APPENDIX A— SWMUS SUPPORTING DOCUMENTATION

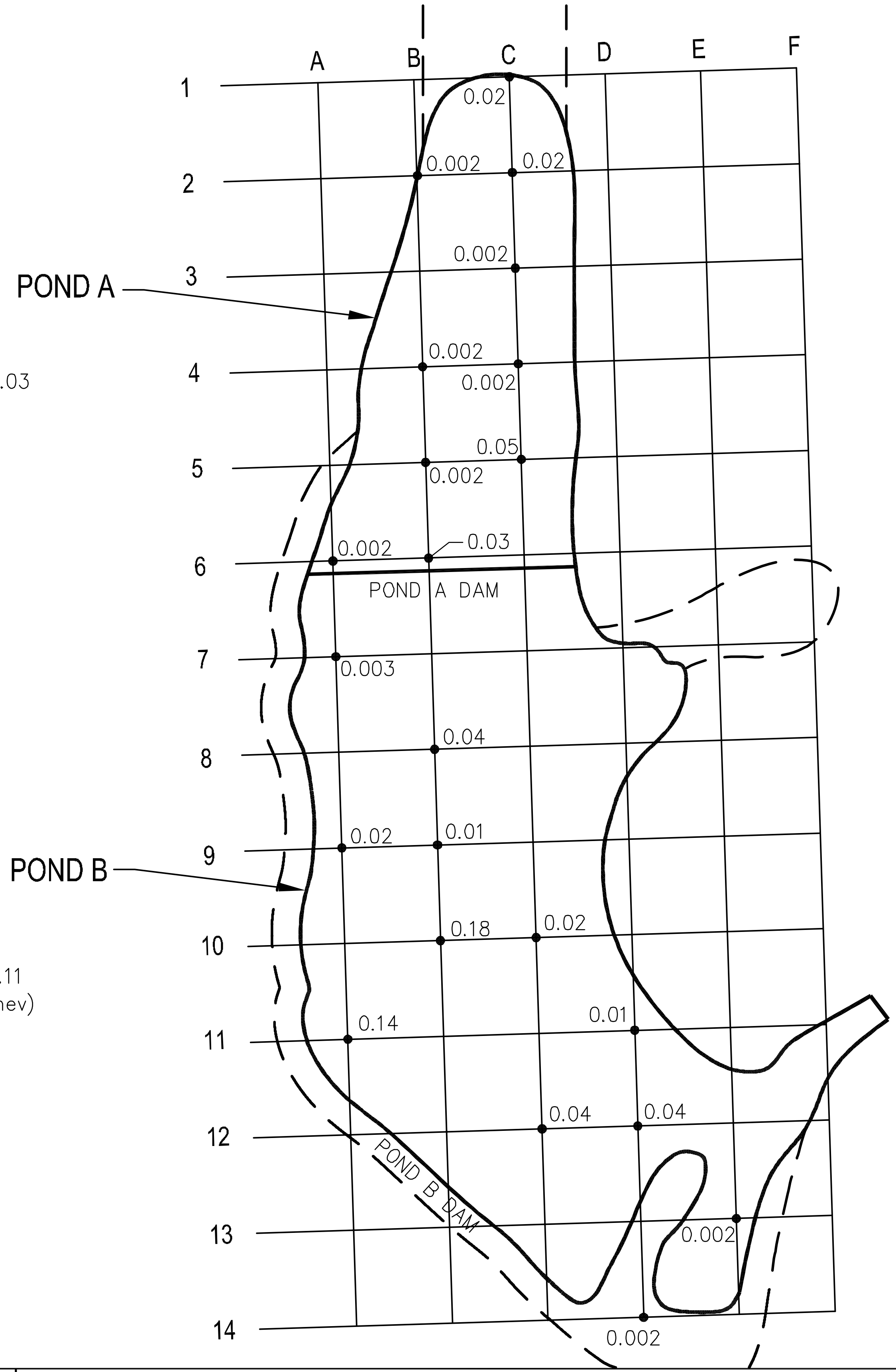
APPENDIX A-1

SWMU #1 – NPDES Ponds

APPENDIX A-1

SWMU #1 – NPDES Ponds

ARCADIS (2011a)
Site Closure Report



POND A UCL = 0.03
(95% KM (t)

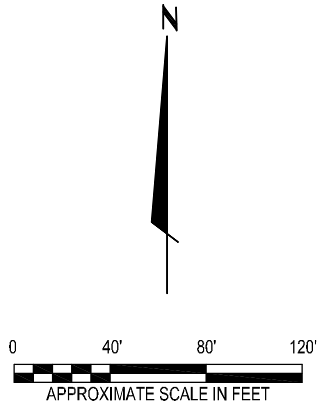
POND B UCL = 0.11
(95% KM (Chebyshev)

LEGEND:

0.02 ● PAH TOTAL TOXICITY EQUIVALENT CONCENTRATIONS (TTEC), MILLIGRAMS PER KILOGRAM (mg/kg)

NOTE:

LETTERS AND NUMBERS DEFINE GRID POINTS. FOR EXAMPLE, GRID POINT C1 CONFIRMATION RESULT IS 0.02 (mg/kg).



Acad Version : R17.0s (LMS Tech)
User Name : MHoefer

Current Plotsyle : ByColor
Path\Name : G:\Common\Matt H\Goldendale\MT000978-grid\COLOC-0439.dwg

Drafter
M. HOEFER

Project Manager
K. SMITH

Task Manager
M. RISHER

Technical Review
M. RISHER

ARCADIS

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NPDES PONDS A AND B

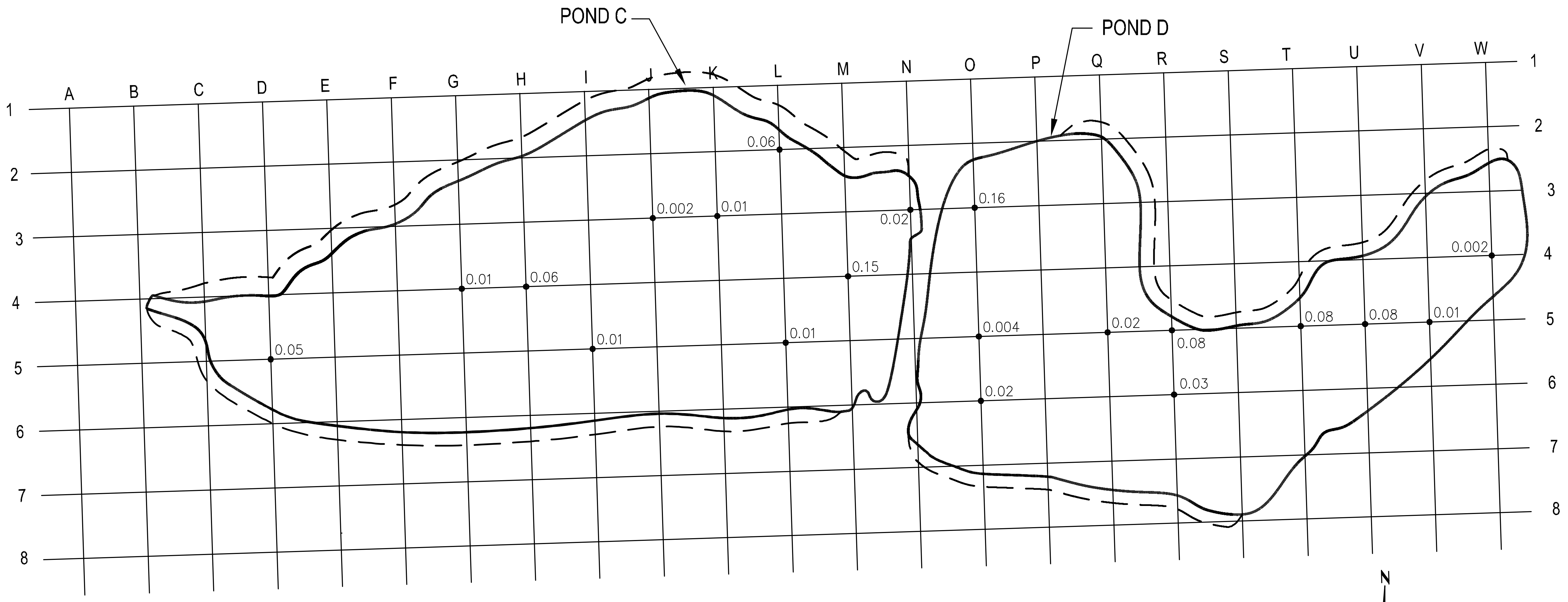
POST REMOVAL PAH CONFIRMATION SAMPLING RESULTS, FINAL

GOLDENDALE, WASHINGTON

Project Number
MH000978.0001

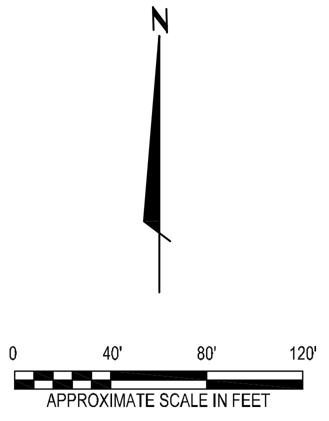
Drawing Date
11/08/2010

Figure
2



POND C UCL = 0.10
(95% KM (Chebyshev)

POND D UCL = 0.08
(95% KM (t)



LEGEND:

0.04 ● PAH TOTAL TOXICITY EQUIVALENT CONCENTRATIONS (TTEC), MILLIGRAMS PER KILLOGRAM (mg/kg)

NOTE:

LETTERS AND NUMBERS DEFINE GRID POINTS. FOR EXAMPLE, GRID POINT D5 CONFIRMATION RESULT IS 0.05 (mg/kg).

Current Plotstyle : ByColor
Path\Name : G:\Common\Matt H\Goldendale\MT000978-grid\COLOC-0440.dwg
Acad Version : R17.0s (LMS Tech)
User Name : MHoefer

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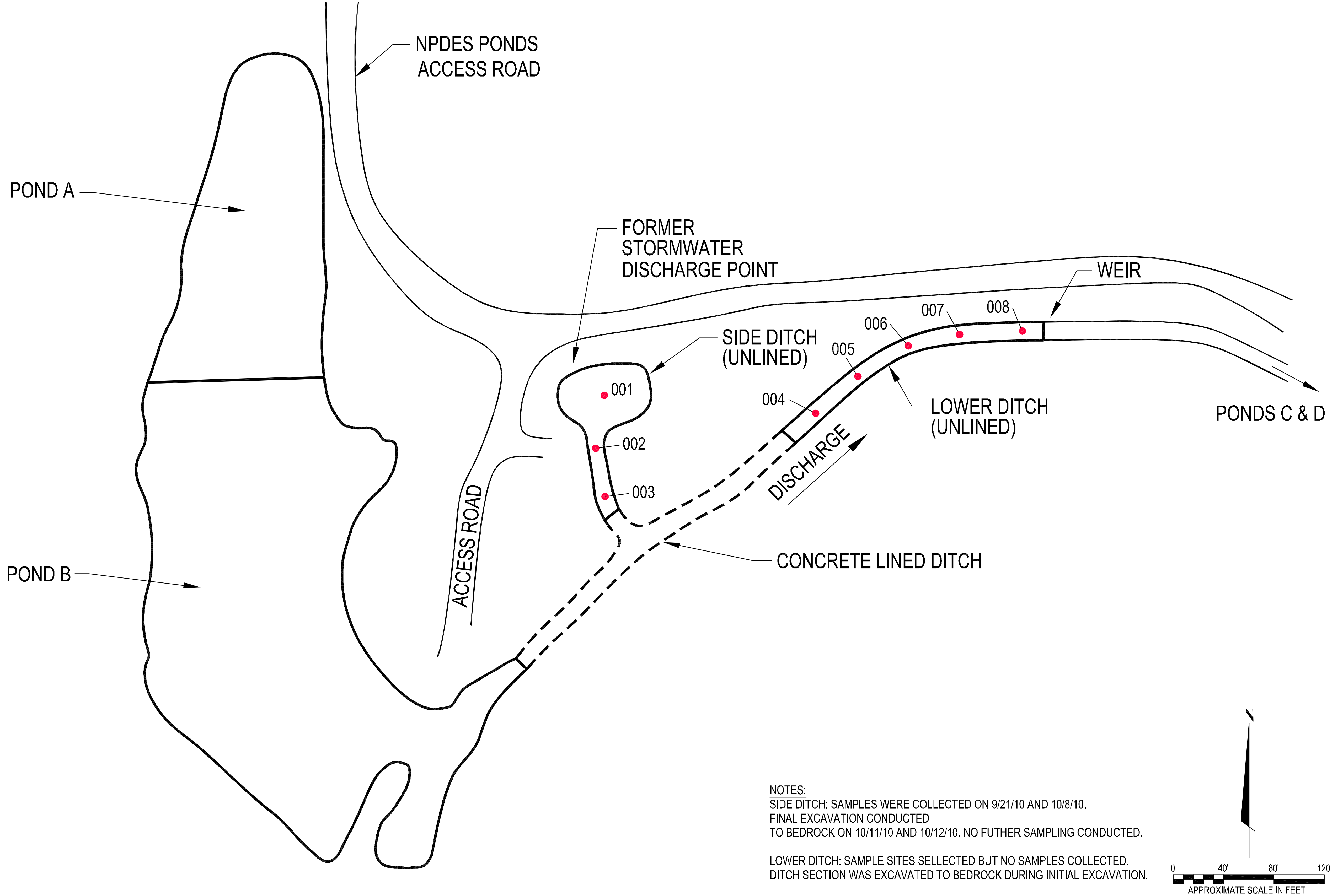
NPDES PONDS C AND D

POST REMOVAL PAH CONFIRMATION SAMPLING RESULTS, FINAL

GOLDENDALE, WASHINGTON

Project Number
MH000978.0001
Drawing Date
11/08/2010
Figure
3



NOTES:
SIDE DITCH: SAMPLES WERE COLLECTED ON 9/21/10 AND 10/8/10.
FINAL EXCAVATION CONDUCTED
TO BEDROCK ON 10/11/10 AND 10/12/10. NO FUTHER SAMPLING CONDUCTED.

LOWER DITCH: SAMPLE SITES SELLECTED BUT NO SAMPLES COLLECTED.
DITCH SECTION WAS EXCAVATED TO BEDROCK DURING INITIAL EXCAVATION.

Drafter	M. HOEFER
Project Manager	M. RISHER
Task Manager	A. CATTANI
Technical Review	A. CATTANI

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LEGEND:
- ▬▬ UNLINED DITCH
- ‒ ‒ CONCRETE LINED DITCH
- ● COMPOSITE SAMPLE SITE CENTER POINTS

NPDES DITCH
EXCAVATION AREA

GOLDENDALE, WASHINGTON

Project Number
MH000978.0002

Drawing Date
11/15/2010

Figure
4

Acad Version : R17.0s (LMS Tech)
User Name : MHoefer
Current Plotstyle : ByColor
Path\Name : G:\Common\Matt H\Goldendale\MT000978\COLOC-0438.dwg

Table 6-2
Confirmation Sampling - Pond A PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1]	**CLEANUP**		**SS-C1, POND A**			**SS-B2, POND A**			**SS-C2, POND A**			**SS-C3, POND A**			**SS-B4, POND A**		
DATE COLLECTED	**STANDARD [2]**		**09/15/10**		**MRL**	**10/05/10**		**MRL**	**09/15/10**		**MRL**	**09/15/10**		**MRL**	**09/15/10**		**MRL**
ANALYTE	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)
Acenaphthene	-	-	0.0038		nd*(0.00761)	0.0017		nd*(0.00334)	0.0040		nd*(0.00793)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Acenaphthylene	-	-	0.0038		nd*(0.00761)	0.0017		nd*(0.00334)	0.0040		nd*(0.00793)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Anthracene	-	-	0.0038		nd*(0.00761)	0.0017		nd*(0.00334)	0.0040		nd*(0.00793)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(a)anthracene	-	-	0.0413		0.00761	0.0017		nd*(0.00334)	0.0554		0.00793	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(a)pyrene	-	-	0.0473		0.00761	0.0017		nd*(0.00334)	0.0556		0.00793	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(b+k)fluoranthene [4]	-	-	0.117		0.0153	0.0017		nd*(0.00334)	0.157		0.0159	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(g,h,i)perylene	-	-	0.0564	J	0.00761	0.0017		nd*(0.00334)	0.0776	J	0.00793	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Chrysene	-	-	0.0964		0.00761	0.0017		nd*(0.00334)	0.123		0.00793	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Dibenzo(a,h)anthracene	-	-	0.0120		0.00761	0.0017		nd*(0.00334)	0.0166		0.00793	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Fluoranthene	-	-	0.102		0.00761	0.0017		nd*(0.00334)	0.128		0.00793	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Fluorene	-	-	0.0038		nd*(0.00761)	0.0017		nd*(0.00334)	0.0040		nd*(0.00793)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Indeno(1,2,3-cd)pyrene	-	-	0.0574	J	0.00761	0.0017		nd*(0.00334)	0.0769	J	0.00793	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Naphthalene	-	-	0.0076		nd*(0.0152)	0.0017		nd*(0.00334)	0.0079		nd*(0.0158)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Phenanthrene	-	-	0.0191		0.00761	0.0017		nd*(0.00334)	0.0290		0.00735	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Pyrene	-	-	0.0843		0.00761	0.0017		nd*(0.00334)	0.103		0.00735	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
TOTAL PAH [5]	-	-	0.7			0.0			0.8			0.0			0.0		

cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzo(a)anthracene	-	0.10	0.00	**Weighted TTEC[8]** 1 of 5 aliquots	0.00	**Weighted TTEC[8]** 0 of 5 aliquots	0.01	**Weighted TTEC[8]** 1 of 5 aliquots	0.00	**Weighted TTEC[8]** 0 of 5 aliquots	0.00	**Weighted TTEC[8]** 0 of 5 aliquots
Benzo(a)pyrene	-	1.00	0.05		0.00		0.06		0.00		0.00	
Benzo(b+k)fluoranthene	-	0.10	0.01		0.00		0.02		0.00		0.00	
Chrysene	-	0.01	0.00		0.00		0.00		0.00		0.00	
Dibenzo(a,h)anthracene	-	0.10	0.00		0.00		0.00		0.00		0.00	
Indeno(1,2,3-cd)pyrene	-	0.10	0.01		0.00		0.01		0.00		0.00	
TTEC [7]	0.14	-	0.071	**0.02**	0.002	**0.002**	0.09	**0.02**	0.002	**0.002**	0.002	**0.002**

MRL - Method Reporting Limit

mg/kg - milligrams per kilogram

nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figures 2 and 3), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.

[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.

[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.

[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

The UCL for this data set is 0.03 (95% KM(t))

Bolded TTEC result - final confirmation sample result

Table 6-2
Confirmation Sampling - Pond A PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1]	CLEANUP		SS-C4, POND A			SS-B5, POND A			SS-C5, POND A			SS-A6, POND A			SS-B6, POND A			UCL [9]
DATE COLLECTED	STANDARD [2]		09/15/10		MRL	10/08/10		MRL	10/05/10		MRL	09/15/10		MRL	10/05/10		MRL	
ANALYTE	(mg/kg)		(mg/kg)	Q [3]	(mg/kg)	(mg/kg)	Q [3]	(mg/kg)	(mg/kg)	Q [3]	(mg/kg)	(mg/kg)	Q [3]	(mg/kg)	(mg/kg)	Q [3]	(mg/kg)	
Acenaphthene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0220		nd*(0.0440)	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Acenaphthylene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0220		nd*(0.0440)	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Anthracene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0220		nd*(0.0440)	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Benzo(a)anthracene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.106		0.0440	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Benzo(a)pyrene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0722		0.0440	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Benzo(b+k)fluoranthene [4]	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.269		0.0885	0.0017		nd*(0.00334)	0.0421		nd*(0.0841)	-
Benzo(g,h,i)perylene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.102		0.0440	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Chrysene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.244		0.0440	0.0017		nd*(0.00334)	0.0421		0.0419	-
Dibenzo(a,h)anthracene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0220		nd*(0.0440)	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Fluoranthene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.549		0.0440	0.0017		nd*(0.00334)	0.0503		0.0419	-
Fluorene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0220		nd*(0.0440)	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Indeno(1,2,3-cd)pyrene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0973		0.0440	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Naphthalene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0439		nd*(0.0878)	0.0017		nd*(0.00334)	0.0418		nd*(0.0835)	-
Phenanthrene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0443		0.0440	0.0017		nd*(0.00334)	0.0210		nd*(0.0419)	-
Pyrene	-	-	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.536		0.0440	0.0017		nd*(0.00334)	0.0437		0.0419	-
TOTAL PAH [5]	-	-	0.0			0.0			2.2			0.0			0.4			-
cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	-
Benzo(a)anthracene	-	0.10	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.01		**Weighted TTEC[8]** 2 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 4 of 5 aliquots	-
Benzo(a)pyrene	-	1.00	0.00			0.00			0.07			0.00			0.02			-
Benzo(b+k)fluoranthene	-	0.10	0.00			0.00			0.03			0.00			0.00			-
Chrysene	-	0.01	0.00			0.00			0.00			0.00			0.00			-
Dibenzo(a,h)anthracene	-	0.10	0.00			0.00			0.00			0.00			0.00			-
Indeno(1,2,3-cd)pyrene	-	0.10	0.00			0.00			0.01			0.00			0.00			-
TTEC [7]	0.14	-	0.002		**0.002**	0.002		**0.002**	0.124		**0.05**	0.002		**0.002**	0.032		**0.03**	**0.03**

MRL - Method Reporting Limit

mg/kg - milligrams per kilogram

nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figures 2 and 3), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.

[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.

[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.

[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

The UCL for this data set is 0.03 (95% KM(t))

Bolded TTEC result - final confirmation sample result

Table 6-4
Confirmation Sampling - Pond B PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID[1] DATE COLLECTED	CLEANUP STANDARD[2]		SS-A7, POND B 10/08/10		MRL	SS-B8, POND B 10/05/10		MRL	SS-A9, POND B 09/10/10		MRL	SS-B9, POND B 09/24/10		MRL	SS-B10, POND B 09/24/10		MRL
ANALYTES	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)
Acenaphthene	-		0.0039		nd*(0.00789)	0.0034		nd*(0.00679)	0.005		nd*(0.00916)	0.0042		nd*(0.00844)	0.0041		nd*(0.00827)
Acenaphthylene	-		0.0201		0.00789	0.0034		nd*(0.00679)	0.005		nd*(0.00916)	0.0042		nd*(0.00844)	0.0041		nd*(0.00827)
Anthracene	-		0.0039		nd*(0.00789)	0.0200		0.00679	0.0138		0.00916	0.0042		nd*(0.00844)	0.0108		0.00827
Benzo(a)anthracene	-		0.0039		nd*(0.00789)	0.0451		0.00679	0.0163		0.00916	0.0042		nd*(0.00844)	0.108		0.00827
Benzo(a)pyrene	-		0.0039		nd*(0.00789)	0.0229		0.00679	0.0136		0.00916	0.0042		nd*(0.00844)	0.115		0.00827
Benzo(b+k)fluoranthene[4]	-		0.0080		nd*(0.0159)	0.0741		0.0136	0.0351		0.0184	0.0085		nd*(0.0169)	0.381		0.0166
Benzo(g,h,i)perylene	-		0.0039		nd*(0.00789)	0.0239		0.00679	0.0158		0.00916	0.0042		nd*(0.00844)	0.104		0.00827
Chrysene	-		0.0039		nd*(0.00789)	0.0776		0.00679	0.0492		0.00916	0.0042		nd*(0.00844)	0.352		0.00827
Dibenzo(a,h)anthracene	-		0.0039		nd*(0.00789)	0.0034		nd*(0.00679)	0.005		nd*(0.00916)	0.0042		nd*(0.00844)	0.0245		0.00827
Fluoranthene	-		0.00925		0.00789	0.401		0.00679	0.197		0.00916	0.0042		nd*(0.00844)	0.221		0.00827
Fluorene	-		0.0039		nd*(0.00789)	0.0315		0.00679	0.0166		0.00916	0.0042		nd*(0.00844)	0.0179		0.00827
Indeno(1,2,3-cd)pyrene	-		0.0039		nd*(0.00789)	0.0231		0.00679	0.0158		0.00916	0.0042		nd*(0.00844)	0.0959		0.00827
Naphthalene	-		0.0079		nd*(0.0157)	0.0068		nd*(0.0135)	0.0092		nd*(0.0183)	0.0084		nd*(0.0168)	0.0083		nd*(0.0165)
Phenanthrene	-		0.0039		nd*(0.00789)	0.172		0.00679	0.239		0.00916	0.0042		nd*(0.00844)	0.0362		0.00827
Pyrene	-		0.0188		0.00789	0.334		0.00679	0.126		0.00916	0.0042		nd*(0.00844)	0.307		0.00827
TOTAL PAH[5]	-		0.1			1.2			0.8			0.1			1.8		
cPAH with TEF[6]	(mg/kg)	TEF[6]	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)			(mg/kg)			(mg/kg)		
Benzo(a)anthracene	-	0.10	0.00		**Weighted TTEC[8]** 3 of 5 aliquots	0.00			0.00			0.00			0.01		
Benzo(a)pyrene	-	1.00	0.00			0.02			0.01			0.00			0.12		
Benzo(b+k)fluoranthene	-	0.10	0.00			0.01			0.00			0.00			0.04		
Chrysene	-	0.01	0.00			0.00			0.00			0.00			0.00		
Dibenzo(a,h)anthracene	-	0.10	0.00			0.00			0.00			0.00			0.00		
Indeno(1,2,3-cd)pyrene	-	0.10	0.00			0.00			0.00			0.00			0.01		
TTEC[7]	0.14		0.01		**0.003**	**0.04**			**0.02**			**0.01**			**0.18**		

MRL - Method Reporting Limit

mg/kg - milligrams per kilogram

nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figures 2 and 3), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.

[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.

[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.

[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

The UCL for this data set is 0.11 (95% KM(Chebyshev)

Bolded TTEC result - final confirmation sample result

Table 6-4
Confirmation Sampling - Pond B PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1]	CLEANUP		SS-C10 , POND B			SS-A11, POND B			SS-D11, POND B			SS-C12, POND B			SS-D12, POND B		
DATE COLLECTED	STANDARD [2]		10/05/10		MRL	09/10/10		MRL	09/10/10		MRL	09/10/10		MRL	09/10/10		MRL
ANALYTES	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)
Acenaphthene	-		0.0044		nd*(0.00879)	0.005		nd*(0.00997)	0.004		nd*(0.00783)	0.0045		nd*(0.00903)	0.0046		nd*(0.00911)
Acenaphthylene	-		0.0044		nd*(0.00879)	0.005		nd*(0.00997)	0.004		nd*(0.00783)	0.0045		nd*(0.00903)	0.0046		nd*(0.00911)
Anthracene	-		0.0044		nd*(0.00879)	0.005		nd*(0.00997)	0.004		nd*(0.00783)	0.0180		0.00903	0.0103		0.00911
Benzo(a)anthracene	-		0.0147		0.00879	0.0925		0.00997	0.004		nd*(0.00783)	0.0344		0.00903	0.0232		0.00911
Benzo(a)pyrene	-		0.0146		0.00879	0.0872		0.00997	0.004		nd*(0.00783)	0.0225		0.00903	0.0250		0.00911
Benzo(b+k)fluoranthene [4]	-		0.0501		0.0176	0.274		0.0200	0.008		nd*(0.01566)	0.0679		0.0181	0.0633		0.0183
Benzo(g,h,i)perylene	-		0.0217		0.00879	0.113		0.00997	0.004		nd*(0.00783)	0.0238		0.00903	0.0291		0.00911
Chrysene	-		0.0423		0.00879	0.307		0.00997	0.0088		0.00880	0.091		0.00903	0.0590		0.00911
Dibenzo(a,h)anthracene	-		0.0044		nd*(0.00879)	0.0257		0.00997	0.004		nd*(0.00783)	0.0045		nd*(0.00903)	0.005		nd*(0.00911)
Fluoranthene	-		0.0463		0.00879	0.258		0.00997	0.112		0.00783	0.1780		0.00903	0.189		0.00911
Fluorene	-		0.0185		0.00879	0.005		nd*(0.00997)	0.004		nd*(0.00783)	0.0104		0.00903	0.005		nd*(0.00911)
Indeno(1,2,3-cd)pyrene	-		0.0208		0.00879	0.097		0.00997	0.004		nd*(0.00783)	0.0225		0.00903	0.0277		0.00911
Naphthalene	-		0.0088		nd*(0.0175)	0.0100		nd*(0.0199)	0.0078		nd*(0.0156)	0.009		nd*(0.0180)	0.0091		nd*(0.0182)
Phenanthrene	-		0.0726		0.00879	0.0377		0.00997	0.004		nd*(0.00783)	0.107		0.00903	0.112		0.00911
Pyrene	-		0.0515		0.00879	0.211		0.00997	0.0521		0.00783	0.180		0.00903	0.145		0.00911
TOTAL PAH [5]	-		0.4			1.5			0.2			0.8			0.7		
cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)			(mg/kg)			(mg/kg)			(mg/kg)			(mg/kg)		
Benzo(a)anthracene	-	0.10	0.00			0.01			0.00			0.00			0.00		
Benzo(a)pyrene	-	1.00	0.01			0.09			0.00			0.02			0.03		
Benzo(b+k)fluoranthene	-	0.10	0.01			0.03			0.00			0.01			0.01		
Chrysene	-	0.01	0.00			0.00			0.00			0.00			0.00		
Dibenzo(a,h)anthracene	-	0.10	0.00			0.00			0.00			0.00			0.00		
Indeno(1,2,3-cd)pyrene	-	0.10	0.00			0.01			0.00			0.00			0.00		
TTEC [7]	0.14		**0.02**			**0.14**			**0.01**			**0.04**			**0.04**		

MRL - Method Reporting Limit
mg/kg - milligrams per kilogram
nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figures 2 and 3), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.
[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.
[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.
[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.
[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.
[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.
[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.
[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).
[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

The UCL for this data set is 0.11 (95% KM(Chebyshev)

Bolded TTEC result - final confirmation sample result

Table 6-4
Confirmation Sampling - Pond B PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1] DATE COLLECTED	CLEANUP STANDARD [2]		SS-D14, LOWER POND B 10/12/10		MRL	SS-E13, LOWER POND B 10/12/10		MRL	UCL [9]
ANALYTES	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	
Acenaphthene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Acenaphthylene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(a)anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(a)pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(b+k)fluoranthene [4]	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(g,h,i)perylene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Chrysene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Dibenzo(a,h)anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Fluoranthene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Fluorene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Indeno(1,2,3-cd)pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Naphthalene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Phenanthrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
TOTAL PAH [5]	-		0.0			0.0			
cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	
Benzo(a)anthracene	-	0.10	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	
Benzo(a)pyrene	-	1.00	0.00			0.00			
Benzo(b+k)fluoranthene	-	0.10	0.00			0.00			
Chrysene	-	0.01	0.00			0.00			
Dibenzo(a,h)anthracene	-	0.10	0.00			0.00			
Indeno(1,2,3-cd)pyrene	-	0.10	0.00			0.00			
TTEC [7]	0.14		0.00		**0.002**	0.00		**0.002**	**0.11**

MRL - Method Reporting Limit
mg/kg - milligrams per kilogram
nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figures 2 and 3), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.

[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.

[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.

[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

The UCL for this data set is 0.11 (95% KM(Chebyshev)

Bolded TTEC result - final confirmation sample result

Table 6-7
Confirmation Sampling - Pond C PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1]	CLEANUP		SS-D5, POND C			SS-G4, POND C			SS-H4, POND C			SS-I5, POND C			SS-J3, POND C		
DATE COLLECTED	STANDARD [2]		09/15/10		MRL	09/14/10		MRL	09/15/10		MRL	09/15/10		MRL	10/05/10		MRL
ANALYTE	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)
Acenaphthene	-		0.0038		nd*(0.00759)	0.00846		0.00716	0.0042		nd*(0.00847)	0.0261		0.00853	0.0017		nd*(0.00334)
Acenaphthylene	-		0.0038		nd*(0.00759)	0.0036		nd*(0.00716)	0.0042		nd*(0.00847)	0.0043		nd*(0.00853)	0.0017		nd*(0.00334)
Anthracene	-		0.00926		0.00759	0.0130		0.00716	0.0228		0.00847	0.0287		0.00853	0.0017		nd*(0.00334)
Benzo(a)anthracene	-		0.0461		0.00759	0.0036		nd*(0.00716)	0.0342		0.00847	0.0043		nd*(0.00853)	0.0017		nd*(0.00334)
Benzo(a)pyrene	-		0.0322		0.00759	0.0036		nd*(0.00716)	0.0438		0.00847	0.0093		0.00853	0.0017		nd*(0.00334)
Benzo(b+k)fluoranthene [4]	-		0.0646		0.0152	0.0072		nd*(0.0144)	0.0844		0.0170	0.0176		0.0171	0.0017		nd*(0.00334)
Benzo(g,h,i)perylene	-		0.0236	J	0.00759	0.0036		nd*(0.00716)	0.0476	J	0.00847	0.0043		nd*(0.00853)	0.0017		nd*(0.00334)
Chrysene	-		0.0664		0.00759	0.00958		0.00716	0.0705		0.00847	0.0167		0.00853	0.0017		nd*(0.00334)
Dibenzo(a,h)anthracene	-		0.0038		nd*(0.00759)	0.0036		nd*(0.00716)	0.0042		nd*(0.00847)	0.0043		nd*(0.00853)	0.0017		nd*(0.00334)
Fluoranthene	-		0.173		0.00759	0.572		0.00716	0.341		0.00847	0.788		0.00853	0.0017		nd*(0.00334)
Fluorene	-		0.0038		nd*(0.00759)	0.0036		nd*(0.00716)	0.0150		0.00847	0.0306		0.00853	0.0017		nd*(0.00334)
Indeno(1,2,3-cd)pyrene	-		0.0255	J	0.00759	0.0036		nd*(0.00716)	0.0481	J	0.00847	0.0043		nd*(0.00853)	0.0017		nd*(0.00334)
Naphthalene	-		0.0076		nd*(0.0151)	0.0072		nd*(0.0143)	0.0085		nd*(0.0169)	0.0085		nd*(0.0170)	0.0017		nd*(0.00334)
Phenanthrene	-		0.00774		0.00759	0.0401		0.00716	0.0244		0.00847	0.0203		0.00853	0.0017		nd*(0.00334)
Pyrene	-		0.116		0.00759	0.328		0.00716	0.231		0.00847	0.425		0.00853	0.0017		nd*(0.00334)
TOTAL PAH [5]	-		0.6			1.0			1.0			1.4			0.0		
cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)			(mg/kg)			(mg/kg)			(mg/kg)			(mg/kg)		(mg/kg)
Benzo(a)anthracene	-	0.10	0.005			0.000			0.003			0.000			0.000		**Weighted TTEC[8]** 0 of 5 aliquots
Benzo(a)pyrene	-	1.00	0.032			0.004			0.044			0.009			0.002		
Benzo(b+k)fluoranthene	-	0.10	0.006			0.001			0.008			0.002			0.000		
Chrysene	-	0.01	0.001			0.000			0.001			0.000			0.000		
Dibenzo(a,h)anthracene	-	0.10	0.000			0.000			0.000			0.000			0.000		
Indeno(1,2,3-cd)pyrene	-	0.10	0.003			0.000			0.005			0.000			0.000		
TTEC [7]	0.14		**0.05**			**0.01**			**0.06**			**0.01**			0.002		**0.002**

MRL - Method Reporting Limit

mg/kg - milligrams per kilogram

nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figures 2 and 3), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

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[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

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[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

The UCL for this data set is 0.10 (95% KM (Chebyshev))

Bolded TTEC result - final confirmation sample result

Table 6-7
Confirmation Sampling - Pond C PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1] DATE COLLECTED	CLEANUP STANDARD [2]		SS-K3, POND C 09/14/10		MRL	SS-L2, POND C 09/14/10		MRL	SS-L5, POND C 09/14/10		MRL	SS-M4, POND C 09/14/10		MRL	SS-N3, POND C 10/05/10		MRL	UCL [9]
ANALYTE	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	
Acenaphthene	-		0.0041		nd*(0.00817)	0.0036		nd*(0.00727)	0.0042		nd*(0.00846)	0.0033		nd*(0.00660)	0.0034		nd*(0.00676)	
Acenaphthylene	-		0.0041		nd*(0.00817)	0.0036		nd*(0.00727)	0.0042		nd*(0.00846)	0.0033		nd*(0.00660)	0.0034		nd*(0.00676)	
Anthracene	-		0.00959		0.00817	0.0036		nd*(0.00727)	0.0042		nd*(0.00846)	0.0507		0.00660	0.0034		nd*(0.00676)	
Benzo(a)anthracene	-		0.0041		nd*(0.00817)	0.0483		0.00727	0.0042		nd*(0.00846)	0.152		0.00660	0.0217		0.00676	
Benzo(a)pyrene	-		0.0041		nd*(0.00817)	0.0371		0.00727	0.0042		nd*(0.00846)	0.0992		0.00660	0.0141		0.00676	
Benzo(b+k)fluoranthene [4]	-		0.0082		nd*(0.0163)	0.107		0.0146	0.0085		nd*(0.0170)	0.261		0.0133	0.0542		0.0136	
Benzo(g,h,i)perylene	-		0.0041		nd*(0.00817)	0.0493	J	0.00727	0.0042		nd*(0.00846)	0.0995	J	0.00660	0.0235		0.00676	
Chrysene	-		0.0118		0.00817	0.115		0.00727	0.0174		0.00846	0.304		0.00660	0.0471		0.00676	
Dibenzo(a,h)anthracene	-		0.0041		nd*(0.00817)	0.00935		0.00727	0.0042		nd*(0.00846)	0.0208		0.00660	0.0034		nd*(0.00676)	
Fluoranthene	-		0.319		0.00817	0.169		0.00727	0.140		0.00846	1.65		0.00660	0.0538		0.00676	
Fluorene	-		0.0041		nd*(0.00817)	0.0036		nd*(0.00727)	0.0042		nd*(0.00846)	0.0124		0.00660	0.0034		nd*(0.00676)	
Indeno(1,2,3-cd)pyrene	-		0.0041		nd*(0.00817)	0.0449	J	0.00727	0.0042		nd*(0.00846)	0.091	J	0.00660	0.0220		0.00676	
Naphthalene	-		0.0082		nd*(0.0163)	0.0073		nd*(0.0145)	0.0085		nd*(0.0169)	0.0066		nd*(0.0132)	0.0068		nd*(0.0135)	
Phenanthrene	-		0.0041		nd*(0.00817)	0.0192		0.00727	0.0042		nd*(0.00846)	0.0187		0.00660	0.0034		nd*(0.00676)	
Pyrene	-		0.268		0.00817	0.157		0.00727	0.0776		nd*(0.00846)	1.45		0.00660	0.0551		0.00676	
TOTAL PAH [5]	-		0.7			0.8			0.3			4.2			0.3			
cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)			(mg/kg)			(mg/kg)			(mg/kg)			(mg/kg)			
Benzo(a)anthracene	-	0.10	0.00			0.00			0.00			0.02			0.00			
Benzo(a)pyrene	-	1.00	0.00			0.04			0.00			0.10			0.01			
Benzo(b+k)fluoranthene	-	0.10	0.00			0.01			0.00			0.03			0.01			
Chrysene	-	0.01	0.00			0.00			0.00			0.00			0.00			
Dibenzo(a,h)anthracene	-	0.10	0.00			0.00			0.00			0.00			0.00			
Indeno(1,2,3-cd)pyrene	-	0.10	0.00			0.00			0.00			0.01			0.00			
TTEC [7]	0.14		**0.01**			**0.06**			**0.01**			**0.15**			**0.02**			**0.10**

MRL - Method Reporting Limit

mg/kg - milligrams per kilogram

nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figures 2 and 3), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.

[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.

[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.

[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

The UCL for this data set is 0.10 (95% KM (Chebyshev))

Bolded TTEC result - final confirmation sample result

Table 6-12
Confirmation Sampling - Ditch PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1]	CLEANUP STANDARD [2]		SS-001, DITCH*			SS-002, DITCH*			SS-003, DITCH*			SS-004, DITCH			SS-005, DITCH		
DATE COLLECTED			10/12/10		MRL	10/12/10		MRL	10/12/10		MRL	09/21/10		MRL	09/21/10		MRL
ANALYTE	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)
Acenaphthene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Acenaphthylene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(a)anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(a)pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(b+k)fluoranthene [4]	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Benzo(g,h,i)perylene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Chrysene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Dibenzo(a,h)anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Fluoranthene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Fluorene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Indeno(1,2,3-cd)pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Naphthalene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Phenanthrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
Pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)
TOTAL PAH [5]	-		0.0			0.0			0.0			0.0			0.0		
cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)
Benzo(a)anthracene	-	0.10	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots
Benzo(a)pyrene	-	1.00	0.00			0.00			0.00			0.00			0.00		
Benzo(b+k)fluoranthene	-	0.10	0.00			0.00			0.00			0.00			0.00		
Chrysene	-	0.01	0.00			0.00			0.00			0.00			0.00		
Dibenzo(a,h)anthracene	-	0.10	0.00			0.00			0.00			0.00			0.00		
Indeno(1,2,3-cd)pyrene	-	0.10	0.00			0.00			0.00			0.00			0.00		
TTEC [7]	0.14		0.00		**0.002**	0.00		**0.002**	0.00		**0.002**	0.00		**0.002**	0.00		**0.002**

MRL - Method Reporting Limit

mg/kg - milligrams per kilogram

nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

* - Samples SS-001, SS-002, and SS-003 are labeled as SS-009, SS-010, and SS-011, respectively in the laboratory analytical data and were changed for consistency with the other previously collected samples.

[1] **SAMPLE ID**. SS denotes Soil Sample, Number corresponds to location on Figure4, followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.

[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.

[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.

[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

Bolded TTEC result - final confirmation sample result

The UCL for this data set is NA No samples collected
Both ditch sections excavated to bedrock.

Table 6-12
Confirmation Sampling - Ditch PAH Dry Weight Analyses
Lockheed Martin, NPDES Ponds
Goldendale, Washington

SAMPLE ID [1]	CLEANUP		SS-006, DITCH			SS-007, DITCH			SS-008, DITCH			UCL [9]
DATE COLLECTED	STANDARD [2]		09/21/10		MRL	09/21/10		MRL	09/21/10		MRL	
ANALYTE	(mg/kg)		(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	(mg/kg)	Q[3]	(mg/kg)	
Acenaphthene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Acenaphthylene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(a)anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(a)pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(b+k)fluoranthene [4]	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Benzo(g,h,i)perylene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Chrysene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Dibenzo(a,h)anthracene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Fluoranthene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Fluorene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Indeno(1,2,3-cd)pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Naphthalene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Phenanthrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
Pyrene	-		0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	0.0017		nd*(0.00334)	
TOTAL PAH [5]	-		0.0			0.0			0.0			
cPAH with TEF [6]	(mg/kg)	TEF [6]	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	
Benzo(a)anthracene	-	0.10	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	0.00		**Weighted TTEC[8]** 0 of 5 aliquots	
Benzo(a)pyrene	-	1.00	0.00			0.00			0.00			
Benzo(b+k)fluoranthene	-	0.10	0.00			0.00			0.00			
Chrysene	-	0.01	0.00			0.00			0.00			
Dibenzo(a,h)anthracene	-	0.10	0.00			0.00			0.00			
Indeno(1,2,3-cd)pyrene	-	0.10	0.00			0.00			0.00			
TTEC [7]	0.14		0.00		**0.002**	0.002		**0.002**	0.002		**0.002**	NA

MRL - Method Reporting Limit

mg/kg - milligrams per kilogram

nd* - Sample result for analyte was non-detectable. The reported number is one half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary among sample analyses.

* - Samples SS-001, SS-002, and SS-003 are labeled as SS-009, SS-010, and SS-011, respectively in the laboratory analytical data and were changed for consistency with the other previously collected samples.

[1] **SAMPLE ID**. SS denotes Soil Sample, Letter-Number combination denotes Grid Point (Figure4), followed by location. All confirmation samples were collected from the depth interval of 0 to 6 inches.

[2] **CLEANUP STANDARD** - The cleanup standard is Model Toxics Control Act (MTCA) Method B soil cleanup for unrestricted use.

[3] **Q** - Lab Qualifiers. **J** - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

[4] Peak separation for Benzo(b) and Benzo(k)Fluoranthenes did not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

[5] **TOTAL PAH** - The sum of all polycyclic aromatic hydrocarbons.

[6] **cPAH with TEF**.- **cPAHs** are the known carcinogenic PAHs. **TEFs** are Toxicity Equivalent Factors (WAC 173-340-900). WAC uses the potency equivalency factors (PEFs) for cPAHs adopted by the California Environmental Protection Agency.

[7] **TTEC** - Total Toxicity Equivalent (Soil) Concentration. The sum of the cPAHs after the TEF has been applied. Used to determine level of cleanup.

[8] **Weighted TTEC** calculated using one half the method reporting limit (0.00334 mg/kg for PAHs) for each aliquot of a composite confirmation sample that could not be sampled (excavated to rock).

[9] **UCL** - The statistical method used to determine the Upper Confidence Limit.

Bolded TTEC result - final confirmation sample result

The UCL for this data set is NA No samples collected
Both ditch sections excavated to bedrock.

APPENDIX A-1

SWMU #1 – NPDES Ponds

ARCADIS (2008a)

Site Investigation Report and Closure Alternatives Analysis

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User Name : mhoefer

Current Plotstyle : ByColor
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Drafter
M. HOEFER

Project Manager
K. SMITH

Task Manager
M. RISHER

Technical Review
M. RISHER / C. COLE

ARCADIS

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1610 B Street, Suite 100
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LEGEND:

B-C1 ●	COMPOSITE SAMPLE
B-L1 ●	LATERAL BOUNDING SAMPLE
B-U1 ●	VERTICAL BOUNDING SAMPLE
――――	POND SLUDGE PERIMETER
– – – –	EXTENDED PERIMETER (THIN LAYER OF SLUDGE OUTSIDE POND PERIMETER)

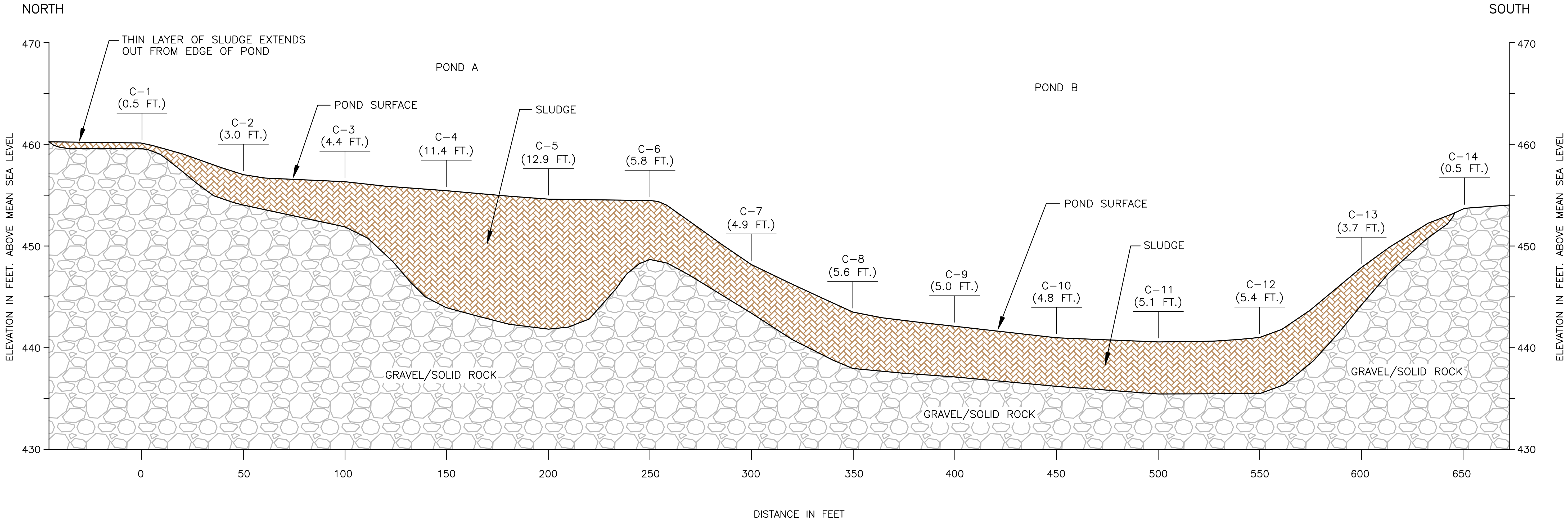
NPDES PONDS A AND B SAMPLE LOCATIONS

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001

Drawing Date
9/4/2007

Figure
2



LEGEND:

▨ SLUDGE

▨ GRAVEL/SOLID ROCK

(5.8 FT.) SLUDGE DEPTH IN FEET

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Project Manager
K. SMITH
Task Manager
M. RISHER
Technical Review
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www.arcadis-us.com

GRID LINE C CROSS SECTION (SEE FIGURE 2)
NPDES PONDS A AND B

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001
Drawing Date
9/4/2007
Figure
2a

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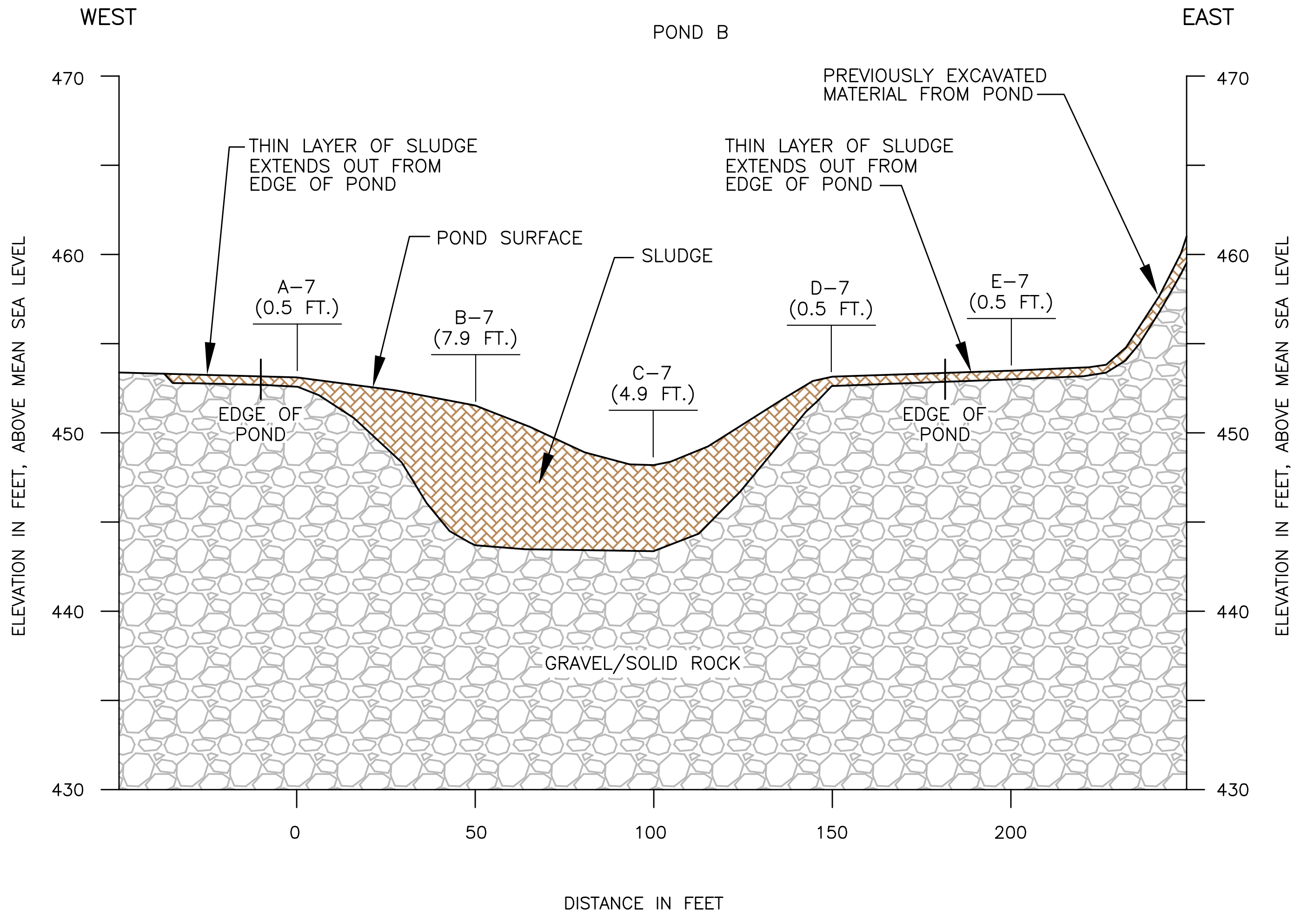

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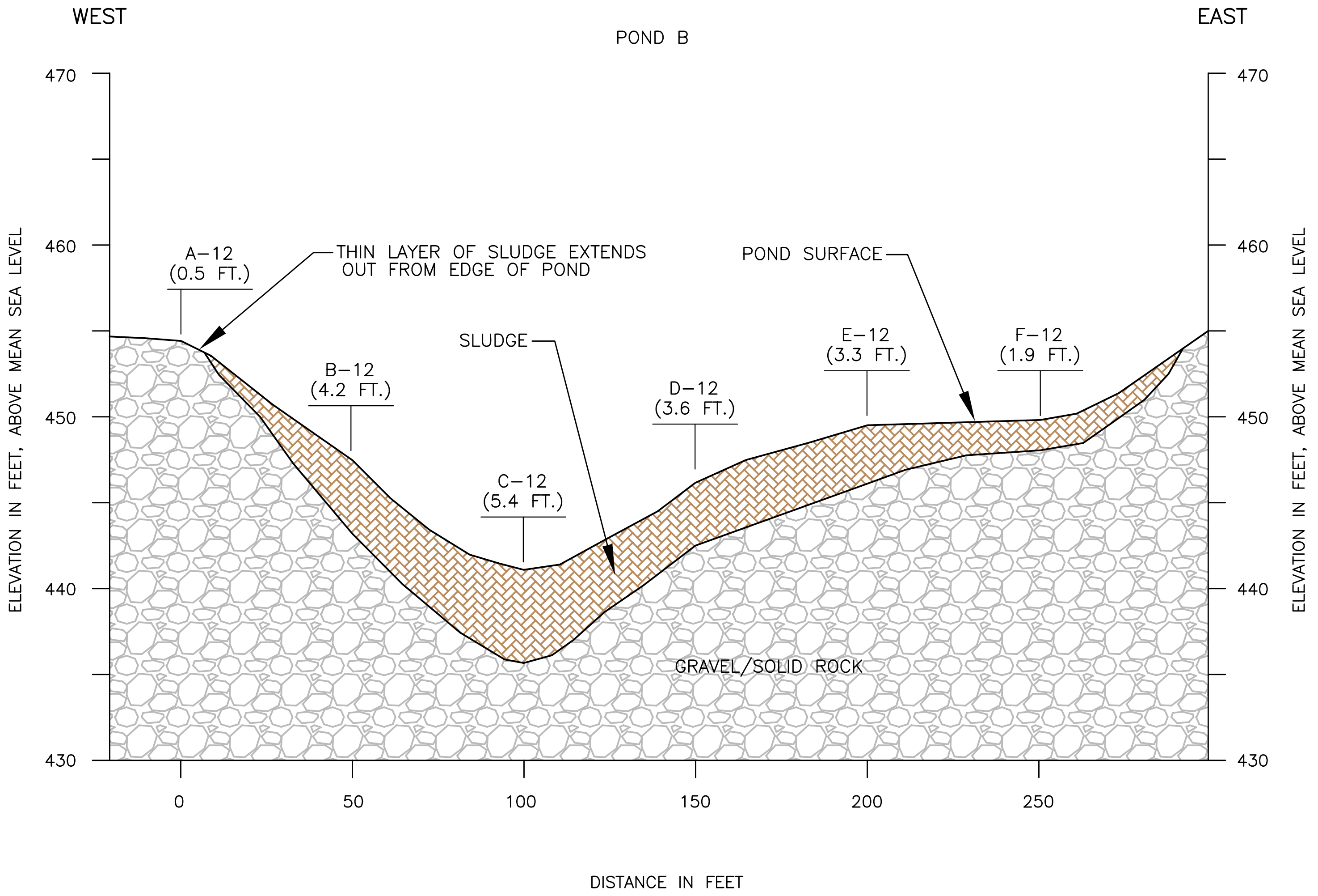

LINE 12

LEGEND:

▨ SLUDGE

▨ GRAVEL/SOLID ROCK

(4.9 FT.) SLUDGE DEPTH IN FEET

Acad Version : R16.2s (LMS Tech)
User Name : mhoefer
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Drafter
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K. SMITH

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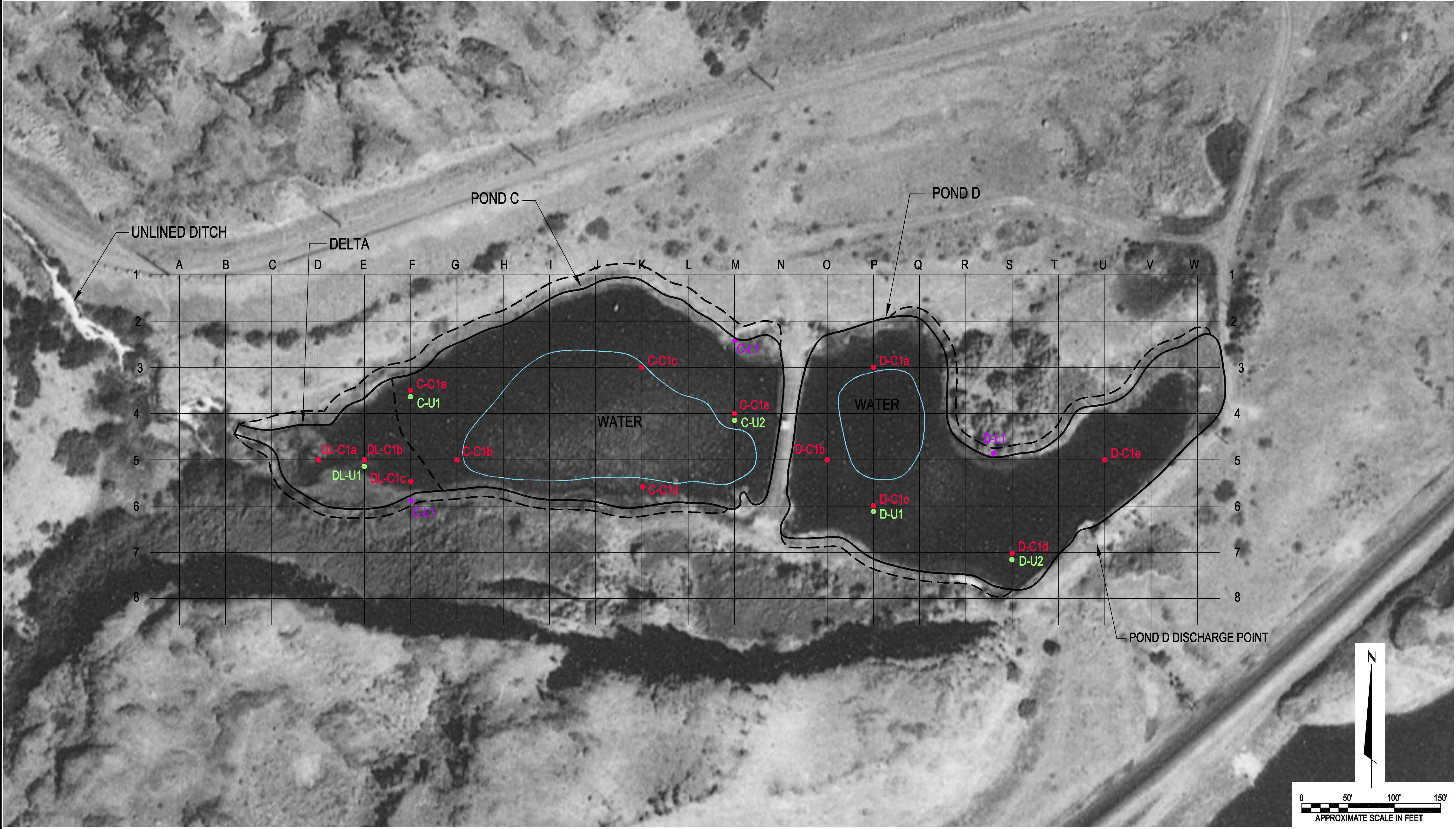
GRID LINES 7 AND LINE 12 CROSS SECTIONS (SEE FIGURE 2)
NPDES PONDS A AND B

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001

Drawing Date
9/4/2007

Figure
2b



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User Name : mhoefer

Drafter
M. HOEFER

Project Manager
K. SMITH

Task Manager
M. RISHER

Technical Review
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LEGEND:

C-C1 ●	COMPOSITE SAMPLE
C-L1 ●	LATERAL BOUNDING SAMPLE
C-U1 ●	VERTICAL BOUNDING SAMPLE
━━	POND SLUDGE PERIMETER
━ ━	EXTENDED PERIMETER (THIN LAYER OF SLUDGE (OUTSIDE POND PERIMETER)
─	WATER LEVEL ON JULY 13, 2007

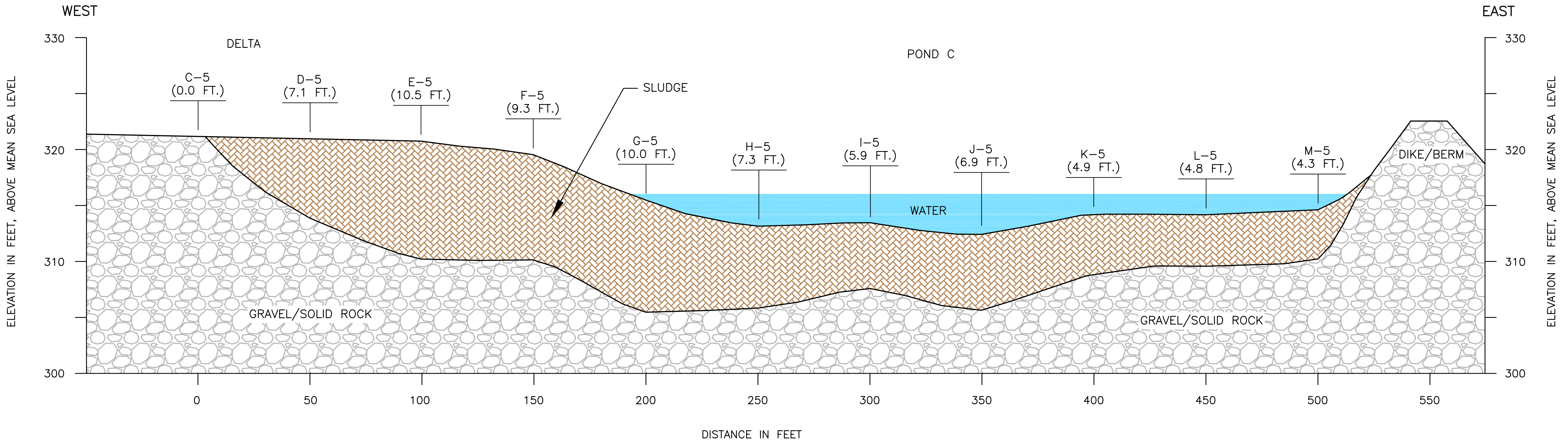
NPDES PONDS C AND D SAMPLE LOCATIONS

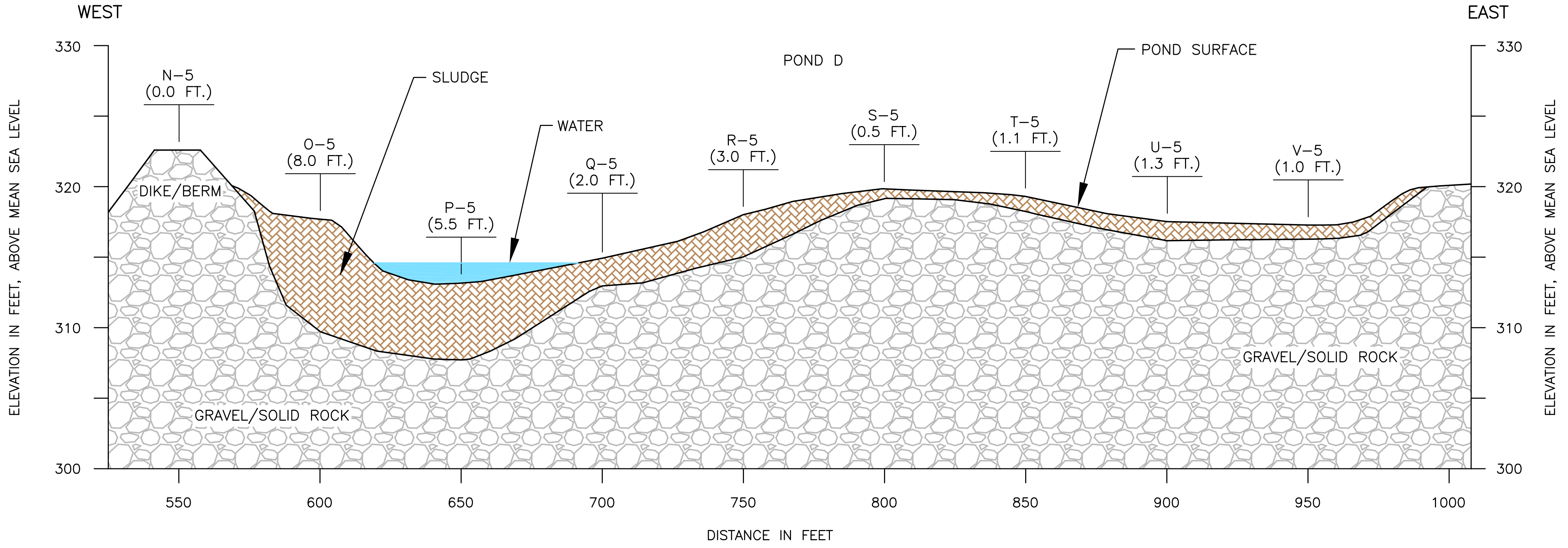
GOLDENDALE, WASHINGTON

Project Number
MH000968.0001

Drawing Date
9/4/2007

Figure
3





LEGEND:

▨ SLUDGE

▢ GRAVEL/SOLID ROCK

(5.5 FT.) SLUDGE DEPTH IN FEET

Acad Version : R16.2s (LMS Tech)
User Name : mhoefer
Path\Name : G:\Common\Matt H\Goldendale\COCRS-0264.dwg

Drafter
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ARCADIS

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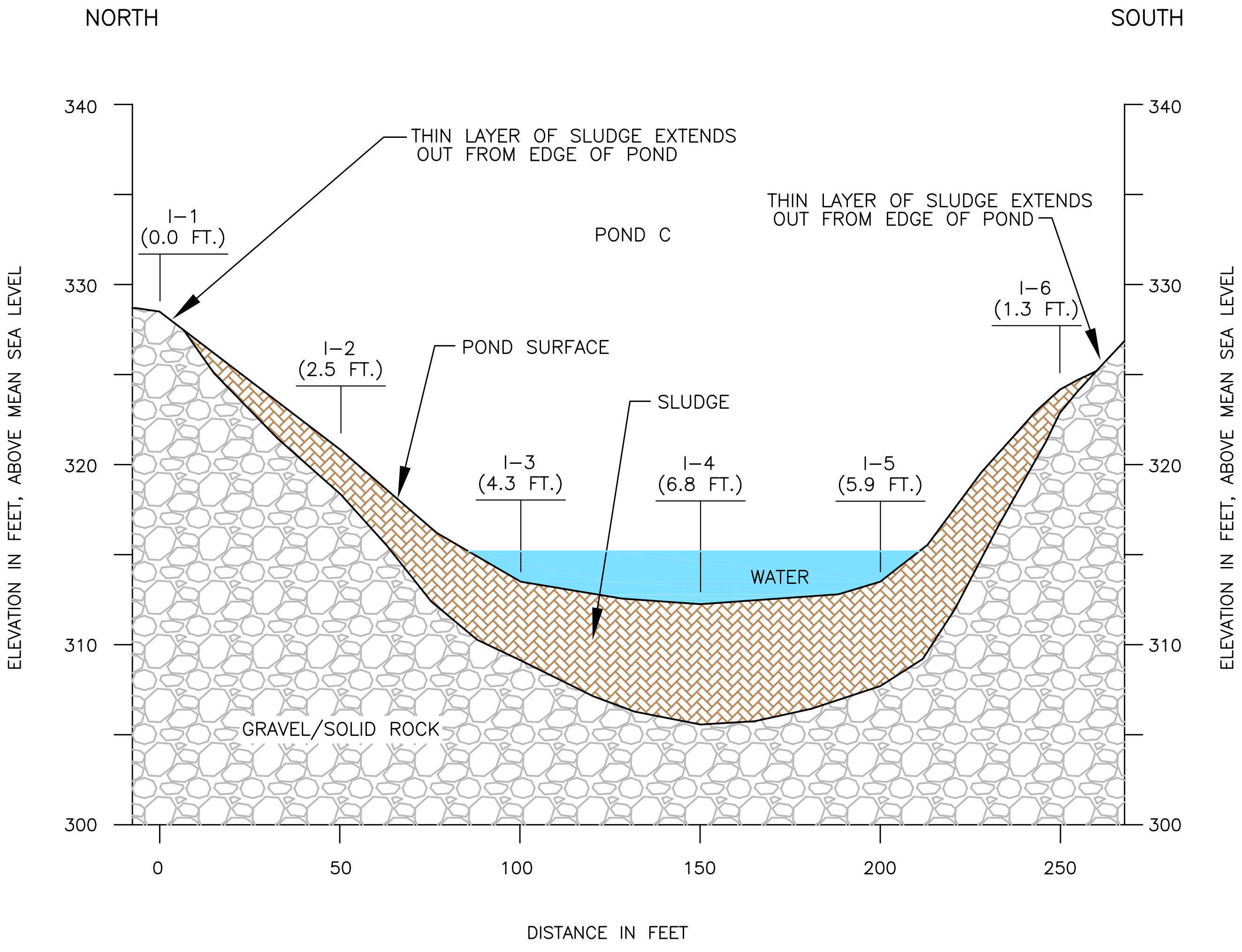
GRID LINE 5 CROSS SECTION (SEE FIGURE 3)
NPDES PONDS C AND D

GOLDENDALE, WASHINGTON

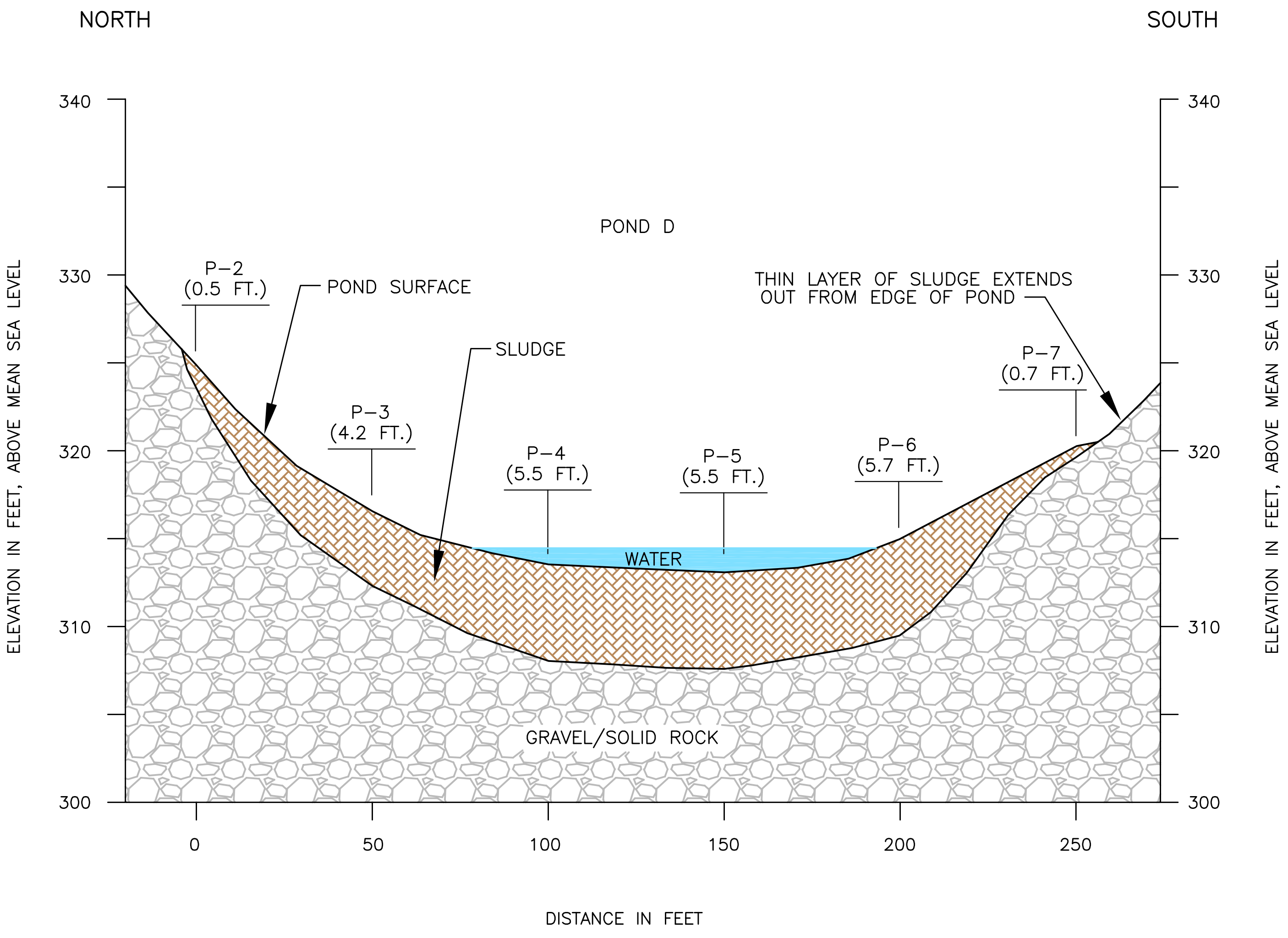
Project Number
MH000968.0001

Drawing Date
9/4/2007

Figure
3a



LINE I



LINE P

LEGEND:

▨ SLUDGE

▦ GRAVEL/SOLID ROCK

(4.3 FT.) SLUDGE DEPTH IN FEET

Acad Version : R16.2s (LMS Tech)
User Name : mhoefer
Path\Name : G:\Common\Matt H\Goldendale\COCRS-0263.dwg

Drafter
M. HOEFER
Project Manager
K. SMITH
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M. RISHER
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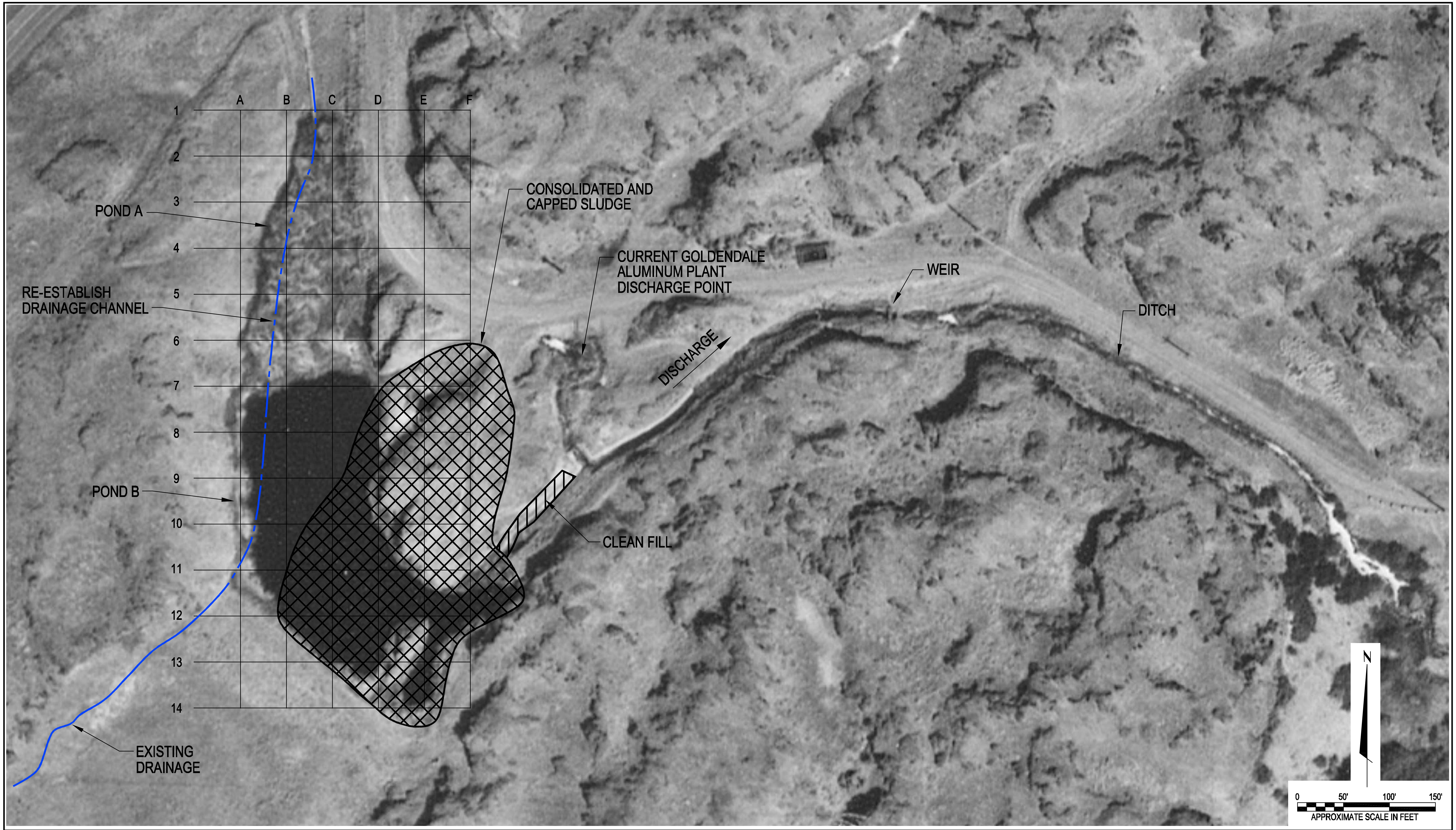
www.arcadis-us.com

GRID LINES I AND LINE P CROSS SECTIONS (SEE FIGURE 3)
NPDES PONDS C AND D

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001
Drawing Date
9/4/2007
Figure
3b



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User Name : mhoefer

Drafter
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LEGEND:

— — - — RE-ESTABLISHED DRAINAGE CHANNEL

☒ CONSOLIDATED SLUDGE

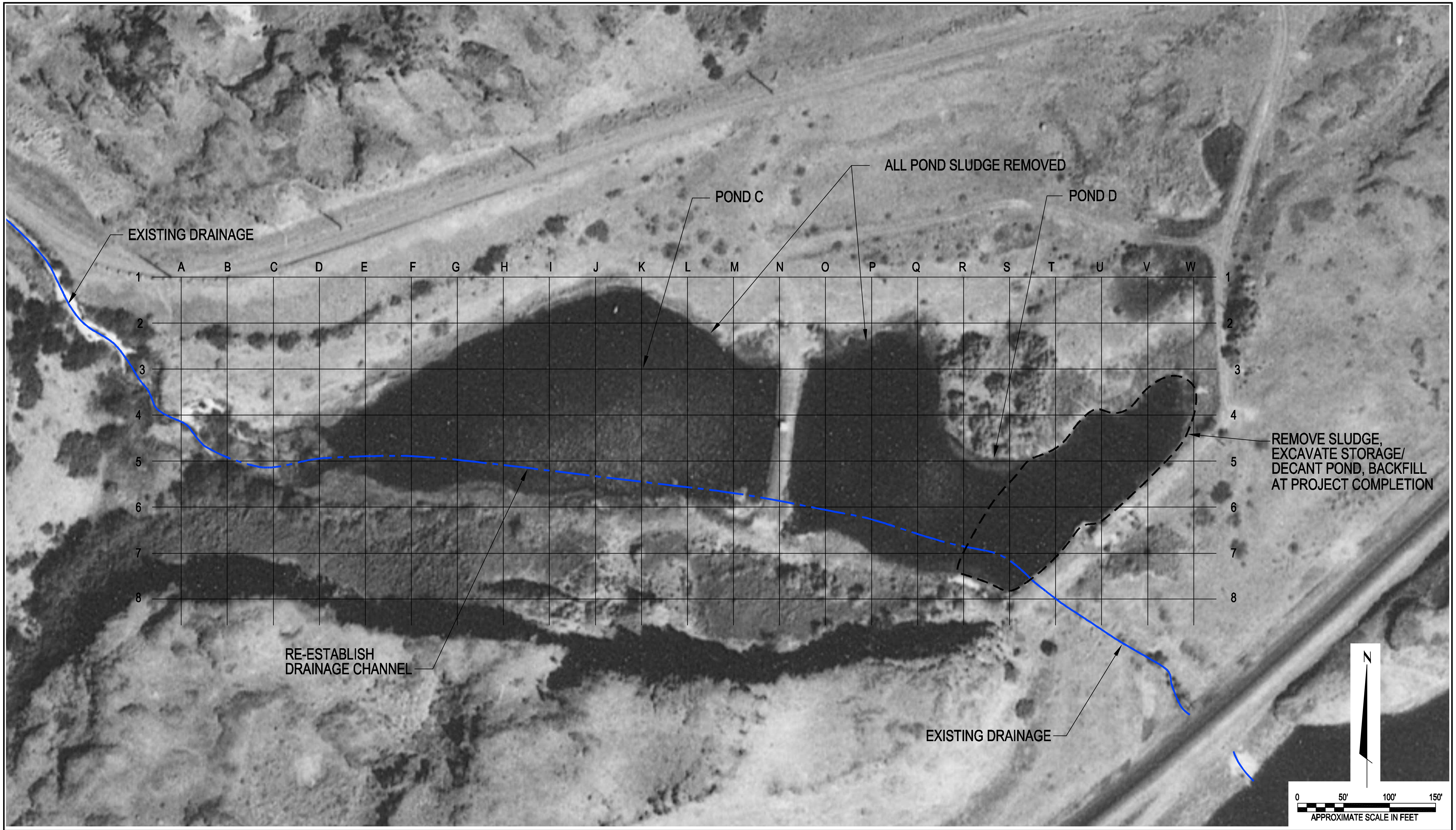
NPDES PONDS A AND B CLOSURE OPTIONS B, C, AND D

OPTION B: CONSOLIDATE AND CAP SLUDGE FROM ALL AREAS TO REPOSITORY
OPTIONS C AND D: REMOVE ALL SLUDGE TO OFF-SITE LANDFILL
ALL OPTIONS: RE-ESTABLISH DRAINAGE CHANNEL
GOLDENDALE, WASHINGTON

Project Number
MH000968.0001

Drawing Date
10/30/2007

Figure
4



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LEGEND:

— - — RE-ESTABLISHED DRAINAGE CHANNEL

NPDES PONDS C AND D CLOSURE OPTIONS B, C, AND D

OPTION B: REMOVE ALL SLUDGE TO REPOSITORY AT POND B
OPTIONS C AND D: REMOVE ALL SLUDGE TO OFF-SITE LANDFILL
ALL OPTIONS: DECANT POND AND RE-ESTABLISH DRAINAGE CHANNEL

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001

Drawing Date
10/30/2007

Figure
5

Table 2. Goldendale NPDES Ponds Soil Sampling - Volatile Organic Compound Analyses

Lockheed Martin Corporation, Goldendale, Washington

ANALYTE Area	**Pond A**	**Pond A**	**Pond C**	**Pond C**	**Pond D**	**Pond D**	
Sample ID	A-B6S	A-B6U	C-F3.5S	C-F3.5U	D-RS5LE	DL-E5U	Trip Blank
Date	07/26/07	07/26/07	07/31/07	07/31/07	07/31/07	07/31/07	08/01/07
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Acetone	nd	nd	nd	nd	nd	nd	nd
Benzene	nd	nd	nd	nd	nd	nd	nd
Bromobenzene	nd	nd	nd	nd	nd	nd	nd
Bromochloromethane	nd	nd	nd	nd	nd	nd	nd
Bromodichloromethane	nd	nd	nd	nd	nd	nd	nd
Bromoform	nd	nd	nd	nd	nd	nd	nd
Bromomethane	nd	nd	nd	nd	nd	nd	nd
2-Butanone (MEK)	nd	nd	nd	nd	nd	nd	nd
n-Butylbenzene	nd	nd	nd	nd	nd	nd	nd
sec-Butylbenzene	nd	nd	nd	nd	nd	nd	nd
tert-Butylbenzene	nd	nd	nd	nd	nd	nd	nd
Carbon disulfide	nd	nd	nd	nd	nd	nd	nd
Carbon tetrachloride	nd	nd	nd	nd	nd	nd	nd
Chlorobenzene	nd	nd	nd	nd	nd	nd	nd
Chloroethane	nd	nd	nd	nd	nd	nd	nd
Chloroform	nd	nd	nd	nd	nd	nd	nd
Chloromethane	nd	nd	nd	nd	nd	nd	nd
2-Chlorotoluene	nd	nd	nd	nd	nd	nd	nd
4-Chlorotoluene	nd	nd	nd	nd	nd	nd	nd
1,2-Dibromo-3-chloropropane	nd	nd	nd	nd	nd	nd	nd
Dibromochloromethane	nd	nd	nd	nd	nd	nd	nd
1,2-Dibromoethane	nd	nd	nd	nd	nd	nd	nd
Dibromomethane	nd	nd	nd	nd	nd	nd	nd
1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd
1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd
1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd
Dichlorodifluoromethane	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloroethane	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	nd	nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloropropane	nd	nd	nd	nd	nd	nd	nd
1,3-Dichloropropane	nd	nd	nd	nd	nd	nd	nd
2,2-Dichloropropane	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloropropene	nd	nd	nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	nd	nd	nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd
Hexachlorobutadiene	nd	nd	nd	nd	nd	nd	nd
2-Hexanone	nd	nd	nd	nd	nd	nd	nd
Isopropylbenzene	nd	nd	nd	nd	nd	nd	nd
p-Isopropyltoluene	nd	nd	nd	nd	nd	nd	nd
4-Methyl-2-pentanone	nd	nd	nd	nd	nd	nd	nd
Methyl tert-butyl ether	nd	nd	nd	nd	nd	nd	nd
Methylene chloride	nd	nd	nd	nd	nd	nd	nd
Naphthalene	nd	nd	nd	nd	nd	nd	nd
n-Propylbenzene	nd	nd	nd	nd	nd	nd	nd
Styrene	nd	nd	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd
1,2,3-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd
1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	nd	nd	nd	nd	nd	nd	nd
Trichlorofluoromethane	nd	nd	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	nd	nd	nd	nd	nd	nd	nd
1,2,4-Trimethylbenzene	nd	nd	nd	nd	nd	nd	nd
1,3,5-Trimethylbenzene	nd	nd	nd	nd	nd	nd	nd
Vinyl chloride	nd	nd	nd	nd	nd	nd	nd
o-Xylene	nd	nd	nd	nd	nd	nd	nd
m,p-Xylene	nd	nd	nd	nd	nd	nd	nd

A-B6S - Pond A, grid location B6, Sludge sample.
A-B6U - Pond A, grid location B6, Underlying soil sample.
DL-E5U - Delta (Pond C), grid location E5, Underlying soil sample.
C-F3.5U - midway between F3 and F4 on F line.
D-RS5LE - midway between R and S on 5 line, Lateral Extent.

Table 3a. Sludge and Soil Material Testing
NPDES Ponds July 2007 Sampling
Lockheed Martin Corporation, Goldendale, Washington

Sample ID (Pond - Grid Point Type) [1]	Collection Date	Sample Description	Wet Density (lb/ft^3)	Dry Density (lb/ft^3)	Specific Gravity (std units)	Moisture Content (%)	Porosity (std units)
A - B6 gs	07/26/07	Silt	88.8	44.4	2.84	100	0.75
B - C11.5 gu	07/26/07	Silt	92.9	47.2	2.74	96.64	0.72
C - F3.5 gs	07/31/07	Silt	87.9	44.1	2.76	99.14	0.74
C - F3.5 gu	07/31/07	Silt	78.9	73.9	2.77	6.82	0.57
D - U5 gu	07/31/07	Silt	90.9	88.0	2.7	3.26	0.48
Average in place density - all samples =			87.9	59.5	lbs/ft^3		
Average Density of Sludge =			88.4	44.3	lbs/ft^3		
Average Density of Underlying soils =			87.6	69.7	lbs/ft^3		

Using Average Density of Sludge, conversion factor to tons is 1.2 tons per cubic yard (wet or in place density).
Wet Density (Shelby Tube analysis) best characterizes the in place density of the material.

[1] Sample Designation A - B6 gs: Pond A, Grid Point B6, and gs for geophysical sample of sludge (u denotes underlying soils).

Test
Bulk Density / Wet Density
Loose/Compacted Density
Specific Gravity
Moisture Content
Grain Size
Dry density
Porosity
Total Porosity calculated from bulk density, specific gravity and moisture content.

Table 3b. Sludge and Soil Material Testing - Sieve Analysis
NPDES Ponds - July 2007 Sampling
Lockheed Martin Corporation, Goldendale, Washington

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
Sample ID [1]																			
A - B6 gs	100	100	100	100	100	100	100	94.2	88.4	85.5	84.1	82.1	70.6	61.5	50.1	42.5	34.9	24.3	13.7
B - C11.5 gu	100	75.8	60.1	60.1	58.5	57.6	56.8	50.8	44	39.5	36.3	32.6	30.3	27.5	23.3	19.6	15.9	11.2	7.5
C - F3.5 gs	100	100	100	100	100	100	100	98.1	95.3	93.7	92.5	88.2	56.9	48	36.2	30.3	25.1	17.7	9.6
C - F3.5 gu	100	100	100	100	100	98.2	96.4	92	70.5	57.4	39.4	17.7	8.5	6.3	4.7	3.8	3	2.5	2.1
D - U5 gu	100	100	100	96.5	95.5	92.8	91	89.3	83.6	62.6	42.5	24.2	10	8.4	6.8	5.2	5.2	5.2	4.8

Percent Retained in Each Size Fraction

Description	% Coarse Gravel			% Gravel			Description	% Coarse Sand	% Medium Sand		% Fine Sand			% Very Course Silt	% Coarse Silt
Particle Size (inches)	3" - 2"	2" - 1"	1" - 3/4"	3/4" - 1/2"	1/2 - 3/8"	3/8"- 4750	(microns)	4750 - 2000	2000 - 850	850 - 425	425 - 250	250 - 150	150 - 75	75 - 32	32 - 22
A - B6 gs	0	0	0	0	0	0	A - B6 gs	0	5.8	5.9	2.9	1.4	2	11.5	9.1
B - C11.5 gu	0	24.2	15.7	0	1.7	0.8	B - C11.5 gu	0.8	6	6.8	4.5	3.2	3.8	2.2	2.8
C - F3.5 gs	0	0	0	0	0	0	C - F3.5 gs	0	1.9	2.8	1.6	1.2	4.4	31.3	8.9
C - F3.5 gu	0	0	0	0	0	1.8	C - F3.5 gu	1.7	4.5	21.5	13.1	18	21.7	9.2	2.1
D - U5 gu	0	0	0	3.5	1	2.7	D - U5 gu	1.7	1.7	5.7	21	20.1	18.3	14.1	1.6

Percent Retained in Each Size Fraction

Description	% Medium Silt	% Fine Silt		% Very Fine Silt	% Clay
Particle Size (inches)	22 - 13	13 - 9	9 - 7	7 - 3.2	<3.2
A - B6 gs	11.4	7.6	7.6	10.6	24.3
B - C11.5 gu	4.2	3.7	3.7	4.7	11.2
C - F3.5 gs	11.8	5.9	5.2	7.4	17.7
C - F3.5 gu	1.7	0.8	0.8	0.4	2.5
D - U5 gu	1.6	1.6	0	0	5.2

[1] Sample ID Designation A - B6 gs: Pond A, Grid Point B6, and gs for geophysical sample of sludge (u denotes underlying soils).

Table 4. NPDES Pond Removal Areas, Volumes and Contaminant Summary
NPDES Ponds - July 2007 Soil Sampling
Lockheed Martin Corporation, Goldendale, Washington

2007 Estimates								**2007 Sample Analytical - Composite Sample Results**					
Area	Area (ft^2)	Sludge Volume [3] (cy)	Volume + 6 inches [4] (cy)	Add [5] 10% (cy)	Volume per Pond (cy)	Total Tonnage [6] (ton)	Tonnage per Pond (ton)	PAHs (mg/kg)	Al (mg/kg)	As (mg/kg)	Cyanide (total) (mg/kg)	Fluoride (mg/kg)	Sulfate (mg/kg)
Pond A	30,614	5,673	6,149	6,764	7,085	10,146	10,627	1,264	23,500	17	nd	64.7	505
A North [1]	4,484	-	83	91		137		-	-	-	-	-	-
A-B W&S [1]	11,255	-	208	229		344		-	-	-	-	-	-
Pond B	62,921	7,353	8,194	9,013	9,095	13,520	13,642	5,499	-	-	-	-	-
B-East [1]	3,983	-	74	81		122		-	-	-	-	-	-
Ditch	200	15	19	20	20	31	31	1,329	26,600	4.96	nd	20.7	52.9
C-Delta [2]	15,185	-	-	-	-	-	-	6,578	-	-	-	-	-
Pond C	78,732	14,576	16,301	17,931	18,245	26,897	27,367	7,987	67,300	12.9	nd	215	497
C North [1]	9,811	-	182	200		300		-	-	-	-	-	-
C South [1]	5,592	-	104	114		171		-	-	-	-	-	-
Pond D	78,374	5,725	7,218	7,940	8,095	11,910	12,143	3,745	-	-	-	-	-
D North [1]	5,068	-	94	103		155		-	-	-	-	-	-
D South [1]	2,555	-	47	52		78		-	-	-	-	-	-
						Area (ft^2) =	**308,774**						
						Area (acre) =	**7.1**						
						Volume (cy) =	**42,539**						
						Weight (tons) [6] =	**63,809**						

[1] See Figures 2 and 3. A thin layer of sludge extends out from the pond perimeters in a several locations. Because of the rocky soil, excavation is estimated at 0.5 feet for all extended perimeter areas.

[2] The delta area of Pond C was separated out for purposed of the site characterization. Excavation volumes are combined with Pond C proper.

[3] Base volume of sludge (2007 field and survey data).

[4] Excavation volume of ponds when adding 6 inches to depth of sludge (minimum cut of excavator for underlying gravel and rock).

[5] Anticipated additional volume due to irregularities in sludge depths and terrain.

[6] Density tests of the sludge reveal a conversion factor of 1.2 tons per cy for the in place material (Table 3a); however, a standard factor of 1.5 tons per cubic yard has been applied.

Table 5a. NPDES Ponds Cost Estimate Summary

Lockheed Martin Corporation, Goldendale, Washington

OPTION A: NO ACTION		
	Total Option A	**$19,640**

OPTION B: CONSOLIDATE AND CAP MATERIAL ON-SITE		
Work Plan and Bid Documents	$73,970	
Project Consulting and Regulatory Oversight	$148,368	
Consolidate All Material to Pond B	$2,592,942	
	Total Option B	**$2,815,279**

OPTION C: COMPLETE REMOVAL TO OFF-SITE LANDFILL		
Assumes All Material is Solid Waste		
Work Plan and Bid Documents	$73,970	
Project Consulting and Regulatory Oversight	$148,368	
Complete Removal to Off-Site Landfill	$4,006,962	
	Total Option C	**$4,229,300**

OPTION D: COMPLETE REMOVAL TO OFF-SITE LANDFILL		
Assumes One-Third Solid Waste and Two-Thirds Hazardous Waste		
Work Plan and Bid Documents	$73,970	
Project Consulting and Regulatory Oversight	$148,368	
Complete Removal to Off-Site Landfill	$6,001,025	
	Total Option D	**$6,223,362**

TABLE 5b. COST ESTIMATE - NPDES PONDS CLOSURE OPTIONS
Lockheed Martin Corporation, Goldendale, WA

OPTION A: NO ACTION

Task	Quant	Units	Unit $	Cost	Task Total	Notes
Option A: No Action				**Estimated project duration =**		**3 months**
1. Risk Assessment						
Senior Management	8	HR	$150	$1,200		Project management.
Regulatory Specialist	40	HR	$115	$4,600		Research all ARARs.
Scientist	40	HR	$100	$4,000		Risk assessment.
RS and Sc	60	HR	$100	$6,000		Develop scenarios, write report.
Administration Asst	12	HR	$70	$840		Reporting and financials
Expenses	2	EA	$1,500	$3,000		Two trips, 3 days ea - Goldendale, WDOE. All costs.
				Subtotal	**$19,640**	

Option A: No Action		
	Total Option A	**$19,640**

TABLE 5b. COST ESTIMATE - NPDES PONDS CLOSURE OPTIONS
Lockheed Martin Corporation, Goldendale, WA

OPTION B: CONSOLIDATE AND CAP MATERIAL ON-SITE

Task	Quant	Units	Unit $	Cost	Task Total	Notes
Work Plan and Bid Documents						Estimated project duration = 7 weeks (WK)
1. Construction Work Plan	1	LS	$47,720	$47,720		Removal work plan, post-removal SAP
2. Bid Preparation	1	LS	$18,000	$18,000		Prepare bid documents.
3. Site Walk	1	LS	$3,850	$3,850		Conduct site walk with prospective bidders. Includes expenses.
3. Bid Selection	1	LS	$4,400	$4,400		Review bids, subcontractor selection and administration
					$73,970	
Project Consulting and Regulatory Oversight						Estimated project duration = 17 weeks (WK)
1. Project Oversight	1	LS	$37,790	$37,790		Project management, regulatory interaction, contractor coordinator.
2. Regulatory Oversight	1	LS	$35,000	$35,000		Washington DOE
3. Health and Safety	1	LS	$13,800	$13,800		Develop and review HASP, on site safety support.
4. Sampling Technician [1]	5	WK	$5,088	$25,438		Air and soil sampling. Includes air sampling costs.
5. Reports						
Weekly Progress Reports	1	LS	$8,760	$8,760		Weekly progress reports during removal.
Statistical Analysis	1	LS	$9,780	$9,780		Post removal soil sampling data analysis and negotiations.
Final Report	1	LS	$17,800	$17,800		Final clean-up report.
[1] Assumes on site one-half of removal duration.						
					$148,368	
Consolidate All Material to Pond B						Estimated project duration = 17 weeks (WK) Cap surface area = 3.4 acres
1. Construction Oversight	17	WK	$6,495	$110,415		Construction coordinator (time and expenses, including truck).
2. Mobe / De-mobe [1]	1	LS	$40,000	$40,000		Heavy equipment, water truck, site support.
3. Other Project Costs	1	LS	$20,500	$20,500		Permits, taxes, licenses, surveyor, security, site trailer, etc.
4. Site Preparation	1	LS	$38,300	$38,300		Access and road construction, road base, stormwater control.
5. Water Management						
Diversion Pipeline	1	LS	$39,160	$39,160		Install pipeline to convey discharge water around Ponds C and D.
Water Storage Pond [2]	1	LS	$31,000	$31,000		Construct storage / decant pond.
De-water ponds	1	LS	$38,000	$38,000		Pump and haul water to storage pond (sumps, excavations).
6. Consolidate Ponds	41	DAY	$10,490	$426,399		Remove, place, dry and compact.
7. Shape for Drainage	1	LS	$24,850	$24,850		Grade to drain. Remove west dam and restore drainage pathway.
8. Post Removal Samples	1	LS	$8,000	$8,000		All removal areas.
9. Synthetic Cover	146,204	SQ FT	$1.25	$182,755		HDPE, 60 mil. Installed cost.
10. Soil	10,830	CY	$33	$351,973		24 inches of soil over consolidated material (in place cost).
11. Synthetic Drain Layer	146,204	SQ FT	$1.00	$146,204		Double sided geo-composite. Installed cost.
12. Rock Cover (armor)	5,415	CY	$43	$232,844		12 inches of crushed rock cover (in place cost).
13. Final grade	85	DAY	$10,490	$891,650		Remove haul roads, scarify disturbance areas
14. Revegetaton	4.4	AC	$2,500	$10,891		Scarify and seed all disturbed areas, roads, etc.. No cap seeding.
					$2,592,942	

[1] Assumes mobilization from Portland, OR.

[2] Remove waste from lower end of Pond 4, then excavate pond to store and decant water from all ponds. Assumes this water can be discharged once decanted.

Work Plan and Bid Documents	$73,970	
Project Consulting and Regulatory Oversight	$148,368	
Consolidate All Material to Pond B	$2,592,942	
	Total Option B	**$2,815,279**

TABLE 5b. COST ESTIMATE - NPDES PONDS CLOSURE OPTIONS
Lockheed Martin Corporation, Goldendale, WA

OPTION C: COMPLETE REMOVAL TO OFF-SITE LANDFILL
Assumes All Material is Solid Waste

Task	Quant	Units	Unit $	Cost	Task Total	Notes
Work Plan and Bid Documents						Estimated project duration = 7 weeks (WK)
1. Construction Work Plan	1	LS	$47,720	$47,720		Removal work plan, post-removal SAP
2. Bid Preparation	1	LS	$18,000	$18,000		Prepare bid documents.
3. Site Walk	1	LS	$3,850	$3,850		Conduct site walk with prospective bidders. Includes expenses.
3. Bid Selection	1	LS	$4,400	$4,400		Review bids, subcontractor selection and administration
					$73,970	
Project Consulting and Regulatory Oversight						Estimated project duration = 17 weeks (WK)
1. Project Oversight	1	LS	$37,790	$37,790		Project management, regulatory interaction, contractor coordinator.
2. Regulatory Oversight	1	LS	$35,000	$35,000		Washington DOE
3. Health and Safety	1	LS	$13,800	$13,800		Develop and review HASP, on site safety support.
4. Sampling Technician [1]	5	WK	$5,088	$25,438		Air and soil sampling. Includes air sampling costs.
5. Reports						
Weekly Progress Reports	1	LS	$8,760	$8,760		Weekly progress reports during removal.
Statistical Analysis	1	LS	$9,780	$9,780		Post removal soil sampling data analysis and negotiations.
Final Report	1	LS	$17,800	$17,800		Final clean-up report.
[1] Assumes on site one-half of removal duration.						
					$148,368	
Complete Removal to Off-Site Landfill						Estimated project duration = 17 weeks (WK)
1. Construction Oversight	17	WK	$6,495	$110,415		Construction coordinator (time and expenses, including truck).
2. Mobe / De-mobe [1]	1	LS	$40,000	$40,000		Heavy equipment, water truck, site support.
3. Other Project Costs	1	LS	$20,500	$20,500		Permits, taxes, licenses, surveyor, security, site trailer, etc.
4. Site Preparation	1	LS	$54,400	$54,400		Access road / pad construction, road base, stormwater control.
5. Water Management						Re-route waste water from plant around Ponds C and D.
Diversion Pipeline	1	LS	$39,160	$39,160		Install pipeline to convey discharge water around Ponds C and D.
Water Storage Pond [2]	1	LS	$31,000	$31,000		Construct storage / decant pond.
De-water ponds	1	LS	$38,000	$38,000		Pump and haul water to storage pond (sumps, excavations).
6. Removal to Staging Area [3]	49	DAY	$9,925	$488,668		Removal all pond material to staging area.
7. Waste Profile Samples	1	LS	$24,000	$24,000		Laboratory analytical costs, courier, shipping.
8. Pond Waste T & D [4]	47,858	TON	$47	$2,225,374		Non-hazardous waste (solid waste) to Waste Management.
9. Pond Waste T & D [4]	15,953	TON	$45	$717,863		Non-hazardous waste (solid waste) to Waste Management.
10. Loader	17	WK	$4,800	$81,600		Loader dedicated to disposal facility haul trucks (5 days/week).
11. Post Removal Samples	1	LS	$8,000	$8,000		Laboratory analytical costs, courier, shipping.
12. Hot Spot Excavation	1,500	TON	$47	$69,750		Assumed additional removal after post-removal sampling.
13. Reshape decant pond [5]	1	LS	$14,525	$14,525		Decon and remove lined pond, reshape area.
14. Revegetaton [6]	10	AC	$4,500	$43,708		Scarify and seed all disturbed areas, roads, etc..
					$4,006,962	

[1] Assumes mobilization from Portland, OR.

[2] Remove waste from lower end of Pond 4, excavate storage pond, install pump/piping. Assumes this water can be discharged once decanted.

[3] Assumes haul to staging area, then load out to landfill. Construction costs can be reduced by direct haul to landfill if larger trucks can access pond areas. Construction costs also assume a working crew foreman (i.e., one of equipment operators).

[4] Transport and Disposal. Assumes all material is solid waste and that trucks will require liners for 75% of the waste (wet). The remaining trucks (25%) will not require liners. Note that the drier material may be transported to a different landfill for potentially less cost.

[5] Does not include waste water disposal at HW facility. Cost is $1.10 per gallon. Assumes water may be discharged via NPDES permit.

[6] Assumes soil available for revegetation after removal.

Work Plan and Bid Documents	$73,970	
Project Consulting and Regulatory Oversight	$148,368	
Complete Removal to Off-Site Landfill	$4,006,962	
	Total Option C	**$4,229,300**

TABLE 5b. COST ESTIMATE - NPDES PONDS CLOSURE OPTIONS
Lockheed Martin Corporation, Goldendale, WA

OPTION D: COMPLETE REMOVAL TO OFF-SITE LANDFILL
Assumes One-Third Solid Waste and Two-Thirds Hazardous Waste

Task	Quant	Units	Unit $	Cost	Task Total	Notes
Work Plan and Bid Documents						Estimated project duration = 7 weeks (WK)
1. Construction Work Plan	1	LS	$47,720	$47,720		Removal work plan, post-removal SAP
2. Bid Preparation	1	LS	$18,000	$18,000		Prepare bid documents.
3. Site Walk	1	LS	$3,850	$3,850		Conduct site walk with prospective bidders. Includes expenses.
3. Bid Selection	1	LS	$4,400	$4,400		Review bids, subcontractor selection and administration
					$73,970	
Project Consulting and Regulatory Oversight						Estimated project duration = 17 weeks (WK)
1. Project Oversight	1	LS	$37,790	$37,790		Project management, regulatory interaction, contractor coordinator.
2. Regulatory Oversight	1	LS	$35,000	$35,000		Washington DOE
3. Health and Safety	1	LS	$13,800	$13,800		Develop and review HASP, on site safety support.
4. Sampling Technician [1]	5	WK	$5,088	$25,438		Air and soil sampling. Includes air sampling costs.
5. Reports						
Weekly Progress Reports	1	LS	$8,760	$8,760		Weekly progress reports during removal.
Statistical Analysis	1	LS	$9,780	$9,780		Post removal soil sampling data analysis and negotiations.
Final Report	1	LS	$17,800	$17,800		Final clean-up report.
[1] Assumes on site one-half of removal duration.						
					$148,368	
Complete Removal to Off-Site Landfill						Estimated project duration = 17 weeks (WK)
1. Construction Oversight	17	WK	$6,495	$110,415		Construction coordinator (time and expenses, including truck).
2. Mobe / De-mobe [1]	1	LS	$40,000	$40,000		Heavy equipment, water truck, site support.
3. Other Project Costs	1	LS	$20,500	$20,500		Permits, taxes, licenses, surveyor, security, site trailer, etc.
4. Site Preparation	1	LS	$54,400	$54,400		Access road / pad construction, road base, stormwater control.
5. Water Management						Re-route waste water from plant around Ponds C and D.
Diversion Pipeline	1	LS	$39,160	$39,160		Install pipeline to convey discharge water around Ponds C and D.
Water Storage Pond [2]	1	LS	$31,000	$31,000		Construct storage / decant pond.
De-water ponds	1	LS	$38,000	$38,000		Pump and haul water to storage pond (sumps, excavations).
6. Removal to Staging Area [3]	49	DAY	$9,925	$488,668		Removal all pond material to staging area.
7. Waste Profile Samples	1	LS	$24,000	$24,000		Laboratory analytical costs, courier, shipping.
8. Pond Waste T & D [4]	15,953	TON	$47	$741,791		Non-hazardous waste (solid waste) to Waste Management.
	5,318	TON	$45	$239,288		Non-hazardous waste (solid waste) to Waste Management.
9. Pond Waste T & D [5]	42,540	TON	$93	$3,956,220		Hazardous waste to Waste Management.
10. Loader	17	WK	$4,800	$81,600		Loader dedicated to disposal facility haul trucks (5 days/week).
11. Post Removal Samples	1	LS	$8,000	$8,000		Laboratory analytical costs, courier, shipping.
12. Hot Spot Excavation	1,500	TON	$47	$69,750		Assumed additional removal after post-removal sampling.
13. Reshape decant pond [6]	1	LS	$14,525	$14,525		Backfill and reshape decant pond area.
14. Revegetaton [7]	10	AC	$4,500	$43,708		Scarify and seed all disturbed areas, roads, etc..
					$6,001,025	

[1] Assumes mobilization from Portland, OR.

[2] Remove waste from lower end of Pond 4, excavate storage pond, install pump/piping. Assumes this water can be discharged once decanted.

[3] Assumes haul to staging area, then load out to landfill. Construction costs can be reduced by direct haul to landfill if larger trucks can access pond areas. Construction costs also assume a working crew foreman (i.e., one of equipment operators).

[4] Transport and Disposal. Assumes one-third of material is solid waste and that trucks will require liners for 75% of this waste (wet). The remaining trucks (25%) will not require liners. Note that the drier material may be transported to a different landfill for potentially less cost.

[5] Assumes two-thirds of material is hazardous waste. All hazardous waste haul trucks will require liners.

[6] Does not include waste water disposal at HW facility. Cost is $1.10 per gallon. Assumes water may be discharged via NPDES permit.

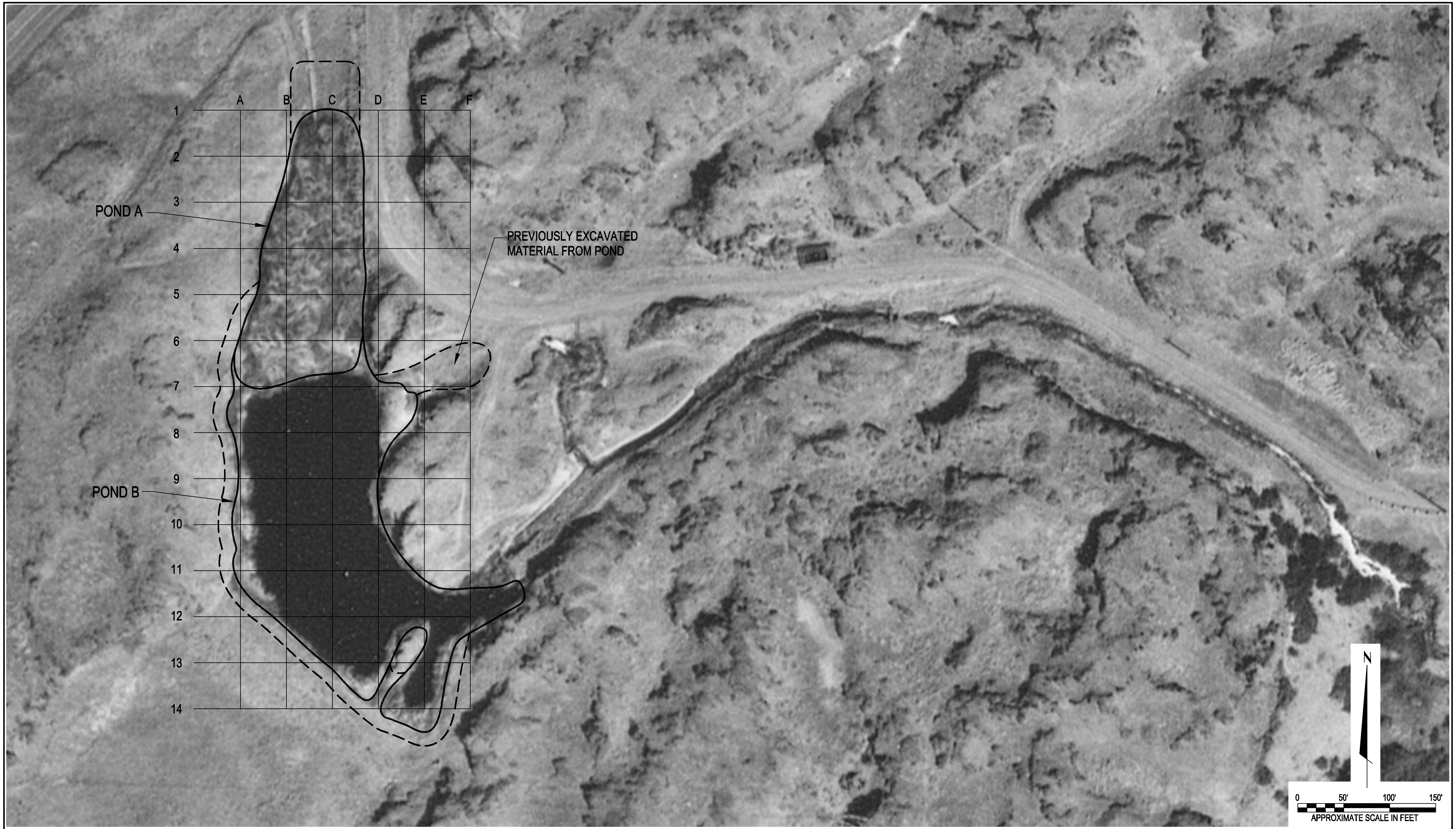
[7] Assumes soil available for revegetation after removal.

Work Plan and Bid Documents	$73,970	
Project Consulting and Regulatory Oversight	$148,368	
Complete Removal to Off-Site Landfill	$6,001,025	
	Total Option D	**$6,223,362**

APPENDIX A-1

SWMU #1 – NPDES Ponds

ARCADIS (2008b)
Supplemental Sample Results



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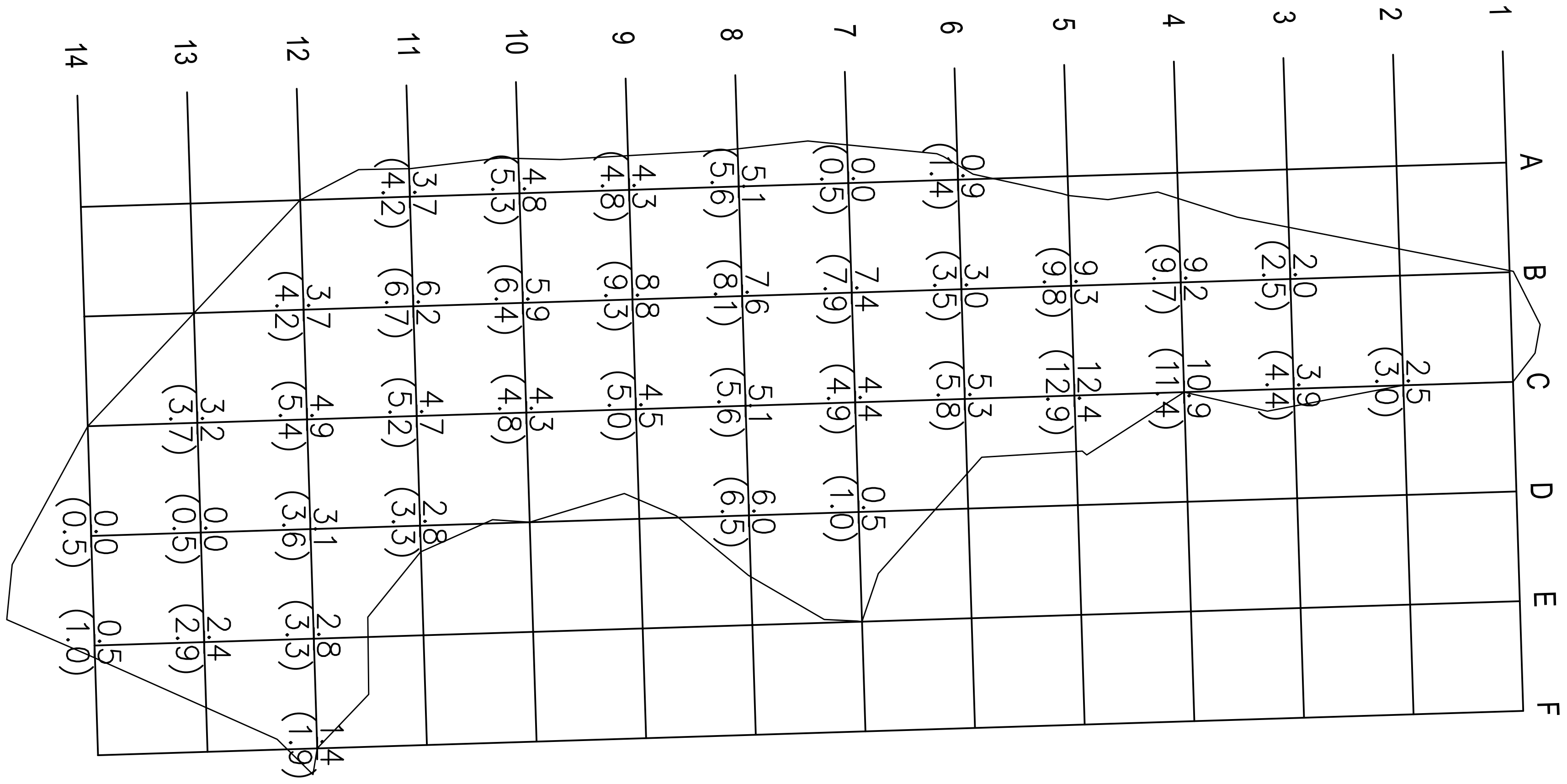
LEGEND:

———	POND SLUDGE PERIMETER
— — —	EXTENDED PERIMETER (THIN LAYER OF SLUDGE OUTSIDE POND PERIMETER)

NPDES PONDS A AND B
GRID POINTS

GOLDENDALE, WASHINGTON

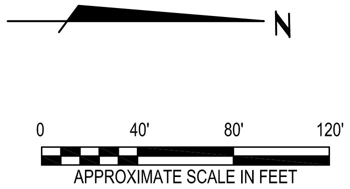
Project Number	MH000978.0001
Drawing Date	6/23/2008
Figure	A1



LEGEND:

2.8 ACTUAL SLUDGE DEPTH
(3.3) MAX EXCAVATION CUT (SLUDGE DEPTH PLUS 6 INCHES)

NOTE: EXTENDED AREAS NOT SHOWN



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NPDES PONDS A AND B

SLUDGE DEPTHS

GOLDENDALE, WASHINGTON

Project Number
MH000978.0001
Drawing Date
06/23/2008
Figure
A2

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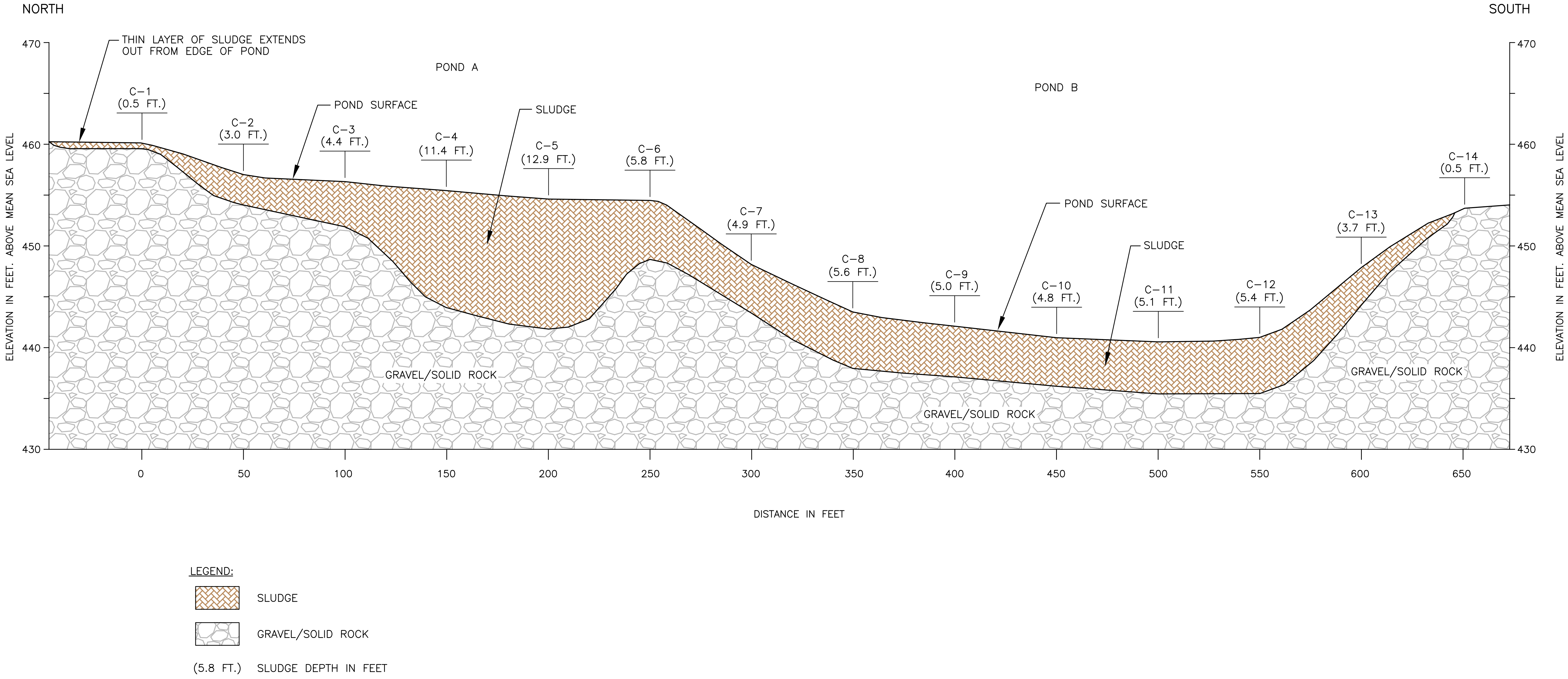

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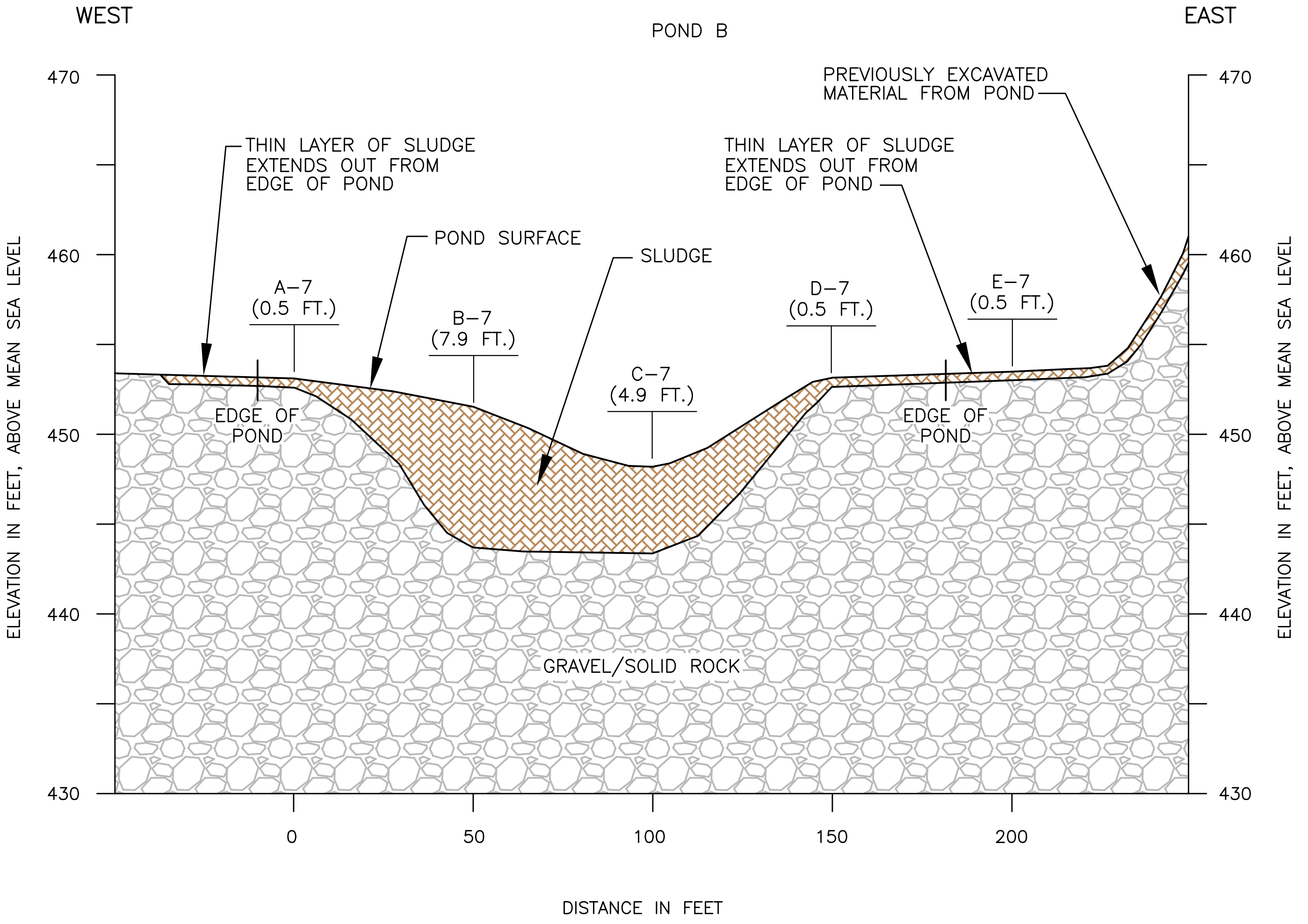
GRID LINE C CROSS SECTION (SEE FIGURE 2)
NPDES PONDS A AND B

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001

Drawing Date
9/4/2007

Figure
A2a



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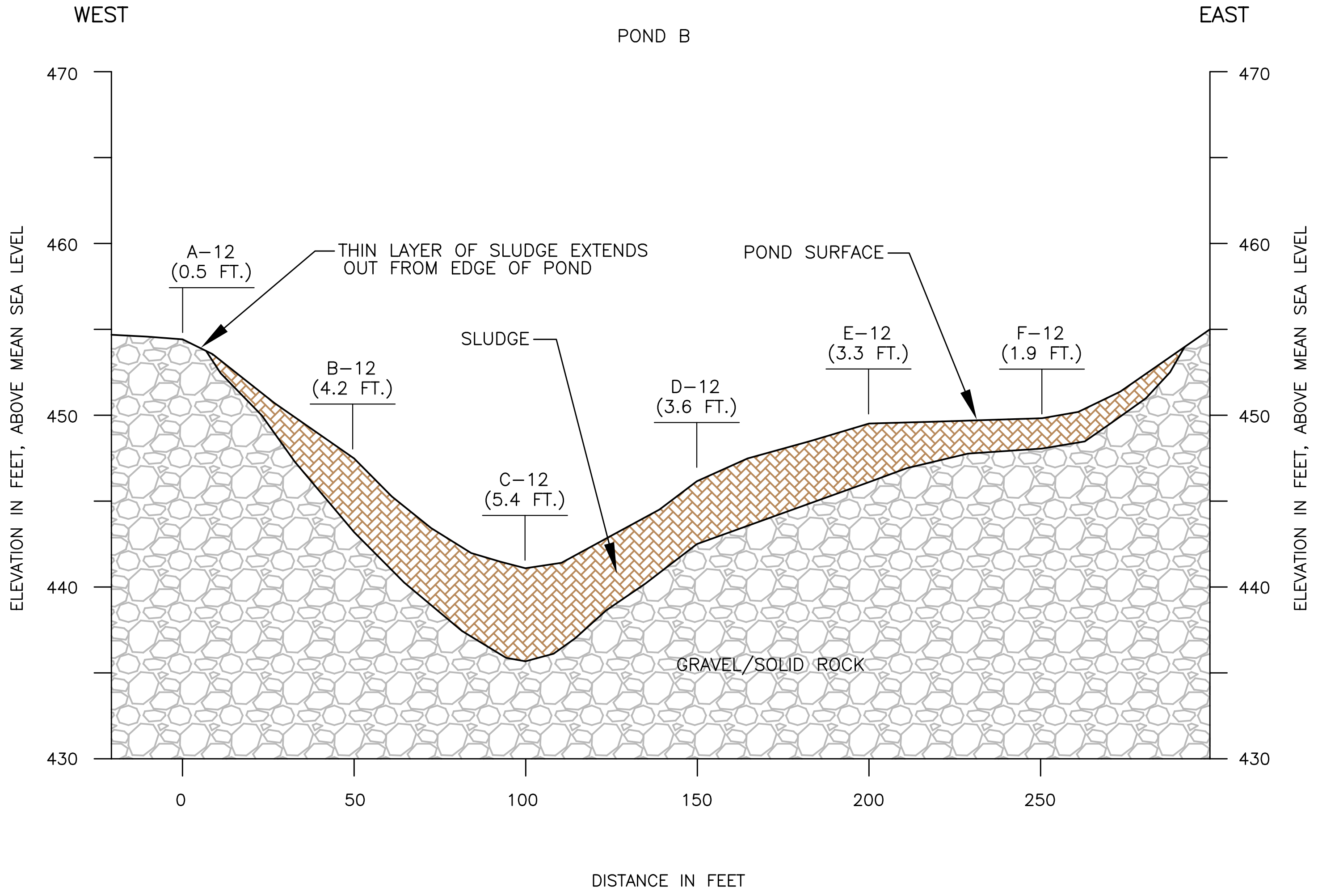

LINE 12

LEGEND:

▨ SLUDGE

░ GRAVEL/SOLID ROCK

(4.9 FT.) SLUDGE DEPTH IN FEET

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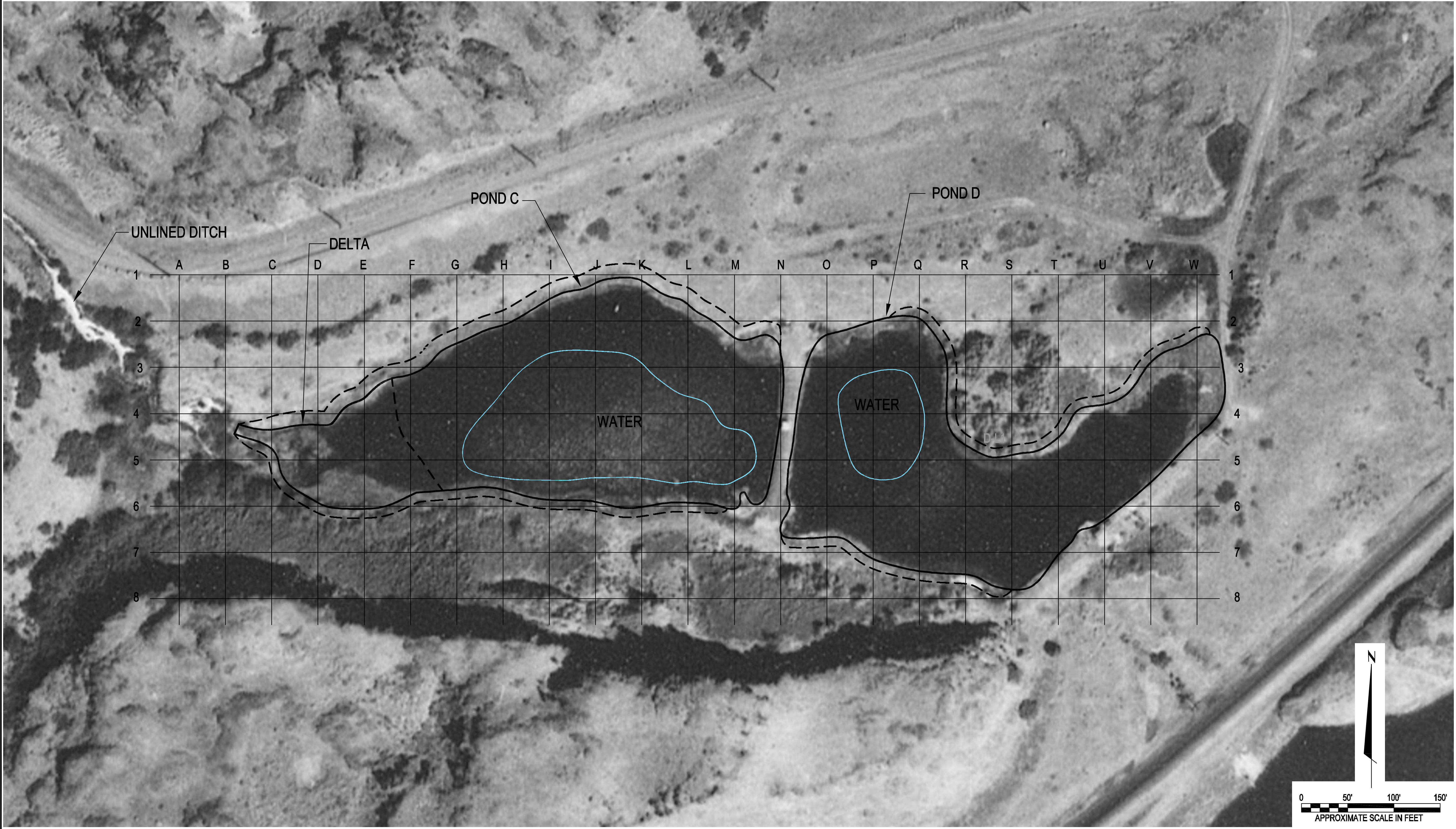
GRID LINES 7 AND LINE 12 CROSS SECTIONS (SEE FIGURE 2)
NPDES PONDS A AND B

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001
Drawing Date
9/4/2007
Figure
A2b



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LEGEND:

▬	POND SLUDGE PERIMETER
– – –	EXTENDED PERIMETER (THIN LAYER OF SLUDGE (OUTSIDE POND PERIMETER)
▬	WATER LEVEL ON JULY 13, 2007

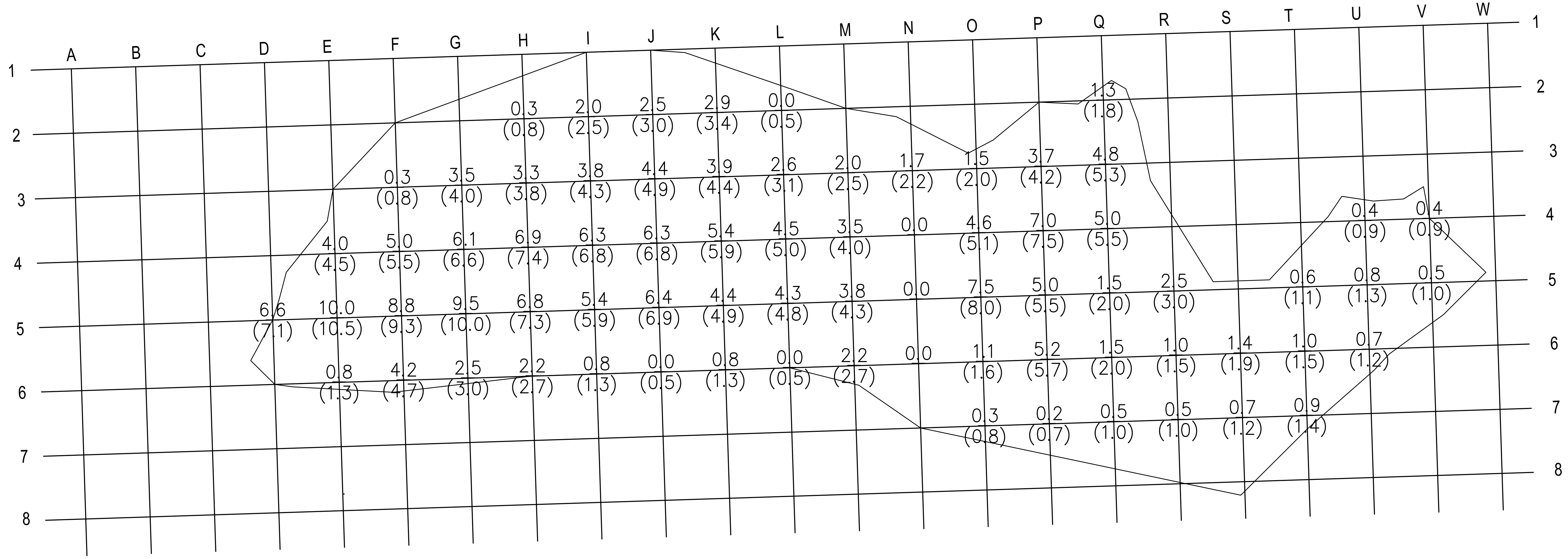
NPDES PONDS C AND D
GRID POINTS

GOLDENDALE, WASHINGTON

Project Number
MH000978.0001

Drawing Date
6/23/2008

Figure
A3



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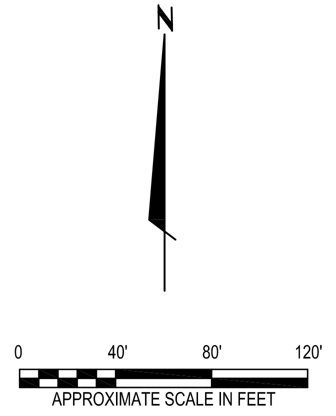
2					0.3 (0.8)	2.0 (2.5)	2.5 (3.0)	2.9 (3.4)	0.0 (0.5)					1.3 (1.8)					
3			0.3 (0.8)	3.5 (4.0)	3.3 (3.8)	3.8 (4.3)	4.4 (4.9)	3.9 (4.4)	2.6 (3.1)	2.0 (2.5)	1.7 (2.2)	1.5 (2.0)	3.7 (4.2)	4.8 (5.3)					
4		4.0 (4.5)	5.0 (5.5)	6.1 (6.6)	6.9 (7.4)	6.3 (6.8)	6.3 (6.8)	5.4 (5.9)	4.5 (5.0)	3.5 (4.0)	0.0	4.6 (5.1)	7.0 (7.5)	5.0 (5.5)				0.4 (0.9)	0.4 (0.9)
5	6.6 (7.1)	10.0 (10.5)	8.8 (9.3)	9.5 (10.0)	6.8 (7.3)	5.4 (5.9)	6.4 (6.9)	4.4 (4.9)	4.3 (4.8)	3.8 (4.3)	0.0	7.5 (8.0)	5.0 (5.5)	1.5 (2.0)	2.5 (3.0)		0.6 (1.1)	0.8 (1.3)	0.5 (1.0)
6		0.8 (1.3)	4.2 (4.7)	2.5 (3.0)	2.2 (2.7)	0.8 (1.3)	0.0 (0.5)	0.8 (1.3)	0.0 (0.5)	2.2 (2.7)	0.0	1.1 (1.6)	5.2 (5.7)	1.5 (2.0)	1.0 (1.5)	1.4 (1.9)	1.0 (1.5)	0.7 (1.2)	
7												0.3 (0.8)	0.2 (0.7)	0.5 (1.0)	0.5 (1.0)	0.7 (1.2)	0.9 (1.4)		



LEGEND:

2.8 ACTUAL SLUDGE DEPTH
(3.3) MAX EXCAVATION CUT (SLUDGE DEPTH PLUS 6 INCHES)

NOTE: EXTENDED AREAS NOT SHOWN

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Current Plotsyle : ByColor

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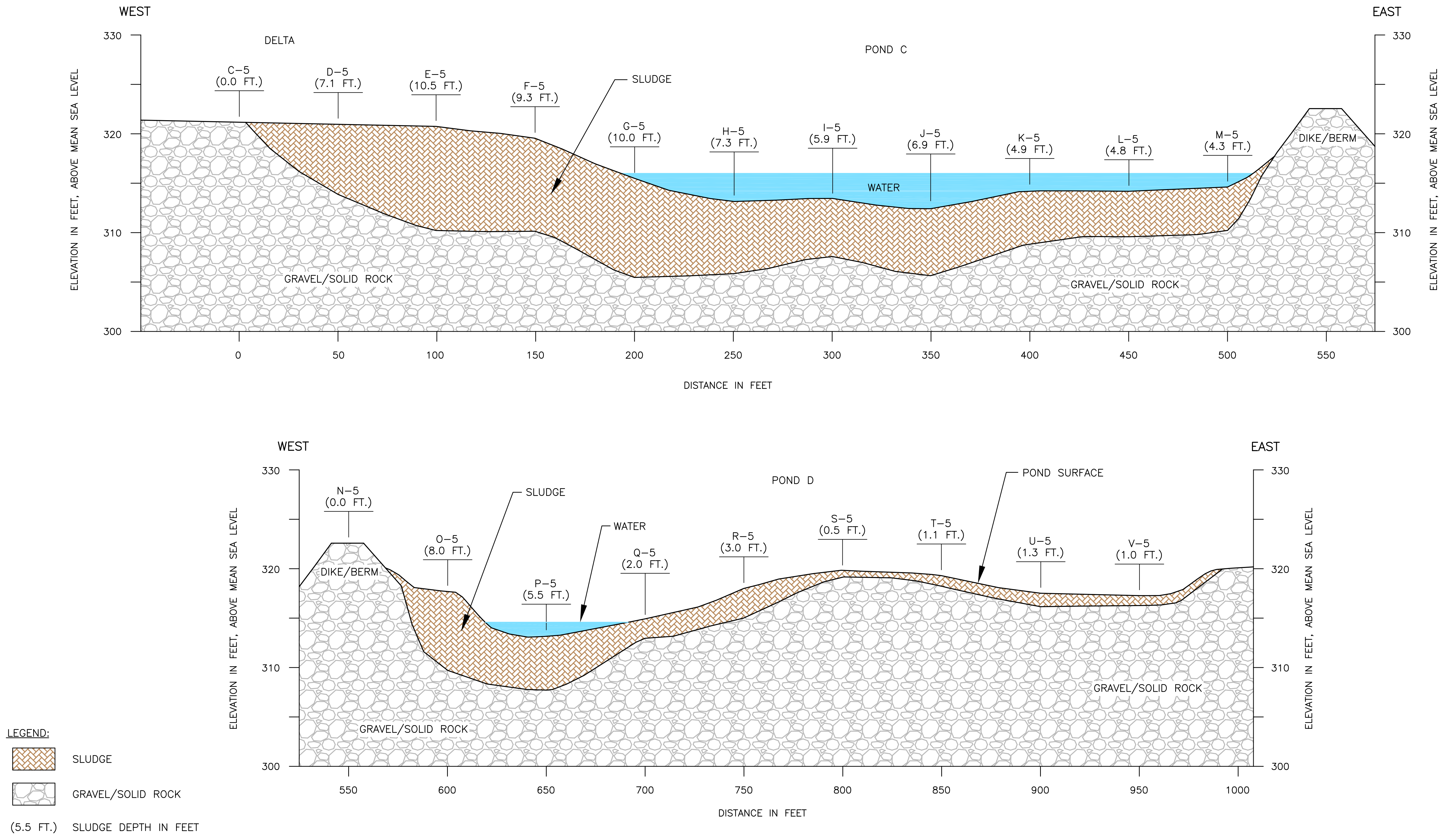
NPDES PONDS C AND D

SLUDGE DEPTHS

GOLDENDALE, WASHINGTON

Project Number
MH000978.0001
Drawing Date
06/23/2008
Figure
A4



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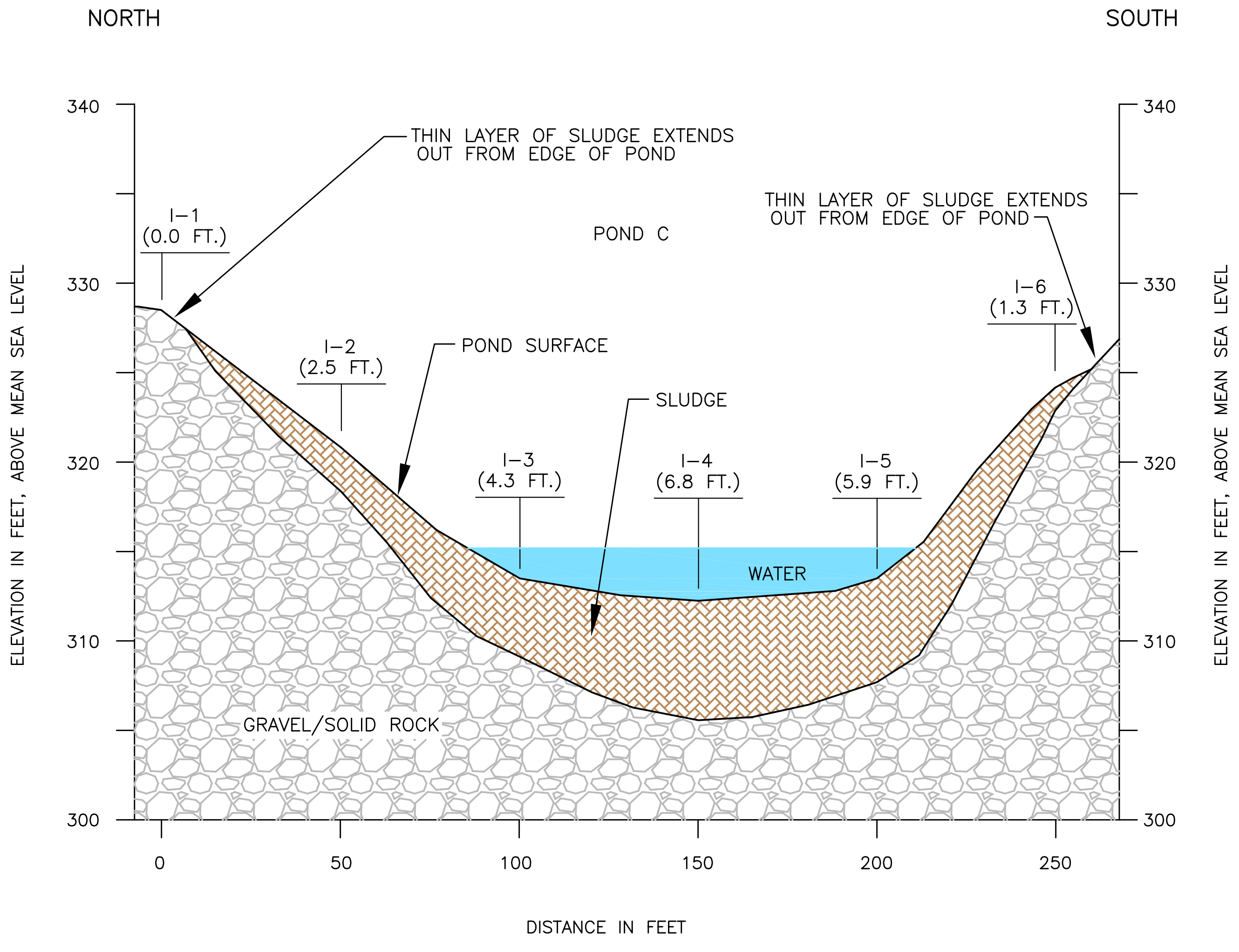
GRID LINE 5 CROSS SECTION (SEE FIGURE 3)
NPDES PONDS C AND D

GOLDENDALE, WASHINGTON

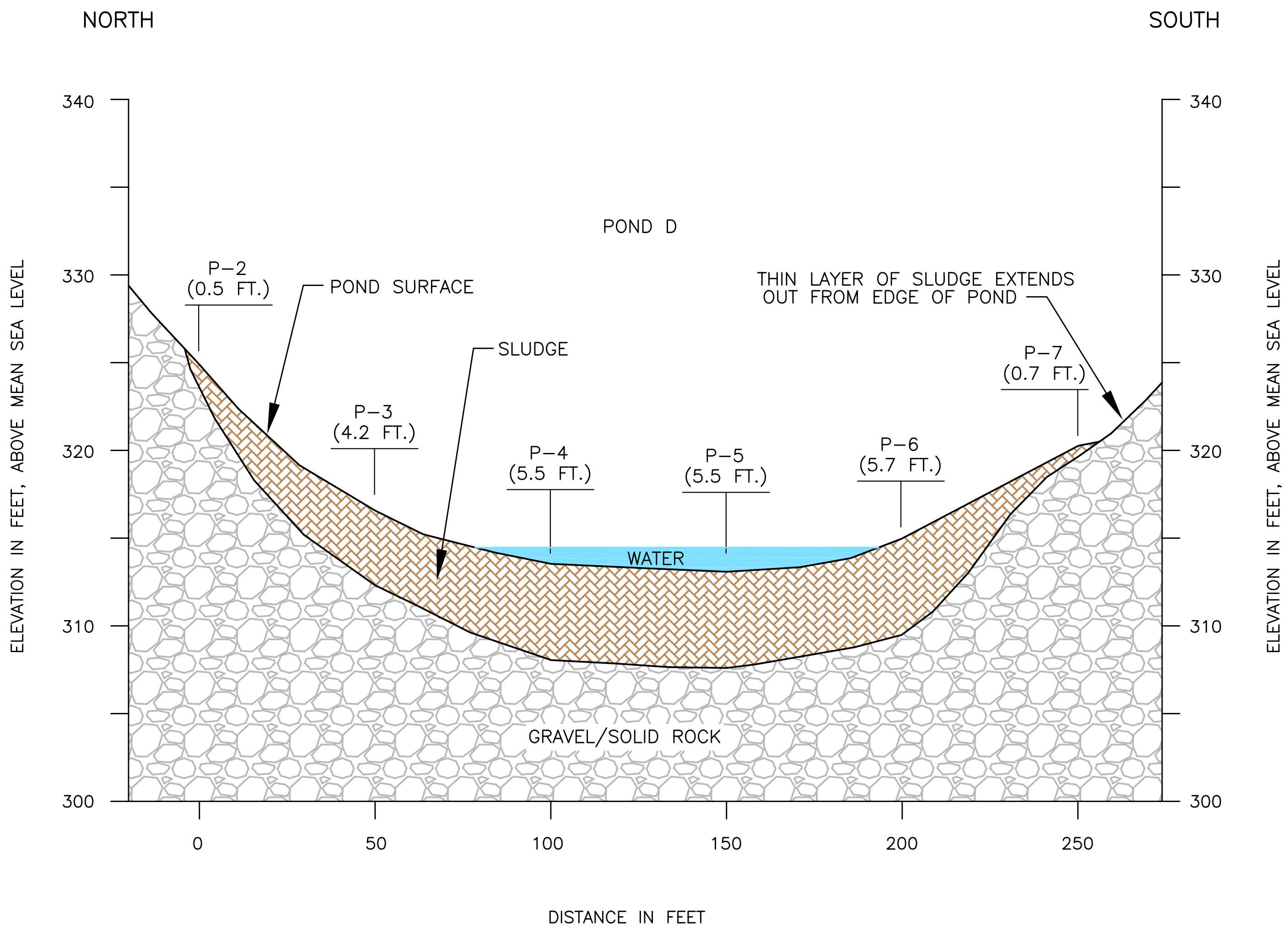
Project Number
MH000968.0001

Drawing Date
9/4/2007

Figure
A4a



LINE I



LINE P

LEGEND:

▨ SLUDGE

▢ GRAVEL/SOLID ROCK

(4.3 FT.) SLUDGE DEPTH IN FEET

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User Name : mhoefer
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GRID LINES I AND LINE P CROSS SECTIONS (SEE FIGURE 3)
NPDES PONDS C AND D

GOLDENDALE, WASHINGTON

Project Number
MH000968.0001
Drawing Date
9/4/2007
Figure
A4b

TABLE 1. October 2008 Goldendale NPDES Ponds Soil Sampling - PAH Dry Weight

Lockheed Martin Corporation, Goldendale, WA

Pond A

Sample ID	**Pond A**		**Pond A**		**Pond A**		**Pond A**		**Pond A**		**Pond A**		**Cleanup**
	C-4, 0-2 ft		**C-4, 2-6 ft**		**C-4, 6-10 ft**		**C-5, 0-2 ft**		**C-5, 2-7 ft**		**C-5, 7-12 ft**		**Standard**
Date Collected	10/09/08	MRL	10/09/08	MRL	10/09/08	MRL	10/09/08	MRL	10/09/08	MRL	10/09/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	1.28	nd* (2.55)	6.55	2.88	1.56	nd* (3.12)	1.45	nd* (2.90)	10.0	2.61	6.01	2.82	-
Acenaphthylene	1.28	nd* (2.55)	9.84	2.88	6.76	3.12	1.45	nd* (2.90)	30.4	2.61	10.7	2.82	-
Anthracene	14.2	2.55	48.1	28.8	24.5	3.12	3.69	2.90	63.8	26.1	48.5	28.2	-
Benzo(a)anthracene	141	25.5	210	28.8	163	31.2	42.1	29.0	264	26.1	251	28.2	-
Benzo(a)pyrene	301	25.5	186	28.8	140	31.2	67.4	29.0	238	26.1	223	28.2	-
Benzo(b)fluoranthene	478	25.5	403	28.8	320	31.2	193	29.0	552	26.1	505	28.2	-
Benzo(g,h,i)perylene	300	25.5	170	28.8	135	31.2	81.3	29.0	204	26.1	205	28.2	-
Benzo(k)fluoranthene	184	25.5	195	28.8	150	31.2	67.6	29.0	213	26.1	219	28.2	-
Chrysene	293	25.5	482	28.8	373	31.2	142	29.0	620	26.1	559	28.2	-
Dibenzo(a,h)anthracene	82.9	25.5	43.4	28.8	38.4	31.2	21.0	2.90	52.2	26.1	51.5	28.2	-
Fluoranthene	268	25.5	776	28.8	567	31.2	140	29.0	996	26.1	899	28.2	-
Fluorene	1.28	nd* (2.55)	19.1	2.88	6.02	3.12	1.45	nd* (2.90)	31.6	2.61	16.1	2.82	-
Indeno(1,2,3-cd)pyrene	261	25.5	131	28.8	105	31.2	68.6	29.0	159	26.1	159	28.2	-
Naphthalene	1.28	nd* (2.55)	1.44	nd* (2.88)	1.56	nd* (3.12)	1.45	nd* (2.90)	1.31	nd* (2.61)	3.04	2.82	-
Phenanthrene	16.0	2.55	437	28.8	276	31.2	4.36	2.90	590	26.1	450	28.2	-
Pyrene	141	25.5	588	28.8	431	31.2	64.2	29.0	752	26.1	683	28.2	-
PAH Totals	2,485		3,706		2,739		901.1		4,777		4,289		-
Percent	0.2%		0.4%		0.3%		0.1%		0.5%		0.4%		-

Pond A

Sample ID	**Pond A**		**Pond A**		**Cleanup**
	C-6, 0-2 ft		**C-6, 2-5 ft**		**Standard**
Date Collected	10/09/08	MRL	10/09/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	1.45	nd* (2.89)	1.50	nd* (2.99)	-
Acenaphthylene	1.45	nd* (2.89)	1.50	nd* (2.99)	-
Anthracene	4.89	2.89	7.29	2.99	-
Benzo(a)anthracene	58.8	28.9	61.4	29.9	-
Benzo(a)pyrene	138	28.9	165	29.9	-
Benzo(b)fluoranthene	253	28.9	311	29.9	-
Benzo(g,h,i)perylene	196	28.9	215	29.9	-
Benzo(k)fluoranthene	123	28.9	153	29.9	-
Chrysene	271	28.9	323	29.9	-
Dibenzo(a,h)anthracene	47.9	28.9	55.7	29.9	-
Fluoranthene	86.0	28.9	90.4	29.9	-
Fluorene	1.45	nd* (2.89)	1.50	nd* (2.99)	-
Indeno(1,2,3-cd)pyrene	153	28.9	160	29.9	-
Naphthalene	1.45	nd* (2.89)	1.50	nd* (2.99)	-
Phenanthrene	11.6	2.89	30.7	2.99	-
Pyrene	54.2	28.9	61.6	29.9	-
PAH Totals	1,403		1,640		-
Percent	0.1%		0.2%		-

Samples required dilution due to high concentrations of target analytes.

mg/kg - milligrams per kilogram (dry)

MRL - Method Reporting Limit

nd* - Sample result for analyte was non-detectable. The reported number is one-half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between sample analyses.

TABLE 1. October 2008 Goldendale NPDES Ponds Soil Sampling - PAH Dry Weight

Lockheed Martin Corporation, Goldendale, WA

Pond B

Sample ID	**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Cleanup**
	B-7, 0-2 ft		**B-7, 2-5 ft**		**B-7, 5-7.5 ft**		**B-8, 0-2 ft**		**B-8, 2-5 ft**		**B-8, 5-7.5 ft**		**Standard**
Date Collected	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	1.09	nd* (2.17)	17.5	2.09	11.9	2.20	2.84	2.20	4.38	2.46	12.8	2.65	-
Acenaphthylene	1.09	nd* (2.17)	1.05	nd* (2.09)	1.1	nd* (2.20)	1.1	nd* (2.20)	3.05	2.46	23.5	2.65	-
Anthracene	25.2	2.17	337	209	280	22.0	10.7	2.20	18.9	2.46	72.2	26.5	-
Benzo(a)anthracene	192	21.7	843	209	943	220	91.7	22.0	135	24.6	373	26.5	-
Benzo(a)pyrene	178	21.7	300	20.9	363	22.0	190	22.0	202	24.6	342	26.5	-
Benzo(b)fluoranthene	487	21.7	706	20.9	867	22.0	446	22.0	446	24.6	726	26.5	-
Benzo(g,h,i)perylene	137	21.7	198	20.9	242	22.0	184	22.0	196	24.6	286	26.5	-
Benzo(k)fluoranthene	227	21.7	419	20.9	444	22.0	131	22.0	150	24.6	307	26.5	-
Chrysene	615	21.7	2,010	209	2,100	220	335	22.0	380	24.6	866	26.5	-
Dibenzo(a,h)anthracene	43.5	21.7	66.1	20.9	78.7	22.0	51.8	22.0	53.5	24.6	83.6	26.5	-
Fluoranthene	658	21.7	5,710	209	6,170	220	164	22.0	348	24.6	1,290	26.5	-
Fluorene	1.09	nd* (2.17)	31.2	2.09	16.0	2.20	1.1	nd* (2.20)	4.47	2.46	27.7	2.65	-
Indeno(1,2,3-cd)pyrene	121	21.7	179	20.9	212	22.0	158	22.0	166	24.6	221	26.5	-
Naphthalene	1.09	nd* (2.17)	1.05	nd* (2.09)	1.1	nd* (2.20)	1.1	nd* (2.20)	1.23	nd* (2.46)	4.94	2.65	-
Phenanthrene	16.4	2.17	888	209	442	22.0	21.2	2.20	113	24.6	569	26.5	-
Pyrene	167	21.7	3,630	209	4,220	220	331	22.0	326	24.6	1,060	26.5	-
PAH Totals	2,871		15,337		16,392		2,121		2,548		6,265		-
Percent	0.3%		1.5%		1.6%		0.2%		0.3%		0.6%		-

Pond B

Sample ID	**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Cleanup**
	B-9, 0-2 ft		**B-9, 2-4 ft**		**B-9, 4-6 ft**		**B-10, 0-2 ft**		**B-10, 2-4 ft**		**B-10, 4-6 ft**		**Standard**
Date Collected	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	2.34	nd* (4.68)	17.2	6.15	26.3	6.04	2.20	nd* (4.39)	2.53	nd* (5.06)	2.58	nd* (5.16)	-
Acenaphthylene	2.34	nd* (4.68)	31.5	6.15	40.2	6.04	2.20	nd* (4.39)	2.53	nd* (5.06)	2.58	nd* (5.16)	-
Anthracene	47.9	4.68	171	123	208	121	14.0	4.39	22.9	5.06	32.2	5.16	-
Benzo(a)anthracene	415	93.6	774	123	884	121	189	43.9	281	50.6	257	51.6	-
Benzo(a)pyrene	226	93.6	684	123	757	121	200	43.9	380	50.6	385	51.6	-
Benzo(b)fluoranthene	633	93.6	1,430	123	1,540	121	615	43.9	844	50.6	820	51.6	-
Benzo(g,h,i)perylene	181	4.68	525	123	540	121	210	43.9	314	50.6	338	51.6	-
Benzo(k)fluoranthene	289	93.6	673	123	758	121	211	43.9	394	50.6	337	51.6	-
Chrysene	980	93.6	1,810	123	2,020	121	649	43.9	1,030	50.6	979	51.6	-
Dibenzo(a,h)anthracene	57.8	4.68	151	123	141	121	65.9	43.9	83.2	50.6	101	51.6	-
Fluoranthene	2,900	93.6	2,930	123	3,280	121	1,370	43.9	1,000	50.6	556	51.6	-
Fluorene	5.68	4.68	123	6.15	117	6.04	2.20	nd* (4.39)	5.74	5.06	11.6	5.16	-
Indeno(1,2,3-cd)pyrene	156	4.68	391	123	409	121	173	43.9	243	50.6	255	51.6	-
Naphthalene	2.34	nd* (4.68)	6.92	6.15	10.7	6.04	2.20	nd* (4.39)	2.53	nd* (5.06)	2.58	5.16	-
Phenanthrene	152	4.68	1,660	123	2,150	121	19.9	4.39	111	5.06	210	5.16	-
Pyrene	1,320	93.6	2,810	123	3,100	121	934	43.9	709	50.6	488	51.6	-
PAH Totals	7,370		14,188		15,981		4,660		5,425		4,778		-
Percent	0.7%		1.4%		1.6%		0.5%		0.5%		0.5%		-

Samples required dilution due to high concentrations of target analytes.

mg/kg - milligrams per kilogram (dry)

MRL - Method Reporting Limit

nd* - Sample result for analyte was non-detectable. The reported number is one-half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between sample analyses.

TABLE 1. October 2008 Goldendale NPDES Ponds Soil Sampling - PAH Dry Weight
Lockheed Martin Corporation, Goldendale, WA

Pond B

Sample ID	**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Pond B**		**Cleanup**
	B-11, 0-2 ft		**B-11, 2-4 ft**		**B-11, 4-6 ft**		**C-8, 0-2 ft**		**C-10, 0-2 ft**		**C-11, 0-2 ft**		**Standard**
Date Collected	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	10/10/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	5.07	4.46	2.20	nd* (4.39)	2.18	nd* (4.36)	2.11	nd* (4.22)	4.85	nd* (9.69)	7.43	4.65	-
Acenaphthylene	2.23	nd* (4.46)	2.20	nd* (4.39)	2.18	nd* (4.36)	2.11	nd* (4.22)	4.85	nd* (9.69)	4.81	4.65	-
Anthracene	63.3	4.46	57.3	4.39	53.2	4.36	16.4	4.22	70.6	9.69	85.0	4.65	-
Benzo(a)anthracene	594	178	439	175	542	174	185	42.2	622	194	699	186	-
Benzo(a)pyrene	323	178	273	175	299	174	281	42.2	338	9.69	430	186	-
Benzo(b)fluoranthene	908	178	812	175	891	174	712	42.2	1,100	194	1,160	186	-
Benzo(g,h,i)perylene	210	4.46	210	4.39	197	4.36	198	4.22	233	9.69	325	186	-
Benzo(k)fluoranthene	460	178	318	175	380	174	270	42.2	453	9.69	546	186	-
Chrysene	1,430	178	1,140	175	1,410	174	673	42.2	1,680	194	1,640	186	-
Dibenzo(a,h)anthracene	67.2	4.46	66.5	4.39	63.9	4.36	62.2	4.22	75.1	9.69	85.2	4.65	-
Fluoranthene	4,440	178	3,550	175	4,830	174	584	42.2	6,330	194	4,820	186	-
Fluorene	8.03	4.46	7.03	4.39	5.32	4.36	2.11	nd* (4.22)	4.85	nd* (9.69)	22.4	4.65	-
Indeno(1,2,3-cd)pyrene	176	4.46	176	4.39	166	4.36	172	4.22	202	9.69	226	4.65	-
Naphthalene	2.23	nd* (4.46)	2.20	nd* (4.39)	2.18	nd* (4.36)	2.11	nd* (4.22)	4.85	nd* (9.69)	2.33	nd* (4.65)	-
Phenanthrene	137	4.46	126	4.39	105	4.36	12.0	4.22	95.8	9.69	371	186	-
Pyrene	2,920	178	2,280	175	3,130	174	540	42.2	4,080	194	3,230	186	-
PAH Totals	11,746		9,461		12,079		3,714		15,299		13,654		-
Percent	1.2%		0.9%		1.2%		0.4%		1.5%		1.4%		-

Pond B

Sample ID	**Pond B**		**Pond B**		**Pond B**		**Cleanup**
	C-11A, 0-2 ft		**C-11A, 0-2 ft (duplicate)**		**EF-12, 0-2 ft**		**Standard**
Date Collected	10/14/08	MRL	10/14/08	MRL	10/10/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	2.52	nd* (5.03)	2.50	nd* (4.99)	2.28	nd* (4.56)	-
Acenaphthylene	2.52	nd* (5.03)	2.50	nd* (4.99)	6.63	4.56	-
Anthracene	41.7	5.03	38.7	4.99	76.2	4.56	-
Benzo(a)anthracene	441	126	439	125	1,110	182	-
Benzo(a)pyrene	355	126	363	125	1,020	182	-
Benzo(b)fluoranthene	930	126	966	125	2,910	182	-
Benzo(g,h,i)perylene	294	126	306	125	935	182	-
Benzo(k)fluoranthene	401	126	401	125	1,180	182	-
Chrysene	1,230	126	1,220	125	2,330	182	-
Dibenzo(a,h)anthracene	88.0	5.03	85.7	4.99	189	4.56	-
Fluoranthene	2,730	126	2,530	125	4,230	182	-
Fluorene	6.44	5.03	5.90	4.99	14.4	4.56	-
Indeno(1,2,3-cd)pyrene	219	126	222	125	672	182	-
Naphthalene	2.52	nd* (5.03)	2.50	nd* (4.99)	2.28	nd* (4.56)	-
Phenanthrene	102	5.03	95.8	4.99	583	182	-
Pyrene	2,060	126	1,950	125	4,370	182	-
PAH Totals	8,906		8,631		19,631		-
Percent	0.9%		0.9%		2.0%		-

Samples required dilution due to high concentrations of target analytes.

mg/kg - milligrams per kilogram (dry)

MRL - Method Reporting Limit

nd* - Sample result for analyte was non-detectable. The reported number is one-half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between sample analyses.

TABLE 1. October 2008 Goldendale NPDES Ponds Soil Sampling - PAH Dry Weight
Lockheed Martin Corporation, Goldendale, WA

Pond C

Sample ID	**Pond C D-5, 0-2 ft**		**Pond C D-5, 0-2 ft (duplicate)**		**Pond C D-5, 2-4 ft**		**Pond C D-5, 4-6.5 ft**		**Pond C F-4, 0-2 ft**		**Pond C F-5, 0-2 ft**		**Cleanup Standard**
Date Collected	10/13/08 (mg/kg)	MRL (mg/kg)	10/13/08 (mg/kg)	MRL (mg/kg)	10/13/08 (mg/kg)	MRL (mg/kg)	10/13/08 (mg/kg)	MRL (mg/kg)	10/13/08 (mg/kg)	MRL (mg/kg)	10/13/08 (mg/kg)	MRL (mg/kg)	(mg/kg)
Acenaphthene	1.91	nd* (3.82)	1.93	nd* (3.86)	36.1	4.19	35.3	8.66	7.90	5.15	1.84	nd* (3.67)	-
Acenaphthylene	1.91	nd* (3.82)	1.93	nd* (3.86)	2.10	nd* (4.19)	4.33	nd* (8.66)	2.58	nd* (5.15)	1.84	nd* (3.67)	-
Anthracene	74.8	3.82	95.3	3.86	931	210	482	216	344	206	13.5	3.67	-
Benzo(a)anthracene	378	95.6	475	96.5	1,060	210	725	216	619	206	67.9	36.7	-
Benzo(a)pyrene	276	95.6	335	96.5	455	210	477	216	468	206	99.5	36.7	-
Benzo(b)fluoranthene	518	95.6	611	96.5	658	210	886	216	811	206	140	36.7	-
Benzo(g,h,i)perylene	173	95.6	208	96.5	241	210	283	216	336	206	106	36.7	-
Benzo(k)fluoranthene	327	95.6	409	96.5	644	210	545	216	488	206	82.1	36.7	-
Chrysene	699	95.6	974	96.5	2,010	210	1,210	216	1,010	206	119	36.7	-
Dibenzo(a,h)anthracene	48.8	3.82	73.5	3.86	70.5	4.19	72.3	8.66	96.7	5.15	27.3	3.67	-
Fluoranthene	1,190	95.6	1,690	96.5	6,440	210	4,110	216	3,760	206	152	36.7	-
Fluorene	1.91	nd* (3.82)	1.93	nd* (3.86)	49.3	4.19	53.3	8.66	19.4	5.15	1.84	nd* (3.67)	-
Indeno(1,2,3-cd)pyrene	145	95.6	179	96.5	199	4.19	223	216	284	206	84.1	36.7	-
Naphthalene	1.91	nd* (3.82)	1.93	nd* (3.86)	2.10	nd* (4.19)	4.33	nd* (8.66)	2.58	nd* (5.15)	1.84	nd* (3.67)	-
Phenanthrene	49.0	3.82	63.3	3.86	1,530	210	1,140	216	454	206	27.0	3.67	-
Pyrene	615	95.6	889	96.5	4,980	210	2,940	216	2,480	206	106	36.7	-
PAH Totals	4,501		6,010		19,308		13,191		11,183		1,032		-
Percent	0.5%		0.6%		1.9%		1.3%		1.1%		0.1%		-

Pond C

Sample ID	**Pond C F-5, 2-5 ft**		**Pond C F-5, 5-9 ft**		**Pond C G-5, 0-2 ft**		**Pond C G-5, 2-5 ft**		**Pond C G-5, 5-8.2 ft**		**Pond C H-3, 0-2 ft**		**Cleanup Standard**
Date Collected	10/13/08 (mg/kg)	MRL (mg/kg)	10/13/08 (mg/kg)	MRL (mg/kg)	10/14/08 (mg/kg)	MRL (mg/kg)	10/25/08 (mg/kg)	MRL (mg/kg)	10/25/08 (mg/kg)	MRL (mg/kg)	10/13/08 (mg/kg)	MRL (mg/kg)	(mg/kg)
Acenaphthene	18.2	5.05	25.0	5.48	36.0	11.2	33.6	11.2	13.5	11.8	25.0	6.50	-
Acenaphthylene	2.53	nd* (5.05)	2.74	nd* (5.48)	5.60	nd* (11.2)	5.60	nd* (11.2)	5.90	nd* (11.8)	3.25	nd* (6.50)	-
Anthracene	104	50.5	207	110	237	11.2	359	11.2	109	11.8	290	6.50	-
Benzo(a)anthracene	378	50.5	458	110	727	280	782	280	240	11.8	805	260	-
Benzo(a)pyrene	305	50.5	266	110	499	280	432	11.2	167	11.8	521	260	-
Benzo(b)fluoranthene	453	50.5	394	110	882	280	859	280	279	11.8	922	260	-
Benzo(g,h,i)perylene	249	50.5	162	110	365	280	273	11.2	116	11.8	364	260	-
Benzo(k)fluoranthene	296	50.5	291	110	522	280	454	11.2	165	11.8	538	260	-
Chrysene	634	50.5	769	110	1,320	280	1,360	280	371	11.8	1,300	260	-
Dibenzo(a,h)anthracene	62.8	50.5	55.8	5.48	129	11.2	79.8	11.2	29.6	11.8	95.9	6.50	-
Fluoranthene	1,580	50.5	2,740	110	3,950	280	4,440	280	1,200	295	4,680	260	-
Fluorene	16.1	5.05	32.0	5.48	68.4	11.2	49.5	11.2	19.9	11.8	29.6	6.50	-
Indeno(1,2,3-cd)pyrene	203	50.5	131	110	283	280	231	11.2	96.9	11.8	281	260	-
Naphthalene	2.53	nd* (5.05)	2.74	nd* (5.48)	5.60	nd* (11.2)	5.60	nd* (11.2)	5.90	nd* (11.8)	3.25	nd* (6.50)	-
Phenanthrene	299	50.5	557	110	937	280	989	280	341	11.8	531	260	-
Pyrene	1,100	50.5	2,150	110	2,730	280	3,230	280	863	295	3,560	260	-
PAH Totals	5,703		8,243		12,697		13,583		4,023		13,949		-
Percent	0.6%		0.8%		1.3%		1.4%		0.4%		1.4%		-

Samples required dilution due to high concentrations of target analytes.

mg/kg - milligrams per kilogram (dry)

MRL - Method Reporting Limit

nd* - Sample result for analyte was non-detectable. The reported number is one-half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between sample analyses.

TABLE 1. October 2008 Goldendale NPDES Ponds Soil Sampling - PAH Dry Weight

Lockheed Martin Corporation, Goldendale, WA

Pond C

Sample ID	**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Cleanup Standard**
	H-3, 0-2 ft (duplicate)		**H-4, 0-2 ft**		**H-4, 2-4 ft**		**H-4, 4-6.8 ft**		**J-3, 0-2 ft**		**J-4, 0-2 ft**		
Date Collected	10/13/08	MRL	10/25/08	MRL	10/25/08	MRL	10/25/08	MRL	10/14/08	MRL	10/14/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	36.5	13.0	46.3	13.3	58.3	15.3	56.0	16.4	27.4	14.7	87.0	10.9	-
Acenaphthylene	6.50	nd* (13.0)	6.65	nd* (13.3)	7.65	nd* (15.3)	8.20	nd* (16.4)	7.35	nd* (14.7)	5.45	nd* (10.9)	-
Anthracene	437	325	276	13.3	356	15.3	638	16.4	267	14.7	980	273	-
Benzo(a)anthracene	1,160	325	712	333	956	381	1,430	410	854	368	2,820	273	-
Benzo(a)pyrene	672	325	448	13.3	450	15.3	716	16.4	549	368	1,170	273	-
Benzo(b)fluoranthene	1,110	325	793	333	1,120	381	1,320	410	876	368	2,940	273	-
Benzo(g,h,i)perylene	408	325	284	13.3	278	15.3	389	16.4	254	14.7	709	273	-
Benzo(k)fluoranthene	703	325	421	13.3	475	15.3	756	16.4	582	368	1,510	273	-
Chrysene	2,020	325	1,310	333	1,790	381	2,460	410	1,510	368	4,990	273	-
Dibenzo(a,h)anthracene	157	13.0	85.7	13.3	90.4	15.3	116	16.4	130	14.7	140	10.9	-
Fluoranthene	7,100	325	4,290	333	7,110	381	1,020	410	4,240	368	11,300	546	-
Fluorene	45.5	13.0	81.7	13.3	136	15.3	76.2	16.4	29.7	14.7	439	273	-
Indeno(1,2,3-cd)pyrene	299	13.0	240	13.3	236	15.3	327	16.4	246	14.7	576	273	-
Naphthalene	6.50	nd* (13.0)	6.65	nd* (13.3)	7.65	nd* (15.3)	8.20	nd* (16.4)	7.35	nd* (14.7)	5.45	nd* (10.9)	-
Phenanthrene	755	325	962	333	1,750	381	1,950	410	720	368	5,590	273	-
Pyrene	5,760	325	2,970	333	4,510	381	8,080	410	3,360	368	12,900	273	-
PAH Totals	20,676		12,933		19,331		19,351		13,660		46,162		-
Percent	2.1%		1.3%		1.9%		1.9%		1.4%		4.6%		-

Pond C

Sample ID	**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Cleanup Standard**
	J-4, 2-4 ft		**J-4, 4-6.5 ft**		**J-5, 0-2 ft**		**K-4, 0-2 ft**		**K-4, 2-4 ft**		**K-4, 4-5.5 ft**		
Date Collected	10/14/08	MRL	10/25/08	MRL	10/14/08	MRL	10/14/08	MRL	10/14/08	MRL	10/25/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	57.9	13.3	61.5	14.2	99.9	13.6	92.8	13.2	112	15.6	39.3	13.8	-
Acenaphthylene	6.65	nd* (13.3)	7.10	nd* (14.2)	6.80	nd* (13.6)	6.60	nd* (13.2)	7.80	nd* (15.6)	6.90	nd* (13.8)	-
Anthracene	347	332	399	14.2	607	341	371	329	405	391	384	13.8	-
Benzo(a)anthracene	1,360	332	1,030	354	1,850	341	1,550	329	1,790	391	880	345	-
Benzo(a)pyrene	670	332	543	14.2	820	341	1,100	329	1,390	391	481	13.8	-
Benzo(b)fluoranthene	1,400	332	1,170	354	2,040	341	2,020	329	2,210	391	1,010	345	-
Benzo(g,h,i)perylene	408	332	342	14.2	508	341	742	329	914	391	309	13.8	-
Benzo(k)fluoranthene	768	332	564	14.2	1,000	341	1,040	329	1,460	391	436	13.8	-
Chrysene	2,410	332	1,920	354	3,480	341	2,930	329	3,180	391	1,650	345	-
Dibenzo(a,h)anthracene	151	13.3	120	14.2	175	13.6	250	13.2	279	15.6	98.5	13.8	-
Fluoranthene	7,830	332	7,260	354	13,400	341	8,130	329	7,060	391	5,800	345	-
Fluorene	114	13.3	126	14.2	269	13.6	187	13.2	144	15.6	46.5	13.8	-
Indeno(1,2,3-cd)pyrene	262	13.3	284	14.2	402	341	585	329	732	391	251	13.8	-
Naphthalene	6.65	nd* (13.3)	7.10	nd* (14.2)	6.80	nd* (13.6)	6.60	nd* (13.2)	7.80	nd* (15.6)	6.90	nd* (13.8)	-
Phenanthrene	1,490	332	1,690	354	3,420	341	1,690	329	1,580	391	1,240	345	-
Pyrene	5,230	332	4,970	354	8,290	341	5,340	329	4,940	391	4,640	345	-
PAH Totals	22,511		20,494		36,375		26,041		26,212		17,279		-
Percent	2.3%		2.0%		3.6%		2.6%		2.6%		1.7%		-

Samples required dilution due to high concentrations of target analytes.

mg/kg - milligrams per kilogram (dry)

MRL - Method Reporting Limit

TABLE 1. October 2008 Goldendale NPDES Ponds Soil Sampling - PAH Dry Weight
Lockheed Martin Corporation, Goldendale, WA

nd* - Sample result for analyte was non-detectable. The reported number is one-half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between sample analyses.

Pond C

Sample ID	**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Pond C**		**Cleanup Standard**
	L-3, 0-2 ft		**L-5, 0-2 ft**		**L-5, 2-4 ft**		**M-4, 0-2 ft**		**M-5, 0-2 ft**		**M-5, 2-3 ft**		
Date Collected	10/13/08	MRL	10/14/08	MRL	10/14/08	MRL	10/13/08	MRL	10/14/08	MRL	10/14/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	2.46	nd* (4.91)	33.0	11.5	44.4	12.6	22.2	11.2	25.6	13.6	27.6	13.8	-
Acenaphthylene	2.46	nd* (4.91)	5.75	nd* (11.5)	6.30	nd* (12.6)	5.60	nd* (11.2)	6.80	nd* (13.6)	6.90	nd* (13.8)	-
Anthracene	62.1	49.1	205	11.5	483	314	218	11.2	210	13.6	360	345	-
Benzo(a)anthracene	336	49.1	768	286	1,060	314	789	279	688	339	925	345	-
Benzo(a)pyrene	361	49.1	496	286	618	314	599	279	496	339	659	345	-
Benzo(b)fluoranthene	654	49.1	902	286	1,140	314	1,220	279	982	339	1,250	345	-
Benzo(g,h,i)perylene	325	49.1	324	286	377	314	421	279	354	339	428	345	-
Benzo(k)fluoranthene	287	49.1	578	286	690	314	648	279	551	339	677	345	-
Chrysene	657	49.1	1,440	286	1,720	314	1,550	279	1,400	339	1,720	345	-
Dibenzo(a,h)anthracene	79.2	49.1	94.6	11.5	105	12.6	113	11.2	101	13.6	116	13.8	-
Fluoranthene	1,500	49.1	3,950	286	6,990	314	4,140	279	3,940	339	5,590	345	-
Fluorene	2.46	nd* (4.91)	36.3	11.5	64.0	12.6	24.8	11.2	49.5	13.6	39.2	13.8	-
Indeno(1,2,3-cd)pyrene	269	49.1	269	11.5	310	12.6	320	279	286	13.6	350	13.8	-
Naphthalene	2.46	nd* (4.91)	5.75	nd* (11.5)	6.30	nd* (12.6)	5.60	nd* (11.2)	6.80	nd* (13.6)	6.90	nd* (13.8)	-
Phenanthrene	42.0	4.91	596	286	1,430	314	437	279	800	339	833	345	-
Pyrene	915	49.1	2,900	286	5,370	314	3,030	279	2,660	339	4,150	345	-
PAH Totals	5,497		12,603		20,414		13,543		12,557		17,139		-
Percent	0.5%		1.3%		2.0%		1.4%		1.3%		1.7%		-

Pond D

Sample ID	**Pond D**		**Pond D**		**Pond D**		**Pond D**		**Pond D**		**Pond D**		**Cleanup Standard**
	P-3, 0-2 ft		**P-4, 0-2.5 ft**		**P-5, 0-2.5 ft**		**P-6, 0-1.5 ft**		**R-6, 0-1.5 ft**		**U-5, 0-1.5 ft**		
Date Collected	10/13/08	MRL	10/13/08	MRL	10/13/08	MRL	10/13/08	MRL	10/13/08	MRL	10/13/08	MRL	
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	2.83	nd* (5.66)	42.4	7.16	12.2	6.26	2.49	nd* (4.98)	1.64	nd* (3.27)	1.42	nd* (2.83)	-
Acenaphthylene	2.83	nd* (5.66)	3.58	nd* (7.16)	3.13	nd* (6.26)	2.49	nd* (4.98)	1.64	nd* (3.27)	1.42	nd* (2.83)	-
Anthracene	62.1	5.66	432	286	152	6.26	63.0	49.8	8.49	3.27	5.51	2.83	-
Benzo(a)anthracene	436	56.6	1,460	286	454	125	341	49.8	134	32.7	204	28.3	-
Benzo(a)pyrene	417	56.6	778	286	314	125	318	49.8	245	32.7	287	28.3	-
Benzo(b)fluoranthene	712	56.6	1,200	286	502	125	553	49.8	434	32.7	743	28.3	-
Benzo(g,h,i)perylene	336	56.6	453	286	195	125	256	49.8	222	32.7	282	28.3	-
Benzo(k)fluoranthene	359	56.6	864	286	295	125	271	49.8	200	32.7	332	28.3	-
Chrysene	850	56.6	2,480	286	785	125	627	49.8	403	32.7	637	28.3	-
Dibenzo(a,h)anthracene	84.9	56.6	112	7.16	62.1	6.26	61.5	49.8	55.4	32.7	85.6	28.3	-
Fluoranthene	1,390	56.6	9,370	286	2,050	125	1,490	49.8	392	32.7	216	28.3	-
Fluorene	2.83	nd* (5.66)	45.4	7.16	16.0	6.26	2.49	nd* (4.98)	1.64	nd* (3.27)	1.42	nd* (2.83)	-
Indeno(1,2,3-cd)pyrene	277	56.6	371	286	159	125	210	49.8	186	32.7	239	28.3	-
Naphthalene	2.83	nd* (5.66)	3.58	nd* (7.16)	3.13	nd* (6.26)	2.49	nd* (4.98)	1.64	nd* (3.27)	1.42	nd* (2.83)	-
Phenanthrene	23.3	5.66	857	286	150	125	75.0	49.8	6.24	3.27	5.93	2.83	-
Pyrene	739	56.6	6,770	286	1,310	125	943	49.8	105	32.7	47.9	28.3	-
PAH Totals	5,698		25,242		6,463		5,218		2,398		3,091		-
Percent	0.6%		2.5%		0.6%		0.5%		0.2%		0.3%		-

Samples required dilution due to high concentrations of target analytes.

mg/kg - milligrams per kilogram (dry)

MRL - Method Reporting Limit

TABLE 1. October 2008 Goldendale NPDES Ponds Soil Sampling - PAH Dry Weight
Lockheed Martin Corporation, Goldendale, WA

nd* - Sample result for analyte was non-detectable. The reported number is one-half the MRL (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between sample analyses.

APPENDIX A-1

SWMU #1 – NPDES Ponds

JUB Engineers (1985)
Sediment Survey

addition of 5 ml of concentrated nitric acid per liter of sample is less than 4.00 and this would tend to liberate more metals. The analytical methods for analyses are provided in Table III.2

IV RESULTS OF WASTEWATER LAGOON AND COLUMBIA RIVER SEDIMENT SAMPLES

1. WASTEWATER LAGOON SEDIMENTS

A sampling grid was laid out to cover wastewater lagoons A B C, and D. The general location of the lagoons is shown on Figure II.1.1 The sampling locations are shown in figure II.1.2. The sediment depth at each location is provided in IV.1.1 through IV.1.4. The total quantity of sediments in each pond is provided in Table IV.1.1. Lagoon A is completely full of sediment and any water discharged to this lagoon meanders across the surface to the outlet. Lagoon B is about 38% full of sediment while Lagoons C and D are approximately 30% and 25% full. The cross sections (Figures IV.1.1 - IV.1.4) visually show the relative quantities of sediment and water volumes in each pond.

The metal content of the sediments from each of the lagoons is provided in Table IV.1.2 and the organic contents provided in Table IV.1.3.

The appearance of the sediments remained very uniform, especially the black color and consistency, between ponds as did their chemical content. One exception being the amount of aluminum in A & B ponds. This most unique feature on the sediment contents was the amount of polynuclear aromatic hydrocarbons. By adding the concentration of these compounds shown in Table IV.1.3 the relative concentrations in the sediments of A, B, C, and D ponds are 1, 1.5, 2.0, and 1% respectively.

2. COLUMBIA RIVER SEDIMENTS

There was no visible accumulation of sludge near the Commonwealth outfall and the sediments were not discolored as would be the case if appreciable quantities of the black sediments were being released from the wastewater ponds.

The metal content of the sediments at each of the river locations is shown in Table IV.2.1. Organic contents of the river sediments are shown in Table IV.2.2. Station 7NMFS is considered to be a background station outside of any influence of the Commonwealth discharge. Station 7.1 and 7.3 are on the downstream edges of the dilution zone and would be expected to influenced by the discharge. Likewise the station outside of the boat basin could be influenced by the discharge as well.

The sample taken inside the boat basin was collected to determine if plant runoff has had any impact upon the sediments at this location. There was very little difference between the

TABLE IV.1.2
METAL CONTENTS OF WASTEWATER LAGOON SEDIMENTS (úg/g)

SITE	AL	Sb	Cd	Cu	Pb	Ni	Zn
Lagoon A	66000	8	9	339	384	247	129
Lagoon B	51200	7	24	282	403	186	63
Lagoon C	2200	6	100	346	468	306	286
Lagoon D	1400	6	54	156	297	257	283

TABLE IV.1.3
ORGANIC CONTENTS OF WASTEWATER LAGOON SEDIMENTS (úg/g)

PARAMETERS	LAGOONS			
	A	B	C	D
Napthalene	<780	290	<195	<775
Flourene	<100	110	<25	<100
Phenanthrene	1091	1340	1110	165
Anthracene	123	114	344	99
Fluoranthene	3441	4454	8800	3722
Pyrene	2556	3641	4923	2111
Benz(a)anthracene	1169	1406	1992	1424
Chrysene	1182	1684	2053	1483
Benzo(a)pryene	648	723	897	546
Dibenz(a,h)anthracene	293	262	<117	292
Benzo(g,h,i)perylene	459	478	349	318

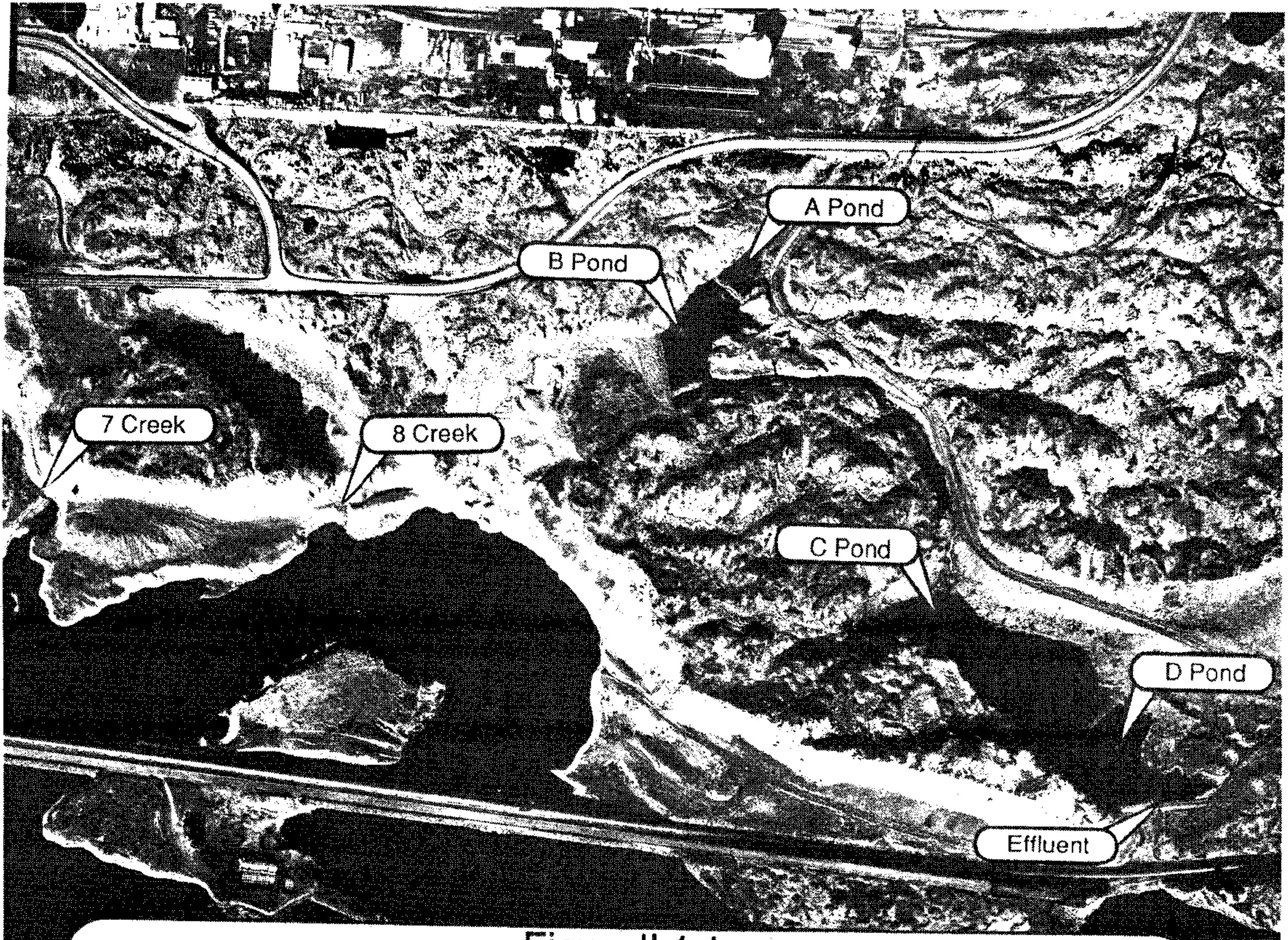


Figure II.1.1
Wastewater Lagoon System and Discharge Sampling Locations

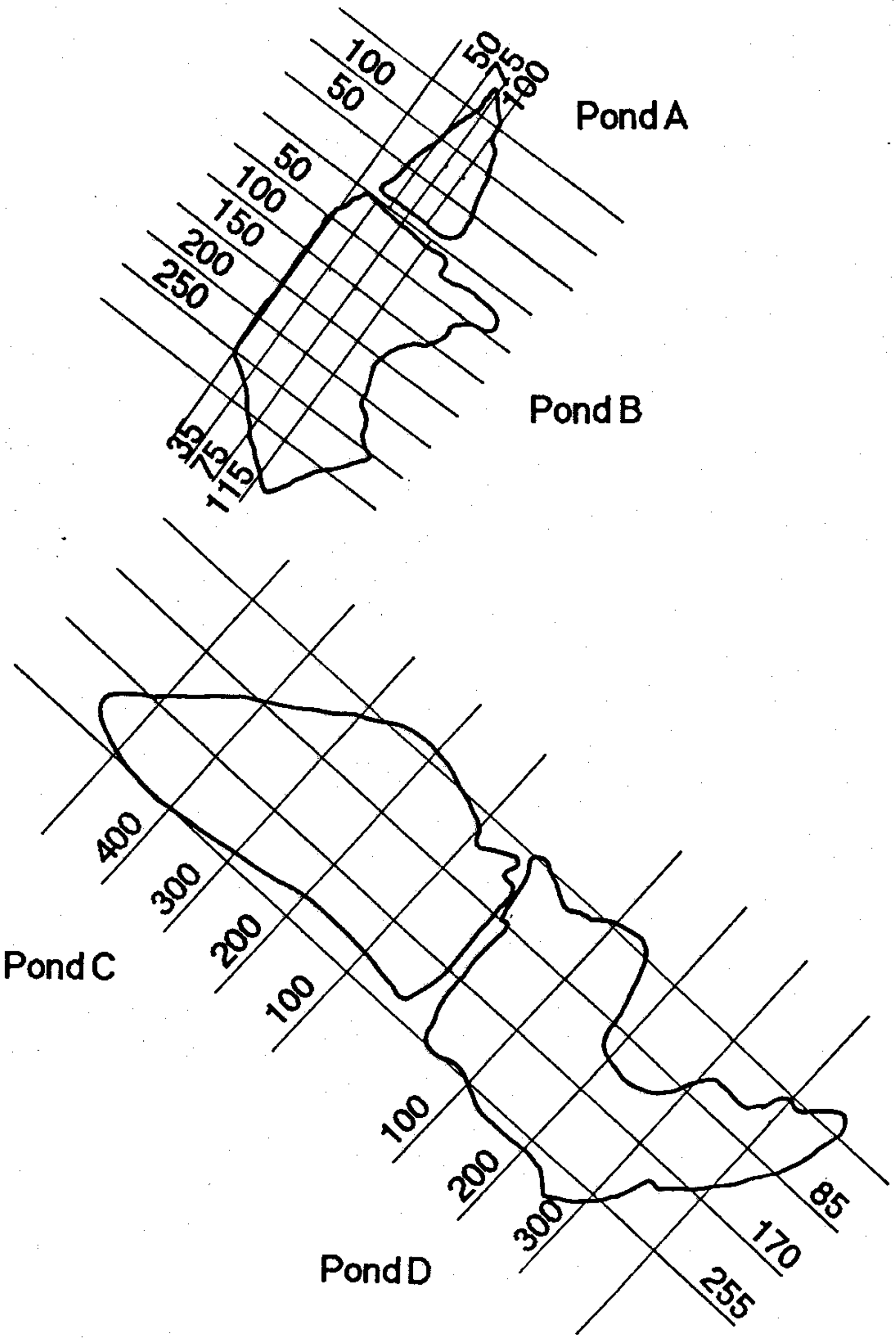


Figure II.1.2
Wastewater Lagoon Sediment Sampling Locations

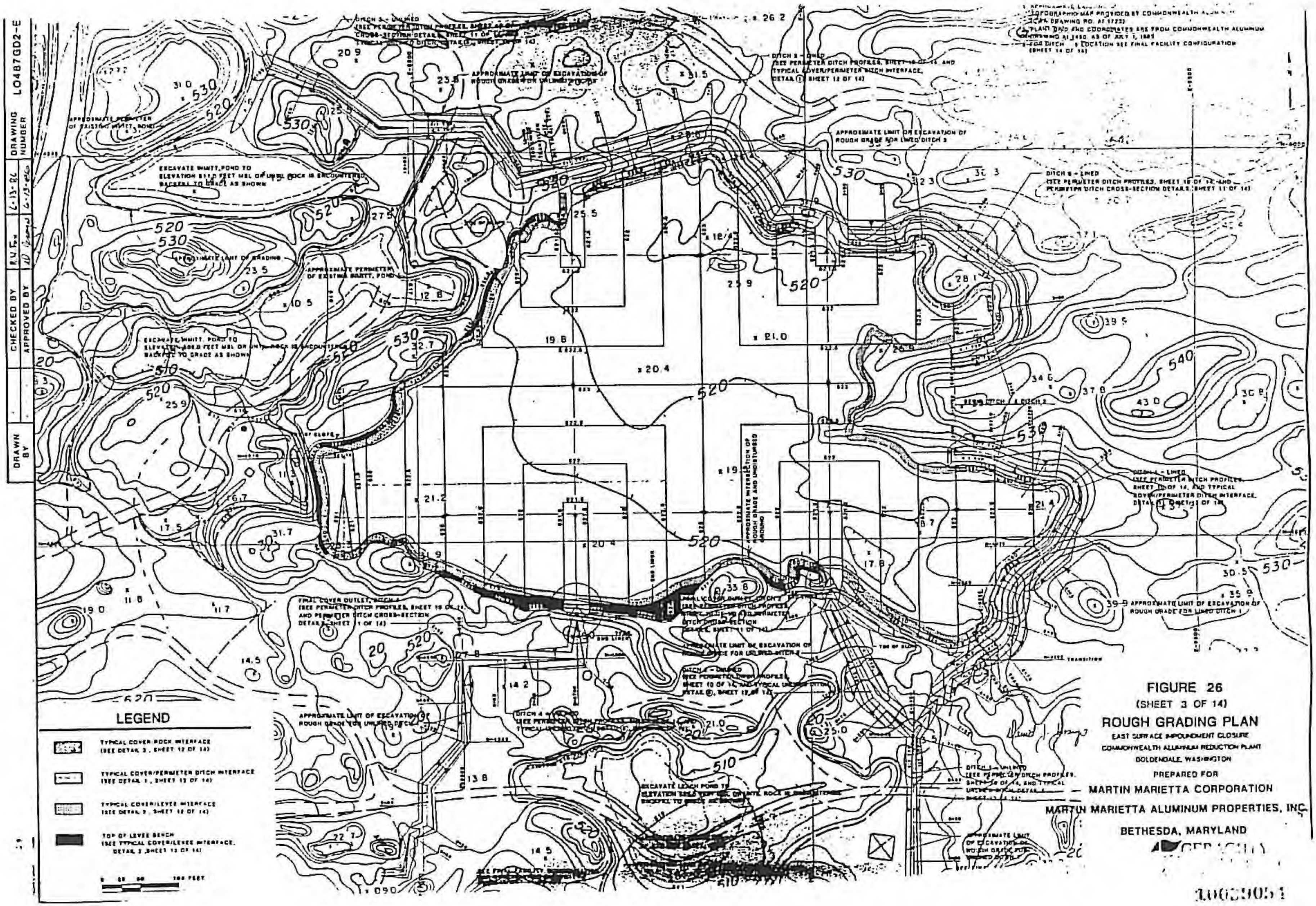
APPENDIX A-2

SWMU #2 – East Surface Impoundment (ESI)

APPENDIX A-2

SWMU #2 – East Surface Impoundment (ESI)

Geraghty & Miller (1986)
Closure Drawings



DRAWN BY	CHECKED BY	R.V. Fm	6-13-86	DRAWING NUMBER	LO487GD2-E
	APPROVED BY	W. Vesey	6-13-86		

FIGURE 26

(SHEET 3 OF 14)

ROUGH GRADING PLAN

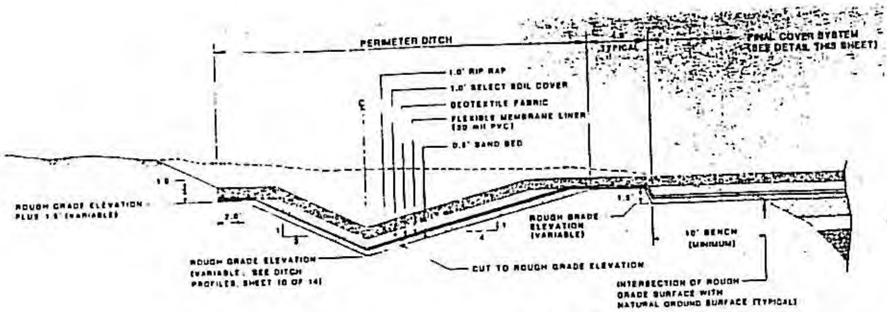
EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON

PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND

David J. Gray

GERAGHTY

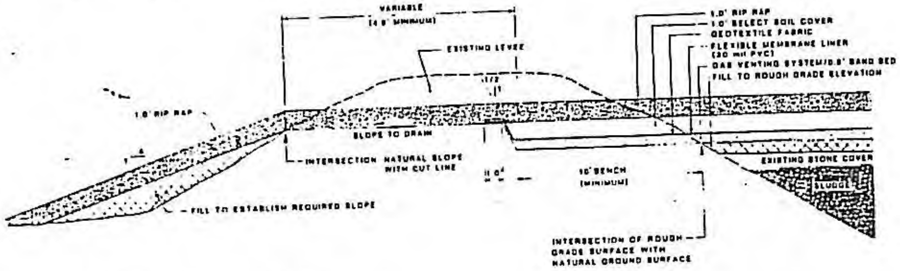
DRAWN BY DRM 6-2-86
CHECKED BY
APPROVED BY
DRAWING NUMBER L0487GD2-E12



TYPICAL COVER/PERIMETER DITCH INTERFACE DETAIL

0 5 10 FEET

DETAIL ①

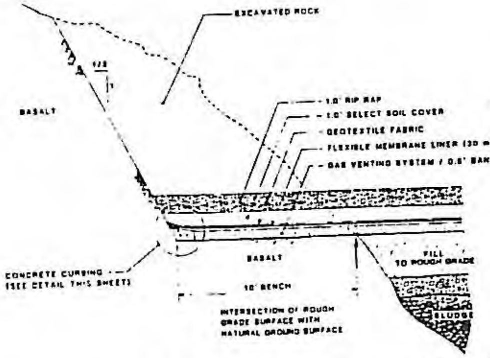


NOTE: SEE SOUTH SIDE OF CROSS-SECTION D-D (FIGURE 6) AND EAST SIDE OF CROSS-SECTION E-E (FIGURE 7) FOR ALTERNATE DETAIL IN AREAS WHERE ROUGH GRADE ELEVATION IS AT OR HIGHER THAN THE TOP OF LEVEE ELEVATION

TYPICAL COVER/LEVEE INTERFACE DETAIL

0 3 6 FEET

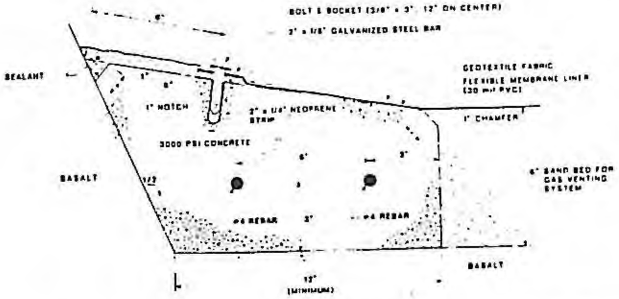
DETAIL ②



DETAIL 3

TYPICAL COVER/ROCK INTERFACE DETAIL

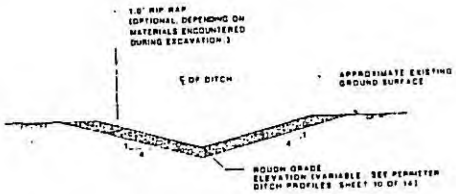
0 3 6 FEET



TYPICAL FLEXIBLE MEMBRANE LINER/CONCRETE CURBING CONNECTION DETAIL

N.T.S.

DETAIL ④



TYPICAL UNLINED DITCH DETAIL

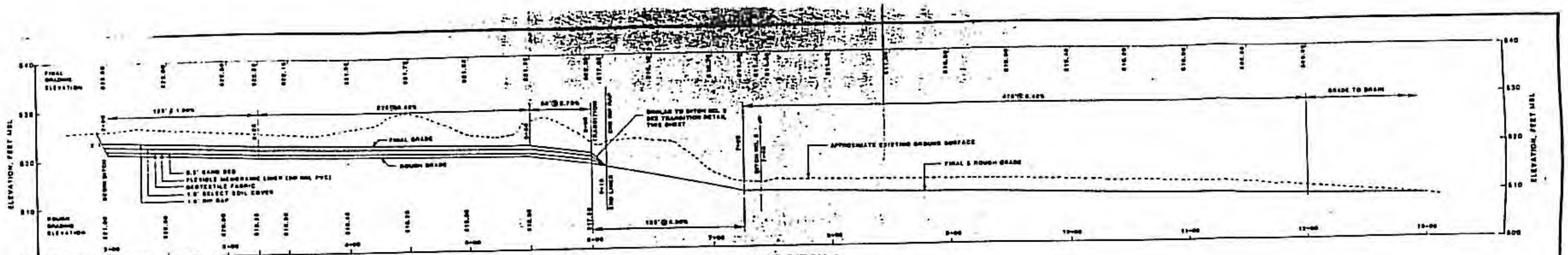
N.T.S.

DETAIL ⑤

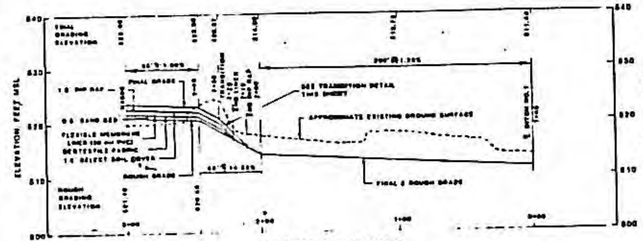
David J. Jennings

FIGURE 27
(SHEET 12 OF 14)
TYPICAL DETAILS
EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE WASHINGTON
PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC
BETHESDA, MARYLAND
GERAGHTY

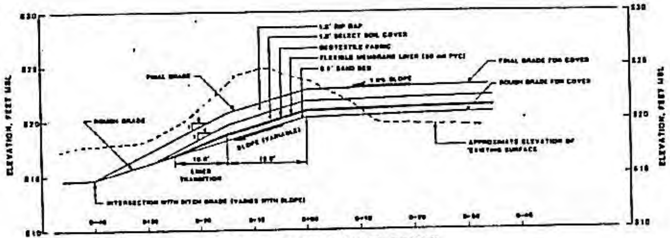
DRAWN BY	DJJ 6-9-86	CHECKED BY APPROVED BY	DRAWING NUMBER L0487GD2-E10



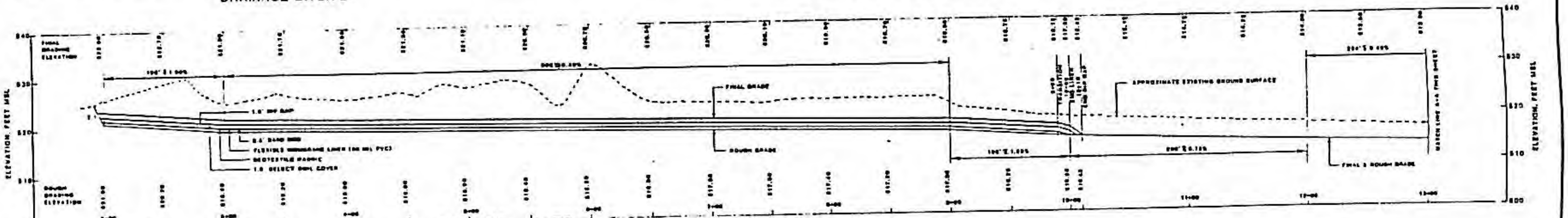
DRAINAGE DITCH 1



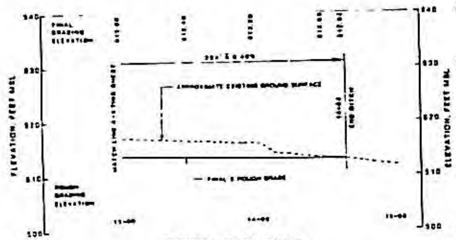
DRAINAGE DITCH 2



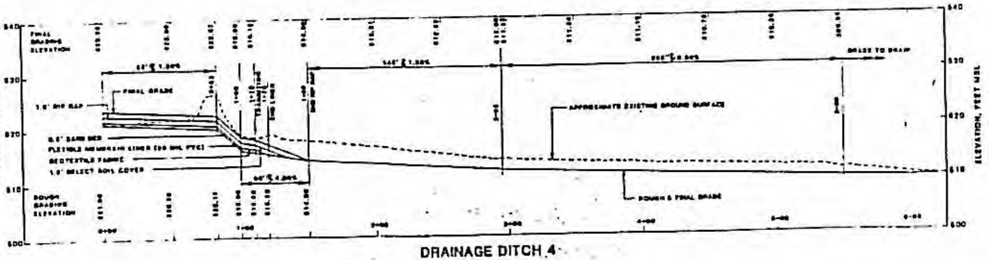
TYPICAL TRANSITION DETAIL



DRAINAGE DITCH 3



DRAINAGE DITCH 3



DRAINAGE DITCH 4

HORIZONTAL AND VERTICAL SCALES AS NOTED

FIGURE 28

(SHEET 10 OF 14)

PERIMETER DITCH PROFILES

EAST SURFACE IMPOUNDMENT CLOSURE

COMMONWEALTH ALUMINUM REDUCTION PLANT

GOLDENDALE WASHINGTON

PREPARED FOR

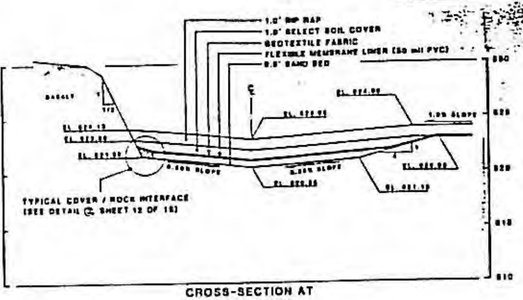
MARTIN MARIETTA CORPORATION

MARTIN MARIETTA ALUMINUM PROPERTIES, INC.

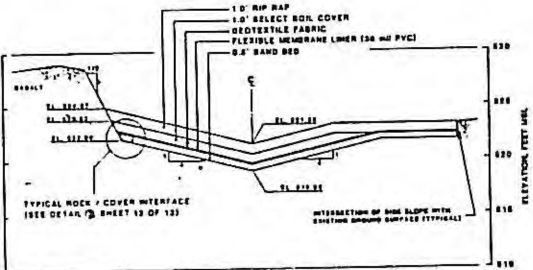
BETHESDA, MARYLAND

GERAGHTY

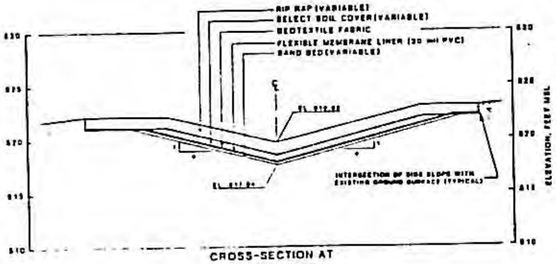
DRAWN BY	DJJ	6-7-86
CHECKED BY	SJF	6/10/88
APPROVED BY		6-10-88
DRAWING NUMBER	L0487G02-E1	



CROSS-SECTION AT
STATION 0+46
(LOOKING NORTH)



CROSS-SECTION AT
STATION 0+55
(LOOKING NORTH)



CROSS-SECTION AT
STATION 0+65
(LOOKING NORTH)

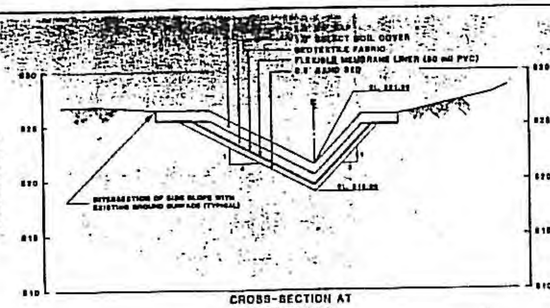
NOTES

1. SAND BEDDING LAYER STARTS PINCH OUT AT STATION [illegible] AND ENDS AT STATION [illegible]
2. SELECT SOIL COVER LAYER STARTS PINCH OUT AT STATION [illegible] AND ENDS AT STATION [illegible]
3. RIP RAP STARTS PINCH OUT AT STATION [illegible] AND ENDS AT STATION [illegible]
4. SEE PERIMETER DITCH PROFILES (SHEET 10 OF 14) AND ROUGH GRADING PLAN (SHEET 3 OF 14) FOR DITCH LAYOUT DETAILS

0 1 2 3 4 5 10 15 FEET
HORIZONTAL SCALE

VERTICAL SCALE AS NOTED

DITCH 2
FINAL COVER OUTLET



CROSS-SECTION AT
STATION 4+00
(LOOKING NORTHWEST)

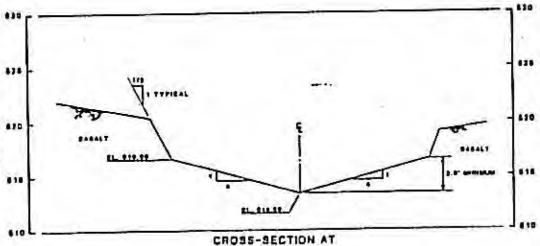
NOTES:

1. TYPICAL CROSS-SECTION FOR STATION [illegible] STATIONS [illegible]
2. SEE CROSS-SECTION [illegible] (SHEET [illegible] OF 14)
3. SEE PERIMETER DITCH PROFILES (SHEET 10 OF 14) AND ROUGH GRADING PLAN (SHEET 3 OF 14) FOR DITCH LAYOUT DETAILS

0 2 4 6 8 10 20 30 FEET
HORIZONTAL SCALE

VERTICAL SCALE AS NOTED

DITCH 3
LINED SECTION



CROSS-SECTION AT
STATION 13+25
(LOOKING WEST)

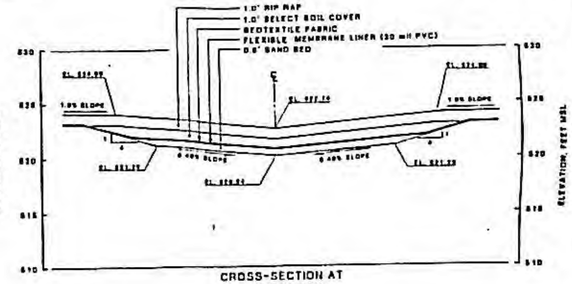
NOTES:

1. TYPICAL CROSS-SECTION FOR STATION [illegible] THRU STATION [illegible]
2. SEE PERIMETER DITCH PROFILES (SHEET 10 OF 14) AND ROUGH GRADING PLAN (SHEET 3 OF 14) FOR DITCH LAYOUT DETAILS

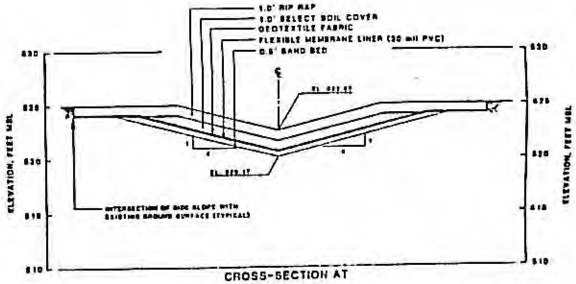
0 1 2 3 4 5 10 15 FEET
HORIZONTAL SCALE

VERTICAL SCALE AS NOTED

DITCH 3
UNLINED SECTION



CROSS-SECTION AT
STATION 0+75
(LOOKING NORTH)



CROSS-SECTION AT
STATION 0+83
(LOOKING NORTH)

NOTES

1. SAND BEDDING LAYER STARTS PINCH OUT AT STATION [illegible] AND ENDS AT STATION [illegible]
2. SELECT SOIL COVER LAYER STARTS PINCH OUT AT STATION [illegible] AND ENDS AT STATION [illegible]
3. RIP RAP LAYER STARTS PINCH OUT AT STATION [illegible] AND ENDS AT STATION [illegible]
4. SEE PERIMETER DITCH PROFILES (SHEET 10 OF 14) AND ROUGH GRADING PLAN (SHEET 3 OF 14) FOR DITCH LAYOUT DETAILS

0 1 2 3 4 5 10 15 FEET
HORIZONTAL SCALE

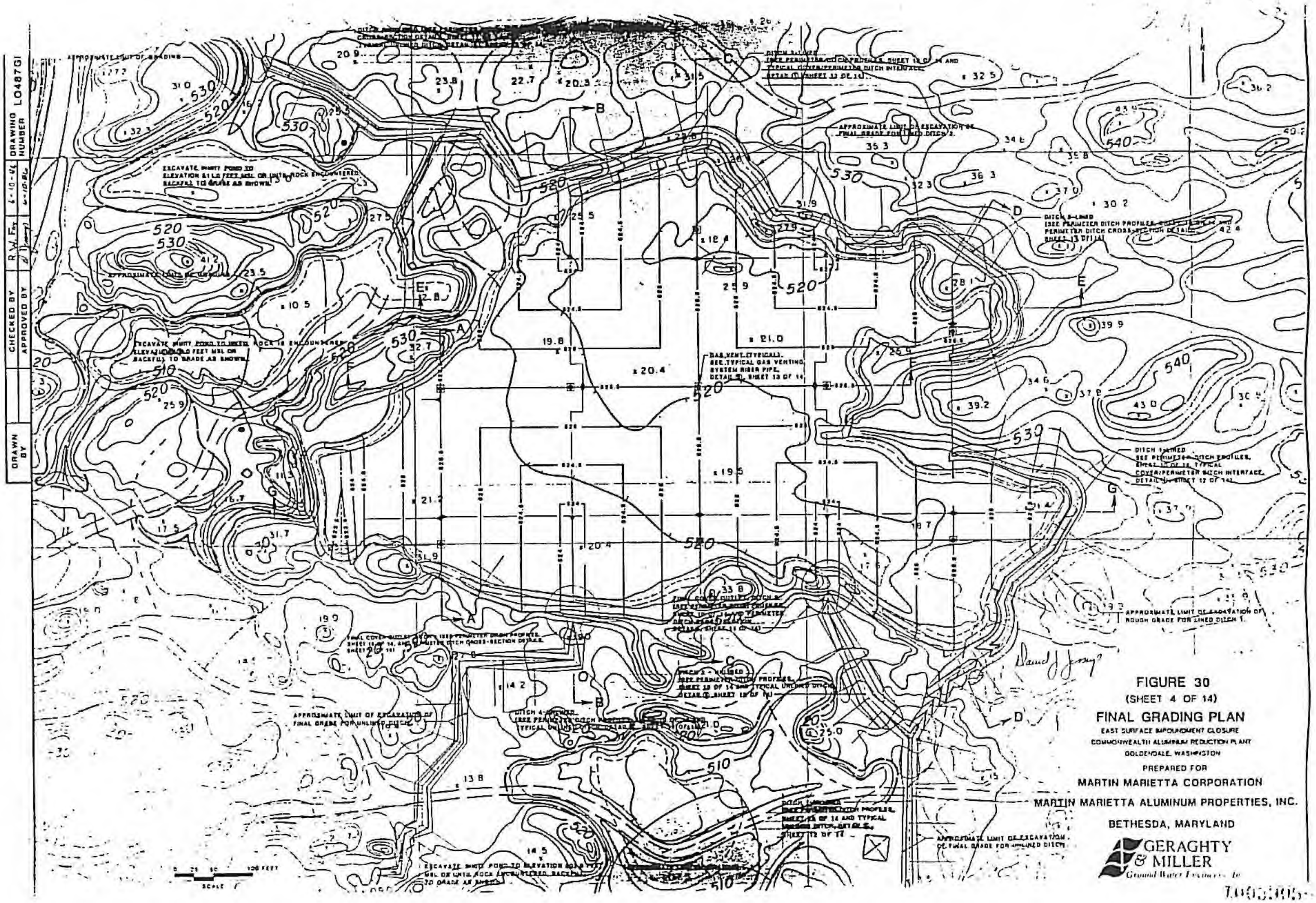
VERTICAL SCALE AS NOTED

DITCH 4
FINAL COVER OUTLET

Daniel J. Jessup

FIGURE 29
(SHEET 11 OF 14)
PERIMETER DITCH
CROSS-SECTION DETAILS
EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON
PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND
GERAGHTY & MILLER

DRAWN BY	CHECKED BY	R.W. Fox	6-10-86	DRAWING NUMBER	LO487GI
	APPROVED BY		6-10-86		



David J. Jorgy?

FIGURE 30

(SHEET 4 OF 14)

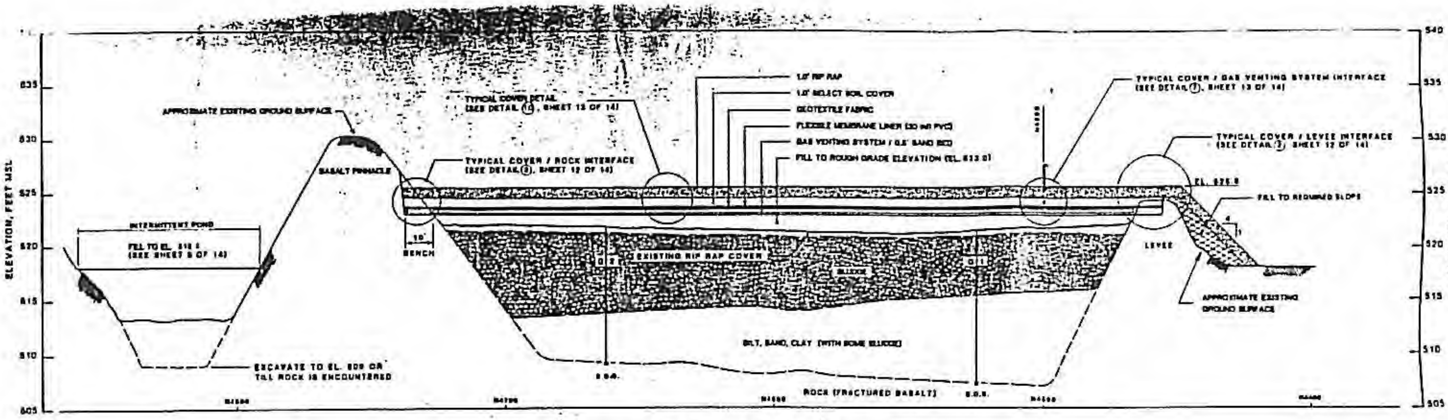
FINAL GRADING PLAN

EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON

PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND

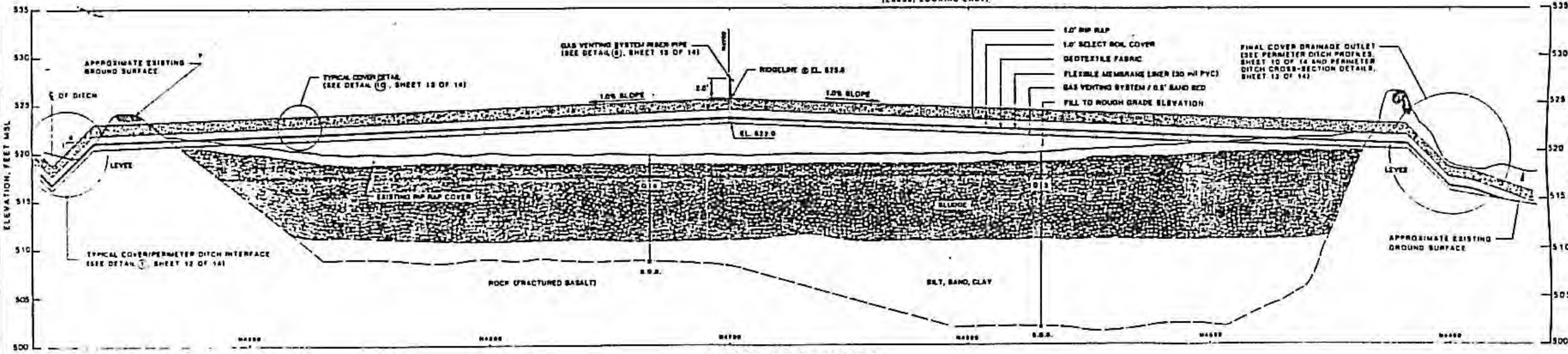
GERAGHTY & MILLER
Ground Water Engineers, Inc

DRAWN BY
CHECKED BY
APPROVED BY
DRAWING NUMBER L048



CROSS-SECTION A-A

(E5838, LOOKING EAST)



CROSS-SECTION B-B

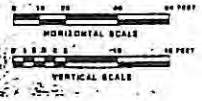
(E5700, LOOKING EAST)

NOTES.

1. SEE FIGURE 4. FOR CROSS-SECTION LOCATIONS.
2. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS TAKEN FROM TOPOGRAPHIC MAP PROVIDED BY COMMONWEALTH ALUMINUM (CWA DRAWING NO. AI 1723)
3. SUBSURFACE DETAILS EXTRAPOLATED FROM BORINGS COMPLETED NOVEMBER 18 AND 19, 1985 BY CENTURY ENVIRONMENTAL SCIENCES. EXACT SUBSURFACE CONDITIONS ARE KNOWN ONLY AT THE BORING LOCATIONS.
4. VERTICAL SCALE IS EXAGGERATED 4 TIMES
5. SEE FIGURES 3, 4, 10, 11 AND 12 FOR PERIMETER DITCH LAYOUT DETAILS.

EXPLANATION

BORING LOCATION AND NUMBER
APPROXIMATE EXISTING GROUND SURFACE
APPROXIMATE SUBSURFACE FEATURE LOCATION
B.O.B. BOTTOM OF BORING
▤ SLUDGE
▨ RIP RAP COVER
☐ SELECT SOIL COVER
☐ SAND



David J. Jessup

FIGURE 31

(SHEET 5 OF 14)

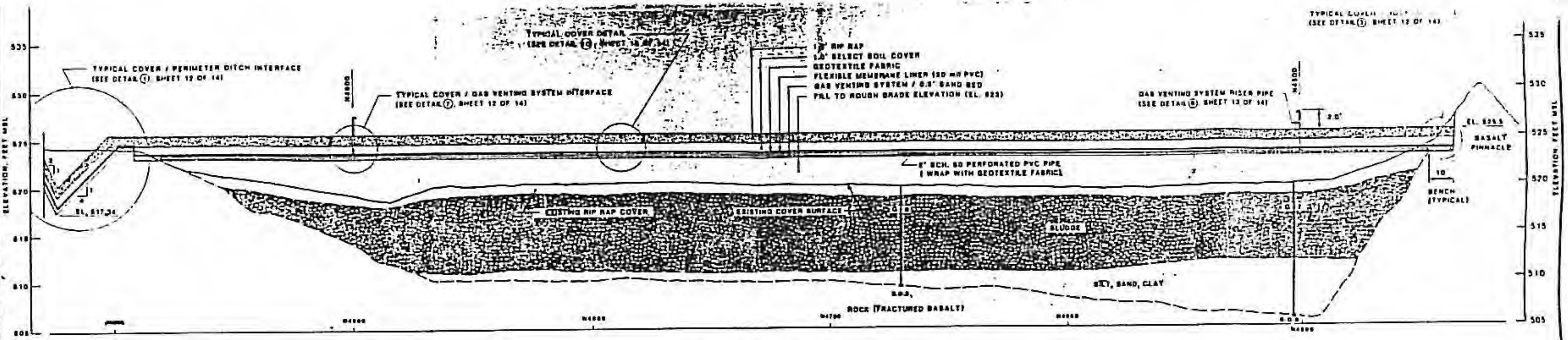
CROSS-SECTIONS A-A AND B-B

EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON

PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND

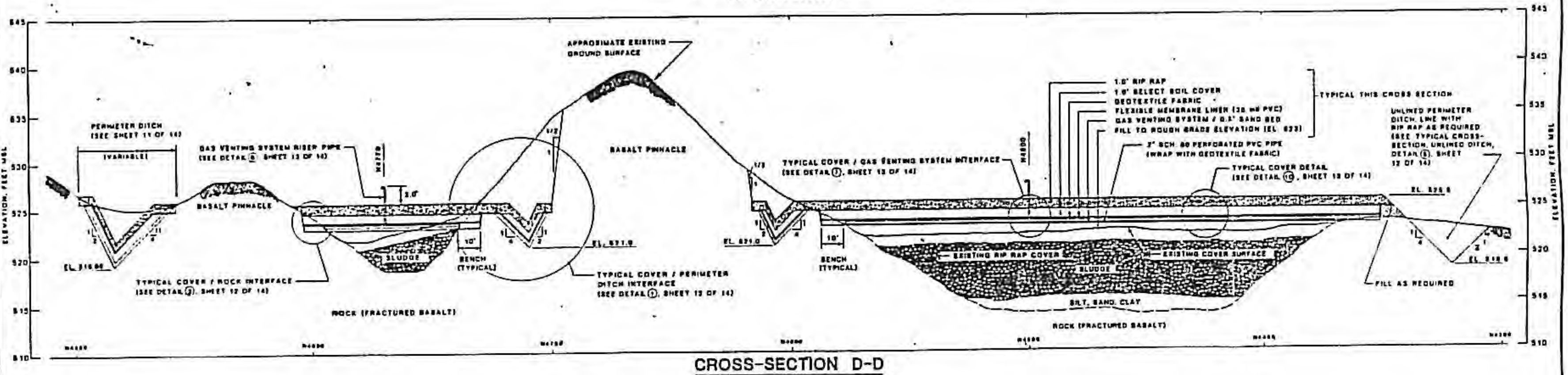
GERAGHTY & MILLER
Ground Water Engineers

DRAWN BY
CHECKED BY
APPROVED BY
DRAWING NUMBER L0487GD2-



CROSS-SECTION C-C

(E8600, LOOKING EAST)



CROSS-SECTION D-D

(E9196, LOOKING EAST)

NOTES

1. SEE FIGURE 4 FOR CROSS-SECTION LOCATIONS.
2. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS TAKEN FROM TOPOGRAPHIC MAP PROVIDED BY COMMONWEALTH ALUMINUM (CWA DRAWING NO. AI 1723).
3. SUBSURFACE DETAILS EXTRAPOLATED FROM BORINGS COMPLETED NOVEMBER 18 AND 19, 1985 BY CENTURY ENVIRONMENTAL SCIENCES. EXACT SUBSURFACE CONDITIONS ARE KNOWN ONLY AT THE BORING LOCATIONS.
4. VERTICAL SCALE IS EXAGGERATED 4 TIMES.
5. SEE FIGURES 3, 4, 10, 11, AND 12 FOR PERIMETER DITCH LAYOUT DETAIL

EXPLANATION

B-4	BORING LOCATION AND NUMBER
▨	APPROXIMATE EXISTING GROUND SURFACE
— —	APPROXIMATE SUBSURFACE FEATURE LOCATION
B.O.B.	BOTTOM OF BORING
▦	SLUDGE
▩	RIP RAP COVER
☐	SELECT SOIL COVER
☐	SAND

0 10 20 40 60 FEET
HORIZONTAL SCALE

0 1 2 3 4 5 10 15 FEET
VERTICAL SCALE

Daniel J Jerup

FIGURE 32

(SHEET 6 OF 14)

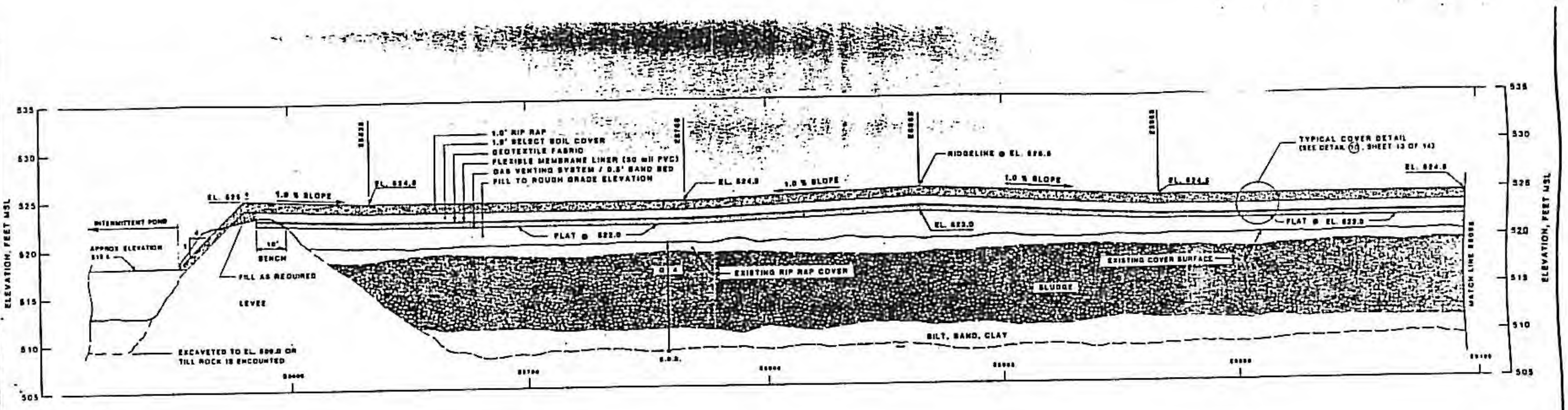
CROSS - SECTIONS C-C and D-D

EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON

PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND

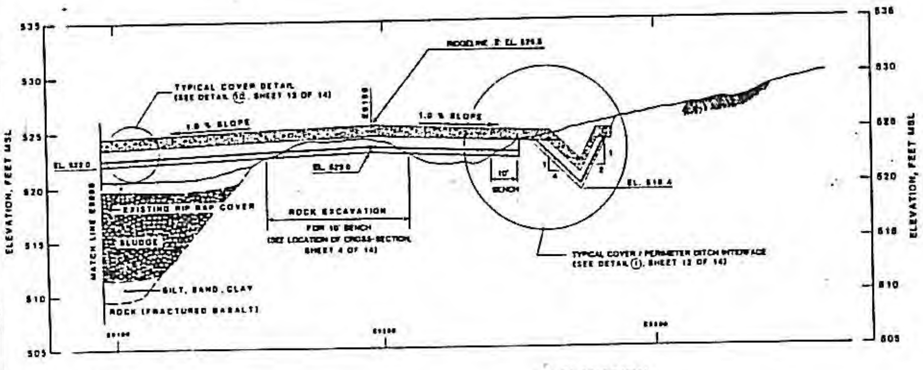
GERAGHTY & MILLER

DRAWN BY
CHECKED BY
APPROVED BY
DRAWING NUMBER L0487GD



CROSS-SECTION E-E

(N4800, LOOKING NORTH)



NOTES

1. SEE FIGURE 4 FOR CROSS-SECTION LOCATIONS.
2. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS TAKEN FROM TOPOGRAPHIC MAP PROVIDED BY COMMONWEALTH ALUMINUM (CWA DRAWING NO. AI 1723)
3. SUBSURFACE DETAILS EXTRAPOLATED FROM BORINGS COMPLETED NOVEMBER 18 AND 19, 1985 BY CENTURY ENVIRONMENTAL SCIENCES. EXACT SUBSURFACE CONDITIONS ARE KNOWN ONLY AT THE BORING LOCATIONS.
4. VERTICAL SCALE IS EXAGGERATED 4 TIMES.
5. SEE FIGURES 3, 4, 10, 11 AND 12 FOR PERIMETER DITCH LAYOUT DETAILS

EXPLANATION

⊥	BORING LOCATION AND NUMBER
⁄	APPROXIMATE EXISTING GROUND SURFACE
⁄	APPROXIMATE SUBSURFACE FEATURE LOCATION
BOB	BOTTOM OF BORING
☰	SLUDGE
⬚	RIP RAP COVER
☐	SELECT SOIL COVER
☐	SAND

HORIZONTAL SCALE

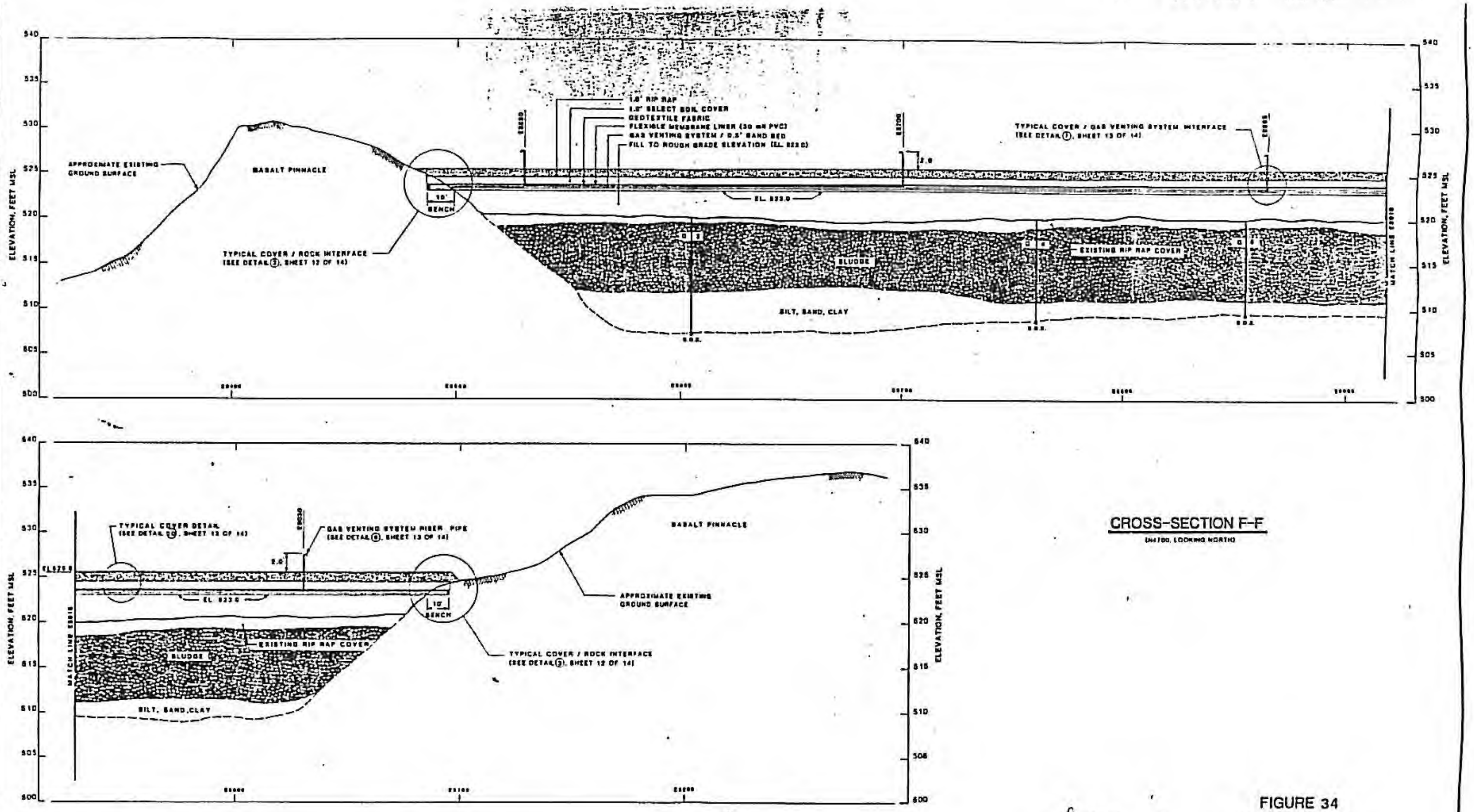
VERTICAL SCALE

David J. Jenyo

FIGURE 33
(SHEET 7 OF 14)
CROSS-SECTION E-E
EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON
PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND

GERAGHTY & MILLER
Ground Water Consultants, Inc.

DRAWN BY RLG 5-27-86
CHECKED BY
APPROVED BY
DRAWING NUMBER LO487GD2-E8



CROSS-SECTION F-F

LOOKING NORTH

NOTES

1. SEE FIGURE 4. FOR CROSS-SECTION LOCATIONS.
2. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS TAKEN FROM TOPOGRAPHIC MAP PROVIDED BY COMMONWEALTH ALUMINUM (CWA DRAWING NO. AI 1723).
3. SUBSURFACE DETAILS EXTRAPOLATED FROM BORINGS COMPLETED NOVEMBER 18 AND 19, 1985 BY CENTURY ENVIRONMENTAL SCIENCES. EXACT SUBSURFACE CONDITIONS ARE KNOWN ONLY AT THE BORING LOCATIONS.
4. VERTICAL SCALE IS EXAGGERATED 4 TIMES.
5. SEE FIGURES 3, 4, 10, 11 AND 12 FOR PERIMETER DITCH LAYOUT DETAILS.

EXPLANATION

┃	BORING LOCATION AND NUMBER
⁄	APPROXIMATE EXISTING GROUND SURFACE
╱	APPROXIMATE SUBSURFACE FEATURE LOCATION
BOB	BOTTOM OF BORING
▦	SLUDGE
▨	RIP RAP COVER
☐	SELECT SOIL COVER
▩	SAND

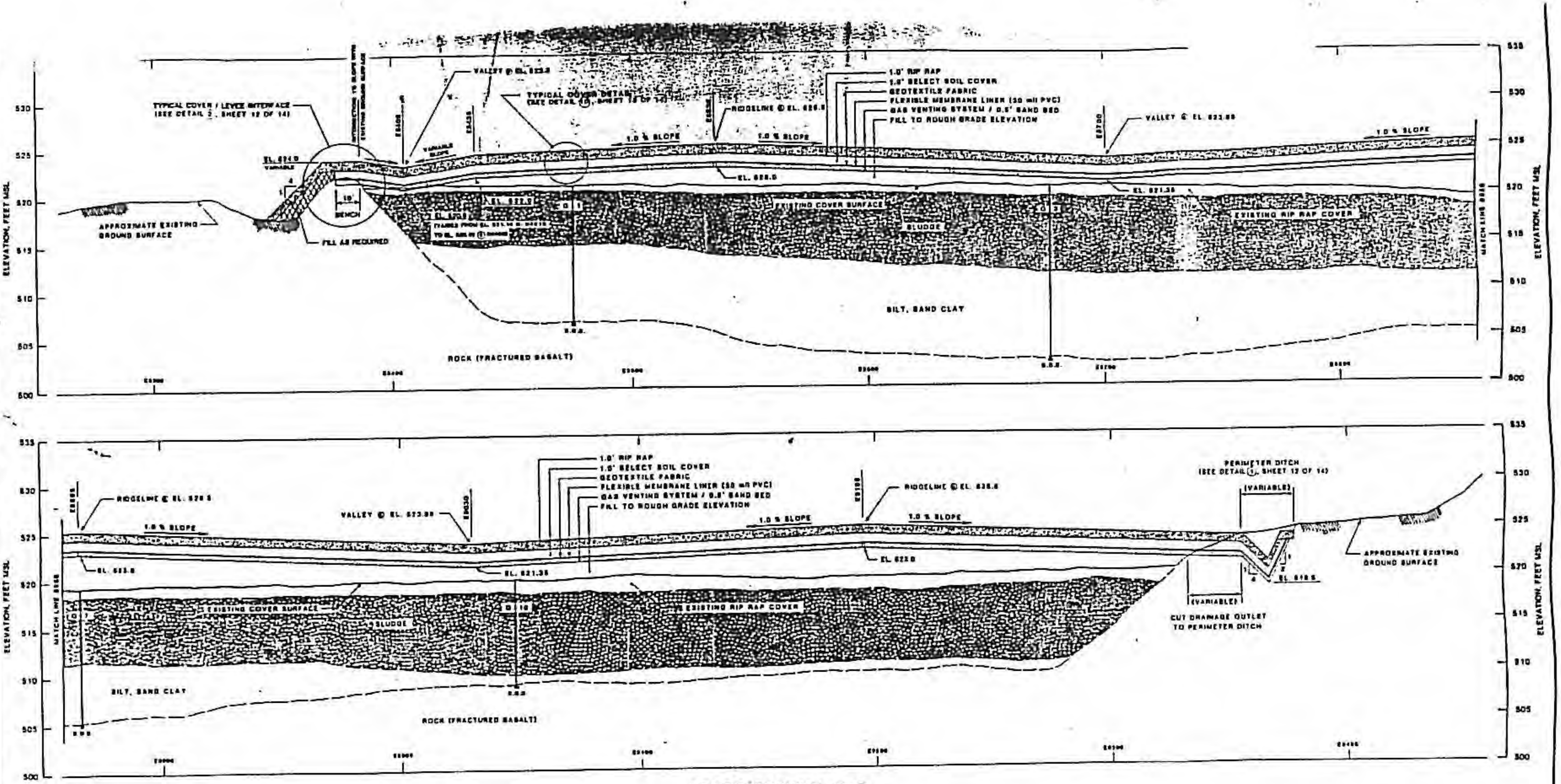
0 10 20 40 60 FEET
HORIZONTAL SCALE

0 1 2 3 4 5 10 15 FEET
VERTICAL SCALE

David J Jeong

FIGURE 34
(SHEET 8 OF 14)
CROSS-SECTION F-F
EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON
PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND

DRAWN BY
CHECKED BY
APPROVED BY
DRAWING NUMBER LO487GC.



CROSS-SECTION G-G

(N4535, LOOKING NORTH)

NOTES

1. SEE FIGURE 4. FOR CROSS-SECTION LOCATIONS.
2. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS TAKEN FROM TOPOGRAPHIC MAP PROVIDED BY COMMONWEALTH ALUMINUM (CWA DRAWING NO. AI 1723).
3. SUBSURFACE DETAILS EXTRAPOLATED FROM BORINGS COMPLETED NOVEMBER 18 AND 19, 1985 BY CENTURY ENVIRONMENTAL SCIENCES. EXACT SUBSURFACE CONDITIONS ARE KNOWN ONLY AT THE BORING LOCATIONS.
4. VERTICAL SCALE IS EXAGGERATED 4 TIMES.
5. SEE FIGURES 3, 4, 10, 11 AND 12 FOR PERIMETER DITCH LAYOUT DETAILS.

EXPLANATION

⌶	BORING LOCATION AND NUMBER
▨	APPROXIMATE EXISTING GROUND SURFACE
⁄	APPROXIMATE SUBSURFACE FEATURE LOCATION
508	BOTTOM OF BORING.
☰	SLUDGE
▩	RIP RAP COVER
☐	SELECT SOIL COVER
☐	SAND

HORIZONTAL SCALE
VERTICAL SCALE

David J. Jessup

FIGURE 35

(SHEET 9 OF 14)

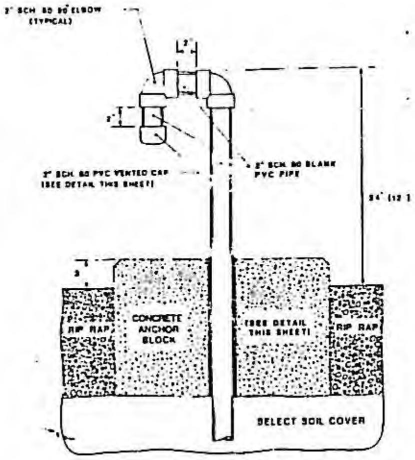
CROSS-SECTION G-G

EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON

PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC.
BETHESDA, MARYLAND

GERAGHTY & MILLER

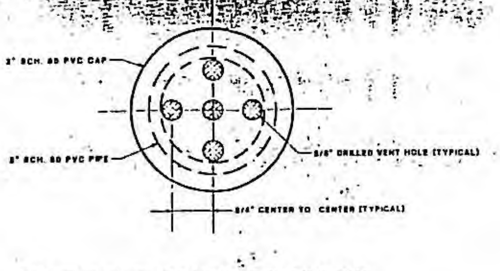
DRAWN BY G.P.M. 6.10.86
CHECKED BY S-E
APPROVED BY
DRAWING NUMBER L0487GD.



TYPICAL GAS VENTING SYSTEM RISER PIPE

0 0.5 1.0 INCH

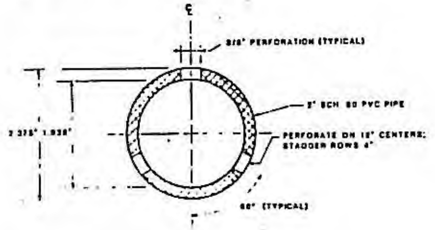
DETAIL ⑥



GAS VENTING SYSTEM RISER PIPE CAP DETAIL

DETAIL ⑧

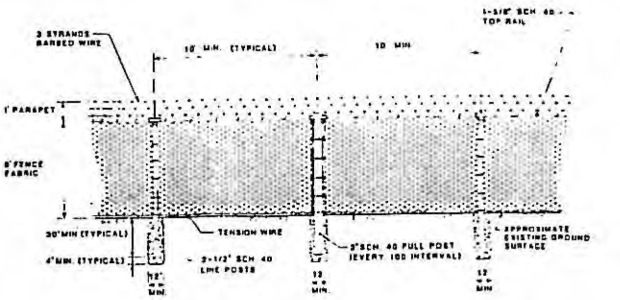
0 1.0 2.0 INCHES



GAS VENTING SYSTEM PIPE PERFORATION DETAIL

DETAIL ⑨

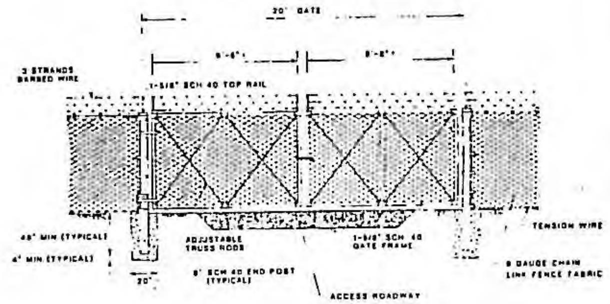
0 1.0 2.0 INCHES



TYPICAL FENCE DETAIL

DETAIL ⑪

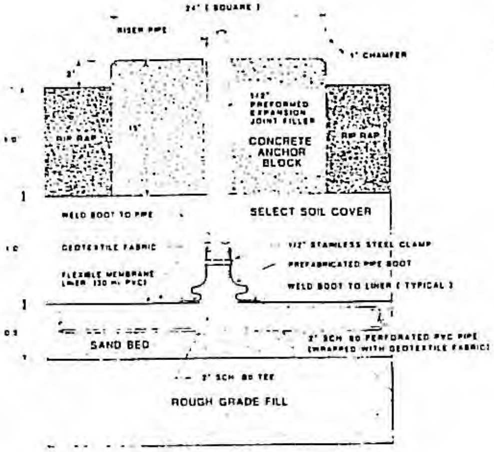
N.T.S.



TYPICAL GATE DETAIL

N.T.S.

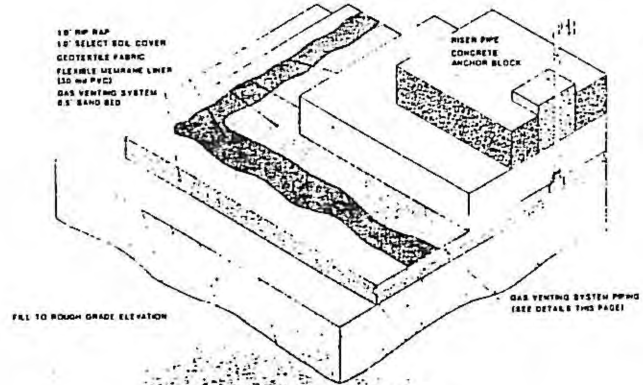
DETAIL ⑫



TYPICAL COVER/GAS VENTING SYSTEM INTERFACE DETAIL

0 0.5 1.0 INCH

DETAIL 7

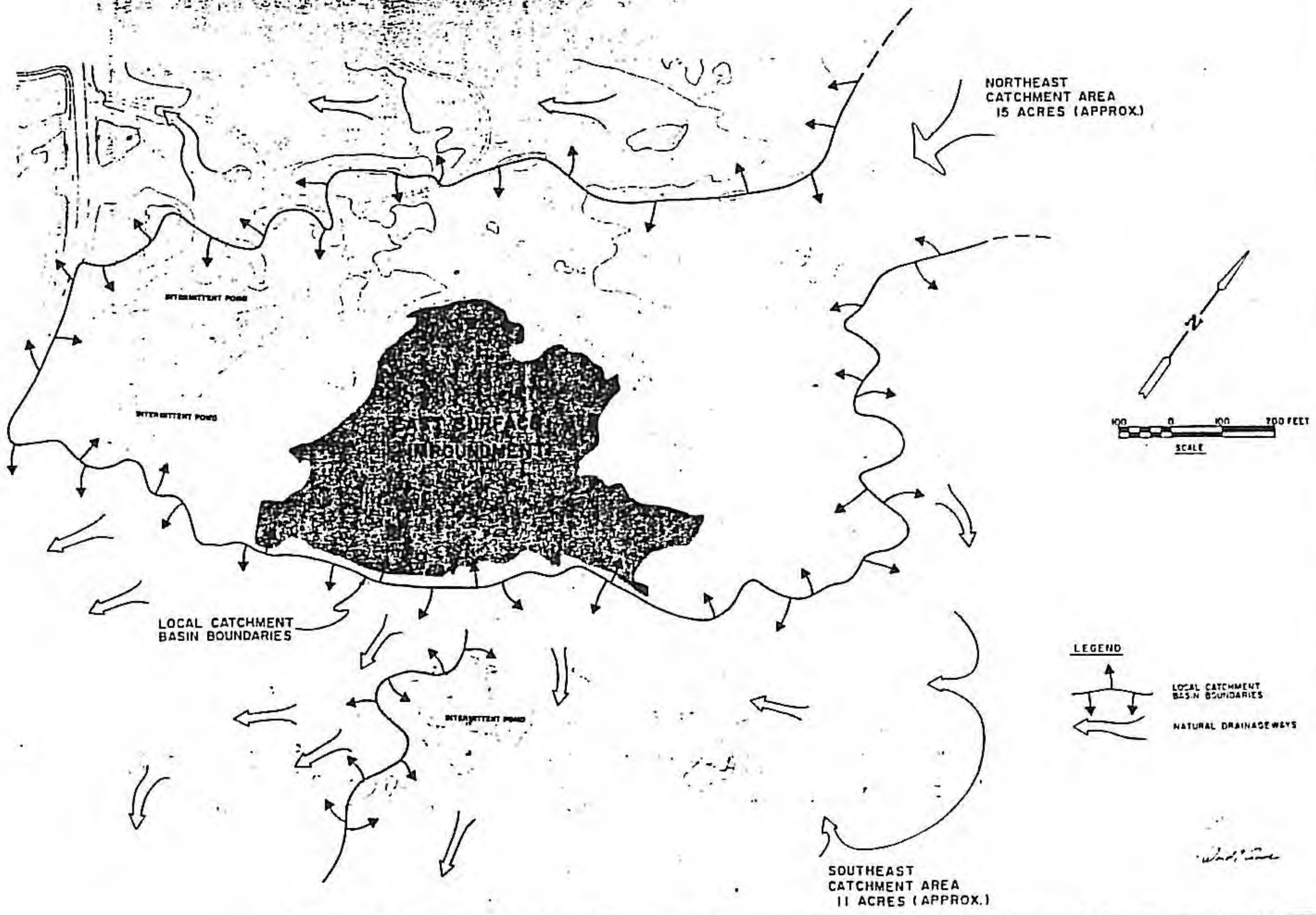


DETAIL ⑩

TYPICAL COVER DETAIL

David J. Jessup

FIGURE 36
(SHEET 13 OF 14)
TYPICAL DETAIL
EAST SURFACE IMPOUNDMENT CLOSURE
COMMONWEALTH ALUMINUM REDUCTION PLANT
GOLDENDALE, WASHINGTON
PREPARED FOR
MARTIN MARIETTA CORPORATION
MARTIN MARIETTA ALUMINUM PROPERTIES, INC
BETHESDA, MARYLAND
GERAGHTY & MILLER



REVISIONS				
NO.	BY	APPVL		DATE

DESIGNED BY DWO | DATE JUNE 1988
DRAWN BY JG | SCALE 1" = 100'
CHECKED BY TER | SEC
DRAWING NO. [illegible]

EXISTING SURFACE DRAINAGE MAP

Commonwealth Aluminum, Goldendale Facility
Modified ESI Closure and Post-Closure Plan

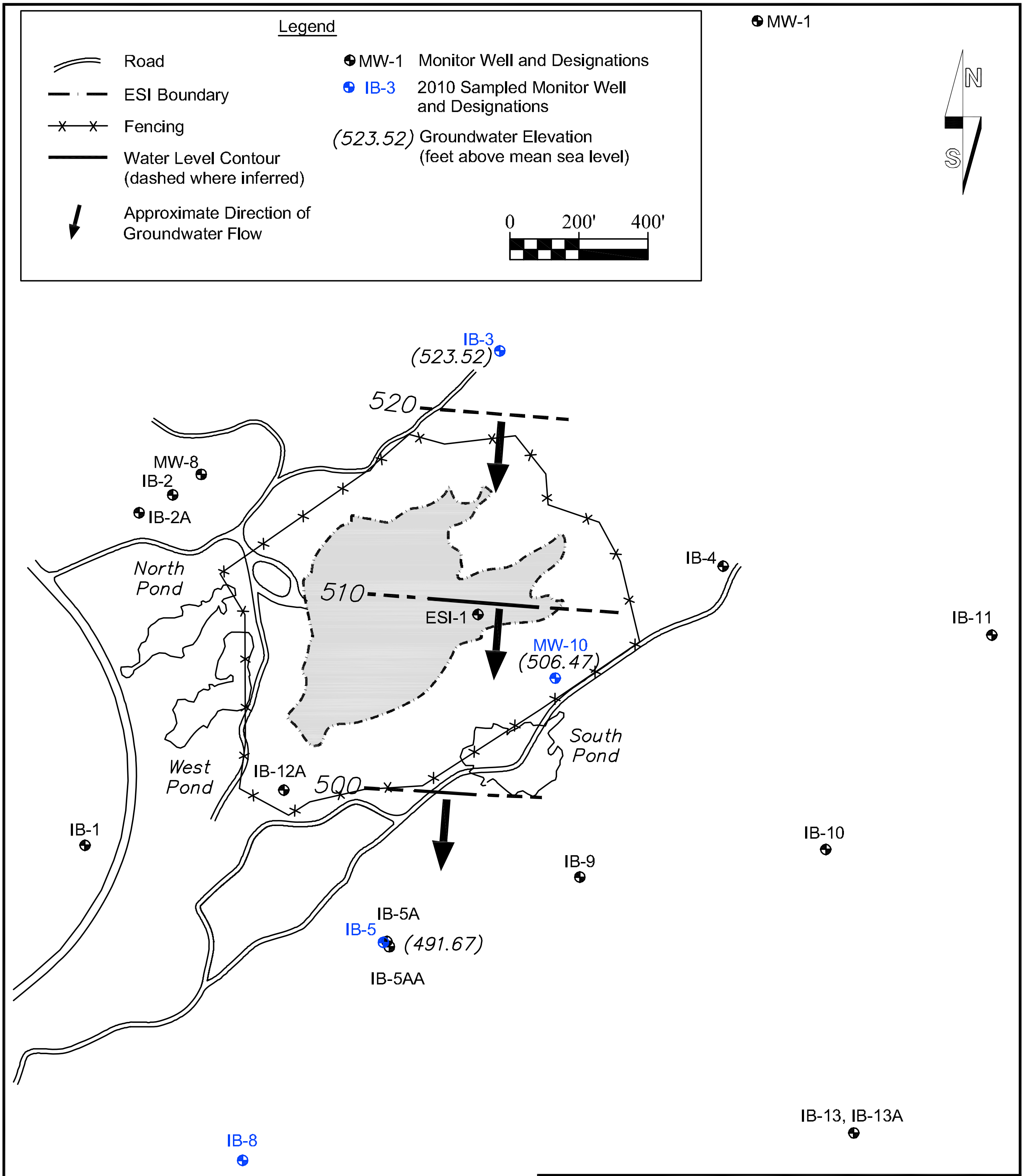
CENTURY WEST ENGINEERING

FIGURE
37

APPENDIX A-2

SWMU #2 – East Surface Impoundment (ESI)

ARCADIS (2011b)
2010 Groundwater Monitoring Report



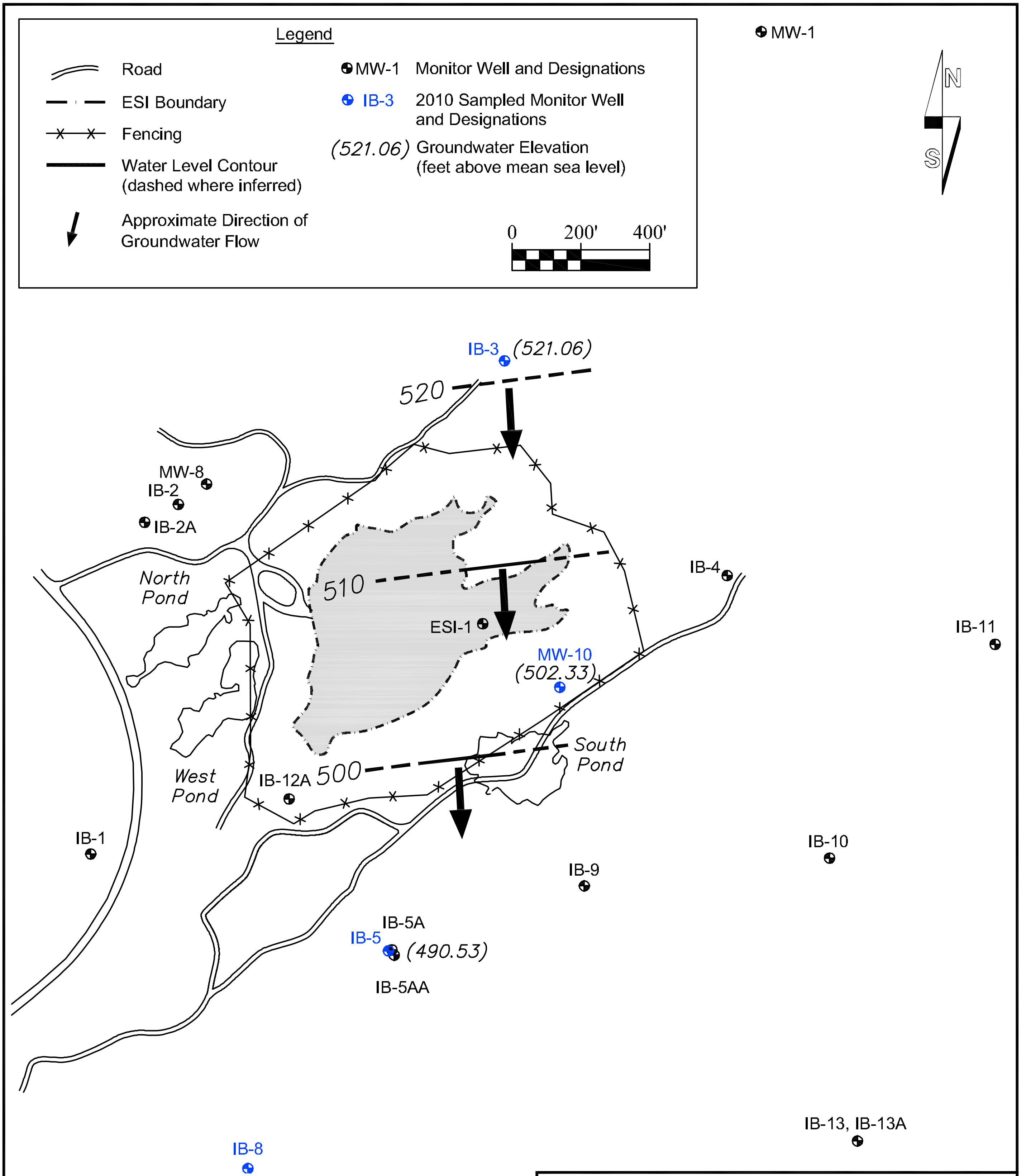
EAST SURFACE IMPOUNDMENT
GOLDENDALE, WASHINGTON
2010 GROUNDWATER MONITORING REPORT

GROUNDWATER ELEVATIONS SHALLOW ZONE MARCH 2010

ARCADIS

FIGURE
3

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\Common\Matt H\Goldendale\COWLE-0526.dwg LAYOUT: GW ELEV SHALLOW - MAR-2010 SAVED: 1/24/2011 2:54 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: DAN1.CTB PLOTTED: 1/24/2011 2:58 PM BY: HOEFER, MATTHEW
XREFS: IMAGES: PROJECTNAME: ----
ARCADISLogo2.jpg



EAST SURFACE IMPOUNDMENT
GOLDENDALE, WASHINGTON
2010 GROUNDWATER MONITORING REPORT

GROUNDWATER ELEVATIONS
SHALLOW ZONE SEPTEMBER 2010

ARCADIS

FIGURE
4

TABLE 1. SUMMARY OF 2010 GROUNDWATER ANALYTICAL RESULTS
EAST SURFACE IMPOUNDMENT, GOLDENDALE, WASHINGTON

MONITOR WELL ID	DATE SAMPLED	CASING ELEV. (ft msl)	DEPTH TO WATER (feet)	G.W. ELEV. (ft msl)	PH (S.U.)	COND. (μhos/cm)	D.O.	TEMP. (^{o}C)	TOTAL CN (mg/L)	FLUORIDE (mg/L)	SULFATE (mg/L)	TOTAL IRON (mg/L)	DISSOLVED IRON (mg/L)	TOTAL MN (mg/L)	DISSOLVED MN (mg/L)	NOTES
Upgradient Monitoring Wells																
IB-3	Mar-10	533.15	9.63	523.52	6.81	182	7.7	14.8	-	<0.500	16.4	<0.100	-	-	-	
	Jun-10		10.33	522.82	7.11	194	5.3	15.1	-	<0.500	15.6	<0.100	-	-	-	
	Jun-10*									0.850	15.7	<0.100	-	-	-	Duplicate
	Sep-10		12.09	521.06	7.07	178.5	6.1	16.5	-	0.25	16.1	<0.100				
	Dec-10		11.11	522.04	7.35	202.1	5.0	14.8	-	0.26	16.8	<0.100				
Monitoring Well Screened in Uppermost Water-Bearing Zone																
MW-10	Mar-10	514.79	8.32	506.47	6.91	750	7.3	13	-	**5.32**	204	<0.100	-	-	-	
	Jun-10		9.72	505.07	7.00	1283	5.0	14.3	-	**9.30**	**389**	<0.100	-	-	-	
	Sep-10		11.91	502.88	6.94	1993	5.07	18.5	-	**4.0**	**747**	**0.430**				
	Dec-10		7.82	506.97	7.49	639	4.51	16.1	-	**7.3**	140	<0.100				
IB-5	Mar-10	503.26	11.57	491.69	7.07	1856	5.8	14.2	-	<0.500	**955**	<0.100	-	-	-	
	Jun-10		11.68	491.58	7.21	1947	4.2	16.0	-	<0.500	**830**	<0.100	-	-	-	
	Sep-10		12.68	490.58	7.32	1681	4.35	17.1	-	0.22	**860**	<0.100				
	Dec-10		14.01	489.25	7.90	1714	4.32	15.4	-	0.21	**823**	<0.100				
Monitoring Well Screened in Deeper Water-Bearing Zones																
IB-8	Mar-10	462.36	195.79	266.57	6.80	1609	7.4	20.4	-	1.88	**797**	<0.100	-	-	-	
	Mar-10*								-	1.89	**790**	<0.100	-	-	-	Duplicate
	Jun-10		198.37	263.99	7.07	1685	4.3	20.5	-	**4.20**	**630**	<0.100	-	-	-	
	Sep-10		198.55	263.81	7.05	1459	5.45	20.8	-	2.7	**679**	<0.100				
	Sep-10*									2.7	**671**	<0.100				Duplicate
	Dec-10		199.00	263.36	7.35	1640	5.8	18.1	-	2.8	**740**	<0.100				
	Dec-10*									2.8	**738**	<0.100				
Rinsate Analysis																
Rinsate-1	Mar-10				-	-	-	-	-	<0.500	<1.00	<0.100	-	-	-	
Rinsate-1	Jun-10									<0.500	<1.00	<0.100				
Rinsate-1	Sep-10									<0.10	<1.00	<0.100				
Rinsate-1	Dec-10									<0.10	<1.00	<0.100				
Washington State Board of Health MCLs									0.20	4	250	0.3	0.3	0.05	0.05	

ft msl = feet above mean sea level.

mg/L = milligrams per liter

DO = Dissolved Oxygen

COND = Specific conductance in micromhos per centimeter

μhos/cm = micromhos per centimeter

* Duplicate sample.

\- Not sampled, measured, or analyzed or not available.

nd not detected

Bold Concentration exceeds Washington State Board of Health MCLs

MCL = Maximum Concentration Limit

TABLE 2. HISTORIC GROUNDWATER ANALYTICAL RESULTS

EAST SURFACE IMPOUNDMENT, GOLDENDALE, WASHINGTON

MONITOR WELL ID	DATE SAMPLED	CASING ELEV. (ft msl)	DEPTH TO WATER (feet)	G.W. ELEV. (ft msl)	PH (S.U.)	COND. (µhos/cm)	D.O.	TEMP. (°C)	TOTAL CN (mg/L)	FLUORIDE (mg/L)	SULFATE (mg/L)	TOTAL IRON (mg/L)	DISSOLVED IRON (mg/L)	TOTAL MN (mg/L)	DISSOLVED MN (mg/L)	NOTES
Upgradient Monitoring Wells																
IB-3	Jan-02	533.15	12.33	520.82	-	-	-	-	<0.005	0.260	20.4	<0.1	-	0.00446	-	
	Jul-02		12.70	520.45	-	-	-	-	<0.005	0.298	20.1	-	-	-	-	
	Jan-03		11.25	521.90	-	-	-	-	0.04	0.278	20.1	<0.1	-	<0.002	-	
	Jul-03		11.70	521.45	-	-	-	-	<0.005	0.268	20.0	-	-	-	-	
	Jan-05		12.23	520.92	6.98	196	-	-	-	0.265	19.3	0.121	-	-	-	Laboratory pH and Conductivity.
	Jan-05*		-	-	7.40	198	-	-	-	0.289	19.6	<0.100	-	-	-	Duplicate
	Apr-05		12.88	520.27	7.16	193	41.0	14.6	-	<0.500	19.0	<0.150	-	-	-	
	Jul-05		12.50	520.65	7.22	186	3.0	18.7	-	<0.500	19.1	<0.100	-	-	-	
	Jul-05*		-	-	-	-	-	-	-	<0.500	19.1	<0.100	-	-	-	Duplicate
	Oct-05		13.13	520.02	7.07	194	8.0	14.6	-	<0.500	18.5	<0.100	-	-	-	
	Feb-06		6.25	526.90	7.10	197	4.0	14.2	-	<0.500	21.3	<0.100	-	-	-	
	May-06		8.59	524.56	7.05	198	5.5	15.4	-	<0.500	22.3	<0.100	-	-	-	
	Aug-06		11.13	522.02	6.96	193	4.0	14.9	-	<0.500	20.9	<0.150	-	-	-	
	Aug-06*		-	-	-	-	-	-	-	<0.500	20.9	<0.150	-	-	-	Duplicate
	Sep-07		12.03	521.12	7.16	185	6.8	16.1	-	<0.500	17.7	0.223	-	-	-	
	Mar-10		9.63	523.52	6.81	182	7.7	14.8	-	<0.500	16.4	<0.100	-	-	-	
	Jun-10		10.33	522.82	7.11	194	5.3	15.1	-	<0.500	15.6	<0.100	-	-	-	
	Jun-10*				-	-	-	-	-	0.850	15.7	<0.100	-	-	-	Duplicate
	Sep-10		12.09	521.06	7.07	178.5	6.1	16.5	-	0.25	16.1	<0.100	-	-	-	
	Dec-10		11.11	522.04	7.35	202.1	5.0	14.8	-	0.26	16.8	<0.100	-	-	-	
Monitoring Well Screened in Uppermost Water-Bearing Zone																
MW-10	Jan-02	514.79	8.69	506.10	-	-	-		<0.005	**7.22**	125	**8.76**	-	0.326	-	
	Jul-02		11.31	503.48	-	-	-	-	<0.005	**5.64**	**602**	-	-	-	-	
	Jan-03		6.46	508.33	-	-	-	-	<0.005	**8.31**	87.3	**1.33**	<0.1	**0.0646**	<0.002	
	Jul-03		10.71	504.08	-	-	-	-	<0.005	**5.33**	**683**	-	-	-	-	
	Jan-05		11.75	503.04	7.40	2230	-	-	-	**4.64**	**858**	**3.19**	-	-	-	Laboratory pH and Conductivity.
	Apr-05		12.52	502.27	6.95	2171	30.1	13.3	-	3.28	**835**	**4.98**	-	-	-	
	Jul-05		12.40	502.39	7.03	200	0.8	17.8	-	3.03	**804**	**1.57**	-	-	-	
	Oct-05		-	-	-	-	-	-	-	-	-	-	-	-	-	Well dry.
	Feb-06		3.40	511.39	7.31	561	4.7	10.0	-	**6.19**	130	**3.89**	-	-	-	
	May-06		5.63	509.16	6.78	1931	2.9	14	-	2.66	**711**	0.288	-	-	-	
	May-06*		-	-	-	-	-	-	-	2.66	**712**	0.286	-	-	-	Duplicate
	Aug-06		9.30	505.49	6.90	1819	5.0	17.4	-	2.87	**642**	**6.46**	-	-	-	
	Sep-07		11.34	503.45	6.83	2193	25.1	19.0	-	3.5	**894**	**7.09**	-	-	-	
	Mar-10		8.32	506.47	6.91	750	7.3	13	-	**5.32**	204	<0.100	-	-	-	
	Jun-10		9.72	505.07	7.00	1283	5.0	14.3	-	**9.30**	**389**	<0.100	-	-	-	
	Sep-10		11.91	502.88	6.94	1993	5.07	18.5	-	**4.0**	**747**	**0.430**	-	-	-	
	Dec-10		7.82	506.97	7.49	639	4.51	16.1	-	**7.3**	140	<0.100	-	-	-	

TABLE 2. HISTORIC GROUNDWATER ANALYTICAL RESULTS

EAST SURFACE IMPOUNDMENT, GOLDENDALE, WASHINGTON

MONITOR WELL ID	DATE SAMPLED	CASING ELEV. (ft msl)	DEPTH TO WATER (feet)	G.W. ELEV. (ft msl)	PH (S.U.)	COND. (µhos/cm)	D.O.	TEMP. (^{o}C)	TOTAL CN (mg/L)	FLUORIDE (mg/L)	SULFATE (mg/L)	TOTAL IRON (mg/L)	DISSOLVED IRON (mg/L)	TOTAL MN (mg/L)	DISSOLVED MN (mg/L)	NOTES
IB-5	Jan-02	503.26	13.48	489.78	-	-	-	-	<0.005	0.150	**1710**	**0.432**	-	0.0430	-	
	Jul-02		12.86	490.40	-	-	-	-	<0.005	0.171	**1520**	-	-	-	-	
	Jan-03		12.09	491.17	-	-	-	-	<0.005	0.165	**1610**	<0.1	-	0.00741	-	
	Jul-03		11.99	491.27	-	-	-	-	<0.005	0.163	**1440**	-	-	-	-	
	Jan-05		12.25	491.01	7.55	2710	-	-	-	0.186	**1470**	**1.40**	-	-	-	Laboratory pH and Conductivity.
	Apr-05		14.08	489.18	7.24	2605	44.2	14..4	-	<0.500	**1390**	0.168	-	-	-	
	Jul-05		14.20	489.06	7.30	2482	4.3	18.5	-	<0.500	**1480**	0.155	-	-	-	
	Oct-05		14.92	488.34	7.16	2602	5.7	15.7	-	<0.500	**1460**	<0.100	-	-	-	
	Feb-06		8.32	494.94	7.09	235	1.2	13.7	-	<0.500	**1240**	**3.71**	-	-	-	
	May-06		13.79	489.47	7.14	2231	7.1	15.5	-	<0.500	**1140**	**9.72**	-	-	-	Water silty, slow recovery. Bailed 3 well volumes on 5/23 and returned to collect sample on 5/24.
	Aug-06		14.40	488.86	7.02	2204	6.0	15.9	-	<0.500	**1170**	**6.14**	-	-	-	
	Sep-07		13.31	489.95	7.21	2062	32.5	17.5	-	<0.500	**1080**	<0.00200	-	-	-	
	Mar-10		11.57	491.69	7.07	1856	5.8	14.2	-	<0.500	**955**	<0.100	-	-	-	
	Jun-10		11.68	491.58	7.21	1947	4.2	16.0	-	<0.500	**830**	<0.100	-	-	-	
	Sep-10		12.68	490.58	7.32	1681	4.35	17.1	-	0.22	**860**	<0.100	-	-	-	
	Dec-10		14.01	489.25	7.90	1714	4.32	15.4	-	0.21	**823**	<0.100	-	-	-	
Monitoring Well Screened in Deeper Water-Bearing Zones																
IB-8	Jan-02	462.36	196.08	266.28	-	-	-	-	0.04	1.38	**744**	<0.1	-	<0.002	-	
	Jul-02		197.57	264.79	-	-	-	-	0.06	1.50	**741**	-	-	-	-	
	Jan-03		196.05	266.31	-	-	-	-	0.06	1.76	**723**	0.271	-	0.00491	-	
	Jul-03		198.69	263.67	-	-	-	-	0.07	2.12	**764**	-	-	-	-	
	Nov-05		197.73	264.63	7.14	2029	4.8	17.4	-	<0.500	20.4	<0.100	-	-	-	
	Nov-05*		-	-	-	-	-	-	-	<0.500	8.79	<0.100	-	-	-	Duplicate
	Feb-06		195.72	266.64	7.08	1993	1.7	17.5	-	1.9	**910**	<0.100	-	-	-	
	Feb-06*		-	-	-	-	-	-	-	1.9	**911**	<0.100	-	-	-	Duplicate
	May-06		197.55	264.81	6.41	2062	4.1	18.5	-	1.99	**952**	<0.100	-	-	-	
	Aug-06		198.34	264.02	7.10	2109	6.0	19.9	-	2.00	**965**	<0.150	-	-	-	
	Sep-07		198.58	263.78	7.00	2024	54.6	20.1	-	2.01	**981**	0.0332	-	-	-	
	Sep-07*								-	2.00	**991**	0.0266	-	-	-	Duplicate
	Mar-10		195.79	266.57	6.80	1609	7.4	20.4	-	1.88	**797**	<0.100	-	-	-	
	Mar-10*								-	1.89	**790**	<0.100	-	-	-	Duplicate
	Jun-10		198.37	263.99	7.07	1685	4.3	20.5	-	**4.20**	**630**	<0.100	-	-	-	
	Sep-10		198.55	263.81	7.05	1459	5.45	20.8	-	2.7	**679**	<0.100	-	-	-	
	Sep-10*				-	-	-	-	-	2.7	**671**	<0.100	-	-	-	Duplicate
	Dec-10		199.00	263.36	7.35	1640	5.8	18.1	-	2.8	**740**	<0.100	-	-	-	
	Dec-10*				-	-	-	-	-	2.8	**738**	<0.100	-	-	-	

TABLE 2. HISTORIC GROUNDWATER ANALYTICAL RESULTS

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MONITOR WELL ID	DATE SAMPLED	CASING ELEV. (ft msl)	DEPTH TO WATER (feet)	G.W. ELEV. (ft msl)	PH (S.U.)	COND. (μhos/cm)	D.O.	TEMP. (°C)	TOTAL CN (mg/L)	FLUORIDE (mg/L)	SULFATE (mg/L)	TOTAL IRON (mg/L)	DISSOLVED IRON (mg/L)	TOTAL MN (mg/L)	DISSOLVED MN (mg/L)	NOTES
Rinsate Analysis																
Rinsate-1	Jan-05				7.51	<10.0	-	-	-	<0.100	<1.00	<0.100	-	-	-	
Rinsate-1	Apr-05				-	-	-	-	-	<0.500	1.73	<0.150	-	-	-	
Rinsate-1	Jul-05				-	-	-	-	-	<0.500	<1.00	-	-	-	-	no Fe sample container
Rinsate-1	Oct-05				-	-	-	-	-	<0.500	<1.00	<0.100	-	-	-	
EB-110705	Nov-05				-	-	-	-	-	<0.500	10	<0.100	-	-	-	
Rinsate-1	Feb-06				-	-	-	-	-	<0.500	<1.00	<0.100	-	-	-	
GD-EB-0524	May-06				-	-	-	-	-	<0.500	<1.00	<0.150	-	-	-	
Rinsate-1	Aug-06				-	-	-	-	-	<0.500	<1.00	<0.150	-	-	-	
Rinsate-1	Sep-07				-	-	-	-	-	<0.500	<1.00	**18**	-	-	-	
Rinsate-1	Mar-10				-	-	-	-	-	<0.500	<1.00	<0.100	-	-	-	
Rinsate-1	Jun-10				-	-	-	-	-	<0.500	<1.00	<0.100	-	-	-	
Rinsate-1	Sep-10				-	-	-	-	-	<0.10	<1.00	<0.100	-	-	-	
Rinsate-1	Dec-10				-	-	-	-	-	<0.10	<1.00	<0.100	-	-	-	
Washington State Board of Health MCLs									0.20	4	250	0.3	0.3	0.05	0.05	

ft msl = feet above mean sea level.

mg/L = milligrams per liter

DO = Dissolved Oxygen

COND = Specific conductance in micromhos per centimeter

μhos/cm = micromhos per centimeter

* Duplicate sample.

\- Not sampled, measured, or analyzed or not available.

nd not detected

Bold Concentration exceeds Washington State Board of Health MCLs

MCL = Maximum Concentration Limit

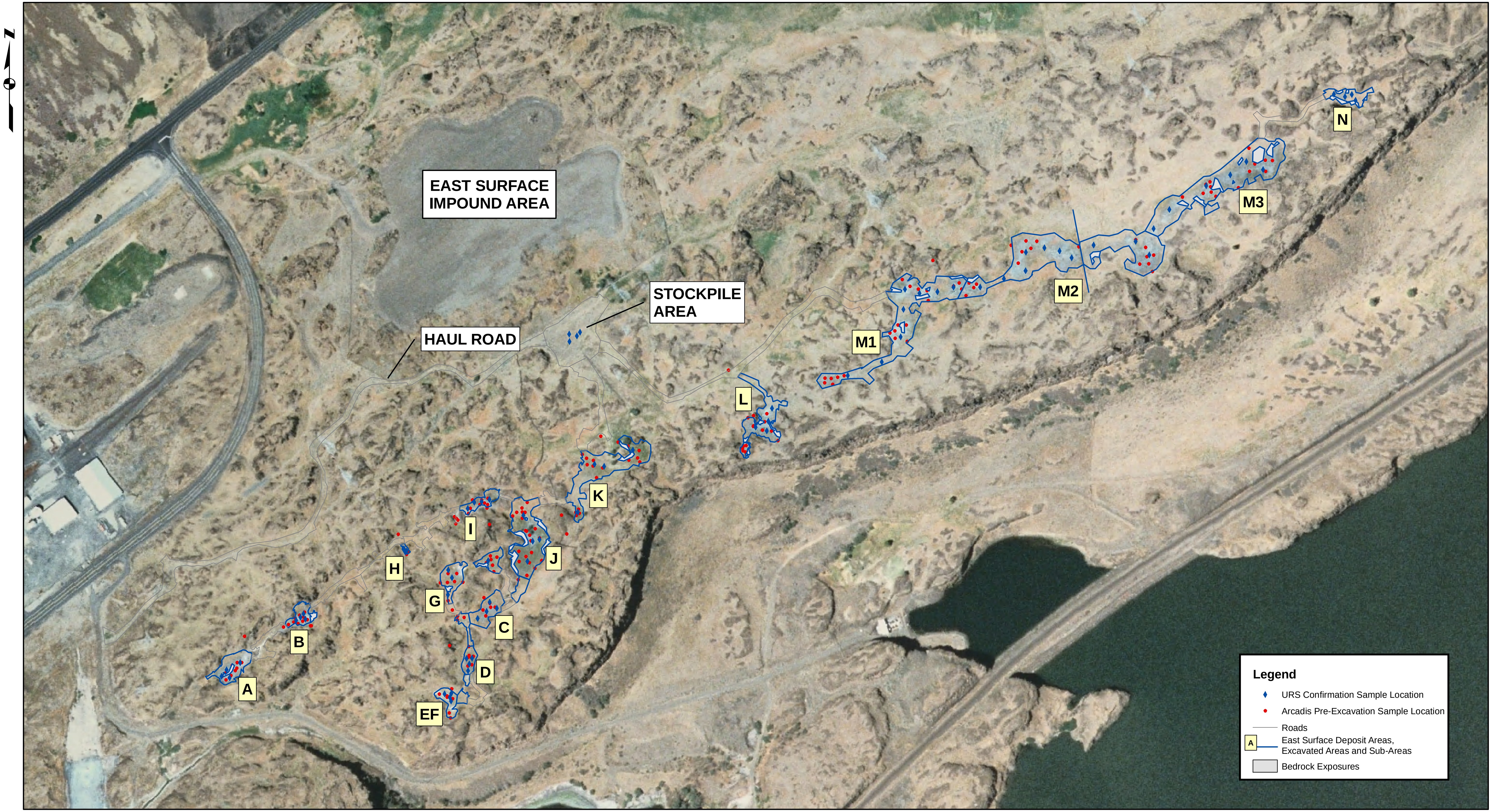
APPENDIX A-3

SWMU #3 – Intermittent Sludge Disposal Ponds

APPENDIX A-3

SWMU #3 – Intermittent Sludge Disposal Ponds

URS (2008b)
Cleanup Action Report



Source: NAIP Imagery, 2006.

0 500 1,000 Feet

URS

DRAFT

SITE PLAN MAP

JANUARY 2008
36298241

LOCKHEED MARTIN
GOLDENDALE ALUMINUM FACILITY
KLICKITAT COUNTY, WASHINGTON

FIGURE 2

K:\Clipper_MXD\Fig 2 Site Map.mxd

Source: NAIP Imagery, 2006.

0 250 500 Feet

DRAFT

SITE MAP - WEST

JANUARY 2008
36298241

LOCKHEED MARTIN
GOLDENDALE ALUMINUM FACILITY
KLICKITAT COUNTY, WASHINGTON

FIGURE 3

K:\Clipper_MXD\Fig 3 Site Map - West.mxd

Source: NAIP Imagery, 2006.

DRAFT

SITE MAP - EAST

JANUARY 2008
36298241

LOCKHEED MARTIN
GOLDENDALE ALUMINUM FACILITY
KLICKITAT COUNTY, WASHINGTON

FIGURE 4

K:\Clipper_MXD\Fig 4 Site Map - East.mxd

Table 1
Summary of ESDA Material Excavation Areas
Lockheed Martin Corporation
Goldendale, Washington

Area	Ft^2	Approximate Volume (CY)	Avg. Depth (ft)	Approximate Max. Depth (ft)	No. Confirmation Samples
A	9800	510	1.4	3	4
B	5500	578	2.8	2.5	4
C	11300	173	0.4	3	4
D	4700	133	0.8	2	4
EF	6200	203	0.9	1.6	4
G	12400	200	0.4	0.8	4
H	600	60	2.7	0.5	4
I	5200	350	1.8	2	4
J	30900	1039	0.9	3	4
K	26800	605	0.6	4	4
L	16200	678	1.1	2	4
M1	45100	1077	0.6	3	8
M2	38600	660	0.5	1	8
M3	79500	1248	0.4	1	8
N	6900	132	0.5	1.5	4

DRAFT

Table 2
Analytical Results for Polycyclic Aromatic Hydrocarbons in Soil (mg/kg)
East Surface Deposit Area
Lockheed-Martin Corporation
Goldendale, Washington

Excavated Area	Sample ID^{1}	Sample Depth (inches bgs)	Date Collected	TTEC	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene^{2}	Benzo(a) pyrene^{2}	Benzo(b) fluoranthene^{2}	Benzo(g,h,i) perylene	Benzo(k) fluoranthene^{2}	Chrysene^{2}	Dibenz(a,h) anthracene^{2}	Fluoranthene	Fluorene	Indeno(1,2,3-cd) pyrene^{2}	Naphthalene	Phenanthrene	Pyrene
A	A-1-C	0-4	11/21/2007	0.008305	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 UJ	0.0110 U	0.0110 UJ	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U
	A-2-E	0-4	11/21/2007	0.008671	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 UJ	0.0114 U	0.0114 U	0.0121 J	0.0114 U	0.0114 UJ	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U
	A-3-S	0-4	11/21/2007	0.0079275	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 UJ	0.0105 U	0.0105 UJ	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U
	A-4-W	0-4	11/21/2007	0.0082295	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 UJ	0.0109 U	0.0109 UJ	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U
B	B-1-C	0-4	11/21/2007	0.0080785	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 UJ	0.0107 U	0.0107 UJ	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U
	B-2-E	0-4	11/21/2007	0.0082295	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 UJ	0.0109 U	0.0109 UJ	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U
	B-3-S	0-4	11/21/2007	0.0082295	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 UJ	0.0109 U	0.0109 UJ	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U
	B-4-W	0-4	11/21/2007	0.0080785	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 UJ	0.0107 U	0.0107 UJ	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U
C	C-1-C	0-4	11/28/2007	0.0080785	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U	0.0107 U
	C-2-E	0-4	11/28/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
	C-3-S	0-4	11/28/2007	0.008305	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U
	C-4-W	0-4	11/28/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
D	D-1-C	0-4	11/28/2007	0.0092865	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U	0.0123 U
	D-2-W	0-4	11/28/2007	0.009513	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U	0.0126 U
	D-3-E	0-4	11/28/2007	0.009815	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U
	D-4-S	0-4	11/28/2007	0.008607	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U
E/F	EF-1	0-4	11/19/2007	0.017652	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 UJ	0.0118 UJ	0.0118 UJ	0.0158 J	0.0142	0.0118 UJ	0.0118 U	0.0118 U	0.0118 UJ	0.0118 U	0.0118 U	0.0158
	EF-2-S	0-4	11/21/2007	0.009433	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 UJ	0.0124 U	0.0124 UJ	0.0133	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0149
	EF-3-W	0-4	11/21/2007	0.0098905	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 UJ	0.0131 U	0.0131 UJ	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U
	EF-4-E	0-4	11/21/2007	0.0094375	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 UJ	0.0125 U	0.0125 UJ	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U
G	G-1-C	0-4	11/28/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
	G-2-W	0-4	11/28/2007	0.008305	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U
	G-3-E	0-4	11/28/2007	0.008909	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U	0.0118 U
	G-4-S	0-4	11/28/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
H	H-1-C	0-4	11/28/2007	0.05475	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0104 U	0.0389	0.0104 U	0.0765 J	0.0640	0.0410	0.0202 J	0.0153	0.0104 U	0.0598 J	0.0104 U	0.0104 U	0.0139
	H-2-E	0-4	11/28/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
	H-3-W	0-4	11/28/2007	0.0085315	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U
	H-4-N	0-4	11/28/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
I	I-1-C	0-4	11/28/2007	0.009362	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U	0.0124 U
	I-2-E	0-4	11/28/2007	0.0094375	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U	0.0125 U
	I-3-W	0-4	11/28/2007	0.0079275	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U	0.0105 U
	I-4-N	0-4	11/28/2007	0.008607	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U
J	J-1-C	0-4	11/28/2007	0.0149765	0.0133 U	0.0133 U	0.0133 U	0.0133 U	0.0133 U	0.0133 U	0.0133 U	0.0133 U	0.108 J	0.0133 U	0.0133 U	0.0133 U	0.0133 U	0.0133 U	0.0560 J	0.0133 U	0.0133 U	0.0133 U
	J-2-E	0-4	11/28/2007	0.011766	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0395 J	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0132 U	0.0246 J	0.0132 U	0.0132 U	0.0132 U
	J-3-S	0-4	11/28/2007	0.0098905	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U	0.0131 U
	J-4-N	0-4	11/28/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
K	K-1-C	0-4	11/28/2007	0.0097395	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U	0.0129 U
	K-2-E	0-4	11/28/2007	0.0089845	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U
	K-3-S	0-4	11/28/2007	0.010419	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U	0.0138 U
	K-4-W	0-4	11/28/2007	0.0106455	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U	0.0141 U
L	L-1-C	0-4	11/29/2007	0.0082295	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U	0.0109 U
	L-2-E	0-4	11/29/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
	L-3-S	0-4	11/29/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
	L-4-W	0-4	11/29/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
MTCA Soil Cleanup Levels			Method A (industrial land use)	2	NE	NE	NE	NE	NE	NE	2	NE	NE	NE	NE	NE	NE	NE	NE	5	NE	NE
			Method C	18	1,100	14,000	210,000	NE	1,100,000	NE^{3}	18	NE^{3}	NE	NE^{3}	NE^{3}	NE^{3}	140,000	140,000	NE^{3}	70,000	NE	110,000

Table 2
Analytical Results for Polycyclic Aromatic Hydrocarbons in Soil (mg/kg)
East Surface Deposit Area
Lockheed-Martin Corporation
Goldendale, Washington

Excavated Area	Sample ID[1]	Sample Depth (inches bgs)	Date Collected	TTEC	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene[2]	Benzo(a) pyrene[2]	Benzo(b) fluoranthene[2]	Benzo(g,h,i) perylene	Benzo(k) fluoranthene[2]	Chrysene[2]	Dibenz(a,h) anthracene[2]	Fluoranthene	Fluorene	Indeno(1,2,3-cd) pyrene[2]	Naphthalene	Phenanthrene	Pyrene
M1	M1-1-C1	0-4	12/7/2007	0.0085315	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U
	M1-2-E1	0-4	12/7/2007	0.008607	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 UJ	0.0114 UJ	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U
	M1-3-W1	0-4	12/7/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 UJ	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 UJ	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
	M1-4-N1	0-4	12/7/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 UJ	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 UJ	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
	M1-5-C2	0-4	12/7/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 UJ	0.0112 UJ	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
	M1-6-W2	0-4	12/7/2007	0.0085315	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U
	M1-7-E2	0-4	12/7/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 UJ	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 UJ	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
	M1-8-N2	0-4	12/7/2007	0.0083805	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 UJ	0.0111 UJ	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
M2	M2-1-C1	0-4	12/6/2007	0.008305	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U
	M2-2-E1	0-4	12/6/2007	0.0085315	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U
	M2-3-S1	0-4	12/6/2007	0.0085315	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U
	M2-4-W1	0-4	12/6/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
	M2-5-C2	0-4	12/6/2007	0.008607	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 UJ	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 U	0.0114 UJ	0.0114 U	0.0114 U	0.0114 U	0.0114 U
	M2-6-E2	0-4	12/6/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
	M2-7-S2	0-4	12/6/2007	0.008456	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0112 U
	M2-8-W2	0-4	12/6/2007	0.008758	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 UJ	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 UJ	0.0116 U	0.0116 U	0.0116 U	0.0116 U
M3	M3-1-C1	0-4	12/6/2007	0.015256	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0110 U	0.0220 J	0.0543	0.0191	0.0176	0.0125	0.0110 U	0.0110 UJ	0.0367	0.0110 U	0.0110 U	0.0110 U
	M3-2-NE	0-4	12/6/2007	0.0089845	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U	0.0119 U
	M3-3-SE	0-4	12/6/2007	0.009815	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U
	M3-4-WC	0-4	12/6/2007	0.008003	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U	0.0106 U
	M3-5-C2	0-4	12/6/2007	0.008758	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 UJ	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 UJ	0.0116 U	0.0116 U	0.0116 U	0.0116 U
	M3-6-EC	0-4	12/6/2007	0.0085315	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U
	M3-7-SW	0-4	12/6/2007	0.007852	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ	0.0104 UJ
	M3-8-NW	0-4	12/6/2007	0.0086825	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U
N	N-1-C	0-4	12/6/2007	0.008758	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 UJ	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 UJ	0.0116 U	0.0116 U	0.0116 U	0.0116 U
	N-2-E	0-4	12/6/2007	0.0085315	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 UJ	0.0113 U	0.0113 U	0.0113 U	0.0113 U
	N-3-S	0-4	12/6/2007	0.008758	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U	0.0116 U
	N-4-W	0-4	12/6/2007	0.0086825	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 UJ	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0115 UJ	0.0115 U	0.0115 U	0.0115 U	0.0115 U
Stockpile	SP-1-C1	0-4	12/11/2007	0.55871	0.0112 U	0.0112 U	0.0112 U	0.0112 U	0.0120	0.186	0.371	0.613	0.373	0.553	0.701	0.127	0.210	0.0112 U	0.328	0.0112 U	0.0600	0.283
	SP-2-E	0-4	12/11/2007	0.056437	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0113 U	0.0286	0.0376	0.0602	0.0339	0.0474	0.0557	0.0150	0.0542	0.0113 U	0.0316	0.0113 U	0.0158	0.0331
	SP-3-S	0-4	12/11/2007	0.37672	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.110	0.246	0.433	0.331	0.363	0.482	0.0940	0.124	0.0111 U	0.259	0.0111 U	0.0289	0.164
	SP-4-W-1	0-4	12/11/2007	1.9221	0.0115 U	0.0115 U	0.0115 U	0.0115 U	0.0177	0.539	1.23	1.83	2.11	2.02	2.61	0.581	0.563	0.0115 U	1.69	0.0115 U	0.0716	0.982
MTCA Soil Cleanup Levels			Method A (industrial land use)	2	NE	NE	NE	NE	NE	NE	2	NE	NE	NE	NE	NE	NE	NE	NE	5	NE	NE
			Method C	18	1,100	14,000	210,000	NE	1,100,000	NE[3]	18	NE[3]	NE	NE[3]	NE[3]	NE[3]	140,000	140,000	NE[3]	70,000	NE	110,000

Notes:
Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. MTCA Method C values are from Ecology website CLARC tables downloaded December 2007 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).
bgs - below ground surface
ND - Not detected
NE - Not established
PAH - Polycyclic aromatic hydrocarbon
TTEC - Total Toxicity Equivalent Soil Concentration. When a PAH is reported as not detected, a value of one-half the reporting limit is used for the TTEC calculation.
U - Compound was analyzed for but not detected above the reporting limit shown.
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
J - Estimated concentration.

[1] Extensions "Confirmation", "Confirm", and "-0-4" were removed from the sample IDs listed in the analytical laboratory reports.

[2] These compounds are considered carcinogenic PAHs (c-PAHs) and are subject to WAC-173-340 Toxicity Equivalent Soil Concentration calculations.

[3] When establishing and determining compliance with cleanup levels and remediation levels for mixutres of cPAHs under MTCA, the mixture shall be considered a single hazardous substance. For cPAHs, the reference chemical is benzo(a)pyrene and the toxicity equivalency factor for each cPAH is an estimate of the relative toxicity of the cPAH compound when compared to benzo(a)pyrene.

Table 3
Soil Data 95% Confidence Limit Calculation Results
Lockheed Martin Corporation
Goldendale, Washington

General UCL Statistics for Full Data Sets

User Selected Options

From File	I:\WM&RD\Lockheed Martin\Goldendale\ESDA Pond Remediation\Technical\Analytical\Lockhe
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

TTEC-All

General Statistics

Number of Valid Observations	113	Number of Distinct Observations	70

Raw Statistics

Minimum	0
Maximum	3.867
Mean	0.245
Median	0.00898
SD	0.555
Coefficient of Variation	2.265
Skewness	3.674

Log-transformed Statistics

Log Statistics Not Avaliable

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.349
Lilliefors Critical Value	0.0833

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Not Available

Assuming Normal Distribution

95% Student's-t UCL	0.332

Assuming Normal Distribution

95% Student's-t UCL	0.332

Assuming Lognormal Distribution

95% H-UCL	N/A

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.35
95% Modified-t UCL	0.335

Gamma Distribution Test

Gamma Statistics Not Available

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL	0.473

95% CLT UCL	0.331
95% Jackknife UCL	0.332
95% Standard Bootstrap UCL	0.33
95% Bootstrap-t UCL	0.359
95% Hall's Bootstrap UCL	0.378
95% Percentile Bootstrap UCL	0.335
95% BCA Bootstrap UCL	0.363
95% Chebyshev(Mean, Sd) UCL	0.473
97.5% Chebyshev(Mean, Sd) UCL	0.571
99% Chebyshev(Mean, Sd) UCL	0.765

Table 3
Soil Data 95% Confidence Limit Calculation Results
Lockheed Martin Corporation
Goldendale, Washington

TTEC-2007

General Statistics

Number of Valid Observations	76
Number of Distinct Observations	34

Raw Statistics

Minimum	0.00785
Maximum	1.922
Mean	0.0475
Median	0.00853
SD	0.231
Coefficient of Variation	4.854
Skewness	7.538

Log-transformed Statistics

Minimum of Log Data	-4.847
Maximum of Log Data	0.653
Mean of log Data	-4.495
SD of log Data	0.926

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.486
Lilliefors Critical Value	0.102

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.407
Lilliefors Critical Value	0.102

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.0916
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	0.115
95% Modified-t UCL	0.0954

Assuming Lognormal Distribution

95% H-UCL	0.0216
95% Chebyshev (MVUE) UCL	0.0262
97.5% Chebyshev (MVUE) UCL	0.0302
99% Chebyshev (MVUE) UCL	0.038

Gamma Distribution Test

k star (bias corrected)	0.438
Theta Star	0.109
nu star	66.51
Approximate Chi Square Value (.05)	48.75
Adjusted Level of Significance	0.0468
Adjusted Chi Square Value	48.45
Anderson-Darling Test Statistic	25.14
Anderson-Darling 5% Critical Value	0.831
Kolmogorov-Smirnov Test Statistic	0.49
Kolmogorov-Smirnov 5% Critical Value	0.109

Data not Gamma Distributed at 5% Significance Level

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	0.091
95% Jackknife UCL	0.0916
95% Standard Bootstrap UCL	0.0909
95% Bootstrap-t UCL	0.231
95% Hall's Bootstrap UCL	0.248
95% Percentile Bootstrap UCL	0.0971
95% BCA Bootstrap UCL	0.123
95% Chebyshev(Mean, Sd) UCL	0.163
97.5% Chebyshev(Mean, Sd) UCL	0.213
99% Chebyshev(Mean, Sd) UCL	0.311

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.0648
95% Adjusted Gamma UCL	0.0652

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 0.163

APPENDIX A-3

SWMU #3 – Intermittent Sludge Disposal Ponds

ARCADIS (2007a)
Site Investigation and Closure Alternatives Analysis

Acad Version : R16.2s (LMS Tech)
User Name : dkudlicki
Path\Name : \\MT1FP\Wanshare\LMC The Dalles-Goldendale\goldendale.dwg

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Helena, MT 59601
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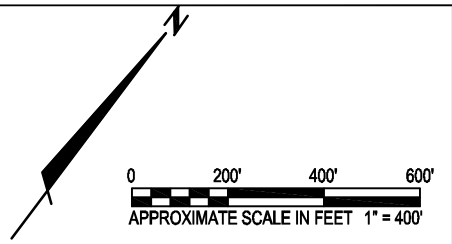
Site Location Map

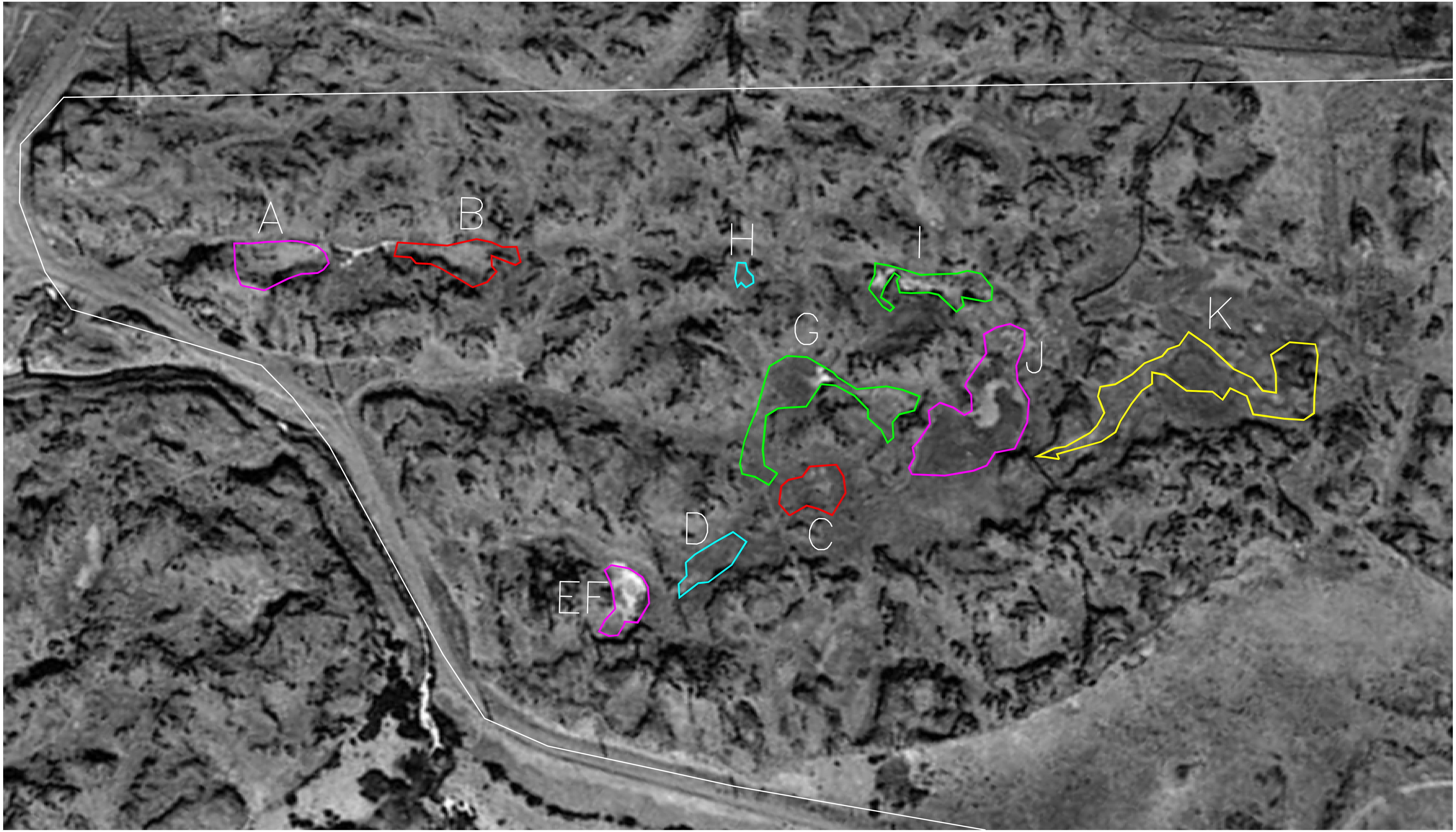
GOLDENDALE, WASHINGTON

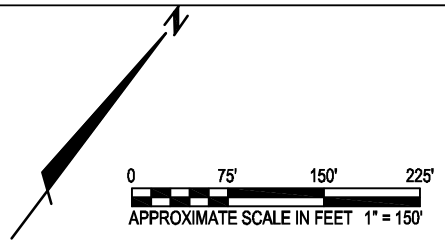


Project Number
AZ001128.0001

Drawing Date
12/13/2006

Figure
1





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User Name : dkudlicki
Path\Name : \\MT1FP\Wanshare\LMC The Dalles-Goldendale\goldendale.dwg

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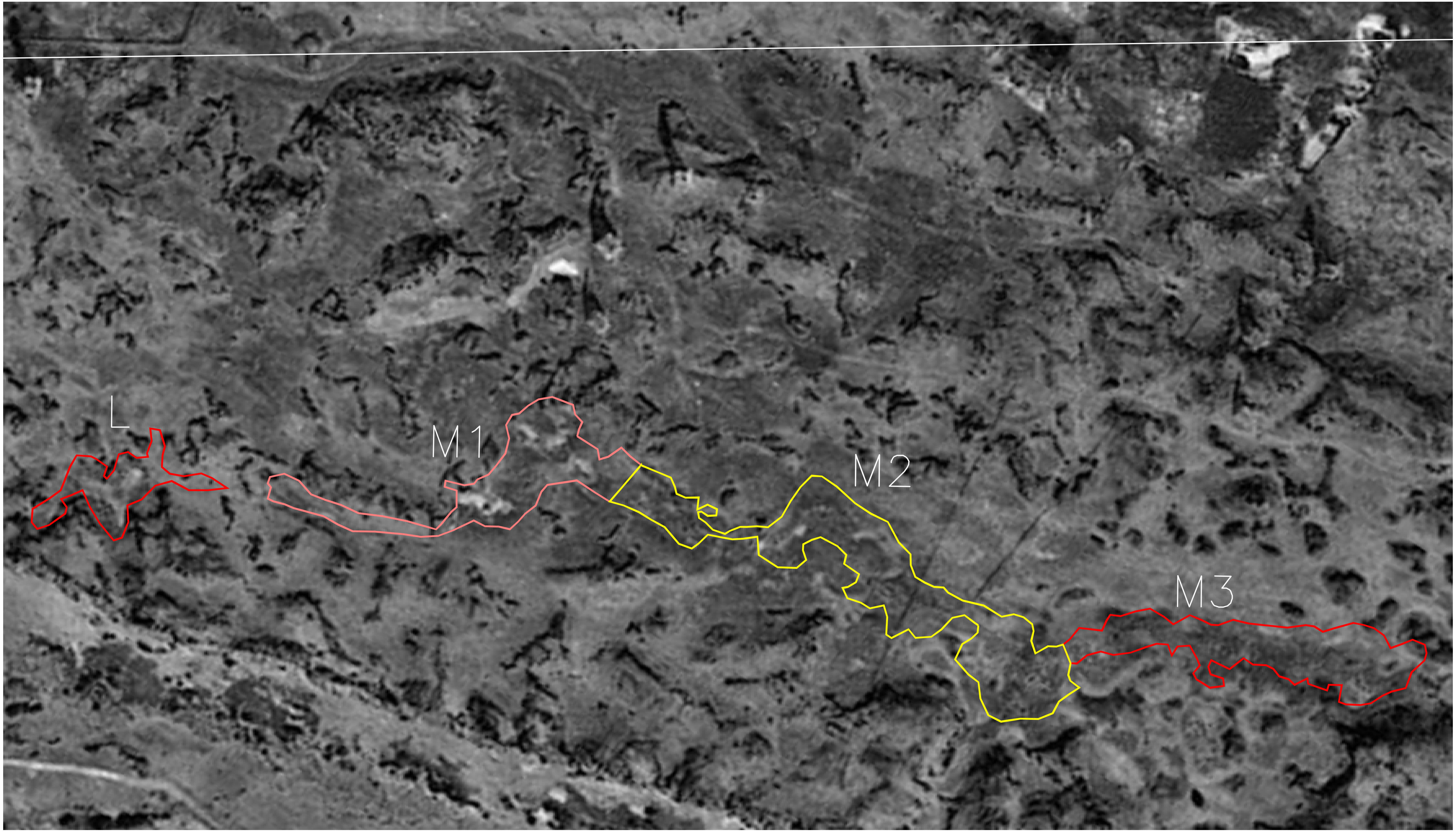
East Surface Deposit Area

West End

GOLDENDALE, WASHINGTON

Project Number	AZ001128.0001
Drawing Date	12/13/2006
Figure	2



East Surface Deposit Area

East End

GOLDENDALE, WASHINGTON

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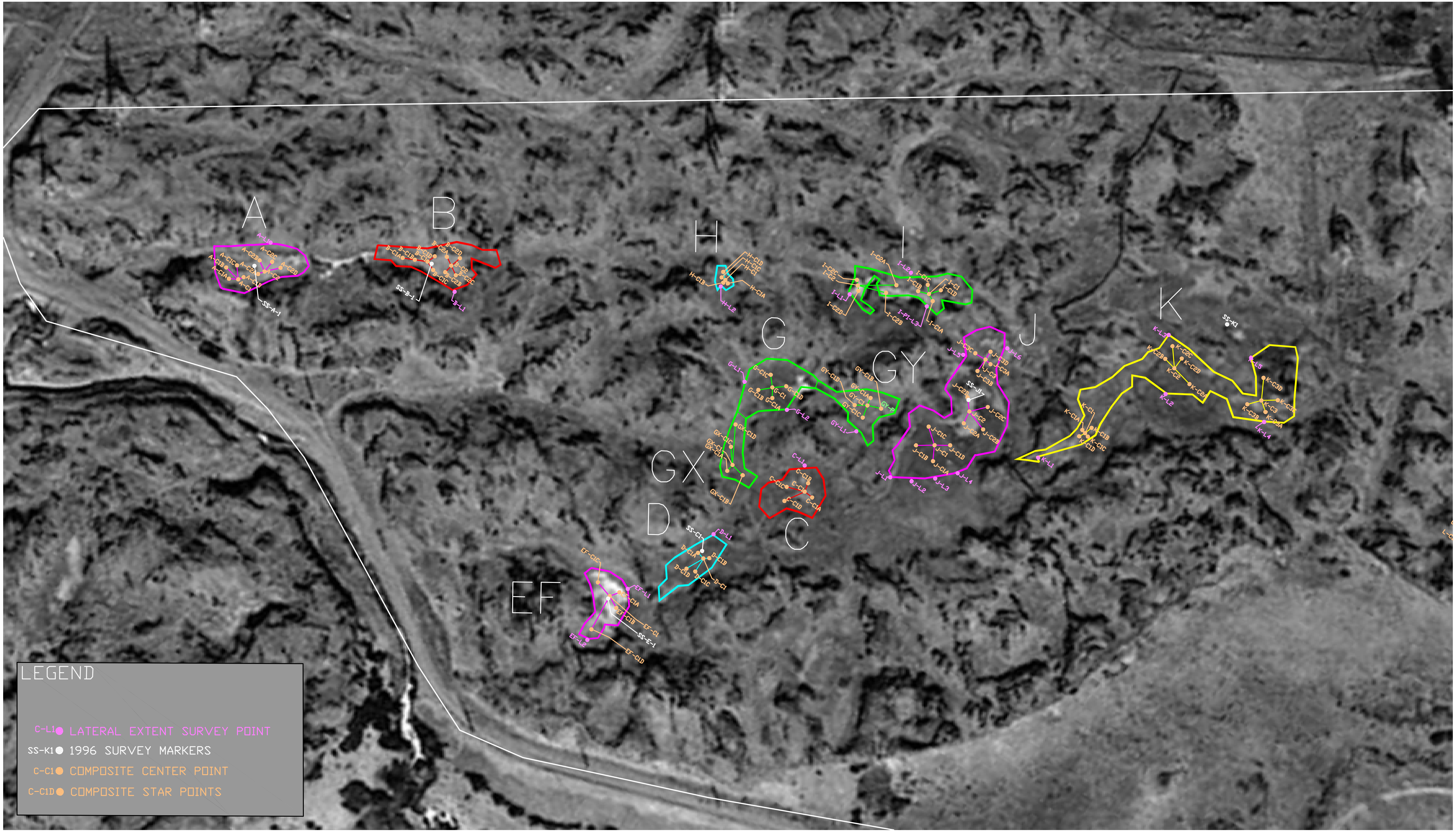
N

0 75' 150' 225'
APPROXIMATE SCALE IN FEET 1" = 150'

Project Number
AZ001128.0001

Drawing Date
12/13/2006

Figure
3



Acad Version : R16.2s (LMS Tech)
User Name : dkudlicki
Path\Name : \\MT1FP\Wanshare\LMC The Dalles-Goldendale\goldendale.dwg

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East Surface Deposit Area Sample Locations

West End

GOLDENDALE, WASHINGTON

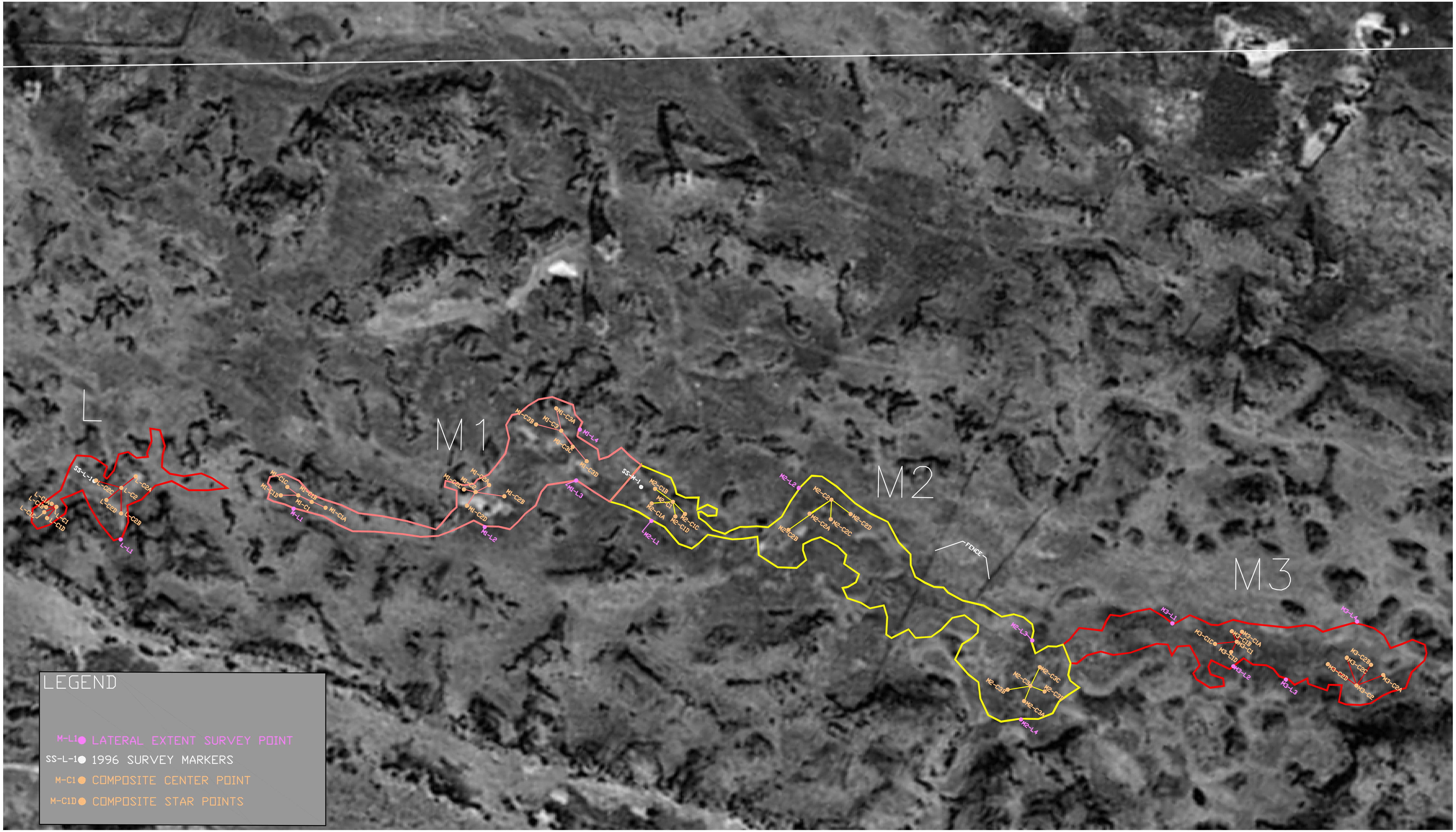
N

0 75' 150' 225'
APPROXIMATE SCALE IN FEET 1" = 150'

Project Number
AZ001128.0001

Drawing Date
12/13/2006

Figure
4



Acad Version : R16.2s (LMS Tech)
User Name : dkudlicki
Path\Name : \\MT1FP\Wanshare\LMC The Dalles-Goldendale\goldendale.dwg

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East Surface Deposit Area Sample Locations

East End

GOLDENDALE, WASHINGTON

N

0 75' 150' 225'
APPROXIMATE SCALE IN FEET 1" = 150'

Project Number
AZ001128.0001

Drawing Date
12/13/2006

Figure
5

Table 2c. Lateral Extent PAH Discrete Sample Analyses (TEF)

East Surface Deposit Area - 2006 Soil Sampling

Lockheed Martin Corporation, Goldendale, Washington

ANALYTE	**SAMPLE ANALYSIS - LATERAL EXTENT (OUTSIDE SEDIMENT PERIMETER)**																															
Area	**A**				**B**				**C**				**D**				**EF**				**EF**				**G**				**G**			
Sample ID	A-L1-0-4[1]				B-L1-0-4				C-L1-0-4				D-L1-0-4				EF-L1-0-4				EF-L2-0-4				G-L1-0-4				G-L2-0-4			
Date	11/07/06				11/07/06				11/08/06				11/08/06				11/08/06				11/08/06				11/07/06				11/07/06			
Time	11:30				12:50				11:15				10:40				9:55				10:00				16:45				16:50			
Units	mg/kg[2]	TEF[3]	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg	
Benzo (a) anthracene	0.32	0.10	0.03		0.28	0.10	0.03		0.66	0.10	0.07		0.16	0.10	0.02		0.05	0.10	0.01	nd*	0.05	0.10	0.01	nd*	0.04	0.10	0.00		0.03	0.10	0.00	
Benzo (a) pyrene	0.50	1.00	0.50		0.46	1.00	0.46		0.98	1.00	0.98		0.29	1.00	0.29		0.53	1.00	0.53		0.50	1.00	0.50		0.06	1.00	0.06		0.05	1.00	0.05	
Benzo (b) fluoranthene	0.67	0.10	0.07		0.54	0.10	0.05		1.08	0.10	0.11		0.34	0.10	0.03		0.59	0.10	0.06		0.64	0.10	0.06		0.07	0.10	0.01		0.07	0.10	0.01	
Benzo (k) fluoranthene	0.57	0.10	0.06		0.48	0.10	0.05		0.76	0.10	0.08		0.25	0.10	0.02		0.51	0.10	0.05		0.57	0.10	0.06		0.05	0.10	0.00		0.11	0.10	0.01	
Chrysene	0.51	0.01	0.01		0.43	0.01	0.00		0.92	0.01	0.01		0.23	0.01	0.00		0.53	0.01	0.01		0.49	0.01	0.00		0.05	0.01	0.00		0.07	0.01	0.00	
Dibenzo (a,h) anthracene	0.20	0.40	0.08		0.02	0.40	0.01	nd*	0.05	0.40	0.02	nd*	0.02	0.40	0.01	nd*	0.05	0.40	0.02	nd*	0.05	0.40	0.02	nd*	0.00	0.40	0.00	nd*	0.04	0.40	0.02	
Indeno (1,2,3-cd) pyrene	0.67	0.10	0.07		0.42	0.10	0.04		0.69	0.10	0.07		0.23	0.10	0.02		0.05	0.10	0.01	nd*	0.66	0.10	0.07		0.05	0.10	0.00		0.11	0.10	0.01	
Total PAHs	5.52		0.81		4.05		0.65		8.23		1.33		2.41		0.39		4.22		0.68		4.71		0.72		0.52		0.08		0.77		0.10	

ANALYTE	**SAMPLE ANALYSIS - LATERAL EXTENT (OUTSIDE SEDIMENT PERIMETER)**																															
Area	**GY**				**H**				**I**				**I**				**J**				**J**				**J**				J			
Sample ID	GY-L1-0-4				H-L2-0-4				I-L1-0-4				I-L2-0-4				J-L1-0-4				J-L2-0-4				J-L3-0-4				J-L4-0-4			
Date	11/08/06				11/07/06				11/07/06				11/07/06				11/08/06				11/08/06				11/08/06				11/08/06			
Time	12:05				16:30				15:30				15:35				14:10				14:15				14:18				14:20			
Units	mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg	
Benzo (a) anthracene	0.02	0.10	0.00	nd*	1.02	0.10	0.10		0.05	0.10	0.00	nd*	0.61	0.10	0.06		0.63	0.10	0.06		0.07	0.10	0.01		0.48	0.10	0.05		1.52	0.10	0.15	
Benzo (a) pyrene	0.22	1.00	0.22		1.56	1.00	1.56		0.55	1.00	0.55		0.90	1.00	0.90		1.01	1.00	1.01		0.12	1.00	0.12		0.81	1.00	0.81		2.55	1.00	2.55	
Benzo (b) fluoranthene	0.30	0.10	0.03		1.88	0.10	0.19		0.94	0.10	0.09		1.17	0.10	0.12		1.17	0.10	0.12		0.14	0.10	0.01		0.97	0.10	0.10		2.94	0.10	0.29	
Benzo (k) fluoranthene	0.24	0.10	0.02		1.48	0.10	0.15		0.67	0.10	0.07		0.98	0.10	0.10		0.91	0.10	0.09		0.12	0.10	0.01		0.75	0.10	0.08		3.05	0.10	0.31	
Chrysene	0.21	0.01	0.00		1.46	0.01	0.01		0.59	0.01	0.01		1.03	0.01	0.01		0.97	0.01	0.01		0.10	0.01	0.00		0.71	0.01	0.01		2.32	0.01	0.02	
Dibenzo (a,h) anthracene	0.02	0.40	0.01	nd*	0.10	0.40	0.04	nd*	0.05	0.40	0.02	nd*	0.05	0.40	0.02	nd*	0.05	0.40	0.02	nd*	0.04	0.40	0.02		0.35	0.40	0.14		1.31	0.40	0.52	
Indeno (1,2,3-cd) pyrene	0.31	0.10	0.03		1.50	0.10	0.15		0.93	0.10	0.09		0.85	0.10	0.08		0.96	0.10	0.10		0.14	0.10	0.01		0.95	0.10	0.09		4.12	0.10	0.41	
Total PAHs	2.23		0.31		14.35		2.20		5.49		0.84		9.27		1.29		9.07		1.41		1.17		0.19		7.87		1.27		28.61		4.26	

ANALYTE	**SAMPLE ANALYSIS - LATERAL EXTENT (OUTSIDE SEDIMENT PERIMETER)**																															
Area	**J**				**J**				**K**				**K**				**K**				**K**				**K**				L			
Sample ID	J-L5-0-4				J-L6-0-4				K-L1, 0-4				K-L2, 0-4				K-L3, 0-4				K-L4, 0-4				K-L5, 0-4				L-L1, 0-4			
Date	11/08/06				11/08/06				11/09/06				11/09/06				11/09/06				11/09/06				11/09/06				11/09/06			
Time	14:22				14:25				8:40				8:35				8:32				8:30				8:25				10:45			
Units	mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg	
Benzo (a) anthracene	0.84	0.10	0.08		0.45	0.10	0.04		0.32	0.10	0.03		0.68	0.10	0.07		0.01	0.10	0.00	nd*	0.25	0.10	0.02		0.04	0.10	0.00		0.00	0.10	0.00	nd*
Benzo (a) pyrene	1.25	1.00	1.25		0.69	1.00	0.69		0.50	1.00	0.50		0.97	1.00	0.97		0.11	1.00	0.11		0.37	1.00	0.37		0.06	1.00	0.06		0.00	1.00	0.00	nd*
Benzo (b) fluoranthene	1.61	0.10	0.16		0.76	0.10	0.08		0.67	0.10	0.07		2.29	0.10	0.23		0.13	0.10	0.01		0.57	0.10	0.06		0.12	0.10	0.01		0.05	0.10	0.00	
Benzo (k) fluoranthene	1.11	0.10	0.11		0.62	0.10	0.06		0.57	0.10	0.06		0.04	0.10	0.00	nd*	0.11	0.10	0.01		0.43	0.10	0.04		0.00	0.10	0.00	nd*	0.00	0.10	0.00	nd*
Chrysene	1.29	0.01	0.01		0.63	0.01	0.01		0.51	0.01	0.01		1.09	0.01	0.01		0.11	0.01	0.00		0.49	0.01	0.00		0.06	0.01	0.00		0.02	0.01	0.00	
Dibenzo (a,h) anthracene	0.05	0.40	0.02	nd*	0.19	0.40	0.08		0.20	0.40	0.08		0.43	0.40	0.17		0.01	0.40	0.00	nd*	0.21	0.40	0.08		0.03	0.40	0.01		0.00	0.40	0.00	nd*
Indeno (1,2,3-cd) pyrene	1.16	0.10	0.12		0.64	0.10	0.06		0.67	0.10	0.07		1.14	0.10	0.11		0.14	0.10	0.01		0.52	0.10	0.05		0.07	0.10	0.01		0.03	0.10	0.00	
Total PAHs	12.40		1.76		6.43		1.02		8.74		0.81		10.57		1.57		1.07		0.15		4.25		0.64		0.60		0.09		0.16		0.01	

[1] A-L1-0-4 - Denotes sediment area A, lateral extent (discrete) sample 1, collected from 0-4 inch depth. Each sample was collected from one foot outside the estimated pond perimeter.

[2] mg/kg dry

[3] TEF - Toxicity Equivalency Factors (WAC 173-340-708(8))

nd* - Sample result for analyte was non-detectable. The reported number is one-half the detection limit (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between samples.

Table 2c. Lateral Extent PAH Discrete Sample Analyses (TEF)
East Surface Deposit Area - 2006 Soil Sampling
Lockheed Martin Corporation, Goldendale, Washington

ANALYTE	**SAMPLE ANALYSIS - LATERAL EXTENT (OUTSIDE SEDIMENT PERIMETER)**																															
Area	**M1**				**M1**				**M1**				**M1**				**M2**				**M2**				**M2**				**M2**			
Sample ID	M1-L1, 0-4 [1]				M1-L2, 0-4				M1-L3, 0-4				M1-L4-0-4				M2-L1 0-4				M2-L2 0-4				M2-L3, 0-4				M2-L4, 0-4			
Date	11/09/06				11/09/06				11/09/06				11/09/06				11/09/06				11/09/06				11/09/06				11/09/06			
Time	11:05				11:40				12:45				12:47				13:12				13:50				14:32				14:37			
Units	mg/kg [2]	TEF [3]	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg	
Benzo (a) anthracene	0.08	0.10	0.01		0.02	0.10	0.00		0.00	0.10	0.00	nd*	0.02	0.10	0.00	nd*	0.00	0.10	0.00	nd*	0.00	0.10	0.00	nd*	0.00	0.10	0.00	nd*	0.03	0.10	0.00	
Benzo (a) pyrene	0.11	1.00	0.11		0.05	1.00	0.05		0.00	1.00	0.00	nd*	0.22	1.00	0.22		0.02	1.00	0.02		0.00	1.00	0.00	nd*	0.00	1.00	0.00	nd*	0.09	1.00	0.09	
Benzo (b) fluoranthene	0.56	0.10	0.06		0.10	0.10	0.01		0.05	0.10	0.01		0.85	0.10	0.08		0.05	0.10	0.01		0.00	0.10	0.00	nd*	0.01	0.10	0.00	nd*	0.37	0.10	0.04	
Benzo (k) fluoranthene	0.00	0.10	0.00	nd*	0.09	0.10	0.01		0.00	0.10	0.00	nd*	0.02	0.10	0.00	nd*	0.00	0.10	0.00	nd*	0.00	0.10	0.00	nd*	0.01	0.10	0.00	nd*	0.00	0.10	0.00	nd*
Chrysene	0.17	0.01	0.00		0.05	0.01	0.00		0.02	0.01	0.00		0.36	0.01	0.00		0.03	0.01	0.00		0.00	0.01	0.00	nd*	0.00	0.01	0.00	nd*	0.16	0.01	0.00	
Dibenzo (a,h) anthracene	0.14	0.40	0.06		0.06	0.40	0.02		0.00	0.40	0.00	nd*	0.17	0.40	0.07		0.00	0.40	0.00	nd*	0.00	0.40	0.00	nd*	0.00	0.40	0.00	nd*	0.11	0.40	0.04	
Indeno (1,2,3-cd) pyrene	0.47	0.10	0.05		0.19	0.10	0.02		0.04	0.10	0.00		0.55	0.10	0.06		0.04	0.10	0.00		0.00	0.10	0.00	nd*	0.00	0.10	0.00	nd*	0.35	0.10	0.04	
Total PAHs	2.41		0.28		0.98		0.12		0.21		0.01		3.58		0.44		0.21		0.03		0.03		0.00		0.04		0.00		1.70		0.21	

ANALYTE	**SAMPLE ANALYSIS - LATERAL EXTENT (OUTSIDE SEDIMENT PERIMETER)**															
Area	**M3**				**M3**				M3				M3			
Sample ID	M3-L1 0-4				M3-L2 0-4				M3-L3 0-4				M3-L4 0-4			
Date	11/09/06				11/09/06				11/09/06				11/09/06			
Time	15:30				15:27				15:25				15:00			
Units	mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg		mg/kg	TEF	mg/kg	
Benzo (a) anthracene	0.02	0.10	0.00	nd*	0.05	0.10	0.00	nd*	0.02	0.10	0.00	nd*	0.02	0.10	0.00	
Benzo (a) pyrene	0.23	1.00	0.23		0.05	1.00	0.05	nd*	0.21	1.00	0.21		0.03	1.00	0.03	
Benzo (b) fluoranthene	0.49	0.10	0.05		1.96	0.10	0.20		1.90	0.10	0.19		0.13	0.10	0.01	
Benzo (k) fluoranthene	0.48	0.10	0.05		0.05	0.10	0.00	nd*	0.02	0.10	0.00	nd*	0.00	0.10	0.00	nd*
Chrysene	0.34	0.01	0.00		0.80	0.01	0.01		0.48	0.01	0.00		0.07	0.01	0.00	
Dibenzo (a,h) anthracene	0.27	0.40	0.11		0.40	0.40	0.16		0.44	0.40	0.17		0.02	0.40	0.01	
Indeno (1,2,3-cd) pyrene	0.89	0.10	0.09		1.42	0.10	0.14		1.48	0.10	0.15		0.05	0.10	0.01	
Total PAHs	4.35		0.52		7.55		0.56		6.83		0.73		0.47		0.06	

[1] M1-L1-0-4 - Denotes sediment area M1, lateral extent (discrete) sample 1, collected from 0-4 inch depth. Each sample was collected from one foot outside the estimated pond perimeter.

[2] mg/kg dry

[3] TEF - Toxicity Equivalency Factors (WAC 173-340-708(8))

nd* - Sample result for analyte was non-detectable. The reported number is one-half the detection limit (mg/kg). Due to the range of sample dilution requirements, the detection limit may vary between samples.

APPENDIX A-4

SWMU #4 – West Surface Impoundment

APPENDIX A-4

SWMU #4 – West Surface Impoundment

Parametrix (2004d)
WSI As-Built Drawings

GOLDEN NORTHWEST ALUMINUM, INC.

WEST SURFACE IMPOUNDMENT CLOSURE ENGINEERING PLANS

BEFORE

AFTER

COMPANIES AND OFFICIALS:

GOLDEN NORTHWEST ALUMINUM, INC.
WAYNE E. WOOSTER, PROJECT MANAGER

LOCKHEAD MARTIN

COMMONWEALTH INDUSTRIES

RICHARD A. BURKHALTER
1047
EXPIRES 06/17/2006

SHEET INDEX

SHEET NO.	**TITLE**
C1	COVER SHEET
C2	EXISTING FILTER/SLUDGE CONTOURS AND ORIGINAL LINER CONTOURS
C3	FINAL GRADING PLAN
C4	SECTIONS AND DETAILS

REVISED TO CONFORM WITH CONSTRUCTION RECORDS
BY: G. NICOLL DATE: NOV 2004

DATE: 11/11/04 2:47pm
IMAGES: 100_0463 | 100_0082 |
XREF'S: XS3244005P01T03-TB |

△	REVISIONS	DATE	BY	
				DESIGNED G. ARNDT
				DRAWN B. HOLT
				CADD CHECKED
				CHECKED S. EMGE
				APPROVED

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY
FILE NAME SU3244005P01T03-C01
JOB No. 215-3244-005
DATE SEPTEMBER 2004

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T. 253.863.5128 F. 253.863.0946
www.parametrix.com

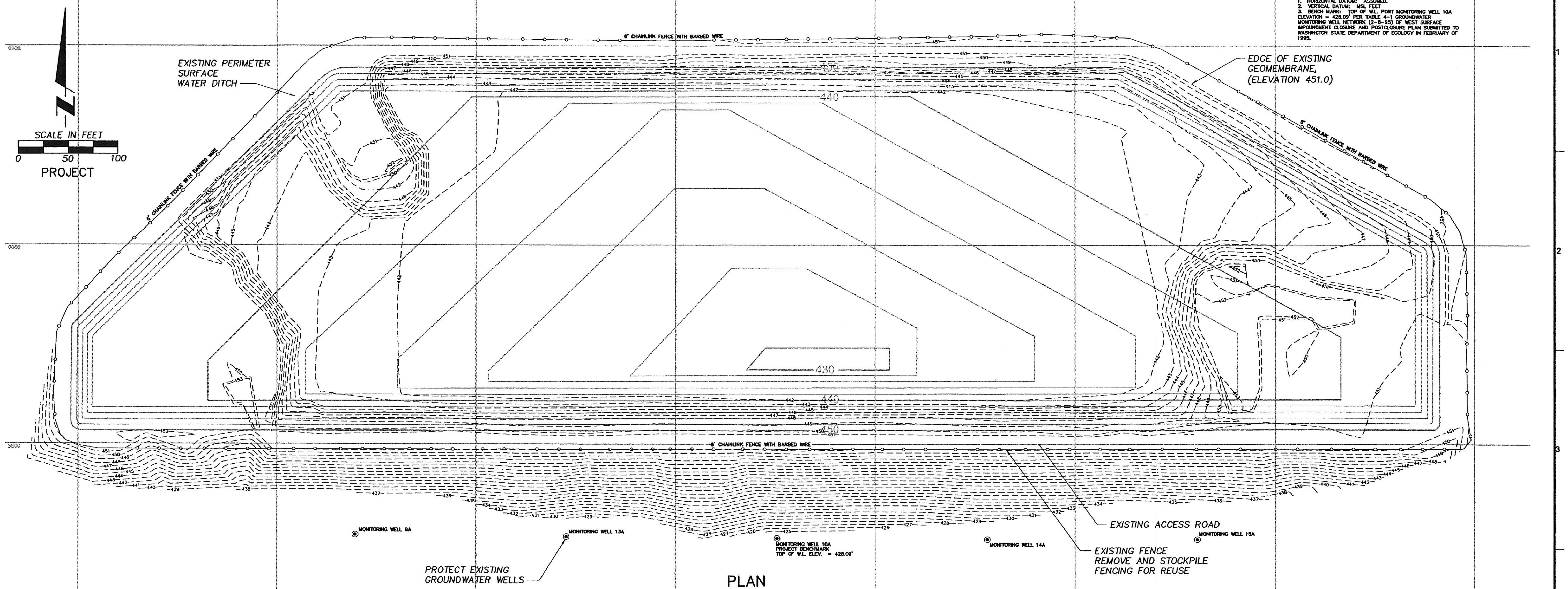
PROJECT NAME
GOLDEN NORTHWEST ALUMINUM, INC.
WEST SURFACE IMPOUNDMENT CLOSURE
GOLDENDALE, WASHINGTON

COVER SHEET

DRAWING NO.
1 OF 4
C1

NOTES

1. HORIZONTAL DATUM: ASSUMED.
2. VERTICAL DATUM: MSL FEET
3. BENCH MARK: TOP OF W.L. PORT MONITORING WELL 10A ELEVATION = 428.09' PER TABLE 4-1 GROUNDWATER MONITORING WELL NETWORK (2-8-95) OF WEST SURFACE IMPOUNDMENT CLOSURE AND POSTCLOSURE PLAN SUBMITTED TO WASHINGTON STATE DEPARTMENT OF ECOLOGY IN FEBRUARY OF 1995.



PLAN

1"=50'

ABBREVIATIONS:

ACP	ALUMINUM CULVERT PIPE
℄	CENTERLINE
CDN	COMPOSITE DRAINAGE NET
ø/DIA	DIAMETER
EXIST./EX	EXISTING
' / "	FEET/INCHES
GCL	GEOSYNTHETIC CLAY LINER
HDPE	HIGH DENSITY POLYETHYLENE
IE	INVERT ELEVATION
MAX	MAXIMUM
MIL	1/1000 OF AN INCH
MIN	MINIMUM
OZ	OUNCE
PERF	PERFORATED
SS	STAINLESS STEEL
TYP	TYPICAL

PATTERNS:

▨	COVER SOIL
▨	BEDDING LAYER
▨	STABILIZATION LAYER
▨	CRUSHED ROCK
▨	BENTONITE
▨	PREPARED SUBGRADE

LEGEND:

–○–○–	EXISITNG FENCE
----457----	EXISTING CONTOUR
——457——	FINAL CONTOUR
→	GRADE OR SURFACE SLOPE
1 ⌐ 3	SLOPE DESIGNATION
—·—·—	EDGE OF GEOMEMBRANE (PLAN)
—··—··—	SUFACE WATER DITCH
———	GEOMEMBRANE (SECTION)
–GCL–GCL–GCL–	GCL (SECTION)
– – – –	GEOTEXTILE
— — —	BURIED GAS PIPE
(101)	COORDINATE SCHEDULE POINT NUMBER
▲	GAS VENT
◎	EXISTING GROUNDWATER

NOTES:

1. SEE BEFORE PHOTOGRAPH ON C1 FOR WHAT THE SITE VISUALLY LOOKED LIKE BEFORE CONSTRUCTION BEGAN.

RICHARD A. BURK

EXPIRES 06/17/ 2006

REVISED TO CONFORM WITH CONSTRUCTION RECORDS
BY: G. NICOLL DATE: NOV 2004

DATE: 11/11/04 2:47pm
IMAGES:
XREF'S: XS3244005P01T03-TB | XS3244B01P01T01-BA1 | XS3244B01P01T01-BA |

△	REVISIONS	DATE	BY	
				DESIGNED G. ARNDT
				DRAWN C DYER
				CADD CHECKED
				CHECKED S. EMGE
				APPROVED

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY
FILE NAME SU3244005P01T03-C02
JOB No. 215-3244-005
DATE SEPTEMBER 2004

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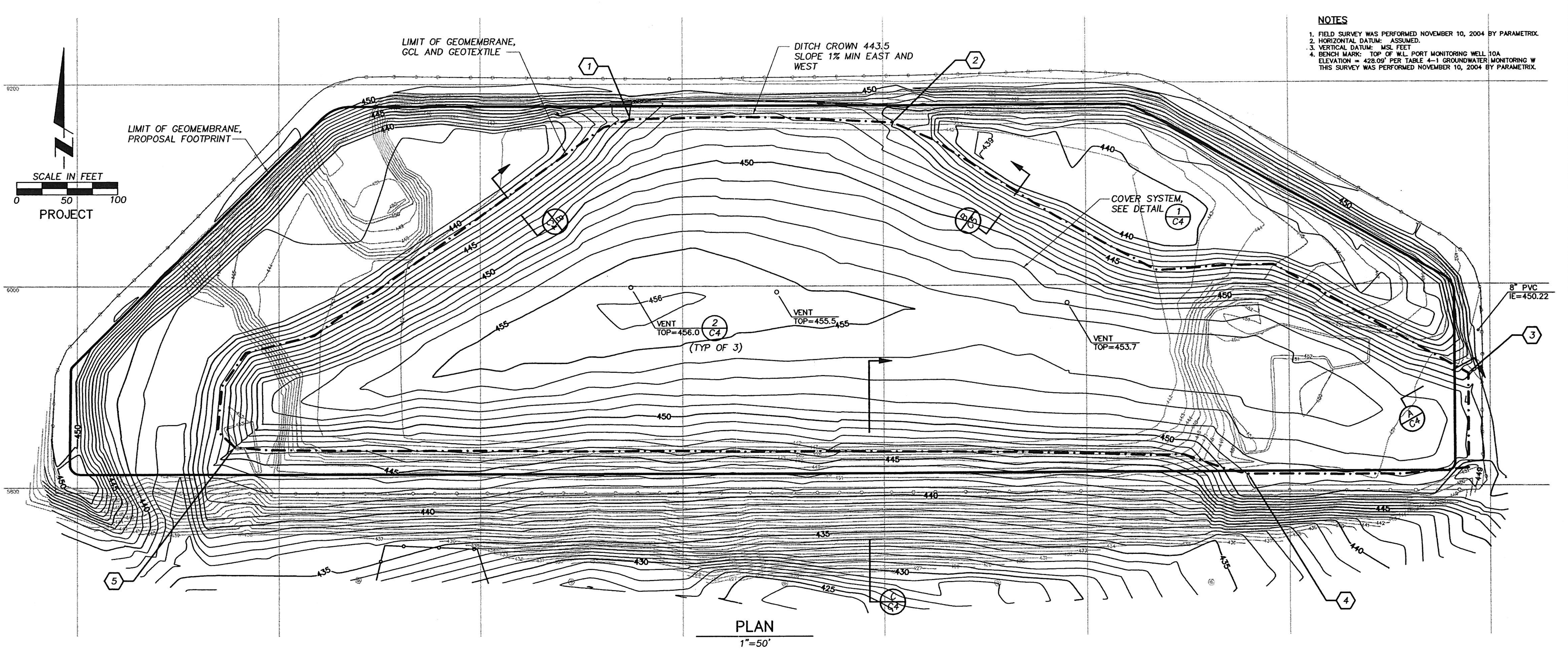
GOLDEN NORTHWEST ALUMINUM, INC.
WEST SURFACE IMPOUNDMENT CLOSURE
GOLDENDALE, WASHINGTON

EXISTING FILTER CAKE/SLUDGE CONTOURS AND ORIGINAL LINER CONTOURS

DRAWING NO.
2 OF 4
C2



PLAN

1"=50'

NOTES

1. FIELD SURVEY WAS PERFORMED NOVEMBER 10, 2004 BY PARAMETRIX.
2. HORIZONTAL DATUM: ASSUMED.
3. VERTICAL DATUM: MSL FEET
4. BENCH MARK: TOP OF W.L. PORT MONITORING WELL 10A ELEVATION = 428.09' PER TABLE 4-1 GROUNDWATER MONITORING W THIS SURVEY WAS PERFORMED NOVEMBER 10, 2004 BY PARAMETRIX.

NOTES:

1. SEE AFTER PHOTOGRAPH ON C1 FOR WHAT THE SITE VISUALLY LOOKED LIKE AFTER CONSTRUCTION WAS COMPLETED.

GEOMEMBRANE	ACRES
PROPOSAL FOOTPRINT FINAL FOOTPRINT	10.05 6.53
DIFFERENCE	3.52

RICHARD A. BURKHALTER
10477

EXPIRES 06/17/ 2006

REVISED TO CONFORM WITH CONSTRUCTION RECORDS

BY: G. NICOLL DATE: NOV 2004

△	REVISIONS	DATE	BY	
				DESIGNED G. ARNDT
				DRAWN J. TORR
				CADD CHECKED
				CHECKED S. EMGE
				APPROVED

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

FILE NAME SU3244005P01T03-C06

JOB No. 215-3244-005

DATE SEPTEMBER 2004

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PROJECT NAME

GOLDEN NORTHWEST ALUMINUM, INC.
WEST SURFACE IMPOUNDMENT CLOSURE

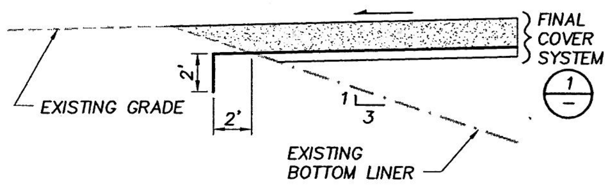
GOLDENDALE, WASHINGTON

FINAL
GRADING PLAN

DRAWING NO.
3 OF 4

C3

DATE: 11/11/04 2:47pm IMAGES: XREF'S: XS3244005P01T03-TB | XS3244801P01T01-BA | XS3244801P01T01-BA_ASBUILT |



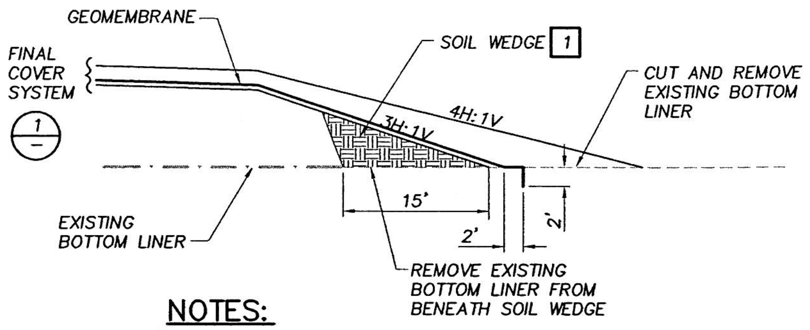
BETWEEN POINTS ⟨3⟩ AND ⟨4⟩, ⟨1⟩ AND ⟨2⟩

COVER SYSTEM TERMINATION

EAST EDGE

SECTION A / C3

NO SCALE



NOTES:

1 SOIL WEDGE TO BE EMBANKMENT FROM THE COURSE BORROW PIT.

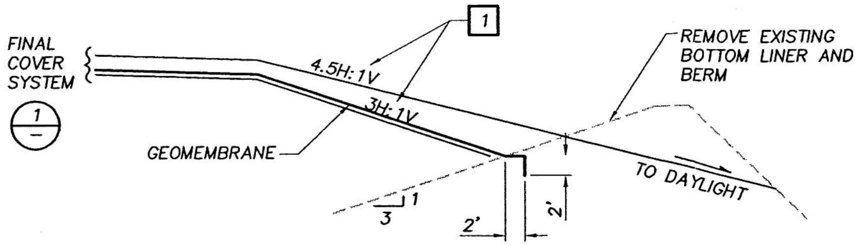
BETWEEN POINTS ⟨5⟩ AND ⟨1⟩, ⟨2⟩ AND ⟨3⟩

COVER SYSTEM TERMINATION

NORTH AND WEST EDGES

SECTION B / C3

NO SCALE



NOTES:

1 SLOPE VARIES BUT IS NEVER STEEPER THAN THE SLOPE INDICATED.

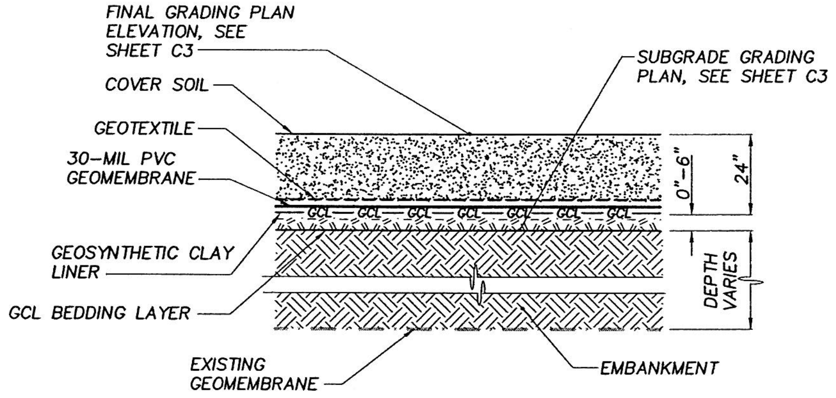
BETWEEN POINTS ⟨4⟩ AND ⟨5⟩

COVER SYSTEM TERMINATION

SOUTH EDGE

SECTION C / C3

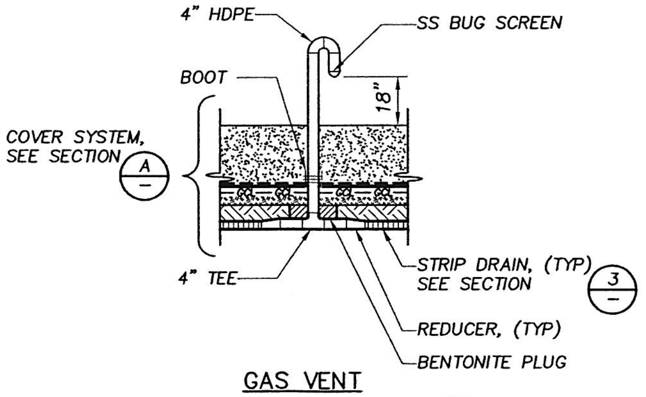
NO SCALE



COVER SYSTEM

DETAIL 1 / C2,C3

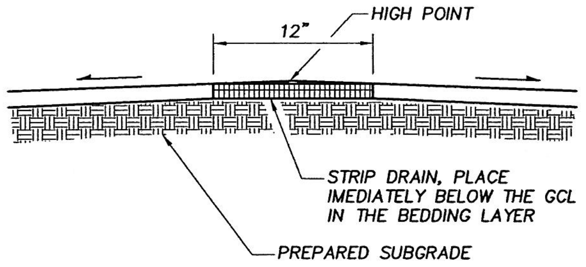
NO SCALE



GAS VENT

DETAIL 2 / C3

NO SCALE



GAS COLLECTION PIPE

DETAIL 3 / C3

NO SCALE

RICHARD A. BURKHALTER

EXPIRES 06/17/2006

REVISED TO CONFORM WITH CONSTRUCTION RECORDS

BY: G. NICOLL DATE: NOV 2004

△	REVISIONS	DATE	BY	
				DESIGNED G. ARNDT
				DRAWN B. HOLT
				CADD CHECKED
				CHECKED S. EMGE
				APPROVED

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FILE NAME SU3244005P01T03-C03

JOB No. 215-3244-005

DATE SEPTEMBER 2004

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PROJECT NAME

GOLDEN NORTHWEST ALUMINUM, INC.
WEST SURFACE IMPOUNDMENT CLOSURE

GOLDENDALE, WASHINGTON

SECTIONS AND DETAILS

DRAWING NO. 4 OF 4

C4

DATE: 11/12/04 09:18am IMAGES: XREF'S: XS3244005P01T03-TB |

APPENDIX A-4

SWMU #4 – West Surface Impoundment

GeoPro (2014)
2014 Annual Monitoring Report

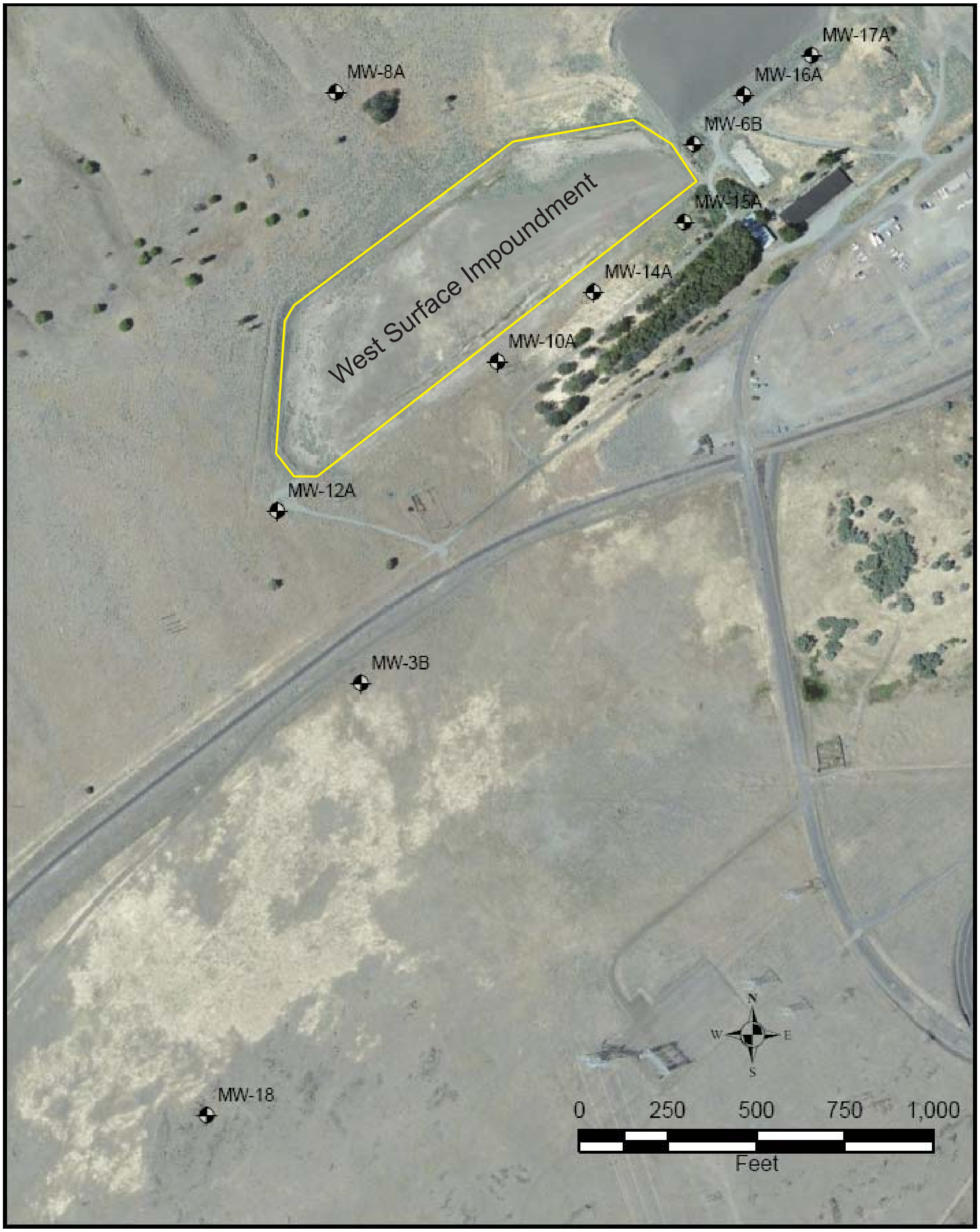


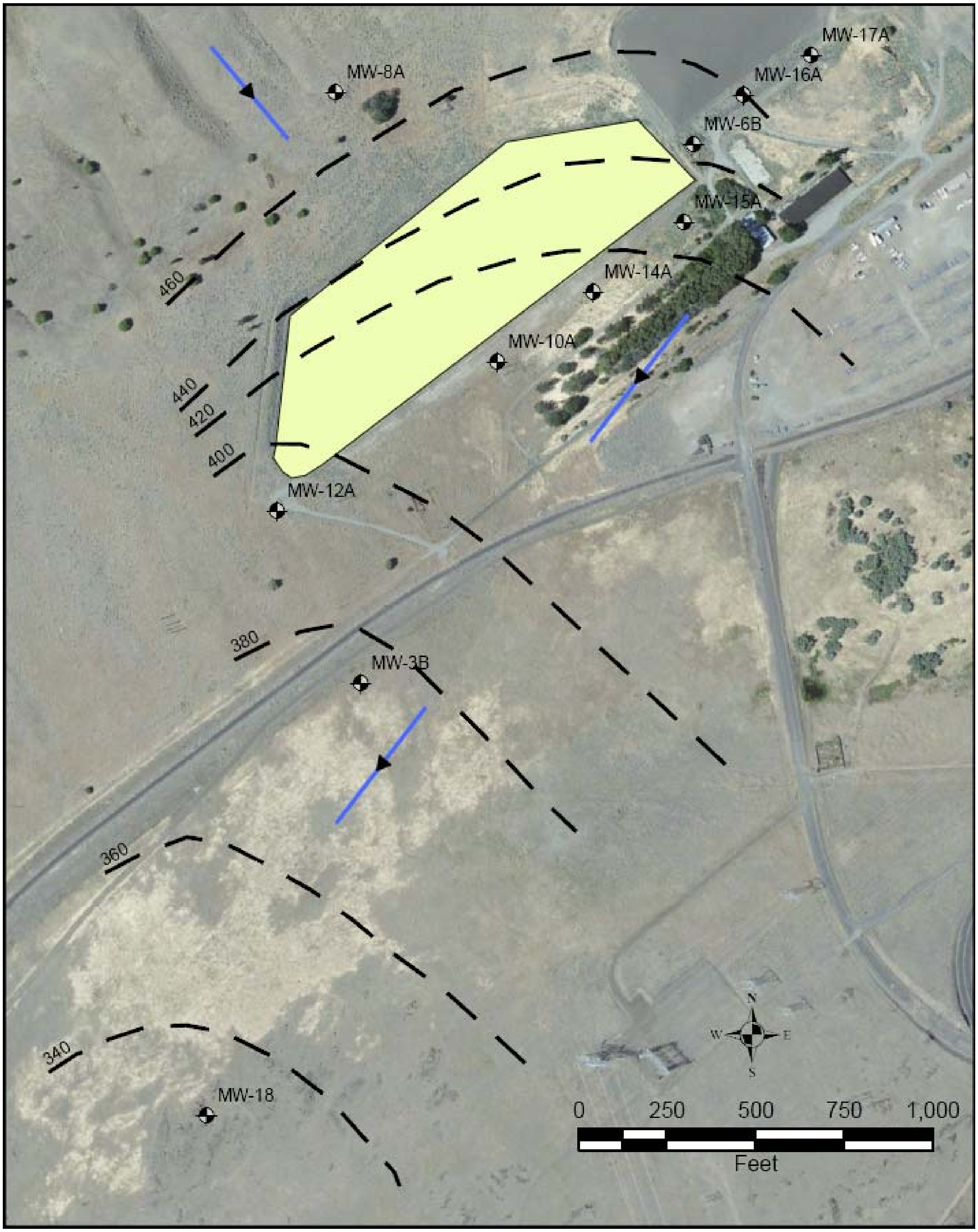
FIGURE 2

WEST SURFACE IMPOUNDMENT GROUNDWATER MONITOR WELLS LOCATION MAP

Columbia Gorge Aluminum Corporation
Former Columbia Gorge Aluminum Smelter
Goldendale, Washington

GeoPro LLC
PO Box 26
Battle Ground, WA 98604

June 2014



contour interval 20 feet
contours in feet MSL

flow direction

FIGURE 3

WEST SURFACE IMPOUNDMENT GROUNDWATER CONTOUR MAP

Columbia Gorge Aluminum Corporation
Former Columbia Gorge Aluminum Smelter
Goldendale, Washington

GeoPro LLC
PO Box 26
Battle Ground, WA 98604

June 2014

Summary Post-Closure Groundwater Sample Analyses (mg/L): page 1 of 2

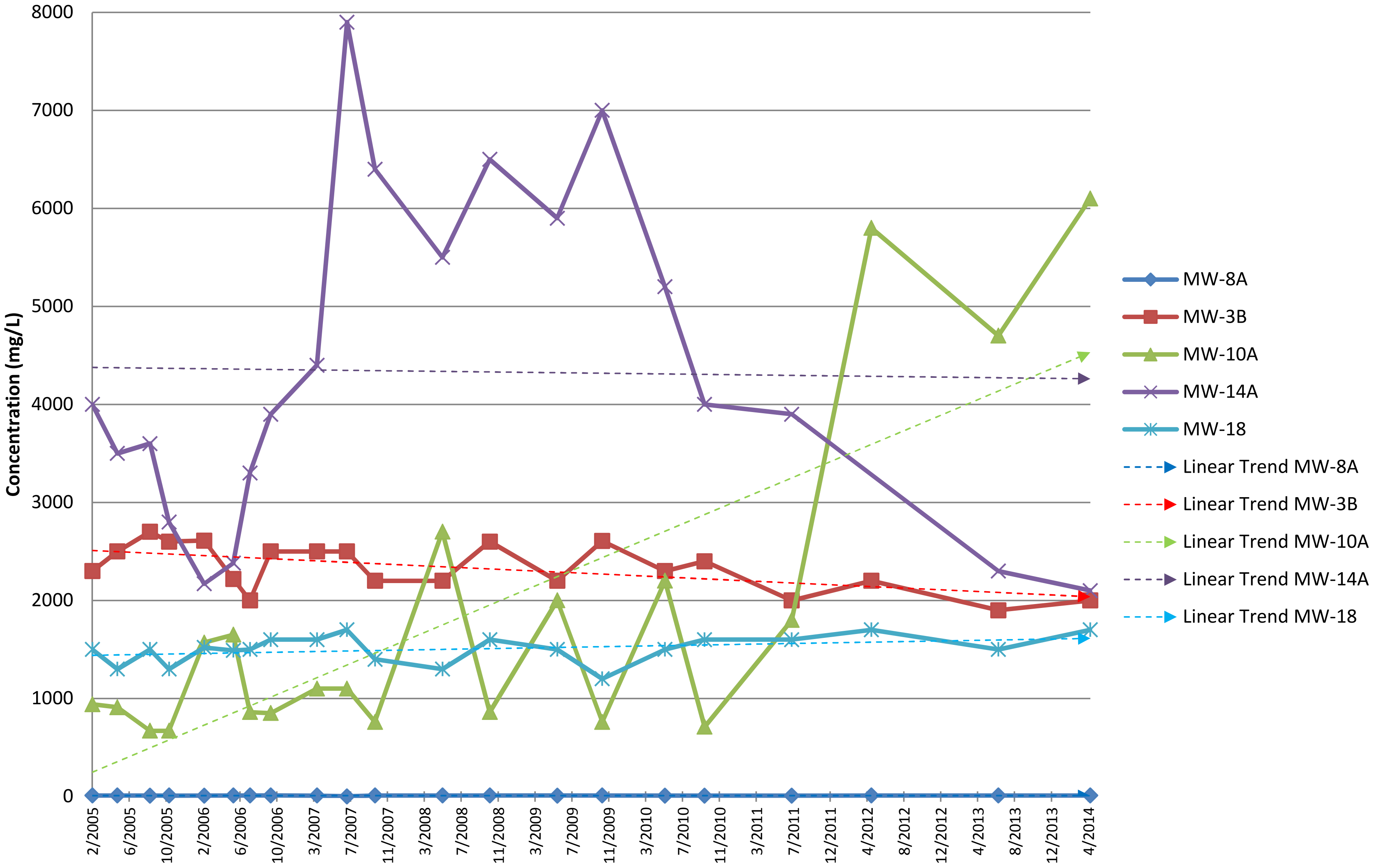
	Upgradient Well MW-8A				**Downgradient Well MW-3B**				**Downgradient Well MW-10A**			
	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)
Lowest Groundwater Protection Standard	250	0.96	250	0.2	250	0.96	250	0.2	250	0.96	250	0.2
Sample Date												
2/16/2005	10	0.9	5.6	<0.01	2300	0.6	130	<0.01	940	1.8	29	0.04
5/11/2005	9.8	0.3	4.6	<0.01	2500	0.4	140	<0.01	910	1.5	31	0.05
8/29/2005	8.9	0.4	4.2	<0.01	2700	0.6	120	<0.01	670	1.2	28	0.04
11/1/2005	9.6	0.9	4.7	<0.01	2600	0.9	130	<0.01	670	2.7	28	0.03
2/27/2006	9.27	2.8	4.2	<0.01	2610	0.7	118	<0.01	1570	2.3	43	0.03
6/5/2006	9.8	0.2	4.9	<0.05	2220	0.2	113	<0.01	1650	3.2	48	0.03
7/31/2006	9.8	0.1	4.6	<0.01	2000	3.7	110	<0.01	860	2.3	35	0.08
10/9/2006	9.7	<0.2	4.5	<0.01	2500	3.8	110	<0.01	850	1.9	30	0.03
3/13/2007	10	<0.1	6.6	<0.01	2500	3.8	110	<0.01	1100	3.4	45	0.04
6/22/2007	1	<10	4.89	<0.01	2500	<10	97	<0.01	1100	<10	36	<0.01
9/24/2007	10	<1	4.2	<0.01	2200	<1	124.79	<0.01	760	1.2	30	0.04
11/14/2007	-	-	-	<0.01	-	-	-	<0.01	-	-	-	0.043
5/8/2008	10	<1	4	<0.01	2200	<50	100	<0.01	2700	<50	100	0.05
10/14/2008	10	0.1	4.5	<0.01	2600	<10	100	<0.01	860	<10	30	0.04
5/29/2009	9	<1	3	<0.02	2200	<1	96	<0.02	2000	2	68	0.03
10/27/2009	10	<1	5.5	<0.02	2606	<1	110	<0.02	760	<1	79	<0.02
5/26/2010	9.3	<1	4.4	<0.02	2300	2.3	120	<0.02	2200	4.4	83	0.032
10/6/2010	8.9	<1	3.6	<0.02	2400	<1	110	<0.02	710	1	23	0.022
7/26/2011	7.8	<1	3.6	<0.02	2000	<1	98	<0.02	1800	3.3	62	0.028
4/19/2012	10	0.18	3.8	<0.005	2200	0.16	90	<0.005	5800	1.9	180	0.007
6/20/2013	9.4	0.16	4.8	<0.005	1900	0.16	91	0.006	4700	3.1	99	0.008
4/25/2014	9.5	0.19	4.9	<0.005	2000	0.18	91	<0.006	6100	2	190	ND<0.005

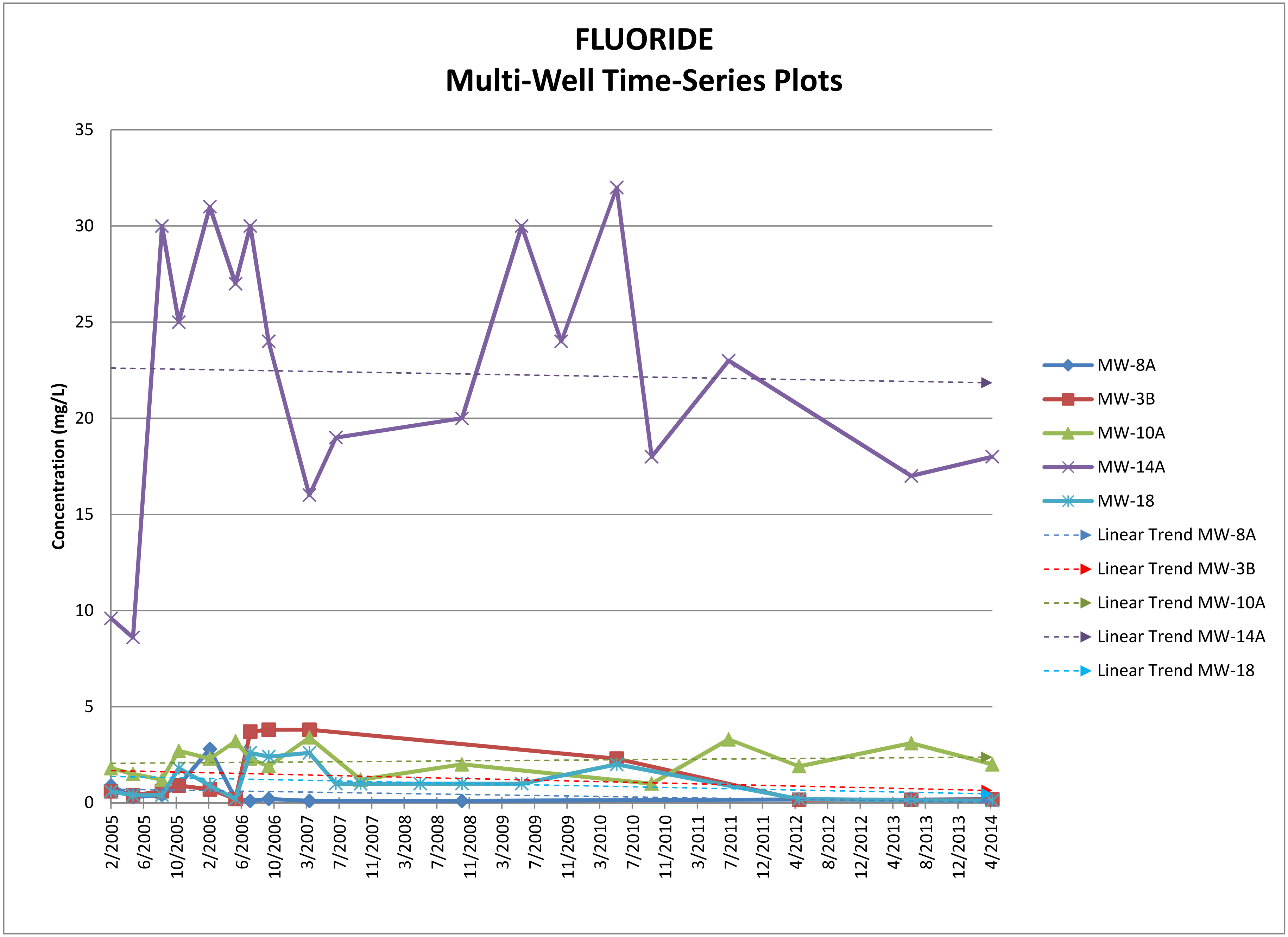
Summary Post-Closure Groundwater Sample Analyses (mg/L): page 2 of 2

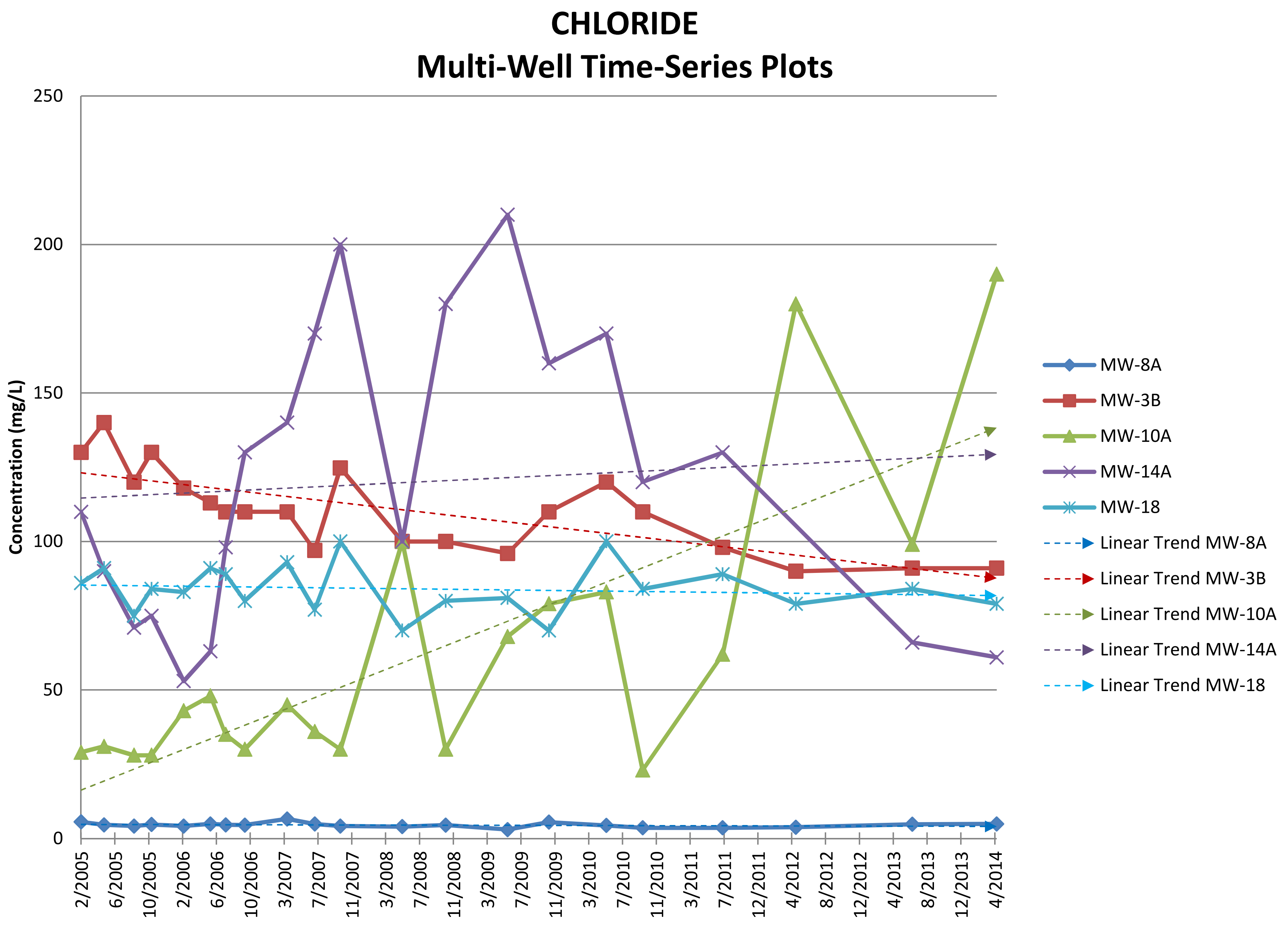
	Downgradient Well MW-12A				Downgradient Well MW-14A				Downgradient Well MW-18			
	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)
Lowest Groundwater Protection Standard	250	0.96	250	0.2	250	0.96	250	0.2	250	0.96	250	0.2
Sample Date												
2/16/2005	Dry	Dry	Dry	Dry	4000	9.6	110	0.35	1500	0.6	86	<0.01
5/11/2005	Dry	Dry	Dry	Dry	3500	8.6	90	0.24	1300	0.4	91	<0.01
8/29/2005	Dry	Dry	Dry	Dry	3600	30	71	0.27	1500	0.4	75	<0.01
11/1/2005	Dry	Dry	Dry	Dry	2800	25	75	0.19	1300	1.8	84	<0.01
2/27/2006	Dry	Dry	Dry	Dry	2170	31	53	0.19	1520	0.9	83	<0.01
6/5/2006	Dry	Dry	Dry	Dry	2380	27	63	0.2	1490	0.2	91	<0.01
7/31/2006	Dry	Dry	Dry	Dry	3300	30	98	0.17	1500	2.6	89	<0.01
10/9/2006	Dry	Dry	Dry	Dry	3900	24	130	0.01	1600	2.4	80	<0.01
3/13/2007	1800	6.3	150	<0.01	4400	16	140	0.12	1600	2.6	93	<0.01
6/22/2007	Dry	Dry	Dry	Dry	7900	19	170	<0.01	1700	<1	77	<0.01
9/24/2007	Dry	Dry	Dry	Dry	6400	<50	200	0.03	1400	<50	100	<0.01
11/14/2007	Dry	Dry	Dry	Dry	-	-	-	<0.01	-	-	-	<0.01
5/8/2008	Dry	Dry	Dry	Dry	5500	<50	100	0.19	1300	<50	70	<0.01
10/14/2008	Dry	Dry	Dry	Dry	6500	20	180	0.12	1600	<1	80	<0.01
5/29/2009	Dry	Dry	Dry	Dry	7000	30	210	0.14	1500	1	81	<0.01
10/27/2009	Dry	Dry	Dry	Dry	5900	24	160	0.044	1200	<1	70	<0.01
5/26/2010	Dry	Dry	Dry	Dry	5200	32	170	0.14	1500	2	100	<0.02
10/6/2010	Dry	Dry	Dry	Dry	4000	18	120	0.086	1600	<1	84	<0.02
7/26/2011	Dry	Dry	Dry	Dry	3900	23	130	0.066	1600	<1	89	<0.02
4/19/2012	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1700	0.2	79	<0.005
6/20/2013	Dry	Dry	Dry	Dry	2300	17	66	0.028	1500	0.13	84	<0.005
4/25/2014	Dry	Dry	Dry	Dry	2100	18	61	0.037	1700	0.12	79	<0.005

Appendix B1
Multi-Well Time-Series Graphs: Sulfate, Fluoride, Chloride, Cyanide

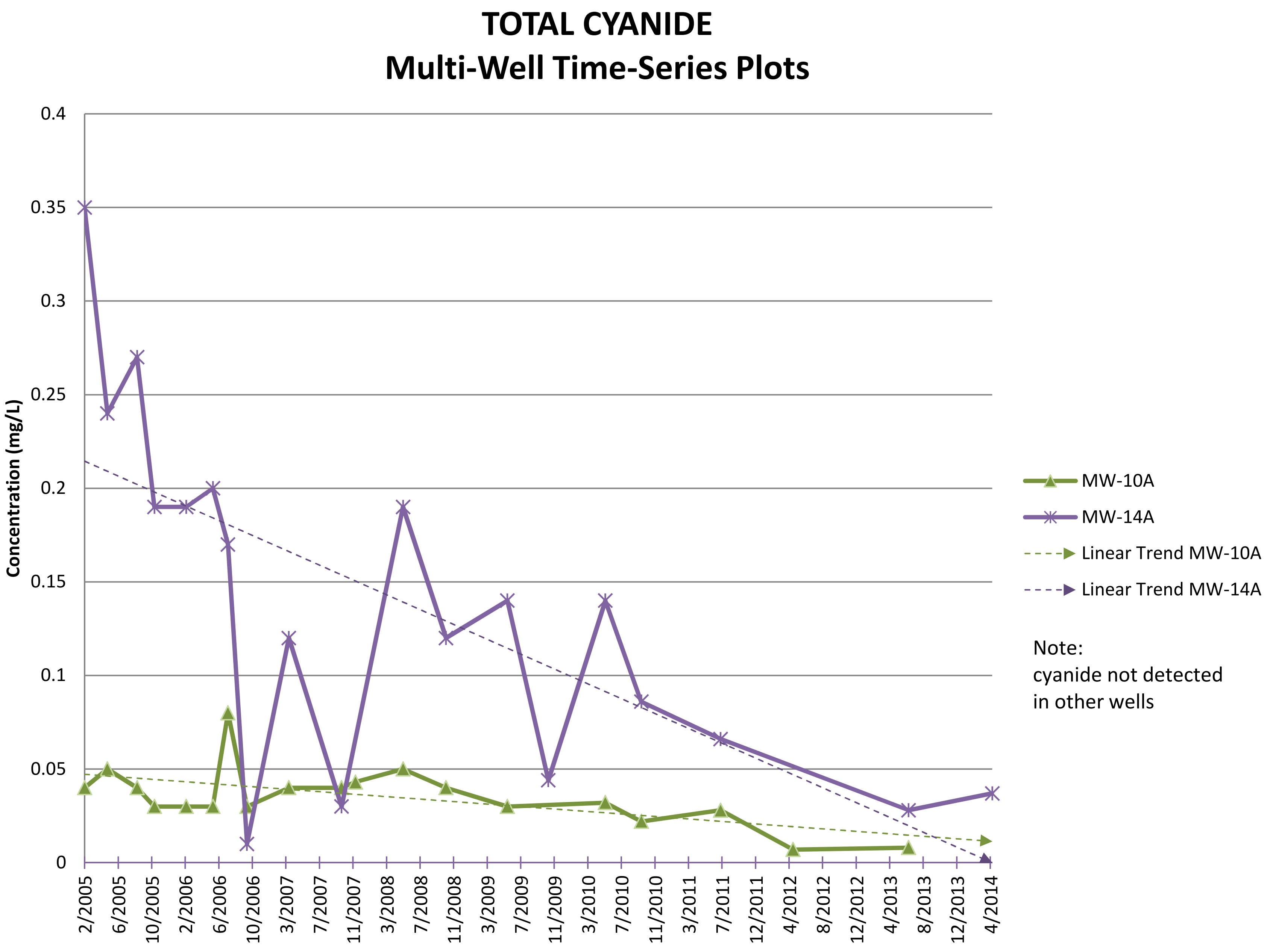
SULFATE
Multi-Well Time-Series Plots




FLUORIDE
Multi-Well Time-Series Plots
Concentration (mg/L)
35
30
25
20
15
10
5
0
2/2005
6/2005
10/2005
2/2006
6/2006
10/2006
3/2007
7/2007
11/2007
3/2008
7/2008
11/2008
3/2009
7/2009
11/2009
3/2010
7/2010
11/2010
3/2011
7/2011
12/2011
4/2012
8/2012
12/2012
4/2013
8/2013
12/2013
4/2014
MW-8A
MW-3B
MW-10A
MW-14A
MW-18
Linear Trend MW-8A
Linear Trend MW-3B
Linear Trend MW-10A
Linear Trend MW-14A
Linear Trend MW-18


CHLORIDE
Multi-Well Time-Series Plots
Concentration (mg/L)
250
200
150
100
50
0
2/2005
6/2005
10/2005
2/2006
6/2006
10/2006
3/2007
7/2007
11/2007
3/2008
7/2008
11/2008
3/2009
7/2009
11/2009
3/2010
7/2010
11/2010
3/2011
7/2011
12/2011
4/2012
8/2012
12/2012
4/2013
8/2013
12/2013
4/2014
MW-8A
MW-3B
MW-10A
MW-14A
MW-18
Linear Trend MW-8A
Linear Trend MW-3B
Linear Trend MW-10A
Linear Trend MW-14A
Linear Trend MW-18

TOTAL CYANIDE
Multi-Well Time-Series Plots



Note:
cyanide not detected
in other wells

Appendix B2
Summary of Results - Mann-Kendall Test for Trend

SUMMARY MANN-KENDALL TEST FOR TREND RESULTS

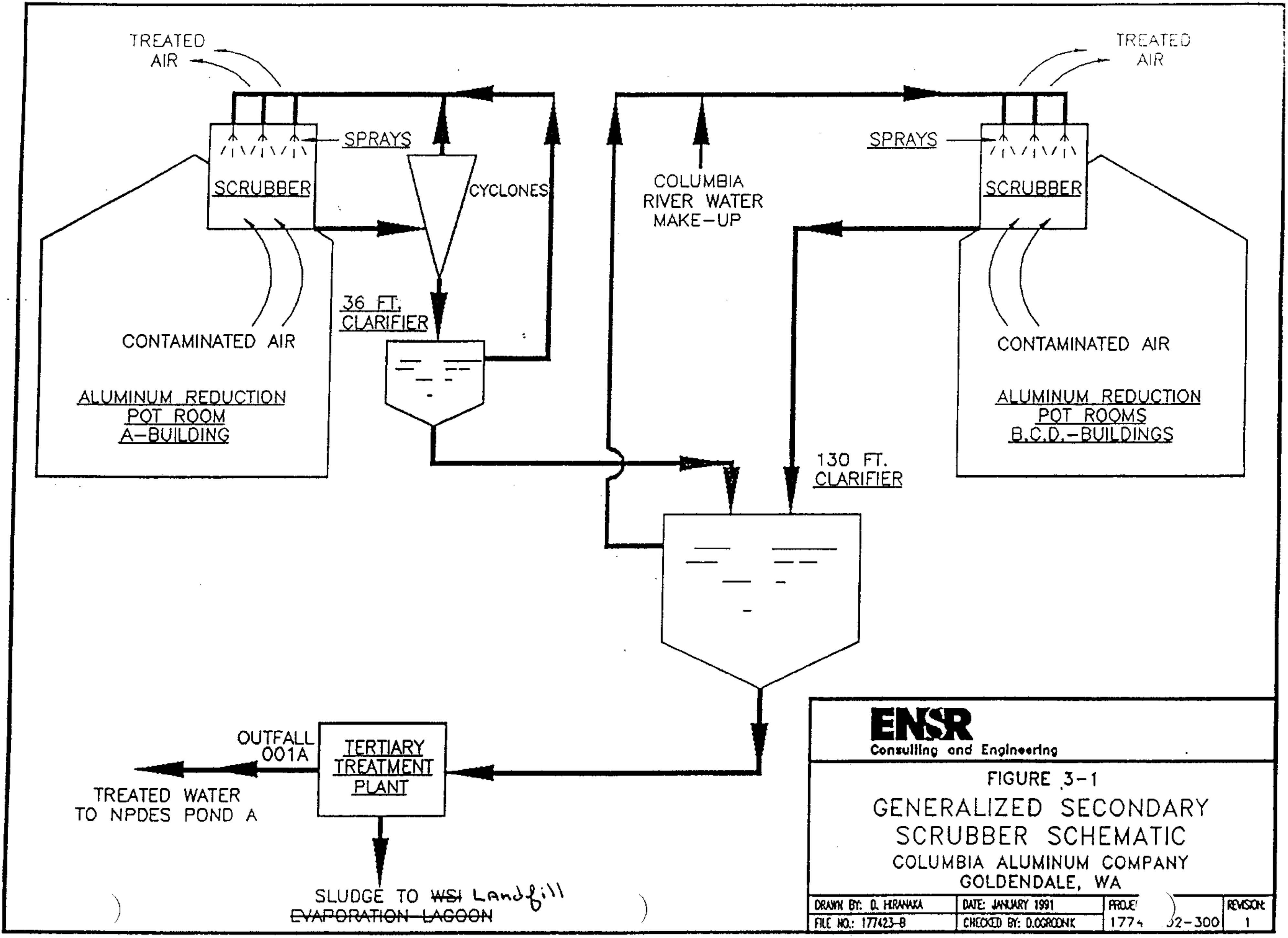
Well ID	Analyte	n	S	Variance	Z	Probability	Trend
MW-3B	**Sulfate**	21	-81	**1074**	**2.441**	**0.008**	Significantly Negative
	Fluoride	21	-40	1076	1.189	0.121	Negative
	Chloride	21	-130	**1076**	**3.933**	**0.000**	Significantly Negative
	Cyanide	22	13	904	0.399	0.369	Positive
MW-8A	Sulfate	21	-13	1048	0.371	0.371	Negative
	Fluoride	21	-29	1048	0.865	0.21	Negative
	Chloride	21	-43	1089	1.273	0.109	Negative
	Cyanide	22	0	968	-0.032	0.5	Neutral
MW-10A	**Sulfate**	21	78	**1093**	**2.329**	**0.009**	Significantly Positive
	Fluoride	21	17	1092	0.484	0.327	Positive
	Chloride	21	102	**1092**	**3.056**	**0.001**	Significantly Positive
	Cyanide	22	-98	**1224**	**2.773**	**0.00384**	Significantly Negative
MW-12A	Sulfate	1	-	-	-	-	-
	Fluoride	1	-	-	-	-	-
	Chloride	1	-	-	-	-	-
	Cyanide	1	-	-	-	-	-
MW-14A	Sulfate	20	16	948	0.016	0.119	Positive
	Fluoride	20	-18	941	0.552	0.293	Negative
	Chloride	20	36	948	1.137	0.13	Positive
	Cyanide	21	-102	**1090**	**3.059**	**0.001**	Significantly Negative
MW-18	**Sulfate**	21	61	**1045**	**1.856**	**0.037**	Significantly Positive
	Fluoride	21	-42	1076	1.250	0.109	Negative
	Chloride	21	-32	1087	0.940	0.265	Negative
	Cyanide	22	-9	757	0.291	0.219	Negative

Notes:
n = Sample size
S = Mann-Kendall test statistic; calculated based on S and the estimated variance when the sample size
Variance = Standard Deviation of S Squared
Z = Approximate normal test statistic; calculated based on S and the estimated variance when the
Probability from Table A.21 [Hollander and Wolfe (1973)]
Trends significant at alpha = 0.05 or less are shown in bold type

APPENDIX A-5

SWMU #5 – Line A Secondary Scrubber Recycle Station

Goldendale Aluminum Company (2002a)
O&M Manual for Secondary Roof Scrubbers



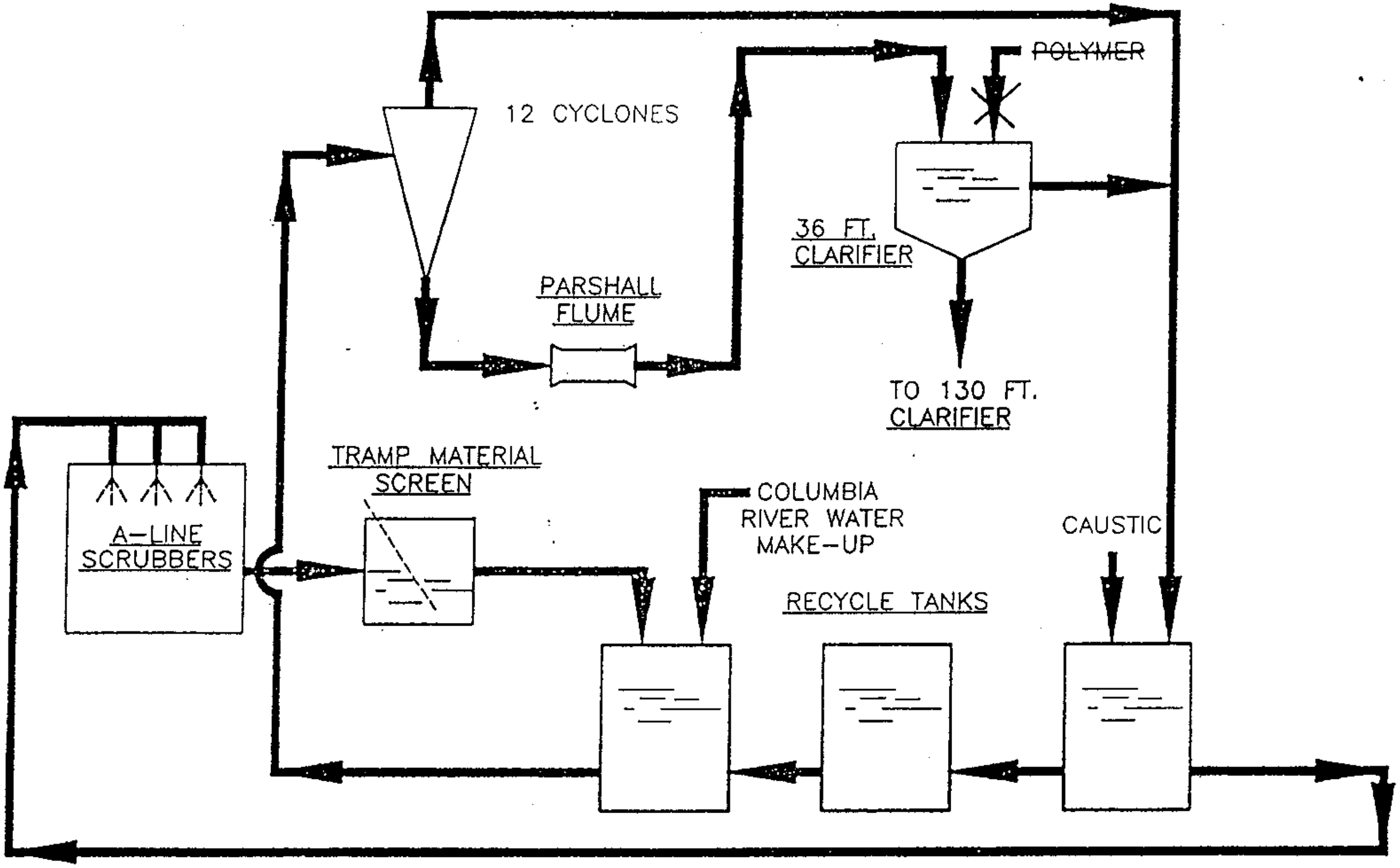
ENSR
Consulting and Engineering

FIGURE 3-1

GENERALIZED SECONDARY SCRUBBER SCHEMATIC

COLUMBIA ALUMINUM COMPANY
GOLDENDALE, WA

DRAWN BY: D. HIRANAKA	DATE: JANUARY 1991	PROJE	REVISION
FILE NO.: 177423-B	CHECKED BY: D.OGRODNIK	1774 [illegible]2-300	1



ENSR
Consulting and Engineering

FIGURE 3-2

SCHEMATIC A-LINE SECONDARY SCRUBBER WATER RECIRC.SYSTEM

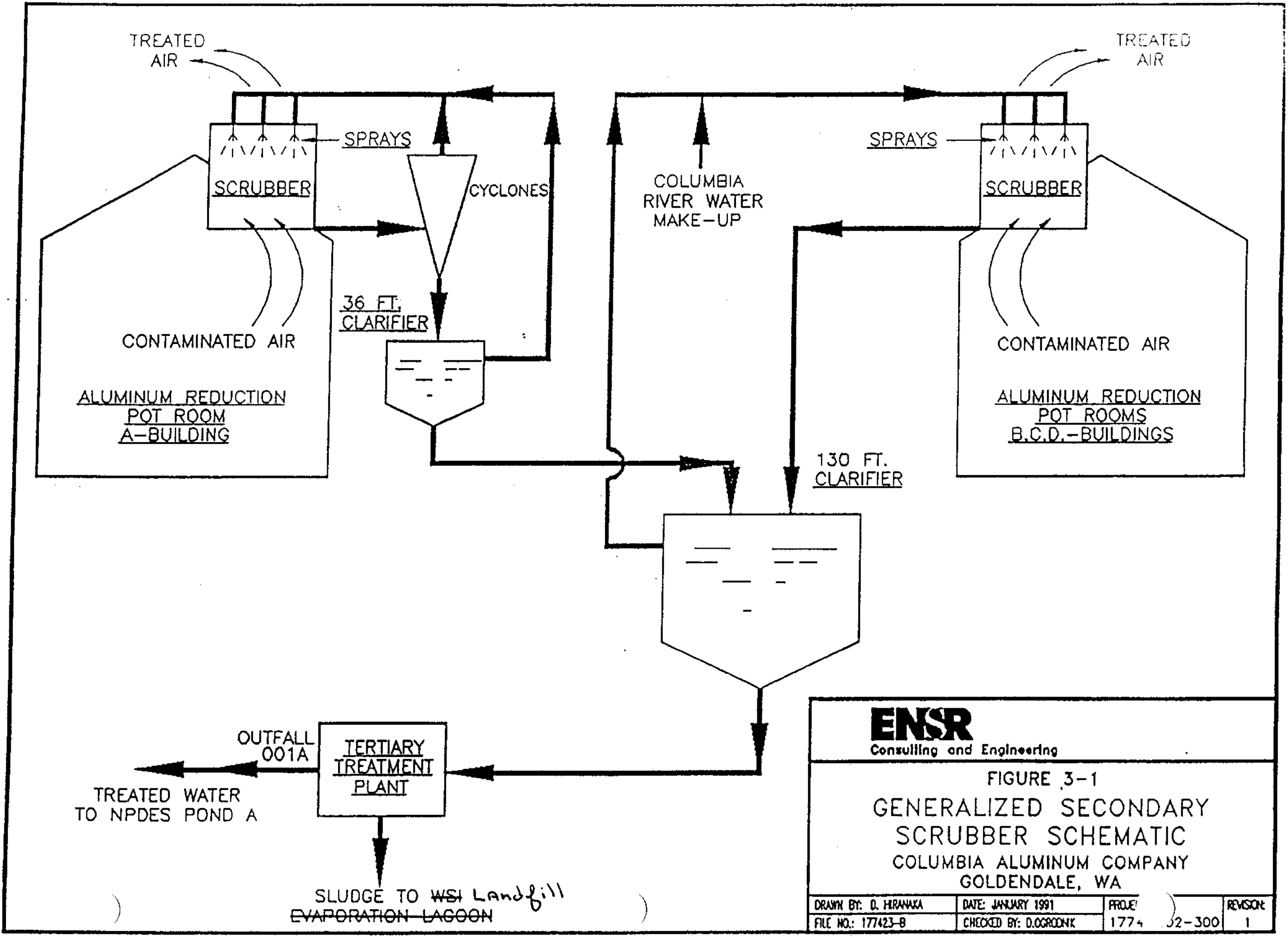
COLUMBIA ALUMINUM COMPANY
GOLDENDALE, WA

DRAWN BY: D. HIRANAKA	DATE: JANUARY 1991	PROJECT NO.: 1774-002-[illegible]	REVISION: 1
FILE NO.: 177423-C	CHECKED BY: D.OGRODNIK		

APPENDIX A-6

SWMU #6 – Line B, C, D Secondary Scrubber Recycle Stations

Goldendale Aluminum Company (2002a)
O&M Manual for Secondary Roof Scrubbers



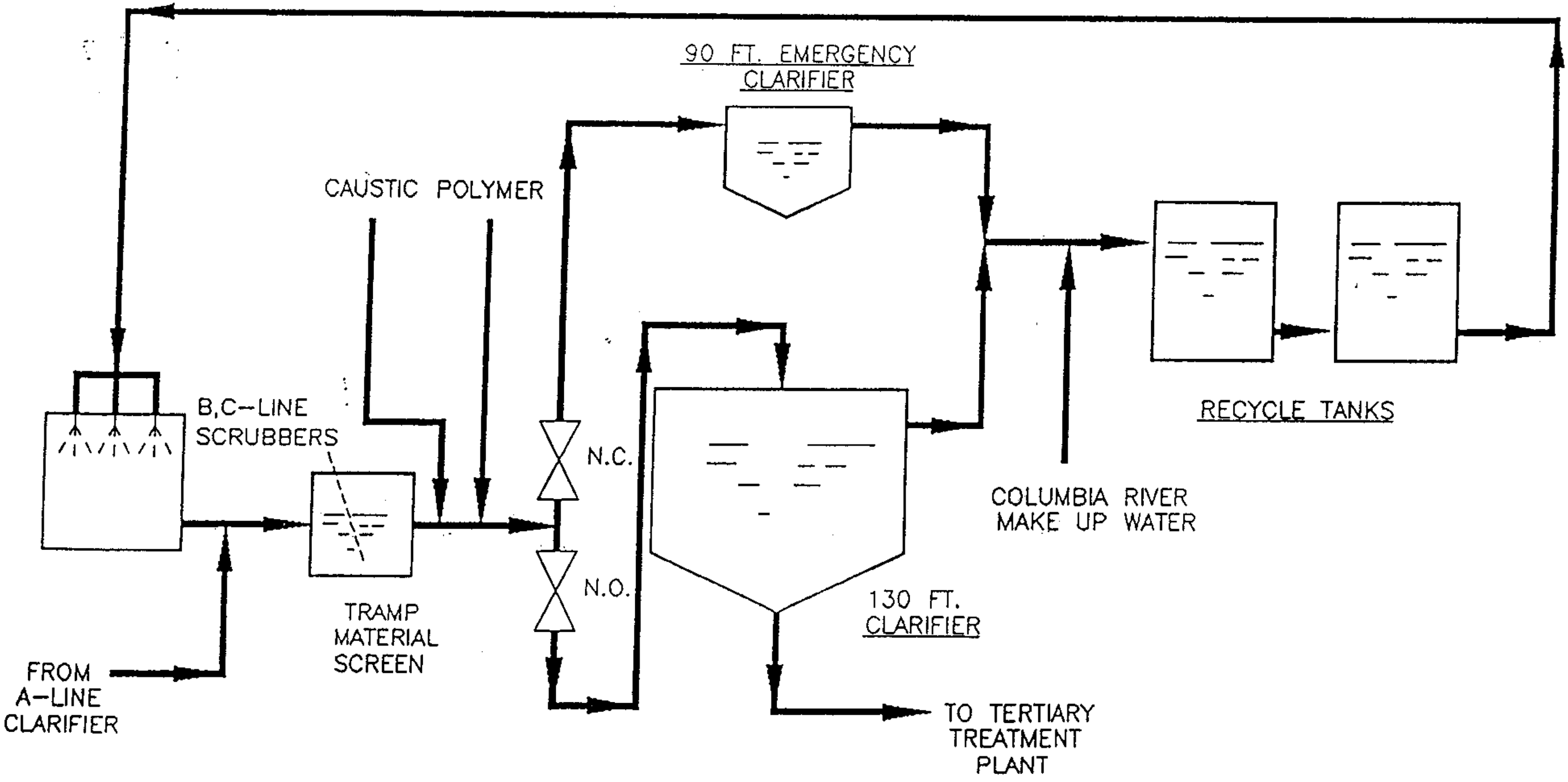
ENSR
Consulting and Engineering

FIGURE 3-1

GENERALIZED SECONDARY SCRUBBER SCHEMATIC

COLUMBIA ALUMINUM COMPANY
GOLDENDALE, WA

DRAWN BY: D. HIRANAKA	DATE: JANUARY 1991	PROJE	REVISION:
FILE NO.: 177423-B	CHECKED BY: D.OGROONK	1774 [illegible]2-300	1



N.O. – NORMALLY OPEN
N.C. – NORMALLY CLOSED

ENSR
Consulting and Engineering

FIGURE 3-3

B,C-LINE SECONDARY SCRUBBER WATER RECIRC. SYSTEM

COLUMBIA ALUMINUM COMPANY
GOLDENDALE, WA

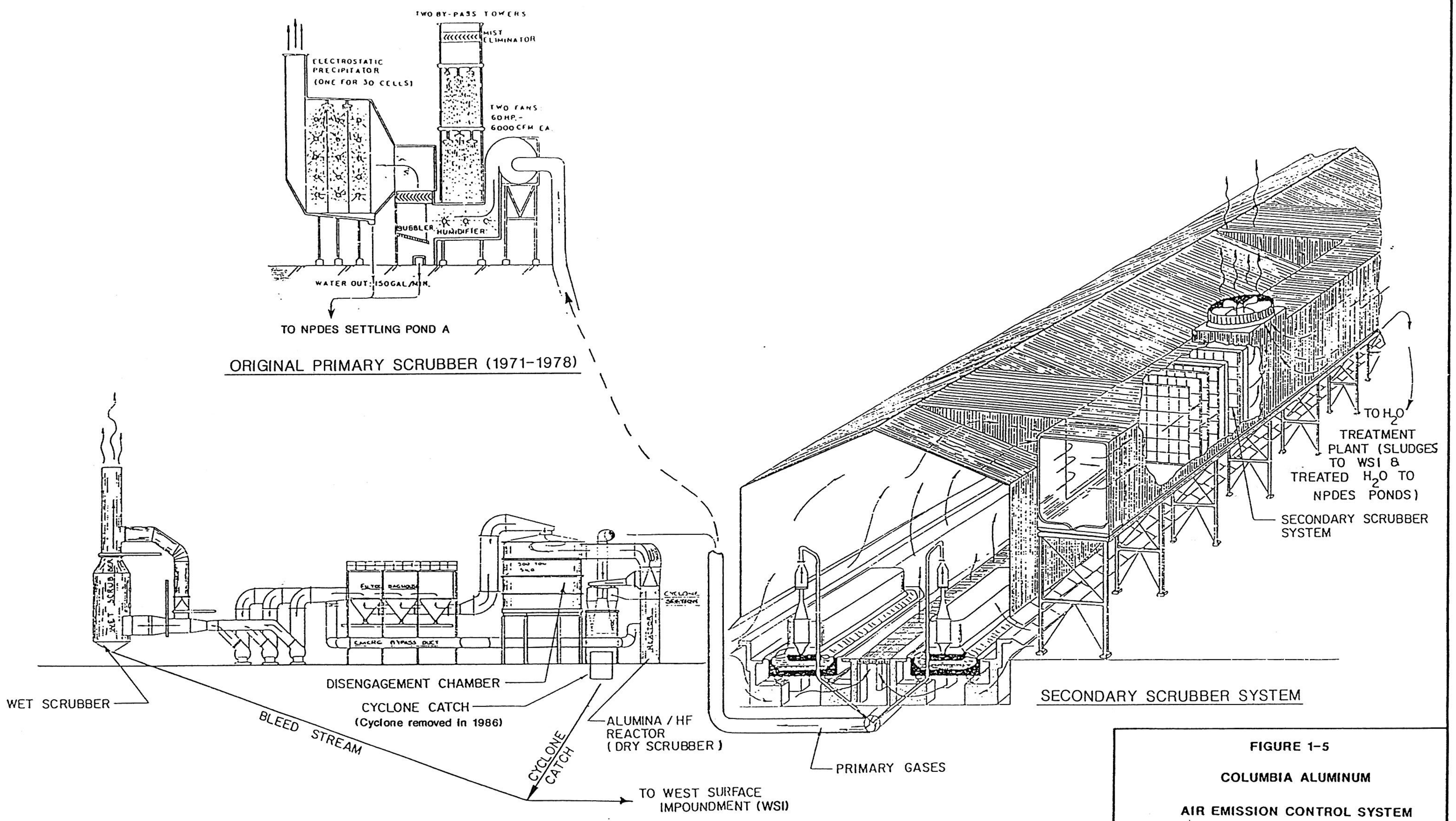
DRAWN BY: D. HIRANAKA	DATE: JANUARY 1991	PROJEC 1774 -300	REVISION: 1
FILE NO.: 177423-D	CHECKED BY: D.OOROONK		

APPENDIX A-7

SWMU #7 – Decommissioned Air Pollution Control Equipment

ENSR (1991)

Air Emission Control Figure RCRA Part B Permit Application



ORIGINAL PRIMARY SCRUBBER (1971-1978)

SECONDARY SCRUBBER SYSTEM

CURRENT PRIMARY SCRUBBER SYSTEM (1978 to present)

SOURCE: CENTURY WEST ENGINEERING DRAWING NO. 6001400305 (2/86)

FIGURE 1-5

COLUMBIA ALUMINUM

AIR EMISSION CONTROL SYSTEM

ENSR
Consulting and Engineering

JOB NO: 1774-001
DATE: 5-4-90

APPENDIX A-7

SWMU #7 – Decommissioned Air Pollution Control Equipment

Ecology (1997a)
Letter Regarding WESP Demolition

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

March 5, 1997

Mr. Wayne Wooster
Environmental Manager
Goldendale Aluminum Company
85 John Day Dam Road
Goldendale, WA 98620-9302

Dear Mr. Wooster:

I am writing to clarify the Department of Ecology's requirements for your wet electrostatic precipitator demolition project (WESP). In a letter dated June 21, 1995 you proposed classifying the entire electrostatic precipitator air emission control system as solid waste. The Department did not formally address your letter, but in subsequent telephone conversations we indicated the we did not agree with the methods that you used to determine that all of the control equipment was solid waste. Since the Department did not formally reply to the letter, the ultimate disposal of the system was not determined in 1995.

You and representatives from Lockheed Martin corporation met with the Industrial Section last April 1996 and discussed the demolition project in general terms. No determination of the exact RCRA status of the old ESP air emission control system was made during that meeting except that the Department was willing to break the system down into individual units and classify where each of those units could be disposed. The sludges found in the interior of some of the individual components of the system designate as state dangerous waste due to high levels of PAHs. Data presented at the meeting indicated that only one of the components of the system, the WESPs, had large amounts of sludge and scale that was consistently above the 1% PAH state DW designation level.

In telephone discussions earlier this month you indicated that Goldendale Aluminum was taking over as the lead operator for the project and that Goldendale Aluminum would like to proceed with the cleanup this spring. You proposed to divide the electrostatic precipitators units into three specific components: the concrete bubblers, the redwood towers, and the interior and exterior surfaces of the electrostatic precipitators. The cleanup proposal centered around using physical removal as a cleanup method and scraping off any thick accumulations of PAH residue that was found on the equipment. The PAH residue would be manifested and sent to a DW landfill. The remaining air pollution control equipment, the bubblers, redwood towers and WESP contactors would be sent to a solid waste landfill.

I have talked with Jack Boller of the EPA Washington Operations Office and other members of the Industrial Section staff concerning the proposed project. All of the individuals that I contacted indicated that recycle of the metal portions of the precipitators was the preferred cleanup option rather than landfilling and that the guidelines set up in the hazardous debris rule could be used as a standard to work from concerning the determination of what is clean and what decontamination methods were practical for solid debris. All of the individuals thought that the debris rule could be used as guidance, even though the debris rule only applies directly to federal hazardous waste that has land disposal restrictions placed on it. With that in mind, the Department will approve the removal of the wet scrubber system from the smelter. The Department agrees that the concrete bubblers and redwood towers are solid waste. The WESP units have high levels of PAHs deposited as scale on their interior surfaces. The Department will require that these units be disposed of in one of three ways. The units can: 1) be transported to a dangerous waste landfill without any decontamination efforts, 2) be scraped clean using the physical extraction standards set forth in the hazardous debris rule found in Federal Register Vol. 57, No. 160 Tuesday, August 18, 1992. The clean units can then be landfilled in a solid waste landfill and the PAH scale must be treated as dangerous waste, or 3) be recycled as feed stock for a steel furnace after being scraped clean using a visual standard. Under option 2, the metal object residual surface area criterion of the rule can be changed from 5% of the surface area to 10% and under option 3, the units must be scraped clean enough so that PAH scale will not flake off during transportation to the recycler.

I hope this answers all of your questions concerning the demolition of the wet electrostatic precipitators found at Goldendale Aluminum. If you have any questions please call me (360 407-6949).

Sincerely,

Paul Skyllingstad

Paul Skyllingstad
Industrial Section

PES:

cc: Muhsun "Mac" Seyhanli - Goldendale Aluminum
E. Oie - WDOE
R. King - WDOE

APPENDIX A-8

SWMU #8 – Tertiary Treatment Plant

Goldendale Aluminum Company (2002a)
O&M Manual Description of Tertiary Treatment Plant

scrubbers. The solids slurry clarifier underflow from the 36-foot diameter clarifier (about 40 gpm) is pumped to the 130-foot diameter lines 2 and 3 clarifier. Make-up water from the Columbia River is added to the recycle pump tank to replace losses from evaporation and blowdown (i.e. solids slurry pumped to 130 foot clarifier).

3.2 Lines 2 and 3 Scrubber Water Recirculation System

Scrubber water from lines 2 and 3 are treated and recirculated by the B room, C room and D room recirculation systems. This system consists of a large 130-foot clarifier for solids removal. The line 2 and 3 systems are located just East of D-Room. A flow schematic of the system is shown in Figure 3-3.

4.0 WATER TREATMENT PLANT PROCESS DESCRIPTION

The Water Treatment Plant (WTP) is designed to treat the combined blowdown, from the two roof scrubber water recycle systems and two wet S02 scrubbers, to remove fluoride and meet WTP NPDES permit effluent limitations for total suspended solids (TSS) and benzo(a)pyrene (B(a)P). The treatment process consists of precipitation of fluoride as calcium fluoride, flocculation to increase TSS settling rates, clarification to remove TSS, and deep bed filtration to remove residual TSS prior to discharge to internal outfall 001A. A schematic flow diagram of the WTP is provided with the reference drawings found in the last section of this manual.

The WTP is designed to treat up to 150 gpm of combined scrubber (roof scrubbers and wet SO2 scrubbers) water blowdown. Blowdown from the roof scrubber water recycle systems is necessary to: 1) dispose of solids (primarily alumina) collected in the clarifiers; and 2) to control dissolved solids (primarily fluoride) to prevent excessive calcium fluoride scale formation. Blowdown from the line 1 system is pumped with two variable capacity pumps (one operating, one spare) from the bottom of the 36 foot diameter clarifier to the line 2 and 3 130-foot diameter clarifier at a normal rate of 40 gpm. The 40 gpm blowdown is sufficient to control solids accumulations in the 36-foot diameter clarifier and maintain acceptable dissolved solids concentrations. This blowdown rate is normally held constant. Blowdown from lines 2 and 3 is pumped with two variable capacity pumps (one operating, one spare) from the bottom of the 130-foot clarifier to the WTP at a rate up to 150 gpm.

Blowdown from the wet SO2 scrubbers is pumped to the 90' clarifier with two pumps (one operating, one spare at each wet SO2 scrubber). The 90' clarifier acts not as a clarifier but as a storage and equalization basin for the blowdown received from the two SO2 scrubbers prior to treatment in the WTP.

The blowdown rate from each clarifier, 90' and 130', is evaluated daily based on solids accumulation in the 130-foot diameter clarifier, fluoride concentrations in the recirculated roof scrubber water and fluoride concentration and level in the 90' clarifier.

The blowdown from each clarifier is directed independently into the WTP where they are mixed in the chemical reaction tank.

The chemical reaction tank is 6 feet in diameter and continuously mixed with a turbine mixer. Caustic is metered into the reaction tank, as needed, to control pH. A 36 percent solution of calcium chloride is metered into the combined blowdown to precipitate fluoride as calcium fluoride. The calcium chloride is fed with variable capacity metering pumps. The plant operator manually adjusts the calcium chloride feed rate based on fluoride and calcium concentrations in the reaction tank, the reaction clarifier and fluoride in the WTP effluent. A fluoride ion selective electrode continuously monitors the dissolved fluoride content in the plant effluent. To enhance process stability, these monitors are set to automatically alarm at a fluoride concentration of 40 ppm and shutdown the system at 50 ppm.

Effluent from the reaction tank flows by gravity to the reactor clarifier. A solution of high molecular weight organic polymer is metered into the reaction clarifier inlet chamber and mixed with a slow speed turbine mixer to promote flocculation of solids. The suspended solids are removed in the clarifier by a combination of settling and filtration. The flocculated waste exits the reaction chamber near the bottom of the clarifier. Clarifier effluent turbidity and sludge blanket depth are monitored to assess operating performance. The clarifier effluent turbidimeter is set to automatically alarm at 40 NTU's and shutdown the system at 50 NTU's. The most common causes of high turbidity are high or low sludge blanket level causing TTS carryover or inadequate polymer addition (too high and too low) resulting in poor flocculation. The sludge blanket depth is monitored with inspection ports and periodically checked with a manual sludge blanket probe. In the event the sludge blanket is too high, sludge removal from the bottom of the clarifier is increased. When high turbidity associated with poor flocculation is encountered, the polymer addition rate is increased or decreased as necessary at the manually adjusted metering pumps.

Reactor-clarifier effluent flows by gravity to a surge tank from which it is pumped with two centrifugal pumps (one operating, one spare) through two parallel deep bed filters for removal of any residual suspended solids. The downflow filters have multiple layers of filter media including coarse coal on top and fine sand at the bottom and allow for in-depth filtration and extended filter runs. The filters are operated one at a time. While one filter is in operation, the other is backwashed and placed in a standby ready position. The filter backwash cycles are automated and are initiated by either high-pressure drop or by time, the mode selected by the operator. Columbia River water is used for backwashing. The backwash water is discharged to the lines 2 and 3 secondary scrubber system where it is used as make-up water. The filtered water flows through a monitoring station prior to being discharged at internal outfall 001A. Flow is then by gravity to NPDES Settling Pond A and to final outfall 001. Filtered effluent turbidity is continuously monitored to assess filter operating performance. To prevent permit exceedance, the turbidimeter has set points to automatically alarm and shutdown the WTP system. The most common causes of high filter turbidity are high reactor-clarifier sludge level, excessive filter run times and fouled filter media. The operator monitors filter performance and takes corrective action as necessary to prevent or correct filter problems as they occur.

Reactor clarifier underflow slurry is pumped to either a vacuum drum filter or a filter press for liquid-solids separation. Filtrate from each of these filters is directed back into the reaction clarifier. Filter cake is transported and disposed off-site. The operators adjust the slurry volume pumped from the reaction clarifier and the thickener tank to remove solids at the rate they accumulate.

A WTP effluent monitoring station contains the following instrumentation and samplers:

- pH probe
- Flow recorder
- Turbidimeter
- Fluoride probe
- Automatic composite sampler's

The pH probe indicates effluent pH and automatically shuts down the system at pH 8.5to prevent scaling in the WTP.

The flow recorder provides a record of total WTP flow as required to calculate mass loadings at outfall 001A.

The turbidimeter provides a real time indication of effluent TSS levels and overall WTP performance. The operator uses the turbidity measurements to monitor and troubleshoot the system. The turbidimeter automatically alarms at 20 NTU's and shuts the system down at 25 NTU's.

The fluoride probe provides a real time indication of effluent-dissolved fluoride levels and the basis for adjusting the calcium chloride feed rate within effective operating parameters. The fluoride probe calibration is checked by the operator one time per day to assure accuracy. If the probe is not in calibration, the instrument shop is available for repair and replacement.

The automatic sampler collects 24-hour composite samples of WTP effluent for laboratory analysis of TSS, fluoride, and B(a)P as required in the NPDES permit.

5.0 WATER TREATMENT PLANT DISCHARGE LIMITATIONS

The Water Treatment Plant (WTP) has been designed to reduce fluoride and total suspended solids (TSS) concentrations, from the primary and secondary scrubber water blowdown, to meet NPDES permit limitations for regulated parameters. Fluoride is precipitated as calcium fluoride and removed by settling and filtration. The TSS is removed by settling and filtration. B(a)P's are absorbed on the surface of solids and removed when the TSS is removed. The following are the WTP permitted monthly average and daily maximum effluent limitations for TSS, B(a)P's, and the monitoring requirements for fluoride:

a. Suspended Solids:	Monthly Average:	50.0 lbs/day
	Daily Maximum:	100.0 lbs/day
b. Benzo(a)Pyrene (B(a)P	Monthly Average:	0.03 lbs/day
	Daily Maximum:	0.06 lbs/day
c. Fluoride	Monitor Daily	

APPENDIX A-9

SWMU #9 – Paste Plant Recycle Water System

Columbia Aluminum Corporation (1991)
Paste Plant Recycle Water System Schematic and Memo

COLUMBIA
ALUMINUM CORPORATION -- EMPLOYEE OWNED

Interoffice Memo

January 16, 1991

TO: Fred Rufner
Environmental Manager

FROM: Jim Floersch JEF
Sr. Electrical Engineer

SUBJECT: SPILL PREVENTION - PASTE PLANT RECYCLES

Several measures have been taken to prevent spills in the Paste Plant Cooling Water Recycle System. The measures taken fall into 3 categories: controls, alarms, and overflows.

A sketch of the system is attached. Referencing it throughout the following discussion will be useful.

I. CONTROLS

Level probes and electrically controlled valves have been installed to regulate the flow of water to control levels.

A. Sump Pumps

High and low level probes have been mounted in the SUMP to control the sump pumps. When the water level falls below the LOW level probe, the sump pump turns off. When the water level rises and touches the HIGH level probe, the sump pump turns on.

B. Make Up Water Valve

An electrically operated solenoid valve has been inserted into the make up water line. A high and low level probe have been mounted in Tank #2 to control the MAKE UP WATER valve. When the water level in Tank #2 falls below the LOW level probe, the MAKE UP WATER valve turns on. When the water level rises and touches the HIGH level probe, the MAKE UP WATER valve shuts off.

Fresh water must be added to the system occasionally because water is lost to evaporation.

C. Demand Valve
A motor-operated valve (MOV) has been inserted in parallel around an existing manual gate valve. High and low level probes were mounted in the Cooling Tower. When the water level in the Cooling Tower falls below the LOW level probe, then the DEMAND valve opens. When the Demand valve is opened, the flow into the Cooling Tower is high because water flows through both the manual valve and the MOV. When the water level rises and touches the HIGH level probe, the DEMAND valve closes. When the Demand valve is closed, the flow to the Cooling Tower is low because water is flowing through the manual valve only.

II. **ALARMS**

In addition to the 6 control probes discussed above, 4 more probes were installed to sense HI-HI levels. When a HI-HI level is sensed at any one of these locations, an alarm horn sounds at the 4th floor control room and an appropriate device is automatically shut down. An operator responds to the alarm, corrects the problem, and restarts the system. The device that was automatically shut down is prevented from restarting until the alarm condition is cleared and the operator resets the alarm. All automatic actions ultimately result in water being pumped or drained into the sump. This causes the sump area to flood, but the sump is inside the building and can safely contain all water from the tanks and the cooling tower.

A. Sump HI-HI Alarm
One HI-HI probe was mounted in the sump. When the water level in the sump rises to touch the Sump HI-HI probe, the MAKE UP WATER valve is automatically disabled. Usually, when the sump floods, the tanks empty. When the tanks empty, the MAKE UP WATER valve is opened to add more water to the system. But in a Sump HI-HI condition, the system doesn't really need more water. Disabling the MAKE UP WATER valve prevents adding this water unnecessarily.

B. Tank #1 HI-HI Alarm
A second HI-HI probe was mounted in Tank #1. When the water level in Tank #1 rises to touch the HI-HI probe, the sump pump, which feeds water into Tank #1, is automatically shut off. This will cause the tanks to empty and the sump area to fill.

C. Tank #2 HI-HI Alarm
A third HI-HI probe was mounted in Tank #2. When the water level in Tank #2 rises to touch the HI-HI probe, the sump pump is automatically shut off (if a Tank #1 HI-HI alarm hadn't already shut it off) and the MAKE UP WATER valve is disabled. This shuts off all flows into Tank #2. Again, this allows the tanks to empty and causes the sump to fill.

D. Cooling Tower HI-HI Alarm
A fourth HI-HI probe was mounted on the curb of the containment wall that encloses the Cooling Tower. When water spills over the Cooling Tower and rises within the containment area to touch the HI-HI probe, the MAKE UP WATER valve feeding Tank #2 is disabled and the pump feeding the Cooling Tower is automatically shut off. Eventually, this will cause the tanks to fill, make the tank HI-HI probes, and shut off the sump pumps. This shuts off flow into the Cooling Tower and the tanks and causes the sump to fill.

III. **OVERFLOWS**

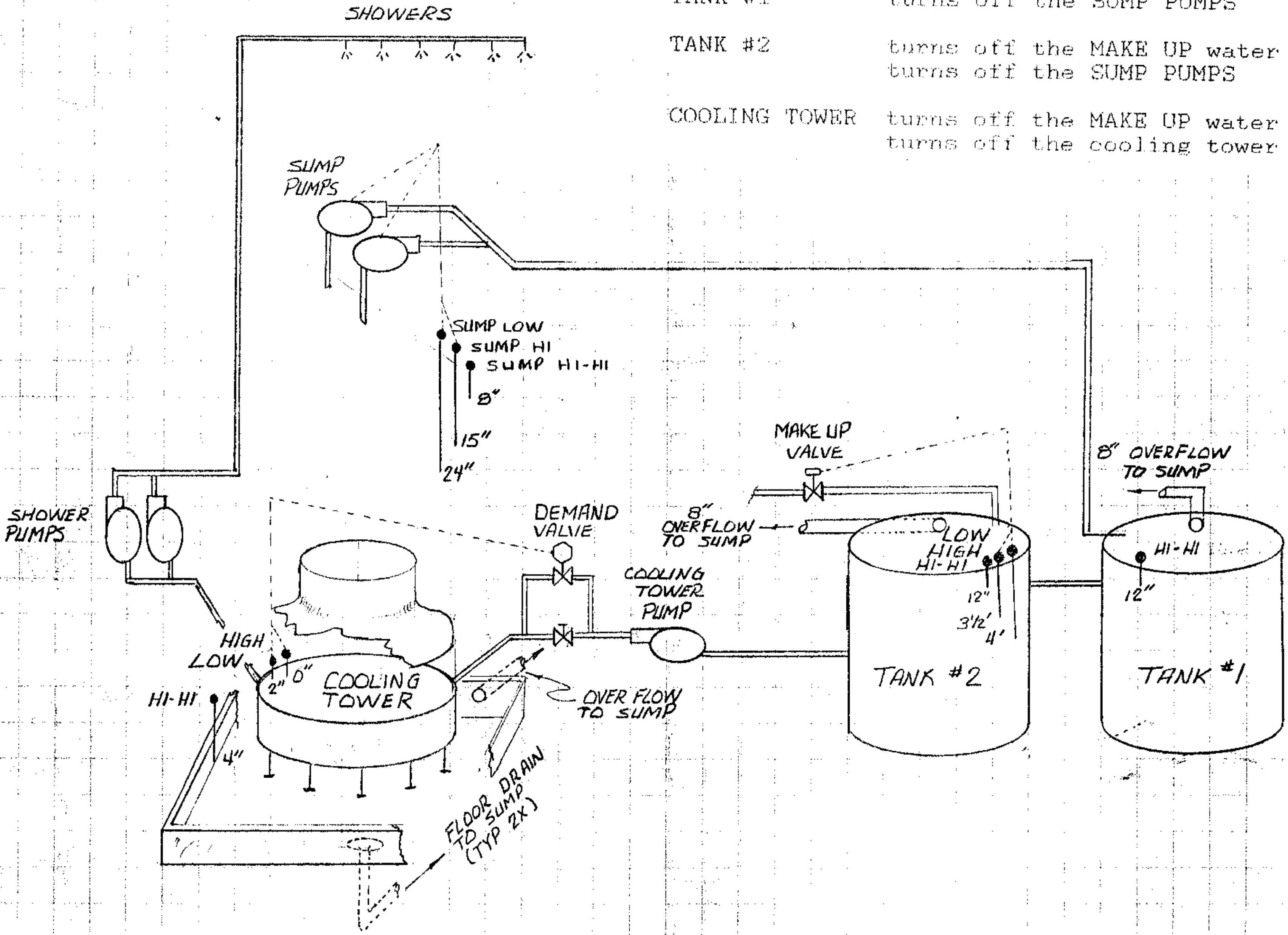
A. Tanks #1 & #2 Overflow pipes
An 8" overflow drain pipe was installed on each of the two tanks and routed back to the sump. The overflow is located above the probe so that as the tank water level rises, the HI-HI probe is touched first and shuts off the pump feeding water into Tank #1. However, if the water continues to rise, the overflow will drain water back to the sump.

B. Cooling Tower Overflow pipe
A 3" overflow drain pipe was installed in the Cooling Tower containment wall and routed back to the sump. The overflow is located above the HI-HI probe so that as the water level in the containment wall rises, the probe is touched first and shuts off the pump feeding the Cooling Tower. However, if the water continues to rise, the overflow will drain water back to the sump.

The overflows are the final backup. If all other systems fail, the overflows in the tanks and Cooling Tower are designed to drain the maximum flow into the container back to the sump. This causes the sump area to flood, but the sump is inside the building and can safely contain all water from the tanks and Cooling Tower.

c: J. Hilton, Carbon Service Manager
D. Sager, Maintenance/Engineer/Env./Lab Manager

HI-HI LEVEL ALARM	AUTOMATIC CONTROL ACTION
SUMP	turns off the MAKE UP water valve
TANK #1	turns off the SUMP PUMPS
TANK #2	turns off the MAKE UP water valve turns off the SUMP PUMPS
COOLING TOWER	turns off the MAKE UP water valve turns off the cooling tower pump

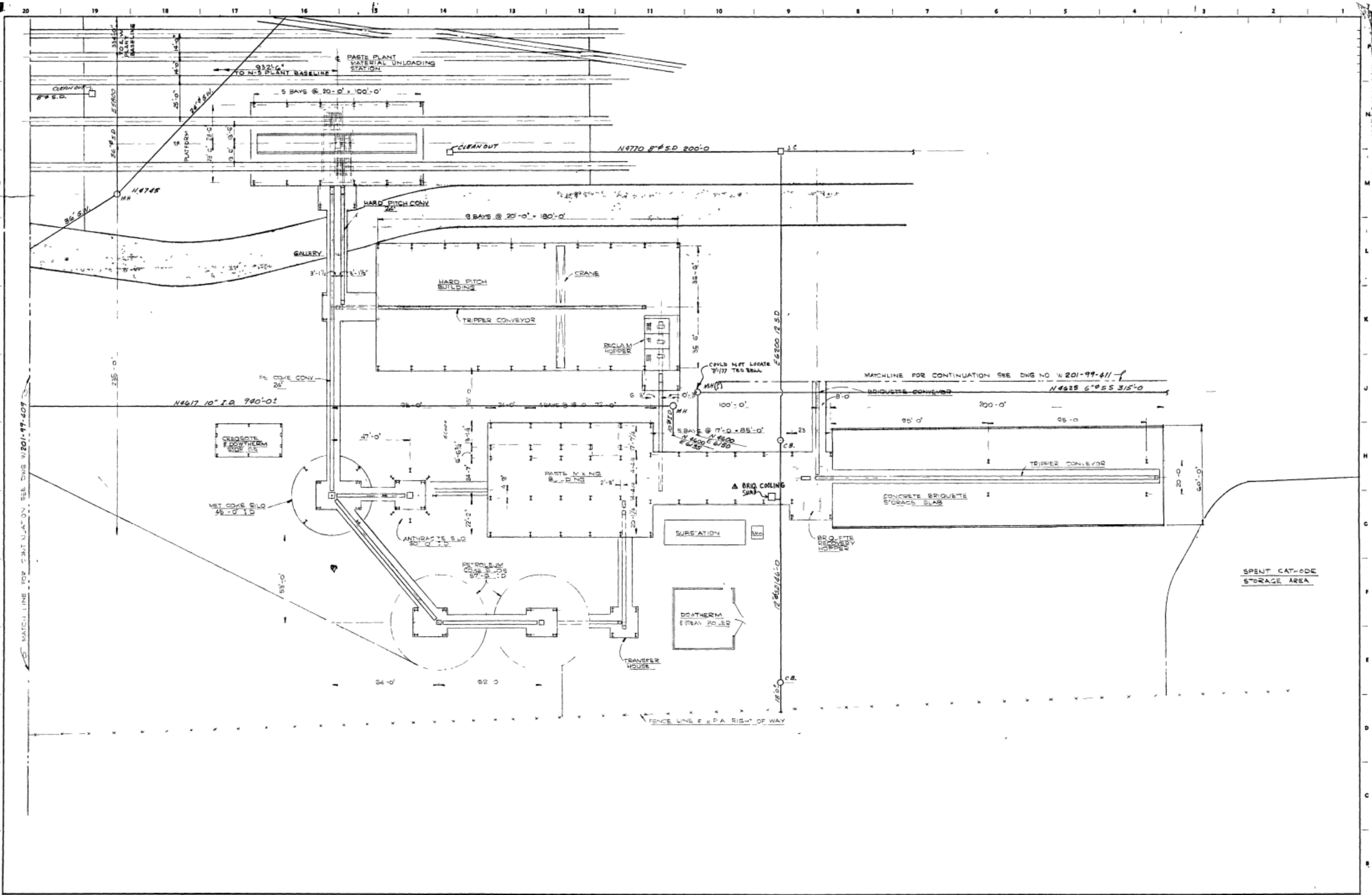


PASTE PLANT COOLING WATER LEVEL CONTROL

APPENDIX A-9

SWMU #9 – Paste Plant Recycle Water System

Harvey Aluminum (1985)
Paste Plant Area Design Drawing



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NO	REVISION	DATE	BY	APP'D
△	ADDED SUMP OVERFLOW	6-21-80	JC	

APPROVED FOR CONSTRUCTION

	INIT.	DATE
ENGINEERING STAFF		
DESIGN ENGINEER		
CHIEF ELECTRICAL ENGINEER		
CHIEF PROCESS ENGINEER		
CHIEF DESIGN ENGINEER, A & E		
CHIEF PROJECT ENGINEER		

HARVEY ALUMINUM
(INCORPORATED)
TORRANCE, CALIFORNIA

PLANT LOCATION JOHN DAY, WASHINGTON

FACILITY— REDUCTION PLANT
SUB FACILITY— PLANT SITE UTILITIES

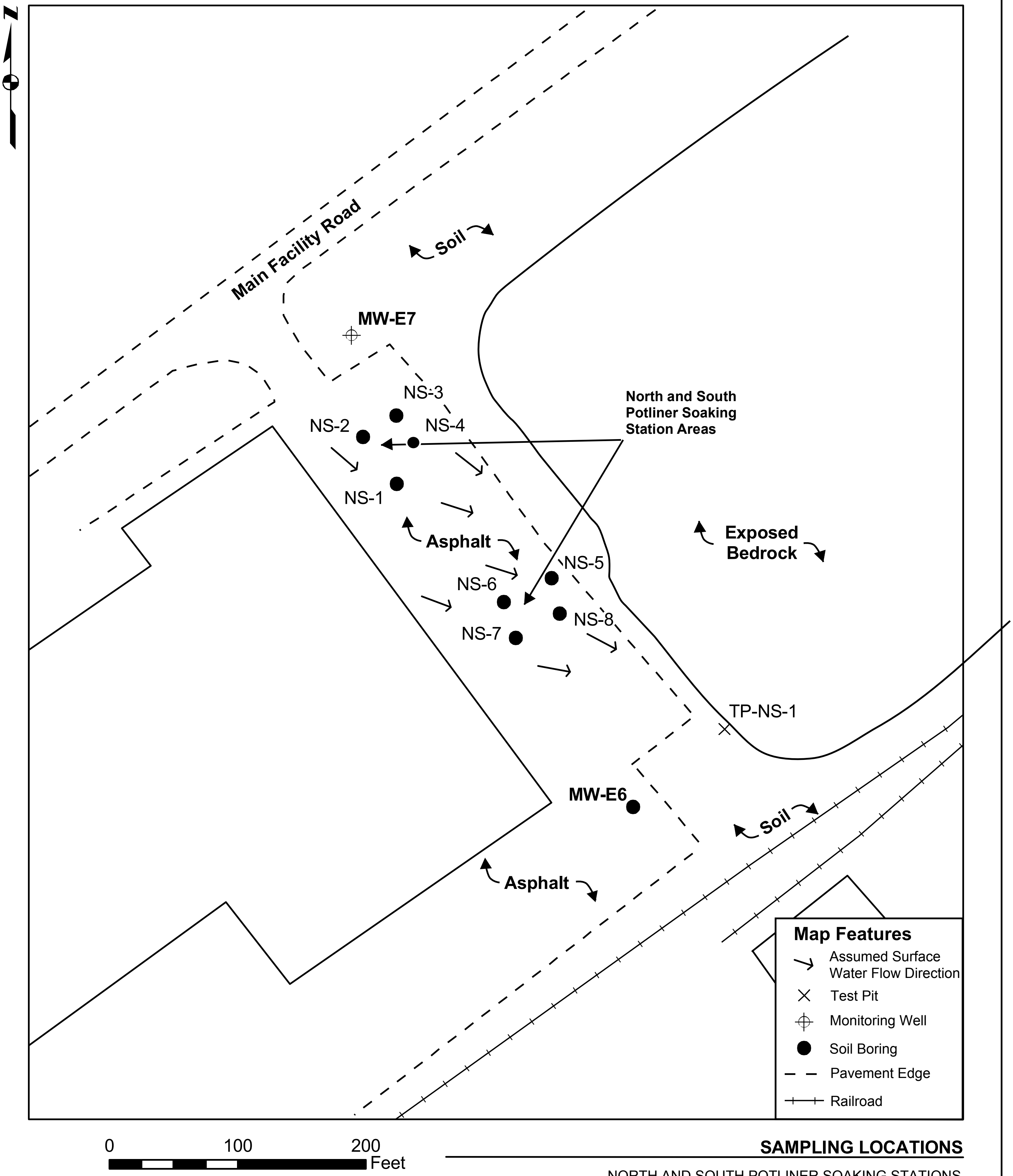
DRAWING TITLE
PASTE PLANT AREA
BUILDING, STORM, MONITOR & SCRUBBER DRAINS

	INT.	DATE	
DRN BY	JB	9-29-69	SCALE 1" = 20'-0
CKD BY			JOB NO A0 10217
DESIGN ENG	✓		DWG NO 201-99-410

APPENDIX A-10

SWMU #10 – North Pot Liner Soaking Station

URS (2008e)
Draft RI/FS Report



SAMPLING LOCATIONS

NORTH AND SOUTH POTLINER SOAKING STATIONS
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

AUGUST 2008
36298257

URS

FIGURE 2

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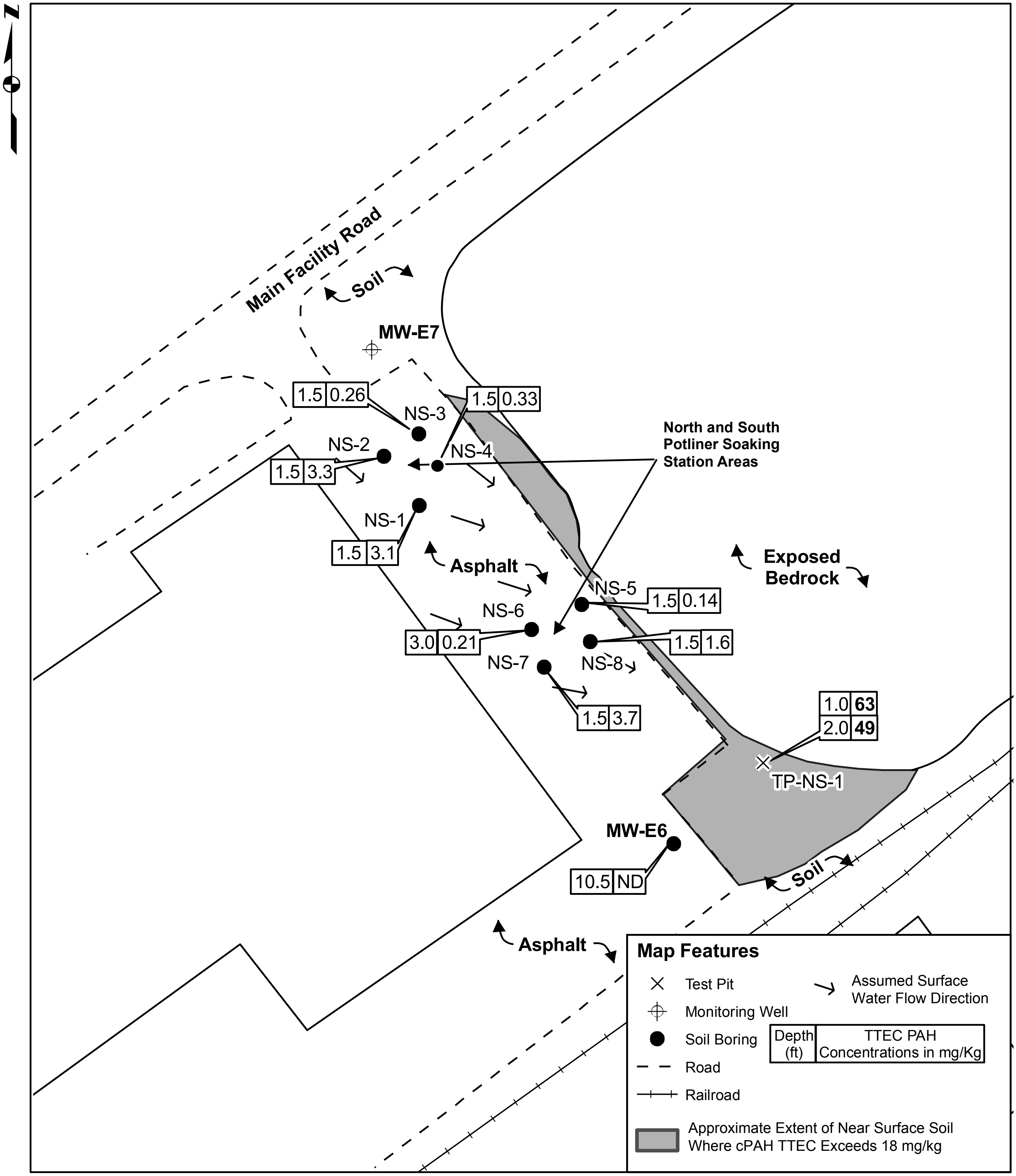


NEAR SURFACE SOIL SAMPLE RESULTS

NORTH AND SOUTH POTLINER SOAKING STATIONS
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

AUGUST 2008
36298257

FIGURE 3

O:\36298241 Goldendale Aluminum\5000 Technical\GIS\MXD\NSPLSSA_Sample_Results.mxd

Table 3
Summary of Soil Analytical Results
North & South Potliner Soaking Station Areas
Lockheed-Martin Corporation
Goldendale, Washington

Sample ID:	MTCA Soil Cleanup Levels Method C (ingestion)	B-NS-1	B-NS-2	B-NS-3	B-NS-4	B-NS-5	B-NS-6	B-NS-7	B-NS-8	MW-E6	TP-NS-1	TP-NS-1
Sample Date:		6/20/2008	6/20/2008	6/20/2008	6/20/2008	6/21/2008	6/21/2008	6/21/2008	6/21/2008	6/21/2008	6/24/2008	6/24/2008
Sample Depth (ft bgs):		1.5	1.5	1.5	1.5	1.5	3.0	1.5	1.5	10.5	1.0	2.0
Sample Type:		Soil Boring								Soil Boring	Test Pit	
PAHs (mg/kg)												
1-Methylnaphthalene	1,100	0.0472	0.124 U	0.0563 UJ	0.0617 U	0.0164 U	0.0591 U	0.110 U	0.0683 U	0.0115 U	0.657 U	2.86 UJ
2-Methylnaphthalene	14,000	0.0708	0.124 U	0.0563 UJ	0.0617 U	0.0164 U	0.0867	0.110 U	0.0683 U	0.0115 U	0.875	2.86 UJ
Acenaphthene	210,000	0.271	0.124 U	0.0563 UJ	0.0617 U	0.0164 U	0.0591 U	0.236	0.0774	0.0115 U	3.76	2.86 UJ
Acenaphthylene	NE	0.443 U	0.124 U	0.0563 UJ	0.0617 U	0.0164 U	0.0591 U	0.110 U	0.0683 U	0.0115 U	0.657 U	2.86 UJ
Anthracene	1,100,000	0.333	0.191	0.0563 UJ	0.0781	0.0164 U	0.0631	0.42	0.109	0.0115 U	4.99	2.86 J
Benzo(a)anthracene [a]	See note a	3.09	1.67	0.150 J	0.177	0.0895	0.103	2.54	0.893	0.0115 U	47.7	30.0 J
Benzo(a)pyrene [a]	18	2.07	2.25	0.180 J	0.230	0.100	0.146	2.57 J	1.13	0.0115 U	**44.7**	**35.7 J**
Benzo(b)fluoranthene [a]	See note a	2.26	2.68	0.158 J	0.243	0.105	0.150	3.02 J	1.13	0.0115 U	53.4	41.8 J
Benzo(g,h,i)perylene	NE	2.12	3.43	0.304 J	0.325	0.131	0.465	2.40 J	1.43	0.0115 U	26.4	29.6 J
Benzo(k)fluoranthene [a]	See note a	1.89	1.62	0.158 J	0.193	0.0808	0.0986	2.10 J	0.806	0.0115 U	37.2	23.3 J
Chrysene [a]	See note a	3.51	1.87	0.169 J	0.218	0.0993	0.146	2.55	1.06	0.0115 U	54.0	38.4 J
Dibenz(a,h)anthracene [a]	See note a	0.814	1.07	0.0975 J	0.107	0.0469	0.0749	0.883 J	0.506	0.0115 U	10.5	9.74 J
Fluoranthene	140,000	4.00	2.16	0.225 J	0.206	0.0961	0.106	3.95	1.01	0.0115 U	69.1	47.5 J
Fluorene	140,000	0.201	0.124 U	0.0563 UJ	0.0617 U	0.0164 U	0.0591 U	0.140	0.0683 U	0.0115 U	2.32 J	2.86 UJ
Indeno(1,2,3-cd)pyrene [a]	See note a	1.89	2.83	0.225 J	0.247	0.111	0.225	2.13 J	1.24	0.0115 U	24.9	25.6 J
Naphthalene	70,000	0.0738	0.124 U	0.0563 UJ	0.0617 U	0.0164 U	0.0591 U	0.110 U	0.0683 U	0.0115 U	1.18 J	2.86 UJ
Phenanthrene	NE	1.77	0.705	0.0938 J	0.0740	0.0448	0.0631	1.91	0.446	0.0115 U	24.2	13.7 J
Pyrene	110,000	5.00	3.00	0.341 J	0.321	0.131	0.221	5.31	1.55	0.0115 U	46.5	37.8 J
TTEC Concentration (cPAHs) (mg/kg)	18	3.1	3.3	0.26	0.33	0.14	0.21	3.7	1.6	NA	**63**	**49**
PCBs (ug/kg)	66,000 [b]	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Total Metals (mg/kg)												
Arsenic	88	2.85 U	2.67 U	2.61 U	2.63 U	4.13 U	2.71 U	2.63 U	2.94 U	2.88 U	11.5	NA
Barium	700,000	62.9 J	55.9 J	44.9 J	33.2 J	136 J	72.5 J	58.4 J	81.4 J	85.5 J	107 J	NA
Cadmium	3,500	0.239	0.228	0.209 U	0.211 U	0.331 U	0.421	0.211 U	0.503	0.231 U	0.744	NA
Chromium	5,300,000 / 11,000 [c]	5.12 J	4.78 J	2.04 J	2.73 J	12.5 J	4.85 J	2.60 J	4.28 J	5.55 J	71.4	NA
Lead	1,000 [e]	7.27	2.06	1.57 U	1.58 U	2.48 U	4.11	1.58 U	4.86	1.73 U	28.3	NA
Mercury	1,100	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	NA
Selenium	18,000	2.85 U	2.67 U	2.61 U	2.63 U	4.13 U	2.71 U	2.63 U	2.94 U	2.88 U	2.97 U	NA
Silver	18,000	0.569 U	0.534 U	0.522 U	0.527 U	0.826 U	0.541 U	0.526 U	0.588 U	0.577 U	0.593 U	NA
Conventionals (mg/kg)												
Total cyanide	70,000	1.1 U	0.82 U	2.1	1.8	1.4 U	2.60	0.79 U	0.98 U	0.74 U	0.15	NA
Fluoride	210,000	57.0	116	64.0	21.7	307	51.5	731	328	65.8	235	NA
Sulfate	NE	57.4	6.60	9.31	6.36	9.20	213	14.1	23.8	10.8	123	NA

Notes:
Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded July 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).
Shaded data indicate detections above laboratory reporting limits.
Bold data indicate exceedance of MTCA Method C industrial cleanup levels.
bgs - Below ground surface
NA - Not applicable
NE - Not established
PCBs - Polychlorinated biphenyl compounds
TTEC - Total toxicity equivalent soil concentration
U/ND - Compound was analyzed for but not detected above the reporting limit
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
J - Estimated concentration; see Appendix C.
[a] These compounds are considered carcinogenic PAHs (c-PAHs) and are subject to WAC-173-340 Toxicity Equivalent Soil Concentration calculations.
[b] Listed levels are for total PCBs.
[c] Listed levels are for Cr(III) and Cr(VI). Values for total chromium are not established.
[e] MTCA Method A industrial cleanup level; Method C does not present a soil cleanup level for lead

Table 4
Summary of Groundwater Analytical Results
North & South Potliner Soaking Station Areas
Lockheed-Martin Corporation
Goldendale, Washington

Sample ID:	**MTCA Groundwater Cleanup Levels**	**MCLs**	**MW-E7**		
Sample Date:			6/26/2008	(DUP)	8/2/2008
Depth to Water (ft)			18.09		16.78
TOC Elevation (ft MSL)			499.90		499.90
Groundwater Elevation (ft MSL)			481.81		481.81
TPH (mg/L)					
Gasoline-Range	1.0 [a]	NE	0.100 U	NA	NA
Diesel-Range	0.5 [a]	NE	0.236 U	NA	NA
Heavy Oil-Range	0.5 [a]	NE	0.100 U	NA	NA
VOCs (mg/L)	Varies	Varies	ND	NA	NA
PAHs (mg/L)	Varies	Varies	NA	ND	ND
PCBs (ug/L)	0.44	Varies	ND	NA	NA
Total Metals (mg/L)					
Arsenic	0.005 [a]	0.01	0.00100 U	NA	NA
Barium	7	2	0.013	NA	NA
Cadmium	0.018	0.005	0.00200 U	NA	NA
Chromium	53 / 0.11 [b]	0.1	0.00800 U	NA	NA
Lead	0.015 [a]	0.015	0.00100 U	NA	NA
Mercury	0.011	0.002	0.000200 U	NA	NA
Selenium	0.18	0.05	0.00119	NA	NA
Silver	0.18	NE	0.0100 U	NA	NA
Conventionals (mg/L)					
Total cyanide	NE	0.2	NA	0.050 U	0.050 U
WAD cyanide	NE	NE	NA	0.010 U	0.010 U
Fluoride	2.1	4.0	NA	2.34	2.32
Sulfate	NE	250 [c]	NA	76.0	77.7

Notes:

Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded July 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).
Shaded data indicate detections above laboratory reporting limits.
Only detected results for VOCs and PCBs are shown.
DUP - Field Duplicate
NA - Not analyzed
ND - Compounds were not detected above the specific compound reporting limits.
NE - Not established
PCBs - Polychlorinated biphenyl compounds
TPH - Total petroleum hydrocarbons
VOCs - Volatile organic compounds
U - Compound was analyzed for but not detected above the reporting limit shown.
[a] MTCA Method A cleanup levels; see Section 3.5.
[b] Listed levels are for Cr(III) and Cr(VI). Values for total chromium are not established.
[c] The sulfate MCL is a secondary MCL set to protect against aesthetic affects such as color, taste and odor; exceeding this MCL does not pose a risk to public health.

APPENDIX A-11

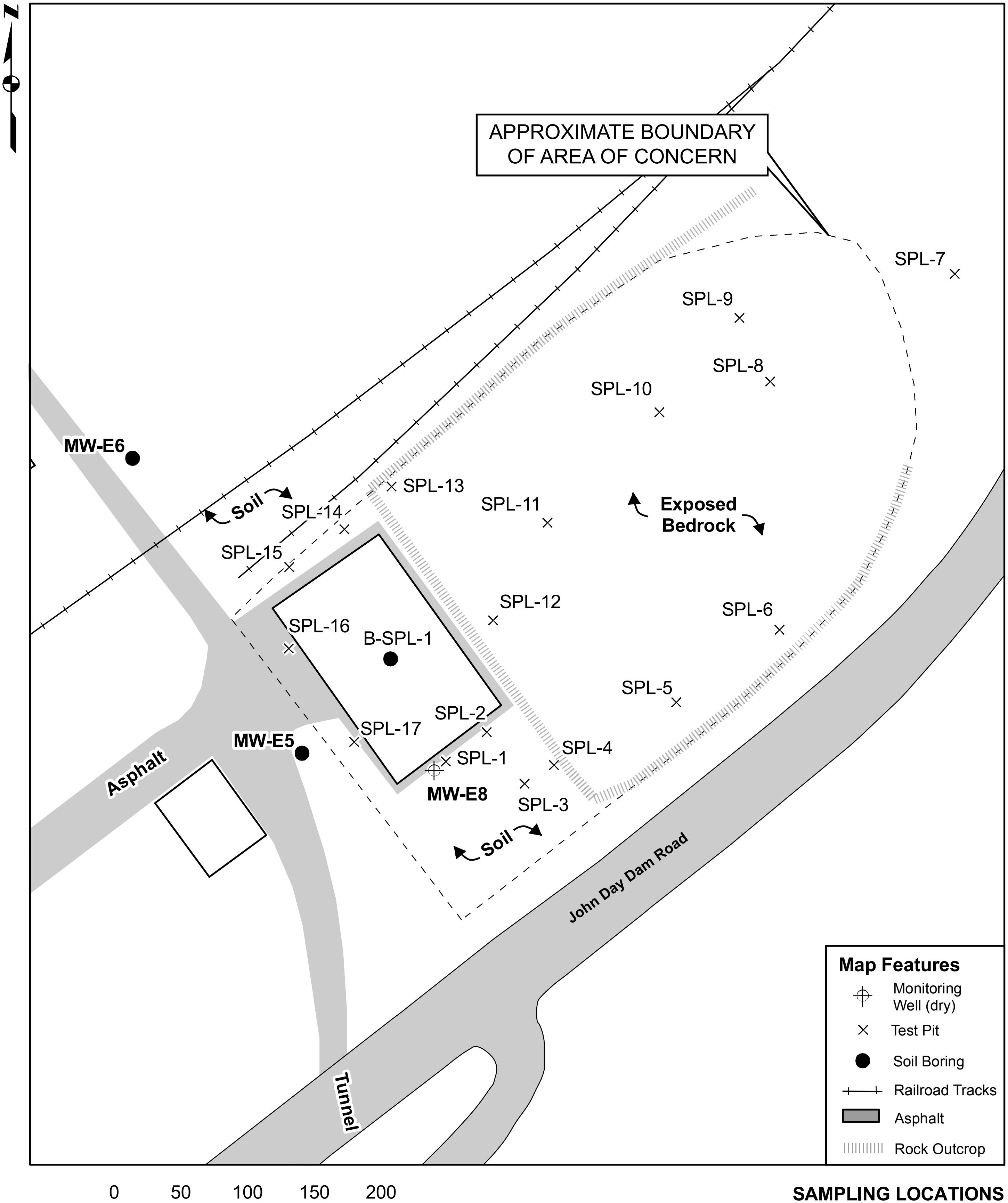
SWMU #11 – South Pot Liner Soaking Station

Refer to SWMU #10 (Appendix A-10)

APPENDIX A-12

SWMU #12 – East SPL Storage Area

URS (2008c)
Draft RI/FS Report



URS

SAMPLING LOCATIONS

AUGUST 2008
36298253

EAST SPL STORAGE AREA
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

FIGURE 2

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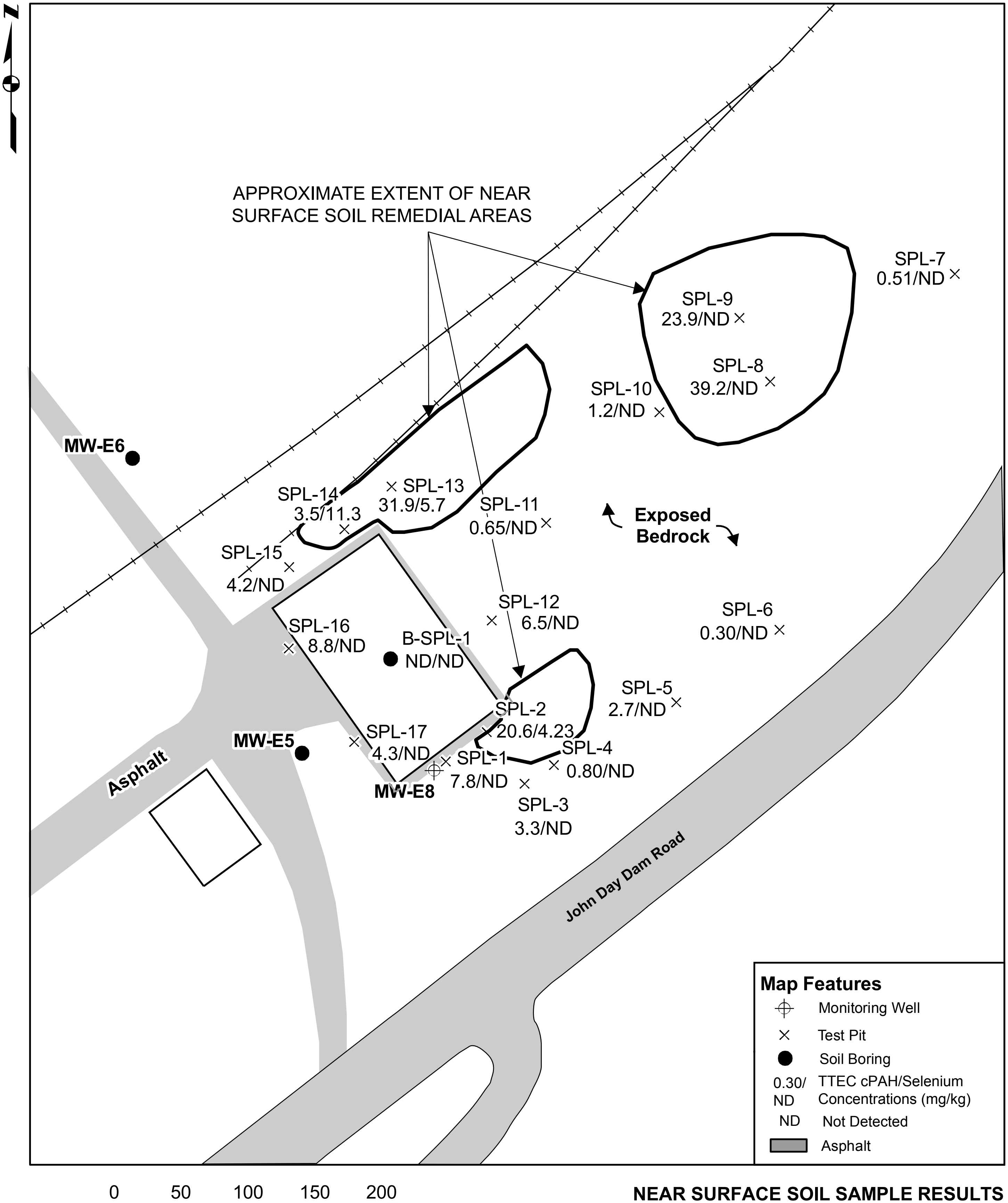

NEAR SURFACE SOIL SAMPLE RESULTS

EAST SPL STORAGE AREA
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

AUGUST 2008
36298253

FIGURE 3

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Table 3
Summary of Soil Analytical Results
East SPL Storage Area
Lockheed-Martin Corporation
Goldendale, Washington

Sample ID:	**MTCA Soil Cleanup Levels Method C (ingestion)**	**SPL-1**	**SPL-2**	**SPL-3**	**SPL-4**	**SPL-5**	**SPL-6**	**SPL-7**	**SPL-8**	**SPL-9**	**SPL-10**	**SPL-11**	**SPL-12**	**SPL-13**	**SPL-14-1.5**	**SPL-15**	**SPL-16**	**SPL-17**	**B-SPL-1**	**MW-E8**
Sample Date:		6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008	6/24/2008
Sample Depth (ft bgs):		0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	1.0-1.5	0.5-1.0	0.5-1.0	0.5-1.0	1.0 - 3.0	15.0
Sample Type:																			Soil Boring	
PAHs (mg/kg)																				
1-Methylnaphthalene	1,100	0.174 U	0.328 U	0.0416 U	0.0217 U	0.0215 U	0.0109 U	0.0108 U	0.350	0.338	0.0414 U	0.0106 U	0.287 U	0.330 U	0.189 U	0.330 U	0.289 U	0.108 U	0.0108 U	0.0106 U
2-Methylnaphthalene	14,000	0.174 U	0.328 U	0.0416 U	0.0217 U	0.0215 U	0.0109 U	0.0108 U	0.547	0.432	0.0414 U	0.0106 U	0.287 U	0.330	0.189 U	0.330 U	0.289 U	0.108 U	0.0108 U	0.0106 U
Acenaphthene	210,000	0.521	1.51	0.147	0.0405	0.127	0.0160	0.0151	2.34	1.73	0.0441	0.0317	0.364	1.96	0.189	0.330 U	0.637	0.302	0.0108 U	0.0106 U
Acenaphthylene	NE	0.174 U	0.328 U	0.0416 U	0.0217 U	0.0215 U	0.0109 U	0.0108 U	0.328 U	0.282 U	0.0414 U	0.0106 U	0.287 U	0.330 U	0.189 U	0.330 U	0.289 U	0.108 U	0.0108 U	0.0106 U
Anthracene	1,100,000	0.614	1.55	0.264	0.0550	0.250	0.0240	0.0251	3.30	3.14	0.0772	0.0451	0.537	3.08	0.316	1.76	3.55	0.475	0.0108 U	0.0106 U
Benzo(a)anthracene ^{a}	See note a	5.13	13.2	2.31	0.576	2.35	0.201	0.301	38.5	17.5	0.703	0.429	4.10	23.9	2.24	2.09	5.00	2.41	0.0368	0.0106 U
Benzo(a)pyrene ^{a}	18	5.46	**14.5**	2.27	0.554	1.84	0.208	0.358	**25.0**	**16.5**	0.844	0.452	4.50	**22.2**	2.54	3.00	6.33	3.15	0.0462	0.0106 U
Benzo(b)fluoranthene ^{a}	See note a	7.38	18.6	2.68	0.738	2.00	0.265	0.467	38.3	20.6	0.995	0.583	4.70	24.7	2.87	3.44	6.66	3.64	0.0419	0.0106 U
Benzo(g,h,i)perylene	NE	4.07	12.4	2.05	0.480	1.68	0.189	0.305	26.3	14.2	0.777	0.371	4.29	18.5	2.03	2.60	6.27	1.17	0.0585	0.106
Benzo(k)fluoranthene ^{a}	See note a	4.69	11.0	1.82	0.484	1.37	0.184	0.304	22.0	13.4	0.868	0.399	4.56	19.4	1.88	2.67	4.63	3.23	0.0296	0.0106 U
Chrysene ^{a}	See note a	5.43	13.8	2.41	0.639	2.38	0.220	0.333	43.4	17.9	0.794	0.473	4.75	24.3	2.32	2.69	5.81	2.53	0.0368	0.0106 U
Dibenz(a,h)anthracene ^{a}	See note a	1.66	4.99	0.861	0.202	0.619	0.0787	0.121	11.7	6.12	0.312	0.155	1.86	7.84	0.808	0.947	2.10	0.489	0.0209	0.0106 U
Fluoranthene	140,000	8.04	19.5	3.26	0.778	3.40	0.296	0.444	49.1	29.9	0.904	0.612	5.73	33.1	3.02	3.22	7.29	4.79	0.0599	0.0106 U
Fluorene	140,000	0.255	0.591	0.0888	0.0231	0.0730	0.0109 U	0.0108 U	1.75	0.976	0.0414 U	0.0162	0.287 U	1.21	0.189 U	0.330 U	0.289 U	0.158	0.0108 U	0.0106 U
Indeno(1,2,3-cd)pyrene ^{a}	See note a	4.09	12.2	2.05	0.470	1.54	0.188	0.304	27.0	14.4	0.769	0.372	4.18	18.5	1.96	2.2	5.31	1.17	0.0513	0.0106
Naphthalene	70,000	0.174 U	0.328 U	0.0416 U	0.0217 U	0.0215 U	0.0109 U	0.0108 U	0.525	0.357	0.0414 U	0.0106 U	0.287 U	0.419	0.189 U	0.330 U	0.289 U	0.108 U	0.0108 U	0.0106 U
Phenanthrene	NE	2.71	6.52	1.12	0.255	1.20	0.103	0.116	17.1	13.7	0.292	0.201	2.07	12.7	1.10	1.74	3.61	2.31 J	0	0.0106 U
Pyrene	110,000	5.67	15	2.45	0.648	3.49	0.235	0.406	44.7	24.8	0.736	0.535	5.29	30.3	2.59	2.51	7.27	2.49	0.0715	0.0106 U
TTEC Concentration (cPAHs) (mg/kg)	18	7.8	**21**	3.3	0.81	2.7	0.30	0.51	**39**	**24**	1.2	0.65	6.5	**32**	3.5	4.2	8.8	4.3	0.1	0.0011
PCBs (ug/kg)	66,000^{b}	NA	ND*	NA	NA	NA	NA	NA	ND*	NA	NA	NA	NA	ND*	ND*	NA	NA	NA	NA	NA
Total Metals (mg/kg)																				
Arsenic	88	2.89 U	2.72 U	2.67 U	2.74 U	2.73 U	2.81 U	2.73 U	2.68 U	2.61 U	2.61 U	2.71 U	2.60 U	5.01	38.6	2.73 U	2.76 U	2.74 U	2.68 U	2.73 U
Barium	700,000	107 J	109 J	53.8 J	140 J	143 J	123 J	128 J	150 J	119 J	95.7 J	120 J	98.2 J	115 J	112 J	40.0 J	113 J	117 J	67.5 J	72.7
Cadmium	3,500	0.439	0.509	0.214 U	0.227	0.256	0.225 U	0.225	0.884	0.461	0.278	0.224	0.231	0.761	0.455	0.218 U	0.402	0.271	0.214 U	0.219 U
Chromium	5,300,000 / 11,000^{c}	6.32 J	6.01 J	4.94 J	10.7 J	14.9 J	16.5 J	15.3 J	17.6 J	19.0 J	8.49 J	10.7	5.43	10.7	5.82	3.45	10.6	9.91	6.43 J	5.46
Lead	NE	4.33	5.50	2.44	3.91	5.10	4.40	4.18	19.6	11.7	2.15	4.10	3.99	18.0	1.71 U	1.64 U	7.80	3.75	1.97	2.74
Mercury	1,100	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Selenium	18,000	2.89 U	4.23	2.67 U	2.74 U	2.73 U	2.81 U	2.73 U	2.68 U	2.61 U	2.61 U	2.71 U	2.60 U	5.68	11.3	2.73 U	2.76 U	2.74 U	2.68 U	2.73 U
Silver	18,000	0.579 U	0.545 U	0.534 U	0.547 U	0.545 U	0.562 U	0.545 U	0.536 U	0.522 U	0.521 U	0.543 U	0.521 U	0.551 U	0.570 U	0.545 U	0.551 U	0.548 U	0.535 U	0.546 U
Conventionals (mg/kg)																				
Total cyanide	70,000	2.5	0.055 U	0.054 U	0.065	0.054 U	0.055 U	0.053 U	0.053 U	0.91	0.11	6.1	0.13	0.054 U	0.056 U	0.054 U	0.25	0.10	3.00	0.97 U
Fluoride	210,000	977	1380	773	296	636	178	79.4	664	636	220	167	346	995	1920	249	743	302	55.2	24.8
Sulfate	NE	30.0	22.8	10.7	12.0	15.1	4.41 U	4.28 U	29.9	242	52.3	174	4.17 U	14.5	29.9	8.19	24.6	63.5	65.7	25.2

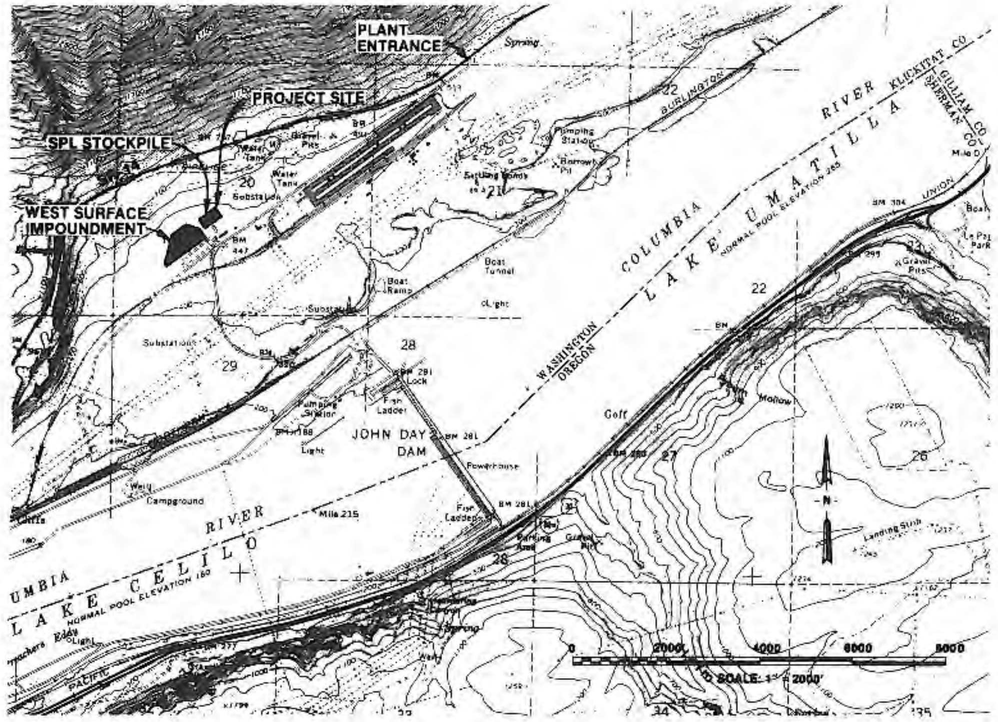
Notes:
Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded July 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).
Bold data indicate exceedance of MTCA Method C industrial cleanup levels.
bgs - below ground surface
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
NA - not applicable
NE - not established
PCBs - polychlorinated biphenyl compounds
PAHs - polynuclear/polycyclic aromatic hydrocarbons
TTEC - total toxicity equivalent soil concentration
[a] These compounds are considered carcinogenic PAHs (cPAHs) and are subject to WAC-173-340 Toxicity Equivalent Soil Concentration calculations.
[b] Listed levels are for total PCBs.
[c] Listed levels are for Cr(III) and Cr(VI). Values for total chromium are not established.
U/ND - Compound was analyzed for but not detected above the reporting limit shown.
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
J - Estimated concentration.

APPENDIX A-13

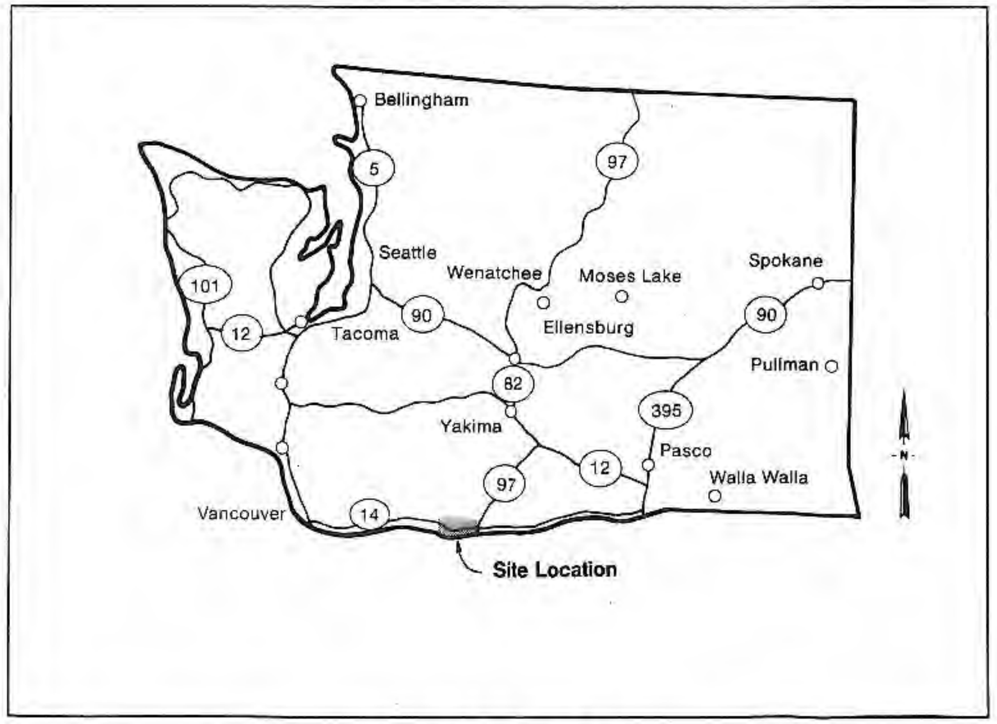
SWMU #13 – West SPL Storage Area

CH2MHill (1988b)
Landfill Cap Design Drawings

COLUMBIA ALUMINUM
SPL STOCKPILE CLOSURE
GOLDENDALE, WASHINGTON



SITE MAP



VICINITY MAP

INDEX TO DRAWINGS

CH2M HILL

DSGN R.G. CRIM
DR A.L. ROGERS
CHK J.R. SCHNEIDER
APVD R.G. CRIM

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1	7/88	FOR CLIENT & INTERNAL REVIEW	RGC	

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COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON
SPL STOCKPILE CLOSURE

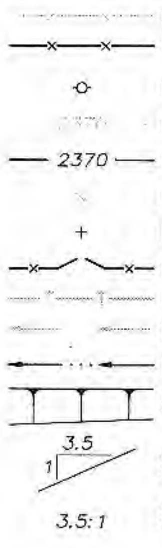
INDEX TO DRAWINGS, SITE MAP, AND VICINITY MAP

SHEET 1
DWG NO. C24907-1
DATE July 1988
PROJ NO. P24907.A1

ABBREVIATIONS

APPROX	APPROXIMATE
ADD'L	ADDITIONAL
℄	CENTERLINE
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
CONST	CONSTRUCTION
CPLG	COUPLING
CTR	CENTER
CU FT	CUBIC FOOT
CU YD	CUBIC YARD
DBL	DOUBLE
DIA	DIAMETER
E.W.	EACH WAY
EA	EACH
EL	ELEVATION
ELL	ELBOW
EXIST	EXISTING
EXST	EXISTING
FLEX	FLEXIBLE
FT	FOOT
FTG	FITTING
GALV	GALVANIZED
I.E.	INVERT ELEVATION
INTERS	INTERSECTION
INV	INVERT
MAX	MAXIMUM
MIN	MINIMUM
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NOM	NOMINAL
O.C.	ON CENTER
P/P	POWER POLE
PE	POLYETHYLENE
PERF	PERFORATED
ℙ	PROPERTY LINE
PROP	PROPERTY
PT	POINT
REQ'D	REQUIRED
R/W	RIGHT OF WAY
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SEC	SECTION
SH	SHEET
SPECS	SPECIFICATIONS
SPL	SPENT POT LINER
SQ	SQUARE
SST	STAINLESS STEEL
STD	STANDARD
TBM	TEMPORARY BENCH MARK
TELE	TELEPHONE
TP	TEST PIT
TYP	TYPICAL
W/	WITH

LEGEND

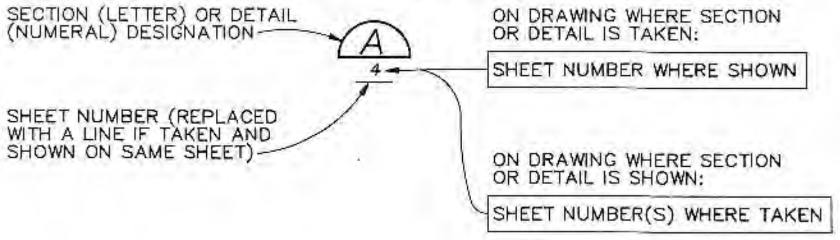


EXISTING FENCE
NEW FENCE
POWER POLE, OVERHEAD LINES
EXISTING CONTOURS
FINISH CONTOURS
EXISTING SPOT ELEVATION
FINISH GRADE SPOT ELEVATION
NEW DOUBLE LEAF VEHICLE GATE
EXISTING TELEPHONE
EXISTING SURFACE WATER DRAINAGE WAY
NEW SURFACE WATER DRAINAGE WAY
EMBANKMENT OR CUT SLOPE
SLOPE DESIGNATION (3.5 HORIZONTAL TO 1 VERTICAL)
SLOPE DESIGNATION (3.5 HORIZONTAL TO 1 VERTICAL)

GENERAL NOTES

1. CONTROL MONUMENTS SHOWN ON PLANS ARE TO REMAIN. PRESERVE AND PROTECT FROM DISTURBING. IF DISTURBED, THE CONTRACTOR SHALL BEAR ALL COSTS FOR REPLACEMENT BY AN APPROVED LICENSED SURVEYOR.
2. EXISTING ITEMS DESIGNATED "TO REMAIN" ARE TO BE PROTECTED FROM DAMAGE. IF TEMPORARY REMOVAL OF SUCH ITEMS IS NECESSARY TO FACILITATE CONSTRUCTION , REPLACE IN SIMILAR LOCATION AND SIMILAR OR BETTER CONDITION.
3. CONSTRUCTION STAKING SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY. SEE GENERAL CONDITIONS OF THE SPECS.

SECTION AND DETAIL DESIGNATION



DSGN R.G. CRIM
DR 24907C3 R.B. RICKS
CHK J.R. SCHNEIDER
APVD R.G. CRIM

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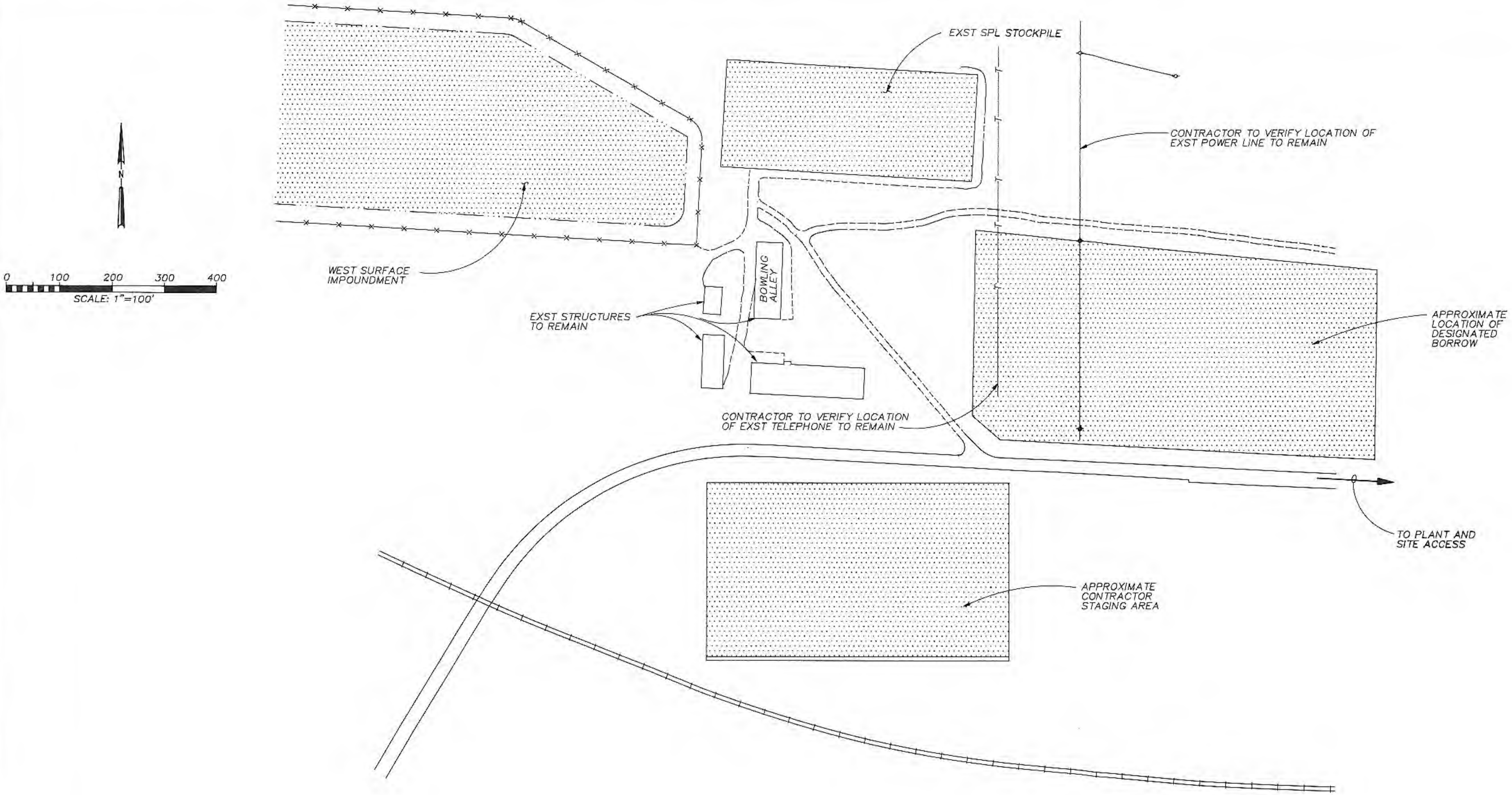
COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON

SPL STOCKPILE CLOSURE

ABBREVIATIONS, LEGEND, AND GENERAL NOTES

SHEET 2
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1



NOTE:

THIS SHEET DEVELOPED FROM INFORMATION TAKEN FROM COMMON WEALTH ALUMINUM DRAWING NO. A1 1721, DATED 7/86.

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DR 24907C5 A.L.ROGERS
CHK J.R. SCHNEIDER
APVD R.G. CRIM

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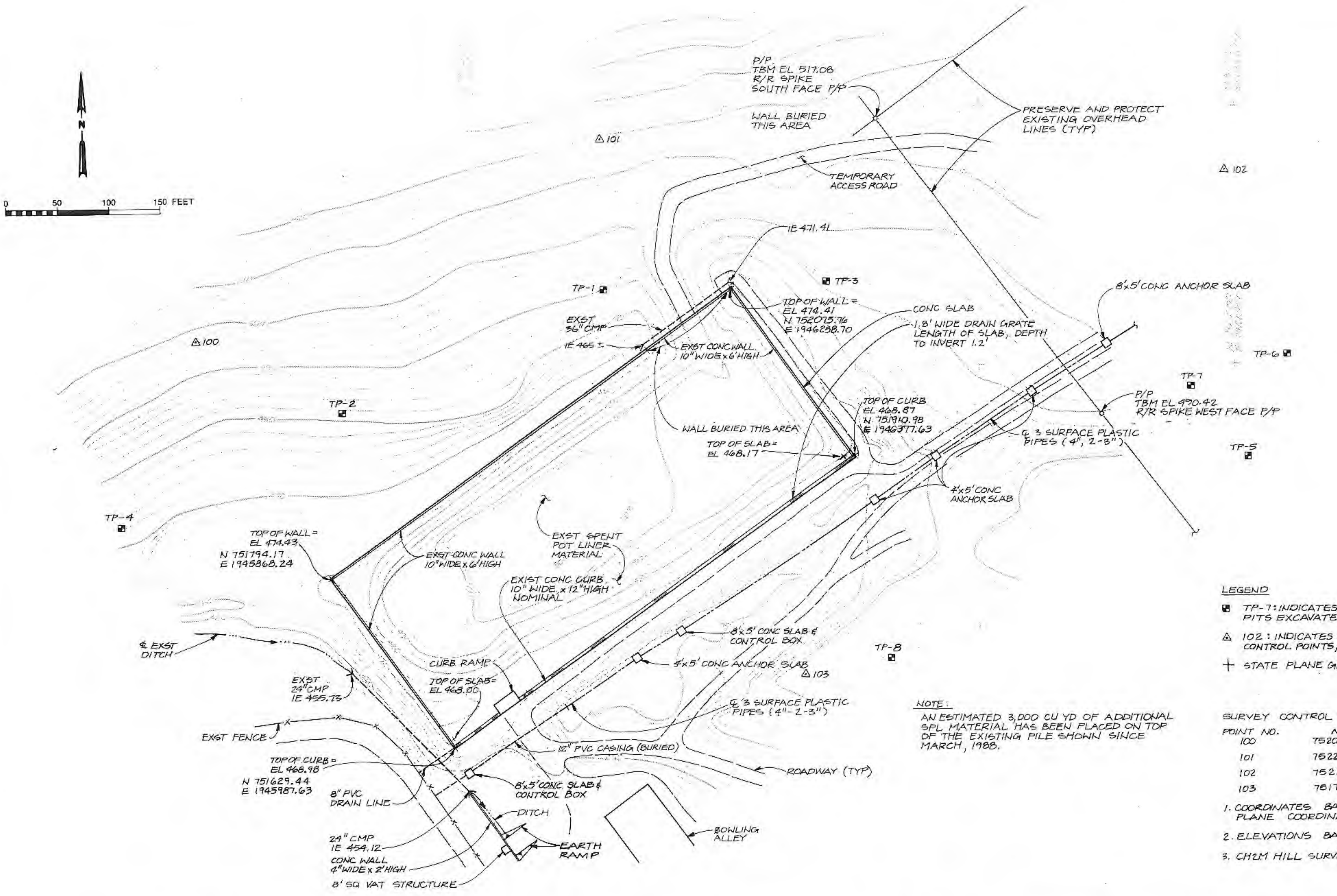
COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON

SPL STOCKPILE CLOSURE

CONTRACTOR STAGING AND BORROW AREAS

SHEET 3
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1



NOTE:

AN ESTIMATED 3,000 CU YD OF ADDITIONAL SPL MATERIAL HAS BEEN PLACED ON TOP OF THE EXISTING PILE SHOWN SINCE MARCH, 1988.

LEGEND

- ▣ TP-7: INDICATES APPROXIMATE LOCATION OF TEST PITS EXCAVATED MARCH 16, AND 17, 1988.
- △ 102: INDICATES APPROXIMATE LOCATION OF SURVEY CONTROL POINTS, 5/8" IRON ROD (TYP).
- + STATE PLANE GRID

SURVEY CONTROL POINT DATA

POINT NO.	N	E	ELEVATION
100	752023.22	1945736.85	496.12
101	752220.85	1946131.20	519.56
102	752189.51	1946740.33	530.10
103	751704.95	1946331.31	482.89

1. COORDINATES BASED ON WASHINGTON STATE PLANE COORDINATES
2. ELEVATIONS BASED ON NGVD
3. CH2M HILL SURVEY PERFORMED MARCH, 1988.

CH2M HILL

DSGN J. ABRAMS
DR R. SUNDRE, A. ROGERS
CHK J.R. SCHNEIDER
APVD R.G. CRIM

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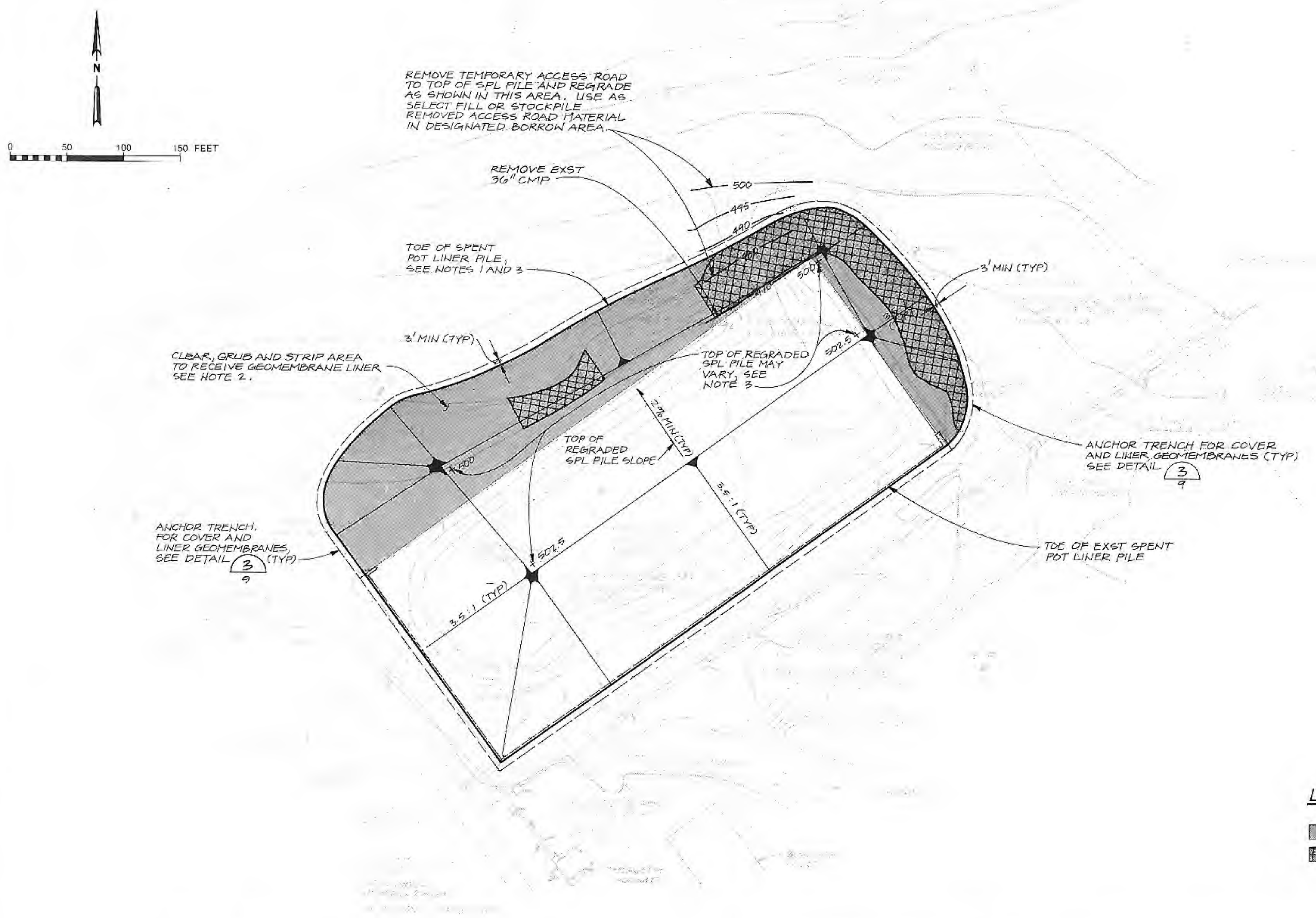
COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON
SPL STOCKPILE CLOSURE

EXISTING TOPOGRAPHIC MAP AND SITE FEATURES

SHEET 4
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1



NOTES:

1. ESTABLISH THE TOE OF REGRADED SPL PILE ON THE BASIS OF GRADING PLAN SHOWN.
2. CLEAR, GRUB, AND STRIP ALL AREAS TO RECEIVE GEOMEMBRANE LINER AND SURFACE WATER COLLECTION DITCHES AND CULVERTS. REFER TO SECTION CLEARING, GRUBBING, AND STRIPPING FOR ADDITIONAL REQUIREMENTS. PREPARE SUBGRADES AS REQUIRED IN SECTION EARTHWORK.
3. THE FINAL GEOMETRY AND ELEVATIONS OF THE TOP OF THE REGRADED STOCKPILE MAY VARY FROM THOSE SHOWN. MAINTAIN THE REGRADED PILE FOOTPRINT AS SHOWN AND ADJUST THE TOP OF PILE ELEVATIONS AND THE TOP OF PILE AREA AS REQUIRED TO REGRADE THE SPL PILE USING THE SLOPES SHOWN.
4. THE STEEPEST SLOPE AGAINST WHICH ANY GEOMEMBRANE IS TO BE PLACED IS 3:1. THE FLATTEST GRADE FOR ANY COVER PORTION OF THE REGRADED SPL PILE (TOP) IS 2 PERCENT.
5. PROVIDE A MINIMUM COVER OF 4 FEET OVER THE HDPE COVER AT ALL TEMPORARY ACCESS ROAD LOCATIONS. PROVIDE A MINIMUM OF 12 INCHES OF MATERIAL OVER THE HDPE COVER TO OPERATE LOW PRESSURE TRACKED EQUIPMENT AT ALL OTHER LOCATIONS. SEE EARTHWORK SPECIFICATIONS FOR ADDITIONAL INFORMATION.
6. GAS VENTING SYSTEM PIPE LOCATION AND PENETRATION DETAILS NOT SHOWN IN THIS SHEET. REFER TO GAS VENTING SYSTEM, SHEET 6, FOR DETAILS.
7. STRIP DRAINS ARE NOT SHOWN ON HDPE COVER LAYOUT. SEE STRIP DRAIN LAYOUT FOR LOCATION AND DETAILS, SHEET 8.
8. ALL SEAMS SHALL BE FIELD TESTED PRIOR TO PLACING COVER MATERIAL OVER HDPE IN ACCORDANCE WITH THE SPECIFICATIONS.
9. ANCHOR TRENCH ALIGNMENT AND ANY NECESSARY INVERT GRADE TRANSITIONS SHALL BE SMOOTH TO MINIMIZE KINKS AND FOLDS IN GEOMEMBRANE.

LEGEND:

▒	AREA OF LINER GEOMEMBRANE PLACED ON PREPARED SUBGRADE AND BEDDING MAT'L.
▦	EXISTING SLOPES STEEPER THAN 3:1 GRADE SLOPES IN THIS AREA TO A MAXIMUM 3:1 SLOPE OR FLATTER, PRIOR TO SUBGRADE PREPARATION AND PLACEMENT OF LINER BEDDING MATERIAL.

CH2M HILL

DSGN J. DEHNER
DR R. SUNDRE, A. ROGERS
CHK J.R SCHNEIDER
APVD R.G. CRIM

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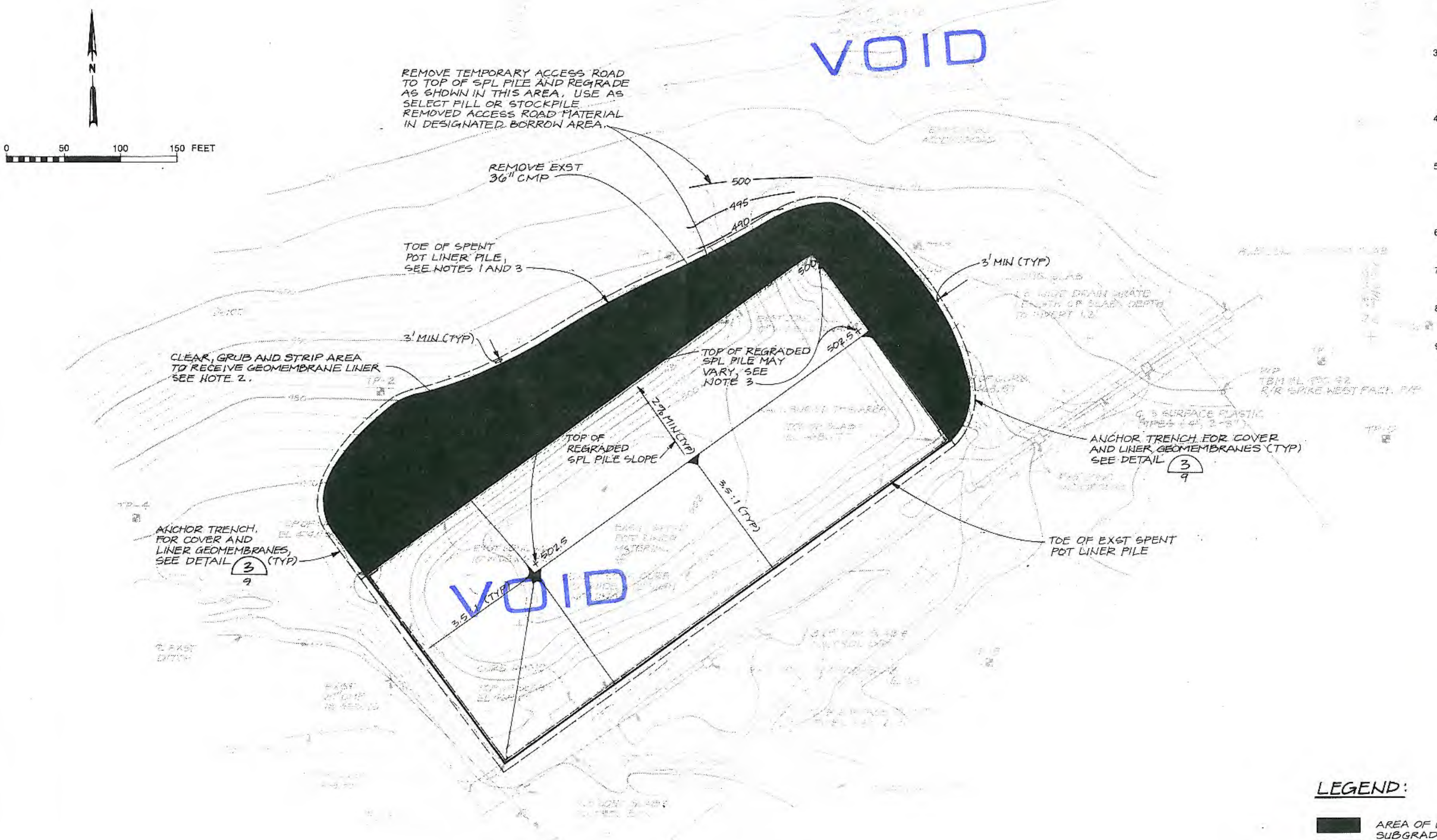
COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON
SPL STOCKPILE CLOSURE

SPL LINER, GRADING PLAN, AND COVER LAYOUT

SHEET 5
DWG NO C24907-1
DATE JULY 1988
PROJ NO. P24907.A1

VOID



VOID

VOID

NOTES:

1. ESTABLISH THE TOE OF REGRADED SPL PILE ON THE BASIS OF GRADING PLAN SHOWN.
2. CLEAR, GRUB, AND STRIP ALL AREAS TO RECEIVE GEOMEMBRANE LINER AND SURFACE WATER COLLECTION DITCHES AND CULVERTS. REFER TO SECTION CLEARING, GRUBBING, AND STRIPPING FOR ADDITIONAL REQUIREMENTS. PREPARE SUBGRADES AS REQUIRED IN SECTION EARTHWORK.
3. THE FINAL GEOMETRY AND ELEVATIONS OF THE TOP OF THE REGRADED STOCKPILE MAY VARY FROM THOSE SHOWN. MAINTAIN THE REGRADED PILE FOOTPRINT AS SHOWN AND ADJUST THE TOP OF PILE ELEVATIONS AND THE TOP OF PILE AREA AS REQUIRED TO REGRADE THE SPL PILE USING THE SLOPES SHOWN.
4. THE STEEPEST SLOPE AGAINST WHICH ANY GEOMEMBRANE IS TO BE PLACED IS 3:1. THE FLATTEST GRADE FOR ANY COVER PORTION OF THE REGRADED SPL PILE (TOP) IS 2 PERCENT.
5. PROVIDE A MINIMUM COVER OF 4 FEET OVER THE HDPE COVER AT ALL TEMPORARY ACCESS ROAD LOCATIONS. PROVIDE A MINIMUM OF 12 INCHES OF MATERIAL OVER THE HDPE COVER TO OPERATE LOW PRESSURE TRACKED EQUIPMENT AT ALL OTHER LOCATIONS. SEE EARTHWORK SPECIFICATIONS FOR ADDITIONAL INFORMATION.
6. GAS VENTING SYSTEM PIPE LOCATION AND PENETRATION DETAILS NOT SHOWN IN THIS SHEET. REFER TO GAS VENTING SYSTEM, SHEET 6, FOR DETAILS.
7. STRIP DRAINS ARE NOT SHOWN ON HDPE COVER LAYOUT. SEE STRIP DRAIN LAYOUT FOR LOCATION AND DETAILS, SHEET 8.
8. ALL SEAMS SHALL BE FIELD TESTED PRIOR TO PLACING COVER MATERIAL OVER HDPE IN ACCORDANCE WITH THE SPECIFICATIONS.
9. ANCHOR TRENCH ALIGNMENT AND ANY NECESSARY INVERT GRADE TRANSITIONS SHALL BE SMOOTH TO MINIMIZE KINKS AND FOLDS IN GEOMEMBRANE.

LEGEND:

■	AREA OF LINER GEOMEMBRANE PLACED ON PREPARED SUBGRADE AND BEDDING MAT'L.
■	EXISTING SLOPES STEEPER THAN 3:1 GRADE SLOPES IN THIS AREA TO A MAXIMUM 3:1 SLOPE OR FLATTER, PRIOR TO SUBGRADE PREPARATION AND PLACEMENT OF LINER BEDDING MATERIAL.

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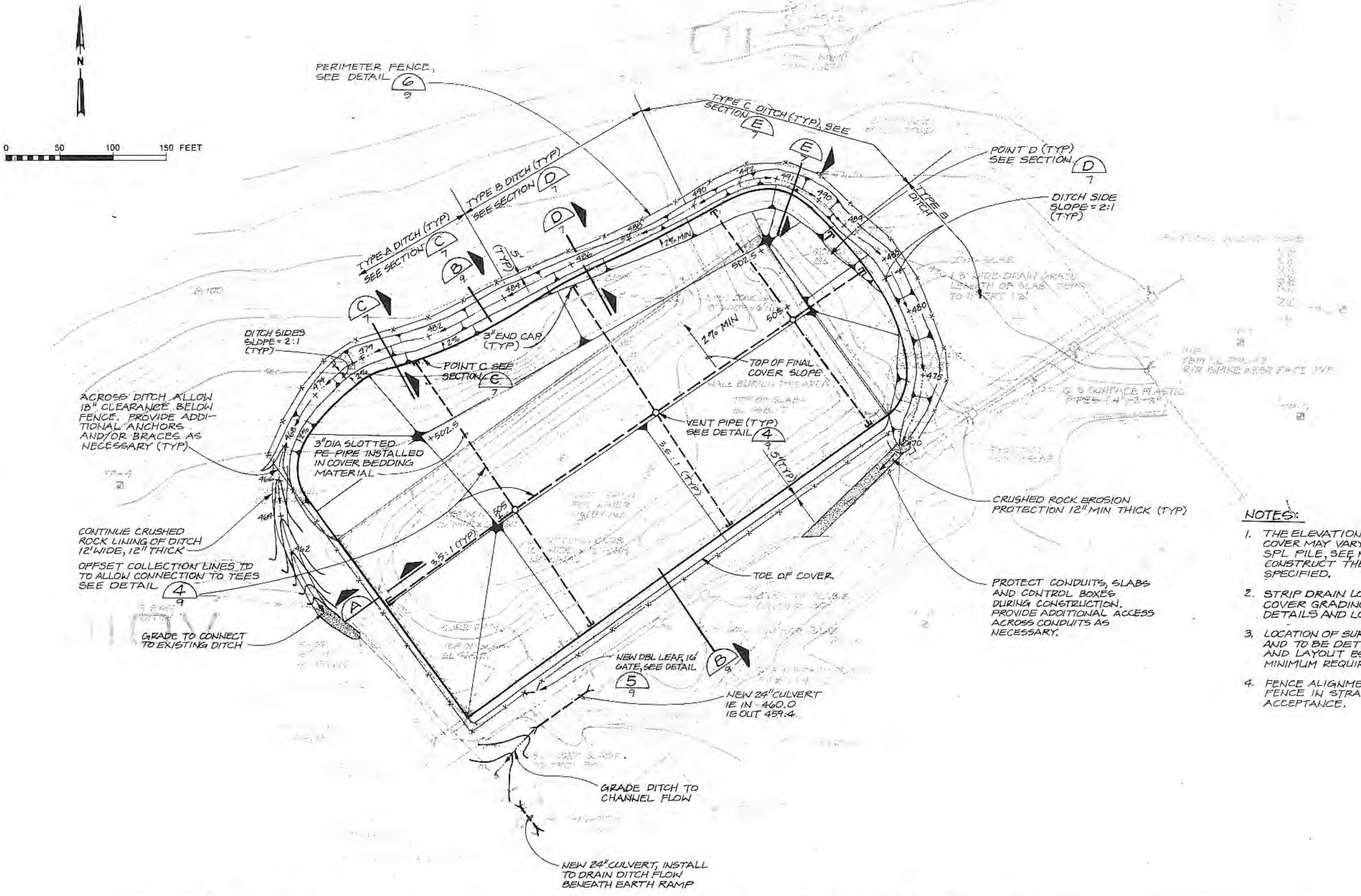
SPL STOCKPILE CLOSURE

SPL LINER, GRADING PLAN, AND COVER LAYOUT

SHEET 5
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1



NOTES:

1. THE ELEVATIONS AND GEOMETRY OF THE TOP OF THE FINAL COVER MAY VARY DEPENDING ON THE FINAL GRADING OF THE SPL PILE, SEE NOTE 3, SHEET 5. THE CONTRACTOR SHALL CONSTRUCT THE FINAL COVER TO THE MINIMUM THICKNESS SPECIFIED.
2. STRIP DRAIN LOCATIONS ARE NOT SHOWN ON THIS FINAL COVER GRADING PLAN. SEE STRIP DRAIN LAYOUT FOR DETAILS AND LOCATIONS
3. LOCATION OF SURFACE DRAINAGE DITCH SHOWN IS APPROXIMATE AND TO BE DETERMINED IN FIELD BASED ON ACTUAL GRADES AND LAYOUT ESTABLISHED FOR SPL STOCKPILE AND MINIMUM REQUIREMENTS SHOWN ON DRAWINGS.
4. FENCE ALIGNMENT AS SHOWN IS APPROXIMATE. LAYOUT FENCE IN STRAIGHT RUNS AND OBTAIN ENGINEER'S ACCEPTANCE.

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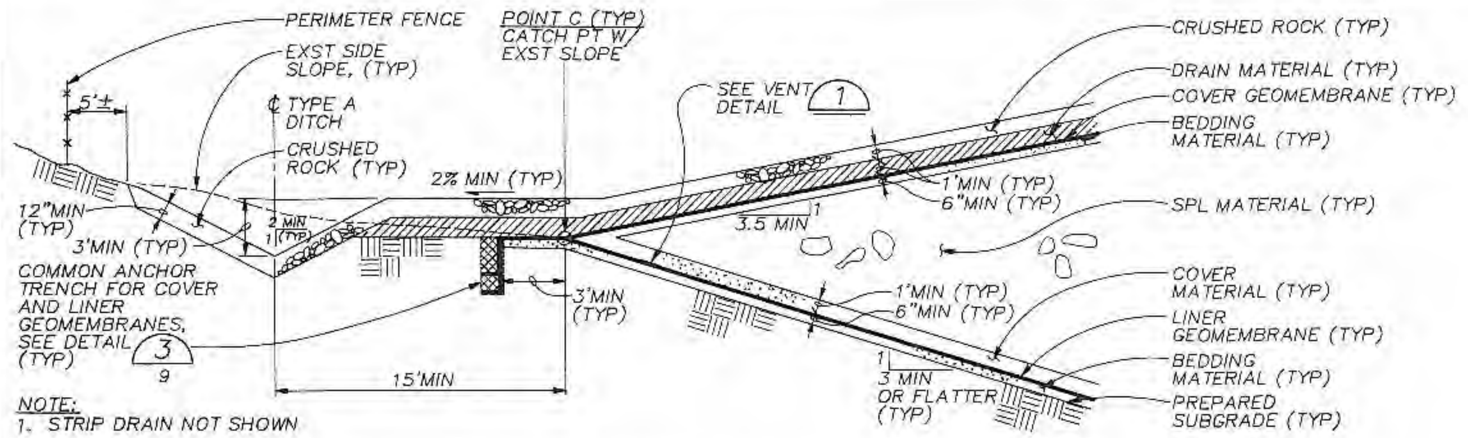
GOLDENDALE, WASHINGTON
SPL STOCKPILE CLOSURE

FINAL COVER GRADING PLAN
AND GAS VENTING SYSTEM

SHEET 6
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1

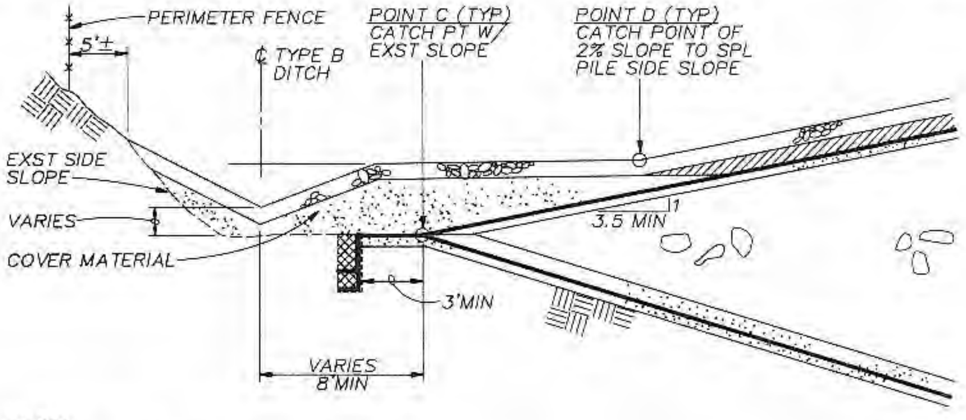
07-15-88 24907C1.DWG



NOTE:
1. STRIP DRAIN NOT SHOWN

COVER, LINER, AND TYPE A DITCH – SECTION C 6,9

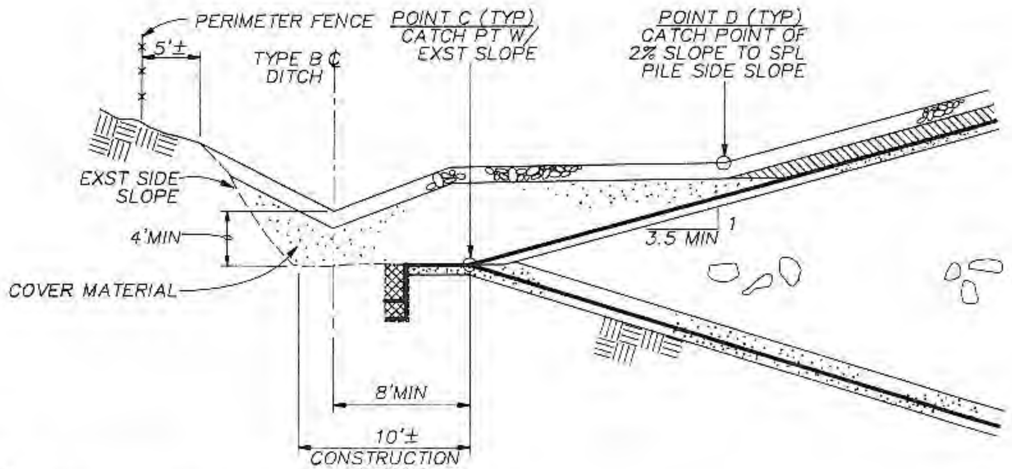
NTS



NOTES:
1. TYPE B DITCH IS A TRANSITION DITCH SECTION FROM TYPE A TO TYPE C.
2. STRIP DRAINS NOT SHOWN

TYPE B DITCH – SECTION D 6

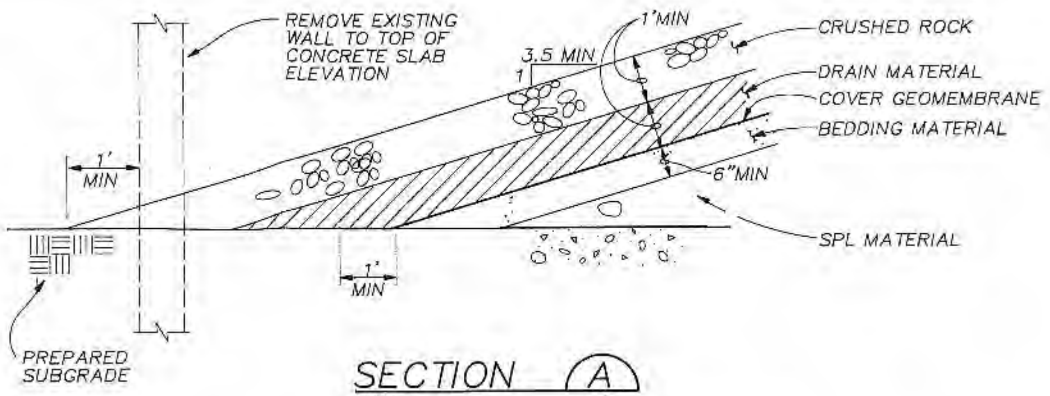
NTS



NOTES:
1. STRIP DRAINS NOT SHOWN

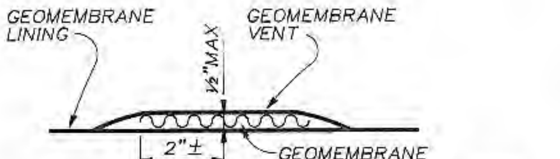
TYPE C DITCH – SECTION E 6

NTS



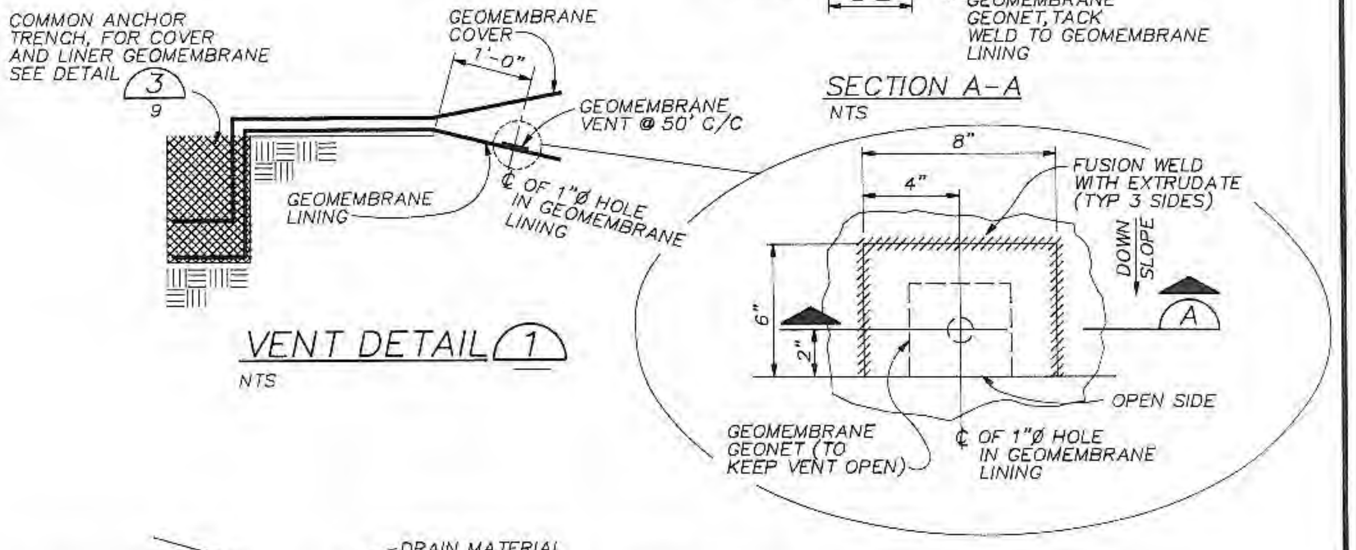
SECTION A 6

NTS



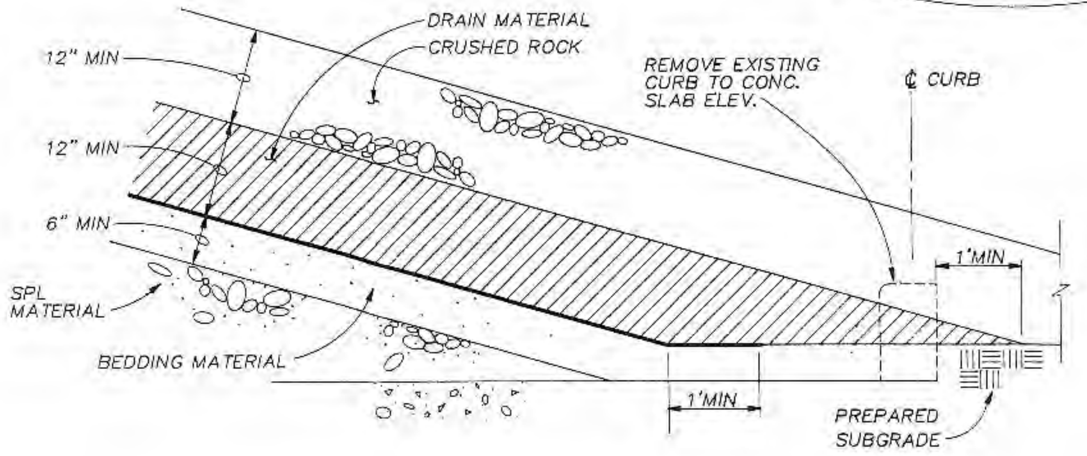
SECTION A-A

NTS



VENT DETAIL 1

NTS



COVER GEOMEMBRANE AT CURB DETAIL 2 5

NTS

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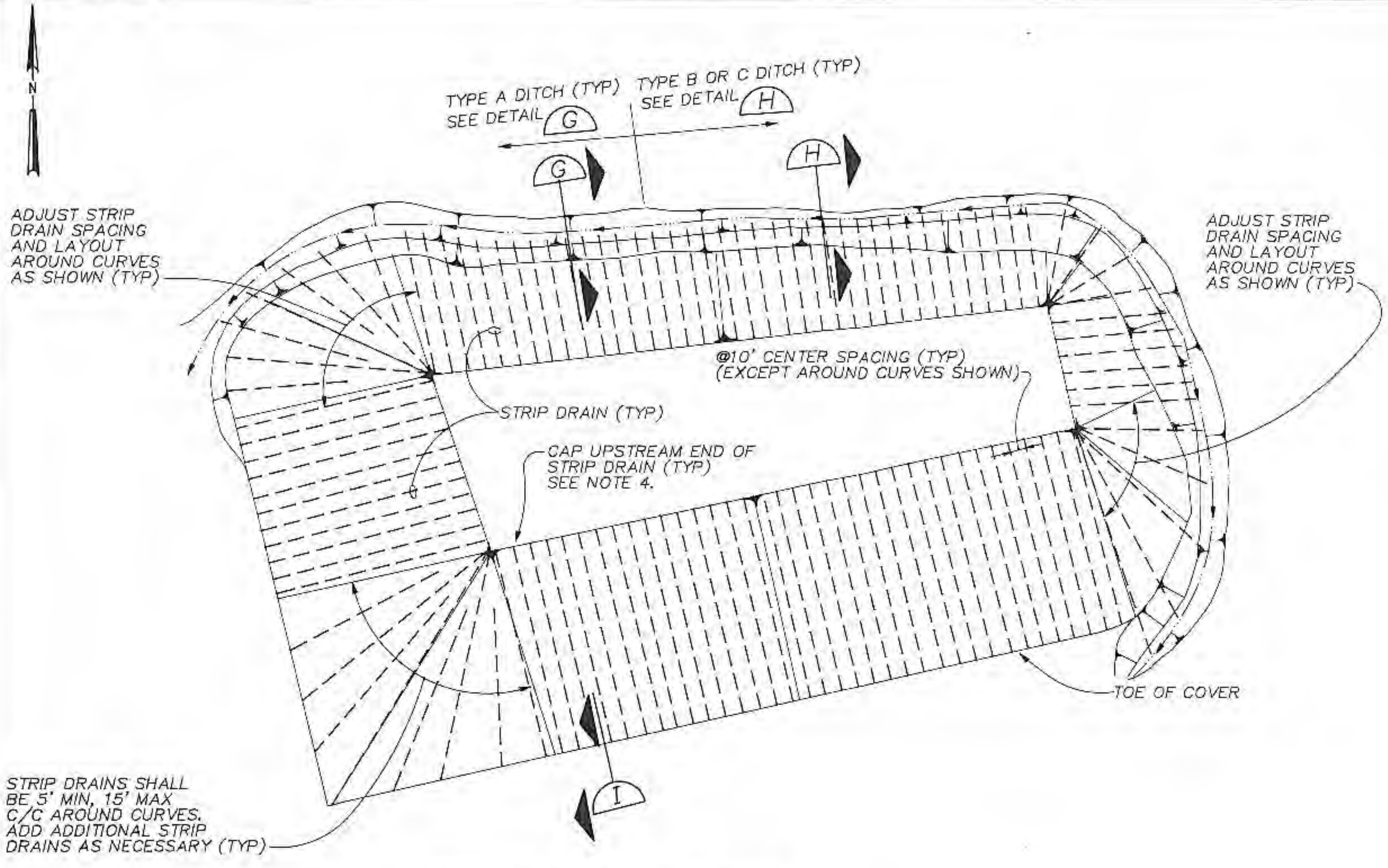
GOLDENDALE, WASHINGTON

SPL STOCKPILE CLOSURE

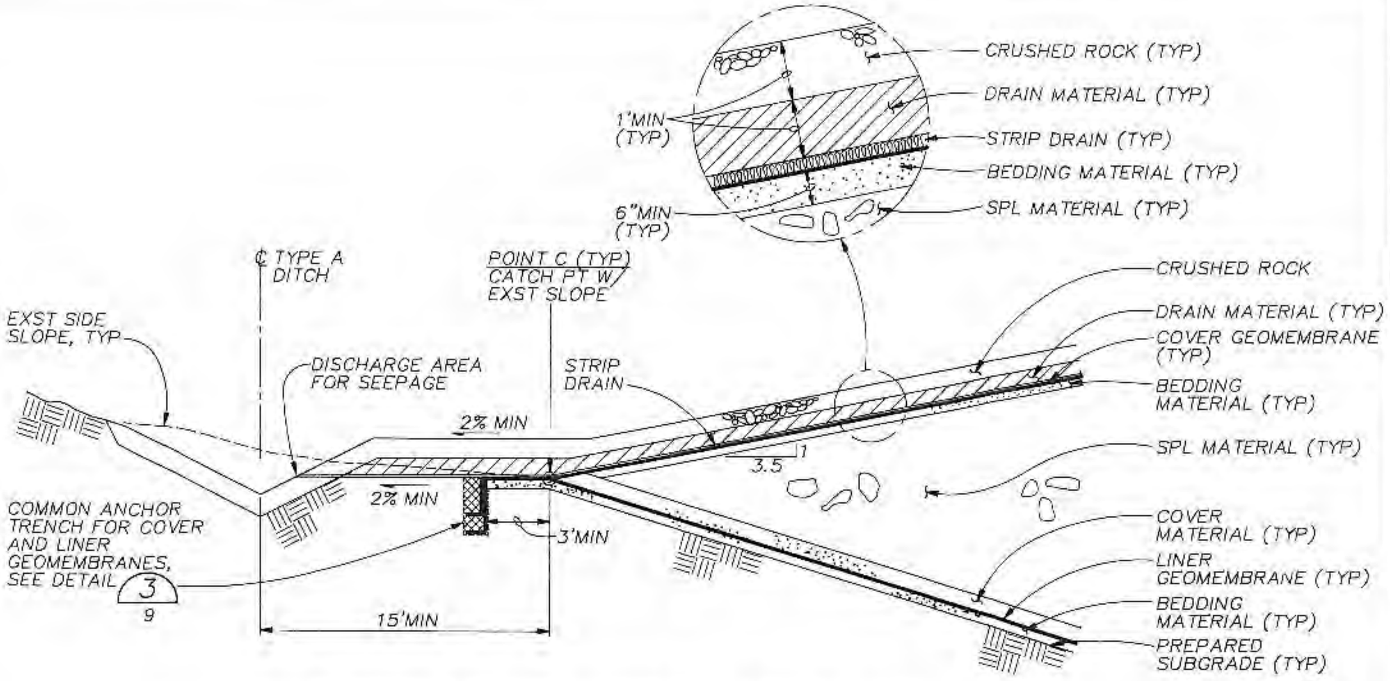
SPL COVER AND LINER SECTIONS AND DETAILS

SHEET 7
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1



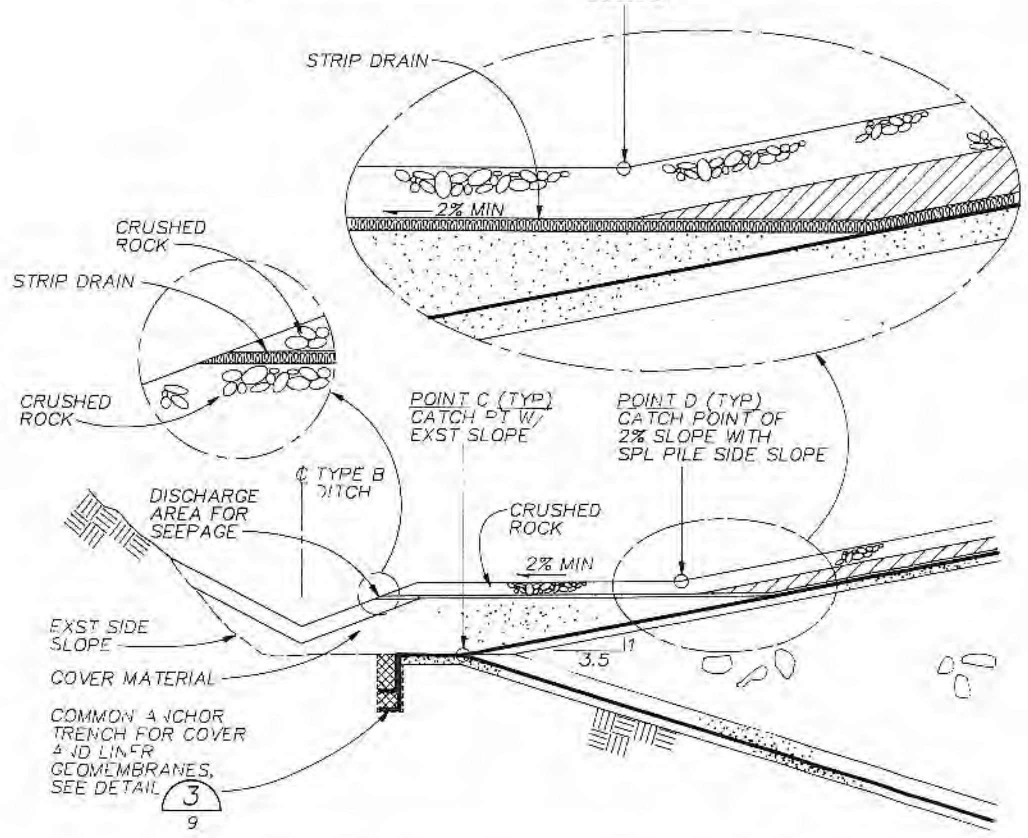
STRIP DRAIN LAYOUT

1"=50'



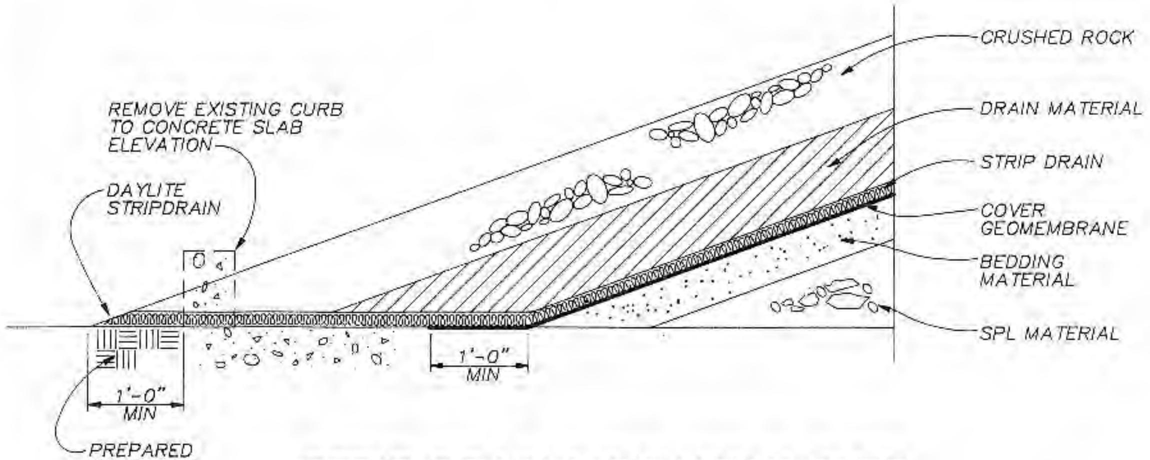
STRIP DRAIN INSTALLATION IN TYPE A DITCH AREAS - SECTION G

NTS



STRIP DRAIN INSTALLATION IN TYPE B AND C DITCH AREAS - SECTION H

NTS



STRIP DRAIN DISCHARGE OVER CURB - SECTION I

NTS

CH2M HILL

DSGN J. DEHNER
DR 24907C4 R.B. RICKS
CHK J.R. SCHNEIDER
APVD R.G. CRIM

NO.	DATE	REVISION	BY	APVD
1	8/88	ISSUED FOR BIDDING PURPOSES	RGC	
1	7/88	ISSUED FOR CLIENT AND INTERNAL REVIEW	RGC	

REUSE OF DOCUMENTS

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BAR IS ONE INCH ON ORIGINAL DRAWING.
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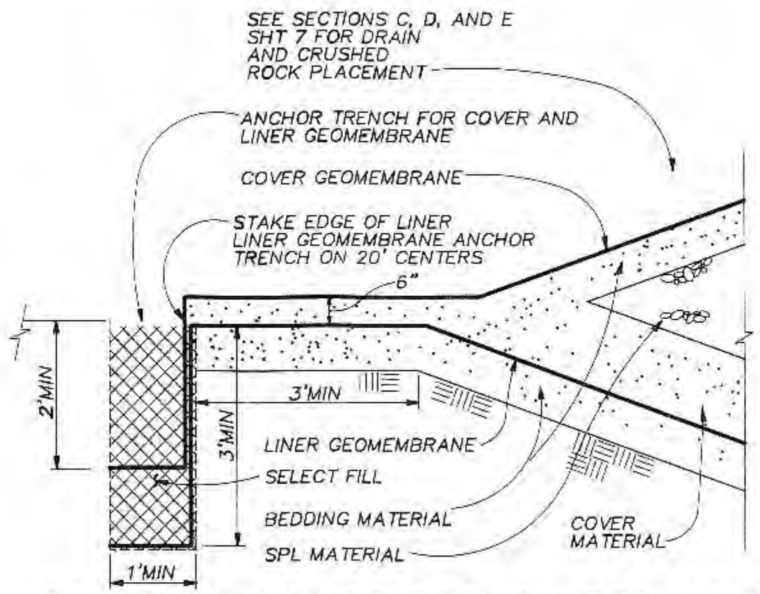
COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON
SPL STOCKPILE CLOSURE

STRIP DRAIN LAYOUT AND DETAILS

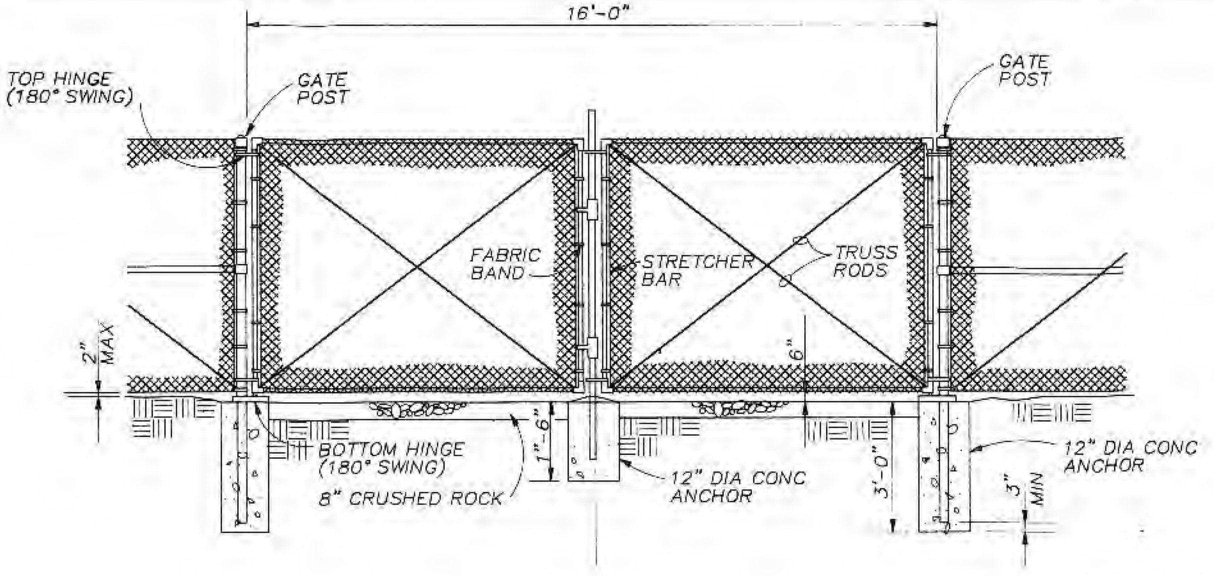
SHEET 8
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1

07-19-88 24907C2.DWG



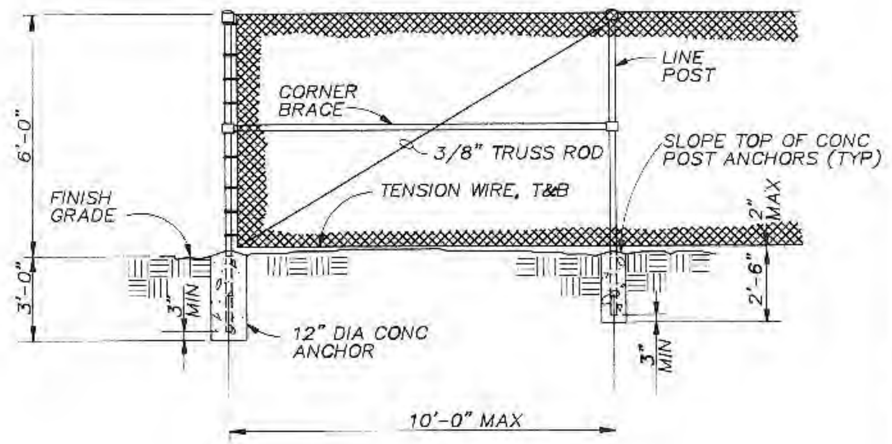
COMMON ANCHOR TRENCH FOR COVER AND LINER GEOMEMBRANES DETAIL (3)

NTS 5,7



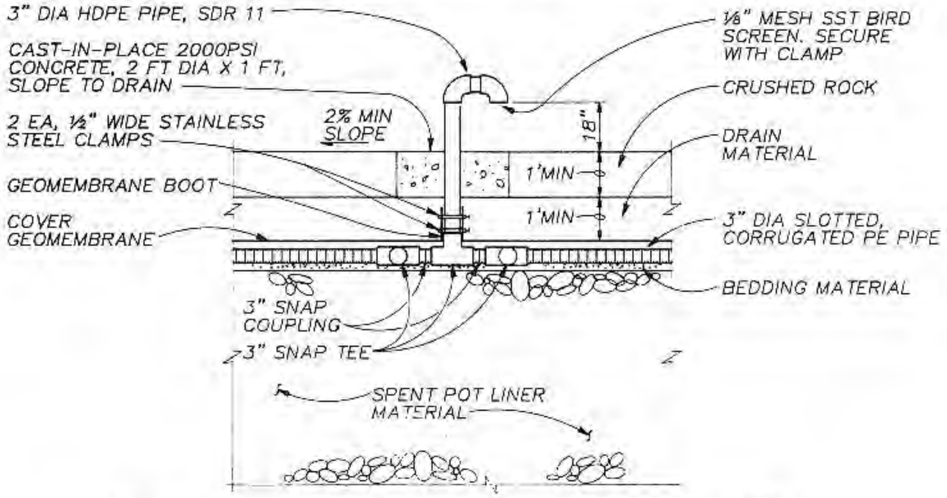
16' VEHICLE GATE DETAIL (5)

NTS 6



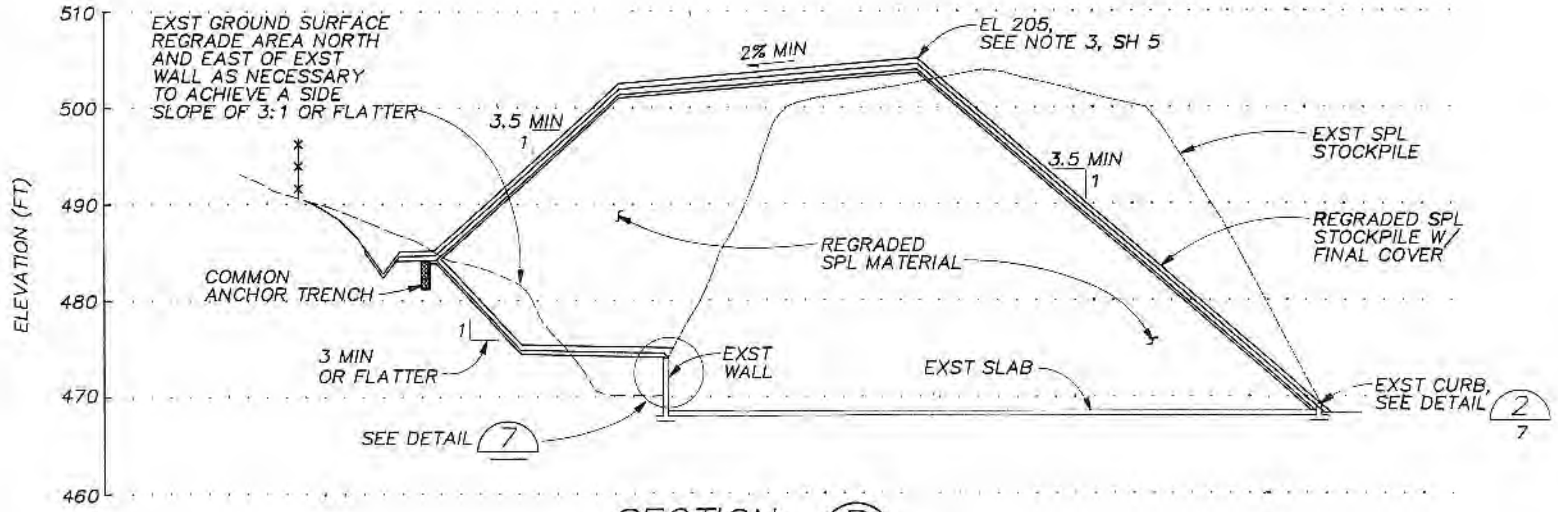
TYPICAL FENCE DETAIL (6)

NTS 6



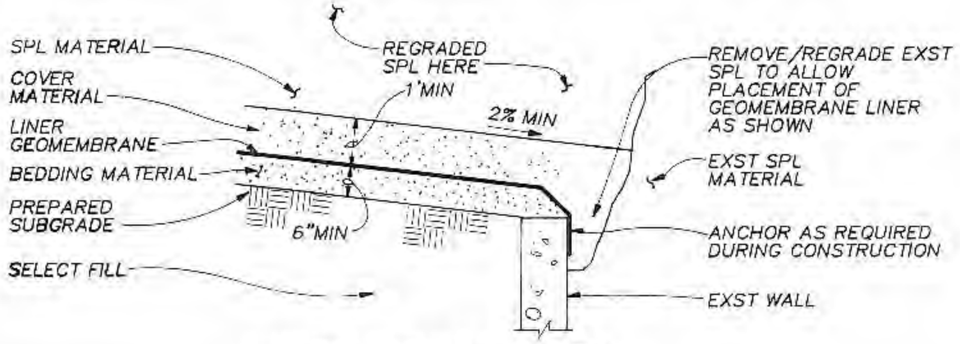
GAS VENTING SYSTEM DETAIL (4)

NTS 6



SECTION (B)

SCALE: 1"=10' (V) 6
1"=30' (H)



LINER DETAIL (7)

NTS (TYPICAL)

DSGN R.G. CRIM
DR A.L. ROGERS
CHK J.R. SCHNEIDER
APVD R.G. CRIM

NO.	DATE	REVISION	BY	APVD
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1	7/88	ISSUED FOR CLIENT AND INTERNAL REVIEW	RGC	

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COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON

SPL STOCKPILE CLOSURE

MISCELLANEOUS DETAILS

SHEET 9
DWG NO. C24907-1
DATE JULY 1988
PROJ NO. P24907.A1

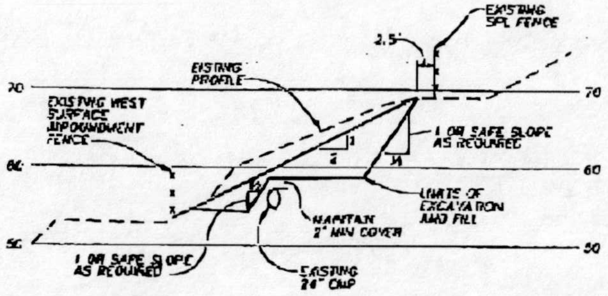
APPENDIX A-13

SWMU #13 – West SPL Storage Area

APPENDIX A-13

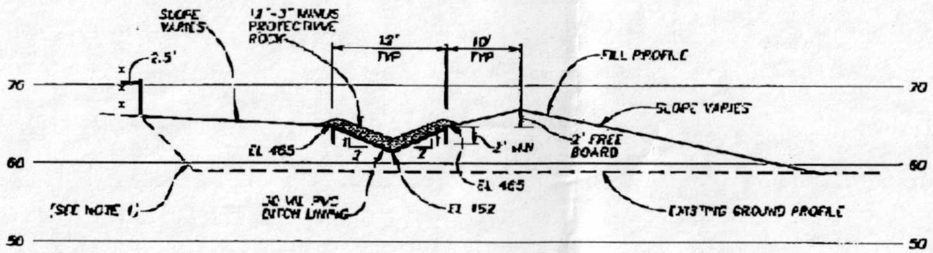
SWMU #13 – West SPL Storage Area

CH2MHill (1996c)
Slope Repairs and Grading Plan



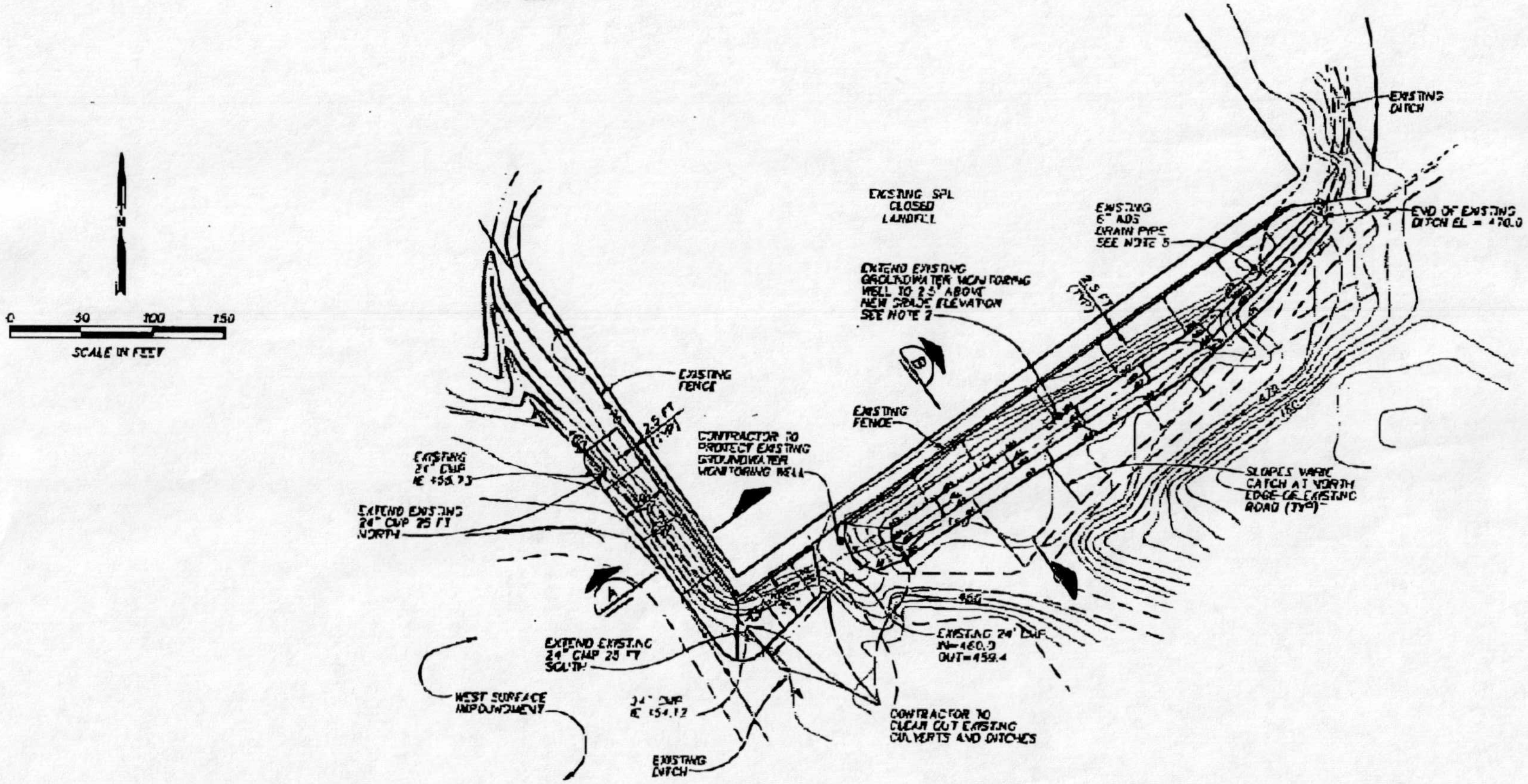
WEST-EXCAVATION AND FILL SECTION (A)

SCALE 1"=10'



DITCH DETAIL AND SOUTH SIDE EXCAVATION AND FILL-SECTION (B)

SCALE 1"=10'



NOTES

1. DITCH ELEVATIONS SHOWN ARE TOP OF LINING SEE DITCH DETAIL (SECTION B) THIS SHEET
2. CONTRACTOR SHALL EXTEND THE EXISTING GROUNDWATER MONITORING WELL, STEEL PROTECTIVE CASING AND 2" PVC WELL CASING TO 2.5' ABOVE NEW GRADE AT THE WELL LOCATION AND INSTALL A NEW PROTECTIVE CAP AND CONCRETE PAD. EXTENSION OF EXISTING 2" PVC WELL CASING SHALL BE A WATER TIGHT CONNECTION WITH A 2-INCH PVC COMPRESSION COUPLING AND 2-INCH SCH 40 PVC EXTENSION PIPE. WELD AN EXTENSION SECTION OF STEEL PROTECTIVE CASING PIPE TO EXISTING STEEL PROTECTIVE CASING AND EXTEND TO NEW ELEVATION AND FILL ANNULAR SPACE WITH BENTONITE CHIPS. THE 3 EXISTING GUARD POST SHALL BE RELOCATED TO NEW ELEVATION.
3. CONSTRUCTION OF THE SOUTH SIDE FILL AND DITCH SHALL BE SCHEDULED IN A MANNER WHERE THE FILL IS PLACED AND COMPACTED IN ITS ENTIRETY AND THEN THE DITCH SECTION IS CUT OUT. EXCAVATION OF DITCH MATERIAL CAN BE USED TO CONSTRUCT THE 2 FOOT HIGH FREE BOARD BERM ON THE SOUTH SIDE OF THE DITCH.
4. IN THE AREA OF THE SOUTH SIDE FILL CONTRACTOR SHALL CUT EXISTING BANK TO 1/2 HORZ. TO 1 VERTICAL AND/OR REMOVE ANY LOOSE SOILS ALONG BANK.
5. TIE EXISTING 6" ADS DRAIN PIPE INTO NEW DITCH AT TOP OF LINING. FIELD VERIFY LOCATION AND ELEVATION OF DRAIN PIPE AND INTERSECT NEW DITCH AT A LOCATION 6" BELOW EXISTING 6" DRAIN LINE ELEVATION.
6. COMPACT ALL MATERIALS WITH A MINIMUM OF COMPLETE PASSES WITH MINIMUM 10 TON STATIC WEIGHT VIBRATORY ROLLER.
7. PLACE ALL MATERIALS IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING 8-INCHES PRIOR TO COMPACTION.
8. OVER BUILD AND CUT BACK SLOPES ON WEST FILL TO ENSURE COMPACTION ON OUTSIDE OF SLOPE.

CH2M HILL

DSGN W.G. GRIFFIN
DR S.R. BAILEY
CHK M. COOLEY
APVD R.G. CRINN

NO.	DATE	REVISION	BY	APVD

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COLUMBIA ALUMINUM
GOLDENDALE, WASHINGTON
SPL SLOPE REPAIR

SLOPE REPAIR GRADING PLAN

SHEET 1
DWG NO.
DATE AUG 95
PROJ NO. 107037.E1.11

PRELIMINARY

APPENDIX A-13

SWMU #13 – West SPL Storage Area

Bakemeier (2009)
Groundwater Monitoring Data Summary

BAKEMEIER, P.C.

ROBERT F. BAKEMEIER
7683 SE 27TH ST., SUITE 464
MERCER ISLAND, WA 98040

LAW OFFICE
A PROFESSIONAL CORPORATION

TELEPHONE: 206-230-0600
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Facility:
Year: Left Right
Air [✓ Corr]
Water Reports
NPDES Permit
WET-Tox Enf
DW/RCRA Eng
[✓ Clean Up] Sub
SW
HW
Goldandale
Aluminum

March 12, 2009

Paul E. Skyllingstad
Department of Ecology
Industrial Section
P.O. Box 47600
Olympia, WA 98504-7600

RECEIVED
MAR 13 2009
Ecology - SWFA - Ind

Re: Groundwater Monitoring at the Closed Spent Potliner Landfill – Goldendale, Washington

Dear Mr. Skyllingstad:

Enclosed please find a copy of the most recent groundwater monitoring data summary of the Closed Spent Potliner ("SPL") Landfill at Goldendale, Washington.

Very truly yours,

Robert F. Bakemeier

Robert F. Bakemeier

Enclosure

cc: Roger Burden (w/enc.)
Cynthia R. Donnerberg/CH2M Hill (w/enc.)

Table 1
Monitoring Well Groundwater Analytical Results
Aleris International, Inc./Commonwealth Aluminum - Goldendale, Washington - Closed Spent Potliner Landfill

Well ID	Sample Collection Date	Free Cyanide (mg/L)	Q	Total Cyanide (mg/L)	Q	Chloride (mg/L)	Q	Fluoride (mg/L)	Q	Sulfate (mg/L)	Q	Sodium (mg/L)	Q	pH [H+]	EC (µmhos/cm)	Temp (Celsius)
	Method:	EPA 335.1 (a)		EPA 335.2 (f)		EPA 325.1		EPA 340.2		EPA 300.0		SW 6010		Field Parameters		
MW-06B	03/14/90	0.1		0.277		3.7		0.2		14.8		8.94		6.75	151	15.1
	05/25/90	0.13		0.298		3.4		0.23		15.1		9.09		6.72	150	18.6
	08/28/90	0.05	U	0.293		3.13		0.23		15		8.33		6.63	172	16.9
	11/28/90	0.05	U	0.316		2.64		0.16		14.5		9.12		7.25	180	15.1
	05/29/91	0.07		0.241		N/A		0.18		15.3		N/A		7.2	170	16.1
	08/27/91	0.05	U	0.18		4.9		0.16		16.6		N/A		7.04	160	16.5
	11/26/91	0.05	U	0.225		N/A		0.2		14.5		N/A		7.28	150	14.5
	02/18/92	0.05	U	0.163		N/A		0.22		15		N/A		7.3	160	13.5
	05/11/92	0.05		0.185		N/A		0.24		N/A		N/A		7.21	150	15.7
	08/27/92	0.05	U	0.13		N/A		0.16		13.5		N/A		6.58	204	18.4
	11/30/92	0.05	U	0.12		N/A		0.133		13.7		N/A		7.72	158	14.6
	02/23/93	0.103		0.11		N/A		0.282		14.2		N/A		7.68	152	13.8
	05/21/93	0.07		0.07		N/A		0.182		14.2		N/A		7.11	150	16
	08/30/93	0.05	U	0.165		N/A		0.166		15.2		N/A		7.38	162	16
	11/30/93	0.008	U	0.209		N/A		0.206		17.9		N/A		7.23	169	15
	03/31/94	0.129		0.176		N/A		0.22		18.9		N/A		7.14	172	15.7
	09/27/94	0.164		0.182		N/A		0.2		20.5		N/A		7.25	195	16.9
	03/09/95	0.126		0.139		N/A		0.19		18.7		N/A		7.2	175	15.7
	03/05/96	0.018		0.187		N/A		0.22		38.9		N/A		7.16	262	14.9
	06/05/96	0.01	U	0.193		N/A		0.21		38.8		N/A		7.0	288	16.1
	09/05/96	0.078		0.381		N/A		0.20		48.9		N/A		6.79	337	15.6
	12/05/96	0.1		0.606		N/A		0.20		41.2		N/A		7.02	283	14.9
	03/20/97	0.241		0.999		N/A		0.20		48.8		N/A		7.10	344	15.8
	06/19/97	0.05		1.54		N/A		0.22		50.8		N/A		7.04	360	16.2
	09/11/97	0.10	U	1.17		N/A		0.27		55.5		N/A		6.97	362	15.4
	12/10/97 *(b)*	--		--		N/A		0.26		51.8		N/A		7.11	450	14.1
	01/23/98	0.19		3.26		N/A		N/A		N/A		N/A		7.26	496	15.1
	03/19/98	0.01		3.00		N/A		0.25		58.2		N/A		7.06	525	15.8
	06/03/98	0.09		3.54		N/A		0.27		66.1		N/A		6.97	560	15.9
	03/11/99	0.10	U	1.44		N/A		0.31		27.4		N/A		7.44	316	15.8
	04/04/00	0.025	U	0.402		N/A		4.38		16.1		N/A		7.34	252	15.8
	07/19/00	0.010	U	0.350		N/A		4.60		17.4		N/A		7.25	229	16.6
	07/19/00 *(c)*	NA		0.415		N/A		4.69		19.1		N/A		N/A	N/A	N/A
	03/27/01	0.07		0.22		N/A		4.10		14.9		N/A		7.16	218	15.5
	03/05/02	0.108		0.138		N/A		2.40		15.3		N/A		7.19	215	15.5
	03/31/03	0.010	U	0.010	U	N/A		1.80		15.8		N/A		7.59	213	15.7
	04/30/04	0.010		0.130		3.64		1.43		15.34		18.43		7.41	228	15.0
	04/19/05	0.085		0.22		N/A		1.52		27.2		N/A		7.10	335	16.0
	03/14/06 *(e)*	0.021		0.132		N/A		1.3		29.5		N/A		7.20	320	15.5
	04/17/07 *(e)*	0.22		0.315		N/A		1.4		36.8		N/A		7.12	400	15.9
	05/28/08 *(e)*	0.19		0.420		N/A		1.8		40.5		N/A		7.01	371	15.8

Table 1
Monitoring Well Groundwater Analytical Results
Aleris International, Inc./Commonwealth Aluminum - Goldendale, Washington - Closed Spent Potliner Landfill

Well ID	Sample Collection Date	Free Cyanide (mg/L)	Q	Total Cyanide (mg/L)	Q	Chloride (mg/L)	Q	Fluoride (mg/L)	Q	Sulfate (mg/L)	Q	Sodium (mg/L)	Q	pH [H+]	EC (µmhos/cm)	Temp (Celsius)
	Method:	EPA 335.1 (a)		EPA 335.2 (f)		EPA 325.1		EPA 340.2		EPA 300.0		SW 6010		Field Parameters		
MW-11A	03/14/90	0.05	U	0.01	U	5.6		0.21		8.5		7.42		N/A	N/A	N/A
	05/25/90	0.05	U	0.01	U	3.3		0.24		8.4		7.21		7.15	150	16.8
	08/28/90	0.05	U	0.01	U	3.05		0.25		8.2		7.06		6.9	161	17.2
	09/26/90	0.05	U	0.05	U	5.96		0.22		13.43		7.38		7.54	219	N/A
	11/29/90 *	0.05	U	0.05	U	1.6		0.21		7.46		6.27		7.64	196	N/A
	05/29/91 *	0.05	U	0.05	U	1.58		0.19		8.91		7.37		7.64	209	N/A
	07/30/91 *	0.05	U	0.05	U	2.87		0.2		9.36		7.18		7.42	231	N/A
	10/23/91 *	0.05	U	0.05	U	N/A		0.19		17.03		N/A		7.65	200	N/A
	01/28/92 *	0.05	U	0.05	U	N/A		0.26		9.83		N/A		7.43	178	N/A
	04/22/92 *	0.05	U	0.05	U	N/A		0.24		18.19		N/A		7.58	186	N/A
	07/28/92 *	0.05	U	0.05	U	N/A		0.24		11.05		N/A		7.67	197	N/A
	10/27/92 *	0.05	U	0.05	U	5.2		0.24		9.01		7.57		7.62	198	N/A
	03/24/93 *	0.05	U	0.05	U	3		0.3		8.68		7.5		7.68	199	N/A
	06/23/93 *	0.05	U	0.05	U	3.5		0.26		17.36		9		7.66	200	N/A
	08/25/93 *	0.05	U	0.05	U	4.5		0.26		7.86		7.43		7.41	191	N/A
	11/23/93 *	0.05	U	0.05	U	2		0.31		7.82		8.96		7.45	192	N/A
	03/23/94 *	0.05	U	0.05	U	2.2		0.27		11.01		6.07		7.51	192	N/A
	08/24/94 *	0.05	U	0.05	U	2		0.26		8.93		9.54		7.37	194	N/A
	11/22/94 *	0.05	U	0.05	U	3.5		0.25		8.76		7.61		7.64	184	N/A
	01/25/95 *	0.001	U	0.001	U	4.4		0.24		9.09		7.72		7.60	186	N/A
	05/22/95 *	0.001	U	0.001	U	5.00		0.21		12.57		7.72		7.60	233	N/A
	08/23/95 *	0.001	U	0.001	U	5.5		0.24		9.82		9.08		7.52	240	N/A
	10/25/95 *	0.001	U	0.001	U	2.2		0.22		9.59		9.997		7.59	242	N/A
	01/24/96 *	0.001	U	0.001	U	4.0		0.21		8.14		9.047		7.75	247	N/A
	04/26/96 *	0.001	U	0.001	U	4.0		0.18		18.75		10.04		7.58	275	N/A
	07/02/96 *	0.001	U	0.001	U	4.4		0.26		9.78		9.63		7.42	247	N/A
	10/23/96 *	0.001	U	0.001	U	4.6		0.24		10.44		7.35		7.53	230	N/A
	03/26/97 *	0.001	U	0.001	U	6.3		0.21		11.35		7.94		7.48	200	N/A
	06/25/97 *	0.001	U	0.001	U	4.31		0.23		10.69		9.36		7.44	200	N/A
	09/24/97 *	0.001	U	0.001	U	6.40		0.24		10.90		9.15		7.41	250	N/A
	12/23/97 *	0.001	U	0.001	U	4.65		0.25		11.40		7.98		7.60	230	N/A
	03/25/98 *	0.001	U	0.001	U	6.60		0.22		12.84		7.91		7.29	211	N/A
	06/25/98 *	0.001	U	0.001	U	6.70		0.22		13.90		7.91		7.24	257	N/A
	09/23/98 *	0.001	U	0.001	U	5.40		0.22		12.14		7.84		7.12	239	N/A
	11/24/98 *	0.001	U	0.001	U	4.86		0.21		21.30		8.91		7.39	235	N/A

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Monitoring Well Groundwater Analytical Results
Aleris International, Inc./Commonwealth Aluminum - Goldendale, Washington - Closed Spent Potliner Landfill

Well ID	Sample Collection Date	Free Cyanide (mg/L)	Q	Total Cyanide (mg/L)	Q	Chloride (mg/L)	Q	Fluoride (mg/L)	Q	Sulfate (mg/L)	Q	Sodium (mg/L)	Q	pH [H+]	EC (µmhos/cm)	Temp (Celsius)
	Method:	EPA 335.1 (a)		EPA 335.2 (f)		EPA 325.1		EPA 340.2		EPA 300.0		SW 6010		Field Parameters		
MW-11A (cont)	03/24/99 *	0.001	U	0.001	U	6.38		0.20		12.24		8.47		7.51	252	N/A
	06/22/99 *	0.001	U	0.001	U	5.68		0.19		13.04		8.14		7.44	247	N/A
	08/26/99 *	0.001	U	0.001	U	7.43		0.18		12.32		7.94		7.07	250	N/A
	11/23/99 *	0.001	U	0.001	U	6.38		0.20		11.66		7.90		7.35	235	N/A
	05/22/00 *	N/A		N/A		6.39		0.21		11.51		7.57		7.44	231	N/A
	08/22/00 *	(a)														
	11/21/00 *	0.001	U	0.001	U	7.99		0.21		19.86		10.90		7.45	269	N/A
	02/27/01 *	0.001	U	0.001	U	6.07		0.22		11.72		8.13		7.73	239	N/A
	05/23/01 *	0.001	U	0.001	U	6.08		0.20		13.91		10.59		7.27	258	N/A
	08/28/01 *	(a)														N/A
	11/29/01 *	0.001	U	0.001	U	6.04		0.21		12.79		8.31		7.32	307	N/A
	02/21/02 *	0.001	U	0.001	U	6.09		0.22		11.31		8.44		7.54	251	N/A
	05/14/02 *	0.001	U	0.001	U	5.90		0.22		11.60		7.55		7.50	223	N/A
	07/30/02 *	(a)														
	10/22/02 *	(a)														
	02/27/03 *	0.001	U	0.001	U	6.24		0.24		10.40		8.07		7.82	218	NA
	04/30/04 *	(a)														
	04/19/05	(a)														
	03/14/06	(a)														
	04/17/07	(a)														
MW-16A	03/14/90	0.05	U	0.188		3.8		0.21		15.3		10.5		6.57	161	16.5
	05/25/90	0.14		0.17		3.3		0.24		14.9		9.41		6.74	172	17.5
	08/28/90	0.05	U	0.14		3.05		0.23		14.7		9.51		6.08	190	17.8
	11/28/90	0.05	U	0.176		2.5		0.19		14		9.68		7.15	195	16.3
	05/29/91	0.05	U	0.186		N/A		0.18		15.2		N/A		7.04	187	17.1
	08/27/91	0.05		0.17		4.9		0.16		16.9		N/A		7.2	195	17.7
	11/26/91	0.05	U	0.143		N/A		0.18		14.4		N/A		6.92	180	16.1
	02/18/92	0.05	U	0.149		N/A		0.07		15.2		N/A		6.8	180	15.3
	05/11/92	0.07		0.14		N/A		0.2		N/A		N/A		7.64	175	16.7
	08/27/92	0.05	U	0.1		N/A		0.2		15.1		N/A		6.25	249	19.1
	11/30/92	0.05	U	0.1		N/A		0.366		37.8		N/A		7.2	197	15.2
	02/23/93	0.07		0.09		N/A		0.22		14.9		N/A		7.34	175	14.4
	05/21/93	0.05		0.05		N/A		0.148		14.7		N/A		7.64	190	17.5
	08/30/93	0.05	U	0.124		N/A		0.148		19		N/A		7.19	218	17.7
	11/30/93	0.009		0.11		N/A		0.165		15.7		N/A		7.27	192	15.7

Table 1
Monitoring Well Groundwater Analytical Results
Aleris International, Inc./Commonwealth Aluminum - Goldendale, Washington - Closed Spent Potliner Landfill

Well ID	Sample Collection Date	Free Cyanide (mg/L)	Q	Total Cyanide (mg/L)	Q	Chloride (mg/L)	Q	Fluoride (mg/L)	Q	Sulfate (mg/L)	Q	Sodium (mg/L)	Q	pH [H+]	EC (µmhos/cm)	Temp (Celsius)
	Method:	EPA 335.1 (a)		EPA 335.2 (f)		EPA 325.1		EPA 340.2		EPA 300.0		SW 6010		Field Parameters		
MW-16A (cont)	03/31/94	0.0861		0.0849		N/A		0.18		15.7		N/A		7.47	185	16.2
	09/27/94	0.0855		0.0981		N/A		0.19		16.6		N/A		7.14	210	17.6
	03/09/95	0.0802		0.0989		N/A		0.16		18.4		N/A		7.09	210	15.9
	03/05/96	0.085		0.763		N/A		0.16		180		N/A		7.14	690	15.0
	06/05/96	0.022		0.458		N/A		0.22		131		N/A		7.2	690	17.1
	09/05/96	0.14		1.43		N/A		0.44		49.5		N/A		7.00	475	15.6
	12/05/96	0.37		1.93		N/A		0.5		42.7		N/A		7.12	461	15.4
	03/20/97	0.223		0.956		N/A		0.59		131		N/A		7.24	722	17.1
	06/19/97	0.05	U	0.626		N/A		0.75		51.0		N/A		7.25	450	17.2
	09/11/97	0.113		0.883		N/A		0.75		66.2		N/A		7.00	596	16.9
	12/10/97 *(b)*	--		--		N/A		0.46		74.1		N/A		7.03	730	16.1
	01/23/98	0.19		1.65		N/A		N/A		N/A		N/A		7.24	653	17.0
	03/19/98	0.01	U	1.53		N/A		0.66		51.3		N/A		7.05	622	17.8
	06/03/98	0.10		1.70		N/A		0.55		35.3		N/A		7.16	437	16.3
	03/11/99	0.10	U	1.02		N/A		0.88		25.5		N/A		7.53	314	16.2
	04/04/00	0.116		0.337		N/A		7.63		19.3		N/A		7.42	309	16.1
	07/19/00	0.047		0.450		N/A		6.50		22.1		N/A		7.43	280	16.2
	07/19/00 *(c)*	N/A		0.441		N/A		6.26		23.8		N/A		N/A	N/A	N/A
	03/27/01	0.03		0.14		N/A		5.3		14.8		N/A		7.25	231	15.7
	03/05/02	0.048		0.048		N/A		3.3		15.7		N/A		6.94	207	15.3
	03/31/03	0.077		0.082		N/A		2.8		17.3		N/A		6.85	222	15.9
	05/10/04 *(e)*	0.054		0.193		N/A		2.4		53.6		N/A		6.82	366	16.5
	04/19/05 *(e)*	0.029		0.107		N/A		2.42		26.6		N/A		6.61	324	16.2
	03/14/06	0.031		0.32		N/A		1.5		49.3		N/A		6.94	375	16.0
	04/17/07	0.086		0.091		N/A		1.4		53.3		N/A		7.08	419	16.0
	05/28/08	0.02	U	0.12		N/A		1.7		39.4		N/A		7.02	358	16.1
MW-17A	03/14/90	0.05	U	0.01	U	4.1		0.23		15.1		8.16		N/A	171	15
	05/25/90	0.08		0.016		3.1		0.27		14.5		7.97		6.84	132	17
	08/28/90	0.05	U	0.01	U	2.9		0.21		14.3		7.45		7.03	142	16.2
	11/28/90	0.05	U	0.01	U	2.65		0.22		14.2		8.34		7.71	150	14
	05/29/91	0.05	U	0.01	U	N/A		0.2		15.5		N/A		7.63	148	15.7
	08/27/91	0.05	U	0.01	U	3.4		0.2		15.5		N/A		7.1	140	17.3
	11/26/91	0.05	U	0.01	U	N/A		0.2		14.6		N/A		7.6	135	14.3
	02/18/92	0.05	U	0.01	U	N/A		0.17		15.1		N/A		7.6	140	15
	05/11/92	0.05	U	0.01	U	N/A		0.2		N/A		N/A		7.38	135	15.5
	08/27/92	0.05	U	0.01	U	N/A		0.19		15.2		N/A		6.19	192	17.2
	11/30/92	0.05	U	0.01	U	N/A		0.15		15.1		N/A		7.48	150	14.8
	02/23/93	0.05	U	0.01	U	N/A		0.24		15.8		N/A		7.95	140	14.1
	05/21/93	0.01	U	0.01	U	N/A		0.179		14.9		N/A		7.88	140	17.6
	08/30/93	0.05	U	0.01	U	N/A		0.18		15.2		N/A		7.47	142	15.2
	11/30/93	0.01	U	0.01	U	N/A		0.183		15.1		N/A		7.66	142	14.6

Table 1
Monitoring Well Groundwater Analytical Results
Aleris International, Inc./Commonwealth Aluminum - Goldendale, Washington - Closed Spent Potliner Landfill

Well ID	Sample Collection Date	Free Cyanide (mg/L)	Q	Total Cyanide (mg/L)	Q	Chloride (mg/L)	Q	Fluoride (mg/L)	Q	Sulfate (mg/L)	Q	Sodium (mg/L)	Q	pH [H+]	EC (µmhos/cm)	Temp (Celsius)
	Method:	EPA 335.1 (a)		EPA 335.2 (f)		EPA 325.1		EPA 340.2		EPA 300.0		SW 6010		Field Parameters		
MW-17A (continued)	03/31/94	0.01	U	0.01	U	N/A		0.22		15.1		N/A		7.52	135	15.2
	09/27/94	0.01	U	0.0167		N/A		0.2		16.2		N/A		7.52	152	15.9
	03/09/95	0.0102		0.0128		N/A		0.19		16.7		N/A		7.46	165	15.1
	03/05/96	0.028		0.132		N/A		0.18		163		N/A		7.40	720	14.7
	06/05/96	0.01	U	0.132		N/A		4.15		67.0		N/A		7.50	391	14.9
	09/05/96	0.17		3.60		N/A		1.53		74.5		N/A		7.16	657	15.0
	12/05/96	0.73		4.80		N/A		0.95		72.7		N/A		7.20	673	15.2
	03/20/97	0.89		3.70		N/A		1.57		60.4		N/A		7.37	659	14.7
	06/19/97	0.225		1.11		N/A		2.50		27.4		N/A		7.43	427	15.4
	09/11/97	0.10	U	1.16		N/A		1.50		37.3		N/A		7.27	368	16.1
	12/10/97 *(b)*	--		--		N/A		0.65		21.9		N/A		7.43	278	15.6
	01/23/98	0.14		1.83		N/A		N/A		N/A		N/A		7.56	378	15.1
	03/19/98	0.01	U	0.71		N/A		0.86		30.9		N/A		7.39	359	15.8
	06/03/98	0.06		0.85		N/A		0.64		33.0		N/A		7.44	334	15.4
	03/11/99	0.05	U	0.18		N/A		0.22		18.7		N/A		7.76	239	15.7
	04/04/00	0.10	U	0.10		N/A		0.33		17.1		N/A		7.57	284	15.7
	07/19/00	0.010	U	0.076		N/A		0.30		19.6		N/A		7.62	260	16.0
	07/19/00 *(c)*	N/A		0.077		N/A		0.28		20.6		N/A		N/A	N/A	N/A
	03/27/01	0.01	U	0.03		N/A		0.30		16.9		N/A		7.26	197	15.0
	03/06/02	0.013		0.013		N/A		0.30		17.0		N/A		7.82	172	15.1
	03/31/03	0.024		0.033		N/A		0.30		17.4		N/A		7.45	170	15.4
	05/10/04	0.042		0.047		N/A		1.8		46.3		N/A		7.09	345	17.3
	04/19/05	0.043		0.049		N/A		0.81		19.1		N/A		7.42	237	15.5
	03/14/06	0.010	U	0.076		N/A		2.80		68.7		N/A		7.46	495	15.5
	04/17/07	0.010		0.015		N/A		0.69		33.1		N/A		7.54	286	15.4
	05/30/08	0.020	U	0.049		N/A		1.10		21.0		N/A		7.49	218	15.5

Notes:

1. **Q = Qualifiers:** U = Less than indicated detection limit.
   * = Well sampled and analyzed by Goldendale Aluminum Company (formerly Columbia Aluminum Corporation).
2. N/A = Not analyzed or data not available.
3. Field = Parameter measured in field.

(a) Free Cyanide analysis changed from SM412H to EPA 335.1 in 11/93.
(b) Cyanide values not obtained due to laboratory exceeding holding times. Groundwater resampled on 1/23/97 and analysis obtained for cyanide concentrations only.
(c) July 2000 groundwater samples split with Goldendale Aluminum Company - as part of confirmation sampling event. These data results from Goldendale Aluminum onsite laboratory.
(d) MW-11A not sampled because there was insufficient water level recharge to sample. Goldendale Aluminum is no longer required to sample this well as part of its WSI monitoring.
(e) Laboratory values for parent and duplicate samples are averaged. Prior to the 2004 sampling event the higher concentration was reported.
(f) Method EPA 335.4 for Total Cyanide was used by laboratory on the 2008 sample.

APPENDIX A-14

SWMU #14 – North SPL Storage Containment Building

APPENDIX A-14

SWMU #14 – North SPL Storage Containment Building

Golder (1996b)
Recommendations for Certification

conditions, including when vehicles and personnel are entering and exiting the unit.

3. SITE INSPECTION

3.1 Overview

On Tuesday, October 3, 1995, Mr. Thomas Miller and Mr. Chris Wolschlag of Golder Associates met with Mr. Paul Woodin, Mr. Wayne E. Wooster, and Mr. Tim Furlong of Columbia Aluminum at the Goldendale, WA plant site. After a discussion of the project status and requirements, Mr. Wooster and Mr. Furlong accompanied Mr. Miller and Mr. Wolschlag to both the CRRUD Room and the North SPL Building.

3.2 CRRUD Room

Operations had ceased in the CRRUD Room for many days prior to our visit. Figure P1 is a photograph taken from the North side of the building looking South at the dust scrubbers. The negative air pressure imposed by this dust mitigation system is intended to keep all fugitive emissions within the building during operations. Figure P2 is from the inside of the CRRUD Room and indicates the range in particle size of the SPL from boulder size pieces many feet in diameter to dust size particles.

Figure P3 is of the CRRUD Room slab where the SPL is broken down. In this area, the upper portion of the slab is reinforced with a steel grating that has kept the slab in a relatively good condition. The CRRUD Room walls, roof, and entryways do have cracks and pinholes that would allow fugitive dust transmission during operations as indicated in Figure P4. However, the negative pressure system has been designed to keep the dust from being transported through such openings.

The track hoe ram used to break down the SPL was parked outside the building at the time of our visit and is shown in Figures P5 and P6. There is some potential for accumulation of SPL on the tracks and outside of the machine during operations such that decontamination (i.e., brooming operations) or complete dedication of the machine to the building interior may be necessary for regulatory compliance.

In summary, from the visual inspection, it was evident that the structural integrity of the building has been maintained during the operations to date. The floor slab (primary barrier) was in good condition with relatively few cracks. Expansion joints were filled with a rubber seal and there was no evidence of the potential for transport of the dry SPL materials through the primary barrier.

3.3 North SPL Building

Figures P7 and P8 depict the outside and entrance of the North SPL Building. The 200-ft long by 100-ft wide buildings sits at the base of a talus slope, several hundred feet high to the North. The building was completely empty at the time of our visit. There is no electric power in the building at this time and Columbia Aluminum does not intend to extend power to the building because of cost considerations. Eight skylight panels provide the only source of interior light to the building. The entrance is on the South side of the building and consists of a 16-ft wide by 14-ft high opening with no door except for a set of exterior tarp curtains (Figure P8).

Except for a 4-ft high perimeter concrete wall, the exterior of the building consists of aluminum sheeting that is attached to an interior steel frame. Exterior photographs of the concrete perimeter wall shown in Figures P9 and P10 illustrate the popouts and vertical cracking in the concrete wall that is common around the perimeter of the building. The connection between the aluminum sheeting and the concrete wall is disrupted in many locations as shown in Figure P11.

Damp or wet areas at the base of the concrete wall were encountered throughout the West and North sides of the building as indicated in Figure P12. Where the water or dampness occurred, the slab had significant surface deterioration in the upper 1/4 inch or so. The deterioration resulted in elimination of the cementation between aggregate particles at the slab surface, with a deposit of finely divided and possibly cementitious material. Given that low temperature cycling does occur in the region and that the SPL contains large amounts of sulfate, the deterioration of the concrete may be the result of freeze-thaw cycling or sulfate exposure. Both of these phenomena require the presence of water which corroborates the fact that deterioration was always present where water or dampness was also present.

The elevation of the top of the slab is 1 or 2 feet lower than the grade surrounding the building. Furthermore, a culvert beneath a road to the North of the building, collects water produced by the existing talus slope, and a trench has been dug to carry the water around to the West side of the building. The trench stops along the West side of the building with no provision for the water to be carried further away from the building. This might explain why perimeter water or dampness was only noticed on the West and North sides of the building. Furthermore, it substantiates the notion that the water or dampness is caused by seeps from the building exterior into the building interior through shrinkage and temperature cracks and expansion joints.

In addition to the slab perimeter, damp or wet areas were also observed throughout the interior of the building, at locations unassociated with joints (Figure P13) and at intersections of slab joints (Figure P14). In all areas where water was observed, the upper 1/4 inch or more of the slab had deteriorated as described above. It also appeared as though no joint filler had been placed in any of the slab joints. All joints were generally about 1/2 inch in width and full of either fine-grained SPL or the deteriorated concrete deposit described in the previous paragraph. Sources for the water or dampness at slab interior locations could also include rainwater drips from the pinholes observed in the roof above.

Although the concrete slab was extensively cracked and jointed, it was generally structurally sound and had performed its intended function. The deterioration was never more than about a 1/2 inch thick, and the seepage all appeared to be from the outside of the building inward. However, if water may seep in, then it may also seep out and carry SPL with it.

The aluminum roof and wall sheeting was found to be occasionally penetrated by pinholes or ruptures caused perhaps by the daily operations of storing the SPL. The interior steel frame also had experienced local impact loads from either SPL or the operations machinery causing buckling or distortion of flanges of some of the structural members. However, the performance of the building has not been hindered by any of the damage.

4. RECOMMENDED MINIMUM BUILDING MODIFICATIONS

4.1 General

Once the design standards contained in 40 CFR 265.1101 are met (Section 2.2), there is a regulatory requirement for certification by a registered Professional Engineer as indicated in the following paragraph:

265.1101(c)(2) *Owners or operators of all containment buildings must obtain certification by a qualified registered professional engineer that the containment building design meets the requirements of paragraphs (a) through (c) of this section. For units placed into operation prior to February 18, 1993, this certification must be place in the facility's operating record (on-site files for generators who are not formally required to have operating records) no later than 50 days after the date of initial operation of the unit. After February 18, 1993, PE certification will be required prior to operation of the unit.*

Golder Associates is prepared to provide a P.E. certification as indicated above for the CRRUD Room and North SPL Building, once the necessary design modifications have been made to bring the two buildings up to regulatory standards as outlined in Section 2.2 of this report. These modifications are described in the following paragraphs.

4.2 CRRUD Room

The CRRUD Room addition was made in 1990 through SCM Consultants of Kennewick, WA. Golder Associates received copies of the original drawings, specifications, and engineering calculations in early February 1996. After a modest review, and in consideration of our site visit, we have the following recommendations for building modifications:

(1) Construction or contraction joints in the floor slab must be cleaned of all latence and sealed with a resin or rubber joint filler, if not already present. Other visible random cracks in concrete slab and perimeter walls must be cleaned of latence and sealed with a resin or epoxy joint filler.

(2) All holes, tears, or other openings in metal walls and roof must be sealed or modified as necessary to prevent moisture from entering the building.

(3) The operating procedures must ensure that tracking of hazardous waste materials from the building interior to the buildings exterior does not take place. Several schemes may be adopted to prevent tracking. Vehicles or operations equipment such as loaders or track hoes could be dedicated to the building. Staging areas could be designed just

inside the buildings where outside vehicles, such as dump trucks are broomed down prior to exiting the building. A double-door system may be helpful in this regard.

(4) The existing negative air pressure system that is in place must be functional during normal operations and capable of containing all fugitive dust even when doors are opened for personnel and equipment traffic into or out of the building. Due to high winds, an interior door, working in conjunction with the exterior door to form a double-door system may be necessary to contain the dust when the outer door is opened periodically. In any event, operating procedures should be changed so that the exterior door is normally closed and not left open during windy conditions.

4.3 North SPL Building

The North SPL Building was designed and built in 1988 by GARCO Building Systems of Spokane, WA. Golder Associates received copies of the original drawings, specifications, and engineering calculations in late 1995. After a moderate review of the design data, and in consideration of our site inspection, we have the following recommendations for building modifications:

(1) Examination of the drawings made available to Golder Associates indicate that the floor slab contains an insufficient amount of reinforcement to meet applicable code requirements for shrinkage and temperature crack control. Furthermore, it is our opinion that structural analysis of the slab under the anticipated operational loads would also demonstrate the lack of sufficient reinforcement from a strength perspective. There are several ways to mitigate these slab deficiencies:

(A) Argue that the slab has performed reasonably well thus far and that the proposed design waste quantity (10,000 tons) is significantly less than what the slab has been subjected to in the past (15,000 tons). Proof of the 15,000 tons would be required.

(B) Same argument as above. However, in addition, a 2″ to 3″ asphalt overlay could be placed to aid in the performance of the slab from an abrasion, durability, and watertightness perspective. The estimated cost for this overlay is \$1.00/ft^2, or \$20,000 for a 20,000 ft^2 building.

(C) Ignore the existing slab, and construct a new slab that meets the code requirements. The estimated cost for an 8″ thick slab with #5's @ 12″ is \$3.75/ft^2, or about \$75,000 for a 20,000 ft^2 building.

(2) Construction or contraction joints in the floor slab must be cleaned of all latence and sealed with a resin or rubber joint filler, if not already present. Other visible random cracks in concrete walls and slabs must be cleaned of latence and sealed with a resin or epoxy joint filler.

(3) All holes, tears, or other openings in metal walls and roof must be sealed or modified as necessary to prevent moisture from entering the building or fugitive dust from exiting the building.

(4) SPL shall be placed in working piles that will not come in contact with the perimeter walls. In accordance with our discussions with Columbia Aluminum, a continuous yellow line shall be painted along the inside of the perimeter walls, at a distance of 10-ft from these walls. Waste will be piled at its angle of repose up to the confines of this yellow line. The 10-ft zone shall serve as a buffer area and allow for equipment access to the entire perimeter of the SPL piles. It is assumed that the total design load for the building is 10,000 tons.

(5) The operations procedures must ensure that no tracking of SPL from the building interior to the building exterior takes place. Several schemes may be adopted to prevent tracking. Vehicles or operations equipment such as loaders could be dedicated to the buildings in which they are used. Staging areas could be designed just inside the buildings where outside vehicles, such as dump trucks are broomed down prior to exiting the building. Due to the high winds in the area, a double-door system may be necessary in this regard.

(6) An outer door must be installed that will resist wind and vehicular impact loads and prohibit water or wind from entering the building or fugitive dust from exiting the building.

(7) In addition, an interior door, working in conjunction with the exterior door to form a double-door system will likely be necessary to contain the dust when the outer door is opened periodically during operations. The nature of this door system must be such that the no visible emissions state is maintained during normal operating conditions and when vehicles and personnel are entering or exiting the building.

(8) The existing diversion channel that extends from the culvert on the North side of the building to the road at the Southwest corner of the building is intended to divert surface water collected in the culvert away from the North SPL Building. The channel is incomplete and must be completed with a grade and cross-sectional area capable of transporting the anticipated flows away from the North SPL Building.

5. CLOSURE

We feel confident that if the recommendations provided herein are carried out as indicated, the CRRUD Room and North SPL Building will meet the applicable regulatory requirements for Containment Buildings described herein.

APPENDIX A-14

SWMU #14 – North SPL Storage Containment Building

CH2MHill (2009)
Closure Certification Letter Report

TABLE 1

Sample Coordinates for May 2009 Sand Samples

Columbia Gorge Aluminum

Sample Location	X RAND1 [a]	Y RAND2	X Coordinate [b] Wall Length = 200 feet	Y Coordinate Wall Length = 100 feet
SS-050609-01	0.25005	0.221819	50	22
SS-050609-02	0.723351	0.624242	145	62
SS-050609-03	0.141118	0.250092	28	25
SS-050609-04	0.716423	0.495914	143	50
SS-050609-05	0.097763	0.399581	20	40
SS-050609-06	0.129494	0.842842	26	84

Notes:

[a] RAND1 and RAND2 generated using Microsoft Excel 2003 with Random Generator add-on application

[b] Coordinates calculated by normalizing random number pairs to distances in feet from the southwest corner of the building by multiplying with corresponding wall length Sample locations found in the building by treating the southwest corner of the bldg as the origin of a Cartesian coordinate system. The south wall served as the X axis and the west wall as the Y axis . A measuring wheel was used to measure coordinate distances from the southwest corner of the building.

Table 2

Raw Data - Analytical Results for Concrete and Dust Samples

Columbia Gorge Aluminum

Constituent				Cyanide, Free	Cyanide, Total	Fluoride, Total	Fluoride, Water Soluble
Screening Criteria:				1,600			240
Units:				mg/Kg	mg/Kg	mg/Kg	mg/L
Matrix	**Sample ID**	**Sample Location**	**Date Sampled**				
CONCRETE	CON-S1-082608	NW corner of bldg	08/26/08	0.062 U	**2.4**	**294**	**0.24**
CONCRETE	CON-S2-082608	SW corner of bldg (crack location)	08/26/08	**0.97**	**416**	**19,900**	**83.8**
CONCRETE	CON-S3-082608	N central portion of bldg	08/26/08	0.063 U J	**5.5**	**642**	**0.426**
CONCRETE	CON-S4-082608	NE corner of bldg	08/26/08	0.013 U J	**2.3**	**2,140**	**21.3**
CONCRETE	CON-S5-082708	S central portion of bldg (crack location)	08/27/08	0.062 U	**3.4**	**763**	**2.87**
DUST	DS-S1-082708	Concrete support post in E side of bldg	08/27/08	**0.095**	**138**	**118,000**	**200**
DUST	DS-S2-082708	Concrete support post in W side of bldg	08/27/08	**0.6**	**91.1**	**163,000**	**$\boxed{465}$**
DUST	DS-S3-082708	Rafters in central portion of bldg	08/27/08	**0.15**	**127**	**133,000**	**171**
DUST	DS-S4-082708	Rafters in E side of bldg	08/27/08	**0.13**	**45.9**	**172,000**	**117**
DUST	DS-S5-082708	Rafters in W side of bldg	08/27/08	**0.16**	**50.8**	**136,000**	**33.6**
DUST	DS-S6-082708	Central section of W aluminum wall	08/27/08	**0.25**	**79.2**	**128,000**	**141**
DUST	DS-S7-082708	Central section of N aluminum wall	08/27/08	**0.36**	**103**	**129,000**	**187**
DUST	DS-S8-082708	Central section of S aluminum wall	08/27/08	**0.22**	**106**	**117,000**	**$\boxed{322}$**
DUST	DS-S9-082708	Central section of E aluminum wall	08/27/08	**0.46**	**190**	**138,000**	**$\boxed{442}$**
DUST	DS-S10-082708	Central section of S concrete wall	08/27/08	**1.4**	**23.8**	**158,000**	**102**
DUST	DS-S11-082708	Central section of W concrete wall	08/27/08	**0.3**	**21.9**	**125,000**	**37.5**
DUST	DS-S12-082708	Central section of E concrete wall	08/27/08	**0.068**	**21.5**	**176,000**	**117**
DUST	DS-S13-082708	Central section of N concrete wall	08/27/08	**0.14**	**31.8**	**162,000**	**88.6**

Notes:

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

CL = crack location

J = Estimated value

U = Constituent included in the analysis but not detected.

Bold results indicate result detected above the reporting limit.

Boxed results indicate result detected above screening criterion.

1) Screening criteria from SPL closure plan

2) Screening criteria derived from clean closure target level of 4,800 mg/kg water soluble fluoride. Based on the SPLP method 1312, using a 20 to 1 weight of liquid to solid the equivalent clean closure target level for a liquid is 240 mg/L.

Table 3

Raw Data - Analytical Results for Soil and Sand Samples

Columbia Gorge Aluminum

Constituent				Cyanide, Free	Cyanide, Total	Fluoride, Total	Fluoride, Water Soluble
Screening Criteria:				32	32		240
Units:				mg/Kg	mg/Kg	mg/Kg	mg/L
Matrix	**Sample ID**	**Sample Location**	**Date Sampled**				
SAND	SS-S1-082608	Inside bldg, 70 ft N & 25 ft E of SW Corner (UCCS)	08/26/08	0.065 U	**0.76**	**506**	**0.264**
SAND	SS-S2-082608	Inside bldg, 29 ft N & 50 ft E of SW Corner (CL)(UCCS)	08/26/08	**0.44**	$\boxed{\mathbf{35.5}}$	**2,890**	**19**
SAND	SS-S3-082608	Inside bldg, 82 ft N and 93 ft E of SW Corner (UCCS)	08/26/08	0.071 U	**0.86**	**380**	**0.165**
SAND	SS-S4-082608	Inside bldg, 66 ft N and 174 ft E of SW Corner (UCCS)	08/26/08	0.065 U	**2**	**2,150**	**6.12**
SAND	SS-S5-082708	Inside bldg, 36 ft N and 92 ft E of SW Corner (CL)(UCCS)	08/27/08	0.064 U	**2.2**	**676**	**1.01**
SAND	SS-050609-01	Inside bldg, 22 ft N & 50 ft E of SW Corner	05/06/09	NA	**5.31**	NA	NA
SAND	SS-050609-02	Inside bldg, 62 ft N & 144 ft E of SW Corner	05/06/09	NA	**1.78**	NA	NA
SAND	SS-050609-03	Inside bldg, 25 ft N & 28 ft E of SW Corner	05/06/09	NA	**1.11**	NA	NA
SAND	SS-050609-04	Inside bldg, 50 ft N & 143 ft E of SW Corner	05/07/09	NA	0.282 U	NA	NA
SAND	SS-050609-05	Inside bldg, 40 ft N & 20 ft E of SW Corner	05/07/09	NA	**1.47**	NA	NA
SAND	SS-050609-06	Inside bldg, 84 ft N & 26 ft E of SW Corner	05/07/09	NA	**0.390**	NA	NA
SOIL	SS-S6-082708	Outside bldg, next to W wall	08/27/08	0.0063 U J	0.075 U J	**1,300**	**11.7**
SOIL	SS-S7-082708	Outside bldg, next to N wall	08/27/08	0.067 U	0.21 U J	**2,620**	**5.82**
SOIL	SS-S8-082708	Outside bldg, next to E wall	08/27/08	0.093 U	0.26 U J	**805**	**4.96**
SOIL	SS-S9-082708	Outside bldg, next to S wall	08/27/08	0.071 U	0.59 U	**12,000**	**30**

Notes:

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

CL = crack location

NA = not analyzed

J = Estimated value

U = Analyte included in the anlaysis but not detected.

Bold results indicate result detected above the reporting limit.

Boxed results indicate result detected above screening criterion.

1) Screening criteria from SPL closure plan

2) Screening criteria derived from clean closure target level of 4,800 mg/kg water soluble fluoride. Based on the SPLP method 1312, using a 20 to 1 weight of liquid to solid the equivalent clean closure target level for a liquid is 240 mg/L.

3) For sand samples, the abbreviation UCCS means under corresponding concrete sample location

APPENDIX A-15

SWMU #15 – South SPL Storage Building

Golder (1996a)
Closure Certification Report

5. VERIFICATION SAMPLING

On November 20, 1995, a representative of Golder Associates inspected the South and South Annex SPL Building. At this time the physical condition of the concrete floor slab and concrete knee walls were inspected and samples were collected for analyses. Photographs of the sampling were also taken and are on file. The results of each are discussed below.

5.1 Physical Condition of Concrete Slab and Walls

In general, the concrete floor slab and walls were found to be in good condition. Some large gouging (chipping) of the concrete floor was observed. Columbia Aluminum reports that this was caused by equipment during the removal of the SPL. A visual inspection of the gouged area showed that the integrity of the concrete floor had not been breached.

Some cracking of the concrete floor slab was noted near the east and west entrances to the building. The cracks were associated with the entrance ramps into the building. The location of the cracks were noted for sampling.

5.2 Sample Collection Methods

5.2.1 Concrete Core Samples

A total of five samples of the concrete floor were collected for analyses. A roto-hammer drill was used for the coring. A sample was collected from the center of each storage bay (three in total) inside the building, representing one third of the building floor. The two remaining core samples were at crack location(s) at the east and west entrances. Cores collected at crack locations were taken through the crack and stopped at the top of the sand layer. The sand layer was visually inspected for free water at each coring location. None was noted. The PVC liner was not penetrated. One concrete sample consisting of a composite of drill cuttings from the full depth of the concrete slab was collected from each concrete coring location.

5.2.2 Sand Layer Samples

One composite sand sample was collected from each concrete coring location using a 3/8 inch copper pipe tapped into the sand layer.

5.2.3 Sweep Samples

Sweep samples were collected from the center of each concrete wall surface and the aluminum wall, approximately 5 feet above the location where the concrete wall sweep sample had been collected. The area swept was 10 square feet (38 inches on a side) in size and marked on the wall prior to sampling. Locations of sweep samples weighing less than 10 grams were declared clean. A calibrated scale was used to determine the weight of the samples. Laboratory grade brushes and 11 inch by 14 inch white paper were used for collecting the sweep samples.

The same sweep sampling procedure was used to collect the ceiling sample. The ceiling samples were collected from the center of each storage bay.

Two support posts were also sampled using the methods outlined above.

5.2.4 Soils

The soil adjacent to the South and South Annex SPL Building was visually inspected for potliner and staining which could be indicative of contaminated areas. None were observed. One sample was collected from soil adjacent to each of the building's four walls. The samples were collected from the approximate center of each wall. The surfaces adjacent to the north and west walls were covered by asphalt and sampled by chipping pieces of asphalt from the surface. Soil samples were collected using a stainless steel trowel.

5.3 Analytical Results

Laboratory data sheets are presented in Appendix A. The results of each of the analyses are presented below.

5.3.1 Concrete Core Samples

The five concrete core samples were analyzed for Total Cyanide and Total Fluorides. The results are as follows.

	Results in mg/kg			
Sample	Total Cyanide	Free Cyanide	Total Fluoride	Soluble Fluoride
Concrete Crack East Bay	5.7	na	15	na
West Bay Crack Concrete	1.74	na	16	na
Concrete East Bay	0.51	na	4.8	na
Concrete Middle Bay	ND	na	3.9	na
Concrete West Bay	0.7	na	ND	na

Note na = not applicable. None of the sample concentrations exceeded 1,600 mg/kg Total Cyanides or 4,800 Total Fluoride; therefore, analyses for Free Cyanide and Soluble Fluoride were not conducted.

5.3.2 Sand Layer Samples

The five sand samples from under the concrete slab were analyzed for Total Cyanide and Total Fluorides. The results are as follows.

	Results in mg/kg			
	Total	Free	Total	Soluble
Sample	Cyanide	Cyanide	Fluoride	Fluoride
Sand Crack West Bay	ND	na	ND	na
Sand Crack East Bay	1.94	na	17	na
Sand West Bay	0.26	na	8.8	na
Sand Middle Bay	ND	na	6.5	na
Sand East Bay	ND	na	3.3	na

Note na = not applicable. None of the sample concentrations exceeded 32 mg/kg Total Cyanide or 4,800 mg/kg Total Fluoride; therefore, analyses for Free Cyanide and Soluble Fluoride were not conducted.

5.3.3 Sweep Samples

Sweep samples were collected as described in section 5.2.3 from 13 locations. A scale was used to weigh the largest of the sweep samples. It was collected from the support beam in the middle bay and weighed greater than 10 grams. None of the other sweep samples were submitted for analyses because all weighted less than 10 grams. The analytical results of the support beam sample are:

	Results in mg/kg			
	Total	Free	Total	Soluble
Sample	Cyanide	Cyanide	Fluoride	Fluoride
Support Beam Middle Bay	7.64	na	750	na

Note na = not applicable. None of the sample concentrations exceeded 1,600 mg/kg Total Cyanides or 4,800 mg/kg Total Fluoride; therefore, analyses for Free Cyanide and Soluble Fluoride were not conducted.

5.3.4 Soils Samples

Two soil (dirt) and two asphalt samples were analyzed for Total Cyanide and Total Fluorides. The results are as follows.

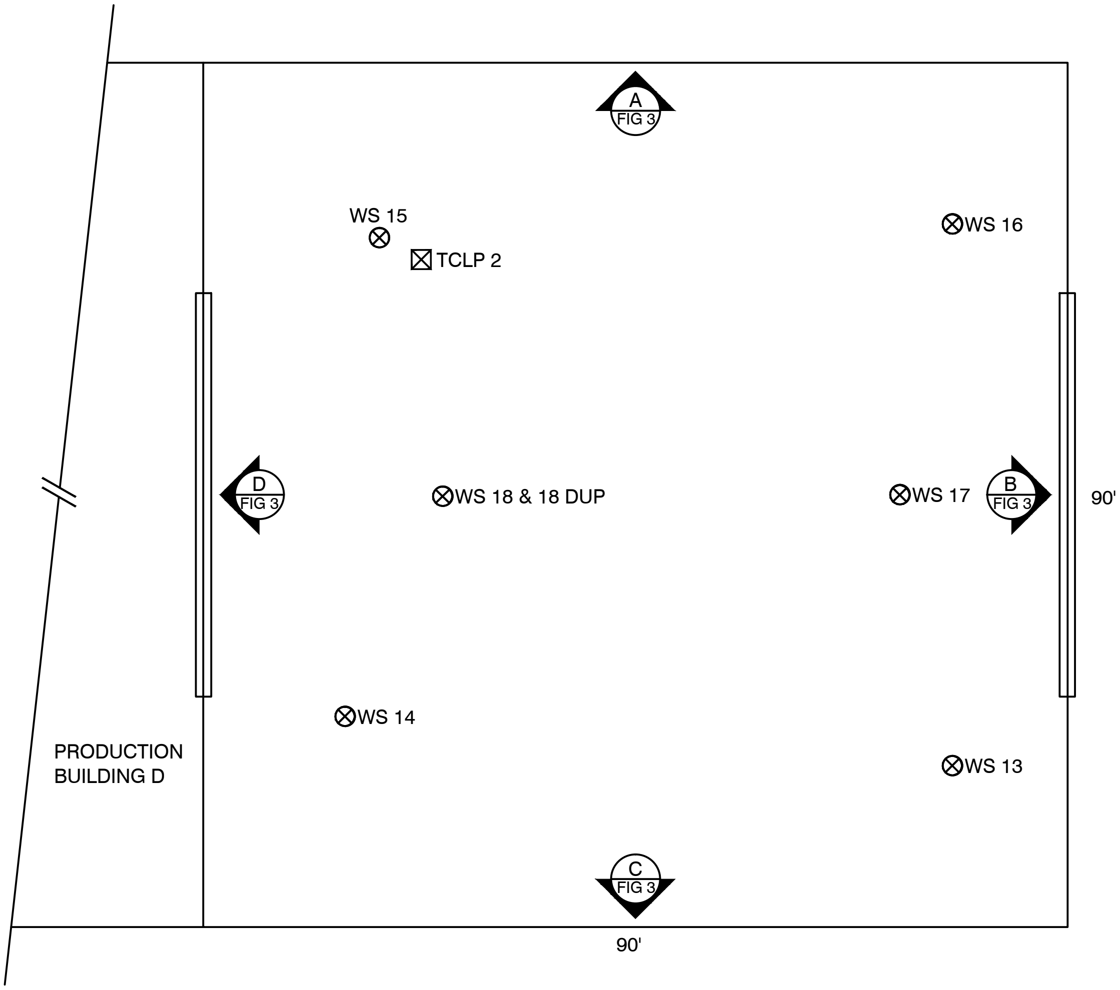
	Results in mg/kg			
Sample	Total Cyanide	Free Cyanide	Total Fluoride	Soluble Fluoride
Dirt South Side	0.21	na	58	na
Dirt East Side	7.2	na	1030	na
Asphalt North Side	0.17	na	63	na
Asphalt West Side	ND	na	49	na

Note na = not applicable. None of the sample concentrations exceeded 32 mg/kg Total Cyanides or 4,800 mg/kg Total Fluoride, and therefore, analyses for Free Cyanide and Soluble Fluoride were not conducted. Soils under the PVC liner within the building were not tested since the concentrations of cyanide did not exceed the target cleanup level of 32 mg/Kg.

APPENDIX A-16

SWMU #16 – SPL Handling Containment Building

PGG (2011)
Closure Certification



FLOOR PLAN

⊗	WS-1 WIPE SAMPLES FROM BUILDING INTERIOR, COLLECTED JUNE 10, 2010.
☒	TCLP-2 DUST SAMPLES FROM BUILDING INTERIOR, COLLECTED JUNE 10, 2010.
DUP	DUPLICATE SAMPLE LOCATION

FIGURE 2

CATHODE RECOVERY BUILDING
FLOOR SAMPLE LOCATION MAP

COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON

DATE: NOVEMBER 2011

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604

FIGURE 3

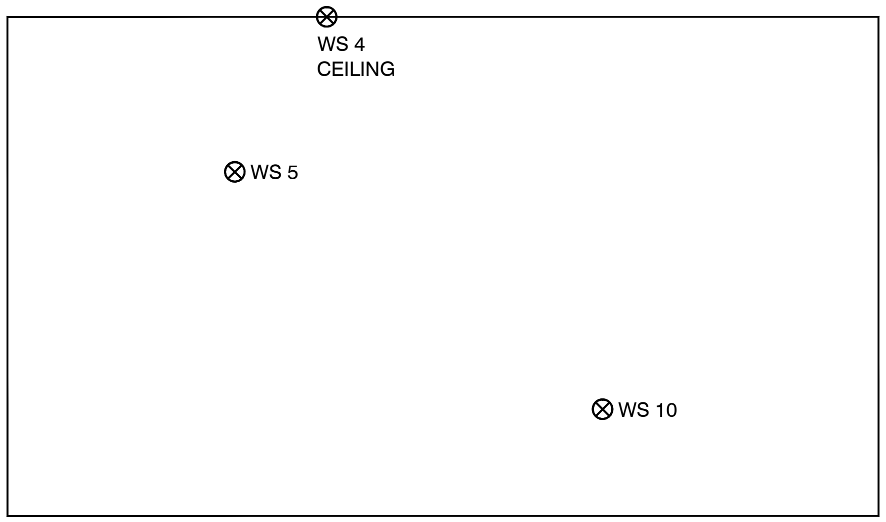
CATHODE RECOVERY BUILDING INTERIOR WALLS SAMPLE LOCATION MAP

COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON

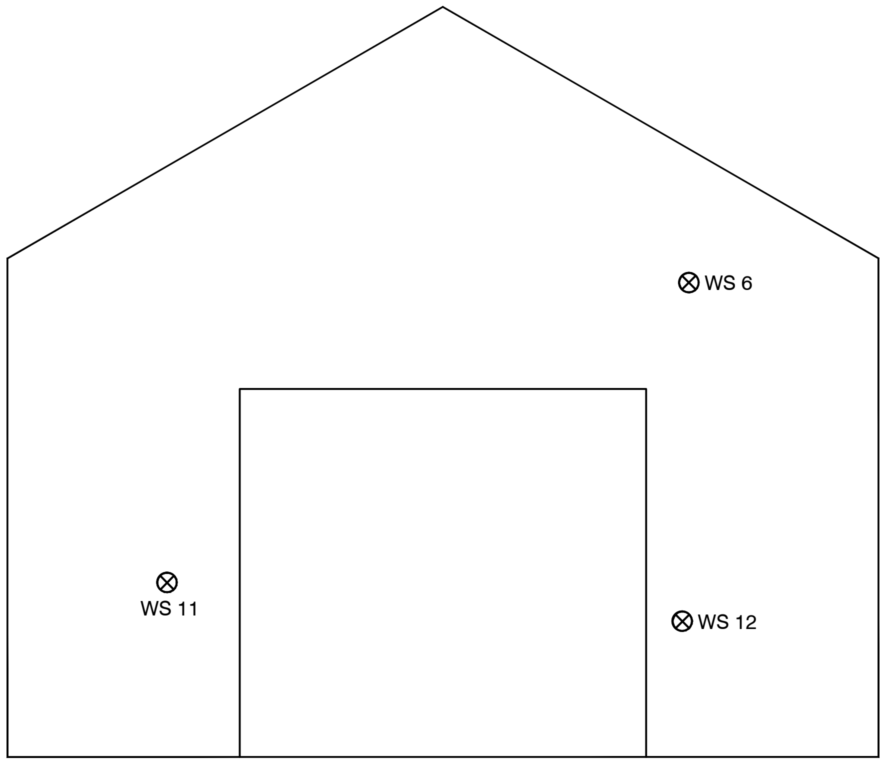
⊗ WS-1
WIPE SAMPLES FROM BUILDING INTERIOR, COLLECTED JUNE 10, 2010.

☒ TCLP-1
DUST SAMPLES FROM BUILDING INTERIOR, COLLECTED JUNE 10, 2010.

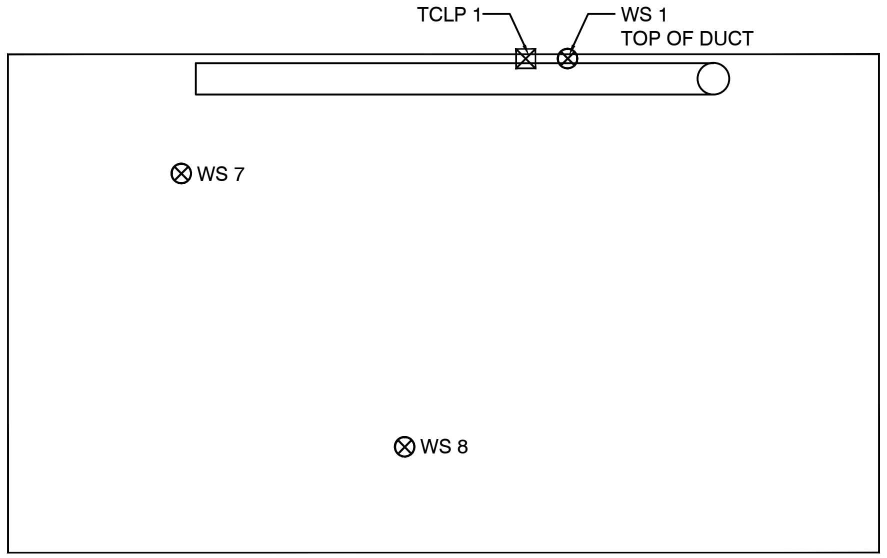
DUP DUPLICATE SAMPLE LOCATION



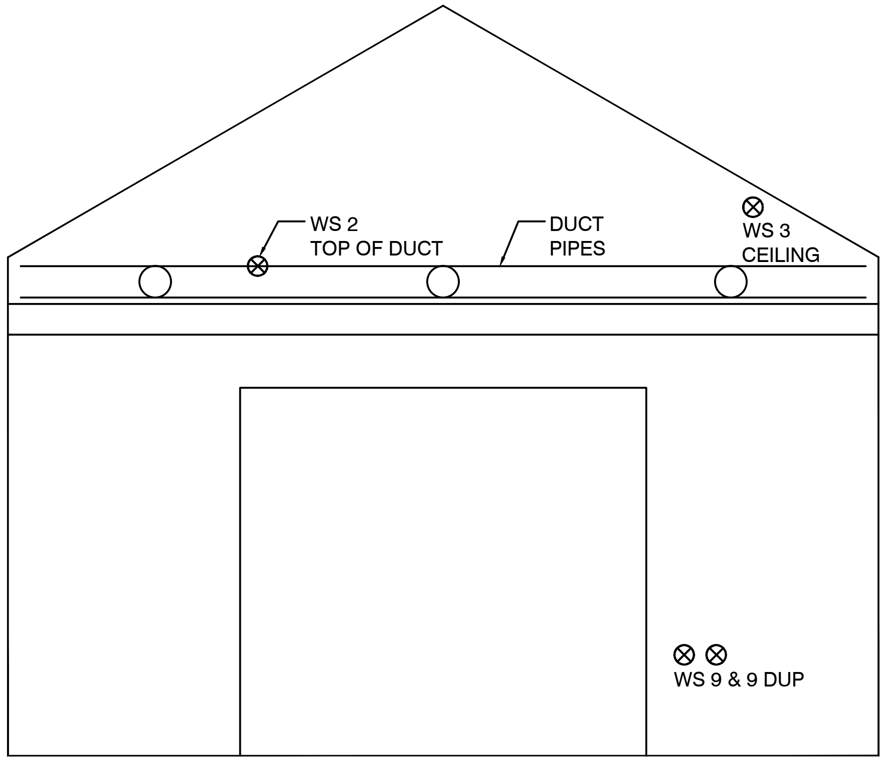
A
FIG 3
NORTH WALL



B
FIG 3
EAST WALL



C
FIG 3
SOUTH WALL



D
FIG 3
WEST WALL

DATE: NOVEMBER 2011

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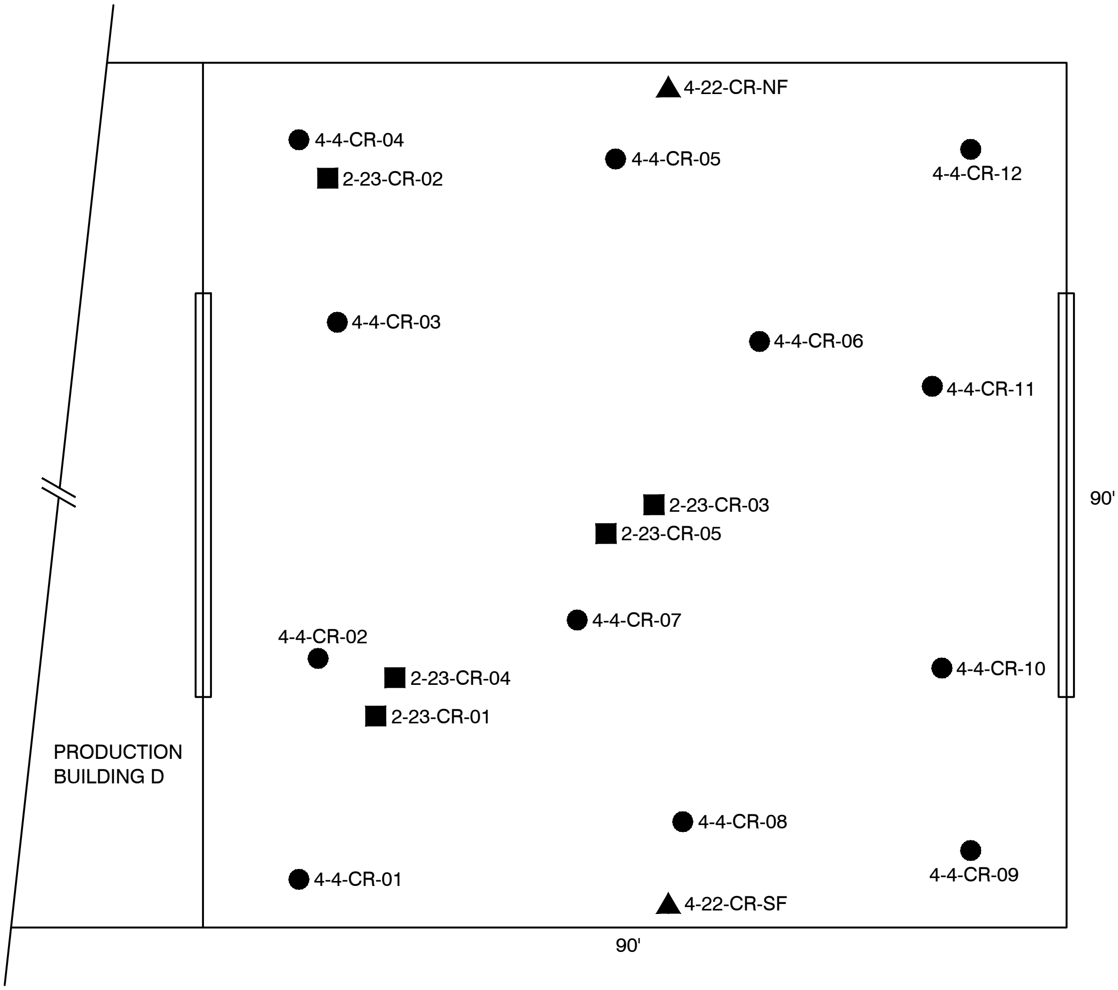
PO BOX 1020
BATTLE GROUND, WA 98604



FLOOR PLAN

■ 2-23-CR-01
SAMPLES OF SOIL FROM BENEATH WEST FLOOR SLAB, COLLECTED FEBRUARY 23, 2011.

● 4-4-CR-01
CONFIRMATION SOIL SAMPLES AFTER FLOOR SLAB AND 30 INCHES OF SUB-SLAB SOIL REMOVED, COLLECTED APRIL 4, 2011.

▲ 4-22-CR-NF
COMPOSITE SAMPLES OF CONCRETE FOOTINGS AND CRUSHED CONCRETE FROM FLOOR, COLLECTED APRIL 22, 2011. SAMPLE 4-22-CR-FC NOT SHOWN ON MAP; SAMPLE COLLECTED FROM STOCKPILED CRUSHED FLOOR CONCRETE.

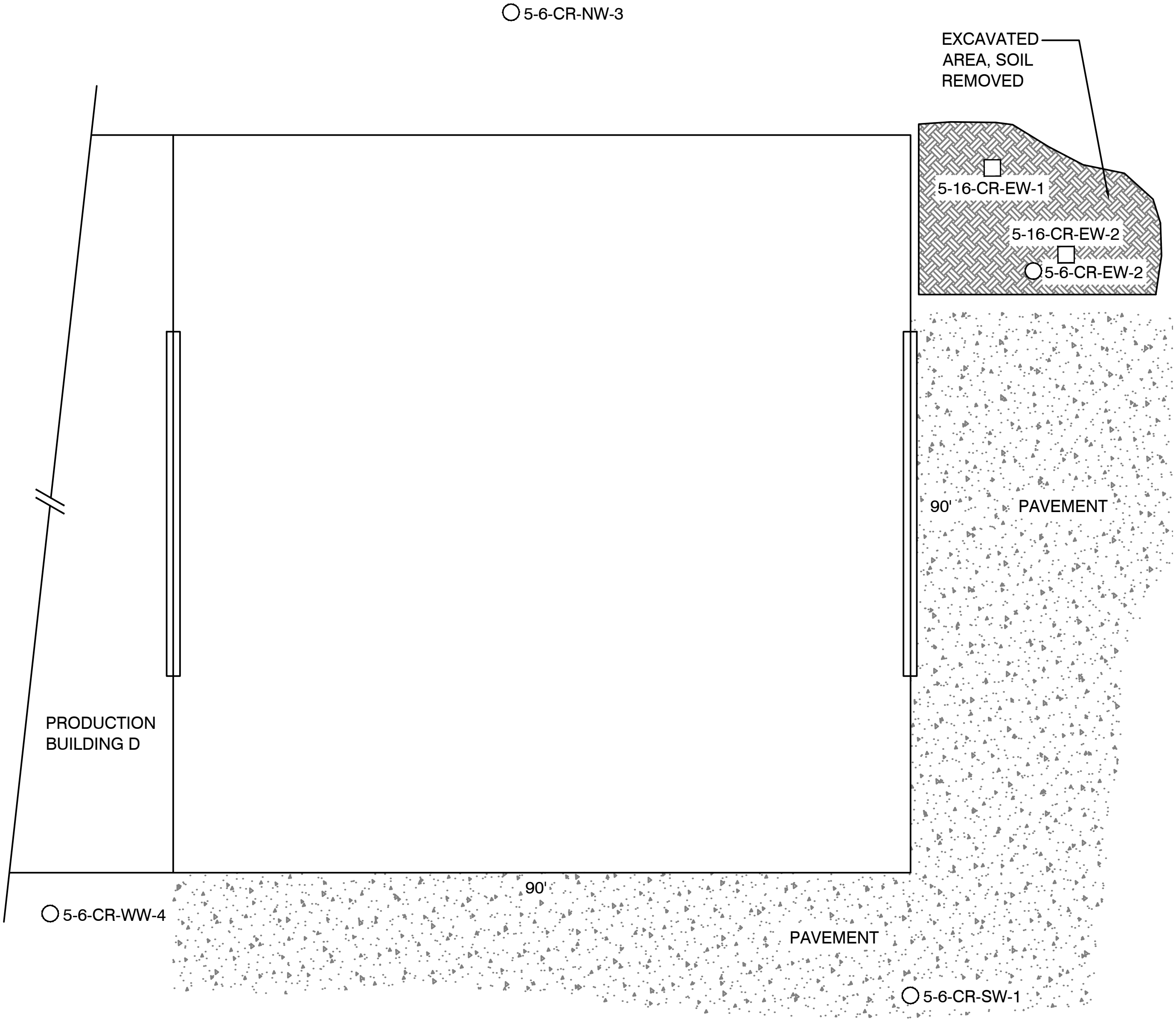
FIGURE 4

CATHODE RECOVERY BUILDING
SUB-SLAB SOIL SAMPLE LOCATION MAP

COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON

DATE: NOVEMBER 2011

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604



FLOOR PLAN

○ 5-6-CR-SW-1
EXTERIOR SOIL SAMPLES, COLLECTED MAY 6, 2011.

□ 5-16-11-CR-EW-1
CONFIRMATION SOIL SAMPLE AFTER SOIL REMOVAL, COLLECTED MAY 16, 2011.

NORTH

FIGURE 5

CATHODE RECOVERY BUILDING
EXTERIOR SOIL SAMPLE LOCATION MAP

COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON

DATE: NOVEMBER 2011

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604

FIGURE 6

CATHODE RECOVERY BUILDING
POST SOIL REMOVAL
INTERIOR PHOTOGRAPHS

COLUMBIA GORGE ALUMINUM
COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON

A Panorama view west from the Cathode Building entrance after removal of the concrete floor slab and 18 inches of soil.

B Soil exposed beneath concrete floor slab after removal of the floor slab and 18 inches of soil.

C View south of the southeast corner of the Cathode Building interior after the concrete floor slab was removed.

DATE: NOVEMBER 2011

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604

	Total Cyanide	Free Cyanide	Fluoride
Chemical Method	EPA 335.4	EPA 335.4	SM 4500-CI E
Units	ug/wipe	ug/wipe	mg/wipe
Sample Number			
WS1	23	39.6	6.7
WS2	3.8	15.9	4.4
WS3	10.4	5.26	5.6
WS4	3.59	18.7	3.2
WS5	7.67	7.45	8.6
WS6	5.98	13.1	4.5
WS7	7.19	23.1	5.9
WS8	4.94	37.8	2.5
WS9	3.13	11.7	4
WS9D	15.6	9.16	4.1
WS10	33.6	23.5	2.6
WS11	12.2	17.7	1.8
WS12	15.2	13.5	5.5
WS13	6.69	8.47	1.7
WS14	7.86	21.6	1.6
WS15	5.95	22.7	3.3
WS16	21.8	117	5.3
WS17	9.93	33.8	2.9
WS18	16.6	40.7	4
WS18D	19.1	36.8	4.2

Notes: Wipe samples results in micrograms (ug) per wipe area of 100 centimeters square. Samples collected on June 10, 2011.

Table 1 – Cathode Building Interior Surface Wipe Samples, Cyanide and Fluoride

	Sample Depth	**Total Cyanide**	**Free Cyanide**	**Fluoride**
Chemical Method		SW846 9012	SW846 9012	SM 4500-F C
Units	inches	mg/kg	mg/kg	mg/kg
Sample Number				
2-23-CR-01	3-6	<0.05	<0.05	98
2-23-CR-02	3-6	0.054	<0.05	82
2-23-CR-03	3-6	0.28	<0.05	230
2-23-CR-04	24-30	<0.05	<0.05	29
2-23-CR-05	24-30	<0.05	<0.05	29
4-4-CR-01	30	<0.05	<0.05	240
4-4-CR-02	30	<0.05	<0.05	60
4-4-CR-03	30	<0.05	<0.05	55
4-4-CR-04	30	<0.05	<0.05	28
4-4-CR-05	30	<0.05	<0.05	110
4-4-CR-06	30	<0.05	<0.05	190
4-4-CR-07	30	<0.05	<0.05	150
4-4-CR-08	30	<0.05	<0.05	46
4-4-CR-09	30	<0.05	<0.05	21
4-4-CR-10	30	<0.05	<0.05	17
4-4-CR-11	30	<0.05	<0.05	420
4-4-CR-12	30	<0.05	<0.05	94
Notes: Soil samples collected from beneath the Cathode Building concrete floor slab. Samples collected on February 23, 2011 and April 4, 2011.				

Table 2 – Cathode Building Floor Sub-Slab Soil Samples, Cyanide and Fluoride

	Sample Depth	Total Cyanide	Free Cyanide	Fluoride
Chemical Method		SW846 9012	SW846 9012	SM 4500-F C
Units	Inches	mg/kg	mg/kg	mg/kg
Sample Number				
4-22-CR-NF	30	4.1	1	6.9
4-22-CR-SF	30	3	<0.25	14
4-22-CR-FC	Floor Slab	<0.25	<0.25	35

Notes: Samples of concrete building footings (4-22-CR-NF and 4-22-CR-SF) collected from the surface of the footing at a depth of 30 inches below the floor slab. Sample of building concrete collected after slab broken prior to disposal.

Table 3 – Cathode Building Concrete Samples, Cyanide and Fluoride

	Sample Depth	Total Cyanide	Free Cyanide	Fluoride
Chemical Method		SW846 9012	SW846 9012	SM 4500-F C
Units	Feet	mg/kg	mg/kg	mg/kg
Sample Number				
5-6-SW-1	Surface	<0.05	<0.05	290
5-6-EW-2	Surface	0.24	<0.05	1100
5-6-NW-3	Surface	<0.05	<0.05	130
5-6-WW-4	Surface	<0.05	<0.05	2000
5-16-CR-EW-1	3	<0.05	<0.05	490
5-16-CR-EW-2	3	<0.05	<0.05	360

Notes: Samples at building exterior collected on May 6, 2011. Confirmation samples collected after soil removal on May 16, 2011.

Table 4 – Cathode Building Exterior Soil Samples, Cyanide and Fluoride

	Wipe Sample Numbers																		TCLP Sample Numbers	
CHEMICALS	WS1	WS2	WS3	WS4	WS5	WS6	WS7	WS8	WS9	WS10	WS11	WS12	WS13	WS14	WS15	WS16	WS17	WS18	TCLP #1	TCLP #2
Total Metals (EPA 6010B/7471A) mg/Wipe																			mg/l	mg/l
Arsenic	<0.000002	<0.000002	<0.000002	<0.000002	0.000004	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.4	<0.4
Barium	0.0007	0.00003	0.000008	0.000009	0.00004	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.53	<0.2
Cadmium	0.00001	0.000002	<0.000001	<0.000001	0.00003	0.00001	0.00001	0.000001	<0.000001	0.000002	<0.000001	<0.000001	<0.000001	0.00001	<0.000001	0.000003	0.000004	0.000003	0.024	<0.02
Chromium	0.00006	0.00004	0.00002	0.000009	0.00002	0.00001	0.00003	0.00001	0.000005	0.00001	0.00002	0.00001	0.000003	0.00003	0.000004	0.00003	0.00005	0.00007	0.28	0.14
Lead	0.00002	<0.00001	<0.00001	<0.00001	0.00002	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.00002	0.00001	<0.2	<0.2
Mercury	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.00000013	<0.005	<0.005
Selenium	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.4	<0.4
Silver	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.02	<0.02
Fluoride (SM 4500-F C) mg/Wipe	6.7	4.4	5.6	3.2	8.6	4.5	5.9	2.5	4.1	2.6	1.8	5.5	1.7	1.6	3.3	5.3	2.9	4.2		
Cyanide (SW846 9010/9012) mg/Wipe																				
Total Cyanide	0.023	0.0038	0.0104	0.00359	0.00767	0.00598	0.00719	0.00494	0.00313	0.0336	0.0122	0.0152	0.00669	0.00786	0.00595	0.0218	0.00993	0.0166		
Free Cyanide	0.04	0.0159	0.00526	0.0187	0.00745	0.0131	0.0231	0.0378	0.0117	0.0235	0.0177	0.0135	0.00847	0.0216	0.0227	1.17	0.0338	0.0407		
PAHs (EPA 8270D/SIM) mg/Wipe																				
Benzo(a)anthracene	0.0034	0.0025	0.0019	0.0035	0.0037	0.0039	0.0021	0.0031	0.0017	0.0049	0.002	0.00092	0.00045	0.00047	0.0025	0.0054	0.0048	0.0018		
Chrysene	0.12	0.01	0.005	0.11	0.15	0.14	0.008	0.11	0.0058	0.02	0.0081	0.0029	0.0017	0.0022	0.01	0.021	0.019	0.006		
Benzo(b)fluoranthene	0.0091	0.0083	0.0065	0.01	0.0055	0.011	0.0024	0.0092	0.0046	0.014	0.0052	0.0025	0.0014	0.0016	0.0085	0.016	0.014	0.0046		
Benzo(k)fluoranthene	0.0049	0.0041	0.0026	0.005	0.0055	0.005	0.0024	0.0041	0.0022	0.0066	0.0027	0.0014	0.0006	0.00066	0.0036	0.007	0.0066	0.0022		
Benzo(a)pyrene	0.0023	0.0016	0.0017	0.0035	0.0029	0.0026	0.0011	0.0033	0.0018	0.0035	0.0014	0.00091	0.00035	0.00034	0.0019	0.0036	0.004	0.0015		
Ideno(1,2,3-c,d)pyrene	0.0034	0.0027	0.0023	0.0041	0.004	0.0038	0.0016	0.0034	0.0017	0.0049	0.0018	0.001	0.00045	0.00046	0.0027	0.0051	0.0046	0.0016		
Dibenz(a,h)anthracene	0.0012	0.0009	0.0019	0.0035	0.0014	0.0013	0.00057	0.0012	0.00063	0.0016	0.00061	0.00037	<0.0002	<0.0002	0.00087	0.0017	0.0015	0.00058		
Notes: Wipe samples results in milligrams (mg) per wipe area of 100 centimeters square. Samples collected on June 10, 2011.																				

Table 5 – Cathode Building Interior Surface Wipe and TCLP Samples, Site COCs

CHEMICALS	Background 90th Percentile	Human Health Screening Levels	Soil Samples				
			2-23-CR-01	2-23-CR-02	2-23-CR-03	2-23-CR-04	2-23-CR-05
Sample Depth, Inches			3-6	3-6	3-6	24-30	24-30
Total Metals (EPA 6010B/7471A) mg/kg							
Arsenic	7.61	20 [1]	<11	<11	<11	<11	<11
Barium		16,000 [4]	55	61	66	87	72
Cadmium	0.81	2 [1]	<0.54	<0.53	<0.53	<0.56	<0.57
Chromium	31.9	19 [2]	6.1	5.8	22	9.2	6.2
Lead	13.1	250 [2]	<5.4	<5.3	6.3	7	<5.7
Mercury	0.04	2 [2]	<0.27	<0.26	<0.27	<0.28	<0.29
Selenium		400 [4]	<11	<11	<11	<11	<11
Silver		400 [4]	<0.54	<0.53	<0.53	<0.56	<0.57
Fluoride (SM 4500-F C) mg/kg		3200 [4]	98	82	230	29	29
Cyanide (SW846 9010/9012) ug/g							
Total Cyanide		1600 [4]	<0.05	0.054	0.28	<0.05	<0.05
Free Cyanide			<0.05	<0.05	<0.05	<0.05	<0.05
PAHs (EPA 8270D/SIM) mg/kg							
Naphthalene		5 [2]	0.052	<0.017	0.023	<0.0075	<0.0076
2-Methylnaphthalene		5 [2]	<0.017	<0.017	0.02	<0.0075	<0.0076
1-Methylnaphthalene		5 [2]	<0.017	<0.017	<0.017	<0.0075	<0.0076
Acenaphthylene		2400 [4]	0.046	<0.017	<0.017	<0.0075	<0.0076
Acenaphthene		4800 [4]	0.028	<0.017	0.087	<0.0075	<0.0076
Fluorene		3200 [4]	0.03	<0.017	0.046	<0.0075	<0.0076
Phenanthrene		2400 [4]	0.4	0.22	0.7	0.0085	<0.0076
Anthracene		24,000 [4]	0.05	0.02	0.1	<0.0075	<0.0076
Fluoranthene		3200 [4]	0.62	0.75	1.5	0.026	<0.0076
Pyrene		2400 [4]	0.57	0.4	1.2	0.018	<0.0076
Benzo(a)anthracene		1.4 [3]	0.27	0.18	0.82	0.022	<0.0076
Chrysene		14 [3]	0.39	0.59	1.2	0.029	<0.0076
Benzo(b)fluoranthene		1.4 [3]	0.49	0.47	1.5	0.035	<0.0076
Benzo(k)fluoranthene		14 [3]	0.29	0.17	0.98	0.019	<0.0076
Benzo(a)pyrene		0.1 [3]	0.4	0.1	1.1	0.028	<0.0076
Ideno(1,2,3-c,d)pyrene		1.4 [3]	0.39	0.15	1.1	0.022	<0.0076
Dibenz(a,h)anthracene		0.14 [3]	0.11	0.049	0.4	0.0082	<0.0076
Benzo(g,h,i)perylene		2400 [3]	0.5	0.19	1.4	0.029	<0.0076

Notes: Human Health screening levels from Washington Department of Ecology, Model Toxics Control Act (MTCA). [1] MTCA Method A unrestricted carcinogenic, [2] MTCA Method A unrestricted non-carcinogenic, [3] MTCA Method B carcinogenic, [4] MTCA Method B non-carcinogenic. Detected concentrations in cells shaded blue exceed MTCA screening levels. For location of soil samples see Figure 4.

Table 6 – Cathode Building West Floor Sub-Slab Soil Samples, Site COCs

CHEMICALS	Background 90th Percentile	Human Health Screening Levels	Soil Samples											
Total Metals (EPA 6010B/7471A) mg/kg			4-4-CR-1	4-4-CR-2	4-4-CR-3	4-4-CR-4	4-4-CR-5	4-4-CR-6	4-4-CR-7	4-4-CR-8	4-4-CR-9	4-4-CR-10	4-4-CR-11	4-4-CR-12
Arsenic	7.61	20 [1]	<11	<11	<11	<11	<10	<10	<11	<11	<13	<12	<10	<11
Barium		16,000 [4]	100	91	70	73	79	69	90	110	150	110	91	110
Cadmium	0.81	2 [1]	3.6	<0.54	<0.53	<0.53	<0.52	<0.52	<0.53	<0.55	<0.63	<0.58	<0.52	<0.55
Chromium	31.9	19 [2]	24	9.4	7	5.8	8.7	7.9	9.9	11	6	7.2	13	13
Lead	13.1	250 [2]	7.4	6.3	<5.3	<5.3	<5.2	<5.2	5.6	6.4	7	<5.8	<5.2	6.5
Mercury	0.04	2 [2]	<0.28	<0.27	<0.27	<0.26	<0.26	<0.26	<0.027	<0.28	<0.31	<0.29	<0.26	<0.28
Selenium		400 [4]	<11	<11	<11	<11	<10	<10	<11	<11	<13	<12	<10	<11
Silver		400 [4]	<0.56	<0.54	<0.53	<0.53	<0.52	<0.52	<0.053	<0.55	<0.63	<0.58	<0.52	<0.55
Fluoride (SM 4500-F C) mg/kg		3200 [4]	240	60	55	28	110	190	150	46	21	17	420	94
Cyanide (SW846 9010/9012) ug/g														
Total Cyanide		1600 [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Free Cyanide			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
PAHs (EPA 8270D/SIM) mg/kg														
Naphthalene		5 [2]	0.047	<0.0072	0.022	<0.0071	0.016	0.018	0.0097	<0.0073	<0.0084	<0.0078	0.038	<0.0074
2-Methylnaphthalene		5 [2]	0.019	<0.0072	0.011	<0.0071	0.0082	<0.0070	<0.0071	<0.0073	<0.0084	<0.0078	0.019	<0.0074
1-Methylnaphthalene		5 [2]	0.013	<0.0072	<0.0071	<0.0071	<0.0070	<0.0070	<0.0071	<0.0073	<0.0084	<0.0078	0.013	<0.0074
Acenaphthylene		2400 [4]	<0.0074	<0.0072	<0.0071	<0.0071	<0.0070	<0.0070	<0.0071	<0.0073	<0.0084	<0.0078	<0.0070	<0.0074
Acenaphthene		4800 [4]	0.15	<0.0072	0.059	<0.0071	0.067	0.058	0.036	0.015	<0.0084	<0.0078	0.15	0.015
Fluorene		3200 [4]	0.085	<0.0072	0.039	<0.0071	0.027	0.027	0.019	0.0082	<0.0084	<0.0078	0.068	0.0085
Phenanthrene		2400 [4]	0.9	0.05	0.39	0.0078	0.3	0.31	0.22	0.096	0.017	0.019	0.79	0.14
Anthracene		24,000 [4]	0.14	0.0093	0.059	<0.0071	0.043	0.051	0.031	0.016	<0.0084	<0.0078	0.11	0.022
Fluoranthene		3200 [4]	1.8	0.31	0.89	0.047	0.78	0.86	0.63	0.29	0.095	0.11	2	0.51
Pyrene		2400 [4]	1.5	0.17	0.67	0.027	0.62	0.67	0.48	0.24	0.051	0.06	1.6	0.35
Benzo(a)anthracene		1.4 [3]	1	0.081	0.44	0.012	0.42	0.44	0.31	0.16	0.022	0.025	1.2	0.2
Chrysene		14 [3]	1.3	0.24	0.6	0.038	0.57	0.64	0.46	0.23	0.064	0.081	1.6	0.4
Benzo(b)fluoranthene		1.4 [3]	1.3	0.19	0.64	0.028	0.63	0.71	0.5	0.25	0.051	0.06	1.7	0.37
Benzo(k)fluoranthene		14 [3]	0.92	0.089	0.39	0.014	0.39	0.49	0.29	0.17	0.026	0.029	1.1	0.25
Benzo(a)pyrene		0.1 [3]	1.3	0.058	0.53	<0.0071	0.58	0.62	0.41	0.2	0.017	0.015	1.6	0.23
Ideno(1,2,3-c,d)pyrene		1.4 [3]	0.89	0.062	0.35	0.0089	0.4	0.42	0.28	0.15	0.02	0.02	1.1	0.2
Dibenz(a,h)anthracene		0.14 [3]	0.3	0.02	0.14	<0.0071	0.13	0.14	0.094	0.056	<0.0084	<0.0078	0.37	0.072
Benzo(g,h,i)perylene		2400 [3]	1	0.71	0.39	0.011	0.46	0.48	0.33	0.17	0.023	0.025	1.3	0.24
PCBs (EPA 8082) mg/kg														
Aroclor 1016		5.6 [3]	<0.056	<0.054	<0.053	<0.053	<0.052	<0.052	<0.053	<0.055	<0.063	<0.058	<0.052	<0.055
Aroclor 1221		14 [3]	<0.056	<0.054	<0.053	<0.053	<0.052	<0.052	<0.053	<0.055	<0.063	<0.058	<0.052	<0.055
Aroclor 1232		14 [3]	<0.056	<0.054	<0.053	<0.053	<0.052	<0.052	<0.053	<0.055	<0.063	<0.058	<0.052	<0.055
Aroclor 1242		14 [3]	<0.056	<0.054	<0.053	<0.053	<0.052	<0.052	<0.053	<0.055	<0.063	<0.058	<0.052	<0.055
Aroclor 1248		14 [3]	<0.056	<0.054	<0.053	<0.053	<0.052	<0.052	<0.053	<0.055	<0.063	<0.058	<0.052	<0.055
Aroclor 1254		0.5 [3]	<0.056	<0.054	<0.053	<0.053	<0.052	<0.052	<0.053	<0.055	<0.063	<0.058	<0.052	<0.055
Aroclor 1260		0.5 [3]	<0.056	<0.054	<0.053	<0.053	<0.052	<0.052	<0.053	<0.055	<0.063	<0.058	<0.052	<0.055

Notes: Human Health screening levels from Washington Department of Ecology, Model Toxics Control Act (MTCA). [1] MTCA Method A unrestricted carcinogenic, [2] MTCA Method A unrestricted non-carcinogenic, [3] MTCA Method B carcinogenic, [4] MTCA Method B non-carcinogenic. Detected concentrations in cells shaded blue exceed MTCA screening criteria. Samples collected on April 4, 2011. For location of soil samples see Figure 4.

Table 7 – Cathode Building Floor Sub-Slab Confirmation Soil Samples, Site COCs

CHEMICALS	**Human Health Screening Levels**	**Concrete Samples**		
Total Metals (EPA 6010B/7471A) mg/kg		4-22-CR-NF	4-22-CR-SF	4-22-CR-FC
Arsenic	20 [1]	<10	<10	<10
Barium	16,000 [4]	100	89	78
Cadmium	2 [1]	<0.5	<0.50	<0.50
Chromium	19 [2]	14	21	17
Lead	250 [2]	8.4	6.9	<5.0
Mercury	2 [2]	<0.25	<0.25	<0.25
Selenium	400 [4]	<10	<10	<10
Silver	400 [4]	<0.5	<0.50	<0.50
Fluoride (SM 4500-F C) mg/kg	3200 [4]	6.9	14	35
Cyanide (SW846 9010/9012) ug/g				
Total Cyanide	1600 [4]	4.1	3	<0.25
Free Cyanide		1	<0.25	<0.25
PAHs (EPA 8270D/SIM) mg/kg				
Naphthalene	5 [2]	<0.0067	<0.0067	<0.0067
2-Methylnaphthalene	5 [2]	<0.0067	<0.0067	<0.0067
1-Methylnaphthalene	5 [2]	<0.0067	<0.0067	<0.0067
Acenaphthylene	2400 [4]	<0.0067	<0.0067	<0.0067
Acenaphthene	4800 [4]	<0.0067	<0.0067	<0.0067
Fluorene	3200 [4]	<0.0067	<0.0067	<0.0067
Phenanthrene	2400 [4]	0.045	0.14	0.2
Anthracene	24,000 [4]	<0.0067	0.022	0.024
Fluoranthene	3200 [4]	0.17	0.81	1
Pyrene	2400 [4]	0.063	0.45	0.5
Benzo(a)anthracene	1.4 [3]	0.011	0.15	0.17
Chrysene	14 [3]	0.052	0.54	0.64
Benzo(b)fluoranthene	1.4 [3]	0.036	0.26	0.41
Benzo(k)fluoranthene	14 [3]	0.014	0.099	0.2
Benzo(a)pyrene	0.1 [3]	<0.0067	0.028	0.057
Ideno(1,2,3-c,d)pyrene	1.4 [3]	0.0068	0.05	0.1
Dibenz(a,h)anthracene	0.14 [3]	<0.0067	0.017	0.036
Benzo(g,h,i)perylene	2400 [3]	0.0079	0.056	0.11
PCBs (EPA 8082) mg/kg				
Aroclor 1016	5.6 [3]	<0.10	<0.10	<0.10
Aroclor 1221	14 [3]	<0.10	<0.10	<0.10
Aroclor 1232	14 [3]	<0.10	<0.10	<0.10
Aroclor 1242	14 [3]	<0.10	<0.10	<0.10
Aroclor 1248	14 [3]	<0.10	<0.10	<0.10
Aroclor 1254	0.5 [3]	<0.10	<0.10	<0.10
Aroclor 1260	0.5 [3]	<0.10	<0.10	<0.10
Petroleum Hydrocarbons (NWTPH) mg/kg				
Mineral Oils	4000 [2]			
Lube Oil Range	2000 [2]	<50	<50	<50
Diesel Range	2000 [2]	<25	<25	<25

Notes: Human Health screening levels from Washington Department of Ecology, Model Toxics Control Act (MTCA). [1] MTCA Method A unrestricted carcinogenic, [2] MTCA Method A unrestricted non-carcinogenic, [3] MTCA Method B carcinogenic, [4] MTCA Method B non-carcinogenic. Detected concentrations in cells shaded blue exceed MTCA screening criteria. Samlples collected on April 22, 2011. For location of soil samples see Figure 4.

Table 8 – Cathode Building Concrete Footing and Floor Concrete Samples, Site COCs

CHEMICALS	Background 90th Percentile	Human Health Screening Levels	Soil Samples				TCLP Samples				Confirmation Soil Samples	
Total Metals (EPA 6010B/7471A) mg/kg			5-6-CR-SW-1	5-6-CR-EW-2	5-6-CR-NW-3	5-6-CR-WW-4	5-6-CR-SW-1	5-6-CR-EW-2	5-6-CR-NW-3	5-6-CR-WW-4	5-16-CR-EW-1	5-16-CR-EW-2
Arsenic	7.61	20[1]	<11	<11	<11	<10					<14	<17
Barium		16,000[4]	31	78	69	64					75	84
Cadmium	0.81	2[1]	<0.54	<0.54	<0.54	8					<0.68	<0.83
Chromium	31.9	19[2]	5.9	24	19	37					17	15
Lead	13.1	250[2]	<5.4	<5.4	5.5	17					<6.8	<8.3
Mercury	0.04	2[2]	<0.27	<0.27	<0.27	<0.26					<0.34	<0.41
Selenium		400[4]	<11	<11	<11	<10					<14	<17
Silver		400[4]	<0.54	<0.54	<0.54	<0.52					<0.68	<0.83
Antimony							<0.20	<0.20	<0.20	<0.20		
Beryllium							<0.020	<0.020	<0.020	<0.020		
Nickel							<0.10	<0.10	<0.10	0.19		
Fluoride (SM 4500-F C) mg/kg		3200[4]	290	1100	130	2000					490	360
Cyanide (SW846 9010/9012) ug/g												
Total Cyanide		1600[4]`	<0.05	0.24	<0.05	<0.05					<0.05	<0.05
Free Cyanide			<0.05	<0.05	<0.05	<0.05					<0.05	<0.05
PAHs (EPA 8270D/SIM) mg/kg												
Naphthalene		5[2]	<0.036	<0.071	0.037	0.17					<0.091	<0.11
2-Methylnaphthalene		5[2]	<0.036	<0.071	0.023	0.12					<0.091	<0.11
1-Methylnaphthalene		5[2]	<0.036	<0.071	0.02	0.09					<0.091	<0.11
Acenaphthylene		2400[4]	<0.036	<0.071	0.017	<0.070					<0.091	<0.11
Acenaphthene		4800[4]	0.06	0.26	0.11	0.84					<0.091	<0.11
Fluorene		3200[4]	<0.036	0.12	0.078	0.41					<0.091	<0.11
Phenanthrene		2400[4]	0.39	2.1	0.93	8					0.25	0.23
Anthracene		24,000[4]	0.063	0.37	0.17	1.3					<0.091	<0.11
Fluoranthene		3200[4]	1	6.4	1.7	36					0.89	0.85
Pyrene		2400[4]	0.9	5.5	1.5	26					0.86	0.73
Benzo(a)anthracene		1.4[3]	0.66	3.4	0.84	14					0.55	0.39
Chrysene		14[3]	0.89	6.4	1.3	32					1.2	0.96
Benzo(b)fluoranthene		1.4[3]	1.1	6.3	1.1	27					1.1	0.82
Benzo(k)fluoranthene		14[3]	0.75	3.6	0.78	15					0.62	0.5
Benzo(a)pyrene		0.1[3]	0.88	5	1.2	13					0.61	0.45
Ideno(1,2,3-c,d)pyrene		1.4[3]	0.61	3.5	0.64	8.6					0.43	0.33
Dibenz(a,h)anthracene		0.14[3]	0.24	1.3	0.23	2.8					0.14	<0.11
Benzo(g,h,i)perylene		2400[3]	0.83	4.5	0.65	9.7					0.53	0.4
PCBs (EPA 8082) mg/kg												
Aroclor 1016		5.6[3]	<0.054	<0.054	<0.054	<0.052					<0.068	<0.083
Aroclor 1221		14[3]	<0.054	<0.054	<0.054	<0.052					<0.068	<0.083
Aroclor 1232		14[3]	<0.054	<0.054	<0.054	<0.052					<0.068	<0.083
Aroclor 1242		14[3]	<0.054	<0.054	<0.054	<0.052					<0.068	<0.083
Aroclor 1248		14[3]	<0.054	<0.054	<0.054	<0.052					<0.068	<0.083
Aroclor 1254		0.5[3]	<0.054	<0.054	<0.054	<0.052					<0.068	<0.083
Aroclor 1260		0.5[3]	<0.054	<0.054	<0.054	<0.052					<0.068	<0.083

Notes: Human Health screening levels from Washington Department of Ecology, Model Toxics Control Act (MTCA). [1] MTCA Method A unrestricted carcinogenic, [2] MTCA Method A unrestricted non-carcinogenic, [3] MTCA Method B carcinogenic, [4] MTCA Method B non-carcinogenic. Detected concentrations in cells shaded blue exceed MTCA screening criteria. Samples collected on May 6 and 16, 2011. For location of soil samples see Figure 5.

Table 9 – Cathode Building Exterior Soil Samples, Site COCs

CHEMICALS	**Human Health Screening Levels**	**Crushed Concrete Samples Collected on 4/4/2011**			**Crushed Concrete Samples Collected on 7/19/2010**					
Total Metals (EPA 6010B/7471A) mg/kg		4-4-CSP-1	4-4-CSP-2	4-4-CSP-3	SP-C-1	SP-C-2	SP-C-3	SP-C-4	SP-C-5	SP-C-6
Arsenic	20 [1]	<10	<10	<10	<10	<10	<10	<10	<10	<10
Barium	16,000 [3]	190	180	190	81	100	81	85	74	100
Cadmium	2 [1]	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chromium	19 [2]	11	7.9	10	11	13	9.9	11	14	14
Lead	250 [2]	<5	5.3	<5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Mercury	2 [2]	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Selenium	400 [3]	<10	<10	<10	<10	<10	<10	<10	<10	<10
Silver	400 [3]	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
TCLP Metals (EPA 1311/6010B/7470A) mg/l										
Arsenic	5[4]				<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Barium	100[4]				0.24	0.24	0.34	0.32	0.34	0.36
Cadmium	1[4]				<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Chromium	5[4]				0.077	0.079	0.04	<0.020	0.032	0.027
Lead	5[4]				<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Mercury	0.2[4]				<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Selenium	1[4]				<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Silver	5[4]				<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Fluoride (SM 4500-F C) mg/kg	3200 [3]	0.45	0.47	0.46	11	10	7.8	15	29	10
Cyanide (SW846 9010/9012) ug/g										
Total Cyanide	1600 [3]	<0.05	<0.05	<0.05	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Free Cyanide		<0.05	<0.05	<0.05	<0.25	<0.25	<25	0.5	<0.25	<0.25
PAHs (EPA 8270D/SIM) mg/kg										
Naphthalene	5 [2]	<0.0067	<0.0067	<0.0067						
2-Methylnaphthalene	5 [2]	<0.0067	<0.0067	<0.0067						
1-Methylnaphthalene	5 [2]	<0.0067	<0.0067	<0.0067						
Acenaphthylene	2400 [6]	<0.0067	<0.0067	<0.0067						
Acenaphthene	4800 [6]	<0.0067	<0.0067	<0.0067						
Fluorene	3200 [6]	<0.0067	<0.0067	<0.0067						
Phenanthrene	2400 [6]	0.053	<0.0067	<0.0067						
Anthracene	24,000 [6]	0.0092	<0.0067	<0.0067						
Fluoranthene	3200 [6]	0.067	<0.0067	<0.0067						
Pyrene	2400 [6]	0.06	<0.0067	<0.0067						
Benzo(a)anthracene	1.4 [5]	0.026	<0.0067	<0.0067						
Chrysene	14 [5]	0.026	<0.0067	<0.0067						
Benzo(b)fluoranthene	1.4 [5]	0.019	<0.0067	<0.0067						
Benzo(k)fluoranthene	14 [5]	0.019	<0.0067	<0.0067						
Benzo(a)pyrene	0.1 [5]	0.024	<0.0067	<0.0067						
Ideno(1,2,3-c,d)pyrene	1.4 [5]	0.012	<0.0067	<0.0067						
Dibenz(a,h)anthracene	0.14 [5]	<0.0067	<0.0067	<0.0067						
Benzo(g,h,i)perylene	2400 [5]	0.014	<0.0067	<0.0067						
PCBs (EPA 8082) mg/kg										
Aroclor 1016	5.6 [5]	<0.2	<0.2	<0.2						
Aroclor 1221	14 [5]	<0.2	<0.2	<0.2						
Aroclor 1232	14 [5]	<0.2	<0.2	<0.2						
Aroclor 1242	14 [5]	<0.2	<0.2	<0.2						
Aroclor 1248	14 [5]	<0.2	<0.2	<0.2						
Aroclor 1254	0.5 [5]	<0.2	<0.2	<0.2						
Aroclor 1260	0.5 [5]	<0.2	<0.2	<0.2						

Notes: Human health screening levels from Washington Department of Ecology, Model Toxics Control Act (MTCA). Toxicity Characteristic Leaching Procedure (TCLP) criteria for D-Listed waste per Code of Federal Regulations (CFR) Title 40 Subpart C Section 261.24. [1] MTCA Method A unrestricted carcinogenic, [2] MTCA Method A unrestricted non-carcinogenic, [3] MTCA Method B non-carcinogenic, [4] TCLP criteria for D-Listed waste, [5] MTCA Method B carcinogenic, [6] MTCA Method B non-carcinogenic. Samples collected on July 19, 2010 and April 4, 2011. Source of concrete is demolished production buildings and concrete was crushed and stockpiled onsite for use as backfill.

Table 10 – Crushed Concrete Backfill Samples, Site COCs

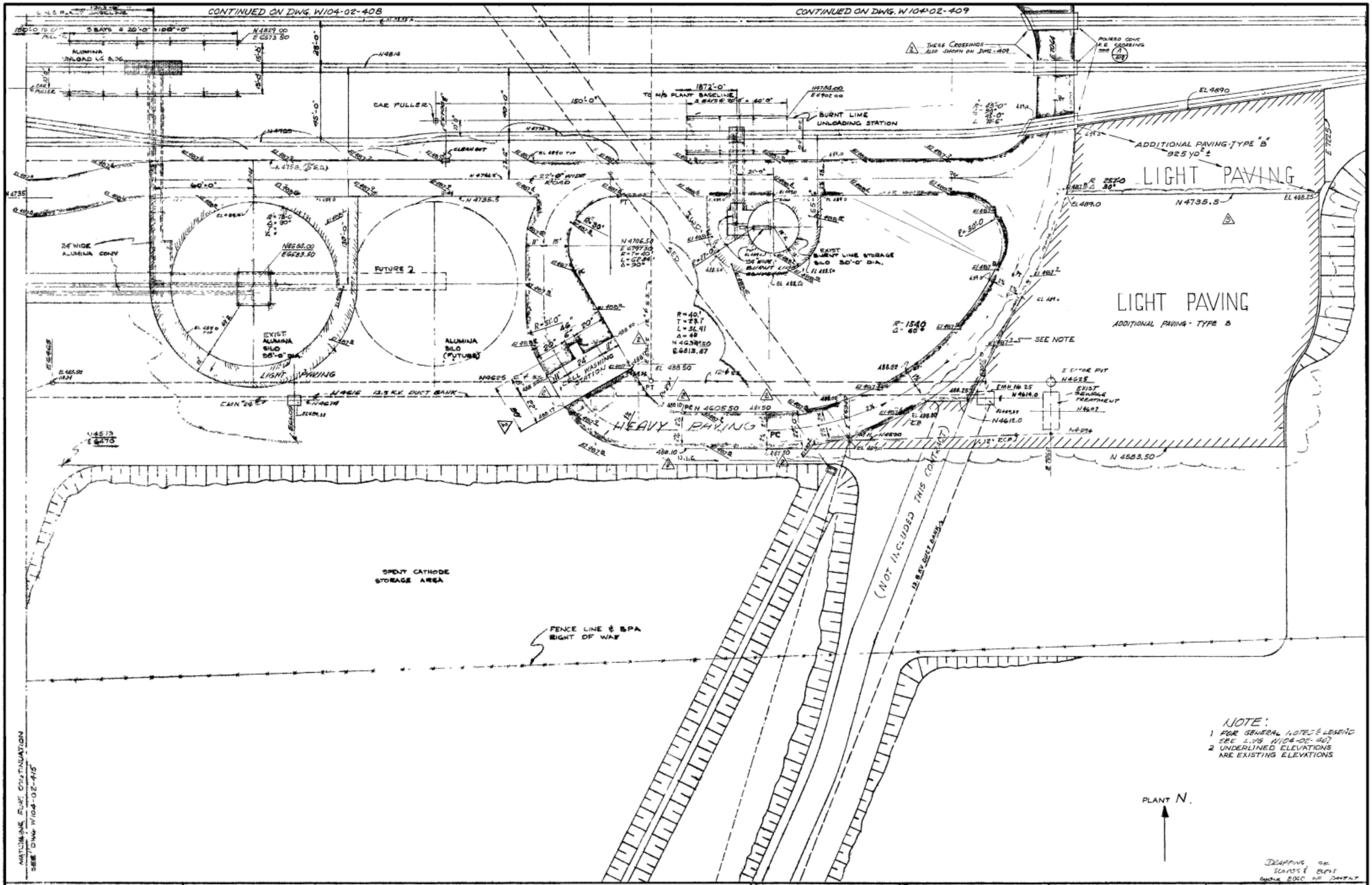
APPENDIX A-17

SWMU #17 – East End Landfill

APPENDIX A-17

SWMU #17 – East End Landfill

Harvey Aluminum (1971c)
Drawing for Alumina Storage Area



NOTE:
1 FOR GENERAL NOTES & LEGEND SEE DWG W104-02-407
2 UNDERLINED ELEVATIONS ARE EXISTING ELEVATIONS

BUSINESS CONFIDENTIAL

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REFERENCE DWG'S:
W104-02-408
W104-02-409
W104-02-416

REVISION	DATE	BY	APPD
1 RELOCATE CELL WASHING STATION & ADJ. ROAD TO SUIT.			
2 ELEVS. ADDED - NOTE ADDED DELETE PAD	7-8-71	HPW	
3. ADD Light Paving areas	8-1-71		

APPROVED FOR CONSTRUCTION	INT	DATE
ENGINEERING STAFF		
DESIGN ENGINEER		5-12-71
CHIEF ELECTRICAL ENGINEER		5-17-71
CHIEF PROCESS ENGINEER		5-17-71
CHIEF DESIGN ENGINEER, A & S		5/17/71
CHIEF PROJECT ENGINEER		

HARVEY ALUMINUM
(INCORPORATED)
TORRANCE, CALIFORNIA
PLANT LOCATION JOHN DAY, WASHINGTON
FACILITY — REDUCTION PLANT
SUB FACILITY — PAVING & ROADS

DRAWING TITLE
ALUMINA STORAGE AREA

	INIT	DATE	
DRWN BY	A.D.D	3-15-71	SCALE 1"=20'-0"
CKD BY	HPW	6-25-71	JOB NO 20-104-02 A010099
DESIGN ENG		5-17-71	DWG NO W104-02-416

APPENDIX A-17

SWMU #17 – East End Landfill

Tetra Tech (2011a)
Historical Aerial Photographs

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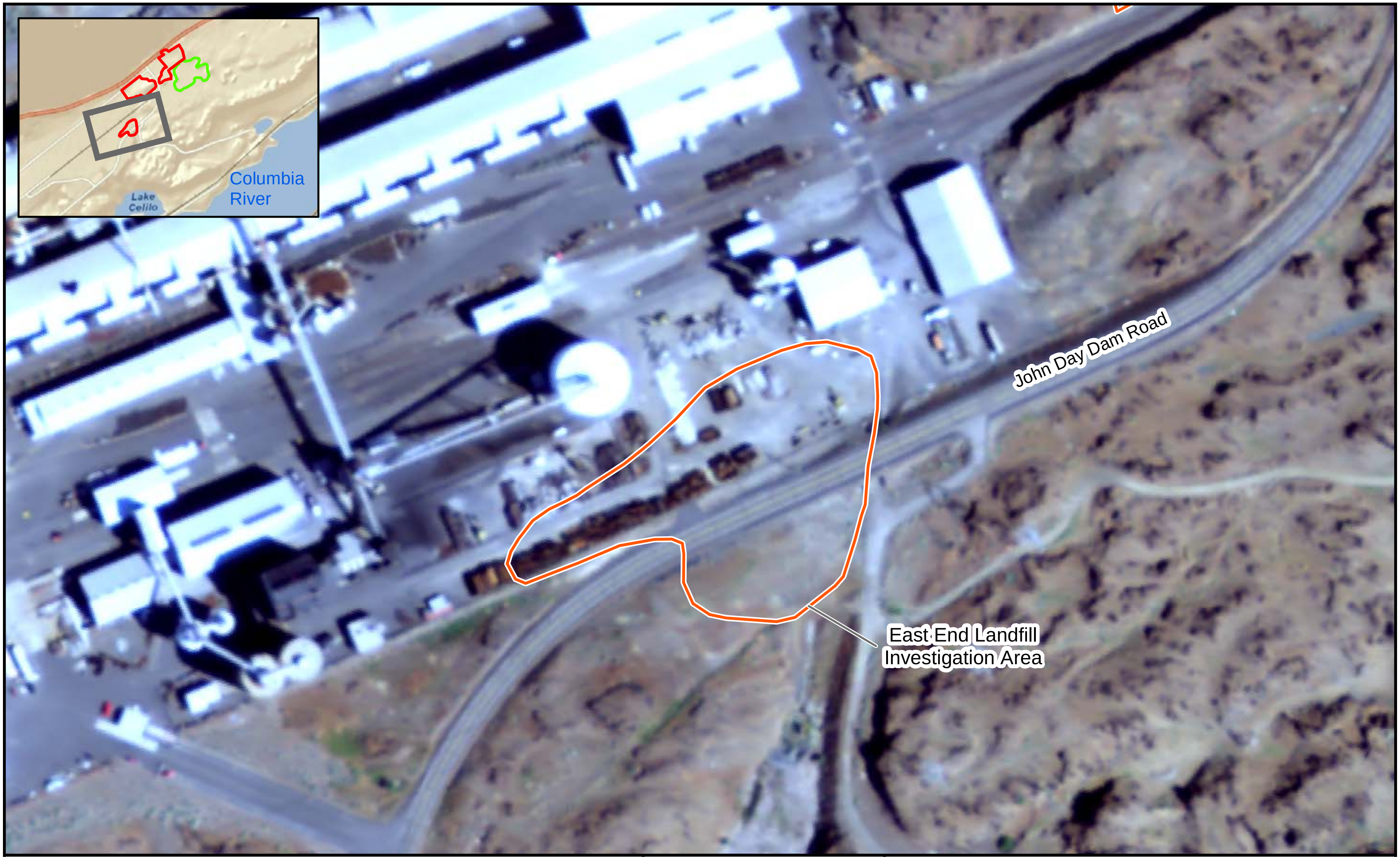

Legend

🟧 Investigation Area

N
W
E
S

Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 2009

Revision Date: 03/02/2011

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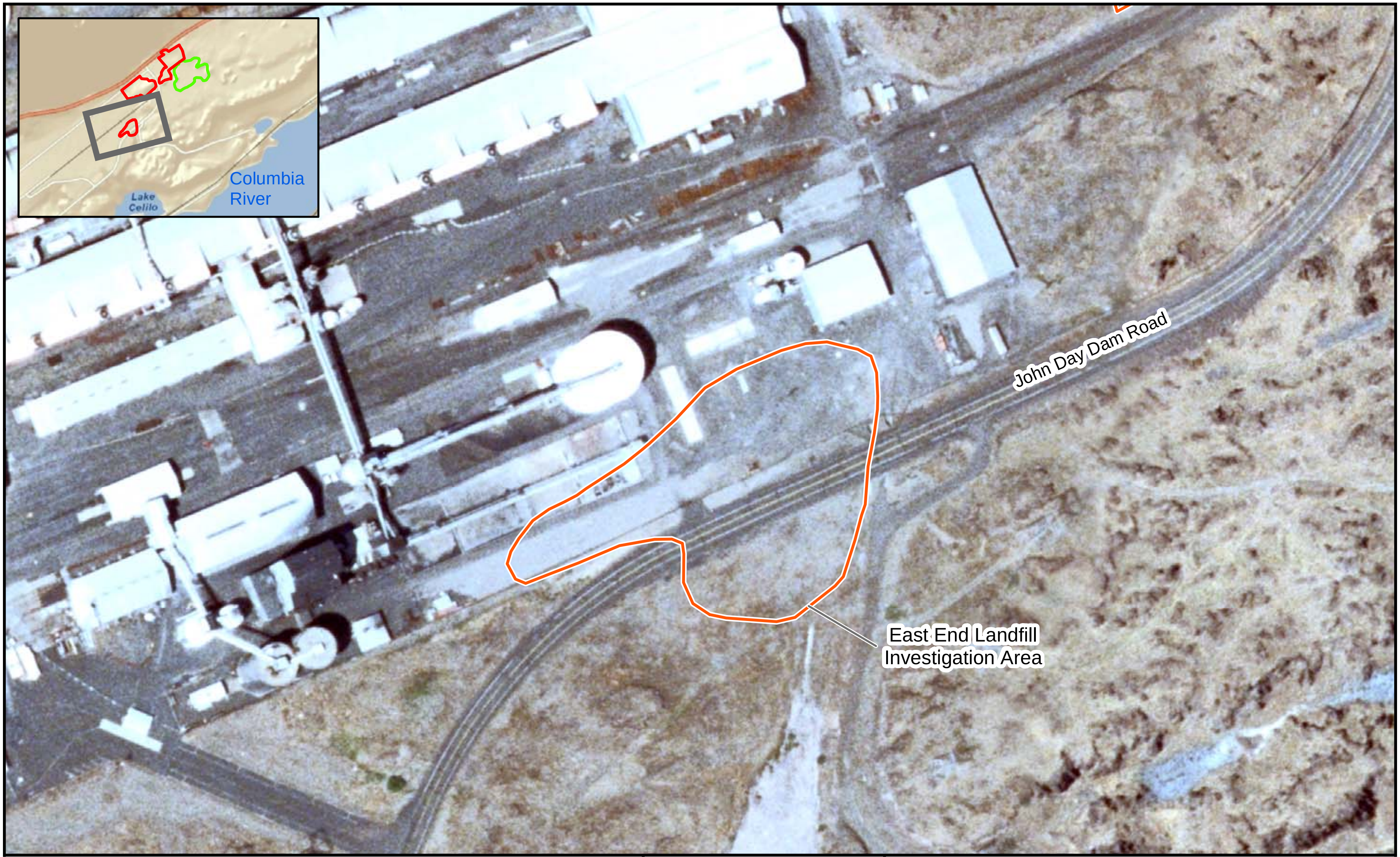

Legend

🟧 Investigation Area

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Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 2006

Revision Date: 03/02/2011

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Legend

🟧 Investigation Area

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Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 1995

Revision Date: 03/02/2011

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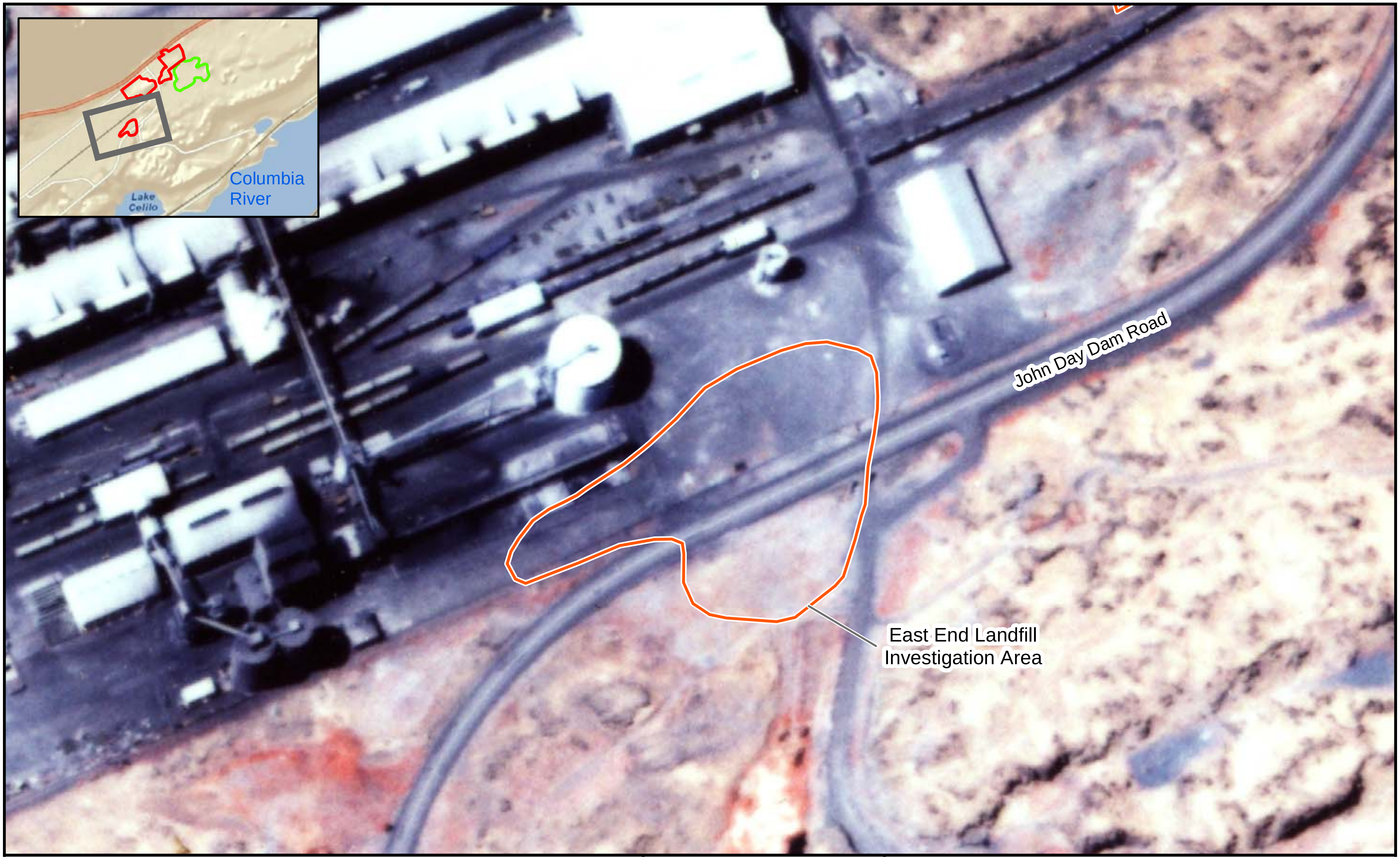


Legend

🟧 Investigation Area

Imagery Data Sources: NAIP 2009

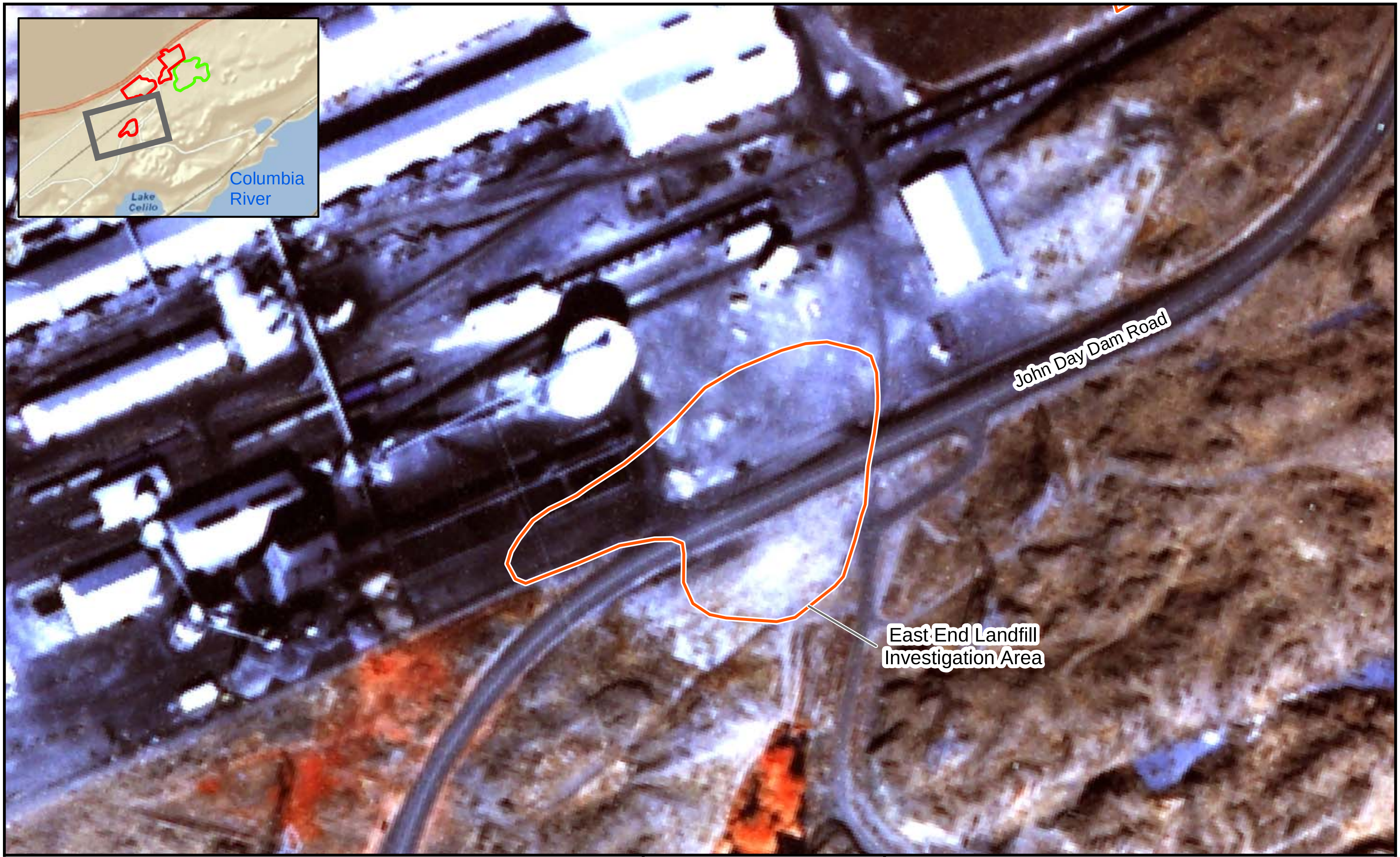
Rotation -15°

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 1992

Revision Date: 03/02/2011



Legend

🟧 Investigation Area

Imagery Data Sources: NAIP 2009

Rotation -15°

0 50 100 200
Feet

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 1989

Revision Date: 03/02/2011

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Legend

▭ Investigation Area

N
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Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 1979

Revision Date: 03/02/2011

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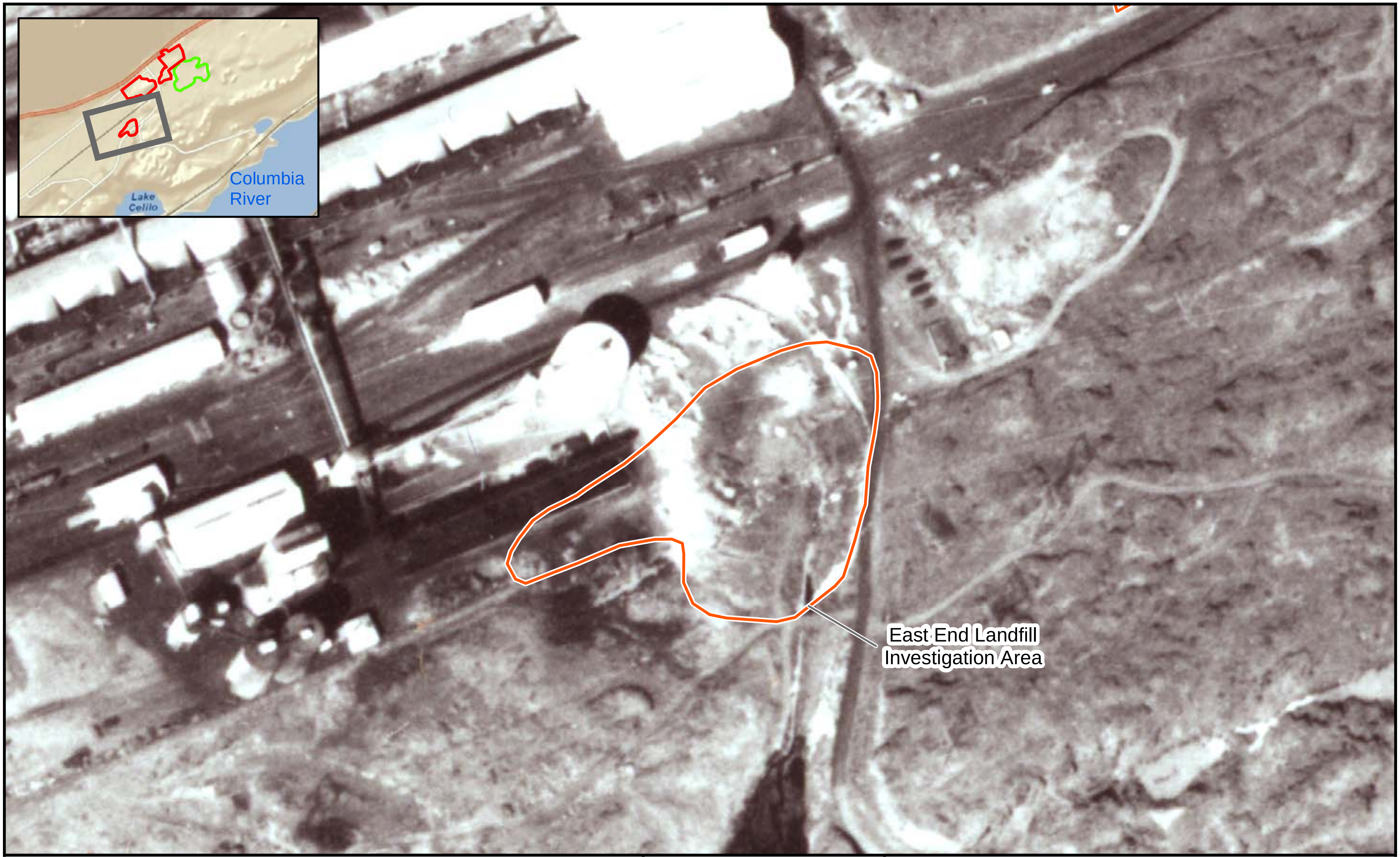

Legend

🟧 Investigation Area

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Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 1978

Revision Date: 03/02/2011

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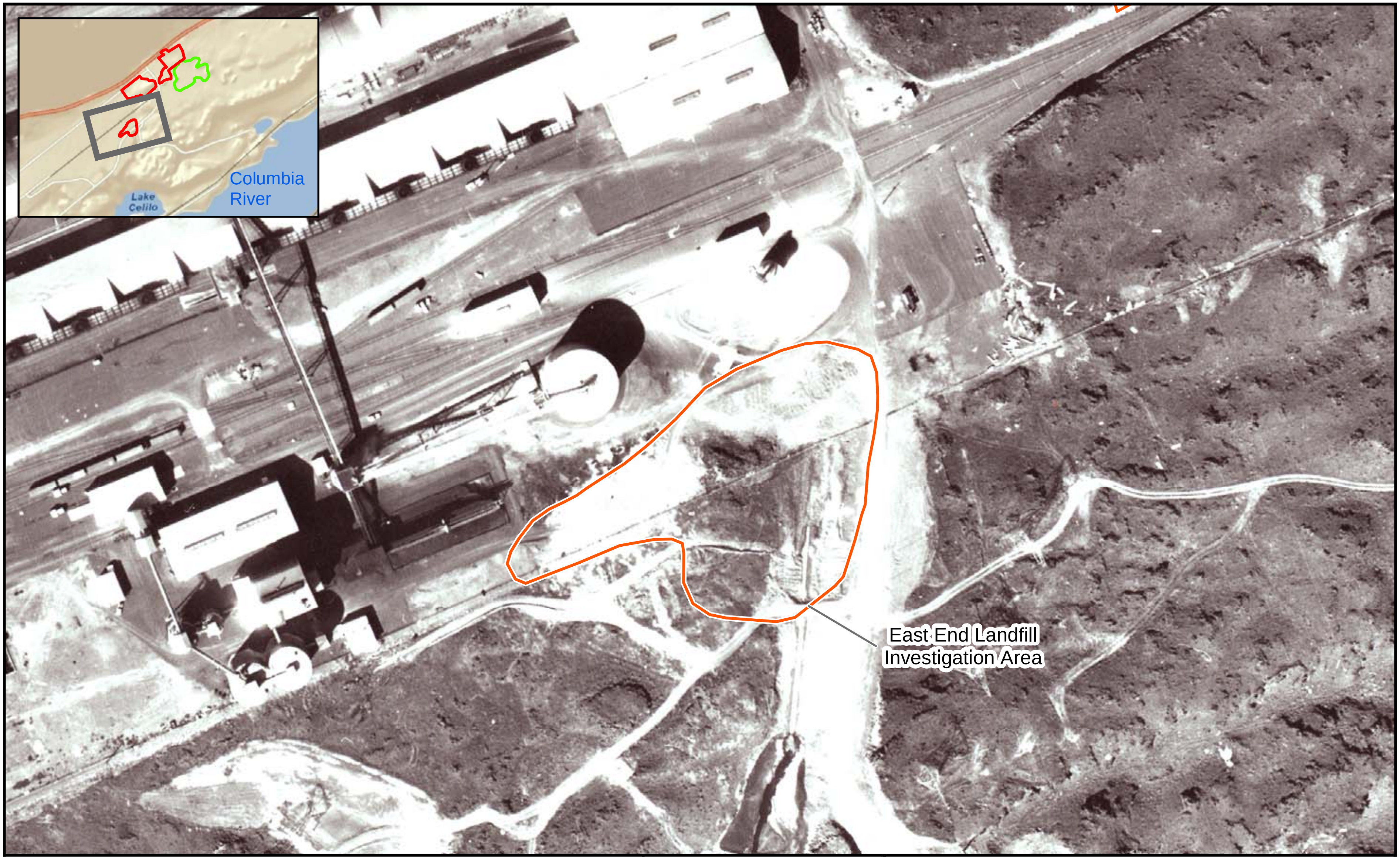

Legend

🟧 Investigation Area

Rotation -15°

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 1972

Revision Date: 03/02/2011

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Legend

🟧 Investigation Area

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Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

East End Landfill Investigation Area
Aerial 1967

Revision Date: 03/02/2011

APPENDIX A-17

SWMU #17 – East End Landfill

Technico Environmental Services (1991)
East End Landfill Investigation Letter Report

COPY

TECHNICO
Environmental Services
201 West 33rd Avenue
Kennewick, Washington 99337
(509) 582-7447 Fax (509) 586-7363

March 8, 1991
Project No. 91-8

Mr. Fred A. Rufner
Environmental Manager
Columbia Aluminum
85 John Day Dam Road
Goldendale, Washington 98620

Re: East End Landfill Investigation

Dear Mr. Rufner:

On February 14 and 15, 1991, we excavated several pits in the suspected area of the East End Landfill. Figure 1, with its associated Overlay #1, indicates the lateral extent of the landfill. Figure 1 with Overlay #2 indicates the location of the exact test-pit excavations. The landfill covers approximately 2 acres and is 12 feet at its deepest point. Figure 2 shows photographs of selected areas within the landfill. Table 1 specifies the depth of the fill at each excavation site with descriptive fieldnotes.

The landfill generally contained a cross-section of waste materials associated with the aluminum smelter process. There were two items encountered which may be of particular significance in future developments associated with this landfill area. At excavation site no. 19 a buried drum was encountered and, although in excellent condition, was opened to determine its contents. The drum contained pitch, which has been classified as an extremely hazardous waste, and as such, currently cannot be legally disposed of in the state of Washington. This presents a regulatory issue favoring the removal of this material. At location no. 22, the excavation was discontinued at a depth of 10 feet because we encountered a white, fibrous material, probably friable asbestos insulation. This area would obviously be best left in place.

The Model Toxics Control Act and new groundwater quality standards will undoubtedly play a role in the disposition of these landfill materials. I am trying to get up-to-date revisions of both regulations now. I will forward them to you as soon as they arrive.

Sincerely,

John A. Zilich

JAZ:jlh

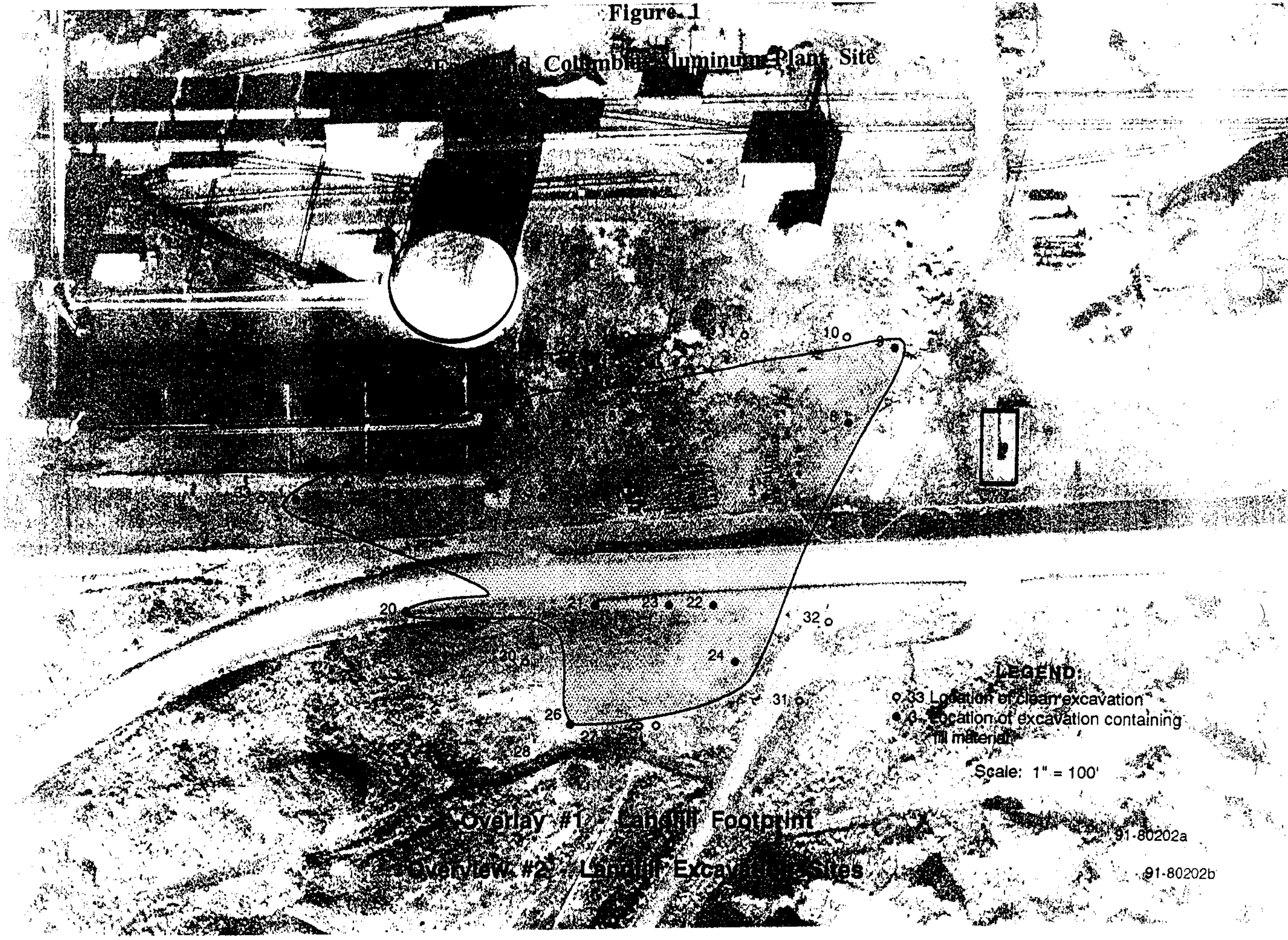
DRAFT

Table 1
Materials Encountered in Landfill Excavations

Excavation No.	Depth of Fill	Description
1	6.5 ft.	
2	7.5 ft.	
3	3.5 ft.	
4	12 ft.	All fill to bedrock, no clean soil
5	8 ft.	All fill to bedrock
6	3 ft.	
7	10 ft.	
8	4 ft.	
9	1 ft.	
10	Clean	
11	Clean	
12	Clean	
13	Clean	
14	2 ft.	
15	Clean	
16	Clean	
17	Clean	
18	2 ft.	
19	7 ft.	Yellow barrel sampled.
20	0.5 ft.	Bottom of ditch is bedrock. Ditch contains floor sweepings. Top of hill is fill.
21	2 ft.	Thin layer contaminated 2 ft. down and surface only.
22		White-powder bricks, wood charcoal, metal bars, and air hoses from top of cells.
22	10 ft.	Asbestos at 10 ft.
23	3 ft.	1 ft. clean dirt on top.
24	8.5 ft	Bricks, lots of scrap iron, air hoses.
25	Clean	
26	4 ft.	All material black, occasional air hose.
27	Clean	
28	Clean	
29	Clean	
30	Clean	
31	Clean	
32	Clean	
33	Clean	

Figure 1

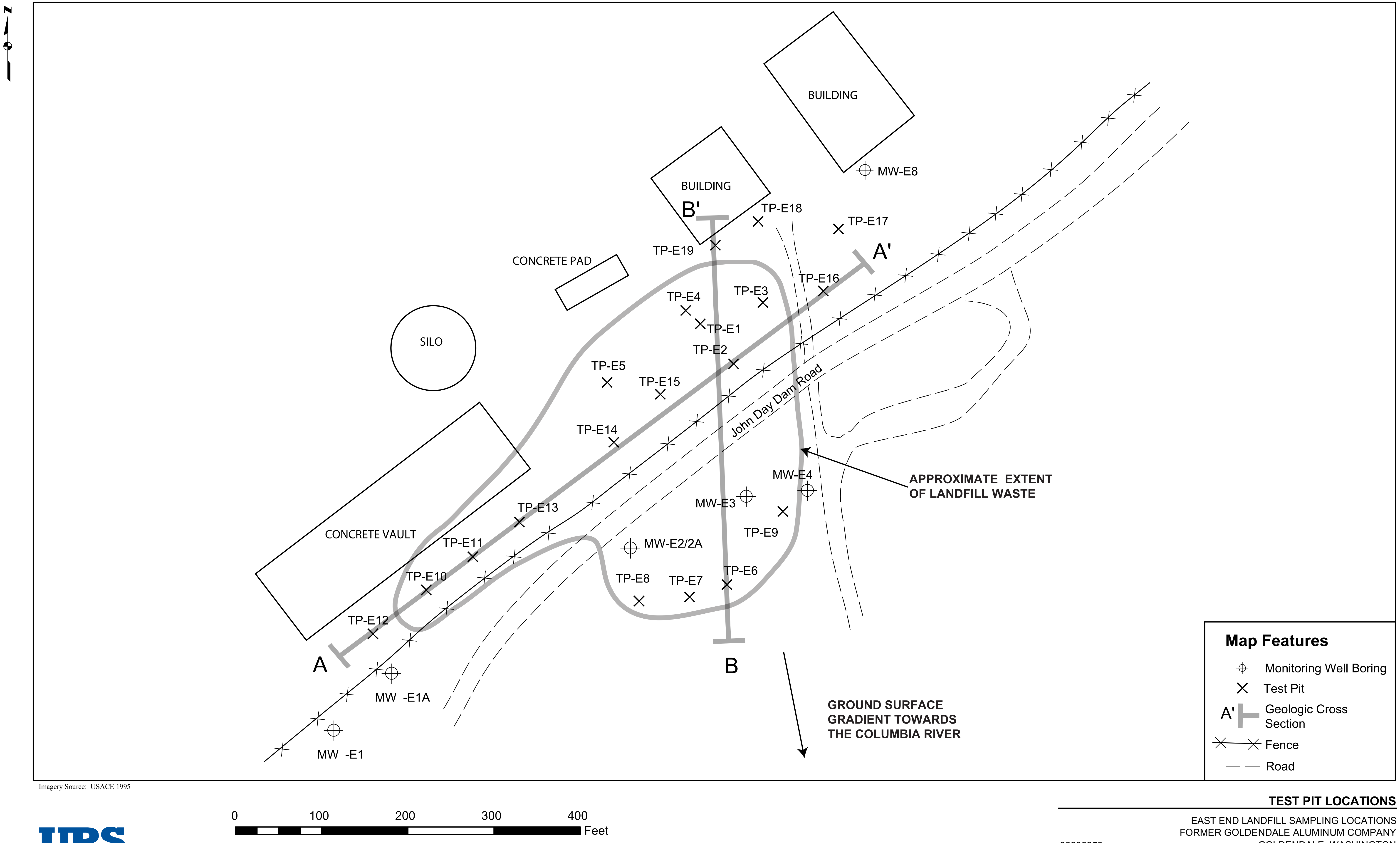
[illegible] Columbia Aluminum Plant Site



APPENDIX A-17

SWMU #17 – East End Landfill

URS (2008a)
Draft RI/FS Report



Imagery Source: USACE 1995

URS

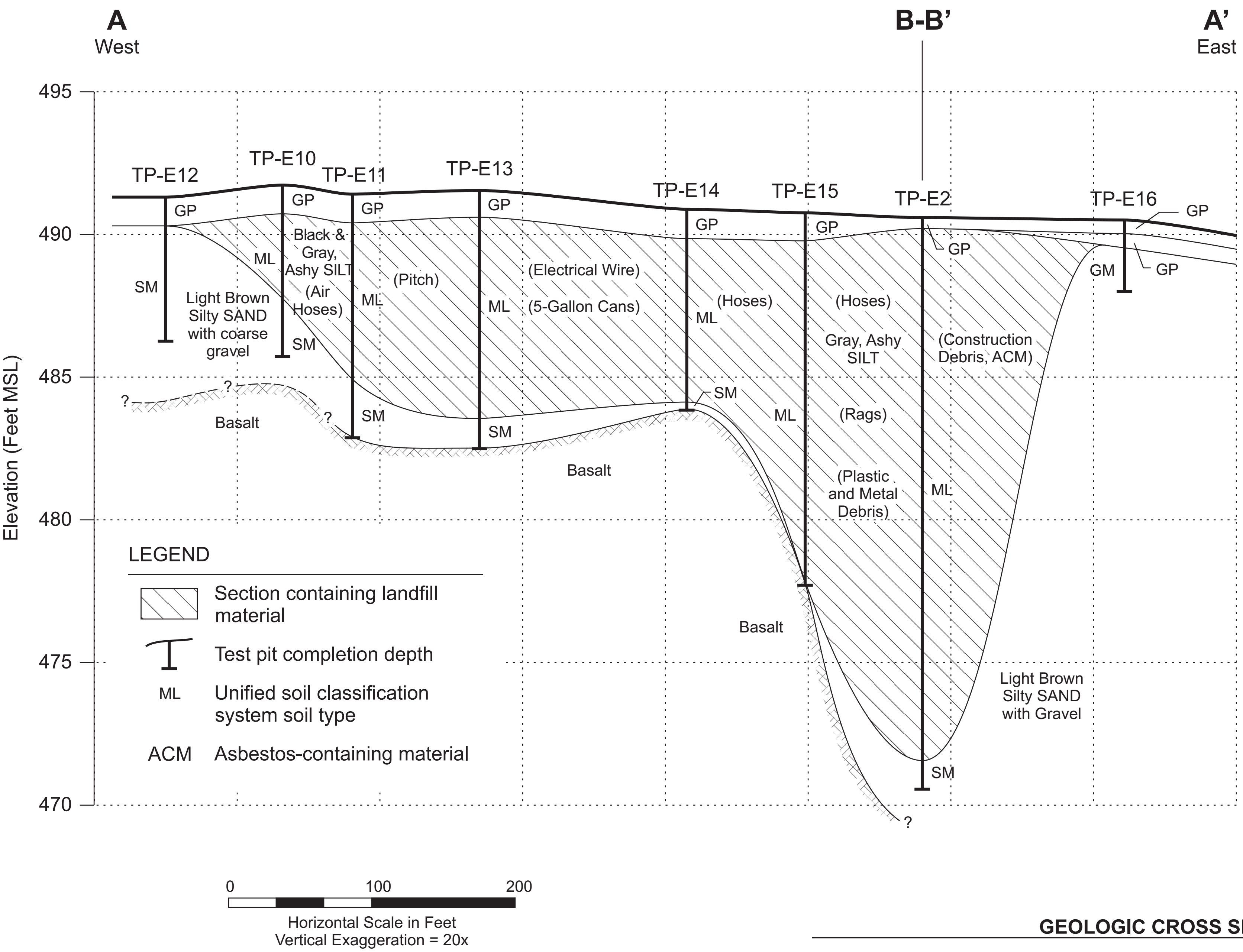
TEST PIT LOCATIONS

EAST END LANDFILL SAMPLING LOCATIONS
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

36298253

FIGURE 2

36298253_06.cdr



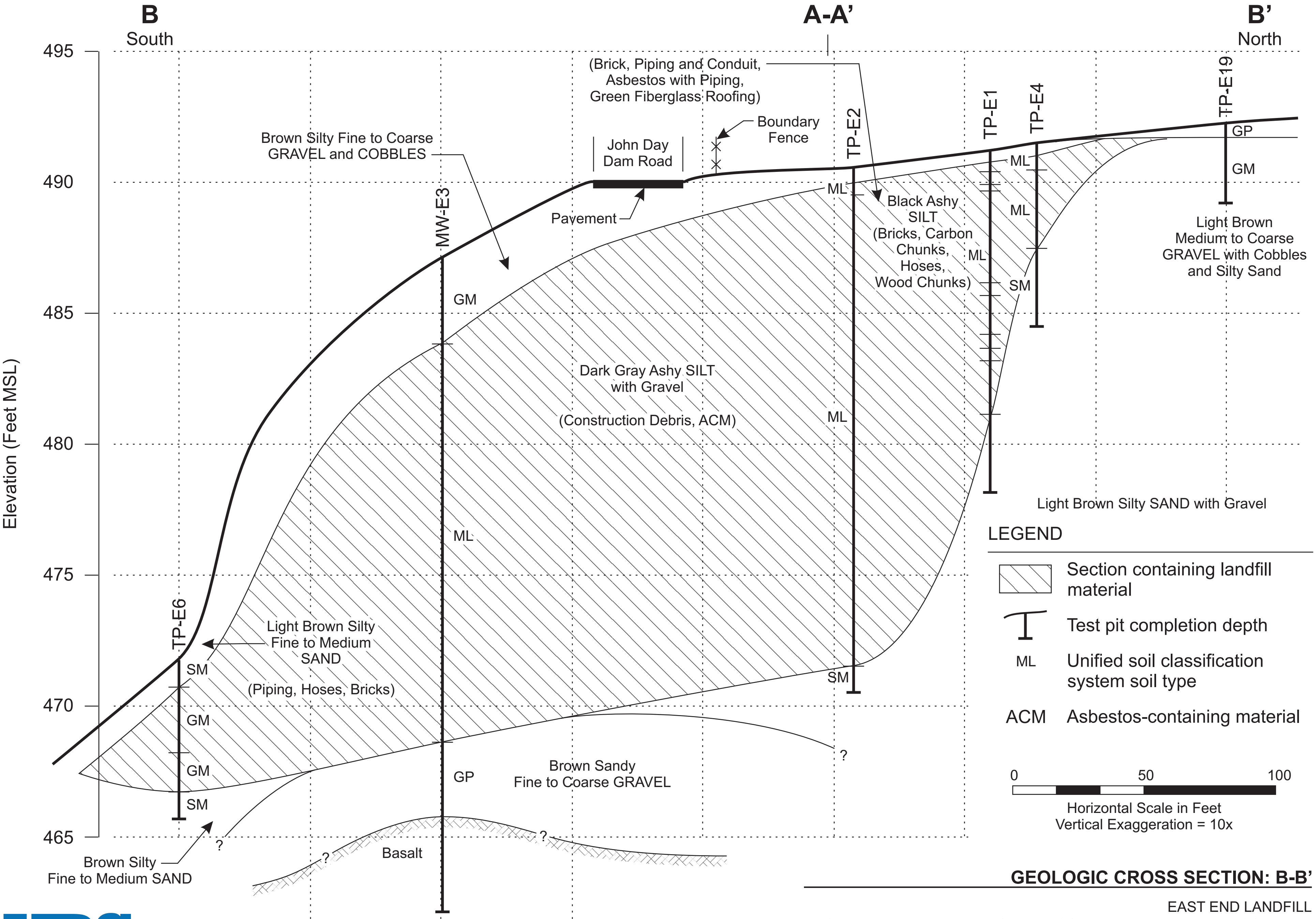
GEOLOGIC CROSS SECTION: A-A'

EAST END LANDFILL
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

DECEMBER 2008
36298253

FIGURE 3

36298253_07.cdr



GEOLOGIC CROSS SECTION: B-B'

DECEMBER 2008
36298253

EAST END LANDFILL
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

FIGURE 4

Table 3
Summary of Soil Analytical Results
East End Landfill
Lockheed-Martin Corporation
Goldendale, Washington

Sample ID:	**Soil Cleanup Levels MTCA Method C (ingestion)**	**TP-E11**	**TP-E1**	**TP-E3**	**TP-E4**	**TP-E5**	**TP-E6**	**TP-E7**	**TP-E8**	**TP-E10**	**TP-E11**	**TP-E13**	**TP-E14**	**MW-E3**	**MW-E4**
Sample Date:		06/20/2008	6/19/2008	06/19/2008	06/19/2008	06/19/2008	06/19/2008	06/19/2008	06/19/2008	06/19/2008	06/20/2008	06/20/2008	06/20/2008	6/23/2008	6/23/2008
Sample Depth (ft bgs):		8.5	13	11	7	5	6	2.5	6.5	6	8.5	9	7	20	25.0
Sample Type:		Test Pit	Test Pit											Soil Boring	Soil Boring
Material Type:		Silty black waste material	Soil below landfill waste												Soil outside landfill
Total Petroleum Hydrocarbons (TPH, mg/kg)															
Gasoline-Range	100[a]	NA	NA	NA	NA	7.00 U	NA	NA	6.49 U	NA	6.22 U	6.74 U	NA	5.63 U	5.81 U
Diesel-Range	2000[a]	NA	NA	NA	NA	310	NA	NA	11.1 U	NA	10.3 U	605	NA	9.95 U	10.4 U
Heavy Oil-Range	2000[a]	NA	NA	NA	NA	411	NA	NA	36.3	NA	25.8 U	**2,620**	NA	24.9 U	25.9 U
VOCs (mg/kg)[b]															
Naphthalene	70,000	NA	NA	NA	NA	0.0893 U	NA	NA	0.189 U	NA	2.43 J	0.126 U	NA	0.197 U	0.195 U
SVOCs (mg/kg)[c]															
Carbazole	6,600	NA	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	20.8	1.95 U	0.351 U	0.359 U
Dibenzofuran	7,000	NA	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	9.22	1.95 U	0.351 U	0.359 U
PCBs (ug/kg)	66,000[d]	NA	NA	NA	NA	ND	NA	NA	ND	NA	ND	ND	NA	NA	NA
PAHs (ug/kg)															
1-Methylnaphthalene	1,100	58.7 U	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	3.86 U	1.95 U	0.351 U	0.359 U
2-Methylnaphthalene	14,000	58.7 U	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	4.43	1.95 U	0.351 U	0.359 U
Acenaphthene	210,000	333	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	20.8	1.95 U	0.351 U	0.359 U
Acenaphthylene	NE	58.7 U	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	3.86 U	1.95 U	0.351 U	0.359 U
Anthracene	1,100,000	658	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	31.7	1.95 U	0.351 U	0.359 U
Benzo(a)anthracene[d]	See note d	3,060	4.13	0.342 U	0.787 U	1.46	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	114	3.82	0.351 U	0.359 U
Benzo(a)pyrene[d]	18	**2,920**	4.78	0.342 U	0.787 U	1.41	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	**130**	4.34	0.351 U	0.359 U
Benzo(b)fluoranthene[d]	See note d	3,100	3.71	0.342 U	0.787 U	1.30	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	88.6	4.19	0.351 U	0.359 U
Benzo(g,h,i)perylene	NE	2,010	4.36	0.342 U	0.787 U	1.22	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	78.1	4.26	0.351 U	0.359 U
Benzo(k)fluoranthene[d]	See note d	1,910	4.25	0.342 U	0.787 U	1.50	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	118	4.15	0.351 U	0.359 U
Chrysene[d]	See note d	2,650	4.58	0.342 U	0.787 U	1.55	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	118	4.63	0.351 U	0.359 U
Dibenz(a,h)anthracene[d]	See note d	888	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	33.9	1.95 U	0.351 U	0.359 U
Fluoranthene	140,000	5110	11.3	0.342 U	0.787 U	4.32	0.378 U	0.412	0.418	0.358 U	0.747	249	10.0	0.351 U	0.359 U
Fluorene	140,000	235	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	12.7	1.95 U	0.351 U	0.359 U
Indeno(1,2,3-cd)pyrene[d]	See note d	2,150	3.76	0.342 U	0.787 U	0.989	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	74.8	3.41	0.351 U	0.359 U
Naphthalene	70,000	82.2	1.87 U	0.342 U	0.787 U	0.780 U	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	6.36	1.95 U	0.351 U	0.359 U
Phenanthrene	NE	2,260	7.51	0.342 U	0.787 U	1.47	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	125	5.86	0.351 U	0.359 U
Pyrene	110,000	3,460	6.57	0.342 U	0.787 U	2.71	0.378 U	0.358 U	0.379 U	0.358 U	0.726 U	228	6.38	0.351 U	0.359 U
TTEC Concentration (c-PAHs)	18	**4,057**	6.4	NA	NA	2.0	NA	NA	NA	NA	NA	**174**	5.9	NA	NA
Asbestos (%)	NA														
Asbestos Point Count		NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Metals (mg/kg)															
Arsenic	88	2.85 U	2.96 U	2.79 U	2.96 U	3.00 U	2.96 U	2.75 U	2.87 U	4.03	3.07	2.93 U	3.02 U	2.66 U	2.70 U
Barium	700,000	10.5 J	98.3 J	66.2 J	71.9 J	121 J	91.3 J	88.8 J	81.5 J	95.6 J	76.2 J	62.4 J	106 J	72.3 J	58.1 J
Cadmium	3,500	0.353	0.236 U	0.223 U	0.237 U	0.240 U	0.237 U	0.220 U	0.230 U	0.224 U	0.224 U	0.235 U	0.708	0.213 U	0.216 U
Chromium	5,300,000 / 11,000[e]	125 J	8.11 J	3.1 J	3.01 J	12.1 J	7.47 J	6.83 J	8.16 J	5.96 J	4.37 J	10.8 J	11.8 J	1.69 J	4.03 J
Lead	250[f]	6.5	4.44	1.90	2.53	4.92	4.27	3.39	4.54	4.62	3.68	5.15	13.2	1.59 U	1.62 U
Mercury	1,100	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Selenium	18,000	10.1	2.96 U	2.79 U	2.96 U	3.00 U	2.96 U	2.75 U	2.87 U	2.80 U	2.81 U	2.93 U	3.02 U	2.66 U	2.70 U
Silver	18,000	0.569 U	0.591 U	0.558 U	0.592 U	0.600 U	0.592 U	0.549 U	0.575 U	0.560 U	0.561 U	0.587 U	0.604 U	0.531 U	0.541 U
Conventionals															
Total cyanide (mg/kg)	70,000	NA	0.280 U	0.267 U	0.286 U	0.563	0.283 U	0.278 U	0.295 U	0.273 U	0.267 U	0.281 U	0.305 U	0.87 U	1.0 U
WAD cyanide (mg/L)	NE	NA	0.243 U	0.236 U	0.895	0.241 U	0.252 U	0.253 U	0.235 U	0.244 U	0.229 U	0.236 U	0.255 U	0.2 U	0.2 U
Fluoride (mg/kg)	210,000	NA	66.5	15.2	88.0	159	80.9	58.1	52.2	24.8	62.6	133	166	30.7	12.1
Sulfate (mg/kg)	NE	NA	721	4.25	37.5	58.7	83.1	4.32 U	31.0	19.6	57.7	185	34.4	56.6	7.14

Notes:
Bold data indicate exceedance of screening levels.
Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded July 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).
bgs - Below ground surface
NA - Not applicable
NE - Not established
PCBs - Polychlorinated biphenyl compounds analyzed using EPA Method 8082
TTEC - Total toxicity equivalent soil concentration
TPH - Total petroleum hydrocarbons, analyzed using methods NWTPH-Gx (gasoline-range) and NWTPH-Dx (diesel- and oil-range
SVOCs - Semivolatile organic compounds, analyzed using EPA Method 8270SIM
VOCs - Volatile organic compounds, analyzed using EPA Method 8260B
U/ND - Compound was analyzed for but not detected above the reporting limit
J - Estimated concentration.

[a] This is a MTCA Method A industrial cleanup level.

[b] Compounds were not detected above the specific compound reporting limits, except as shown.

[c] SVOCs other than PAHs.

[d] These compounds are considered carcinogenic PAHs (c-PAHs) and are subject to WAC-173-340 Toxicity Equivalent Soil Concentration calculations.

[e] Listed levels are for Cr(III) and Cr(VI). Values for total chromium are not established.

[f] This is the MTCA Method A cleanup level for lead; a Method C cleanup level is not provided under MTCA.

Table 5
Summary of Groundwater Analytical Results
East End Landfill
Lockheed-Martin Corporation
Goldendale, Washington

Sample ID:	**Groundwater Screening Levels**			**MW-E1A**		
Sample Date:				6/26/2008	(duplicate)	8/2/2008
Depth to Water (ft):				14.24		12.75
TOC Elevation (ft MSL):	**MTCA Method A**	**MTCA Method C**	**MCLs**	485.67		485.67
Groundwater Elevation (ft MSL):				471.43		472.92
TPH (mg/L)						
Gasoline-Range	0.8 / 1.0 [a]	NE	NE	0.100 U	0.100 U	NA
Diesel-Range	0.5	NE	NE	0.236 U	0.236 U	NA
Heavy Oil-Range	0.5	NE	NE	0.472 U	0.472 U	NA
VOCs (mg/L)	Varies	Varies	Varies	ND	ND	NA
SVOCs (mg/L)	Varies	Varies	Varies	NA	NA	ND
PCBs (ug/L)	0.10	0.44	Varies	ND	ND	NA
Total Metals (mg/L)						
Arsenic	0.005	0.00058	0.01	0.00443	0.00485	NA
Barium	NE	7	2	0.0497	0.0499	NA
Cadmium	0.005	0.018	0.005	0.00200 U	0.00200 U	NA
Chromium	0.05	53 / 0.11 [b]	0.1	0.00800 U	0.00800 U	NA
Lead	0.015	NE	0.015	0.00100 U	0.00100 U	NA
Mercury	0.002	0.011	0.002	0.000200 U	0.000200 U	NA
Selenium	NE	0.18	0.05	0.00327	0.00344	NA
Silver	NE	0.18	NE	0.0100 U	0.0100 U	NA
Conventionals (mg/L)						
Total cyanide	NE	NE	0.2	NA	NA	0.050 U
WAD cyanide	NE	NE	NE	NA	NA	0.020
Fluoride	NE	2.1	4.0	NA	NA	15.3
Sulfate	NE	NE	250 [c]	NA	NA	52.2

Notes:

Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded July 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).

Only detected results for VOCs and PCBs are shown.

DUP - Field Duplicate

NA - Not analyzed

ND - Compounds were not detected above the specific compound reporting limits.

NE - Not established

PCBs - Polychlorinated biphenyl compounds analyzed using EPA Method 8082

TPH - Total petroleum hydrocarbons, analyzed using methods NWTPH-Gx (gasoline-range) and NWTPH-Dx (diesel- and oil-range)

SVOCs - Semivolatile organic compounds, analyzed using EPA Method 8270SIM

VOCs - Volatile organic compounds, analyzed using EPA Method 8260B

U - Compound was analyzed for but not detected above the reporting limit shown.

J - Estimated concentration.

[a] MTCA Method A cleanup levels; see Section 3.5.

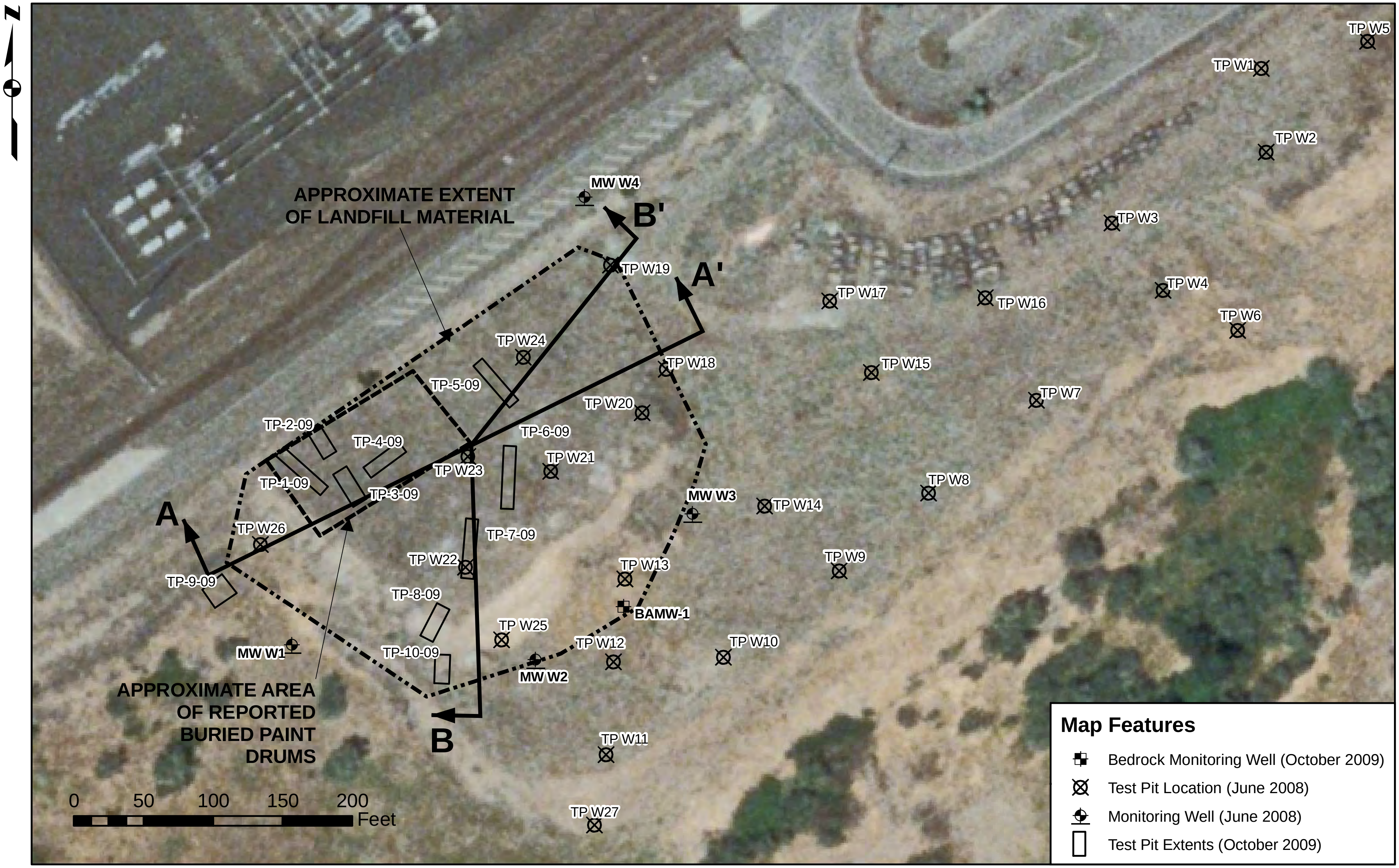
[b] Listed levels are for Cr(III) and Cr(VI). Values for total chromium are not established.

[c] The sulfate MCL is a secondary MCL set to protect against aesthetic affects such as color, taste and odor; exceeding this MCL does not pose a risk to

APPENDIX A-18

SWMU #18 – West End Landfill

URS (2010)
Final Draft RI Report



Imagery Source: USGS 2006

Job No. 36310040

Figure 2

Site Plan, Exploration Locations

West End Landfill
Former Goldendale Aluminum Company
Goldendale, Washington

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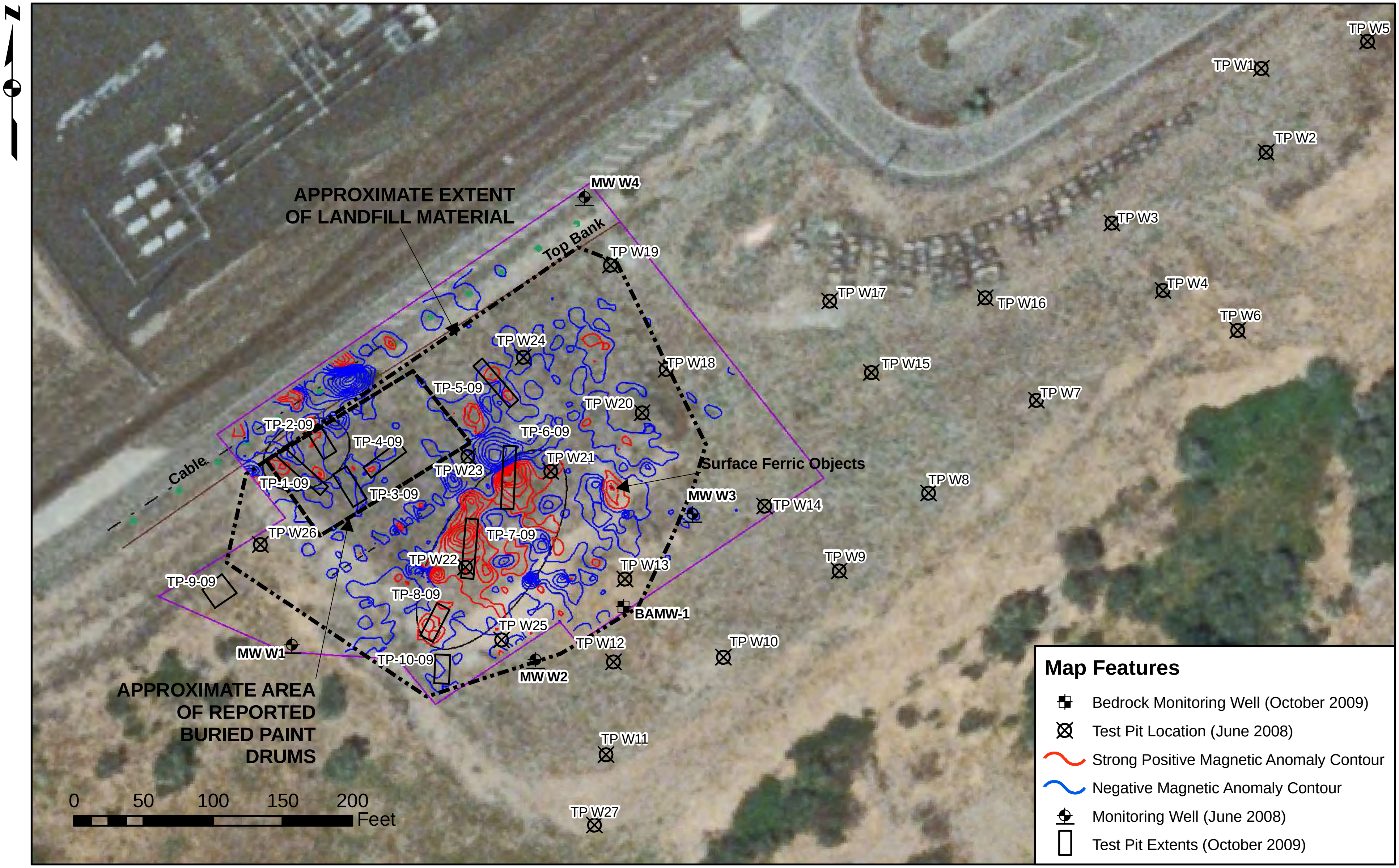

Imagery Source: USGS 2006

Job No. 36310040

Figure 3

Site Plan, Exploration Locations

Magnetic Anomaly Distribution
West End Landfill
Former Goldendale Aluminum Company
Goldendale, Washington

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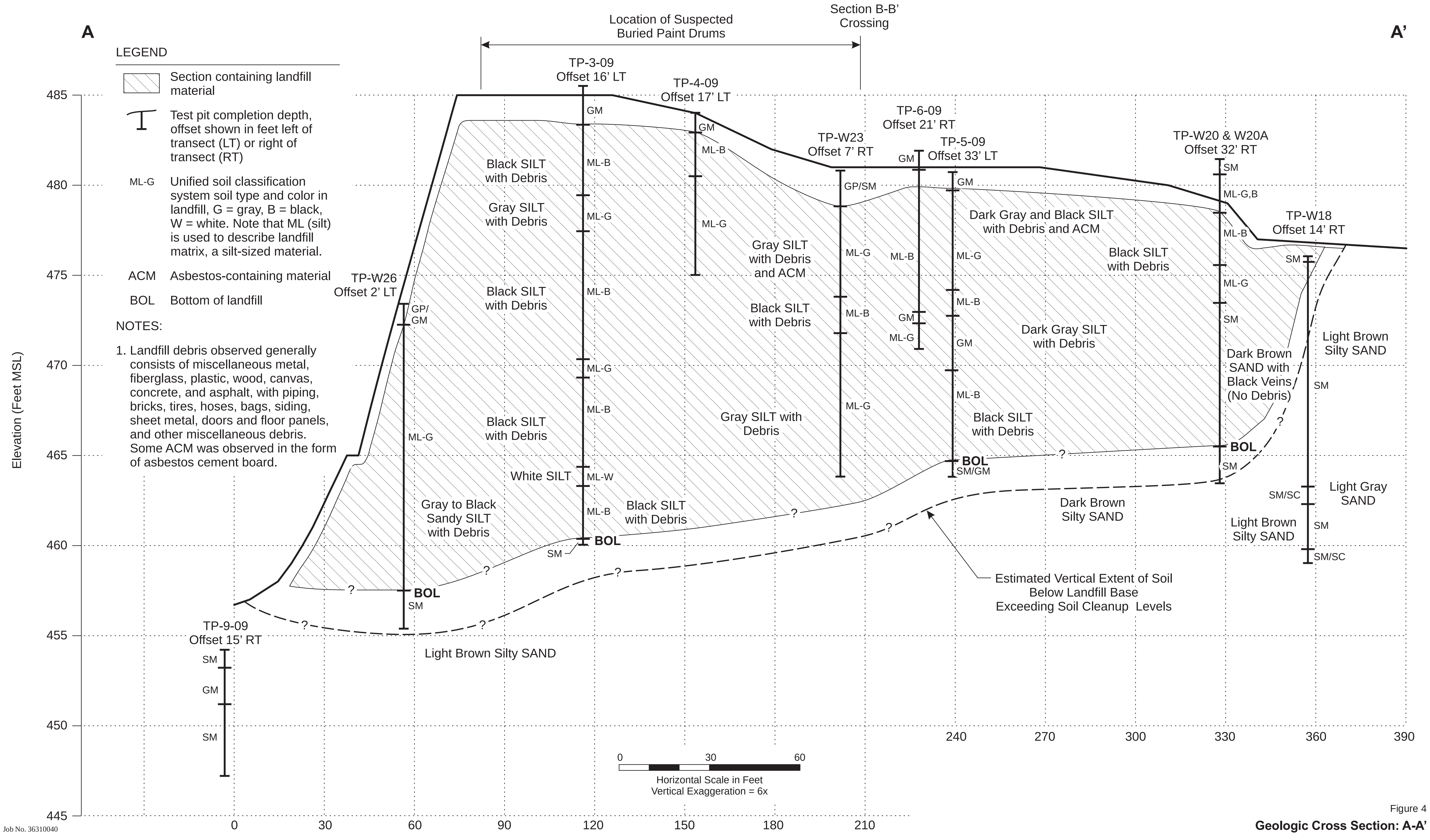


LEGEND

▨ Section containing landfill material

T Test pit completion depth, offset shown in feet left of transect (LT) or right of transect (RT)

ML-G Unified soil classification system soil type and color in landfill, G = gray, B = black, W = white. Note that ML (silt) is used to describe landfill matrix, a silt-sized material.

ACM Asbestos-containing material

BOL Bottom of landfill

NOTES:

1. Landfill debris observed generally consists of miscellaneous metal, fiberglass, plastic, wood, canvas, concrete, and asphalt, with piping, bricks, tires, hoses, bags, siding, sheet metal, doors and floor panels, and other miscellaneous debris. Some ACM was observed in the form of asbestos cement board.

Job No. 36310040

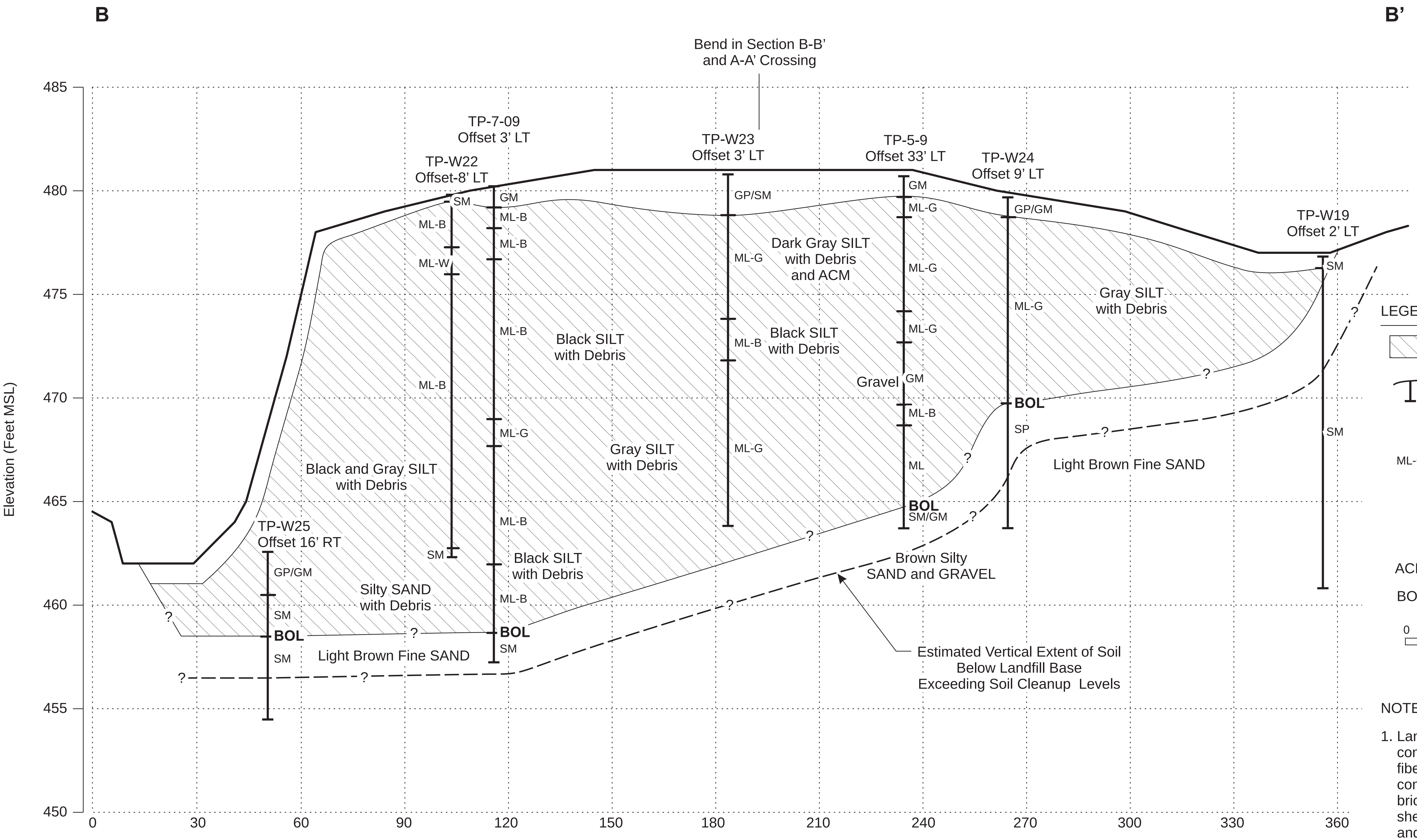
Figure 4

Geologic Cross Section: A-A'

URS

West End Landfill
Former Goldendale Aluminum Company
Goldendale, Washington

36310040_05.cdr



LEGEND

▨	Section containing landfill material
⊤	Test pit completion depth, offset shown in feet left of transect (LT) or right of transect (RT)
ML-G	Unified soil classification system soil type and color in landfill, G = gray, B = black, W = white. Note that ML (silt) is used to describe landfill matrix, a silt-sized material.
ACM	Asbestos-containing material
BOL	Bottom of landfill

0 30 60

Horizontal Scale in Feet
Vertical Exaggeration = 6x

NOTES:

1. Landfill debris observed generally consists of miscellaneous metal, fiberglass, plastic, wood, canvas, concrete, and asphalt, with piping, bricks, tires, hoses, bags, siding, sheet metal, doors and floor panels, and other miscellaneous debris. Some ACM was observed in the form of asbestos cement board.

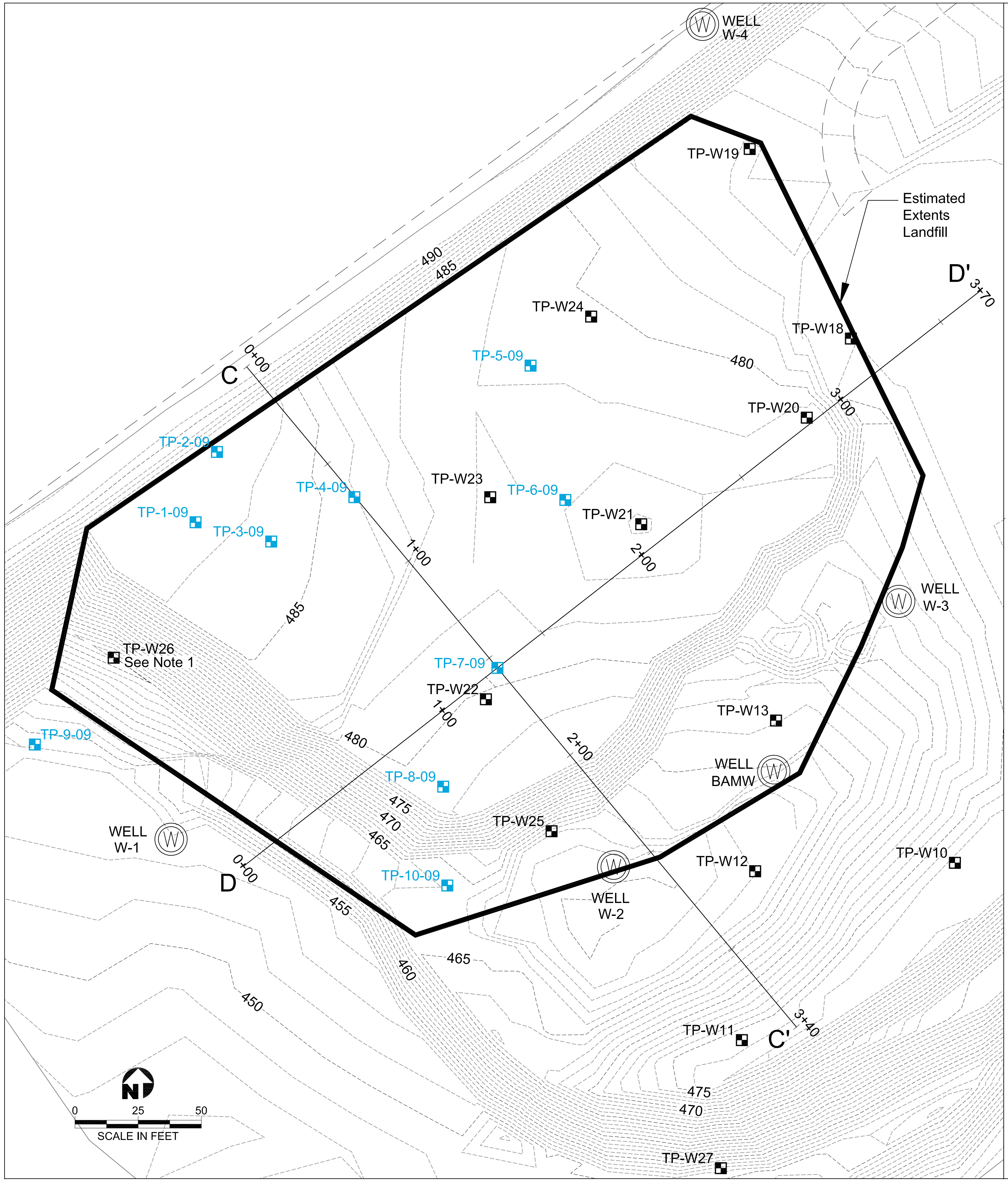
Figure 5

Geologic Cross Section: B-B’

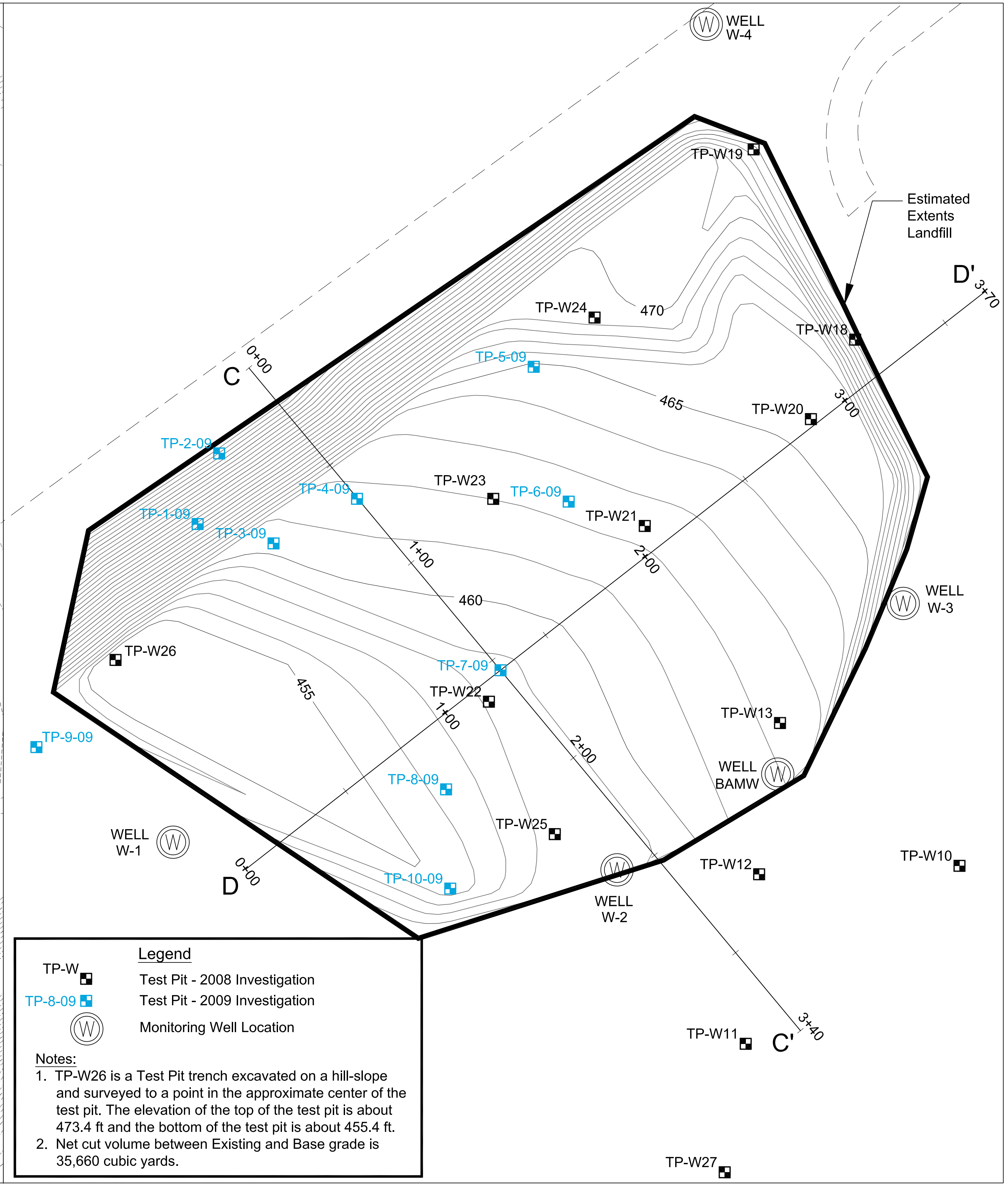
Job No. 36310040

URS

West End Landfill
Former Goldendale Aluminum Company
Goldendale, Washington



Site Plan Topography



Legend

TP-W ▣	Test Pit - 2008 Investigation
TP-8-09 ▣	Test Pit - 2009 Investigation
Ⓦ	Monitoring Well Location

Notes:

1. TP-W26 is a Test Pit trench excavated on a hill-slope and surveyed to a point in the approximate center of the test pit. The elevation of the top of the test pit is about 473.4 ft and the bottom of the test pit is about 455.4 ft.
2. Net cut volume between Existing and Base grade is 35,660 cubic yards.

Estimated Landfill Base Contours

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URS

Figure 6

Goldendale Aluminum
Landfill Base and Surface Contours

West End Landfill
Former Goldendale Aluminum Company
Goldendale, Washington

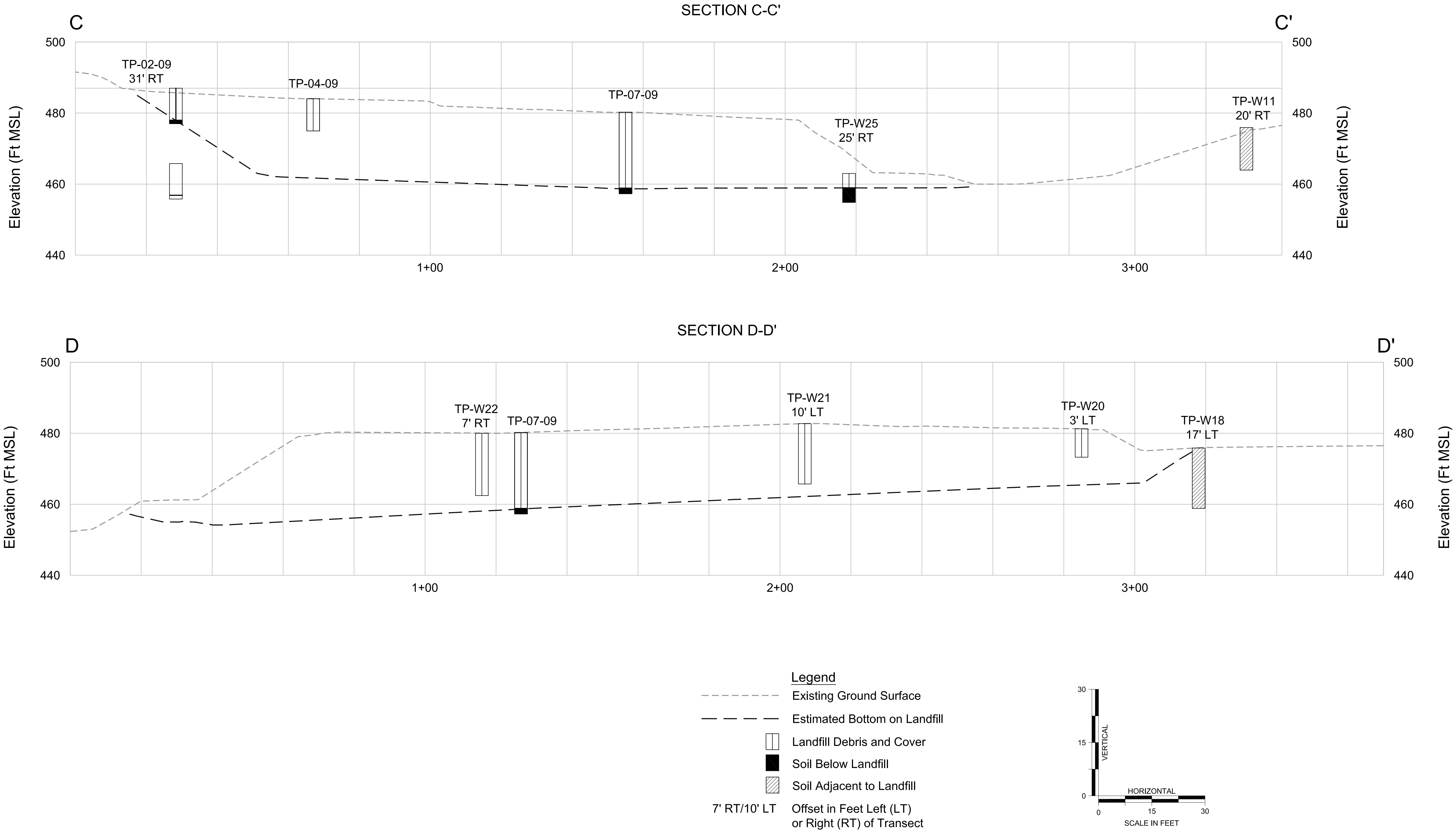

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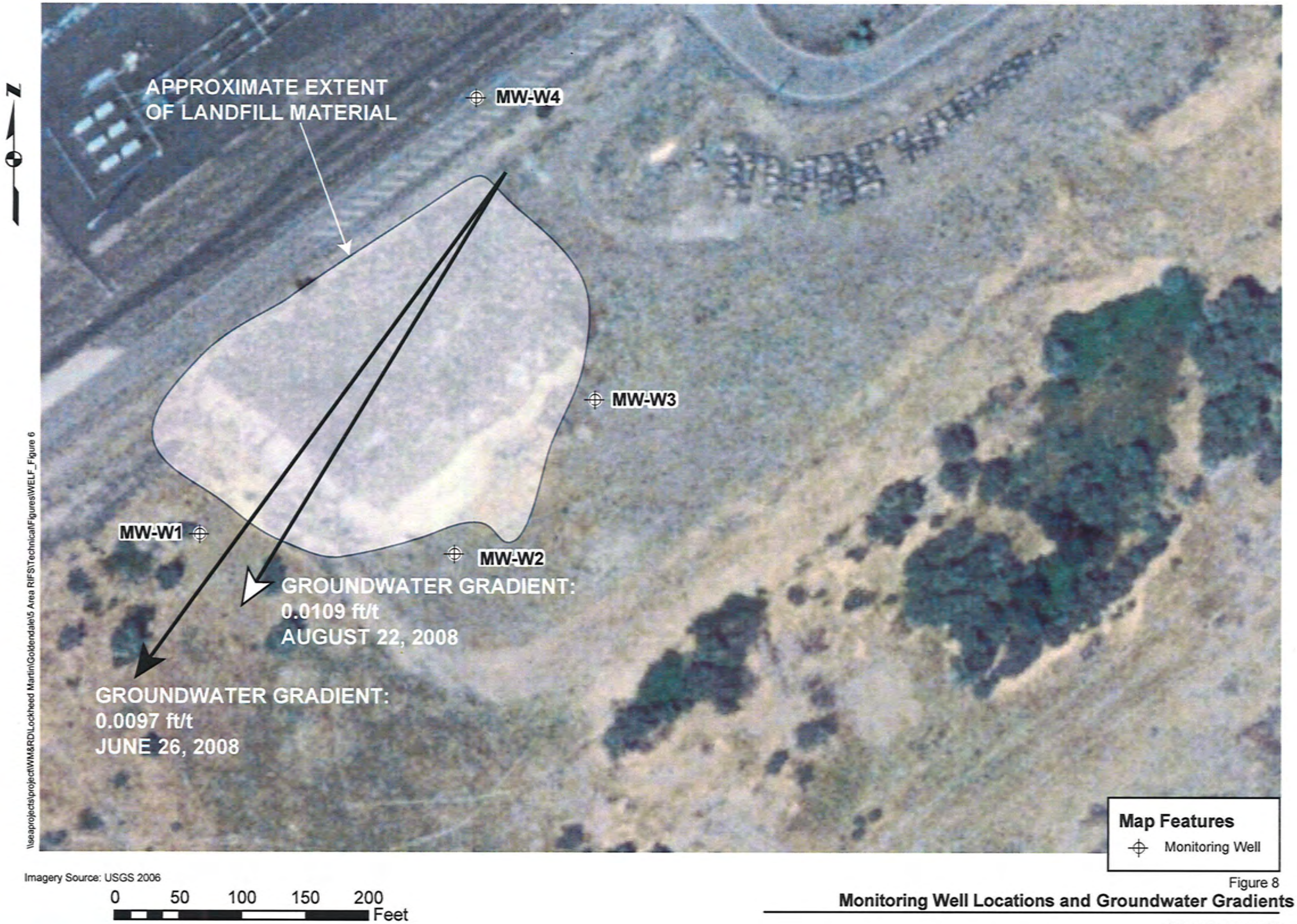
Figure 7
Volume Calculation Cross Sections

West End Landfill
Former Goldendale Aluminum Company
Goldendale, Washington



\\seaprojects\project\WM&RD\Lockheed Martin\Goldendale\5 Area RIFS\Technical\Figures\WELF_Figure 6

Imagery Source: USGS 2006

Figure 8

Monitoring Well Locations and Groundwater Gradients

URS

West End Landfill
Former Goldendale Aluminum Company
Goldendale, Washington

36298254

Table 3
Summary of Soil Analytical Results for the West End Landfill

	Soil Screening Levels															
Sample ID:	MTCA Method A (industrial)	MTCA Method C (ingestion)	Soil Concentrations Protective of Groundwater [f]	MTCA Priority Contaminants of Ecological Concern	State-Wide Background (Metals)	**TP-W20**	**TP-W22**	**TP-W20A**	**TP-W24**	**TP-W25**	**TP-W26**	**TP-3-25**	**TP-5-17**	**TP-7-22**	**TP-10-10**	**TP-9-07**
Sample Date:						6/17/2008	6/18/2008	6/18/2008	6/18/2008	6/18/2008	6/18/2008	10/7/2009	10/8/2009	10/9/2009	10/9/2009	10/9/2009
Sample Depth (ft bgs)/DBLB (ft):						1.5/NA	17.5/NA	18/2	16/6	8/4	18/2	25/0	17/1	22/0	10/1	7/NA
Sample Type						Test Pit										
Material Type						Landfill Material		Soil Below Landfill								Adjacent to Landfill
Total Petroleum Hydrocarbons (mg/kg)																
Gasoline-Range	30 / 100 [a]	NE	–	12,000	–	NA	NA	6.82 U	6.88 U	7.79 U	5.98 U	NA	NA	NA	NA	NA
Diesel-Range	2,000	NE	–	15,000	–	NA	NA	112 U	265	12.9 U	9.79 U	79.5	11.8 U	11.8 U	12.8 U	10.6 U
Heavy Oil-Range	2,000	NE	–	NE	–	NA	NA	558	**2,170**	32.2 U	24.5 U	249	29.6 U	29.4 U	31.9 U	26.6 U
VOCs (mg/kg)	Varies	Varies	–	NE	–	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs (mg/kg)[b]	Varies	Varies	–	Varies	–	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA
PAHs (mg/kg)																
1-Methylnaphthalene	NE	NE	–	NE	–	2.90 UJ	0.586 U	1.96 U	1.95 U	0.403 U	0.723 U	0.120 U	0.0592 U	0.0118 U	0.0128 U	0.0106 U
2-Methylnaphthalene	NE	14,000	–	NE	–	2.90 UJ	0.586 U	1.96 U	1.95 U	0.403 U	0.723 U	0.120 U	0.0592 U	0.0118 U	0.0128 U	0.0106 U
Acenaphthene	NE	210,000	–	NE	–	5.03 J	0.586 U	1.96 U	1.95 U	0.403 U	0.723 U	0.288	0.0592 U	0.0118 U	0.0128 U	0.0106 U
Acenaphthylene	NE	NE	–	NE	–	2.90 UJ	0.586 U	1.96 U	1.95 U	0.403 U	0.723 U	0.120 U	0.0592 U	0.0118 U	0.0128 U	0.0106 U
Anthracene	NE	1,100,000	–	NE	–	4.64 J	2.62	1.96 U	1.95 U	0.403 U	0.723 U	0.480	0.0750	0.0118 U	0.0128 U	0.0106 U
Benzo(a)anthracene [c]	NE	See note c	–	NE	–	36.8 J	21.4	2.92	11.8	0.403 U	0.723 U	3.93	0.600	0.0423	0.0128 U	0.0106 U
Benzo(a)pyrene [c]	2	18	2.3	300	–	**53.8 J**	**17.0**	**4.08**	**14.4**	0.403 U	0.723 U	**4.76**	0.829	0.0400	0.0128 U	0.0106 U
Benzo(b)fluoranthene [c]	NE	See note c	–	NE	–	103 J	26.6	3.72	12.5	0.403 U	0.723 U	9.11	1.51	0.113	0.0136	0.0106 U
Benzo(g,h,i)perylene	NE	NE	–	NE	–	58.2 J	18.1	3.41	12.9	0.403 U	0.723 U	3.65	0.0592 U	0.0478	0.0128 U	0.0106 U
Benzo(k)fluoranthene [c]	NE	See note c	–	NE	–	2.90 UJ	15.9	4.00	13.2	0.403 U	0.723 U	0.120 U	0.0592 U	0.0118 U	0.0128 U	0.0106 U
Chrysene [c]	NE	See note c	–	NE	–	51.3 J	24.5	3.68	13.6	0.403 U	0.723 U	4.70	0.739	0.0627	0.0128 U	0.0106 U
Dibenz(a,h)anthracene [c]	NE	See note c	–	NE	–	18.4 J	7.89	1.96 U	2.18	0.403 U	0.723 U	1.04	0.182	0.0196	0.0128 U	0.0106 U
Fluoranthene	NE	140,000	–	NE	–	73.7 J	27.5	4.74	19.8	0.403 U	0.723 U	6.69	0.916	0.0721	0.0128 U	0.0106 U
Fluorene	NE	140,000	–	NE	–	2.90 UJ	0.586 U	1.96 U	1.95 U	0.403 U	0.723 U	0.144	0.0592 U	0.0118 U	0.0128 U	0.0106 U
Indeno(1,2,3-cd)pyrene [c]	NE	See note c	–	NE	–	52.6 J	17.8	2.72	10.7	0.403 U	0.723 U	2.74	0.367	0.0415	0.0128 U	0.0106 U
Naphthalene	5	70,000	–	NE	–	2.90 UJ	0.586 U	1.96 U	1.95 U	0.403 U	0.723 U	0.120 U	0.0592 U	0.0118 U	0.0128 U	0.0106 U
Phenanthrene	NE	NE	–	NE	–	19.5 J	7.58	2.00	7.13	0.403 U	0.723 U	2.34	0.355	0.0259	0.0128 U	0.0106 U
Pyrene	NE	110,000	–	NE	–	53.4 J	18.3	4.78	20.9	0.403 U	0.723 U	7.23	0.928	0.0705	0.0128 U	0.0106 U
TTEC (c-PAHs)	2	18	2.3	–	2.3	**75**	**26**	**5.5**	**20**	NA	NA	**6.49**	1.10	0.062	0.0014	NA
PCBs (ug/kg)	10,000	66,000 [d]	–	2	–	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Asbestos (%)																
Asbestos Point Count	NE	NE	NE	NE	NE	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA
Total Metals (mg/kg)																
Arsenic	20	88	NA	20	7	**22.5**	9.83	2.96 U	6.31	3.43	2.74 U	3.59	2.96 U	5.24	5.17	2.66 U
Barium	NE	700,000	NE	1,320	255	92.5 J	94.2 J	91.3 J	102 J	83.1 J	45.5 J	NA	NA	NA	NA	NA
Cadmium	2	3,500	2.5	36	1.0	**3.35**	**3.98**	0.261	0.868	0.256 U	0.220 U	0.240 U	0.237 U	0.235 U	0.255 U	0.213 U
Chromium	2,000 / 19 [e]	5,300,000 / 11,000 [e]	1,000	135	41.9	86.3 J	66.8 J	13.4 J	20.0 J	10.5 J	10.5 J	6.22	7.13	8.73	8.87	7.07
Lead	1,000	NE	3,000	220	17.09	78.0	188	6.60	33.8	4.98	2.10	6.17	5.42	5.90	5.22	1.92
Mercury	2	1,100	11.5	9	0.07	0.206	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	NA	NA	NA	NA	NA
Selenium	NE	18,000	18.2	0.8	0.78	**15.8**	**7.89**	2.96 U	2.97 U	3.20 U	2.74 U	3.00 U	2.96 U	2.94 U	3.19 U	2.66 U
Silver	NE	18,000	NE	NE	0.61	0.575 U	0.592 U	0.591 U	0.594 U	0.639 U	0.549 U	NA	NA	NA	NA	NA
Conventionals																
Total cyanide (mg/kg)	NE	70,000	2.0	NE	–	NA	NA	0.301 U	0.970	0.318 U	0.276 U	NA	NA	NA	NA	NA
WAD cyanide (mg/L)	NE	NE	–	NE	–	NA	NA	0.243 U	0.245 U	0.247 U	0.242 U	NA	NA	NA	NA	NA
Fluoride (mg/kg)	NE	210,000	330	NE	–	NA	NA	165	**593**	25.2	5.28	29.3 J	22.5 J	3.90 J	10.1 J	1.60 J
Sulfate (mg/kg)	NE	NE	–	NE	–	NA	NA	1,130	781	1,590	640	NA	NA	NA	NA	NA

Notes:

Bold data indicate exceedance of one or more screening levels.

Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded March 2010 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).

bgs - Below ground surface
DBLB - Depth below landfill base
NA - Not applicable or not analyzed
NE - Not established
PCBs - Polychlorinated biphenyl compounds
TTEC - Total toxicity equivalent soil concentration
TPH - Total petroleum hydrocarbons
VOCs - Volatile organic compounds
U/ND - Compound was analyzed for but not detected above the reporting limit
J - Estimated concentration.

[a] The soil cleanup level is 100 mg/kg if benzene is not present and the total of ethylbenzene, toluene, and xylenes is less than 1% of the gasoline mixture. The cleanup level for all other gasoline mixtures is 30 mg/kg.

[b] SVOCs other than PAHs.

[c] These compounds are considered carcinogenic PAHs (c-PAHs) and are subject to WAC-173-340 Toxicity Equivalent Soil Concentration calculations.

[d] Listed levels are for total PCBs.

[e] Listed levels are for Cr(III) and Cr(VI). Values for total chromium are not established.

[f] Chromium and lead protective of Method A groundwater criteria; cadmium, mercury, and selenium protective of Method C groundwater criteria. Arsenic is not shown because value is higher than background. Cyanide and fluoride protective of MCL as described in EPA Region 9 PRGs.

Table 5
Summary of Groundwater Monitoring Results for the West End Landfill

Sample ID:	Groundwater Screening Levels			MW-W1			MW-W2		MW-W3[d]		MW-W4	
Sample Date:				6/26/2008		8/2/2008	6/26/2008	8/2/2008	6/26/2008	7/31/2008	6/26/2008	8/2/2008
Depth to Water (ft)	MTCA Method A	MTCA Method C	MCLs	19.49		21.15	26.06	27.7	19.5	NA	52.52	53.73
TOC Elevation (ft MSL)				455.11	(duplicate)	455.11	462.81	462.81	474.53	NA	491.65	491.65
Groundwater Elevation (ft MSL)				435.62		433.96	436.75	435.11	455.03	NA	439.13	437.92
TPHs (mg/L)												
Gasoline-Range	0.8 / 1.0 [a]	NE	NE	0.100 U	0.100 U	NA	0.100 U	NA	NA	NA	0.100 U	NA
Diesel-Range	0.5	NE	NE	0.236 U	0.236 U	NA	0.236 U	NA	NA	NA	0.236 U	NA
Heavy Oil-Range	0.5	NE	NE	0.472 U	0.472 U	NA	0.472 U	NA	NA	NA	0.472 U	NA
VOCs (mg/L)	Varies	Varies	Varies	ND	ND	NA	ND	NA	NA	NA	ND	NA
SVOCs (mg/L)	Varies	Varies	Varies	NA	NA	ND	NA	ND	NA	NA	NA	ND
PCBs (ug/L)	0.10	0.44	Varies	ND	ND	NA	ND	NA	NA	NA	ND	NA
Total Metals (mg/L)												
Arsenic	0.005	0.00058[e]	0.01	0.00100 U	0.00100 U	NA	0.00296	NA	NA	NA	**0.00846**	NA
Barium	NE	7	2	0.0354	0.0349	NA	0.367	NA	NA	NA	1.43	NA
Cadmium	0.005	0.018	0.005	0.00200 U	0.00200 U	NA	0.00200 U	NA	NA	NA	0.00257	NA
Chromium	0.05	53 / 0.11 [b]	0.1	0.00800 U	0.00800 U	NA	**0.0751**	NA	NA	NA	**0.285**	NA
Lead	0.015	NE	0.015	0.00100 U	0.00100 U	NA	0.00348	NA	NA	NA	**0.0212**	NA
Mercury	0.002	0.011	0.002	0.000200 U	0.000200 U	NA	0.000200 U	NA	NA	NA	0.000322	NA
Selenium	NE	0.18	0.05	0.00235	0.00157	NA	0.00113	NA	NA	NA	0.00224	NA
Silver	NE	0.18	NE	0.0100 U	0.0100 U	NA	0.0100 U	NA	NA	NA	0.0100 U	NA
Conventionals (mg/L)												
Total cyanide	NE	NE	0.2	NA	NA	0.082	NA	0.050 U	NA	0.050 U	NA	0.050 U
WAD cyanide	NE	NE	NE	NA	NA	0.015	NA	0.010 U	NA	0.019	NA	0.010 U
Fluoride	NE	2.1	4.0	NA	NA	0.590	NA	0.590	NA	NA	NA	0.390
Sulfate	NE	NE	250 [c]	NA	NA	65.1	NA	91.6	NA	NA	NA	51.4

Notes:

Bold indicates a value in exceedance of one or more screening levels.

Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded March 2010 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).

ft MSL - feet above Mean Sea Level

ND - Compounds were not detected above the specific compound reporting limits.

NE - Not established

PCBs - Polychlorinated biphenyl compounds

TOC - Top of casing

TPH - Total petroleum hydrocarbons

VOCs - Volatile organic compounds

U - Compound was analyzed for but not detected above the reporting limit shown.

[a] In water, if benzene is present, the cleanup level for groundwater is 800 ug/L. If there is no detectable benzene, cleanup level for groundwater is 1,000 ug/L.

[b] Listed levels are for Cr(III) and Cr(VI). Chromium (VI) is not expected at this site.

[c] The sulfate MCL is a secondary MCL.

[d] This well was screened in a perched water layer; the water measured was considered water held within the end cap and not a true groundwater elevation.

APPENDIX A-19

SWMU #19 – Plant Construction Landfill

No Materials Included

APPENDIX A-20

SWMU #20 – Drum Storage Area

URS (2008d)
Draft RI Report

Imagery Source: USACE 1995

URS

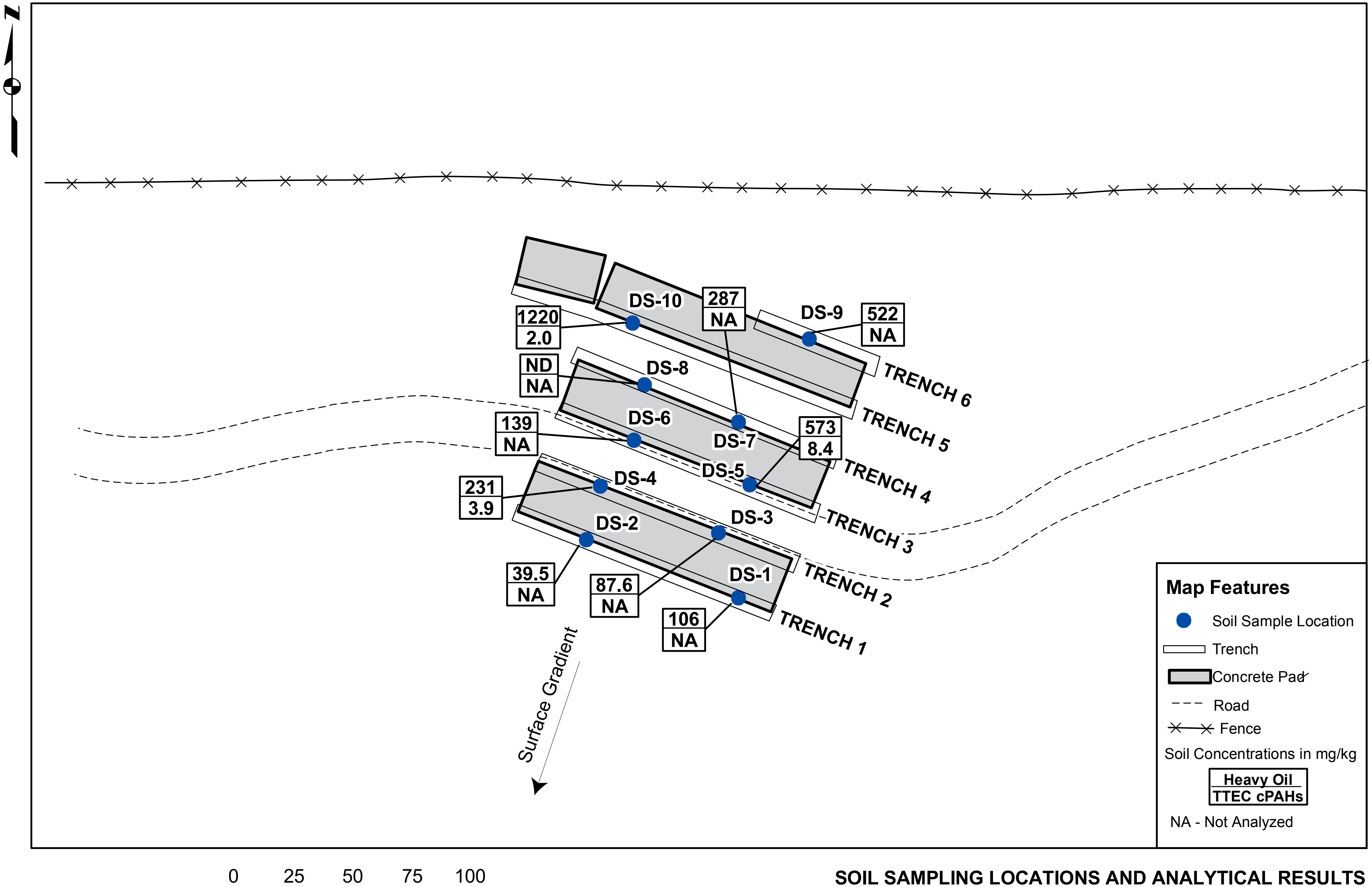
SITE LOCATION MAP

AUGUST 2008

DRUM STORAGE AREA
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

FIGURE 1

O:\36298241 Goldendale Aluminum\5000 Technical\GIS\MXD\Fig 1 - Site Location Map DSA.mxd



SOIL SAMPLING LOCATIONS AND ANALYTICAL RESULTS

DRUM STORAGE AREA
FORMER GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

AUGUST 2008
36298253

URS

FIGURE 2

O:\36298241 Goldendale Aluminum\5000 Technical\GIS\MXD\DSA.mxd

Table 3
Field Screening Results for Soil
Drum Storage Area
Lockheed-Martin Corporation
Goldendale, Washington

Trench 1, Pad 1
Samples collected every 5 linear feet beginning at Northwest corner of pad.

Analytical Soil Sample	Subsample	USCS Soil Type	Sheen	PID	Other Info
	1	GM	NS	0.0	
	2	GM	NS	0.0	
	3	GM	NS	0.0	
DS-1	4	GM	NS	0.0	
	5	GM	NS	0.0	
	6	GM	NS	0.0	
	7	GM	NS	0.0	
	8	GM	NS	0.0	
	9	GM	NS	0.0	
	10	GM	NS	0.0	
	11	GM	NS	0.0	
	12	GM	NS	0.0	
	13	GM	NS	0.0	
	14	GM	NS	0.0	
	15	GM	NS	0.0	
DS-2	16	GM	NS	0.0	
	17	GM	NS	0.0	
	18	GM	NS	0.0	
	19	GM	NS	0.0	
	20	GM	NS	0.0	

Trench 2, Pad 1
Samples collected every 5 linear feet beginning at Southeast corner of pad.

Analytical Soil Sample	Subsample	USCS Soil Type	Sheen	PID	Other Info
	1	GM	NS	0.0	Beneath pad corner
	2	GM	NS	0.0	Beneath pad corner
	3	GM	NS	0.0	Beneath pad corner
	4	GM	NS	0.0	Beneath pad corner
	5	GM	NS	0.0	
	6	GM	NS	0.0	
DS-3	7	GM	NS	0.0	
	8	GM	NS	0.0	
	9	GM	NS	0.0	
	10	GM	NS	0.0	
	11	GM	NS	0.0	
	12	GM	NS	0.0	
	13	GM	NS	0.0	
	14	GM	NS	0.0	
	15	GM	NS	0.0	
DS-4	16	GM	NS	0.0	
	17	GM	NS	0.0	
	18	GM	NS	0.0	
	19	GM	NS	0.0	
	20	GM	NS	0.0	
	21	GM	NS	0.0	

Trench 3, Pad 2
Samples collected every 5 linear feet beginning at Northwest corner of pad.

Analytical Soil Sample	Subsample	USCS Soil Type	Sheen	PID	Other Info
	1	GM	NS	0.0	
	2	GM	NS	0.0	
	3	GM	NS	0.0	
	4	GM	NS	2.8	4-inch by 4-inch clump
DS-5	5	GM	NS	0.0	of very dark soil material
	6	GM	NS	0.0	
	7	GM	NS	0.0	
	8	GM	NS	0.0	
	9	GM	NS	0.0	
	10	GM	NS	0.0	
	11	GM	NS	0.0	
	12	GM	NS	0.0	
	13	GM	NS	0.0	
	14	GM	NS	0.0	
	15	GM	NS	0.0	
	16	GM	NS	0.0	
DS-6	17	GM	NS	0.0	Beneath pad corner
	18	GM	NS	0.0	Beneath pad corner
	19	GM	NS	0.0	Beneath pad corner
	20	GM	NS	0.0	Beneath pad corner
	21	GM	NS	0.0	Beneath pad corner

Trench 4, Pad 2
Samples collected every 5 linear feet beginning at Southeast corner of pad.

Analytical Soil Sample	Subsample	USCS Soil Type	Sheen	PID	Other Info
	1	GM	NS	0.0	
	2	GM	NS	0.0	
	3	GM	NS	0.0	
	4	GM	NS	0.0	
DS-7	5	GM	NS	2.8	
	6	GM	NS	0.0	
	7	GM	NS	0.0	
	8	GM	NS	0.0	
	9	GM	NS	0.0	
	10	GM	NS	0.0	
	11	GM	NS	0.0	
	12	GM	NS	0.0	
	13	GM	NS	0.0	
	14	GM	NS	0.0	
DS-8	15	GM	NS	0.0	
	16	GM	NS	0.0	
	17	GM	NS	0.0	
	18	GM	NS	0.0	
	19	GM	NS	0.0	
	20	GM	NS	0.0	
	21	GM	NS	0.0	

Trench 5, Pad 3
Samples collected every 5 linear feet beginning at Northwest corner of pad.

Analytical Soil Sample	Subsample	USCS Soil Type	Sheen	PID	Other Info
	1	GM	NS	0.0	
	2	GM	NS	0.0	
	3	GM	NS	0.0	
	4	GM	NS	0.0	
DS-9	5	GM	NS	0.0	
	6	GM	NS	0.0	
	7	GM	NS	0.0	
	8	GM	NS	0.0	
	9	GM	NS	0.0	
	10	GM	NS	0.0	
	11	GM	NS	0.0	
	12	GM	NS	0.0	
	13	GM	NS	0.0	
	14	GM	NS	0.0	
	15	GM	NS	0.0	
DS-10	16	GM	NS	0.0	
	17	GM	NS	0.0	Beneath pad corner
	18	GM	NS	0.0	Beneath pad corner
	19	GM	NS	0.0	Beneath pad corner
	20	GM	NS	0.0	Beneath pad corner
	21	GM	NS	0.0	Beneath pad corner
	22	GM	NS	0.0	
DS-11	23	GM	NS	0.0	not analyzed
	24	GM	NS	0.0	
	25	GM	NS	0.0	
	26	GM	NS	0.0	

Trench 6, Pad 3
Samples collected every 5 linear feet beginning at Southeast corner of pad.

Analytical Soil Sample	Subsample	USCS Soil Type	Sheen	PID	Other Info
	1	GM	NS	0.0	
	2	GM	NS	0.0	
	3	GM	NS	0.0	
	4	GM	NS	0.0	
DS-12	5	GM	NS	0.0	not analyzed
	6	GM	NS	0.0	
	7	GM	NS	0.0	
	8	GM	NS	0.0	
	9	GM	NS	0.0	

Sheen Description:
N - None
S - Slight; light, colorless, dissipating film, spotty to globular
M - Moderate; light to heavy, irregular with some color or iridescence
H - Heavy; heavy, colorful, iridescent, spreads rapidly

Note: All concrete pads were observed to have been placed on plastic sheeting.
USCS - Unified Soil Classification System

Table 4
Analytical Results for Soil
Drum Storage Area
Lockheed-Martin Corporation
Goldendale, Washington

Sample ID:	**MTCA Soil Cleanup Levels**	**DS-1**	**DS-2**	**DS-3**	**DS-4**	**DS-5**	**DS-6**	**DS-7**	**DS-8**	**DS-9**	**DS-10**
Sample Date:		6/23/2008	6/23/2008	6/23/2008	6/23/2008	6/23/2008	6/23/2008	6/23/2008	6/23/2008	6/23/2008	6/23/2008
Sample Depth (ft bgs):	**Method C (ingestion)**	2.0	2.0	1.0	1.5	1.5	1.5	2.0	3.0	2.5	2.0
TPH (mg/kg)											
Gasoline-Range	100 [a]	6.34 U	5.91 U	5.78 U	6.21 U	6.29 U	5.74 U	6.81 U	6.60 U	6.61 U	10.9 U
Diesel-Range	2000 [a]	54.6	14.8	32.2	65.1	181	38.9	111	11.3 U	61.6	162
Heavy Oil-Range	2000 a	106	39.50	87.60	231	573	139	287	28.2 U	522	1,220
VOCs (mg/kg)											
VOCs	Varies	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*
Naphthalene	70,000	0.164 U	0.112 U	0.120 U	0.113 U	1.11	0.0936 U	0.147 U	0.111 U	0.129 U	0.247 U
PAHs (mg/kg)											
1-Methylnaphthalene	1,100	NA	NA	NA	0.332 UJ	7.23 J	NA	NA	NA	NA	0.226 UJ
2-Methylnaphthalene	14,000	NA	NA	NA	0.332 UJ	9.01 J	NA	NA	NA	NA	0.226 UJ
Acenaphthene	210,000	NA	NA	NA	0.376 J	4.51 J	NA	NA	NA	NA	0.226 J
Acenaphthylene	NE	NA	NA	NA	0.332 UJ	0.167 UJ	NA	NA	NA	NA	0.226 UJ
Anthracene	1,100,000	NA	NA	NA	0.443 J	1.40 J	NA	NA	NA	NA	1.01 J
Benzo(a)anthracene [b]	See note b	NA	NA	NA	2.55 J	6.01 J	NA	NA	NA	NA	1.26 J
Benzo(a)pyrene [b]	18	NA	NA	NA	2.86 J	5.93 J	NA	NA	NA	NA	1.48 J
Benzo(b)fluoranthene [b]	See note b	NA	NA	NA	3.36 J	6.25 J	NA	NA	NA	NA	1.57 J
Benzo(g,h,i)perylene	NE	NA	NA	NA	2.15 J	5.83 J	NA	NA	NA	NA	2.09 J
Benzo(k)fluoranthene [b]	See note b	NA	NA	NA	1.57 J	4.18 J	NA	NA	NA	NA	1.40 J
Chrysene [b]	See note b	NA	NA	NA	3.10 J	7.21 J	NA	NA	NA	NA	1.75 J
Dibenz(a,h)anthracene [b]	See note b	NA	NA	NA	0.730 J	2.21 J	NA	NA	NA	NA	0.226 UJ
Fluoranthene	140,000	NA	NA	NA	3.76 J	10.6 J	NA	NA	NA	NA	2.42 J
Fluorene	140,000	NA	NA	NA	0.332 UJ	0.644 J	NA	NA	NA	NA	0.226 UJ
Indeno(1,2,3-cd)pyrene [b]	See note b	NA	NA	NA	1.97 J	5.19 J	NA	NA	NA	NA	0.647 J
Naphthalene	70,000	NA	NA	NA	0.332 UJ	2.59 J	NA	NA	NA	NA	0.226 UJ
Phenanthrene	NE	NA	NA	NA	1.35 J	3.82 J	NA	NA	NA	NA	0.723 J
Pyrene	110,000	NA	NA	NA	3.08 J	10.5 J	NA	NA	NA	NA	2.62 J
TTEC Concentration (c-PAHs)	18	NA	NA	NA	3.9	8.4	NA	NA	NA	NA	2.0
PCBs (ug/kg)	66,000 [c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Metals (mg/kg)											
Arsenic	88	2.83 U	2.73 U	2.69 U	2.80 U	2.82 U	2.69 U	2.95 U	2.90 U	2.90 U	5.44
Barium	700,000	64.0	55.0	58.7	60.6	65.0	63.4	95.3	111	71.2	133
Cadmium	3,500	0.227 U	0.218 U	0.216 U	0.224 U	0.226 U	0.231	0.236 U	0.232 U	0.232 U	0.330
Chromium	5,300,000 / 11,000 [d]	5.87	3.53	4.36	5.01	7.54	5.99	8.15	5.81	5.72	73.60
Lead	1,000 [a]	4.34	2.56	2.66	3.07	3.90	4.91	4.27	2.96	7.05	9.62
Selenium	18,000	2.83 U	2.73 U	2.69 U	2.80 U	2.82 U	2.69 U	2.95 U	2.90 U	2.90 U	3.97 U
Silver	18,000	0.567 U	0.545 U	0.539 U	0.561 U	0.564 U	0.537 U	0.590 U	0.580 U	0.581 U	0.795 U
Mercury	1,100	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U

Notes:

Model Toxics Control Act (MTCA) Cleanup Regulation, WAC 173-340. Values are from Ecology website CLARC tables downloaded July 2008 (https://fortress.wa.gov/ecy/clarc/reporting/CLARCReporting.aspx).

Bold data indicate exceedance of MTCA Method C industrial soil cleanup levels.

bgs - Below ground surface

NA - Not applicable

ND* - Compounds were not detected above the specific reporting limits, except as shown.

NE - Not established

PCBs - Polychlorinated biphenyl compounds

TTEC - Total toxicity equivalent soil concentration

TPH - Total petroleum hydrocarbons

VOCs - Volatile organic compounds

U/ND - Compound was analyzed for but not detected above the reporting limit shown.

UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.

J - Estimated concentration; PAH results were flagged for exceedance of method hold times.

[a] MTCA Method A industrial cleanup level; Method C does not present soil cleanup levels for either petroleum hydrocarbons or lead

[b] These compounds are considered carcinogenic PAHs (cPAHs) and are subject to WAC-173-340 Toxicity Equivalent Soil Concentration calculations.

[c] Listed levels are for total PCBs.

[d] Listed levels are for Cr(III) and Cr(VI). Values for total chromium are not established.

APPENDIX A-21

SWMU #21 – Construction Rubble Storage Area

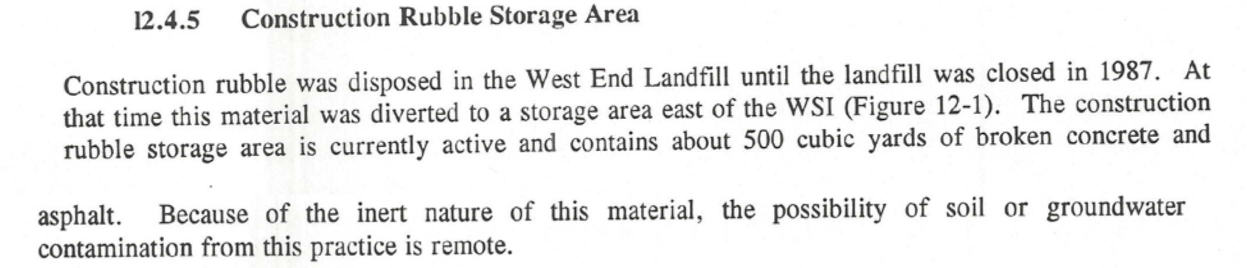
APPENDIX A-21

SWMU #21 – Construction Rubble Storage Area

PGG (2014b)
Notes on Location

SWMU 21 Construction Rubble Storage Area
Notes on Location Prepared by PGG
June 8, 2014

The following text is from Part B Dangerous Waste Permit Application (Parametrix 2004):

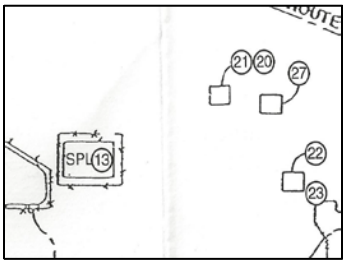


12.4.5 Construction Rubble Storage Area

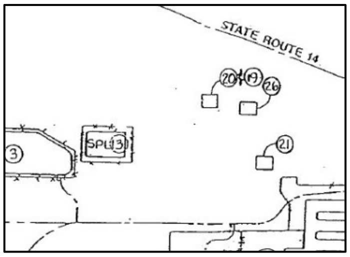
Construction rubble was disposed in the West End Landfill until the landfill was closed in 1987. At that time this material was diverted to a storage area east of the WSI (Figure 12-1). The construction rubble storage area is currently active and contains about 500 cubic yards of broken concrete and asphalt. Because of the inert nature of this material, the possibility of soil or groundwater contamination from this practice is remote.

The description of SWMU 21 in the AO is taken from this passage but also includes an update to this description: "This SWMU includes any disposal site for demolition debris generated during plant demolition." No demolition debris was disposed during demolition; all debris was either recycled (metals and machinery), disposed (waste, contaminated building materials, SPL structure debris), or evaluated and stockpiled onsite for reuse (concrete from production buildings and coke silos). BMEC is preparing a summary of all demo debris temporary storage locations. Production building crushed concrete stockpiles are documented in "Crushed Concrete Sample Data Report" (PGG 2012). Coke silo crushed concrete is currently being evaluated and data/location map will be available in June 2014.

The following are maps showing potential SWMU 21 locations are extracted from Figure 12-1 of the 2004 Part B Permit Application and from Google Earth.



Upper left box is marked SWMU 21 and SWMU 20 (drum storage area). No piles of concrete and asphalt debris have been observed between 2010 present. This figure suggests both SWMU 20 and 21 are in the same place but are more likely near each other.



Right center of this excerpt from Figure 16-1 of the 1989 PA are SWMU 20 & 19. The list that is on this map suggests that SWMU 20 is the construction rubble storage and 19 is the drum storage. This is consistent with the AO description.

Right of upper center of Google extract are the concrete pads for SWMU 20 (and 27). SWMU 13 is in lower left corner. Borrow pit is lower right quarter of photo. Potential location for SWMU 21 is from center photo to top photo, left of or westerly from concrete pads.

APPENDIX A-21

SWMU #21 – Construction Rubble Storage Area

PGG (2012c)
Crushed Concrete Sample Data Report

Figure 2 – Crushed Concrete Stockpile Locations

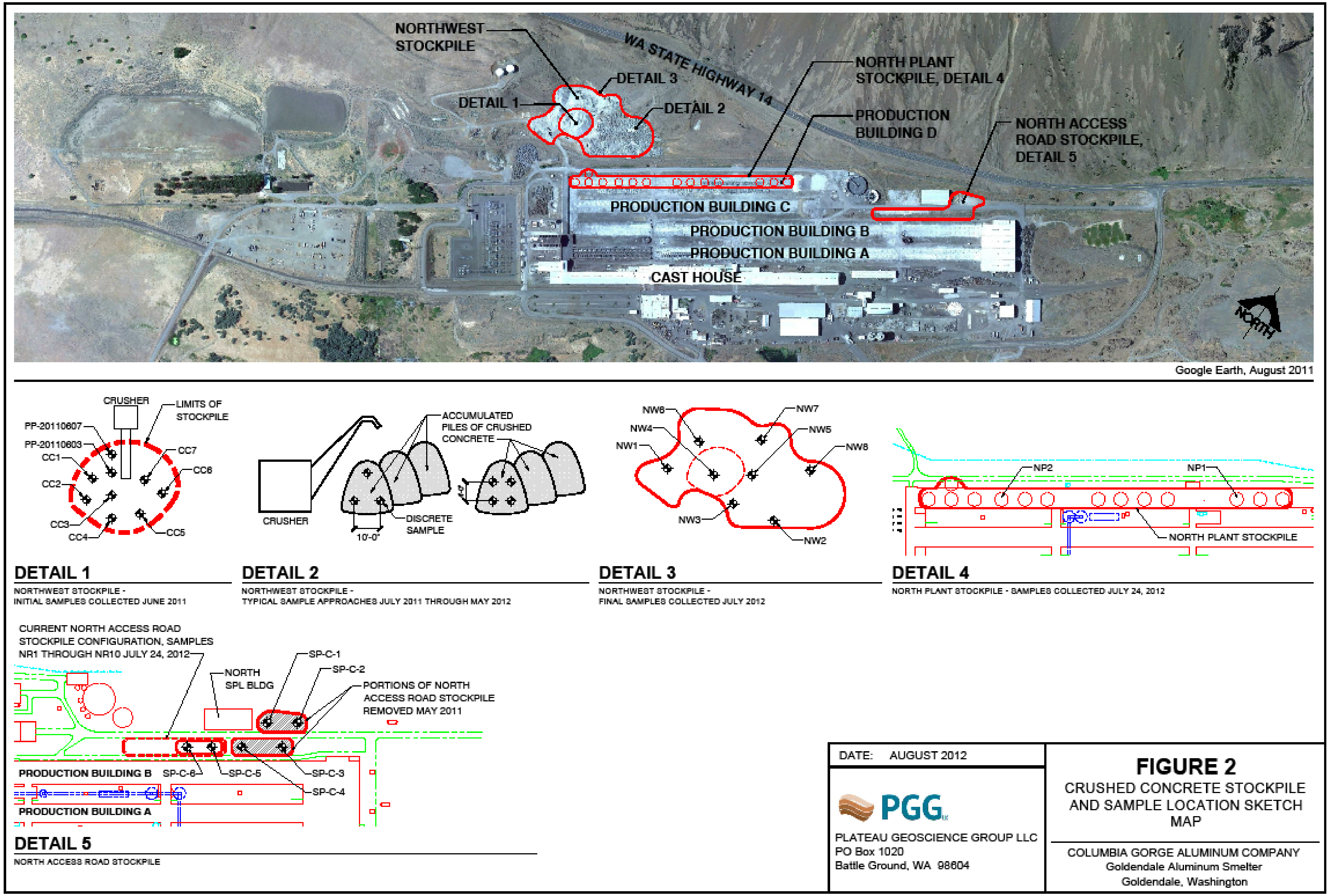


Table 1 Crushed Concrete Sample Analytical Results

CHEMICALS	**Crushed Concrete Samples, August 11, 2011 (1108-185)**												**Crushed Concrete Samples, August 16, 2011 (1108-185)**											
	Northwest Stockpile												**Northwest Stockpile**											
	8-11-CC-1	8-11-CC-1 TCLP	8-11-CC-1 SPLP	8-11-CC-2	8-11-CC-2 TCLP	8-11-CC-2 SPLP	8-11-CC-3	8-11-CC-3 TCLP	8-11-CC-3 SPLP	8-11-CC-4	8-11-CC-4 TCLP	8-11-CC-4 SPLP	8-16-CC-1	8-16-CC-1 TCLP	8-16-CC-1 SPLP	8-16-CC-2	8-16-CC-2 TCLP	8-16-CC-2 SPLP	8-16-CC-3	8-16-CC-3 TCLP	8-16-CC-3 SPLP	8-16-CC-4	8-16-CC-4 TCLP	8-16-CC-4 SPLP
Total Metals (EPA 6010B/7471A) mg/kg		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l
Aluminum																								
Antimony																								
Arsenic	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40
Barium	**95**	<0.20	<0.20	**80**	<0.20	<0.20	**84**	<0.20	<0.20	**85**	<0.20	<0.20	**74**	<0.20	<0.20	**78**	**0.21**	<0.20	**78**	<0.20	<0.20	**69**	<0.20	<0.20
Beryllium																								
Cadmium	**0.98**	<0.02	<0.02	**0.93**	<0.02	<0.02	<0.50	<0.02	<0.02	**0.55**	<0.02	<0.02	**0.58**	<0.02	<0.02	<0.50	<0.02	<0.02	**0.56**	<0.02	<0.02	**0.57**	<0.02	<0.02
Chromium	**25**	**0.072**	**0.035**	**18**	**0.09**	**0.049**	**29**	**0.053**	**0.04**	**20**	**0.068**	**0.04**	**36**	**0.065**	**0.032**	**21**	**0.028**	**0.026**	**23**	**0.09**	**0.035**	**23**	**0.046**	**0.027**
Lead	**11**	<0.20	<0.20	**7**	<0.20	<0.20	**5.7**	<0.20	<0.20	**5.3**	<0.20	<0.20	**15**	<0.20	<0.20	<5	<0.20	<0.20	**5.4**	<0.20	<0.20	**5.1**	<0.20	<0.20
Mercury	<0.25	<0.005	<0.005	<0.25	<0.005	<0.005	<0.25	<0.005	<0.005	<0.25	<0.005	<0.005	<0.25	<0.005	<0.005	<0.25	<0.005	<0.005	<0.25	<0.005	<0.005	<0.25	<0.005	<0.005
Selenium	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40	<10	<0.40	<0.40
Silver	<0.50	<0.02	<0.20	<0.50	<0.02	<0.02	<0.50	<0.02	<0.02	<0.50	<0.02	<0.02	<0.50	<0.02	<0.02	<0.5	<0.02	<0.02	<0.50	<0.02	<0.02	<0.50	<0.02	<0.02
Zinc																								
Fluoride (SM 4500-F C) mg/kg	**49**	**20**	**17**	**55**	**11**	**20**	**27**	**11**	**6.3**	**22**	**10**	**5.1**	**100**	**7.3**	**2.4**	**34**	**12**	**1.2**	**72**	**16**	**3.4**	**10**	**3.5**	**0.87**
Cyanide (SW846 9010/9012) ug/g																								
Total Cyanide	<0.05			<0.05			<0.05			<0.05			<0.05			<0.05			<0.05			<0.05		
Free Cyanide	<0.05			<0.05			<0.05			<0.05			<0.05			<0.05			<0.05			<0.05		
PAHs (EPA 8270D/SIM) mg/kg																								
Naphthalene	**0.038**			<0.033			**0.038**			**0.046**			<0.0067			**0.013**			**0.04**			**0.021**		
2-Methylnaphthalene	**0.033**			<0.033			**0.059**			**0.037**			<0.0067			**0.016**			**0.058**			**0.016**		
1-Methylnaphthalene	<0.033			<0.033			**0.037**			<0.033			<0.0067			**0.01**			**0.043**			**0.01**		
Acenaphthylene	<0.033			<0.033			<0.033			<0.033			<0.0067			<0.0067			<0.033			<0.0067		
Acenaphthene	**0.25**			**0.19**			**0.23**			**0.27**			**0.013**			**0.074**			**0.18**			**0.12**		
Fluorene	**0.16**			**0.14**			**0.17**			**0.2**			**0.0074**			**0.047**			**0.12**			**0.072**		
Phenanthrene	**2.9**			**2.6**			**3.1**			**3.8**			**0.17**			**0.82**			**2.1**			**1.2**		
Anthracene	**0.6**			**0.51**			**0.64**			**0.76**			**0.032**			**0.18**			**0.41**			**0.24**		
Fluoranthene	**13**			**11**			**13**			**14**			**0.83**			**4.2**			**8.1**			**5.6**		
Pyrene	**8.8**			**7.4**			**9.2**			**9.9**			**0.56**			**2.8**			**5.3**			**3.9**		
Benzo(a)anthracene	**5.6**			**5**			**6**			**6.2**			**0.33**			**1.6**			**3.3**			**2.2**		
Chrysene	**8.7**			**7.2**			**9.9**			**9.8**			**0.65**			**2.4**			**5.3**			**3.6**		
Benzo(b)fluoranthene	**7.4**			**6.9**			**8**			**8.3**			**0.5**			**2**			**4.5**			**3.1**		
Benzo(k)fluoranthene	<0.33			**4.2**			**4.4**			**5**			**0.24**			**1.1**			**2.3**			**1.6**		
Benzo(a)pyrene	**4.5**			**3.8**			**4.4**			**4.5**			**0.21**			**1.1**			**2.6**			**1.6**		
Ideno(1,2,3-c,d)pyrene	**3.6**			**3.2**			**3.7**			**3.1**			**0.17**			**0.85**			**2**			**1.2**		
Dibenz(a,h)anthracene	**1.1**			**0.96**			**1.1**			**0.88**			**0.048**			**0.27**			**0.6**			**0.4**		
Benzo(g,h,i)perylene	**4**			**3.4**			**4.1**			**3.5**			**0.19**			**0.94**			**2.2**			**1.4**		
PCBs (EPA 8082) mg/kg																								
Aroclor 1016	<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20		
Aroclor 1221	<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20		
Aroclor 1232	<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20		
Aroclor 1242	<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20		
Aroclor 1248	<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20		
Aroclor 1254	<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20		
Aroclor 1260	<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20			<0.20		

Table 2– Summary of Cyanide Detection and SPLP Analyses

Sample Date	Sample Number	Total Cyanide ug/g	SPLP Total Cyanide mg/L	Free Cyanide ug/g	SPLP Free Cyanide mg/L	Lab Report
7/19/2010	SP-C-4	<0.25		**0.5**		1007-140
8/25/2011	8-23-11-CC-1,2,3,4	**0.082**		<0.05		1109-020
9/1/2011	9-1-CC-3	**0.21**	<0.005	<0.050	<0.005	1109-007
9/21/2011	9-21-CC-1	**0.061**		<0.05		1109-175
10/19/2011	10-19-CC-2	**0.13**	<0.005	<0.05		1110-144
11/10/2011	11-10-CC-1	**0.18**	<0.005	<0.05	<0.005	1111-096
11/10/2011	11-10-CC-2	**0.11**	<0.005	<0.05	<0.005	1111-096
11/10/2011	11-10-CC-3	**0.083**	<0.005	<0.05	<0.005	1111-096
11/22/2011	11-22-CC-1	**0.25**		<0.05		1111-190
11/22/2011	11-22-CC-2	**0.081**		<0.05		1111-190
2/22/2012	2-22-CC-1	**0.16**		<0.05		1202-187
2/22/2012	2-22-CC-2	**0.16**		<0.05		1202-187
2/22/2012	2-22-CC-3	**0.16**		<0.05		1202-187
3/1/2012	3-1-CC-1	**0.068**		<0.05		1203-016
3/1/2012	3-1-CC-2	**0.056**		<0.05		1203-016
3/1/2012	3-1-CC-3	**0.06**		<0.05		1203-016
3/6/2012	3-6-CC1	**0.2**		**0.051**		1203-064
3/6/2012	3-6-CC2	**0.11**		**0.062**		1203-064
3/6/2012	3-6-CC3	**0.12**		**0.084**		1203-064
3/22/2012	3-22-CC2	**0.05**		<0.05		1203-215

Notes: Summary of samples where either total or free cyanide detected. SPLP means Synthetic Precipitation Leaching Procedure test conducted on select concrete samples where cyanide is detected. After November 10, 2011, SPLP test would be conducted only when detected concentrations of cyanide exceeded 5 mg/kg. Blank cells indicate no test conducted. All concentrations of total and free cyanide in units of milligrams per kilogram (ug/g) and SPLP test results reported in milligrams per liter (mg/l). Highlighted rows indicate concrete samples from North Access Road Stockpile (orange), Northwest Stockpile (purple), and North Plant Stockpile (green). See Figure 2 for location of crushed concrete stockpiles.

PAHs are detected in all concrete samples. Carcinogenic PAHs are detected more frequently and at higher concentrations than non-carcinogenic PAHs.

Aroclor 1242 was detected at a frequency of 57% in the crushed concrete samples. No other aroclor was detected in the crushed concrete.

TCLP and SPLP tests were conducted on the crushed concrete samples to evaluate potential disposal options. The results are tabulated on Table 1 but the data will not be discussed further in this report. The TCLP and SPLP data was not used in the statistical evaluation of the crushed concrete data.

Table 3 Statistical Comparison of Analytical Data for Three Crushed Concrete Stockpiles

	North Access Road Stockpile					Northwest Stockpile					North Plant Stockpile					TOTAL DATABASE				
CHEMICALS	% Detects	Mean	Min	Max	Median	Detects	Mean	Min	Max	Median	Detects	Mean	Min	Max	Median	Detects	Mean	Min	Max	Median
Aluminum	100%	14300	12000	18000	13500	100%	15750	12000	20000	16000	100%	16000	12000	22000	15000	100%	15370.4	12000	22000	15000
Antimony	0%					0%					0%					0%				
Arsenic	63%	4.8	3.6	6.5	5	11%	4.9	2	5.5	5	12%	3.7	3.6	3.8	4	100%	2.7	2.5	6.5	2.5
Barium	100%	86.8	74	100	83	100%	99.6	54	240	95.5	100%	98.9	59	130	99	100%	89.1	3.6	240	93
Beryllium	0%					0%					0%					0%				
Cadmium	0%					53%	0.5	0.25	1.7	0.55	73%	1.0	0.25	1.9	0.86	47%	0.5	0.25	1.9	0.28
Total Chromium	100%	12.2	9.9	14	12	100%	24.6	16	44	23.5	100%	27.7	15	49	27	100%	24.3	9.9	49	23
Cr III	100%	32	22	46	31.5	100%	42.8	17	120	33	100%	33.5	30	37	33.5	100%	32.3	22	120	31.5
Cr VI	10%	0.55	0.5	1	0.5	0%					0%					8%	0.5	0.5	1	0.5
Lead	0%					59%	7.4	2.5	44	5.9	87%	9.2	2.5	15	8.1	60%	7.3	2.5	44	6.2
Mercury	0%					0%					0%					0%				
Selenium	0%					0%					0%					0%				
Silver	0%					0%					0%					0%				
Zinc	100%	196.8	77	690	140	100%	144.1	63	220	155	100%	206.9	68	500	170	100%	203.1	68	690	170
Fluoride	100%	54.0	7.8	210	33	100%	50.9	5.3	290	48	100%	84.2	19	250	62	100%	56.5	5.3	290	49
Total Cyanide	0%					13%	0.1	0.025	0.25	0.025	60%	0.08	0.03	0.2	0.06	21%	0.07	0.03	0.25	0.03
Free Cyanide	6%	0.93	0.1	0.5	0.125	0%					20%	0.03	0.03	0.08	0.03	4%	0.19	0.0	0.5	0.03
Naphthalene	20%	0.06	0.003	0.47	0.003	51%	0.03	0.003	0.1	0.03	47%	0.06	0.00	0.19	0.04	47%	0.04	0.003	0.47	0.03
2-Methylnaphthalene	20%	0.04	0.003	0.25	0.003	56%	0.03	0.003	0.1	0.03	47%	0.05	0.01	0.11	0.04	51%	0.04	0.003	0.25	0.03
1-Methylnaphthalene	20%	0.03	0.003	0.16	0.003	47%	0.03	0.003	0.1	0.02	33%	0.04	0.01	0.09	0.03	42%	0.03	0.003	0.16	0.02
Acenaphthylene	20%	0.01	0.003	0.07	0.003	4%	0.02	0.003	0.1	0.02	7%	0.03	0.00	0.04	0.03	6%	0.02	0.003	0.074	0.02
Acenaphthene	80%	0.23	0.003	1.7	0.02	90%	0.13	0.007	0.4	0.1	80%	0.18	0.04	0.44	0.17	87%	0.1	0.003	1.7	0.09
Fluorene	70%	0.16	0.003	1.1	0.014	87%	0.09	0.003	0.3	0.1	73%	0.15	0.04	0.32	0.13	83%	0.1	0.003	1.1	0.09
Phenanthrene	100%	1.84	0.1	13	0.24	100%	1.70	0.16	6.9	1.5	100%	2.35	0.6	5.2	1.8	100%	1.8	0.11	13	1.4
Anthracene	90%	0.39	0.0	2.8	0.032	97%	0.30	0.03	1.1	0.2	100%	0.42	0.1	0.9	0.3	97%	0.3	0.003	2.8	0.24
Fluoranthene	100%	4.87	0.5	33	0.85	100%	5.72	0.80	15.0	5.5	100%	8.59	2	19	7.2	100%	6.1	0.47	33	5.6
Pyrene	100%	4.43	0.4	30	0.61	100%	3.96	0.56	11.0	3.6	100%	6.24	1.3	14	4.9	100%	4.4	0.39	30	3.7
Benzo(a)anthracene	100%	2.90	0.2	21	0.46	100%	2.17	0.22	6.2	1.8	100%	3.26	0.54	8.9	2.6	100%	2.4	0.16	21	1.8
Chrysene	100%	4.14	0.6	24	1.3	100%	4.47	0.65	15.0	3.7	100%	6.27	1.3	14	4.5	100%	4.7	0.61	24	3.8
Benzo(b)fluoranthene	100%	6.26	0.9	40	1.6	100%	3.60	0.46	12.0	2.8	100%	7.11	1.2	17	5.7	100%	4.5	0.46	40	2.9
Benzo(k)fluoranthene	100%	1.72	0.2	12	0.37	99%	1.79	0.17	5.1	1.6	100%	1.75	0.25	4.6	1.2	99%	1.8	0.02	12	1.2
Benzo(a)pyrene	100%	3.67	0.1	29	0.56	100%	1.90	0.10	5.8	1.5	100%	2.71	0.32	9.4	1.8	100%	2.2	0.1	29	1.3
Ideno(1,2,3-c,d)pyrene	100%	3.37	0.3	24	0.73	100%	3.04	0.13	107.0	1.2	100%	2.66	0.45	8.6	1.8	100%	3.0	0.13	107	1.2
Dibenz(a,h)anthracene	100%	0.75	0.1	5.3	0.16	96%	0.52	0.04	1.7	0.4	100%	0.65	0.11	2	0.42	97%	0.6	0.041	5.3	0.4
Benzo(g,h,i)perylene	100%	2.97	0.3	21	0.67	100%	1.68	0.14	4.6	1.4	100%	2.62	0.43	8.6	1.7	100%	2.0	0.14	21	1.3
Aroclor 1016	0%					0%					0%					0%				
Aroclor 1221	0%					0%					0%					0%				
Aroclor 1232	0%					0%					0%					0%				
Aroclor 1242	60%	0.0587	0.03	0.11	0.06	56%	0.12	0.03	0.9	0.1	60%	0.27	0.028	0.9	0.24	57%	0.14	0.03	0.9	0.09
Aroclor 1248	0%					0%					0%					0%				
Aroclor 1254	0%					0%					0%					0%				
Aroclor 1260	0%					0%					0%					0%				

Notes: Rows and cells highlighted brown indicate general similarity between the three crushed concrete stockpiles. Rows and cells highlighted orange indicate general similarity between two of the three stockpiles. See Figure 2 for location of stockpiles. Sample data presented in Table 1. PAHs shown *italicized* are carcinogenic.

Table 4– Summary of Statistical Analysis of North Access Road, Northwest and North Plant Stockpiles Sample Data

		MTCA 3 Part Compliance [2]								95% UCL [4]						
CHEMICALS [1]	Human Health Screening Levels	95 UCL > Soil Clean Up Level	No value > 2x Soil Clean Up Level	> 10% samples > Soil Clean Up Level	Mean	Min.	Max.	Percent of Non-Detects [3]	Distribution	Max Conc. (>50 ND)	Land's method	95% KM (t) UCL	95% KM (% Bootstrap) UCL	Use 95% Student's-t UCL	95% Modified-t UCL	Calculator Used
Total Metals (EPA 6010B/7471A) mg/kg																
Aluminum	80000	No	No	No	15457.14	12000	22000	0%	Lognormal		16259.74					DOE
Antimony	32	No	No	No				100%								DOE
Arsenic	7.61	No	No	No	4.11	2	6.5	0%	Neither					4.53	4.54	EPA
Barium	16000	No	No	No	98.64	54	240	0%	Lognormal		102.87					DOE
Beryllium	1.3	No	No	No				100%								DOE
Cadmium	2	No	No	No	0.56	0.25	1.9	53%	Neither			0.74	0.75			EPA
Chromium III	2000	No	No	No	26.55	9.9	120	100%	Lognormal		28.03					DOE
Lead	250	No	No	No	7.22	0.25	44	40%	Neither			9.41	9.43			EPA
Mercury	2	No	No	No				100%								DOE
Selenium	400	No	No	No				100%								DOE
Silver	400	No	No	No				100%								DOE
Zinc	3200	No	No	No	189.66	63	690	0%	Lognormal		226.38					DOE
Fluoride (SM 4500-F C) mg/kg	3200	No	No	No	40.09	0.69	290	0%	Lognormal		63.38					DOE
Cyanide (SW846 9010/9012) ug/g																
Total Cyanide	1600	No	No	No	0.06	0.0125	0.25	79%	Neither	0.25						EPA
Free Cyanide	1600	No	No	No	0.06	0.025	0.5	96%	Neither	0.5						EPA
PAHs (EPA 8270D/SIM) mg/kg																
Naphthalene	5	No	No	No	0.04	0.003	0.47	53%	Lognormal	0.47						DOE
2-Methylnaphthalene	5	No	No	No	0.05	0.0034	0.25	49%	Lognormal	0.25						DOE
1-Methylnaphthalene [5]	5	No	No	No	0.03	0.003	0.16	58%	Lognormal	0.16						DOE
Acenaphthylene	2400	No	No	No	0.02	0.003	0.074	94%	Neither	0.074						EPA
Acenaphthene	4800	No	No	No	0.15	0.0034	1.7	13%	Lognormal		0.23					DOE
Fluorene	3200	No	No	No	0.11	0.003	1.1	17%	Lognormal		0.17					DOE
Phenanthrene	2400	No	No	No	1.82	0.11	13	0%	Lognormal		2.56					DOE
Anthracene	24000	No	No	No	0.32	0.0067	2.8	3%	Lognormal		0.49					DOE
Fluoranthene	3200	No	No	No	6.09	0.47	33	0%	Lognormal		8.16					DOE
Pyrene	2400	No	No	No	4.38	0.39	30	0%	Lognormal		5.83					DOE
Benzo(a)anthracene	1.4	**Yes**	**Yes**	**Yes**	2.42	0.16	21	0%	Lognormal		3.31					DOE
Chrysene	140	No	No	No	4.73	0.61	24	0%	Lognormal		5.98					DOE
Benzo(b)fluoranthene	1.4	**Yes**	**Yes**	**Yes**	4.45	0.46	40	0%	Lognormal		5.61					DOE
Benzo(k)fluoranthene	14	No	No	No	1.75	0.22	12	1%	Lognormal		2.27					DOE
Benzo(a)pyrene	0.1	**Yes**	**Yes**	**Yes**	2.22	0.1	29	0%	Lognormal		3.1					DOE
Ideno(1,2,3-c,d)pyrene	1.4	**Yes**	**Yes**	**Yes**	1.70	0.13	8.6	0%	Lognormal		2.33					DOE
Dibenz(a,h)anthracene	0.14	**Yes**	**Yes**	**Yes**	0.56	0.041	5.3	3%	Lognormal		0.72					DOE
Benzo(g,h,i)perylene	2400	No	No	No	1.97	0.14	21	0%	Lognormal		2.53					DOE
PCBs (EPA 8082) mg/kg																
Aroclor 1016	5.6	No	No	No				100%								DOE
Aroclor 1221	14	No	No	No				100%								DOE
Aroclor 1232	14	No	No	No				100%								DOE
Aroclor 1242	14	No	No	No	0.14	0.025	0.9	43%	Lognormal		0.17					DOE
Aroclor 1248	14	No	No	No				100%								DOE
Aroclor 1254	0.5	No	No	No				100%								DOE
Aroclor 1260	0.5	No	No	No				100%								DOE

Notes: [1] All concentrations are in miligrams per kilogram (mg/kg) except for cyanide which is in micrograms per gram (ug/g) [7] Washingron State Department of Ecology Toxins Cleanup Program. *Guidance on sampling and Data Analysis Methods.* 1995. Print. [3] Percent of non detectable data at the practical quantitation limit (PQL). [4] UCL was computed using the DOE calculator for normal and lognormal datasets then calculated using ProUCL for nonparametric datasets. [5] PAHs shown in italics are carcinogenic PAHs.

APPENDIX A-21

SWMU #21 – Construction Rubble Storage Area

PGG (2014c)
Coke Silos Concrete Sample Data Report

Figure 2 – Facility Features

CHEMICALS	Crushed Concrete Core Samples, June 11, 2012 (1206-064) [1]															
	PCS-1	PCS-1 TCLP	PCS-2	PCS-2 TCLP	PCS-3	PCS-3 TCLP	PCS-4	PCS-4 TCLP	PCS-5	PCS-5 TCLP	PCS-6	PCS-6 TCLP	PCS-7	PCS-7 TCLP	PCS-8	PCS-8 TCLP
Total Metals (EPA 6010B/7471A) mg/kg																
Aluminum	**7900**	**1**	**8100**	**0.86**	**8000**	**0.76**	**8800**	**0.44**	**8700**	**0.62**	**9100**	**0.7**	**8700**	**0.79**	**9100**	**0.81**
Antimony	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2
Arsenic	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4
Barium	**77**	**0.35**	**79**	**0.45**	**82**	**0.39**	**88**	**0.67**	**84**	**0.62**	**89**	**0.73**	**88**	**0.71**	**87**	**0.52**
Beryllium	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02
Cadmium	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02
Chromium	**27**	**0.14**	**24**	**0.13**	**21**	**0.1**	**31**	**0.084**	**31**	**0.11**	**25**	**0.077**	**22**	**0.064**	**24**	**0.086**
Lead	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2
Mercury	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005
Selenium	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4
Silver	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02
Zinc	**25**	0.1	**26**	0.1	**26**	0.1	**27**	0.1	**25**	0.1	**25**	0.1	**25**	0.1	**25**	0.1
PAHs (EPA 8270D/SIM) mg/kg																
Naphthalene	0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
2-Methylnaphthalene	0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
1-Methylnaphthalene	0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
Acenaphthylene	0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
Acenaphthene	0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
Fluorene	0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
Phenanthrene	**0.0071**		**0.019**		**0.025**		**0.018**		**0.015**		**0.01**		**0.0075**		**0.02**	
Anthracene	0.0067		**0.017**		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
Fluoranthene	**0.013**		**0.026**		**0.055**		**0.042**		**0.043**		**0.023**		**0.021**		**0.044**	
Pyrene	**0.011**		**0.022**		**0.046**		**0.03**		**0.03**		**0.019**		**0.016**		**0.032**	
Benz(a)anthracene	0.0067		**0.0089**		**0.023**		**0.012**		**0.014**		**0.011**		**0.0085**		**0.012**	
Chrysene	**0.0081**		**0.012**		**0.038**		**0.028**		**0.032**		**0.015**		**0.018**		**0.03**	
Benzo(b)fluoranthene	**0.007**		**0.0097**		**0.034**		**0.02**		**0.023**		**0.011**		**0.01**		**0.021**	
Benzo(k)fluoranthene	0.0067		0.0067		**0.022**		**0.012**		**0.013**		**0.0088**		**0.0075**		**0.014**	
Benzo(a)pyrene	**0.0069**		**0.01**		**0.035**		**0.015**		**0.016**		**0.012**		**0.0076**		**0.016**	
Ideno(1,2,3-c,d)pyrene	0.0067		**0.0067**		**0.025**		**0.013**		**0.014**		**0.0081**		0.0067		**0.013**	
Dibenz(a,h)anthracene	0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067		0.0067	
Benzo(g,h,i)perylene	0.0067		**0.009**		**0.034**		**0.017**		**0.019**		**0.011**		**0.0067**		**0.019**	
PCBs (EPA 8082) mg/kg																
Aroclor 1016	0.05								0.05							
Aroclor 1221	0.05								0.05							
Aroclor 1232	0.05								0.05							
Aroclor 1242	0.05								0.05							
Aroclor 1248	0.05								0.05							
Aroclor 1254	0.05								0.05							
Aroclor 1260	0.05								0.05							
Petroleum Hydrocarbons (NWTPH) mg/kg																
Lube Oil Range	100		100		100		100		100		100		100		100	
Diesel Range	50		50		50		50		50		50		50		50	
Gasoline Range	20		20		20		20		20		20		20		20	

Notes: [1] Laboratory analytical report number; analytical report included in Appendix A. Values in Bold type are detected chemical concentrations; values in normal type are practical quantitation limits for non-detected chemicals.

Table 1– Concrete Core Sample Analytical Results

CHEMICALS	Crushed Concrete Samples, August 20, 2012 (1208-178) [1]															
	PCS-CC1	PCS-CC1 TCLP	PCS-CC2	PCS-CC2 TCLP	PCS-CC3	PCS-CC3 TCLP	PCS-CC4	PCS-CC4 TCLP	PCS-CC5	PCS-CC5 TCLP	PCS-CC6	PCS-CC6 TCLP	PCS-CC7	PCS-CC7 TCLP	PCS-CC8	PCS-CC8 TCLP
Total Metals (EPA 6010B/7471A) mg/kg																
Aluminum	**8500**	**0.66**	**13000**	**0.51**	**11000**	**0.39**	**8000**	**0.95**	**6300**	**0.77**	**7000**	**0.75**	**7600**	**0.52**	**8100**	**0.46**
Antimony	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2
Arsenic	**2.6**	0.4	**2.8**	0.4	**3.2**	0.4	**2.8**	0.4	2	0.4	**2.1**	0.4	**2.4**	0.4	**2.5**	0.4
Barium	**87**	**0.58**	**79**	**0.4**	**79**	**0.39**	**87**	**0.52**	**67**	**0.57**	**71**	**0.59**	**78**	**0.49**	**79**	**0.42**
Beryllium	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02
Cadmium	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02
Chromium	**28**	**0.15**	**26**	**0.17**	**30**	**0.14**	**25**	**0.15**	**18**	**0.095**	**19**	**0.06**	**26**	**0.13**	**30**	**0.15**
Lead	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2	5	0.2
Mercury	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005	0.25	0.005
Selenium	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4	10	0.4
Silver	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02
Zinc	**29**	0.1	**44**	0.1	**31**	0.1	**28**	0.1	**24**	0.1	**21**	0.1	**27**	0.1	**30**	0.1
Fluoride (SM 4500-F C) mg/kg	**2.7**		**6.2**		**4.8**		**2.1**		**0.92**		**0.99**		**1.1**		**1.2**	
Hexavalent Chromium (EPA 7196A) mg/kg	1		1		1		1		1		1		1		1	
Cyanide (SW846 9010/9012) ug/g																
Total Cyanide	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
Free Cyanide	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
PAHs (EPA 8270D/SIM) mg/kg																
Naphthalene	0.0067		**0.038**		**0.026**		**0.26**		0.0067		0.0067		**0.092**		**0.11**	
2-Methylnaphthalene	0.0067		**0.028**		**0.014**		**0.16**		0.0067		0.0067		**0.06**		**0.063**	
1-Methylnaphthalene	0.0067		**0.026**		**0.011**		**0.16**		0.0067		0.0067		**0.063**		**0.063**	
Acenaphthylene	0.0067		0.0067		0.0067		**0.014**		0.0067		0.0067		0.033		0.033	
Acenaphthene	**0.064**		**0.51**		**0.2**		**2.1**		**0.071**		**0.039**		**1.1**		**1**	
Fluorene	**0.048**		**0.41**		**0.13**		**1.6**		**0.051**		**0.025**		**0.87**		**0.85**	
Phenanthrene	**0.83**		**5.3**		**1.7**		**12**		**0.76**		**0.49**		**9.8**		**8.4**	
Anthracene	**0.19**		**1.2**		**0.3**		**3.5**		**0.19**		**0.11**		**2.4**		**1.9**	
Fluoranthene	**1**		**6.8**		**2.3**		**14**		**0.81**		**0.62**		**11**		**8.6**	
Pyrene	**0.78**		**5.3**		**1.8**		**11**		**0.73**		**0.48**		**8.5**		**6.8**	
Benz(a)anthracene	**0.52**		**3.8**		**1.4**		**5.5**		**0.42**		**0.28**		**4.7**		**3.5**	
Chrysene	**0.55**		**3.6**		**1.5**		**5.1**		**0.42**		**0.29**		**4.3**		**3.2**	
Benzo(b)fluoranthene	**0.72**		**5**		**2.3**		**4.6**		**0.45**		**0.34**		**3.8**		**3.2**	
Benzo(k)fluoranthene	**0.2**		**1.6**		**0.68**		**1.4**		**0.13**		**0.092**		**1.2**		**0.97**	
Benzo(a)pyrene	**0.54**		**3.7**		**1.7**		**3.2**		**0.36**		**0.26**		**3**		**2.3**	
Ideno(1,2,3-c,d)pyrene	**0.43**		**2.5**		**1.2**		**1.5**		**0.24**		**0.18**		**1.4**		**1.2**	
Dibenz(a,h)anthracene	**0.093**		**0.65**		**0.32**		**0.44**		**0.058**		**0.04**		**0.43**		**0.33**	
Benzo(g,h,i)perylene	**0.35**		**2.4**		**1.2**		**1.4**		**0.19**		**0.15**		**1.4**		**1.1**	
Petroleum Hydrocarbons (NWTPH) mg/kg																
Lube Oil Range	**100**		**100**		100		100		100		100		100		**100**	
Diesel Range	50		**50**		50		50		50		50		50		**50**	
Gasoline Range	20		20		20		20		20		20		20		20	

Notes: [1] Laboratory analytical report number; analytical report included in Appendix A. Values in Bold type are detected chemical concentrations; values in normal type practical quantitation limits for non-detected chemicals.

Table 2– Crushed Concrete Sample Analytical Results

General Statistics for Raw Data Sets Using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV	Data Distribution	95 UCL	Basis	DOE UCL	Basis	EPC
Aluminum	8	0	6300	13000	8688	8050	4932679	2221	1112	1.258	0.256	Normal	10175	Student's t	10175.51	t statistic	10175.5
Arsenic	7	0	2.1	3.2	2.629	2.6	0.122	0.35	0.297	0.19	0.133	Normal	2.816	KM(t)	2.76	t statistic	2.8
Barium	8	0	67	87	78.38	79	47.7	6.906	6.672	-0.341	0.0881	Normal	83	Student's t	83	t statistic	83.0
Chromium	8	0	18	30	25.25	26	20.79	4.559	4.448	-0.782	0.181	Normal	28.3	Student's t	28.3	t statistic	28.3
Fluoride	8	0	0.92	6.2	2.501	1.65	3.944	1.986	1.03	1.224	0.794	Normal	3.831	Student's t	3.832	t statistic	3.8
Naphthalene	5	0	0.026	0.26	0.105	0.092	0.00874	0.0935	0.0801	1.483	0.889	Normal	0.129	KM(t)	0.086	t statistic	0.09
2-Methylnaphthalene	5	0	0.014	0.16	0.065	0.06	0.00326	0.0571	0.0474	1.511	0.878	Normal	0.08	KM(t)	0.054	t statistic	0.05
1-Methylnaphthalene	5	0	0.011	0.16	0.0646	0.063	0.00337	0.058	0.0549	1.4	0.898	Normal	0.0801	KM(t)	0.0541	t statistic	0.05
Acenaphthylene	1	0	0.014	0.014	0.014	0.014	N/A	N/A	0	N/A	N/A	N/A	0.014	MAX	0.012	Cohen's method	0.01
Acenaphthene	8	0	0.039	2.1	0.636	0.355	0.529	0.727	0.45	1.302	1.144	Normal	1.122	Student's t	1.123	t statistic	1.12
Fluorene	8	0	0.025	1.6	0.498	0.27	0.321	0.566	0.346	1.149	1.137	Normal	0.877	Student's t	0.877	t statistic	0.88
Phenanthrene	8	0	0.49	12	4.91	3.5	21.46	4.633	4.262	0.493	0.943	Normal	8.013	Student's t	8.014	t statistic	8.01
Anthracene	8	0	0.11	3.5	1.224	0.75	1.608	1.268	0.89	0.874	1.036	Normal	2.073	Student's t	2.073	t statistic	2.1
Fluoranthene	8	0	0.62	14	5.641	4.55	27.13	5.209	5.686	0.524	0.923	Normal	9.13	Student's t	9.13	t statistic	9.1
Pyrene	8	0	0.48	11	4.424	3.55	16.52	4.064	4.366	0.533	0.919	Normal	7.146	Student's t	7.147	t statistic	7.1
Benz(a)anthracene	8	0	0.28	5.5	2.515	2.45	4.416	2.101	2.936	0.214	0.836	Normal	3.923	Student's t	3.923	t statistic	3.9
Chrysene	8	0	0.29	5.1	2.37	2.35	3.654	1.912	2.765	0.187	0.807	Normal	3.65	Student's t	3.65	t statistic	3.7
Benzo(b)fluoranthene	8	0	0.34	5	2.551	2.75	3.556	1.886	2.876	-0.0211	0.739	Normal	3.814	Student's t	3.815	t statistic	3.8
Benzo(k)fluoranthene	8	0	0.092	1.6	0.784	0.825	0.359	0.599	0.89	0.0391	0.764	Normal	1.185	Student's t	1.185	t statistic	1.2
Benzo(a)pyrene	8	0	0.26	3.7	1.883	2	1.893	1.376	1.972	-0.0342	0.731	Normal	2.804	Student's t	2.804	t statistic	2.8
Ideno(1,2,3-c,d)pyrene	8	0	0.18	2.5	1.081	1.2	0.609	0.78	0.793	0.546	0.722	Normal	1.604	Student's t	1.604	t statistic	1.6
Dibenz(a,h)anthracene	8	0	0.04	0.65	0.295	0.325	0.047	0.217	0.257	0.225	0.735	Normal	0.44	Student's t	0.44	t statistic	0.44
Benzo(g,h,i)perylene	8	0	0.15	2.4	1.024	1.15	0.59	0.768	0.778	0.491	0.75	Normal	1.538	Student's t	1.538	t statistic	1.5
Lube Oil Range	3	0	100	100	100	100	0	0	0	N/A	N/A	N/A	100	MAX	100	Land's Method (Cohen's method)	100
Diesel Range	2	0	50	50	50	50	0	0	0	N/A	N/A	N/A	50	MAX	50	MAX	50

Notes:
SD = Standard Deviation, CV - Covariant, UCL - Upper Confidence Limit, EPC = Exposure Point Concentration
N/A = Not Applicable, MAX = Maximum
Concentrations are in milligrams per kilogram (mg/kg)

Table 3– Summary Statistics for Crushed Concrete EPC Calculations

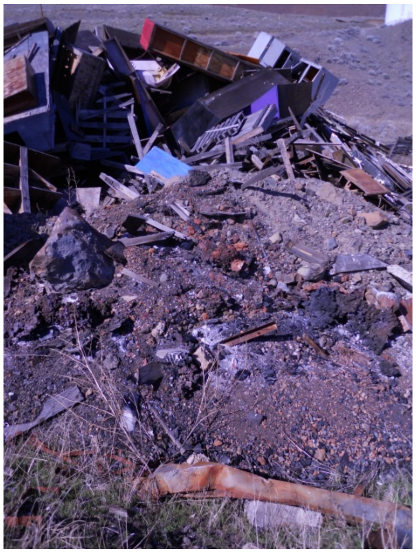
APPENDIX A-22

SWMU #22 – Wood Pallet Storage Area

PGG (2012a)
Photographs and Notes

SWMU 22 Wood Pallet Storage Area
Photographs March 2012

Measure perimeter of pile



Burn residue with unburned debris

Burn residue with unburned debris

Debris includes wood, plastic, metal, wires

Wire coating includes fiberglass (?) and plastic

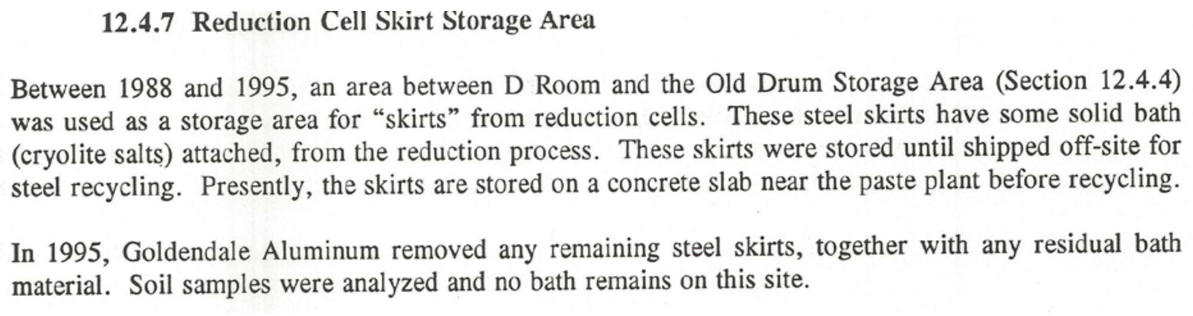
APPENDIX A-23

SWMU #23 – Reduction Cell Skirt Storage Area

BMEC (Personal Communication May 22, 2014)
E-mail Correspondence/Notes

SWMU 23 Reduction Cell Skirt Storage Area
Notes on Items Stored by PGG
June 10, 2014

Used reduction cell skirts were stored in SWMU 23. This is documented in the part B Dangerous Waste Permit Application page 98 (Parametrix 2004):



12.4.7 Reduction Cell Skirt Storage Area

Between 1988 and 1995, an area between D Room and the Old Drum Storage Area (Section 12.4.4) was used as a storage area for "skirts" from reduction cells. These steel skirts have some solid bath (cryolite salts) attached, from the reduction process. These skirts were stored until shipped off-site for steel recycling. Presently, the skirts are stored on a concrete slab near the paste plant before recycling.

In 1995, Goldendale Aluminum removed any remaining steel skirts, together with any residual bath material. Soil samples were analyzed and no bath remains on this site.

Text from the Agreed Order page 45 suggests that CAC conducted a soil removal but no sampling or report has been located.

Reduction Cell Skirt Storage Area (SWMU #23). Between 1988 and 1995, an area between Cell Room D and the Drum Storage Area (SWMU # 20) was used for the storage of failed "skirts" from the reduction cells. These steel skirts have solid bath (cryolite salts) attached to the steel. The skirts were stored in the area until the steel was recycled off-site. After 1995, the skirts were stored on a concrete pad next to the paste plant before recycling. In 1995, Columbia Aluminum Corporation (CAC) removed all of the skirts and residual bath in soils at the site.

Plant Manager Mac Seyhanli indicated used cell skirts were stored at this SWMU in conversation with Mavis Kent in 2011, and by email with Peter Trabusiner on May 22, 2014:

From: Mac-Donna Seyhanli <seyhanli@live.com>
Date: May 22, 2014 at 11:40:09 AM PDT
To: Peter Trabussiner <ptrabus1@frontier.com>, Galen May <m1link@gorge.net>
Cc: Dave Rooney <drooney_50@hotmail.com>
Subject: SWMU

Hi Peter
Dames & Moore May 2 1996 had these SMWUs listed. They were also listed in Part B applications in the 90's.
We could not see a reference to #23 Cell Skirt storage. This was the area west of plant - north of rectifier building where we kept new cast iron skirts. Some used skirts which were in good condition and could be reused were also stored here. I presume bath could have dropped to ground from these used skirts. The bulk of the used skirts were stored on pads towards east of plant and were shipped back to the foundries.

APPENDIX A-24

SWMU #24 – Carbon Waste Roll-off Area

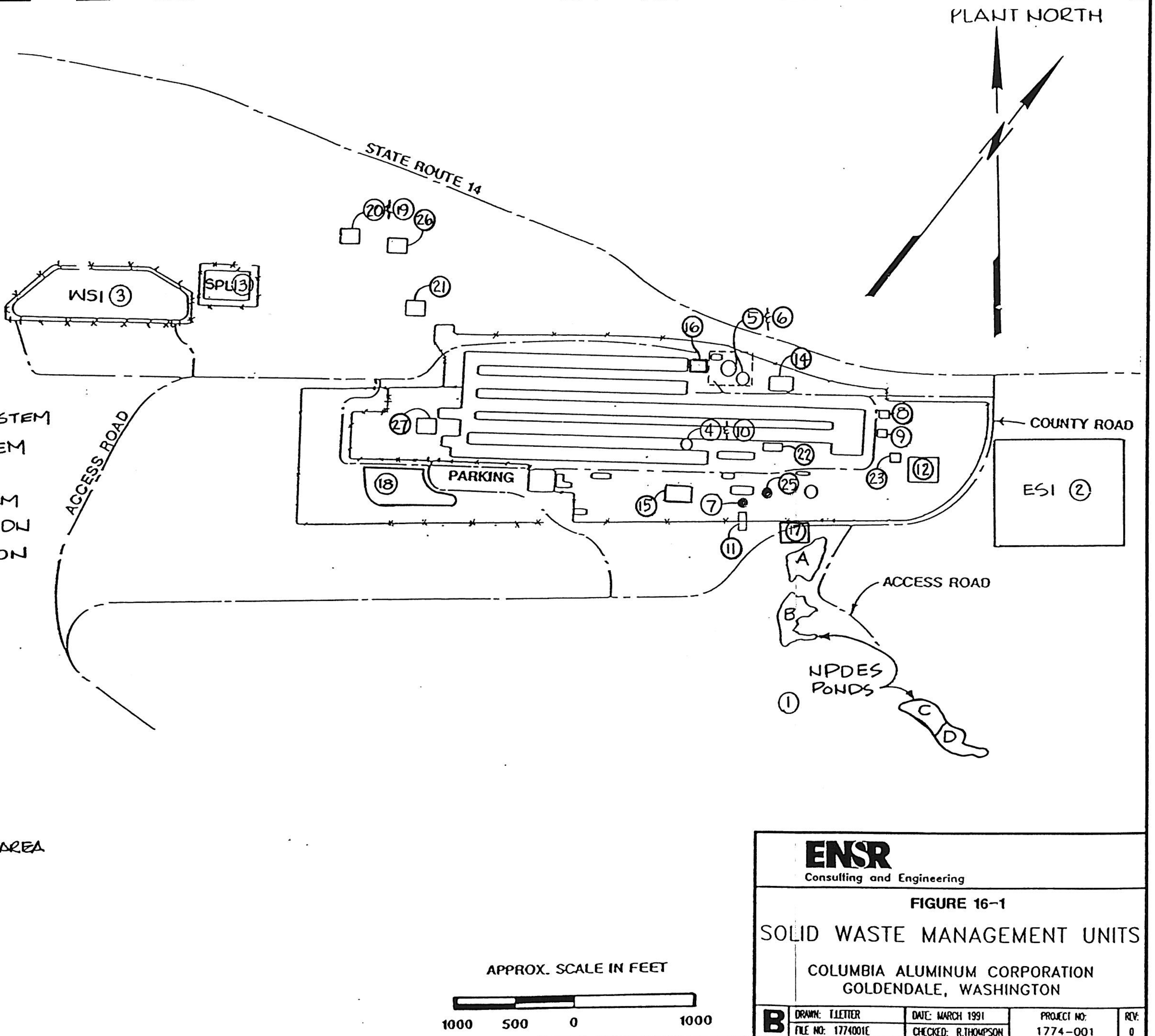
APPENDIX A-24

SWMU #24 – Carbon Waste Roll-off Area

ENSR (1991)
1991 SWMU Map

LEGEND

DES TREATMENT PONDS
ST SURFACE IMPOUNDMENT
ST SURFACE IMPOUNDMENT
3 LINE SCRUBBER RECYCLE SYSTEM
INE SCRUBBER RECYCLE SYSTEM
RTIARY TREATMENT PLANT
STE PLANT RECYCLE WATER SYSTEM
RTH POTLINER SOAKING STATION
UTH POTLINER SOAKING STATION
USTIC SPILL
STE PLANT RELEASES
ST SPL STORAGE AREA
ST SPL STORAGE/DISPOSAL AREA
RTH SPL STORAGE BUILDING
JTH SPL STORAGE BUILDING
L HANDLING BUILDING
ST END LANDFILL
ST END LANDFILL
UM STORAGE AREA
JSTRUCTION RUBBLE STORAGE AREA
OD/PELLET STORAGE
RBON WASTE ROLL-OFF BOX
ID WASTE COLLECTION BIN
F FILTER ROLL-OFF BOX
E/WHEEL STORAGE AREA
AY DRUM STORAGE AREA



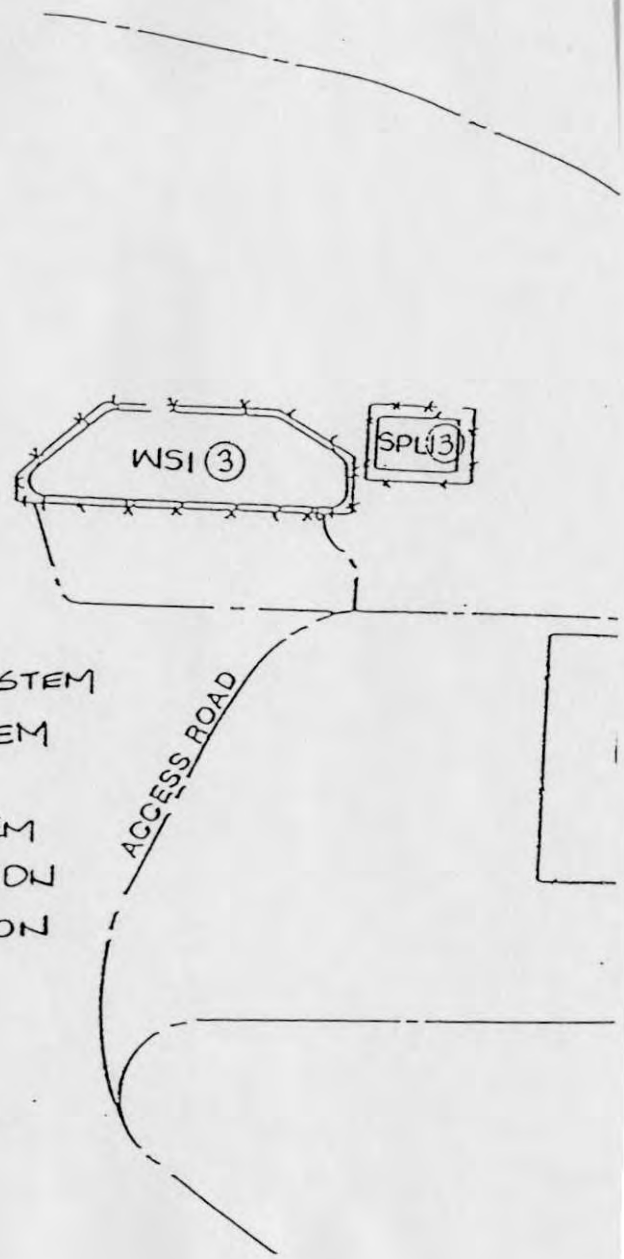
ENSR
Consulting and Engineering

FIGURE 16-1

SOLID WASTE MANAGEMENT UNITS

COLUMBIA ALUMINUM CORPORATION
GOLDENDALE, WASHINGTON

B
DRAWN: T.LETTER
FILE NO: 1774001E
DATE: MARCH 1991
CHECKED: R.THOMPSON
PROJECT NO: 1774-001
REV: 0



LEGEND

① NPDES TREATMENT PONDS
✓② EAST SURFACE IMPOUNDMENT
✓③ WEST SURFACE IMPOUNDMENT
④ A/B LINE SCRUBBER RECYCLE SYSTEM
⑤ C LINE SCRUBBER RECYCLE SYSTEM
⑥ TERTIARY TREATMENT PLANT
⑦ PASTE PLANT RECYCLE WATER SYSTEM
⑧ NORTH POTLINER SOAKING STATION
⑨ SOUTH POTLINER SOAKING STATION
⑩ CAUSTIC SPILL
⑪ PASTE PLANT RELEASES
⑫ PAST SPL STORAGE AREA
✓⑬ WEST SPL STORAGE/DISPOSAL AREA
⑭ NORTH SPL STORAGE BUILDING
⑮ SOUTH SPL STORAGE BUILDING
⑯ SPL HANDLING BUILDING
⑰ EAST END LANDFILL ?
⑱ WEST END LANDFILL
⑲ DRUM STORAGE AREA
⑳ CONSTRUCTION RUBBLE STORAGE AREA
㉑ WOOD/PELLET STORAGE
㉒ CARBON WASTE ROLL-OFF BOX
㉓ SOLID WASTE COLLECTION BIN
㉕ HEAF FILTER ROLL-OFF BOX
㉖ TIRE/WHEEL STORAGE AREA
㉗ 90 DAY DRUM STORAGE AREA

APPENDIX A-24

SWMU #24 – Carbon Waste Roll-off Area

Golden Aluminum (1997a,b)
1997 SWMU Map

SOLID WASTE MANAGEMENT UNITS

AO to do removal 1. 4 NPDES Treatment Ponds - Independent RI
2. East Surface Impoundment (ESI) - unit closed under RCRA
NFA Order 3. Intermittent Sludge Disposal Ponds - Ind. Removal - Fall 07
4. West Surface Impoundment (WSI) 80% Golden NW, 20% LMC
5. A Line Secondary Scubber Recycle System
6. B/C Lines Secondary Scrubber Recycle System
7. Decommissioned Air Pollution Control Equipment (ESP's)
8. Tertiary Treatment Plant
9. Paste Plant Recycle Water System
10. North Potliner Soaking Station
11. South Potliner Soaking Station
12. East SPL Storage Area
13. West SPL Storage Area
14. North SPL Storage Containment Building
15. South SPL Storage Building
16. SPL Handling Containment Building
17. East End Landfill
18. West End Landfill
19. Plant Construction Landfill
20. Drum Storage Area
21. Construction Rubble Storage Area
22. Wood and Pallet Storage Area
23. Reduction Cell Skirt Storage Area
24. Carbon Waste Roll-Off Bin
25. Solid Waste Collection Bins and Dumpsters
26. HEAF Filter Roll-Off Bin
27. Tire and Wheel Storage Area
28. 90 Day Drum Storage Area
29. Caustic Spill
30. Paste Plant Spill

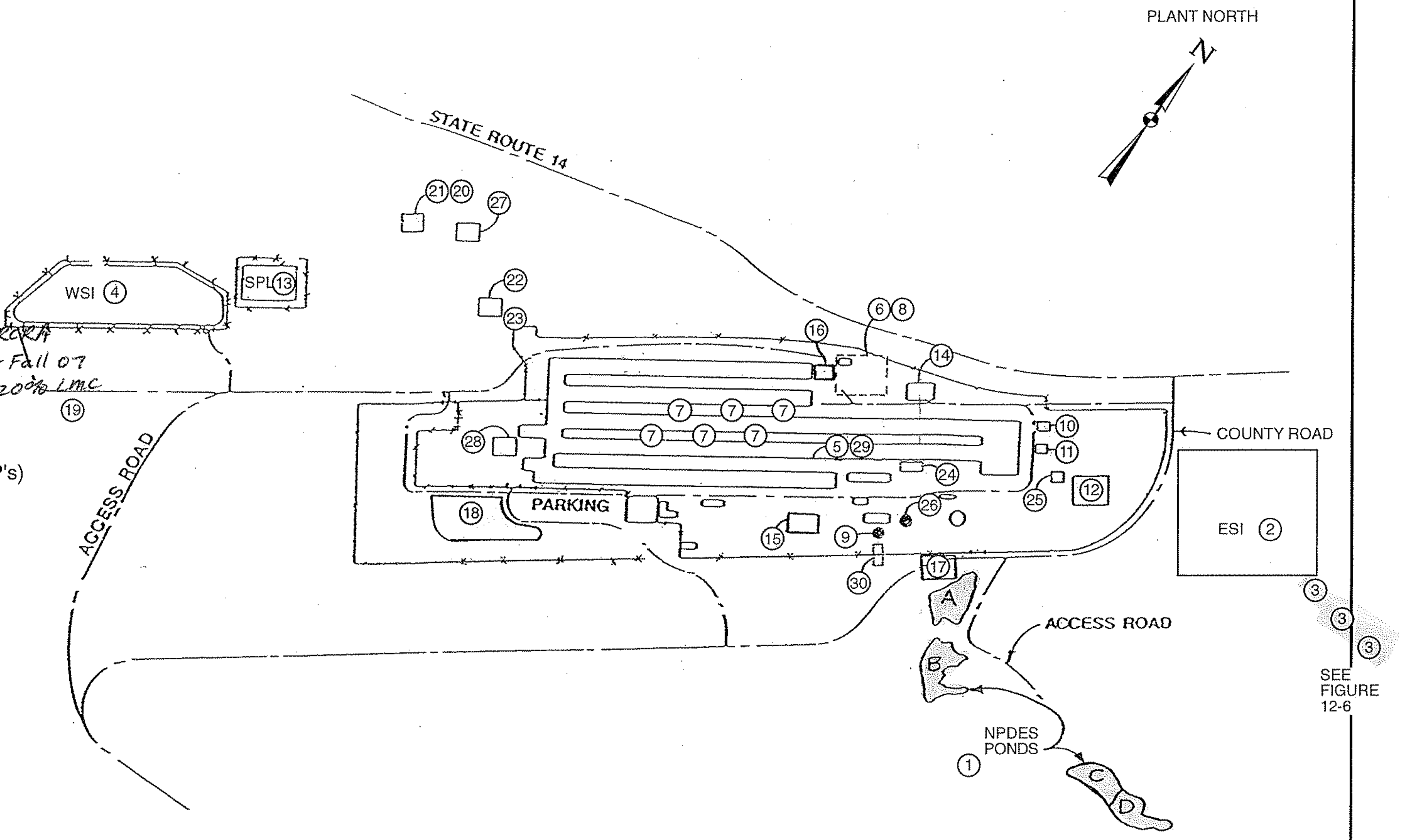


Figure 12-1

SOLID WASTE MANAGEMENT UNITS

GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

DATE: SEPTEMBER 1997

APPENDIX A-24

SWMU #24 – Carbon Waste Roll-off Area

Parametrix (2004a)
2004 SWMU Map

SOLID WASTE MANAGEMENT UNITS

1. 4 NPDES Treatment Ponds
2. East Surface Impoundment (ESI)
3. Intermittent Sludge Disposal Ponds
4. West Surface Impoundment (WSI)
5. A Line Secondary Scubber Recycle System
6. B/C Lines Secondary Scrubber Recycle System
7. Decommissioned Air Pollution Control Equipment (ESP's)
8. Tertiary Treatment Plant
9. Paste Plant Recycle Water System
10. North Potliner Soaking Station
11. South Potliner Soaking Station
12. East SPL Storage Area
13. West SPL Storage Area
14. North SPL Storage Containment Building
15. South SPL Storage Building
16. SPL Handling Containment Building
17. East End Landfill
18. West End Landfill
19. Plant Construction Landfill
20. Drum Storage Area
21. Construction Rubble Storage Area
22. Wood and Pallet Storage Area
23. Reduction Cell Skirt Storage Area
24. Carbon Waste Roll-Off Bin
25. Solid Waste Collection Bins and Dumpsters
26. HEAF Filter Roll-Off Bin
27. Tire and Wheel Storage Area
28. 90 Day Drum Storage Area
29. Caustic Spill
30. Paste Plant Spill

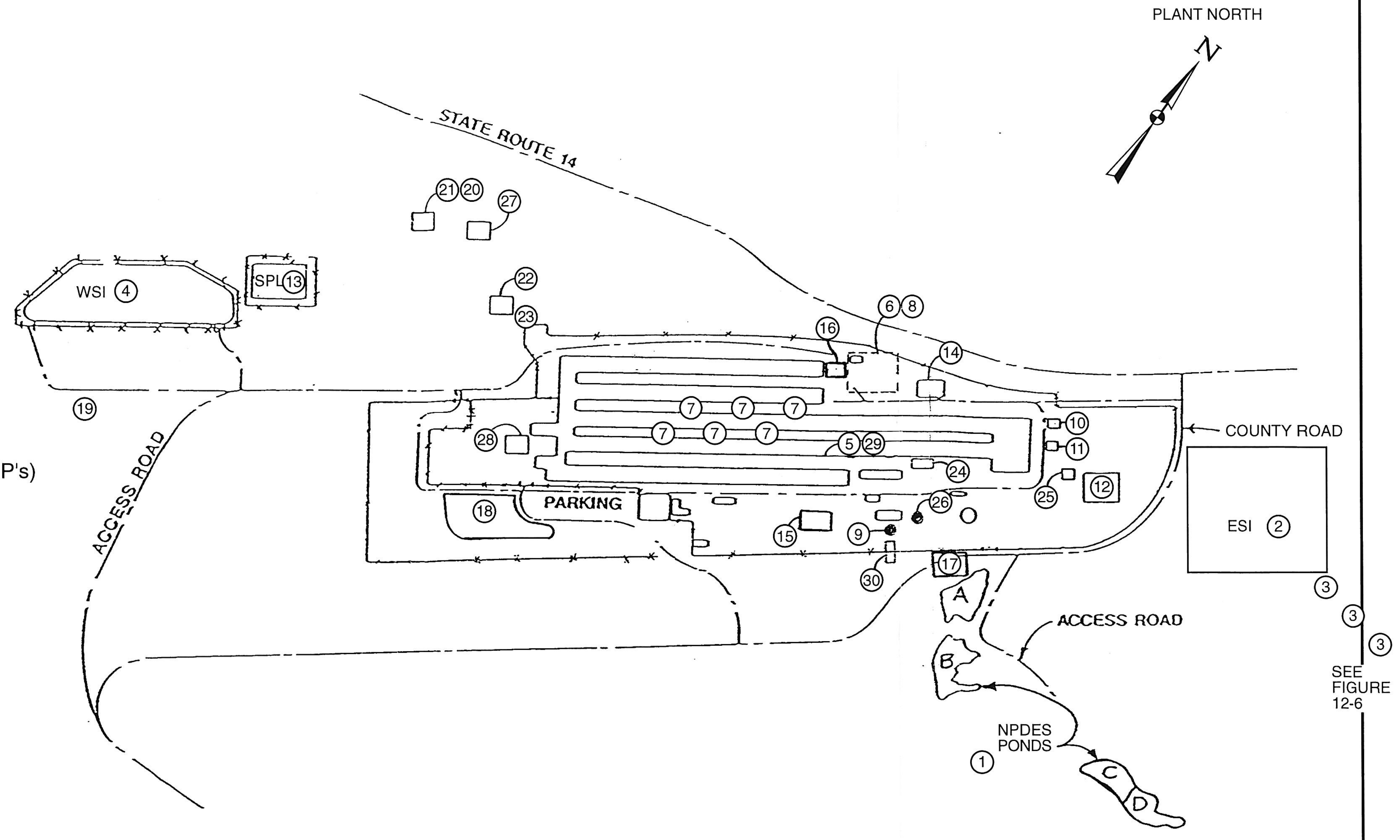


Figure 12-1

SOLID WASTE MANAGEMENT UNITS

GOLDENDALE ALUMINUM COMPANY
GOLDENDALE, WASHINGTON

DATE: SEPTEMBER 1997

APPENDIX A-25

SWMU #25 – Solid Waste Collection Bin and Dumpsters

Refer to SWMU #24 – Appendix A-24 for SWMU Maps

APPENDIX A-26

SWMU #26 – HEAF Filter Roll-Off Bin

No Materials Included

APPENDIX A-27

SWMU #27 – Tire and Wheel Storage Area

No Materials Included

APPENDIX A-28

SWMU #28 – 90-Day Drum Storage Area

No Materials Included

APPENDIX A-29

SWMU #29 – Caustic Spill

Ecology (1990e,f)
Documentation of Caustic Spill

Internal
Water

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

CENTRAL OPERATIONS

MEMORANDUM

November 7, 1990

TO: Greg Sorlie
Columbia Aluminum Enforcement and Water Correspondence Files

THROUGH: Dick Burkhalter/Ted Mix

FROM: Wayne Wooster WEW

SUBJECT: Revised Recommendation for Enforcement - Caustic Spill at Columbia Aluminum (followup to original October 23, 1990 memo)

This memo presents the revisions made to the recommended enforcement action concerning the Columbia Aluminum October 3, 1990 caustic spill. Please refer to the attached October 23, 1990 Wooster to Burkhalter memo for a description of the events leading up to the spill, during the spill, and following the spill.

The original enforcement recommendation included a $5,000 penalty issued under the authority of RCW 90.48.144 and RCW 70.105.080. The original recommendation also included an Order issued under RCW 90.48.120 and RCW 70.105.095 requiring Columbia Aluminum to install secondary containment around all caustic storage tanks on the plant site. The revised enforcement recommendation is cited under the same authority. The new recommendation doubles the original $5,000 penalty to $10,000 and includes an expanded Order. The $10,000 penalty is one-half the statutory maximum of $20,000 that could have been applied if the dangerous waste (RCW 70.105.080) and water quality (RCW 90.48.144) statutory maximums of $10,000 per day per violation, respectively, were followed. Due to the circumstances leading up to the spill, I believe the $10,000 penalty is justified. The revised Order requires Columbia Aluminum to conduct first response training for their Wastewater Treatment Plant personnel and other employees responsible during the handling and transfer of raw products having spill potential. The revised Order also requires Columbia to install the aforementioned secondary containment.

Finally, I received the soil sample results from the Manchester Laboratory. I collected four soil samples around the spill site, the pH ranged from 9.3 to 11.1. The highest pH of 11.1 is below the dangerous waste corrosivity of 12.5, therefore, I do not believe additional cleanup of this site is necessary. The lab results are attached for your review.

WEW:
attachments
®COLUMBIA®CAUSTIC2.MEM

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

CENTRAL OPERATIONS

MEMORANDUM

October 23, 1990

TO: Dick Burkhalter
Columbia Aluminum Enforcement and Water Correspondence Files

THROUGH: Ted Mix

FROM: Wayne Wooster WEW

SUBJECT: Recommendation for Enforcement - Caustic Spill at Columbia Aluminum

The purpose of this memo is to inform you of the events concerning a caustic spill that occurred at the Columbia Aluminum smelter in Goldendale, Washington on October 3, 1990, and to approve the recommended enforcement action resulting from the spill. A description of the spill itself, the notification and cleanup actions taken by Columbia, and the Department's initial response and subsequent followup site visit are detailed below. The recommended enforcement action is also given below.

Spill and Followup Investigation

1) On October 3, 1990, Columbia Aluminum's Fred Rufner telephoned the Industrial Section office to report a caustic (NaOH) spill that had occurred on the plant site earlier that day. I was away from the office that day and George Houck handled the call. The initial estimated spill volume was 100 - 150 gallons of 20% NaOH. The spill was due from a tank being overfilled. Fred Rufner also reported that Columbia intended to dilute the spill and flush it to the industrial wastewater treatment system, and that the area was cordoned off and contained, and that the contaminated soil would be cleaned up. George told Fred to phone the Central Region spill response people and that I would call him after I returned to the office.

2) On October 4, 1990, I telephoned Mr. Rufner and asked him about the spill. Fred reiterated the story that he told George the day before, and that the cleanup had followed the guidelines listed in their SPCC plan. I did not pursue the issue any further at this point.

3) On October 12, 1990, Ted Mix received a telephone call from a Columbia Aluminum employee claiming that the cleanup was inadequate, the spill was not cordoned off and several workers were injured while walking through it, the high level alarm wires were burned off during a tap out in the basement, and that the overflow lasted approximately 2 hours.

4) After Ted and I discussed the employee complaint, we decided that I should investigate the items listed in the complaint. On October 17, 1990, I conducted a site visit and followup investigation. Columbia's Fred Rufner accompanied me during the site visit and investigation. I visited the spill area, collected soil samples, and spoke with several Columbia Aluminum employees. During the course of the investigation it became clear that nearly all of the items raised in the Environmental Complaint were true. The employees questioned included:

- Fred Rufner, Environmental Manager;
- Larry West, Electrical, Maintenance and Emission Control General Foreman;
- Tim Yearout, Instrument Technician;
- Jack James, Electrical Department Foreman;
- Gene Caudill, Assistant Maintenance and Engineering Manager;
- Steve League, Paste Plant Employee and the Local Steelworkers Union President; and
- Larry Brown, Safety Officer

5) The site visit findings and investigation results are summarized below.

Fred Rufner is the primary environmental official to be notified during spill events. According to Fred, the spill occurred during a transfer operation between a 30,000 and 60,000 gallon (20% NaOH) caustic tanks. Neither of these tanks have secondary containment. The transfer operation started at about 4:30 am, the operator then left the transfer operation to attend to other duties (Fred said this was SOP), and later returned at about 6:30 or 7:00 am and found the spill. The operator apparently then attempted to perform some kind of cleanup action on his own without calling for help. Fred and other staff were unsure of what this action consisted of. I did not speak to the operator in question. The operator also failed to adequately secure the area to prevent other employees from entering the area. Meanwhile other Columbia employees walked through the spill thinking that it was a harmless rainwater puddle. The spill consisted of a puddle varying in depth from one to four inches. After a short while, some of these workers started experiencing burns on their feet. At this point, Fred believed the spill was officially discovered after determining that the workers had walked through the caustic storage area. Fred was unsure if Columbia's fire/emergency brigade was notified of the spill after learning of the workers' burns or if the operator had reported it. Some of the confusion was due to the time of the event; the 7:00 am hour is plant shift change. Fred confessed that a couple of workers had received some burns due to the spill. Fred also revised his initial estimate of 100 - 150 gallons of spilled caustic to approximately 5,000 gallons. The

5,000 gallons of 20% NaOH represents approximately 18,000 lbs of NaOH (the "Reportable Quantity" is 1,000 lbs). Fred told me that the flushed caustic entered the Storm Water Retention basin prior to being discharged through the industrial wastewater outfall. Fred said that the flushed caustic was diluted and that no pH excursions were observed at the final outfall. Fred also admitted that other, smaller spills had happened in this area in the past; Fred did not discuss the earlier spills in much detail and I did not press him on it. After returning to the office, Ted and I discussed Columbia's previous history with spills, Ted did not find any record of earlier spills in his telephone log or the Martin Marietta/Commonwealth Aluminum/Columbia Aluminum enforcement file.

I asked Fred about the high level alarms on the storage tanks and about the possibility of the wiring being burned out thereby making the alarms inoperative. Fred told me that he was unaware of this situation but that he and I should investigate further. We returned to his office and Fred called three other employees to report to his office. I questioned the three, Larry West, Tim Yearout, and Jack James, separately to ascertain if the wiring was burned off, and if so, for how long. After speaking with these individuals, it became evident that the wiring was burned off for some time, but none of these three individuals knew for how long.

After this questioning, Fred and I returned to the spill site. I collected soil samples from four locations around the spill site, and submitted them to the Manchester Laboratory for pH analysis. A drawing indicating the four sample locations is attached for your review. Fred told me that Columbia scraped/removed contaminated soil and that it would be disposed of in Arlington, Oregon. Fred stated that the cleanup was not entirely finished, but that the most contaminated soils were already removed. Fred told me that the remaining soil had a pH of approximately 10. Columbia had also recently asphalted some of the area and prepared an asphalt covered diversion/drainage ditch to a nearby stormwater grate. I have included photographs of this area for your review. I have not received the laboratory results, but expect the samples to have a pH ranging between 9 and 14.

Immediately prior to the sample collection, Gene Caudill and Steve League walked around the spill area. I questioned them about the spill and what measures Columbia intended to take to ensure that future spills are prevented. Steve confirmed that some Columbia employees were burned after walking through the unsecured spill area. Gene and Fred each stated that Columbia had allocated money during the next year to install secondary containment around the caustic tanks on the industrial facility. Gene, Fred, and Steve each discussed that the SOP employed during the transfer operation should be reviewed and if necessary, changed.

Finally, Fred and I met with Larry Brown. Mr. Brown confirmed that two employees received OSHA reportable injuries; one individual had a third degree burn on his big toe, and the second individual had second degree burns on the side of his foot. Larry also stated that three other individuals experienced minor irritations or discomfort. None of the employees lost work time.

Enforcement Recommendation

One of items raised in the complaint was that the individual was concerned with groundwater contamination resulting from this spill. Due to the volume of the spill and that the remaining soil's pH was around 10 (the cleanup level after Columbia removed the top layer of soil from the spill area), I believe that the groundwater underneath the spill area may have been affected. I believe Columbia Aluminum violated RCW 90.48.080. RCW 90.48.020 defines underground waters as waters of the state. RCW 90.48.080 provides that it shall be unlawful for any person to throw, drain, run, or otherwise discharge into any of the waters of this state, or to cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharge into such waters any organic or inorganic matter that shall cause or tend to cause pollution of such waters according to the determination of the Director.

In addition, by allowing workers to come into contact with the spilled caustic, I believe Columbia Aluminum failed to comply with the following Washington State Dangerous Waste regulation.

> WAC 173-303-145 Spills and discharges into the environment.
> WAC 173-303-145(1) states in part "This section shall apply when any dangerous waste or hazardous substance is intentionally or accidently spilled or discharged in the environment such that public health or the environment are threatened, regardless of the quantity of dangerous waste or hazardous substance."
> WAC 173-303-145(3) states in part "The person responsible for a nonpermitted spill or discharge shall take appropriate immediate action to protect human health and the environment."

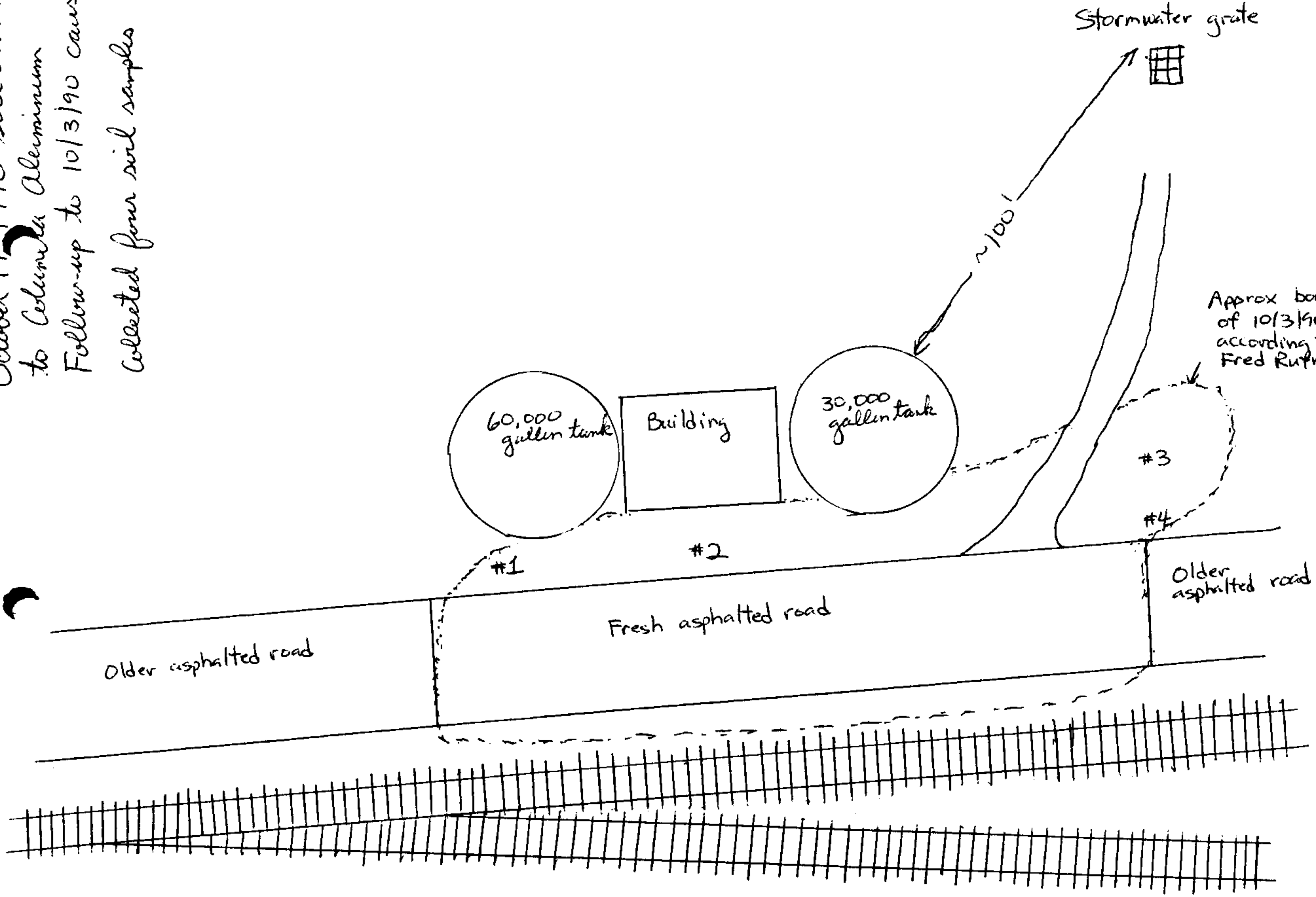
Due to the magnitude of the spill (approximately 5,000 gallons) and that workers were exposed and injured by the spill coupled with the inoperable alarms, I recommend a penalty of $5,000. As you may recall, in May 1990, James River Camas had a much smaller caustic spill on their industrial facility (approximately 70 lbs of NaOH) which did not injure any employees. SWRO spill response personnel investigated that spill and originally recommended a $5,000 penalty. The recommended penalty was later reduced by Industrial Section staff to $1,000. I also believe an administrative order should be issued requiring Columbia to install secondary treatment around their caustic storage tanks. I do not believe secondary containment is necessary for the other air pollution/water pollution control chemical storage tanks since Columbia only stores large quantities of two chemicals in the secondary air pollution control system; two 30,000 gallon & two 60,000 gallon sodium hydroxide tanks, and one 20,000 gallon & one 30,000 gallon calcium chloride tanks. All other air pollution/water pollution control chemicals used are stored in smaller quantities of less than 12 gallons.

WEW:

attachments

®COLUMBIA®CAUSTIC.MEM

October 17, 1990 site visit
to Columbia Aluminum
Follow-up to 10/3/90 caustic spill
collected four soil samples



APPENDIX A-30

SWMU #30 – Paste Plant Spill

APPENDIX A-30

SWMU #30 – Paste Plant Spill

Ecology (1990a)
May 1990 Inspection

We also walked through some of the old buildings located immediately southeast of the WSI and found no drums.

I inspected groundwater monitoring well #MW-10. We also observed four (4) or five (5) drums nearby that contained the monitoring well drill cuttings. Fred explained that some of the drill cuttings from other wells were emptied into the WSI (those with elevated sulfate concentrations), while other cuttings were placed in drums and left on-site near each appropriate well location.

ESI: We walked around the closed ESI facility. We saw no signs of animal disturbance to the cover, or any standing water. We checked two gas vents, no gas was detected.

Paste Plant Area: We visited the paste plant area and observed an overflow event at the cooling tower on the south side of the facility. The overflow reached the fence on the south side of the facility. I have attached a sketch of the area. Apparently, these events had occurred before (almost 300,000 lbs of contaminated soil (WP03, EHW) was disposed of according to the 1989 Generator Annual Dangerous Waste Report). None of this material was reported for the 1988 generator year. As you may recall, the entire paste plant situation has been a wastewater, hazardous waste, and air emission departmental concern. Although I was vaguely aware of the overflow events, nevertheless, the frequency of the spills and the volume of contaminated waste soil being generated was surprising. To CAC's credit, they did make an attempt to clean the area up by disposing of the nearly 300,000 lbs of contaminated soil, however, they failed to keep the department apprised of the frequency and magnitude of the spills, or of the cleanup actions taken. Fred explained that since 1/90 the paste plant operators have been checking this area for overflow events once per hour. I counted approximately ten (10) overflow events that occurred between 1/29/90 and 4/1/90. Sediment samples were taken from four (4) locations behind the paste plant facility (please refer to sketch). CAC split samples on three (3) of the locations. The samples were analyzed for polynuclear aromatic hydrocarbons (PAH's). The preliminary CAC and the WDOE results are given below.

Sample Location	WDOE % 4,5,6 ring PAH	CAC % 4+ rings PAH
1	failed preliminary screen	0.33
2	0.29	1.69
3	0.44	1.10
4	3.2	no sample collected

While differences exist between the WDOE and CAC results, it is clear that a dangerous waste was discharged/spilled. The samples would either designate as DW or EHW from section -103 Carcinogenic dangerous waste or as EHW from section -102 Persistent dangerous waste. CAC has previously designated these waste soils as EHW persistent dangerous waste.

The Department recently issued two enforcement actions to CAC that should prevent future spills. The first, Order No. DE 90-I001, approved CAC's Notice of Construction (NOC) request to install a new piece of air pollution equipment (HEAF or High Efficiency Air Filtration unit) that will eliminate a portion of the paste plant cooling water wastestream. As you may recall, this HEAF unit is similar to the one employed at the Kaiser-Tacoma smelter. To CAC's credit, they initiated the installation of this unit at a cost of approximately $800,000. The second enforcement action, NOV No. DE 90-I043, directed CAC to investigate alternatives that would eliminate a portion of the paste plant cooling water wastestream responsible for the May 10, 1990 overflow event and a second unpermitted discharge that was observed on July 18, 1990. The NOV also required CAC to submit a report that outlined a course of corrective action to eliminate these unpermitted discharges. CAC submitted this report in late August. In addition, a third enforcement action is being recommended for issuance. The third enforcement action, water Order No. DE 90-I054, will direct CAC to implement the recommendations cited in their response to the NOV. CAC's Fred Rufner believes that the installation of the HEAF unit and implementation of the other corrective measures should eliminate the cooling tower overflow events and the second unpermitted overflow events. A copy of CAC's report and the Order are included under a separate cover for your review and signature.

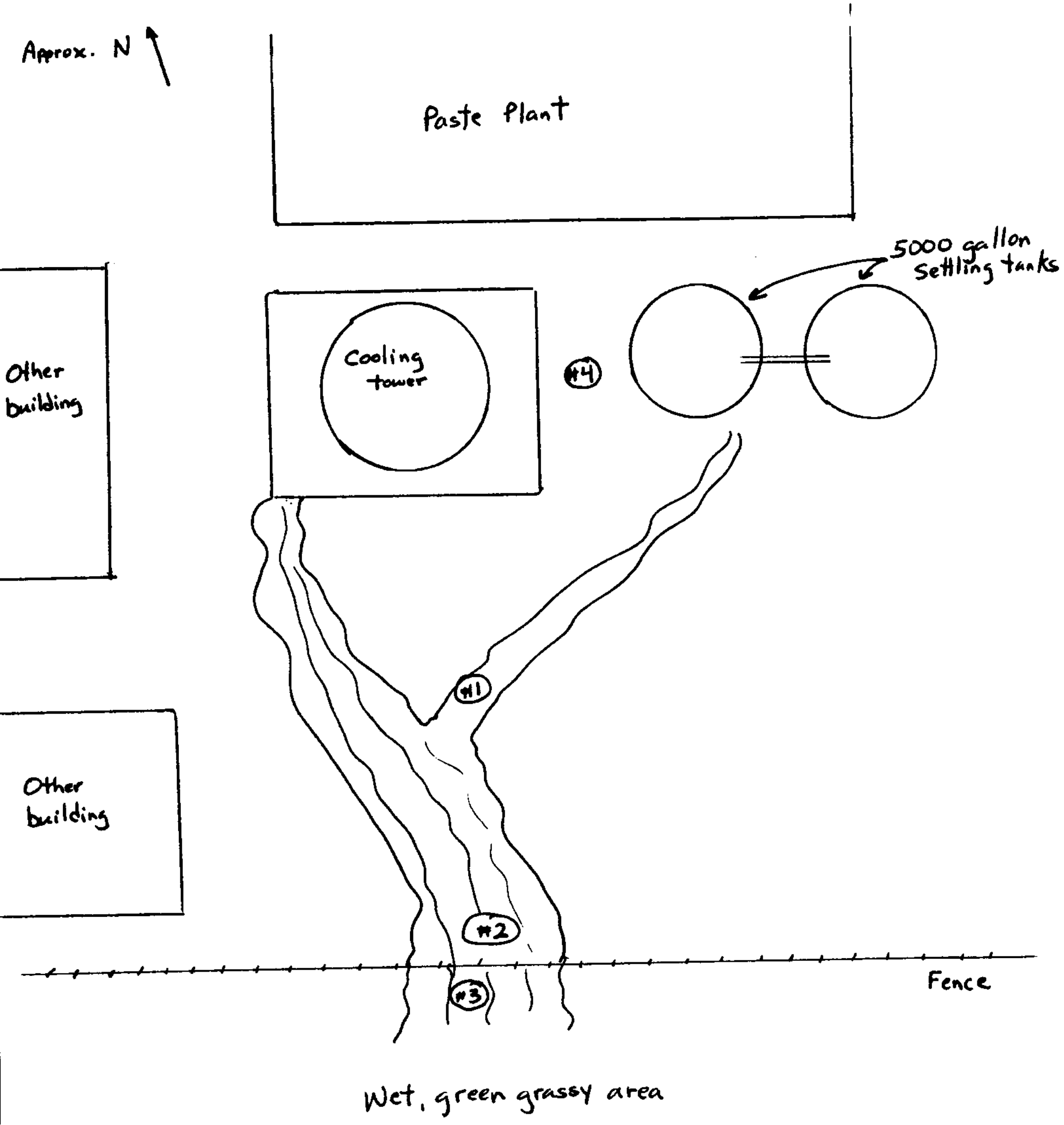
Closing Interview: Following the site visit and the records review, Ted and I briefly discussed the inspections findings with Fred Rufner and Joe White. We told them that we observed several items of concern that required better attention, e.g., the carbon duct dust area, and the spills behind the paste plant and at the 90-day hazardous waste accumulation area. We informed Fred and Joe that the items of concern would be detailed in the inspection writeup, and that the writeup would not be completed until August or September. We thanked them for their time and assistance and left the facility.

COMPLIANCE

The following is a list of the items of non-compliance noted during the May 9 and 10, 1990 RCRA/Washington State Dangerous Waste compliance inspection. The violations are categorized as Class I or Class II. Class I violations are more serious than Class II. Class I violations are those which either result, or could result in an imminent threat to human health and/or the environment. Class II violations encompass all violations which would not be considered as Class I.

Violation & Class	Description of Violation
WAC 173-303-060(2) and (5) Notification and identification Class II	Although Columbia submitted a (Form 2) Notification of Dangerous Waste Activities in July 1987, this form does not include any wastes except for the sludge material being stored in the WSI. The notification form was incorrectly filled out; all

Columbia Aluminum Paste Plant Facility & Surrounding Area



FRED FYI - Wayne Wooster DOE File

Fred

Preliminary

SOIL SAMPLES FROM PASTE PLANT FENCE LINE
ANALYZED FOR 16 PRIORITY POLLUTANT POLYAROMATIC HYDROCARBONS

	COMPOUND	#1 ug/g	#2 ug/g	#3 ug/g
1	NAPHTHALENE	-	-	-
2	ACENAPHTHALENE	-	-	-
3	ACENAPHTHENE	-	-	-
4	FLUORENE	-	-	-
5	PHENANTHRENE	254	690	486
6	ANTHRACENE	65	162	126
7	FLUORANTHENE	754	2560	2414
8	PYRENE	470	1829	1651
9	BENZO-A-ANTHRACENE	339	1752	2481
10	CHRYSENE	383	1894	953
11	BENZO-B-FLUORANTHENE	444	2285	1781
12	BENZO-K-FLUORANTHENE	185	986	1315
13	BENZO-A-PYRENE	489	2709	984
14	DIBENZ-AH-ANTHRACENE	275	1545	438
15	BENZO-GHI-PERYLENE	342	1898	640
16	INDENO-123,CD-PYRENE	348	2001	723
	TOTAL PRIORITY PAH	4349	20313	13993
	TOTAL 4+ RINGS PAH	3276	16901	10967
	(#8-#16)	0.33%	1.69%	1.10%

JUL [illegible]

FILE COPY

☐
☐
☐
☐

ANALYST RE McKenney 6-14-90

MANCHESTER ENVIRONMENTAL LABORATORY

7411 Beach Drive S.E. Port Orchard, WA 98366

CASE NARRATIVE

August 3, 1990

Paste Plant
DW samples

Subject: Columbia Aluminum - Polynuclear Aromatic Hydrocarbons

Samples: 90 - 197136 through -197139

Case No.: DOE-524M

By: Dickey D. Huntamer
Organics Analysis Unit

HW POLYNUCLEAR AROMATIC HYDROCARBONS

ANALYTICAL METHODS:

"Chemical Testing Methods for Complying with the Dangerous Waste Regulation", Chapter 173-303-WAC , Apendix E and G. Polynuclear Aromatic Hydrocarbon Hazardous (PAH) Waste Designation procedure.

HOLDING TIMES:

No sample or analysis holding times have been established for hazardous waste designation procedures.

BLANKS:

Blanks are not required by the PAH Hazardous waste analysis method. The blanks B0144 and B0144D are laboratory reagent blanks for the High Performance Liquid Chromatography (HPLC) analysis method. No PAH compounds were detected in B0144 and low levels of some PAH compounds were found in B0144D but not enough was present to affect the sample analysis.

SURROGATES:

Not required by the method.

MATRIX SPIKE AND MATRIX SPIKE DULPICATE:

Not required by the method.

COMMENTS:

Sample 90- 197137 failed the preliminary screening test of >1% residue weight after extraction and the acid - base wash procedure. The remaining samples were cleaned up with silica gel and analyzed by HPLC. The percent of 4,5 and 6 member ring PAHs was determined by summing the last 10 compounds, fluoranthene (7) through Indeno(1,2,3-cd)pyrene (16).

Sample #	% 4,5,6 ring PAH	
-197137	0.29	
-197138	0.44	
-197139	**3.2**	**HW Designation**

QUALIFIER CODES:

U	-	The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
J	-	The associated numerical value is an estimated quantity.
R	-	The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.
NAR	-	No Analytical Result.
FPS	-	Failed Preliminary Screen
ND	-	Not Detected

Washingt State Department of Ecol

*** Lab Analysis Report ***

==> Transaction #: 07310732 Laboratory: (WE) Ecology, Manchester Lab

Work Group: (67) Poly Arom Hydrocrbn (PAH) Scan

Instrument: (HPLC-FL) HPLC, Waters 840, Fluorescence Detec

Method: (EP2-610) Polynuclear Aromatic Hydrocarbons, GC or HPLC

Chemist: (DKS) Solberg, Keith DOE Hours Worked: ______

Project: DOE-524M COLUMBIA ALUMINUM Prg Ele#: C7300

Prj Off: Wooster, Wayne DOE Analysis Due: 900511 Revised Due:

*** Sample Records in Transaction ***

Parameter Form File: PAH2 Title: Polynuclear Aromatic Hydrocarbons

Seq#	Sample #	QA	Date/Time	Description	Alternate Keys
01	90197136		900510	PP#1	
02	90197137		900510	PP#2	
03	90197138		900510	PP#3	
04	90197139		900510	PP#4	
05	90197136	LBK1	900510	PP#1	
06	90197136	LBK2	900510	PP#1	

Record Type: TRNIN1 Date Verified: 8/2/90 By:

Transaction Status: Edited Transaction...First Printing...Unverified.

Processed: 1-AUG-90 16:47:37 Status: E Batch: (In CUR DB)

Transaction #: 07310732 (67) Poly Arom Hydrocrbn (PAH) Scan
Proj Code : DOE-524M COLUMBIA ALUMINUM PE # : C7300

Blank ID:					B0144
Sample Number:	90197136	90197137	90197138	90197139	90197136
Sample Description:	PP#1	PP#2	PP#3	PP#4	PP#1
Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment
Units:	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
% Slds:					
QA Code:					LBK1
Date Extract:	900524	900524	900524	900524	900524
Date Analyzd:	900703	900703	900703	900703	900703
1 Napthalene	FPS	2.4E5U	2.4E5U	4.6E5U	ND
2 Acenaphthylene	FPS	3.0E5U	3.0E5U	5.8E5U	ND
3 Acenaphthene	FPS	4.0E5U	3.9E5U	7.7E5U	ND
4 Fluorene	FPS	4.7E4U	4.7E4U	7.1E5	ND
5 Phenanthrene	FPS	9.9E4	4.9E4U	1.2E7	ND
6 Anthracene	FPS	1.9E4	1.8E4	5.2E5	ND
7 Fluoranthene	FPS	6.5E5	5.1E5	1.7E7	ND
8 Pyrene	FPS	5.1E5	4.5E5	INT.	ND
9 Benzo(a)anthracene	FPS	2.6E5	3.2E5	3.4E6	ND
10 Chrysene	FPS	1.7E5	2.5E5	1.7E6	ND
11 Benzo(b)fluoranthene	FPS	3.9E5	5.9E5	2.6E6	ND
12 Benzo(k)fluoranthene	FPS	1.2E5	1.9E5	1.0E6	ND
13 Benzo(a)pyrene	FPS	3.3E5	3.9E5	1.8E6	ND
14 Dibenzo(a,h)anthracene	FPS	1.7E5	5.5E5	6.5E5	ND
15 Benzo(ghi)perylene	FPS	2.3E5	8.7E5	3.5E6	ND
16 Indeno(1,2,3-cd)pyrene	FPS	6.8E4	2.9E5	3.0E5	ND

*** Lab Analysis Report ***

Transaction #: 07310732 (67) Poly Arom Hydrocrbn (PAH) Scan
Proj Code : DOE-524M COLUMBIA ALUMINUM PE # : C7300

Blank ID:	B0144D
Sample Number:	90197136
Sample Description:	PP#1
Matrix:	Sediment
Units:	ug
% Slds:	
QA Code:	LBK2
Date Extract:	900524
Date Analyzd:	900703
1 Napthalene	ND
2 Acenaphthylene	ND
3 Acenaphthene	ND
4 Fluorene	ND
5 Phenanthrene	ND
6 Anthracene	ND
7 Fluoranthene	ND
8 Pyrene	ND
9 Benzo(a)anthracene	ND
10 Chrysene	0.036
11 Benzo(b)fluoranthene	0.09
12 Benzo(k)fluoranthene	0.02
13 Benzo(a)pyrene	0.0324
14 Dibenzo(a,h)anthracene	0.11
15 Benzo(ghi)perylene	ND
16 Indeno(1,2,3-cd)pyrene	ND

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

CENTRAL OPERATIONS

MEMORANDUM

July 26, 1990

TO: Dick Burkhalter
Columbia Aluminum Internal Water Correspondence File

THROUGH: Ted Mix

FROM: Wayne Wooster WEW

SUBJECT: Recommendation for Enforcement, Notice of Violation - Uncontrolled Discharge from the Paste Plant Area at Columbia Aluminum

On July 18, 1990, Paul Skyllingstad and I visited the Columbia Aluminum complex in Goldendale, Washington. While the principal purpose of the visit was to conduct a site visit around the closed East Surface Impoundment (ESI) with Martin Marietta (MM) representatives, we also visited the Columbia Aluminum smelter (see Paul Skyllingstad memo to Ted Mix summarizing the meeting with MM representatives & the ESI site visit). Subsequently, during our visit Paul and I observed an uncontrolled & unpermitted discharge behind the paste plant facility.

Upon closer inspection, we determined that the discharge was caused by surface runoff of cooling water used by Columbia to keep their anode briquettes from fusing together. Columbia typically operates their paste plant for seven or eight days followed by four or five shut down days. Columbia does not have adequate briquette building storage and thereby stores the briquettes on an uncovered concrete slab. During periods of hot weather, a series of water spray nozzles located above the concrete slab/briquette pile are used to cool the briquettes and keep them from becoming one solid carbonaceous block. The runoff (estimated flow of 5 gpm) was flowing across a paved area, under a chainlink fence, and down into semi-wet area south of the paste plant facility. I have attached a sketch of the area.

The runoff was first observed at 0800 with an ambient temperature of approximately 70 degrees Fahrenheit. Interestingly, while Paul and I took photos of the runoff & Columbia's briquette cooling water spray system the water spray system was shut down. Paul and I then left the area, met with the MM representatives and was later joined by Columbia's Fred Rufner during the ESI inspection. After the ESI inspection and discussion with MM, Paul and I discussed the paste plant wastestream with Fred. I told him that the department would probably issue a Notice of Violation for the unpermitted discharge and that Columbia would have to develop some means of correcting this situation. We told Fred that we planned on collecting a sample prior to leaving the site and that we would analyze the sample for PAH's. We left the site at 1100 and while the water spray system was still shut down and the discharge had nearly dried up, we were able to collect our sample. We also collected a sample for Columbia.

I am sure that this was not an isolated occurrence since the grassy area below the chainlink fence was much greener than the surrounding area. In addition, Ted Mix and I observed a second stream draining underneath this fence during the May 10, 1990 dangerous waste inspection (we collected soil samples at that time for PAH's analysis but have not received the laboratory results). This second wastestream was caused by an overflow event at the paste plant cooling tower. The cooling tower overflow events should be eliminated or largely controlled after Columbia installs additional air pollution control equipment in their paste plant facility (please refer to the recent Notice of Construction approval for installation of a High Efficiency Air Filtration, or HEAF unit).

While the May 10 or July 18 samples may indicate elevated PAH's which could lead to dangerous waste enforcement at a later date, I believe water quality based enforcement should be applied at this time. As you may recall, the groundwaters and surface waters surrounding the smelter facility have been of concern to the department and other interested parties. Therefore, I believe a Notice of Violation should be issued for the uncontrolled and unpermitted surface water runoff. Additional water or dangerous waste enforcement action may be taken at a later date based on the laboratory results of the May 10 and July 18 samples. A copy of the NOV is attached for your review.

WEW:

attachments

\90COLUMB\RUNOFF.MEM

APPENDIX A-30

SWMU #30 – Paste Plant Spill

Technico Environmental Services (1991c)
Soil Removal Action Letter Report

File

Copy

TECHNICO
Environmental Services
201 West 33rd Avenue
Kennewick, Washington 99337
(509) 582-7447 Fax (509) 586-7363

October 30, 1991
Project No. 91-43

Mr. Don Reif
Industrial Division FZ-14
Department of Ecology
Post Office Box 47600
Olympia, Washington 98504-7706

Re: Columbia Aluminum Order No. DE90-1050

Dear Mr. Reif:

I am writing on behalf of Mr. Fred Rufner, Environmental Manager, Columbia Aluminum Corporation. A 90-day extension was requested and granted per Mr. Richard Burkhalter's June 11, 1991 letter to Mr. Rufner. The original order, Mr. Rufner's request for an extension, and Mr. Burkhalter's letter are included as Attachment 1. This letter addresses items 6 and 7 of the order.

Surface soils were removed inside and outside of the fence near the Paste Plant as indicated on Figure 1. James Dean Construction Inc., 55 Mt. Adams Highway, Glenwood, Washington, 98619-9123, removed these surface materials in the quantity of 1,140 cubic yards from the inside of the fence and 1,690 cubic yards from the outside of the fence.

Samples taken at time of the cleanup by James Dean Construction indicated the surface soils removed on the north side of the fence contained an average concentration of 195 mg/kg of polycyclic aromatic hydrocarbons (PAHs). A precleanup composite sample also taken by James Dean Construction of the soils outside the fence contained an average PAH concentration of 829 mg/kg.

All of these surface soils were taken to the West Surface Impoundment, which is on Columbia Aluminum property, and because they contained less than 1% of PAHs, they would be designated as solid waste, but not dangerous or extremely hazardous wastes.

James Dean Construction was also the transporter of these materials. Since the soils were deposited in the West Surface Impoundment, the name and address of the disposal facility would be Columbia Aluminum, 85 John Day Dam Road, Goldendale Washington, 98620.

During cleanup of the surface soils inside the fence, it was discovered that there was a landfill in this area containing plant waste from previous operations. Therefore, soils inside the fence could not be cleaned to below Model Toxics Control Act (MTCA) cleanup levels. And the cleanup inside the fence was terminated when these materials were encountered. Postcleanup levels of surface soils inside the fence were found to be 474 mg/kg.

A separate investigation was conducted associated with the landfill materials and this investigation is written up as Attachment 2 to this report.

Figure 1 shows the area where soils were removed outside of the plant fence indicated by cleanup samples 1 and 2 as part of the cleanup project. A composite sample taken prior to cleanup of the soils outside the fence showed an average concentration of 829 mg/kg of PAH.

Soil sample 1 was taken directly beneath the discharge pipe, which formerly carried contaminated water outside the fence. Soil cores were taken at 1-foot intervals at each of these locations. Bedrock was encountered just beyond 2 feet at Location 1 and at 3 feet at Location 2. Postcleanup samples were analyzed by WAC 173 303 gravimetric procedures to determine 1% PAH concentrations for classification as a dangerous or extremely hazardous waste. Soil samples were analyzed by WAC 173 (gravimetric) and EPA SW 8310 (HPLC) procedures. Table 1 shows the remaining soils are not hazardous wastes because they are less than 1% by either procedure.

Industrial soil cleanup levels have been established in WAC 173-340-745 (4)(a)(iii)(B). The cleanup level of 20 mg/kg cited in Table 2 is exceeded by surface soils at locations 1 and 2.

It is my opinion that further removal of materials from these sites would lead to dispersion of the waste materials to a much greater extent than would occur if the materials were left in place. The landfill and the area where the soils were cleaned outside of the fence are located in an arid area with very fine soils, that is frequently subjected to high winds. Since the PAHs are a contact carcinogen, the dispersion of these materials needs to be prevented. The dispersion of these materials can be prevented by providing a cap to stabilize these soils.

We have spent a great deal of time trying to understand the implications of the MTCA on these actions. It is important to note that these soils are in an industrial area that has historical been and will continue to be used primarily for industrial purposes. Institutional controls can clearly be implemented to minimize exposure to these materials.

Cleanup standards cannot be obtained; however, we do believe the cleanup actions taken to date plus the covering of these areas will protect human health and the environment. Compliance monitoring will have to be provided to demonstrate this level of protection.

The type of cover to be applied, the complexity of the MTCA, and the subject of continuing monitoring are complicated enough that we request a meeting with you on Friday, November 15, 1991. Please call me to confirm a time.

Sincerely,

John A. Zillich
President

JAZ:jlh

Attachments:
Table 1 - Outside the Fence Cleanup Area Soil PAH Concentrations vs. Hazardous Waste Levels
Table 2 - Outside the Fence Pre and Post Cleanup Area Soil PAH Concentrations vs. Industrial Soil Cleanup Levels
Figure 1 - Paste Plant Soil Cleanup Area
Attachment 1 - Relevant Correspondence

cc: Mr. Fred Rufner, Columbia Aluminum

Table 1
Outside the Fence
Cleanup Area Soil PAH Concentrations vs. Hazardous Waste Levels

	Sample Location	PAH by DOE WAC 173 Procedure (%)	PAH by EPA SW 8310 Procedure (%)	Hazardous Waste (%)
Cleanup 1	0 to 1 foot	0.05	0.003	1.0
	1 to 2 feet	0.01	0	1.0
	2 feet to bedrock	0.05	0.003	1.0
Cleanup 2	0 to 1 foot	0.06	0.005	1.0
	1 to 2 feet	0.06	0	1.0
	2 to 3 feet	0.04	0	1.0
Soils uncleaned		0.19	0.066	1.0

PAH = Polycyclic Aromatic Hydrocarbons

Table 2
Outside the Fence
Pre and Post Cleanup Area Soil PAH Concentrations vs. Industrial Soil Cleanup Levels

	Sample Location	PAH by EPA SW 8310 Procedure (mg/kg)	Industrial Cleanup Levels (mg/kg)
Precleanup	Composite	829	20
Postcleanup 1	0 to 1 foot	32.21	20
	1 to 2 feet	0.29	20
Postcleanup 2	0 to 1 foot	47.88	20
	1 to 2 feet	3.62	20
	2 to 3 feet	0.38	20

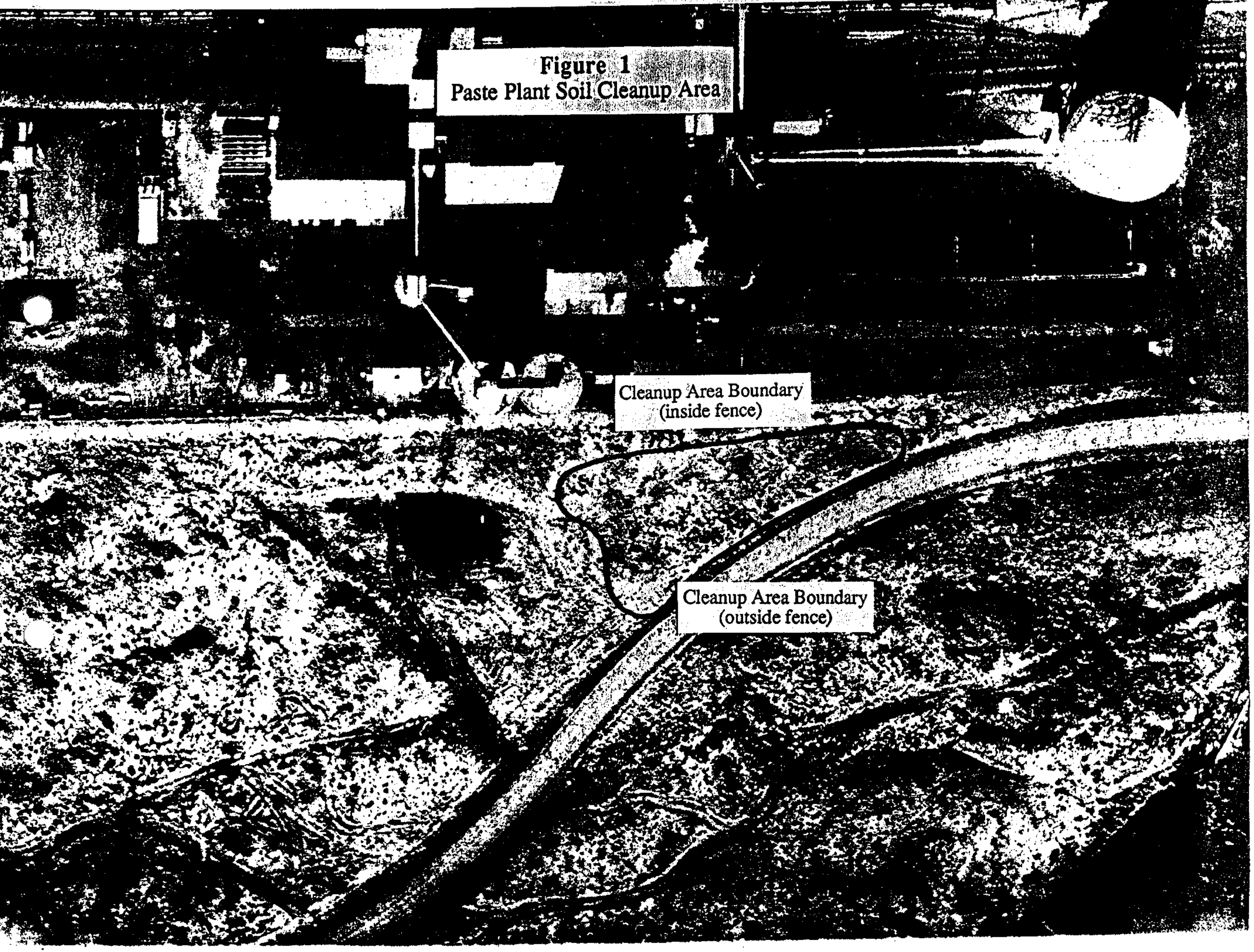


Figure 1
Paste Plant Soil Cleanup Area

APPENDIX A-31

SWMU #31 – Smelter Sign Area

Tetra Tech (2011b)
NESI Historical Aerial Photographs

R:\projects_2011\LockheedMartin_GoldendaleSiteInvestig\maps\WorkPlan_Report_Maps\Site3_NorthESI_WorkPlan\Appendix_MultiYear_Aerials_Site3_NorthESI_v2.mxd Date: 03/02/2011

Legend

🟧 Investigation Area

🟩 Impoundment Area(Closed)

Imagery Data Sources: NAIP 2009

Rotation -20°

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 2009

Revision Date: 03/02/2011

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Legend

🟧 Investigation Area

🟩 Impoundment Area(Closed)

Imagery Data Sources: NAIP 2009

N W E S

Rotation -20°

0 50 100 200

Feet

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 2006

Revision Date: 03/02/2011

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Legend

🟥 Investigation Area

🟩 Impoundment Area(Closed)

N W E S

Rotation -20°

0 50 100 200

Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 1995

Revision Date: 03/02/2011

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Legend

🟥 Investigation Area

🟩 Impoundment Area(Closed)

N
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Rotation -20°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 1992

Revision Date: 03/02/2011

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Legend

🟥 Investigation Area

🟩 Impoundment Area(Closed)

Rotation -20°

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 1989

Revision Date: 03/02/2011

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Legend

🟧 Investigation Area

🟩 Impoundment Area(Closed)

Rotation -20°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI) Investigation Area Aerial 1979

Revision Date: 03/02/2011

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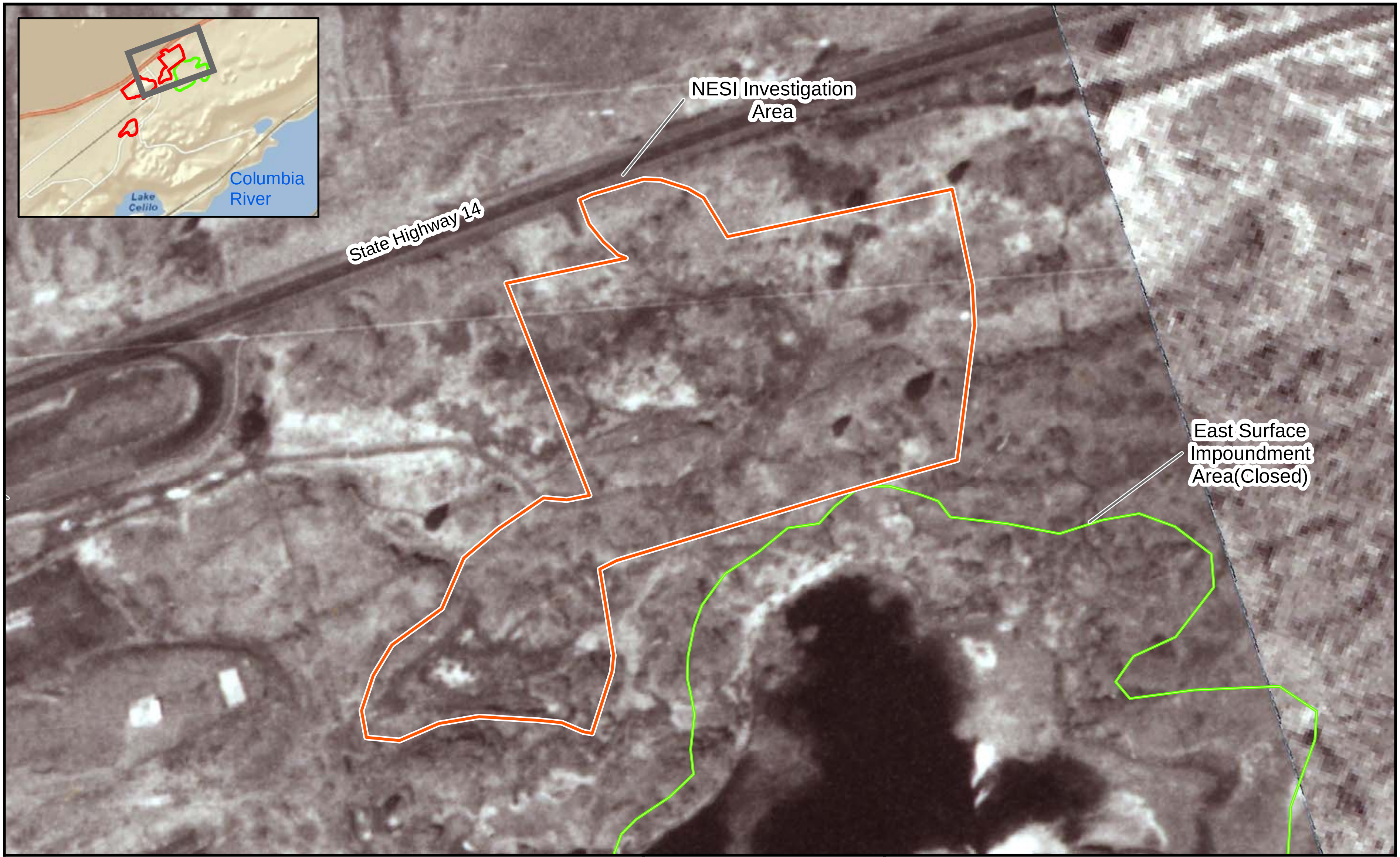

Legend

🟧 Investigation Area
🟩 Impoundment Area(Closed)

Imagery Data Sources: NAIP 2009

N W E S

Rotation -20°

0 50 100 200
Feet

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 1978

Revision Date: 03/02/2011

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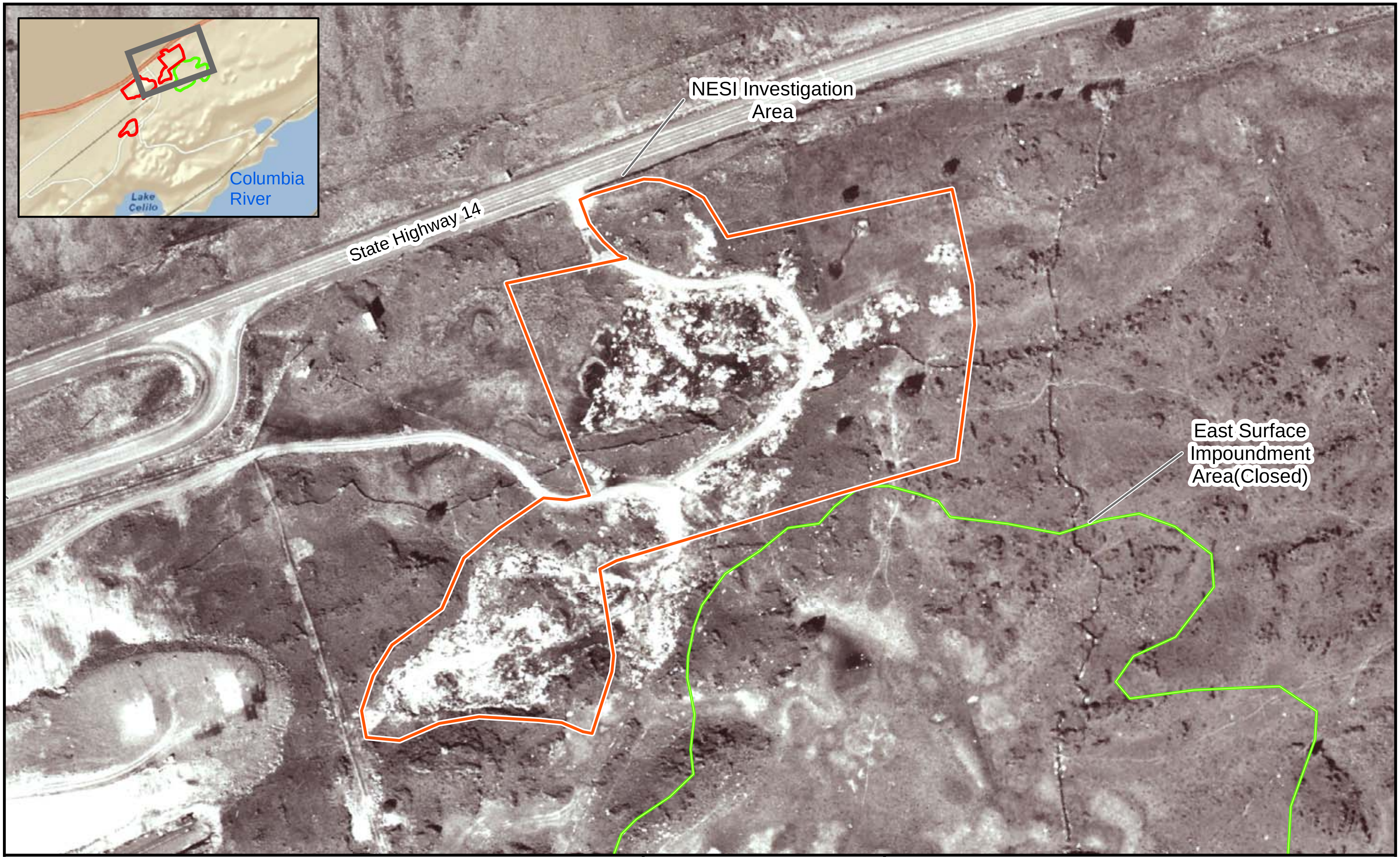

Legend

🟥 Investigation Area

🟩 Impoundment Area(Closed)

N
W E
S

Rotation -20°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 1972

Revision Date: 03/02/2011

APPENDIX A-31

SWMU #31 – Smelter Sign Area

Tetra Tech (2011c)
Smelter Sign Historical Aerial Photographs

R:\projects_2011\LockheedMartin_GoldendaleSiteInvestig\mapsWorkPlan_Report_MapsSite2_SmelterSign_WorkPlanAppendix_MultiYear_Aerials_Site2_SmelterSign_v2.mxd Date: 03/02/2011

Legend

🟧 Investigation Area

N W E S

Rotation -15°

0 50 100 200

Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 2009

Revision Date: 03/02/2011

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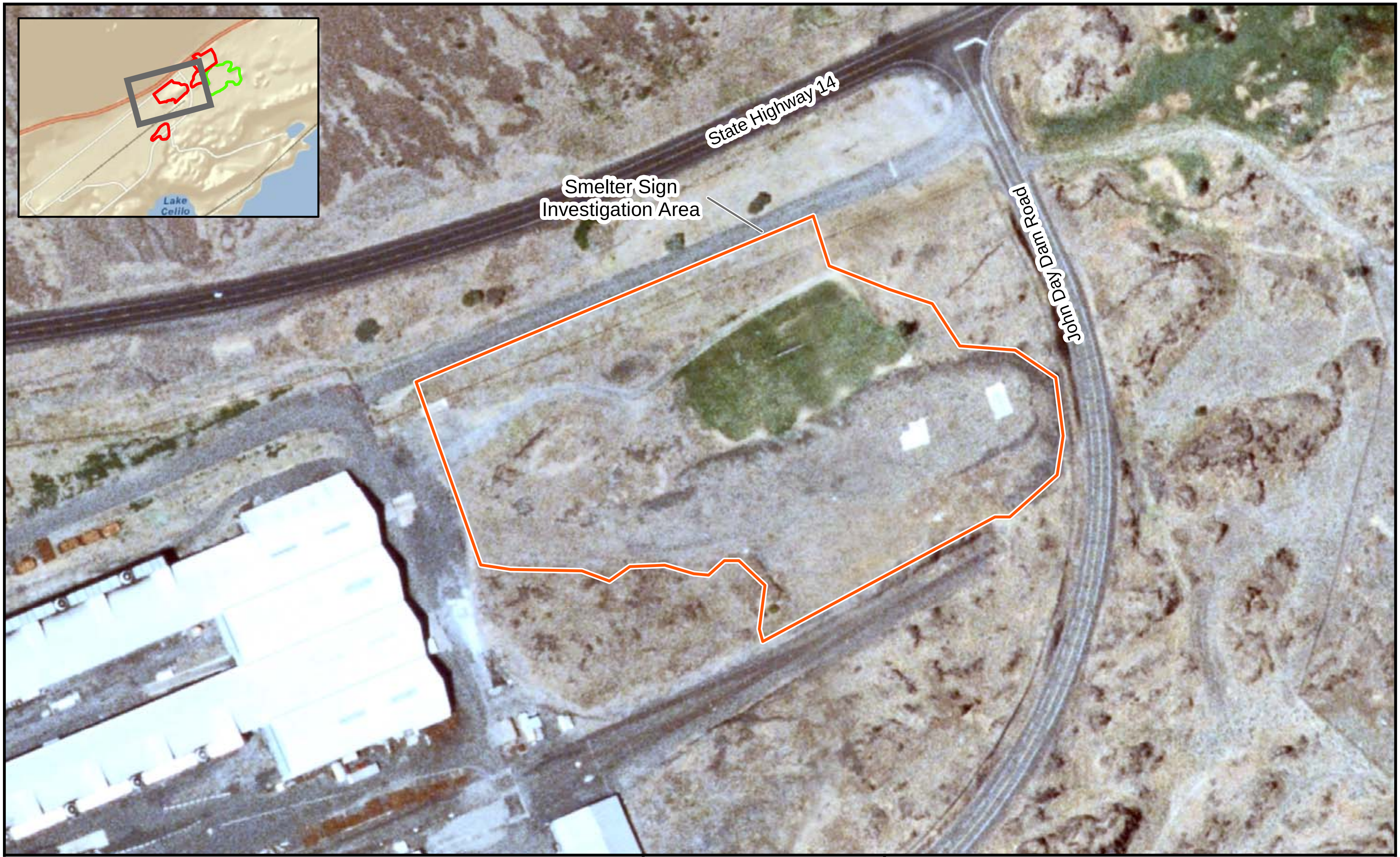
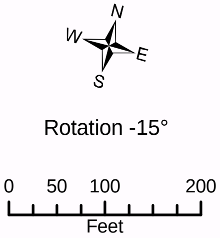


Legend

🟧 Investigation Area

Imagery Data Sources: NAIP 2009



TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 2006

Revision Date: 03/02/2011

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Legend

🟧 Investigation Area

Imagery Data Sources: NAIP 2009

Rotation -15°

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 1995

Revision Date: 03/02/2011

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Legend

🟧 Investigation Area

Imagery Data Sources: NAIP 2009

N
W
E
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Rotation -15°

0 50 100 200

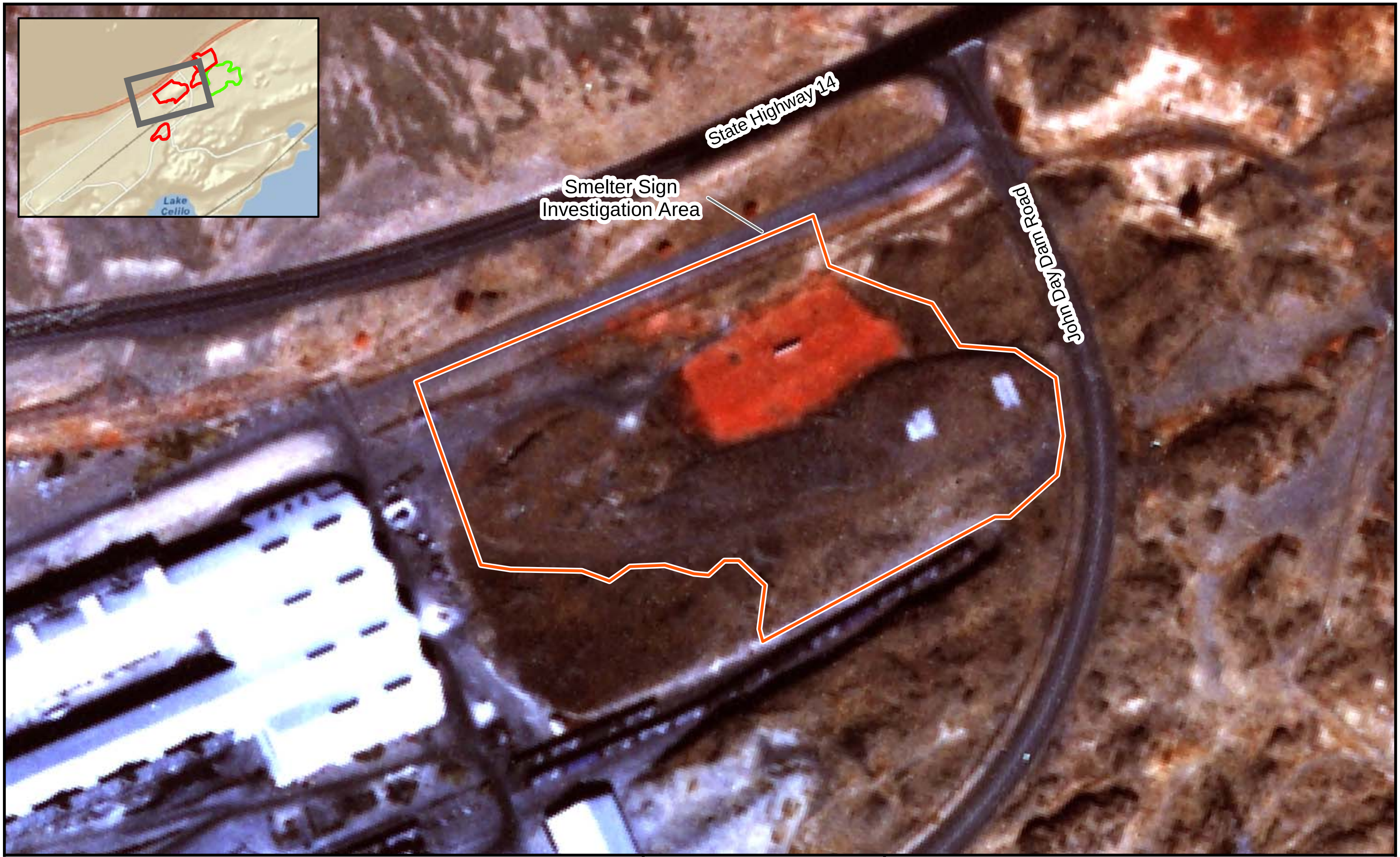
Feet

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 1992

Revision Date: 03/02/2011



Legend

🟧 Investigation Area

N W E S

Rotation -15°

0 50 100 200

Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 1989

Revision Date: 03/02/2011

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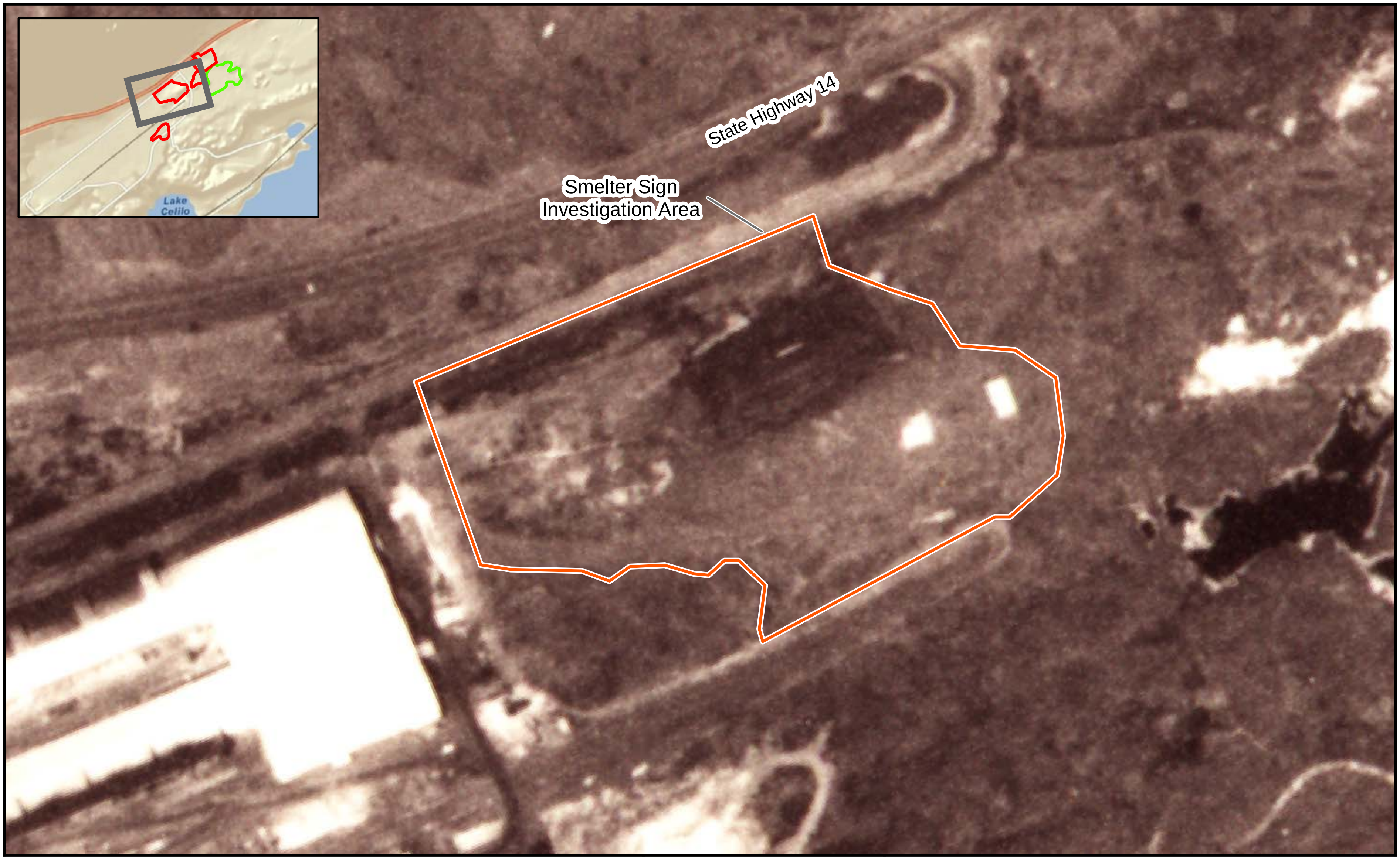

Legend

🟧 Investigation Area

N
W
E
S

Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 1979

Revision Date: 03/02/2011

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Legend

🟧 Investigation Area

N
W
E
S

Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 1978

Revision Date: 03/02/2011

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Legend

▭ Investigation Area

Rotation -15°

Imagery Data Sources: NAIP 2009

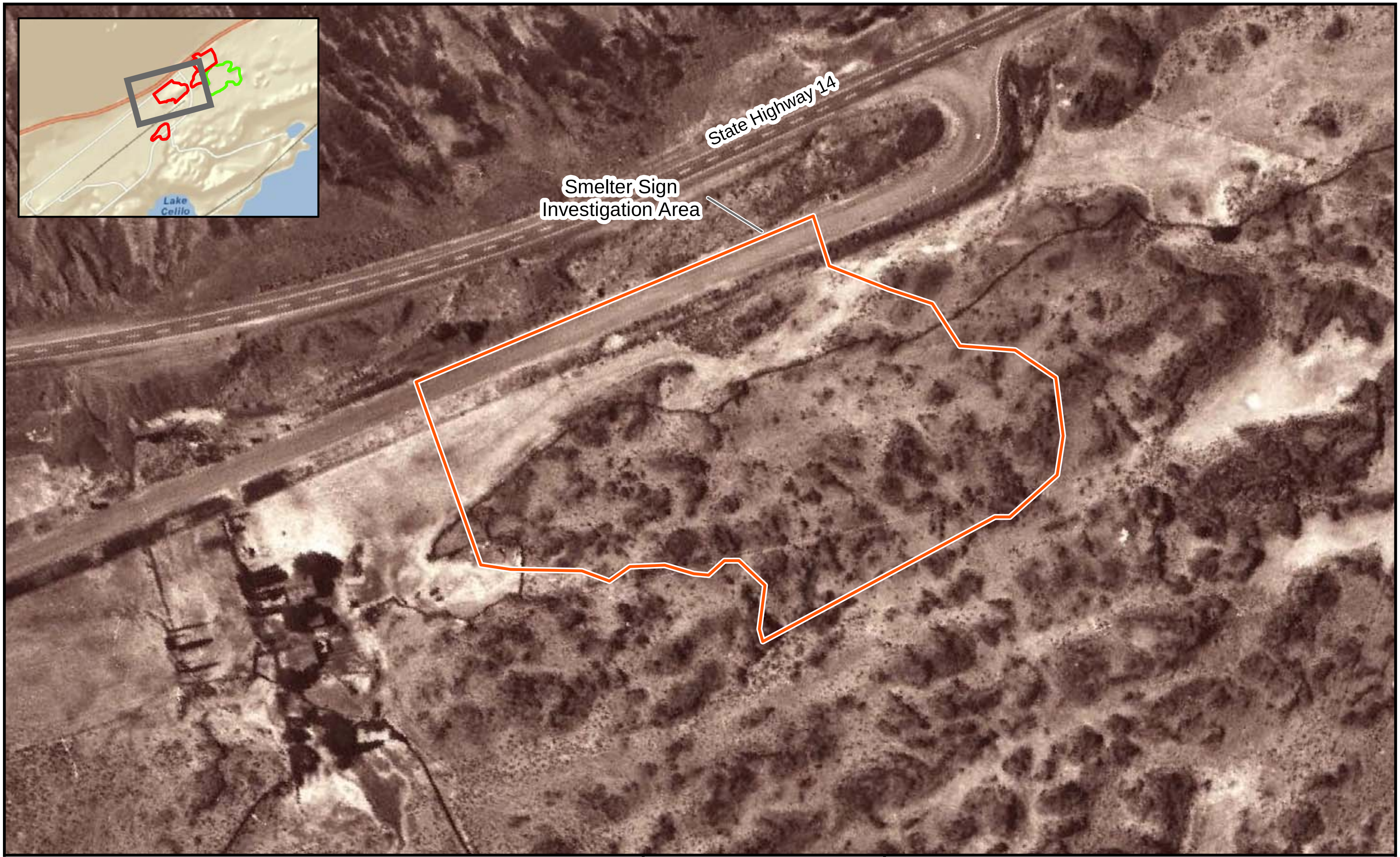
TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 1972

Revision Date: 03/02/2011

R:\projects_2011\LockheedMartin_GoldendaleSiteInvestig\maps\WorkPlan_Report_Maps\Site2_SmelterSign_WorkPlan\Appendix_MultiYear_Aerials_Site2_SmelterSign_v2.mxd Date: 03/02/2011



Legend

🟧 Investigation Area

N
W E
S

Rotation -15°

0 50 100 200
Feet

Imagery Data Sources: NAIP 2009

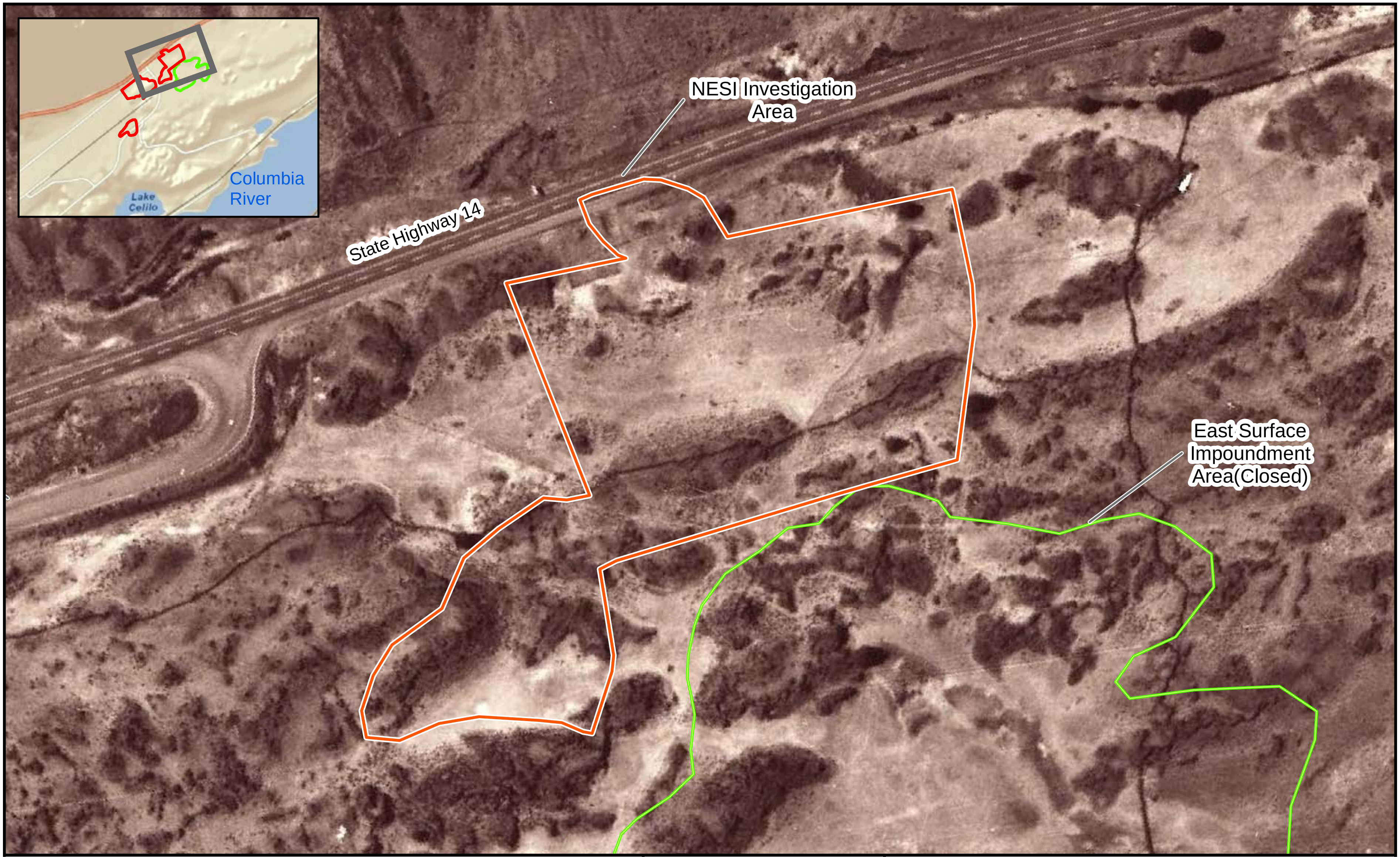
TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

Smelter Sign Investigation Area
Aerial 1967

Revision Date: 03/02/2011

R:\projects_2011LockheedMartin_GoldendaleSiteInvestigmapsWorkPlan_Report_MapsSite3_NorthESI_WorkPlanAppendix_MultiYear_Aerials_Site3_NorthESI_v2.mxd Date: 03/02/2011



Legend

🟧 Investigation Area
🟩 Impoundment Area(Closed)

Rotation -20°

Imagery Data Sources: NAIP 2009

TETRA TECH

Goldendale, Washington
2011 Three Areas Investigation

North of the East Surface Impoundment(NESI)
Investigation Area
Aerial 1967

Revision Date: 03/02/2011

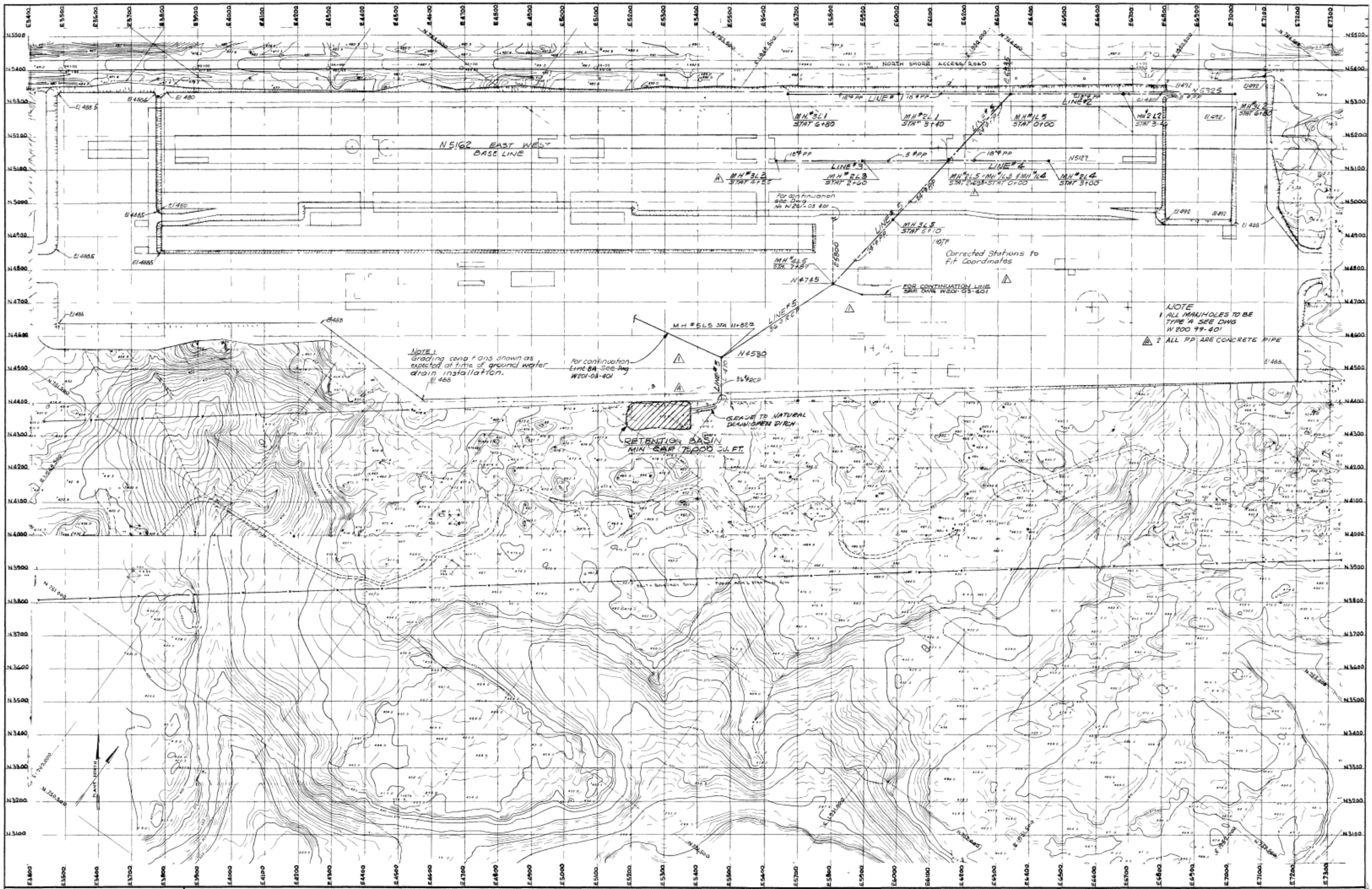
APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

Harvey Aluminum (1971a)
Groundwater Drainage Plan



NOTE:
Grading conditions shown as expected at time of ground water drain installation.

NOTE
1 ALL MANHOLES TO BE TYPE 'A' SEE DWG W 200 99-401
△A 2 ALL PP ARE CONCRETE PIPE

BUSINESS CONFIDENTIAL

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REFERENCE DWGS
W 201-03-401
W 201-03-402
W 201-03-403
W 201-03-404
W 103-99-411
W 200-99-401

NO	REVISION	DATE	BY	APP'D
A	CHANGED JTP #3L2 & 3L3 & ADD	—	—	—
	NOTE #2 REMOVED [illegible]	—	—	—
	ADDED DRAIN DET & E [illegible]	[illegible]	[illegible]	[illegible]
1	CORR'T COORDS MH 2, 3 & 6	—	—	—
	& LINE 5 Added NOTE 1	—	—	—
	RETENTION BASIN	3 9 70	[illegible]	[illegible]
△3	AS BUILT	[illegible]/70	[illegible]	
△4	AS BUILT; SUPERCEDES △3	11/30/70	[illegible]	

APPROVED FOR CONSTRUCTION

ENGINEERING STAFF	INIT.	DATE
DESIGN ENGINEER	[illegible]	10 28 69
CHIEF ELECTRICAL ENGINEER		11/26/69
CHIEF PROCESS ENGINEER		11/28/69
CHIEF DESIGN ENGINEER A & E		1 X 69
CHIEF PROJECT ENGINEER		11/28/69

HARVEY ALUMINUM
(INCORPORATED)
TORRANCE, CALIFORNIA
PLANT LOCATION JOHN DAY, WASHINGTON
FACILITY — REDUCTION PLANT
SUB FACILITY — LAND AND DEVELOPMENT

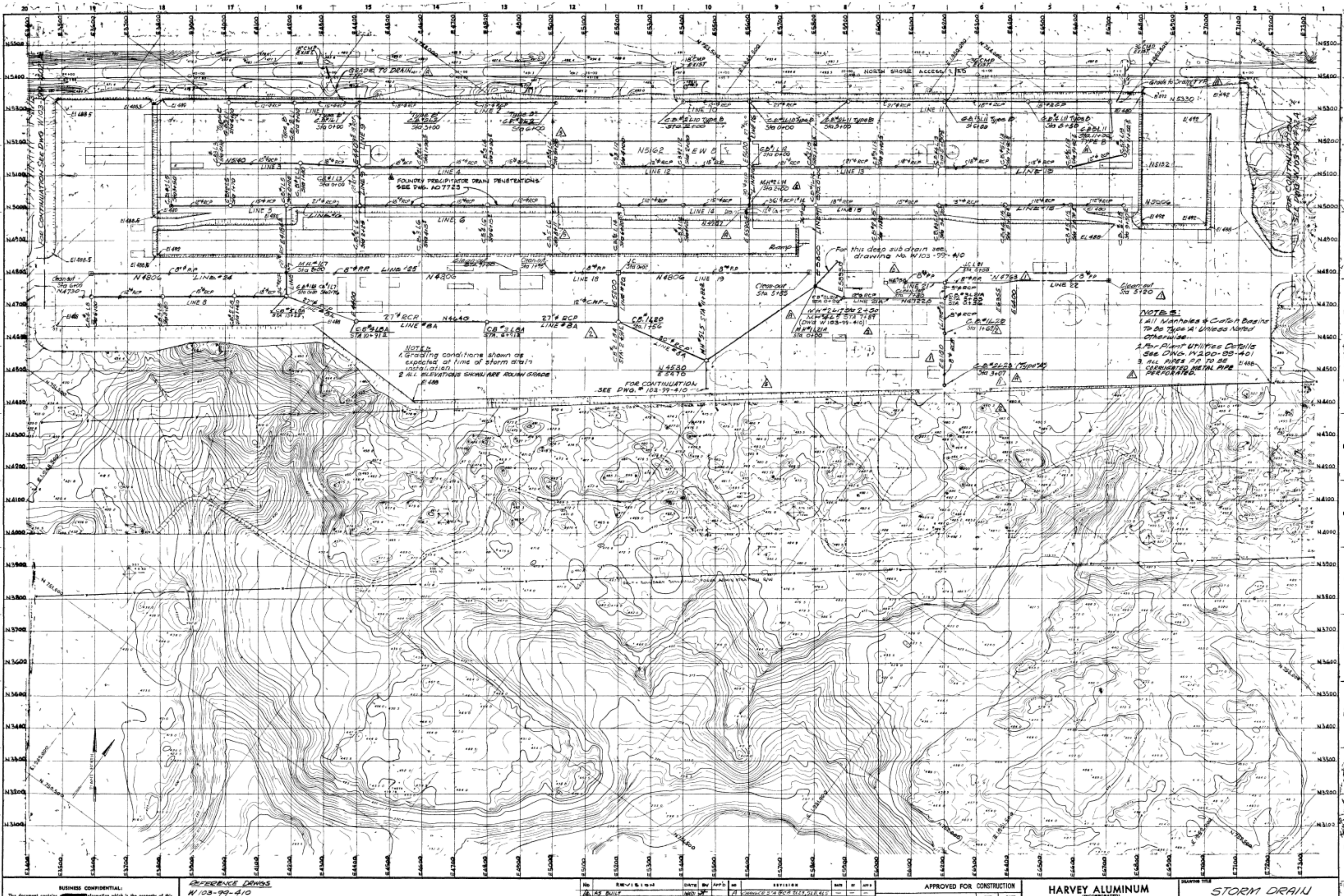
DRAWING TITLE
GROUND WATER DRAIN PLAN

	INIT	DATE	SCALE 1" = 100'
DRN BY		8 27 69	JOB NO A0/0051
CKD BY		10 28 69	DWG NO W103-99-410
DESIGN ENG	[illegible]	10 28 69	

APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

Harvey Aluminum (1981)
Storm Drain Plan



NOTE:
1. Grading conditions shown as expected at time of storm drain installation.
2. ALL ELEVATIONS SHOWN ARE ROUGH GRADE

NOTES:
1. All Manholes & Catch Basins To Be Type 'A' Unless Noted Otherwise.
2. For Plant Utilities Details See DWG. W200-99-401
3. ALL PIPES P.P. TO BE CORRUGATED METAL PIPE PERFORATED.

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REFERENCE DRWGS
W 103-99-410
W 103-99-411
W 200-99-401
W 201-03-402
W 201-03-403
W 201-03-404

No	REVISION	DATE	BY	APP'D
△4	AS BUILT	[illegible]	[illegible]	
△5	AS BUILT; SUPERCEDES △4	[illegible]	[illegible]	
△6	DRAIN PENETRATION NOTE	6/19/81	TJF	

NO	REVISION	DATE	BY	APP'D
A	CHANGED STA @ CB 2L23, 2L11, 4L5	—	—	—
	ADDED 12"#RCP @ LINE 23	[illegible]	[illegible]	[illegible]
1	CHANGED COORDINATE @ LINE #22	—	—	—
	& STAT. @ LINE #21 & 22	1-6-70	[illegible]	[illegible]
2	CHANGED COORD @ LINE 22 & STA @	—	—	—
	MH #2L17 & MH #2L14	—	—	—
	ADDED LINE #8, 21 & CATCH BASINS	3-9-70	[illegible]	[illegible]
3	RELEASED 'HOLD' AREA & ADDED	—	—	—
	LINE 21A & 2 CATCH BASINS	3-11-70	[illegible]	[illegible]

APPROVED FOR CONSTRUCTION

ENGINEERING STAFF	INIT.	DATE
DESIGN ENGINEER	[illegible]	10.28.69
CHIEF ELECTRICAL ENGINEER	[illegible]	10/28/69
CHIEF PROCESS ENGINEER	[illegible]	10/28/69
CHIEF DESIGN ENGINEER, A & E	[illegible]	10/2?/69
CHIEF PROJECT ENGINEER	[illegible]	10/29/69

HARVEY ALUMINUM
(INCORPORATED)
TORRANCE, CALIFORNIA
PLANT LOCATION JOHN DAY, WASHINGTON
FACILITY — REDUCTION PLANT
SUB FACILITY — PLANT AND SITE UTILITIES

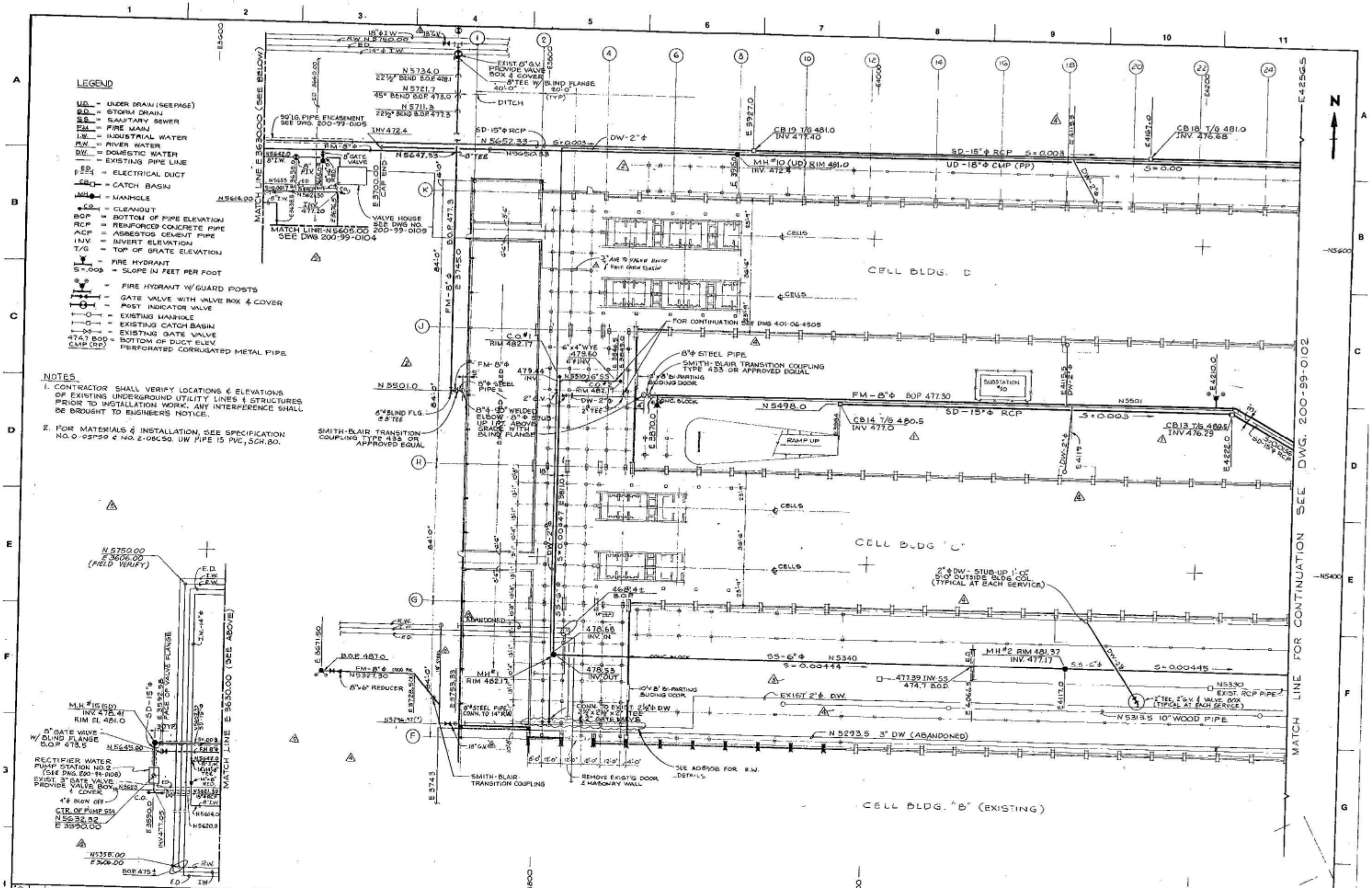
DRAWING TITLE
STORM DRAIN PLAN

	INIT.	DATE	
DRN BY	[illegible]	8-28-69	SCALE 1" = 100'-0
CKD BY	[illegible]	9-23-69	JOB NO. A0/0193
DESIGN ENG	[illegible]	10 28 69	DWG NO. W201-03-401

APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

Martin Marietta (1980)
Cell Addition Site Utilities Plan



LEGEND

U.D. = UNDER DRAIN (SEEPAGE)
S.D. = STORM DRAIN
S.S. = SANITARY SEWER
F.M. = FIRE MAIN
I.W. = INDUSTRIAL WATER
R.W. = RIVER WATER
D.W. = DOMESTIC WATER
— = EXISTING PIPE LINE
ED = ELECTRICAL DUCT
CB = CATCH BASIN
MH = MANHOLE
CO = CLEANOUT
BOP = BOTTOM OF PIPE ELEVATION
RCP = REINFORCED CONCRETE PIPE
ACP = ASBESTOS CEMENT PIPE
INV. = INVERT ELEVATION
T/G = TOP OF GRATE ELEVATION
= FIRE HYDRANT
S=.003 = SLOPE IN FEET PER FOOT
= FIRE HYDRANT W/GUARD POSTS
= GATE VALVE WITH VALVE BOX & COVER
= POST INDICATOR VALVE
= EXISTING MANHOLE
= EXISTING CATCH BASIN
= EXISTING GATE VALVE
474.7 BOD = BOTTOM OF DUCT ELEV.
CMP (PP) PERFORATED CORRUGATED METAL PIPE

NOTES

1. CONTRACTOR SHALL VERIFY LOCATIONS & ELEVATIONS OF EXISTING UNDERGROUND UTILITY LINES & STRUCTURES PRIOR TO INSTALLATION WORK. ANY INTERFERENCE SHALL BE BROUGHT TO ENGINEER'S NOTICE.

2. FOR MATERIALS & INSTALLATION, SEE SPECIFICATION NO. 0-05P50 & NO. 2-08C50. DW PIPE IS PVC, SCH. 80.

NO.	DATE	REVISION
7	2-9-83	ADDED AIR PIPING TO CATCH BASIN & VALVE HOUSE
6	11-13-81	ADDED ELEC. SUBSTATION #20
		RELOCATED 14"x8" RED (I.W.) NEAR P.S. NO. 2
5	9-11-81	RELOCATED VALVE HOUSE & REV. PIPING
4	10-7-80	ADDED 2"Φ DW, RELOCATE PUMP STA & 8"Φ FM
3	9-9-80	ADDED F.M. DW, SD & I.W.
2	8-19-80	DELETED FM AT N5635 & PIV
1	7-8-80	CHG. IN T/G EL., RIM EL.

REFERENCE DRAWINGS	
A10281	AIR SUPPLY TO VALVE HOUSE
401-06-4505	PLANS, SECS. - PLUMBING & HVAC
200-99-0109	VALVE HOUSE - RECTIFIER DELUGE SYSTEM
200-99-0108	RECTIFIER WATER PUMP STA. NO. 2
200-99-0105	SITE UTILITIES - SECTIONS & DETAILS
200-99-0104	SITE UTILITIES - PLAN - SHEET 4
200-99-0102	SITE UTILITIES - PLAN - SHEET 2

NO	NOTES	DATE	BY
8	REV TO RW. F-4 & A-4	10-30-81	REP

CONSTRUCTION APPROVAL

APPROVED FOR CONSTRUCTION

APPROVAL	DATE	APPROVAL	DATE
George Steele	6/2/80	J.J. Koehler	6/23/80
Otto Palm	6/24/80	DK Mowbs	6/24/80

		DATE
SCALE	1" = 20'-0"	
DESIGNED BY	U. BHAUMIK/T.C.	6-23-80
DRAWN BY	B. ANGLE	6-20-80
CHECKED BY	U. BHAUMIK/E. YETZ	6-25-80
APPROVED BY	E. F. Yenzi	6-25-80
APPROVED BY		

PROFESSIONAL SEAL

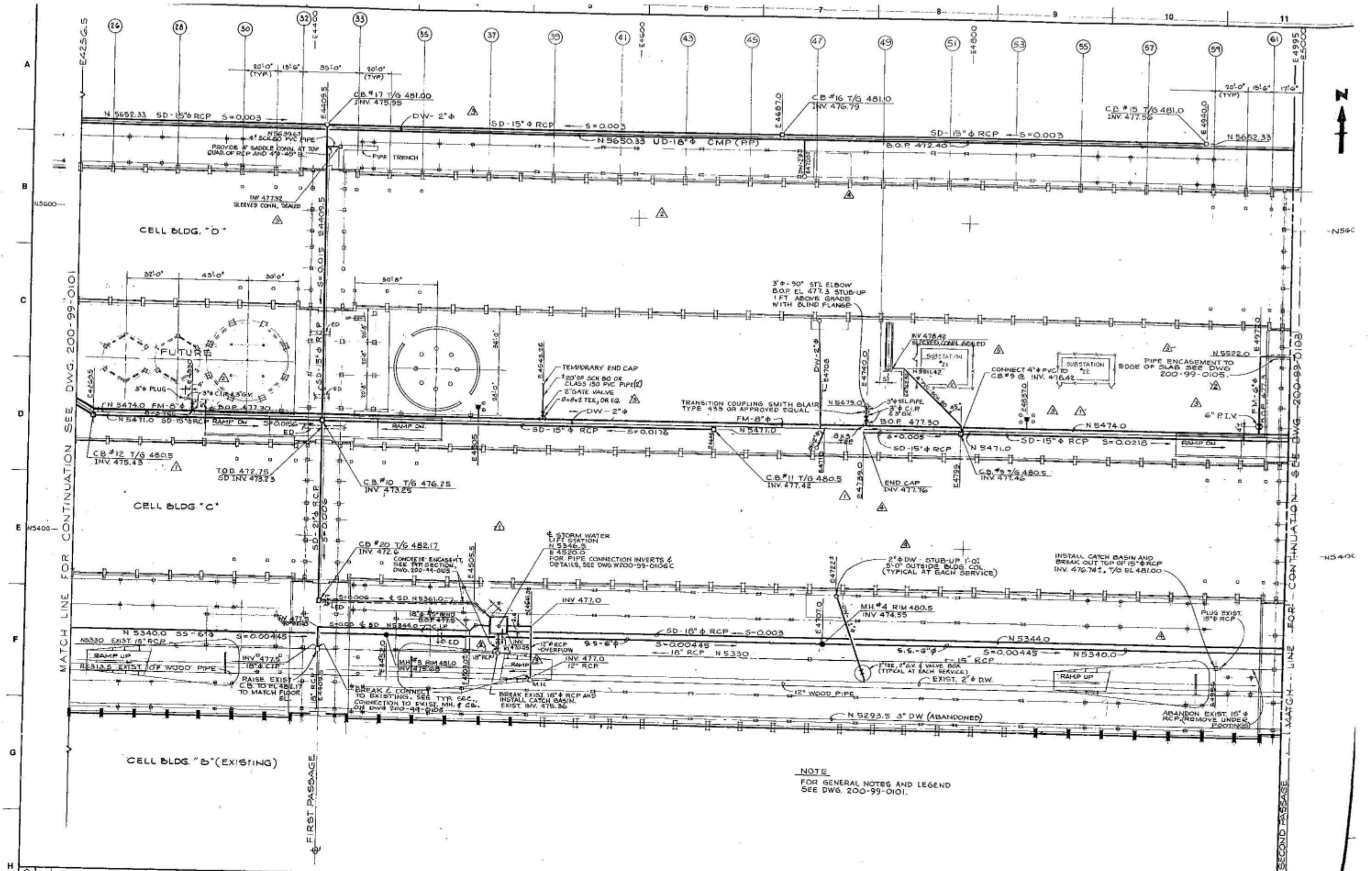
AS BUILT

KAISER ENGINEERS

MARTIN MARIETTA GOLDENDALE PLANT

CELL ADDITION PROGRAM

SITE UTILITIES PLAN - SHEET 1



NOTE
FOR GENERAL NOTES AND LEGEND SEE DWG. 200-99-0101.

AS BUILT

NO.	DATE	REVISION	BY	APP.	APP.
6	7-20-82	ADDED ELEC. SUBSTATIONS #21 & #22			
5	3-2-81	ADDED 4"Φ PVC DRAINS			
4	3-30-81	EXTEND 15" SD & ADDED 2"Φ DW & C.B.			
3	[illegible]	ADDED 2"Φ DW, ADDED SD ELEV., ADDED P.I.V.			
2	[illegible]	DELETED FM AT N5635, ADDED CB & 18"Φ RCP			
1	[illegible]	RELOCATE LIFT STATION, REV. ELEVATIONS			

REFERENCE DRAWINGS

200-99-0106	STORM WATER LIFT STATION
200-99-0105	SITE UTILITIES SECTIONS & DETAILS
200-99-0103	SITE UTILITIES PLAN - SH. 3
200-99-0101	SITE UTILITIES PLAN - SH. 1

NOTES

CONSTRUCTION APPROVAL

APPROVED FOR CONSTRUCTION

APPROVAL	DATE	APPROVAL	DATE
George Steele		U. Kettinger D.K. Morton	

		DATE
SCALE	1" = 20'-0"	
DESIGNED BY	U. BHAUMIK/T.C.	6-23-80
DRAWN BY	B. ANGLE	6-20-80
CHECKED BY	U. Bhaumik/E. Yeezi	6-25-80
APPROVED BY	E. F. Yezzi	6-25-80
APPROVED BY		6-26-80

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PROFESSIONAL SEAL

KAISER ENGINEERS

KAISER ENGINEERS, INC. 300 LAKESIDE DRIVE • P.O. BOX 23210 OAKLAND, CALIFORNIA 94623

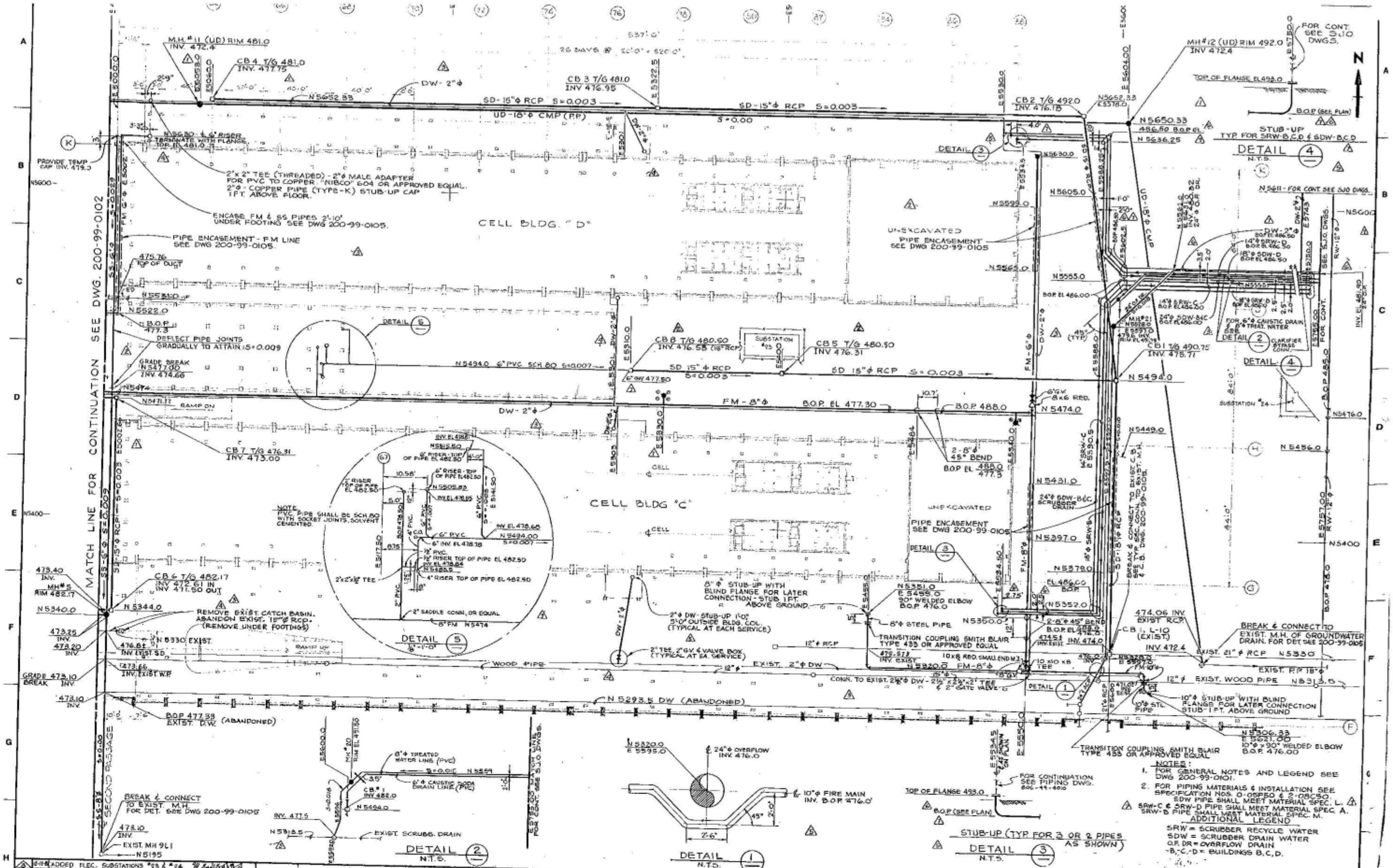
MARTIN MARIETTA GOLDENDALE PLANT

CELL ADDITION PROGRAM

SITE UTILITIES PLAN - SHEET 2

JOB No. 79185 DWG. No. W 200-99-0102C REV. R-1

AO/8629



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG 200-99-0101.
2. FOR PIPING MATERIALS & INSTALLATION SEE SPECIFICATION NOS. 0-08P50 & 2-08C50. SDW PIPE SHALL MEET MATERIAL SPEC. L. SRW-C & SRW-D PIPE SHALL MEET MATERIAL SPEC. A. SRW-B PIPE SHALL MEET MATERIAL SPEC. M.

ADDITIONAL LEGEND

SRW = SCRUBBER RECYCLE WATER
SDW = SCRUBBER DRAIN WATER
O.F. DR = OVERFLOW DRAIN
-B,-C,-D = BUILDINGS B,C,D.

AS BUILT

NO.	DATE	REVISION	BY/CHK	APP.	APP.
8	[illegible]	ADDED ELEC. SUBSTATIONS #23 & #24			
7	[illegible]	ADDED DETAIL 5, REV. ELEVATIONS FOR SCRUBBER PIPES			
6	[illegible]	REV. B.O.P. ELEV., RELOCATED EAST-WEST ALIGNMENT			
5	[illegible]	ADDED PIPING @ EAST END OF CELL BLDG "D"			
4	[illegible]	ADDED 2"φ DW & FM RISER, REV. NOTE & DELETE			
3	9-9-80	ADDED 2"φ DW & ENCASEMENT, RELOC. STUB-UP			
2	[illegible]	RELOCATE FM, CHG. T/G EL.			
1	[illegible]	RELOCATE 18"φ U.D., REV. INV. ELEVATIONS			

	REFERENCE DRAWINGS
401-06-4506	STUD CLEANING PLAN, SECT, DET.
200-99-0105	SITE UTILITIES SECTIONS & DETAILS
200-99-0102	SITE UTILITIES PLAN - SH. 2
200-99-0101	SITE UTILITIES PLAN - SH. 1

NOTES

CONSTRUCTION APPROVAL

APPROVED FOR CONSTRUCTION

APPROVAL	DATE	APPROVAL	DATE
Otto Belimann	[illegible]	JT Kettinger	[illegible]
George Steele	[illegible]	DC Howes	[illegible]

		DATE
SCALE	1" = 20'-0"	
DESIGNED BY	U. BHAUMIK/E.C.	6-23-80
DRAWN BY	B. ANGLE	6-20-80
CHECKED BY	U. Bhaumik/E.YE221	6-26-80
APPROVED BY	E. F. Yezzi	6-25-80
APPROVED BY	[illegible]	6-11-80

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PROFESSIONAL SEAL

KAISER ENGINEERS

MARTIN MARIETTA GOLDENDALE PLANT

CELL ADDITION PROGRAM

SITE UTILITIES PLAN - SHEET 3

JOB No. 79185 DWG. No. W200-99-0103C REVISION R-8

A0/0630

APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

Goldendale Aluminum (1996e)
Underground Storm and Sewer Piping Drawing

LEGEND

○———	SANITARY SEWER MANHOLE
●—— ——	INDUSTRIAL & MONITORING MANHOLE
○———	STORM DRAIN CATCH BASIN
∘———	GROUND WATER MANHOLE
———	SCRUBBER EFFLUENT MANHOLE
◎———	STORM DRAIN MANHOLE
☒———	SEWAGE EJECTOR
□———	RECTIFIER PUMP STATION
▫———	STORM DRAIN CLEAN OUT
▫—— ——	OIL TRAP
———	6" PERFORATED LINE
1 □	ELECTRICAL SUBSTATIONS
—— ——	BURIED LINE

CHEMICAL OR OIL STORAGE SOURCES
(NOT OTHERWISE NOTED)

A	CAUSTIC LINE – SECONDARY SYSTEM
B	TRANSFORMER OIL REPROCESSING STORAGE TANKS (NO LONGER IN USE)
C	DIESEL OIL STORAGE TANKS
D	LUBE OIL TANKS
E	HEATING FUEL TANK

TITLE BLOCK REVISION	C

REFERENCE DRAWING	NUMBER
GROUND WATER DRAIN PLAN	A0/0051
STORM DRAIN PLAN	A0/0193
SCRUBBER EFFLUENT PLAN	A0/0200
IR U.G. PIPING PLAN	A0/7533
SITE UTILITIES "C" LINE	A0/8628-30
RECYCLE AREA U.G. PIPING	A0/8956

REVISION	DATE	BY
1 REVISED & REDRAWN ON CAD	7/25/95	JRS
2 ADDED RIVER WATER PIPING	11/7/95	REC
3 INSERTED G.A.C. TITLE BLOCK	10/8/96	REC
4 REM'D OIL TANK BY PURCH	11/8/96	REC

GOLDENDALE ALUMINUM COMPANY

GOLDENDALE REDUCTION PLANT
FACILITY: 01 LAND & DEVELOPMENT
SUB FACILITY: 0109 U. GROUND UTILITIES

UNDERGROUND STORM & SANITARY SEWER PIPING W\ CHEM'L & OIL STR'G AREAS

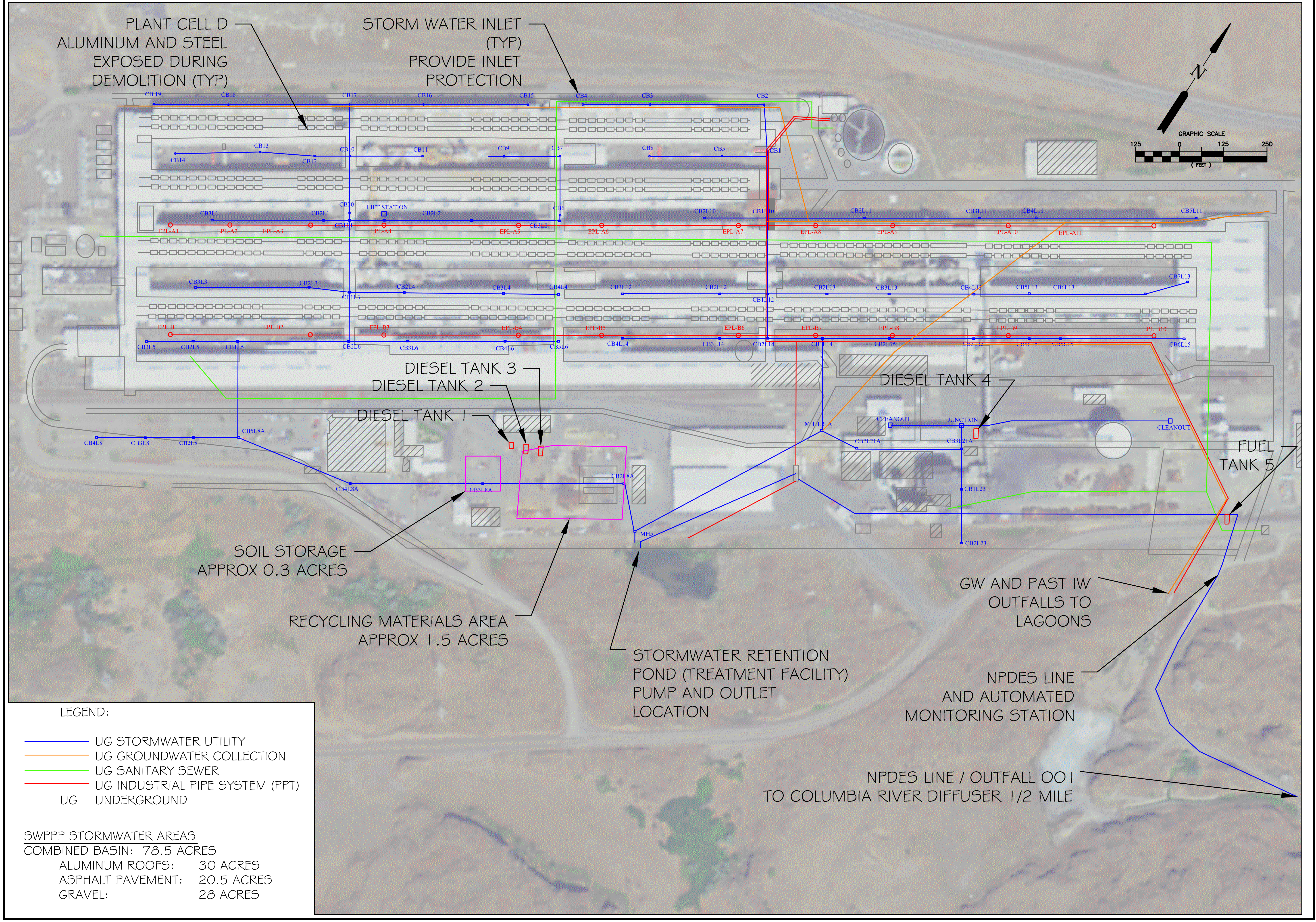
SCALE: NONE
DRN RG 10/27/86
DWG NO A1/1752
REV 4

J:\LIB\A11752 Fri Nov 08 08:08:36 1996

APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

Columbia Gorge Aluminum (2011)
Stormwater Pollution Prevention Plan Underground Utilities Figure



LEGEND:

━	UG STORMWATER UTILITY
━	UG GROUNDWATER COLLECTION
━	UG SANITARY SEWER
━	UG INDUSTRIAL PIPE SYSTEM (PPT)
UG	UNDERGROUND

SWPPP STORMWATER AREAS

COMBINED BASIN: 78.5 ACRES

ALUMINUM ROOFS:	30 ACRES
ASPHALT PAVEMENT:	20.5 ACRES
GRAVEL:	28 ACRES

Aquarius Environmental
www.aquariusenv.com

Designed: n/a
Drawn: DEK
Checked: DEK
Date: 05/03/11
Scale: 1" = 250' (11x17)

Columbia Gorge Aluminum Company
Goldendale, WA
SWPPP Site Map

REVISIONS

Rev	Date	Description

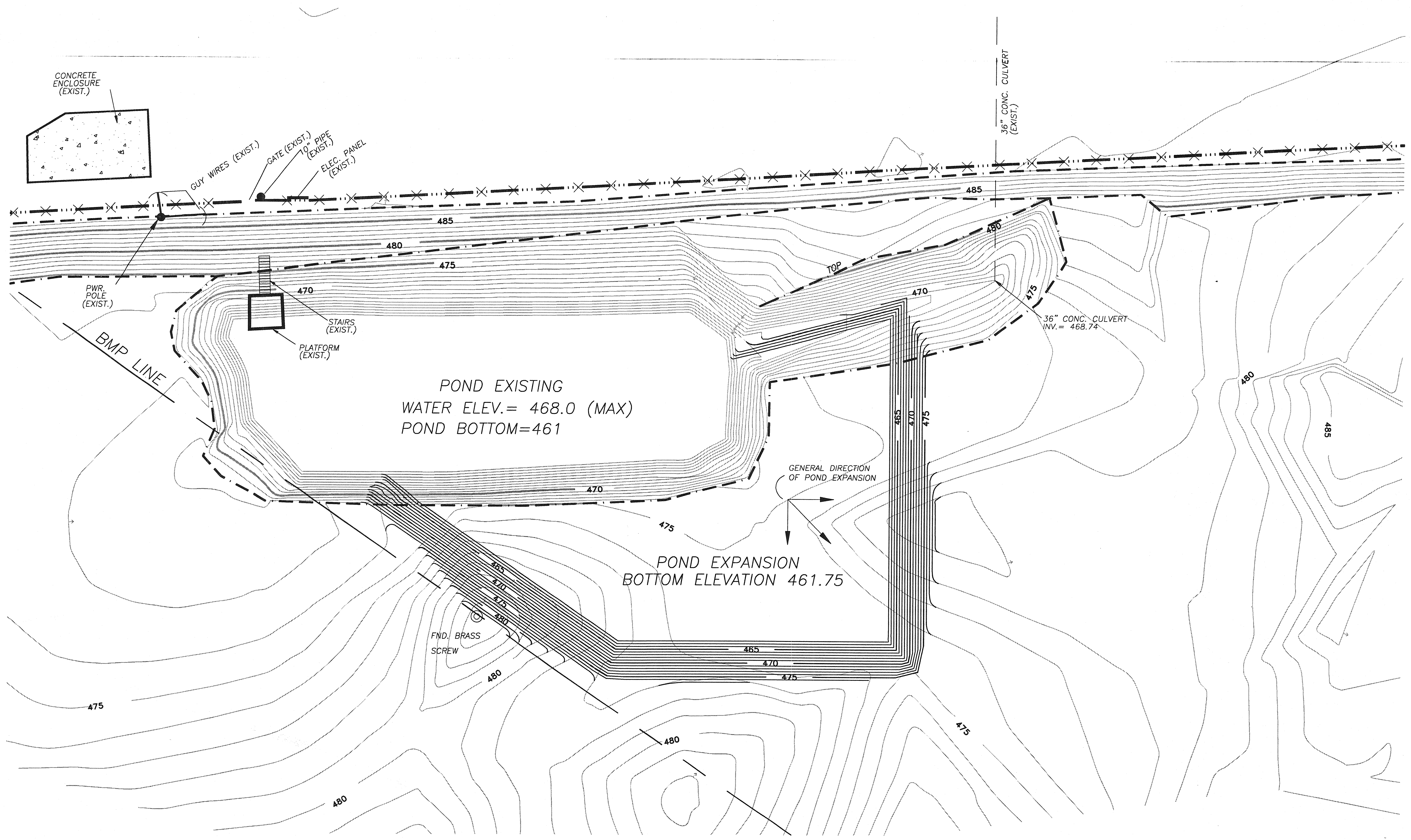
SHEET
1
1 OF 1

File: Site.dwg

APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

Lockwood Green et al. (1999)
Stormwater Pond Expansion Drawing



1 GRADING PLAN
POND EXPANSION
SCALE: 1"=20'
0 5 10 20 40

PROJECT NORTH
TRUE NORTH

NOTES:

1. EXISTING POND BOTTOM ELEVATION OF 461 BASED ON BEST AVAILABLE SURVEY DATA. CONTRACTOR TO FIELD VERIFY EXISTING BOTTOM OF POND ELEVATION. IF THE EXISTING POND BOTTOM ELEVATION IS HIGHER THAN ELEVATION 461 THE CONTRACTOR SHALL CONTACT THE ENGINEER.
2. THE POND EXPANSION AREA SHALL BE CLEARED AND GRUBBED, AND THE AREA STRIPPED OF OVERBURDEN. ALL OVERSIZE STONES, ROCK FRAGMENTS, OR BOULDERS UP TO AND INCLUDING THOSE MEASURING 18 INCHES IN THE GREATEST DIMENSION, SHALL BE UTILIZED IN THE PRODUCTION OF 1 INCH MINUS AGGREGATE BASE AND ROCK EMBANKMENT MATERIAL. ALL PRODUCTION AND STOCKPILE OF MATERALS ASSOCIATED WITH THE POND EXPANSION SHALL BE IN ACCORDANCE WITH DIVISION THREE OF THE 1998 WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.

ROBERT A. BONNEY
12520
EXP. 8/16/00

TOLERANCES
UNLESS OTHERWISE NOTED:
FRACTIONAL – ±1/16
DECIMAL -----±0.005
ANGULAR -----±2°
TITLE BLOCK REVISION C

REFERENCE DRAWING	NUMBER	REVISION	DATE	BY
		A ISSUED FOR REVIEW	1/21/99	SHD
		0 ISSUED FOR BIDDING	1/29/99	SHD

MOFFATT NICHOL & BONNEY, INC.
Consulting Engineers
1845 Northeast Couch Street, Portland Oregon 97232
Telephone (503) 232-2117, Fax (503) 232-8023

LOCKWOOD GREENE
Planners/Engineers/Architects/Managers
Knoxville, Tennessee

GOLDENDALE ALUMINUM COMPANY
GOLDENDALE REDUCTION PLANT
FACILITY: 17-YARDS AND BUILDING DRAINS
SUB FACILITY: 1701-GROUND WATER DRAINS

GRADING PLAN
POND EXPANSION
SOUTH SHIPPING BUILDING WORK

APPD	SHD	01/29-99	SCALE: 1"=30'
DRN	MHO	12/28/98	DWG NO A1/4025
CKD	SHD	01/29-99	
ENG	SHD	01/29-99	REV 0

APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

Technico Environmental Services (1991b)
Stormwater Pond Sediment Investigation Report

TECHNICO
Environmental Services
201 West 33rd Avenue
Kennewick, Washington 99337
(509) 582-7447 Fax (509) 586-7363

September 19, 1991
Project 90-17

Mr. Fred Rufner
Environmental Manager
Columbia Aluminum
85 John Day Dam Road
Goldendale, Washington 98620

Re: Polycyclic Aromatic Hydrocarbon Concentrations in the Stormwater Retention Basin Sediments

Dear Mr. Rufner:

Part of our workplan for evaluating the surface and groundwater quality in the vicinity of the Columbia Aluminum Plant was to determine the concentrations of polycyclic aromatic hydrocarbons (PAHs) in the stormwater retention basin (SWRB).

Initially, three samples were analyzed by the Washington State Department of Ecology (WDOE) gravimetric method in accordance with WAC 173 303. The method requires analysis of the samples through successive stages until the result obtained is less than 1% by weight, or until the fourth stage has been completed. By definition, PAH concentrations greater than 1% are considered extremely hazardous waste and would probably mean the SWRB would have to be cleaned up, and that these wastes cannot, by definition, be left in place.

Table 1 shows the PAH concentrations in the SWRB to be 0.84%, 1.13%, and 0.66%, as compared to the extremely hazardous waste concentration of 1%. A fourth sample was taken in soils as deep as could be dug, 49 feet southwest of the SWRB. Table 1 shows the PAH concentration in the soil was less than the detection limit of 0.05%.

The fifth column of Table 1 indicates the PAH concentrations in milligram per kilogram (mg/kg) and shows that even the WDOE procedure detection limit of 0.05% is equivalent to a level of less than 500 mg/kg. Industrial cleanup levels cited in the Model Toxics Control Act for PAH concentrations are set at 20 mg/kg.

The initial samples were analyzed by the statistical procedures in Section 1 of SW 846, the Environmental Protection Agency's (EPA's) test methods for evaluating solid waste. An estimate of the mean and variance of the SWRB PAH concentration based on these three samples indicated the mean was approximately 0.887%, but that about 13 samples would be required to say with confidence whether the mean would be above or below the regulatory threshold of 1%.

Thirteen random samples were removed from the SWRB. Because of the WDOE sampling method's inability to detect lower concentrations, it was decided that the 13 samples would be analyzed using Test Method 8310 with SW 3550 as an extraction method.

Table 2 shows the concentrations of PAHs in the SWRB sediments. The table lists the compounds found at each location, along with the total concentration in micrograms per kilograms (ug/kg). The bottom row of the table also indicates the total percent of PAHs in the sediment. Figure 1 shows the measured percentages of PAHs in each of the 13 samples as compared to the 1% PAH concentration defined as extremely hazardous waste.

The new estimate of the mean concentration in the SWRB is 1.88%. Statistical calculations indicate that 13 samples is an adequate number to say with confidence that the 1.88% concentration is above the regulatory threshold of 1%.

My interpretation of this data is that the concentration of PAHs in the sediments in the SWRB are high enough that this basin must be cleaned up in order to comply with the requirements of the Model Toxics Control Act. However, I am not certain that these materials are an extremely hazardous waste because the designation occurs only as a result of the WDOE gravimetric procedure. I think you and I should both evaluate the dangerous waste regulations and the Model Toxics Control Act for the implications of these findings.

I am looking forward to our discussion on September 20.

Sincerely,

John A. Zillich

JAZ:jlh

Attachments: Table 1 - SWRB Sediment PAH Concentrations vs. Hazardous Waste and Cleanup Levels
Table 2 - SWRB PAH Concentrations as Measured by EPA Method 8310
Figure 1 - PAH Concentrations in SWRB Sediments as Compared to the 1% Extremely Hazardous Waste Concentrations

Table 1.

Storm Water Retention Basin Sediment PAH Concentrations VS Hazardous Waste and Cleanup Levels as Measured by WDOE Gravimetric Method

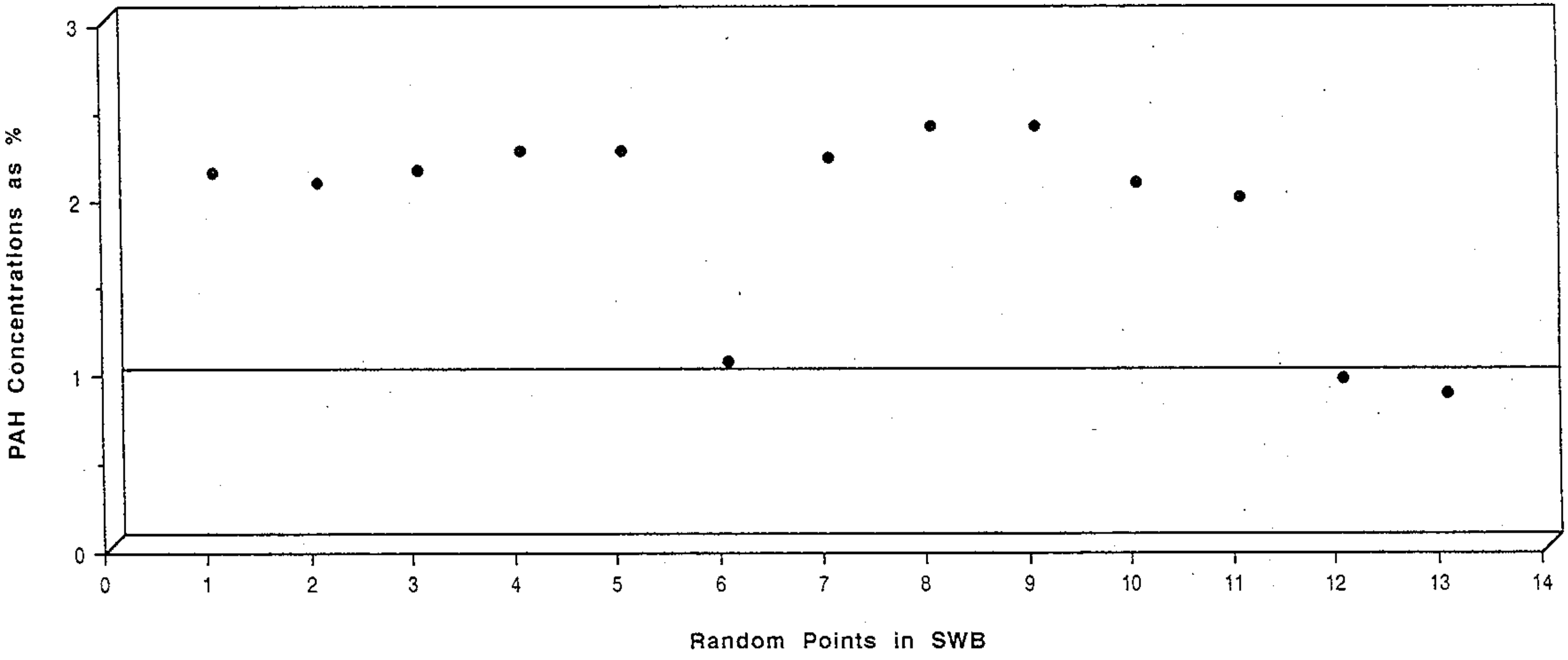
	Measured Concentrations		Industrial	Hazardous
Sample Location	PAH as mg/kg	PAH as %	Cleanup Levels (mg/kg)	Waste Designations (%)
SWRB Inlet	840	0.84	20	1.0
SWRB Middle	1130	1.13	20	1.0
SWRB West End	660	0.66	20	1.0
49' SW of SWRB	<500	<0.05	20	1.0

Table 2. Stormwater Retention Basin Sediment PAH Concentrations (mg/Kg) as Measured by EPA Method 8310 (HDLC)

Compound ug/Kg	RB2	RB4	RB5	RB6	RB7	RB8	RB9	RB10	RB11	RB12	RB15	RB19	RB20
Naphthalene	< 225000	< 245000	< 225000	< 195000	45000	< 155000	38000	39000	< 19500	1800	26000	< 135000	< 1600
Acenaphthylene	3700000	4100000	4400000	4300000	4400000	1700000	4600000	4900000	4700000	4200000	4100000	1800000	16000
Fluorene	120000	150000	160000	150000	180000	68000	180000	170000	16000	160000	170000	42000	420
Acenaphthene	< 225000	< 245000	< 225000	< 195000	< 145000	< 155000	< 165000	< 185000	< 195000	< 180000	< 170000	< 135000	< 1600
Phenanthrene	1100000	1000000	110000	1200000	1300000	590000	1300000	1300000	1300000	1200000	1100000	420000	4300
Anthracene	170000	160000	200000	220000	200000	77000	180000	210000	220000	200000	150000	64000	650
Fluoranthene	2500000	2200000	2600000	2600000	2800000	1200000	2500000	2900000	2900000	2500000	2300000	1100000	8800
Pyrene	3000000	2800000	3100000	3400000	3300000	1500000	3100000	3400000	3500000	2900000	2700000	1200000	11000
Chrysene	1600000	1400000	1700000	1600000.3	1600000	710000	1600000	1700000	1700000	1500000	1400000	720000	5500
Benzo(a)anthracene	1600000	1500000	1600000	1700000	1700000	650000	1600000	1800000	1800000	1500000	1400000	650000	5500
Benzo(b)fluoranthene	2800000	2700000	2800000	2700000	2700000	1400000	2700000	2900000	2900000	2500000	2500000	1300000	1100
Benzo(k)fluoranthene	1000000	1000000	1100000	920000	1100000	510000	1000000	1100000	1200000	990000	980000	410000	4200
Benzo(a)pyrene	1400000	1400000	1400000	1500000	1400000	730000	1400000	1500000	1600000	1300000	1300000	640000	6100
Dibenzo(ah)anthracene	< 3700	< 4050	< 3700	< 3300	< 2400	< 2550	< 2800	< 3100	< 3300	< 3050	< 2850	< 2250	< 265
Indeno(123,cd)pyrene	910000	930000	940000	940000	830000	500000	890000	930000	980000	800000	810000	450000	4300
Benzo(ghi)perylene	660000	680000	680000	660000	560000	360000	620000	640000	680000	560000	590000	340000	3300
Total as mg/Kg	21013700	20514050	21243700	22283300	22262400	10307550	21875800	23677100	23713800	20494850	19698850	9408250	845350
Total as %	2.101	2.051	2.124	2.228	2.226	1.031	2.188	2.368	2.371	2.049	1.970	0.941	0.845

Note: < values are 1/2 the actual detection limits.

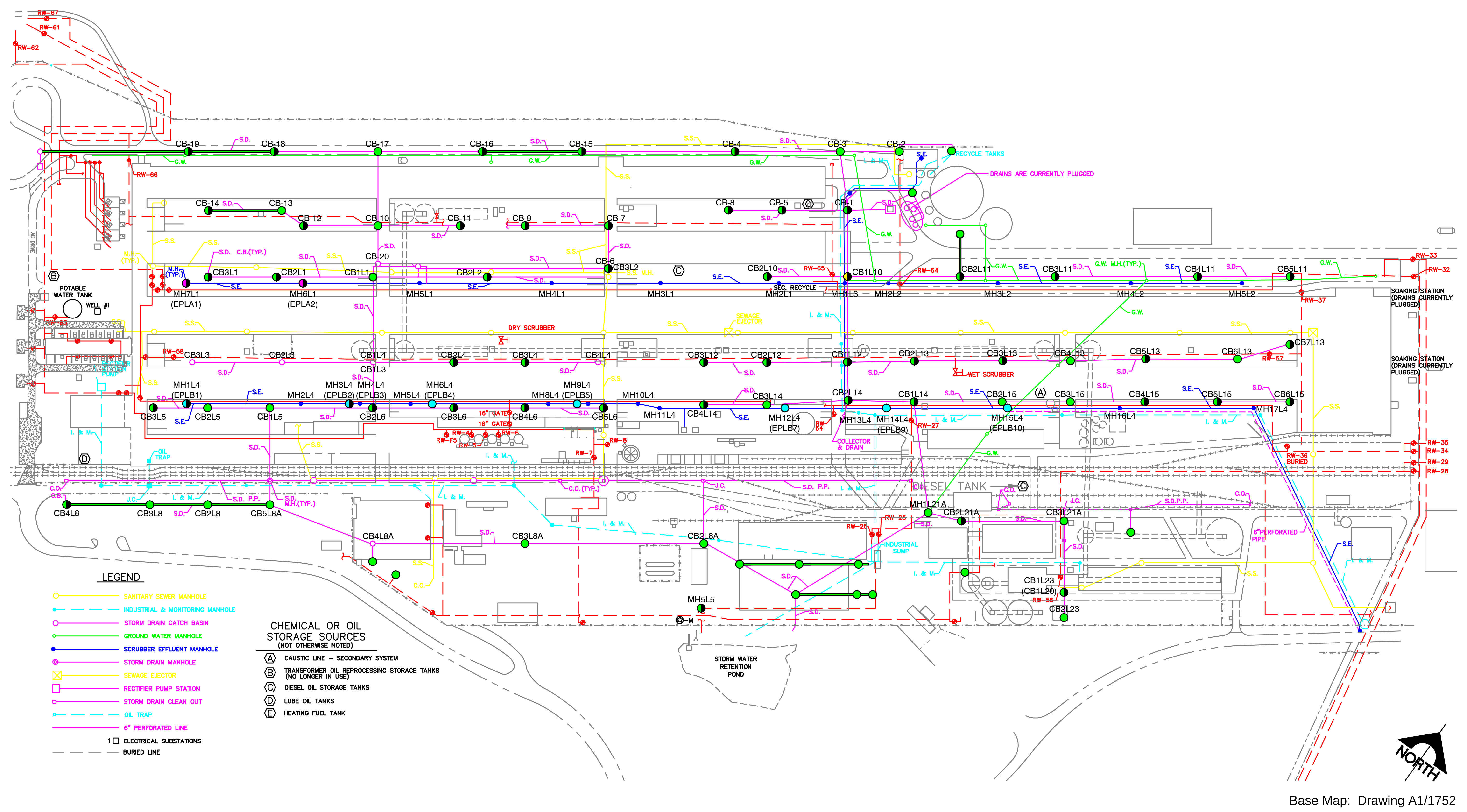
Figure 1 PAH Concentrations in SWRB Sediments as Compared to the 1% Extremely Hazardous Waste Concentrations



APPENDIX A-32

SWMU #32 – Stormwater Pond and Appurtenant Facilities

PGG (2012b)
Stormwater Catch Basin Sample Results and Figure



Base Map: Drawing A1/1752

DATE: JUNE 2012

PGG
PLATEAU GEOSCIENCE GROUP LLC
Po Box 1020
Battle Ground, WA 98604

LEGEND

SAMPLE LOGS ARE IN APPENDIX A

ELECTROSTATIC PRECIPITATOR REDWOOD LINES

●	MH7L1 (EPLA1)	MANHOLE WOOD SAMPLE
●	MH4L4 (EPLB3)	MANHOLE SEDIMENT SAMPLE
●	MH1L4 (EPLB1)	MANHOLE WOOD AND SEDIMENT SAMPLE

STORM DRAIN LINES

●	CATCH BASIN SEDIMENT SAMPLE
●	CATCH BASIN SEDIMENT SAMPLE AND CATCH BASIN CLEANED
●	CATCH BASIN CLEANED, NO SEDIMENT SAMPLE
○━━━○	STORM LINE CLEANED

FIGURE 3

STORM DRAIN LINE AND ELECTROSTATIC PRECIPITATOR EFFLUENT LINE SAMPLE LOCATION MAP

COLUMBIA GORGE ALUMINUM COMPANY
Goldendale Aluminum Smelter
Goldendale, Washington

Table 5 - Chemicals Detected in Catch Basin Sediment Samples

CHEMICALS	**MTCA Method B Screening Values (mg/kg)** [1]	**Ecological Screening Levels (mg/kg)** [2]	**STORMWATER CATCH BASIN SEDIMENT SAMPLES** [3]										
			CB-1	**CB-4**	**CB-5**	**CB-7**	**CB-8**	**CB-9**	**CB-11**	**CB-12**	**CB-14**	**CB-15**	**CB-16**
Total Metals (EPA 6010B/7471A) mg/kg													
Aluminum	80000	50	**27000**	**22000**	**51000**	**27000**	**11000**	**23000**	**16000**	**26000**	**7300**	**17000**	**9100**
Arsenic	7.6	7	< 13	**30**	**32**	**14**	< 11	< 10	**89**	**15**	< 11	**24**	**32**
Barium	16000	100	**71**	**120**	**170**	**73**	**58**	**51**	**31**	**60**	**38**	**110**	**130**
Cadmium	2	14	**0.67**	**4.3**	**6.7**	**8.2**	**4**	**4**	**8.1**	**4.5**	**2.6**	**7.6**	**3.7**
Chromium (VI)	19	420	**51**	**190**	**41**	**35**	**17**	**44**	**270**	**44**	**15**	**300**	**250**
Lead	250	120	**8**	**33**	**63**	**30**	**9.1**	**78**	**820**	**140**	**12**	**29**	**55**
Mercury	2	0.1	< 0.33	< 0.35	< 0.33	< 0.28	< 0.28	< 0.26	< 0.31	< 0.29	< 0.28	< 0.32	< 0.28
Selenium	400	0.3	< 13	< 14	< 13	< 11	< 11	< 10	< 12	< 12	< 11	< 13	< 11
Silver	400	50	<0.66	< 0.69	< 0.65	< 0.55	< 0.56	< 0.52	< 0.62	< 0.58	< 0.56	< 0.65	< 0.57
Fluoride (SM 4500-F C) mg/kg	3200		**530**	**1300**	**470**	**310**	**200**	**200**	**68**	**160**	**150**	**2000**	**1600**
Cyanide (SW846 9010/9012) ug/g													
Total Cyanide	1600		< 0.05	**2**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.25	< 0.05	< 0.05	**0.29**	**0.1**
Free Cyanide			< 0.05	**0.96**	< 0.05	**0.079**	< 0.05	< 0.05	**0.15**	< 0.05	< 0.05	< 0.05	< 0.05
PAHs (EPA 8270D/SIM) mg/kg													
Naphthalene	5	10	< 0.44	**120**	< 1.7	< 0.44	< 1.5	< 0.83	< 20	< 1.6	< 0.89	< 21	**12**
2-Methylnaphthalene	5		< 0.44	**47**	< 1.7	< 0.44	< 1.5	< 0.83	< 20	< 1.6	< 0.89	< 21	< 7.6
1-Methylnaphthalene [4]	5		< 0.44	**34**	< 1.7	< 0.44	< 1.5	< 0.83	< 20	< 1.6	< 0.89	< 21	< 7.6
Acenaphthylene	2400	20	< 0.44	< 22	< 1.7	< 0.44	< 1.5	< 0.83	< 20	< 1.6	< 0.89	< 21	<7.6
Acenaphthene	4800	20	< 0.44	**79**	**3.6**	< 0.44	< 1.5	< 0.83	< 20	< 1.6	< 0.89	< 21	**11**
Fluorene	3200	30	< 0.44	**77**	**2.4**	< 0.44	< 1.5	< 0.83	< 20	< 1.6	< 0.89	< 21	**11**
Phenanthrene	2400		**3.3**	**800**	**25**	**6.3**	**3.5**	**2.9**	**58**	**5.3**	**3.8**	**98**	**120**
Anthracene	24000		**0.49**	**250**	**3.8**	**1.1**	< 1.5	< 0.83	< 20	< 1.6	**2.8**	**21**	**32**
Fluoranthene	3200		**19**	**1500**	**96**	**42**	**49**	**23**	**160**	**74**	**8.4**	**260**	**270**
Pyrene	2400		**14**	**1300**	**73**	**30**	**38**	**14**	**100**	**66**	**6.8**	**210**	**220**
Benzo(a)anthracene	1.4	2.5	**7.5**	**550**	**35**	**13**	**15**	**4.6**	**49**	**22**	**4.3**	**93**	**92**
Chrysene	140	35	**15**	**750**	**80**	**78**	**85**	**22**	**200**	**94**	**8.9**	**190**	**160**
Benzo(b)fluoranthene	1.4		**15**	**490**	**64**	**44**	**44**	**14**	**230**	**52**	**10**	**140**	**110**
Benzo(k)fluoranthene	14	38	**8.1**	**430**		**14**	**16**	**4.2**	**66**	**18**	**4.3**	**80**	**81**
Benzo(a)pyrene	0.14	7	**9.2**	**480**	**38**	**6.6**	**4.4**	**1.9**	**40**	**5.7**	**5.3**	**74**	**80**
Ideno(1,2,3-c,d)pyrene	1.4	1.9	**6.5**	**250**	**28**	**8.3**	**6.6**	**2.5**	**55**	**8.7**	**3.7**	**50**	**52**
Dibenz(a,h)anthracene	0.14		**2**	**99**	**9.1**	**2.7**	**2.5**	**0.91**	**20**	**3.1**	**1.4**	< 21	**17**
Benzo(g,h,i)perylene	2400		**7.5**	**290**	**32**	**9.4**	**7.2**	**3.2**	**74**	**10**	**4.3**	**60**	**58**
PCBs (EPA 8082) mg/kg													
Aroclor 1016	5.6	100	< 0.066	< 0.28	< 0.065	< 0.22	< 0.056	< 0.21	< 0.25	< 0.058	< 0.22	< 0.26	< 0.057
Aroclor 1221	14		< 0.066	< 0.28	< 0.065	< 0.22	< 0.056	< 0.21	< 0.25	< 0.058	< 0.22	< 0.26	< 0.057
Aroclor 1232	14		< 0.066	< 0.28	< 0.065	< 0.22	< 0.056	< 0.21	< 0.25	< 0.058	< 0.22	< 0.26	< 0.057
Aroclor 1242	14	1.5	< 0.066	< 0.28	< 0.065	< 0.22	< 0.056	< 0.21	< 0.25	< 0.058	< 0.22	< 0.26	< 0.057
Aroclor 1248	14		< 0.066	< 0.28	< 0.065	< 0.22	< 0.056	< 0.21	< 0.25	< 0.058	< 0.22	< 0.26	< 0.057
Aroclor 1254	0.5	0.7	< 0.066	< 0.28	< 0.065	< 0.22	< 0.056	< 0.21	< 0.25	< 0.058	< 0.22	< 0.26	< 0.057
Aroclor 1260	0.5	0.7	< 0.066	< 0.28	< 0.065	< 0.22	< 0.056	< 0.21	< 0.25	< 0.058	< 0.22	< 0.26	< 0.057
Petroleum Hydrocarbons (NWTPH) mg/kg													
Lube Oil Range	2000	200	**4300**	**55000**	**4100**	**1300**	**2100**	**530**	**5400**	**3900**	**1100**	**9500**	**9800**
Diesel Range	2000	200	**370**	**15000**	**970**	< 550	**700**	< 100	**780**	**950**	< 110	**3100**	**3400**

Notes: [1] Human health screening levels based on DOE Model Toxics Control Act (MTCA) lowest value of Methods A and B. [2] Ecological screening levels based on DOE MTCA lowest values for soil for plants, invertebrates, birds or mammals. [3] See Figure 3 for location of catch basin sediment samples. Samples are discrete samples submitted to Onsite Environmental Inc. laboratory in Redmond, WA. All screening levels and analytical results are in milligrams per kilogram (mg/kg or ug/g). Chemicals that are not detected are shown as less than ("<") the practical quantitation limit (PQL). Results in **bold** are detected concentrations, results higlighted in yellow exceed human health screening levels, highlighted in gray exceed ecological screening levels, and highlighted in dark yellow exceed both human health and ecological screening levels. [4] PAHs shown in italic are carcinogenic.

Table 5 - Chemicals Detected in Catch Basin Sediment Samples

CHEMICALS	**MTCA Method B Screening Values (mg/kg) [1]**	**Ecological Screening Levels (mg/kg) [2]**	**STORMWATER CATCH BASIN SEDIMENT SAMPLES [3]**										
			CB-18	**CB-19**	**CB2L1**	**CB3L1**	**CB2L2**	**CB3L2**	**CB2L4**	**CB3L4**	**CB3L5**	**CB2L6**	**CB3L6**
Total Metals (EPA 6010B/7471A) mg/kg													
Aluminum	80000	50	**14000**	**13000**	**29000**	**35000**	**35000**	**31000**	**150000**	**29000**	**39000**	**37000**	**73000**
Arsenic	7.6	7	**18**	< 11	**53**	**35**	**27**	**33**	**14**	< 13	**22**	**20**	**26**
Barium	16000	100	**160**	**54**	**160**	**280**	**340**	**330**	**70**	**71**	**63**	**150**	**89**
Cadmium	2	14	**4.3**	**1.1**	**2.9**	**2.7**	**3.3**	**2.4**	**3**	**2.4**	**10**	**3.4**	**4.3**
Chromium (VI)	19	420	**180**	**72**	**85**	**100**	**120**	**95**	**66**	**58**	**68**	**110**	**170**
Lead	250	120	**20**	**12**	**62**	**46**	**24**	**54**	**39**	**22**	**42**	**130**	**240**
Mercury	2	0.1	< 0.30	< 0.28	< 0.36	< 0.38	< 0.31	< 0.32	**29**	< 0.32	< 0.28	< 0.33	< 0.31
Selenium	400	0.3	< 12	< 11	< 14	< 15	< 12	< 13	< 12	< 13	< 11	< 13	< 13
Silver	400	50	< 0.61	< 0.56	< 0.71	**0.9**	< 0.62	< 0.64	< 0.62	< 0.63	< 0.56	< 0.66	< 0.63
Fluoride (SM 4500-F C) mg/kg	3200		**540**	**1600**	**2000**	**2900**	**1100**	**750**	**170**	**52**	**490**	**280**	**320**
Cyanide (SW846 9010/9012) ug/g													
Total Cyanide	1600		< 0.05	**0.066**	< 0.05	< 0.05	< 0.05	< 0.05	**0.42**	< 0.05	**0.063**	**0.056**	**0.067**
Free Cyanide			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.16**	< 0.05	< 0.05	< 0.05	< 0.05
PAHs (EPA 8270D/SIM) mg/kg													
Naphthalene	5	10	< 1.6	**7.8**	< 1.9	< 2.0	< 1.6	< 8.5	< 20	< 20	< 18	< 21	< 20
2-Methylnaphthalene	5		< 1.6	**3**	< 1.9	< 2.0	< 1.6	< 8.5	< 20	< 20	< 18	< 21	< 20
1-Methylnaphthalene [4]	5		< 1.6	**1.8**	< 1.9	< 2.0	< 1.6	< 8.5	< 20	< 20	< 18	< 21	< 20
Acenaphthylene	2400	20	< 1.6	< 1.5	< 1.9	< 2.0	< 1.6	< 8.5	< 20	< 20	< 18	< 21	< 20
Acenaphthene	4800	20	**2.2**	**9.6**	**3.6**	< 2.0	< 1.6	< 8.5	< 20	< 20	< 18	< 21	< 20
Fluorene	3200	30	**2.1**	**9.5**	**2.5**	< 2.0	< 1.6	< 8.5	< 20	< 20	< 18	< 21	< 20
Phenanthrene	2400		**34**	**120**	**34**	**24**	**9.6**	**17**	**160**	**72**	**18**	**110**	**68**
Anthracene	24000		**6.7**	**35**	**8.8**	**4.2**	**1.7**	< 8.5	**27**	< 20	< 18	< 21	< 20
Fluoranthene	3200		**65**	**180**	**120**	**75**	**39**	**86**	**510**	**190**	**93**	**400**	**220**
Pyrene	2400		**49**	**130**	**110**	**66**	**31**	**88**	**430**	**160**	**56**	**320**	**180**
Benzo(a)anthracene	1.4	2.5	**25**	**58**	**55**	**31**	**15**	**47**	**290**	**120**	**36**	**180**	**100**
Chrysene	140	35	**63**	**68**	**160**	**78**	**50**	**160**	**490**	**170**	**150**	**400**	**250**
Benzo(b)fluoranthene	1.4		**45**	**51**	**120**	**78**	**41**	**130**	**490**	**210**	**140**	**600**	**230**
Benzo(k)fluoranthene	14	38	**30**	**46**	**55**	**39**	**15**	**62**	**350**	**130**	**50**	**250**	**130**
Benzo(a)pyrene	0.14	7	**24**	**53**	**49**	**27**	**12**	**42**	**420**	**190**	< 18	**220**	**120**
Ideno(1,2,3-c,d)pyrene	1.4	1.9	**19**	**28**	**43**	**31**	**11**	**38**	**260**	**120**	**26**	**310**	**92**
Dibenz(a,h)anthracene	0.14		**6.1**	**11**	**14**	**8.8**	**3.7**	**13**	**83**	**460**	< 18	**100**	**31**
Benzo(g,h,i)perylene	2400		**21**	**30**	**53**	**36**	**13**	**46**	**300**	**150**	**28**	**390**	**120**
PCBs (EPA 8082) mg/kg													
Aroclor 1016	5.6	100	< 0.061	< 0.056	< 0.071	< 0.076	< 0.062	< 0.064	< 0.25	< 0.25	< 0.22	< 0.27	< 0.25
Aroclor 1221	14		< 0.061	< 0.056	< 0.071	< 0.076	< 0.062	< 0.064	< 0.25	< 0.25	< 0.22	< 0.27	< 0.25
Aroclor 1232	14		< 0.061	< 0.056	< 0.071	< 0.076	< 0.062	< 0.064	< 0.25	< 0.25	< 0.22	< 0.27	< 0.25
Aroclor 1242	14	1.5	< 0.061	< 0.056	< 0.071	< 0.076	< 0.062	< 0.064	< 0.25	< 0.25	< 0.22	< 0.27	< 0.25
Aroclor 1248	14		< 0.061	< 0.056	< 0.071	< 0.076	< 0.062	< 0.064	< 0.25	< 0.25	< 0.22	< 0.27	< 0.25
Aroclor 1254	0.5	0.7	< 0.061	< 0.056	**1.7**	**0.2**	< 0.062	**0.38**	< 0.25	< 0.25	< 0.22	< 0.27	< 0.25
Aroclor 1260	0.5	0.7	< 0.061	< 0.056	< 0.071	< 0.076	< 0.062	< 0.064	< 0.25	< 0.25	< 0.22	< 0.27	< 0.25
Petroleum Hydrocarbons (NWTPH) mg/kg													
Lube Oil Range	2000	200	**1300**	**2100**	**5000**	**3700**	**1100**	**3800**	**25000**	**8700**	**3800**	**20000**	**13000**
Diesel Range	2000	200	**280**	**930**	**1300**	**1700**	**220**	**720**	**4100**	**1200**	**840**	**3900**	**2200**

Table 5 - Chemicals Detected in Catch Basin Sediment Samples

CHEMICALS	MTCA Method B Screening Values (mg/kg) [1]	Ecological Screening Levels (mg/kg) [2]	STORMWATER CATCH BASIN SEDIMENT SAMPLES [3]										
			CB4L6	CB5L6	CB4L8	CB1L10	CB2L10	CB2L11	CB3L11	CB4L11	CB5L11	CB1L12	CB2L12
Total Metals (EPA 6010B/7471A) mg/kg													
Aluminum	80000	50	74000	27000	14000	18000	16000	33000	36000	45000	35000	26000	16000
Arsenic	7.6	7	48	14	< 13	12	25	45	68	50	40	< 15	< 11
Barium	16000	100	100	92	62	140	120	240	120	120	82	140	51
Cadmium	2	14	7.6	3.6	< 0.64	1.6	4	16	11	6.7	9.3	2.2	2.2
Chromium	19	420	200	61	13	31	330	65	170	95	85	22	51
Lead	250	120	100	18	31	15	50	140	110	230	44	45	25
Mercury	2	0.1	0.66	0.31	< 0.32	< 0.3	< 0.27	< 0.50	< 0.38	< 0.44	< 0.35	< 0.36	< 0.28
Selenium	400	0.3	< 15	< 12	< 13	< 12	< 11	< 20	< 15	< 17	< 14	< 15	< 11
Silver	400	50	< 0.75	< 0.59	< 0.64	< 0.6	< 0.54	< 1.0	< 0.77	< 0.87	< 0.70	< 0.73	< 0.56
Fluoride (SM 4500-F C) mg/kg	3200		720	180	3500	840	1600	3900	2700	3500	3700	150	130
Cyanide (SW846 9010/9012) ug/g													
Total Cyanide	1600		0.11	< 0.05	0.36	< 0.05	< 0.05	0.1	< 0.05	0.071	< 0.05	0.13	< 0.05
Free Cyanide			< 0.05	< 0.05	< 0.05	< 0.05	0.074	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
PAHs (EPA 8270D/SIM) mg/kg													
Naphthalene	5	10	< 24	< 0.95	0.61	1.2	25	< 27	< 20	< 23	< 19	< 230	< 18
2-Methylnaphthalene	5		< 24	< 0.95	< 0.1	0.5	< 17	< 27	< 20	< 23	< 19	< 230	< 18
1-Methylnaphthalene [4]	5		< 24	< 0.95	< 0.1	< 0.48	< 17	< 27	< 20	< 23	< 19	< 230	< 18
Acenaphthylene	2400	20	< 24	< 0.95	< 0.1	< 0.48	< 17	< 27	< 20	< 23	< 19	< 230	< 18
Acenaphthene	4800	20	< 24	< 0.95	0.38	1.4	26	< 27	< 20	< 23	< 19	< 230	< 18
Fluorene	3200	30	< 24	< 0.95	0.17	1.2	28	< 27	< 20	< 23	< 19	< 230	< 18
Phenanthrene	2400		90	5.5	2.6	16	330	66	54	33	100	460	26
Anthracene	24000		< 24	< 0.95	0.47	3.9	90	< 27	< 20	< 23	24	< 230	< 18
Fluoranthene	3200		320	22	7.2	59	720	310	180	130	180	1400	72
Pyrene	2400		240	17	6.4	45	550	220	150	99	140	1200	66
Benzo(a)anthracene	1.4	2.5	130	9.8	4	25	250	96	86	130	60	860	47
Chrysene	140	35	420	22	6	95	520	290	250	500	94	1300	73
Benzo(b)fluoranthene	1.4		380	22	7.7	63	360	260	230	630	120	1500	83
Benzo(k)fluoranthene	14	38	140	11	5	29	170	110	100	270	99	880	53
Benzo(a)pyrene	0.14	7	110	11	6.2	17	180	91	82	220	76	1100	71
Ideno(1,2,3-c,d)pyrene	1.4	1.9	100	8.4	3.9	14	110	64	73	170	51	710	48
Dibenz(a,h)anthracene	0.14		35	2.6	1.2	5	38	< 27	26	57	< 19	270	< 18
Benzo(g,h,i)perylene	2400		120	10	4.6	16	120	79	87	210	62	830	57
PCBs (EPA 8082) mg/kg													
Aroclor 1016	5.6	100	< 0.30	< 0.24	< 0.26	< 0.24	< 0.22	< 0.10	< 0.077	< 0.087	< 0.070	< 0.29	< 0.22
Aroclor 1221	14		< 0.30	< 0.24	< 0.26	< 0.24	< 0.22	< 0.10	< 0.077	< 0.087	< 0.070	< 0.29	< 0.22
Aroclor 1232	14		< 0.30	< 0.24	< 0.26	< 0.24	< 0.22	< 0.10	< 0.077	< 0.087	< 0.070	< 0.29	< 0.22
Aroclor 1242	14	1.5	< 0.30	< 0.24	< 0.26	< 0.24	< 0.22	< 0.10	< 0.077	< 0.087	< 0.070	< 0.29	< 0.22
Aroclor 1248	14		< 0.30	< 0.24	< 0.26	< 0.24	< 0.22	< 0.10	< 0.077	< 0.087	< 0.070	< 0.29	< 0.22
Aroclor 1254	0.5	0.7	< 0.30	< 0.24	< 0.26	< 0.24	0.64	< 0.10	0.21	0.17	< 0.070	< 0.29	< 0.22
Aroclor 1260	0.5	0.7	< 0.30	< 0.24	< 0.26	< 0.24	< 0.22	< 0.10	< 0.077	< 0.087	< 0.070	< 0.29	< 0.22
Petroleum Hydrocarbons (NWTPH) mg/kg													
Mineral Oil	2000	200	18000	1900									
Lube Oil Range	2000	200	3800	< 590	1000	2900	5600	7900	17000	13000	6200	65000	6600
Diesel Range	2000	200	170	< 610	1600	2000	3700	1400	1400	11000	670	540	13000

Table 5 - Chemicals Detected in Catch Basin Sediment Samples

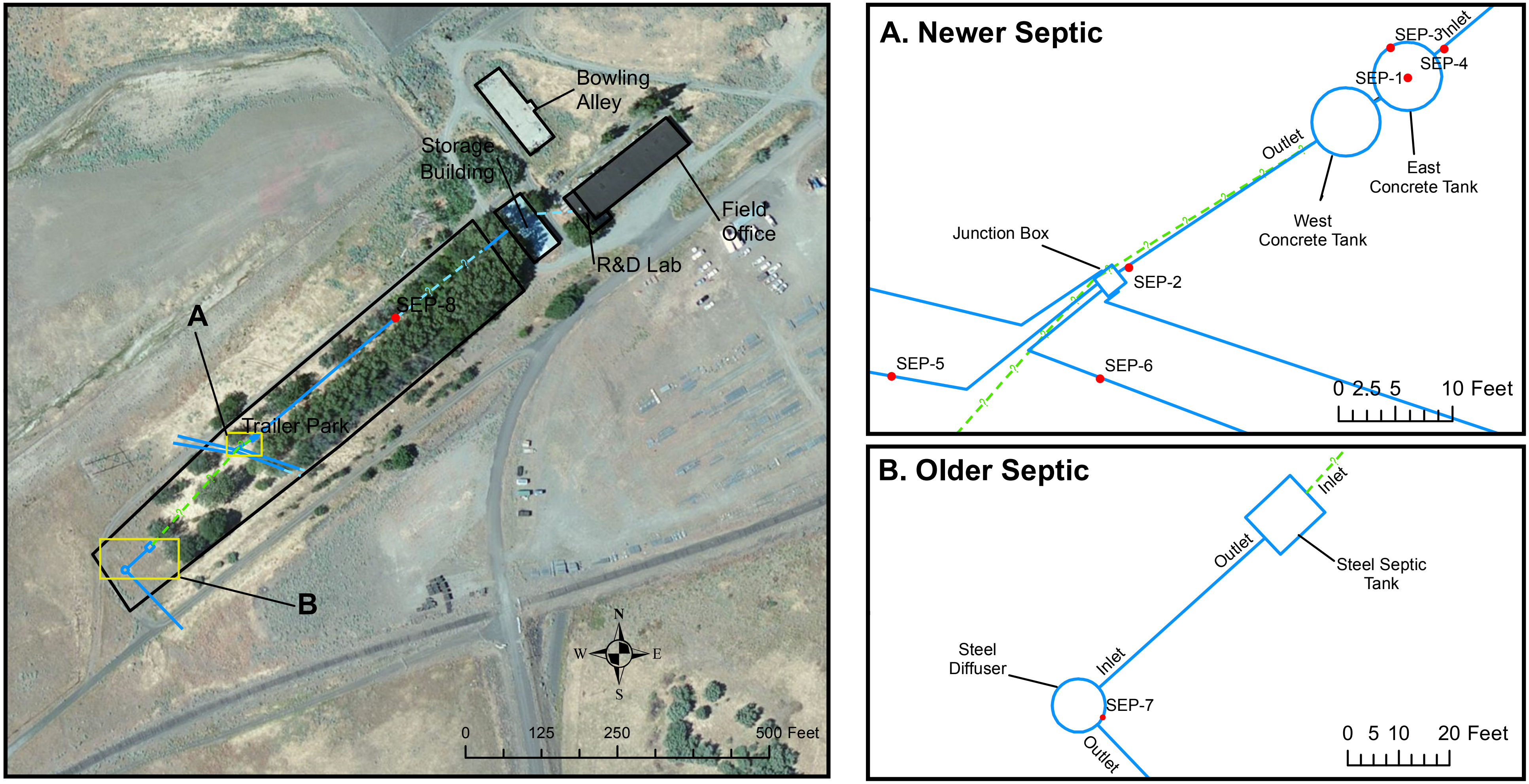
CHEMICALS	**MTCA Method B Screening Values (mg/kg)** [1]	**Ecological Screening Levels (mg/kg)** [2]	**STORMWATER CATCH BASIN SEDIMENT SAMPLES** [3]										
			CB3L12	**CB2L13**	**CB3L13**	**CB5L13**	**CB7L13**	**CB1L14**	**CB2L14**	**CB4L14**	**CB4L15**	**CB5L15**	**CB6L15**
Total Metals (EPA 6010B/7471A) mg/kg													
Aluminum	80000	50	**14000**	**34000**	**55000**	**120000**	**15000**	**15000**	**45000**	**42000**	**15000**	**32000**	**53000**
Arsenic	7.6	7	< 11	< 14	< 13	< 14	**24**	< 11	**41**	**35**	< 14	< 14	**14**
Barium	16000	100	**52**	**45**	**97**	**42**	**47**	**66**	**310**	**84**	**47**	**82**	**93**
Cadmium	2	14	**2.1**	**2.6**	**2.5**	**3.5**	**1.2**	**4**	**5.2**	**4.4**	**3.1**	**3.3**	**3.9**
Chromium	19	420	**260**	**20**	**110**	**27**	**210**	**46**	**110**	**100**	**40**	**41**	**45**
Lead	250	120	**34**	**34**	**41**	**85**	**25**	**40**	**62**	**21**	**67**	**39**	**32**
Mercury	2	0.1	< 0.27	< 0.36	< 0.32	< 0.35	**0.97**	< 0.27	< 0.34	< 0.27	< 0.35	< 0.34	< 0.31
Selenium	400	0.3	< 11	< 14	< 13	< 14	< 14	< 11	< 14	< 11	< 14	< 14	< 12
Silver	400	50	< 0.54	< 0.72	< 0.64	< 0.70	< 0.72	< 0.54	< 0.68	< 0.54	< 0.69	< 0.69	< 0.62
Fluoride (SM 4500-F C) mg/kg	3200		**65**	**260**	**120**	**130**	**160**	**290**	**300**	**340**	**510**	**1000**	**940**
Cyanide (SW846 9010/9012) ug/g													
Total Cyanide	1600		< 0.05	< 0.05	< 0.05	< 0.05	**0.061**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	**0.065**
Free Cyanide			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
PAHs (EPA 8270D/SIM) mg/kg													
Naphthalene	5	10	< 17	< 48	< 20	< 19	< 0.48	< 17	< 22	< 17	< 22	< 22	< 200
2-Methylnaphthalene	5		< 17	< 48	< 20	< 19	< 0.48	< 17	< 22	< 17	< 22	< 22	< 200
1-Methylnaphthalene [4]	5		< 17	< 48	< 20	< 19	< 0.48	< 17	< 22	< 17	< 22	< 22	< 200
Acenaphthylene	2400	20	< 17	< 48	< 20	< 19	< 0.48	< 17	< 22	< 17	< 22	< 22	< 200
Acenaphthene	4800	20	< 17	**110**	< 20	< 19	0.57	**49**	< 22	< 17	< 22	< 22	< 200
Fluorene	3200	30	< 17	< 48	< 20	< 19	< 0.48	**27**	< 22	< 17	< 22	< 22	< 200
Phenanthrene	2400		**19**	**740**	**110**	**110**	**4.1**	**420**	**31**	< 17	**200**	**81**	**400**
Anthracene	24000		< 17	**130**	< 20	**27**	**0.65**	**73**	< 22	< 17	**33**	< 22	< 200
Fluoranthene	3200		**54**	**2400**	**380**	**350**	**12**	**1400**	**93**	**58**	**640**	**280**	**1100**
Pyrene	2400		**48**	**2100**	**340**	**290**	**10**	**1200**	**83**	**44**	**560**	**240**	**980**
Benzo(a)anthracene	1.4	2.5	**33**	**1300**	**230**	**190**	**6.9**	**810**	**44**	**24**	**390**	**170**	**670**
Chrysene	140	35	**49**	**1600**	**320**	**230**	**9**	**1100**	**87**	**79**	**590**	**380**	**1200**
Benzo(b)fluoranthene	1.4		**63**	**2100**	**390**	**300**	**14**	**1200**	**89**	**60**	**670**	**390**	**1300**
Benzo(k)fluoranthene	14	38	**41**	**1700**	**250**	**220**	**11**	**870**	**55**	**26**	**450**	**180**	**680**
Benzo(a)pyrene	0.14	7	**50**	**2200**	**340**	**300**	**13**	**1200**	**57**	**20**	**540**	**200**	**900**
Ideno(1,2,3-c,d)pyrene	1.4	1.9	**35**	**1200**	**200**	**170**	**7.4**	**700**	**41**	**18**	**350**	**150**	**640**
Dibenz(a,h)anthracene	0.14		< 17	**480**	**62**	**64**	**2.8**	**270**	< 22	< 17	**110**	**50**	**210**
Benzo(g,h,i)perylene	2400		**42**	**1400**	**230**	**190**	**8.6**	**810**	**50**	**23**	**410**	**180**	**760**
PaHs (EPA 8270D/SIM) mg/kg													
Aroclor 1016	5.6	100	< 0.22	< 0.072	< 0.26	< 0.070	< 0.072	< 0.21	< 0.27	< 0.21	< 0.28	< 0.27	< 0.25
Aroclor 1221	14		< 0.22	< 0.072	< 0.26	< 0.070	< 0.072	< 0.21	< 0.27	< 0.21	< 0.28	< 0.27	< 0.25
Aroclor 1232	14		< 0.22	< 0.072	< 0.26	< 0.070	< 0.072	< 0.21	< 0.27	< 0.21	< 0.28	< 0.27	< 0.25
Aroclor 1242	14	1.5	< 0.22	< 0.072	< 0.26	< 0.070	< 0.072	< 0.21	< 0.27	< 0.21	< 0.28	< 0.27	< 0.25
Aroclor 1248	14		< 0.22	< 0.072	< 0.26	< 0.070	< 0.072	< 0.21	< 0.27	< 0.21	< 0.28	< 0.27	< 0.25
Aroclor 1254	0.5	0.7	< 0.22	< 0.072	< 0.26	< 0.070	< 0.072	< 0.21	< 0.27	< 0.21	**0.39**	< 0.27	< 0.25
Aroclor 1260	0.5	0.7	< 0.22	< 0.072	< 0.26	< 0.070	< 0.072	< 0.21	< 0.27	< 0.21	< 0.28	< 0.27	< 0.25
Petroleum Hydrocarbons (NWTPH) mg/kg													
Lube Oil Range	2000	200	**4700**	**76000**	**25000**	**14000**	**1600**	**36000**	**4400**	**2800**	**17000**	**11000**	**4400**
Diesel Range	2000	200	**4200**	**2500**	**310**			**5800**	< 680	< 540	**2400**	**2800**	**680**

Table 5 - Chemicals Detected in Catch Basin Sediment Samples

CHEMICALS	**MTCA Method B Screening Values (mg/kg)** [1]	**Ecological Screening Levels (mg/kg)** [2]	**STORMWATER CATCH BASIN SEDIMENT SAMPLES** [3]										
			CB1L23 (CB1L20)	**CB2L21A**	**MH5L5**	**EPLB1 (MH1L4)**	**EPLB2 (MH3L4)**	**EPLB3 (MH4L4)**	**EPLB4 (MH6L4)**	**EPLB5 (MH9L4)**	**EPLB7 (MH12L4)**	**EPLB9 (MH14L4)**	**EPLB10 (MH15L4)**
Total Metals (EPA 6010B/7471A) mg/kg													
Aluminum	80000	50	**32000**	**4600**	**35000**	**29000**	**16000**	**27000**	**20000**	**26000**	**49000**	**30000**	**78000**
Arsenic	7.6	7	< 17	< 11	**58**	**39**	**66**	**53**	**24**	**67**	**32**	**42**	**45**
Barium	16000	100	**76**	**52**	**210**	**71**	**70**	**47**	**83**	**60**	**500**	**1700**	**190**
Cadmium	2	14	**4.4**	< 0.57	**3.1**	**6.4**	**10**	**4.3**	**5.1**	**4.3**	**2.7**	**4.8**	**12**
Chromium	19	420	**48**	**3.7**	**55**	**100**	**110**	**340**	**140**	**330**	**250**	**100**	**110**
Lead	250	120	**33**	< 5.7	**46**	**150**	**320**	**54**	**61**	**45**	**60**	**130**	**92**
Mercury	2	0.1	< 0.42	< 0.29	< 0.32	< 0.3	**1**	< 0.3	< 0.28	< 0.33	**3.2**	< 0.35	< 0.33
Selenium	400	0.3	< 17	< 11	< 13	< 12	< 13	< 12	< 11	< 13	< 14	< 14	< 13
Silver	400	50	< 0.84	< 0.57	< 0.64	< 0.59	< 0.65	< 0.6	< 0.56	< 0.66	< 0.7	< 0.70	< 0.65
Fluoride (SM 4500-F C) mg/kg	3200		**760**	**66**	**130**	**730**	**650**	**520**	**450**	**270**	**260**	**1800**	**2000**
Cyanide (SW846 9010/9012) ug/g													
Total Cyanide	1600		**0.091**	< 0.05	**0.72**	**0.1**	< 0.05	**0.26**	< 0.05	< 0.05	**0.071**	< 0.05	< 0.05
Free Cyanide			< 0.05	< 0.05	**0.45**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
PAHs (EPA 8270D/SIM) mg/kg													
Naphthalene	5	10	< 27	< 0.92	< 1	< 19	< 21	< 19	< 18	< 21	< 23	< 22	< 21
2-Methylnaphthalene	5		< 27	< 0.92	< 1	< 19	< 21	< 19	< 18	< 21	< 23	< 22	< 21
1-Methylnaphthalene [4]	5		< 27	< 0.92	< 1	< 19	< 21	< 19	< 18	< 21	< 23	< 22	< 21
Acenaphthylene	2400	20	< 27	< 0.92	< 1	< 19	< 21	< 19	< 18	< 21	< 23	< 22	< 21
Acenaphthene	4800	20	**230**	< 0.92	< 1	< 19	< 21	< 19	< 18	< 21	< 23	< 22	< 21
Fluorene	3200	30	**230**	< 0.92	< 1	< 19	< 21	< 19	< 18	< 21	< 23	< 22	< 21
Phenanthrene	2400		**1900**	**5**	**8.5**	**45**	**52**	**35**	**54**	**39**	< 23	**24**	**41**
Anthracene	24000		**280**	< 0.92	**1.2**	< 19	< 21	< 19	< 18	< 21	< 23	< 22	< 21
Fluoranthene	3200		**2800**	**15**	**28**	**700**	**380**	**160**	**250**	**90**	**53**	**80**	**140**
Pyrene	2400		**2100**	**12**	**22**	**490**	**290**	**130**	**180**	**72**	**45**	**71**	**110**
Benzo(a)anthracene	1.4	2.5	**730**	**8.1**	**12**	**190**	**200**	**77**	**90**	**32**	**31**	**51**	**73**
Chrysene	140	35	**880**	**13**	**24**	**860**	**860**	**260**	**300**	**68**	**79**	**150**	**130**
Benzo(b)fluoranthene	1.4		**890**	**15**	**26**	**420**	**750**	**230**	**190**	**63**	**89**	**150**	**170**
Benzo(k)fluoranthene	14	38	**510**	**11**	**13**	**120**	**170**	**110**	**94**	**37**	**41**	**70**	**89**
Benzo(a)pyrene	0.14	7	**640**	**12**	**14**	**41**	**53**	**74**	**77**	**35**	**39**	**67**	**100**
Ideno(1,2,3-c,d)pyrene	1.4	1.9	**360**	**7.8**	**11**	**56**	**100**	**72**	**64**	**29**	**35**	**64**	**88**
Dibenz(a,h)anthracene	0.14		**120**	**2.5**	**3.9**	**22**	**44**	**24**	**22**	< 21	< 23	< 22	**26**
Benzo(g,h,i)perylene	2400		410	**9.2**	**13**	**60**	**120**	**90**	**82**	**38**	**43**	**79**	**110**
PCBs (EPA 8082) mg/kg													
Aroclor 1016	5.6	100	< 0.34	< 0.23	< 0.26	< 0.24	< 0.26	< 0.24	< 0.22	< 0.26	< 0.28	< 0.28	< 0.26
Aroclor 1221	14		< 0.34	< 0.23	< 0.26	< 0.24	< 0.26	< 0.24	< 0.22	< 0.26	< 0.28	< 0.28	< 0.26
Aroclor 1232	14		< 0.34	< 0.23	< 0.26	< 0.24	< 0.26	< 0.24	< 0.22	< 0.26	< 0.28	< 0.28	< 0.26
Aroclor 1242	14	1.5	< 0.34	< 0.23	< 0.26	< 0.24	< 0.26	< 0.24	< 0.22	< 0.26	< 0.28	< 0.28	< 0.26
Aroclor 1248	14		< 0.34	< 0.23	< 0.26	< 0.24	< 0.26	< 0.24	< 0.22	< 0.26	< 0.28	< 0.28	< 0.26
Aroclor 1254	0.5	0.7	**0.36**	< 0.23	< 0.26	**0.25**	**3.2**	< 0.24	< 0.22	**1.4**	**0.37**	**8.1**	< 0.26
Aroclor 1260	0.5	0.7	< 0.34	< 0.23	< 0.26	< 0.24	< 0.26	< 0.24	< 0.22	< 0.26	< 0.28	< 0.28	< 0.26
Petroleum Hydrocarbons (NWTPH) mg/kg													
Lube Oil Range	2000	200	**37000**	**650**	**6600**	**12000**	**17000**	**8000**	**8800**	**2600**	**3100**	**11000**	**4100**
Diesel Range	2000	200	**83000**	< 120	**860**	**4300**	**3300**	**950**	**1900**	< 660	< 700	**2700**	< 650

APPENDIX A-33

Northwestern Area – Research and Development Laboratory Septic Drainfield



MARCH 2013

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604

LEGEND

- - -?- Older Projected Septic Line
- - -?- Newer Projected Septic Line
── Septic Line
● Sample Points

FIGURE 2

SEPTIC SYSTEMS SAMPLE
LOCATION MAP

COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON

A. R&D Lab and Field Office

B. New septic underneath west side of office building

C. New septic system : East Concrete Tank

D.West concrete tank

E. Old Septic System

F. Old septic system pipe line (Orangeburg).

MARCH 2013

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604

FIGURE 3

PHOTOGRAPHS OF SEPTIC SYSTEMS

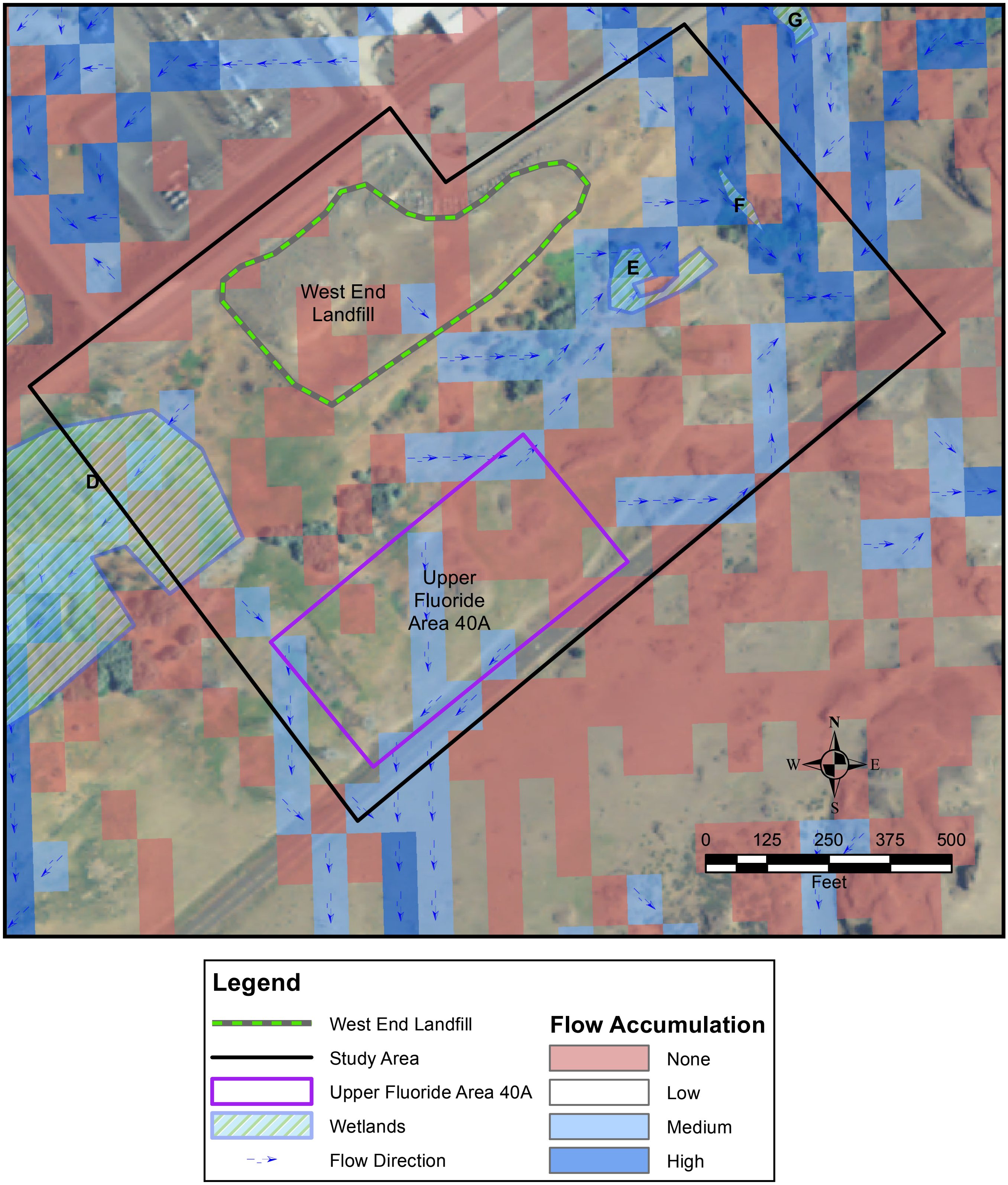
COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON

CHEMICALS	**Human Health Screening Levels (mg/kg)[1]**	**Protection of Ground Water (mg/kg) [3]**	**Septic Sludge [4]**	**Septic System Drain Field Soil [5]**							**TCLP [6] mg/l**
				New System						**Old System**	
			SEP-1	**SEP-2**	**SEP-3**	**SEP-4**	**SEP-5**	**SEP-6**	**SEP-8**	**SEP-7**	**SEP-1**
Benzene	0.18	0.0002	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	0.0016	<0.0013	
1, 2-Dichloropropane	NC	0.00013	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Dibromomethane	NC	0.0019	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Bromodichloromethane	16	0.000032	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
2-Chloroethyl Vinyl Ether	NC		<0.12	<0.005	<0.0057	<0.0061	<0.0061	<0.0057	<0.0059	<0.0063	
(cis) 1,3-Dichloropropene	10	0.00015	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Methyl Isobutyl Ketone	NC	0.23	<0.12	<0.005	<0.0057	<0.0061	<0.0061	<0.0057	<0.0059	<0.0063	
Toluene	7	0.59	**0.15**	<0.005	<0.0057	<0.0061	<0.0061	<0.0057	<0.0059	<0.0063	
(trans) 1,3-Dichloropropene	10	0.00015	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,1,2-Trichloroethane	18	0.000077	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Tetrachloroethene	0.05	0.0044	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,3-Dichloropropane	NC	0.099	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
2-Hexanone	NC	0.0079	<0.12	<0.005	<0.0057	<0.0012	<0.0012	<0.0057	<0.0012	<0.0063	
Dibromochloromethane	12	0.000039	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,2-Dibromoethane	NC	0.0000018	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Chlorobenzene	1600	0.049	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,1,1,2-Tetrachloroethane	38	0.00019	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Ethylbenzene	6	0.0015	**0.23**	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
m,p-Xylene	16000	0.18	**0.92**	<0.002	<0.0023	<0.0024	<0.0024	<0.0023	<0.0024	<0.0025	
o-Xylene	16000	0.19	**0.42**	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Styrene	16000	1.2	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Bromoform	130	0.0021	<0.024	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Isopropylbenzene	8000	0.64	**0.13**	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Bromobenzene	NC	0.036	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,1,2,2-Tetrachlorethane	5	0.000026	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,2,3-Trichloropropane	320	0.00000028	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
n-Propylbenzene	8000	0.99	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
2-Chlorotoulene	1600	0.17	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
4-Chlorotoluene	NC	0.18	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,3,5-Trimethylbenzene	800	0.12	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
tert-Butylbenzene	8000	0.64	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,2,4-Trimethylbenzene	ND	0.021	**4.2**	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
sec-Butylbenzene	8000	0.64	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,3-Dichlorobenzene	ND	0.0004	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
p-Isopropyltoluene	8000	0.64	**11**	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	**0.017**	<0.0013	
1,4-Dichlorobenzene	ND	0.0004	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,2-Dichlorobenzene	7200	0.27	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
n-Butylbenzene	8000	2.5	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,2-Dibromo-3-chloropropane	1.3	0.00000014	<10	<0.005	<0.0057	<0.0061	<0.0061	<0.0057	<0.0059	<0.0063	
1,2,4-Trichlorobenzene	35	0.0029	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
Hexachlorobutadiene	80	0.0005	<10	<0.005	<0.0057	<0.0061	<0.0061	<0.0057	<0.0059	<0.0063	
Naphthalene	5	0.00047	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	
1,2,3-Trichlorobanzene	NC	0.015	<2.0	<0.001	<0.0011	<0.0012	<0.0012	<0.0011	<0.0012	<0.0013	

Notes: [1] Human health screening levels based on DOE Model Toxics Control Act (MTCA) lowest value of Methods A and B. [2] Ecological screening levels based on DOE MTCA lowest values for soil for plants, invertebrates, birds or mammals. [3] MTCA values for contaminant concentrations in that are protective of groundwater. [4] Sludge accummulated in bottom of north concrete septic tank, removed and tank decommissioned in June 2012. [5] Soil sampled adjacent to new system drain field pipes and old system steel tanks and drain lines. [6] Toxicity Characteristic Leaching Procedure (TCLP) test of new system septic tank sludge sample SEP-1 for purpose of disposal. [7] ND means no data available. [8] NC means MTCA A and/or MTCA B value not calculated. [9] Surrogates used: iodomethane used for carbon tetrachloride, 1,1-dichloropropene used for n-butylbenzene, sec-butylbenzene, tert-butylbenzene, and p-isopropyltoluene used for isopropylbenzene.

APPENDIX A-34

Western Area – Upper Fluoride Area



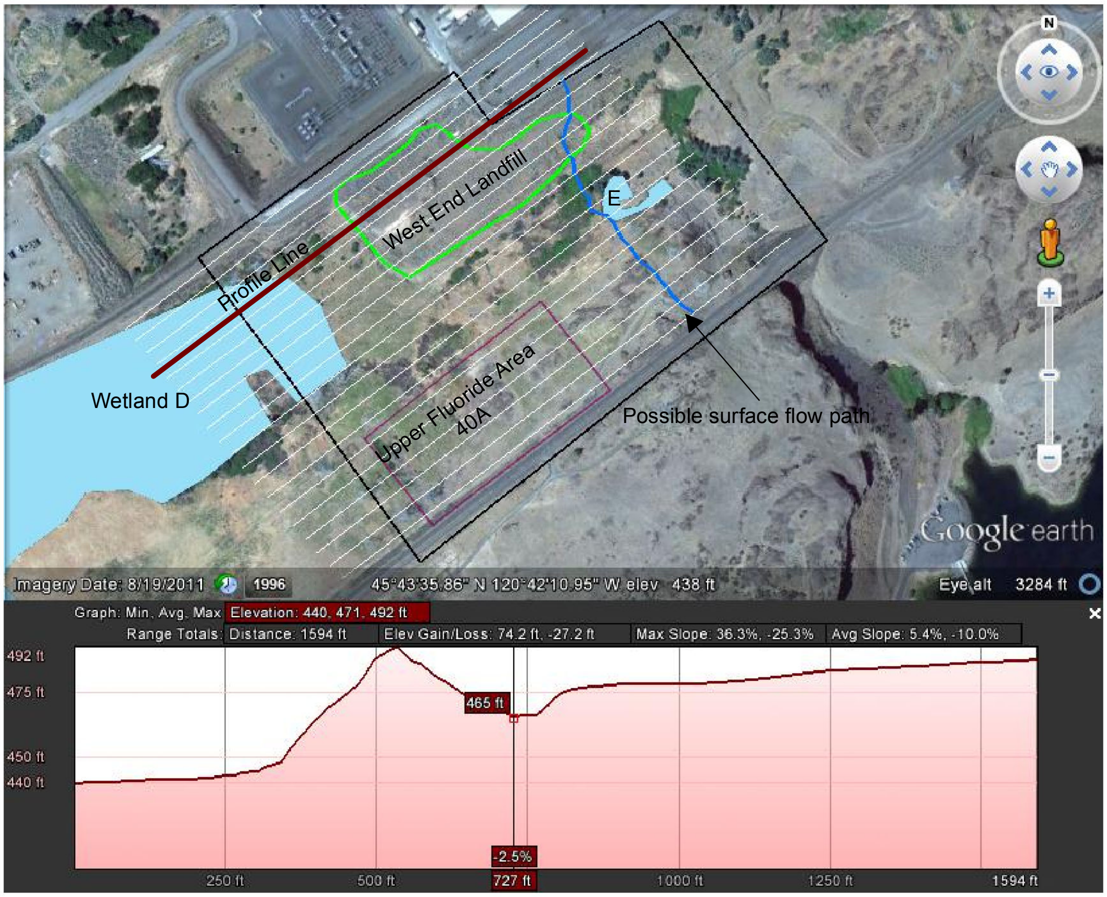
MARCH 2013

FIGURE 10

UPPER FLUORIDE AREA
FLOW ACCUMULATION MAP

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604

COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON



Imagery Date: 8/19/2011 1996 45°43'35.86" N 120°42'10.95" W elev 438 ft Eye alt 3284 ft

Graph: Min, Avg, Max Elevation: 440, 471, 492 ft

Range Totals: Distance: 1594 ft Elev Gain/Loss: 74.2 ft, -27.2 ft Max Slope: 36.3%, -25.3% Avg Slope: 5.4%, -10.0%

MARCH 2013

PLATEAU GEOSCIENCE GROUP LLC
PO BOX 1020
BATTLE GROUND, WA 98604

FIGURE 11

UPPER FLUORIDE AREA ELEVATION PROFILE

COLUMBIA GORGE ALUMINUM COMPANY
GOLDENDALE ALUMINUM SMELTER
GOLDENDALE, WASHINGTON