HYDROLOGY STUDY FOR
WB MINING, LLC

FISHTRAP MINE NO. 2

P-3930 / REVISION R-1

JEFFERSON COUNTY, ALABAMA

BY

PERC ENGINEERING CO., INC.

P.O. BOX 1712

JASPER, ALABAMA 35502

DETAILED DESIGN PLANS

BASIN 009AE MODIFICATION

AND

BASIN 009E MODIFICATION

ATTACHMENT III-B-2(a)

AUGUST 24, 2011

PERC
ENGINEERING CO., INC.

Telephone: (205) 384-5553
Facsimile: (205) 295-3114 - Main Building
(205) 295-3115 - Water Lab
Web Address: www.percengineering.com

August 24, 2011

Mr. Michael Harrison, P.E.
Alabama Surface Mining Commission
Post Office Box 2390
Jasper, Alabama 35502-2390

RE: WB Mining, LLC
Fishtrap Mine No. 2
P-3930 / Revision R-1

Dear Michael:

I hereby certify the attached detailed design plans for Basin 009AE Modification and Basin 009E Modification for the above referenced mine are in accordance with the Regulations of the Alabama Surface Mining Commission as adopted by Act 81-435 of December 18, 1981 and amended to date, and are true and correct to the best of my knowledge and belief.

If you have any questions or require additional information, please feel free to call.

Sincerely,
PERC Engineering Co., Inc.

Leslie G. Stephens, P.E., P.L.S.
Alabama Registration No. 14117-E

ALABAMA PROFESSIONAL ENGINEER AND LAND SURVEYOR REGISTERED No.14117 LESLIE G. STEPHENS

P.O. Box 1712 • Jasper, Alabama 35502 • 1606 Highway 78 West • Jasper, Alabama 35501

Pond Construction Criteria

The embankment for sediment basins (temporary and permanent) shall be designed and built using the following as minimum criteria:

1. The top of the dam shall be no less than 12 feet wide.

2. See design sheet for maximum and minimum embankment slopes.

3. The foundation and abutments for the impounding structure shall be designed to be stable under all conditions of construction and operation of the impoundments, with a minimum static safety factor of 1.3 for the normal pool with steady seepage saturation conditions.

4. The dam shall be constructed with a cutoff trench based upon prudent engineering practices for the site. The cutoff shall be located on the dam centerline and be of sufficient depth to extend into a relatively impervious material from which the core of the dam shall also be constructed.

5. The embankment foundation area shall be cleared of all organic matter, all surfaces sloped to no steeper than lv:lh, and the entire foundation surface scarified.

6. The entire embankment and cutoff trench shall be compacted to 95 percent density, based on standard proctor as outlined in ASTM.

7. The material placed in the embankment shall be free of sod, roots, stones over 6 inches in diameter, and other objectionable materials. The fill material shall be placed and spread over the entire fill area, starting at the lowest point of the foundation, in layers not to exceed 12 inches in thickness. Construction of the fill shall be undertaken only at such times that the moisture content of the fill material will permit satisfactory compaction in accordance with paragraph 5.

8. The pool area of all basins will be cleared of timber and large undergrowth.

9. The primary decant system when consisting of a pipe shall be installed according to Class C pipe installation for embankment bedding.

10. The primary decant system shall be equipped with a device, or constructed, such as to insure that subsurface withdrawal is accomplished to prevent discharge of floating solids. If a channel is used as the primary decant a skimmer shall be installed to prevent floating solids from discharging.

11. A splash pad or riprap may be required under the discharge of the primary decant system where necessary to insure that the discharge does not erode the embankment.

12. The combination primary and secondary decant system shall be designed to safely carry the expected peak flow from a 25 year - 6 hour storm. The entire emergency overflow spillway channel will be a stabilized channel and will be stabilized upon completion of construction as specified within the detailed design plans using prudent engineering measures. These measures may consist of lining the spillway with concrete or a durable rock riprap, or the spillway being constructed in consolidated non-erodible material and planted with a mixture or both annual and perennial grasses, or a combination of any or all of the above.

13. Sediment basins using a single spillway system shall be an open channel of non-erodible construction consisting of concrete, durable rock riprap or its being constructed in consolidated non-erodible material as specified in the detailed design plans.

14. The settled embankment for temporary impoundments shall be a minimum of 1.0 foot above the maximum water elevation for the runoff from a 25 year - 6 hour, or a 10 year - 24 hour precipitation event (whichever has the greatest runoff). The settled embankment for permanent impoundments shall be a minimum of 1.0 foot above the maximum water elevation for the runoff from a 25 year - 6 hour, or a 10 year - 24 hour precipitation event or greater event as specified by the Regulatory Authority.(whichever has the greatest runoff).

15. If basins are built in series, then the combined decant system for each shall be designed to accommodate the entire contributing drainage area.

16. The dam and all disturbed areas shall be seeded with both perennial and annual grasses, fertilized and mulched in order to insure erosion is minimized. Hay bales or riprap may be placed at the toe of the dam immediately upon completion of construction.

17. The constructed height of the dam shall be increased a minimum of 5 percent over the design height to allow for settlement over the life of the embankment.

18. Final graded slopes of the entire permanent water impoundment area shall not exceed 2.5H-1.0V to provide for adequate safety and access for proposed water users.

19. Prior to Phase II bond release, additional data concerning water quality, water quantity, depth, size, configuration, postmining land use, etc., for each proposed permanent water impoundment, shall be submitted to the Regulatory Authority for permanent water impoundment approval.

20. All sediment basins will be inspected for stability, erosion, etc. two (2) times a month until removal of the structure or release of the reclamation bond.

21. The embankment and spillway will be maintained by repairing any damage such as erosion, slope failure or spillway damage until removal of the structure or release of the performance bond.

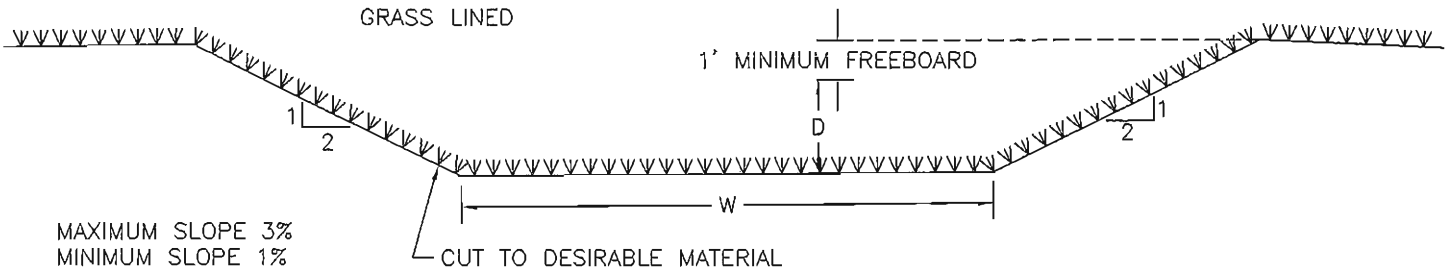
22. All ponds shall be examined quarterly for structural weakness, instability, erosion, or other hazardous conditions and maintenance performed as necessary. Formal inspections shall be made on an annual basis, including any reports or modifications, in accordance with 880-X-10C-.20[l(j)] of the Alabama Surface Mining Commission Regulations.

23. Sediment will be removed from each pond when the accumulated sediment reaches the sediment storage volume as shown on the detailed design sheet.

24. Upon completion of mining, successful reclamation and effluent standards being met, each sediment basin not remaining as a permanent water impoundment will be dewatered in an environmentally safe manner (such as siphoning, pumping, etc.) and reclaimed to approximate original contours by the following procedure: A permanent diversion channel (designed for a 10 year - 24 hour precipitation event) shall be cut along the outer edge of the basin to re-route drainage around the basin and back through the stabilized spillway to allow reclamation of the sediment basin. The diversion channel shall be designed and grassed as per enclosed information. (See permanent diversion for basin disposal).Upon completion of the diversion channel the back slope of the dam shall be graded to a minimum 3H to 1V slope. The dewatered sediment basin area shall be seeded with some combination of the following: Fescue, Bermuda, rye grass, canary grass and willows. After seeding the area shall be mulched. Any additional sediment or embankment material not used to meet original contour, if non-toxic, shall be spread in thin layers within the permit area and vegetated as stated in the approved reclamation plan. All toxic material encountered in the basin disposal shall be buried and covered with 4 feet of non-toxic material and vegetated as stated in the approved reclamation plan.

25. A qualified registered professional engineer or other qualified professional specialist, under the direction of the professional engineer shall conduct regular inspections during construction and upon completion shall inspect each basin for certification purposes.

26. Point source discharge embankments shall be constructed and abutments keyed into desirable material if at all possible. In the event that undesirable material is encountered, addition design and construction criteria shall be submitted prior to certification.



$$Q = \frac{1.49}{N} A R^{2/3} S^{1/2}$$

N(LOOSE STONE OR GRASS LINED) = 0.035

A = AREA

R = AREA/WETTED PERIMETER

S = SLOPE

* GRASS LINING: FESCUE, BERMUDA, RYE GRASS

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 8.0 FT.	
PEAK FLOW Q (CFS)	DEPTH D (FT)
0–15	0.5
15–50	1.0
50–100	1.5
100–180	2.0
180–270	2.5

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 10.0 FT.	
PEAK FLOW Q (CFS)	DEPTH D (FT)
0–15	0.5
15–60	1.0
60–120	1.5
120–210	2.0
210–320	2.5

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 12.0 FT.	
PEAK FLOW Q (CFS)	DEPTH D (FT)
0–20	0.5
20–70	1.0
70–150	1.5
150–250	2.0
250–383	2.5

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 15.0 FT.	
PEAK FLOW Q (CFS)	DEPTH D (FT)
0–25	0.5
25–90	1.0
90–180	1.5
180–300	2.0
300–450	2.5

PERC ENGINEERING CO., INC.
1808 Highway 78 West Jasper, Alabama 35501
P.O. Box 1712 Jasper, Alabama 35502
(205) 384-5553 Office (205) 384-3114 Fax

TYPICAL PERMANENT DIVERSION FOR BASIN DISPOSAL

DRAWN BY:	S.D.M.	DATE:	1/4/2011
DWG. NAME:	TYPICALS		
APPROVED BY:	L.G.S.	SCALE:	NONE

ATTACHMENT III–B–2–A

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NOTES

1) During the construction of Basins 009AE and 009E, C & H Mining Company, Inc., the contract miner, wanted to construct these basins as large as possible in order to do away with the requirement for Basin 009BP if possible. During construction field surveys were performed at various stages of construction to insure the volumes did not reach MSHA requirements for embankment height of less than 20.0 feet above natural ground and volume of 19.9 acre-feet above natural ground. Basin 009AE was limited to an open channel spillway height of 19.85 feet and a volume of 19.65 acre-feet. Basin 009E was incised up to within 0.85 feet of the primary spillway elevation, therefore the height and volume limits by MSHA are not applicable for this basin.

2) Basin 009BP was determined to be an obstacle to the Operations Plan by C & H Mining Company, Inc., thus the idea to eliminate the requirement for Basin 009BP occurred. Then work began as described in line item #1 to determine if this modification was feasible to construct.

3) The primary spillway of Basin 009AE consists of a 4 feet wide open channel lined with 4 inches of concrete reinforced with 6X6-W2.9XW2.9 concrete reinforcement wire. The channel lining extends back to the existing drainage course. A 6′ X 6′ X 4″ concrete splash pad reinforced with 6X6-W2.9XW2.9 welded wire fabric is located at the exit point of the tail section of the channel.

4) The primary spillway of Basin 009E consists of a 4 feet wide open channel lined with 4 inches of concrete reinforced with 6X6-W2.9XW2.9 concrete reinforcement wire. The channel lining extends back to the existing drainage course. A 6′ X 6′ X 4″ concrete splash pad reinforced with 6X6-W2.9XW2.9 welded wire fabric is located at the exit point of the tail section of the channel. Also, the spillway will consist of a 4″ (inch) diameter PVC fixed siphon tube constructed to the lines and grades as detailed within the design plans.

5) Due to Basins 009AE and 009E constructed in spoil material, the interior of the basins were lined with 1.0 feet (minimum) of clay material with a permeability no greater than 1×10^{-6} cm/sec up to the emergency spillway elevation to minimize infiltration and to provide a stable pool level with the clay placed in 6″ lifts compacted to 95% of the standard proctor.

6) Due to the normal pool of Basin 009E backing water onto the backslope of the embankment of Basin 009AE, Class II rip-rap was placed on the backslope of the embankment of Basin 009AE up to the normal pool of Basin 009E.

7) Modifications to Basin 009E include raising the top of boards elevation to 327.7 and extending the boards 0.3 feet. Field inspections found the boards to be at elevation 327.4. Adding a 2"X4" board to the top of the boards would raise the top of board elevation and achieve the modified board width. No other modifications are required for Basins 009E and 009AE.

8) The soil material used to construct the embankments of Basins 009E and 009AE were from the same location. The embankment material tested for Basin 009E will be used for the stability analysis of Basin 009AE within these design plans.

RIP-RAP CLASSIFICATION SPECIFICATIONS

CLASS 1 RIP-RAP

No more than 10% of the stone will have a diameter greater than twelve (12) inches; no more than 50% of the stone will have a diameter less than ten (10) inches; and no more than 10% of the stone will have a diameter of less than six (6) inches. The thickness of the rip-rap liner will be no less than twelve (12) inches.

CLASS 2 RIP-RAP

No more than 10% of the stone will have a diameter greater than sixteen (16) inches; no more than 50% of the stone will have a diameter less than twelve (12) inches; and no more than 10% of the stone will have a diameter of less than six (6) inches. The thickness of the rip-rap liner will be no less than sixteen (16) inches.

CLASS 3 RIP-RAP

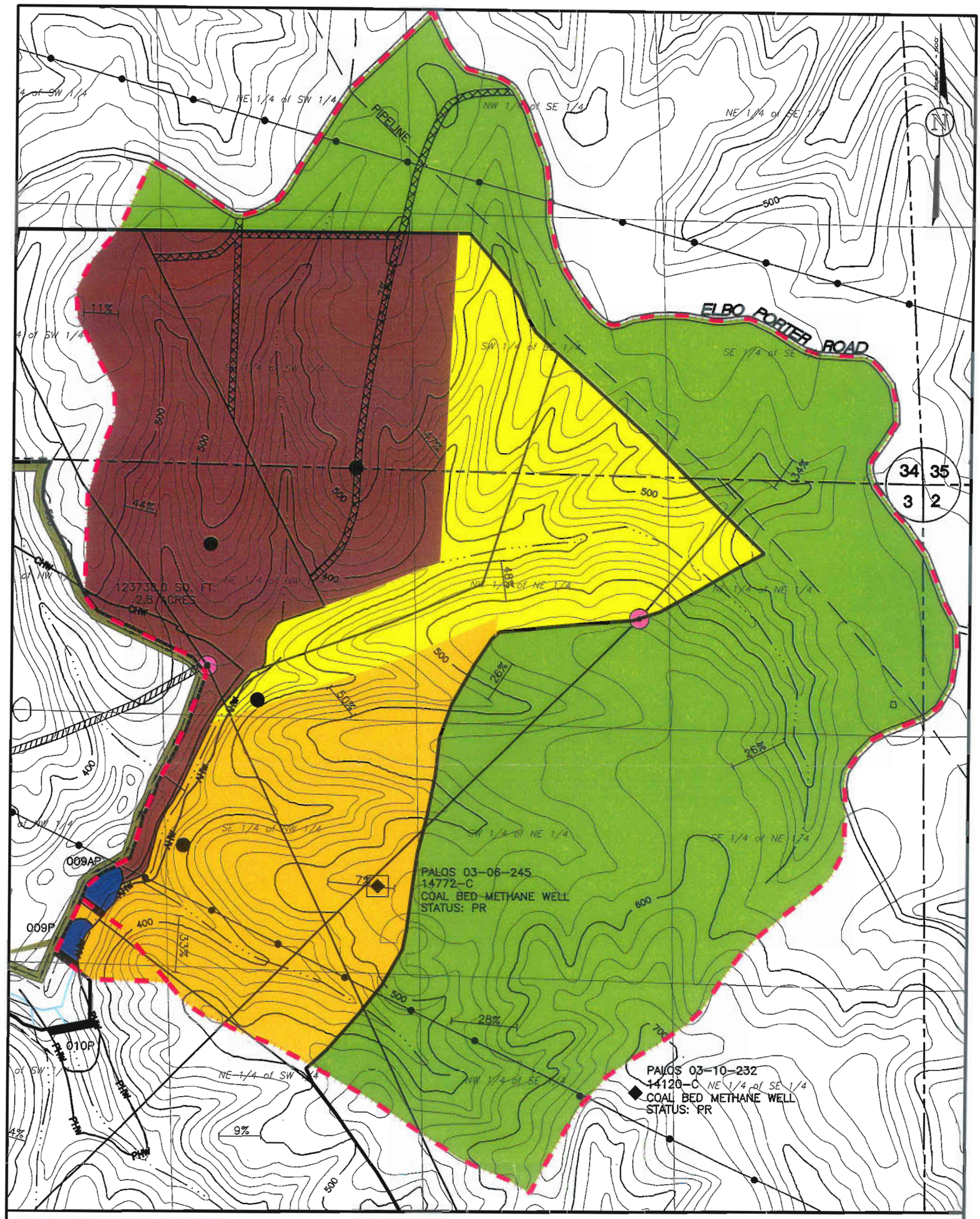
No more than 10% of the stone will have a diameter greater than twenty two (22) inches; no more than 50% of the stone will have a diameter less than sixteen (16) inches; and no more than 10% of the stone will have a diameter of less than eight (8) inches. The thickness of the rip-rap liner will be no less than twenty two (22) inches.

CLASS 4 RIP-RAP

No more than 10% of the stone will have a diameter greater than twenty seven (27) inches; no more than 50% of the stone will have a diameter less than twenty two (22) inches; and no more than 10% of the stone will have a diameter of less than ten (10) inches. The thickness of the rip-rap liner will be no less than twenty seven (27) inches.

CLASS 5 RIP-RAP

No more than 10% of the stone will have a diameter greater than thirty four (34) inches; no more than 50% of the stone will have a diameter less than twenty seven (27) inches; and no more than 10% of the stone will have a diameter of less than sixteen (16) inches. The thickness of the rip-rap liner will be no less than thirty four (34) inches.



LEGEND

- Permit Boundary
- CHW — Current Highwall
- Drainage Divide
- Previously Surface Mined by Others
- Occupied Dwelling
- Unoccupied Dwelling
- 001P — Sediment Basin
- Drainage Course by ASMC Regulation Definition
- Intermittent Stream
- Perennial Stream
- Permit P-3813

LANDUSE AND CURVE NUMBER INFORMATION

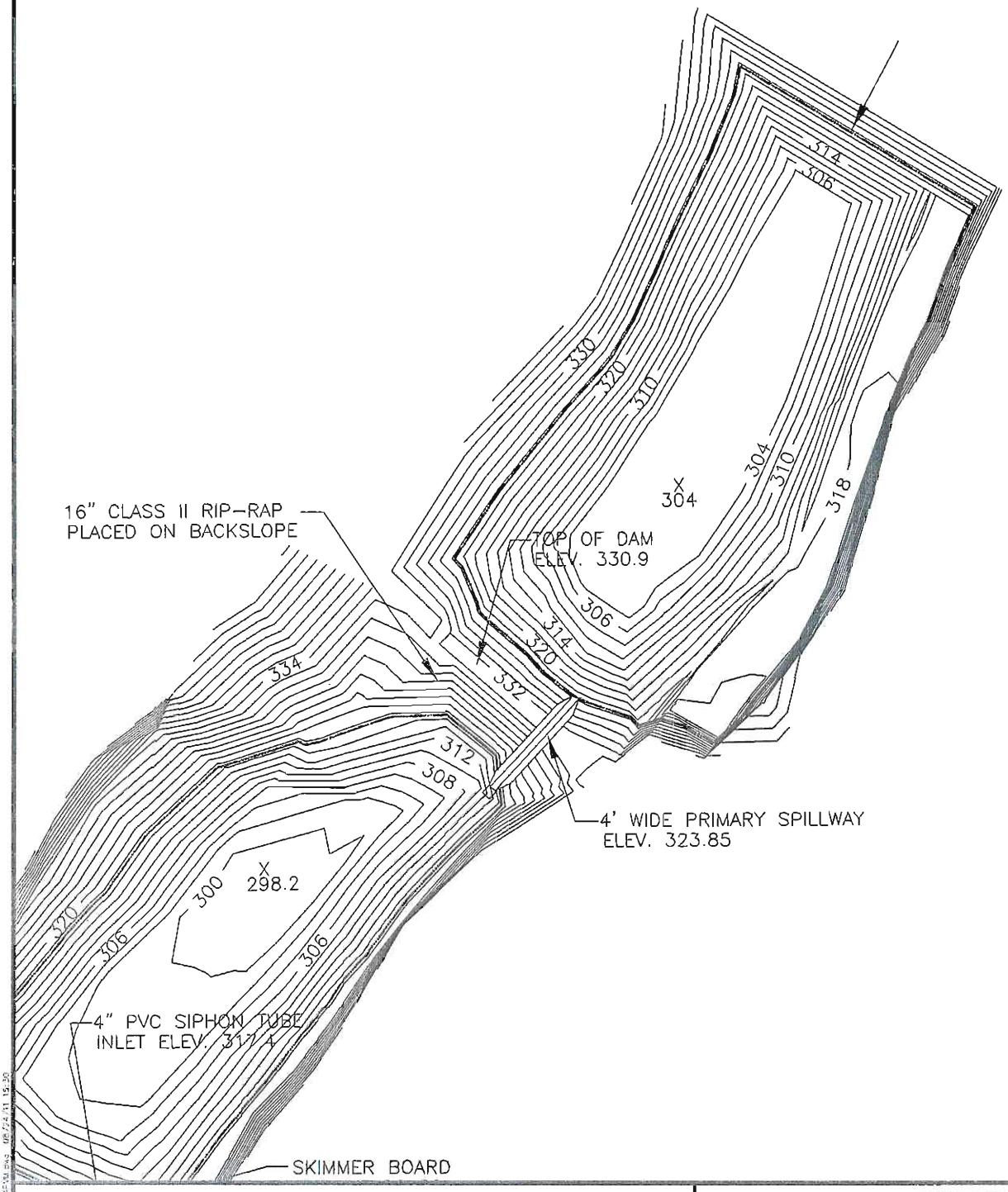
- Unmanaged Timberland, Curve Number 70
- 2-12 Months Revegated, Curve Number 74
- 0-2 Months Revegated, Curve Number 79
- Graded & Bare, Curve Number 81
- Sediment Basin, Curve Number 100

PERC ENGINEERING CO., INC.

Attachment III-B-2(a)
WB Mining LLC
Fishtrap Mine No. 2
P-3930 / Revision R-1
Basins 009 & 009A Watershed Map
Phase II

DRAWN BY: L.G.S. DWG. NAME: WBFT2B9&9A WSP11.GS	DATE: 9/29/2011
APPROVED BY: L.G.S.	SCALE: 1"=500'

V:\Leslie Stephens\C & H Mining\Fishtrap No. 2\WBFT2B9&9AWSP11.GS.dwg 09/29/11 11:32



LEGEND

- MAJOR INFLOW
- NORMAL POOL LEVEL BASIN 009AE ELEV. 323.85
- NORMAL POOL LEVEL BASIN 009E ELEV. 317.4
- 324 PROPOSED FINISHED GRADE

Scale: 1"=100'

N

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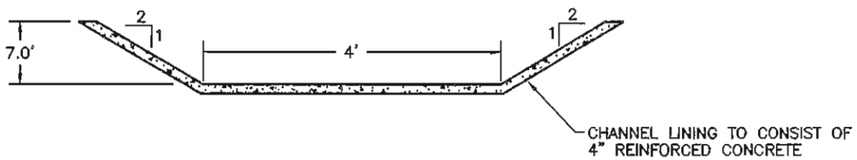
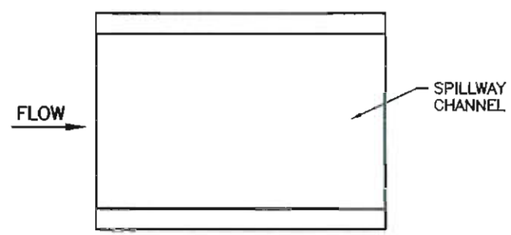
WB MINING, LLC
FISHTRAP MINE NO. 2
P-3930 / REVISION R-1
BASIN 009AE MODIFICATION
PLAN VIEW

DRAWN BY: S.D.M. DWG. NAME: WBFT2B9&9APV	DATE: 8/24/2011
APPROVED BY: L.G.S.	SCALE: 1" = 100'

Top of Dam Elev.	330.9
Spillway Elev.	323.85
Q Out	434.5 C.F.S.
V Out	4.6 FT/S





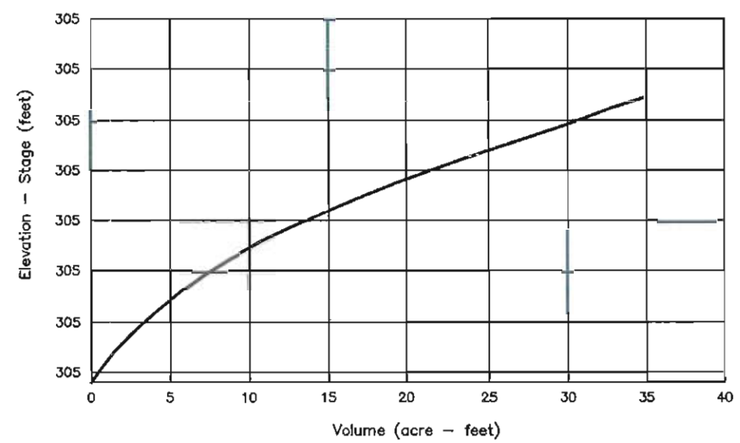
PLAN VIEW

Spillway Tail Section Gradient shall be Approximately 40%

Notes:

1. The sediment shall be removed from the basin when the accumulated sediment reaches the sediment storage volume.
2. Outer slopes of embankment shall be grassed.
3. Fill material shall be placed in 12" lifts and compacted to 95% of standard proctor.
4. The surface beneath the embankment shall be stripped of undesirable material.
5. Upon completion of mining, reclamation and maintenance of water quality standards the pond will be de-watered and reclaimed.
6. See the attached pond construction criteria.
7. See the attached drawings and specifications for diversions.
8. Elevations are based on assumed datum.
9. Channel lining within the control section of the spillway channel will extend to the maximum water elevation.

Stage vs. Storage Curve

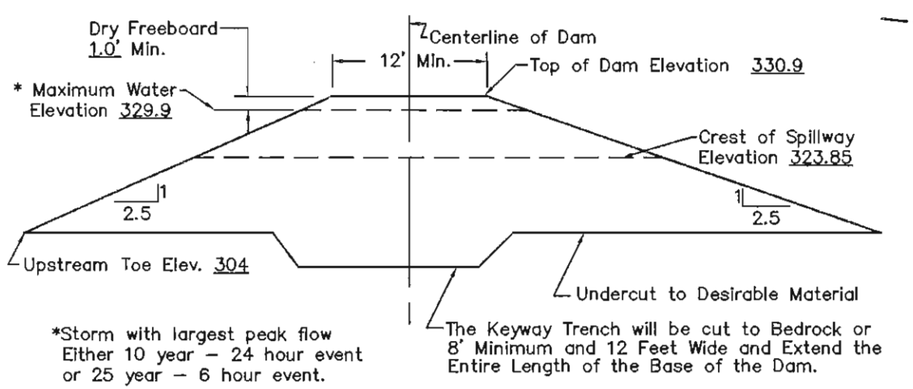


Storage Computation

Elevation (feet)	Area (acres)	Avg. Area (acres)	Interval (feet)	Storage (ac.-ft.)	Acc. Storage (ac.-ft.)
304	0.423				0.000
		0.446	1	0.445	
305	0.468				0.445
		0.590	5	2.929	
310	0.712				3.374
		0.356	5	4.172	
315	0.963				7.546
		1.220	5	6.054	
320	1.477				13.600
		1.602	5	8.002	
325	1.727				21.602
		1.842	5	9.202	
330	1.956				30.804
		2.002	2	4.002	
332	2.047				34.806

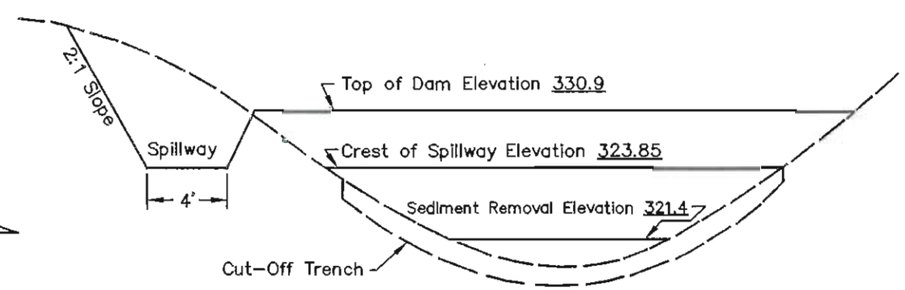
Key Basin Parameters

Drainage Area	423.0 Acres
Disturbed Area	210.0 Acres
Sediment Storage	15.6 Ac. Ft.
Detention Storage	4.0 Ac. Ft.
Permanent Pool Capacity	19.6 Ac. Ft.
Total Basin Capacity	30.6 Ac. Ft.
Peak Inflow	434.5 C.F.S.
Peak Outflow	521.4 C.F.S.



*Storm with largest peak flow
Either 10 year - 24 hour event
or 25 year - 6 hour event.

Typical Cross Section
Along Spillway



Typical Profile Looking Downstream

09/24/2011

Leslie G. Stephens, P.E., P.L.S. — *Date*
AL Registration. #14117-E

PERC ENGINEERING CO., INC.
1608 Highway 78 West Jasper, Alabama 35501
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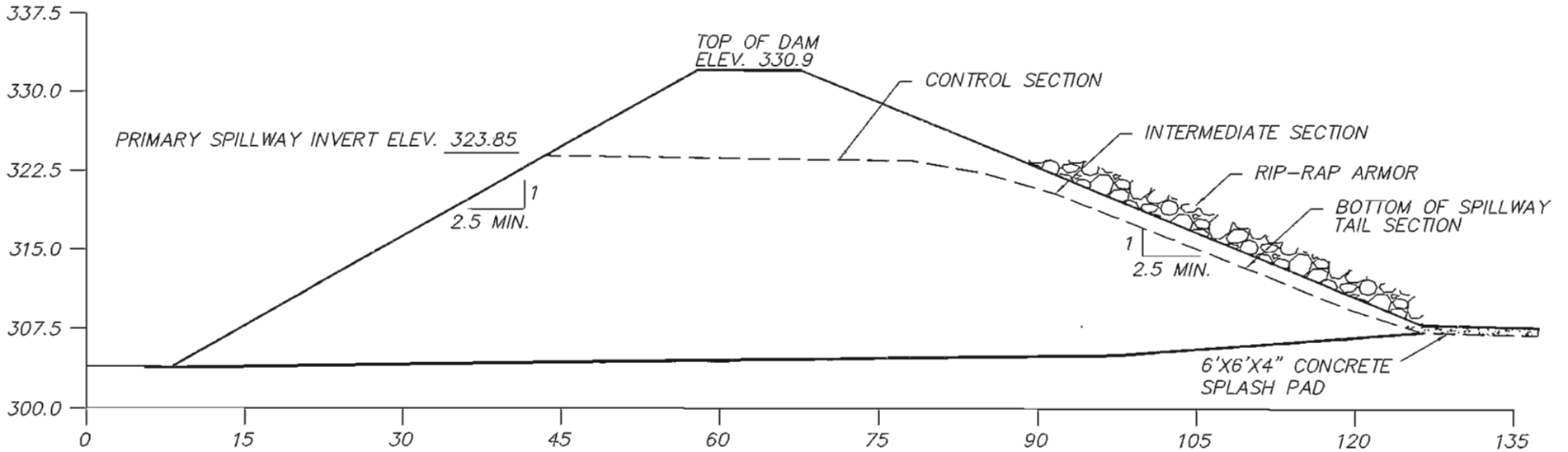
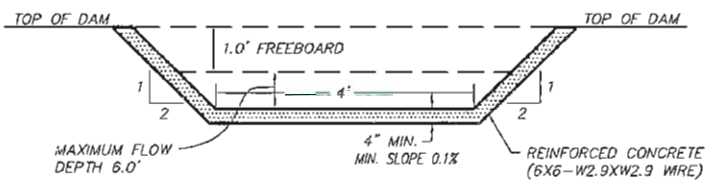
(205) 384-5661 Office (205) 384-9815 Fax

WB MINING, LLC
FISHTRAP MINE NO. 2
P-3930 / REVISION R-1
BASIN 009AE MODIFICATION

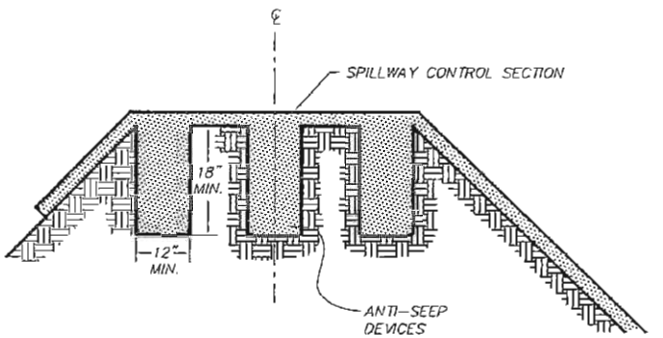
DRAWN BY:	S.D.M.	DATE:	8/24/2011
DWG. NAME:	WBFT2B9ADTM		
APPROVED BY:	L.G.S.	SCALE:	NONE





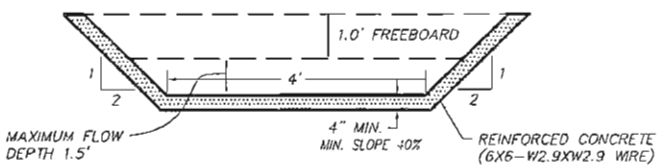
SPILLWAY CONTROL SECTION TYPICAL

N.T.S.



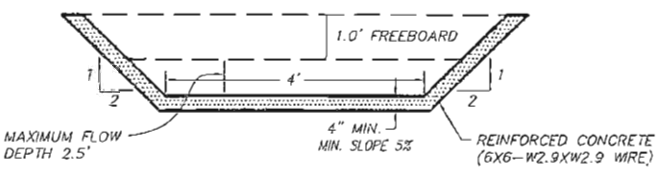
ANTI-SEEP DEVICE TYPICAL

N.T.S.



SPILLWAY TAIL SECTION TYPICAL

N.T.S.



SPILLWAY INTERMEDIATE SECTION TYPICAL

N.T.S.

PERC ENGINEERING CO. INC.

WB MINING, LLC
FISHTRAP MINE NO. 2
P-3930 / REVISION R-1
BASIN 009AE MODIFICATION
DAM DETAILS

DRAWN BY:	S.D.M.	DATE:	8/24/2011
DWG. NAME:	WBFT2B9ADDM		
APPROVED BY:	L.G.S.	SCALE:	AS NOTED

V:\Steve Miner\Steve Docs\Mines\Fishtrap No. 2\Basins 009 & 009A Mod\WBFT2B9ADDM.dwg 8/25/11 12:57

P-3930 / Revision R-1 Basin 009A Modification Spillway Control Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	0.1	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	434.50 cfs	
Depth:	5.98 ft	6.98 ft
Top Width:	27.91 ft	31.91 ft
Velocity:	4.56 fps	
X-Section Area:	95.36 sq ft	
Hydraulic Radius:	3.103 ft	
Froude Number:	0.43	

P-3930 / Revision R-1 Basin 009A Modification Spillway Intermediate Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	5.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	434.50 cfs	
Depth:	2.48 ft	3.48 ft
Top Width:	13.91 ft	17.91 ft
Velocity:	19.59 fps	
X-Section Area:	22.18 sq ft	
Hydraulic Radius:	1.471 ft	
Froude Number:	2.73	

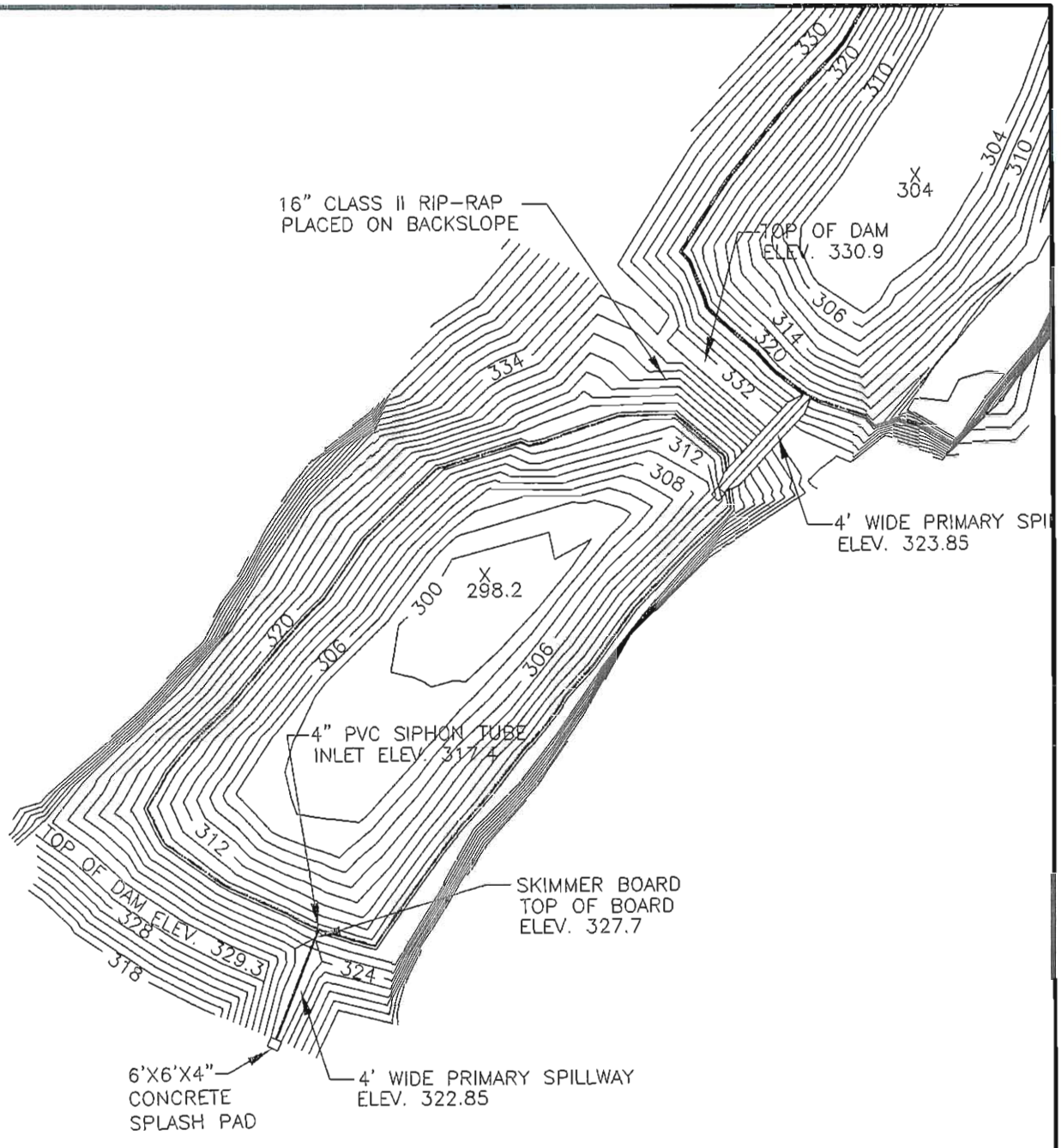
P-3930 / Revision R-1 Basin 009A Modification Spillway Tail Ditch Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	40.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	434.50 cfs	
Depth:	1.48 ft	2.48 ft
Top Width:	9.93 ft	13.93 ft
Velocity:	42.03 fps	
X-Section Area:	10.34 sq ft	
Hydraulic Radius:	0.972 ft	
Froude Number:	7.26	



LEGEND

- MAJOR INFLOW
- NORMAL POOL LEVEL BASIN 009AE ELEV. 323.85
- NORMAL POOL LEVEL BASIN 009E ELEV. 317.4
- 324 PROPOSED FINISHED GRADE

SCALE: 1"=100'

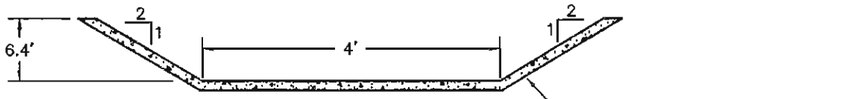
N

PERC ENGINEERING CO., INC.

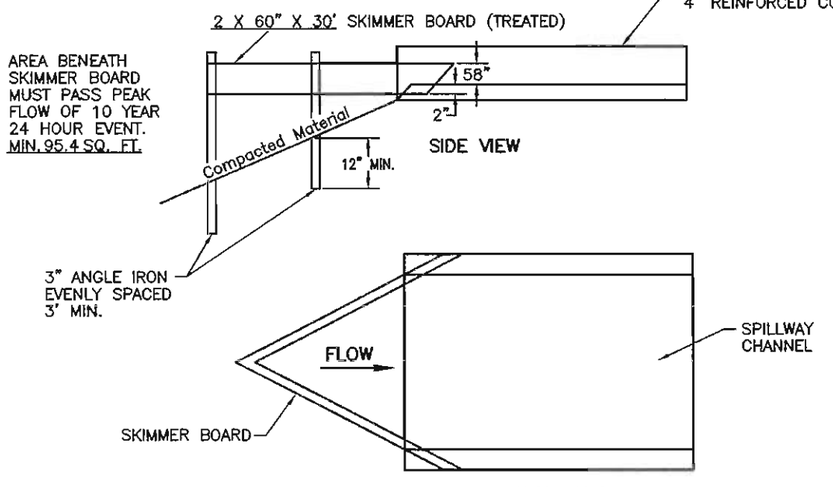
WB MINING, LLC
FISHTRAP MINE NO. 2
P-3930 / REVISION R-1
BASIN 009E MODIFICATION
PLAN VIEW

DRAWN BY: S.D.M. DWG. NAME: WBFT2B9&9APV	DATE: 8/24/2011
APPROVED BY: L.G.S.	SCALE: 1" = 100'

Skimmer Board Elev. 327.7
Spillway Elev. 322.85
Q Out 339.1 C.F.S.
V Out 4.3 FT/S



Spillway Control Section Gradient shall be Approximately 0.1%



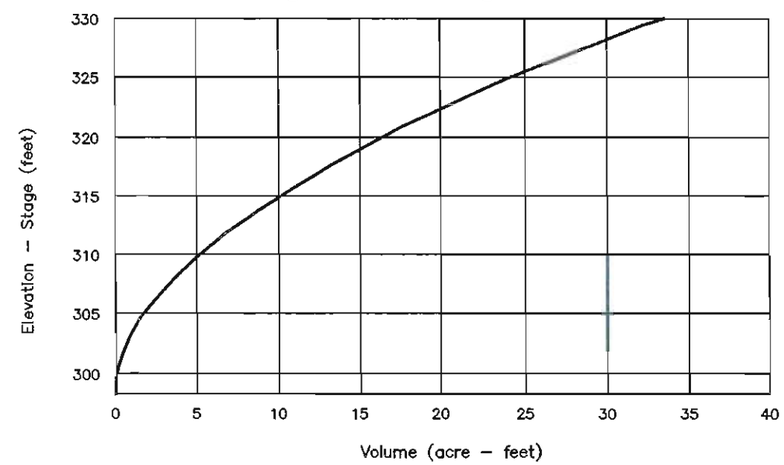
SKIMMER BOARD DETAIL

Spillway Tail Section Gradient shall be Approximately 40%

Notes:

1. The sediment shall be removed from the basin when the accumulated sediment reaches the sediment storage volume.
2. Outer slopes of embankment shall be grassed.
3. Fill material shall be placed in 12" lifts and compacted to 95% of standard proctor.
4. The surface beneath the embankment shall be stripped of undesirable material.
5. Upon completion of mining, reclamation and maintenance of water quality standards the pond will be de-watered and reclaimed.
6. See the attached pond construction criteria.
7. See the attached drawings and specifications for diversions.
8. Elevations are based on assumed datum.
9. Channel lining within the control section of the spillway channel will extend to the maximum water elevation.

Stage vs. Storage Curve

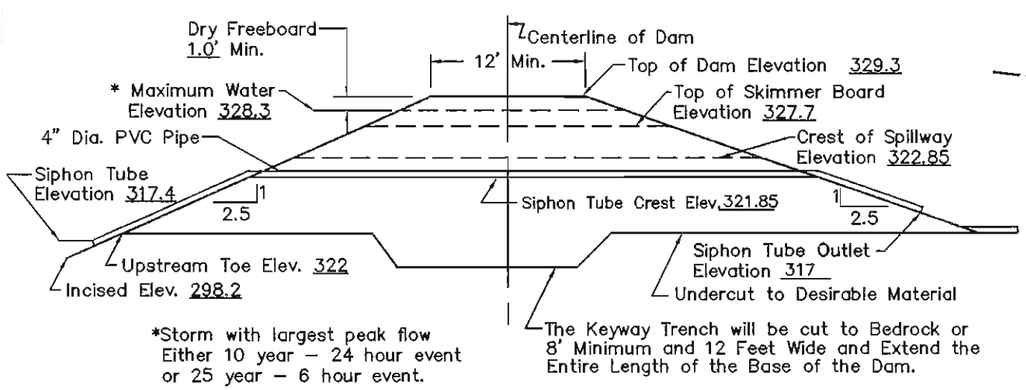


Storage Computation

Elevation (feet)	Area (acres)	Avg. Area (acres)	Interval (feet)	Storage (ac.-ft.)	Acc. Storage (ac.-ft.)
298.2	0.000				0.000
		0.076	1.98	0.091	
300	0.151				0.091
		0.359	5	1.684	
305	0.567				1.775
		0.705	5	3.500	
310	0.842				5.275
		0.984	5	4.903	
315	1.126				10.178
		1.278	5	6.361	
320	1.430				16.539
		1.562	5	7.732	
325	1.693				24.271
		1.855	5	9.261	
330	2.016				33.532

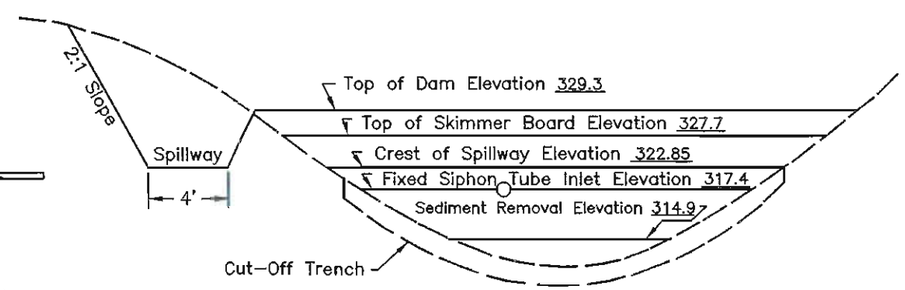
Key Basin Parameters

Drainage Area 426.5 Acres
Disturbed Area 208.8 Acres
Sediment Storage 10.1 Ac. Ft.
Detention Storage 3.0 Ac. Ft.
Permanent Pool Capacity 13.1 Ac. Ft.
Total Basin Capacity 30.4 Ac. Ft.
Peak Inflow 437.4 C.F.S.
Peak Outflow 339.1 C.F.S.



*Storm with largest peak flow
Either 10 year – 24 hour event
or 25 year – 6 hour event.

Typical Cross Section
Along Spillway



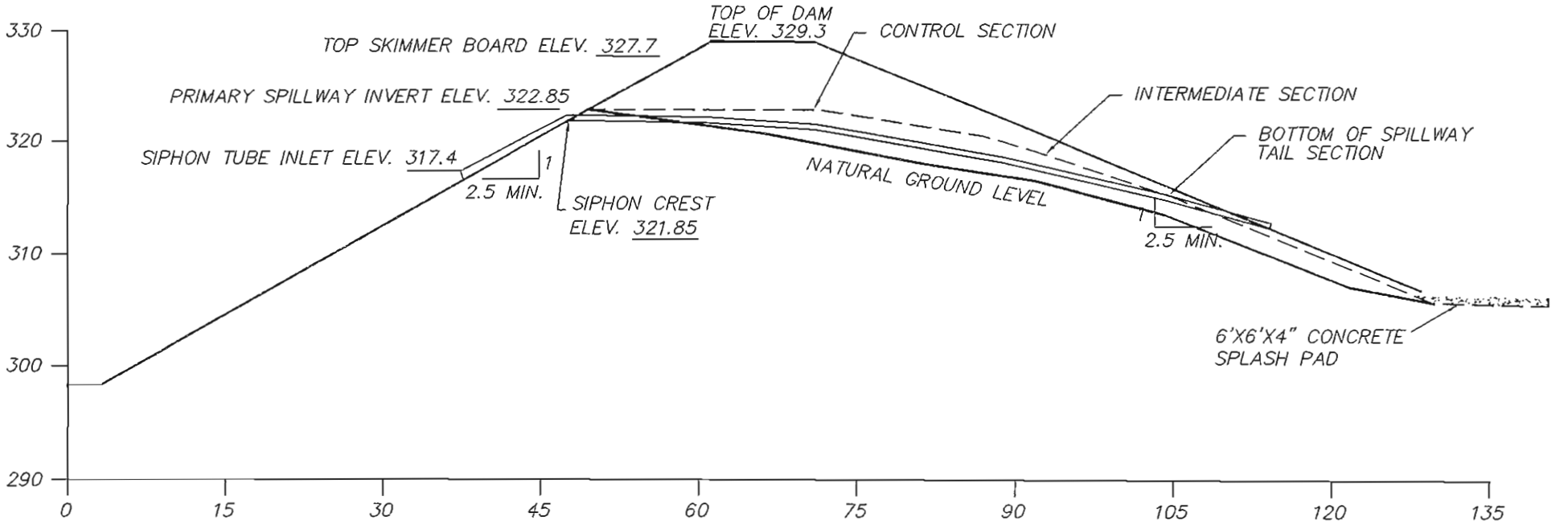
Typical Profile Looking Downstream

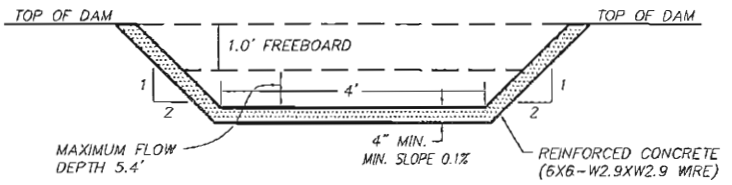
Leslie G. Stephens, P.E., P.L.S. 08/24/2011
Leslie G. Stephens, P.E., P.L.S. Date
AL Registration. #14117-E

PERC ENGINEERING CO., INC.
1806 Highway 78 West Jasper, Alabama 35501
P.O. Box 1712 Jasper, Alabama 35502
(205) 384-3363 Office (205) 384-1931 fax

WB MINING, LLC
FISHTRAP MINE NO. 2
P-3930 / REVISION R-1
BASIN 009E MODIFICATION

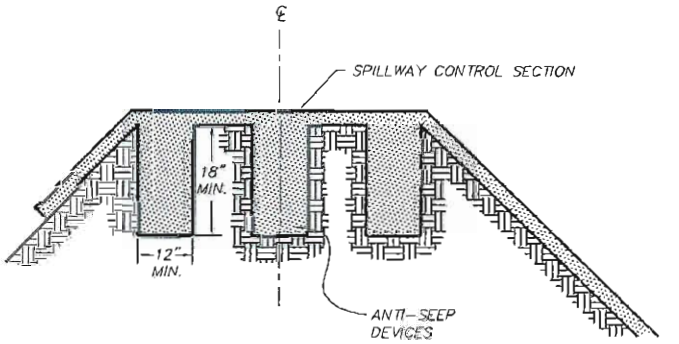
DRAWN BY: S.D.M. DWG. NAME: WBFT2B9DTM	DATE: 8/24/2011
APPROVED BY: L.G.S.	SCALE: NONE





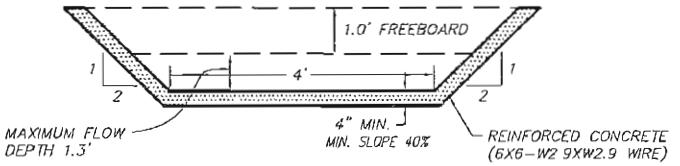
SPILLWAY CONTROL SECTION TYPICAL

N.T.S.



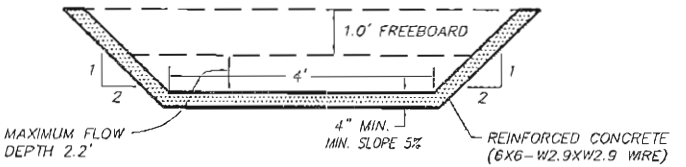
ANTI-SEEP DEVICE TYPICAL

N.T.S.



SPILLWAY TAIL SECTION TYPICAL

N.T.S.



SPILLWAY INTERMEDIATE SECTION TYPICAL

N.T.S.

PERC ENGINEERING CO. INC.

WB MINING, LLC
FISHTRAP MINE NO. 2
P-3930 / REVISION R-1
BASIN 009E MODIFICATION
DAM DETAILS

DRAWN BY:	S.D.M.	DATE:	8/24/2011
DWG. NAME:	WBFT2B9DDM		
APPROVED BY:	L.G.S.	SCALE:	AS NOTED

P-3930 / Revision R-1 Basin 009 Modification Spillway Control Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	0.1	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	339.10 cfs	
Depth:	5.37 ft	6.37 ft
Top Width:	25.49 ft	29.49 ft
Velocity:	4.28 fps	
X-Section Area:	79.21 sq ft	
Hydraulic Radius:	2.826 ft	
Froude Number:	0.43	

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P-3930 / Revision R-1 Basin 009 Modification Spillway Intermediate Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	5.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	339.10 cfs	
Depth:	2.20 ft	3.20 ft
Top Width:	12.80 ft	16.80 ft
Velocity:	18.36 fps	
X-Section Area:	18.47 sq ft	
Hydraulic Radius:	1.335 ft	
Froude Number:	2.69	

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P-3930 / Revision R-1 Basin 009 Modification Spillway Tail Ditch Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	2.0:1	2.0:1	40.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	339.10 cfs	
Depth:	1.31 ft	2.31 ft
Top Width:	9.22 ft	13.22 ft
Velocity:	39.26 fps	
X-Section Area:	8.64 sq ft	
Hydraulic Radius:	0.878 ft	
Froude Number:	7.15	

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WB Mining, LLC
Fishtrap Mine No. 2
P-3930 / Revision R-1
Basins 009AE Modification and 009E Modification

6.0 Inches, 10 Year-24 Hour,

DRN 58

LGS

PERC Engineering Co., Inc.
P.O. Box 1712
Jasper, Alabama 35502

Phone: 205-295-3127
Email: lstephens@percengineering.com

General Information

Storm Information:

Storm Type:	DRN58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	6.000 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	100.000%	100.000%
2.0000	96.000%	91.000%
1.0000	85.000%	84.000%
0.5000	76.000%	62.000%
0.3000	63.000%	49.000%
0.2000	53.000%	40.000%
0.1000	44.000%	33.000%
0.0500	33.000%	26.000%
0.0300	27.000%	18.000%
0.0200	24.000%	14.000%
0.0100	15.000%	12.000%
0.0050	10.000%	8.000%
0.0030	7.000%	4.000%
0.0010	4.000%	2.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	#2	0.004	0.347	Basin 009A
Pond	#2	==>	End	0.000	0.000	Basin 009

	#1 *Pond*
#2 *Pond*	

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	1.67	1.00	60.00	3.87	0.004
#1	**Muskingum K:**					**0.004**

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	423.000	423.000	375.08	96.57	12,761.4	186,002	129.51	64.85
	Out			353.94	96.57	1,775.5	27,671	2.72	1.40
#2	In	3.500	426.500	358.44	97.92	2,008.8	30,524	5.13	2.63
	Out			339.13	91.32	1,529.3	21,362	0.53	0.32

Particle Size Distribution(s) at Each Structure

Structure #1 (Basin 009A):

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	94.003%	100.000%
1.0000	87.047%	100.000%
0.5000	64.373%	100.000%
0.3000	50.903%	100.000%
0.2000	41.568%	100.000%
0.1000	34.296%	100.000%
0.0500	27.006%	100.000%
0.0300	18.735%	100.000%
0.0200	14.600%	100.000%
0.0100	12.462%	89.572%
0.0050	8.308%	59.715%
0.0030	4.173%	29.992%
0.0010	2.091%	15.029%
0.0001	0.000%	0.000%

Structure #2:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	98.759%	100.000%
1.0000	97.794%	100.000%
0.5000	94.760%	100.000%
0.3000	92.967%	100.000%
0.2000	91.726%	100.000%
0.1000	90.761%	100.000%
0.0500	89.796%	100.000%
0.0300	88.692%	100.000%
0.0200	88.141%	100.000%
0.0100	80.824%	100.000%
0.0050	53.882%	70.774%
0.0030	27.060%	35.543%
0.0010	13.560%	17.810%

Size (mm)	In	Out
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Basin 009A

Pond Inputs:

Initial Pool Elev:	323.85 ft
Initial Pool:	4.01 ac-ft
*Sediment Storage:	15.64 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
323.85	12.00	2.00:1	2.00:1	4.00

Pond Results:

Peak Elevation:	328.81 ft
H'graph Detention Time:	0.69 hrs
Pond Model:	CSTRS
Dewater Time:	1.34 days
Trap Efficiency:	86.09 %

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)	
321.35	1.543	0.000	0.000		Top of Sed. Storage
321.50	1.550	0.232	0.000		
322.00	1.575	1.013	0.000		
322.50	1.599	1.806	0.000		
323.00	1.624	2.612	0.000		
323.50	1.650	3.431	0.000		
323.80	1.665	3.928	0.000		
323.85	1.668	4.011	0.000		Spillway #1
324.00	1.675	4.262	1.111	14.75	
324.50	1.701	5.106	4.813	4.05	
325.00	1.727	5.963	15.774	1.15	
325.20	1.736	6.309	22.168	0.25	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
325.50	1.749	6.832	33.758	0.40	
326.00	1.772	7.712	58.454	7.80	
326.50	1.794	8.604	90.721	2.00	
327.00	1.817	9.507	131.118	0.80	
327.50	1.840	10.421	180.173	0.35	
328.00	1.863	11.346	238.382	0.20	
328.50	1.886	12.284	306.207	0.25	
328.81	1.900	12.865	353.945	0.20	Peak Stage
329.00	1.909	13.232	384.084		
329.50	1.932	14.193	472.420		
330.00	1.956	15.165	571.603		
330.50	1.979	16.148	681.999		
331.00	2.001	17.143	803.956		
331.50	2.024	18.150	937.805		
332.00	2.047	19.167	1,083.867		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
321.35	0.000	0.000
321.50	0.000	0.000
322.00	0.000	0.000
322.50	0.000	0.000
323.00	0.000	0.000
323.50	0.000	0.000
323.80	0.000	0.000
323.85	0.000	0.000
324.00	1.111	1.111
324.50	4.813	4.813
325.00	15.774	15.774
325.20	22.168	22.168
325.50	33.758	33.758
326.00	58.454	58.454
326.50	90.721	90.721
327.00	131.118	131.118
327.50	180.173	180.173
328.00	238.382	238.382
328.50	306.207	306.207
329.00	384.084	384.084

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
329.50	472.420	472.420
330.00	571.603	571.603
330.50	681.999	681.999
331.00	803.956	803.956
331.50	937.805	937.805
332.00	1,083.867	1,083.867

Structure #2 (Pond)

Basin 009

Pond Inputs:

Initial Pool Elev:	317.40 ft
Initial Pool:	2.98 ac-ft
*Sediment Storage:	10.06 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
322.85	12.00	2.00:1	2.00:1	4.00

Fixed Siphon

Crest Elev	Inlet Elev	Outlet Elev	Diameter (in)	Length (ft)	Manning's n
321.85	317.40	317.00	4.00	60.00	0.0140

Pond Results:

Peak Elevation:	327.71 ft
H'graph Detention Time:	1.39 hrs
Pond Model:	CSTRS
Dewater Time:	7.40 days
Trap Efficiency:	23.87 %

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)	
314.89	1.120	0.000	0.000		Top of Sed. Storage
315.00	1.126	0.119	0.000		
315.20	1.137	0.345	0.000		
315.70	1.164	0.920	0.000		
316.20	1.191	1.509	0.000		
316.70	1.219	2.112	0.000		
317.20	1.247	2.728	0.000		
317.40	1.258	2.978	0.000		
317.70	1.275	3.358	0.287	16.01*	
318.20	1.303	4.003	0.385	20.24*	
318.70	1.332	4.662	0.466	17.10*	
319.20	1.361	5.335	0.536	15.19*	
319.70	1.391	6.023	0.600	13.88*	
320.20	1.420	6.726	0.658	12.92*	
320.50	1.438	7.155	0.690	7.51*	
320.70	1.450	7.443	0.711	4.92*	
321.20	1.481	8.176	0.760	11.66*	
321.50	1.499	8.623	0.788	6.86*	
321.70	1.512	8.924	0.807	4.52*	
321.85	1.521	9.152	0.820	3.36*	Spillway #2
322.00	1.530	9.380	0.834	3.32*	
322.20	1.541	9.688	0.851	4.37*	
322.50	1.557	10.152	0.877	6.55	
322.70	1.568	10.465	0.893	4.45	
322.85	1.576	10.700	0.906	3.90	Spillway #1
323.20	1.595	11.255	4.434	4.70	
323.70	1.622	12.059	9.474	2.55	
324.20	1.649	12.877	23.179	1.25	
324.70	1.676	13.708	43.812	5.00	
325.00	1.693	14.214	59.523	3.30	
325.20	1.705	14.554	71.503	1.05	
325.70	1.737	15.414	106.990	1.35	
326.20	1.768	16.290	150.822	0.60	
326.70	1.800	17.182	203.514	0.35	
327.20	1.832	18.090	265.548	0.25	
327.70	1.864	19.014	337.374	0.35	
327.71	1.865	19.034	339.131	0.05	Peak Stage
328.20	1.896	19.954	419.417		
328.70	1.929	20.910	512.077		
329.20	1.962	21.883	615.731		
329.70	1.996	22.873	730.739		
330.00	2.016	23.475	805.336		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
314.89	0.000	0.000	0.000
315.00	0.000	0.000	0.000
315.20	0.000	0.000	0.000
315.70	0.000	0.000	0.000
316.20	0.000	0.000	0.000
316.70	0.000	0.000	0.000
317.20	0.000	0.000	0.000
317.40	0.000	0.000	0.000
317.70	0.000	0.287*	0.287
318.20	0.000	0.385*	0.385
318.70	0.000	0.466*	0.466
319.20	0.000	0.536*	0.536
319.70	0.000	0.600*	0.600
320.20	0.000	0.658*	0.658
320.50	0.000	0.690*	0.690
320.70	0.000	0.711*	0.711
321.20	0.000	0.760*	0.760
321.50	0.000	0.788*	0.788
321.70	0.000	0.807*	0.807
321.85	0.000	0.820	0.820
322.00	0.000	0.834	0.834
322.20	0.000	0.851	0.851
322.50	0.000	0.877	0.877
322.70	0.000	0.893	0.893
322.85	0.000	0.906	0.906
323.20	3.501	0.934	4.434
323.70	8.501	0.973	9.474
324.20	22.168	1.011	23.179
324.70	42.765	1.047	43.812
325.00	58.454	1.068	59.523
325.20	70.421	1.082	71.503
325.70	105.873	1.117	106.990
326.20	149.672	1.150	150.822
326.70	202.332	1.183	203.514
327.20	264.333	1.214	265.548
327.70	336.128	1.246	337.374

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
328.20	418.141	1.276	419.417
328.70	510.771	1.306	512.077
329.20	614.396	1.335	615.731
329.70	729.376	1.363	730.739
330.00	803.956	1.380	805.336

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	211.300	0.212	0.135	0.382	70.000	M	161.11	39.487
	2	62.480	0.178	0.000	0.000	81.000	F	76.63	19.439
	3	91.300	0.182	0.000	0.000	74.000	M	79.37	19.588
	4	1.670	0.001	0.000	0.000	100.000	F	2.63	0.834
	5	56.250	0.097	0.000	0.000	79.000	M	70.30	17.223
	Σ	**423.000**						**375.08**	**96.571**
#2	1	1.260	0.001	0.000	0.000	100.000	F	1.98	0.629
	2	2.240	0.087	0.000	0.000	81.000	F	2.91	0.724
	Σ	**426.500**						**358.44**	**97.924**

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	0.300	200.00	29.00	0.0030	1.0000	1	101.8	3,343	2.16	1.22
	2	0.240	200.00	32.00	0.9000	1.0000	2	10,817.0	561,484	391.36	238.20
	3	0.240	200.00	29.00	0.0500	1.0000	2	613.0	40,140	27.50	15.59
	4	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	5	0.240	200.00	27.00	0.1400	1.0000	2	1,229.6	89,348	62.56	35.82
	Σ							**12,761.4**	**186,002**	**129.51**	**64.85**
#2	1	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	2	0.240	200.00	33.00	0.9000	1.0000	2	277.0	413,876	289.80	173.21
	Σ							**2,008.8**	**30,524**	**5.13**	**2.63**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	1. Forest with heavy ground litter	10.00	20.00	200.00	0.800	0.069
		8. Large gullies, diversions, and low flowing streams	14.38	230.00	1,600.00	11.370	0.039
#1	**1**	**Time of Concentration:**					**0.212**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	10.00	20.00	200.00	3.160	0.017
		8. Large gullies, diversions, and low flowing streams	4.20	100.00	2,380.00	6.140	0.107

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**2**	**Time of Concentration:**					**0.178**
#1	4	3. Short grass pasture	5.00	10.00	200.00	1.780	0.031
		8. Large gullies, diversions, and low flowing streams	2.13	20.00	940.00	4.370	0.059
#1	**4**	**Time of Concentration:**					**0.001**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	5.00	10.00	200.00	2.230	0.024
#2	**1**	**Time of Concentration:**					**0.001**

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WB Mining, LLC
Fishtrap Mine No. 2
P-3930 / Revision R-1
Basins 009AE Modification and 009E Modification

4.8 Inches, 25 Year-6 Hour,

SCS 6 Hour

LGS

PERC Engineering Co., Inc.
P.O. Box 1712
Jasper, Alabama 35502

Phone: 205-295-3127
Email: lstephens@percengineering.com

General Information

Storm Information:

Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1680
1.00	0.3840
1.50	0.6480
2.00	1.1040
2.50	2.8800
3.00	3.3600
3.50	3.7440
4.00	4.0080
4.50	4.2480
5.00	4.4400
5.50	4.6320
6.00	4.8000

Peak 30-minute Intensity: 3.552 in/hr

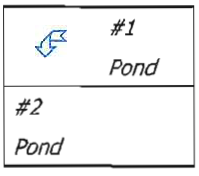
Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	100.000%	100.000%
2.0000	96.000%	91.000%
1.0000	85.000%	84.000%
0.5000	76.000%	62.000%
0.3000	63.000%	49.000%
0.2000	53.000%	40.000%
0.1000	44.000%	33.000%
0.0500	33.000%	26.000%
0.0300	27.000%	18.000%
0.0200	24.000%	14.000%
0.0100	15.000%	12.000%
0.0050	10.000%	8.000%
0.0030	7.000%	4.000%

Size (mm)	Topsoil	Spoil
0.0010	4.000%	2.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	#2	0.004	0.347	Basin 009A
Pond	#2	==>	End	0.000	0.000	Basin 009



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	1.67	1.00	60.00	3.87	0.004
#1	**Muskingum K:**					**0.004**

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	423.000	423.000	521.44	67.15	15,166.2	321,430	222.27	105.64
	Out			434.50	67.15	2,322.5	51,092	6.62	3.28
#2	In	3.500	426.500	437.40	68.17	2,456.2	133,454	21.20	4.16
	Out			318.36	62.76	1,490.8	25,716	0.13	0.09

Particle Size Distribution(s) at Each Structure

Structure #1 (Basin 009A):

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	97.786%	100.000%
1.0000	90.639%	100.000%
0.5000	67.304%	100.000%
0.3000	53.279%	100.000%
0.2000	43.507%	100.000%
0.1000	35.895%	100.000%
0.0500	28.266%	100.000%
0.0300	19.606%	100.000%
0.0200	15.276%	99.754%
0.0100	13.044%	85.179%
0.0050	8.696%	56.786%
0.0030	4.366%	28.509%
0.0010	2.187%	14.284%
0.0001	0.000%	0.000%

Structure #2:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	98.730%	100.000%
1.0000	97.743%	100.000%
0.5000	94.639%	100.000%
0.3000	92.805%	100.000%
0.2000	91.536%	100.000%
0.1000	90.548%	100.000%
0.0500	89.561%	100.000%
0.0300	88.432%	100.000%
0.0200	87.868%	100.000%
0.0100	82.236%	100.000%
0.0050	54.824%	90.326%
0.0030	27.522%	45.344%
0.0010	13.789%	22.718%

Size (mm)	In	Out
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Basin 009A

Pond Inputs:

Initial Pool Elev:	323.85 ft
Initial Pool:	4.01 ac-ft
*Sediment Storage:	15.64 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
323.85	12.00	2.00:1	2.00:1	4.00

Pond Results:

Peak Elevation:	329.29 ft
H'graph Detention Time:	0.50 hrs
Pond Model:	CSTRS
Dewater Time:	1.02 days
Trap Efficiency:	84.69 %

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)	
321.35	1.543	0.000	0.000		Top of Sed. Storage
321.50	1.550	0.232	0.000		
322.00	1.575	1.013	0.000		
322.50	1.599	1.806	0.000		
323.00	1.624	2.612	0.000		
323.50	1.650	3.431	0.000		
323.80	1.665	3.928	0.000		
323.85	1.668	4.011	0.000		Spillway #1
324.00	1.675	4.262	1.111	14.75	
324.50	1.701	5.106	4.813	4.05	
325.00	1.727	5.963	15.774	1.15	
325.20	1.736	6.309	22.168	0.20	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
325.50	1.749	6.832	33.758	0.25	
326.00	1.772	7.712	58.454	0.30	
326.50	1.794	8.604	90.721	0.35	
327.00	1.817	9.507	131.118	1.45	
327.50	1.840	10.421	180.173	0.80	
328.00	1.863	11.346	238.382	0.50	
328.50	1.886	12.284	306.207	0.30	
329.00	1.909	13.232	384.084	0.15	
329.29	1.922	13.780	434.500	0.20	Peak Stage
329.50	1.932	14.193	472.420		
330.00	1.956	15.165	571.603		
330.50	1.979	16.148	681.999		
331.00	2.001	17.143	803.956		
331.50	2.024	18.150	937.805		
332.00	2.047	19.167	1,083.867		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
321.35	0.000	0.000
321.50	0.000	0.000
322.00	0.000	0.000
322.50	0.000	0.000
323.00	0.000	0.000
323.50	0.000	0.000
323.80	0.000	0.000
323.85	0.000	0.000
324.00	1.111	1.111
324.50	4.813	4.813
325.00	15.774	15.774
325.20	22.168	22.168
325.50	33.758	33.758
326.00	58.454	58.454
326.50	90.721	90.721
327.00	131.118	131.118
327.50	180.173	180.173
328.00	238.382	238.382
328.50	306.207	306.207
329.00	384.084	384.084

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
329.50	472.420	472.420
330.00	571.603	571.603
330.50	681.999	681.999
331.00	803.956	803.956
331.50	937.805	937.805
332.00	1,083.867	1,083.867

Structure #2 (Pond)

Basin 009

Pond Inputs:

Initial Pool Elev:	317.40 ft
Initial Pool:	2.98 ac-ft
*Sediment Storage:	10.06 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
322.85	12.00	2.00:1	2.00:1	4.00

Fixed Siphon

Crest Elev	Inlet Elev	Outlet Elev	Diameter (in)	Length (ft)	Manning's n
321.85	317.40	317.00	4.00	60.00	0.0140

Pond Results:

Peak Elevation:	327.57 ft
H'graph Detention Time:	1.75 hrs
Pond Model:	CSTRS
Dewater Time:	7.07 days
Trap Efficiency:	39.30 %

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)	
314.89	1.120	0.000	0.000		Top of Sed. Storage
315.00	1.126	0.119	0.000		
315.20	1.137	0.345	0.000		
315.70	1.164	0.920	0.000		
316.20	1.191	1.509	0.000		
316.70	1.219	2.112	0.000		
317.20	1.247	2.728	0.000		
317.40	1.258	2.978	0.000		
317.70	1.275	3.358	0.287	16.01*	
318.20	1.303	4.003	0.385	20.24*	
318.70	1.332	4.662	0.466	17.10*	
319.20	1.361	5.335	0.536	15.19*	
319.70	1.391	6.023	0.600	13.88*	
320.20	1.420	6.726	0.658	12.92*	
320.50	1.438	7.155	0.690	7.51*	
320.70	1.450	7.443	0.711	4.92*	
321.20	1.481	8.176	0.760	11.66*	
321.50	1.499	8.623	0.788	6.86*	
321.70	1.512	8.924	0.807	4.52*	
321.85	1.521	9.152	0.820	3.36*	Spillway #2
322.00	1.530	9.380	0.834	3.35	
322.20	1.541	9.688	0.851	4.40	
322.50	1.557	10.152	0.877	6.60	
322.70	1.568	10.465	0.893	4.45	
322.85	1.576	10.700	0.906	3.85	Spillway #1
323.20	1.595	11.255	4.434	4.70	
323.70	1.622	12.059	9.474	2.50	
324.20	1.649	12.877	23.179	1.15	
324.70	1.676	13.708	43.812	0.55	
325.00	1.693	14.214	59.523	0.25	
325.20	1.705	14.554	71.503	0.20	
325.70	1.737	15.414	106.990	0.60	
326.20	1.768	16.290	150.822	1.50	
326.70	1.800	17.182	203.514	0.60	
327.20	1.832	18.090	265.548	0.45	
327.57	1.855	18.769	318.357	0.35	Peak Stage
327.70	1.864	19.014	337.374		
328.20	1.896	19.954	419.417		
328.70	1.929	20.910	512.077		
329.20	1.962	21.883	615.731		
329.70	1.996	22.873	730.739		
330.00	2.016	23.475	805.336		

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
314.89	0.000	0.000	0.000
315.00	0.000	0.000	0.000
315.20	0.000	0.000	0.000
315.70	0.000	0.000	0.000
316.20	0.000	0.000	0.000
316.70	0.000	0.000	0.000
317.20	0.000	0.000	0.000
317.40	0.000	0.000	0.000
317.70	0.000	0.287*	0.287
318.20	0.000	0.385*	0.385
318.70	0.000	0.466*	0.466
319.20	0.000	0.536*	0.536
319.70	0.000	0.600*	0.600
320.20	0.000	0.658*	0.658
320.50	0.000	0.690*	0.690
320.70	0.000	0.711*	0.711
321.20	0.000	0.760*	0.760
321.50	0.000	0.788*	0.788
321.70	0.000	0.807*	0.807
321.85	0.000	0.820	0.820
322.00	0.000	0.834	0.834
322.20	0.000	0.851	0.851
322.50	0.000	0.877	0.877
322.70	0.000	0.893	0.893
322.85	0.000	0.906	0.906
323.20	3.501	0.934	4.434
323.70	8.501	0.973	9.474
324.20	22.168	1.011	23.179
324.70	42.765	1.047	43.812
325.00	58.454	1.068	59.523
325.20	70.421	1.082	71.503
325.70	105.873	1.117	106.990
326.20	149.672	1.150	150.822
326.70	202.332	1.183	203.514
327.20	264.333	1.214	265.548
327.70	336.128	1.246	337.374

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
328.20	418.141	1.276	419.417
328.70	510.771	1.306	512.077
329.20	614.396	1.335	615.731
329.70	729.376	1.363	730.739
330.00	803.956	1.380	805.336

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	211.300	0.212	0.135	0.382	70.000	M	234.50	26.594
	2	62.480	0.178	0.000	0.000	81.000	F	145.31	14.061
	3	91.300	0.182	0.000	0.000	74.000	M	127.09	13.566
	4	1.670	0.001	0.000	0.000	100.000	F	5.98	0.666
	5	56.250	0.097	0.000	0.000	79.000	M	142.58	12.262
	Σ	**423.000**						**521.44**	**67.150**
#2	1	1.260	0.001	0.000	0.000	100.000	F	4.51	0.502
	2	2.240	0.087	0.000	0.000	81.000	F	6.00	0.522
	Σ	**426.500**						**437.40**	**68.173**

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	0.300	200.00	29.00	0.0030	1.0000	1	100.7	4,315	2.70	1.74
	2	0.240	200.00	32.00	0.9000	1.0000	2	12,911.5	758,576	525.04	358.94
	3	0.240	200.00	29.00	0.0500	1.0000	2	649.5	54,629	36.74	23.31
	4	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	5	0.240	200.00	27.00	0.1400	1.0000	2	1,513.9	140,677	98.50	60.99
	Σ							**15,166.2**	**321,430**	**222.27**	**105.64**
#2	1	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	2	0.240	200.00	33.00	0.9000	1.0000	2	346.5	603,730	422.73	279.49
	Σ							**2,456.2**	**133,454**	**21.20**	**4.16**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	1. Forest with heavy ground litter	10.00	20.00	200.00	0.800	0.069
		8. Large gullies, diversions, and low flowing streams	14.38	230.00	1,600.00	11.370	0.039
#1	**1**	**Time of Concentration:**					**0.212**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	10.00	20.00	200.00	3.160	0.017

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	4.20	100.00	2,380.00	6.140	0.107
#1	**2**	**Time of Concentration:**					**0.178**
#1	4	3. Short grass pasture	5.00	10.00	200.00	1.780	0.031
		8. Large gullies, diversions, and low flowing streams	2.13	20.00	940.00	4.370	0.059
#1	**4**	**Time of Concentration:**					**0.001**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	5.00	10.00	200.00	2.230	0.024
#2	**1**	**Time of Concentration:**					**0.001**

WB Mining, LLC
Fishtrap Mine No. 2
P-3930 / Revision R-1
Basins 009AE and 009E
Soil Classification

WB Mining, LLC
Fishtrap Mine No. 2
P-3930 / Revision R-1

STABILITY ANALYSIS DATA

METHODOLOGY

The static and dynamic loading stability analyses were performed using the Simplified Bishop Method. The computer program used was the REAME Slope Stability Program as developed by Dr. Yang H. Haung, P.E. of the University of Kentucky.

SOIL CLASSIFICATION UNITS

The soil type (soil classification) to be used in the construction of the embankment structure of Basin 009AE (ML) and Basin 009E (SM) and the soil type (soil classification) of the material between the proposed embankment and stiff base of Basins 009AE and 009E were sampled and analyzed by PERC Engineering Co., Inc. The soil properties used in the stability analysis (SM) type soil, was taken from the U.S. Department of the Interior Bureau of Reclamation Design of Small Dams.*

SOIL PROPERTIES

	UNIFIED CLASS	COHESION (PSF)	ANGLE OF INT. FRC.	DESIGN DENSITY (PCF)
Dam Material Basin 009AE	SM	273.6	33.0	132.1
Foundation Basin 009AE	SM	273.6	33.0	132.1
Dam Material Basin 009E	SM	273.6	33.0	132.1
Foundation Basin 009E	SM	273.6	33.0	132.1

*United States Department of Interior Bureau of Reclamation Design of Small Dams Second Edition 1973, Revised Reprint 1974 page 137 and United States Department of Interior Bureau of Reclamation Design of Small Dams Third Edition 1987 page 96 and 97.

STABILITY ANALYSIS DATA

(Continued)

DESIGN DATA

1) Design Density = 95% of the standard proctor maximum density.
2) Embankment top width: 12.0'.
3) Freeboard minimum = 10% of structure (from top of embankment to normal pool level).
4) Safety factors for embankments with 2.5H:1V slopes, front and back.
5) Basin 009AE design height = 26.9 ft.
6) Basin 009E design height = 31.1 ft.
7) DMIN = 0.00
8) All design heights are measured from the top of the embankment to the toe of the upstream slope.

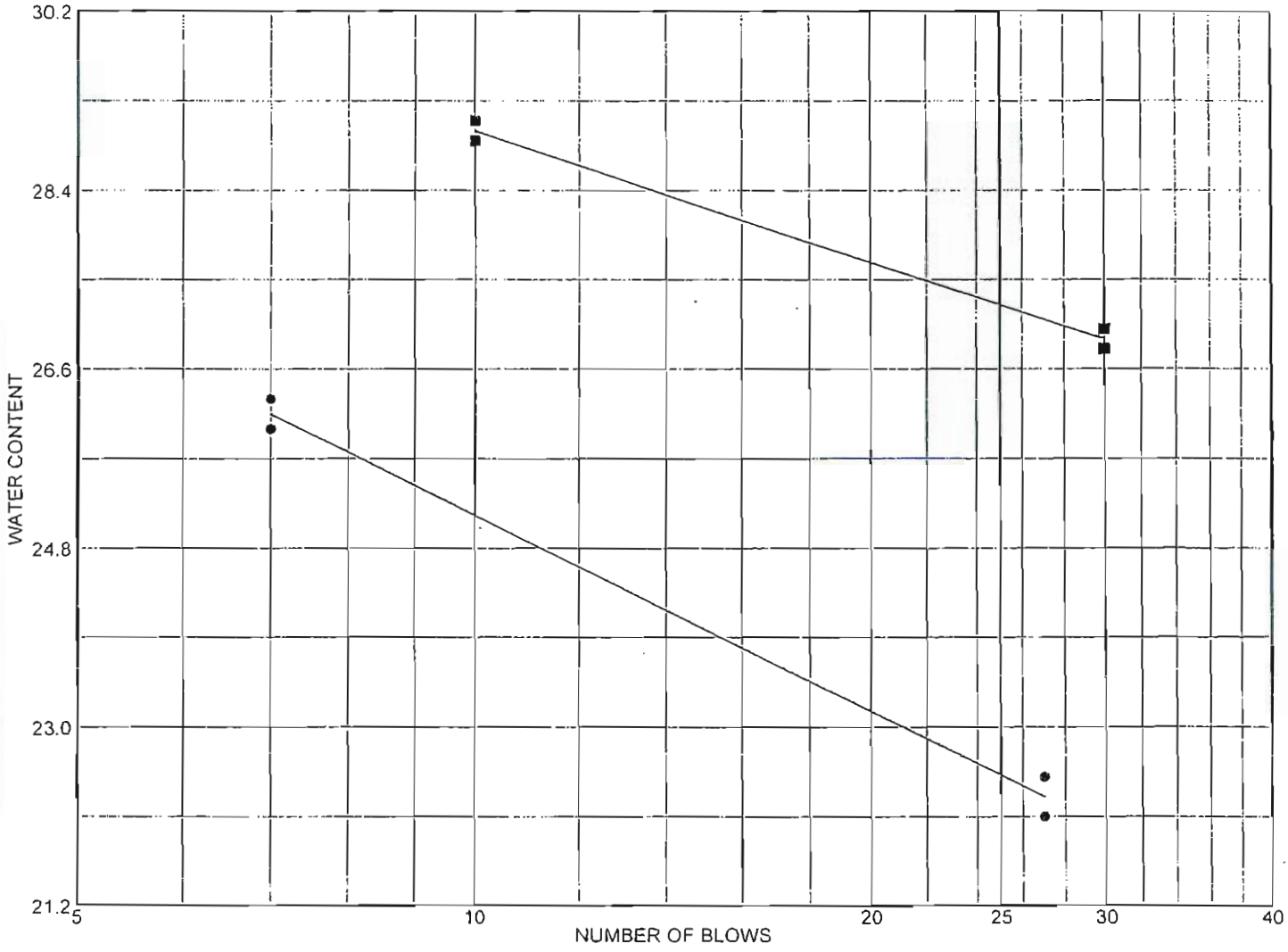
SAFETY FACTORS

BASIN NUMBER	STATIC SAFETY FACTOR
009AE	2.2
009E	1.8

FOUNDATIONS AND ABUTMENTS

The foundation and abutments area will be inspected for visible structural deficiencies after clearing and grubbing, and if found they will be treated using sound engineering practices.

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand with gravel	23	20	3	52.21	39.95	SM
■	Silty sand with gravel	27	26	1	49.11	35.43	SM

Project No. Client: WB Mining LLC

Project: Basin 009

Basin 009

● Location: Fish Trap 2

■ Location: Fish Trap 2

Remarks:

● Dam Material

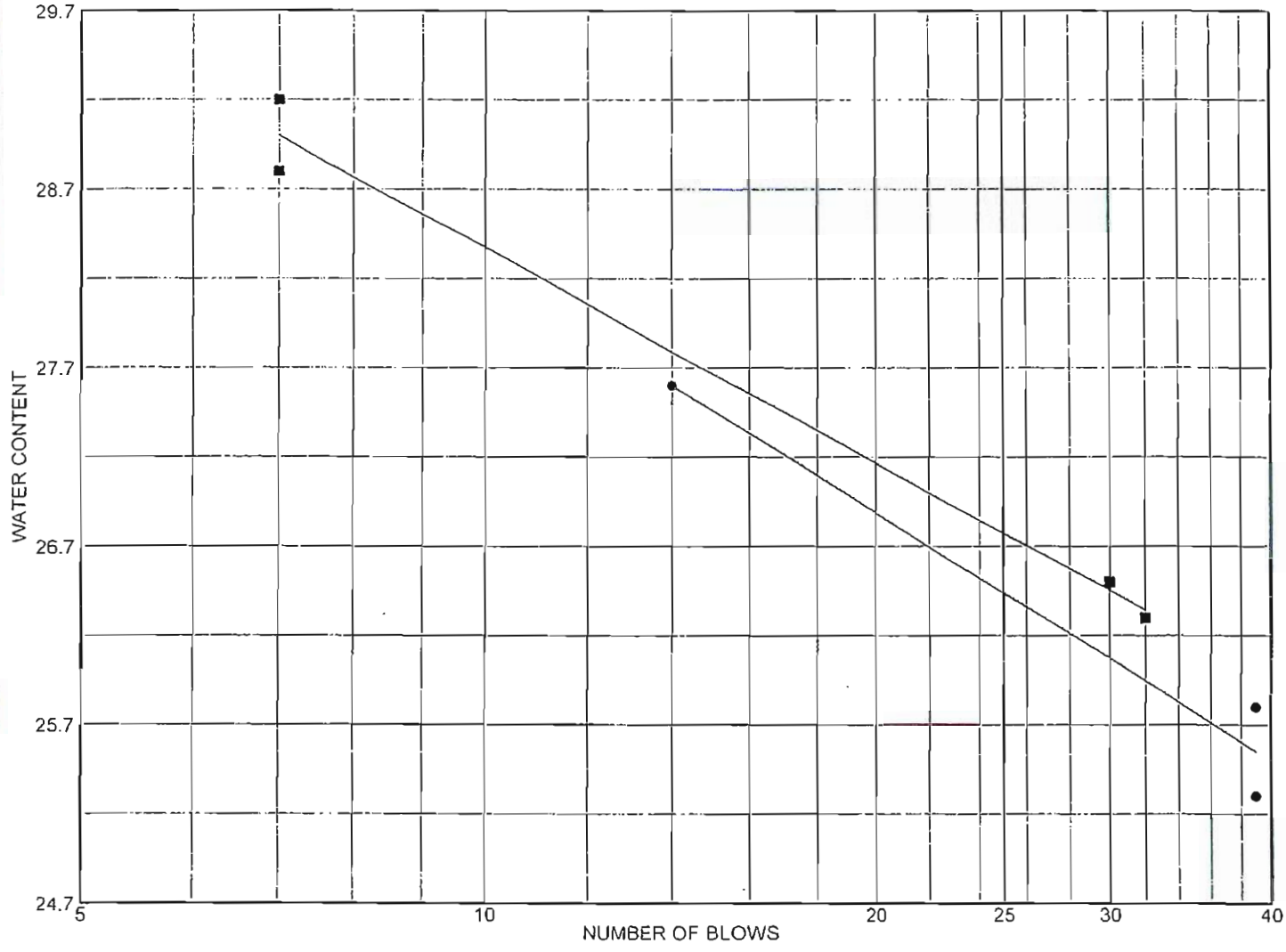
■ Foundation Material

PERC ENGINEERING CO., INC.

Jasper, Alabama

Date 7-22-2009

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy silt	26	23	3	82.82	58.53	ML
■	Silty sand with gravel	27	25	2	49	34.61	SM

Project No. Client: WB Mining LLC

Project: Basin 009A

Basin 009A

● Location: Fish Trap 2

■ Location: Fish Trap 2

Remarks:

● Dam Material

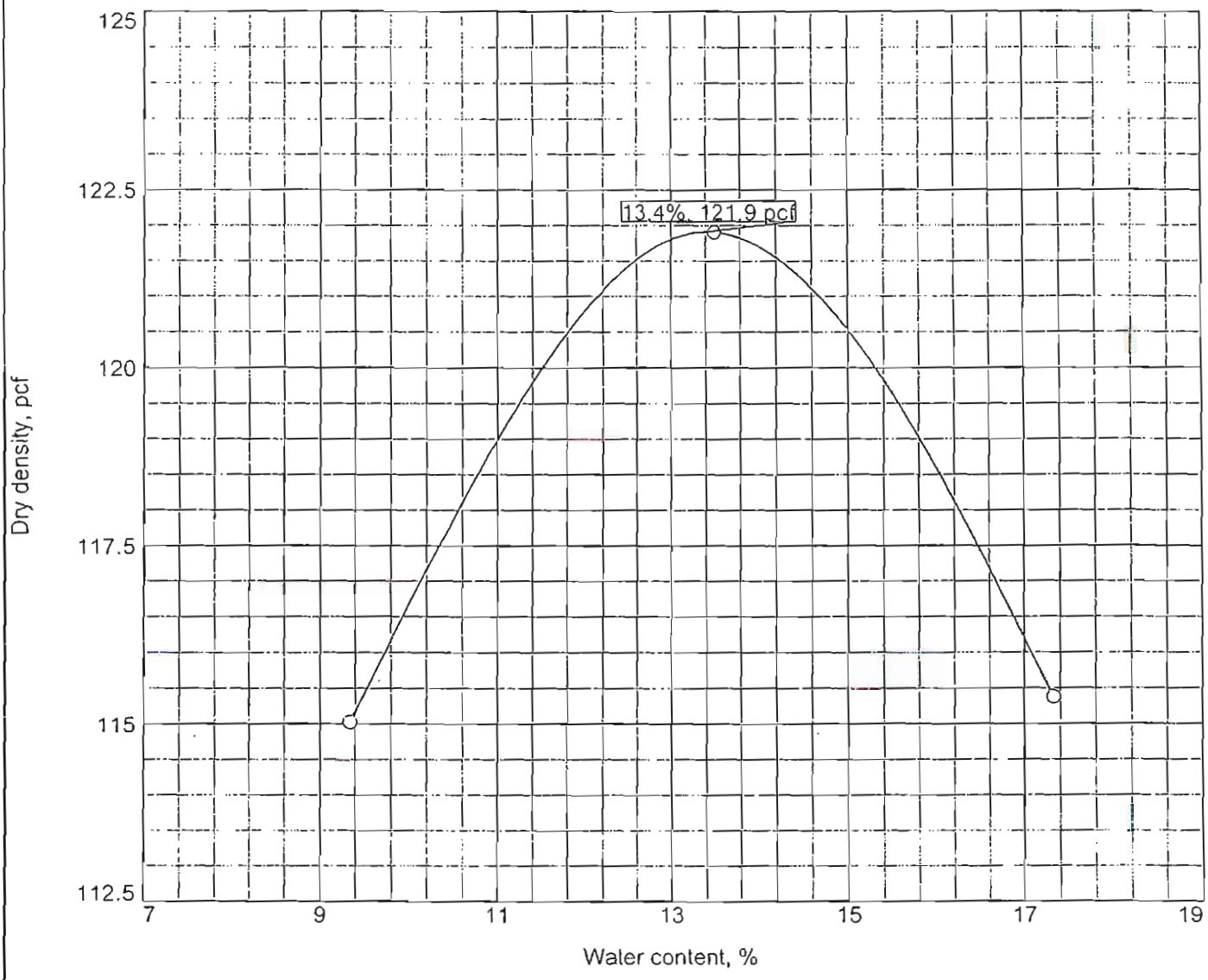
■ Dam Foundation

PERC ENGINEERING CO., INC.

Jasper, Alabama

Date 7-22-2009

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SM				23	3		39.95

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.9 pcf Optimum moisture = 13.4 %	Silty sand with gravel

Project No. **Client:** WB Mining LLC
Project: Basin 009

o **Location:** Fish Trap 2

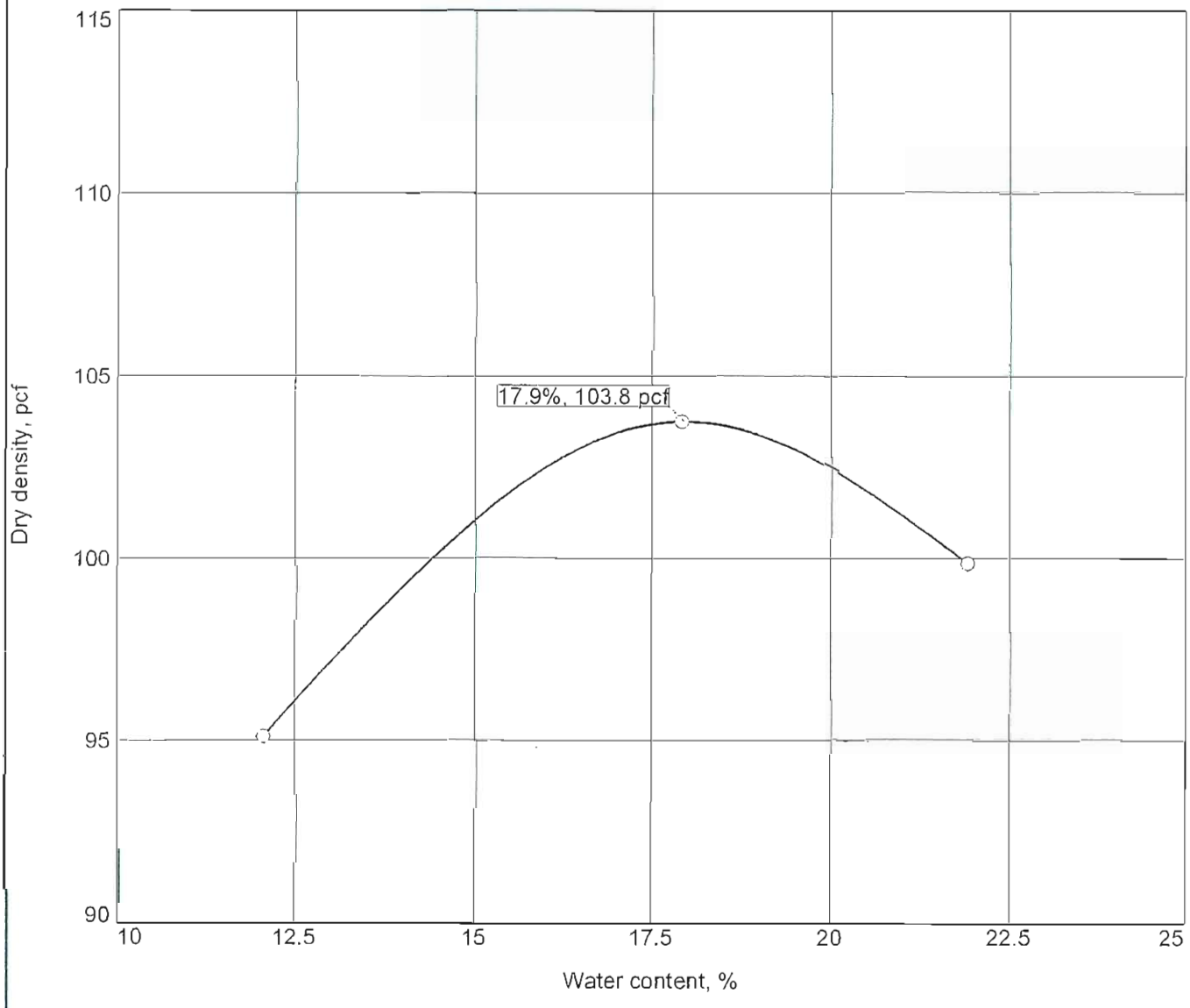
Remarks:
Dam Material

PERC ENGINEERING CO., INC.

Jasper, Alabama

Date 7-22-2009

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.8 pcf Optimum moisture = 17.9 %	Dam Material

Project No. **Client:** WB Mining LLC

Project: Fish Trap #2

Date:

Location: Basin 009A

Remarks:

PERC ENGINEERING CO., INC.

Jasper, Alabama

Date 7-11-11

WB Mining, LLC
Fishtrap Mine No. 2
P-3930 / Revision R-1
Basin 009AE and 009E
Stability Analysis

```
 REAME (Rotational Equilibrium Analysis of Multilayered Embankments)
     Implemented on the 16-bit Microcomputers C. F. Hains, Jr. and D. M. Hains
     2301 22nd Ave.
     Northport, AL 35476
     (205)-339-6536


WB MINING, LLC  FISHTRAP MINE NO. 2  P-3930 / REVISION R-1
BASIN 009E MODIFICATION
STATIC



          Number of cases to be analyzed    1



          Case Number    1


     Number of boundary lines=    4
     Number of points    on boundary lines are:         2         2         3
7

     On boundary line no. 1 Point no. and coordinates  are:
    1      .000    15.000    2   500.000      .000

     On boundary line no. 2 Point no. and coordinates  are:
    1   200.000    17.000    2   381.081    11.568

     On boundary line no. 3 Point no. and coordinates  are:
    1      .000    23.000    2   200.000    17.000    3   261.625    41.650

     On boundary line no. 4 Point no. and coordinates  are:
    1      .000    41.650    2   261.625    41.650    3   277.750    48.100    4
289.750    48.100    5   359.271    20.291
    6   381.081    11.568    7   500.000     8.000

     Line no. and slope of each segment are:
           1     -.030
           2     -.030
           3     -.030      .400
           4      .000      .400      .000     -.400     -.400     -.030

     No. of radius control zones=  1     Plot or no plot=  1     No. of seepage
cases=  1

     Total no. of lines at bottom of radius control zones   is:    1

     For rad. cont. zone no.  1     Radius decrement=      .000     No. of
Circles=  5     Id no. for first circle=,  1
        Line no.=  1     Begin pt. no.=  1     End pt. no.=  2
```

```
     Soil no.  Cohesion     F. angle     Unit wt.
         1      273.600       33.000      132.100
         2      273.600       33.000      132.100
         3         .000         .000       62.400

     Seismic coefficient=      .000     Min. depth of tallest slice=      .000
Unit weight of water=    62.400

     The factors of safety are determined by the SIMPLIFIED BISHOP method

     NSPG= 1  NSRCH= 0  No. of slices= 10  No. of add. radii= 2

     No. of points on water table for each case=   6

     Under seepage condition 1point no. and            coordinates of water
table are:
    1      .000    41.650    2   261.625    41.650    3   301.204    33.528    4
359.271    20.291    5   381.081    11.568
    6   500.000     8.000

 point1=(   291.000,    69.000) point2=(   291.000,    49.000) point3=(
382.000,    49.000) NJ=    2 NI=    2
     Automatic search will follow after grid with XINC=    10.000 and YINC=
10.000

 At point (   291.000,    69.000) under seepage    1,the radius and the
corresponding factor of safety are:
         62.702    10.017         54.349    10.199         45.996    10.331
37.643    10.057         29.290     9.429
         26.506     9.938         23.722    14.929
     Lowest factor of safety=     9.429 and occurs at radius  =     29.290


 At point (   291.000,    59.000) under seepage    1,the radius and the
corresponding factor of safety are:
         52.706    10.354         44.359    10.519         36.012    10.070
27.665     9.234         19.318     8.372
         16.536     9.148         13.754    12.970
     Lowest factor of safety=     8.372 and occurs at radius  =     19.318


 At point (   291.000,    49.000) under seepage    1,the radius and the
corresponding factor of safety are:
         42.711    11.307         34.429    11.207         26.146    10.092
17.864     9.477          9.582    10.012
         23.386     9.819         20.625     9.653         15.104     9.637
12.343     9.678
     Lowest factor of safety=     9.477 and occurs at radius  =     17.864


 At point (   336.500,    69.000) under seepage    1,the radius and the
corresponding factor of safety are:
         64.066     2.100         58.607     2.113         53.147     2.244
47.687     2.585         42.228     3.523
     Lowest factor of safety=     2.100 and occurs at radius  =     64.066
```

At point (336.500, 59.000) under seepage 1,the radius and the corresponding factor of safety are:
54.071 2.181 48.753 2.218 43.436 2.360
38.118 2.706 32.801 3.671
Lowest factor of safety= 2.181 and occurs at radius = 54.071

At point (336.500, 49.000) under seepage 1,the radius and the corresponding factor of safety are:
44.075 2.369 38.900 2.441 33.724 2.588
28.549 2.926 23.374 3.902
Lowest factor of safety= 2.369 and occurs at radius = 44.075

At point (382.000, 69.000) under seepage 1,the radius and the corresponding factor of safety are:
65.431 2.562 63.078 2.636 60.725 2.815
58.372 3.215 56.019 4.595
Lowest factor of safety= 2.562 and occurs at radius = 65.431

At point (382.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:
55.435 2.728 53.224 2.818 51.014 3.010
48.803 3.463 46.592 4.757
Lowest factor of safety= 2.728 and occurs at radius = 55.435

At point (382.000, 49.000) under seepage 1,the radius and the corresponding factor of safety are:
45.440 2.945 43.371 3.048 41.302 3.267
39.234 3.796 37.165 5.000
Lowest factor of safety= 2.945 and occurs at radius = 45.440

For piezometric line No. 1

At point (336.500, 69.000) ,RADIUS 64.066
the minimum factor of safety is 2.100

At point (336.500, 69.000) under seepage 1,the radius and the corresponding factor of safety are:
64.066 2.100 58.607 2.113 53.147 2.244
47.687 2.585 42.228 3.523
Lowest factor of safety= 2.100 and occurs at radius = 64.066

At point (346.500, 69.000) under seepage 1,the radius and the corresponding factor of safety are:
64.366 1.938 59.589 1.995 54.812 2.155
50.036 2.525 45.259 3.645
Lowest factor of safety= 1.938 and occurs at radius = 64.366

At point (356.500, 69.000) under seepage 1,the radius and the corresponding factor of safety are:
64.666 1.881 60.572 1.936 56.478 2.112
52.384 2.499 48.290 3.745
Lowest factor of safety= 1.881 and occurs at radius = 64.666

At point (366.500, 69.000) under seepage 1,the radius and the corresponding factor of safety are:
64.966 1.970 61.555 1.982 58.143 2.110
54.732 2.544 51.321 3.884
Lowest factor of safety= 1.970 and occurs at radius = 64.966

At point (356.500, 79.000) under seepage 1,the radius and the corresponding factor of safety are:
74.661 1.838 70.425 1.888 66.189 2.073
61.953 2.463 57.717 3.701
Lowest factor of safety= 1.838 and occurs at radius = 74.661

At point (356.500, 89.000) under seepage 1,the radius and the corresponding factor of safety are:
84.657 1.822 80.279 1.858 75.900 2.044
71.522 2.440 67.144 3.659
Lowest factor of safety= 1.822 and occurs at radius = 84.657

At point (356.500, 99.000) under seepage 1,the radius and the corresponding factor of safety are:
94.652 1.833 90.132 1.849 85.611 2.020
81.091 2.424 76.571 3.616
Lowest factor of safety= 1.833 and occurs at radius = 94.652

At point (366.500, 89.000) under seepage 1,the radius and the corresponding factor of safety are:
84.957 1.891 81.261 1.917 77.566 2.058
73.870 2.487 70.175 3.813
Lowest factor of safety= 1.891 and occurs at radius = 84.957

At point (346.500, 89.000) under seepage 1,the radius and the corresponding factor of safety are:
84.357 1.904 79.296 1.935 74.235 2.075
69.174 2.442 64.113 3.498
Lowest factor of safety= 1.904 and occurs at radius = 84.357

At point (359.000, 89.000) under seepage 1,the radius and the corresponding factor of safety are:
84.732 1.830 80.524 1.853 76.317 2.045
72.109 2.446 67.901 3.699
Lowest factor of safety= 1.830 and occurs at radius = 84.732

```
 At point (   354.000,    89.000) under seepage    1,the radius and the
corresponding factor of safety are:
         84.582     1.823         80.033     1.869         75.484     2.045
70.935     2.435         66.386     3.621
     Lowest factor of safety=     1.823 and occurs at radius  =     84.582


 At point (   356.500,    91.500) under seepage    1,the radius and the
corresponding factor of safety are:
         87.156     1.821         82.742     1.854         78.328     2.036
73.914     2.435         69.500     3.647
     Lowest factor of safety=     1.821 and occurs at radius  =     87.156


 At point (   356.500,    94.000) under seepage    1,the radius and the
corresponding factor of safety are:
         89.655     1.822         85.205     1.851         80.756     2.030
76.307     2.431         71.857     3.637
     Lowest factor of safety=     1.822 and occurs at radius  =     89.655


 At point (   359.000,    91.500) under seepage    1,the radius and the
corresponding factor of safety are:
         87.231     1.828         82.988     1.848         78.744     2.038
74.501     2.442         70.258     3.690
     Lowest factor of safety=     1.828 and occurs at radius  =     87.231


 At point (   354.000,    91.500) under seepage    1,the radius and the
corresponding factor of safety are:
         87.081     1.825         82.496     1.866         77.912     2.038
73.327     2.430         68.743     3.609
     Lowest factor of safety=     1.825 and occurs at radius  =     87.081



 For piezometric line No.    1

 At point (   356.500,    91.500) ,RADIUS    87.156
     the minimum factor of safety is      1.821


1

     Cross section in distorted scale. Numerals indicate boundary line no.
     If there area more than 10 bound. lines, alphabets will then be used. P
     Indicates Piezometric line. If a portion of Piezometric line coincides with
     the ground or another boundary line, only the ground or boundary
     line will be shown. X indicates intersection of two boundary
     lines. * indicates failure surface.
```

```
The minimum factor of safety is      1.821
5.000E+01 X+++++++++X+++++++++X++++++++X++++++++X++++++++X
          +    +                                         +
          +    +                44                       +
          +    +                                         +
          +    +                                         +
4.500E+01 X    X    +         +         +         +     X
          +    +                                         +
          +    +                                         +
          +    444444444444444X                          +
          +    +                   4                     +
4.000E+01 X    X    +         + P       +         +     X
          +    +                                         +
          +    +                                         +
          +    +                 P                       +
          +    +                                         +
3.500E+01 X    X    +         +         +         +     X
          +    +                   P4                    +
          +    +              3                          +
          +    +                                         +
          +    +                                         +
3.000E+01 X    X    +         +    P    +         +     X
          +    +                  *                      +
          +    +                                         +
          +    +                    4                    +
          +    +                                         +
2.500E+01 X    X    +        3+     P   +         +     X
          +    +                                         +
          +    333                                       +
          +    +  33                                     +
          +    +    33                                   +
2.000E+01 X    X    + 33      +      4  +         +     X
          +    +        33                               +
          +    +          33                             +
          +    +            X22    *                    +
          +    +               22     4                  +
1.500E+01 X    X11  +         +  22     +         +     X
          +    +  11               22                    +
          +    +    11               22                  +
          +    +      11               X4                +
          +    +        11               44              +
1.000E+01 X    X    +     11  +         +  44     +     X
          +    +            11      *        4           +
          +    +              11              4          +
          +    +                11                       +
          +    +                  11                     +
5.000E+00 X    X    +         +     11  +         +     X
          +    +                      11                 +
          +    +                        11               +
          +    +                          11             +
          +    +                            11           +
 .000E+00 X+++++++++X++++++++++X++++++++X+++++1+++X++++++++X
0          -8.00E+01  8.00E+01  2.40E+02  4.00E+02  5.60E+02  7.20E+02
```

REAME (Rotational Equilibrium Analysis of Multilayered Embankments)
Implemented on the 16-bit Microcomputers C. F. Hains, Jr. and D. M. Hains
2301 22nd Ave.
Northport, AL 35476
(205)-339-6536

WB MINING, LLC FISHTRAP MINE NO. 2 P-3930 / REVISION R-1
BASIN 009A MODIFICATION
STATIC

Number of cases to be analyzed 1

Case Number 1

Number of boundary lines= 4
Number of points on boundary lines are: 2 2 3
7

On boundary line no. 1 Point no. and coordinates are:
1 .000 5.000 2 500.000 .000

On boundary line no. 2 Point no. and coordinates are:
1 200.000 3.100 2 350.256 1.597

On boundary line no. 3 Point no. and coordinates are:
1 .000 5.100 2 200.000 3.100 3 249.625 22.950

On boundary line no. 4 Point no. and coordinates are:
1 .000 22.950 2 249.625 22.950 3 267.250 30.000 4
279.250 30.000 5 337.979 6.509
6 350.256 1.597 7 500.000 .100

Line no. and slope of each segment are:
1 -.010
2 -.010
3 -.010 .400
4 .000 .400 .000 -.400 -.400 -.010

No. of radius control zones= 1 Plot or no plot= 1 No. of seepage
cases= 1

Total no. of lines at bottom of radius control zones is: 1

For rad. cont. zone no. 1 Radius decrement= .000 No. of
Circles= 5 Id no. for first circle=, 1
Line no.= 1 Begin pt. no.= 1 End pt. no.= 2

```
     Soil no.  Cohesion     F. angle     Unit wt.
         1      273.600       33.000      132.100
         2      273.600       33.000      132.100
         3         .000         .000       62.400

     Seismic coefficient=      .000     Min. depth of tallest slice=      .000
Unit weight of water=    62.400

     The factors of safety are determined by the SIMPLIFIED BISHOP method

     NSPG= 1  NSRCH= 0  No. of slices= 10  No. of add. radii= 2

     No. of points on water table for each case=   6

     Under seepage condition 1point no. and            coordinates of water
table are:
    1      .000    22.950    2   249.625    22.950    3   286.358    17.078    4
337.979     6.509    5   350.256     1.597
    6   500.000      .100

 point1=(   280.000,    51.000) point2=(   280.000,    31.000) point3=(
351.000,    31.000) NJ=    2 NI=    2
     Automatic search will follow after grid with XINC=    10.000 and YINC=
10.000

 At point (   280.000,    51.000) under seepage    1,the radius and the
corresponding factor of safety are:
         48.798    11.177         43.241    11.071         37.684    10.718
32.127    10.409         26.570    10.583
         35.832    10.665         33.979    10.606         30.275    10.134
28.423    10.118
     Lowest factor of safety=    10.118 and occurs at radius  =     28.423


 At point (   280.000,    41.000) under seepage    1,the radius and the
corresponding factor of safety are:
         38.798    11.036         33.244    10.308         27.689     9.815
22.135     9.240         16.580     9.723
         25.838     9.652         23.986     9.473         20.283     8.948
18.432     8.996
     Lowest factor of safety=     8.948 and occurs at radius  =     20.283


 At point (   280.000,    31.000) under seepage    1,the radius and the
corresponding factor of safety are:
         28.799    10.998         23.280    10.411         17.762    10.014
12.244    10.245          6.725    11.712
         21.441    10.227         19.601    10.120         15.923     9.909
14.083    10.284
     Lowest factor of safety=     9.909 and occurs at radius  =     15.923


 At point (   315.500,    51.000) under seepage    1,the radius and the
corresponding factor of safety are:
         49.153     2.406         45.914     2.546         42.676     2.815
39.437     3.349         36.199     4.525
     Lowest factor of safety=     2.406 and occurs at radius  =     49.153
```

At point (315.500, 41.000) under seepage 1,the radius and the corresponding factor of safety are:

39.153 2.519 36.058 2.690 32.962 2.980
29.867 3.537 26.771 4.760

Lowest factor of safety= 2.519 and occurs at radius = 39.153

At point (315.500, 31.000) under seepage 1,the radius and the corresponding factor of safety are:

29.154 2.821 26.201 3.007 23.249 3.309
20.296 3.883 17.344 5.144

Lowest factor of safety= 2.821 and occurs at radius = 29.154

At point (351.000, 51.000) under seepage 1,the radius and the corresponding factor of safety are:

49.508 3.988 48.835 4.399 48.162 5.465
47.490 7.602 46.817 13.943

Lowest factor of safety= 3.988 and occurs at radius = 49.508

At point (351.000, 41.000) under seepage 1,the radius and the corresponding factor of safety are:

39.508 4.720 38.978 5.154 38.449 6.478
37.919 9.128 37.390 17.039

Lowest factor of safety= 4.720 and occurs at radius = 39.508

At point (351.000, 31.000) under seepage 1,the radius and the corresponding factor of safety are:

29.509 6.030 29.122 6.518 28.735 8.292
28.349 11.857 27.962 22.569

Lowest factor of safety= 6.030 and occurs at radius = 29.509

For piezometric line No. 1

At point (315.500, 51.000) ,RADIUS 49.153

the minimum factor of safety is 2.406

At point (315.500, 51.000) under seepage 1,the radius and the corresponding factor of safety are:

49.153 2.406 45.914 2.546 42.676 2.815
39.437 3.349 36.199 4.525

Lowest factor of safety= 2.406 and occurs at radius = 49.153

At point (325.500, 51.000) under seepage 1,the radius and the corresponding factor of safety are:

49.253 2.321 46.737 2.531 44.221 2.905
41.706 3.599 39.190 5.206

Lowest factor of safety= 2.321 and occurs at radius = 49.253

At point (335.500, 51.000) under seepage 1,the radius and the corresponding factor of safety are:
49.353 2.437 47.560 2.710 45.767 3.177
43.974 4.117 42.181 6.492
Lowest factor of safety= 2.437 and occurs at radius = 49.353

At point (325.500, 61.000) under seepage 1,the radius and the corresponding factor of safety are:
59.252 2.251 56.593 2.443 53.935 2.806
51.276 3.468 48.618 4.978
Lowest factor of safety= 2.251 and occurs at radius = 59.252

At point (325.500, 71.000) under seepage 1,the radius and the corresponding factor of safety are:
69.252 2.244 66.450 2.410 63.649 2.734
60.847 3.362 58.046 4.785
Lowest factor of safety= 2.244 and occurs at radius = 69.252

At point (325.500, 81.000) under seepage 1,the radius and the corresponding factor of safety are:
79.251 2.283 76.307 2.441 73.362 2.730
70.418 3.257 67.473 4.617
Lowest factor of safety= 2.283 and occurs at radius = 79.251

At point (335.500, 71.000) under seepage 1,the radius and the corresponding factor of safety are:
69.352 2.281 67.273 2.544 65.194 2.974
63.115 3.805 61.037 5.790
Lowest factor of safety= 2.281 and occurs at radius = 69.352

At point (315.500, 71.000) under seepage 1,the radius and the corresponding factor of safety are:
69.152 2.471 65.627 2.594 62.103 2.819
58.579 3.202 55.055 4.187
Lowest factor of safety= 2.471 and occurs at radius = 69.152

At point (328.000, 71.000) under seepage 1,the radius and the corresponding factor of safety are:
69.277 2.225 66.656 2.413 64.035 2.774
61.414 3.448 58.793 4.982
Lowest factor of safety= 2.225 and occurs at radius = 69.277

At point (330.500, 71.000) under seepage 1,the radius and the corresponding factor of safety are:
69.302 2.224 66.861 2.438 64.421 2.830
61.981 3.549 59.541 5.211
Lowest factor of safety= 2.224 and occurs at radius = 69.302

At point (333.000, 71.000) under seepage 1,the radius and the corresponding factor of safety are:

69.327 2.240 67.067 2.487 64.808 2.895 62.548 3.667 60.289 5.476

Lowest factor of safety= 2.240 and occurs at radius = 69.327

At point (330.500, 73.500) under seepage 1,the radius and the corresponding factor of safety are:

71.801 2.219 69.326 2.427 66.850 2.813 64.374 3.520 61.898 5.155

Lowest factor of safety= 2.219 and occurs at radius = 71.801

At point (330.500, 76.000) under seepage 1,the radius and the corresponding factor of safety are:

74.301 2.218 71.790 2.419 69.278 2.794 66.767 3.492 64.255 5.102

Lowest factor of safety= 2.218 and occurs at radius = 74.301

At point (330.500, 78.500) under seepage 1,the radius and the corresponding factor of safety are:

76.801 2.221 74.254 2.415 71.707 2.776 69.159 3.466 66.612 5.050

Lowest factor of safety= 2.221 and occurs at radius = 76.801

At point (333.000, 76.000) under seepage 1,the radius and the corresponding factor of safety are:

74.326 2.225 71.995 2.455 69.665 2.861 67.334 3.606 65.003 5.353

Lowest factor of safety= 2.225 and occurs at radius = 74.326

At point (328.000, 76.000) under seepage 1,the radius and the corresponding factor of safety are:

74.276 2.234 71.584 2.407 68.892 2.744 66.200 3.396 63.507 4.886

Lowest factor of safety= 2.234 and occurs at radius = 74.276

For piezometric line No. 1

At point (330.500, 76.000) ,RADIUS 74.301

the minimum factor of safety is 2.218

1

Cross section in distorted scale. Numerals indicate boundary line no. If there area more than 10 bound. lines, alphabets will then be used. P Indicates Piezometric line. If a portion of Piezometric line coincides with the ground or another boundary line, only the ground or boundary line will be shown. X indicates intersection of two boundary lines. * indicates failure surface.

```
The minimum factor of safety is      2.218
3.600E+01 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X
          +    +                                            +
          +    +                                            +
          +    +                                            +
          +    +                                            +
3.200E+01 X    X    +         +         +         +         X
          +    +                                            +
          +    +                                            +
          +    +                4                           +
          +    +                                            +
2.800E+01 X    X    +         +         +         +         X
          +    +                                            +
          +    +                                            +
          +    +                                            +
          +    +                                            +
2.400E+01 X    X    +         +  4      +         +         X
          +    444444444444444X                             +
          +    +                                            +
          +    +                  *                         +
          +    +                                            +
2.000E+01 X    X    +         + P       +         +         X
          +    +                                            +
          +    +                   4                        +
          +    +                                            +
          +    +                  P                         +
1.600E+01 X    X    +         3         +         +         X
          +    +                                            +
          +    +                                            +
          +    +                   P                        +
          +    +                    4                       +
1.200E+01 X    X    +         +         +         +         X
          +    +                                            +
          +    +                   *P                       +
          +    +             3                              +
          +    +                                            +
8.000E+00 X    X    +         +         +         +         X
          +    +                                            +
          +    +                     4                      +
          +    +                                            +
          +    XXXXXX3                                      +
4.000E+00 X    X    +1XXXX33  +    *    +         +         X
          +    +          11XXX22                           +
          +    +               11XXX2                       +
          +    +                    1XXXX4                  +
          +    +                         1XXXX              +
 .000E+00 X+++++++++X+++++++++X+++++++++X+++++X+++X+++++++++X
          +    +                                            +
          +    +                                            +
          +    +                                            +
          +    +                                            +
-4.000E+00 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X
0          -8.00E+01  8.00E+01  2.40E+02  4.00E+02  5.60E+02  7.20E+02
```