Attachment 2.05.3(3)-12
Sediment Pond 012 Engineering Design

Pond 012 was initially designed for the 2000 Permit Amendment. The pond was constructed in 2007. The as built report is included in attachment 2.05.3(3)-13. Due to changes in the planned post mine topography, Pond 012's post mine and pre mine drainage have to be compared.

Pond 012 - Design Confirmation

Pond 012 is currently in place at New Horizon Mine. However, changes to the reclamation plan have altered the post mine drainage. The pre mine drainage area is 55.1 acres, while the post mine drainage area is 38.1 acres. Therefore the pre mine drainage will continue to be the worst case,and the design will remain unchanged.

Runoff Curve Number and Runoff
Project: POND 012 By: R . L. GUBKA
Location: NEW HORIZON MINE
Present

	CN	C	AREA
UNDISTURBED	80	C	12.152 Acres
DISTURBED	85	C	42.933 Acres

CN (weighted): 84
CF (weighted): 0.500
2. Runoff
Frequency ..... : 10 yr
Rainfall, P (24-hour) .. : 2.00 in
Runoff, Q ..... : 0.74 in
Runoff Volume ..... : 3.39 Acre-Ft
==========
Time of Concentration (SCS Method)
Curve Number: 84
Length of Flow (ft): 1354.62
Average Land Slope (): 6.40
Time of Concentration (hrs): 0.23

==========

Pond Report

Top of dam elevation: 5610.0000

Bottom of pond elevation: 5603.0000

Top of dam width: 10.0000

Cut slope percent grade: 100.00, slope ratio: 1.00

Fill slope percent grade: 25.00, slope ratio: 4.00

Interior slope percent grade: 40.00, slope ratio: 2.50

Lower left grid corner : 1114657.98,601617.47

Upper right grid corner: 1117967.98,603397.47

X grid resolution: 331, Y grid resolution: 178

X grid cell size: 10.00, Y grid cell size: 10.00

Pond EarthWork Volumes

Total fill: 4,186.42 C.F., 155.05 C.Y.

Total cut : 500,392.33 C.F., 18,533.05 C.Y.

Pond Storage Volumes

Water Elev	Storage(AcreFt)	(C.Y.)	(C.F.)	Area(Acre)
5603.00	0.00000	0.0	0.0	0.515
5604.00	0.54061	872.2	23549.1	0.584
5605.00	1.14204	1842.5	49747.1	0.638
5606.00	1.78390	2878.0	77706.9	0.700
5607.00	2.48382	4007.2	108195.3	0.720
5608.00	3.22681	5205.9	140559.8	0.781
5609.00	4.02186	6488.6	175192.2	0.830
5610.00	4.86649	7851.3	211984.4	0.852

POND 012
25YR-24HR EVENT

TOTALLY ENCISED TOP OF DAM AT 5610 AND BOTTOM OF 5603,

Ross L. Gubka, P.E.

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	2.400 inches

Particle Size Distribution:

Size (mm)	NEW HORIZON MINE 1 PARTICAL SIZE DISTRIBUTION
2.0000	100.000%
1.0000	70.000%
0.5000	67.000%
0.2500	58.000%
0.1250	52.000%
0.0630	38.000%
0.0160	21.000%
0.0040	11.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#1	In	55.080	55.080	33.02	4.55	750.1	233,893	141.94	80.87
	Out			2.33	1.66	38.0	29,941	0.00	0.00

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
2.0000	100.000%	100.000%
1.0000	91.478%	100.000%
0.5000	87.557%	100.000%
0.2500	75.796%	100.000%
0.1250	67.955%	100.000%
0.0630	49.659%	100.000%
0.0160	27.443%	100.000%
0.0040	14.375%	100.000%

Structure Detail:

Structure #1 (Pond)

Pond Inputs:

Permanent Pool Elev:	5,604.50
Permanent Pool:	0.85 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**No sediment capacity defined*

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev	Number of Holes per Elev
18.00	5.00	18.00	100.00	0.01	0.0150	5,608.00	1

Pond Results:

Peak Elevation:	5,608.23
H'graph Detention Time:	4.38 hrs
Dewater Time:	0.58 days
Trap Efficiency:	94.93 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
5,603.00	0.515	0.000	0.000		Top of Sed. Storage
5,603.50	0.549	0.266	0.000		
5,604.00	0.584	0.549	0.000		
5,604.50	0.611	0.848	0.000		Low hole SPW #1
5,605.00	0.638	1.160	0.000		
5,605.50	0.669	1.487	0.000		
5,606.00	0.700	1.829	0.000		
5,606.50	0.710	2.181	0.000		
5,607.00	0.720	2.539	0.000		
5,607.50	0.750	2.906	0.000		
5,608.00	0.781	3.289	0.000		Spillway #1
5,608.23	0.790	3.468	2.333	13.90	Peak Stage
5,608.50	0.805	3.686	5.165		
5,609.00	0.830	4.094	8.509		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
5,609.50	0.841	4.512	10.421	
5,610.00	0.852	4.935	12.033	

Detailed Discharge Table

Elevation	Perf. Riser (cfs)	Combined Total Discharge (cfs)
5,603.00	0.000	0.000
5,603.50	0.000	0.000
5,604.00	0.000	0.000
5,604.50	0.10>0.000	0.000
5,605.00	0.000	0.000
5,605.50	0.000	0.000
5,606.00	0.000	0.000
5,606.50	0.000	0.000
5,607.00	0.000	0.000
5,607.50	0.000	0.000
5,608.00	0.000	0.000
5,608.50	5.165	5.165
5,609.00	8.509	8.509
5,609.50	10.421	10.421
5,610.00	12.033	12.033

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	42.930	0.148	0.148	0.299	84.000	M	32.18	3.717
	2	12.150	0.044	0.044	0.302	80.000	M	11.23	0.831
	Σ	**55.080**						**33.02**	**4.547**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#1	1	0.320	1,351.51	6.40	0.5000	1.0000	1	636.2	261,451	160.43	87.83
	2	0.320	420.77	6.77	1.0000	1.0000	1	179.5	284,327	184.92	95.06
	Σ							**750.1**	**233,893**	**141.94**	**80.87**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	6.40	86.45	1,351.51	2.520	0.148
#1	**1**	**Time of Concentration:**					**0.148**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.77	28.47	420.77	2.600	0.044
#1	**2**	**Time of Concentration:**					**0.044**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	6.40	86.45	1,351.51	2.520	0.148
#1	**1**	**Muskingum K:**					**0.148**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.77	28.47	420.77	2.600	0.044
#1	**2**	**Muskingum K:**					**0.044**

POND 012
10 YR-24HR EVENT

TOTALLY ENCISED TOP OF DAM AT 5610 AND BOTTOM OF 5603,

Ross L. Gubka, P.E.

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	2.000 inches

Particle Size Distribution:

Size (mm)	NEW HORIZON MINE 1 PARTICAL SIZE DISTRIBUTION
2.0000	100.000%
1.0000	70.000%
0.5000	67.000%
0.2500	58.000%
0.1250	52.000%
0.0630	38.000%
0.0160	21.000%
0.0040	11.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#1	In	55.080	55.080	24.99	3.41	487.4	225,506	135.51	70.10
	Out			0.84	0.52	7.5	21,321	0.00	0.00

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
2.0000	100.000%	100.000%
1.0000	94.455%	100.000%
0.5000	90.406%	100.000%
0.2500	78.262%	100.000%
0.1250	70.166%	100.000%
0.0630	51.275%	100.000%
0.0160	28.336%	100.000%
0.0040	14.843%	100.000%

Structure Detail:

Structure #1 (Pond)

Pond Inputs:

Permanent Pool Elev:	5,604.50
Permanent Pool:	0.85 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**No sediment capacity defined*

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev	Number of Holes per Elev
18.00	5.00	18.00	100.00	0.01	0.0150	5,608.00	1

Pond Results:

Peak Elevation:	5,608.08
H'graph Detention Time:	7.62 hrs
Dewater Time:	0.36 days
Trap Efficiency:	98.46 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
5,603.00	0.515	0.000	0.000		Top of Sed. Storage
5,603.50	0.549	0.266	0.000		
5,604.00	0.584	0.549	0.000		
5,604.50	0.611	0.848	0.000		Low hole SPW #1
5,605.00	0.638	1.160	0.000		
5,605.50	0.669	1.487	0.000		
5,606.00	0.700	1.829	0.000		
5,606.50	0.710	2.181	0.000		
5,607.00	0.720	2.539	0.000		
5,607.50	0.750	2.906	0.000		
5,608.00	0.781	3.289	0.000		Spillway #1
5,608.08	0.782	3.354	0.844	8.70	Peak Stage
5,608.50	0.805	3.686	5.165		
5,609.00	0.830	4.094	8.509		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
5,609.50	0.841	4.512	10.421	
5,610.00	0.852	4.935	12.033	

Detailed Discharge Table

Elevation	Perf. Riser (cfs)	Combined Total Discharge (cfs)
5,603.00	0.000	0.000
5,603.50	0.000	0.000
5,604.00	0.000	0.000
5,604.50	0.10>0.000	0.000
5,605.00	0.000	0.000
5,605.50	0.000	0.000
5,606.00	0.000	0.000
5,606.50	0.000	0.000
5,607.00	0.000	0.000
5,607.50	0.000	0.000
5,608.00	0.000	0.000
5,608.50	5.165	5.165
5,609.00	8.509	8.509
5,609.50	10.421	10.421
5,610.00	12.033	12.033

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	42.930	0.149	0.149	0.299	85.000	M	24.64	2.845
	2	12.150	0.044	0.044	0.302	80.000	M	7.85	0.570
	Σ	**55.080**						**24.99**	**3.414**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#1	1	0.320	1,351.51	6.40	0.5000	1.0000	1	471.7	255,227	156.27	85.12
	2	0.320	420.77	6.77	0.5000	1.0000	1	59.5	151,759	98.70	47.93
	Σ							**487.4**	**225,506**	**135.51**	**70.10**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	6.38	86.45	1,354.63	2.520	0.149
#1	**1**	**Time of Concentration:**					**0.149**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.77	28.47	420.77	2.600	0.044
#1	**2**	**Time of Concentration:**					**0.044**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	6.38	86.45	1,354.62	2.520	0.149
#1	**1**	**Muskingum K:**					**0.149**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.77	28.47	420.77	2.600	0.044
#1	**2**	**Muskingum K:**					**0.044**

POND 012 BANK SAFETY CALCULATIONS

Note:
Embankment data (#1) for SB–Slope = tri–axial results (Advanced Terra Testing) from pond 009
density = 107
cohesion = 84 pcf
PHI = 29.1

Native data (#2) for SB–Slope = tri–axial results (Western Colorado Testing) for pond 012 embankment
density = 118 pcf
cohesion = 79 pcf
PHI = 28.7

Point#	Northing	Easting	Elev	Description
1	100.000	100.000	0.000	
2	144.500	100.000	0.000	
3	149.500	100.000	0.000	
4	146.500	197.500	0.000	
5	149.500	205.000	0.000	
6	151.500	210.000	0.000	
7	151.500	220.000	0.000	
8	146.500	240.000	0.000	
9	146.500	280.000	0.000	
10	100.000	280.000	0.000	
11	144.500	192.500	0.000	

Min X: 100.000 Max X: 280.000
Min Y: 100.000 Max Y: 151.500
Min Z: 0.000 Max Z: 0.000
Number of points listed> 11

WESTERN FUELS – COLORADO
A LIMITED LIABILITY COMPANY
NEW HORIZON MINE
P.O. Box 628, NUCLA, CO. 81424

POND 012

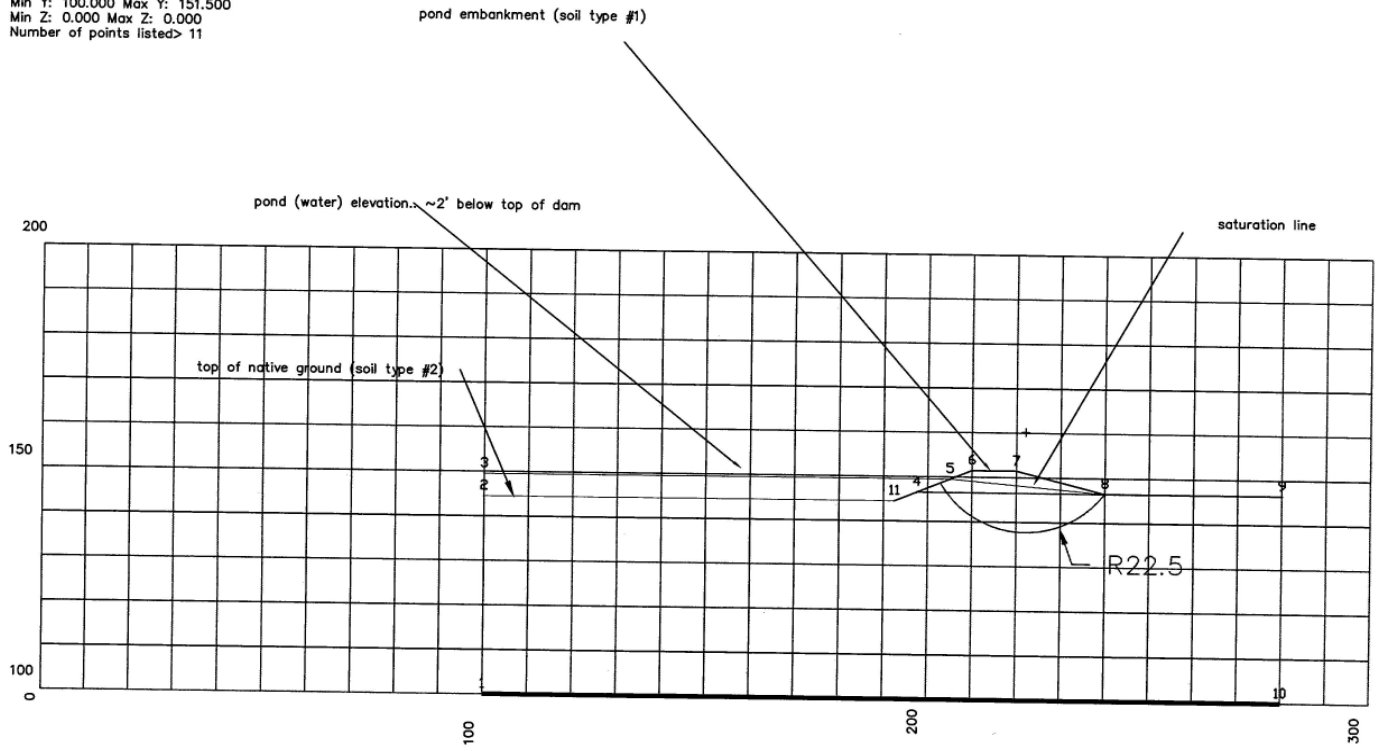
FACTOR OF SAFETY USING SB–SLOPE PROGRAM

R. L. GUSKA, P.E.

F:\END\DATA\ACAD\SB–SLOPE\012POND.DWG

results from SB–Slope program, with failure passing thru pt #8
center of failure plane = 222.1x,160.2y,
r=22.5,

FACTOR OF SAFETY=1.62



GEOSYSTEM SLOPE STABILITY PROGRAM
SB-SLOPE

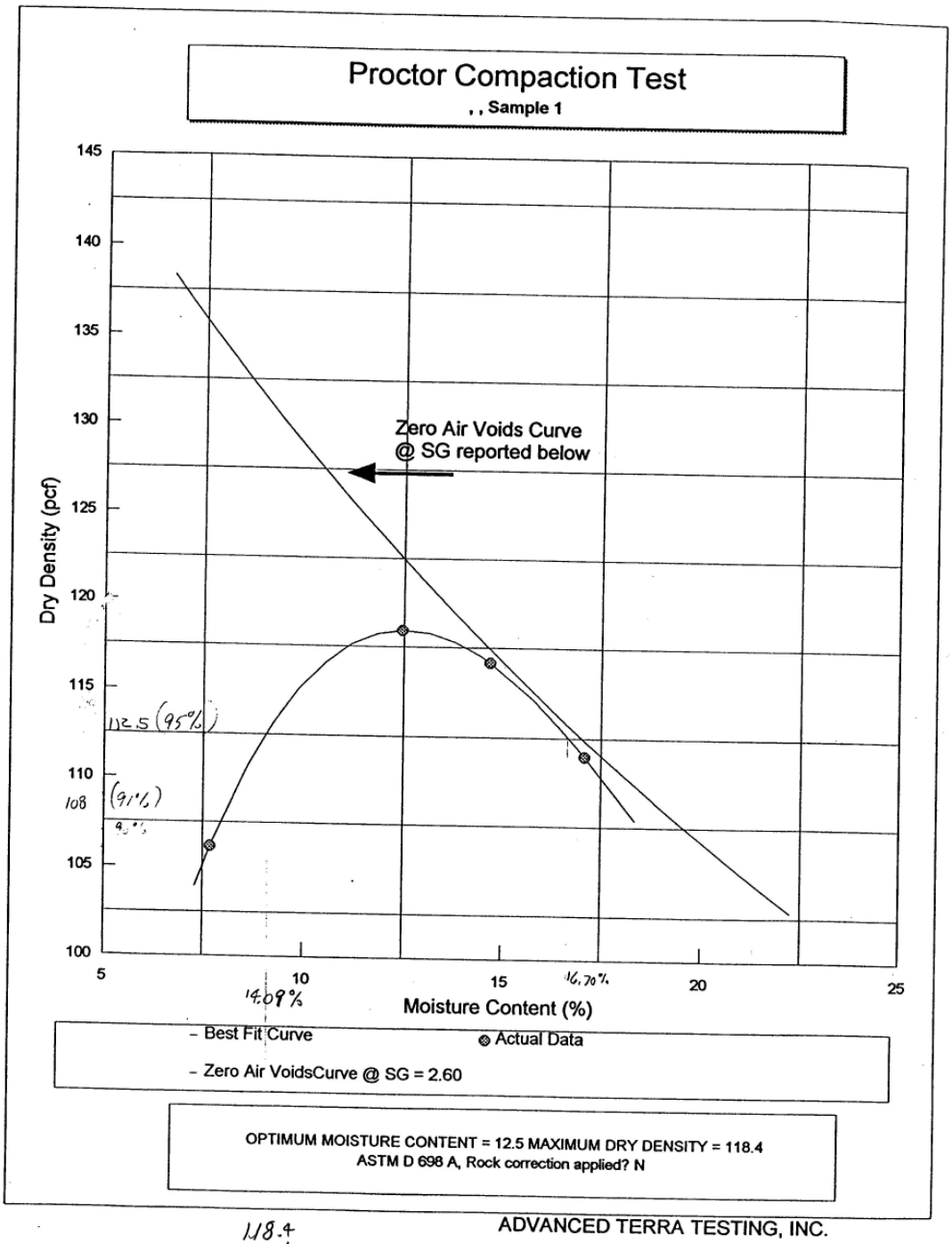
PROJECT DATA:
Project: 012 POND
Location: NEW HORIZON MINE
Filename: 012POND Description: 012 POND 2.5h:1V

ANALYSIS DATA:

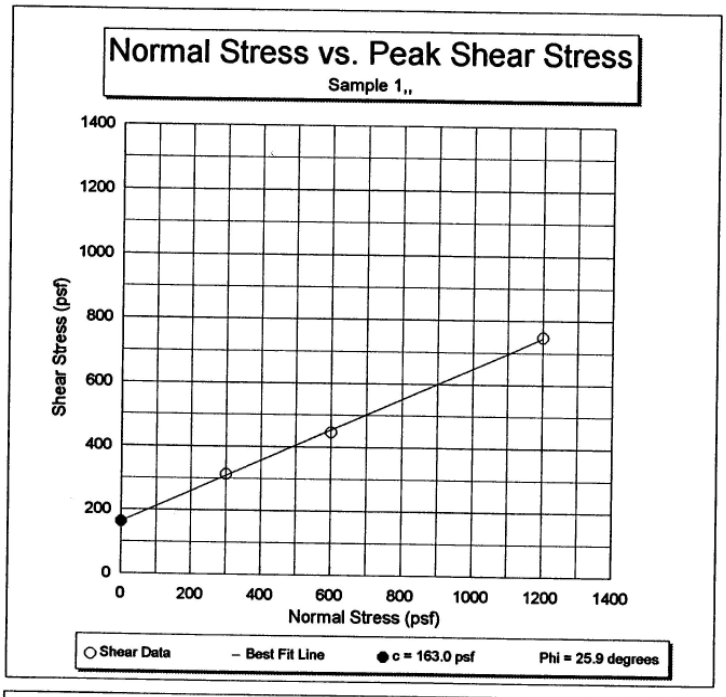
Point No.	Coordinates X	Y
1	100.0	100.0
2	100.0	144.5
3	100.0	149.5
4	197.5	146.5
5	205.0	149.5
6	210.0	151.5
7	220.0	151.5
8	240.0	146.5
9	280.0	146.5
10	280.0	100.0
11	192.5	144.5

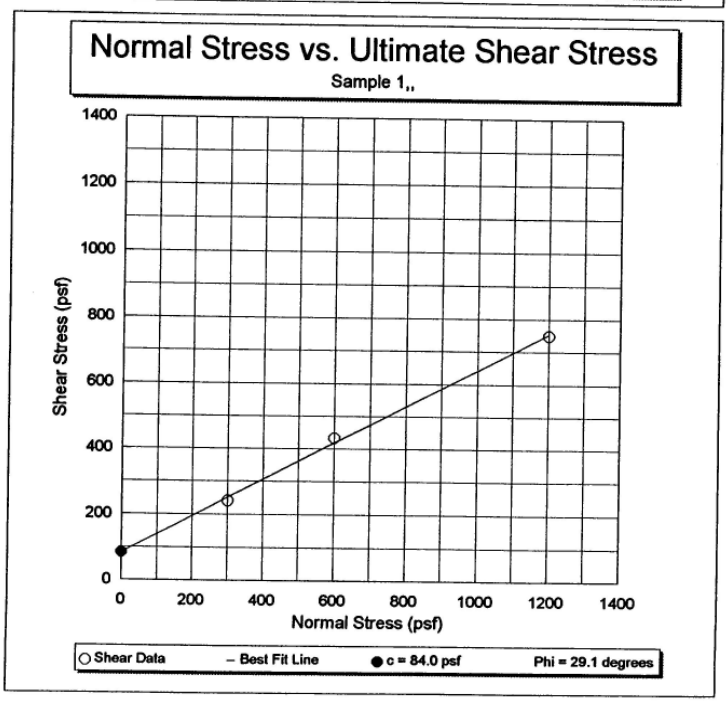
Line No.	Left Point	Right Point	Soil No.	Phreatic Line
1	1	10	2	N
2	2	11	2	N
3	11	4	2	N
4	4	8	2	N
5	8	9	2	N
6	4	5	1	N
7	5	6	1	N
8	6	7	1	N
9	7	8	1	N
10	5	8	1	Y

Soil No.	Density pcf	Cohesion psf	Phi Deg
1	107.0	84	29.0
2	118.0	79	29.0



118.4
x 90%
107 pcf For Pond 012 Embankment

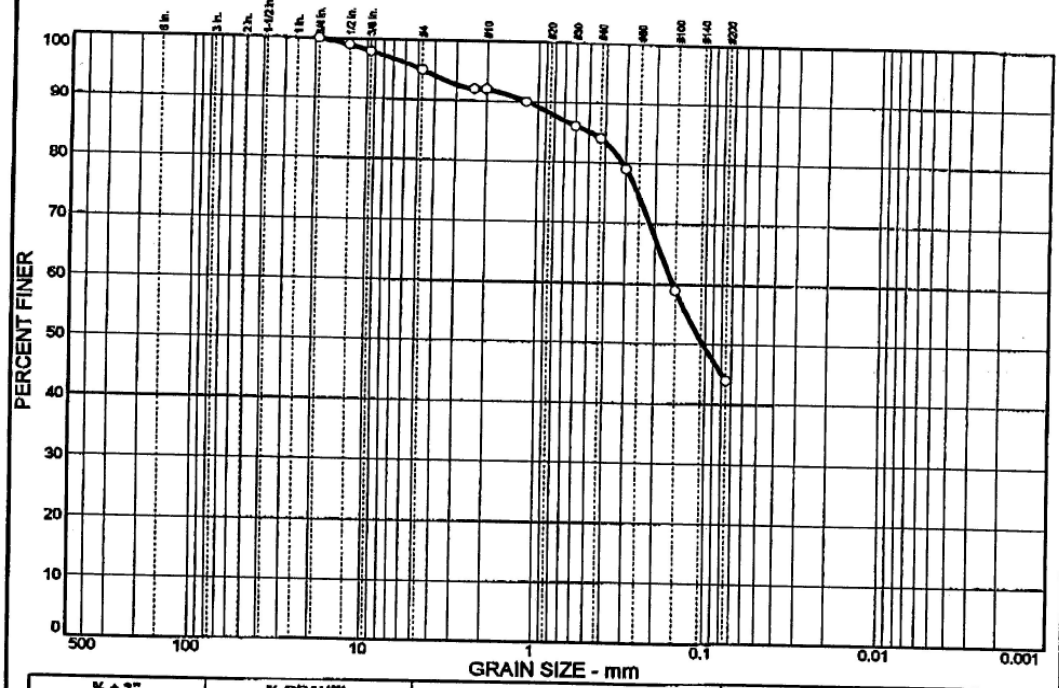




USE FOR Pond 012 Embankment

ADVANCED TERRA TESTING, INC.

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.0	51.0	44.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.0		
3/8 in.	98.0		
#4	95.0		
#8	92.0		
#10	92.0		
#16	90.0		
#30	86.0		
#40	84.0		
#50	79.0		
#100	59.0		
#200	44.0		

* (no specification provided)

Soil Description
Sand, silty, clayey (SC-SM)

Atterberg Limits
PL= 16 LL= 22 PI= 6

Coefficients
D_{85}= 0.491 D_{60}= 0.155 D_{50}= 0.103
D_{30}= D_{15}= D_{10}=
C_U= C_C=

Classification
USCS= SC-SM AASHTO= A-4(0)

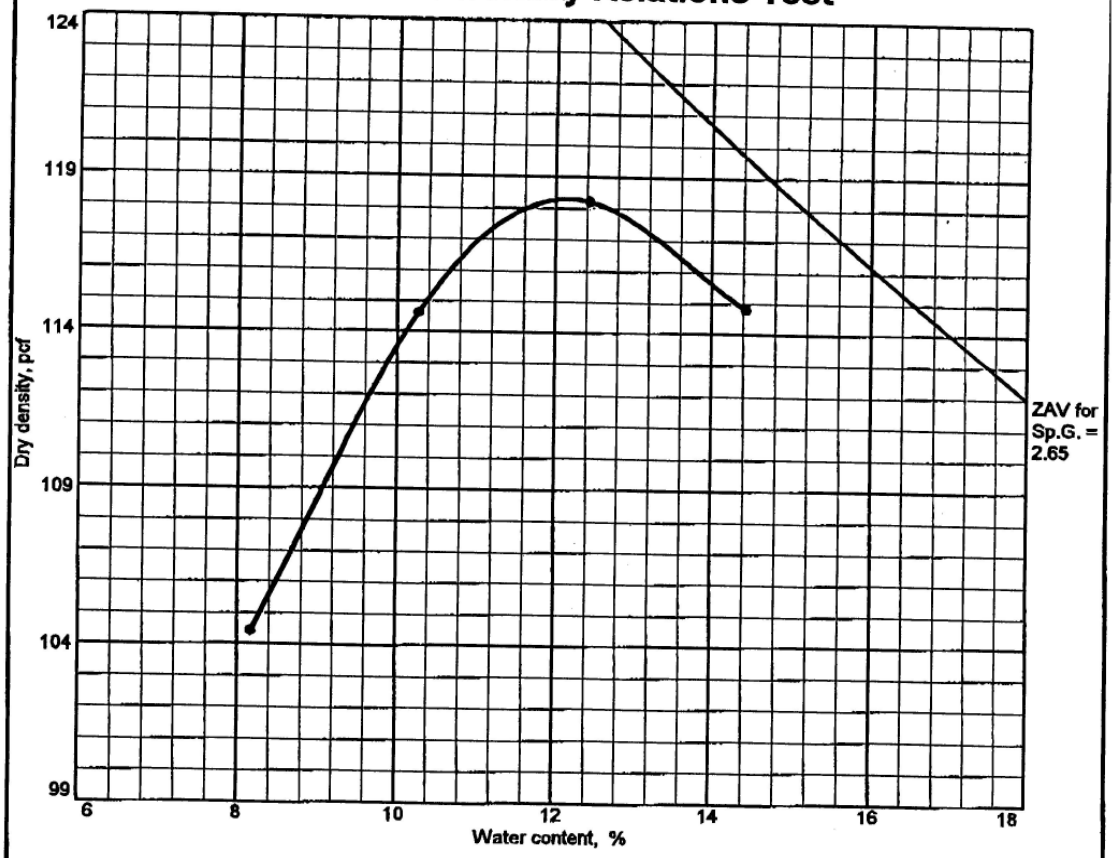
Remarks
Sampled by JB, 12-7-04
Tested by JB, 12-9-04
Reviewed by JCH

Sample No.: 04-402 **Source of Sample:** **Date:** 12-17-04
Location: Pond 102 Fill Material **Elev./Depth:** N/A

WESTERN COLORADO TESTING, INC.	**Client:** Western Fuels **Project:** Pond 102 **Project No:** 301505 **Figure** 2

Pond 012 POND - Native

Moisture-Density Relations Test



Test specification: ASTM D 698-00a Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
N/A	SC-SM	A-4(0)	---	---	22	6	5.0	44

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 118.5 pcf Optimum moisture = 12 %	Sand, silty, clayey (SC-SM)

Project No. 301505 **Client:** Western Fuels
Project: Pond 102
● **Location:** Pond 102 Fill Material

Remarks:
Sampled by JB, 12-7-04
Tested by JB, 12-10-04
Reviewed by JCH

Moisture-Density Relations Test

WESTERN COLORADO TESTING, INC.

Figure P1

POND 012 -Native

WESTERN COLORADO TESTING, INC.

Consolidated Triaxial Compression, ASTM D 4767-95

Job Name: Triaxial Testing Job No.: 301,505 Technician: BJR/JCH Date: 1/10/2005
Sample Location: Undisturbed in-situ Depth: 0 Lab Number: 04-405
Description: Sand, silty, clayey (SC-SM)
MDD (pcf): n/a OMC (%): n/a Compaction Method: n/a

Confining Pressure: 6 psi	Initial	Final
Dry Density (pcf)	103.2	84.1
Moisture Content (%)	7.8%	20.9%
Saturation (%)	--	--
Height (in.)	3.50	3.39
Diameter (in.)	1.93	
Cross-Sec. Area (in²)	2.93	3.31
Void Ratio	0.38	0.43
Specific Gravity*	2.65	

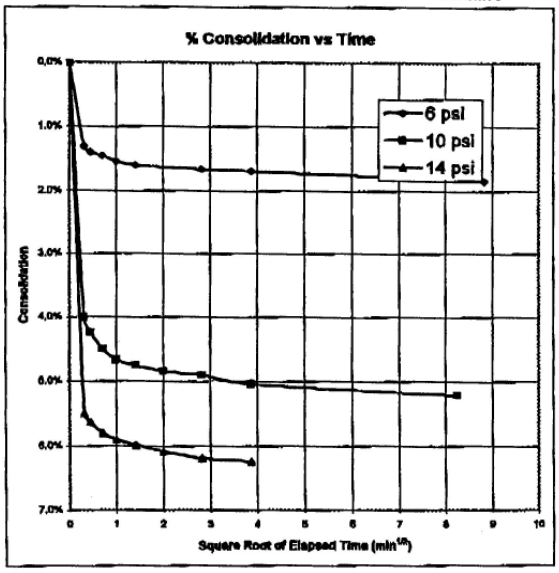
*Assumed

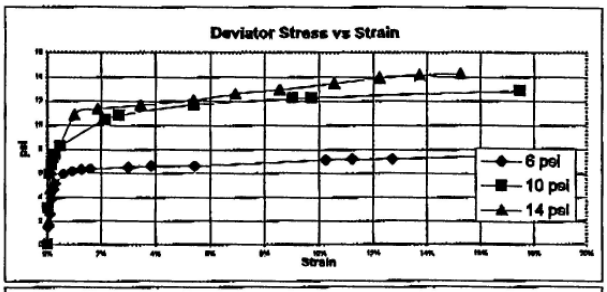
Confining Pressure: 10 psi	Initial	Final
Dry Density (pcf)	98.2	95.9
Moisture Content (%)	6.4%	22.5%
Saturation (%)	--	--
Height (in.)	3.59	2.96
Diameter (in.)	1.94	
Cross-Sec. Area (in²)	2.97	3.68
Void Ratio	0.41	0.42
Specific Gravity*	2.65	

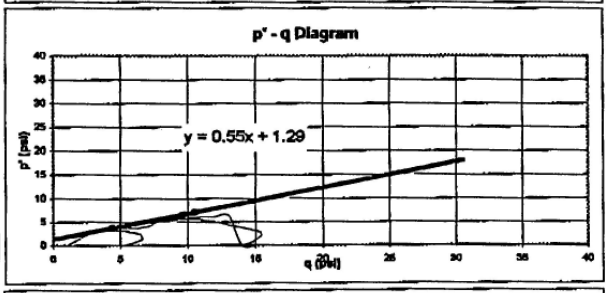
*Assumed

Confining Pressure: 14 psi	Initial	Final
Dry Density (pcf)	106.7	95.6
Moisture Content (%)	5.3%	15.9%
Saturation (%)	--	--
Height (in.)	3.94	3.34
Diameter (in.)	1.94	
Cross-Sec. Area (in²)	2.95	3.53
Void Ratio	0.36	0.42
Specific Gravity*	2.65	

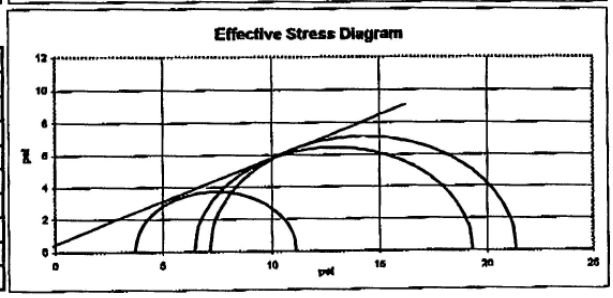
*Assumed







	6 psi	10 psi	14 psi
B Coefficient	99	97	95
t_{50} (min)	1.1	1.1	1.1
Back Pressure (psi)	69.4	71.4	70.9
Effective Stress (psi)	5.4	8.3	14.1
Minor Eff. Stress (psi)	0.7	2.9	2.9
Major Eff. Stress (psi)	5.4	8.3	14.1
Deviator Stress (psi)	7.4	12.9	14.2
Stain @ Failure (%)	18.3%	17.5%	15.3%
Shear Rate (in/min)	0.0022	0.0023	0.0022



Failure Criteria: Maximum Load

NATIVE EARTH
Angle of Internal Friction: 28.7 degrees q_u: 0.55 psi

Site #2

Fig. S2

$= 144 * 0.55$
$= 79.2 \frac{lb}{ft^2}$

POND 012 Native