TestAmerica
ANALYTICAL TESTING CORPORATION

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

URS Corp.-Portland	Project Name:	**ALCOA Port of Vancouver**	
111 SW Columbia, Suite 1500	Project Number:	25696370	Report Created:
Portland, OR 97201-5850	Project Manager:	Brian McNamara	07/26/07 18:16

Gasoline Hydrocarbons per NW TPH-Gx Method - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 7070567 **Water Preparation Method: EPA 5030B**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (7070567-BLK1)								**Extracted: 07/16/07 13:06**						
Gasoline Range Hydrocarbons	NW TPH-Gx	ND	---	80.0	ug/l	1x	--	--	--	--	--	--	07/16/07 14:48	
Surrogate(s): 4-BFB		*Recovery: 103%*			*Limits: 50-150%*	"							*07/16/07 14:48*	
LCS (7070567-BS2)								**Extracted: 07/16/07 13:06**						
Gasoline Range Hydrocarbons	NW TPH-Gx	405	---	80.0	ug/l	1x	--	500	81.0%	(70-130)	--	--	07/16/07 13:34	
Surrogate(s): 4-BFB		*Recovery: 105%*			*Limits: 50-150%*	"							*07/16/07 13:34*	
LCS Dup (7070567-BSD2)								**Extracted: 07/16/07 13:06**						
Gasoline Range Hydrocarbons	NW TPH-Gx	438	---	80.0	ug/l	1x	--	500	87.7%	(70-130)	7.87%	(35)	07/16/07 13:59	
Surrogate(s): 4-BFB		*Recovery: 115%*			*Limits: 50-150%*	"							*07/16/07 13:59*	
Duplicate (7070567-DUP1)					**QC Source: PQG0450-03**			**Extracted: 07/16/07 13:06**						
Gasoline Range Hydrocarbons	NW TPH-Gx	8080	---	1600	ug/l	20x	8680	--	--	--	7.25%	(35)	07/16/07 22:38	
Surrogate(s): 4-BFB		*Recovery: 99.0%*			*Limits: 50-150%*	*1x*							*07/16/07 22:38*	
Duplicate (7070567-DUP2)					**QC Source: PQG0450-06**			**Extracted: 07/16/07 13:06**						
Gasoline Range Hydrocarbons	NW TPH-Gx	101000	---	8000	ug/l	100x	104000	--	--	--	2.86%	(35)	07/16/07 23:53	
Surrogate(s): 4-BFB		*Recovery: 110%*			*Limits: 50-150%*	*1x*							*07/16/07 23:53*	

Sarah Rockwell For Christina Woodcock, Project Manager

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URS Corp.-Portland	Project Name:	**ALCOA Port of Vancouver**	
111 SW Columbia, Suite 1500	Project Number:	25696370	Report Created:
Portland, OR 97201-5850	Project Manager:	Brian McNamara	07/26/07 18:16

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 7070576 **Water Preparation Method: EPA 3520/600 Series**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (7070576-BLK1)								**Extracted: 07/17/07 11:50**						
Diesel Range Organics	NWTPH-Dx	ND	---	0.250	mg/l	1x	--	--	--	--	--	--	07/18/07 12:04	
Heavy Oil Range Hydrocarbons	"	ND	---	0.500	"	"	--	--	--	--	--	--	"	
Surrogate(s): 1-Chlorooctadecane		*Recovery: 96.4%*			*Limits: 50-150%*	"							*07/18/07 12:04*	
LCS (7070576-BS1)								**Extracted: 07/17/07 11:50**						
Diesel Range Organics	NWTPH-Dx	2.51	---	0.250	mg/l	1x	--	2.50	101%	(50-150)	--	--	07/18/07 11:23	
Heavy Oil Range Hydrocarbons	"	1.65	---	0.500	"	"	--	1.51	109%	"	--	--	"	
Surrogate(s): 1-Chlorooctadecane		*Recovery: 99.5%*			*Limits: 50-150%*	"							*07/18/07 11:23*	
LCS Dup (7070576-BSD1)								**Extracted: 07/17/07 11:50**						
Diesel Range Organics	NWTPH-Dx	2.57	---	0.250	mg/l	1x	--	2.50	103%	(50-150)	2.20%	(50)	07/18/07 11:44	
Heavy Oil Range Hydrocarbons	"	1.68	---	0.500	"	"	--	1.51	112%	"	2.20%	"	"	
Surrogate(s): 1-Chlorooctadecane		*Recovery: 103%*			*Limits: 50-150%*	"							*07/18/07 11:44*	

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111 SW Columbia, Suite 1500	Project Number:	25696370	Report Created:
Portland, OR 97201-5850	Project Manager:	Brian McNamara	07/26/07 18:16

Volatile Organic Compounds per EPA Method 8260B - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 7070648 **Water Preparation Method: EPA 5030B**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (7070648-BLK1)								Extracted: 07/18/07 08:11						
Acetone	EPA 8260B	ND	---	25.0	ug/l	1x	--	--	--	--	--	--	07/18/07 10:57	
Benzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Bromobenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Bromochloromethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Bromodichloromethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Bromoform	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Bromomethane	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
2-Butanone (MEK)	"	ND	---	10.0	"	"	--	--	--	--	--	--	"	
n-Butylbenzene	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
sec-Butylbenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
tert-Butylbenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Carbon disulfide	"	ND	---	10.0	"	"	--	--	--	--	--	--	"	
Carbon tetrachloride	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Chlorobenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Chloroethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Chloroform	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Chloromethane	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
2-Chlorotoluene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
4-Chlorotoluene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2-Dibromo-3-chloropropane	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
Dibromochloromethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2-Dibromoethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Dibromomethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2-Dichlorobenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,3-Dichlorobenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,4-Dichlorobenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Dichlorodifluoromethane	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
1,1-Dichloroethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2-Dichloroethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,1-Dichloroethene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
cis-1,2-Dichloroethene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
trans-1,2-Dichloroethene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2-Dichloropropane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,3-Dichloropropane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
2,2-Dichloropropane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,1-Dichloropropene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
cis-1,3-Dichloropropene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
trans-1,3-Dichloropropene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Ethylbenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	

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Sarah Rockwell For Christina Woodcock, Project Manager

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111 SW Columbia, Suite 1500	Project Number:	25696370	Report Created:
Portland, OR 97201-5850	Project Manager:	Brian McNamara	07/26/07 18:16

Volatile Organic Compounds per EPA Method 8260B - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 7070648 **Water Preparation Method: EPA 5030B**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (7070648-BLK1)								Extracted: 07/18/07 08:11						
Hexachlorobutadiene	EPA 8260B	ND	---	4.00	ug/l	1x	--	--	--	--	--	--	07/18/07 10:57	
2-Hexanone	"	ND	---	10.0	"	"	--	--	--	--	--	--	"	
Isopropylbenzene	"	ND	---	2.00	"	"	--	--	--	--	--	--	"	
p-Isopropyltoluene	"	ND	---	2.00	"	"	--	--	--	--	--	--	"	
4-Methyl-2-pentanone	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
Methyl tert-butyl ether	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Methylene chloride	"	ND	---	5.00	"	"	--	--	--	--	--	--	"	
Naphthalene	"	ND	---	2.00	"	"	--	--	--	--	--	--	"	
n-Propylbenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Styrene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,1,1,2-Tetrachloroethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,1,2,2-Tetrachloroethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Tetrachloroethene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Toluene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2,3-Trichlorobenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2,4-Trichlorobenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,1,1-Trichloroethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,1,2-Trichloroethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Trichloroethene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Trichlorofluoromethane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2,3-Trichloropropane	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,2,4-Trimethylbenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
1,3,5-Trimethylbenzene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
Vinyl chloride	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
o-Xylene	"	ND	---	1.00	"	"	--	--	--	--	--	--	"	
m,p-Xylene	"	ND	---	2.00	"	"	--	--	--	--	--	--	"	
Surrogate(s): 4-BFB		*Recovery: 97.2%*			*Limits: 80-120%*	"							*07/18/07 10:57*	
1,2-DCA-d4		*103%*			*80-120%*	"							"	
Dibromofluoromethane		*102%*			*80-120%*	"							"	
Toluene-d8		*98.0%*			*80-120%*	"							"	

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111 SW Columbia, Suite 1500	Project Number:	25696370	Report Created:
Portland, OR 97201-5850	Project Manager:	Brian McNamara	07/26/07 18:16

Volatile Organic Compounds per EPA Method 8260B - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 7070648 **Water Preparation Method: EPA 5030B**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
LCS (7070648-BS1)							Extracted: 07/18/07 08:11							
Benzene	EPA 8260B	19.8	---	1.00	ug/l	1x	--	20.0	99.0%	(80-120)	--	--	07/18/07 09:08	
Chlorobenzene	"	20.9	---	1.00	"	"	--	"	104%	(80-124)	--	--	"	
1,1-Dichloroethene	"	17.7	---	1.00	"	"	--	"	88.3%	(78-120)	--	--	"	
Toluene	"	20.8	---	1.00	"	"	--	"	104%	(80-124)	--	--	"	
Trichloroethene	"	18.4	---	1.00	"	"	--	"	92.2%	(80-132)	--	--	"	
Surrogate(s): 4-BFB		*Recovery: 103%*			*Limits: 80-120%*	"							*07/18/07 09:08*	
1,2-DCA-d4		*102%*			*80-120%*	"							"	
Dibromofluoromethane		*102%*			*80-120%*	"							"	
Toluene-d8		*103%*			*80-120%*	"							"	
Matrix Spike (7070648-MS1)					QC Source: PQG0398-01		Extracted: 07/18/07 08:11							P
Benzene	EPA 8260B	10.9	---	1.00	ug/l	1x	ND	20.0	54.4%	(80-124)	--	--	07/18/07 09:35	M2
Chlorobenzene	"	11.0	---	1.00	"	"	ND	"	55.1%	(72.9-134)	--	--	"	M2
1,1-Dichloroethene	"	11.4	---	1.00	"	"	ND	"	57.1%	(79.3-127)	--	--	"	M2
Toluene	"	10.8	---	1.00	"	"	ND	"	54.0%	(79.7-131)	--	--	"	M2
Trichloroethene	"	10.0	---	1.00	"	"	ND	"	50.0%	(68.4-130)	--	--	"	M2
Surrogate(s): 4-BFB		*Recovery: 102%*			*Limits: 80-120%*	"							*07/18/07 09:35*	
1,2-DCA-d4		*103%*			*80-120%*	"							"	
Dibromofluoromethane		*105%*			*80-120%*	"							"	
Toluene-d8		*102%*			*80-120%*	"							"	
Matrix Spike Dup (7070648-MSD1)					QC Source: PQG0398-01		Extracted: 07/18/07 08:11							P
Benzene	EPA 8260B	12.3	---	1.00	ug/l	1x	ND	20.0	61.4%	(80-124)	11.9%	(25)	07/18/07 10:03	M2
Chlorobenzene	"	12.4	---	1.00	"	"	ND	"	62.2%	(72.9-134)	12.0%	"	"	M2
1,1-Dichloroethene	"	12.6	---	1.00	"	"	ND	"	62.9%	(79.3-127)	9.67%	"	"	M2
Toluene	"	12.3	---	1.00	"	"	ND	"	61.4%	(79.7-131)	12.9%	"	"	M2
Trichloroethene	"	11.1	---	1.00	"	"	ND	"	55.7%	(68.4-130)	10.8%	"	"	M2
Surrogate(s): 4-BFB		*Recovery: 105%*			*Limits: 80-120%*	"							*07/18/07 10:03*	
1,2-DCA-d4		*109%*			*80-120%*	"							"	
Dibromofluoromethane		*111%*			*80-120%*	"							"	
Toluene-d8		*107%*			*80-120%*	"							"	

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111 SW Columbia, Suite 1500	Project Number:	25696370	Report Created:
Portland, OR 97201-5850	Project Manager:	Brian McNamara	07/26/07 18:16

Polynuclear Aromatic Compounds per EPA 8270M-SIM - Laboratory Quality Control Results

TestAmerica - Portland, OR

QC Batch: 7070536 **Water Preparation Method: 3520B Liq-Liq**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (7070536-BLK1)								Extracted: 07/16/07 12:00						
Acenaphthene	EPA 8270m	ND	---	0.100	ug/l	1x	--	--	--	--	--	--	07/18/07 11:43	
Acenaphthylene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Anthracene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Benzo (a) anthracene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Benzo (a) pyrene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Benzo (b) fluoranthene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Benzo (ghi) perylene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Benzo (k) fluoranthene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Chrysene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Dibenzo (a,h) anthracene	"	ND	---	0.200	"	"	--	--	--	--	--	--	"	
Fluoranthene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Fluorene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Indeno (1,2,3-cd) pyrene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Naphthalene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Phenanthrene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Pyrene	"	ND	---	0.100	"	"	--	--	--	--	--	--	"	
Surrogate(s): Fluorene-d10		*Recovery: 90.7%*			*Limits: 25-125%*	"							*07/18/07 11:43*	
Pyrene-d10		*95.1%*			*23-150%*	"							"	
Benzo (a) pyrene-d12		*89.3%*			*10-125%*	"							"	
LCS (7070536-BS1)								Extracted: 07/16/07 12:00						
Acenaphthene	EPA 8270m	2.42	---	0.100	ug/l	1x	--	2.50	96.7%	(26-135)	--	--	07/18/07 12:44	
Benzo (a) pyrene	"	2.65	---	0.100	"	"	--	"	106%	(38-137)	--	--	"	
Pyrene	"	2.47	---	0.100	"	"	--	"	98.8%	(33-133)	--	--	"	
Surrogate(s): Fluorene-d10		*Recovery: 105%*			*Limits: 25-125%*	"							*07/18/07 12:44*	
Pyrene-d10		*104%*			*23-150%*	"							"	
Benzo (a) pyrene-d12		*102%*			*10-125%*	"							"	
LCS Dup (7070536-BSD1)								Extracted: 07/16/07 12:00						
Acenaphthene	EPA 8270m	2.52	---	0.100	ug/l	1x	--	2.50	101%	(26-135)	3.95%	(60)	07/18/07 13:14	
Benzo (a) pyrene	"	2.64	---	0.100	"	"	--	"	106%	(38-137)	0.313%	"	"	
Pyrene	"	2.49	---	0.100	"	"	--	"	99.6%	(33-133)	0.837%	"	"	
Surrogate(s): Fluorene-d10		*Recovery: 109%*			*Limits: 25-125%*	"							*07/18/07 13:14*	
Pyrene-d10		*104%*			*23-150%*	"							"	
Benzo (a) pyrene-d12		*106%*			*10-125%*	"							"	

Sarah Rockwell

Sarah Rockwell For Christina Woodcock, Project Manager

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URS Corp.-Portland	Project Name:	**ALCOA Port of Vancouver**	
111 SW Columbia, Suite 1500	Project Number:	25696370	Report Created:
Portland, OR 97201-5850	Project Manager:	Brian McNamara	07/26/07 18:16

Notes and Definitions

Report Specific Notes:

M2	-	The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
P	-	The sample, as received, was not preserved in accordance to the referenced analytical method.
RL3	-	Reporting limit raised due to high concentrations of non-target analytes.
Z3	-	The sample required a dilution due to the nature of the sample matrix. Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.
Z9	-	Unable to calculate surrogate recovery due to matrix interference.

Laboratory Reporting Conventions:

DET	-	Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.
ND	-	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR/NA	-	Not Reported / Not Available
dry	-	Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight.
wet	-	Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' nor 'dry' are reported on a Wet Weight Basis.
RPD	-	RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries).
MRL	-	METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.
MDL*	-	METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results.
Dil	-	Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.
Reporting Limits	-	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.
Electronic Signature	-	Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy.* Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Sarah Rockwell

Sarah Rockwell For Christina Woodcock, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

11720 North Creek Pkwy N Suite 400, Bothell, WA 98011-8244 425-420-9200 FAX 420-9210
11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave, Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210
2000 W International Airport Rd Ste A10, Anchorage AK 99502-1119 907-563-9200 FAX 563-9210

CHAIN OF CUSTODY REPORT

Work Order #: PQG0449

CLIENT: Port of Vancouver
INVOICE TO: Port of Vancouver
REPORT TO: Brian McNamara
ADDRESS: URS Corp
111 SW Columbia, Ste 1500, Portland, OR 97201
PHONE: 969.6348 FAX: 227.4292
P.O. NUMBER:
PROJECT NAME: P of V - ALCOA
PROJECT NUMBER: 25696370
SAMPLED BY: BP McNamara, CD Moody

TURNAROUND REQUEST
in Business Days *
Organic & Inorganic Analyses: 10 SPL | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: 5 STD | 4 | 3 | 2 | 1 | <1
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	PRESERVATIVE												MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	TA WO ID
			HCl	None	HCl	HCl	None											
			REQUESTED ANALYSES															
			VOCs	PAHs	NWTPH-Dx	NWTPH-Gx*	PCBs											
1	MW19	7-12-7/1030	X	X	X	X									W	6	Contains sheen, strong diesel odor, some silt in water	
2	MW48A	7-12-7/1300	HOLD FOR ANALYSIS												W	5		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

RELEASED BY:		DATE: 7-13-7	RECEIVED BY:		DATE: 7/13/07	
PRINT NAME: BP McNamara	FIRM: URS	TIME: 0800	PRINT NAME: Jeremy Morgan	FIRM: TAP	TIME: 1107	
RELEASED BY:		DATE: 7-13-07	RECEIVED BY:		DATE: 7/13/07	
PRINT NAME: Jeremy Morgan	FIRM: TAP	TIME: 1140	PRINT NAME:	FIRM: TAP	TIME: 1230	

ADDITIONAL REMARKS: * Run the NWTPH-Gx analysis if enough volume is available (do not run @ higher reporting limits)

TEMP: 3.0

COC REV 09.2004

PAGE 1 OF 1

TestAmerica Sample Receipt Checklist

Cooler ID(s): C5

Received by: *(section A)* Date: 7/13/07 Time: 1230 Initials: HSD

Unpacked by: *(section B)* Date: 7-13 Initials: AF

Logged-in by: Date: 7-13 Initials: MC

Work Order No. PQG0449

Client: ~~Port of Vancouver~~ UPS

Project: Alcoa - Port of Vancouver

Temperature out of range:
___No Ice
___Ice Melted
___Win 4 Hours
___Other:

***ESI Clients *(see Section C)*

Cooler Temperature (IR): 3.0 °C plastic (glass) NA *(oil/air samples, ESI client)*

A

Custody Seals: (#___)

Signature: (Y) N Dated: 7/13

___None

Container Type:

___#Cooler(s)

___#Box(s)

___None (___#Other:_____)

Coolant Type:

___Gel Ice

X Loose Ice

___None

Packing Material:

___Bubble Bags

___Styrofoam Cubbies

X None (___Other:_____)

Received from:

X TA Courier

___Senvoy

___UPS

___Fed Ex

___Client

___TDP

___DHL

___SDS

___Mid-Valley

___GS/TA

___GS/Senvoy

___Other:_____

B

Sample Status:

(If N circled, see NOD)

General:			
Intact?	(Y)	N	
# Containers Match COC?	(Y)	N	none given
IDs Match COC?	(Y)	N	
For Analyses Requested:			
Correct Type & Preservation?	(Y)	N	
Adequate Volume?	(Y)	N	
Within Hold Time?	(Y)	N	
Volatiles:			
VOAs Free of Headspace?	(Y)	N	NA
TB on COC?	not provided (Y)	N	NA
Metals:			
HNO3 Preserved?	Y	N	(NA)

C

***ESI Clients Only:

Temperature Blank: _____°C not provided

All preserved bottles checked Y N NA *(voas/soils/all unp.)*

All preserved accordingly? Y N *(see NOD)* NA *(voas/soils/all unp.)*

Army Corp:

Geiger (ticks/min): ___ ___ ___ ___

Temperatures (IR): _____°C _____°C _____°C _____°C

(left) (middle) (right) (air)

Project Managers:

Comments:_____

PM Reviewed:_____ *(Initial/Date)*

APPENDIX I

BIOSCREEN MODEL

The BIOSCREEN model was used to evaluate the fate and transport of TPH-Dx contamination in groundwater, from the source area to the Columbia River. **Figure I-1** illustrates the source and plume data used in the model. The following discussion describes how the model input values were selected. Where available, site-specific data was used. Where site-specific data was not available, model default values were used.

I.1 HYDROGEOLOGIC DATA

- Seepage Velocity: BIOSCREEN calculates this value from user-entered conductivity, gradient, and effective porosity. The calculated seepage velocity is 4.8 feet per year.

- Hydraulic Conductivity: In February 1996, slug tests were conducted on MW-1, EX-2, MW-18, and MW-7. Slug test data was interpreted using the Brouwer-Rice method for unconfined aquifers. The average hydraulic conductivity measured during the tests was 7.7×10^{-5} ft/sec, which is characteristic of silt and silty sand. The low value was 2.65×10^{-5} ft/sec, and the high value was 2.39×10^{-4} ft/sec.

  Also in February 1996, a pump test was conducted on EX-2. Using the Theis method, the recovery curve was used to estimate a transmissivity of 5.2×10^{-3} ft^2/min (8.7×10^{-5} ft^2/sec). Assuming an aquifer thickness of 7 feet (the thickness of the sand in EX-2, prior to contact with the silt unit), this corresponds to a hydraulic conductivity of 1.2×10^{-5} ft/sec. Although it is probably overestimated due to the effect of sand packs in the wells, the higher, more conservative average value of 7.7×10^{-5} ft/sec from the slug tests was used in the BIOSCREEN model.

- Hydraulic Gradient: Historical groundwater elevation contours are presented on **Figures E-1 to E-5** in **Appendix E** of this report. An average hydraulic gradient was determined from **Figures E-1, E-2, E-3, and E-5**. **Figure E-4** was not used because the GW elevations were not measured for MW-7 and MW-8. The following gradients were measured:

Figure	Average Elevation of MW-7 and MW-8 (Y, ft)	Average Elevation of MW-13 and MW-14 (Z, ft)	Gradient (ft/ft) (Y-Z)/X
Figure E-1	21.65	15.7	0.026
Figure E-2	18.53	13.06	0.024
Figure E-3	17.27	12.95	0.019
Figure E-5	18.52	13.07	0.024
		Average	**0.023**

Where X is 225 feet, the distance in feet from MW-7 to MW-13.

- Effective Porosity: Soil porosity ranges from 0.38 for sand to 0.49 for silt. An average value of 0.44 was used in the model.

I.2 DISPERSION

- Longitudinal Dispersivity: Calculated by BIOSCREEN based on plume length.

- Transverse Dispersivity: Calculated by BIOSCREEN based on plume length.

- Vertical Dispersivity: Calculated by BIOSCREEN based on plume length.

- Plume Length: The plume length is not known; however, a conservative estimate of plume length may be derived using the seepage velocity, as outlined in the BIOSCREEN user's manual. To be conservative, no retardation factor was used. The Columbia River is 160 feet from the south end of the South Pond, and it is 260 feet from the south edge of the West Pond. At a seepage velocity of 4.8 feet per year, it would take the plume 33 years to travel the 160 feet from the South Pond to the river, and it would take 54 years to travel from the West Pond to the river.

  The earliest possible date of a release from the South Pond is 1961, the earliest possible date of a release from the West Pond is 1964. A simulation time over the next 60 years has been chosen. From the earliest possible date of the initial release, 1961, to 2067 is a period of 106 years. Multiplying this simulation time by the seepage velocity, a theoretical maximum plume length of 500 feet was used.

I.3 ADSORPTION DATA

- Retardation Factor: Calculated by BIOSCREEN based on the following parameters.

- Soil Bulk Density: Soil bulk density ranges from 1.35 for silt to 1.66 for sand. An average value of 1.5 was used in the model.

- Partition Coefficient: MTCA's spreadsheet contains data with estimated K_{OC} values for petroleum fractions. The lowest K_{OC} for a petroleum fraction detected in the three EPH/VPH samples is 2.5×10^3 L/Kg, and the highest value was 9.55×10^9 L/Kg. The largest fraction detected in the three samples is AL_EC>12-16, and the KOC value for that fraction is 5.4×10^6 L/Kg, which is the value used in the model.

- Fraction organic carbon: Fraction organic carbon can range from zero to as much as six percent in topsoil and significantly less in subsurface soils. The fraction organic carbon in subsurface site soils is not known, therefore, the conservative BIOSCREEN default value is 0.001, and this is the value that was used in the model.

I.4 BIODEGRADATION DATA

- First Order Decay Coefficient: BIOSCREEN recommends values of 0.1 $year^{-1}$ to 36 $year^{-1}$. A literature search for diesel biodegradation rate constants identified values ranging from 0.006 day^{-1} to 0.4 day^{-1}, which are equivalent to 2 to 146 $year^{-1}$. Based on these ranges, a conservative rate of 2 $year^{-1}$, which is the lowest value identified in the literature search, was used.

- Dissolved Plume Solute Half-Life: BIOSCREEN guidance lists half-lives of 0.02 to 2 years for BTEX compounds, which correspond to decay coefficients of 0.35 to 34 $year^{-1}$.

- Or Instantaneous: This model is not used; however, for evaluation purposes, the median default values provided by BIOSCREEN were used for all compounds.

I.5 GENERAL DATA

- Model Area: The width of the modeled area is 375 feet (**Figure I-1**), and the length of the simulated model area is 650 feet.

- Simulation Time: A simulation time of 60 years was selected.

I.6 SOURCE DATA

- Source Thickness in Saturated Zone: Based on the conservative estimated thickness of the source area as being from ground surface to the depth of the deepest impacts, the estimated total thickness of the source is approximately 15 feet.

- Source Zone Width: The source zone width is estimated to be 250 feet. This width is divided by 5 as described in the BIOSCREEN manual, and each subzone is equal to a width of 45 feet. The outer zones have been assigned concentrations of 3 mg/l, the middle areas 10 mg/L, and the central area a conservative value of 30 mg/L, which is the highest concentration measured on site.

- Soluble Mass: Based on Cross Section B-B. Conservative estimated extent of the contaminated zone is 250 feet long by 120 feet wide by 15 feet thick. This corresponds to a volume of 450,000 cubic feet. Assuming a bulk density of 1.5 kg/L, this corresponds to 1.9×10^7 kg of soil. An average concentration of the data points was approximately 4,600 mg/Kg. At this average concentration, the conservative total mass of contaminants would be 87,000 Kg.

I.7 FIELD DATA FOR COMPARISON

Other than MW-13 and MW-14, there are no downgradient wells for comparison purposes.

I.8 RESULTS

Under the baseline conditions identified above, the results show no migration of the plume under degradation conditions and a migration of only 40 feet under conditions of no degradation. This agrees with observations made in the field that there does not appear to be significant migration in groundwater.

A sensitivity analysis was conducted to evaluate potential predicted plume extents under different conditions. The following parameters were varied to evaluate the sensitivity of the model to these parameters:

- Hydraulic Conductivity: From 1×10^{-5} ft/sec to 2.4×10^{-4} ft/sec.
- Hydraulic Gradient: From 0.019 to 0.026 ft/ft.
- Effective Porosity: From 0.38 to 0.49.
- K_{OC}: From 2.5×10^3 L/Kg, to 9.55×10^9 L/Kg.
- Fraction Organic Carbon: From 0.0001 to 0.06.

- Decay Constant: From 0.5 $year^{-1}$ to 150 $year^{-1}$.

Hydraulic Conduct-ivity (ft/sec)	Hydraulic Gradient (ft/ft)	Effective Porosity	K_{OC} (L/Kg)	Fraction Organic Carbon	Decay Constant ($year^{-1}$)	Estimated Length of Plume, No Degradation (ft)	Estimated Length of Plume, Degradation (ft)
7.7×10^{-5}	0.023	0.44	5.4×10^{6}	0.001	2	2	0.4
1×10^{-5}	0.023	0.44	5.4×10^{6}	0.001	2	1.6	0.2
2.4×10^{-4}	0.023	0.44	5.4×10^{6}	0.001	2	4	0.8
7.7×10^{-5}	**0.019**	0.44	5.4×10^{6}	0.001	2	2	0.4
7.7×10^{-5}	**0.026**	0.44	5.4×10^{6}	0.001	2	3	0.4
7.7×10^{-5}	0.023	**0.38**	5.4×10^{6}	0.001	2	2	0.4
7.7×10^{-5}	0.023	**0.49**	5.4×10^{6}	0.001	2	2	0.4
7.7×10^{-5}	0.023	0.44	**2.5×10^{3}**	0.001	2	700	30
7.7×10^{-5}	0.023	0.44	**9.6×10^{9}**	0.001	2	NA	NA
7.7×10^{-5}	0.023	0.44	5.4×10^{6}	**0.0001**	2	24	3
7.7×10^{-5}	0.023	0.44	5.4×10^{6}	**0.06**	2	0.8	0
7.7×10^{-5}	0.023	0.44	5.4×10^{6}	0.001	**0.5**	2.2	0.8
7.7×10^{-5}	0.023	0.44	5.4×10^{6}	0.001	**146**	2.2	0
2.4×10^{-4}	**0.026**	**0.49**	**2.5×10^{3}**	**0.0001**	**0.5**	1,080	120

Note: **Bold** entries are the values that were changed for that BIOSCREEN run.

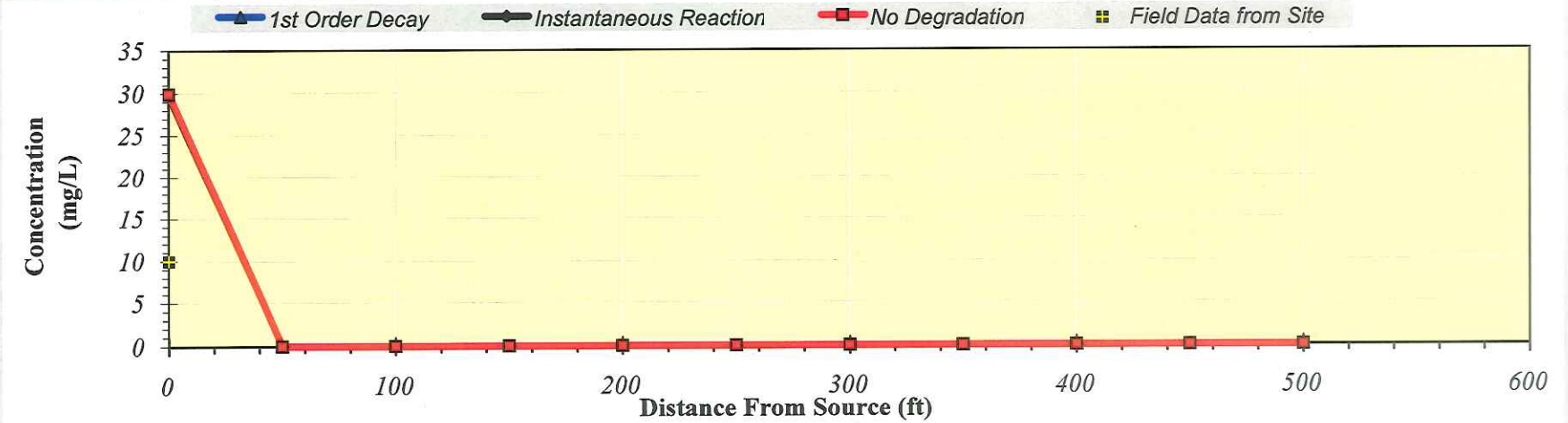
Under baseline conditions, there is very little migration of TPH from the source area. The low migration rate is due to a high retardation factor, which is, in turn, due to the high K_{OC} value for the TPH mixture. The predicted low mobility of the petroleum mixture in site groundwater present is supported by the observed low mobility of the petroleum mixture in soil, as evidenced by the presence of TPH at in shallow soil samples at concentrations significantly higher than detected in deeper samples collected immediately below the shallow samples.

To evaluate an ultra-conservative scenario, the most conservative values from the above ranges were input into the BIOSCREEN spreadsheet. Using these ultra-conservative values, the maximum plume length under degradation conditions is still only 120 feet. Both the baseline and the ultra-conservative BIOSCREEN models demonstrate that contaminants in site groundwater are not likely to migrate to the Columbia River. This conclusion is supported by the fact that, now, 30 years after initial TPH releases likely occurred, there is no TPH detected in MW-13 and MW-14.

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	29.949	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	29.949	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	29.802	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	10.000										



Calculate Animation

Time:
104 Years

Return to Input

Recalculate This Sheet

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Keesler AFB
SWMU 66
Run Name

Data Input Instructions:

1. Enter value directly....or
2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

115 / or / 0.02

Variable* — Data used directly in model.
20 — Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	4.2	(ft/yr)
or		or	
Hydraulic Conductivity	K	7.7E-05	(cm/sec)
Hydraulic Gradient	i	0.023	(ft/ft)
Porosity	n	0.44	(-)

2. DISPERSION

Longitudinal Dispersivity	alpha x	17.9	(ft)
Transverse Dispersivity*	alpha y	1.8	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	500	(ft)

3. ADSORPTION

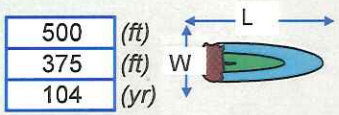
Retardation Factor*	R	18410.1	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	5.40E+06	(L/kg)
FractionOrganicCarbon	foc	1.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	2.0E+0	(per yr)
or		or	
Solute Half-Life	t-half		(year)
or Instantaneous Reaction Mode			
Delta Oxygen*	DO	5.8	(mg/L)
Delta Nitrate*	NO3	6.3	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	24.6	(mg/L)
Observed Methane*	CH4	7.2	(mg/L)

5. GENERAL

Modeled Area Length*	500	(ft)
Modeled Area Width*	375	(ft)
Simulation Time*	104	(yr)



6. SOURCE DATA

Source Thickness in Sat.Zone* 11 (ft)

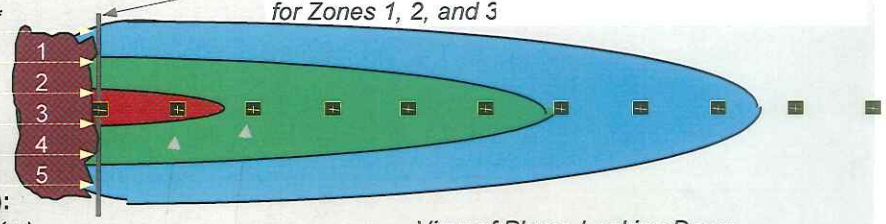
Source Zones:

Width* (ft)	Conc. (mg/L)*
45	3
45	10
45	30
45	10
45	3

Source Halflife (see Help):

>1000	>1000	(yr)
Inst. React.	1st Order	
Soluble Mass	87000	(Kg)
In Source NAPL, Soil		

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	10.0										
Dist. from Source (ft)	0	50	100	150	200	250	300	350	400	450	500

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

Recalculate This Sheet

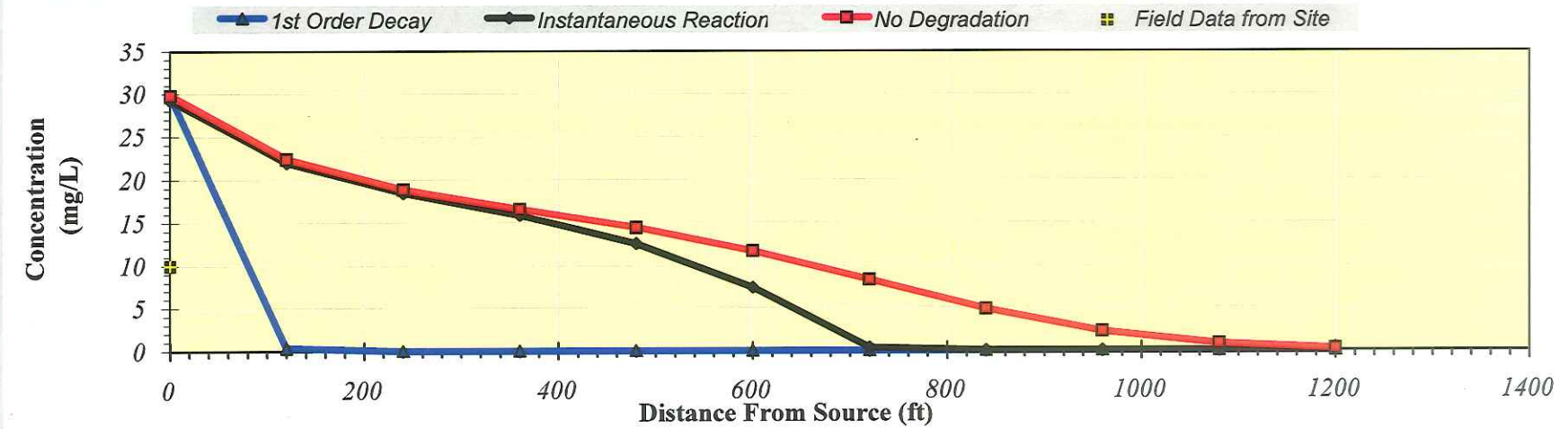
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	120	240	360	480	600	720	840	960	1080	1200
No Degradation	29.819	22.390	18.884	16.609	14.413	11.668	8.269	4.833	2.224	0.780	0.204
1st Order Decay	29.819	0.341	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	29.302	22.004	18.496	15.857	12.527	7.396	0.319	0.000	0.000	0.000	0.000
Field Data from Site	10.000										



Calculate Animation

Time:
104 Years

Return to Input

Recalculate This Sheet

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Keesler AFB
SWMU 66
Run Name

Data Input Instructions:

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — Data used directly in model.

20 — Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	13.2	(ft/yr)
or		or	
Hydraulic Conductivity	K	2.4E-04	(cm/sec)
Hydraulic Gradient	i	0.026	(ft/ft)
Porosity	n	0.49	(-)

2. DISPERSION

Longitudinal Dispersivity	alpha x	26.4	(ft)
Transverse Dispersivity*	alpha y	2.6	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	1200	(ft)

3. ADSORPTION

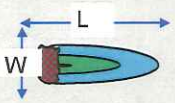
Retardation Factor*	R	1.8	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	2.50E+03	(L/kg)
FractionOrganicCarbon	foc	1.0E-4	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	5.0E-1	(per yr)
or		or	
Solute Half-Life	t-half		(year)
or Instantaneous Reaction Mode			
Delta Oxygen*	DO	5.8	(mg/L)
Delta Nitrate*	NO3	6.3	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	24.6	(mg/L)
Observed Methane*	CH4	7.2	(mg/L)

5. GENERAL

Modeled Area Length*	1200	(ft)
Modeled Area Width*	375	(ft)
Simulation Time*	104	(yr)



6. SOURCE DATA

Source Thickness in Sat.Zone* 11 (ft)

Source Zones:

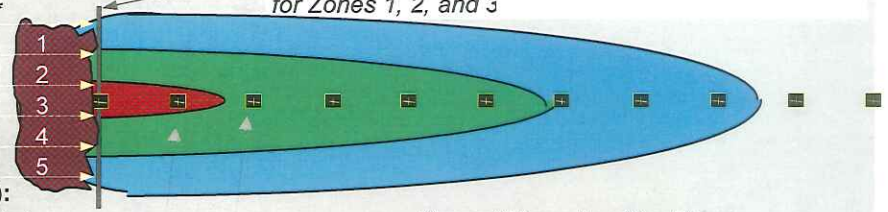
Width* (ft)	Conc. (mg/L)*
45	3
45	10
45	30
45	10
45	3

Source Halflife (see Help):

>1000	>1000	(yr)
Inst. React.	1st Order	

Soluble Mass 87000 (Kg)
In Source NAPL, Soil

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	Concentration (mg/L)
0	10.0
120	
240	
360	
480	
600	
720	
840	
960	
1080	
1200	

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

APPENDIX J

MTCA SPREADSHEETS

B. Worksheet for Calculating Potable Ground Water Cleanup Levels (Method B only) WAC 173-340-720

1. Enter Site Information

Date: 11/12/2007
Site Name: Crowley Marine Services, Vancouver, WA
Sample info: MW-2

2. Enter Ground Water Concentration Measured

Notes for Data Entry

Chemical of Concern or EC Group	Measured GW Conc	GW Cleanup Level	Current Condition HQ	Current Condition RISK	Current Condition Pass or Fail?	Adjusted Condition GW Conc being tested	Adjusted Condition HQ	Adjusted Condition RISK	Adjusted Condition Pass or Fail?
	ug/L	ug/L	unitless	unitless		ug/L	unitless	unitless	
Petroleum EC Fraction									
AL_EC >5-6	25		1.84E-03			1.44E+01	1.06E-03		
AL_EC >6-8	25		1.84E-03			1.44E+01	1.06E-03		
AL_EC >8-10	25		1.04E-01			1.44E+01	5.99E-02		
AL_EC >10-12	90.5		3.77E-01			5.20E+01	2.17E-01		
AL_EC >12-16	736		1.53E+00			4.23E+02	8.82E-01		
AL_EC >16-21	851		2.66E-02			4.89E+02	1.53E-02		
AL_EC >21-34	481		1.50E-02			2.77E+02	8.64E-03		
AR_EC >8-10	25		3.13E-02			1.44E+01	1.80E-02		
AR_EC >10-12	62.6		3.91E-01			3.60E+01	2.25E-01		
AR_EC >12-16	86.8		1.09E-01			4.99E+01	6.24E-02		
AR_EC >16-21	301		6.27E-01			1.73E+02	3.61E-01		
AR_EC >21-34	96.6		1.51E-01			5.55E+01	8.68E-02		
Benzene	0	5							
Toluene	0	1000							
Ethylbenzene	0	700							
Total Xylenes	0	1000							
Naphthalene	0.14	160	8.75E-04			8.05E-02	5.03E-04		
1-Methyl Naphthalene	19.9		4.98E-02			1.14E+01	2.86E-02		
2-Methyl Naphthalene	0.236		7.38E-03			1.36E-01	4.24E-03		
n-Hexane	0								
MTBE	0	20							
Ethylene Dibromide (EDB)	0	0.01							
1,2 Dichloroethane (EDC)	0	5							
Benzo(a)anthracene	0.0945	for		7.88E-07	*for*	5.43E-02		4.53E-07	*for*
Benzo(b)fluoranthene	0.0945	all		7.88E-07	*all*	5.43E-02		4.53E-07	*all*
Benzo(k)fluoranthene	0.0945	cPAHs		7.88E-07	*cPAHs*	5.43E-02		4.53E-07	*cPAHs*
Benzo(a)pyrene	0.0945	Risk =		7.88E-06	*Fail*	5.43E-02		4.53E-06	
Chrysene	0.0945	1E-05		7.88E-08		5.43E-02		4.53E-08	
Dibenz(a,h)anthracene	0.188			6.27E-06	Σ Risk=	1.08E-01		3.61E-06	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.0945			7.88E-07	1.74E-05	5.43E-02		4.53E-07	1.00E-05
Sum	**2826.531**		3.43E+00	1.74E-05	*Fail*	1.63E+03	1.97E+00	1.00E-05	*Fail*

Not-detected in this sample, listed value is one-half the detection limit.
Not-detected in any recent samples; therefore, zero was used.
Parameter not analyzed.

TEST CURRENT CONDITION

Measured TPH GW Conc, ug/L = 2826.531
HI = 3.427E+00
RISK = 1.739E-05
Pass or Fail? *Fail*

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate a protective TPH ground water concentration based on various ground water quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH GW Conc

Selected Criterion:
Most Stringent?
Protective TPH GW Conc, ug/L =
HI =
RISK =

SUMMARY OF PROTECTIVE GW CONCENTRATIONS

Protective GW TPH Conc, ug/L	
Most Stringent Criterion	

Ground Water Criteria	Most Stringent?	GW TPH, ug/L	RISK @	HI @
HI = 1				
Total Risk = 1E-5				
Total Risk = 1E-6				
Benzene MCL = 5 ug/L				
MTBE = 20 ug/L				
Risk of cPAHs = 1E-5				
Toluene =1000 ug/L				
Ethylbenzene = 700 ug/L				
Total Xylenes = 1000 ug/L				

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH GW Conc

Tested TPH GW Conc, ug/L=
HI=
RISK=
Pass or Fail?

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date:
Site Name: Former Columbia Marine Lines
Sample Name: GP3 7-8'

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	125	1.30%
AL_EC >6-8	125	1.30%
AL_EC >8-10	94.3	0.98%
AL_EC >10-12	961	9.98%
AL_EC >12-16	3130	32.49%
AL_EC >16-21	1730	17.96%
AL_EC >21-34	339	3.52%
AR_EC >8-10	125	1.30%
AR_EC >10-12	856	8.89%
AR_EC >12-16	1500	15.57%
AR_EC >16-21	409	4.25%
AR_EC >21-34	237	2.46%
Benzene	0	0.00%
Toluene	0	0.00%
Ethylbenzene	0	0.00%
Total Xylenes	0	0.00%
Naphthalene	0.5	0.01%
1-Methyl Naphthalene	0.2	0.00%
2-Methyl Naphthalene	0.4	0.00%
n-Hexane	0	0.00%
MTBE	0	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.2	0.00%
Benzo(b)fluoranthene	0.2	0.00%
Benzo(k)fluoranthene	0.2	0.00%
Benzo(a)pyrene	0.2	0.00%
Chrysene	0.485	0.01%
Dibenz(a,h)anthracene	0.2	0.00%
Indeno(1,2,3-cd)pyrene	0.2	0.00%
Sum	9634.085	100.00%

Notes for Data Entry | Set Default Hydrogeology

Clear All Soil Concentration Data Entry Cells

Restore All Soil Concentration Data cleared previously

REMARK:
EnWr sLWr-sSHFtfF InfRrP DWRn KHrH.....

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here: 832 ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date:
Site Name: Former Columbia Marine Lines
Sample Name: GP3 7-8'
Measured Soil TPH Concentration, mg/kg **9,634.085**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	2,493	3.52E-06	3.86E+00	Fail
	Method C	33,563	8.74E-07	2.87E-01	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protection	513	2.39E-10	1.12E+00	Fail
	Target TPH GW Conc. @ 832 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

Warning! Check Residual Saturation (WAC340-747(10)).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	2,493.01	33,562.63
Most Stringent Criterion	HI =1	HI =1

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	YES	2.49E+03	9.11E-07	1.00E+00	YES	3.36E+04	3.04E-06	1.00E+00
Total Risk=1E-5	*NO*	2.74E+04	1.00E-05	1.10E+01	*NO*	1.10E+05	1.00E-05	3.28E+00
Risk of Benzene= 1E-6	NA	NA	NA	NA	NA			
Risk of cPAHs mixture= 1E-6	*NO*	2.74E+03	1.00E-06	1.10E+00				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	HI=1
Protective Ground Water Concentration, ug/L	282.65
Protective Soil Concentration, mg/kg	513.28

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	2.83E+02	2.53E-10	1.00E+00	5.13E+02
Total Risk = 1E-5	*NO*	3.33E+02	2.39E-10	1.12E+00	100% NAPL
Total Risk = 1E-6	*NO*	3.33E+02	2.39E-10	1.12E+00	100% NAPL
Risk of cPAHs mixture= 1E-5	*NO*	3.33E+02	2.39E-10	1.12E+00	100% NAPL
Benzene MCL = 5 ug/L	NA	NA	NA	NA	NA
MTBE = 20 ug/L	NA	NA	NA	NA	NA

Note: 100% NAPL is 71000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 832 ug/L	3.33E+02	2.39E-10	1.12E+00	**100% NAPL**

A2. 1B Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method B: Unrestricted Land Use (WAC 173-340-740)

Date: 1/0/1900
Site Name: Former Columbia Marine Lines
Sample Name: GP3 7-8'

Chemical of Concern or EC group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	125	9.95E-04			3.23E+01	2.57E-04		
AL_EC >6-8	125	9.95E-04			3.23E+01	2.57E-04		
AL_EC >8-10	94.3	4.25E-02			2.44E+01	1.10E-02		
AL_EC >10-12	961	4.33E-01			2.49E+02	1.12E-01		
AL_EC >12-16	3130	1.88E+00			8.10E+02	4.86E-01		
AL_EC >16-21	1730	1.56E-02			4.48E+02	4.03E-03		
AL_EC >21-34	339	3.05E-03			8.77E+01	7.90E-04		
AR_EC >8-10	125	1.69E-02			3.23E+01	4.38E-03		
AR_EC >10-12	856	5.79E-01			2.22E+02	1.50E-01		
AR_EC >12-16	1500	5.40E-01			3.88E+02	1.40E-01		
AR_EC >16-21	409	2.45E-01			1.06E+02	6.35E-02		
AR_EC >21-34	237	1.07E-01			6.13E+01	2.76E-02		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	0.5	4.13E-04			1.29E-01	1.07E-04		
1-Methyl Naphthalene	0.2	5.14E-05			5.18E-02	1.33E-05		
2-Methyl Naphthalene	0.4	1.28E-03			1.04E-01	3.32E-04		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.2		1.93E-07	*For*	5.18E-02		4.99E-08	*For*
Benzo(b)fluoranthene	0.2		1.93E-07	*all*	5.18E-02		4.99E-08	*all*
Benzo(k)fluoranthene	0.2		1.93E-07	*cPAHs*	5.18E-02		4.99E-08	*cPAHs*
Benzo(a)pyrene	0.2		1.93E-06		5.18E-02		4.99E-07	
Chrysene	0.485		4.68E-08	*Fail*	1.26E-01		1.21E-08	
Dibenz(a,h)anthracene	0.2		7.72E-07	ΣRisk=	5.18E-02		2.00E-07	ΣRisk=
Indeno(1,2,3-cd)pyrene	0.2		1.93E-07	3.52E-06	5.18E-02		4.99E-08	9.11E-07
Sum	**9634.085**	3.86E+00	3.52E-06	Fail	2.49E+03	1.00E+00	9.11E-07	

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 9634.085
HI= 3.864E+00
RISK= 3.519E-06
Pass or Fail? ***Fail***

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH Soil Conc

Selected Criterion:
Most Stringent?
Protctive TPH Soil Conc, mg/kg =
HI =
RISK =

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg =
HI =
RISK =
Pass or Fail?

A2. 1C Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method C: Industrial Land Use (WAC 173-340-745)

Date: 1/0/1900
Site Name: Former Columbia Marine Lines
Sample Name: GP3 7-8'

Chemical of Concern or EC Group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	125	5.1E-05			4.35E+02	1.76E-04		
AL_EC >6-8	125	5.1E-05			4.35E+02	1.76E-04		
AL_EC >8-10	94.3	2.16E-03			3.29E+02	7.53E-03		
AL_EC >10-12	961	2.20E-02			3.35E+03	7.67E-02		
AL_EC >12-16	3130	1.57E-01			1.09E+04	5.45E-01		
AL_EC >16-21	1730	1.30E-03			6.03E+03	4.52E-03		
AL_EC >21-34	339	2.54E-04			1.18E+03	8.86E-04		
AR_EC >8-10	125	8.59E-04			4.35E+02	2.99E-03		
AR_EC >10-12	856	2.94E-02			2.98E+03	1.03E-01		
AR_EC >12-16	1500	4.50E-02			5.23E+03	1.57E-01		
AR_EC >16-21	409	2.05E-02			1.42E+03	7.12E-02		
AR_EC >21-34	237	8.89E-03			8.26E+02	3.10E-02		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	0.5	3.08E-05			1.74E+00	1.07E-04		
1-Methyl Naphthalene	0.2	2.25E-06			6.97E-01	7.84E-06		
2-Methyl Naphthalene	0.4	5.63E-05			1.39E+00	1.96E-04		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.2		4.79E-08		6.97E-01		1.67E-07	
Benzo(b)fluoranthene	0.2		4.79E-08		6.97E-01		1.67E-07	
Benzo(k)fluoranthene	0.2		4.79E-08		6.97E-01		1.67E-07	
Benzo(a)pyrene	0.2		4.79E-07		6.97E-01		1.67E-06	
Chrysene	0.485		1.16E-08		1.69E+00		4.05E-08	
Dibenz(a,h)anthracene	0.2		1.92E-07		6.97E-01		6.67E-07	
Indeno(1,2,3-cd)pyrene	0.2		4.79E-08		6.97E-01		1.67E-07	
Sum	**9634.085**	2.87E-01	8.74E-07		3.36E+04	1.00E+00	3.04E-06	

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 9634.085
HI= 2.870E-01
RISK= 8.738E-07
Pass or Fail? Pass
Check Residual Saturation (WAC340-747(10))

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH soil Conc

Selected Criterion:
Most Stringent?
Protctive TPH Soil Conc, mg/kg =
HI =
RISK =

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg=
HI=
RISK=
Pass or Fail?

A2. 2 Worksheet for Calculating Soil Cleanup Level for the Protection of Ground Water Quality (Leaching Pathway)

WAC 173-340-740 and 747

Date: 1/0/1900

Site Name: Former Columbia Marine Lines

Sample Name: GP3 7-8'

Chemical of Concern or EC Group	Measured Soil Conc @dry basis	GW Cleanup Level	Adjusted Condition: Soil Conc being tested	Predicted Conc @Well	HQ @ Well	RISK @ Well	Pass or Fail?
	mg/kg	ug/L	mg/kg	ug/L	unitless	unitless	
Petroleum EC Fraction							
AL_EC >5-6	125		9.32E+02	5.20E+01	3.82E-03		
AL_EC >6-8	125		9.32E+02	6.34E+00	4.66E-04		
AL_EC >8-10	94.3		7.03E+02	2.93E-01	1.22E-03		
AL_EC >10-12	961		7.17E+03	1.92E-01	8.00E-04		
AL_EC >12-16	3130		2.33E+04	1.12E-02	2.33E-05		
AL_EC >16-21	1730		1.29E+04	7.83E-06	2.45E-10		
AL_EC >21-34	339		2.53E+03	1.20E-11	3.74E-16		
AR_EC >8-10	125		9.32E+02	6.35E+01	7.94E-02		
AR_EC >10-12	856		6.38E+03	1.55E+02	9.66E-01		
AR_EC >12-16	1500		1.12E+04	5.45E+01	6.81E-02		
AR_EC >16-21	409		3.05E+03	1.03E+00	2.15E-03		
AR_EC >21-34	237		1.77E+03	6.13E-03	9.58E-06		
Benzene	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Toluene	0	1000	0.00E+00	0.00E+00	0.00E+00		
Ethylbenzene	0	700	0.00E+00	0.00E+00	0.00E+00		
Total Xylenes	0	1000	0.00E+00	0.00E+00	0.00E+00		
Naphthalene	0.5	160	3.73E+00	1.14E-01	7.11E-04		
1-Methyl Naphthalene	0.2		1.49E+00	3.30E-02	8.25E-05		
2-Methyl Naphthalene	0.4		2.98E+00	6.50E-02	2.03E-03		
n-Hexane	0		0.00E+00	0.00E+00	0.00E+00		
MTBE	0	20	0.00E+00	0.00E+00	0.00E+00		
Ethylene Dibromide (EDB)	0	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.2	for	1.49E+00	7.74E-06		6.46E-11	for
Benzo(b)fluoranthene	0.2	all	1.49E+00	1.12E-06		9.33E-12	all
Benzo(k)fluoranthene	0.2	cPAHs	1.49E+00	5.96E-07		4.97E-12	cPAHs
Benzo(a)pyrene	0.2	Risk=	1.49E+00	1.21E-06		1.01E-10	
Chrysene	0.485	1E-05	3.62E+00	3.20E-06		2.67E-12	
Dibenz(a,h)anthracene	0.2		1.49E+00	1.68E-06		5.62E-11	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.2		1.49E+00	1.50E-08		1.25E-13	2.39E-10
Sum	9634.085		7.19E+04	3.33E+02	1.12E+00	2.39E-10	***Fail***

Site-Specific Hydrogeological Properties previously entered:			
Item	Symbol	Value	Units
Total soil porosity:	n	0.43	unitless
Volumetric water content:	Θ_w	0.3	unitless
Volumetric air content:	Θ_a	0.13	unitless
Soil bulk density measured:	ρ_b	1.5	kg/L
Fraction Organic Carbon:	f_{oc}	0.001	unitless
Dilution Factor:	DF	20	unitless

Target Ground Water TPH conc adjusted previously if any:

Target Ground Water TPH Conc, ug/L ⇒ 832

CALCULATE PROTECTIVE CONDITION OR TEST ADJUSTED CONDITION — Calculate or Test

Selected Criterion:

Most Stringent?

Protective TPH Soil Conc, mg/kg =

Protective TPH GW Conc, ug/L =

RISK @ Well =

HI @Well =

DEDAILED MODEL RESULTS — TPH Range Test

Type of model used for computation:

Computation completed?

Initial Weighted Average MW of NAPL, g/mol:

Equilibrated Weighted Average MW of NAPL, g/mol:

Initial Weighted Average Density of NAPL, kg/L:

Volumetric NAPL Content, Θ_{NAPL} :

NAPL Saturation (%), Θ_{NAPL}/n:

100% NAPL, mg/kg

Mass Distribution Pattern @ 4-phase in soil pore system: Mass Balance Pattern

Total Mass distributed in Water Phase: in Solid:

Total Mass distributed in Air Phase: in NAPL:

Please Check Soil Residual Saturation TPH Levels: Refer to Table 747-5!

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 10/01/07
Site Name: Former Columbia Marine Lines
Sample Name: GPE-6-11

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	6.58	0.18%
AL_EC >6-8	6.6	0.18%
AL_EC >8-10	38.4	1.07%
AL_EC >10-12	347	9.67%
AL_EC >12-16	1350	37.62%
AL_EC >16-21	971	27.06%
AL_EC >21-34	165	4.60%
AR_EC >8-10	6.59	0.18%
AR_EC >10-12	92.8	2.59%
AR_EC >12-16	186	5.18%
AR_EC >16-21	329	9.17%
AR_EC >21-34	70	1.95%
Benzene	0	0.00%
Toluene	0	0.00%
Ethylbenzene	0	0.00%
Total Xylenes	0	0.00%
Naphthalene	0.359	0.01%
1-Methyl Naphthalene	10.6	0.30%
2-Methyl Naphthalene	6.43	0.18%
n-Hexane	0	0.00%
MTBE	0	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.449	0.01%
Benzo(b)fluoranthene	0.292	0.01%
Benzo(k)fluoranthene	0.183	0.01%
Benzo(a)pyrene	0.272	0.01%
Chrysene	0.727	0.02%
Dibenz(a,h)anthracene	0.09	0.00%
Indeno(1,2,3-cd)pyrene	0.09	0.00%
Sum	3588.462	100.00%

Notes for Data Entry | Set Default Hydrogeology
Clear All Soil Concentration Data Entry Cells
Restore All Soil Concentration Data cleared previously

REMARK:
EnWr sLWr-sSHFfLF LnfRrP DWRn KHrH.....

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here: 824 ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 10/1/2007
Site Name: Former Columbia Marine Lines
Sample Name: GPE-6-11
Measured Soil TPH Concentration, mg/kg **3,588.462**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	893	4.02E-06	1.38E+00	Fail
	Method C	33,814	9.98E-07	1.06E-01	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protection	100% NAPL	1.00E-09	4.67E-01	Pass
	Target TPH GW Conc. @ 824 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through -7494).

Warning! Check Residual Saturation (WAC340-747(10)).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	892.84	33,813.56
Most Stringent Criterion	Risk of cPAHs mixture= 1E-6	HI =1

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	*NO*	2.61E+03	2.92E-06	1.00E+00	YES	3.38E+04	9.40E-06	1.00E+00
Total Risk=1E-5	*NO*	8.93E+03	1.00E-05	3.43E+00	*NO*	3.60E+04	1.00E-05	1.06E+00
Risk of Benzene= 1E-6	NA	NA	NA	NA	NA			
Risk of cPAHs mixture= 1E-6	YES	8.93E+02	1.00E-06	3.43E-01				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	NA
Protective Ground Water Concentration, ug/L	NA
Protective Soil Concentration, mg/kg	Soil-to-Ground Water is not a critical pathway!

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	1.03E+02	1.00E-09	4.78E-01	100% NAPL
Total Risk = 1E-5	YES	1.03E+02	1.00E-09	4.78E-01	100% NAPL
Total Risk = 1E-6	YES	1.03E+02	1.00E-09	4.78E-01	100% NAPL
Risk of cPAHs mixture= 1E-5	YES	1.03E+02	1.00E-09	4.78E-01	100% NAPL
Benzene MCL = 5 ug/L	NA	NA	NA	NA	NA
MTBE = 20 ug/L	NA	NA	NA	NA	NA

Note: 100% NAPL is 70000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 824 ug/L	1.03E+02	1.00E-09	4.78E-01	**100% NAPL**

A2. 1B Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method B: Unrestricted Land Use (WAC 173-340-740)

Date: 10/1/2007
Site Name: Former Columbia Marine Lines
Sample Name: GPE-6-11

Chemical of Concern or EC group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	6.58	5.24E-05			1.64E+00	1.30E-05		
AL_EC >6-8	6.6	5.25E-05			1.64E+00	1.31E-05		
AL_EC >8-10	38.4	1.73E-02			9.55E+00	4.31E-03		
AL_EC >10-12	347	1.57E-01			8.63E+01	3.89E-02		
AL_EC >12-16	1350	8.10E-01			3.36E+02	2.02E-01		
AL_EC >16-21	971	8.74E-03			2.42E+02	2.17E-03		
AL_EC >21-34	165	1.49E-03			4.11E+01	3.69E-04		
AR_EC >8-10	6.59	8.92E-04			1.64E+00	2.22E-04		
AR_EC >10-12	92.8	6.28E-02			2.31E+01	1.56E-02		
AR_EC >12-16	186	6.70E-02			4.63E+01	1.67E-02		
AR_EC >16-21	329	1.97E-01			8.19E+01	4.91E-02		
AR_EC >21-34	70	3.15E-02			1.74E+01	7.84E-03		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	0.359	2.96E-04			8.93E-02	7.38E-05		
1-Methyl Naphthalene	10.6	2.72E-03			2.64E+00	6.77E-04		
2-Methyl Naphthalene	6.43	2.06E-02			1.60E+00	5.14E-03		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.449		4.33E-07	*For*	1.12E-01		1.08E-07	*For*
Benzo(b)fluoranthene	0.292		2.82E-07	*all*	7.27E-02		7.01E-08	*all*
Benzo(k)fluoranthene	0.183		1.77E-07	*cPAHs*	4.55E-02		4.39E-08	*cPAHs*
Benzo(a)pyrene	0.272		2.62E-06		6.77E-02		6.53E-07	
Chrysene	0.727		7.01E-08	*Fail*	1.81E-01		1.74E-08	
Dibenz(a,h)anthracene	0.09		3.47E-07	ΣRisk=	2.24E-02		8.64E-08	ΣRisk=
Indeno(1,2,3-cd)pyrene	0.09		8.68E-08	4.02E-06	2.24E-02		2.16E-08	1.00E-06
Sum	**3588.462**	1.38E+00	4.02E-06	Fail	8.93E+02	3.43E-01	1.00E-06	

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg=3588.462
HI= 1.377E+00
RISK= 4.019E-06
Pass or Fail? *Fail*

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH Soil Conc

Selected Criterion:
Most Stringent?
Protctive TPH Soil Conc, mg/kg =
HI =
RISK =

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg =
HI =
RISK =
Pass or Fail?

A2. 1C Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method C: Industrial Land Use (WAC 173-340-745)

Date: 10/1/2007
Site Name: Former Columbia Marine Lines
Sample Name: GPE-6-11

Chemical of Concern or EC Group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	6.58	2.7E-06			6.20E+01	2.51E-05		
AL_EC >6-8	6.6	2.7E-06			6.22E+01	2.52E-05		
AL_EC >8-10	38.4	8.80E-04			3.62E+02	8.29E-03		
AL_EC >10-12	347	7.95E-03			3.27E+03	7.49E-02		
AL_EC >12-16	1350	6.75E-02			1.27E+04	6.36E-01		
AL_EC >16-21	971	7.28E-04			9.15E+03	6.86E-03		
AL_EC >21-34	165	1.24E-04			1.55E+03	1.17E-03		
AR_EC >8-10	6.59	4.53E-05			6.21E+01	4.27E-04		
AR_EC >10-12	92.8	3.19E-03			8.74E+02	3.01E-02		
AR_EC >12-16	186	5.58E-03			1.75E+03	5.26E-02		
AR_EC >16-21	329	1.65E-02			3.10E+03	1.55E-01		
AR_EC >21-34	70	2.63E-03			6.60E+02	2.47E-02		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	0.359	2.21E-05			3.38E+00	2.08E-04		
1-Methyl Naphthalene	10.6	1.19E-04			9.99E+01	1.12E-03		
2-Methyl Naphthalene	6.43	9.04E-04			6.06E+01	8.52E-03		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.449		1.08E-07		4.23E+00		1.01E-06	
Benzo(b)fluoranthene	0.292		6.99E-08		2.75E+00		6.59E-07	
Benzo(k)fluoranthene	0.183		4.38E-08		1.72E+00		4.13E-07	
Benzo(a)pyrene	0.272		6.51E-07		2.56E+00		6.14E-06	
Chrysene	0.727		1.74E-08		6.85E+00		1.64E-07	
Dibenz(a,h)anthracene	0.09		8.62E-08		8.48E-01		8.12E-07	
Indeno(1,2,3-cd)pyrene	0.09		2.16E-08		8.48E-01		2.03E-07	
Sum	**3588.462**	1.06E-01	9.98E-07		3.38E+04	1.00E+00	9.40E-06	

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 3588.462
HI= 1.061E-01
RISK= 9.979E-07
Pass or Fail? Pass
Check Residual Saturation (WAC340-747(10))

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH soil Conc

Selected Criterion:
Most Stringent?

Protctive TPH Soil Conc, mg/kg =
HI =
RISK =

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg=
HI=
RISK=
Pass or Fail?

A2. 2 Worksheet for Calculating Soil Cleanup Level for the Protection of Ground Water Quality (Leaching Pathway)

Calculating Soil Cleanup Level for the Protection of Ground Water Quality (Leaching Pathway) Ground Water

WAC 173-340-740 and 747

Date: 10/1/2007

Site Name: Former Columbia Marine Lines

Sample Name: GPE-6-11

Chemical of Concern or EC Group	Measured Soil Conc @dry basis	GW Cleanup Level	Adjusted Condition				
			Soil Conc being tested	Predicted Conc @Well	HQ @ Well	RISK @ Well	Pass or Fail?
	mg/kg	ug/L	mg/kg	ug/L	unitless	unitless	
Petroleum EC Fraction							
AL_EC >5-6	6.58		6.58E+00	7.65E+00	5.63E-04		
AL_EC >6-8	6.6		6.60E+00	9.96E-01	7.32E-05		
AL_EC >8-10	38.4		3.84E+01	3.61E-01	1.51E-03		
AL_EC >10-12	347		3.47E+02	2.11E-01	8.78E-04		
AL_EC >12-16	1350		1.35E+03	1.47E-02	3.06E-05		
AL_EC >16-21	971		9.71E+02	1.34E-05	4.17E-10		
AL_EC >21-34	165		1.65E+02	1.77E-11	5.54E-16		
AR_EC >8-10	6.59		6.59E+00	9.68E+00	1.21E-02		
AR_EC >10-12	92.8		9.28E+01	4.96E+01	3.10E-01		
AR_EC >12-16	186		1.86E+02	2.04E+01	2.55E-02		
AR_EC >16-21	329		3.29E+02	2.52E+00	5.26E-03		
AR_EC >21-34	70		7.00E+01	5.51E-03	8.62E-06		
Benzene	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Toluene	0	1000	0.00E+00	0.00E+00	0.00E+00		
Ethylbenzene	0	700	0.00E+00	0.00E+00	0.00E+00		
Total Xylenes	0	1000	0.00E+00	0.00E+00	0.00E+00		
Naphthalene	0.359	160	3.59E-01	2.44E-01	1.53E-03		
1-Methyl Naphthalene	10.6		1.06E+01	5.17E+00	1.29E-02		
2-Methyl Naphthalene	6.43		6.43E+00	3.09E+00	9.65E-02		
n-Hexane	0		0.00E+00	0.00E+00	0.00E+00		
MTBE	0	20	0.00E+00	0.00E+00	0.00E+00		
Ethylene Dibromide (EDB)	0	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.449	for	4.49E-01	5.29E-05		4.41E-10	for
Benzo(b)fluoranthene	0.292	all	2.92E-01	4.97E-06		4.15E-11	all
Benzo(k)fluoranthene	0.183	cPAHs	1.83E-01	1.66E-06		1.39E-11	cPAHs
Benzo(a)pyrene	0.272	Risk=	2.72E-01	5.00E-06		4.17E-10	
Chrysene	0.727	1E-05	7.27E-01	1.46E-05		1.22E-11	
Dibenz(a,h)anthracene	0.09		9.00E-02	2.31E-06		7.70E-11	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.09		9.00E-02	2.05E-08		1.71E-13	1.00E-09
Sum	3588.462		3.59E+03	1.00E+02	4.67E-01	1.00E-09	Pass

Site-Specific Hydrogeological Properties previously entered:

Item	Symbol	Value	Units
Total soil porosity:	n	0.43	unitless
Volumetric water content:	Θ_w	0.3	unitless
Volumetric air content:	Θ_a	0.13	unitless
Soil bulk density measured:	ρ_b	1.5	kg/L
Fraction Organic Carbon:	f_{oc}	0.001	unitless
Dilution Factor:	DF	20	unitless

Target Ground Water TPH conc adjusted previously if any:

Target Ground Water TPH Conc, ug/L ⇒ 824

CALCULATE PROTECTIVE CONDITION OR TEST ADJUSTED CONDITION Calculate or Test

Selected Criterion:

Most Stringent?

Protective TPH Soil Conc, mg/kg =

Protective TPH GW Conc, ug/L =

RISK @ Well =

HI @Well =

DEDAILED MODEL RESULTS TPH Range Test

Type of model used for computation:

Computation completed?

Initial Weighted Average MW of NAPL, g/mol:

Equilibrated Weighted Average MW of NAPL, g/mol:

Initial Weighted Average Density of NAPL, kg/L:

Volumetric NAPL Content, Θ_{NAPL} :

NAPL Saturation (%), Θ_{NAPL}/n :

100% NAPL, mg/kg

Mass Distribution Pattern @ 4-phase in soil pore system: Mass Balance Pattern

Total Mass distributed in Water Phase: in Solid:

Total Mass distributed in Air Phase: in NAPL:

Please Check Soil Residual Saturation TPH Levels: Refer to Table 747-5!

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 10/01/07
Site Name: Former Columbia Marine Lines
Sample Name: GPE-7-10

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	41.3	0.63%
AL_EC >6-8	41.3	0.63%
AL_EC >8-10	121	1.86%
AL_EC >10-12	753	11.57%
AL_EC >12-16	2560	39.32%
AL_EC >16-21	1610	24.73%
AL_EC >21-34	224	3.44%
AR_EC >8-10	41.3	0.63%
AR_EC >10-12	107	1.64%
AR_EC >12-16	301	4.62%
AR_EC >16-21	559	8.59%
AR_EC >21-34	112	1.72%
Benzene	0	0.00%
Toluene	0	0.00%
Ethylbenzene	0	0.00%
Total Xylenes	0	0.00%
Naphthalene	1.24	0.02%
1-Methyl Naphthalene	36.1	0.55%
2-Methyl Naphthalene	0.177	0.00%
n-Hexane	0	0.00%
MTBE	0	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.529	0.01%
Benzo(b)fluoranthene	0.177	0.00%
Benzo(k)fluoranthene	0.177	0.00%
Benzo(a)pyrene	0.177	0.00%
Chrysene	0.803	0.01%
Dibenz(a,h)anthracene	0.177	0.00%
Indeno(1,2,3-cd)pyrene	0.177	0.00%
Sum	6510.634	100.00%

Notes for Data Entry | Set Default Hydrogeology
Clear All Soil Concentration Data Entry Cells
Restore All Soil Concentration Data cleared previously

REMARK:
EnWr sLWl-sSHFlfIF lnfRrP DWRn KHrH.....

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here: 828 ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 10/1/2007
Site Name: Former Columbia Marine Lines
Sample Name: GPE-7-10
Measured Soil TPH Concentration, mg/kg **6,510.634**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	1,865	3.49E-06	2.53E+00	Fail
	Method C	33,373	8.67E-07	1.95E-01	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protection	100% NAPL	5.33E-10	2.96E-01	Pass
	Target TPH GW Conc. @ 828 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

Warning! Check Residual Saturation (WAC340-747(10)).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	**1,865.43**	**33,372.92**
Most Stringent Criterion	**Risk of cPAHs mixture= 1E-6**	**HI =1**

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	*NO*	2.57E+03	1.38E-06	1.00E+00	YES	3.34E+04	4.44E-06	1.00E+00
Total Risk=1E-5	*NO*	1.87E+04	1.00E-05	7.25E+00	*NO*	7.51E+04	1.00E-05	2.25E+00
Risk of Benzene= 1E-6	NA	NA	NA	NA	NA			
Risk of cPAHs mixture= 1E-6	YES	1.87E+03	1.00E-06	7.25E-01				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	**NA**
Protective Ground Water Concentration, ug/L	**NA**
Protective Soil Concentration, mg/kg	**Soil-to-Ground Water is not a critical pathway!**

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	1.28E+02	5.31E-10	3.00E-01	100% NAPL
Total Risk = 1E-5	YES	1.28E+02	5.31E-10	3.00E-01	100% NAPL
Total Risk = 1E-6	YES	1.28E+02	5.31E-10	3.00E-01	100% NAPL
Risk of cPAHs mixture= 1E-5	YES	1.28E+02	5.31E-10	3.00E-01	100% NAPL
Benzene MCL = 5 ug/L	NA	NA	NA	NA	NA
MTBE = 20 ug/L	NA	NA	NA	NA	NA

Note: 100% NAPL is 70000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 828 ug/L	1.28E+02	5.31E-10	3.00E-01	**100% NAPL**

A2. 1B Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method B: Unrestricted Land Use (WAC 173-340-740)

Date: 10/1/2007
Site Name: Former Columbia Marine Lines
Sample Name: GPE-7-10

Chemical of Concern or EC group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	41.3	3.29E-04			1.18E+01	9.42E-05		
AL_EC >6-8	41.3	3.29E-04			1.18E+01	9.42E-05		
AL_EC >8-10	121	5.46E-02			3.47E+01	1.56E-02		
AL_EC >10-12	753	3.40E-01			2.16E+02	9.73E-02		
AL_EC >12-16	2560	1.54E+00			7.33E+02	4.40E-01		
AL_EC >16-21	1610	1.45E-02			4.61E+02	4.15E-03		
AL_EC >21-34	224	2.02E-03			6.42E+01	5.78E-04		
AR_EC >8-10	41.3	5.59E-03			1.18E+01	1.60E-03		
AR_EC >10-12	107	7.24E-02			3.07E+01	2.07E-02		
AR_EC >12-16	301	1.08E-01			8.62E+01	3.10E-02		
AR_EC >16-21	559	3.35E-01			1.60E+02	9.61E-02		
AR_EC >21-34	112	5.04E-02			3.21E+01	1.44E-02		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	1.24	1.02E-03			3.55E-01	2.93E-04		
1-Methyl Naphthalene	36.1	9.27E-03			1.03E+01	2.66E-03		
2-Methyl Naphthalene	0.177	5.68E-04			5.07E-02	1.63E-04		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.529		5.10E-07	*For*	1.52E-01		1.46E-07	*For*
Benzo(b)fluoranthene	0.177		1.71E-07	*all*	5.07E-02		4.89E-08	*all*
Benzo(k)fluoranthene	0.177		1.71E-07	*cPAHs*	5.07E-02		4.89E-08	*cPAHs*
Benzo(a)pyrene	0.177		1.71E-06		5.07E-02		4.89E-07	
Chrysene	0.803		7.75E-08	*Fail*	2.30E-01		2.22E-08	
Dibenz(a,h)anthracene	0.177		6.83E-07	ΣRisk=	5.07E-02		1.96E-07	ΣRisk=
Indeno(1,2,3-cd)pyrene	0.177		1.71E-07	3.49E-06	5.07E-02		4.89E-08	1.00E-06
Sum	**6510.634**	2.53E+00	3.49E-06	Fail	1.87E+03	7.25E-01	1.00E-06	

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 6510.634
HI= 2.530E+00
RISK= 3.490E-06
Pass or Fail? *Fail*

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH Soil Conc

Selected Criterion:
Most Stringent?

Protctive TPH Soil Conc, mg/kg =
HI =
RISK =

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg =
HI =
RISK =
Pass or Fail?

A2. 1C Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method C: Industrial Land Use (WAC 173-340-745)

Date: 10/1/2007
Site Name: Former Columbia Marine Lines
Sample Name: GPE-7-10

Chemical of Concern or EC Group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	41.3	1.7E-05			2.12E+02	8.56E-05		
AL_EC >6-8	41.3	1.7E-05			2.12E+02	8.56E-05		
AL_EC >8-10	121	2.77E-03			6.20E+02	1.42E-02		
AL_EC >10-12	753	1.73E-02			3.86E+03	8.85E-02		
AL_EC >12-16	2560	1.28E-01			1.31E+04	6.56E-01		
AL_EC >16-21	1610	1.21E-03			8.25E+03	6.19E-03		
AL_EC >21-34	224	1.68E-04			1.15E+03	8.61E-04		
AR_EC >8-10	41.3	2.84E-04			2.12E+02	1.46E-03		
AR_EC >10-12	107	3.68E-03			5.48E+02	1.89E-02		
AR_EC >12-16	301	9.03E-03			1.54E+03	4.63E-02		
AR_EC >16-21	559	2.80E-02			2.87E+03	1.43E-01		
AR_EC >21-34	112	4.20E-03			5.74E+02	2.15E-02		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	1.24	7.63E-05			6.36E+00	3.91E-04		
1-Methyl Naphthalene	36.1	4.06E-04			1.85E+02	2.08E-03		
2-Methyl Naphthalene	0.177	2.49E-05			9.07E-01	1.28E-04		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.529		1.27E-07		2.71E+00		6.49E-07	
Benzo(b)fluoranthene	0.177		4.24E-08		9.07E-01		2.17E-07	
Benzo(k)fluoranthene	0.177		4.24E-08		9.07E-01		2.17E-07	
Benzo(a)pyrene	0.177		4.24E-07		9.07E-01		2.17E-06	
Chrysene	0.803		1.92E-08		4.12E+00		9.86E-08	
Dibenz(a,h)anthracene	0.177		1.70E-07		9.07E-01		8.69E-07	
Indeno(1,2,3-cd)pyrene	0.177		4.24E-08		9.07E-01		2.17E-07	
Sum	**6510.634**	1.95E-01	8.67E-07		3.34E+04	1.00E+00	4.44E-06	

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 6510.634
HI= 1.951E-01
RISK= 8.666E-07
Pass or Fail? Pass
Check Residual Saturation (WAC340-747(10))

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH soil Conc

Selected Criterion:
Most Stringent?
Protctive TPH Soil Conc, mg/kg =
HI =
RISK =

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg=
HI=
RISK=
Pass or Fail?

A2. 2 Worksheet for Calculating Soil Cleanup Level for the Protection of Ground Water Quality (Leaching Pathway)

Calculating Soil Cleanup Level for the Protection of Ground Water Quality (Leaching Pathway)

WAC 173-340-740 and 747

Date: 10/1/2007

Site Name: Former Columbia Marine Lines

Sample Name: GPE-7-10

Chemical of Concern or EC Group	Measured Soil Conc @dry basis	GW Cleanup Level	Adjusted Condition				
			Soil Conc being tested	Predicted Conc @Well	HQ @ Well	RISK @ Well	Pass or Fail?
	mg/kg	ug/L	mg/kg	ug/L	unitless	unitless	
Petroleum EC Fraction							
AL_EC >5-6	41.3		4.45E+02	2.80E+01	2.06E-03		
AL_EC >6-8	41.3		4.45E+02	3.40E+00	2.50E-04		
AL_EC >8-10	121		1.30E+03	6.11E-01	2.55E-03		
AL_EC >10-12	753		8.12E+03	2.44E-01	1.02E-03		
AL_EC >12-16	2560		2.76E+04	1.49E-02	3.10E-05		
AL_EC >16-21	1610		1.74E+04	1.18E-05	3.70E-10		
AL_EC >21-34	224		2.42E+03	1.28E-11	4.01E-16		
AR_EC >8-10	41.3		4.45E+02	3.41E+01	4.26E-02		
AR_EC >10-12	107		1.15E+03	3.14E+01	1.96E-01		
AR_EC >12-16	301		3.25E+03	1.78E+01	2.22E-02		
AR_EC >16-21	559		6.03E+03	2.29E+00	4.77E-03		
AR_EC >21-34	112		1.21E+03	4.70E-03	7.35E-06		
Benzene	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Toluene	0	1000	0.00E+00	0.00E+00	0.00E+00		
Ethylbenzene	0	700	0.00E+00	0.00E+00	0.00E+00		
Total Xylenes	0	1000	0.00E+00	0.00E+00	0.00E+00		
Naphthalene	1.24	160	1.34E+01	4.58E-01	2.86E-03		
1-Methyl Naphthalene	36.1		3.89E+02	9.68E+00	2.42E-02		
2-Methyl Naphthalene	0.177		1.91E+00	4.67E-02	1.46E-03		
n-Hexane	0		0.00E+00	0.00E+00	0.00E+00		
MTBE	0	20	0.00E+00	0.00E+00	0.00E+00		
Ethylene Dibromide (EDB)	0	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	0.529	for	5.70E+00	3.33E-05		2.78E-10	for
Benzo(b)fluoranthene	0.177	all	1.91E+00	1.61E-06		1.34E-11	all
Benzo(k)fluoranthene	0.177	cPAHs	1.91E+00	8.57E-07		7.15E-12	cPAHs
Benzo(a)pyrene	0.177	Risk=	1.91E+00	1.74E-06		1.45E-10	
Chrysene	0.803	1E-05	8.66E+00	8.60E-06		7.17E-12	
Dibenz(a,h)anthracene	0.177		1.91E+00	2.42E-06		8.08E-11	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.177		1.91E+00	2.15E-08		1.80E-13	5.31E-10
Sum	6510.634		7.02E+04	1.28E+02	3.00E-01	5.31E-10	Pass

Site-Specific Hydrogeological Properties previously entered:			
Item	Symbol	Value	Units
Total soil porosity:	n	0.43	unitless
Volumetric water content:	Θ_w	0.3	unitless
Volumetric air content:	Θ_a	0.13	unitless
Soil bulk density measured:	ρ_b	1.5	kg/L
Fraction Organic Carbon:	f_{oc}	0.001	unitless
Dilution Factor:	DF	20	unitless

Target Ground Water TPH conc adjusted previously if any:	
Target Ground Water TPH Conc, ug/L ⇒	828

CALCULATE PROTECTIVE CONDITION OR TEST ADJUSTED CONDITION — Calculate or Test

Selected Criterion:

Most Stringent?

Protective TPH Soil Conc, mg/kg =

Protective TPH GW Conc, ug/L =

RISK @ Well =

HI @Well =

DEDAILED MODEL RESULTS — TPH Range Test

Type of model used for computation:

Computation completed?

Initial Weighted Average MW of NAPL, g/mol:

Equilibrated Weighted Average MW of NAPL, g/mol:

Initial Weighted Average Density of NAPL, kg/L:

Volumetric NAPL Content, Θ_{NAPL} :

NAPL Saturation (%), Θ_{NAPL}/n :

100% NAPL, mg/kg

Mass Distribution Pattern @ 4-phase in soil pore system: Mass Balance Pattern

Total Mass distributed in Water Phase: in Solid:

Total Mass distributed in Air Phase: in NAPL:

Please Check Soil Residual Saturation TPH Levels: Refer to Table 747-5!