	P	20.00				
06 08 SOLID WASTE COLLECT/CONTAINMENT							
06 08 01 EXCAVATION							
06 08 01 03 CONTAMINATED SOIL							
06 08 01 03 01 PHASE I, Excavate/Load PCB Soils							
06 08 01 03 01 01 Excavate/Load PCB Soils							
	S & A	O					
	CONTINGENCY	P	40.00				
06 08 01 03 01 02 Transport PCB Soils - Arlington							
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 01 03 PPEquip, Class D							
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 02 PHASE II,Excavate/Load PCB Soils							
06 08 01 03 02 01 Excavate/Load PCB Soils							
	S & A	O					
	CONTINGENCY	P	40.00				
06 08 01 03 02 02 Transport PCB Soils - Arlington							
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 02 03 PPEquip, Class D							
	S & A	O					
	CONTINGENCY	P	25.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
06 08 01 03 03	Post Removal						
06 08 01 03 03 01	Excavate/Load Crew						
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 03 02	PPEquip, Class D						
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 91	Safety and Quality Assurance						
	S & A	O					
	CONTINGENCY	P	20.00				
06 21	DEMOBILIZATION						
06 21 04	DEMOB OF EQUIPMENT & PERSONNEL						
06 21 04 01	TRANSPORTATION						
06 21 04 01 01	PH I, Demob and take down						
	S & A	O					
	CONTINGENCY	P	20.00				
06 21 04 01 02	PH II, Demob and Take down						
	S & A	O					
	CONTINGENCY	P	20.00				

** CONTRACTOR SETTINGS **

		AMOUNT	PCT	PCT S	RISK	DIFF	SIZE	PERIOD	INVEST	ASSIST	SUBCON
AA REMEDIAL GENERAL CONTRACTOR											
JOB OFFICE OVERHEAD	P		15.00								
HOME OFFICE OVERHEAD	P		5.00								
PROFIT	P		8.00								
PERFORMANCE BOND	C			(Class: B)							
B & O AND OTHER TAXES	P		1.00								

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DOE/RL-92-67

HORN RAPIDS LANDFILL
OFFSITE DISPOSAL

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HANFORD: REMEDIATION
1.4.10.1.1.23.01.2
1100-EM-1 OPERABLE UNIT
HORN RAPIDS LANDFILL (PCBs)
OFF-SITE DISPOSAL

Designed By: CENPW-EN-EE
Estimated By: NPW COST ENGR

Prepared By: NPW COST ENGINEERING BRANCH
LARRY CHENEY, CHIEF, COST ENGR

Date: 10/12/92

HANFORD: 1.4.10.1.1.23.01.2 1100-EM-1 Baselines

This is the structure for the Subproject and Operable Unit remediation cost estimates. The Work Breakdown Structure (WBS) is based on the DOE-HQ WBS and a site specific remediation WBS being developed for Hanford.

"1.4.10.1.1" is DOE, Richland Operations, Hanford Environmental Restoration, Remedial Action.

".23" is the Subproject (ie. 1100-EM)

".01" is the Operable Unit

".2" is Remediation

In this MCACES estimate project breakdown, the first level, "06", represents Remedial Action. The numbers for the next three levels (2nd thru 4th) are from the Hanford Remedial Action WBS. The fifth thru seventh levels are user defined, the fifth level being used for "Bid Items".

The Price Level for the estimate dollars is 1 Oct 93. See Contingency Notes for explanation of Contingency percentages. S & A is estimated at 15%. See Detail notes (pg. 1) for explanation of overhead percentages used.

This project estimate covers the Off-site Incineration of PCB "Hot Spot" in the Horn Rapids Landfill (HRL). PCB contaminated soils will be loaded into 20-Ton roll-off units, for transportation to Texas.

1. Contingency is based on uncertainty of the amount of time required to do the work represented in the estimate, etc.

2. Contingency is based on the uncertainty of the quantities presented.

3. Contingency based on the unit costs obtained by Vendor and therefore may be different by the time work will actually be accomplished.

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Fri 23 Oct 1992

U.S. Army Corps of Engineers
PROJECT PCBOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, HORN RAPIDS LANDFILL, OFF-SITE DISPSL
** PROJECT OWNER SUMMARY - LEVEL 5 (Rounded to 10's) **

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06 REMEDIAL ACTION							
06 01 MOBILIZATION AND PREPATORY WORK							
06 01 01 MOB OF EQUIPMENT & PERSONNEL							
06 01 01 1 TRANSPORTATION							
06 01 01 1 01- Ph I, Equip Mob, Detailed List		2,710	410	620	3,730		
06 01 01 1 02- Ph II, Equip Mob, Detailed List		2,710	410	620	3,730		
TRANSPORTATION		5,410	810	1,240	7,470		
MOB OF EQUIPMENT & PERSONNEL		5,410	810	1,240	7,470		
06 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
06 01 03 01 TRAILERS AND BUILDINGS							
06 01 03 01 01 Ph I, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
06 01 03 01 02 Ph II, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
TRAILERS AND BUILDINGS		7,580	1,140	1,740	10,460		
06 01 03 02 DECONTAMINATION FACILITIES							
06 01 03 02 03 Ph I, Trailers - assbly/setup	120.00 HR	4,550	680	1,050	6,270	52.28	
06 01 03 02 04 Ph II, Trailers - assbly/setup	120.00 HR	4,550	680	1,050	6,270	52.28	
DECONTAMINATION FACILITIES		9,090	1,360	2,090	12,550		
SETUP/CONSTRUCT TEMP FACILITIES		16,670	2,500	3,830	23,000		
MOBILIZATION AND PREPATORY WORK		22,080	3,310	5,080	30,470		
06 02 MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 06 SAMPLING SOIL, SED & SOLID WASTE							
06 02 06 01 SURFACE SOIL							
06 02 06 01 01 PHASE I, Soil Sample	60.00 EA	43,470	6,520	10,000	59,980	999.74	
06 02 06 01 02 PHASE II, Soil Sample	60.00 EA	53,440	8,020	12,290	73,740	1229.03	
SURFACE SOIL		96,900	14,540	22,290	133,730		
SAMPLING SOIL, SED & SOLID WASTE		96,900	14,540	22,290	133,730		

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	MONITOR, SAMPLE, TEST, ANALYSIS		96,900	14,540	22,290	133,730		
06 03	SITE WORK							
06 03 05	FENCING							
06 03 05 01	FENCING							
06 03 05 01 01	Temporary Fencing	400.00 LF	13,290	1,990	3,060	18,340	45.86	
	FENCING		13,290	1,990	3,060	18,340		
	FENCING		13,290	1,990	3,060	18,340		
	SITE WORK		13,290	1,990	3,060	18,340		
06 08	SOLID WASTE COLLECT/CONTAINMENT							
06 08 01	EXCAVATION							
06 08 01 03	CONTAMINATED SOIL							
06 08 01 03 01	PHASE I, Excavate/Load PCB Soils	230.00 CY	131,680	19,750	38,180	189,610	824.39	
06 08 01 03 02	PHASE II,Excavate/Load PCB Soils	110.00 CY	93,490	14,020	27,110	134,620	1223.86	
06 08 01 03 03	Post Removal		2,120	320	610	3,050		
06 08 01 03 91	Safety and Quality Assurance	3.00 WK	20,740	3,110	4,770	28,620	9538.78	
	CONTAMINATED SOIL		248,030	37,200	70,670	355,900		
	EXCAVATION		248,030	37,200	70,670	355,900		
	SOLID WASTE COLLECT/CONTAINMENT		248,030	37,200	70,670	355,900		
06 21	DEMOBILIZATION							
06 21 04	DEMOB OF EQUIPMENT & PERSONNEL							
06 21 04 01	TRANSPORTATION							
06 21 04 01 01	PH I, Demob and take down		8,060	1,210	1,850	11,130		
06 21 04 01 02	PH II, Demob and Take down		8,060	1,210	1,850	11,130		
	TRANSPORTATION		16,120	2,420	3,710	22,250		
	DEMOB OF EQUIPMENT & PERSONNEL		16,120	2,420	3,710	22,250		
	DEMOBILIZATION		16,120	2,420	3,710	22,250		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
REMEDIAL ACTION		396,420	59,460	104,800	560,690		
HANFORD: REMEDIATION		396,420	59,460	104,800	560,690		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06 REMEDIAL ACTION							
06 01 MOBILIZATION AND PREPATORY WORK							
06 01 01 MOB OF EQUIPMENT & PERSONNEL							
06 01 01 1 TRANSPORTATION							
06 01 01 1 01- Ph I, Equip Mob, Detailed List							
Ph I, Equip Mob, Detailed List		2,710	410	620	3,730		
06 01 01 1 02- Ph II, Equip Mob, Detailed List							
Ph II, Equip Mob, Detailed List		2,710	410	620	3,730		
TRANSPORTATION		5,410	810	1,240	7,470		
MOB OF EQUIPMENT & PERSONNEL		5,410	810	1,240	7,470		
06 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
06 01 03 01 TRAILERS AND BUILDINGS							
06 01 03 01 01 Ph I, Office Trailers - setup							
Ph I, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
06 01 03 01 02 Ph II, Office Trailers - setup							
Ph II, Office Trailers - setup	100.00 HR	3,790	570	870	5,230	52.28	
TRAILERS AND BUILDINGS		7,580	1,140	1,740	10,460		
06 01 03 02 DECONTAMINATION FACILITIES							
06 01 03 02 01 Personnel Decon Facilities							
06 01 03 02 02 Equip/Vehicle Decon Facilities							
06 01 03 02 03 Ph I, Trailers - assbly/setup							

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	Ph I, Trailers - assbly/setup	120.00 HR	4,550	680	1,050	6,270	52.28	
06 01 03 02 04	Ph II, Trailers - assbly/setup							
	Ph II, Trailers - assbly/setup	120.00 HR	4,550	680	1,050	6,270	52.28	
	DECONTAMINATION FACILITIES		9,090	1,360	2,090	12,550		
	SETUP/CONSTRUCT TEMP FACILITIES		16,670	2,500	3,830	23,000		
	MOBILIZATION AND PREPATORY WORK		22,080	3,310	5,080	30,470		
06 02	MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 06	SAMPLING SOIL, SED & SOLID WASTE							
06 02 06 01	SURFACE SOIL							
06 02 06 01 01	PHASE I, Soil Sample							
06 02 06 01 01 01	Soil Sampling	60.00 EA	39,880	5,980	9,170	55,030	917.19	1
06 02 06 01 01 02	QA Report		3,590	540	830	4,950		1
	PHASE I, Soil Sample	60.00 EA	43,470	6,520	10,000	59,980	999.74	
06 02 06 01 02	PHASE II, Soil Sample							
06 02 06 01 02 01	Soil Sampling	60.00 EA	49,850	7,480	11,460	68,790	1146.49	1
06 02 06 01 02 02	QA Report		3,590	540	830	4,950		1
	PHASE II, Soil Sample	60.00 EA	53,440	8,020	12,290	73,740	1229.03	
	SURFACE SOIL		96,900	14,540	22,290	133,730		
	SAMPLING SOIL, SED & SOLID WASTE		96,900	14,540	22,290	133,730		
	MONITOR, SAMPLE, TEST, ANALYSIS		96,900	14,540	22,290	133,730		
06 03	SITE WORK							
06 03 05	FENCING							
06 03 05 01	FENCING							
06 03 05 01 01	Temporary Fencing							

		QUANTITY	UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06 03 05 01 01 01	Temporary Fencing - 6' Security	400.00	LF	13,290	1,990	3,060	18,340	45.86	
	Temporary Fencing	400.00	LF	13,290	1,990	3,060	18,340	45.86	
	FENCING			13,290	1,990	3,060	18,340		
	FENCING			13,290	1,990	3,060	18,340		
	SITE WORK			13,290	1,990	3,060	18,340		
06 08 SOLID WASTE COLLECT/CONTAINMENT									
06 08 01 EXCAVATION									
06 08 01 03 CONTAMINATED SOIL									
06 08 01 03 01 PHASE I, Excavate/Load PCB Soils									
06 08 01 03 01 01	Excavate/Load PCB Soils	350.00	CY	1,870	280	860	3,020	8.61	2
06 08 01 03 01 02	Transport PCB Soils - Arlington	350.00	CY	127,130	19,070	36,550	182,750	522.16	2,3
06 08 01 03 01 03	PPEquip, Modified Class D	3.00	DAY	2,670	400	770	3,840	1279.59	1
	PHASE I, Excavate/Load PCB Soils	230.00	CY	131,680	19,750	38,180	189,610	824.39	
06 08 01 03 02 PHASE II,Excavate/Load PCB Soils									
06 08 01 03 02 01	Excavate/Load PCB Soils	250.00	CY	1,340	200	620	2,150	8.61	1,2
06 08 01 03 02 02	Transport PCB Soils - Arlington	250.00	CY	90,370	13,560	25,980	129,910	519.65	2,3
06 08 01 03 02 03	PPEquip, Modified Class D	2.00	DAY	1,780	270	510	2,560	1279.59	1
	PHASE II,Excavate/Load PCB Soils	110.00	CY	93,490	14,020	27,110	134,620	1223.86	
06 08 01 03 03 Post Removal									
06 08 01 03 03 01	Excavate/Load Crew	1.00	DAY	1,230	180	350	1,770	1769.02	1
06 08 01 03 03 02	PPEquip, Modified Class D	1.00	DAY	890	130	260	1,280	1279.59	1
	Post Removal			2,120	320	610	3,050		
06 08 01 03 91 Safety and Quality Assurance									
	Safety and Quality Assurance	3.00	WK	20,740	3,110	4,770	28,620	9538.78	
	CONTAMINATED SOIL			248,030	37,200	70,670	355,900		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
EXCAVATION		248,030	37,200	70,670	355,900		
SOLID WASTE COLLECT/CONTAINMENT		248,030	37,200	70,670	355,900		
06 21 DEMOBILIZATION							
06 21 04 DEMOB OF EQUIPMENT & PERSONNEL							
06 21 04 01 TRANSPORTATION							
06 21 04 01 01 PH I, Demob and take down							
PH I, Demob and take down		8,060	1,210	1,850	11,130		
06 21 04 01 02 PH II, Demob and Take down							
PH II, Demob and Take down		8,060	1,210	1,850	11,130		
TRANSPORTATION		16,120	2,420	3,710	22,250		
DEMOB OF EQUIPMENT & PERSONNEL		16,120	2,420	3,710	22,250		
DEMOBILIZATION		16,120	2,420	3,710	22,250		
REMEDIAL ACTION		396,420	59,460	104,800	560,690		
HANFORD: REMEDIATION		396,420	59,460	104,800	560,690		

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06	REMEDIAL ACTION									
06 01	MOBILIZATION AND PREPATORY WORK									
06 01 01	MOB OF EQUIPMENT & PERSONNEL									
06 01 01 1	TRANSPORTATION									
06 01 01 1 01-	Ph I, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
06 01 01 1 02-	Ph II, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
	TRANSPORTATION		4,070	610	230	390	50	50	5,410	
	MOB OF EQUIPMENT & PERSONNEL		4,070	610	230	390	50	50	5,410	
06 01 03	SETUP/CONSTRUCT TEMP FACILITIES									
06 01 03 01	TRAILERS AND BUILDINGS									
06 01 03 01 01	Ph I, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
06 01 03 01 02	Ph II, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
	TRAILERS AND BUILDINGS		5,700	860	330	550	70	80	7,580	
06 01 03 02	DECONTAMINATION FACILITIES									
06 01 03 02 03	Ph I, Trailers - assbly/setup	120.00 HR	3,420	510	200	330	40	50	4,550	37.88
06 01 03 02 04	Ph II, Trailers - assbly/setup	120.00 HR	3,420	510	200	330	40	50	4,550	37.88
	DECONTAMINATION FACILITIES		6,840	1,030	390	660	80	90	9,090	
	SETUP/CONSTRUCT TEMP FACILITIES		12,540	1,880	720	1,210	150	170	16,670	
	MOBILIZATION AND PREPATORY WORK		16,610	2,490	960	1,600	200	220	22,080	
06 02	MONITOR, SAMPLE, TEST, ANALYSIS									
06 02 06	SAMPLING SOIL, SED & SOLID WASTE									
06 02 06 01	SURFACE SOIL									
06 02 06 01 01	PHASE I, Soil Sample	60.00 EA	32,700	4,910	1,880	3,160	390	430	43,470	724.45
06 02 06 01 02	PHASE II, Soil Sample	60.00 EA	40,200	6,030	2,310	3,880	480	530	53,440	890.60
	SURFACE SOIL		72,900	10,940	4,190	7,040	870	960	96,900	
	SAMPLING SOIL, SED & SOLID WASTE		72,900	10,940	4,190	7,040	870	960	96,900	

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	MONITOR, SAMPLE, TEST, ANALYSIS		72,900	10,940	4,190	7,040	870	960	96,900	
06 03	SITE WORK									
06 03 05	FENCING									
06 03 05 01	FENCING									
06 03 05 01 01	Temporary Fencing	400.00 LF	10,000	1,500	580	970	120	130	13,290	33.23
	FENCING		10,000	1,500	580	970	120	130	13,290	
	FENCING		10,000	1,500	580	970	120	130	13,290	
	SITE WORK		10,000	1,500	580	970	120	130	13,290	
06 08	SOLID WASTE COLLECT/CONTAINMENT									
06 08 01	EXCAVATION									
06 08 01 03	CONTAMINATED SOIL									
06 08 01 03 01	PHASE I, Excavate/Load PCB Soils	230.00 CY	99,060	14,860	5,700	9,570	1,190	1,300	131,680	572.51
06 08 01 03 02	PHASE II,Excavate/Load PCB Soils	110.00 CY	70,330	10,550	4,040	6,790	840	930	93,490	849.92
06 08 01 03 03	Post Removal		1,600	240	90	150	20	20	2,120	
06 08 01 03 91	Safety and Quality Assurance	3.00 WK	15,600	2,340	900	1,510	190	210	20,740	6912.16
	CONTAMINATED SOIL		186,590	27,990	10,730	18,020	2,240	2,460	248,030	
	EXCAVATION		186,590	27,990	10,730	18,020	2,240	2,460	248,030	
	SOLID WASTE COLLECT/CONTAINMENT		186,590	27,990	10,730	18,020	2,240	2,460	248,030	
06 21	DEMOBILIZATION									
06 21 04	DEMOB OF EQUIPMENT & PERSONNEL									
06 21 04 01	TRANSPORTATION									
06 21 04 01 01	PH I, Demob and take down		6,070	910	350	590	70	80	8,060	
06 21 04 01 02	PH II, Demob and Take down		6,070	910	350	590	70	80	8,060	
	TRANSPORTATION		12,130	1,820	700	1,170	150	160	16,120	
	DEMOB OF EQUIPMENT & PERSONNEL		12,130	1,820	700	1,170	150	160	16,120	
	DEMOBILIZATION		12,130	1,820	700	1,170	150	160	16,120	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
REMEDIAL ACTION		298,230	44,730	17,150	28,810	3,580	3,920	396,420	
HANFORD: REMEDIATION		298,230	44,730	17,150	28,810	3,580	3,920	396,420	
S & A								59,460	
SUBTOTAL								455,890	
CONTINGENCY								104,800	
TOTAL INCL OWNER COSTS								560,690	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 REMEDIAL ACTION									
06 01 MOBILIZATION AND PREPATORY WORK									
06 01 01 MOB OF EQUIPMENT & PERSONNEL									
06 01 01 1 TRANSPORTATION									
06 01 01 1 01- Ph I, Equip Mob, Detailed List									
Ph I, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
06 01 01 1 02- Ph II, Equip Mob, Detailed List									
Ph II, Equip Mob, Detailed List		2,040	310	120	200	20	30	2,710	
TRANSPORTATION		4,070	610	230	390	50	50	5,410	
MOB OF EQUIPMENT & PERSONNEL		4,070	610	230	390	50	50	5,410	
06 01 03 SETUP/CONSTRUCT TEMP FACILITIES									
06 01 03 01 TRAILERS AND BUILDINGS									
06 01 03 01 01 Ph I, Office Trailers - setup									
Ph I, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
06 01 03 01 02 Ph II, Office Trailers - setup									
Ph II, Office Trailers - setup	100.00 HR	2,850	430	160	280	30	40	3,790	37.88
TRAILERS AND BUILDINGS		5,700	860	330	550	70	80	7,580	
06 01 03 02 DECONTAMINATION FACILITIES									
06 01 03 02 01 Personnel Decon Facilities									
06 01 03 02 02 Equip/Vehicle Decon Facilities									
06 01 03 02 03 Ph I, Trailers - assbly/setup									

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	Ph I, Trailers - assbly/setup	120.00 HR	3,420	510	200	330	40	50	4,550	37.88
06 01 03 02 04	Ph II, Trailers - assbly/setup									
	Ph II, Trailers - assbly/setup	120.00 HR	3,420	510	200	330	40	50	4,550	37.88
	DECONTAMINATION FACILITIES		6,840	1,030	390	660	80	90	9,090	
	SETUP/CONSTRUCT TEMP FACILITIES		12,540	1,880	720	1,210	150	170	16,670	
	MOBILIZATION AND PREPATORY WORK		16,610	2,490	960	1,600	200	220	22,080	
06 02	MONITOR, SAMPLE, TEST, ANALYSIS									
06 02 06	SAMPLING SOIL, SED & SOLID WASTE									
06 02 06 01	SURFACE SOIL									
06 02 06 01 01	PHASE I, Soil Sample									
06 02 06 01 01 01	Soil Sampling	60.00 EA	30,000	4,500	1,720	2,900	360	390	39,880	664.63
06 02 06 01 01 02	QA Report		2,700	410	160	260	30	40	3,590	
	PHASE I, Soil Sample	60.00 EA	32,700	4,910	1,880	3,160	390	430	43,470	724.45
06 02 06 01 02	PHASE II, Soil Sample									
06 02 06 01 02 01	Soil Sampling	60.00 EA	37,500	5,630	2,160	3,620	450	490	49,850	830.79
06 02 06 01 02 02	QA Report		2,700	410	160	260	30	40	3,590	
	PHASE II, Soil Sample	60.00 EA	40,200	6,030	2,310	3,880	480	530	53,440	890.60
	SURFACE SOIL		72,900	10,940	4,190	7,040	870	960	96,900	
	SAMPLING SOIL, SED & SOLID WASTE		72,900	10,940	4,190	7,040	870	960	96,900	
	MONITOR, SAMPLE, TEST, ANALYSIS		72,900	10,940	4,190	7,040	870	960	96,900	
06 03	SITE WORK									
06 03 05	FENCING									
06 03 05 01	FENCING									
06 03 05 01 01	Temporary Fencing									

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 03 05 01 01 01	Temporary Fencing - 6' Security	400.00 LF	10,000	1,500	580	970	120	130	13,290	33.23
	Temporary Fencing	400.00 LF	10,000	1,500	580	970	120	130	13,290	33.23
	FENCING		10,000	1,500	580	970	120	130	13,290	
	FENCING		10,000	1,500	580	970	120	130	13,290	
	SITE WORK		10,000	1,500	580	970	120	130	13,290	
06 08 SOLID WASTE COLLECT/CONTAINMENT										
06 08 01 EXCAVATION										
06 08 01 03 CONTAMINATED SOIL										
06 08 01 03 01 PHASE I, Excavate/Load PCB Soils										
06 08 01 03 01 01	Excavate/Load PCB Soils	350.00 CY	1,410	210	80	140	20	20	1,870	5.35
06 08 01 03 01 02	Transport PCB Soils - Arlington	350.00 CY	95,640	14,350	5,500	9,240	1,150	1,260	127,130	363.24
06 08 01 03 01 03	PPEquip, Modified Class D	3.00 DAY	2,010	300	120	190	20	30	2,670	890.15
	PHASE I, Excavate/Load PCB Soils	230.00 CY	99,060	14,860	5,700	9,570	1,190	1,300	131,680	572.51
06 08 01 03 02 PHASE II,Excavate/Load PCB Soils										
06 08 01 03 02 01	Excavate/Load PCB Soils	250.00 CY	1,010	150	60	100	10	10	1,340	5.35
06 08 01 03 02 02	Transport PCB Soils - Arlington	250.00 CY	67,990	10,200	3,910	6,570	820	890	90,370	361.49
06 08 01 03 02 03	PPEquip, Modified Class D	2.00 DAY	1,340	200	80	130	20	20	1,780	890.15
	PHASE II,Excavate/Load PCB Soils	110.00 CY	70,330	10,550	4,040	6,790	840	930	93,490	849.92
06 08 01 03 03 Post Removal										
06 08 01 03 03 01	Excavate/Load Crew	1.00 DAY	930	140	50	90	10	10	1,230	1230.62
06 08 01 03 03 02	PPEquip, Modified Class D	1.00 DAY	670	100	40	60	10	10	890	890.15
	Post Removal		1,600	240	90	150	20	20	2,120	
06 08 01 03 91 Safety and Quality Assurance										
	Safety and Quality Assurance	3.00 WK	15,600	2,340	900	1,510	190	210	20,740	6912.16
	CONTAMINATED SOIL		186,590	27,990	10,730	18,020	2,240	2,460	248,030	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
EXCAVATION		186,590	27,990	10,730	18,020	2,240	2,460	248,030	
SOLID WASTE COLLECT/CONTAINMENT		186,590	27,990	10,730	18,020	2,240	2,460	248,030	
06 21 DEMOBILIZATION									
06 21 04 DEMOB OF EQUIPMENT & PERSONNEL									
06 21 04 01 TRANSPORTATION									
06 21 04 01 01 PH I, Demob and take down									
PH I, Demob and take down		6,070	910	350	590	70	80	8,060	
06 21 04 01 02 PH II, Demob and Take down									
PH II, Demob and Take down		6,070	910	350	590	70	80	8,060	
TRANSPORTATION		12,130	1,820	700	1,170	150	160	16,120	
DEMOB OF EQUIPMENT & PERSONNEL		12,130	1,820	700	1,170	150	160	16,120	
DEMOBILIZATION		12,130	1,820	700	1,170	150	160	16,120	
REMEDIAL ACTION		298,230	44,730	17,150	28,810	3,580	3,920	396,420	
HANFORD: REMEDIATION		298,230	44,730	17,150	28,810	3,580	3,920	396,420	
S & A								59,460	
SUBTOTAL								455,890	
CONTINGENCY								104,800	
TOTAL INCL OWNER COSTS								560,690	

0 AA. REMEDIAL GENERAL CONTRACTOR	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST

0 AA. REMEDIAL GENERAL CONTRACTOR

Overhead Percentage Explanation:

Field office Overhead (FOOH): Normal is 10%, using 15% to allow for extra safety and Hanford related items.

Home office Overhead (HOOH): 4-5% is normal for this size of job.

PROFIT: 7-8% is normal for this size of job. However, PROFIT may be calculated separately for each job using the Weighted-Guide Line Method.

BOND: Calculated per dollar amount of job using B Bond rates by GOLD.

B&O TAX: 1% covers the 0.5% WA State B&O tax, and the 0.5% TARO tax.

06. REMEDIAL ACTION
06 01. MOBILIZATION AND PREPATORY WORK
06 01 01. MOB OF EQUIPMENT & PERSONNEL
06 01 01 1. TRANSPORTATION
06 01 01 1 01-. Ph I, Equip Mob, Detailed List
This item covers the Mobilization of the equipment and misc. items as detailed below. A 100-mi radius mob is assumed.

USR AA <01505 3235 >	Mob, FEnd Ldr, wheel 1-1/2-3 cy Atriculated Fr, 100-mi Radius	1.00	EA	0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 6115 >	Mob, Dozer, Crawler, 50-100 hp w/blade, incl set up 100 mi radius	1.00	EA	0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 7131 >	Mob, Water Tank, 3,000 Gal, Mtd/FT800 Trk, 100-mi Radius	1.00	EA	0.00	0.00 0	0.00 0	150.00 150	0.00 0	0.00 0	150.00 150	150.00
USR AA <01505 8921 >	Mob, Decontamination Trailer w/25,000 GVW Trk, 100-mi Radius	1.00	EA	0.00	0.00 0	0.00 0	135.00 135	0.00 0	0.00 0	135.00 135	135.00
USR AA <01505 1101 >	Mob - Field Office Trailer	1.00	EA	0.00	0.00 0	0.00 0	250.00 250	0.00 0	0.00 0	250.00 250	250.00
	Ph I, Equip Mob, Detailed List				0	0	2,035	0	0	2,035	

06 01. MOBILIZATION AND PREPATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 01 1 02-. Ph II, Equip Mob, Detailed List This item covers the Mobilization of the equipment and misc. items as detailed below. A 100-mi radius mob is assumed.											
USR AA <01505 3235 > Mob, FEnd Ldr, wheel 1-1/2-3 cy Atriculated Fr, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 6115 > Mob, Dozer, Crawler, 50-100 hp w/blade, incl set up 100 mi radius	1.00	EA		0.00	0.00 0	0.00 0	750.00 750	0.00 0	0.00 0	750.00 750	750.00
USR AA <01505 7131 > Mob, Water Tank, 3,000 Gal, Mtd/FT800 Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	150.00 150	0.00 0	0.00 0	150.00 150	150.00
USR AA <01505 8921 > Mob, Decontamination Trailer w/25,000 GVW Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	135.00 135	0.00 0	0.00 0	135.00 135	135.00
USR AA <01505 1101 > Mob - Field Office Trailer	1.00	EA		0.00	0.00 0	0.00 0	250.00 250	0.00 0	0.00 0	250.00 250	250.00
Ph II, Equip Mob, Detailed List					0	0	2,035	0	0	2,035	
TRANSPORTATION					0	0	4,070	0	0	4,070	

06 01. MOBILIZATION AND PREPATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 03. SETUP/CONSTRUCT TEMP FACILITIES											
06 01 03 01. TRAILERS AND BUILDINGS											
06 01 03 01 01. Ph I, Office Trailers - setup											
Allow 100mhrs for setup of contractor's trailer and equipment and site layout. An allowance for some equipment and material has been added.											
Ph I, Office Trailers - setup	100.00	HR			0	2,500	250	100	0	2,850	28.50
06 01 03 01 02. Ph II, Office Trailers - setup											
Allow 100mhrs for setup of contractor's trailer and equipment and site layout. An allowance for some equipment and material has been added.											
Ph II, Office Trailers - setup	100.00	HR			0	2,500	250	100	0	2,850	28.50
TRAILERS AND BUILDINGS					0	5,000	500	200	0	5,700	

U.S. Army Corps of Engineers
PROJECT PCBOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, HORN RAPIDS LANDFILL, OFF-SITE DISPSL
06. REMEDIAL ACTION

06 01. MOBILIZATION AND PREPATORY WORK	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 03 02. DECONTAMINATION FACILITIES									
06 01 03 02 01. Personnel Decon Facilities									
Personnel Decon Facilities			0	0	0	0	0	0	
06 01 03 02 02. Equip/Vehicle Decon Facilities									
Equip/Vehicle Decon Facilities			0	0	0	0	0	0	
06 01 03 02 03. Ph I, Trailers - assbly/setup									
Allow 100mhrs for setup of decontaminatio trailer and equipment and site layout. An allowance for some equipment and material has been added.									
Ph I, Trailers - assbly/setup	120.00 HR		0	3,000	300	120	0	3,420	28.50
06 01 03 02 04. Ph II, Trailers - assbly/setup									
Allow 100mhrs for setup of decontaminatio trailer and equipment and site layout. An allowance for some equipment and material has been added.									
Ph II, Trailers - assbly/setup	120.00 HR		0	3,000	300	120	0	3,420	28.50
DECONTAMINATION FACILITIES			0	6,000	600	240	0	6,840	

06 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 02. MONITOR, SAMPLE, TEST, ANALYSIS											
06 02 06. SAMPLING SOIL, SED & SOLID WASTE											
06 02 06 01. SURFACE SOIL											
06 02 06 01 01. PHASE I, Soil Sample											
After the top 12" of soil is removed, soil samples will be taken.											
06 02 06 01 01 01. Soil Sampling											
Sample on 15'x15' grid (50 samples) with analysis at off site lab for BEHP only, with 14-day turnaround. Method 8270. Add 10 QA samples.											
Soil Sampling	60.00	EA		0	0	0	0	0	30,000	30,000	500.00
QA Report				0	0	0	0	0	2,700	2,700	
PHASE I, Soil Sample	60.00	EA		0	0	0	0	0	32,700	32,700	545.00

06 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 02 06 01 02. PHASE II, Soil Sample Another set of soil samples will be taken after the next 6" soil layer is excavated.											
06 02 06 01 02 01. Soil Sampling Same as Phase I, except with 7-day turnaround, add 25%.											
Soil Sampling	60.00	EA			0	0	0	0	37,500	37,500	625.00
QA Report					0	0	0	0	2,700	2,700	
PHASE II, Soil Sample	60.00	EA			0	0	0	0	40,200	40,200	670.00
SURFACE SOIL					0	0	0	0	72,900	72,900	

06 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 03. SITE WORK											
06 03 05. FENCING											
06 03 05 01. FENCING											
06 03 05 01 01. Temporary Fencing											
06 03 05 01 01 01. Temporary Fencing - 6' Security A 6' Security fence will be required during the duration of the cleanup activities around the work site. Cost taken from recent bid quotes. "Other" cost for removal.											
Temporary Fencing - 6' Security	400.00	LF			0	2,000	1,000	5,000	2,000	10,000	25.00
Temporary Fencing	400.00	LF			0	2,000	1,000	5,000	2,000	10,000	25.00
FENCING					0	2,000	1,000	5,000	2,000	10,000	

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08. SOLID WASTE COLLECT/CONTAINMENT											
06 08 01. EXCAVATION											
06 08 01 03. CONTAMINATED SOIL											
06 08 01 03 01. PHASE I, Excavate/Load PCB Soils											
06 08 01 03 01 01. Excavate/Load PCB Soils											
L USR AA <02220 0000 > Excavate top 36-inches of soil	350.00	CY	XXQNA	28.75	0.06 21	1.59 556	0.54 190	0.00 0	0.00 0	2.13 745	2.13
USR AA <02220 0000 > Load excavated/stockpiled soil load in 28-ton dump trucks - DOT approved hazardeous waste hauler. assume 3,100lb/bcy	350.00	CY	XXQMG	28.75	0.03 12	0.94 330	0.95 334	0.00 0	0.00 0	1.90 664	1.90
Excavate/Load PCB Soils	350.00	CY			33	886	523	0	0	1,409	4.03
06 08 01 03 01 02. Transport PCB Soils - Arlington											
USR AA <02220 0000 > Transport soil to Arlington, OR 350 cy x 3,100lb/cy / 2000lb/ton = 542.5 tons @ 28 tons/truck = 19.37 trucks use 20 trucks	20.00	TRK		0.00	0.00 0	0.00 0	0.00 0	0.00 0	400.00 8,000	400.00 8,000	400.00
USR AA <02220 0000 > Disposal of soil in landfill	542.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	134.00 72,695	134.00 72,695	134.00
USR AA <02220 0000 > Oregon state environmental tax	542.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	27.00 14,648	27.00 14,648	27.00
USR AA <02220 0000 > Soil profile fee	1.00	EA		0.00	0.00 0	0.00 0	0.00 0	0.00 0	300.00 300	300.00 300	300.00
Transport PCB Soils - Arlington	350.00	CY			0	0	0	0	95,643	95,643	273.26
06 08 01 03 01 03. PPEquip, Modified Class D											
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)	12.00	EA	N/A	0.00	0.00 0	0.00 0	11.50 138	0.00 0	0.00 0	11.50 138	11.50
M HTW AA <01951 5204 > Coveralls, Tyvek	12.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	7.55 91	0.00 0	7.55 91	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves	12.00	PR	N/A	0.00	0.00 0	0.00 0	2.30 28	0.00 0	0.00 0	2.30 28	2.30

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
HTW AA <01951 5726 > Half-Mask Air Purifying Respirators	12.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	19.94 239	0.00 0	19.94 239	19.94
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)	3.00	DAY	ULABA	0.13	10.00 30	234.30 703	1.45 4	34.83 104	0.00 0	270.58 812	270.58
M HTW AA <01957 4301 > 8 Ft x 36 Ft, 2 Showers, 2 Wall Fans (Monthly Rental)	3.00	DAY	N/A	0.00	0.00 0	0.00 0	0.00 0	26.95 81	0.00 0	26.95 81	26.95
HTW AA <01951 5723 > Cartridges, Respirator	24.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	25.87 621	0.00 0	25.87 621	25.87
PPEquip, Modified Class D	3.00	DAY			30	703	170	1,136	0	2,009	669.66
PHASE I, Excavate/Load PCB Soils	230.00	CY			63	1,588	693	1,136	95,643	99,060	430.70

U.S. Army Corps of Engineers
PROJECT PCBOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, HORN RAPIDS LANDFILL, OFF-SITE DISPSL
06. REMEDIAL ACTION

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 01 03 02. PHASE II,Excavate/Load PCB Soils											
06 08 01 03 02 01. Excavate/Load PCB Soils											
L USR AA <02220 0000 > Excavate next 2-feet of soil	250.00	CY	XXQNA	28.75	0.06 15	1.59 397	0.54 135	0.00 0	0.00 0	2.13 532	2.13
USR AA <02220 0000 > Load excavated/stockpiled soil load in 28-ton dump trucks - DOT approved hazardeous waste hauler. assume 3,100lb/bcy	250.00	CY	XXQMG	28.75	0.03 9	0.94 236	0.95 238	0.00 0	0.00 0	1.90 474	1.90
Excavate/Load PCB Soils	250.00	CY			24	633	374	0	0	1,006	4.03
06 08 01 03 02 02. Transport PCB Soils - Arlington											
USR AA <02220 0000 > Transport soil to Arlington, OR 250 cy x 3,100lb/cy / 2000lb/ton = 387.5 tons @ 28 tons/truck = 13.8 trucks use 14 trucks	14.00	TRK		0.00	0.00 0	0.00 0	0.00 0	0.00 0	400.00 5,600	400.00 5,600	400.00
USR AA <02220 0000 > Disposal of soil in landfill	387.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	134.00 51,925	134.00 51,925	134.00
USR AA <02220 0000 > Oregon state environmental tax	387.50	TON		0.00	0.00 0	0.00 0	0.00 0	0.00 0	27.00 10,463	27.00 10,463	27.00
Transport PCB Soils - Arlington	250.00	CY			0	0	0	0	67,988	67,988	271.95
06 08 01 03 02 03. PPEquip, Modified Class D											
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)	8.00	EA	N/A	0.00	0.00 0	0.00 0	11.50 92	0.00 0	0.00 0	11.50 92	11.50
M HTW AA <01951 5204 > Coveralls, Tyvek	8.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	7.55 60	0.00 0	7.55 60	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves	8.00	PR	N/A	0.00	0.00 0	0.00 0	2.30 18	0.00 0	0.00 0	2.30 18	2.30
HTW AA <01951 5726 > Half-Mask Air Purifying Respirators	8.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	19.94 160	0.00 0	19.94 160	19.94
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)	2.00	DAY	ULABA	0.13	10.00 20	234.30 469	1.45 3	34.83 70	0.00 0	270.58 541	270.58

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
M HTW AA <01957 4301 > 8 Ft x 36 Ft, 2 Showers, 2 Wall Fans (Monthly Rental)	2.00	DAY	N/A	0.00	0.00 0	0.00 0	0.00 0	26.95 54	0.00 0	26.95 54	26.95
HTW AA <01951 5723 > Cartridges, Respirator	16.00	EA	N/A	0.00	0.00 0	0.00 0	0.00 0	25.87 414	0.00 0	25.87 414	25.87
PPEquip, Modified Class D	2.00	DAY			20	469	113	757	0	1,339	669.66
PHASE II,Excavate/Load PCB Soils	110.00	CY			44	1,101	487	757	67,988	70,333	639.39

U.S. Army Corps of Engineers
PROJECT PCBOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, HORN RAPIDS LANDFILL, OFF-SITE DISPSL
06. REMEDIAL ACTION

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 01 03 03. Post Removal									
06 08 01 03 03 01. Excavate/Load Crew									
L USR AA <02220 0000 > Excavation crew	1.00 DAY XXQNA	0.13	14.00 14	365.22 365	124.54 125	0.00 0	0.00 0	489.76 490	489.76
USR AA <02220 0000 > Load crew load in 28-ton dump trucks - DOT approved hazardeous waste hauler. assume 3,100lb/bcy	1.00 DAY XXQMG	0.13	8.00 8	216.72 217	219.31 219	0.00 0	0.00 0	436.03 436	436.03
Excavate/Load Crew	1.00 DAY		22	582	344	0	0	926	925.80
06 08 01 03 03 02. PPEquip, Modified Class D									
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)	4.00 EA N/A	0.00	0.00 0	0.00 0	11.50 46	0.00 0	0.00 0	11.50 46	11.50
M HTW AA <01951 5204 > Coveralls, Tyvek	4.00 EA N/A	0.00	0.00 0	0.00 0	0.00 0	7.55 30	0.00 0	7.55 30	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves	4.00 PR N/A	0.00	0.00 0	0.00 0	2.30 9	0.00 0	0.00 0	2.30 9	2.30
HTW AA <01951 5726 > Half-Mask Air Purifying Respirators	4.00 EA N/A	0.00	0.00 0	0.00 0	0.00 0	19.94 80	0.00 0	19.94 80	19.94
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)	1.00 DAY ULABA	0.13	10.00 10	234.30 234	1.45 1	34.83 35	0.00 0	270.58 271	270.58
M HTW AA <01957 4301 > 8 Ft x 36 Ft, 2 Showers, 2 Wall Fans (Monthly Rental)	1.00 DAY N/A	0.00	0.00 0	0.00 0	0.00 0	26.95 27	0.00 0	26.95 27	26.95
HTW AA <01951 5723 > Cartridges, Respirator	8.00 EA N/A	0.00	0.00 0	0.00 0	0.00 0	25.87 207	0.00 0	25.87 207	25.87
PPEquip, Modified Class D	1.00 DAY		10	234	57	379	0	670	669.66
Post Removal			32	816	401	379	0	1,595	

06 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 01 03 91. Safety and Quality Assurance											
Safety/QA crew:											
WHC HPT: $50/hr x 40hrs = $2,000											
Safety: $70/hr x 40hrs = $2,800											
Special Assistance to QA: $50/hr x 8 hrs = $ 400											
Total cost/week $5,200											
Safety and Quality Assurance	3.00	WK			0	15,600	0	0	0	15,600	5200.00
CONTAMINATED SOIL					139	19,106	1,581	2,272	163,630	186,589	

06 21. DEMOBILIZATION	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 21. DEMOBILIZATION											
06 21 04. DEMOB OF EQUIPMENT & PERSONNEL											
06 21 04 01. TRANSPORTATION											
06 21 04 01 01. PH I, Demob and take down Allow 75% of mobilization and setup costs. PH I, Demob and take down					0	4,125	1,940	0	0	6,065	
06 21 04 01 02. PH II, Demob and Take down Allow 75% of mobilization and setup costs. PH II, Demob and Take down					0	4,125	1,940	0	0	6,065	
TRANSPORTATION					0	8,250	3,880	0	0	12,130	
HANFORD: REMEDIATION					139	40,356	11,631	7,712	238,530	298,229	

Fri 23 Oct 1992

U.S. Army Corps of Engineers
PROJECT PCBOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, HORN RAPIDS LANDFILL, OFF-SITE DISPSL
** CREW BACKUP **

SRC	ITEM ID		DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
	ULABA		1 B-laborer + Small Tools			PROD = 100%				CREW HOURS =	96
MIL	B-LABORER	F	Laborer (Semi-Skilled)	0.25	HR	23.83	0.25	5.96			5.96
MIL	B-LABORER	L	Laborer (Semi-Skilled)	1.00	HR	23.33	1.00	23.33			23.33
MIL	XMIXX020	E	Small Tools	0.13	HR	1.39			0.13	0.18	0.18
	TOTAL						1.25	29.29	0.13	0.18	29.47
	XXQMG		1 X-eqoprmed + 1 Front End Ldr, 2-1/2 Cy, Wheel			PROD = 100%				CREW HOURS =	58
MIL	L40CA004	E	LDR,FE,WH, 2-1/2CY, ARTIC, 936E	1.00	HR	27.41			1.00	27.41	27.41
MIL	X-EQOPRMEDL		Outside Equip. Op. Medium	1.00	HR	27.09	1.00	27.09			27.09
	TOTAL						1.00	27.09	1.00	27.41	54.50
	XXQNA		1 X-eqoprmed + 1 Dozer, Cat D-38, 65 Hp			PROD = 100%				CREW HOURS =	58
MIL	T10CA001	E	BLADE,POWER ANGLE TILT,FOR D3	1.00	HR	1.87			1.00	1.87	1.87
MIL	T15CA003	E	DOZER,CWLR,D-3C,PS,(ADD BLADE)	1.00	HR	13.70			1.00	13.70	13.70
MIL	X-LABORER	L	Outside Laborer	0.50	HR	23.33	0.50	11.67			11.67
MIL	X-EQOPRMEDL		Outside Equip. Op. Medium	1.00	HR	27.09	1.00	27.09			27.09
MIL	X-EQOPRMEDF		Outside Equip. Op. Medium	0.25	HR	27.59	0.25	6.90			6.90
	TOTAL						1.75	45.65	2.00	15.57	61.22

SRC LABOR ID	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	UOM	UPDATE	**** TOTAL **** DEFAULT	HOURS
MIL B-LABORER	Laborer/Helper	23.33	0.0%	0.0%	0.00	0.00	23.33	HR	10/15/92	22.36	120
MIL X-EQOPRMED	Outside Equipment Oper. Medium	27.09	0.0%	0.0%	0.00	0.00	27.09	HR	10/15/92	25.84	130
MIL X-LABORER	Outside Laborer	23.33	0.0%	0.0%	0.00	0.00	23.33	HR	10/15/92	22.36	29

SRC EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	** TOTAL ** TOTAL UOM	HOURS
MIL L40CA004	LDR,FE,WH, 2-1/2CY, ARTIC, 936E	8.03	2.79	3.99	1.6	8.34	2.26	0.34	27.41 HR	58
MIL T10CA001	BLADE,POWER ANGLE TILT,FOR D3	0.75	0.22		0.0	0.82			1.87 HR	58
MIL T15CA003	DOZER,CWLR,D-3C,PS,(ADD BLADE)	3.51	1.14	2.14	0.7	6.14			13.70 HR	58
MIL XMIXX020	Small Tools	0.46	0.17	0.13	0.0	0.57			1.39 HR	12

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Fri 23 Oct 1992 U.S. Army Corps of Engineers TIME 09:10:38

ERROR REPORT PROJECT PCBOFF: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2 ERROR PAGE 1
1100-EM-1, HORN RAPIDS LANDFILL, OFF-SITE DISPSL

No errors detected...

* * * END OF ERROR REPORT * * *

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SUMMARY REPORTS — SUMMARY PAGE

DETAILED ESTIMATE — DETAIL PAGE

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* * * END TABLE OF CONTENTS * * *

** PROJECT SETTINGS **

ESTIMATE TYPE : A-Crews with Auto Reprice

SALES TAX : 7.80%

DATE OF ESCALATION SCHEDULE : 10/07/92

PROJECT DIRECT COST COLUMNS

Col Type	H	L	E	M	U
Rep Width	8	10	10	12	10
Title	MHRS	LABR	EQUIP	MAT	OTHER

PROJECT INDIRECT COST COLUMNS

Col Type	O	U	P	B	U
Rep Width	9	9	9	9	9
Title	FOOH	HOOH	PROF	BOND	B&O TAX

PROJECT OWNER COST COLUMNS

Col Type	U	U	X	X	X
Rep Width	12	12	0	0	0
Title	S & A	CONTG	(Unused)	(Unused)	(Unused)

PROJECT BREAKDOWN

PROJECT ID	Length	Trail Sep	Level Title	2nd View Order
Level 1 ID :	2		Des/Actn	0
Level 2 ID :	2		Feature	0
Level 3 ID :	2		SubFeat	0
Level 4 ID :	2		System	0
Level 5 ID :	4		Bid Item	0
Level 6 ID :	4	-	Task	0

Owner Cost Level : 1

** PROJECT SETTINGS **

2ND VIEW COLUMNS
Quantity Column Width : 10

Col Type	X	X	X	X	X
Rep Width	0	0	0	0	0
Title	(Unused)	(Unused)	(Unused)	(Unused)	(Unused)
Shadow	X	X	X	X	X

DETAIL REPORT FORMATTING

PAGE OPTIONS
Page Break Levels : 5
Table of Contents Levels : 6

0 1 2 3 4 5 6 7

ROW OPTIONS
Print Titles at Levels : Y Y Y Y Y Y
Print Totals at Levels : N N N Y Y Y
Print Notes at Levels : Y Y Y Y Y Y Y Y
Print Unit Cost Row : Y
Print Page Footer : Y
Show Cost Codes : Y

COLUMNS OPTIONS
Print Crew Id : Y
Crew Output : Y
Unit Cost : Y

UPB TITLES
No. of Levels to Print : 0
Bracket Titles With : - :
Include titles Notes : Y

OTHER REPORT FORMATTING

COLUMN TITLES FOR SUMMARY REPORTS

Column 1 FOOH	: JOB OFFICE OVERHEAD
Column 2 HOOH	: HOME OFFICE OVERHEAD
Column 3 PROF	: PROFIT
Column 4 BOND	: PERFORMANCE BOND
Column 5 B&O TAX	: B & O AND OTHER TAXES

Column 1 S & A	: S & A
Column 2 CONTG	: CONTINGENCY
Column 3 (Unused)	:
Column 4 (Unused)	:
Column 5 (Unused)	:

STANDARD COLUMN WIDTHS

Quantity Columns	: 10
Total cost Columns	: 12
Unit Cost Columns	: 12

SUMMARY FEATURES

Round Totals Column	: T-Tens
Contingency Notes	: Yes
Show Project Totals	: Yes

REPORT SELECTION

Project Settings	: Y
Contractor Settings	: Y
Link Listing	: N

Measurement Units : Original

	REPORT FORMAT TYPE			FOR LEVEL (S)
	Direct	Indirect	Owner	0 1 2 3 4 5 6
Detail :	Y			
Project :	N	Y	Y	N N N N Y Y
Contractor :	N	N		N N N N N N
Division :	N	N	N	Y N N N N N
System :	N	N	N	Y N N N N N
2nd View :	N			
Crew :	Y			Y N N N N N
Labor :	Y			
Equipment :	Y			

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
Project Information Record							
06 REMEDIAL ACTION							
	S & A	P	15.00				
	CONTINGENCY	P	0.00				
06 01 MOBILIZATION AND PREPATORY WORK							
06 01 01 MOB OF EQUIPMENT & PERSONNEL							
06 01 01 1 TRANSPORTATION							
06 01 01 1 01- Ph I, Equip Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 01 1 02- Ph II, Equip Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
06 01 03 01 TRAILERS AND BUILDINGS							
06 01 03 01 01 Ph I, Office Trailers - setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 01 02 Ph II, Office Trailers - setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 DECONTAMINATION FACILITIES							
06 01 03 02 01 Personnel Decon Facilities							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 02 Equip/Vehicle Decon Facilities							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 03 Ph I, Trailers - assbly/setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 03 02 04 Ph II, Trailers - assbly/setup							
	S & A	O					
	CONTINGENCY	P	20.00				
06 02 MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 06 SAMPLING SOIL, SED & SOLID WASTE							
06 02 06 01 SURFACE SOIL							
06 02 06 01 01 PHASE I, Soil Sample							
06 02 06 01 01 01 Soil Sampling							
	S & A	O					
	CONTINGENCY	P	20.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	END	*ESCALATN INDEX* BEGIN	END
06 02 06 01 01 02 QA Report							
	S & A	O					
	CONTINGENCY	P	20.00				
06 02 06 01 02 PHASE II, Soil Sample							
06 02 06 01 02 01 Soil Sampling							
	S & A	O					
	CONTINGENCY	P	20.00				
06 02 06 01 02 02 QA Report							
	S & A	O					
	CONTINGENCY	P	20.00				
06 03 SITE WORK							
06 03 05 FENCING							
06 03 05 01 FENCING							
06 03 05 01 01 Temporary Fencing							
06 03 05 01 01 01 Temporary Fencing - 6' Security							
	S & A	O					
	CONTINGENCY	P	20.00				
06 08 SOLID WASTE COLLECT/CONTAINMENT							
06 08 01 EXCAVATION							
06 08 01 03 CONTAMINATED SOIL							
06 08 01 03 01 PHASE I, Excavate/Load PCB Soils							
06 08 01 03 01 01 Excavate/Load PCB Soils							
	S & A	O					
	CONTINGENCY	P	40.00				
06 08 01 03 01 02 Transport PCB Soils - Arlington							
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 01 03 PPEquip, Modified Class D							
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 02 PHASE II,Excavate/Load PCB Soils							
06 08 01 03 02 01 Excavate/Load PCB Soils							
	S & A	O					
	CONTINGENCY	P	40.00				
06 08 01 03 02 02 Transport PCB Soils - Arlington							
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03 02 03 PPEquip, Modified Class D							
	S & A	O					
	CONTINGENCY	P	25.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
06 08 01 03	03 Post Removal						
06 08 01 03	03 01 Excavate/Load Crew						
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03	03 02 PPEquip, Modified Class D						
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 01 03	91 Safety and Quality Assurance						
	S & A	O					
	CONTINGENCY	P	20.00				
06 21	DEMOBILIZATION						
06 21 04	DEMOB OF EQUIPMENT & PERSONNEL						
06 21 04 01	TRANSPORTATION						
06 21 04 01	01 PH I, Demob and take down						
	S & A	O					
	CONTINGENCY	P	20.00				
06 21 04 01	02 PH II, Demob and Take down						
	S & A	O					
	CONTINGENCY	P	20.00				

** CONTRACTOR SETTINGS **

		AMOUNT	PCT	PCT S	RISK	DIFF	SIZE	PERIOD	INVEST	ASSIST	SUBCON
AA REMEDIAL GENERAL CONTRACTOR											
JOB OFFICE OVERHEAD	P		15.00								
HOME OFFICE OVERHEAD	P		5.00								
PROFIT	P		8.00								
PERFORMANCE BOND	C			(Class: B)							
B & O AND OTHER TAXES	P		1.00								

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DOE/RL-92-67

HORN RAPIDS LANDFILL
WAC CAP

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HANFORD: REMEDIATION
1.4.10.1.1.23.01.2
1100-EM-1 OPERABLE UNIT
HORN RAPIDS LANDFILL
WAC CAP

Designed By: CENPW EE BRANCH
Estimated By: CLENDENON

Prepared By: NPW COST ENGINEERING BRANCH
LARRY CHENEY, CHIEF, COST ENGR

Date: 10/23/92
Est Construction Time: 180 Days

HANFORD: 1.4.10.1.1.23.2 1100-EM-1 Baselines

This is the structure for the 1100-EM-1 Area remediation cost estimates. The Work Breakdown Structure (WBS) is based on the DOE-HQ WBS and a site specific remediation WBS being developed for Hanford.

"1.4.10.1.1" is DOE, Richland Operations, Hanford Environmental Restoration, Remedial Action.

"23" is the subproject (ie. 1100-EM)

"01" is the Operable Unit

".2" is Remediation.

In this MCACES estimate project breakdown, the first level, "06", represents Remedial Action. The numbers for the next three levels (2nd thru 4th) are from the Hanford Remedial Action WBS. The fifth thru seventh levels are user defined, the fifth level being used for "Bid Items".

The Price Level for the estimate dollars is 1 Oct 93. S & A is estimated at 15%. See Contingency Notes for explanation of Contingency percentages. See Detail notes (pg. 1) for explanation of overhead percentages used.

This estimate covers the Horn Rapids Landfill - WAC cap, which is one alternative being looked at by NPW's Enivornmental Engineering Branch (EE). This Washington Administrative Code (WAC) cap will cover about a 25 Acre landfill site, that contains various hazardous wastes. The WAC cap will consist of 4-feet of random fill, covered by 6-inches of membrane bedding material (1" minus), covered by a 50-mil Geomembrane, and topped with 6-inches of top soil with Dryland grass seeding. A 4" D pipe drainage system will also be installed. A 6,000 LF perimeter fence will enclose the area.

1. Normal Contingency for this level of estimate is 20-30%.

2. Using 50% Contingency for Setup, as it is undefined.

3. Using higher Contingency for the random fill and top soil as quantities may change, and location and costs of fill and top soil have been assumed.

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SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

BACKUP REPORTS BACKUP PAGE

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U.S. Army Corps of Engineers
PROJECT 11HWAC: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, HORN RAPIDS LANDFILL, WAC CAP
** PROJECT OWNER SUMMARY - LEVEL 5 (Rounded to 10's) **

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06 REMEDIAL ACTIONS							
06 01 MOBILIZATION & PREPARATORY WORK							
06 01 01 MOB OF EQUIPMENT AND FACILITIES							
06 01 01 1 TRANSPORTATION							
06 01 01 1 01 Equipment Mob, Detailed List		7,900	1,180	1,820	10,900		1
TRANSPORTATION		7,900	1,180	1,820	10,900		
MOB OF EQUIPMENT AND FACILITIES		7,900	1,180	1,820	10,900		
06 01 04 SETUP/CONSTRUCT TEMP FACILITIES							
06 01 04 01 TRAILERS AND BUILDINGS							
06 01 04 01 01 Assembly and Setup		3,780	570	2,170	6,520		2
TRAILERS AND BUILDINGS		3,780	570	2,170	6,520		
06 01 04 02 DECONTAMINATION FACILITIES							
06 01 04 02 01 Personnel Decon Facilities		3,020	450	0	3,470		
06 01 04 02 02 Equip/Vehicle Decon Facilities		1,520	230	0	1,750		
DECONTAMINATION FACILITIES		4,550	680	0	5,230		
SETUP/CONSTRUCT TEMP FACILITIES		8,320	1,250	2,170	11,740		
MOBILIZATION & PREPARATORY WORK		16,220	2,430	3,990	22,640		
06 02 MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 91 QA/Safety Monitoring							
06 02 91 01 QA/Safety Monitoring							
06 02 91 01 01 QA/Safety Monitoring		172,280	25,840	39,630	237,750		

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	QA/Safety Monitoring		172,280	25,840	39,630	237,750		
	QA/Safety Monitoring		172,280	25,840	39,630	237,750		
	MONITOR, SAMPLE, TEST, ANALYSIS		172,280	25,840	39,630	237,750		
06 03	SITE WORK							
06 03 05	FENCING (& MISC)							
06 03 05 1	FENCING							
06 03 05 1 01	6' Security Perimeter Fencing	6000.00 LF	159,030	23,850	36,580	219,460	36.58	1
	FENCING	6000.00 LF	159,030	23,850	36,580	219,460	36.58	
06 03 05 2	MISCELLANEOUS IMPROVEMENTS							
06 03 05 2 01	Warning Signs		450	70	80	590		1
	MISCELLANEOUS IMPROVEMENTS		450	70	80	590		
06 03 05 3	LANDSCAPING & TURFING							
06 03 05 3 01	Dryland Grass	25.00 ACR	33,130	4,970	7,620	45,720	1828.87	1
	LANDSCAPING & TURFING	25.00 ACR	33,130	4,970	7,620	45,720	1828.87	
	FENCING (& MISC)		192,610	28,890	44,270	265,780		
	SITE WORK		192,610	28,890	44,270	265,780		
06 08	SOLID WASTE COLLECTION/CONTAINMT							
06 08 05	CAPPING CONTAMINATED AREAS							
06 08 05 1	CAP CONSTRUCTION							
06 08 05 1 01	WAC Cap	121000.00 SY	3,111,410	466,710	1,057,080	4,635,200	38.31	

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
CAP CONSTRUCTION		3,111,410	466,710	1,057,080	4,635,200		
06 08 05 2 LEACHATE COLLECTION							
06 08 05 2 01 Leachate Collection System		28,450	4,270	8,180	40,900		
LEACHATE COLLECTION		28,450	4,270	8,180	40,900		
CAPPING CONTAMINATED AREAS		3,139,860	470,980	1,065,260	4,676,100		
SOLID WASTE COLLECTION/CONTAINMT		3,139,860	470,980	1,065,260	4,676,100		
06 21 DEMOBILIZATION							
06 21 04 DEMOB OF EQUIPMENT & FACILITIES							
06 21 04 01 TRANSPORTATION							
06 21 04 01 01 DEMOBILIZATION		11,930	1,790	2,740	16,460		
TRANSPORTATION		11,930	1,790	2,740	16,460		
DEMOB OF EQUIPMENT & FACILITIES		11,930	1,790	2,740	16,460		
DEMOBILIZATION		11,930	1,790	2,740	16,460		
REMEDIAL ACTIONS		3,532,900	529,940	1,155,900	5,218,740		
HANFORD: REMEDIATION		3,532,900	529,940	1,155,900	5,218,740		

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06	REMEDIAL ACTIONS							
06 01	MOBILIZATION & PREPARATORY WORK							
06 01 01	MOB OF EQUIPMENT AND FACILITIES							
06 01 01 1	TRANSPORTATION							
06 01 01 1 01	Equipment Mob, Detailed List							
	Equipment Mob, Detailed List		7,900	1,180	1,820	10,900		1
	TRANSPORTATION		7,900	1,180	1,820	10,900		
	MOB OF EQUIPMENT AND FACILITIES		7,900	1,180	1,820	10,900		
06 01 04	SETUP/CONSTRUCT TEMP FACILITIES							
06 01 04 01	TRAILERS AND BUILDINGS							
06 01 04 01 01	Assembly and Setup							
06 01 04 01 01 01	Assembly and Setup	100.00 HR	3,780	570	2,170	6,520	65.15	2
	Assembly and Setup		3,780	570	2,170	6,520		2
	TRAILERS AND BUILDINGS		3,780	570	2,170	6,520		
06 01 04 02	DECONTAMINATION FACILITIES							
06 01 04 02 01	Personnel Decon Facilities							
06 01 04 02 01 01	Personnel Decon Facilities	80.00 HR	3,020	450	0	3,470	43.44	
	Personnel Decon Facilities		3,020	450	0	3,470		
06 01 04 02 02	Equip/Vehicle Decon Facilities							
06 01 04 02 02 01	Equip/Vehicle Decon Facilities	40.00 HR	1,520	230	0	1,750	43.82	

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	Equip/Vehicle Decon Facilities		1,520	230	0	1,750		
	DECONTAMINATION FACILITIES		4,550	680	0	5,230		
	SETUP/CONSTRUCT TEMP FACILITIES		8,320	1,250	2,170	11,740		
	MOBILIZATION & PREPARATORY WORK		16,220	2,430	3,990	22,640		
06 02	MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 91	QA/Safety Monitoring							
06 02 91 01	QA/Safety Monitoring							
06 02 91 01 01	QA/Safety Monitoring							
06 02 91 01 01 01	QA/Safety Monitoring	25.00 WK	172,280	25,840	39,630	237,750	9510.13	1
	QA/Safety Monitoring		172,280	25,840	39,630	237,750		
	QA/Safety Monitoring		172,280	25,840	39,630	237,750		
	QA/Safety Monitoring		172,280	25,840	39,630	237,750		
	MONITOR, SAMPLE, TEST, ANALYSIS		172,280	25,840	39,630	237,750		
06 03	SITE WORK							
06 03 05	FENCING (& MISC)							
06 03 05 1	FENCING							
06 03 05 1 01	6' Security Perimeter Fencing							
	6' Security Perimeter Fencing	6000.00 LF	159,030	23,850	36,580	219,460	36.58	1
	FENCING	6000.00 LF	159,030	23,850	36,580	219,460	36.58	
06 03 05 2	MISCELLANEOUS IMPROVEMENTS							

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06 03 05 2 01	Warning Signs							
	Warning Signs		450	70	80	590		1
	MISCELLANEOUS IMPROVEMENTS		450	70	80	590		
06 03 05 3	LANDSCAPING & TURFING							
06 03 05 3 01	Dryland Grass							
	Dryland Grass	25.00 ACR	33,130	4,970	7,620	45,720	1828.87	1
	LANDSCAPING & TURFING	25.00 ACR	33,130	4,970	7,620	45,720	1828.87	
	FENCING (& MISC)		192,610	28,890	44,270	265,780		
	SITE WORK		192,610	28,890	44,270	265,780		
06 08	SOLID WASTE COLLECTION/CONTAINMT							
06 08 05	CAPPING CONTAMINATED AREAS							
06 08 05 1	CAP CONSTRUCTION							
06 08 05 1 01	WAC Cap							
06 08 05 1 01 01	Random Fill - 1st 6"	15000.00 CY	191,170	28,680	76,950	296,800	19.79	3
06 08 05 1 01 02	Random Fill - Next 3.25'	98000.00 CY	1,221,380	183,210	421,380	1,825,960	18.63	3
06 08 05 1 01 03	6" Fine Grain Membrane Bedding	17000.00 CY	292,630	43,890	100,960	437,480	25.73	3
06 08 05 1 01 04	50-mil Geomembrane	105000.00 SY	925,350	138,800	266,040	1,330,190	12.67	1
06 08 05 1 01 05	Top Soil - 6"	20000.00 CY	465,340	69,800	187,300	722,450	36.12	3
06 08 05 1 01 06	Class D - PPEquip	10.00 DAY	15,530	2,330	4,460	22,320	2232.42	1
	WAC Cap	121000.00 SY	3,111,410	466,710	1,057,080	4,635,200	38.31	
	CAP CONSTRUCTION		3,111,410	466,710	1,057,080	4,635,200		
06 08 05 2	LEACHATE COLLECTION							
06 08 05 2 01	Leachate Collection System							

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
06 08 05 2 01 01	4" Perforated Drain Pipe	2750.00 LF	21,910	3,290	6,300	31,500	11.46	1
06 08 05 2 01 02	4" Collection Pipe	200.00 LF	1,440	220	410	2,070	10.34	1
06 08 05 2 01 03	Drywells - 48" D, perf manholes	4.00 EA	5,100	770	1,470	7,330	1833.15	1
	Leachate Collection System		28,450	4,270	8,180	40,900		
	LEACHATE COLLECTION		28,450	4,270	8,180	40,900		
	CAPPING CONTAMINATED AREAS		3,139,860	470,980	1,065,260	4,676,100		
	SOLID WASTE COLLECTION/CONTAINMT		3,139,860	470,980	1,065,260	4,676,100		
06 21 DEMOBILIZATION								
06 21 04 DEMOB OF EQUIPMENT & FACILITIES								
06 21 04 01 TRANSPORTATION								
06 21 04 01 01 DEMOBILIZATION								
06 21 04 01 01 01	DEMOBILIZATION		11,930	1,790	2,740	16,460		1
	DEMOBILIZATION		11,930	1,790	2,740	16,460		
	TRANSPORTATION		11,930	1,790	2,740	16,460		
	DEMOB OF EQUIPMENT & FACILITIES		11,930	1,790	2,740	16,460		
	DEMOBILIZATION		11,930	1,790	2,740	16,460		
	REMEDIAL ACTIONS		3,532,900	529,940	1,155,900	5,218,740		
	HANFORD: REMEDIATION		3,532,900	529,940	1,155,900	5,218,740		

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 REMEDIAL ACTIONS									
06 01 MOBILIZATION & PREPARATORY WORK									
06 01 01 MOB OF EQUIPMENT AND FACILITIES									
06 01 01 1 TRANSPORTATION									
06 01 01 1 01 Equipment Mob, Detailed List		5,960	890	340	580	50	80	7,900	
TRANSPORTATION		5,960	890	340	580	50	80	7,900	
MOB OF EQUIPMENT AND FACILITIES		5,960	890	340	580	50	80	7,900	
06 01 04 SETUP/CONSTRUCT TEMP FACILITIES									
06 01 04 01 TRAILERS AND BUILDINGS									
06 01 04 01 01 Assembly and Setup		2,850	430	160	280	20	40	3,780	
TRAILERS AND BUILDINGS		2,850	430	160	280	20	40	3,780	
06 01 04 02 DECONTAMINATION FACILITIES									
06 01 04 02 01 Personnel Decon Facilities		2,280	340	130	220	20	30	3,020	
06 01 04 02 02 Equip/Vehicle Decon Facilities		1,150	170	70	110	10	20	1,520	
DECONTAMINATION FACILITIES		3,430	510	200	330	30	50	4,550	
SETUP/CONSTRUCT TEMP FACILITIES		6,280	940	360	610	50	80	8,320	
MOBILIZATION & PREPARATORY WORK		12,240	1,840	700	1,180	100	160	16,220	
06 02 MONITOR, SAMPLE, TEST, ANALYSIS									
06 02 91 QA/Safety Monitoring									
06 02 91 01 QA/Safety Monitoring									
06 02 91 01 01 QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,280	

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,280	
	QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,280	
	MONITOR, SAMPLE, TEST, ANALYSIS		130,000	19,500	7,470	12,560	1,050	1,710	172,280	
06 03	SITE WORK									
06 03 05	FENCING (& MISC)									
06 03 05 1	FENCING									
06 03 05 1 01	6' Security Perimeter Fencing	6000.00 LF	120,000	18,000	6,900	11,590	970	1,570	159,030	26.51
	FENCING	6000.00 LF	120,000	18,000	6,900	11,590	970	1,570	159,030	26.51
06 03 05 2	MISCELLANEOUS IMPROVEMENTS									
06 03 05 2 01	Warning Signs		340	50	20	30	0	0	450	
	MISCELLANEOUS IMPROVEMENTS		340	50	20	30	0	0	450	
06 03 05 3	LANDSCAPING & TURFING									
06 03 05 3 01	Dryland Grass	25.00 ACR	25,000	3,750	1,440	2,420	200	330	33,130	1325.27
	LANDSCAPING & TURFING	25.00 ACR	25,000	3,750	1,440	2,420	200	330	33,130	1325.27
	FENCING (& MISC)		145,340	21,800	8,360	14,040	1,170	1,910	192,610	
	SITE WORK		145,340	21,800	8,360	14,040	1,170	1,910	192,610	
06 08	SOLID WASTE COLLECTION/CONTAINMT									
06 08 05	CAPPING CONTAMINATED AREAS									
06 08 05 1	CAP CONSTRUCTION									
06 08 05 1 01	WAC Cap	121000.00 SY	2,347,750	352,160	135,000	226,790	18,890	30,810	3,111,410	25.71

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	CAP CONSTRUCTION		2,347,750	352,160	135,000	226,790	18,890	30,810	3,111,410	
06 08 05 2	LEACHATE COLLECTION									
06 08 05 2 01	Leachate Collection System		21,470	3,220	1,230	2,070	170	280	28,450	
	LEACHATE COLLECTION		21,470	3,220	1,230	2,070	170	280	28,450	
	CAPPING CONTAMINATED AREAS		2,369,220	355,380	136,230	228,870	19,070	31,090	3,139,860	
	SOLID WASTE COLLECTION/CONTAINMT		2,369,220	355,380	136,230	228,870	19,070	31,090	3,139,860	
06 21	DEMOBILIZATION									
06 21 04	DEMOB OF EQUIPMENT & FACILITIES									
06 21 04 01	TRANSPORTATION									
06 21 04 01 01	DEMOBILIZATION		9,000	1,350	520	870	70	120	11,930	
	TRANSPORTATION		9,000	1,350	520	870	70	120	11,930	
	DEMOB OF EQUIPMENT & FACILITIES		9,000	1,350	520	870	70	120	11,930	
	DEMOBILIZATION		9,000	1,350	520	870	70	120	11,930	
	REMEDIAL ACTIONS		2,665,800	399,870	153,280	257,520	21,450	34,980	3,532,900	
	HANFORD: REMEDIATION		2,665,800	399,870	153,280	257,520	21,450	34,980	3,532,900	
	S & A								529,940	
	SUBTOTAL								4,062,840	
	CONTINGENCY								1,155,900	
	TOTAL INCL OWNER COSTS								5,218,740	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 REMEDIAL ACTIONS									
06 01 MOBILIZATION & PREPARATORY WORK									
06 01 01 MOB OF EQUIPMENT AND FACILITIES									
06 01 01 1 TRANSPORTATION									
06 01 01 1 01 Equipment Mob, Detailed List									
Equipment Mob, Detailed List		5,960	890	340	580	50	80	7,900	
TRANSPORTATION		5,960	890	340	580	50	80	7,900	
MOB OF EQUIPMENT AND FACILITIES		5,960	890	340	580	50	80	7,900	
06 01 04 SETUP/CONSTRUCT TEMP FACILITIES									
06 01 04 01 TRAILERS AND BUILDINGS									
06 01 04 01 01 Assembly and Setup									
06 01 04 01 01 01 Assembly and Setup	100.00 HR	2,850	430	160	280	20	40	3,780	37.77
Assembly and Setup		2,850	430	160	280	20	40	3,780	
TRAILERS AND BUILDINGS		2,850	430	160	280	20	40	3,780	
06 01 04 02 DECONTAMINATION FACILITIES									
06 01 04 02 01 Personnel Decon Facilities									
06 01 04 02 01 01 Personnel Decon Facilities	80.00 HR	2,280	340	130	220	20	30	3,020	37.77
Personnel Decon Facilities		2,280	340	130	220	20	30	3,020	
06 01 04 02 02 Equip/Vehicle Decon Facilities									
06 01 04 02 02 01 Equip/Vehicle Decon Facilities	40.00 HR	1,150	170	70	110	10	20	1,520	38.10

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	Equip/Vehicle Decon Facilities		1,150	170	70	110	10	20	1,520	
	DECONTAMINATION FACILITIES		3,430	510	200	330	30	50	4,550	
	SETUP/CONSTRUCT TEMP FACILITIES		6,280	940	360	610	50	80	8,320	
	MOBILIZATION & PREPARATORY WORK		12,240	1,840	700	1,180	100	160	16,220	
06 02	MONITOR, SAMPLE, TEST, ANALYSIS									
06 02 91	QA/Safety Monitoring									
06 02 91 01	QA/Safety Monitoring									
06 02 91 01 01	QA/Safety Monitoring									
06 02 91 01 01 01	QA/Safety Monitoring	25.00 WK	130,000	19,500	7,470	12,560	1,050	1,710	172,280	6891.40
	QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,280	
	QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,280	
	QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,280	
	MONITOR, SAMPLE, TEST, ANALYSIS		130,000	19,500	7,470	12,560	1,050	1,710	172,280	
06 03	SITE WORK									
06 03 05	FENCING (& MISC)									
06 03 05 1	FENCING									
06 03 05 1 01	6' Security Perimeter Fencing									
	6' Security Perimeter Fencing	6000.00 LF	120,000	18,000	6,900	11,590	970	1,570	159,030	26.51
	FENCING	6000.00 LF	120,000	18,000	6,900	11,590	970	1,570	159,030	26.51
06 03 05 2	MISCELLANEOUS IMPROVEMENTS									

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 03 05 2 01	Warning Signs									
	Warning Signs		340	50	20	30	0	0	450	
	MISCELLANEOUS IMPROVEMENTS		340	50	20	30	0	0	450	
06 03 05 3	LANDSCAPING & TURFING									
06 03 05 3 01	Dryland Grass									
	Dryland Grass	25.00 ACR	25,000	3,750	1,440	2,420	200	330	33,130	1325.27
	LANDSCAPING & TURFING	25.00 ACR	25,000	3,750	1,440	2,420	200	330	33,130	1325.27
	FENCING (& MISC)		145,340	21,800	8,360	14,040	1,170	1,910	192,610	
	SITE WORK		145,340	21,800	8,360	14,040	1,170	1,910	192,610	
06 08	SOLID WASTE COLLECTION/CONTAINMT									
06 08 05	CAPPING CONTAMINATED AREAS									
06 08 05 1	CAP CONSTRUCTION									
06 08 05 1 01	WAC Cap									
06 08 05 1 01 01	Random Fill - 1st 6"	15000.00 CY	144,250	21,640	8,290	13,930	1,160	1,890	191,170	12.74
06 08 05 1 01 02	Random Fill - Next 3.25'	98000.00 CY	921,610	138,240	52,990	89,030	7,420	12,090	1,221,380	12.46
06 08 05 1 01 03	6" Fine Grain Membrane Bedding	17000.00 CY	220,810	33,120	12,700	21,330	1,780	2,900	292,630	17.21
06 08 05 1 01 04	50-mil Geomembrane	105000.00 SY	698,240	104,740	40,150	67,450	5,620	9,160	925,350	8.81
06 08 05 1 01 05	Top Soil - 6"	20000.00 CY	351,130	52,670	20,190	33,920	2,830	4,610	465,340	23.27
06 08 05 1 01 06	Class D - PPEquip	10.00 DAY	11,720	1,760	670	1,130	90	150	15,530	1552.98
	WAC Cap	121000.00 SY	2,347,750	352,160	135,000	226,790	18,890	30,810	3,111,410	25.71
	CAP CONSTRUCTION		2,347,750	352,160	135,000	226,790	18,890	30,810	3,111,410	
06 08 05 2	LEACHATE COLLECTION									
06 08 05 2 01	Leachate Collection System									

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
06 08 05 2 01 01	4" Perforated Drain Pipe	2750.00 LF	16,540	2,480	950	1,600	130	220	21,910	7.97
06 08 05 2 01 02	4" Collection Pipe	200.00 LF	1,090	160	60	100	10	10	1,440	7.19
06 08 05 2 01 03	Drywells - 48" D, perf manholes	4.00 EA	3,850	580	220	370	30	50	5,100	1275.24
	Leachate Collection System		21,470	3,220	1,230	2,070	170	280	28,450	
	LEACHATE COLLECTION		21,470	3,220	1,230	2,070	170	280	28,450	
	CAPPING CONTAMINATED AREAS		2,369,220	355,380	136,230	228,870	19,070	31,090	3,139,860	
	SOLID WASTE COLLECTION/CONTAINMT		2,369,220	355,380	136,230	228,870	19,070	31,090	3,139,860	
06 21 DEMOBILIZATION										
06 21 04 DEMOB OF EQUIPMENT & FACILITIES										
06 21 04 01 TRANSPORTATION										
06 21 04 01 01 DEMOBILIZATION										
06 21 04 01 01 01	DEMOBILIZATION		9,000	1,350	520	870	70	120	11,930	
	DEMOBILIZATION		9,000	1,350	520	870	70	120	11,930	
	TRANSPORTATION		9,000	1,350	520	870	70	120	11,930	
	DEMOB OF EQUIPMENT & FACILITIES		9,000	1,350	520	870	70	120	11,930	
	DEMOBILIZATION		9,000	1,350	520	870	70	120	11,930	
	REMEDIAL ACTIONS		2,665,800	399,870	153,280	257,520	21,450	34,980	3,532,900	
	HANFORD: REMEDIATION		2,665,800	399,870	153,280	257,520	21,450	34,980	3,532,900	
	S & A								529,940	
	SUBTOTAL								4,062,840	
	CONTINGENCY								1,155,900	
	TOTAL INCL OWNER COSTS								5,218,740	

0 AA. REMEDIAL GENERAL CONTRACTOR	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST

0 AA. REMEDIAL GENERAL CONTRACTOR

Overhead Percentage Explanation:

Field Office Overhead (FOOH): Normal is 10%, using 15% to allow for extra safety and Hanford related items.

Home Office Overhead (HOOH): 4-5% is normal for this size of job.

PROFIT: 7-8% is normal for this size of job. However, PROFIT may be calculated separately for each job using the Weighted-Guide Line Method.

BOND: Calculated per dollar amount of job using B Bond rates by GOLD.

B&O TAX: 1% covers the 0.5% WA State B&O tax, and the 0.5% TARO tax.

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06. REMEDIAL ACTIONS
06 01. MOBILIZATION & PREPARATORY WORK
06 01 01. MOB OF EQUIPMENT AND FACILITIES
06 01 01 1. TRANSPORTATION

06 01 01 1 01. Equipment Mob, Detailed List
This item covers the Mobilization of the equipment and misc. items as detailed below. A 100-mi Radius mob is assumed.

USR AA <01505 1102 >	Mob, Crane, Hyd, SP, 16-25 Ton, Rough Terrain, 4WD, 100-mi Rad	1.00	EA	0.00	0.00 0	0.00 0	500.00 500	0.00 0	0.00 0	500.00 500	500.00
USR AA <01505 3237 >	Mob, FEnd Ldr, Wheel, 6.0-8 CY, Articulated Fr, 100-mi rad	1.00	EA	0.00	0.00 0	0.00 0	1300.00 1,300	0.00 0	0.00 0	1300.00 1,300	1300.00
USR AA <01505 4201 >	Mob, Roller, Towed, 50-75 Ton, Pneumatic, 100-mi Radius	1.00	EA	0.00	0.00 0	0.00 0	550.00 550	0.00 0	0.00 0	550.00 550	550.00
USR AA <01505 5203 >	Mob, Motor Grader, 150-200 HP, Art. Fr, Pwr Shift, 100-mi Rad	1.00	EA	0.00	0.00 0	0.00 0	525.00 525	0.00 0	0.00 0	525.00 525	525.00
USR AA <01505 6116 >	Mob, Dozer, Crawler, 225-350 HP w/blade, Incl Setup, 100-mi Rad	1.00	EA	0.00	0.00 0	0.00 0	925.00 925	0.00 0	0.00 0	925.00 925	925.00
USR AA <01505 7111 >	Mob, Flatbed w/ Sides, 8'x10', Mtd/FT800 Trk, 100-mi Radius	1.00	EA	0.00	0.00 0	0.00 0	125.00 125	0.00 0	0.00 0	125.00 125	125.00

06 01. MOBILIZATION & PREPARATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
USR AA <01505 7123 > Mob, Bottom Dump trailer, 30 Ton w/CLT8000 Trk, 100-mi Radius	12.00	EA		0.00	0.00 0	0.00 0	125.00 1,500	0.00 0	0.00 0	125.00 1,500	125.00
USR AA <01505 7131 > Mob, Water Tank, 3,000 Gal, Mtd/FT800 Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	150.00 150	0.00 0	0.00 0	150.00 150	150.00
USR AA <01505 8921 > Mob, Decontamination Trailer, w/25,000 GVW Trk, 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	135.00 135	0.00 0	0.00 0	135.00 135	135.00
M CIV AA <01500 1101 > Mob - Field Office Trailer	1.00	EA	N/A	0.00	0.00 0	0.00 0	250.00 250	0.00 0	0.00 0	250.00 250	250.00
Equipment Mob, Detailed List					0	0	5,960	0	0	5,960	
TRANSPORTATION					0	0	5,960	0	0	5,960	

06 01. MOBILIZATION & PREPARATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 04. SETUP/CONSTRUCT TEMP FACILITIES											
06 01 04 01. TRAILERS AND BUILDINGS											
06 01 04 01 01. Assembly and Setup											
06 01 04 01 01 01. Assembly and Setup											
Allow 100 mhrs for setup of contractor's trailer and equipment, and site layout. An allowance for some equipment and material has been added.											
Assembly and Setup	100.00	HR			0	2,500	250	100	0	2,850	28.50
Assembly and Setup					0	2,500	250	100	0	2,850	
TRAILERS AND BUILDINGS					0	2,500	250	100	0	2,850	

06 01. MOBILIZATION & PREPARATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 01 04 02. DECONTAMINATION FACILITIES											
06 01 04 02 01. Personnel Decon Facilities											
06 01 04 02 01 01. Personnel Decon Facilities Allow 80 mhrs for setup of Decontamination trailer. Self contained unit includes changing rooms and showers. An allowancy for some equipment and materials has been added.											
Personnel Decon Facilities	80.00	HR			0	2,000	200	80	0	2,280	28.50
Personnel Decon Facilities					0	2,000	200	80	0	2,280	
06 01 04 02 02. Equip/Vehicle Decon Facilities											
06 01 04 02 02 01. Equip/Vehicle Decon Facilities Allow 40 mhrs for setup of equipment decon facilities.											
Equip/Vehicle Decon Facilities	40.00	HR			0	1,000	100	50	0	1,150	28.75
Equip/Vehicle Decon Facilities					0	1,000	100	50	0	1,150	
DECONTAMINATION FACILITIES					0	3,000	300	130	0	3,430	

06 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST

06 02. MONITOR, SAMPLE, TEST, ANALYSIS
06 02 91. QA/Safety Monitoring
06 02 91 01. QA/Safety Monitoring

06 02 91 01 01. QA/Safety Monitoring
This item covers the QA/Safety Monitoring required for the Hanford site.
Included is the WHC HPT, COE Safety Rep, and COE Special Assistant for QA.

06 02 91 01 01 01. QA/Safety Monitoring
This covers cost of QA and Safety oversight per week:

WHC HPT: 40 Hrs @ $50/Hr	= $2,000
COE Safety Rep: 40 Hrs @ $70/Hr	= 2,800
COE S.A. for QA: 8 Hrs @ $50/Hr	400
	$5,200/wk

Estimated duration of job is 25 weeks, with 1 week for Mob, Setup, & Demob.

QA/Safety Monitoring	25.00	WK	0	130,000	0	0	0	130,000	5200.00
QA/Safety Monitoring			0	130,000	0	0	0	130,000	
QA/Safety Monitoring			0	130,000	0	0	0	130,000	

06 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 03. SITE WORK											
06 03 05. FENCING (& MISC)											
06 03 05 1. FENCING											
06 03 05 1 01. 6' Security Perimeter Fencing A 6' Security perimeter fence is needed around the site, including a 20' gate. A unit cost of $20/LF will be used for the fence based on recent bid opening prices. Assume following breakdown: $5.00 labor, $2.50 equip, and $12.50 Material.											
6' Security Perimeter Fencing	6000.00	LF			780	30,000	15,000	75,000	0	120,000	20.00
FENCING	6000.00	LF			780	30,000	15,000	75,000	0	120,000	20.00

06 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 03 05 2. MISCELLANEOUS IMPROVEMENTS											
06 03 05 2 01. Warning Signs											
USR AA <01951 7911 > 10"x 14" Warning signs					0.00	1.75	0.00	15.09	0.00	16.84	
Alum/Acrylic, attached to fence	20.00	EA	N/A	0.00	0	35	0	302	0	337	16.84
Warning Signs					0	35	0	302	0	337	
MISCELLANEOUS IMPROVEMENTS					0	35	0	302	0	337	

06 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 03 05 3. LANDSCAPING & TURFING											
06 03 05 3 01. Dryland Grass Topsoil to be seeded with dryland grass, 25 Acres. Price used based on recent bid prices for dryland grass per acre.											
Dryland Grass	25.00	ACR			0	17,500	6,250	1,250	0	25,000	1000.00
LANDSCAPING & TURFING	25.00	ACR			0	17,500	6,250	1,250	0	25,000	1000.00

06 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08. SOLID WASTE COLLECTION/CONTAINMT									
06 08 05. CAPPING CONTAMINATED AREAS									
06 08 05 1. CAP CONSTRUCTION									
06 08 05 1 01. WAC Cap WAC cap to cover about 25 Acres, or 121,000 SY. Cap is made from 4' of random fill covered by 6" of bedding material, 50-mil Geomembrane, and 6" of top soil. Special precautions must be taken for the first 6" layer, until the asbestos materials are covered.									
06 08 05 1 01 01. Random Fill - 1st 6" This item covers the first 6" of random fill. Fill material must be spread from the perimeter in, so as not create fugitive asbestos containing dust. Modified Class D worker protection will be required until this 6" layer is in-place. Random fill assumed available within 10-mi radius, will use a ten truck crew of 30-CY dumps.									
USR AA <02212 1001 > 6" random fill, spread to center to avoid asbestos disturbance. Q: 15,000 CY, use 1.2 swell factor == 18,000 LCY.	18000 LCY ZHANC01	275.00	0.02 344	0.49 8,908	0.59 10,649	0.00 0	0.00 0	1.09 19,557	1.09
USR AA <02225 3109 > 10, 30-CY Trucks, 10-mi Haul one-way. Assume: 20 mph ave haul, 90% fill factor, which yields = 275 LCY/HR. Assume random fill available for $3.50/CY (crew has 2 extra dump trucks on standby to allow for breakdowns & maintenance).	18000 LCY ZHANC02	275.00	0.05 851	1.26 22,642	1.51 27,110	3.77 67,914	0.00 0	6.54 117,666	6.54
L CIV AA <02225 2372 > Excav & Load, 7-CY Whl Mtd Ldr, Med Matl, 355 CY/Hr (275 CY/Hr based on haul production rate).	18000 LCY CODLL	275.00	0.01 99	0.14 2,578	0.25 4,451	0.00 0	0.00 0	0.39 7,029	0.39
Random Fill - 1st 6"	15000 CY		1,294	34,128	42,210	67,914	0	144,252	9.62

06 08. SOLID WASTE COLLECTION/CONTAINMT		QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 05 1 01	02. Random Fill - Next 3.25′ This item covers placement of the next 3.25 Ft (98,000 CY) of random fill material. Fill can be spread as best suited. No further worker protection needed.									
USR AA <02212 1001 >	Next 3.5′ random fill, spread Q: 98,000 CY, use 1.2 swell factor == 115,000 LCY.	115000 LCY ZHANC01	275.00	0.02 2,197	0.49 56,914	0.59 68,034	0.00 0	0.00 0	1.09 124,948	1.09
USR AA <02225 3109 >	10, 30-CY Trucks, 10-mi Haul one-way. Assume: 20 mph ave haul, 90% fill factor, which yields = 275 LCY/HR. Assume random fill available for $3.50/CY (crew has 2 extra dump trucks on standby to allow for breakdowns & maintenance).	115000 LCY ZHANC02	275.00	0.05 5,440	1.26 144,659	1.51 173,202	3.77 433,895	0.00 0	6.54 751,755	6.54
L CIV AA <02225 2372 >	Excav & Load, 7-CY Whl Mtd Ldr, Med Matl, 355 CY/Hr (275 CY/Hr based on haul production rate).	115000 LCY CODLL	275.00	0.01 633	0.14 16,468	0.25 28,440	0.00 0	0.00 0	0.39 44,908	0.39
	Random Fill - Next 3.25′	98000 CY		8,269	218,040	269,675	433,895	0	921,610	9.40
06 08 05 1 01	03. 6" Fine Grain Membrane Bedding This item covers suppling the 6" fine grain membrane bedding material. Assume material available locally for $7.50/CY.									
USR AA <02212 1001 >	6" Fine grain bedding, 1" minus Q: 17,000 CY, use 1.1 swell factor == 18,500 LCY.	18500 LCY ZHANC01	275.00	0.02 353	0.49 9,156	0.59 10,945	0.00 0	0.00 0	1.09 20,100	1.09
USR AA <02225 3109 >	10, 30-CY Trucks, 10-mi Haul one-way. Assume: 20 mph ave haul, 90% fill factor, which yields = 275 LCY/HR. Assume bedding available for $7.50/CY (crew has 2 extra dump trucks on standby to allow for breakdowns & maintenance).	18500 LCY ZHANC02	275.00	0.05 875	1.26 23,271	1.51 27,863	8.09 149,573	0.00 0	10.85 200,707	10.85
	6" Fine Grain Membrane Bedding	17000 CY		1,228	32,427	38,807	149,573	0	220,807	12.99

06 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 05 1 01 04. 50-mil Geomembrane This item covers the installation of the geomembrane, assumed to be 50-mil PVC. The crew consists of 6 laborers, 2 skilled workers, a flatbed truck, and a 22-Ton Hydra crane.											
USR AA <02081 2144 > 50-Mil PVC membrane					0.06	1.45	0.30	4.58	0.00	6.33	
Q: 105,000 SY, no overlap, so add 5% == 110,250 SY	110250	SY	ZHANC03	165.00	6,681	160,403	32,722	505,110	0	698,235	6.33
50-mil Geomembrane	105000	SY			6,681	160,403	32,722	505,110	0	698,235	6.65
06 08 05 1 01 05. Top Soil - 6" This item covers placement of 6" top soil layer over the random fill. Assuming top soil locally available for $10/CY.											
USR AA <02212 1001 > 6" Top soil, spread/compact					0.02	0.49	0.59	0.00	0.00	1.09	
Q: 20,000 CY, use 1.2 swell factor == 24,000 LCY.	24000	LCY	ZHANC01	275.00	458	11,878	14,198	0	0	26,076	1.09
USR AA <02225 3109 > 10, 30-CY Trucks, 10-mi Haul one-way. Assume: 20 mph ave haul, 90% fill factor, which yields = 275 LCY/HR. Assume top soil available for $10/CY (crew has 2 extra dump trucks on standby to allow for breakdowns & maintenance).	24000	LCY	ZHANC02	275.00	0.05 1,135	1.26 30,190	1.51 36,146	10.78 258,720	0.00 0	13.54 325,056	13.54
Top Soil - 6"	20000	CY			1,594	42,067	50,345	258,720	0	351,132	17.56
06 08 05 1 01 06. Class D - PPEquip Assume workers in Class C PPE until 6" of random fill covers all of land-fill area, estimated to be 10 working days. Included also is a decontam. shower, and equipment decontamination equipment.											
M HTW AA <01951 5101 > Latex Boots					0.00	0.00	5.25	0.00	0.00	5.25	
	40.00	PR	N/A	0.00	0	0	210	0	0	210	5.25
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)					0.00	0.00	11.50	0.00	0.00	11.50	
	40.00	EA	N/A	0.00	0	0	460	0	0	460	11.50
M HTW AA <01951 5303 > Basic Level B Suit (Lg)					0.00	0.00	175.00	0.00	0.00	175.00	
	40.00	EA	N/A	0.00	0	0	7,000	0	0	7,000	175.00

06 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves					0.00	0.00	2.30	0.00	0.00	2.30	
	40.00	PR	N/A	0.00	0	0	92	0	0	92	2.30
M HTW AA <01951 5728 > Powered Air-Purifying (PARP) Respirator w/ Batt Pack					0.00	0.00	25.00	0.00	0.00	25.00	
	40.00	EA	N/A	0.00	0	0	1,000	0	0	1,000	25.00
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)					10.00	232.40	1.45	34.83	0.00	268.68	
	10.00	DAY	ULABA	0.13	100	2,324	14	348	0	2,687	268.68
M HTW AA <01957 4301 > 8 Ft x 36 Ft, 2 Showers, 2 Wall Fans (Monthly Rental)					0.00	0.00	0.00	26.95	0.00	26.95	
	10.00	DAY	N/A	0.00	0	0	0	270	0	270	26.95
Class D - PPEquip	10.00	DAY			100	2,324	8,776	618	0	11,718	1171.83
WAC Cap	121000	SY			19,166	489,389	442,536	1,415,830	0	2,347,754	19.40
CAP CONSTRUCTION					19,166	489,389	442,536	1,415,830	0	2,347,754	

06 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 08 05 2. LEACHATE COLLECTION											
06 08 05 2 01. Leachate Collection System											
06 08 05 2 01 01. 4" Perforated Drain Pipe This item covers installation of the 4" D perforated drain piping, including trenching, bedding, and backfilling.											
USR AA <02221 1302 > Trench, 1 CY Backhoe, Med Soil 128 CY/Hr, use: 100 CY/Hr	650.00	LCY	CODEG	100.00	0.02 10	0.38 249	0.12 76	0.00 0	0.00 0	0.50 325	0.50
M USR AA <02221 8001 > Backfill Pipe Bedding w/Backhoe Without Compaction. Material cost covers buying and delivery of bedding material. Q: 150 CY x 1.1 == 165 LCY	165.00	LCY	CODEG	30.00	0.05 8	1.28 211	0.39 64	16.17 2,668	0.00 0	17.84 2,943	17.84
USR AA <02082 1312 > 4" D, Sch 40, 2-4 rows of slots	2750.00	LF	ULABD	40.00	0.08 224	1.92 5,275	0.01 41	2.05 5,633	0.00 0	3.98 10,948	3.98
USR AA <02221 5003 > Backfill Trench w/Backhoe Without Compaction. Assuming backfill at 3x bedding quantity	500.00	LCY	CODEG	35.00	0.04 21	1.10 548	0.33 167	0.00 0	0.00 0	1.43 715	1.43
L MIL AA <02221 7002 > Compaction, 6" Layers, Vib Plate (15cm) Layers	665.00	CY	CLACC	30.00	0.10 67	2.33 1,550	0.08 54	0.00 0	0.00 0	2.41 1,604	2.41
4" Perforated Drain Pipe	2750.00	LF			330	7,832	403	8,301	0	16,536	6.01
06 08 05 2 01 02. 4" Collection Pipe This item includes trenching, bedding, and backfilling.											
USR AA <02221 1302 > Trench, 1 CY Backhoe, Med Soil 128 CY/Hr, use: 100 CY/Hr	45.00	LCY	CODEG	100.00	0.02 1	0.38 17	0.12 5	0.00 0	0.00 0	0.50 23	0.50
M USR AA <02221 8001 > Backfill Pipe Bedding w/Backhoe Without Compaction. Material cost covers buying and delivery of bedding material. Q: 10 CY x 1.1 == 11 LCY	11.00	LCY	CODEG	30.00	0.05 1	1.28 14	0.39 4	16.17 178	0.00 0	17.84 196	17.84
L USR AA <02082 1415 > 4" D, PVC, Sdr 21, collection	200.00	LF	ULABD	35.00	0.09 19	2.19 438	0.02 3	1.35 270	0.00 0	3.56 711	3.56

06 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
USR AA <02221 5003 > Backfill Trench w/Backhoe Without Compaction. Assuming backfill at 3x bedding quantity	33.00	LCY	CODEG	35.00	0.04 1	1.10 36	0.33 11	0.00 0	0.00 0	1.43 47	1.43
L MIL AA <02221 7002 > Compaction, 6" Layers, Vib Plate (15cm) Layers	45.00	CY	CLACC	30.00	0.10 5	2.33 105	0.08 4	0.00 0	0.00 0	2.41 109	2.41
4" Collection Pipe	200.00	LF			26	611	28	447	0	1,086	5.43
06 08 05 2 01 03. Drywells - 48" D, perf manholes Perforated drywells: 4' D x 10' deep. Includes excavation/backfill.											
HTW AA <02082 1615 > 3 Ft High x 4 Ft Dia Manhole Base - No Outlets	4.00	EA	ULABD	1.00	3.25 13	76.72 307	0.60 2	209.13 837	0.00 0	286.45 1,146	286.45
HTW AA <02082 1612 > 2-Ft High Riser Section, with steps - 4 Ft Dia, 2 ea needed per manhole.	8.00	EA	ULABD	2.00	1.63 13	38.36 307	0.30 2	125.05 1,000	0.00 0	163.71 1,310	163.71
HTW AA <02082 1613 > 3.25 Ft High Upper Unit, with steps - 4 Ft Dia	4.00	EA	ULABD	1.00	3.25 13	76.72 307	0.60 2	187.57 750	0.00 0	264.89 1,060	264.89
USR AA <02221 1302 > Trench, 1 CY Backhoe, Med Soil 128 CY/Hr, use: 100 CY/Hr Approximately: 12 LCY each x 4 == 48 LCY	48.00	LCY	CODEG	25.00	0.06 3	1.53 74	0.47 22	0.00 0	0.00 0	2.00 96	2.00
M USR AA <02221 8001 > Backfill Bedding w/Backhoe Without Compaction. Material cost covers buying and delivery of bedding material. Use: 0.5 CY ea x 4 == 2 LCY	2.00	LCY	CODEG	16.00	0.09 0	2.40 5	0.73 1	16.17 32	0.00 0	19.30 39	19.30
USR AA <02221 5003 > Backfill manhole w/Backhoe Without Compaction. Assuming backfill at 5 LCY each x 4	20.00	LCY	CODEG	25.00	0.06 1	1.53 31	0.47 9	0.00 0	0.00 0	2.00 40	2.00
L MIL AA <02221 7002 > Compaction, 6" Layers, Vib Plate (15cm) Layers	22.00	CY	CLACC	10.00	0.30 7	6.99 154	0.25 5	0.00 0	0.00 0	7.24 159	7.24
Drywells - 48" D, perf manholes	4.00	EA			50	1,184	46	2,620	0	3,849	962.25

06 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
Leachate Collection System					405	9,627	476	11,368	0	21,471	
LEACHATE COLLECTION					405	9,627	476	11,368	0	21,471	

06 21. DEMOBILIZATION	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
06 21. DEMOBILIZATION											
06 21 04. DEMOB OF EQUIPMENT & FACILITIES											
06 21 04 01. TRANSPORTATION											
06 21 04 01 01. DEMOBILIZATION											
06 21 04 01 01 01. DEMOBILIZATION											
Assume Demob at 75% of Mob and Setup.											
DEMOBILIZATION					0	0	9,000	0	0	9,000	
DEMOBILIZATION					0	0	9,000	0	0	9,000	
TRANSPORTATION					0	0	9,000	0	0	9,000	
HANFORD: REMEDIATION					20,351	682,051	479,772	1,503,979	0	2,665,802	

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
	CLACC	3 B-laborer + 1 Hand Vibrating Compactor, 4 Hp	PROD = 100%						CREW HOURS =	52
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00	HR	23.64	1.00	23.64			23.64
MIL	B-LABORER L	Laborer (Semi-Skilled)	2.00	HR	23.14	2.00	46.28			46.28
MIL	C10WC003 E	RAMMER,VIB,MAN, 13" X 11" SHOE	1.00	HR	2.14			1.00	2.14	2.14
MIL	XMIXX020 E	Small Tools	0.23	HR	1.39			0.23	0.32	0.32
	TOTAL					3.00	69.92	1.23	2.46	72.38
	CODEG	1 B-eqoprmed + 1 Backhoe Loader, 55 Hp	PROD = 100%						CREW HOURS =	62
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50	HR	23.14	0.50	11.57			11.57
MIL	B-EQOPRMEDF	Eq Oper, Medium	1.00	HR	26.77	1.00	26.77			26.77
MIL	L50CS002 E	LDR,W/BH,WH,1.0CY FE BKT/24"DIP	1.00	HR	11.69			1.00	11.69	11.69
	TOTAL					1.50	38.34	1.00	11.69	50.03
	CODLL	1 B-eqoprmed + 1 Front End Ldr, 7 Cy, Wheel Mtd	PROD = 100%						CREW HOURS =	967
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50	HR	23.14	0.50	11.57			11.57
MIL	B-EQOPRCRNL	Eq Oper, Crane/Shovl	1.00	HR	27.82	1.00	27.82			27.82
MIL	L40FI008 E	LDR,FE,WH,7.00CY 4WD ARTIC PWSH	1.00	HR	68.00			1.00	68.00	68.00
	TOTAL					1.50	39.39	1.00	68.00	107.39
	ULABA	1 B-laborer + Small Tools	PROD = 100%						CREW HOURS =	160
MIL	B-LABORER F	Laborer (Semi-Skilled)	0.25	HR	23.64	0.25	5.91			5.91
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	23.14	1.00	23.14			23.14
MIL	XMIXX020 E	Small Tools	0.13	HR	1.39			0.13	0.18	0.18
	TOTAL					1.25	29.05	0.13	0.18	29.23
	ULABD	2 B-skillwkr + Small Tools	PROD = 100%						CREW HOURS =	173
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	23.14	1.00	23.14			23.14
MIL	B-SKILLWKRL	Skilled Worker	2.00	HR	23.76	2.00	47.52			47.52
MIL	B-SKILLWKRF	Skilled Worker	0.25	HR	24.26	0.25	6.07			6.07
MIL	XMIXX020 E	Small Tools	0.43	HR	1.39			0.43	0.60	0.60
	TOTAL					3.25	76.72	0.43	0.60	77.32
	ZHANC01	Mat Distr Crew: D8 Dozer + 14G Grader + Water Tk	PROD = 100%						CREW HOURS =	1276
MIL *	R40HY004 E	ROLL,VIB,TOWED,STL,PAD,58"D,60"	1.00	HR	10.62			1.00	10.62	10.62
MIL	T10CA017 E	BLADE, UNIVERSAL,HYDR,FOR D8	1.00	HR	7.20			1.00	7.20	7.20
MIL	T15CA015 E	DOZER,CWLR,CAT D-8L, (ADD BLADE	1.00	HR	73.29			1.00	73.29	73.29
MIL	G15CA005 E	GRADER,MOTOR,CAT14-G, ARTIC	1.00	HR	41.08			1.00	41.08	41.08
MIL	T40XX033 E	WATER TANK, 3000 GAL (ADD TRUCK	1.00	HR	3.15			1.00	3.15	3.15
MIL	T50FO015 E	TRK, HWY, 54,000 GVW, 3 AXLE	1.00	HR	25.97			1.00	25.97	25.97
MIL	XMIXX020 E	Small Tools	1.00	HR	1.39			1.00	1.39	1.39
MIL	B-EQOPRCRNL	Eq Oper, Crane/Shovl	1.00	HR	27.82	1.00	27.82			27.82
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00	HR	26.27	1.00	26.27			26.27
MIL	B-EQOPROILL	Eq Oper, Oilers	1.00	HR	24.54	1.00	24.54			24.54
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	23.14	1.00	23.14			23.14

MIL	B-TRKDVRHVL Truck Drivers, Heavy	1.00 HR	27.24	1.00	27.24			27.24
USR	B-EQOPRCRNF Eq Oper, Crane/Shovl	0.25 HR	28.32	0.25	7.08			7.08
	TOTAL			5.25	136.09	7.00	162.70	298.79

SRC	ITEM ID		DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
	ZHANC02		12 Bottom Dump Trks, 30-CY & Drivers			PROD = 100%				CREW HOURS =	1276
MIL *	XMIXX020	E	Small Tools	1.00	HR	1.39			1.00	1.39	1.39
MIL *	T45XX003	E	TRK TRLR,BOTTOM DUMP, 30CY,30T	10.00	HR	7.11			10.00	71.06	71.06
MIL *	T50KE003	E	TRK, HWY, 3AXLE, 46,000 GVW	10.00	HR	32.37			10.00	323.66	323.66
MIL *	B-TRKDVRHVL		Truck Drivers, Heavy	11.00	HR	27.24	11.00	299.64			299.64
MIL *	B-LABORER	L	Laborer (Semi-Skilled)	2.00	HR	23.14	2.00	46.28			46.28
USR	T45XX003	U	TRK TRLR,BOTTOM DUMP, 30CY,30T	2.00	HR	2.25	2.00	4.50			4.50
MIL	T50KE003	U	TRK, HWY, 3AXLE, 46,000 GVW	2.00	HR	6.79	2.00	13.58			13.58
	TOTAL						13.00	345.92	25.00	414.19	760.11
	ZHANC03		Skilled Laborers + 3T Flatbed + 22 Ton Hydr Crn			PROD = 100%				CREW HOURS =	1336
MIL *	XMIXX020	E	Small Tools	2.00	HR	1.39			2.00	2.78	2.78
MIL *	T50FO006	E	TRK, HWY,F600,21,000 GVW, 2 AXL	1.00	HR	15.12			1.00	15.12	15.12
MIL	T40XX012	E	TRUCK OPT,FLATBED, 8' x 9.0'	1.00	HR	0.49			1.00	0.49	0.49
MIL	C75GV007	E	CRANE,HYD,SELF,ROUGH TER,4WD,22	1.00	HR	30.57			1.00	30.57	30.57
MIL *	B-LABORER	L	Laborer (Semi-Skilled)	6.00	HR	23.14	6.00	138.84			138.84
MIL *	B-SKILLWKRL		Skilled Worker	1.00	HR	23.76	1.00	23.76			23.76
USR	B-SKILLWKRF		Skilled Worker	1.00	HR	24.26	1.00	24.26			24.26
MIL	B-EQOPRMEDL		Eq Oper, Medium	1.00	HR	26.27	1.00	26.27			26.27
MIL	B-TRKDVRLTL		Truck Drivers, Light	1.00	HR	26.93	1.00	26.93			26.93
	TOTAL						10.00	240.06	5.00	48.97	289.03

SRC LABOR ID	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	UOM	UPDATE	**** TOTAL **** DEFAULT	HOURS
MIL B-EQOPRCRN	Eq Oper, Crane/Shovl	27.82	0.0%	0.0%	0.00	0.00	27.82	HR	10/22/92	21.20	2563
MIL B-EQOPRMED	Eq Oper, Medium	26.27	0.0%	0.0%	0.00	0.00	26.27	HR	10/22/92	17.15	2675
MIL B-EQOPROIL	Eq Oper, Oilers	24.54	0.0%	0.0%	0.00	0.00	24.54	HR	10/22/92	11.00	1276
MIL B-LABORER	Laborer (Semi-Skilled)	23.14	0.0%	0.0%	0.00	0.00	23.14	HR	10/22/92	12.86	12890
MIL B-SKILLWKR	Skilled Worker	23.76	0.0%	0.0%	0.00	0.00	23.76	HR	10/22/92	13.34	3062
MIL B-TRKDVRHV	Truck Drivers, Heavy	27.24	0.0%	0.0%	0.00	0.00	27.24	HR	10/22/92	10.49	15316
MIL B-TRKDVRLT	Truck Drivers, Light	26.93	0.0%	0.0%	0.00	0.00	26.93	HR	10/22/92	9.26	1336

U.S. Army Corps of Engineers
PROJECT 11HWAC: HANFORD: REMEDIATION - 1.4.10.1.1.23.01.2
1100-EM-1, HORN RAPIDS LANDFILL, WAC CAP
** EQUIPMENT BACKUP **

SRC	EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	** TOTAL ** TOTAL	UOM	HOURS
MIL	C10WC003	RAMMER,VIB,MAN, 13" X 11" SHOE	0.56	0.09	0.45	0.1	0.93			2.14	HR	52
MIL	C75GV007	CRANE,HYD,SELF,ROUGH TER,4WD,22T	9.81	3.67	4.31	1.2	10.53	0.85	0.13	30.57	HR	1336
MIL	G15CA005	GRADER,MOTOR,CAT14-G, ARTIC	13.24	5.29	5.41	1.8	13.62	1.47	0.22	41.08	HR	1276
MIL	L40FI008	LDR,FE,WH,7.00CY 4WD ARTIC PWSHF	20.27	6.84	10.33	3.1	18.29	7.98	1.20	68.00	HR	967
MIL	L50CS002	LDR,W/BH,WH,1.0CY FE BKT/24"DIP	3.42	1.16	1.86	0.6	4.04	0.53	0.08	11.69	HR	62
MIL	R40HY004	ROLL,VIB,TOWED,STL,PAD,58"D,60"W	3.76	0.90	1.48	0.4	4.02			10.62	HR	1276
MIL	T10CA017	BLADE, UNIVERSAL,HYDR,FOR D8	2.97	0.87		0.1	3.23			7.20	HR	1276
MIL	T15CA015	DOZER,CWLR,CAT D-8L, (ADD BLADE)	22.47	6.58	10.71	3.0	30.53			73.29	HR	1276
MIL	T40XX012	TRUCK OPT,FLATBED, 8' x 9.0'	0.24	0.06			0.20			0.49	HR	1336
MIL	T40XX033	WATER TANK, 3000 GAL (ADD TRUCK)	1.52	0.37			1.26			3.15	HR	1276
MIL	T45XX003	TRK TRLR,BOTTOM DUMP, 30CY,30T	2.85	0.82		0.0	2.61	0.64	0.10	7.11	HR	12764
MIL	T50FO006	TRK, HWY,F600,21,000 GVW, 2 AXLE	2.32	0.65	7.20	2.1	2.20	0.51	0.08	15.12	HR	1336
MIL	T50FO015	TRK, HWY, 54,000 GVW, 3 AXLE	6.23	1.58	8.74	2.4	5.48	1.31	0.20	25.97	HR	1276
MIL	T50KE003	TRK, HWY, 3AXLE, 46,000 GVW	9.16	2.21	9.83	2.7	7.97	0.39	0.06	32.37	HR	12764
MIL	XMIXX020	Small Tools	0.46	0.17	0.13	0.0	0.57			1.39	HR	5333

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** PROJECT SETTINGS **

ESTIMATE TYPE : A-Crews with Auto Reprice

SALES TAX : 7.80%

DATE OF ESCALATION SCHEDULE : 10/01/92

PROJECT DIRECT COST COLUMNS

Col Type	H	L	E	M	U
Rep Width	8	10	10	12	10
Title	MHRS	LABR	EQUIP	MAT	OTHER

PROJECT INDIRECT COST COLUMNS

Col Type	O	U	P	B	U
Rep Width	9	9	9	9	9
Title	FOOH	HOOH	PROF	BOND	B&O TAX

PROJECT OWNER COST COLUMNS

Col Type	U	U	X	X	X
Rep Width	12	12	0	0	0
Title	S & A	CONTG	(Unused)	(Unused)	(Unused)

PROJECT BREAKDOWN

PROJECT ID	Length	Trail Sep	Level Title	2nd View Order
Level 1 ID :	2		Des/Actn	0
Level 2 ID :	2		Feature	0
Level 3 ID :	2		SubFeat	0
Level 4 ID :	2		System	0
Level 5 ID :	4		Bid Item	1
Level 6 ID :	4	-	Task	2

Owner Cost Level : 1

** PROJECT SETTINGS **

2ND VIEW COLUMNS
Quantity Column Width : 12

Col Type	P	X	X	X	X
Rep Width	25	0	0	0	0
Title	PROJECT	(Unused)	(Unused)	(Unused)	(Unused)
Shadow	R	X	X	X	X

DETAIL REPORT FORMATTING

PAGE OPTIONS
Page Break Levels : 4
Table of Contents Levels : 5

0 1 2 3 4 5 6 7

ROW OPTIONS
Print Titles at Levels : Y Y Y Y Y Y
Print Totals at Levels : N N N Y Y Y
Print Notes at Levels : Y Y Y Y Y Y Y Y
Print Unit Cost Row : Y
Print Page Footer : N
Show Cost Codes : Y

COLUMNS OPTIONS
Print Crew Id : Y
Crew Output : Y
Unit Cost : Y

UPB TITLES
No. of Levels to Print : 0
Bracket Titles With : - :
Include titles Notes : Y

** PROJECT SETTINGS **

OTHER REPORT FORMATTING

COLUMN TITLES FOR SUMMARY REPORTS

Column 1 FOOH	: JOB OFFICE OVERHEAD
Column 2 HOOH	: HOME OFFICE OVERHEAD
Column 3 PROF	: PROFIT
Column 4 BOND	: PERFORMANCE BOND
Column 5 B&O TAX	: B & O AND OTHER TAXES

Column 1 S & A	: S & A
Column 2 CONTG	: CONTINGENCY
Column 3 (Unused)	:
Column 4 (Unused)	:
Column 5 (Unused)	:

STANDARD COLUMN WIDTHS

Quantity Columns	: 10
Total cost Columns	: 12
Unit Cost Columns	: 12

SUMMARY FEATURES

Round Totals Column	: T-Tens
Contingency Notes	: Yes
Show Project Totals	: Yes

REPORT SELECTION

Project Settings	: Y
Contractor Settings	: Y
Link Listing	: N

Measurement Units : Original

	REPORT FORMAT TYPE			FOR LEVEL (S)						
	Direct	Indirect	Owner	0	1	2	3	4	5	6
Detail :	Y									
Project :	N	Y	Y	N	N	N	N	Y	Y	
Contractor :	N	N		N	N	N	N	N	N	
Division :	N	N	N	Y	N	N	N	N	N	
System :	N	N	N	Y	N	N	N	N	N	
2nd View :	N									
Crew :	Y			Y	N	N	N	N	N	
Labor :	Y									
Equipment :	Y									

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
Project Information Record							
06 REMEDIAL ACTIONS							
	S & A	P	15.00				
	CONTINGENCY	P	0.00				
06 01 MOBILIZATION & PREPARATORY WORK							
06 01 01 MOB OF EQUIPMENT AND FACILITIES							
06 01 01 1 TRANSPORTATION							
06 01 01 1 01 Equipment Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
06 01 04 SETUP/CONSTRUCT TEMP FACILITIES							
06 01 04 01 TRAILERS AND BUILDINGS							
06 01 04 01 01 Assembly and Setup							
06 01 04 01 01 01 Assembly and Setup							
	S & A	O					
	CONTINGENCY	P	50.00				
06 01 04 02 DECONTAMINATION FACILITIES							
06 01 04 02 01 Personnel Decon Facilities							
06 01 04 02 01 01 Personnel Decon Facilities							
	S & A	O					
	CONTINGENCY	O					
06 01 04 02 02 Equip/Vehicle Decon Facilities							
06 01 04 02 02 01 Equip/Vehicle Decon Facilities							
	S & A	O					
	CONTINGENCY	O					
06 02 MONITOR, SAMPLE, TEST, ANALYSIS							
06 02 91 QA/Safety Monitoring							
06 02 91 01 QA/Safety Monitoring							
06 02 91 01 01 QA/Safety Monitoring							
06 02 91 01 01 01 QA/Safety Monitoring							
	S & A	O					
	CONTINGENCY	P	20.00				
06 03 SITE WORK							
06 03 05 FENCING (& MISC)							
06 03 05 1 FENCING							
06 03 05 1 01 6' Security Perimeter Fencing							
	S & A	O					
	CONTINGENCY	P	20.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	END	*ESCALATN INDEX* BEGIN	END
06 03 05 2	MISCELLANEOUS IMPROVEMENTS						
06 03 05 2 01	Warning Signs						
	S & A	O					
	CONTINGENCY	P	15.00				
06 03 05 3	LANDSCAPING & TURFING						
06 03 05 3 01	Dryland Grass						
	S & A	O					
	CONTINGENCY	P	20.00				
06 08	SOLID WASTE COLLECTION/CONTAINMT						
06 08 05	CAPPING CONTAMINATED AREAS						
06 08 05 1	CAP CONSTRUCTION						
06 08 05 1 01	WAC Cap						
06 08 05 1 01 01	Random Fill - 1st 6"						
	S & A	O					
	CONTINGENCY	P	35.00				
06 08 05 1 01 02	Random Fill - Next 3.25'						
	S & A	O					
	CONTINGENCY	P	30.00				
06 08 05 1 01 03	6" Fine Grain Membrane Bedding						
	S & A	O					
	CONTINGENCY	P	30.00				
06 08 05 1 01 04	50-mil Geomembrane						
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 05 1 01 05	Top Soil - 6"						
	S & A	O					
	CONTINGENCY	P	35.00				
06 08 05 1 01 06	Class D - PPEquip						
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 05 2	LEACHATE COLLECTION						
06 08 05 2 01	Leachate Collection System						
06 08 05 2 01 01	4" Perforated Drain Pipe						
	S & A	O					
	CONTINGENCY	P	25.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
06 08 05 2 01 02	4" Collection Pipe						
	S & A	O					
	CONTINGENCY	P	25.00				
06 08 05 2 01 03	Drywells - 48" D, perf manholes						
	S & A	O					
	CONTINGENCY	P	25.00				
06 21	DEMOBILIZATION						
06 21 04	DEMOB OF EQUIPMENT & FACILITIES						
06 21 04 01	TRANSPORTATION						
06 21 04 01 01	01 DEMOBILIZATION						
06 21 04 01 01 01	01 DEMOBILIZATION						
	S & A	O					
	CONTINGENCY	P	20.00				

** CONTRACTOR SETTINGS **

		AMOUNT	PCT	PCT S	RISK	DIFF	SIZE	PERIOD	INVEST	ASSIST	SUBCON
AA REMEDIAL GENERAL CONTRACTOR											
JOB OFFICE OVERHEAD	P		15.00								
HOME OFFICE OVERHEAD	P		5.00								
PROFIT	P		8.00								
PERFORMANCE BOND	C			(Class: B)							
B & O AND OTHER TAXES	P		1.00								

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