HYDROLOGY STUDY FOR
CANE CREEK, LLC

CANE CREEK MINE
P-3910 REVISION R-3
WALKER COUNTY, ALABAMA

BY

PERC ENGINEERING CO., INC.

P.O. BOX 1712

JASPER, ALABAMA 35502

DETAILED DESIGN PLANS
BASIN 010P
ATTACHMENT III-B-2(a)

APRIL 9, 2013

PERC
ENGINEERING CO., INC.

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Facsimile: (205) 295-3114 - Main Building
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Web Address: www.percengineering.com

April 9, 2013

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

RE: Cane Creek, LLC
Cane Creek Mine
P- 3910 Revision R-3

Dear Michael:

I hereby certify the attached detailed design plans for Basin 010P 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 required 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
REGISTERED
No. 14117
LESLIE G. STEPHENS

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 the basin 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 and stabilized with a hay mat.

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 (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, post mining 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.

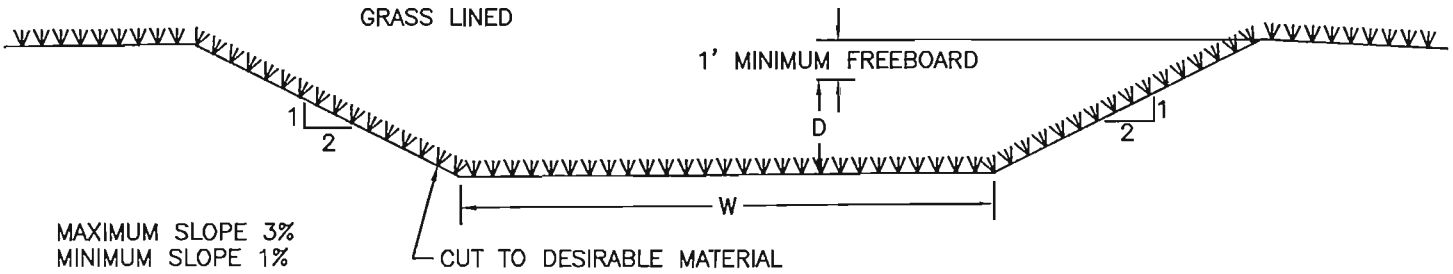
22. All ponds shall be examined quarterly for structural weakness, instability, erosion, or other hazardous conditions and maintenance performed as necessary. Formal inspections shall be made on an annual basis, including any reports or modifications, in accordance with 880-X-10C-.20[l(j)] of the Alabama 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)
1–15	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)
0–20	0.5
20–90	1.0
90–180	1.5
180–300	2.0
300–450	2.5

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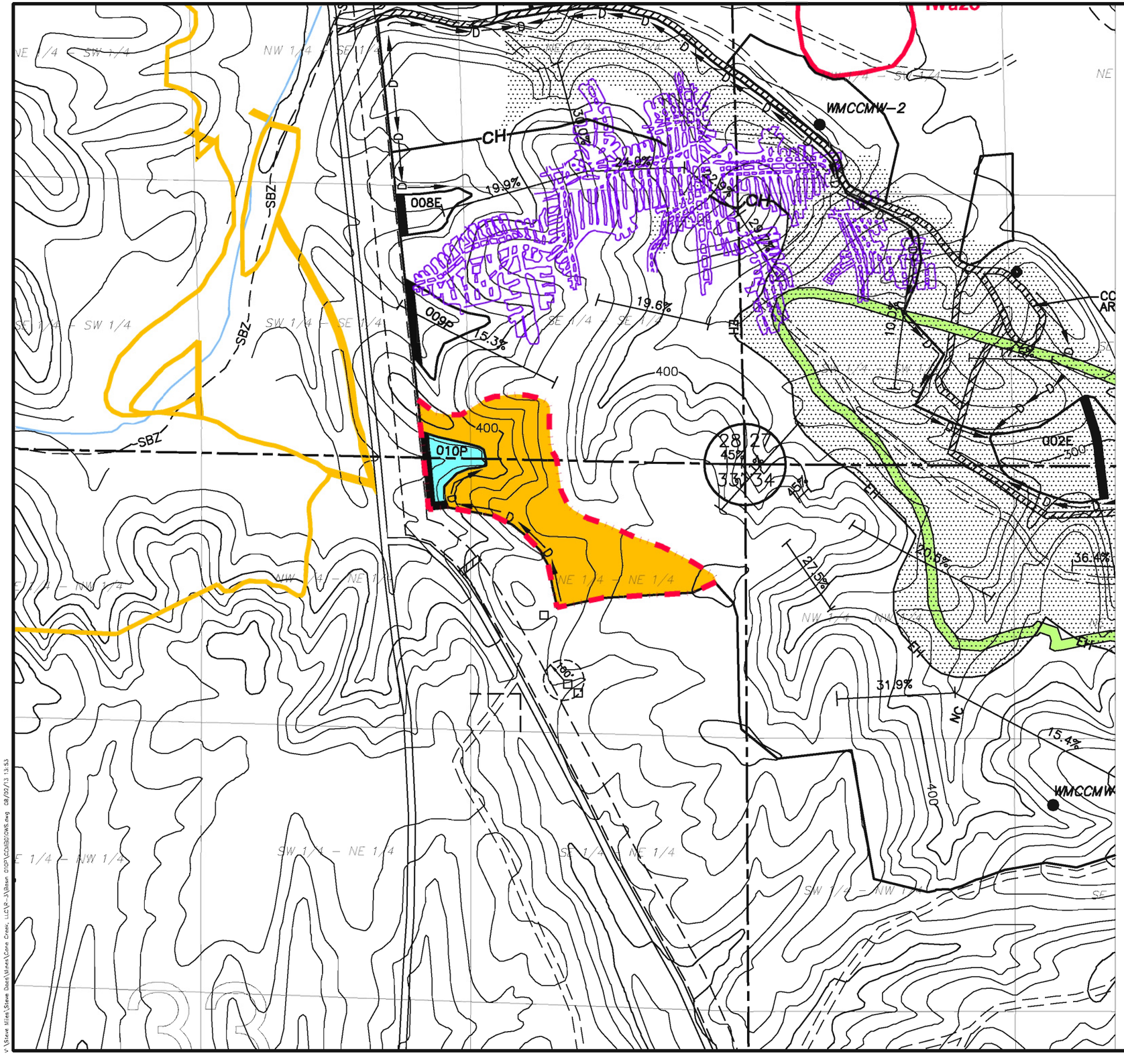
TYPICAL PERMANENT DIVERSION FOR BASIN DISPOSAL

DRAWN BY: J.W.T. DWG. NAME: TYPICALS	DATE: 04–16–2009
APPROVED BY: L.G.S.	SCALE: NONE

NOTES

1) The primary spillway of Basin 010P will consist of a 10 foot wide open channel lined with 4 inches of concrete reinforced with 6X6–W2.9XW2.9 concrete reinforcement wire. The channel lining will extend back to the existing drainage course. A 12' X 12' X 4" concrete splash pad reinforced with 6X6-W2.9XW2.9 welded wire fabric will be located at the exit point of the tail section of the channel.

2) Any coal that is located within the proposed pool area of Basin 010P will be excavated during the time of construction.



LEGEND:

- Permit Boundary
- Exemption Area Boundary
- 500 — Surface Contour
- 002P — Sediment Basin
- Natural Drainage Course
- Intermittent Stream
- Perennial Stream
- Drainage Divide
- SBZ — Stream Buffer Zone
- % — Land Slope Measurement
- D — Diversion Ditch/Berm/Lowwall
- Occupied Dwelling
- Unoccupied Dwelling / Barn / Shed
- Primary Road
- Ancillary Road
- Private Road
- County Road (paved unless otherwise designated)
- Surface Water Monitoring Site
- WMCCMW-1 — Groundwater Monitoring Site
- Power Transmission Line
- Railroad
- Area Previously Disturbed
- Underground Mining (Norvel Mines)
- ASMC Permit P-3748
- ASMC Permit P-3805
- 1Wa20 Archaeological Site To Be Avoided
- Watershed Boundary

LANDUSE AND CURVE NUMBER INFORMATION

- Sediment Basin, Curve Number 100
- Graded and Bare, Curve Number 81

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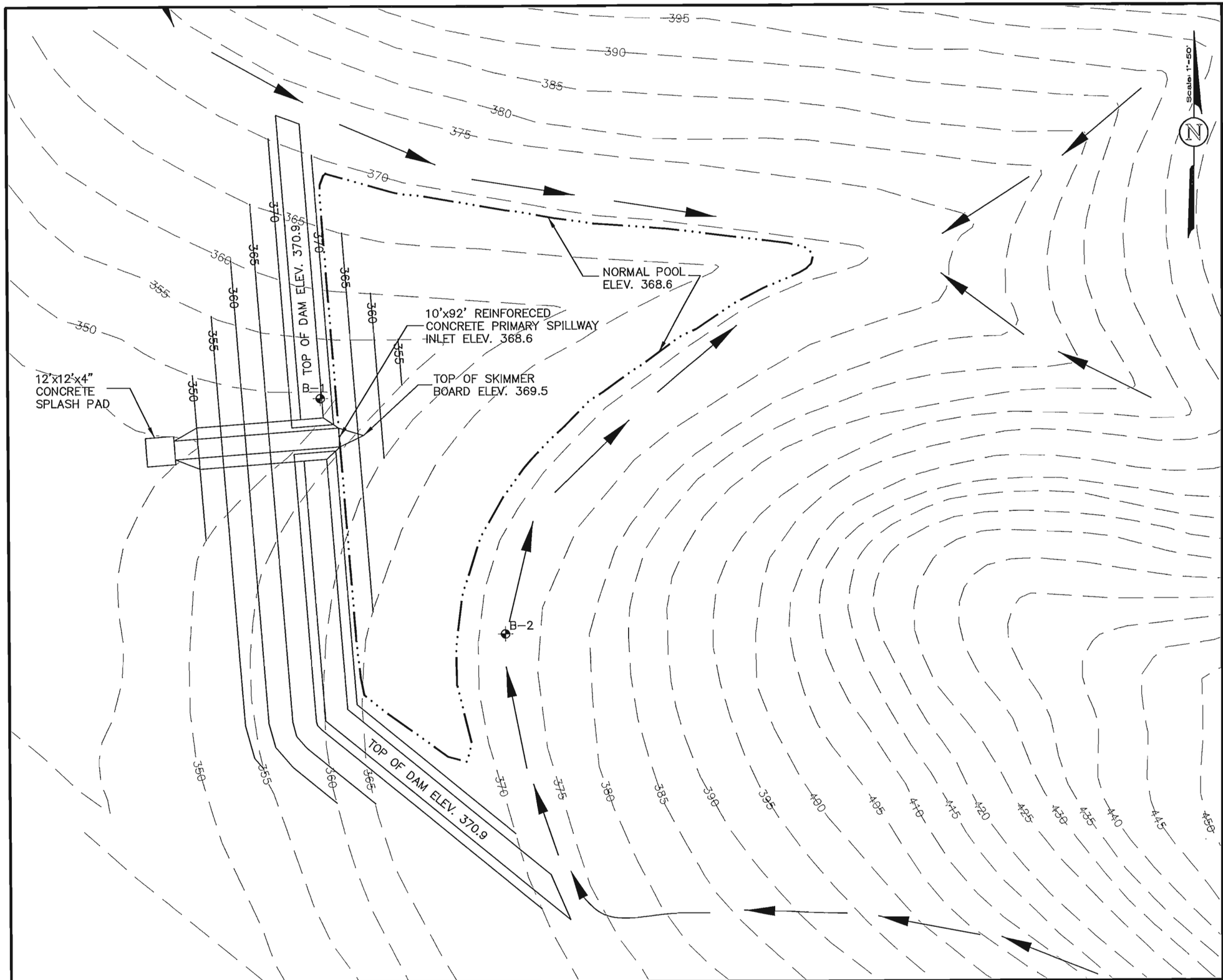
Attachment III-B-2(a)
Watershed Map
Cane Creek LLC
Cane Creek Mine
P-3910 Revision R-3

DRAWN BY: J.W.T. DWG. NAME: CCMB010WS	DATE: 03/26/2013
APPROVED BY: L.G.S.	SCALE: 1"=500'

v:\Steve Miller\Steve Does\Miners\Cane Creek, LLC\P-3\Base 010P\CCMB010WS.dwg 08/02/13 13:53



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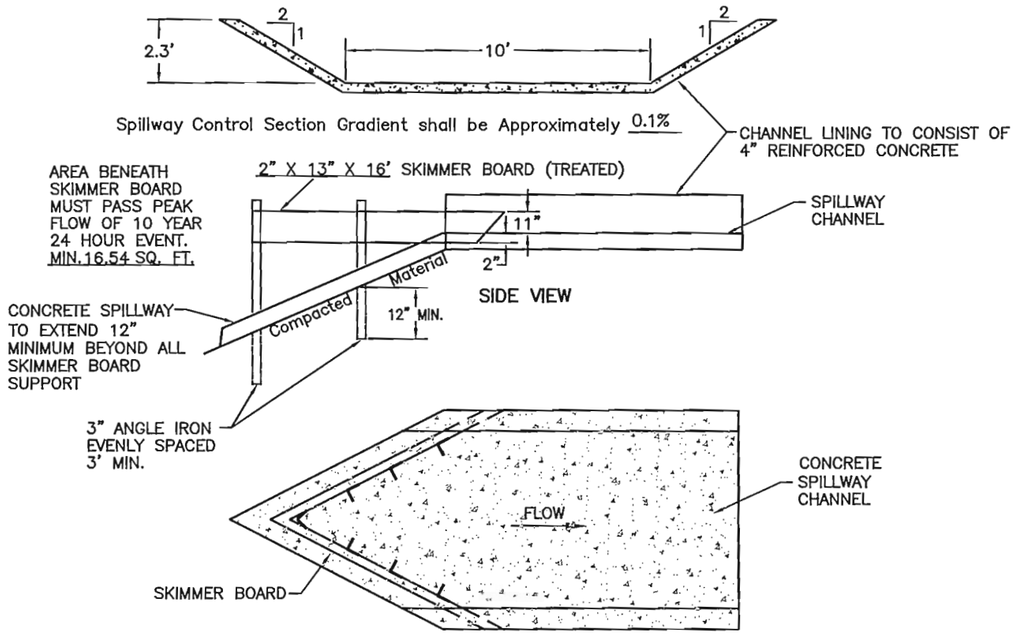
CANE CREEK, LLC
CANE CREEK MINE
P-3910 REVISION R-3
BASIN 010P PLANVIEW

DRAWN BY: J.W.T. DWG. NAME: CCMB010PV	DATE: 04/04/2013
APPROVED BY: L.G.S.	SCALE: 1" = 50'

V:\Steve Miles\Steve Docs\Mines\Cane Creek, LLC\R-3\Basin 010P\CCMB010PV.dwg 08/02/13 16:10

Skimmer Board Elev. 369.5
Spillway Elev. 368.6
Q Out 36.43 C.F.S.
V Out 2.20 FT/S



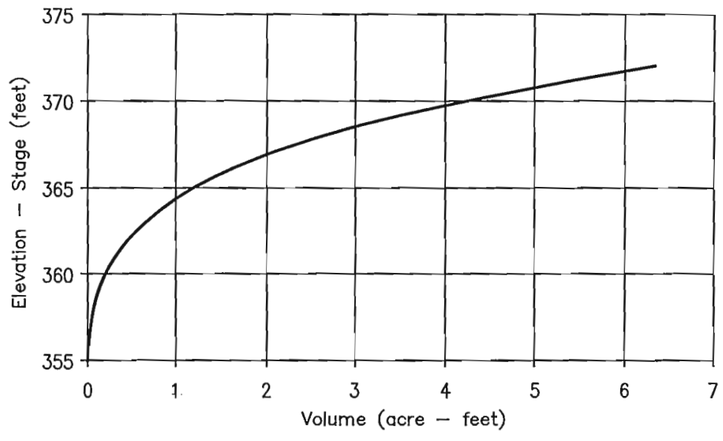
SKIMMER BOARD DETAIL

Spillway Tail Section Gradient shall be Approximately 40.0%

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

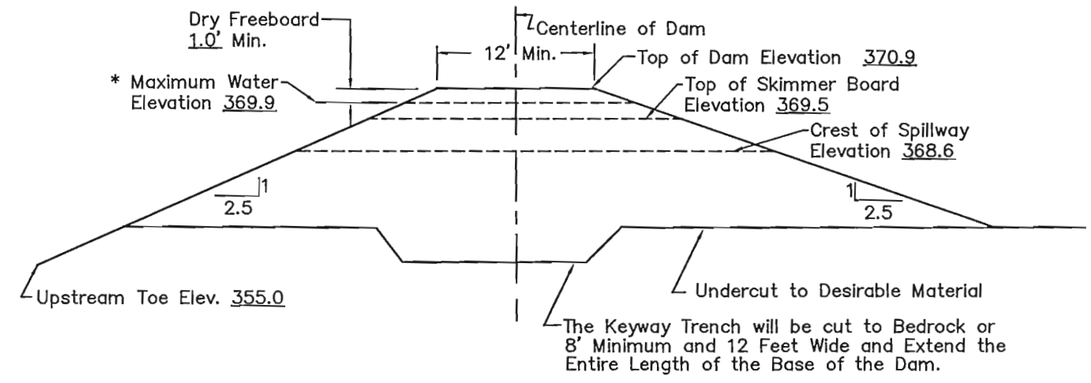


Storage Computation

Elevation (feet)	Area (acres)	Avg. Area (acres)	Interval (feet)	Storage (ac.-ft.)	Acc. Storage (ac.-ft.)
355	0.006				0.000
		0.049	5	0.201	
360	0.091				0.201
		0.212	5	0.994	
365	0.332				1.195
		0.634	5	3.044	
370	0.936				4.239
		1.057	2	2.109	
372	1.178				6.348

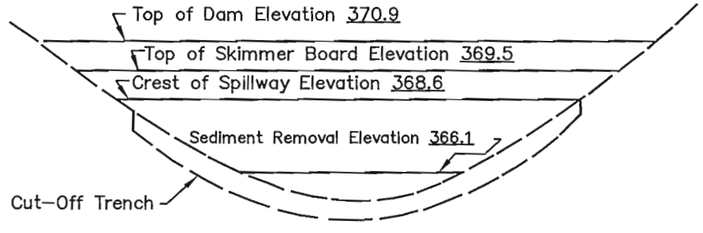
Key Basin Parameters

Drainage Area	14.1 Acres
Disturbed Area	13.1 Acres
Sediment Storage	1.6 Ac.-Ft.
Detention Storage	1.5 Ac.-Ft.
Normal Pool Capacity	3.1 Ac.-Ft.
Total Basin Capacity	4.2 Ac.-Ft.
Peak Inflow	48.3 C.F.S.
Peak Outflow	36.4 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

Leslie G. Stephens, P.E., P.L.S. 08/02/2013
AL Registration. #14117-E Date

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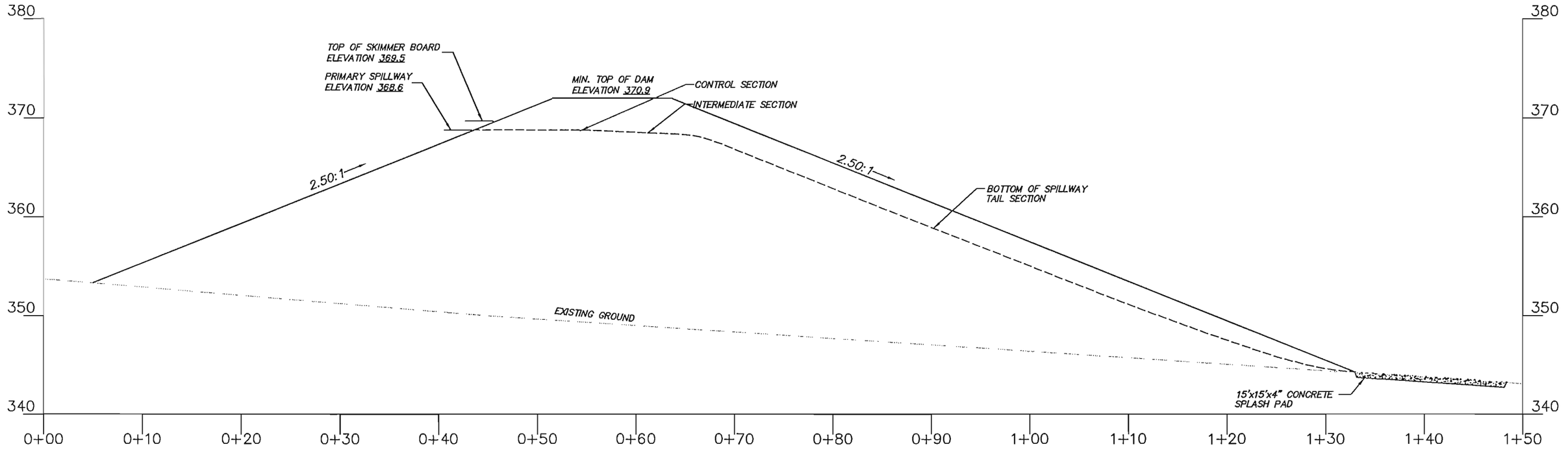
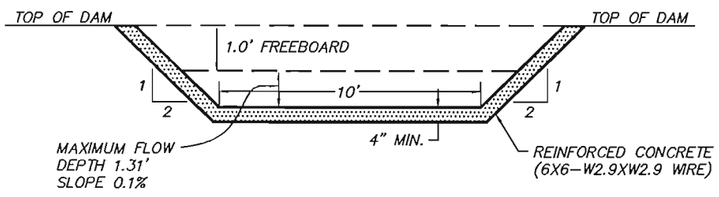
CANE CREEK, LLC
CANE CREEK MINE
P-3910 REVISION R-3
BASIN 010P DESIGN DETAILS

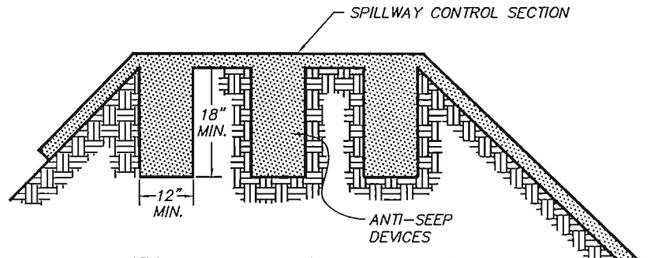
DRAWN BY: J.W.T. DWG. NAME: CCCC010DT	DATE: 04/05/2013
APPROVED BY: L.G.S.	SCALE: NONE





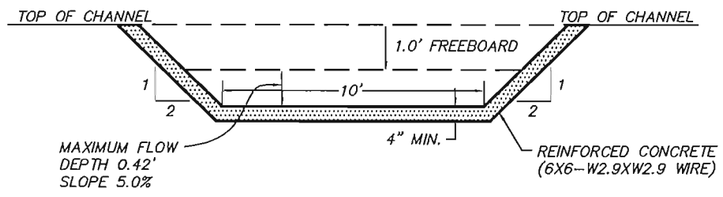
SPILLWAY CONTROL SECTION TYPICAL

N.T.S.



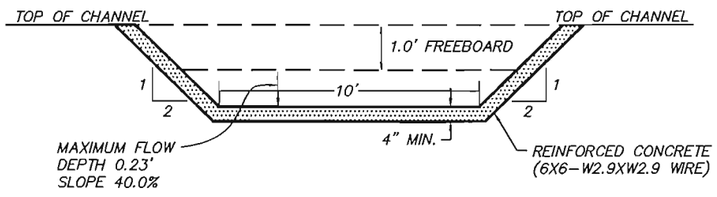
ANTI-SEEP DEVICE TYPICAL

N.T.S.



SPILLWAY INTERMEDIATE SECTION TYPICAL

N.T.S.



SPILLWAY TAIL DITCH SECTION TYPICAL

N.T.S.

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CANE CREEK, LLC
CANE CREEK MINE
P-3910 REVISION R-3
BASIN 010P
DAM DETAILS

DRAWN BY: J.W.T. DWG. NAME: CCCC010DD	DATE: 04/04/2013
APPROVED BY: L.G.S.	SCALE: 1"=10'

V:\Steve Miles\Steve Docs\Mines\Cane Creek, LLC\R-3\Basin 010P\CCCC010DD.dwg 04/04/13 16:39

P-3910 Revision R-3 Basin 010P 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)
10.00	2.0:1	2.0:1	0.1	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	36.43 cfs	
Depth:	1.31 ft	2.31 ft
Top Width:	15.24 ft	19.24 ft
Velocity:	2.20 fps	
X-Section Area:	16.54 sq ft	
Hydraulic Radius:	1.043 ft	
Froude Number:	0.37	

P-3910 Revision R-3 Basin 010P 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)
10.00	2.0:1	2.0:1	5.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	36.43 cfs	
Depth:	0.42 ft	1.42 ft
Top Width:	11.68 ft	15.68 ft
Velocity:	7.99 fps	
X-Section Area:	4.56 sq ft	
Hydraulic Radius:	0.384 ft	
Froude Number:	2.26	

P-3910 Revision R-3 Basin 010P 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)
10.00	2.0:1	2.0:1	40.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	36.43 cfs	
Depth:	0.23 ft	1.23 ft
Top Width:	10.91 ft	14.91 ft
Velocity:	15.38 fps	
X-Section Area:	2.37 sq ft	
Hydraulic Radius:	0.215 ft	
Froude Number:	5.81	

Cane Creek, LLC
Cane Creek Mine
P-3910
Basin 010

6.0 Inches, 10 Year-24 Hour,

DRN 58

JWT

PERC Engineering Co., Inc.
PO BOX 1712
Jasper, AL 35503

Phone: 205-384-5553
Email: John.Taylor@percengineering.com

General Information

Storm Information:

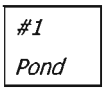
Storm Type:	DRN58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	6.000 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	100.000%	100.000%
2.0000	77.000%	86.000%
1.0000	40.000%	63.000%
0.5000	24.000%	32.000%
0.3000	16.000%	23.000%
0.2000	12.500%	16.000%
0.1000	9.000%	10.000%
0.0500	8.000%	9.000%
0.0300	7.000%	8.000%
0.0200	6.000%	7.000%
0.0100	3.000%	6.000%
0.0050	2.000%	3.500%
0.0030	1.500%	2.500%
0.0010	1.000%	1.500%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Basin 010



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	17.700	17.700	23.25	5.90	1,488.9	294,181	220.61	127.42
	Out			21.03	5.90	64.3	14,168	0.20	0.12

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	86.000%	100.000%
1.0000	63.000%	100.000%
0.5000	32.000%	100.000%
0.3000	23.000%	100.000%
0.2000	16.000%	100.000%
0.1000	10.000%	100.000%
0.0500	9.000%	100.000%
0.0300	8.000%	100.000%
0.0200	7.000%	100.000%
0.0100	6.000%	100.000%
0.0050	3.500%	81.020%
0.0030	2.500%	57.871%
0.0010	1.500%	34.723%

Structure Detail:

Structure #1 (Pond)

Basin 010

Pond Inputs:

Initial Pool Elev:	368.60 ft
Initial Pool:	1.47 ac-ft
*Sediment Storage:	1.60 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)
368.60	12.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	369.41 ft
H'graph Detention Time:	0.36 hrs
Pond Model:	CSTRS
Dewater Time:	0.56 days
Trap Efficiency:	95.68 %

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)	
366.06	0.434	0.000	0.000		Top of Sed. Storage
366.50	0.481	0.204	0.000		
367.00	0.537	0.458	0.000		
367.50	0.596	0.741	0.000		
367.80	0.633	0.926	0.000		
368.00	0.658	1.055	0.000		
368.50	0.723	1.400	0.000		
368.60	0.737	1.473	0.000		Spillway #1
368.70	0.750	1.547	2.593	6.90	
368.80	0.764	1.623	5.185	4.95	
369.00	0.791	1.778	10.370	1.00	
369.41	0.850	2.118	21.031	0.65	Peak Stage

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
369.50	0.862	2.192	23.332	
370.00	0.936	2.641	52.379	
370.50	0.994	3.123	91.283	
371.00	1.054	3.635	139.823	
371.50	1.115	4.177	198.414	
372.00	1.178	4.750	267.384	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
366.06	0.000	0.000
366.50	0.000	0.000
367.00	0.000	0.000
367.50	0.000	0.000
367.80	0.000	0.000
368.00	0.000	0.000
368.50	0.000	0.000
368.60	0.000	0.000
368.70	2.593	2.593
368.80	5.185	5.185
369.00	10.370	10.370
369.50	23.332	23.332
370.00	52.379	52.379
370.50	91.283	91.283
371.00	139.823	139.823
371.50	198.414	198.414
372.00	267.384	267.384

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	16.700	0.081	0.000	0.000	81.000	F	21.68	5.397
	2	1.000	0.001	0.000	0.000	100.000	F	1.57	0.499
	Σ	**17.700**						**23.25**	**5.897**

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	0.240	200.00	19.50	0.9000	1.0000	2	1,488.9	312,845	234.60	138.31
	2	0.001	200.00	0.01	0.0010	1.0000	1	0.0	0	0.00	0.00
	Σ							**1,488.9**	**294,181**	**220.61**	**127.42**

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	5.00	10.00	200.00	2.230	0.024
		8. Large gullies, diversions, and low flowing streams	6.41	100.00	1,559.00	7.590	0.057
#1	**1**	**Time of Concentration:**					**0.081**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	4.44	40.00	900.00	6.320	0.039
#1	**2**	**Muskingum K:**					**0.000**

Cane Creek, LLC

Cane Creek Mine

P-3910

Basin 010

4.8 Inches, 25 Year-6 Hour,

SCS 6 Hour

JWT

PERC Engineering Co., Inc.
PO BOX 1712
Jasper, AL 35503

Phone: 205-384-5553
Email: John.Taylor@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

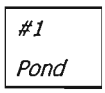
Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	100.000%	100.000%
2.0000	77.000%	86.000%
1.0000	40.000%	63.000%
0.5000	24.000%	32.000%
0.3000	16.000%	23.000%
0.2000	12.500%	16.000%
0.1000	9.000%	10.000%
0.0500	8.000%	9.000%
0.0300	7.000%	8.000%
0.0200	6.000%	7.000%
0.0100	3.000%	6.000%
0.0050	2.000%	3.500%
0.0030	1.500%	2.500%

Size (mm)	Topsoil	Spoil
0.0010	1.000%	1.500%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Basin 010



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	17.700	17.700	48.28	4.29	1,862.4	438,190	328.60	208.45
	Out			36.43	4.29	85.8	19,295	0.38	0.29

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	86.000%	100.000%
1.0000	63.000%	100.000%
0.5000	32.000%	100.000%
0.3000	23.000%	100.000%
0.2000	16.000%	100.000%
0.1000	10.000%	100.000%
0.0500	9.000%	100.000%
0.0300	8.000%	100.000%
0.0200	7.000%	100.000%
0.0100	6.000%	100.000%
0.0050	3.500%	75.983%
0.0030	2.500%	54.274%
0.0010	1.500%	32.564%

Structure Detail:

Structure #1 (Pond)

Basin 010

Pond Inputs:

Initial Pool Elev:	368.60 ft
Initial Pool:	1.47 ac-ft
*Sediment Storage:	1.60 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)
368.60	12.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	369.73 ft
H'graph Detention Time:	0.35 hrs
Pond Model:	CSTRS
Dewater Time:	0.25 days
Trap Efficiency:	95.39 %

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)	
366.06	0.434	0.000	0.000		Top of Sed. Storage
366.50	0.481	0.204	0.000		
367.00	0.537	0.458	0.000		
367.50	0.596	0.741	0.000		
367.80	0.633	0.926	0.000		
368.00	0.658	1.055	0.000		
368.50	0.723	1.400	0.000		
368.60	0.737	1.473	0.000		Spillway #1
368.80	0.764	1.623	5.185	2.45	
369.00	0.791	1.778	10.370	2.15	
369.50	0.862	2.192	23.332	1.15	
369.73	0.896	2.394	36.426	0.15	Peak Stage

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
370.00	0.936	2.641	52.379	
370.50	0.994	3.123	91.283	
371.00	1.054	3.635	139.823	
371.50	1.115	4.177	198.414	
372.00	1.178	4.750	267.384	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
366.06	0.000	0.000
366.50	0.000	0.000
367.00	0.000	0.000
367.50	0.000	0.000
367.80	0.000	0.000
368.00	0.000	0.000
368.50	0.000	0.000
368.60	0.000	0.000
368.80	5.185	5.185
369.00	10.370	10.370
369.50	23.332	23.332
370.00	52.379	52.379
370.50	91.283	91.283
371.00	139.823	139.823
371.50	198.414	198.414
372.00	267.384	267.384

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	16.700	0.081	0.000	0.000	81.000	F	44.70	3.889
	2	1.000	0.001	0.000	0.000	100.000	F	3.58	0.399
	Σ	**17.700**						**48.28**	**4.288**

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	0.240	200.00	19.50	0.9000	1.0000	2	1,862.4	466,739	350.01	227.20
	2	0.001	200.00	0.01	0.0010	1.0000	1	0.0	0	0.00	0.00
	Σ							**1,862.4**	**438,190**	**328.60**	**208.45**

Subwatershed Time of Concentration Details:

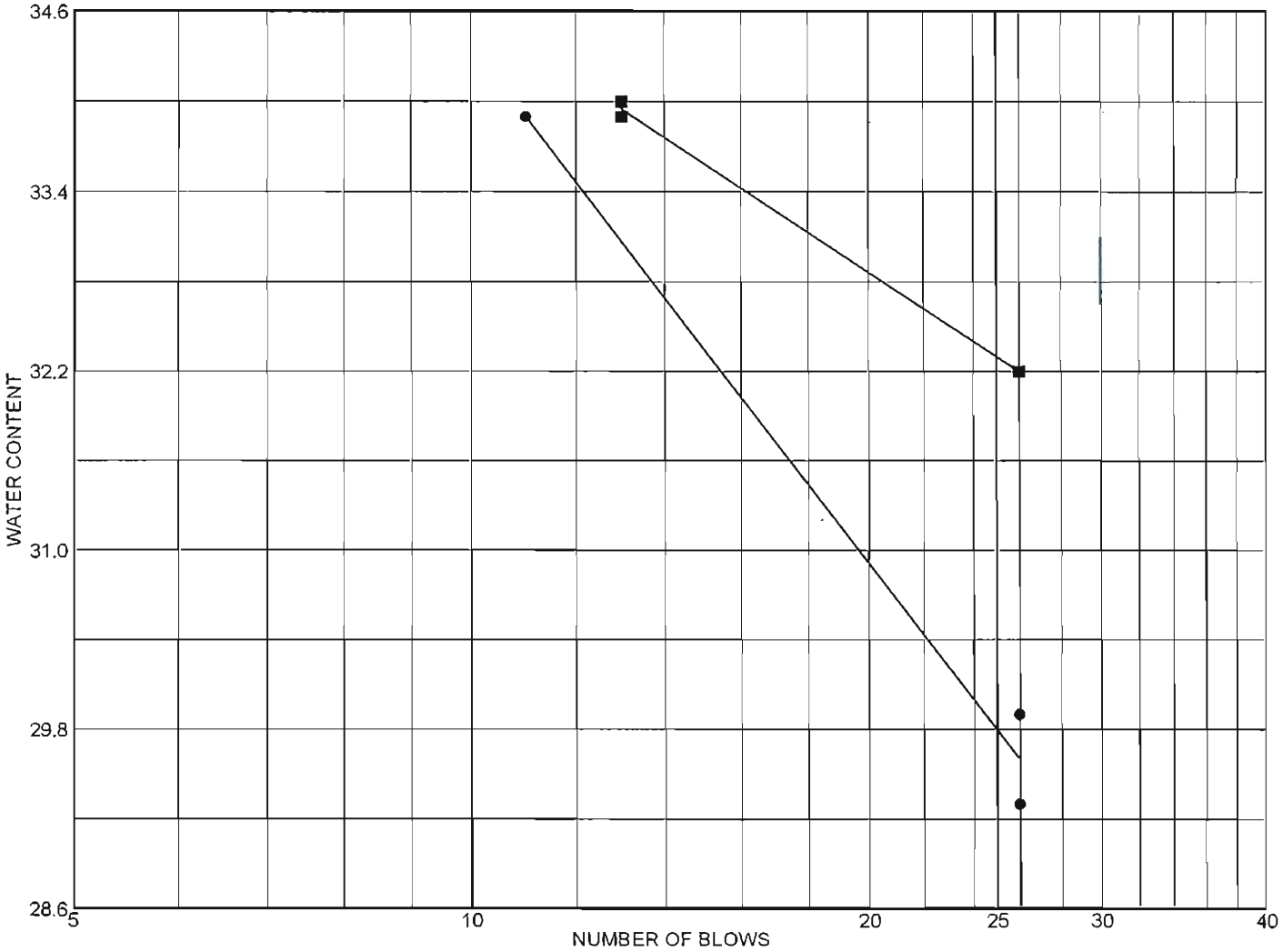
Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.00	10.00	200.00	2.230	0.024
		8. Large gullies, diversions, and low flowing streams	6.41	100.00	1,559.00	7.590	0.057
#1	**1**	**Time of Concentration:**					**0.081**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	4.44	40.00	900.00	6.320	0.039
#1	**2**	**Muskingum K:**					**0.000**

Cane Creek, LLC
Cane Creek Mine
P-3910 REVISION R-3
Basin 010P
Soil Classification

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand with gravel	30	20	10	57.95	45.8	SC
■	Sandy silt	32	25	7	64.53	52.4	ML

Project No. **Client:** Cane Creek LLC

Project: Cane Creek Mine

Cane Creek Mine

● **Location:** Basin 010 Dam Material

■ **Location:** Basin 010 Foundation Material

Remarks:

●

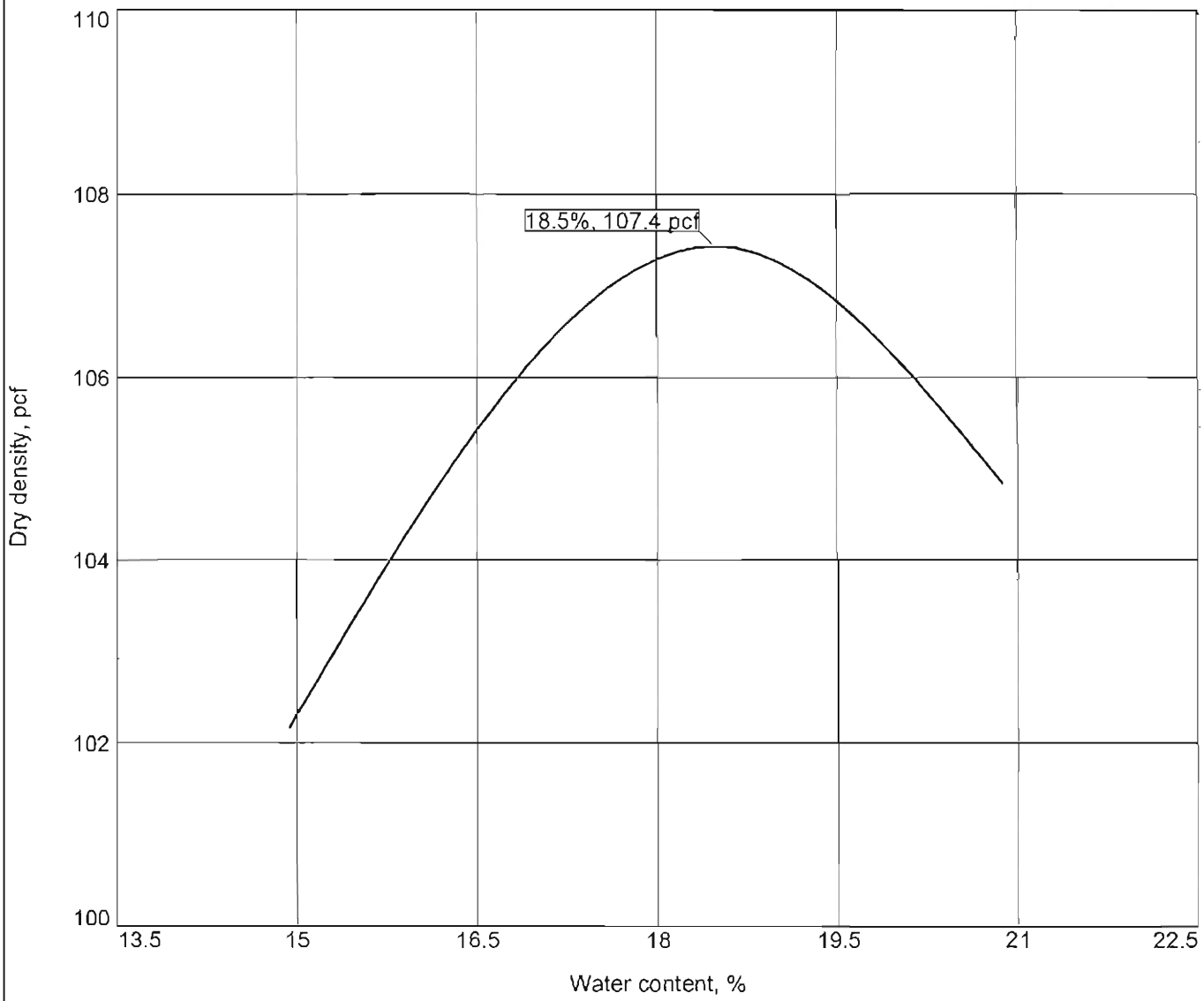
■

PERC ENGINEERING CO., INC.

Jasper, Alabama

Date 4/3/2013

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						
	SC				30	10		45.8

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.4 pcf Optimum moisture = 18.5 %	Clayey sand with gravel

Project No. **Client:** Cane Creek LLC

Project: Cane Creek Mine

Date:

○ **Location:** Basin 010 Dam Material

PERC ENGINEERING CO., INC.

Jasper, Alabama

Remarks:

Date 4/3/2013

Cane Creek, LLC
Cane Creek Mine
P-3910 REVISION R-3
Basin 010P
Stability Analysis

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 010P (SC) and the soil type (soil classification) of the material between the proposed embankment and stiff base of Basin 010P was sampled and analyzed by PERC Engineering Co., Inc. The soil properties used in the stability analysis (SC and ML) type soils, 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 010P	SC	100.8	27.9	133.5
Foundation Basin 010P	ML	100.8	29.7	129.5

*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 010P design height = 15.9 ft.
6) DMIN = 0.00
7) 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
010P	1.4

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.

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

Cane Creek LLC Cane Creek Mine P-3910 Revision R-3 Basin 010P
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 20.600 2 500.000 .000

On boundary line no. 2 Point no. and coordinates are:
1 200.000 15.360 2 302.007 11.157

On boundary line no. 3 Point no. and coordinates are:
1 .000 23.600 2 200.000 15.360 3 234.500 29.160

On boundary line no. 4 Point no. and coordinates are:
1 .000 29.160 2 234.500 29.160 3 239.750 31.260 4
251.750 31.260 5 288.055 16.738
6 302.007 11.157 7 500.000 3.000

Line no. and slope of each segment are:
1 -.041
2 -.041
3 -.041 .400
4 .000 .400 .000 -.400 -.400 -.041

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	100.800	29.700	129.500
2	100.800	27.900	133.500
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    29.160    2   234.500    29.160    3   256.102    24.299    4
288.055    16.738    5   302.007    11.157
    6   500.000     3.000

 point1=(   253.000,    52.000) point2=(   253.000,    32.000) point3=(
303.000,    32.000) NJ=    2 NI=    2
     Automatic search will follow after grid with XINC=    10.000 and YINC=
10.000

 At point (   253.000,    52.000) under seepage    1,the radius and the
corresponding factor of safety are:
         41.788     5.306         37.586     5.077         33.384     5.174
29.182     5.428         24.980     6.335
         40.387     5.249         38.987     5.154         36.185     5.076
34.785     5.126
     Lowest factor of safety=     5.076 and occurs at radius  =     36.185


 At point (   253.000,    42.000) under seepage    1,the radius and the
corresponding factor of safety are:
         31.797     5.245         27.600     4.974         23.403     4.842
19.206     4.915         15.009     5.796
         26.201     4.898         24.802     4.865         22.004     4.801
20.605     4.831
     Lowest factor of safety=     4.801 and occurs at radius  =     22.004


 At point (   253.000,    32.000) under seepage    1,the radius and the
corresponding factor of safety are:
         21.805     5.782         17.674     5.341         13.544     5.475
9.413     6.055          5.282     6.456
         20.428     5.758         19.051     5.537         16.297     5.294
14.921     5.427
     Lowest factor of safety=     5.294 and occurs at radius  =     16.297


 At point (   278.000,    52.000) under seepage    1,the radius and the
corresponding factor of safety are:
         42.817     1.625         40.055     1.616         37.293     1.675
34.530     1.918         31.768     2.612
         41.896     1.628         40.976     1.624         39.134     1.614
38.213     1.638
     Lowest factor of safety=     1.614 and occurs at radius  =     39.134
```

```
 At point (   278.000,    42.000) under seepage    1,the radius and the
corresponding factor of safety are:
         32.826     1.652         30.205     1.648         27.584     1.723
24.963     1.992         22.342     2.744
         31.952     1.649         31.078     1.648         29.331     1.644
28.457     1.673
     Lowest factor of safety=     1.644 and occurs at radius  =     29.331


 At point (   278.000,    32.000) under seepage    1,the radius and the
corresponding factor of safety are:
         22.834     1.869         20.355     1.886         17.875     1.951
15.395     2.202         12.916     2.968
     Lowest factor of safety=     1.869 and occurs at radius  =     22.834


 At point (   303.000,    52.000) under seepage    1,the radius and the
corresponding factor of safety are:
         43.846     1.826         42.735     1.885         41.624     2.009
40.513     2.228         39.402     3.593
     Lowest factor of safety=     1.826 and occurs at radius  =     43.846


 At point (   303.000,    42.000) under seepage    1,the radius and the
corresponding factor of safety are:
         33.855     2.009         32.885     2.089         31.915     2.247
30.945     2.508         29.976     3.876
     Lowest factor of safety=     2.009 and occurs at radius  =     33.855


 At point (   303.000,    32.000) under seepage    1,the radius and the
corresponding factor of safety are:
         23.863     2.323         23.035     2.433         22.206     2.660
21.378     3.148         20.549     4.415
     Lowest factor of safety=     2.323 and occurs at radius  =     23.863


 For piezometric line No.    1

 At point (   278.000,    52.000) ,RADIUS    39.134
     the minimum factor of safety is      1.614


 At point (   278.000,    52.000) under seepage    1,the radius and the
corresponding factor of safety are:
         42.817     1.625         40.055     1.616         37.293     1.675
34.530     1.918         31.768     2.612
         41.896     1.628         40.976     1.624         39.134     1.614
38.213     1.638
     Lowest factor of safety=     1.614 and occurs at radius  =     39.134


 At point (   288.000,    52.000) under seepage    1,the radius and the
corresponding factor of safety are:
         43.229     1.426         41.127     1.477         39.025     1.595
36.923     1.890         34.821     2.825
     Lowest factor of safety=     1.426 and occurs at radius  =     43.229
```

At point (298.000, 52.000) under seepage 1,the radius and the corresponding factor of safety are:
43.641 1.556 42.199 1.577 40.758 1.658
39.316 2.020 37.875 3.147
Lowest factor of safety= 1.556 and occurs at radius = 43.641

At point (288.000, 62.000) under seepage 1,the radius and the corresponding factor of safety are:
53.220 1.429 50.977 1.461 48.734 1.568
46.491 1.874 44.248 2.774
Lowest factor of safety= 1.429 and occurs at radius = 53.220

At point (288.000, 42.000) under seepage 1,the radius and the corresponding factor of safety are:
33.237 1.491 31.277 1.540 29.316 1.635
27.356 1.928 25.395 2.862
Lowest factor of safety= 1.491 and occurs at radius = 33.237

At point (290.500, 52.000) under seepage 1,the radius and the corresponding factor of safety are:
43.332 1.422 41.395 1.472 39.458 1.595
37.522 1.902 35.585 2.865
Lowest factor of safety= 1.422 and occurs at radius = 43.332

At point (293.000, 52.000) under seepage 1,the radius and the corresponding factor of safety are:
43.435 1.445 41.663 1.474 39.891 1.604
38.120 1.925 36.348 2.931
Lowest factor of safety= 1.445 and occurs at radius = 43.435

At point (290.500, 54.500) under seepage 1,the radius and the corresponding factor of safety are:
45.830 1.415 43.858 1.463 41.886 1.588
39.913 1.897 37.941 2.858
Lowest factor of safety= 1.415 and occurs at radius = 45.830

At point (290.500, 57.000) under seepage 1,the radius and the corresponding factor of safety are:
48.328 1.412 46.320 1.455 44.313 1.581
42.305 1.893 40.298 2.852
Lowest factor of safety= 1.412 and occurs at radius = 48.328

At point (290.500, 59.500) under seepage 1,the radius and the corresponding factor of safety are:
50.825 1.411 48.783 1.449 46.740 1.575
44.697 1.890 42.654 2.844
Lowest factor of safety= 1.411 and occurs at radius = 50.825

At point (290.500, 62.000) under seepage 1,the radius and the corresponding factor of safety are:

53.323	1.413	51.245	1.445	49.167	1.570
47.089	1.888	45.011	2.834		

Lowest factor of safety= 1.413 and occurs at radius = 53.323

At point (293.000, 59.500) under seepage 1,the radius and the corresponding factor of safety are:

50.928	1.423	49.051	1.453	47.173	1.585
45.295	1.912	43.418	2.900		

Lowest factor of safety= 1.423 and occurs at radius = 50.928

At point (288.000, 59.500) under seepage 1,the radius and the corresponding factor of safety are:

50.723	1.421	48.515	1.460	46.307	1.571
44.099	1.879	41.891	2.786		

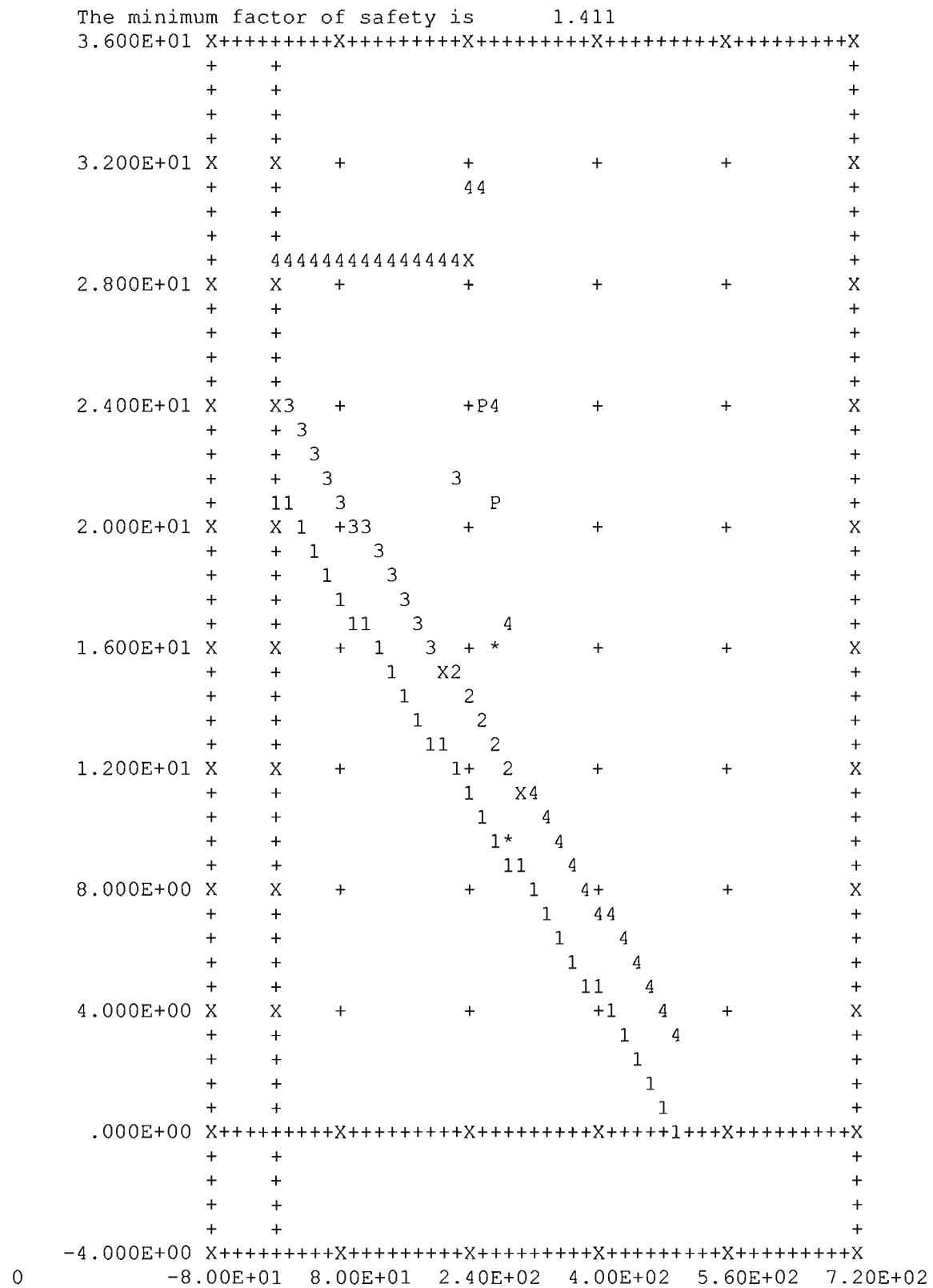
Lowest factor of safety= 1.421 and occurs at radius = 50.723

For piezometric line No. 1

At point (290.500, 59.500) ,RADIUS 50.825
the minimum factor of safety is 1.411

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 1.411
3.600E+01
3.200E+01
2.800E+01
2.400E+01
2.000E+01
1.600E+01
1.200E+01
8.000E+00
4.000E+00
.000E+00
-4.000E+00
0
-8.00E+01
8.00E+01
2.40E+02
4.00E+02
5.60E+02
7.20E+02