AR TARGET SHEET

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

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APPENDIX III

RISK ASSESSMENT CALCULATIONS

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This appendix presents the equations used to generate the Intake and Risk Assessment Tables created for the residential scenario risk assessment, but are similar to those used for the industrial scenario. All example calculations are based on the maximum contaminant concentration from the Phase I RI data, although the same calculations can be used with the 95 percent UCL concentrations.

1.0 CALCULATION OF CONTAMINANT INTAKES FOR THE SOIL INGESTION, INHALATION, AND DERMAL PATHWAYS

Standard EPA equations for calculation of intakes, as provided in RAGS (EPA, 1989a) and EPA (1991a) are used as the basis for all intake calculations. The basic equation for calculating intakes, normalized with respect to body weight, via soil ingestion or inhalation is:

$$\text{Intake} = \frac{C \times IR \times EF \times ED \times CF}{BW \times AT} \quad (1)$$

where:

Intake	=	chronic daily intake of the contaminant (mg/kg-d)
C	=	concentration of contaminant in the medium (*e.g.*, mg/kg or mg/m^3)
IR	=	intake rate (*e.g.*, mg/d or m^3/d)
EF	=	exposure frequency (d/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time (d/yr x yr)
CF	=	conversion factor (as appropriate)

All exposure parameters (*i.e.*, body weight, averaging time, contact rate, exposure frequency, and exposure duration) are those presented for the residential scenario, as presented in EPA Region-10 guidance (EPA-10, 1991). A summary of the residential exposure factors is provided in table III-1.

Table III-1. Summary of Residential Scenario Exposure Factors.

Exposure Factor	Reasonable Maximum Exposure[a]
Intake Rate	
Ingestion	
Adult - Soil	100 mg/d
Child - Soil	200 mg/d
Adult - Groundwater	2 L/d
Inhalation	
Adult - Soil	20 m^3/d
Adult - Groundwater (volatiles)	15 m^3/d
Fish Ingestion[c]	54 g/d
Garden Produce[b]	
Root (e.g., carrots)	0.88 g/d
Leafy (e.g., lettuce)	1.1 g/d
Garden fruit (e.g., tomato)	2.2 g/d
Potato	9.1 g/d
Exposure Frequency	350 d/yr 2.6 h/d, 7 d/yr (swimming)
Exposure Duration	
Soil Ingestion and Dermal	
Adult	24 yr
Child	6 yr
All other pathways	30 yr
Body Weight	
Adult	70 kg
Child	15 kg
Averaging Time	
Carcinogens	70 yr x 365 d/yr
Non-carcinogens	30 yr x 365 d/yr
Skin Surface Area	
Adult - Soil	5000 cm^2 (summer); 1900 cm^2 (winter)
Child - Soil	3900 cm^2
Adult - Swimming	20,000 cm^2
Soil to Skin Adherence Factor	1 mg/cm^2/d
Contaminant-Specific Absorption Factor	
Inorganics[d]	0.001
BEHP[e]	0.0055
All other organics[d]	0.06
Permeability Coefficient - Trichloroethene[d]	4E-01 cm/hr
Groundwater Volatilization Factor[a]	0.5 L/m^3

[a]Factors based on EPA-10 (1991) unless otherwise specified
[b]EPA (1986a)
[c]EPA (1991a)
[d]EPA (1992c)
[e]Calculated factor; see Section 3.3.2

Dermal Exposure

The intake equation provided above is modified to provide the absorbed dose equation for dermal exposures to contaminated soil. Exposure factors, as provided in EPA-10 (EPA-10, 1991) are indicated.

$$\text{Dermally Absorbed Dose} = \frac{(CS \times CF \times ABS \times AF)\left[\left(\frac{SA \times EF \times ED}{BW}\right)_{child} + \left(\frac{SA \times EF \times ED}{BW}\right)_{adult}\right]}{AT} \quad (2)$$

where :

Dermally absorbed dose = (mg/kg-d)

CS	=	maximum concentration of contaminant in soil (mg/kg)
SA	=	skin surface area available for contact (child: 3,900 cm^2, Adult: 5,000 cm^2-summer, 1,900 cm^2-winter)
AF	=	soil-to-skin adherence factor (1 mg/cm^2/day)
ABS	=	contaminant-specific absorption factor (unitless)
EF	=	event frequency (child: 1 event/day, 350 d/yr; adult: 1 event/day 350 d/yr with 90 d as summer and 260 d as winter)
ED	=	exposure duration (6 yr) child (24 yr) adult
CF	=	conversion factor (1E-06 kg/mg)
BW	=	body weight (15 kg) child (70 kg) adult
AT	=	averaging time (noncarcinogenic effects: 365 d/yr x 30 yr; carcinogenic effects: 365 d/yr x 70 yr)

1.1 INTAKE CALCULATIONS

The following subsections present intake calculations for the soil ingestion, fugitive dust inhalation and dermal exposure pathways.

1.1.1 Soil Ingestion

Non-Carcinogenic

$$\text{Intake mg/kg-d} = \frac{(\text{C mg/kg})(1\text{E-}06\ \text{kg/mg})\left[\left(\frac{(200\ \text{mg/d})(350\ \text{d/yr} \times 6\ \text{yr})}{15\ \text{kg}}\right)\text{child} + \left(\frac{(100\ \text{mg/d})(350\ \text{d/yr} \times 24\ \text{yrs})}{70\ \text{kg}}\right)\text{adult}\right]}{(365\ \text{d/yr} \times 30\ \text{yr})}$$

$$= \text{C mg/kg} \times 3.7\text{E-}06\ \text{d}^{-1} \quad (3)$$

Carcinogenic

$$\text{Intake mg/kg-d} = \frac{(\text{C mg/kg})(1\text{E-}06\ \text{kg/mg})\left[\left(\frac{(200\ \text{mg/d})(350\ \text{d/yr} \times 6\ \text{yr})}{15\ \text{kg}}\right)\text{child} + \left(\frac{(100\ \text{mg/d})(350\ \text{d/yr} \times 24\ \text{yrs})}{70\ \text{kg}}\right)\text{adult}\right]}{(365\ \text{d/yr} \times 70\ \text{yr})}$$

$$= \text{C mg/kg} \times 1.6\text{E-}06\ \text{d}^{-1} \quad (4)$$

1.1.2 Inhalation

Intakes for the inhalation of fugitive dust are calculated for a residential receptor at each subunit and are based on fugitive dust emissions from that subunit only. Contaminant specific concentrations within fugitive, dust are calculated by multiplying the subunit specific dust concentration in table 3-1, with the maximum contaminant concentration in soil table 2-1.

Non-Carcinogenic

$$\text{Intake mg/kg-d} = \frac{(\text{C mg/m}^3)(20\ \text{m}^3/\text{d})(350\ \text{d/yr})(30\ \text{yr})}{(70\ \text{kg})(30\ \text{yr} \times 365\ \text{d/yr})} = \text{C mg/m}^3 \times 0.27\ \text{m}^3/\text{kg-d} \quad (5)$$

Carcinogenic

$$\text{Intake mg/kg-d} = \frac{(\text{C mg/m}^3)(20\ \text{m}^3/\text{d})(350\ \text{d/yr})(30\ \text{yr})}{(70\ \text{kg})(70\ \text{yr} \times 365\ \text{d/yr})} = \text{C mg/m}^3 \times 0.12\ \text{m}^3/\text{kg-d} \quad (6)$$

1.1.3 Dermal Absorption

Non-Carcinogenic

$$\text{Dermally Absorbed Dose mg/kg-d} =$$

$$(\text{CS mg/kg})(1\text{E-06 kg/mg})(\text{ABS})(1\ \text{mg/cm}^2\text{-d})$$

$$\frac{\left[\left[\frac{(3900\ \text{cm}^2)(350\ \text{d/yr})(6\ \text{yr})}{15\ \text{kg}}\right]\ \text{child} + \left[\frac{(5000\ \text{cm}^2)(90\ \text{d/yr})(24\ \text{yr})}{70\ \text{kg}} + \frac{(1900\ \text{cm}^2)(260\ \text{d/yr})(24\ \text{yr})}{70\ \text{kg}}\right]\ \text{adult}\right]}{(365\ \text{d/yr} \times 30\ \text{yr})}$$

$$= \text{CS mg/kg} \times \text{ABS} \times 7.9\text{E-05}\ \text{d}^{-1} \quad (7)$$

See table D-1 for ABS values (contaminant-specific absorption factors) and sources.

Carcinogenic

$$\text{Dermally Absorbed Dose mg/kg-d} =$$

$$(\text{CS mg/kg})(1\text{E-06 kg/mg})(\text{ABS})(1\ \text{mg/cm}^2\text{-d})$$

$$\frac{\left[\left[\frac{(3900\ \text{cm}^2)(350\ \text{d/yr})(6\ \text{yr})}{15\ \text{kg}}\right]\ \text{child} + \left[\frac{(5000\ \text{cm}^2)(90\ \text{d/yr})(24\ \text{yr})}{70\ \text{kg}} + \frac{1900\ \text{cm}^2)(260\ \text{d/yr})(24\ \text{yr})}{70\ \text{kg}}\right]\ \text{adult}\right]}{(365\ \text{d/yr} \times 70\ \text{yr})}$$

$$= \text{CS mg/kg} \times \text{ABS} \times 3.4\text{E-05}\ \text{d}^{-1} \quad (8)$$

See table III-1 for ABS values (contaminant-specific absorption factors) and sources.

1.2 EXAMPLE CALCULATIONS

All example intake calculations are made using the maximum contaminant concentrations for arsenic at the HRL. Calculations are not performed for the non-carcinogenic inhalation pathway because none of the COPC have an inhalation RfD.

1.2.1 Soil Ingestion

Non-Carcinogenic

$$6.6 \text{ mg/kg} \times 3.7\text{E-}06 \text{ d}^{-1} = 2.4\text{E-}05 \text{ mg/kg-d}$$

Carcinogenic

$$6.6 \text{ mg/kg} \times 1.6\text{E-}06 \text{d}^{-1} = 1.0\text{E-}05 \text{ mg/kg-d}$$

1.2.2 Inhalation

The concentration of arsenic in air, contributed to the residential receptor via the inhalation of fugitive dust from the HRL is:

$$C \text{ (mg/m}^3\text{)} = U \text{ (mg/kg)} \times D \text{ (}\mu\text{g/m}^3\text{)} \times CF \text{ (kg/}\mu\text{g)} \quad (9)$$

where:

C = Contaminant concentration of arsenic in air.
U = maximum contaminant concentration in soil for arsenic at the HRL (table 2-1).
D = Dust concentration at residential receptor for the HRL (table 3-1).
CF = Conversion Factor = 1E-09 kg/μg.

$$C = 6.6 \text{ mg/kg} \times 9.93 \text{ }\mu\text{g/m}^3 \times 1\text{E-}09 \text{ kg/}\mu\text{g} = 6.6\text{E-}08 \text{ (mg/m}^3\text{)} \quad (10)$$

Therefore,

Carcinogenic

Intake = 6.6E-8 mg/m^3 x 0.12 m^3/kg-d x .30* = 2.4E-09 (mg/kg-d)

*Assumes approximately 30 percent of the inhaled dose of arsenic is absorbed

Non-Carcinogenic

Not applicable.

1.2.3 Dermal Absorption

Non-Carcinogenic

$$6.6 \text{ mg/kg} \times .001 \times 7.9\text{E-}05 \text{ d}^{-1} = 5.2\text{E-}07 \text{ mg/kg-d}$$

Carcinogenic

$$6.6 \text{ mg/kg} \times .001 \times 3.4\text{E-}05 \text{ d}^{-1} = 2.2\text{E-}07 \text{ mg/kg-d}$$

2.0 CALCULATION OF CONTAMINANT INTAKES FOR THE GARDEN PATHWAY

Calculation of contaminant intakes was performed for 4 categories of vegetables:

1) Leafy (lettuce)
2) Root (carrot)
3) Garden vegetable (tomato)
4) Potato

2.1 PLANT CONCENTRATIONS

Before intakes can be calculated a contaminant concentration within each plant must be determined via the following equation:

$$CP = SC \times UF$$

where:

CP = concentration in plant mg/kg
SC = maximum soil concentration mg/kg
UF = uptake factor (unitless)

Table III-2 presents the uptake factors specific to each vegetable category.

Table III-2. Summary of Plant Uptake Factors[a,b].

Contaminant	Leafy	Root	Garden Fruits	Potatoes
Arsenic	0.04	0.02	0.002	0.0006
BEHP[c]	0.38	0.36	0.02	0.02
Beryllium[d]	0.43	0.26	0.041	0.06
Chlordane	0.02[e]	2.02[f]	0.21[e]	0.3[e]
Chromium	0.2[g]	0.26[d]	0.041[d]	0.06[d]
PCBs	0.38	0.36	0.02	0.02
Tetrachloroethene	NA	NA	NA	NA
1,1,1-Tetrachloroethane	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA

[a]All uptake factors expressed as [μg/g tissue DW (μg/g soil)$^{-1}$]
[b]Source: EPA 1986a unless otherwise indicated
[c]PCB uptake factors used as surrogates for BEHP
[d]95% UCL of mean for uptake factors of As, Cd, Pb, Hg, Ni, Se, Zn (EPA 1986a)
[e]Heptachlor uptake factors used as surrogates for chlordane
[f]95% UCL of mean for uptake of chlordane by sugar beets
[g] Kabata - Pendias and Pendias 1984

NA Indicates not applicable

2.1.1 Calculation of Contaminant Concentration in the Four Vegetable Categories

All example calculations use the soil concentration of arsenic at HRL.

Leafy (Lettuce)

$$CP\ mg/kg = 6.6\ mg/kg \times 0.04 = 0.26\ mg/kg$$

Root (Carrots)

$$CP\ mg/kg = 6.6\ mg/kg \times 0.02 = 0.13\ mg/kg$$

Garden Vegetable (tomato)

$$CP\ mg/kg = 6.6\ mg/kg \times 0.002 = 0.013\ mg/kg$$

Potato

$$CP\ mg/kg = 6.6\ mg/kg \times 0.0006 = 0.004\ mg/kg$$

2.2 INTAKE CALCULATIONS

The following section presents intake calculations for the four vegetable groups (leafy, root, garden vegetable, and potato).

The basic intake equation is:

$$\text{Intake mg/kg-d} = \frac{CP \times IR \times EF \times ED \times CF}{BW \times AT} \quad (11)$$

where:

CP	=	concentration in plant mg/kg
EF	=	exposure frequency (350 d/yr)
ED	=	exposure duration (30 yr)
CF	=	conversion factor (1E-03) kg/g
BW	=	body weight (70 kg)
AT	=	averaging time: carcinogens (365 d/yr x 70 yrs) non-carcinogens (365 d/yr x 30 yrs)
IR	=	intake rate for specific vegetable (g/d)

Vegetable Group	Intake Rate (g/d)
Leafy (lettuce)	1.1
Root (carrot)	0.88
Garden vegetable (tomato)	2.2
Potato	9.1

Non-Carcinogenic

$$\text{Intake mg/kg-d} = \frac{\text{(CP mg/kg)(IR g/d)(350 d/yr)(30 yr)(1E-03 kg/g)}}{\text{(70 kg)(365 d/yr x 30 yr)}} \quad (12)$$

$$\text{Intake mg/kg-d} = \text{CP mg/kg x IR g/d x 1.4E-05 g}^{-1}$$

Carcinogenic

$$\text{Intake mg/kg-d} = \frac{\text{(CP mg/kg)(IR g/d)(350 d/yr)(30 yr)(1E-03 kg/g)}}{\text{(70 kg)(365 d/yr x 70 yr)}} \quad (13)$$

$$\text{Intake mg/kg-d} = \text{CP mg/kg x IR g/d x 5.9E-06 g}^{-1}$$

2.3 EXAMPLE CALCULATIONS

Example calculations for the noncarcinogenic intakes are made using concentrations for arsenic at the HRL. As discussed in section 4.2, arsenic in plants is predominatly in organic forms that are not carcinogenic. Therefore, beryllium is used to calculate the example carcinogenic intake.

Non-Carcinogenic (leafy) - arsenic

$$\text{Intake} = 0.26 \text{ mg/kg} \times 1.1 \text{ g/d} \times 1.4\text{E-}05 \text{ g}^{-1} = 4\text{E-}06 \text{ mg/kg-d}$$

Carcinogenic (leafy) - beryllium

$$\text{Intake} = 0.56 \text{ mg/kg} \times 1.1 \text{ g/d} \times 5.9\text{E-}06 \text{g}^{-1} = 3.6\text{E-}06 \text{ mg/kg-d}$$

The additional three vegetable categories are calculated in the same manner with the group specific intake rate (see section 3.2) and plant contaminant concentrations (table 3-3) as the two variables.

3.0 CALCULATION OF CONTAMINANT INTAKES FOR THE GROUNDWATER PATHWAYS

As in sections D2.0 and D3.0, Standard EPA Equations for calculation of contaminant intakes, as provided in RAGS (EPA, 1989a) and EPA (1991a) are used as the basis for groundwater contaminant intake calculations.

The basic equation for calculating intakes via groundwater ingestion or volatile inhalation is:

$$\text{Intake} = \frac{C \times IR \times EF \times ED}{BW \times AT} \quad (14)$$

where:

Intake	=	estimated contaminant intake (mg/kg-d)
C	=	estimated water concentration (mg/L)
IR	=	contact rate (2 L/d)
EF	=	exposure frequency (350 d/yr)
ED	=	exposure duration (30 yr)
BW	=	body weight (70 kg)
AT	=	averaging time: carcinogens (365 d/yr x 70 yrs) non-carcinogens (365 d/yr x 30 yrs)

For volatile inhalation the equation is modified to include a volatilization factor (K):

Therefore,

$$\text{Intake} = \frac{CW \times IR \times EF \times ED}{BW \times AT} \quad (15)$$

where:

Intake	=	estimated contaminant intake (mg/kg-d)
CW	=	estimated water concentration (mg/L) x K volatilization factor (0.5 L/m^3)
IR	=	contact rate (15 L/d)
EF	=	exposure frequency (350 d/yr)
ED	=	exposure duration (30 yr)
BW	=	body weight (70 kg)
AT	=	averaging time: carcinogens (365 d/yr x 70 yrs) non-carcinogens (365 d/yr x 30 yrs)

3.1 Intake Calculations

The following Subsections present intake calculations for the groundwater ingestion and volatile inhalation pathways.

3.1.1 Groundwater Ingestion

Non-Carcinogenic

$$\text{Intake mg/kg-d} = \frac{(\text{C mg/L})(2\ \text{L/d})(350\ \text{d/yr})(30\ \text{yr})}{(70\ \text{kg})(365\ \text{d/yr})(30\ \text{yr})} \quad (16)$$

$$= \text{C mg/L} \times 0.027\ \text{L/kg-d}$$

Carcinogenic

$$\text{Intake mg/kg-d} = \frac{(\text{C mg/L})(2\ \text{L/d})(350\ \text{d/yr})(30\ \text{yr})}{(70\ \text{kg})(365\ \text{d/yr} \times 70\ \text{yr})} \quad (17)$$

$$= \text{C mg/L} \times 0.012\ \text{L/kg-d}$$

3.1.2 Inhalation of Volatiles

Non-Carcinogenic

Not applicable.

Carcinogenic

$$\text{Intake mg/kg-d} = \frac{(\text{C mg/L})(15\ \text{m}^3/\text{d})(350\ \text{d/yr})(30\ \text{yr})(0.54\ \text{m}^3)}{(70\ \text{kg})(365\ \text{d/yr} \times 70\ \text{yr})} \quad (18)$$

$$= \text{C mg/L} \times 4.4\text{E-}02\ \text{L/kg-d}$$

3.2 EXAMPLE CALCULATIONS

Example calculations are performed using the maximum contaminant concentrations for nitrate and trichloroethene as appropriate.

3.2.1 Groundwater Ingestion

Non-Carcinogenic - Nitrate

$$61\ \text{mg/L} \times 0.027\ \text{L/kg-d} = 1.7\ \text{mg/kg-d} \quad (19)$$

Carcinogenic - Trichloroethene

$$0.11\ \text{mg/L} \times 0.012\ \text{L/kg-d} = 1.3\text{E-}03\ \text{mg/kg-d} \quad (20)$$

3.2.2 Inhalation of Volatiles

Non-Carcinogenic

Not applicable.

Carcinogenic - Trichloroethene

$$0.11\ mg/L \times 4.4E-02\ L/kg-d = 4.8E-03\ mg/kg-d \quad (21)$$

4.0 CALCULATION OF HUMAN HEALTH ASSESSMENT

Hazard Quotient

The basic equation for determining the HQ for all pathways is:

$$HQ = I/RfD$$

where:

HQ	=	hazard quotient (unitless)
I	=	intake (mg/kg-d)
RfD	=	contaminant-specific chronic reference dose (mg/kg-d)

Incremental Cancer Risk

The basic equation for determining the ICR for all pathways is:

$$ICR = I \times SF$$

where:

ICR	=	lifetime incremental cancer risk (unitless)
I	=	intake (mg/kg-d)
SF	=	contaminant-specific slope factor $(mg/kg-d)^{-1}$

Note: All ICR calculations are made to one significant figure only.

4.1 EXAMPLE CALCULATIONS

All example calculations are made using values for arsenic at the HRL with the exception of the HQ for the Inhalation Pathway. No HQ's have been calculated for this pathway since there are no published inhalation RfD's available for any of the COPC.

4.1.1 Soil Pathway

4.1.1.1 Soil Ingestion

Hazard Quotient

$$HQ = \frac{2.4E-05\ mg/kg-d}{3.0E-04\ mg/kg-d} = 0.08 \quad (22)$$

Incremental Cancer Risk

$$ICR = (1.0E-05\ mg/kg-d \times 1.7\ (mg/kg-d)^{-1} = 2E-05 \quad (23)$$

4.1.1.2 Inhalation of Fugitive Dust

Hazard Quotient - Not Applicable

Incremental Cancer Risk

$$ICR = 2.4E\text{-}09\ mg/kg\text{-}d \times 50\ (mg/kg\text{-}d)^{-1} = 1E\text{-}07^{*}$$

*The slope factor for arsenic is based on 30 percent absorption of the inhaled arsenic. Therefore, intakes have been adjusted accordingly for arsenic, to determine the ICR.

4.1.1.3 Dermal Exposure

Hazard Quotient

$$HQ = \frac{5.2E-07\ mg/kg-d}{3.0E-04\ mg/kg-d} = 0.002 \quad (24)$$

Incremental Cancer Risk

$$ICR = 2.2E\text{-}07\ mg/kg\text{-}d \times 1.7\ (mg/kg\text{-}d)^{-1} = 4E\text{-}07$$

4.1.2 Garden Pathway

The values used to calculate HQ and ICR for the garden pathway are the total contaminant intake, *i.e.*, the sum of all the intakes for arsenic for the four vegetable groups combined. As discussed in section 4.2, arsenic in plants is predominantly in organic forms that are not carcinogenic. Therefore, beryllium is used for the example ICR calculation.

Hazard Quotient - arsenic

$$HQ = \frac{6.4E-06 \text{ mg/kg-d}}{3.0E-04 \text{ mg/kg-d}} = 0.02 \quad (25)$$

Incremental Cancer Risk - beryllium

$$ICR = 1E\text{-}05 \text{ mg/kg-d} \times 4.3 \text{ (mg/kg-d)}^{-1} = 4E\text{-}05$$

4.1.3 Groundwater Pathway

4.1.3.1 Groundwater Ingestion

Hazard Quotient - nitrate

$$HQ = \frac{1.7 \text{ mg/kg-d}}{1.6 \text{ mg/kg-d}} = 1 \quad (26)$$

Incremental Cancer Risk - trichloroethene

$$ICR = 1.3E-03 \text{ mg/kg-d} \times 1.1E-02 \text{ (mg/kg-d)}^{-1} = 1E-05 \quad (27)$$

4.1.3.2 Inhalation of Volatiles

Hazard Quotient

Not applicable.

Incremental Cancer Risk - trichloroethene

$$ICR = 4.8E-03 \text{ mg/kg-d} \times 6.0E-03 \text{ (mg/kg-d)}^{-1} = 3E-05 \quad (28)$$

APPENDIX IV

STATISTICAL INFORMATION FOR BISRA AND BRSRA

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This appendix presents the methodologies and results for the calculation of the 95-percent upper confidence limit (UCL) of the mean contaminant concentration. Soil contaminants are discussed in section 1.0 and groundwater contaminants are discussed in section 2.0. A discussion of upper tolerance limit (UTL) calculations is provided in section 3.0.

1.0 CALCULATION OF 95-PERCENT UCL'S FOR SOIL CONTAMINANTS

To calculate the 95-percent UCL, data were used that approximately represented the distribution of specific contaminants for each site. Data that were rejected by validation were not included in calculations. All data from the Phase I and Phase II RI's were considered but not all data were used in the calculations. Selected data at the Horn Rapids Landfill (HRL) and the Discolored Soil Site (UN-1100-6) were selected to provide analyses of "hot spots" for soil and the contaminant plume in the groundwater in the vicinity of the HRL, as discussed below. This provides a conservative bias to the 95-percent UCL for certain contaminants. For a contaminant of concern, specific to a subunit, one-half the sample quantitation limit (SQL) (DOE/RL-91-45) was used in the calculations when a contaminant of concern was not detected in a sample. These are reported at one-half the sample quantitation limit (SQL) (*i.e.*, noted with a U qualifier) in all tables in this section. Anywhere polychlorinated biphenyls (PCB's) were detected, the measured concentrations or one-half the SQL, were summed for all the Arochlors detected at that subunit.

Phase I soil data used in the calculations were taken from DOE/RL-90-18 and Phase II soil data is presented in appendix D.

95-percent UCL was calculated as follows (Hines and Montgomery, 1980):

95-percent UCL		=	Sample average + $t_{\alpha, df}$ (sample standard deviation/square root (n))
	n	=	sample size
	t	=	Student's t statistic for α, df (*i.e.*; degrees of freedom)
where:	α	=	0.05
	df	=	n-1

The 95-percent UCL's for soil contaminants are summarized in table IV-1. The data used for calculating the UCL's is provided in tables IV-2, IV-3, and IV-4 for the Discolored Soil Site (UN-1100-6), the Ephemeral Pool, and HRL, respectively.

Table IV-1. Summary of Statistical Calculation Information for Soils.

Location	Contaminant	Sample Mean Concentration mg/kg	Sample Standard Deviation mg/kg	Sample Number	95-percent UCL mg/kg
Ephemeral Pool	Chlordane	1.4	0.89	9	1.9
Ephemeral Pool	Total PCB's	6.5	14	9	15
Discolored Soil Site (UN-1100-6)	BEHP	13,000	6,400	6	18,000
Discolored Soil Site (UN-1100-6)	Chlordane	1.1	0.56	6	1.6
Horn Rapids Landfill	Arsenic	1.3	0.7	100	1.4
Horn Rapids Landfill	Beryllium	0.5	0.3	100	0.5
Horn Rapids Landfill	Chromium	44	170	55	83
Horn Rapids Landfill	Total PCB's	28	26	22	38

Table IV-2. Summary of Phase 1 BEHP and Chlordane Surface Soil Sampling at the Discolored Soil Site (UN-1100-6).

Sample No.	BEHP ug/kg	Q	*Chlordane ug/kg	Q
S6150	25000000		1860	J
S6151	6700000		590	J
S6152	8900000		1780	J
S6153	11000000		820	J
S6154	13000000		960	J
S6155	14000000		670	J

BEHP - Bis(2-ethylhexyl)phthalate
* Chlordane is sum of alpha and gamma chlorane
Q - data qualifier

Table IV-3. Summary of Phase 1 and Phase 2 Soil Sampling Data at the Ephemeral Pool.

SDG	Boring Loc.	Sample No.	Sample Depth (ft)	Total PCB's ug/kg	Q	*Chlordane ug/kg	Q
PHASE I DATA							
S6150A	UNK	S6164A	0-0.5	4700		480	
	UNK	S6165A	0-0.5	300	J	1810	
PHASE II DATA							
B00G51	E1	B00G76	S	170	U	2800	
	E2	B00G51	S	42000		950	
	E3	B00G52	S	11000	J	700	
	E4	B00G53	S	165	U	540	
	E4	B00G54	S	170	U	730	
	E5	B00G77	S	175	U	2560	
	E6	B00G56	S	190	U	1710	

PCB's - polychlorinated biphenyls
* Chlordane is sum of alpha and gamma chlorane
Q - data qualifier

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 1 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
PHASE I DATA								NA		NA	
AH168S/ A1307S		AH168S	0-0.5	0.65	J	0.46		NA		NA	
		AH169S	0-0.5	1.5	J	0.09	U	NA		NA	
		AH171S	0-0.5	2.1	J	0.42		NA		NA	
		AH172S	0-0.5	1.9		0.79		NA		NA	
		AH173S	0-0.5	0.67	J	0.105	U	NA		NA	
		AH174S	0-0.5	1.1	J	0.08	U	NA		NA	
		AH175S	0-0.5	1.6		0.08	U	NA		NA	
		AH176S	0-0.5	1.1		0.085	U	NA		NA	
		AH177S	0-0.5	1.7		0.22		NA		NA	
		AH178S	0-0.5	0.96	J	0.2		NA		NA	
		AH179S	0-0.5	1	J	0.085	U	NA		NA	
AH180S/ A1312S		AH180S	0-0.5	0.62		0.085	U	NA		NA	
		AH181S	0-0.5	2.3		0.83		NA		NA	
		AH184S	0-0.5	0.87		0.13		NA		NA	
		AH185S	0-0.5	3.6		0.67		NA		NA	
AH186S		AH186S	0-0.5	1.1		0.09	U	NA		NA	
AH186S		AH187S	0-0.5	1.3		0.085	U	NA		NA	
		AH188S	0-0.5	1.1		0.09	U	NA		NA	

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 2 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
		AH189S	0-0.5	1.8		0.095	U	NA		NA	
		AH190S	0-0.5	2.1		0.18	U	NA		NA	
		AH191S	0-0.5	1.4		0.08	U	NA		NA	
		AH192S	0-0.5	1.5		0.08	U	NA		NA	
		AH193S	0-0.5	1.2		0.09	U	NA		NA	
		AH194S	0-0.5	1.1		0.095	U	NA		NA	
		AH195S	0-0.5	1.8		0.095	U	NA		NA	
		AH196S	0-0.5	1.8		0.085	U	NA		NA	
		AH197S	0-0.5	1.7		0.085	U	NA		NA	
		AH198S	0-0.5	2.2		0.09	U	NA		NA	
		AH199S	0-0.5	1.3		0.085	U	NA		NA	
		AH200S	0-0.5	1.5		0.08	U	NA		NA	
		AH201S	0-0.5	0.92		0.07	U	NA		NA	
		AH202S	0-0.5	1.9		0.08	U	NA		NA	
		AH203S	0-0.5	0.71		0.07	U	NA		5000	J
		AH204S	0-0.5	1.9		0.08	U	NA		NA	
		AH205S	0-0.5	1.8		0.09	U	NA		NA	

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 3 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
AH206S		AH206S	0-0.5	1.9		0.62		NA		NA	
		AH207S	0-0.5	1.2	J	1.1		NA		NA	
		AH208S	0-0.5	1.6	J	1		NA		NA	
		AH209S	0-0.5	1.2	J	0.94		NA		NA	
		AH211S	0-0.5	1.9	J	0.85		NA		NA	
		AH212S	0-0.5	1.8	J	0.98		NA		NA	
		AH213S	0-0.5	1.4	J	1		NA		NA	
		AH214S	0-0.5	2.1	J	0.52		NA		NA	
		AH215S	0-0.5	NR		NR		NA		NA	
A1615S	HRL-2	A1802S	0-2.5	1.2		0.42		9		NA	
		A1804S	5.1-7.9	1.3	J	0.52		6.6	J	NA	
		A1805S	5.1-7.9	1.1	J	0.55		6	J	NA	
		A1807S	13.9-16.2	0.67	J	0.57		5.1	J	NA	
		A1810S	13.9-16.2	0.67	J	0.55		7.3	J	NA	
A1901S	HRL-3	A2002S	0-2.5	2.2		0.59		13.2		NA	
		A2004S	4.6-7.5	1.3		0.56		7.6	J	NA	
		A2005S	4.6-7.5	1.8		0.69		6.6	J	NA	
		A2007S	10.8-13	1.4	J	0.62		4.6		NA	
A1901S	HRL-3	A2009S	14.5-17	1.4		0.78		7	J	NA	

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 4 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
A1912S	HRL-4	A2202S	0-2.8	0.82	J	0.85		4.1		65000	J
		A2204S	5.4-8	1.5		0.97		7.4		NA	
		A2205S	5.4-8	1.1		0.87		6.2		NA	
		A2207S	10.5-13.6	1		1.1		10		NA	
		A2209S	14.6-16.9	1.7		1.1		1250		NA	
A1501W	HRL-5	A1502S	0-2.1	1.1	J	0.58		5.7	J	NA	
		A1503S	3.8-6	0.56	J	0.54		4.1	J	NA	
		A1504S	0.4-8.6	0.71	J	0.71		5.2	J	NA	
		A1506S	9.4-11.6	0.79	J	0.8		6.1	J	NA	
		A1507S	9.4-11.6	0.79	J	0.66		6.2	J	NA	
		A1509S	13.1-15.5	0.76	J	0.73		81.5	J	NA	
	HRL-6	A1601S	2.4-4.8	0.67	J	0.38		7.9	J	NA	
		A1602S	4.8-7.1	0.81	J	0.58		7.8	J	NA	
		A1604S	7.1-9.4	0.72	J	0.48		4.8	J	NA	
		A1606S	9.4-11.6	0.91	J	0.33		5.8	J	NA	
		A1607S	11.6-13.9	0.57	J	0.59		13.7	J	NA	
		A1608S	11.6-13.9	0.72	J	0.52		8	J	NA	
A2214S	HRL-7	A2301S	0-2.5	1.3	J	0.69		8.8		NA	
		A2303S	4.8-7.2	0.94	J	0.28		7.6		NA	

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 5 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
A2214S	HRL-7	A2304S	4.8-7.2	0.82	J	0.54		9.7		NA	
		A2306S	8.9-11.2	4.2	J	0.76		6.5		NA	
		A2310S	12.7-15.1	0.97	J	0.61		9.1		NA	
A1401W	HRL-8	A1402S	0-2.5	1		0.95		16.2		NA	
		A1404S	5.9-7.4	0.73		0.73		11.4		NA	
		A1406S	8.7-10.9	0.2		1		284		NA	
		A1408S	10.9-12.8	0.45		0.89		72		NA	
		A1409S	15-17.3	1.1		1		119		NA	
A1615S	HRL-9	A1701S	0-2.5	0.76	J	0.44		5	J	NA	
		A1704S	3.7-4.6	0.46	J	0.51		24.9	J	NA	
		A1706S	6.8-9.1	0.58	J	0.62		14	J	NA	
		A1707S	6.8-9.1	0.37	J	0.48		13.2	J	NA	
		A1709S	10.9-13.1	0.48	J	0.42		4.7	J	NA	
A1901S	HRL-10	A1901S	0-2.3	1.9		0.37		10.8	J	NA	
		A1902S	2.3-4	1.7		0.61		17.6	J	NA	
		A1905S	6.9-9.1	1.5		0.69		9.9	J	NA	
		A1906S	6.9-9.1	1.8		0.6		9.6	J	NA	

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 6 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
PHASE II DATA											
WHC 23	TP-11	B00Z59	4	4.1		0.115	U	85.7		NA	
WHC 28	TP-3B	B00ZT3	7-7.5	R		R		4.9	J	NA	
	TP-3B	B00ZT4	7-7.5	R		R		4.3	J	NA	
	TP-3A	B00ZT7	5	R		R		3.7	J	NA	
	TP-3A	B00ZT8	10	R		R		9.9	J	NA	
	TP-4/5	B00ZV1	5	R		R		3.2	J	NA	
	TP-4/5	B00ZV2	12	R		R		133	J	NA	
WHC 29	TP-8	B00ZV3	5	0.74	B	0.55	B	19.8		NA	
WHC 27	TP-7	B00ZT2	5	2.9	J	0.115	U	9.8		NA	
WHC 23	TP-1	B00ZT0	5	NA		NA		NA		NA	
	TP-1	B00ZT1	9	NA		NA		NA		NA	
WHC 30	B5-2	B00ZX5	1	NA		NA		NA		NA	
WHC 31	B5-3	B00ZX7	S	NA		NA		NA		NA	
	B5-3	B00ZY0	1'	NA		NA		NA		NA	
WHC 30	B4-1	B00ZW6	S	NA		NA		NA		NA	
	B4-1	B00ZW7	1	NA		NA		NA		NA	
WHC 31	B5-3	B00ZX9	S	NA		NA		NA		NA	
WHC 6	B5-3	B00GB0	0-1	1.2	J	0.55	B	NA		NA	
WHC 6	B5-3	B00GB1	1-2	1.2	J	0.48	B	NA		NA	

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 7 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
	B5-2	B00GB2	0-1	0.86	J	0.42	B	NA		NA	
	B5-2	B00GB3	1-2	0.76	J	0.42	B	NA		NA	
	B4-1	B00GB4	0-1	1.8	J	1	B	NA		NA	
	B4-1	B00GB5	0-1	1.8	J	1.1	B	NA		NA	
	B4-1	B00GB7	1-2	1.2	J	0.77	B	NA		NA	
	PCB-1	B00G92	0-1	NA		NA		NA		49000	J
	PCB-1	B00G93	1-2	NA		NA		NA		41000	J
	PCB-2	B00G94	0-1	NA		NA		NA		80000	J
	PCB-2	B00G95	1-2	NA		NA		NA		100,000	J
	PCB-3	B00G96	0-1	NA		NA		NA		6100	J
	PCB-3	B00G97	1-2	NA		NA		NA		15000	J
	PCB-4	B00G98	0-1	NA		NA		NA		21000	J
	PCB-4	B00G99	1-2	NA		NA		NA		1500	J
WHC 30	PCB-2A	B00ZV4	1	NA		NA		NA		8500	B
	PCB-2A	B00ZV5	1.5	NA		NA		NA		12000	B
	PCB-3A	B00ZV6	S	NA		NA		NA		3500	B
	PCB-3A	B00ZV7	1	NA		NA		NA		23000	B
	PCB-3A	B00ZV8	20"	NA		NA		NA		9700	B
	PCB-4A	B00ZV9	S	NA		NA		NA		16000	B
WHC 30	PCB-2A	B00ZX6	1.5	NA		NA		NA		2300	B

Table IV-4. Summary of Phase I and Phase II Soil Sampling at the Horn Rapids Landfill (sheet 8 of 8).

SDG	Boring Loc.	Sample No.	Sample Depth	Arsenic mg/kg	Q	Beryllium mg/kg	Q	Chromium mg/kg	Q	Total PCBs ug/kg	Q
	PCB-4A	B00ZW1	S	NA		NA		NA		36000	B
	PCB-4A	B00ZW2	1	NA		NA		NA		39000	B
	PCB-1A	B00ZW3	S	NA		NA		NA		20000	B
	PCB-1A	B00ZW4	1	NA		NA		NA		29000	B
	PCB-1A	B00ZW5	1.5	NA		NA		NA		43000	B

PCB's - polychlorinated biphenyls
Q - data qualifier

DATA REPORTING QUALIFIERS

The following is a summary of data reporting qualifiers and abbreviations used in the tables for this appendix.

B - Organic Samples: Indicates compound was found in the associated blank as well as in the sample.

Inorganic Samples: Indicates value is greater than the instrument detection limit and below the contract required detection limit.

J - Indicates an estimated value.

U - Indicates compound was analyzed for but not detected at the given detection limit. Values associated with a U qualifier are one-half the SQL.

R - Data has been rejected during the validation process.

ABBREVIATIONS

-- Data result not used (see groundwater discussion section 2, appendix E)

UCL - Upper confidence limit of 95 used in the statistical calculations.

SDG - Sample delivery group.

UNK - Location is unknown.

NA - Analysis not performed, not available, or not used in the risk assessment.

NR - Not requested for analysis.

*Chlordane - The concentrations reported for alpha and gamma chlordane were summed.

SQL - Sample quantitation limit.

S - Surface sample.

WHC - Westinghouse Hanford Company.

< - Indicated the radioactivity is less than the given count.

Q - Data qualifier indicating acceptability for use in risk assessment; (a blank indicates no associated qualifier).

1.1 UN-1100-6 SUBUNIT (DISCOLORED SOIL SITE)

Bis(2-ethylhexyl)phthalate (BEHP) and Chlordane

Alpha and gamma chlordane were summed for statistical calculations. Data for BEHP and chlordane were treated in the same way since their distributions on the site are similar. BEHP and chlordane were detected in samples A6150S to A6155S and were greater than any other detections. Because these samples are all in close proximity to each other, only data from these samples were used for statistical calculations. Data used in the calculations are provided in table IV-2. The use of these data provides a conservatively biased estimate of the 95-percent UCL because low values or nondefects are not used.

1.2 EPHEMERAL POOL

Chlordane and PCB's

All data for these contaminants, collected from this site, were used in the calculations. The data are summarized in table IV-3.

1.3 HRL

Arsenic and Beryllium

These contaminants are evenly distributed on the site. All data were included that were taken from the surface to a depth of 15 feet.

Chromium

In borehole HRL-4, chromium was found to be at a significantly higher concentration than any of the other samples on the site. In order to estimate the concentrations over the 15-foot soil column, data taken from all boreholes and trenches down to 15 feet were used in calculations. Data from auger holes and surface samples not associated with boreholes were not used to calculate the 95-percent UCL. These data provide a conservatively biased estimate of the 95-percent UCL for evaluation of chromium.

PCB's

Elevated levels of PCB were mostly found in close proximity to HRL-4, therefore the 95-percent UCL calculations used data from samples taken from this vicinity. Data used were from AH203, Borehole HRL-4 (0-2.8 feet), PCB-1 to PCB-4 and PCB-1A to PCB-4A.

The data for the HRL used to calculate the 95-percent UCL are presented in table IV-4.

2.0 CALCULATION OF 95-PERCENT UCL FOR GROUNDWATER CONTAMINANTS

The 95-percent UCL's for contaminants in the groundwater in the vicinity of the HRL were calculated as described above. Two nonradioactive contaminants are evaluated. These contaminants are trichloroethene and nitrate. In addition, gross alpha and gross beta are evaluated because they have been detected at elevated concentrations in some sampling rounds as discussed in section 5. For radioactive contaminants, actual net counts were used in the tables.

2.1 NONRADIOACTIVE CONTAMINANTS

Trichloroethene (TCE)

Data from monitoring well (MW)-12 to MW-15 were used for statistics, because concentrations of TCE are consistently detected over maximum contaminant level (MCL) (5 mg/L) at these wells. The use of these data provide a conservatively biased 95-percent UCL of groundwater quality within the contaminant plume.

Nitrate (as Nitrogen)

Statistics are performed on data from MW-10 to MW-15 and MW-20 because nitrate was detected above MCL (10 mg/L) at these wells. Other data for nitrate were not used to calculate the 95-percent UCL. As indicated above, this provides a conservatively biased estimate of the groundwater quality within the contaminant plume.

The 95-percent UCL's are summarized in table IV-5. The data used to calculate the 95-percent UCL's are presented in table IV-6.

2.2 RADIOACTIVE CONTAMINANTS

Gross alpha and gross beta contamination have also been detected in the groundwater in the vicinity of HRL. As discussed in chapter 5 of the risk assessment, most of the beta activity appears to be associated with Technetium-99. The 95-percent UCL's for gross alpha and gross beta activity are summarized in table IV-5. Data from wells located within the contaminant plume were used to estimate conservatively biased 95-percent UCL's. In general, gross alpha activity exceeded 5 pCi/L or gross beta activity exceeded 50 pCi/L at the wells used for the calculation of the 95-percent UCL's. These activity levels are not MCL's, but are concentration limits with which the assumption of compliance with radionuclide MCL's may be assumed without further analysis.

The data used to calculate the 95-percent UCL's are presented in table IV-7. The wells used to calculate the 95-percent UCL's for gross alpha are MW-10 to MW-15. The wells used to calculate the 95-percent UCL's for gross beta are MW-10 to MW-15 and MW-20.

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Table IV-5. Summary of Statistical Calculation Information for Groundwater at Horn Rapids Landfill.

Contaminant, units	Sample Mean	Sample Standard Deviation	95-percent UCL of Mean Conc.	Sample Number
TCE, mg/L	71	13	75	39
NO3-N, mg/L	43	8	45	58
Alpha, pCi/L	4.3	3	5	49
Beta, pCi/L	60	21	65	53

TCE - Trichloroethane
UCL - Upper confidence limit

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Table IV-6. Summary of Groundwater Sampling Data (Non-Radioactive) at Horn Rapids Landfill. (sheet 1 of 2)

Well	Round	Trichloroethene (mg/L)	Nitrate as nitrogen (mg/L)
MW-10	1	--	38.4
	2	--	36.9
	3	--	42.1
	4	--	38.3
	5	--	39
	6	--	38
	7	--	47
	7.5	--	38
	8	--	42
	9	--	43
MW-11	1	--	40.6
	2	--	40.5
	3	--	47.8
	4	--	46.5
	5	--	40
	6	--	46
	7	--	39
	7.5	--	48
	8	--	NA
	9	--	49
MW-12	1	92	49
	2	110	49
	3	80	56.7
	4	74	50.8
	5	79	50
	6	78	49
	7	69	51
	7.5	67	52
	8	69	NA
	9	58	52
MW-13	1	90	47
	2	91	44.9
	3	81	60.6
	4	69	46.7
	5	68	45
	6	70	46
	7	69	45
	7.5	66	43
	8	63	NA

Table IV-6. Summary of Groundwater Sampling Data (Non-Radioactive) at Horn Rapids Landfill. (sheet 2 of 2)

Well	Round	Trichloroethene (mg/L)	Nitrate as nitrogen (mg/L)
MW-14	1	40	48.5
	2	73	50.9
	3	60	61
	4	66	49.9
	5	82	47
	6	75	47
	7	75	47
	7.5	76	48
	8	67	NA
	9	58	51
MW-15	1	84	32.3
	2	80	32.2
	3	82	44.3
	4	59	31
	5	60	30
	6	62	33
	7	70	30
	7.5	66	36
	8	64	NA
	9	34	24
MW-20	6	--	NA
	7	--	31
	7.5	--	31
	8	--	28
	9	--	35

-- Data not used in statistical calculations
NA Not available

Table IV-7. Summary of Groundwater Sampling Data (Radioactive) at Horn Rapids Landfill. (sheet 1 of 2)

Well	Round	Alpha (pCi/L)	Beta (pCi/L)
MW-10	1	11.9	30.2
	2	<2.2	85.2
	3	<0	95.4
	4	6.6	88.9
	5	<2	63
	6	<3	62
	7	<1	18
	7.5	2.9	43
	8	<2	48
	9	NA	NA
MW-11	1	12.2	35.2
	2	<2.4	86.5
	3	6.6	74.7
	4	4.2	81
	5	<2	60
	6	<3	61
	7	<2	20
	7.5	<2	49
	8	9.6	60
	9	NA	NA
MW-12	1	7.6	34.6
	2	4.8	87.6
	3	NA	91
	4	6.5	77.6
	5	<2	61
	6	5.5	66
	7	NA	NA
	7.5	3.6	53
	8	<2	58
	9	NA	NA
MW-13	1	9.1	28.8
	2	4.1	71
	3	6.5	81.2
	4	5.8	85.8
	5	6.4	61
	6	<5	48
	7	NA	NA
	7.5	3.5	48
	8	2.9	51

Table IV-7. Summary of Groundwater Sampling Data (Radioactive) at Horn Rapids Landfill. (sheet 2 of 2)

Well	Round	Alpha (pCi/L)	Beta (pCi/L)
MW-14	1	6.3	25.1
	2	4.9	89.4
	3	9.6	90.8
	4	9.2	89
	5	<3	70
	6	8.4	61
	7	NA	NA
	7.5	<2	46
	8	5.3	56
	9	NA	NA
MW-15	1	9.3	23.2
	2	<1.6	51.4
	3	3.7	63.6
	4	5	57.6
	5	<2	46
	6	<5	50
	7	NA	NA
	7.5	2.2	41
	8	3.5	43
	9	NA	NA
MW-20	6	--	NA
	7	--	71
	7.5	--	53
	8	--	87
	9	--	NA

-- Data not used in statistical calculations
NA Not available

3.0 UTL

The tolerance interval is a statistical interval that contains at least a specified proportion, p, of the population with a specified degree of confidence, 100 (1-α) percent (Hahn and Meeker, 1991). Thus, the tolerance interval provides an estimate of the limits which define a proportion of the population, in contrast to the confidence interval which provides an estimate of a population parameter (*e.g.*, mean or variance). As the sample size, n, approaches infinity, the width of the tolerance interval approaches a finite range determined by the tolerance limits. In contrast, the width of a confidence interval approaches zero as n increases (Hines and Montgomery, 1980).

The UTL is an upper bound on the tolerance interval and, therefore, provides an estimate of the maximum expected value for the specified proportion of the population. This UTL is calculated using the equation:

$$UTL = X + Ks$$

where UTL is the upper tolerance limit, X is the sample mean, K is the tolerance factor, and s is the sample standard deviation. Values for K are found in appropriate tables in Hahn and Meeker, 1991, and are based on specified values for the population proportion (p), confidence (1-α), and the number of samples (n) used to calculate the mean and standard deviation.

For this risk assessment, the UTL was calculated for surface soils (1 to 2 feet) and subsurface soils (> 2 feet) to provide a representation of analyte concentrations that could be expected in samples that have been unaffected by activities associated with the 1100-EM-1 Operable Unit (background). Comparison of analyte concentrations in samples collected from within the operable unit with the appropriate analyte UTL determined which analytes are greater than background and must be considered contaminants.

The UTL's were calculated to contain 95-percent of the population (p) with a 95-percent degree of confidence (α=0.05). Tables IV-8 and IV-9 contain the sample mean (X), sample standard deviation (s), number of background samples analyzed (n), the number of background samples in which the analyte is detected (d), and the UTL for the target analyte list (TAL) and target compound list (TCL) analytes, respectively. Background sample data used to generate the statistical values are contained in appendix I of the 1100-EM-1 Phase I RI (DOE/RL-90-18). The samples used to calculate UTL's for surface soils are: AH217S, AH218S, AH222S, AH224S, AH225S, A0201S, A0101, A0301S. The samples used to calculate UTL's for subsurface soils are A0203S, A0204S, A0206S, A0208S, A0209S, A0210S, A0302, A0306, A0104, A0105, A0109S. For those analytes not detected in any sample, the highest sample quantitation limit (SQL) was used as the UTL. If an analyte was detected in at least one sample, the mean and standard deviation were calculated; one-half of the SQL is used as a surrogate sample value for those samples where the analyte was reported as nondetectable in this case. This is consistent with the DOE/RL-91-45.

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Table IV-8. TAL Parameter UTL's for Background Soils (mg/kg). (Sheet 1 of 2)

Parameter	Operable Unit Specific Background									
	0-2 ft deep					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
aluminum	6703	943	8	8	9,710	4,270	698	11	11	6,236
antimony			8	0	3.70*			11	0	3.1*
arsenic	1.51	0.78	8	8	3.99	1.0	0.67	11	10	2.92**
barium	73.5	14.6	8	8	120	90.6	51.5	11	11	236
beryllium	0.32	0.13	8	7	0.74**	0.11	0.06	11	2	0.27**
cadmium	0.24	0.15	8	2	0.70**			11	0	0.36*
calcium	3073	645.2	8	8	5,130	5,443	848	11	11	7,830
chromium	9.19	1.18	8	8	12.9	13.5	12.01	11	11	47.3
cobalt	10.0	2.42	8	8	17.7	12.8	1.44	11	11	16.8
copper	11.1	2.50	8	8	19.1	16.09	1.22	11	11	19.5
iron	19,225	3,728	8	8	31,110	22,445	2,480	11	11	29,400
lead	5.04	2.39	8	8	12.6	2.6	0.85	11	11	5.0
magnesium	3,984	797	8	8	6,524	3,873	286	11	11	4,680
manganese	323	72.0	8	8	552	290	23.1	11	11	355
mercury			8	0	0.10*			11	0	0.1*
nickel	8.92	3.16	8	7	19.0**	10.8	35.4	11	11	28.0
potassium	1,318	186	8	8	1,910	843	115	11	11	966
selenium			8	0	0.39*			11	0	0.41*
silver	0.85	0.50	8	6	2.44**			21	0	0.54*

Table IV-8. TAL Parameter UTL's for Background Soils (mg/kg). (Sheet 2 of 2)

Parameter	Operable Unit Specific Background									
	0-2 ft deep					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
sodium	103	43.5	8	3	242**	306	40.4	11	11	419
thallium			8	0	0.39*			11	0	0.41*
vanadium	44.4	12.4	8	8	83.9	70.4	15.6	11	11	115
zinc	38.9	7.30	8	8	62.2	41.1	3.33	11	11	50.4
cyanide			8	0	0.52*			11	0	0.51*

$\bar{X}$ = Mean.
s = standard deviation.
n = number of samples.
d = number of detects.
UTL = upper 95 percentile tolerance limit.
*Parameter was never detected in the respective background samples; therefore, the highest reported respective background SQL is substituted as a surrogate UTL.
**Some non-detects present, 1/2 SQL used as surrogate value for corresponding sample.
[1]Does not include saturated soils.

Table IV-9. TCL Parameter UTL's for Background Soils (μg/kg). (Sheet 1 of 7)

Parameter	Operable Unit Specific Background									
	>2 ft deep[1]					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
Volatiles										
chloromethane			9	0	11			11	0	11
bromomethane			9	0	11			11	0	11
vinyl chloride			9	0	11			11	0	11
chloroethane			9	0	5			11	0	11
methylene chloride			9	0	5			11	0	5
acetone			9	0	43			11	0	22
carbon disulfide			9	0	5			11	0	5
1,1-dichloroethene			9	0	5			11	0	5
1,1-dichloroethane			9	0	5			11	0	5
1,2-dichloroethene			9	0	5			11	0	5
chloroform			9	0	5			11	0	5
1,2-dichloroethane			9	0	11			11	0	5
2-butanone			9	0	5			11	0	11
1,1,1-trichloroethane			9	0	5			11	0	5
carbon tetrachloride			9	0	11			11	0	5
vinyl acetate			9	0	5			11	0	11
bromodichloromethane			9	0	5			11	0	5
1,2-dichloropropane			9	0	5			11	0	5
cis-1,3-dichloropropene			9	0	5			11	0	5
trichloroethene			9	0	5			11	0	5

Table IV-9. TCL Parameter UTL's for Background Soils (μg/kg). (Sheet 2 of 7)

Parameter	Operable Unit Specific Background									
	>2 ft deep[1]					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
dibromochloromethane			9	0	5			11	0	5
1,1,2-trichloroethane			9	0	5			11	0	5
benzene			9	0	5			11	0	5
trans-1,3-dichloropropene			9	0	5			11	0	5
bromoform			9	0	5			11	0	5
4-methyl-2-pentanone			9	0	11			11	0	11
2-hexanone			9	0	11			11	0	11
tetrachloroethane			9	0	5			11	0	5
1,1,2,2-tetrachloroethane			9	0	5			11	0	5
toluene			9	0	5			11	0	5
chlorobenzene			9	0	5			11	0	5
ethylbenzene			9	0	5			11	0	5
styrene			9	0	5			11	0	5
xylene(total)			9	0	5			11	0	5
Semivolatiles										
phenol			9	1	38,100			11	0	350
bis(2-chloroethyl)ether			9	0	690			11	0	350
2-chlorophenol			9	0	690			11	0	350
1,3-dichlorobenzene			9	0	690			11	0	350
1,4-dichlorobenzene			9	0	690			11	0	350
benzyl alcohol			9	0	690			11	0	350

Table IV-9. TCL Parameter UTL's for Background Soils (μg/kg). (Sheet 3 of 7)

Parameter	Operable Unit Specific Background									
	>2 ft deep[1]					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
1,2-dichlorobenzene			9	0	690			11	0	350
2-methylphenol			9	0	690			11	0	350
bis(2-chloroisopropyl)ether			9	0	690			11	0	350
4-methylphenol			9	0	690			11	0	350
N-nitroso-di-n-propylamine			9	0	690			11	0	350
hexachloroethane			9	0	690			11	0	350
nitrobenzene			9	0	690			11	0	350
isophorone			9	0	690			11	0	350
2-nitrophenol			9	0	690			11	0	350
2,4-dimethylphenol			9	0	690			11	0	350
benzoic acid			9	0	2,792			11	0	1,700
bis(2-chloroethoxy)methane			9	0	690			11	0	350
2,4-dichlorophenol			9	0	690			11	0	350
1,2,4-trichlorobenzene			9	0	690			11	0	350
naphthalene			9	0	690			11	0	350
4-chloroaniline			9	0	690			11	0	350
hexachlorobutadiene			9	0	690			11	0	350
4-chloro-3-methylphenol			9	0	690			11	0	350
2-methylnaphthalene			9	0	690			11	0	350
hexachlorocyclopentadiene			9	0	690			11	0	350
2,4,6-trichlorophenol			9	0	690			11	0	350

Table IV-9. TCL Parameter UTL's for Background Soils (μg/kg). (Sheet 4 of 7)

Parameter	Operable Unit Specific Background									
	>2 ft deep[1]					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
2,4,5-trichlorophenol			9	0	3,300			11	0	1,700
2-chloronaphthalene			9	0	690			11	0	350
2-nitroaniline			9	0	3,300			11	0	1,700
dimethylphthalate			9	0	690			11	0	350
acenaphthylene			9	0	690			11	0	350
2,6-dinitrotoluene			9	0	690			11	0	350
3-nitroaniline			9	0	3,300			11	0	1,700
acenaphthene			9	0	690			11	0	350
2,4-dinitrophenol			9	0	3,300			11	0	1,700
4-nitrophenol			9	0	3,300			11	0	1,700
dibenzofuran			9	0	690			11	0	350
2,4-dinitrotoluene			9	0	690			11	0	350
diethylphthalate			9	0	690			11	0	350
4-chlorophenyl-phenylether			9	0	690			11	0	350
fluorene			9	0	690			11	0	350
4-nitroaniline			9	0	3,300			11	0	1,700
4,6-dinitro-2-methylphenol			9	0	3,300			11	0	1,700
N-nitrosodiphenylamine (1)			9	0	690			11	0	350
4-bromophenyl-phenylether			9	0	690			11	0	350
hexachlorobenzene			9	0	690			11	0	350

Table IV-9. TCL Parameter UTL's for Background Soils (μg/kg). (Sheet 5 of 7)

Parameter	Operable Unit Specific Background									
	>2 ft deep[1]					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
pentachlorophenol			9	0	3,300			11	0	1,700
phenanthrene			9	0	690			11	0	350
anthracene			9	0	690			11	0	350
di-n-butylphthalate			9	0	690			11	0	350
fluoranthene			9	0	690			11	0	350
pyrene			9	0	690			11	0	350
butylbenzylphthalate			9	0	690			11	0	350
3,3'-dichlorobenzidine			9	0	690			11	0	710
benzo(a)anthracene			9	0	690			11	0	350
chrysene			9	0	690			11	0	350
bis(2)-ethylhexyl)phthalate			9	0	690			11	0	350
di-n-octylphthalate			9	0	690			11	0	350
benzo(b)fluoranthene			9	0	690			11	0	350
benzo(k)fluoranthene			9	0	690			11	0	350
benzo(a)pyrene			9	0	690			11	0	350
indeno(1,2,3-cd)pyrene			9	0	690			11	0	350
dibenz(a,h)anthracene			9	0	690			11	0	350
benzo(g,h,i)perylene			9	0	690			11	0	350
Pesticides										
alpha-BHC			9	0	17			11	0	17
beta-BHC			9	0	17			11	0	17

Table IV-9. TCL Parameter UTL's for Background Soils (μg/kg). (Sheet 6 of 7)

Parameter	Operable Unit Specific Background									
	>2 ft deep[1]					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
delta-BHC			9	1	14			11	0	17
gamma-BHC (indane)			9	0	17			11	0	17
heptachlor			9	0	17			11	0	17
aldrin			9	0	17			11	0	17
heptachlor epoxide			9	0	17			11	0	17
endosulfan I			9	0	17			11	0	17
dieldrin			9	0	33			11	0	34
4,4'-DDE			9	0	33			11	0	34
endrin			9	0	33			11	0	34
endosulfan II			9	0	33			11	0	34
4,4'-DDD			9	0	33			11	0	34
Aniline			9	0	33			11	0	34
endosulfan sulfate			9	0	33			11	0	34
4,4'-DDT			9	0	33			11	0	34
methoxychlor			9	0	170			11	0	170
endrin ketone			9	0	33			11	0	34
alpha-chlordane			9	0	170			11	0	170
gamma-chlordane			9	1	160			11	0	170
toxaphene			9	0	330			11	0	340
aroclor-1016			9	0	170			11	0	170
aroclor-1221			9	0	170			11	0	170

Table IV-9. TCL Parameter UTL's for Background Soils (μg/kg). (Sheet 7 of 7)

Parameter	Operable Unit Specific Background									
	>2 ft deep[1]					>2 ft deep[1]				
	$\bar{X}$	s	n	d	UTL	$\bar{X}$	s	n	d	UTL
aroclor-1232			9	0	170			11	0	170
aroclor-1242			9	0	170			11	0	170
aroclor-1248			9	0	170			11	0	170
aroclor-1254			9	0	330			11	0	340
aroclor-1260			9	0	330			11	0	340

X = Mean
s = standard deviation
n = number of samples
d = number of detects
UTL = upper 95 percentile tolerance limit
[1]Does not include saturated soils.
NA = Not analyzed for.

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Tables IV-10 and IV-11 provide a comparison between the UTL and the maximum concentration for contaminants detected in surface and subsurface soil samples, respectively, from the various subunits. These tables incorporate data that was collected during the Phase I and Phase II Operable Unit RI.

4.0 REFERENCES

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Table IV-10 Maximum Concentrations for Detected Compounds, Compared to UTL's for Surface Soils (0 to 2 Feet) from Phase I and II Data (Sheet 1 of 4)

Parameter	Surface Soil UTL	Max Value 1100-1	Max Value 1100-2	Max Value 1100-3	Max Value 1100-4	Max Value 1100-6	Max Value HRL	Max Value EP
INORGANIC COMPOUNDS (mg/kg)								
Aluminum	9708.79	7130	8300	**9770**	7320	8680	**15800**[b]	5810
Antimony	3.70	ND	ND	ND	ND	ND	**15.6**[b]	ND
Arsenic	3.99	3.2	2.3	3.4	2.6	2.7	3.6	2.6
Barium	120.10	80.8	91.5	106	80.9	99.2	**1320**	72.3
Beryllium	0.74	ND	0.51	0.44	0.25	0.4	**1.3**	0.26
Cadmium	0.70	ND	ND	ND	ND	ND	**2**	ND
Calcium	5129.25	**8690**	**6480**	**6810**	**9710**	4180	**86700**	3030
Chromium	12.94	**10.6**	**16.8**	14	11.3	10.9	**17.1**	7.7
Cobalt	17.74	13.2	13.9	14.1	11.4	12.2	**15.9**[b]	10.3
Copper	19.11	**37.9**	**24.4**	**22.8**	14.4	16.2	**58.6**	15.2
Iron	31110.42	21100	26600	25500	23300	23500	29800	18900
Lead	12.64	**266**	**94.6**	**26.4**	5	**22.1**	**482**	54.2
Magnesium	6523.59	6430	5210	6170	4650	4840	**25000**	4250
Manganese	552.27	464	365	436	330	383	423	354
Mercury	0.10	**0.22**	ND	ND	ND	ND	**1.3**	ND
Nickel	19.00	**20.9**	15	14.9	9.8	12.9	**174**	12.5
Potassium	1909.71	850	**2060**	1730	1210	**1950**	**2230**	1140
Selenium	0.39	ND	ND	ND	ND	ND	**0.97**[b]	ND
Silver	2.44	ND	ND	ND	ND	ND	**4.5**	ND
Sodium	241.52	**479**	**374**	**495**	**413**	143	**5140**[b]	216
Thallium	0.39	ND	**0.48**	**.40**	ND	ND	**.42**	ND
Vanadium	83.93	32.5	73.4	70.2	61.8	60.8	**87.3**	44.4
Zinc	62.20	**92**	56.6	59	45.9	**111**	**408**	**67.5**
Cyanide	0.52	ND	ND	ND	ND	ND	**0.56**	ND

Table IV-10 Maximum Concentrations for Detected Compounds, Compared to UTL's for Surface Soils (0 to 2 Feet) from Phase I and II Data (Sheet 2 of 4)

Parameter	Surface Soil UTL	Max Value 1100-1	Max Value 1100-2	Max Value 1100-3	Max Value 1100-4	Max Value 1100-6	Max Value HRL	Max Value EP
VOLATILE ORGANIC COMPOUNDS (μg/kg)								
1,1,1-trichloroethane	5	ND	2	ND	ND	35	ND	ND
1,1-dichloroethene	5	ND	5	ND	ND	ND	ND	ND
2-butanone	11	ND	10[a]	17[a]	ND	69[a]	35[a,b]	ND
2-hexanone	11	ND	ND	ND	ND	53	ND	ND
Acetone	43	ND	19[a]	92[a]	6[a]	190[a]	ND	ND
Chlorobenzene	5	ND	6	ND	ND	ND	ND	ND
Methylene chloride	5	ND	42[a]	120[a]	ND	20[a]	43[a]	4[a]
Tetrachloroethene	5	ND	35	ND	ND	ND	5	ND
Toluene	5	ND	11[a]	6[a]	ND	8[a]	16[a]	ND
Trichloroethene	5	ND	6	ND	ND	ND	ND	ND
Xylene	5	ND	6	ND	ND	ND	ND	ND
SEMI-VOLATILE ORGANIC COMPOUNDS (μg/kg)								
1,2,4-trichlorobenzene	690	ND	120	ND	ND	83	ND	ND
1,3-dichlorobenzene	690	ND	120	ND	ND	ND	ND	ND
1,4-dichlorobenzene	690	ND	120	ND	ND	86	ND	ND
2-chlorophenol	690	ND	230	ND	ND	170	ND	ND
2-methylnaphthalene	690	ND	ND	ND	ND	ND	7100	ND
2,6-dinitrotoluene	690	ND	ND	ND	ND	ND	210[b]	ND
4-chloro-3-methylphenol	690	ND	190	ND	ND	95	ND	ND
4-nitrophenol	3300	ND	ND	ND	ND	ND	3800	ND
Acenaphthene	690	ND	110	ND	ND	77	ND	ND
Anthracene	690	ND	ND	ND	ND	ND	70[b]	ND

Table IV-10 Maximum Concentrations for Detected Compounds, Compared to UTL's for Surface Soils (0 to 2 Feet) from Phase I and II Data (Sheet 3 of 4)

Parameter	Surface Soil UTL	Max Value 1100-1	Max Value 1100-2	Max Value 1100-3	Max Value 1100-4	Max Value 1100-6	Max Value HRL	Max Value EP
SEMI-VOLATILE ORGANIC COMPOUNDS (µg/kg) (continued)								
Benzoic acid	2790	ND	ND	ND	ND	ND	220[a]	ND
Benzo(a)anthracene	690	ND	ND	120	ND	ND	180	ND
Benzo(a)pyrene	690	ND	110	150	ND	ND	200	ND
Benzo(b)fluoranthene	690	150	79	180	ND	ND	250	ND
Benzo(g,h,i)perylene	690	ND	330	230	ND	ND	150	ND
Benzo(k)fluoranthene	690	ND	120	160	ND	ND	190	ND
Bis(2-ethylhexyl)phthalate	690	390[a]	290[a]	940[a]	ND	**2.5E+07**	ND	ND
Butylbenzylphthalate	690	ND	ND	ND	ND	ND	99[a]	ND
Chrysene	690	100	ND	170	ND	ND	240	ND
Dibenzofuran	690	ND	ND	ND	ND	ND	130	ND
Dibenz(a,h)anthracene	690	ND	300	110	ND	ND	ND	ND
Di-n-butyl phthalate	690	ND	ND	ND	ND	ND	65[b]	ND
Di-n-octyl phthalate	690	ND	67[a]	ND	ND	**46000**	ND	ND
Fluoranthene	690	110	ND	220	ND	ND	180	ND
Indeno(1,2,3-cd)pyrene	690	ND	300	230	ND	ND	170	ND
Naphthalene	690	ND	ND	ND	ND	ND	1100	ND
N-nitroso-di-n-propylamine	690	ND	110	ND	ND	78	ND	ND
Pentachlorophenol	3300	ND	ND	99	ND	ND	980[b]	ND
Phenanthrene	690	ND	ND	130	ND	ND	380[b]	ND
Phenol	38100	ND	94	ND	ND	ND	ND	ND
Pyrene	690	97	120	250	ND	94	220	ND

Table IV-10 Maximum Concentrations for Detected Compounds, Compared to UTL's for Surface Soils (0 to 2 Feet) from Phase I and II Data (Sheet 4 of 4)

Parameter	Surface Soil UTL	Max Value 1100-1	Max Value 1100-2	Max Value 1100-3	Max Value 1100-4	Max Value 1100-6	Max Value HRL	Max Value EP
PESTICIDES/PCB's (μg/kg)								
4,4"-DDE	33	6.8	**42**	ND	ND	**170**	**1200**	ND
4,4'-DDD	33	ND	3.6	ND	ND	ND	**260**	ND
4,4'-DDT	33	ND	**57**	ND	ND	ND	**520**[b]	ND
Aldrin	17	ND	9.6[a]	1.1[a]	ND	9.6[a]	11[b]	ND
Alpha-chlordane	170	6.5	ND	ND	ND	**1000**	**770**[b]	**1100**[b]
Total PCB's	1510	290	300	150	ND	ND	**100550**	**42000**
Aroclor 1248	170	ND	ND	ND	ND	ND	**100000**[b]	ND
Aroclor 1260	330	290	300	150	ND	ND	260	**42000**[b]
Aroclor-1254	330	ND	ND	ND	ND	ND	290	ND
Beta-BHC	17	ND	ND	ND	ND	ND	**94**[b]	ND
Delta-BHC	14	ND	ND	ND	ND	13	ND	ND
Dieldrin	33	ND	1.3	ND	ND	2.3	**1200**[b]	ND
Endosulfan II	33	ND	ND	ND	ND	ND	**110**[b]	160
Endosulfan sulfate	33	ND	ND	ND	ND	ND	19	ND
Endrin	33	ND	ND	ND	ND	ND	**280**[b]	**39**
Endrin ketone	33	ND	2	ND	ND	1.3	**140**[b]	ND
Gamma-BHC(Lindane)	17	ND	ND	ND	ND	0.77	1.9	ND
Gamma-chlordane	158	6.2	ND	ND	ND	**860**	82	**1700**[b]
Heptachlor	17	ND	1.2	ND	ND	**65**	ND	29
Methoxychlor	170	ND	ND	ND	ND	ND	140[b]	ND

ND - Contaminant not detected
UTL - Upper tolerance limit
[a]Concentration less than detection limit after blank-adjustment
[b]Phase II data

Table IV-11 Maximum Concentrations for Detected Compounds, Compared to UTL's for Subsurface Soils (> 2 Feet) from Phase I and II Data (Sheet 1 of 3)

Parameter	Sub-surface Soil UTL	Max Value 1100-1	Max Value 1100-2	Max Value 1100-3	Max Value 1100-4	Max Value 1100-6	Max Value HRL	Max Value EP
INORGANICS (mg/kg)								
Aluminum	6236	5860	**7470**	**7400**	**6680**	NS	**17800**[b]	NS
Antimony	3.1	ND	3	ND	ND	NS	**15.6**[b]	NS
Arsenic	2.92	**3.2**	1.8	1.8	**5.8**	NS	**6.6**	NS
Barium	236	85.9	96.6	85.9	98.7	NS	**511**[b]	NS
Beryllium	0.27	ND	ND	ND	**0.93**	NS	**1.1**[b]	NS
Cadmium	0.36	ND	ND	ND	ND	NS	**2.4**[b]	NS
Calcium	7830	6240	**13000**	**9080**	**10600**	NS	**44800**[b]	NS
Chromium	47.3	14.6	10.3	13.6	13.2	NS	**1250**	NS
Cobalt	16.8	11.8	15.3	**17.8**	16.5	NS	**42.5**	NS
Copper	19.5	**25**	**23.6**	**31.7**	**19.8**	NS	**1280**[b]	NS
Cyanide	0.51	ND	ND	ND	ND	NS	**0.56**	NS
Iron	29400	25800	27100	**31700**	26700	NS	**35200**	NS
Lead	5	**191**	**45.9**	4.7	**5.7**	NS	**854**[b]	NS
Magnesium	4680	3860	4620	**5290**	4630	NS	**7640**[b]	NS
Manganese	355	249	**366**	381	329	NS	**501**[b]	NS
Mercury	0.1	**0.39**	ND	ND	ND	NS	**0.44**	NS
Nickel	26	9.5	13.8	11.3	10.7	NS	**557**	NS
Potassium	966	**4880**	**1200**	878	**1030**	NS	**3820**[b]	NS
Selenium	0.41	ND	ND	ND	ND	NS	0.36	NS
Silver	0.54	ND	ND	ND	2	NS	7.7	NS
Sodium	419	**808**	**458**	**999**	**726**	NS	**2360**[b]	NS
Thallium	0.41	ND	ND	ND	**0.48**	NS	**0.46**	NS
Vanadium	115	**118**	80.2	103	82.4	NS	101	NS
Zinc	50.4	**100**	**54.9**	**60**	**63.8**	NS	**3160**[b]	NS

Table IV-11 Maximum Concentrations for Detected Compounds, Compared to UTL's for Subsurface Soils (> 2 Feet) from Phase I and II Data (Sheet 2 of 3)

Parameter	Sub-surface Soil UTL	Max Value 1100-1	Max Value 1100-2	Max Value 1100-3	Max Value 1100-4	Max Value 1100-6	Max Value HRL	Max Value EP
VOLATILE ORGANIC COMPOUNDS (µg/kg)								
2-butanone	11	9[a]	8[a]	**11**[a]	ND	NS	**23**[a]	NS
Acetone	22	**26**[a]	**28**[a]	**29**[a]	9[a]	NS	**200**	NS
Benzene	5	ND	ND	ND	ND	NS	0.3[b]	NS
Ethylbenzene	5	ND	2	ND	ND	NS	ND	NS
Methylene chloride	5	ND	**61**[a]	**16**[a]	ND	NS	**5**[a]	NS
Tetrachloroethene	5	ND	**16**[b]	ND	ND	NS	4[b]	NS
Toluene	5	ND	3[a]	ND	ND	NS	ND	NS
SEMI-VOLATILE ORGANIC COMPOUNDS (µg/kg)								
1,2,4-trichlorobenzene	350	ND	ND	ND	ND	NS	230[b]	NS
1,4-dichlorobenzene	350	ND	ND	ND	ND	NS	170	NS
2-chlorophenol	350	ND	ND	ND	ND	NS	240[b]	NS
2,4-dinitrotoluene	350	ND	ND	ND	ND	NS	92	NS
4-chloro-3-methylphenol	350	ND	ND	ND	ND	NS	290	NS
4-nitrophenol	1700	ND	ND	ND	ND	NS	310	NS
Acenaphthene	350	ND	ND	ND	ND	NS	320[b]	NS
Benzoic Acid	1700	ND	ND	ND	ND	NS	160[a,b]	NS
Benzo(b)fluoranthene	350	74	ND	ND	ND	NS	ND	NS
Bis(2-ethylhexyl) phthalate	350	ND	**3600**[a]	**950**[a]	ND	NS	**1000**[a]	NS
Di-n-butylphthalate	350	ND	37	ND	ND	NS	ND	NS
Di-n-octylphthalate	350	ND	ND	ND	ND	NS	270[a,b]	NS
Fluoranthene	350	110	ND	ND	ND	NS	ND	NS
N-nitro-di-n-propylamine	350	ND	ND	ND	ND	NS	170	NS
Pentachlorophenol	1700	ND	ND	ND	ND	NS	260	NS
Phenol	350	ND	ND	ND	ND	NS	330[b]	NS
Pyrene	350	84	290	ND	ND	NS	270[b]	NS

Table IV-11 Maximum Concentrations for Detected Compounds, Compared to UTL's for Subsurface Soils (> 2 Feet) from Phase I and II Data (Sheet 3 of 3)

Parameter	Sub-surface Soil UTL	Max Value 1100-1	Max Value 1100-2	Max Value 1100-3	Max Value 1100-4	Max Value 1100-6	Max Value HRL	Max Value EP
PESTICIDES (μg/kg)								
Aldrin	17	ND	16[a]	ND	ND	NS	5.5[a,b]	NS
Alpha-chlordane	170	1.3	ND	ND	ND	NS	13[b]	NS
4,4'-DDE	34	ND	**39**	ND	ND	NS	14	NS
4,4'-DDT	34	ND	**121**	ND	ND	NS	ND	NS
Beta-BHC	17	ND	ND	ND	ND	NS	1.2[b]	NS
Dieldrin	34	ND	ND	ND	ND	NS	**90**[b]	NS
Endrin	34	ND	ND	ND	ND	NS	**120**[b]	NS
Endrin ketone	34	ND	22	ND	ND	NS	ND	NS
Heptachlor	17	ND	ND	0.58	ND	NS	ND	NS
Total PCB's	1530	ND	160	ND	ND	NS	**2640**	NS
Aroclor 1248	170	ND	ND	ND	ND	NS	**640**	NS
Aroclor 1254	340	ND	ND	ND	ND	NS	**2000**[b]	NS
Aroclor 1260	340	ND	160	ND	ND	NS	ND	NS

Notes:
ND: Contaminant not detected
UTL: Upper tolerance limit
NS: No subsurface samples collected for analysis
[a]Concentration less than detection limit after blank - adjustment
[b]Phase II data

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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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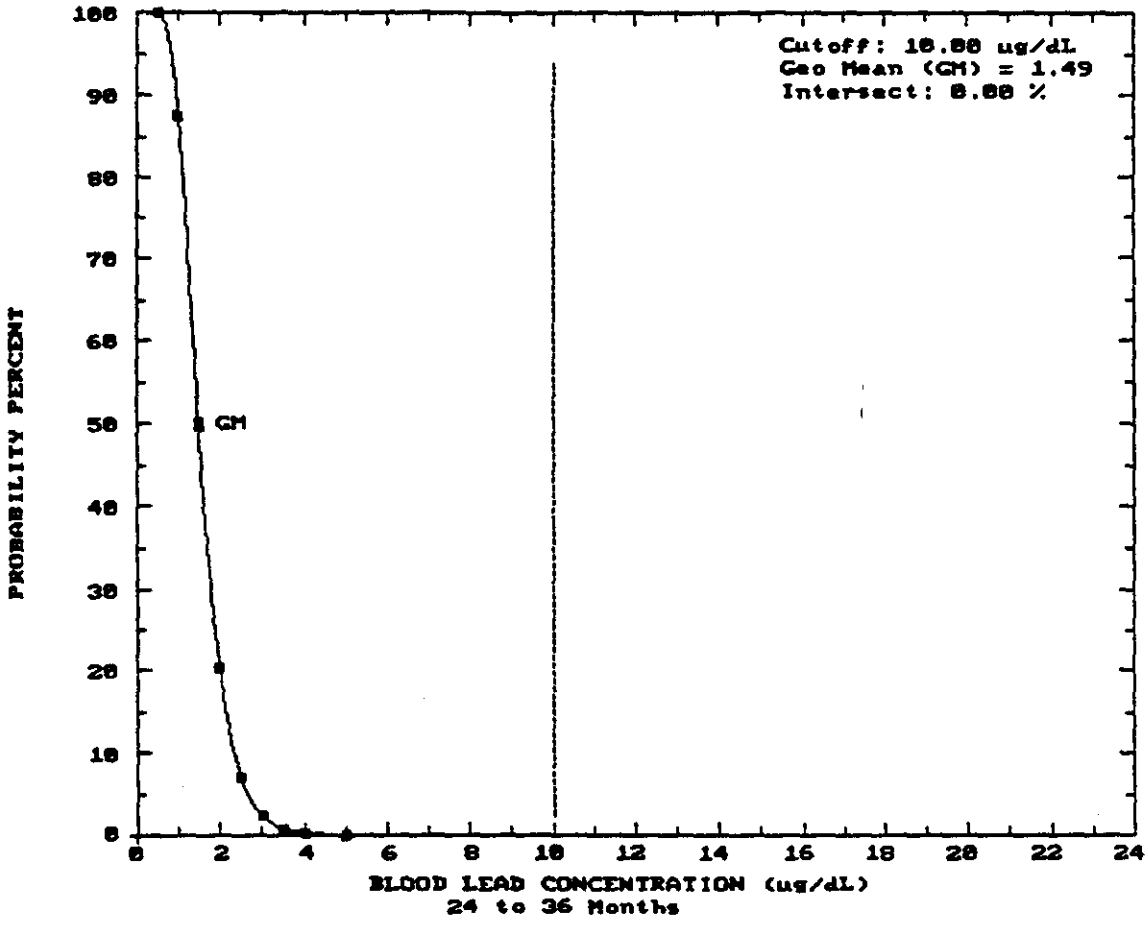
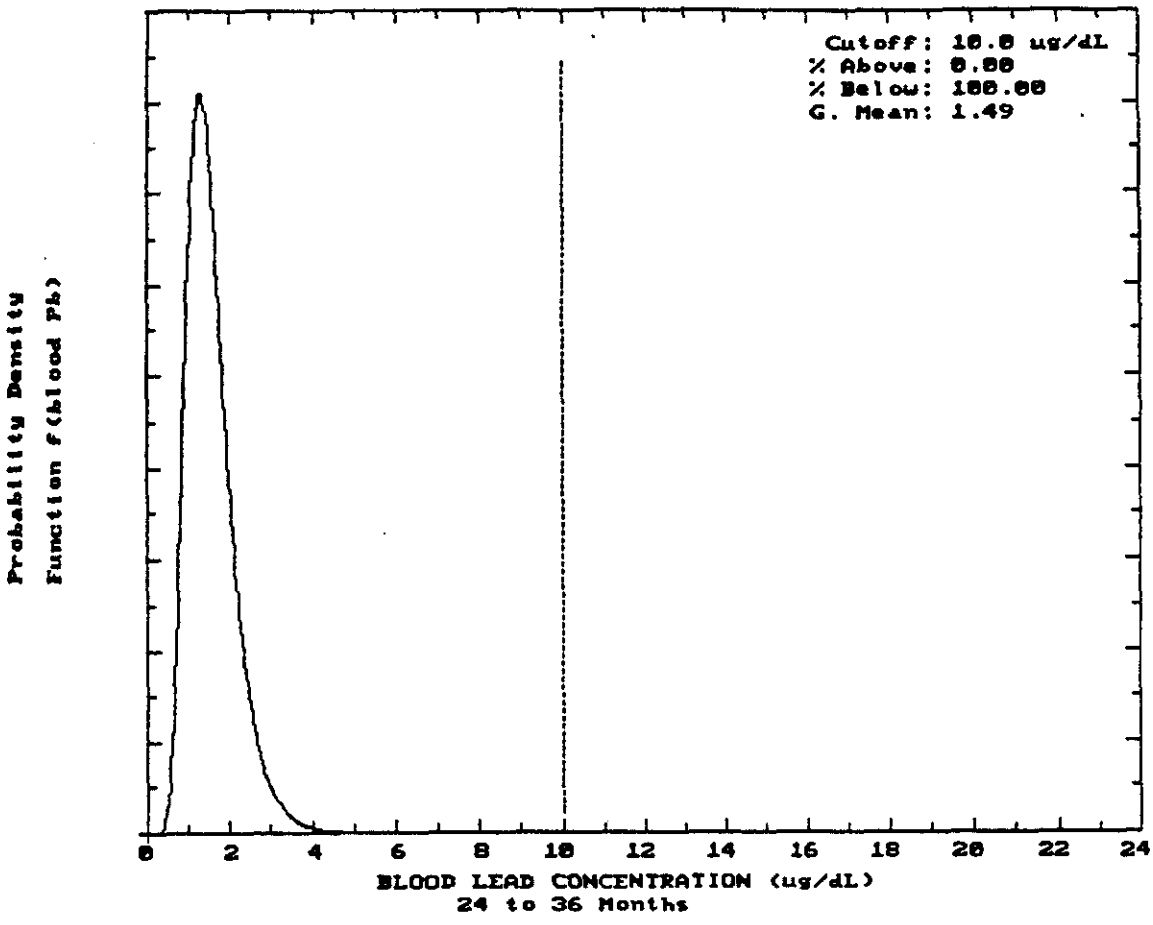


1100-3 UBK Results for Default Parameters Assuming a Soil Lead Concentration of 26.4 (mg/kg)



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

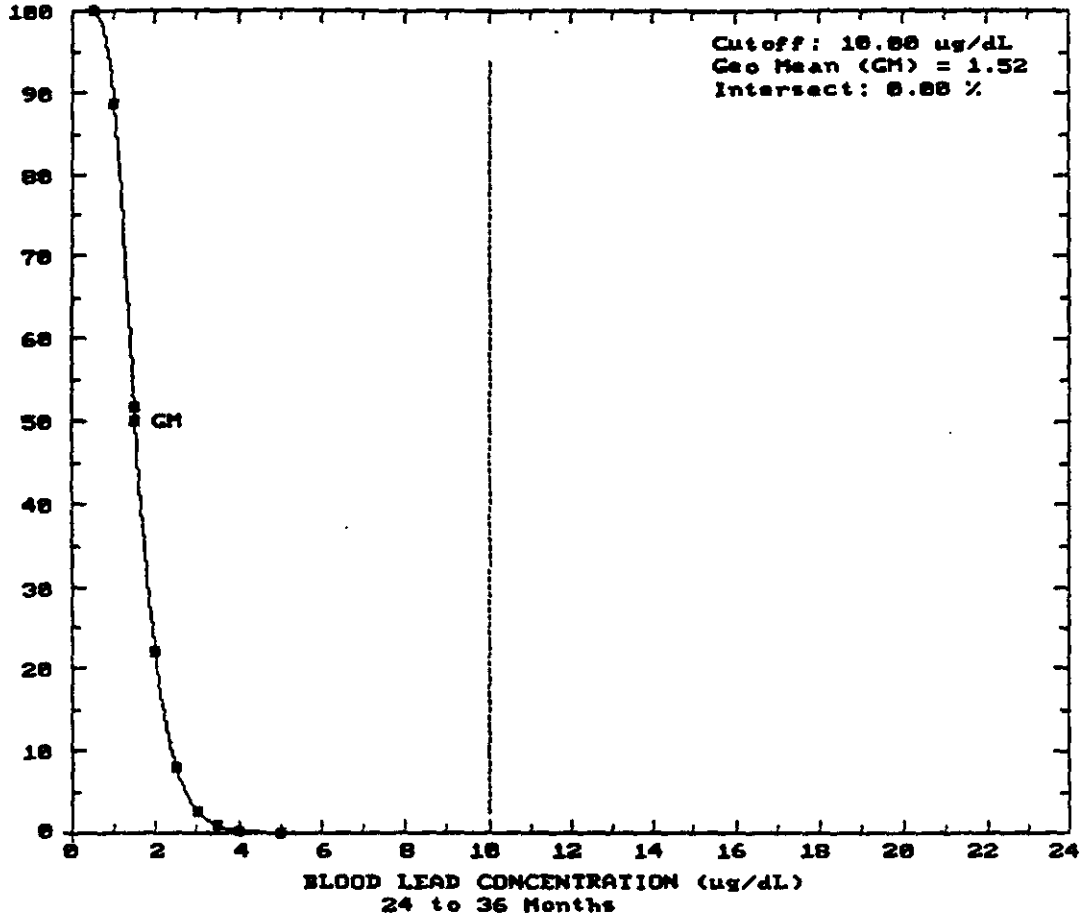
MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 7.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

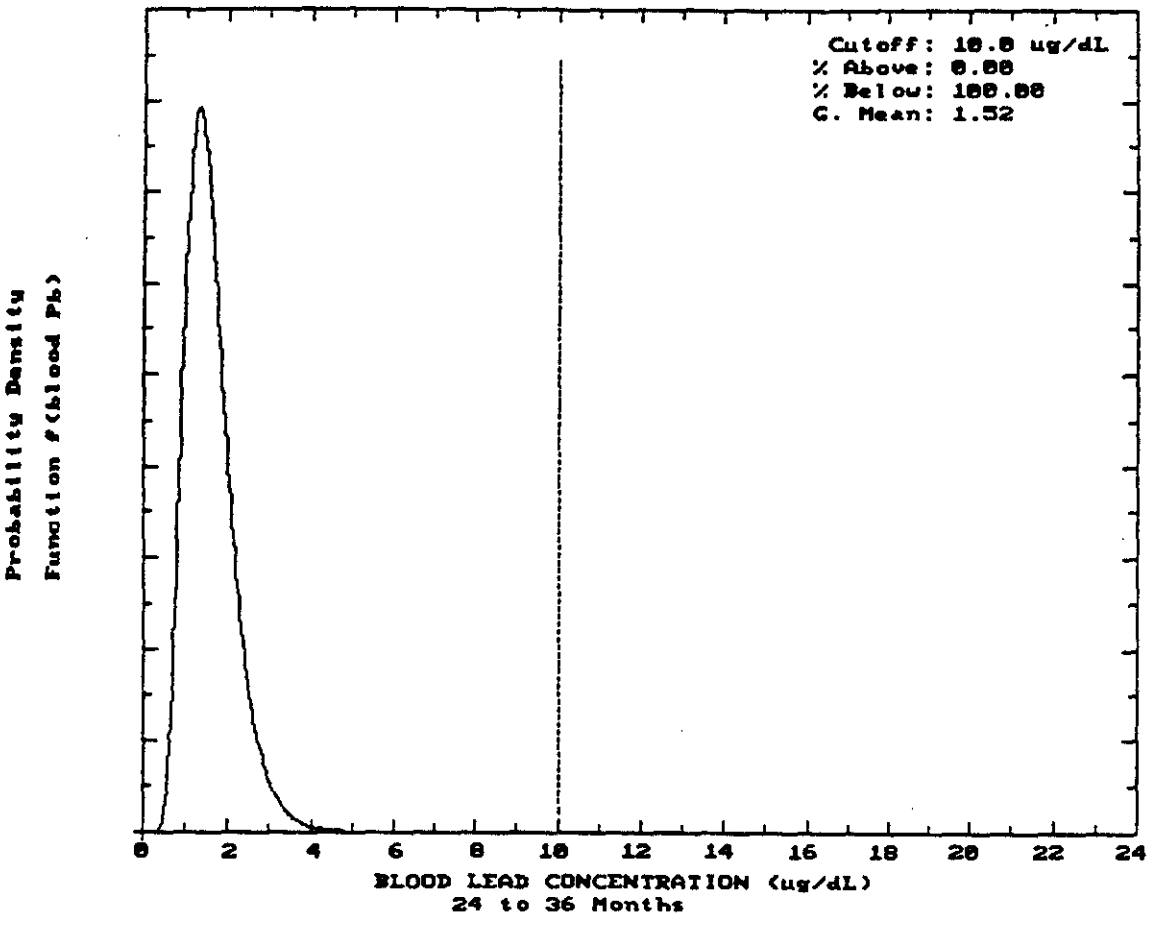
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	1.81	4.19	0.81
1-2:	1.48	4.84	0.81
2-3:	1.52	5.55	0.81
3-4:	1.55	5.29	0.81
4-5:	1.58	5.22	0.81
5-6:	1.60	5.53	0.81
6-7:	1.66	5.92	0.81

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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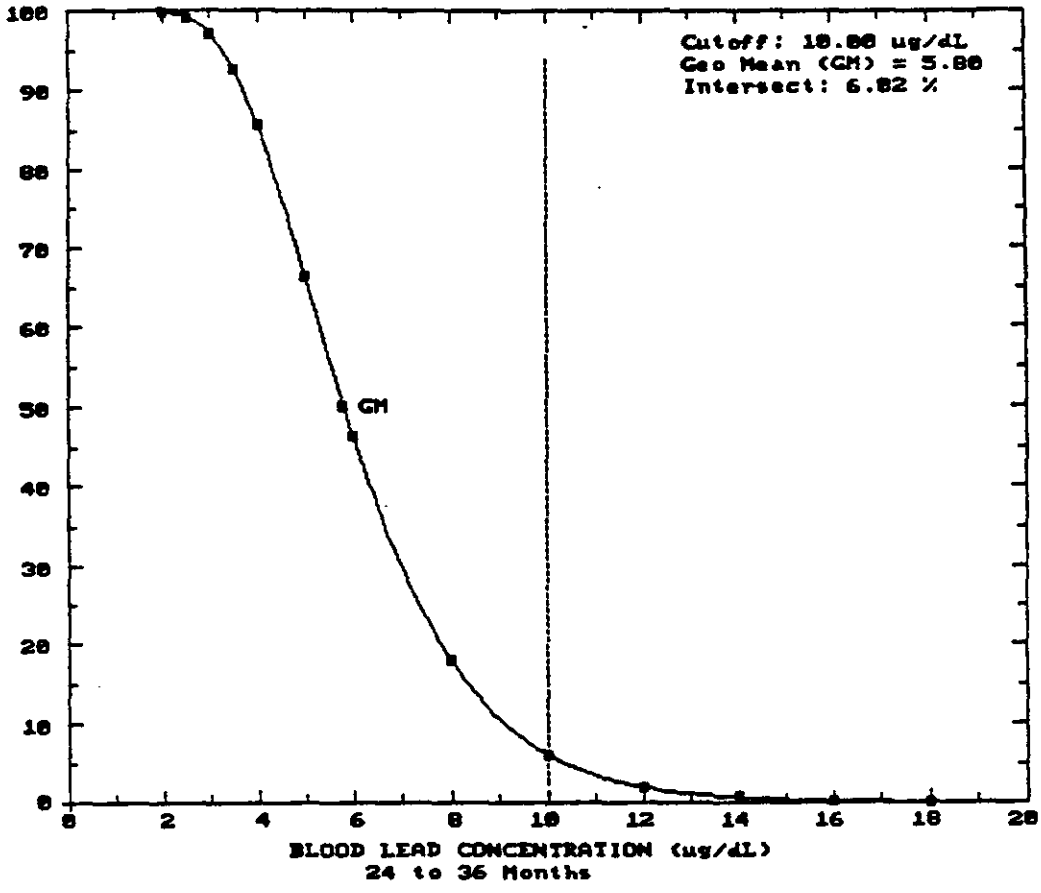
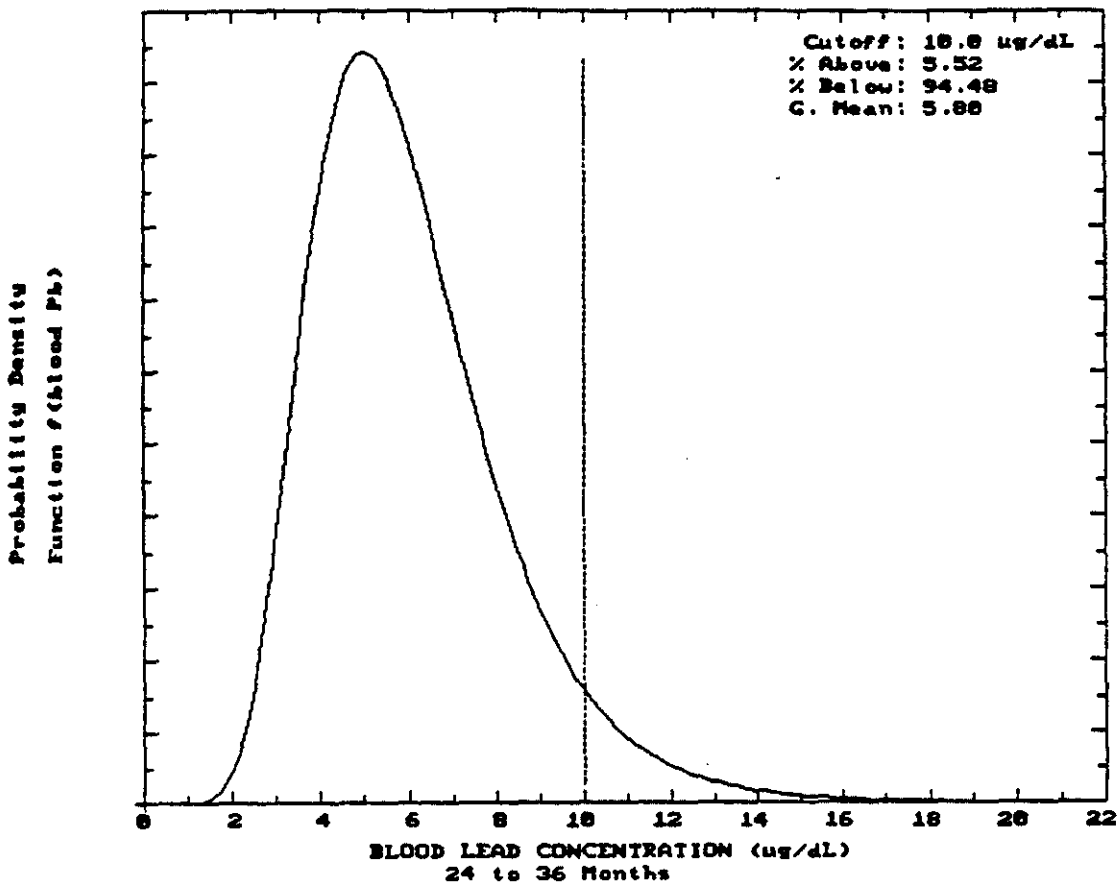


HORN RAPIDS LANDFILL: UBK Results for Default Parameters
Assuming a Soil Lead Concentration of 854 (mg/kg)



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

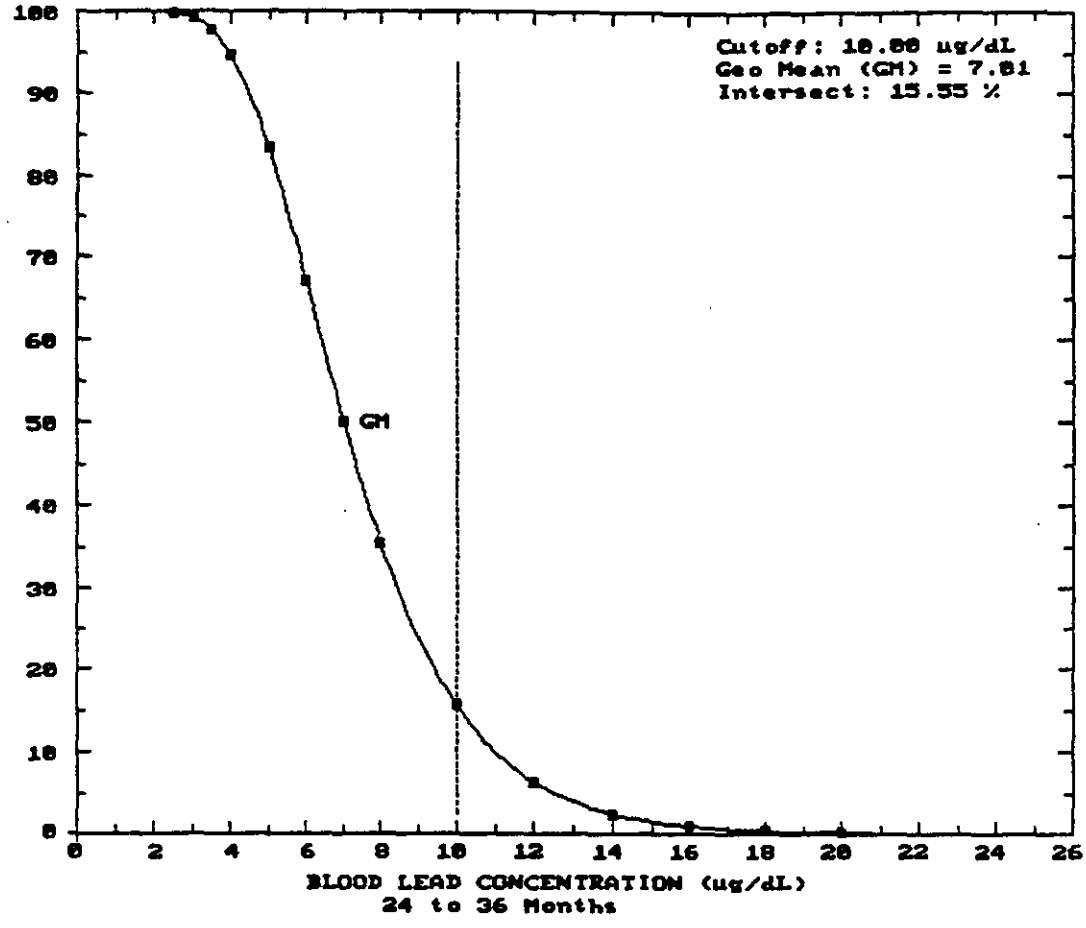
MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 7.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

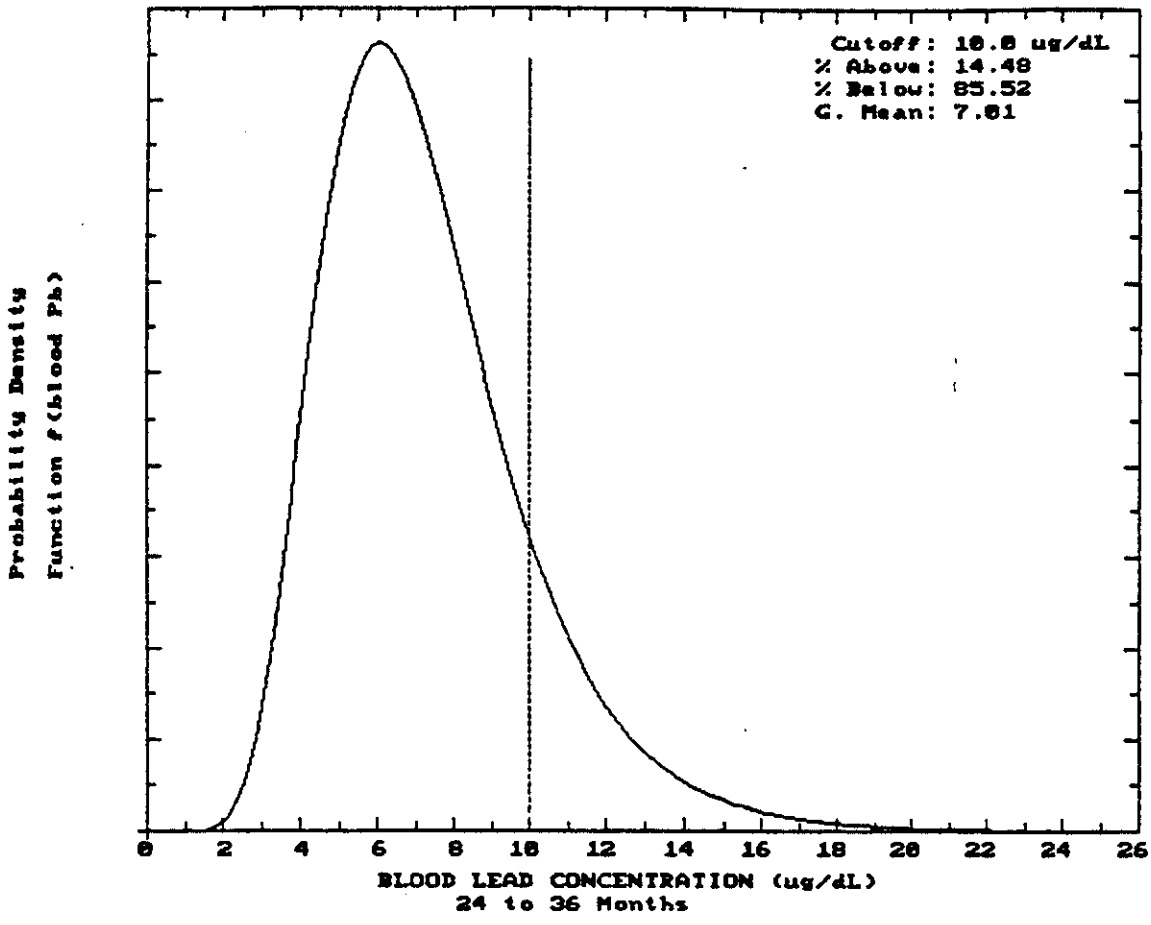
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	6.13	19.19	15.80
1-2:	5.90	19.83	15.80
2-3:	7.01	27.66	15.80
3-4:	6.66	20.28	15.80
4-5:	6.25	20.22	15.80
5-6:	6.14	20.53	15.80
6-7:	6.09	20.91	15.80

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 Upt (ug/da
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 baseline environmental risk 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 (COPC)], 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. Specific scientific field investigations were not conducted to gather ecological data for this baseline ecological risk assessment. 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, selection of endpoints, and conceptual model. Previously conducted studies of the Hanford site ecology and data collected during the Phase I and II RI's 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 or freshwater chronic criteria. 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.

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:				
Long-billed curlews	*Numenius americanus*	F	M	2,3
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
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

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 swainsoni*	F	C	1,2,3
Golden eagles	*Aquila chrysaetos*	O	C	1,2,3
Peregrine falcon	*Falco peregrinus*	I/U	E	1,2,3
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

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 Concern List*, Nongame Program, Wildlife Management Division, Washinton Department of Wildlife, 600 Capital Way, Olympia 98501-1091.

2.1.1 Terrestrial Flora

The dominant plant species at the 1100 Area 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 Area. 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. 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-91-45). Table L-2 includes the COPC from the subunits of the 1100-EM-1 Operable Unit.

Table L-2. Values used in Uptake Calculations

Contaminant	Maximum Concentration, mg/kg	Plant Uptake Factor	Small Mammal Uptake Factor
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, 1985, mg/g tissue DW (mg/g soil DW)-1
[c] Values from Clement Assoc., 1988, d/kg

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 Discolored Soil Site (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 91-18) showed that there was no evidence of adverse impacts from the COPC to the flora and fauna inhabiting any of the subunits, except for Discolored Soil Site. Except for a clump of grass, there is no vegetation growing in the depression of the Discolored Soil Site. The only evidence of ecological damage at the operable unit is this apparent lack of vegetative growth at this subunit. Since the observed adverse effects to vegetation were limited to Discolored Soil Site, specific phytotoxic effects of contaminants are not addressed in this assessment. No terrestrial toxicity bioassays, such as root elongation or seed germination, were conducted. This was, in part, due to the limited scope of this assessment and the limited size and isolated nature of contamination at this site did not warrant the effort. It is unlikely that further exposure of vegetation through migration is possible. Plants were not chosen as an endpoint but were used within the model as a receptor of contaminants which served as the media to transport the contaminant to the next trophic level.

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). Endpoint is an expected or anticipated effect of a contaminant on an ecological receptor. Receptors chosen as endpoints were based on the concern for the species being candidates for considered or monitored for protection. For this

risk assessment, adverse effects on the Swainson's hawk and long-billed curlew are used as measurement endpoints. 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.

3.0 ANALYSIS

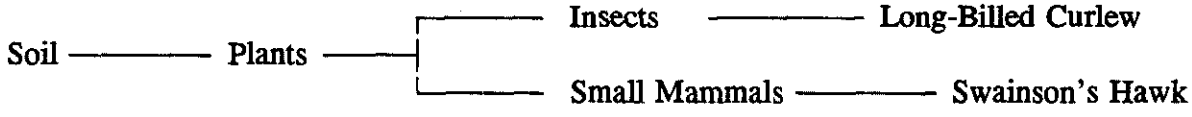
The following analysis involved performing an exposure and toxicity assessment. In paragraph 3.1, the exposure to the COPC for the long-billed curlew and Swainson's hawk is addressed. Paragraph 3.2 reports toxicological parameters (*e.g.*, NOAEL) for the COPC, using parameters taken from the most appropriate 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 Swainson's 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. Additionally, an assumption is that plants would be viable in soil at those contaminant concentrations. 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 Swainson's 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 dw
C_m = Contaminant concentration in small mammals, mg/kg dw

Plant and small mammal uptake factors were not readily available for thallium, beta-hexachlorocyclohexane (β-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 β-HCH. Since PCB has a higher bioconcentration factor for fish than BEHP and β-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 COPC, 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-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	2.6	0.043	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 IR_m was estimated from a mouse study to be 0.0039 kg/d (Clement 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 COPC at Discolored Soil Site cover a relatively small area, the FI for these contaminants was estimated to be the area of Discolored Soil Site 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^2) (Fitzner, 1980). Since the area of Discolored Soil Site is approximately 0.16 ha (1,600 m^2) 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 =

$$\frac{(2.6 \text{ mg/kg})(0.020 \text{ kg/d})(1)(150 \text{ d/yr})(*\text{yr})}{(0.5 \text{ kg})(*\text{d X } 365)} = 0.043 \text{ mg/kg/d}$$

*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 β-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

*Values from IRIS (EPA, 1992a)
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, β-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 Swainson's hawk and long-billed curlew consumed 100 percent diet from the HRL and 100 percent of that diet was contaminated . 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 is that impacts to the ecology of the site would not be distinguishable from background. Even though there are significant uncertainties in this assessment, there has been little evidence of ecological damage at the site. 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 COPC 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. 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 ARAR's, are to be considered. These materials are to be used on an "as appropriate" basis, however, they do not carry the same weight as ARAR's 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, which were

first identified for each operable subunit through risk assessment procedures (appendix K), and then further evaluated and refined by site risk managers (section 7). There are no contaminants of concern which pose unacceptable risks to other ecological receptors (appendix L). The contaminants of concern are:

Operable Subunit	Contaminant
UN-1100-6 (Discolored Soil Site)	BEHP
Ephemeral Pool	PCB's
HRL	PCB's
Groundwater	TCE Nitrate (only in conjunction with TCE treatment)

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 5 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. MCLG's 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, 40 CFR 264 Subpart S, OSWER 9355.4-01, RCW 70.105D and WAC 173-340 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.

The proposed RCRA corrective action rule, 40 CFR 264 Subpart S, proposes similar cleanup levels to the NCP but is specific to RCRA sites. These rules are "to be considered."

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 residential action level is one part per million. The actual level chosen is dependent on the site specific exposure assumptions. This directive is guidance and is "to be considered."

RCW Chapter 70.105D provides Ecology with the authority to investigate and conduct remedial actions upon releases of hazardous substances under MTCA. 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. As with the NCP, cleanup standards are risk based. Ecology's goal is to achieve a concentration for which the upper bound cancer risk is 10^{-5} to 10^{-6} which is more stringent than the NCP. Three basic methods are provided for the establishment of cleanup levels under WAC 173-340. 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--If it can be demonstrated that less conservative cleanup levels comply with state and Federal law, that all practicable methods of treatment will be utilized, and that institutional controls will be implemented, Method C cleanup levels may be used for specific site uses. 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(13) Ecology may use a Record of Decision proposed under CERCLA to select a cleanup action at Federal facilities provided that: (1) the cleanup action protects human health and the environment, complies with state cleanup standards, complies with state and Federal laws, and provides for compliance monitoring [WAC 173-340-360(2)]; (2) the cleanup action uses permanent solutions to the maximum extent practicable, provides for a reasonable restoration timeframe, and considers public comment on the proposed plan [WAC 173-340-360(3)]; and (3) the state has concurred with the cleanup action.

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. Ecology recognizes that for actions involving containment, the cleanup levels selected for the site will not be met at the points of compliance [WAC 173-340-740(6)(d)]. In these cases, the cleanup action may be determined to comply with cleanup standards provided that a compliance monitoring program is designed to ensure the long-term integrity of the containment system, and that the other requirements for containment technologies in WAC 173-340-360(8) are met.

Consensus on long-term land use at the 1100-EM-1 Operable Unit has not been reached. While DOE considers the site industrial (section 7 and appendix J), others such as the Hanford Future Site Users Working Group and Ecology, perceive long-term use within the 1100 Area as a whole as being unrestricted. Although residential use of the land is not anticipated, its close proximity to residential areas and the Richland well field are a concern because of potential contaminant migration. These concerns are based on:

I) The 1100 Area NPL site is bounded at its extreme southeast edge by residential properties within the city of Richland.

II) Agricultural land use is currently being exercised within one-eighth mile of the 1100 Area. Potato crops grown for human consumption are irrigated using water from the Columbia River.

III) The Richland well field is directly down gradient from subunits within the 1100-EM-1 Operable Unit. The well field is used to supplement the Richland water supply system and the concern is with possible migration of contaminants to the groundwater at the well field. It should be noted that no groundwater contamination has been identified upgradient from the well field.

DOE is aware of these concerns and is proposing a land use strategy for 1100-EM-1 Operable Unit which will lead to cost effective remedial alternatives that are protective of human health and the environment (section 7 and appendix J). In summary this strategy is to remediate sites at which contaminants would otherwise exist indefinitely where practicable, and to apply institutional controls at sites associated with low risk where it can be shown that the contaminant would degrade or attenuate within a reasonable timeframe or, at sites where contaminants would remain in place above unrestricted use cleanup goals, when it can be shown that meeting the more stringent cleanup goal is not practicable.

Using this strategy, soil cleanup standards were evaluated for the contaminants of concern at the Discolored Soil Site, the Ephemeral Pool, and the HRL. 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 7 through 9 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 99.9 percent. Cleanup to 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 99.9 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. 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. The migration of asbestos containing fugitive dust is the primary concern to onsite workers but risks can be mitigated for using proper safety procedures. Cleanup of PCB's to unrestricted levels is technologically possible. However, the PCB hot spot lies within a larger area which was used as a landfill for construction debris and office wastes. It also contains significant amounts of asbestos. DOE believes that the unrestricted use of this site is an unrealistic goal. This belief is premised on the fact that the landfill contains a large volume of varied waste with relatively low levels of contamination. It is not practicable to treat such a large volume of waste that poses minimal site risks. Ecology recognizes the need to use engineering controls, such as containment, at such sites [WAC 173-340-360(9)(c)]. In addition to containment, long-term monitoring and institutional controls would be required and the cleanup action plan shall specify the types, levels, and amounts of hazardous substances remaining onsite and the measures that will be used to prevent migration and contact with those substances [WAC 173-340-360(8)(c) and (d)]. 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. Additionally, the soil contaminants of concern are hydrophobic in nature and have low mobility throughout the vadose zone. Therefore, this contaminant migration pathway and cleanup levels are based 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 downgradient of the HRL plume will be used as a drinking water source in the near future (next 25 years) due to the site's current land 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. Consistent with DOE's strategy for this operable unit, cleanup concentrations shall be based on the most stringent requirement of applicable state or Federal law. The TCE standard taken from the Method A Table is 5 μg/L which is equivalent to the SDWA MCL for TCE. The ARAR for nitrate, which will be treated only in conjunction with TCE, is set at the SDWA MCL of 10 mg/L nitrate as nitrogen. These values 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	5.2 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, RCW 70.94, 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 federal standards for maximum emissions are outlined 40 CFR 50. State standards were authorized by RCW 70.94 and are found in WAC 173-400. 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 and be protective of human health and the environment. 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. The point of compliance shall be all portions of the site and the source must be registered by Ecology.

Reference: WAC 173-480 and 246-247.

"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.

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)

Several regulations regarding threatened and endangered species are "to be considered" before remedial action is undertaken to ensure that the habitat of these species is preserved. 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.

4.2 WATER CODES AND RIGHTS (RCW 90.03 and 90.14)

The water code and water rights laws specify conditions for extracting surface or groundwater for non-domestic uses. In essence, the laws provide that water extraction must be consistent with beneficial uses of the resource and must not be wasteful. These laws are "relevant and appropriate."

4.3 WORKER SAFETY (WAC 296-62)

State health and safety regulations are generally similar to those espoused by the federal regulations (*i.e.*, OSHA) and are "applicable" to all remedial actions involving potential human exposure to hazardous material.

5.0 ACTION SPECIFIC ARAR's

5.1 WATER QUALITY (40 CFR 122, 40 CFR 131, 40 CFR 141.13, RCW 90.48, RCW 90.52, and 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 of 40 CFR 141.13.

The state has authority to regulate discharges of any pollutant into surface and groundwaters under RCW 90.48. Additionally, 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 CA.

The state also has the authority to implement water related resources programs under the pollution disclosure act (RCW 90.54) which is "relevant and appropriate."

5.2 GROUNDWATER QUALITY (RCW 90.44, RCW 18.104, WAC 173-154, WAC 173-160, WAC 173-162 and WAC 173-218)

Ecology was given the authority to regulate groundwaters of the state under RCW 90.44 which is "relevant and appropriate." 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 as authorized by RCW 18.104. 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 SOLID AND HAZARDOUS WASTE MANAGEMENT (RCW 70.95 and 70.105)

Chapter 70.95 RCW establishes a state wide program for solid waste handling, and solid waste recovery and/or recycling which will prevent land, air, and water pollution and conserve natural, economic, and energy resources of the state, and is "relevant and appropriate." Similarly, Chapter 70.105 RCW establishes a comprehensive state-wide framework for planning, regulation, control, and management of hazardous waste which will prevent land, air and water pollution and preserve these same resources and is "applicable."

5.4 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.

5.5 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.

5.6 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.

5.7 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.

5.8 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 "relevant and appropriate" requirement.

5.9 LANDFILLING (40 CFR 257, 40 CFR 264 and 40 CFR 268)

Criteria used by RCRA to determine which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or environment are listed in 40 CFR 257. In general the facility shall be sited so as not to impact the surrounding environment and shall not contribute to the contamination of surface water, groundwater, or air. These criteria are "relevant and appropriate."

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. The soil at the Discolored Soil Site may be a RCRA hazardous waste. No TCLP analyses were performed; however, based on the contaminant soil concentrations the leachate from these soils would be above the LDR standard if all the

BEHP were leachable (a worst case comparison). 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.

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

RCRA closure requirements for landfills are "relevant and appropriate" for remedial actions which address containment options. 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 the natural subsoil present. After closure, post closure requirements include maintenance and monitoring.

WAC 173-304 provides guidance for municipal solid waste landfill caps in arid regions such as the Hanford Reservation. An impermeable geomembrane of at least 50 mil thickness is allowed as the impermeable barrier. The geomembrane must be covered with a minimum of 6-inches of topsoil and seeded to dryland grass or other shallow rooted vegetation. This closure option is "relevant and appropriate" to closure actions taken at the site.

5.11 REQUIREMENTS FOR PCB'S (40 CFR 761 and OSWER Directive 9355.4-01)

"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.

OSWER Directive 9355.4-01 provides guidance "to be considered" for remedial actions at CERCLA sites with PCB contamination. For industrial sites with restricted access, appropriate actions for soils contaminated with 100 ppm PCB's or less include a 12-inch soil cover and long-term maintenance and monitoring.

5.12 INCINERATION OF SOILS (40 CFR 264, Subpart O, WAC 173-434 and WAC 173-303-670)

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.

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."

"Applicable" emission and design and operation standards for hazardous waste incinerators are established in WAC 173-303-670.

5.13 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.

5.14 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.

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 40 CFR 264 Subpart S RCRA Corrective Action Rule (Proposed)			x	Gives direction for basing cleanup actions at RCRA sites and is similar to the NCP.
1.3.3 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
1.3.4 RCW 70.105D Hazardous Waste Cleanup, Model Toxic Control Act (MTCA) WAC 173-340 Model Toxic Control Act (MTCA) Cleanup Regulations		x		Ecology's Model Toxic Control Act (MTCA) authorizes Ecology to investigate and conduct remedial action upon release of hazardous substance. 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 RCW 70.94 Washington Clean Air Act 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 246-247 Radiation Protection--Air Emissions 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. The point of compliance is all portions of the site. Additionally, the source must be registered with Ecology. Reference: WAC 173-480 and 246-247
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.

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

ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
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).
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.
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.

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
2.1.2 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 State Water Rights				
2.2.1 RCW 90.13 Water Codes RCW 90.14 Water Rights		x		The water codes and water rights laws specify conditions for extracting surface or groundwater for non-domestic uses. In essence, the laws provide that water extraction must be consistent with the beneficial uses of the resource and must not be wasteful.
2.3 Worker Safety				
2.3.1 WAC 296-62 WISHA	x			State health and safety regulations are generally similar to those espoused by federal regulations (*i.e.*, OSHA). All remedial actions involving potential human exposure to hazardous material must meet these safety standards.
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 RCW 90.48 Water Pollution Control RCW 90.52 Pollution Disclosure Act	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.
3.1.5 RCW 90.54 Water Resources Act		x		Authorizes the state to implement water resources programs.
3.2 Groundwater Quality				
3.2.1 RCW 90.44		x		Authorized Ecology to regulate groundwaters of the state.
3.2.2 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.

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 173-160 and 162 Ground Water Protection RCW 18.104 Water Well Construction		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. These regulations are authorized by RCW 18.104.
3.2.4 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 Solid and Hazardous Waste Management				
3.3.1 RCW 70.95 Solid Waste Management		x		Establishes a state wide program for solid waste handling, and solid waste recovery and/or recycling which will prevent land, air, and water pollution and conserve natural, economic, and energy resources of the state.
3.3.2 RCW 70.105 Hazardous Waste Management	x			Establishes a comprehensive state wide framework for planning, regulation, control, and management of hazardous waste which will prevent land, air, and water pollution and preserve natural, economic, and energy resources of the state.
3.4 Hazardous Waste Generation				
3.4.1 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)

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

ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.5 Hazardous Waste Transportation				
3.5.1 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
3.5.2 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.
3.6 General Storage and Treatment of Hazardous Waste				
3.6.1 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).
3.6.2 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.

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

(Page 12 of 16)

ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.7 Treatment of Wastewater				
3.7.1 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.
3.7.2 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.
3.8 Land Treatment				
3.8.1 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.
3.9 Landfilling				
3.9.1 40 CFR 257 Classification of Solid Waste Disposal Facilities		x		Criteria used by RCRA to determine which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or environment. In general the facility must be sited so as not to impact the surrounding environment and shall not contribute to the contamination of surface water, groundwater, or air.
3.9.2 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.

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

(Page 13 of 16)

ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.9.3 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. No TCLP analyses were performed; however, based on the soil concentrations the leachate from these soils would be above the LDR if all the BEHP were leachable. 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.
3.9.4 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.
3.10 Closure and Post-Closure				
3.10.1 40 CFR 264.111-120, and 264.310 Closure and Post-Closure Care		x		Closure of a landfill may 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 subpart 264.310(a) landfills.
3.10.2 WAC 173-304 Minimum Functional Standards for Solid Waste Handling		x		This section provides for an alternate municipal solid waste landfill 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.
3.11 Requirements for PCB's				

Table M-2. Listing of Potential Federal and State Applicable or Relevant and Appropriate Requirements (ARAR's) for the 1100-EM-1 Operable Unit.
(Page 14 of 16)

ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.11.1 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
3.11.2 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.
3.11.3 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.
3.11.4 OSWER Directive 9355.4-01 A Guide on Remedial Actions at Superfund Sites With PCB Contamination			x	Appropriate actions for industrial sites with restricted access include a 12-inch soil cover and long term maintenance and monitoring where PCB's concentration in soil is less than 100 ppm.

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

(Page 15 of 16)

ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.12 Incineration of Soils				
3.12.1 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.
3.12.2 WAC 173-434 Solid Waste Incinerator Facilities		x		Emission standards for design and operation of solid waste incineration facilities are defined by this regulation.
3.12.3 WAC 173-303-670 Dangerous Waste Regulations--Incinerators	x			Establishes emissions criteria for operators of dangerous waste incinerators.
3.13 Operation of Facilities				
3.13.1 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.

(Page 16 of 16)

ARAR	Applicable	Relevant and Appropriate	To Be Considered	Rationale
3.14 Non-Routine Releases				
3.14.1 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.

3 of 3

DOE/RL-92-67
DRAFT C

Draft Remedial Investigation/ Feasibility Study for the 1100-EM-1 Operable Unit, Hanford

Date Published
April 1, 1993

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

United States
Department of Energy
P.O. Box 550
Richland, Washington

Approved for Public Release

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APPENDIX N

ALTERNATIVE COST ESTIMATES

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APPENDIX N CONTENTS

Alternative cost estimates for:

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:
Estimated By:

Prepared By: USACE/CENPW COST ENGR BRANCH

Date: 12/11/92
Est Construction Time: 30 Days

HANFORD: 1.4.10.1.1.23.01.2 1100-EM-1 Alternative Estimates

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, "02", 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 FY 93. S & A is estimated at 20%, and consists of NPW's Project Management @ 5%, Construction Management @ 10%, and Engineering During Construction @ 5%. See Contingency Notes (Title Page 3) for explanation of Contingency percentages. Contingency was applied at Level 5/6 in the estimate, to allow use of different percentages for the various types of work (see Settings for which percentage was applied). See Detail Page 1 for explanation of Contractor Indirect percentages used. E&D and Escalation will be added by the NPW-Hanford Project Manager.

Ephemeral Pool (PCBs), Off-site Disposal

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. Contaminated soil will be loaded into 30-CY trucks for hauling to Arlington.

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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* * * END TABLE OF CONTENTS * * *

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 2 (Rounded to 1000's) **

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02	REMEDIAL ACTION							
02 01	MOBILIZATION AND PREPATORY WORK		13,000	3,000	3,000	19,000		
02 02	MONITOR, SAMPLE, TEST, ANALYSIS		60,000	12,000	14,000	86,000		
02 03	SITE WORK		25,000	5,000	6,000	36,000		
02 08	SOLID WASTE COLLECT/CONTAINMENT		133,000	27,000	40,000	200,000		
02 21	DEMOBILIZATION		10,000	2,000	2,000	14,000		
	REMEDIAL ACTION		242,000	48,000	66,000	356,000		
	HANFORD: REMEDIATION		242,000	48,000	66,000	356,000		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02 REMEDIAL ACTION							
02 01 MOBILIZATION AND PREPATORY WORK							
02 01 01 MOB OF EQUIPMENT & PERSONNEL							
02 01 01 1 TRANSPORTATION							
02 01 01 1 01- Ph I, Equip Mob, Detailed List							
Ph I, Equip Mob, Detailed List		2,800	560	670	4,040		
02 01 01 1 02- Ph II, Equip Mob, Detailed List							
Ph II, Equip Mob, Detailed List		2,290	460	550	3,300		
TRANSPORTATION		5,100	1,020	1,220	7,340		
MOB OF EQUIPMENT & PERSONNEL		5,100	1,020	1,220	7,340		
02 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
02 01 03 01 TRAILERS AND BUILDINGS							
02 01 03 01 01 Ph I, Office Trailers - setup							
Ph I, Office Trailers - setup	100.00 HR	3,790	760	910	5,460	54.55	
TRAILERS AND BUILDINGS		3,790	760	910	5,460		
02 01 03 02 DECONTAMINATION FACILITIES							
02 01 03 02 01 Personnel Decon Facilities							
Personnel Decon Facilities	120.00 HR	4,550	910	1,090	6,550	54.55	

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02 01 03 02 02	Equip/Vehicle Decon Facilities							
	DECONTAMINATION FACILITIES		4,550	910	1,090	6,550		
	SETUP/CONSTRUCT TEMP FACILITIES		8,330	1,670	2,000	12,000		
	MOBILIZATION AND PREPATORY WORK		13,430	2,690	3,220	19,340		
02 02	MONITOR, SAMPLE, TEST, ANALYSIS							
02 02 06	SAMPLING SOIL, SED & SOLID WASTE							
02 02 06 01	SURFACE SOIL							
02 02 06 01 01	PHASE I, Soil Sample							
02 02 06 01 01 01	Soil Sampling	60.00 EA	15,950	3,190	3,830	22,970	382.83	1
02 02 06 01 01 02	QA Report		3,590	720	860	5,170		1
	PHASE I, Soil Sample	60.00 EA	19,540	3,910	4,690	28,140	468.96	
02 02 06 01 02	PHASE II, Soil Sample							
02 02 06 01 02 01	Soil Sampling	60.00 EA	15,950	3,190	3,830	22,970	382.83	1
02 02 06 01 02 02	QA Report		3,590	720	860	5,170		1
	PHASE II, Soil Sample	60.00 EA	19,540	3,910	4,690	28,140	468.96	
	SURFACE SOIL		39,080	7,820	9,380	56,280		
	SAMPLING SOIL, SED & SOLID WASTE		39,080	7,820	9,380	56,280		
02 02 91	QA/Safety Monitoring							
02 02 91 01	QA/Safety Monitoring							
02 02 91 01 01	Safety and Quality Assurance							
	Safety and Quality Assurance	3.00 WK	20,740	4,150	4,980	29,860	9953.51	

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	QA/Safety Monitoring		20,740	4,150	4,980	29,860		
	QA/Safety Monitoring		20,740	4,150	4,980	29,860		
	MONITOR, SAMPLE, TEST, ANALYSIS		59,820	11,960	14,360	86,140		
02 03	SITE WORK							
02 03 05	FENCING							
02 03 05 03	FENCING							
02 03 05 03 01	Temporary Fencing							
02 03 05 03 01 01	Temporary Fencing - 6' Security	750.00 LF	24,920	4,980	5,980	35,890	47.85	
	Temporary Fencing	750.00 LF	24,920	4,980	5,980	35,890	47.85	
	FENCING		24,920	4,980	5,980	35,890		
	FENCING		24,920	4,980	5,980	35,890		
	SITE WORK		24,920	4,980	5,980	35,890		
02 08	SOLID WASTE COLLECT/CONTAINMENT							
02 08 01	EXCAVATION							
02 08 01 03	CONTAMINATED SOIL							
02 08 01 03 01	PHASE I, Excavate/Load PCB Soils							
02 08 01 03 01 01	Excavate/Load PCB Soils	230.00 CY	2,070	410	990	3,480	15.13	2
02 08 01 03 01 02	Transport PCB Soils - Arlington	230.00 CY	83,610	16,720	25,080	125,410	545.26	2,3
02 08 01 03 01 03	PPEquip, Class D	3.00 DAY	1,930	390	580	2,890	962.87	1
02 08 01 03 01 04	Plastic Cover, Excavation Area	700.00 SY	850	170	0	1,020	1.46	1
	PHASE I, Excavate/Load PCB Soils	230.00 CY	88,460	17,690	26,650	132,800	577.40	
02 08 01 03 02	PHASE II,Excavate/Load PCB Soils							

				QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02 08 01 03	02	01	Excavate/Load PCB Soils	110.00 CY	990	200	480	1,660	15.13	1,2
02 08 01 03	02	02	Transport PCB Soils - Arlington	110.00 CY	40,210	8,040	12,060	60,320	548.33	2,3
02 08 01 03	02	03	PPEquip, Class D	2.00 DAY	1,280	260	390	1,930	962.87	1
02 08 01 03	02	04	Plastic Cover, Excavation Area	700.00 SY	850	170	0	1,020	1.46	1
			PHASE II,Excavate/Load PCB Soils	110.00 CY	43,340	8,670	12,920	64,930	590.28	
02 08 01 03	03		Post Removal - Site Re-grade							
02 08 01 03	03	01	Site Re-grade	1.00 DAY	1,540	310	460	2,320	2317.09	1
			Post Removal - Site Re-grade		1,540	310	460	2,320		
			CONTAMINATED SOIL		133,340	26,670	40,040	200,050		
			EXCAVATION		133,340	26,670	40,040	200,050		
			SOLID WASTE COLLECT/CONTAINMENT		133,340	26,670	40,040	200,050		
02 21			DEMOBILIZATION							
02 21 04			DEMOB OF EQUIPMENT & PERSONNEL							
02 21 04 01			TRANSPORTATION							
02 21 04 01	01		PH I, Demob of equipment							
			PH I, Demob of equipment		10,070	2,010	2,420	14,500		
			TRANSPORTATION		10,070	2,010	2,420	14,500		
			DEMOB OF EQUIPMENT & PERSONNEL		10,070	2,010	2,420	14,500		
			DEMOBILIZATION		10,070	2,010	2,420	14,500		
			REMEDIAL ACTION		241,580	48,320	66,020	355,920		
			HANFORD: REMEDIATION		241,580	48,320	66,020	355,920		

Fri 11 Dec 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
** PROJECT INDIRECT SUMMARY - LEVEL 2 (Rounded to 10's) **

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02	REMEDIAL ACTION									
02 01	MOBILIZATION AND PREPATORY WORK		10,110	1,520	580	980	120	130	13,430	
02 02	MONITOR, SAMPLE, TEST, ANALYSIS		45,000	6,750	2,590	4,350	540	590	59,820	
02 03	SITE WORK		18,750	2,810	1,080	1,810	230	250	24,920	
02 08	SOLID WASTE COLLECT/CONTAINMENT		100,310	15,050	5,770	9,690	1,200	1,320	133,340	
02 21	DEMOBILIZATION		7,580	1,140	440	730	90	100	10,070	
	REMEDIAL ACTION		181,740	27,260	10,450	17,560	2,180	2,390	241,580	
	HANFORD: REMEDIATION		181,740	27,260	10,450	17,560	2,180	2,390	241,580	
	S & A								48,320	
	SUBTOTAL								289,900	
	CONTINGENCY								66,020	
	TOTAL INCL OWNER COSTS								355,920	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02 REMEDIAL ACTION									
02 01 MOBILIZATION AND PREPATORY WORK									
02 01 01 MOB OF EQUIPMENT & PERSONNEL									
02 01 01 1 TRANSPORTATION									
02 01 01 1 01- Ph I, Equip Mob, Detailed List									
Ph I, Equip Mob, Detailed List		2,110	320	120	200	30	30	2,800	
02 01 01 1 02- Ph II, Equip Mob, Detailed List									
Ph II, Equip Mob, Detailed List		1,730	260	100	170	20	20	2,290	
TRANSPORTATION		3,840	580	220	370	50	50	5,100	
MOB OF EQUIPMENT & PERSONNEL		3,840	580	220	370	50	50	5,100	
02 01 03 SETUP/CONSTRUCT TEMP FACILITIES									
02 01 03 01 TRAILERS AND BUILDINGS									
02 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
TRAILERS AND BUILDINGS		2,850	430	160	280	30	40	3,790	
02 01 03 02 DECONTAMINATION FACILITIES									
02 01 03 02 01 Personnel Decon Facilities									
Personnel Decon Facilities	120.00 HR	3,420	510	200	330	40	50	4,550	37.88

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02 01 03 02 02	Equip/Vehicle Decon Facilities									
	DECONTAMINATION FACILITIES		3,420	510	200	330	40	50	4,550	
	SETUP/CONSTRUCT TEMP FACILITIES		6,270	940	360	610	80	80	8,330	
	MOBILIZATION AND PREPATORY WORK		10,110	1,520	580	980	120	130	13,430	
02 02	MONITOR, SAMPLE, TEST, ANALYSIS									
02 02 06	SAMPLING SOIL, SED & SOLID WASTE									
02 02 06 01	SURFACE SOIL									
02 02 06 01 01	PHASE I, Soil Sample									
02 02 06 01 01 01	Soil Sampling	60.00 EA	12,000	1,800	690	1,160	140	160	15,950	265.85
02 02 06 01 01 02	QA Report		2,700	410	160	260	30	40	3,590	
	PHASE I, Soil Sample	60.00 EA	14,700	2,210	850	1,420	180	190	19,540	325.67
02 02 06 01 02	PHASE II, Soil Sample									
02 02 06 01 02 01	Soil Sampling	60.00 EA	12,000	1,800	690	1,160	140	160	15,950	265.85
02 02 06 01 02 02	QA Report		2,700	410	160	260	30	40	3,590	
	PHASE II, Soil Sample	60.00 EA	14,700	2,210	850	1,420	180	190	19,540	325.67
	SURFACE SOIL		29,400	4,410	1,690	2,840	350	390	39,080	
	SAMPLING SOIL, SED & SOLID WASTE		29,400	4,410	1,690	2,840	350	390	39,080	
02 02 91	QA/Safety Monitoring									
02 02 91 01	QA/Safety Monitoring									
02 02 91 01 01	Safety and Quality Assurance									
	Safety and Quality Assurance	3.00 WK	15,600	2,340	900	1,510	190	210	20,740	6912.16

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	QA/Safety Monitoring		15,600	2,340	900	1,510	190	210	20,740	
	QA/Safety Monitoring		15,600	2,340	900	1,510	190	210	20,740	
	MONITOR, SAMPLE, TEST, ANALYSIS		45,000	6,750	2,590	4,350	540	590	59,820	
02 03 SITE WORK										
02 03 05 FENCING										
02 03 05 03 FENCING										
02 03 05 03 01 Temporary Fencing										
02 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	
02 08 SOLID WASTE COLLECT/CONTAINMENT										
02 08 01 EXCAVATION										
02 08 01 03 CONTAMINATED SOIL										
02 08 01 03 01 PHASE I, Excavate/Load PCB Soils										
02 08 01 03 01 01	Excavate/Load PCB Soils	230.00 CY	1,560	230	90	150	20	20	2,070	9.01
02 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
02 08 01 03 01 03	PPEquip, Class D	3.00 DAY	1,450	220	80	140	20	20	1,930	641.91
02 08 01 03 01 04	Plastic Cover, Excavation Area	700.00 SY	640	100	40	60	10	10	850	1.22
	PHASE I, Excavate/Load PCB Soils	230.00 CY	66,550	9,980	3,830	6,430	800	880	88,460	384.60
02 08 01 03 02 PHASE II,Excavate/Load PCB Soils										

		QUANTITY	UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02 08 01 03 02 01	Excavate/Load PCB Soils	110.00	CY	750	110	40	70	10	10	990	9.01
02 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
02 08 01 03 02 03	PPEquip, Class D	2.00	DAY	970	140	60	90	10	10	1,280	641.91
02 08 01 03 02 04	Plastic Cover, Excavation Area	700.00	SY	640	100	40	60	10	10	850	1.22
	PHASE II,Excavate/Load PCB Soils	110.00	CY	32,600	4,890	1,870	3,150	390	430	43,340	393.99
02 08 01 03 03	Post Removal - Site Re-grade										
02 08 01 03 03 01	Site Re-grade	1.00	DAY	1,160	170	70	110	10	20	1,540	1544.73
	Post Removal - Site Re-grade			1,160	170	70	110	10	20	1,540	
	CONTAMINATED SOIL			100,310	15,050	5,770	9,690	1,200	1,320	133,340	
	EXCAVATION			100,310	15,050	5,770	9,690	1,200	1,320	133,340	
	SOLID WASTE COLLECT/CONTAINMENT			100,310	15,050	5,770	9,690	1,200	1,320	133,340	
02 21	DEMOBILIZATION										
02 21 04	DEMOB OF EQUIPMENT & PERSONNEL										
02 21 04 01	TRANSPORTATION										
02 21 04 01 01	PH I, Demob of equipment										
	PH I, Demob of equipment			7,580	1,140	440	730	90	100	10,070	
	TRANSPORTATION			7,580	1,140	440	730	90	100	10,070	
	DEMOB OF EQUIPMENT & PERSONNEL			7,580	1,140	440	730	90	100	10,070	
	DEMOBILIZATION			7,580	1,140	440	730	90	100	10,070	
	REMEDIAL ACTION			181,740	27,260	10,450	17,560	2,180	2,390	241,580	
	HANFORD: REMEDIATION			181,740	27,260	10,450	17,560	2,180	2,390	241,580	
	S & A									48,320	
	SUBTOTAL									289,900	
	CONTINGENCY									66,020	

	QUANTITY	UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
TOTAL INCL OWNER COSTS									355,920	

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9 2 1 2 9 2 3 1 3 3 5

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 Distributed Costs

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.

N-21

DOE/RL-92-67

02. REMEDIAL ACTION
02 01. MOBILIZATION AND PREPATORY WORK
02 01 01. MOB OF EQUIPMENT & PERSONNEL

02 01 01 1. TRANSPORTATION

02 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
USR AA <01505 8952 >	Mob, Hot Water Blstr, 3,200 psi 100-mi Radius	1.00	EA	0.00	0.00 0	0.00 0	75.00 75	0.00 0	0.00 0	75.00 75	75.00

02 01. MOBILIZATION AND PREPATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
Ph I, Equip Mob, Detailed List					0	0	2,110	0	0	2,110	
02 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. The trailers are not re-mob'd, as it is assumed they are left in place for duration of work.											
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 8952 > Mob, Hot Water Blstr, 3,200 psi 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	75.00 75	0.00 0	0.00 0	75.00 75	75.00
Ph II, Equip Mob, Detailed List					0	0	1,725	0	0	1,725	
TRANSPORTATION					0	0	3,835	0	0	3,835	
MOB OF EQUIPMENT & PERSONNEL					0	0	3,835	0	0	3,835	

02 01. MOBILIZATION AND PREPATORY WORK	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 01 03. SETUP/CONSTRUCT TEMP FACILITIES									
02 01 03 01. TRAILERS AND BUILDINGS									
02 01 03 01 01. Ph I, Office Trailers - 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.									
Ph I, Office Trailers - setup	100.00 HR		0	2,500	250	100	0	2,850	28.50
TRAILERS AND BUILDINGS			0	2,500	250	100	0	2,850	
02 01 03 02. DECONTAMINATION FACILITIES									
02 01 03 02 01. Personnel Decon Facilities Allow 120 mhrs for setup of the Personnel Decon Facilities, including equipment and site layout. An allowance for material & equip. is included.									
Personnel Decon Facilities	120.00 HR		0	3,000	300	120	0	3,420	28.50
02 01 03 02 02. Equip/Vehicle Decon Facilities A equipment/vehicle washdown facility has been costed in the Asbestos Cap estimate, and it will be used for all waste site decon. Decon water will be transported by a WHC truck to an on-site disposal area.									
Equip/Vehicle Decon Facilities			0	0	0	0	0	0	
DECONTAMINATION FACILITIES			0	3,000	300	120	0	3,420	
SETUP/CONSTRUCT TEMP FACILITIES			0	5,500	550	220	0	6,270	

02 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 02. MONITOR, SAMPLE, TEST, ANALYSIS											
02 02 06. SAMPLING SOIL, SED & SOLID WASTE											
02 02 06 01. SURFACE SOIL											
02 02 06 01 01. PHASE I, Soil Sample After the top 12" of soil is removed, soil samples will be taken.											
02 02 06 01 01 01. Soil Sampling Sample on 15'x15' grid (50 samples) with analysis at off site lab for PCB only, with 7-day turnaround. Method 8080. Add 10 QA samples. Costs for analysis from Corps North Pacific Division (CENPD) Laboratory.											
Soil Sampling	60.00	EA			0	0	0	0	12,000	12,000	200.00
02 02 06 01 01 02. QA Report Costs for QA Report from CENPD Laboratory.											
QA Report					0	0	0	0	2,700	2,700	
PHASE I, Soil Sample	60.00	EA			0	0	0	0	14,700	14,700	245.00
02 02 06 01 02. PHASE II, Soil Sample Another set of soil samples will be taken after the next 6" soil layer is excavated.											
02 02 06 01 02 01. Soil Sampling Same as Phase I, with 7-day turnaround.											
Soil Sampling	60.00	EA			0	0	0	0	12,000	12,000	200.00
02 02 06 01 02 02. QA Report Same as Phase I.											
QA Report					0	0	0	0	2,700	2,700	
PHASE II, Soil Sample	60.00	EA			0	0	0	0	14,700	14,700	245.00
SURFACE SOIL					0	0	0	0	29,400	29,400	

02 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
SAMPLING SOIL, SED & SOLID WASTE					0	0	0	0	29,400	29,400	

02 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 02 91. QA/Safety Monitoring											
02 02 91 01. QA/Safety Monitoring											
02 02 91 01 01. Safety and Quality Assurance											
Safety/QA crew:											
WHC HPT: $50/hr x 40hrs = $2,000											
COE Safety: $70/hr x 40hrs = $2,800											
COE Special Assist. QA: $50/hr x 8 hrs = $ 400											
Total cost/week $5,200											
The duration of this project is estimated at 3 weeks.											
Safety and Quality Assurance	3.00	WK			0	15,600	0	0	0	15,600	5200.00
QA/Safety Monitoring					0	15,600	0	0	0	15,600	
QA/Safety Monitoring					0	15,600	0	0	0	15,600	

02 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 03. SITE WORK											
02 03 05. FENCING											
02 03 05 03. FENCING											
02 03 05 03 01. Temporary Fencing											
02 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	
FENCING					0	3,750	1,875	9,375	3,750	18,750	

02 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 08. SOLID WASTE COLLECT/CONTAINMENT											
02 08 01. EXCAVATION											
02 08 01 03. CONTAMINATED SOIL											
02 08 01 03 01. PHASE I, Excavate/Load PCB Soils											
02 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	1.98 456	0.00 0	0.00 0	2.92 672	2.92
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	765	0	0	1,558	6.77
02 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

02 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 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
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
USR AA <01957 5805 > Disposal Allowance Allow $100/day for disposal of personnel protection items and equipment/vehicle decon water.	3.00	DAY	N/A	0.00	0.00 0	0.00 0	0.00 0	0.00 0	100.00 300	100.00 300	100.00
PPEquip, Class D	3.00	DAY			30	703	170	276	300	1,449	482.91
02 08 01 03 01 04. Plastic Cover, Excavation Area A plastic cover will be put into place while waiting for sample results.											
M HTW AA <02082 7211 > Plastic Excavation Cover 6-mil visqueen; Area based on the quantity of excavation. Allow $0.50/SY for disposal.	700.00	SY	ULABC	555.56	0.01 4	0.15 103	0.00 1	0.27 189	0.50 350	0.92 643	0.92
Plastic Cover, Excavation Area	700.00	SY			4	103	1	189	350	643	0.92
PHASE I, Excavate/Load PCB Soils	230.00	CY			64	1,599	936	465	63,547	66,546	289.33

02 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 08 01 03 02. PHASE II,Excavate/Load PCB Soils											
02 08 01 03 02 01. Excavate/Load PCB Soils											
L USR AA <02220 0000 > Excavate next 6-inches of soil					0.06	1.59	0.54	0.00	0.00	2.13	
	110.00	CY	XXQNA	28.75	7	175	60	0	0	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					0.03	0.94	1.98	0.00	0.00	2.92	
	110.00	CY	XXQMG	28.75	4	104	218	0	0	322	2.92
USR AA <02220 0000 > Water tank/Soil wet down crew					0.03	0.92	0.80	0.00	0.00	1.72	
	110.00	CY	XTRHC	28.75	4	101	88	0	0	189	1.72
Excavate/Load PCB Soils	110.00	CY			14	379	366	0	0	745	6.77
02 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					0.00	0.00	0.00	0.00	400.00	400.00	
	7.00	TRK		0.00	0	0	0	0	2,800	2,800	400.00
USR AA <02220 0000 > Disposal of soil in landfill					0.00	0.00	0.00	0.00	134.00	134.00	
	170.50	TON		0.00	0	0	0	0	22,847	22,847	134.00
USR AA <02220 0000 > Oregon state environmental tax					0.00	0.00	0.00	0.00	27.00	27.00	
	170.50	TON		0.00	0	0	0	0	4,604	4,604	27.00
Transport PCB Soils - Arlington	110.00	CY			0	0	0	0	30,251	30,251	275.00
02 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)					0.00	0.00	11.50	0.00	0.00	11.50	
	8.00	EA	N/A	0.00	0	0	92	0	0	92	11.50

02 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					0.00	0.00	0.00	7.55	0.00	7.55	
	8.00	EA	N/A	0.00	0	0	0	60	0	60	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves					0.00	0.00	2.30	0.00	0.00	2.30	
	8.00	PR	N/A	0.00	0	0	18	0	0	18	2.30
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)					10.00	234.30	1.45	34.83	0.00	270.58	
	2.00	DAY	ULABA	0.13	20	469	3	70	0	541	270.58
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	
	2.00	DAY	N/A	0.00	0	0	0	54	0	54	26.95
USR AA <01957 5805 > Disposal Allowance Allow $100/day for disposal of personnel protection items and equipment/vehicle decon items.					0.00	0.00	0.00	0.00	100.00	100.00	
	2.00	DAY	N/A	0.00	0	0	0	0	200	200	100.00
PPEquip, Class D	2.00	DAY			20	469	113	184	200	966	482.91

02 08 01 03 02 04. Plastic Cover, Excavation Area
A plastic cover will be put into place while waiting for sample results.

M HTW AA <02082 7211 > Plastic Excavation Cover 6-mil visqueen; Area based on the quantity of excavation. Allow $0.50/SY for disposal.					0.01	0.15	0.00	0.27	0.50	0.92	
	700.00	SY	ULABC	555.56	4	103	1	189	350	643	0.92
Plastic Cover, Excavation Area	700.00	SY			4	103	1	189	350	643	0.92
PHASE II,Excavate/Load PCB Soils	110.00	CY			39	951	480	373	30,801	32,604	296.40

02 08 01 03 03. Post Removal - Site Re-grade

02 08 01 03 03 01. Site Re-grade
Allow 1 day for Post-removal site re-grading with existing equipment.

L USR AA <02220 0000 > Excavation crew					14.00	365.22	124.54	0.00	0.00	489.76	
	1.00	DAY	XXQNA	0.13	14	365	125	0	0	490	489.76
USR AA <02220 0000 > Load crew load in 28-ton dump trucks - DOT approved hazardeous waste					8.00	216.72	455.61	0.00	0.00	672.33	
	1.00	DAY	XXQMG	0.13	8	217	456	0	0	672	672.33

02 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
hauler. assume 3,100lb/bcy									
Site Re-grade	1.00 DAY		22	582	580	0	0	1,162	1162.09
Post Removal - Site Re-grade			22	582	580	0	0	1,162	
CONTAMINATED SOIL			125	3,132	1,996	837	94,347	100,312	
EXCAVATION			125	3,132	1,996	837	94,347	100,312	

02 21. DEMOBILIZATION	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 21. DEMOBILIZATION									
02 21 04. DEMOB OF EQUIPMENT & PERSONNEL									
02 21 04 01. TRANSPORTATION									
02 21 04 01 01. PH I, Demob of equipment Allow 75% of Phase I & II equipment mobilization and site setup.									
PH I, Demob of equipment			0	0	7,575	0	0	7,575	
TRANSPORTATION			0	0	7,575	0	0	7,575	
DEMOB OF EQUIPMENT & PERSONNEL			0	0	7,575	0	0	7,575	
HANFORD: REMEDIATION			125	27,982	15,831	10,432	127,497	181,742	

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SRC	ITEM ID	DESCRIPTION	NO. UOM	RATE	**** LABOR **** HOURS	COST	**** EQUIP **** HOURS	COST	TOTAL COST
	ULABA	1 B-laborer + Small Tools		PROD = 100%				CREW HOURS =	40
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
	ULABC	3 B-laborer + Small Tools		PROD = 100%				CREW HOURS =	3
MIL	B-LABORER L	Laborer (Semi-Skilled)	3.00 HR	23.33	3.00	69.99			69.99
MIL	B-LABORER F	Laborer (Semi-Skilled)	0.50 HR	23.83	0.50	11.92			11.92
MIL	XMIXX020 E	Small Tools	0.40 HR	1.39			0.40	0.56	0.56
	TOTAL				3.50	81.91	0.40	0.56	82.46
	XTRHC	1 X-trkdvrhv + 1 Truck 3ax, W/3000 Gal Water Tnk		PROD = 100%				CREW HOURS =	12
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 =	20
MIL	L40CA007 E	LDR,FE,WH, 5-1/4 CY ARTIC,980-C	1.00 HR	56.95			1.00	56.95	56.95
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	56.95	84.04
	XXQNA	1 X-eqoprmed + 1 Dozer, Cat D-38, 65 Hp		PROD = 100%				CREW HOURS =	20
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	59
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	45
MIL X-LABORER	Outside Laborer	23.33	0.0%	0.0%	0.00	0.00	23.33	HR	10/15/92	22.36	10
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	12

SRC	EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	TOTAL UOM	** TOTAL ** HOURS
MIL	L40CA007	LDR,FE,WH, 5-1/4 CY ARTIC,980-C	17.46	5.87	7.97	2.3	15.74	6.54	0.98	56.95 HR	20
MIL	T10CA001	BLADE,POWER ANGLE TILT,FOR D3	0.75	0.22		0.0	0.82			1.87 HR	20
MIL	T15CA003	DOZER,CWLR,D-3C,PS,(ADD BLADE)	3.51	1.14	2.14	0.7	6.14			13.70 HR	20
MIL	T40XX033	WATER TANK, 3000 GAL (ADD TRUCK)	1.52	0.37			1.26			3.15 HR	12
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	12
MIL	XMIXX020	Small Tools	0.46	0.17	0.13	0.0	0.57			1.39 HR	6

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** PROJECT SETTINGS **

ESTIMATE TYPE : A-Crews with Auto Reprice

SALES TAX : 7.80%

DATE OF ESCALATION SCHEDULE : 10/01/93

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 : 3
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 Y 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		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	Measurement Units	: Original
Link Listing	: N		

	REPORT FORMAT TYPE			FOR LEVEL (S)
	Direct	Indirect	Owner	0 1 2 3 4 5 6
Detail :	Y			
Project :	N	Y	Y	N Y N N N 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							
02 REMEDIAL ACTION							
	S & A	P	20.00				
	CONTINGENCY	P	0.00				
02 01 MOBILIZATION AND PREPATORY WORK							
02 01 01 MOB OF EQUIPMENT & PERSONNEL							
02 01 01 1 TRANSPORTATION							
02 01 01 1 01- Ph I, Equip Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
02 01 01 1 02- Ph II, Equip Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
02 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
02 01 03 01 TRAILERS AND BUILDINGS							
02 01 03 01 01 Ph I, Office Trailers - setup							
	S & A	O					
	CONTINGENCY	P	20.00				
02 01 03 02 DECONTAMINATION FACILITIES							
02 01 03 02 01 Personnel Decon Facilities							
	S & A	O					
	CONTINGENCY	P	20.00				
02 01 03 02 02 Equip/Vehicle Decon Facilities							
	S & A	O					
	CONTINGENCY	P	20.00				
02 02 MONITOR, SAMPLE, TEST, ANALYSIS							
02 02 06 SAMPLING SOIL, SED & SOLID WASTE							
02 02 06 01 SURFACE SOIL							
02 02 06 01 01 PHASE I, Soil Sample							
02 02 06 01 01 01 Soil Sampling							
	S & A	O					
	CONTINGENCY	P	20.00				
02 02 06 01 01 02 QA Report							
	S & A	O					
	CONTINGENCY	P	20.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
02 02 06 01	02 PHASE II, Soil Sample						
02 02 06 01	02 01 Soil Sampling						
	S & A	O					
	CONTINGENCY	P	20.00				
02 02 06 01	02 02 QA Report						
	S & A	O					
	CONTINGENCY	P	20.00				
02 02 91	QA/Safety Monitoring						
02 02 91 01	QA/Safety Monitoring						
02 02 91 01	01 Safety and Quality Assurance						
	S & A	O					
	CONTINGENCY	P	20.00				
02 03	SITE WORK						
02 03 05	FENCING						
02 03 05 03	FENCING						
02 03 05 03	01 Temporary Fencing						
02 03 05 03	01 01 Temporary Fencing - 6' Security						
	S & A	O					
	CONTINGENCY	P	20.00				
02 08	SOLID WASTE COLLECT/CONTAINMENT						
02 08 01	EXCAVATION						
02 08 01 03	CONTAMINATED SOIL						
02 08 01 03	01 PHASE I, Excavate/Load PCB Soils						
02 08 01 03	01 01 Excavate/Load PCB Soils						
	S & A	O					
	CONTINGENCY	P	40.00				
02 08 01 03	01 02 Transport PCB Soils - Arlington						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03	01 03 PPEquip, Class D						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03	01 04 Plastic Cover, Excavation Area						
	S & A	O					
	CONTINGENCY	O					

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
02 08 01 03	02 PHASE II,Excavate/Load PCB Soils						
02 08 01 03	02 01 Excavate/Load PCB Soils						
	S & A	O					
	CONTINGENCY	P	40.00				
02 08 01 03	02 02 Transport PCB Soils - Arlington						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03	02 03 PPEquip, Class D						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03	02 04 Plastic Cover, Excavation Area						
	S & A	O					
	CONTINGENCY	O					
02 08 01 03	03 Post Removal - Site Re-grade						
02 08 01 03	03 01 Site Re-grade						
	S & A	O					
	CONTINGENCY	P	25.00				
02 21	DEMOBILIZATION						
02 21 04	DEMOB OF EQUIPMENT & PERSONNEL						
02 21 04 01	TRANSPORTATION						
02 21 04 01	01 PH I, Demob of equipment						
	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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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:
Estimated By:

Prepared By: USACE/CENPW COST ENGR BRANCH

Date: 12/11/92
Est Construction Time: 30 Days

HANFORD: 1.4.10.1.1.23.01.2 1100-EM-1 Alternative Estimates

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, "02", 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 FY 93. S & A is estimated at 20%, and consists of NPW's Project Management @ 5%, Construction Management @ 10%, and Engineering During Construction @ 5%. See Contingency Notes (Title Page 3) for explanation of Contingency percentages. Contingency was applied at Level 5/6 in the estimate, to allow use of different percentages for the various types of work (see Settings for which percentage was applied). See Detail Page 1 for explanation of Contractor Indirect percentages used. E&D and Escalation will be added by the NPW-Hanford Project Manager.

Horn Rapids Landfill (PCBs), Off-site Disposal

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 Arlington.

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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9 2 1 9 3 1 3 6 7

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

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* * * END TABLE OF CONTENTS * * *

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 2 (Rounded to 1000's) **

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02	REMEDIAL ACTION							
02 01	MOBILIZATION AND PREPATORY WORK		13,000	3,000	3,000	19,000		
02 02	MONITOR, SAMPLE, TEST, ANALYSIS		35,000	7,000	8,000	51,000		
02 03	SITE WORK		13,000	3,000	3,000	19,000		
02 08	SOLID WASTE COLLECT/CONTAINMENT		229,000	46,000	69,000	344,000		
02 21	DEMOBILIZATION		10,000	2,000	2,000	14,000		
	REMEDIAL ACTION		301,000	60,000	87,000	448,000		
	HANFORD: REMEDIATION		301,000	60,000	87,000	448,000		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02 REMEDIAL ACTION							
02 01 MOBILIZATION AND PREPATORY WORK							
02 01 01 MOB OF EQUIPMENT & PERSONNEL							
02 01 01 1 TRANSPORTATION							
02 01 01 1 01- Ph I, Equip Mob, Detailed List							
Ph I, Equip Mob, Detailed List		2,800	560	670	4,040		
02 01 01 1 02- Ph II, Equip Mob, Detailed List							
Ph II, Equip Mob, Detailed List		2,290	460	550	3,300		
TRANSPORTATION		5,100	1,020	1,220	7,340		
MOB OF EQUIPMENT & PERSONNEL		5,100	1,020	1,220	7,340		
02 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
02 01 03 01 TRAILERS AND BUILDINGS							
02 01 03 01 01 Ph I, Office Trailers - setup							
Ph I, Office Trailers - setup	100.00 HR	3,790	760	910	5,460	54.55	
TRAILERS AND BUILDINGS		3,790	760	910	5,460		
02 01 03 02 DECONTAMINATION FACILITIES							
02 01 03 02 01 Personnel Decon Facilities							
Personnel Decon Facilities	120.00 HR	4,550	910	1,090	6,550	54.55	

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02 01 03 02 02	Equip/Vehicle Decon Facilities							
	DECONTAMINATION FACILITIES		4,550	910	1,090	6,550		
	SETUP/CONSTRUCT TEMP FACILITIES		8,330	1,670	2,000	12,000		
	MOBILIZATION AND PREPATORY WORK		13,430	2,690	3,220	19,340		
02 02	MONITOR, SAMPLE, TEST, ANALYSIS							
02 02 06	SAMPLING SOIL, SED & SOLID WASTE							
02 02 06 01	SURFACE SOIL							
02 02 06 01 01	PHASE I, Soil Sample							
02 02 06 01 01 01	Soil Sampling	20.00 EA	5,320	1,060	1,280	7,660	382.83	1
02 02 06 01 01 02	QA Report		1,990	400	480	2,870		1
	PHASE I, Soil Sample	20.00 EA	7,310	1,460	1,750	10,530	526.39	
02 02 06 01 02	PHASE II, Soil Sample							
02 02 06 01 02 01	Soil Sampling	20.00 EA	5,320	1,060	1,280	7,660	382.83	1
02 02 06 01 02 02	QA Report		1,990	400	480	2,870		1
	PHASE II, Soil Sample	20.00 EA	7,310	1,460	1,750	10,530	526.39	
	SURFACE SOIL		14,620	2,920	3,510	21,060		
	SAMPLING SOIL, SED & SOLID WASTE		14,620	2,920	3,510	21,060		
02 02 91	QA/Safety Monitoring							
02 02 91 01	QA/Safety Monitoring							
02 02 91 01 01	Safety and Quality Assurance							
	Safety and Quality Assurance	3.00 WK	20,740	4,150	4,980	29,860	9953.51	

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	QA/Safety Monitoring		20,740	4,150	4,980	29,860		
	QA/Safety Monitoring		20,740	4,150	4,980	29,860		
	MONITOR, SAMPLE, TEST, ANALYSIS		35,360	7,070	8,490	50,920		
02 03	SITE WORK							
02 03 05	FENCING							
02 03 05 01	FENCING							
02 03 05 01 01	Temporary Fencing							
02 03 05 01 01 01	Temporary Fencing - 6' Security	400.00 LF	13,290	2,660	3,190	19,140	47.85	
	Temporary Fencing	400.00 LF	13,290	2,660	3,190	19,140	47.85	
	FENCING		13,290	2,660	3,190	19,140		
	FENCING		13,290	2,660	3,190	19,140		
	SITE WORK		13,290	2,660	3,190	19,140		
02 08	SOLID WASTE COLLECT/CONTAINMENT							
02 08 01	EXCAVATION							
02 08 01 03	CONTAMINATED SOIL							
02 08 01 03 01	PHASE I, Excavate/Load PCB Soils							
02 08 01 03 01 01	Excavate/Load PCB Soils	350.00 CY	2,350	470	1,130	3,950	11.28	2
02 08 01 03 01 02	Transport PCB Soils - Arlington	350.00 CY	127,130	25,430	38,140	190,700	544.86	2,3
02 08 01 03 01 03	PPEquip, Modified Class D	3.00 DAY	3,070	610	920	4,600	1534.61	1
02 08 01 03 01 04	Plastic Cover, Excavation Area	350.00 SY	430	90	0	510	1.46	1
	PHASE I, Excavate/Load PCB Soils	230.00 CY	132,980	26,600	40,190	199,770	868.55	
02 08 01 03 02	PHASE II,Excavate/Load PCB Soils							

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02 08 01 03 02 01	Excavate/Load PCB Soils	250.00 CY	1,680	340	810	2,820	11.28	1,2
02 08 01 03 02 02	Transport PCB Soils - Arlington	250.00 CY	90,370	18,070	27,110	135,560	542.24	2,3
02 08 01 03 02 03	PPEquip, Modified Class D	2.00 DAY	2,050	410	610	3,070	1534.61	1
02 08 01 03 02 04	Plastic Cover, Excavation Area	350.00 SY	430	90	0	510	1.46	1
	PHASE II,Excavate/Load PCB Soils	110.00 CY	94,530	18,910	28,530	141,960	1290.57	
02 08 01 03 03	Post Removal - Site Re-grading							
02 08 01 03 03 01	Site Re-grading	1.00 DAY	1,540	310	460	2,320	2317.09	1
	Post Removal - Site Re-grading		1,540	310	460	2,320		
	CONTAMINATED SOIL		229,050	45,810	69,180	344,050		
	EXCAVATION		229,050	45,810	69,180	344,050		
	SOLID WASTE COLLECT/CONTAINMENT		229,050	45,810	69,180	344,050		
02 21	DEMOBILIZATION							
02 21 04	DEMOB OF EQUIPMENT & PERSONNEL							
02 21 04 01	TRANSPORTATION							
02 21 04 01 01	PH 1, Demob of equipment							
	PH 1, Demob of equipment		10,070	2,010	2,420	14,500		
	TRANSPORTATION		10,070	2,010	2,420	14,500		
	DEMOB OF EQUIPMENT & PERSONNEL		10,070	2,010	2,420	14,500		
	DEMOBILIZATION		10,070	2,010	2,420	14,500		
	REMEDIAL ACTION		301,200	60,240	86,500	447,940		
	HANFORD: REMEDIATION		301,200	60,240	86,500	447,940		

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02	REMEDIAL ACTION									
02 01	MOBILIZATION AND PREPATORY WORK		10,110	1,520	580	980	120	130	13,430	
02 02	MONITOR, SAMPLE, TEST, ANALYSIS		26,600	3,990	1,530	2,570	320	350	35,360	
02 03	SITE WORK		10,000	1,500	580	970	120	130	13,290	
02 08	SOLID WASTE COLLECT/CONTAINMENT		172,310	25,850	9,910	16,650	2,070	2,270	229,050	
02 21	DEMOBILIZATION		7,580	1,140	440	730	90	100	10,070	
	REMEDIAL ACTION		226,590	33,990	13,030	21,890	2,720	2,980	301,200	
	HANFORD: REMEDIATION		226,590	33,990	13,030	21,890	2,720	2,980	301,200	
	S & A								60,240	
	SUBTOTAL								361,440	
	CONTINGENCY								86,500	
	TOTAL INCL OWNER COSTS								447,940	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02 REMEDIAL ACTION									
02 01 MOBILIZATION AND PREPATORY WORK									
02 01 01 MOB OF EQUIPMENT & PERSONNEL									
02 01 01 1 TRANSPORTATION									
02 01 01 1 01- Ph I, Equip Mob, Detailed List									
Ph I, Equip Mob, Detailed List		2,110	320	120	200	30	30	2,800	
02 01 01 1 02- Ph II, Equip Mob, Detailed List									
Ph II, Equip Mob, Detailed List		1,730	260	100	170	20	20	2,290	
TRANSPORTATION		3,840	580	220	370	50	50	5,100	
MOB OF EQUIPMENT & PERSONNEL		3,840	580	220	370	50	50	5,100	
02 01 03 SETUP/CONSTRUCT TEMP FACILITIES									
02 01 03 01 TRAILERS AND BUILDINGS									
02 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
TRAILERS AND BUILDINGS		2,850	430	160	280	30	40	3,790	
02 01 03 02 DECONTAMINATION FACILITIES									
02 01 03 02 01 Personnel Decon Facilities									
Personnel Decon Facilities	120.00 HR	3,420	510	200	330	40	50	4,550	37.88

		QUANTITY UOM	DIRECT	FOOH	MOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02 01 03 02 02	Equip/Vehicle Decon Facilities									
	DECONTAMINATION FACILITIES		3,420	510	200	330	40	50	4,550	
	SETUP/CONSTRUCT TEMP FACILITIES		6,270	940	360	610	80	80	8,330	
	MOBILIZATION AND PREPATORY WORK		10,110	1,520	580	980	120	130	13,430	
02 02	MONITOR, SAMPLE, TEST, ANALYSIS									
02 02 06	SAMPLING SOIL, SED & SOLID WASTE									
02 02 06 01	SURFACE SOIL									
02 02 06 01 01	PHASE I, Soil Sample									
02 02 06 01 01 01	Soil Sampling	20.00 EA	4,000	600	230	390	50	50	5,320	265.85
02 02 06 01 01 02	QA Report		1,500	230	90	140	20	20	1,990	
	PHASE I, Soil Sample	20.00 EA	5,500	830	320	530	70	70	7,310	365.55
02 02 06 01 02	PHASE II, Soil Sample									
02 02 06 01 02 01	Soil Sampling	20.00 EA	4,000	600	230	390	50	50	5,320	265.85
02 02 06 01 02 02	QA Report		1,500	230	90	140	20	20	1,990	
	PHASE II, Soil Sample	20.00 EA	5,500	830	320	530	70	70	7,310	365.55
	SURFACE SOIL		11,000	1,650	630	1,060	130	140	14,620	
	SAMPLING SOIL, SED & SOLID WASTE		11,000	1,650	630	1,060	130	140	14,620	
02 02 91	QA/Safety Monitoring									
02 02 91 01	QA/Safety Monitoring									
02 02 91 01 01	Safety and Quality Assurance									
	Safety and Quality Assurance	3.00 WK	15,600	2,340	900	1,510	190	210	20,740	6912.16

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	QA/Safety Monitoring		15,600	2,340	900	1,510	190	210	20,740	
	QA/Safety Monitoring		15,600	2,340	900	1,510	190	210	20,740	
	MONITOR, SAMPLE, TEST, ANALYSIS		26,600	3,990	1,530	2,570	320	350	35,360	
02 03	SITE WORK									
02 03 05	FENCING									
02 03 05 01	FENCING									
02 03 05 01 01	Temporary Fencing									
02 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	
02 08	SOLID WASTE COLLECT/CONTAINMENT									
02 08 01	EXCAVATION									
02 08 01 03	CONTAMINATED SOIL									
02 08 01 03 01	PHASE I, Excavate/Load PCB Soils									
02 08 01 03 01 01	Excavate/Load PCB Soils	350.00 CY	1,770	270	100	170	20	20	2,350	6.72
02 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
02 08 01 03 01 03	PPEquip, Modified Class D	3.00 DAY	2,310	350	130	220	30	30	3,070	1023.08
02 08 01 03 01 04	Plastic Cover, Excavation Area	350.00 SY	320	50	20	30	0	0	430	1.22
	PHASE I, Excavate/Load PCB Soils	230.00 CY	100,040	15,010	5,750	9,660	1,200	1,320	132,980	578.18
02 08 01 03 02	PHASE II,Excavate/Load PCB Soils									

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02 08 01 03 02 01	Excavate/Load PCB Soils	250.00 CY	1,260	190	70	120	20	20	1,680	6.72
02 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
02 08 01 03 02 03	PPEquip, Modified Class D	2.00 DAY	1,540	230	90	150	20	20	2,050	1023.08
02 08 01 03 02 04	Plastic Cover, Excavation Area	350.00 SY	320	50	20	30	0	0	430	1.22
	PHASE II,Excavate/Load PCB Soils	110.00 CY	71,110	10,670	4,090	6,870	850	940	94,530	859.32
02 08 01 03 03	Post Removal - Site Re-grading									
02 08 01 03 03 01	Site Re-grading	1.00 DAY	1,160	170	70	110	10	20	1,540	1544.73
	Post Removal - Site Re-grading		1,160	170	70	110	10	20	1,540	
	CONTAMINATED SOIL		172,310	25,850	9,910	16,650	2,070	2,270	229,050	
	EXCAVATION		172,310	25,850	9,910	16,650	2,070	2,270	229,050	
	SOLID WASTE COLLECT/CONTAINMENT		172,310	25,850	9,910	16,650	2,070	2,270	229,050	
02 21	DEMOBILIZATION									
02 21 04	DEMOB OF EQUIPMENT & PERSONNEL									
02 21 04 01	TRANSPORTATION									
02 21 04 01 01	PH I, Demob of equipment									
	PH I, Demob of equipment		7,580	1,140	440	730	90	100	10,070	
	TRANSPORTATION		7,580	1,140	440	730	90	100	10,070	
	DEMOB OF EQUIPMENT & PERSONNEL		7,580	1,140	440	730	90	100	10,070	
	DEMOBILIZATION		7,580	1,140	440	730	90	100	10,070	
	REMEDIAL ACTION		226,590	33,990	13,030	21,890	2,720	2,980	301,200	
	HANFORD: REMEDIATION		226,590	33,990	13,030	21,890	2,720	2,980	301,200	
	S & A								60,240	
	SUBTOTAL								361,440	
	CONTINGENCY								86,500	

	QUANTITY	UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
TOTAL INCL OWNER COSTS									447,940	

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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 Distributed Costs

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 8 Bond rates by GOLD.

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

02. REMEDIAL ACTION
02 01. MOBILIZATION AND PREPATORY WORK
02 01 01. MOB OF EQUIPMENT & PERSONNEL

02 01 01 1. TRANSPORTATION

02 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
USR AA <01505 8952 > Mob, Hot Water Blstr, 3,200 psi 100-mi Radius	1.00 EA	0.00	0.00 0	0.00 0	75.00 75	0.00 0	0.00 0	75.00 75	75.00

02 01. MOBILIZATION AND PREPATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
Ph I, Equip Mob, Detailed List					0	0	2,110	0	0	2,110	
02 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. The trailers are not re-mob'd, as it is assumed they are left in place for duration of work.											
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 8952 > Mob, Hot Water Blstr, 3,200 psi 100-mi Radius	1.00	EA		0.00	0.00 0	0.00 0	75.00 75	0.00 0	0.00 0	75.00 75	75.00
Ph II, Equip Mob, Detailed List					0	0	1,725	0	0	1,725	
TRANSPORTATION					0	0	3,835	0	0	3,835	
MOB OF EQUIPMENT & PERSONNEL					0	0	3,835	0	0	3,835	

02 01. MOBILIZATION AND PREPATORY WORK	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 01 03. SETUP/CONSTRUCT TEMP FACILITIES									
02 01 03 01. TRAILERS AND BUILDINGS									
02 01 03 01 01. Ph I, Office Trailers - 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.									
Ph I, Office Trailers - setup	100.00 HR		0	2,500	250	100	0	2,850	28.50
TRAILERS AND BUILDINGS			0	2,500	250	100	0	2,850	
02 01 03 02. DECONTAMINATION FACILITIES									
02 01 03 02 01. Personnel Decon Facilities Allow 120 mhrs for setup of the Personnel Decon Facilities, including equipment and site layout. An allowance for material & equip. is included.									
Personnel Decon Facilities	120.00 HR		0	3,000	300	120	0	3,420	28.50
02 01 03 02 02. Equip/Vehicle Decon Facilities A equipment/vehicle washdown facility has been costed in the Asbestos Cap estimate, and it will be used for all waste site decon. Decon water will be transported by a WHC truck to an on-site disposal area.									
Equip/Vehicle Decon Facilities			0	0	0	0	0	0	
DECONTAMINATION FACILITIES			0	3,000	300	120	0	3,420	
SETUP/CONSTRUCT TEMP FACILITIES			0	5,500	550	220	0	6,270	

02 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 02. MONITOR, SAMPLE, TEST, ANALYSIS											
02 02 06. SAMPLING SOIL, SED & SOLID WASTE											
02 02 06 01. SURFACE SOIL											
02 02 06 01 01. PHASE I, Soil Sample After the top 3 Ft of soil is removed, soil samples will be taken.											
02 02 06 01 01 01. Soil Sampling Sample on 15'x15' grid (16 samples) with analysis at off site lab for PCB only, with 7-day turnaround. Method 8080. Add 4 QA samples. Costs for analysis from the Corps North Pacific Division (CENPD) Laboratory.											
Soil Sampling	20.00	EA		0	0	0	0	0	4,000	4,000	200.00
02 02 06 01 01 02. QA Report Cost for QA Report from CENPD Laboratory.											
QA Report					0	0	0	0	1,500	1,500	
PHASE I, Soil Sample	20.00	EA			0	0	0	0	5,500	5,500	275.00
02 02 06 01 02. PHASE II, Soil Sample Another set of soil samples will be taken after the next 2 Ft soil layer is excavated.											
02 02 06 01 02 01. Soil Sampling Same as Phase I, with 7-day turnaround.											
Soil Sampling	20.00	EA			0	0	0	0	4,000	4,000	200.00
02 02 06 01 02 02. QA Report Same as Phase I.											
QA Report					0	0	0	0	1,500	1,500	
PHASE II, Soil Sample	20.00	EA			0	0	0	0	5,500	5,500	275.00
SURFACE SOIL					0	0	0	0	11,000	11,000	

02 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
SAMPLING SOIL, SED & SOLID WASTE					0	0	0	0	11,000	11,000	

02 02. MONITOR, SAMPLE, TEST, ANALYSIS	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 02 91. QA/Safety Monitoring									
02 02 91 01. QA/Safety Monitoring									
02 02 91 01 01. Safety and Quality Assurance									
Safety/QA crew:									
WHC HPT: $50/hr x 40hrs = $2,000									
COE Safety: $70/hr x 40hrs = $2,800									
COE Special Assist. QA: $50/hr x 8 hrs = $ 400									
Total cost/week $5,200									
The duration of this project is estimated at 3 weeks.									
Safety and Quality Assurance	3.00 WK		0	15,600	0	0	0	15,600	5200.00
QA/Safety Monitoring			0	15,600	0	0	0	15,600	
QA/Safety Monitoring			0	15,600	0	0	0	15,600	

02 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 03. SITE WORK											
02 03 05. FENCING											
02 03 05 01. FENCING											
02 03 05 01 01. Temporary Fencing											
02 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	
FENCING					0	2,000	1,000	5,000	2,000	10,000	

02 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 08. SOLID WASTE COLLECT/CONTAINMENT											
02 08 01. EXCAVATION											
02 08 01 03. CONTAMINATED SOIL											
02 08 01 03 01. PHASE I, Excavate/Load PCB Soils											
02 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	1.98 693	0.00 0	0.00 0	2.92 1,023	2.92
Excavate/Load PCB Soils	350.00	CY			33	886	883	0	0	1,768	5.05
02 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

02 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW	ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 08 01 03 01 03. PPEquip, Modified Class D												
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)						0.00	0.00	11.50	0.00	0.00	11.50	
	12.00	EA	N/A		0.00	0	0	138	0	0	138	11.50
M HTW AA <01951 5204 > Coveralls, Tyvek						0.00	0.00	0.00	7.55	0.00	7.55	
	12.00	EA	N/A		0.00	0	0	0	91	0	91	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves						0.00	0.00	2.30	0.00	0.00	2.30	
	12.00	PR	N/A		0.00	0	0	28	0	0	28	2.30
HTW AA <01951 5726 > Half-Mask Air Purifying Respirators						0.00	0.00	0.00	19.94	0.00	19.94	
	12.00	EA	N/A		0.00	0	0	0	239	0	239	19.94
USR AA <01957 3105 > Cold Water, Gasoline, 3200 psi, 4.2 gpm, 11 HP (Daily cost)						10.00	234.30	1.45	34.83	0.00	270.58	
	3.00	DAY	ULABA		0.13	30	703	4	104	0	812	270.58
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	
	3.00	DAY	N/A		0.00	0	0	0	81	0	81	26.95
HTW AA <01951 5723 > Cartridges, Respirator						0.00	0.00	0.00	25.87	0.00	25.87	
	24.00	EA	N/A		0.00	0	0	0	621	0	621	25.87
USR AA <01951 5805 > Disposal Allowance. Allow $100/day for disposal of personnel protection items and equipment/vehicle decon water.						0.00	0.00	0.00	0.00	100.00	100.00	
	3.00	DAY	N/A		0.00	0	0	0	0	300	300	100.00
PPEquip, Modified Class D	3.00	DAY				30	703	170	1,136	300	2,309	769.66
02 08 01 03 01 04. Plastic Cover, Excavation Area. A plastic cover will be placed over excavated area while waiting for sample results.												
B HTW AA <02082 7211 > Plastic Excavation Cover 6-mil visqueen; Area based on the quantity of excavation. Allow $0.50/SY for disposal.						0.01	0.15	0.00	0.27	0.50	0.92	
	350.00	SY	ULABC		555.56	2	52	0	94	175	321	0.92
Plastic Cover, Excavation Area	350.00	SY				2	52	0	94	175	321	0.92
PHASE I, Excavate/Load PCB Soils	230.00	CY				66	1,640	1,053	1,230	96,118	100,041	434.96

02 08. SOLID WASTE COLLECT/CONTAINMENT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 08 01 03 02. PHASE II,Excavate/Load PCB Soils											
02 08 01 03 02 01. Excavate/Load PCB Soils											
L USR AA <02220 0000 > Excavate next 2-feet of soil					0.06	1.59	0.54	0.00	0.00	2.13	
	250.00	CY	XXQNA	28.75	15	397	135	0	0	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					0.03	0.94	1.98	0.00	0.00	2.92	
	250.00	CY	XXQMG	28.75	9	236	495	0	0	731	2.92
Excavate/Load PCB Soils	250.00	CY			24	633	631	0	0	1,263	5.05
02 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					0.00	0.00	0.00	0.00	400.00	400.00	
	14.00	TRK		0.00	0	0	0	0	5,600	5,600	400.00
USR AA <02220 0000 > Disposal of soil in landfill					0.00	0.00	0.00	0.00	134.00	134.00	
	387.50	TON		0.00	0	0	0	0	51,925	51,925	134.00
USR AA <02220 0000 > Oregon state environmental tax					0.00	0.00	0.00	0.00	27.00	27.00	
	387.50	TON		0.00	0	0	0	0	10,463	10,463	27.00
Transport PCB Soils - Arlington	250.00	CY			0	0	0	0	67,988	67,988	271.95
02 08 01 03 02 03. PPEquip, Modified Class D											
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)					0.00	0.00	11.50	0.00	0.00	11.50	
	8.00	EA	N/A	0.00	0	0	92	0	0	92	11.50
M HTW AA <01951 5204 > Coveralls, Tyvek					0.00	0.00	0.00	7.55	0.00	7.55	
	8.00	EA	N/A	0.00	0	0	0	60	0	60	7.55
M HTW AA <01951 5501 > Butyl, Medium Weight, Gloves					0.00	0.00	2.30	0.00	0.00	2.30	
	8.00	PR	N/A	0.00	0	0	18	0	0	18	2.30

02 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	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
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
USR AA <01951 5805 > Disposal Allowance. Allow $100/day for disposal of personnel protection items and equipment/vehicle decon water.	2.00	DAY	N/A	0.00	0.00 0	0.00 0	0.00 0	0.00 0	100.00 200	100.00 200	100.00
PPEquip, Modified Class D	2.00	DAY			20	469	113	757	200	1,539	769.66
02 08 01 03 02 04. Plastic Cover, Excavation Area A plastic cover will be placed over excavated area while waiting for sample results.											
B HTW AA <02082 7211 > Plastic Excavation Cover 6-mil visqueen; Area based on the quantity of excavation. Allow $0.50/SY for disposal.	350.00	SY	ULABC	555.56	0.01 2	0.15 52	0.00 0	0.27 94	0.50 175	0.92 321	0.92
Plastic Cover, Excavation Area	350.00	SY			2	52	0	94	175	321	0.92
PHASE II,Excavate/Load PCB Soils	110.00	CY			46	1,153	744	852	68,363	71,111	646.47
02 08 01 03 03. Post Removal - Site Re-grading											
02 08 01 03 03 01. Site Re-grading Allow 1-day for site re-grading after site is certified clean.											
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

02 08. SOLID WASTE COLLECT/CONTAINMENT		QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
USR AA <02220 0000 >	Load crew			8.00	216.72	455.61	0.00	0.00	672.33	
	load in 28-ton dump trucks - DOT approved hazardeous waste hauler. assume 3,100lb/bcy	1.00 DAY XXQMG	0.13	8	217	456	0	0	672	672.33
	Site Re-grading	1.00 DAY		22	582	580	0	0	1,162	1162.09
	Post Removal - Site Re-grading			22	582	580	0	0	1,162	
	CONTAMINATED SOIL			134	3,375	2,378	2,082	164,480	172,314	
	EXCAVATION			134	3,375	2,378	2,082	164,480	172,314	

02 21. DEMOBILIZATION	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 21. DEMOBILIZATION									
02 21 04. DEMOB OF EQUIPMENT & PERSONNEL									
02 21 04 01. TRANSPORTATION									
02 21 04 01 01. PH I, Demob of equipment Allow 75% of Phase I & II equipment mobilization and site setup.									
PH I, Demob of equipment			0	0	7,575	0	0	7,575	
TRANSPORTATION			0	0	7,575	0	0	7,575	
DEMOB OF EQUIPMENT & PERSONNEL			0	0	7,575	0	0	7,575	
HANFORD: REMEDIATION			134	26,475	15,338	7,302	177,480	226,594	

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SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	COST	**** EQUIP **** HOURS	COST	TOTAL COST
	ULABA	1 B-laborer + Small Tools			PROD = 100%				CREW HOURS =	40
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
	ULABC	3 B-laborer + Small Tools			PROD = 100%				CREW HOURS =	1
MIL	B-LABORER L	Laborer (Semi-Skilled)	3.00	HR	23.33	3.00	69.99			69.99
MIL	B-LABORER F	Laborer (Semi-Skilled)	0.50	HR	23.83	0.50	11.92			11.92
MIL	XMIXX020 E	Small Tools	0.40	HR	1.39			0.40	0.56	0.56
	TOTAL					3.50	81.91	0.40	0.56	82.46
	XXQMG	1 X-eqoprmed + 1 Front End Ldr, 2-1/2 Cy, Wheel			PROD = 100%				CREW HOURS =	29
MIL	L40CA007 E	LDR,FE,WH, 5-1/4 CY ARTIC,980-C	1.00	HR	56.95			1.00	56.95	56.95
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	56.95	84.04
	XXQNA	1 X-eqoprmed + 1 Dozer, Cat D-38, 65 Hp			PROD = 100%				CREW HOURS =	29
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

Mon 14 Dec 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
** LABOR BACKUP **

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	54
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	65
MIL X-LABORER	Outside Laborer	23.33	0.0%	0.0%	0.00	0.00	23.33	HR	10/15/92	22.36	14

SRC EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	TOTAL UOM	** TOTAL ** HOURS
MIL L40CA007	LDR,FE,WH, 5-1/4 CY ARTIC,980-C	17.46	5.87	7.97	2.3	15.74	6.54	0.98	56.95 HR	29
MIL T10CA001	BLADE,POWER ANGLE TILT,FOR D3	0.75	0.22		0.0	0.82			1.87 HR	29
MIL T15CA003	DOZER,CWLR,D-3C,PS,(ADD BLADE)	3.51	1.14	2.14	0.7	6.14			13.70 HR	29
MIL XMIXX020	Small Tools	0.46	0.17	0.13	0.0	0.57			1.39 HR	6

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** PROJECT SETTINGS **

ESTIMATE TYPE : A-Crews with Auto Reprice

SALES TAX : 7.80%

DATE OF ESCALATION SCHEDULE : 10/01/93

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 : 3
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 Y 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		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 Y N N N 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							
02 REMEDIAL ACTION							
	S & A	P	20.00				
	CONTINGENCY	P	0.00				
02 01 MOBILIZATION AND PREPATORY WORK							
02 01 01 MOB OF EQUIPMENT & PERSONNEL							
02 01 01 1 TRANSPORTATION							
02 01 01 1 01- Ph I, Equip Mob, Detailed List							
	S & A	0					
	CONTINGENCY	P	20.00				
02 01 01 1 02- Ph II, Equip Mob, Detailed List							
	S & A	0					
	CONTINGENCY	P	20.00				
02 01 03 SETUP/CONSTRUCT TEMP FACILITIES							
02 01 03 01 TRAILERS AND BUILDINGS							
02 01 03 01 01 Ph I, Office Trailers - setup							
	S & A	0					
	CONTINGENCY	P	20.00				
02 01 03 02 DECONTAMINATION FACILITIES							
02 01 03 02 01 Personnel Decon Facilities							
	S & A	0					
	CONTINGENCY	P	20.00				
02 01 03 02 02 Equip/Vehicle Decon Facilities							
	S & A	0					
	CONTINGENCY	P	20.00				
02 02 MONITOR, SAMPLE, TEST, ANALYSIS							
02 02 06 SAMPLING SOIL, SED & SOLID WASTE							
02 02 06 01 SURFACE SOIL							
02 02 06 01 01 PHASE I, Soil Sample							
02 02 06 01 01 01 Soil Sampling							
	S & A	0					
	CONTINGENCY	P	20.00				
02 02 06 01 01 02 QA Report							
	S & A	0					
	CONTINGENCY	P	20.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
02 02 06 01	02 PHASE II, Soil Sample						
02 02 06 01 02	01 Soil Sampling						
	S & A	O					
	CONTINGENCY	P	20.00				
02 02 06 01 02	02 QA Report						
	S & A	O					
	CONTINGENCY	P	20.00				
02 02 91	QA/Safety Monitoring						
02 02 91 01	QA/Safety Monitoring						
02 02 91 01	01 Safety and Quality Assurance						
	S & A	O					
	CONTINGENCY	P	20.00				
02 03	SITE WORK						
02 03 05	FENCING						
02 03 05 01	FENCING						
02 03 05 01	01 Temporary Fencing						
02 03 05 01 01	01 Temporary Fencing - 6' Security						
	S & A	O					
	CONTINGENCY	P	20.00				
02 08	SOLID WASTE COLLECT/CONTAINMENT						
02 08 01	EXCAVATION						
02 08 01 03	CONTAMINATED SOIL						
02 08 01 03	01 PHASE 1, Excavate/Load PCB Soils						
02 08 01 03 01	01 Excavate/Load PCB Soils						
	S & A	O					
	CONTINGENCY	P	40.00				
02 08 01 03 01	02 Transport PCB Soils - Arlington						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03 01	03 PPEquip, Modified Class D						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03 01	04 Plastic Cover, Excavation Area						
	S & A	O					
	CONTINGENCY	O					

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
02 08 01 03	02 PHASE II,Excavate/Load PCB Soils						
02 08 01 03	02 01 Excavate/Load PCB Soils						
	S & A	O					
	CONTINGENCY	P	40.00				
02 08 01 03	02 02 Transport PCB Soils - Arlington						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03	02 03 PPEquip, Modified Class D						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 01 03	02 04 Plastic Cover, Excavation Area						
	S & A	O					
	CONTINGENCY	O					
02 08 01 03	03 Post Removal - Site Re-grading						
02 08 01 03	03 01 Site Re-grading						
	S & A	O					
	CONTINGENCY	P	25.00				
02 21	DEMOBILIZATION						
02 21 04	DEMOB OF EQUIPMENT & PERSONNEL						
02 21 04 01	TRANSPORTATION						
02 21 04 01	01 PH I, Demob of equipment						
	S & A	O					
	CONTINGENCY	P	20.00				

N-90

DOE/RL-92-67

** 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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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:
Estimated By:

Prepared By: USACE/CENPW COST ENGR BRANCH

Date: 12/11/92
Est Construction Time: 180 Days

HANFORD: 1.4.10.1.1.23.2 1100-EM-1 Alternative Estimates

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, "02", 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 FY 93. S & A is estimated at 20%, and consists of NPW's Project Management @ 5%, Construction Management @ 10%, and Engineering During Construction @ 5%. See Contingency Notes (Title Page 3) for explanation of Contingency percentages. Contingency was applied at Level 5/6 in the estimate, to allow use of different percentages for the various types of work (see Settings for which percentage was applied). See Detail Page 1 for explanation of Contractor Indirect percentages used. E&D and Escalation will be added by the NPW-Hanford Project Manager.

Horn Rapids landfill, WAC Cap

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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* * * END TABLE OF CONTENTS * * *

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 2 (Rounded to 1000's) **

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02	REMEDIAL ACTIONS							
02 01	MOBILIZATION & PREPARATORY WORK		15,000	3,000	4,000	22,000		
02 02	MONITOR, SAMPLE, TEST, ANALYSIS		172,000	34,000	41,000	248,000		
02 03	SITE WORK		193,000	39,000	46,000	277,000		
02 08	SOLID WASTE COLLECTION/CONTAINMT		3,141,000	628,000	1,112,000	4,880,000		
02 21	DEMOBILIZATION		12,000	2,000	3,000	17,000		
	REMEDIAL ACTIONS		3,532,000	706,000	1,206,000	5,445,000		
	HANFORD: REMEDIATION		3,532,000	706,000	1,206,000	5,445,000		

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
02 REMEDIAL ACTIONS							
02 01 MOBILIZATION & PREPARATORY WORK							
02 01 01 MOB OF EQUIPMENT AND FACILITIES							
02 01 01 1 TRANSPORTATION							
02 01 01 1 01 Equipment Mob, Detailed List							
Equipment Mob, Detailed List		7,900	1,580	1,900	11,370		1
TRANSPORTATION		7,900	1,580	1,900	11,370		
MOB OF EQUIPMENT AND FACILITIES		7,900	1,580	1,900	11,370		
02 01 04 SETUP/CONSTRUCT TEMP FACILITIES							
02 01 04 01 TRAILERS AND BUILDINGS							
02 01 04 01 01 Assembly and Setup							
02 01 04 01 01 01 Assembly and Setup	100.00 HR	3,780	760	2,270	6,800	67.99	2
Assembly and Setup		3,780	760	2,270	6,800		2
TRAILERS AND BUILDINGS		3,780	760	2,270	6,800		
02 01 04 02 DECONTAMINATION FACILITIES							
02 01 04 02 01 Personnel Decon Facilities							
02 01 04 02 01 01 Personnel Decon Facilities	80.00 HR	3,020	600	0	3,630	45.32	
Personnel Decon Facilities		3,020	600	0	3,630		
02 01 04 02 02 Equip/Vehicle Decon Facilities							
DECONTAMINATION FACILITIES		3,020	600	0	3,630		

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	SETUP/CONSTRUCT TEMP FACILITIES		6,800	1,360	2,270	10,420		
	MOBILIZATION & PREPARATORY WORK		14,700	2,940	4,160	21,800		
02 02	MONITOR, SAMPLE, TEST, ANALYSIS							
02 02 91	QA/Safety Monitoring							
02 02 91 01	QA/Safety Monitoring							
02 02 91 01 01	QA/Safety Monitoring							
02 02 91 01 01 01	QA/Safety Monitoring	25.00 WK	172,290	34,460	41,350	248,090	9923.62	1
	QA/Safety Monitoring		172,290	34,460	41,350	248,090		
	QA/Safety Monitoring		172,290	34,460	41,350	248,090		
	QA/Safety Monitoring		172,290	34,460	41,350	248,090		
	MONITOR, SAMPLE, TEST, ANALYSIS		172,290	34,460	41,350	248,090		
02 03	SITE WORK							
02 03 05	FENCING (& MISC)							
02 03 05 1	FENCING							
02 03 05 1 01	6' Security Perimeter Fencing							
	6' Security Perimeter Fencing	6000.00 LF	159,030	31,810	38,170	229,010	38.17	1
	FENCING	6000.00 LF	159,030	31,810	38,170	229,010	38.17	
02 03 05 2	MISCELLANEOUS IMPROVEMENTS							
02 03 05 2 01	Warning Signs							
	Warning Signs		450	90	80	620		1

		QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
	MISCELLANEOUS IMPROVEMENTS		450	90	80	620		
02 03 05 3	LANDSCAPING & TURFING							
02 03 05 3 01	Dryland Grass							
	Dryland Grass	25.00 ACR	33,130	6,630	7,950	47,710	1908.39	1
	LANDSCAPING & TURFING	25.00 ACR	33,130	6,630	7,950	47,710	1908.39	
	FENCING (& MISC)		192,610	38,520	46,200	277,330		
	SITE WORK		192,610	38,520	46,200	277,330		
02 08	SOLID WASTE COLLECTION/CONTAINMT							
02 08 05	CAPPING CONTAMINATED AREAS							
02 08 05 1	CAP CONSTRUCTION							
02 08 05 1 01	WAC Cap							
02 08 05 1 01 01	Random Fill - 1st 6"	15000.00 CY	190,840	38,170	80,150	309,160	20.61	3
02 08 05 1 01 02	Random Fill - Next 3.25'	98000.00 CY	1,219,230	243,850	438,920	1,902,000	19.41	3
02 08 05 1 01 03	6" Fine Grain Membrane Bedding	17000.00 CY	292,200	58,440	105,190	455,830	26.81	3
02 08 05 1 01 04	50-mil Geomembrane	105000.00 SY	928,040	185,610	278,410	1,392,060	13.26	1
02 08 05 1 01 05	Top Soil - 6"	20000.00 CY	464,780	92,960	195,210	752,950	37.65	3
02 08 05 1 01 06	Class D - PPEquip	10.00 DAY	16,880	3,380	5,060	25,320	2532.05	1
	WAC Cap	121000.00 SY	3,111,970	622,390	1,102,950	4,837,310	39.98	
	CAP CONSTRUCTION		3,111,970	622,390	1,102,950	4,837,310		
02 08 05 2	LEACHATE COLLECTION							
02 08 05 2 01	Leachate Collection System							
02 08 05 2 01 01	4" Perforated Drain Pipe	2750.00 LF	22,120	4,420	6,640	33,180	12.06	1
02 08 05 2 01 02	4" Collection Pipe	200.00 LF	1,450	290	440	2,180	10.91	1
02 08 05 2 01 03	Drywells - 48" D, perf manholes	4.00 EA	5,130	1,030	1,540	7,700	1923.78	1

	QUANTITY UOM	CONTRACT	S & A	CONTG	TOTAL COST	UNIT COST	NOTES
Leachate Collection System		28,700	5,740	8,610	43,050		
LEACHATE COLLECTION		28,700	5,740	8,610	43,050		
CAPPING CONTAMINATED AREAS		3,140,670	628,130	1,111,560	4,880,370		
SOLID WASTE COLLECTION/CONTAINMT		3,140,670	628,130	1,111,560	4,880,370		
02 21 DEMOBILIZATION							
02 21 04 DEMOB OF EQUIPMENT & FACILITIES							
02 21 04 01 TRANSPORTATION							
02 21 04 01 01 DEMOBILIZATION							
02 21 04 01 01 01 DEMOBILIZATION		11,930	2,390	2,860	17,180		1
DEMOBILIZATION		11,930	2,390	2,860	17,180		
TRANSPORTATION		11,930	2,390	2,860	17,180		
DEMOB OF EQUIPMENT & FACILITIES		11,930	2,390	2,860	17,180		
DEMOBILIZATION		11,930	2,390	2,860	17,180		
REMEDIAL ACTIONS		3,532,190	706,440	1,206,130	5,444,770		
HANFORD: REMEDIATION		3,532,190	706,440	1,206,130	5,444,770		

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02	REMEDIAL ACTIONS									
02 01	MOBILIZATION & PREPARATORY WORK		11,090	1,660	640	1,070	90	150	14,700	
02 02	MONITOR, SAMPLE, TEST, ANALYSIS		130,000	19,500	7,470	12,560	1,050	1,710	172,290	
02 03	SITE WORK		145,340	21,800	8,360	14,040	1,170	1,910	192,610	
02 08	SOLID WASTE COLLECTION/CONTAINMT		2,369,840	355,480	136,270	228,930	19,070	31,100	3,140,670	
02 21	DEMOBILIZATION		9,000	1,350	520	870	70	120	11,930	
	REMEDIAL ACTIONS		2,665,260	399,790	153,250	257,460	21,450	34,970	3,532,190	
	HANFORD: REMEDIATION		2,665,260	399,790	153,250	257,460	21,450	34,970	3,532,190	
	S & A								706,440	
	SUBTOTAL								4,238,630	
	CONTINGENCY								1,206,130	
	TOTAL INCL OWNER COSTS								5,444,770	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
02 REMEDIAL ACTIONS									
02 01 MOBILIZATION & PREPARATORY WORK									
02 01 01 MOB OF EQUIPMENT AND FACILITIES									
02 01 01 1 TRANSPORTATION									
02 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	
02 01 04 SETUP/CONSTRUCT TEMP FACILITIES									
02 01 04 01 TRAILERS AND BUILDINGS									
02 01 04 01 01 Assembly and Setup									
02 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	
02 01 04 02 DECONTAMINATION FACILITIES									
02 01 04 02 01 Personnel Decon Facilities									
02 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	
02 01 04 02 02 Equip/Vehicle Decon Facilities									
DECONTAMINATION FACILITIES		2,280	340	130	220	20	30	3,020	

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
SETUP/CONSTRUCT TEMP FACILITIES		5,130	770	290	500	40	70	6,800	
MOBILIZATION & PREPARATORY WORK		11,090	1,660	640	1,070	90	150	14,700	
02 02 MONITOR, SAMPLE, TEST, ANALYSIS									
02 02 91 QA/Safety Monitoring									
02 02 91 01 QA/Safety Monitoring									
02 02 91 01 01 QA/Safety Monitoring									
02 02 91 01 01 01 QA/Safety Monitoring	25.00 WK	130,000	19,500	7,470	12,560	1,050	1,710	172,290	6891.40
QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,290	
QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,290	
QA/Safety Monitoring		130,000	19,500	7,470	12,560	1,050	1,710	172,290	
MONITOR, SAMPLE, TEST, ANALYSIS		130,000	19,500	7,470	12,560	1,050	1,710	172,290	
02 03 SITE WORK									
02 03 05 FENCING (& MISC)									
02 03 05 1 FENCING									
02 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
02 03 05 2 MISCELLANEOUS IMPROVEMENTS									
02 03 05 2 01 Warning Signs									
Warning Signs		340	50	20	30	0	0	450	

		QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
	MISCELLANEOUS IMPROVEMENTS		340	50	20	30	0	0	450	
02 03 05 3	LANDSCAPING & TURFING									
02 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	
02 08	SOLID WASTE COLLECTION/CONTAINMT									
02 08 05	CAPPING CONTAMINATED AREAS									
02 08 05 1	CAP CONSTRUCTION									
02 08 05 1 01	WAC Cap									
02 08 05 1 01 01	Random Fill - 1st 6"	15000.00 CY	144,000	21,600	8,280	13,910	1,160	1,890	190,840	12.72
02 08 05 1 01 02	Random Fill - Next 3.25'	98000.00 CY	919,990	138,000	52,900	88,870	7,400	12,070	1,219,230	12.44
02 08 05 1 01 03	6" Fine Grain Membrane Bedding	17000.00 CY	220,480	33,070	12,680	21,300	1,770	2,890	292,200	17.19
02 08 05 1 01 04	50-mil Geomembrane	105000.00 SY	700,260	105,040	40,270	67,650	5,640	9,190	928,040	8.84
02 08 05 1 01 05	Top Soil - 6"	20000.00 CY	350,710	52,610	20,170	33,880	2,820	4,600	464,780	23.24
02 08 05 1 01 06	Class D - PPEquip	10.00 DAY	12,740	1,910	730	1,230	100	170	16,880	1688.03
	WAC Cap	121000.00 SY	2,348,180	352,230	135,020	226,830	18,900	30,810	3,111,970	25.72
	CAP CONSTRUCTION		2,348,180	352,230	135,020	226,830	18,900	30,810	3,111,970	
02 08 05 2	LEACHATE COLLECTION									
02 08 05 2 01	Leachate Collection System									
02 08 05 2 01 01	4" Perforated Drain Pipe	2750.00 LF	16,690	2,500	960	1,610	130	220	22,120	8.04
02 08 05 2 01 02	4" Collection Pipe	200.00 LF	1,100	160	60	110	10	10	1,450	7.27
02 08 05 2 01 03	Drywells - 48" D, perf manholes	4.00 EA	3,870	580	220	370	30	50	5,130	1282.52

	QUANTITY UOM	DIRECT	FOOH	HOOH	PROF	BOND	B&O TAX	TOTAL COST	UNIT COST
Leachate Collection System		21,660	3,250	1,250	2,090	170	280	28,700	
LEACHATE COLLECTION		21,660	3,250	1,250	2,090	170	280	28,700	
CAPPING CONTAMINATED AREAS		2,369,840	355,480	136,270	228,930	19,070	31,100	3,140,670	
SOLID WASTE COLLECTION/CONTAINMT		2,369,840	355,480	136,270	228,930	19,070	31,100	3,140,670	
02 21 DEMOBILIZATION									
02 21 04 DEMOB OF EQUIPMENT & FACILITIES									
02 21 04 01 TRANSPORTATION									
02 21 04 01 01 DEMOBILIZATION									
02 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		2,665,260	399,790	153,250	257,460	21,450	34,970	3,532,190	
HANFORD: REMEDIATION		2,665,260	399,790	153,250	257,460	21,450	34,970	3,532,190	
S & A								706,440	
SUBTOTAL								4,238,630	
CONTINGENCY								1,206,130	
TOTAL INCL OWNER COSTS								5,444,770	

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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 Distributed Costs

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

O 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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02. REMEDIAL ACTIONS
02 01. MOBILIZATION & PREPARATORY WORK
02 01 01. MOB OF EQUIPMENT AND FACILITIES

02 01 01 1. TRANSPORTATION

02 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

02 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					0.00	0.00	125.00	0.00	0.00	125.00	
w/CLT8000 Trk, 100-mi Radius	12.00	EA		0.00	0	0	1,500	0	0	1,500	125.00
USR AA <01505 7131 > Mob, Water Tank, 3,000 Gal,					0.00	0.00	150.00	0.00	0.00	150.00	
Mtd/FT800 Trk, 100-mi Radius	1.00	EA		0.00	0	0	150	0	0	150	150.00
USR AA <01505 8921 > Mob, Decontamination Trailer,					0.00	0.00	135.00	0.00	0.00	135.00	
w/25,000 GVW Trk, 100-mi Radius	1.00	EA		0.00	0	0	135	0	0	135	135.00
M CIV AA <01500 1101 > Mob - Field Office Trailer					0.00	0.00	250.00	0.00	0.00	250.00	
	1.00	EA	N/A	0.00	0	0	250	0	0	250	250.00
Equipment Mob, Detailed List					0	0	5,960	0	0	5,960	
TRANSPORTATION					0	0	5,960	0	0	5,960	
MOB OF EQUIPMENT AND FACILITIES					0	0	5,960	0	0	5,960	

02 01. MOBILIZATION & PREPARATORY WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 01 04. SETUP/CONSTRUCT TEMP FACILITIES											
02 01 04 01. TRAILERS AND BUILDINGS											
02 01 04 01 01. Assembly and Setup											
02 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	
02 01 04 02. DECONTAMINATION FACILITIES											
02 01 04 02 01. Personnel Decon Facilities											
02 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	
02 01 04 02 02. Equip/Vehicle Decon Facilities Equipment/Vehicle Decon Facility costed in the Asbestos Cap estimate.											
Equip/Vehicle Decon Facilities					0	0	0	0	0	0	
DECONTAMINATION FACILITIES					0	2,000	200	80	0	2,280	
SETUP/CONSTRUCT TEMP FACILITIES					0	4,500	450	180	0	5,130	

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

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

02 02 91 01. QA/Safety Monitoring

02 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.

02 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	
QA/Safety Monitoring			0	130,000	0	0	0	130,000	

02 03. SITE WORK	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 03. SITE WORK											
02 03 05. FENCING (& MISC)											
02 03 05 1. FENCING											
02 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
02 03 05 2. MISCELLANEOUS IMPROVEMENTS											
02 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	
02 03 05 3. LANDSCAPING & TURFING											
02 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
FENCING (& MISC)					780	47,535	21,250	76,552	0	145,337	

02 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 08. SOLID WASTE COLLECTION/CONTAINMT									
02 08 05. CAPPING CONTAMINATED AREAS									
02 08 05 1. CAP CONSTRUCTION									
02 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.									
02 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	0.51 9,178	0.59 10,649	0.00 0	0.00 0	1.10 19,827	1.10
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	1.23 22,055	1.51 27,110	3.77 67,914	0.00 0	6.50 117,079	6.50
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	0.15 2,641	0.25 4,451	0.00 0	0.00 0	0.39 7,092	0.39
Random Fill - 1st 6"	15000 CY		1,294	33,874	42,210	67,914	0	143,998	9.60

02 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 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	0.51 58,639	0.59 68,034	0.00 0	0.00 0	1.10 126,673	1.10
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	1.23 140,910	1.51 173,202	3.77 433,895	0.00 0	6.50 748,006	6.50
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	0.15 16,871	0.25 28,440	0.00 0	0.00 0	0.39 45,310	0.39
Random Fill - Next 3.25'	98000 CY		8,269	216,419	269,675	433,895	0	919,989	9.39
02 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	0.51 9,433	0.59 10,945	0.00 0	0.00 0	1.10 20,378	1.10
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	1.23 22,668	1.51 27,863	8.09 149,573	0.00 0	10.82 200,103	10.82
6" Fine Grain Membrane Bedding	17000 CY		1,228	32,101	38,807	149,573	0	220,481	12.97

02 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY UOM CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 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 Q: 105,000 SY, no overlap, so add 5% == 110,250 SY	110250 SY ZHANC03	165.00	0.06 6,681	1.47 162,431	0.30 32,722	4.58 505,110	0.00 0	6.35 700,264	6.35
50-mil Geomembrane	105000 SY		6,681	162,431	32,722	505,110	0	700,264	6.67
02 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 Q: 20,000 CY, use 1.2 swell factor == 24,000 LCY.	24000 LCY ZHANC01	275.00	0.02 458	0.51 12,238	0.59 14,198	0.00 0	0.00 0	1.10 26,436	1.10
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	1.23 29,407	1.51 36,146	10.78 258,720	0.00 0	13.51 324,274	13.51
Top Soil - 6"	20000 CY		1,594	41,645	50,345	258,720	0	350,710	17.54
02 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	40.00 PR N/A	0.00	0.00 0	0.00 0	5.25 210	0.00 0	0.00 0	5.25 210	5.25
M HTW AA <01951 5202 > Boot Covers, Tyvek (Bag Of 10Pr)	40.00 EA N/A	0.00	0.00 0	0.00 0	11.50 460	0.00 0	0.00 0	11.50 460	11.50
M HTW AA <01951 5303 > Basic Level B Suit (Lg)	40.00 EA N/A	0.00	0.00 0	0.00 0	175.00 7,000	0.00 0	0.00 0	175.00 7,000	175.00

02 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	234.30	1.45	34.83	0.00	270.58	
	10.00	DAY	ULABA	0.13	100	2,343	14	348	0	2,706	270.58
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
USR AA <01957 5805 > Disposal Allowance Allow $100/day for disposal of personnel protection items and equipment decon water.					0.00	0.00	0.00	0.00	100.00	100.00	
	10.00	DAY	N/A	0.00	0	0	0	0	1,000	1,000	100.00
Class D - PPEquip	10.00	DAY			100	2,343	8,776	618	1,000	12,737	1273.73
WAC Cap	121000	SY			19,166	488,813	442,536	1,415,830	1,000	2,348,179	19.41
CAP CONSTRUCTION					19,166	488,813	442,536	1,415,830	1,000	2,348,179	
02 08 05 2. LEACHATE COLLECTION											
02 08 05 2 01. Leachate Collection System											
02 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					0.02	0.41	0.12	0.00	0.00	0.52	
	650.00	LCY	CODEG	100.00	10	264	76	0	0	340	0.52
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					0.05	1.35	0.39	16.17	0.00	17.91	
	165.00	LCY	CODEG	30.00	8	223	64	2,668	0	2,955	17.91
USR AA <02082 1312 > 4" D, Sch 40, 2-4 rows of slots					0.08	1.95	0.01	2.05	0.00	4.01	
	2750.00	LF	ULABD	40.00	224	5,358	41	5,633	0	11,031	4.01

02 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	500.00	LCY	CODEG	35.00	0.04 21	1.16 579	0.33 167	0.00 0	0.00 0	1.49 746	1.49
L MIL AA <02221 7002 > Compaction, 6" Layers, Vib Plate (15cm) Layers	665.00	CY	CLACC	30.00	0.10 67	2.35 1,563	0.08 54	0.00 0	0.00 0	2.43 1,617	2.43
4" Perforated Drain Pipe	2750.00	LF			330	7,986	403	8,301	0	16,690	6.07
02 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	0.41 18	0.12 5	0.00 0	0.00 0	0.52 24	0.52
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	1.35 15	0.39 4	16.17 178	0.00 0	17.91 197	17.91
L USR AA <02082 1415 > 4" D, PVC, Sdr 21, collection	200.00	LF	ULABD	35.00	0.09 19	2.23 445	0.02 3	1.35 270	0.00 0	3.59 718	3.59
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	1.16 38	0.33 11	0.00 0	0.00 0	1.49 49	1.49
L MIL AA <02221 7002 > Compaction, 6" Layers, Vib Plate (15cm) Layers	45.00	CY	CLACC	30.00	0.10 5	2.35 106	0.08 4	0.00 0	0.00 0	2.43 109	2.43
4" Collection Pipe	200.00	LF			26	622	28	447	0	1,097	5.49
02 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	77.93 312	0.60 2	209.13 837	0.00 0	287.66 1,151	287.66
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	38.96 312	0.30 2	125.05 1,000	0.00 0	164.31 1,314	164.31

02 08. SOLID WASTE COLLECTION/CONTAINMT	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
HTW AA <02082 1613 > 3.25 Ft High Upper Unit, with steps - 4 Ft Dia	4.00	EA	ULABD	1.00	3.25 13	77.93 312	0.60 2	187.57 750	0.00 0	266.10 1,064	266.10
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	1.62 78	0.47 22	0.00 0	0.00 0	2.09 100	2.09
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	2.53 5	0.73 1	16.17 32	0.00 0	19.44 39	19.44
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	1.62 32	0.47 9	0.00 0	0.00 0	2.09 42	2.09
L MIL AA <02221 7002 > Compaction, 6" Layers, Vib Plate (15cm) Layers	22.00	CY	CLACC	10.00	0.30 7	7.05 155	0.25 5	0.00 0	0.00 0	7.29 160	7.29
Drywells - 48" D, perf manholes	4.00	EA			50	1,206	46	2,620	0	3,871	967.74
Leachate Collection System					405	9,814	476	11,368	0	21,658	
LEACHATE COLLECTION					405	9,814	476	11,368	0	21,658	
CAPPING CONTAMINATED AREAS					19,571	498,627	443,012	1,427,197	1,000	2,369,837	

02 21. DEMOBILIZATION	QUANTY	UOM	CREW ID	OUTPUT	MHRS	LABR	EQUIP	MAT	OTHER	TOTAL COST	UNIT COST
02 21. DEMOBILIZATION											
02 21 04. DEMOB OF EQUIPMENT & FACILITIES											
02 21 04 01. TRANSPORTATION											
02 21 04 01 01. DEMOBILIZATION											
02 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	
DEMOB OF EQUIPMENT & FACILITIES					0	0	9,000	0	0	9,000	
HANFORD: REMEDIATION					20,351	680,662	479,672	1,503,929	1,000	2,665,263	

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	COST	**** EQUIP **** HOURS	COST	TOTAL COST
	CLACC	3 B-laborer + 1 Hand Vibrating Compactor, 4 Hp	PROD = 100%						CREW HOURS =	26
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00	HR	23.83	1.00	23.83			23.83
MIL	B-LABORER L	Laborer (Semi-Skilled)	2.00	HR	23.33	2.00	46.66			46.66
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	70.49	1.23	2.46	72.95
	CODEG	1 B-eqoprmed + 1 Backhoe Loader, 55 Hp	PROD = 100%						CREW HOURS =	31
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50	HR	23.33	0.50	11.67			11.67
MIL	B-EQOPRMEDF	Eq Oper, Medium	1.00	HR	28.89	1.00	28.89			28.89
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	40.56	1.00	11.69	52.25
	CODLL	1 B-eqoprmed + 1 Front End Ldr, 7 Cy, Wheel Mtd	PROD = 100%						CREW HOURS =	484
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50	HR	23.33	0.50	11.67			11.67
MIL	B-EQOPRCRNL	Eq Oper, Crane/Shovl	1.00	HR	28.67	1.00	28.67			28.67
MIL	L40F1008 E	LDR,FE,WH,7.00CY 4WD ARTIC PWSH	1.00	HR	68.00			1.00	68.00	68.00
	TOTAL					1.50	40.34	1.00	68.00	108.34
	ULABA	1 B-laborer + Small Tools	PROD = 100%						CREW HOURS =	80
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
	ULABD	2 B-skillwkr + Small Tools	PROD = 100%						CREW HOURS =	86
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	23.33	1.00	23.33			23.33
MIL	B-SKILLWKRL	Skilled Worker	2.00	HR	24.21	2.00	48.42			48.42
MIL	B-SKILLWKRF	Skilled Worker	0.25	HR	24.71	0.25	6.18			6.18
MIL	XMIXX020 E	Small Tools	0.43	HR	1.39			0.43	0.60	0.60
	TOTAL					3.25	77.93	0.43	0.60	78.53
	ZHANC01	Mat Distr Crew: D8 Dozer + 14G Grader + Water Tk	PROD = 100%						CREW HOURS =	638
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	T50F0015 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	28.67	1.00	28.67			28.67
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00	HR	28.39	1.00	28.39			28.39
MIL	B-EQOPROILL	Eq Oper, Oilers	1.00	HR	26.15	1.00	26.15			26.15
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	23.33	1.00	23.33			23.33

MIL	B-TRKDVRHVL Truck Drivers, Heavy	1.00 HR	26.39	1.00	26.39			26.39
USR	B-EQOPRCRNF Eq Oper, Crane/Shovl	0.25 HR	29.17	0.25	7.29			7.29
	TOTAL			5.25	140.22	7.00	162.70	302.92

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 =	638
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	26.39	11.00	290.29			290.29
MIL *	B-LABORER	L	Laborer (Semi-Skilled)	2.00	HR	23.33	2.00	46.66			46.66
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	336.95	25.00	414.19	751.14
	ZHANC03		Skilled Laborers + 3T Flatbed + 22 Ton Hydr Crn			PROD = 100%				CREW HOURS =	668
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	23.33	6.00	139.98			139.98
MIL *	B-SKILLWKRL		Skilled Worker	1.00	HR	24.21	1.00	24.21			24.21
USR	B-SKILLWKRF		Skilled Worker	1.00	HR	24.71	1.00	24.71			24.71
MIL	B-EQOPRMEDL		Eq Oper, Medium	1.00	HR	28.39	1.00	28.39			28.39
MIL	B-TRKDVRLTL		Truck Drivers, Light	1.00	HR	25.81	1.00	25.81			25.81
	TOTAL						10.00	243.10	5.00	48.97	292.07

Fri 11 Dec 1992

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
** LABOR BACKUP **

TIME 10:39:43

SRC	LABOR ID	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	UOM	UPDATE	**** TOTAL **** DEFAULT	HOURS
MIL	B-EQOPRCRN	Equipment Operator, Crane/Shovel	28.67	0.0%	0.0%	0.00	0.00	28.67	HR	10/15/92	27.59	1281
MIL	B-EQOPRMED	Equipment Operator, Medium	28.39	0.0%	0.0%	0.00	0.00	28.39	HR	10/15/92	26.13	1337
MIL	B-EQOPROIL	Equipment Operator, Oilers	26.15	0.0%	0.0%	0.00	0.00	26.15	HR	10/15/92	24.49	638
MIL	B-LABORER	Laborer/Helper	23.33	0.0%	0.0%	0.00	0.00	23.33	HR	10/15/92	22.36	6445
MIL	B-SKILLWKR	Skilled Worker	24.21	0.0%	0.0%	0.00	0.00	24.21	HR	10/15/92	23.23	1531
MIL	B-TRKDVRHV	Truck Drivers, Heavy	26.39	0.0%	0.0%	0.00	0.00	26.39	HR	10/15/92	25.61	7658
MIL	B-TRKDVRLT	Truck Drivers, Light	25.81	0.0%	0.0%	0.00	0.00	25.81	HR	10/15/92	26.37	668

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	26
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	668
MIL G15CA005	GRADER,MOTOR,CAT14-G, ARTIC	13.24	5.29	5.41	1.8	13.62	1.47	0.22	41.08 HR	638
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	484
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	31
MIL R40HY004	ROLL,VIB,TOWED,STL,PAD,58"D,60"W	3.76	0.90	1.48	0.4	4.02			10.62 HR	638
MIL T10CA017	BLADE, UNIVERSAL,HYDR,FOR D8	2.97	0.87		0.1	3.23			7.20 HR	638
MIL T15CA015	DOZER,CWLR,CAT D-8L, (ADD BLADE)	22.47	6.58	10.71	3.0	30.53			73.29 HR	638
MIL T40XX012	TRUCK OPT,FLATBED, 8' x 9.0'	0.24	0.06			0.20			0.49 HR	668
MIL T40XX033	WATER TANK, 3000 GAL (ADD TRUCK)	1.52	0.37			1.26			3.15 HR	638
MIL T45XX003	TRK TRLR,BOTTOM DUMP, 30CY,30T	2.85	0.82		0.0	2.61	0.64	0.10	7.11 HR	6382
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	668
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	638
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	6382
MIL XMIXX020	Small Tools	0.46	0.17	0.13	0.0	0.57			1.39 HR	2666

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** PROJECT SETTINGS **

ESTIMATE TYPE : A-Crews with Auto Reprice

SALES TAX : 7.80%

DATE OF ESCALATION SCHEDULE : 10/01/93

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 : 3
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 Y 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	Y	N	N	N	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							
02 REMEDIAL ACTIONS							
	S & A	P	20.00				
	CONTINGENCY	P	0.00				
02 01 MOBILIZATION & PREPARATORY WORK							
02 01 01 MOB OF EQUIPMENT AND FACILITIES							
02 01 01 1 TRANSPORTATION							
02 01 01 1 01 Equipment Mob, Detailed List							
	S & A	O					
	CONTINGENCY	P	20.00				
02 01 04 SETUP/CONSTRUCT TEMP FACILITIES							
02 01 04 01 TRAILERS AND BUILDINGS							
02 01 04 01 01 Assembly and Setup							
02 01 04 01 01 01 Assembly and Setup							
	S & A	O					
	CONTINGENCY	P	50.00				
02 01 04 02 DECONTAMINATION FACILITIES							
02 01 04 02 01 Personnel Decon Facilities							
02 01 04 02 01 01 Personnel Decon Facilities							
	S & A	O					
	CONTINGENCY	O					
02 01 04 02 02 Equip/Vehicle Decon Facilities							
	S & A	O					
	CONTINGENCY	O					
02 02 MONITOR, SAMPLE, TEST, ANALYSIS							
02 02 91 QA/Safety Monitoring							
02 02 91 01 QA/Safety Monitoring							
02 02 91 01 01 QA/Safety Monitoring							
02 02 91 01 01 01 QA/Safety Monitoring							
	S & A	O					
	CONTINGENCY	P	20.00				
02 03 SITE WORK							
02 03 05 FENCING (& MISC)							
02 03 05 1 FENCING							
02 03 05 1 01 6' Security Perimeter Fencing							
	S & A	O					
	CONTINGENCY	P	20.00				

** OWNER SETTINGS **

		AMOUNT	PERCENT	*ESCALATN DATE* BEGIN	*ESCALATN DATE* END	*ESCALATN INDEX* BEGIN	*ESCALATN INDEX* END
02 03 05 2	MISCELLANEOUS IMPROVEMENTS						
02 03 05 2 01	Warning Signs						
	S & A	O					
	CONTINGENCY	P	15.00				
02 03 05 3	LANDSCAPING & TURFING						
02 03 05 3 01	Dryland Grass						
	S & A	O					
	CONTINGENCY	P	20.00				
02 08	SOLID WASTE COLLECTION/CONTAINMT						
02 08 05	CAPPING CONTAMINATED AREAS						
02 08 05 1	CAP CONSTRUCTION						
02 08 05 1 01	WAC Cap						
02 08 05 1 01 01	Random Fill - 1st 6"						
	S & A	O					
	CONTINGENCY	P	35.00				
02 08 05 1 01 02	Random Fill - Next 3.25'						
	S & A	O					
	CONTINGENCY	P	30.00				
02 08 05 1 01 03	6" Fine Grain Membrane Bedding						
	S & A	O					
	CONTINGENCY	P	30.00				
02 08 05 1 01 04	50-mil Geomembrane						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 05 1 01 05	Top Soil - 6"						
	S & A	O					
	CONTINGENCY	P	35.00				
02 08 05 1 01 06	Class D - PPEquip						
	S & A	O					
	CONTINGENCY	P	25.00				
02 08 05 2	LEACHATE COLLECTION						
02 08 05 2 01	Leachate Collection System						
02 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
02 08 05 2 01 02 4" Collection Pipe							
S & A	O						
CONTINGENCY	P		25.00				
02 08 05 2 01 03 Drywells - 48" D, perf manholes							
S & A	O						
CONTINGENCY	P		25.00				
02 21 DEMOBILIZATION							
02 21 04 DEMOB OF EQUIPMENT & FACILITIES							
02 21 04 01 TRANSPORTATION							
02 21 04 01 01 DEMOBILIZATION							
02 21 04 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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