HYDROLOGY STUDY FOR
OAK GROVE RESOURCES, LLC

CONCORD PREP. PLANT

P-3233 R-26

JEFFERSON COUNTY, ALABAMA

BY

PERC ENGINEERING CO., INC.

P.O. BOX 1712

JASPER, ALABAMA 35502

DETAILED DESIGN PLANS

DIVERSION I-I'

ATTACHMENT III-B-3

February 3, 2016

PERC
ENGINEERING CO., INC.

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

February 3, 2016

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

RE: Oak Grove Resources, LLC
Concord Prep. Plant
P-3233 Revision R-26

Dear Stephen:

I hereby certify the attached detailed design plans for Diversion Ditch I-I' for the above referenced location 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 me at 295-3127 or e-mail lstephens@percengineering.com

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

Attachment III-B-3

SPECIFICATIONS FOR DIVERSION CHANNELS AND DIVERSION BERMS

1. Temporary diversions shall be constructed to pass safely the peak runoff from a 2-year, 6-hour precipitation event.

2. To protect fills and property and to avoid danger to public health and safety, permanent diversions shall be constructed to pass safely the peak runoff from a 10-year, 6-hour precipitation event. Permanent diversions shall be constructed with gently sloping banks that are stabilized by vegetation.

3. Diversions shall be designed, constructed, and maintained in a manner which prevents additional contributions of suspended solids to stream flow and to runoff outside the permit area, to the extent possible, using the best technology currently available. Appropriate sediment control measures for these diversions may include, but not be limited to, maintenance of appropriate gradients, channel lining, re-vegetation, roughness structures, and detention basins.

4. No diversion shall be located so as to increase the potential for land slides and no diversion shall be constructed on existing land slides.

5. When no longer needed, each temporary diversion shall be removed and the affected land re-graded, topsoiled,

and re-vegetated in accordance with Rules 880-X-10C-.10, 880-X-10C-.11, 880-X-10C-.52 - 880-X-10C-.58, 880-X-10C-.60, and 880-X-10C-.62.

6. Channel linings, when slopes are between 1-3 percent shall consist of both perennial and annual grasses and when slopes are greater than 3 percent, shall consist of riprap or be cut into non-erodible material.

7. Freeboard shall provide protection for transition of flows and for critical areas such as swales and curves along the entire channel length.

8. Energy dissipators shall be installed, when necessary, at discharge points where natural streams and exit velocity of the diversion ditch flow is greater than that of the receiving stream.

9. Excess excavated material not necessary for diversion channel geometry or regrading of the channel shall be disposed of in accordance with Rule 880-X-10C-.36.

10. Topsoil removed from the diversion excavations shall be handled in accordance with Rule 880-X-10C-.07 through 880-X-10C-.11.

11. Diversions shall not be constructed or operated to divert water into underground mines.

12. The embankment or berm foundation area shall be cleared of all organic matter, all surfaces sloped to no steeper than 1v:1h and the entire foundation surface scarified.

13. The entire embankment or berm shall be compacted to 95% density, based on standard proctor as outlined in ASTM.

14. The material placed in the berm 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 as the moisture content of the fill material will permit satisfactory compaction in accordance with paragraph 13.

15. The berm and all disturbed areas shall be seeded with both perennial and annual grasses in order to insure that erosion is minimized. Hay bales or rip-rap may be placed at the toe of the berm immediately upon completion of construction.

16. All berms shall be examined quarterly for structural weakness, instability, erosion, or other hazardous conditions and maintenance performed as necessary.

17. Any soil encountered in the excavation process will be stockpiled within the Permit Boundary to be used for cover material during the reclamation of the Coarse Refuse Disposal Area.
    Any rock material encountered in the excavation process will be used for compacted fill in the ditch area currently flowing to Basin 003A. It may be stockpiled temporally prior to placement.

Attachment III-B-3

DIVERSION DITCH FILL SECTION SPECIFICATIONS

The fill section for diversion ditches (temporary and permanent) shall be designed and built using the following as minimum criteria:

1. The top of the fill section shall be no less than 5 feet wider on either side of the Diversion Ditch dimensions. See attached Detailed Cross Section.

2. See Diversion Ditch Design Cross Section for maximum and minimum fill slopes.

3. The fill section foundation area shall be cleared of all organic matter and the entire foundation surface scarified.

4. The material placed in the fill section 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.

5. Quality control should include, at a minimum, testing of potential compacted fill materials for conformance with the characteristics as follows:

- Liquid Limit < 50
- Plasticity Index < 30
- Maximum Dry Density (ASTM D698-12) > 100 PC
- Maximum Particle Size of three (3) inches

Fill should be placed in lifts no greater than twelve (12) inches and compacted to achieve a minimum percentage of compaction of 95% as determined by the Standard Proctor Method. Moisture of fill materials should be maintained within a +/- 2% of the optimum moisture content for the particular soil being utilized. A nuclear density gauge can be used for compaction testing including the determination of dry density of the in-place compacted fill. Density testing shall be performed at a minimum frequency of 1 test per lift per 2,500 square feet.

6. The fill section 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 fill section immediately upon completion of construction.

7. The constructed height of the fill shall be increased a minimum of 5 percent over the design height to allow for settlement over the life of the fill section.

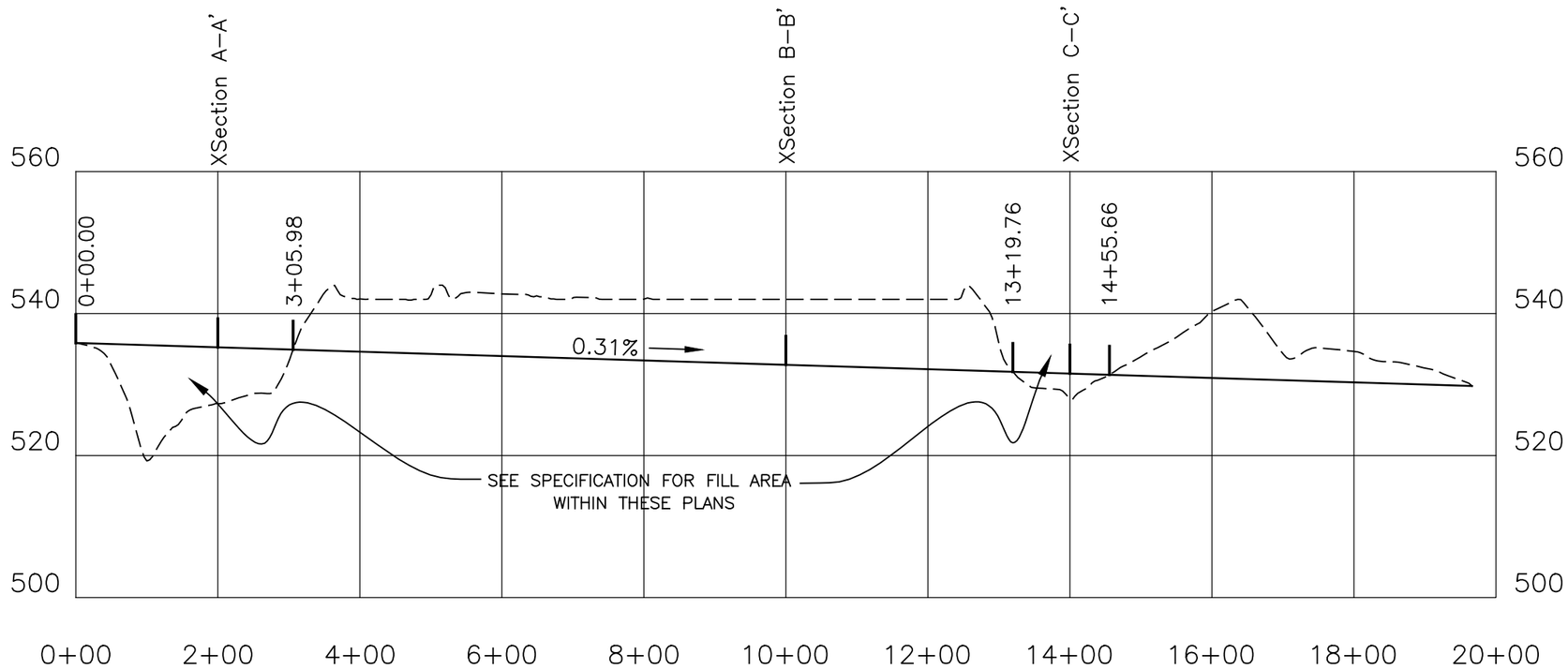
8. Final graded slopes of the entire fill section area

shall be 2.5H-1.0V or flatter to provide for adequate safety and stability.

9. A qualified Alabama registered professional engineer or other qualified professional specialist, under the direction of the professional engineer shall conduct regular inspections during construction and upon completion.

10. The fill section will be maintained by repairing any damage such as erosion, slope failure, etc. until removal of the structure or release of the performance bond.

11. Prior to Phase II bond release a Qualified, Alabama Licensed, Professional Engineer shall inspect the fill sections of the Diversion Ditch for any signs of weakness, erosion, instability, etc. Any repairs deemed necessary by the Professional Engineer must be completed prior to the Phase II Release.



Horizontal Scale: 1"=200'
Vertical Scale: 1"=20'

LEGEND

- - - - - - - - - EXISTING GRADE

———————— PROPOSED FINISHED GRADE

NOTES:

1) THE AREA UPGRADIENT OF THE FILL SECTIONS LOCATED FROM 0+00.00 TO 3+05.98 AND 13+19.76 TO 14+55.66 WILL BE FILLED WITH COARSE REFUSE, AS PER THE ASMC APPROVED PLANS, SO AS NOT TO IMPOUND WATER AND CREATE POSITIVE DRAINAGE INTO DIVERSION I–I'.

2) THIS WILL BE ACCOMPLISHED DURING THE CONSTRUCTION OF DIVERSION I–I'.

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(205) 384–5553 Office (205) 295–3114 Fax

OAK GROVE RESOURCES, LLC.
CONCORD PREP PLANT
P-3233 R-26
Diversion I-I'
Profile

.DWG NAME:	II WATERSHED	DATE:	12–17–15
DRAWN BY:	S.A.E.	SCALE:	AS SHOWN
APPROVED BY:	L.G.S.	JOB NUMBER:	16–04527–004

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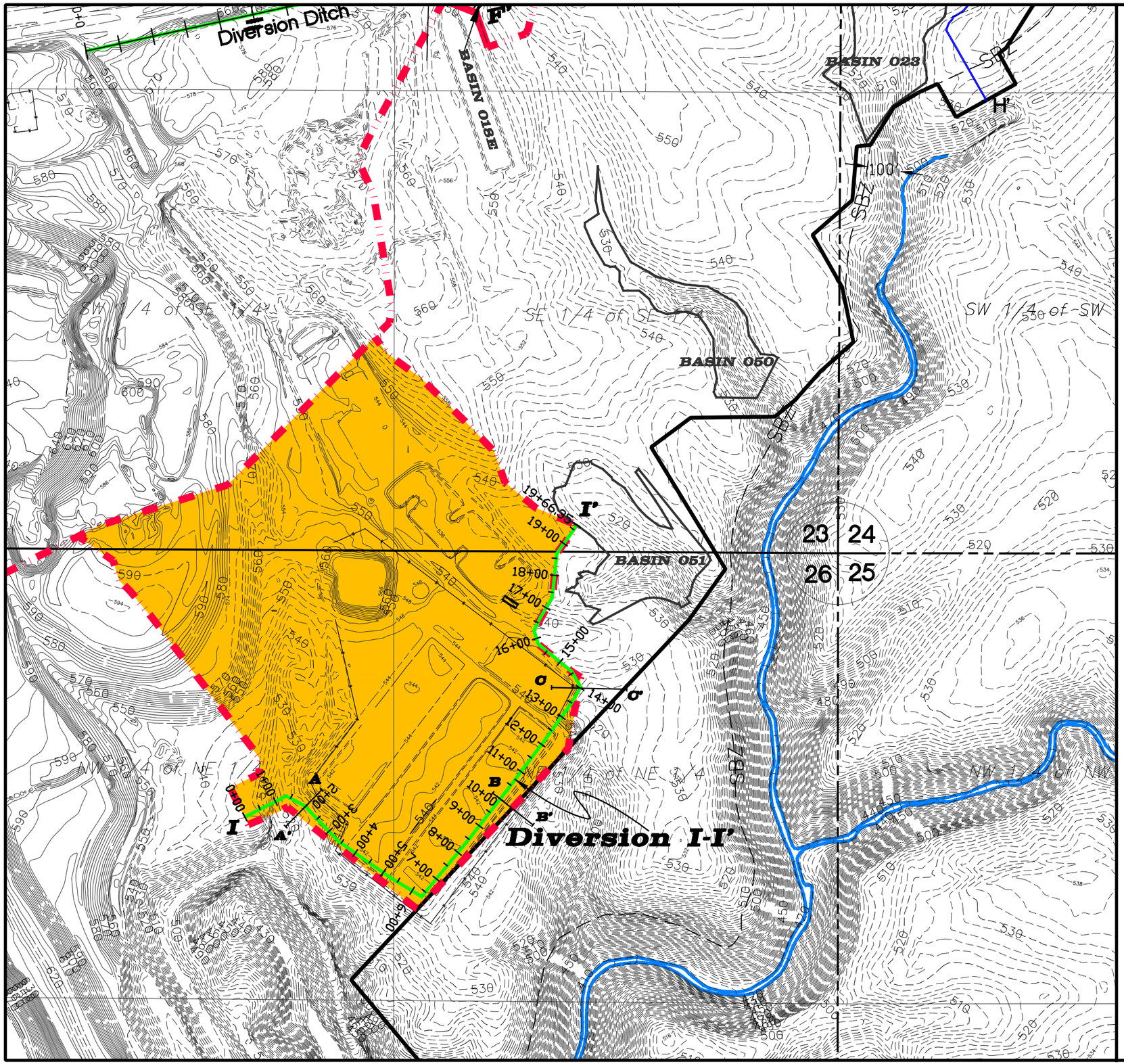

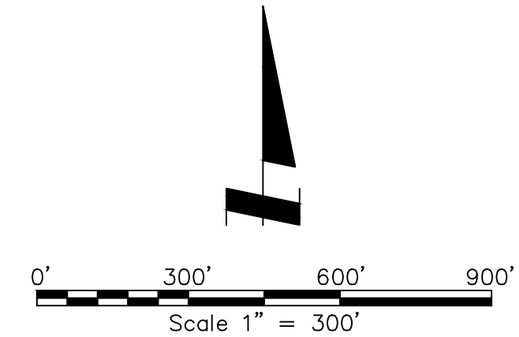

LEGEND

PERMIT BOUNDARY

10' SURFACE CONTOUR INTERVAL

WATERSHED BOUNDARY

PROPOSED DIVERSION DITCH

LANDUSE AND CURVE NUMBER INFORMATION

GRADED AND BARE, CURVE NUMBER, 81

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OAK GROVE RESOURCES, LLC.
CONCORD PREP PLANT / P-3233 R-26
ATTACHMENT III-B-3
DIVERSION I-I'
WATERSHED MAP

.DWG NAME:	II WATERSHED	DATE:	02-08-2016
DRAWN BY:	S.A.E.	SCALE:	1"=300'
APPROVED BY:	L.G.S.	JOB NUMBER:	16-04527-004

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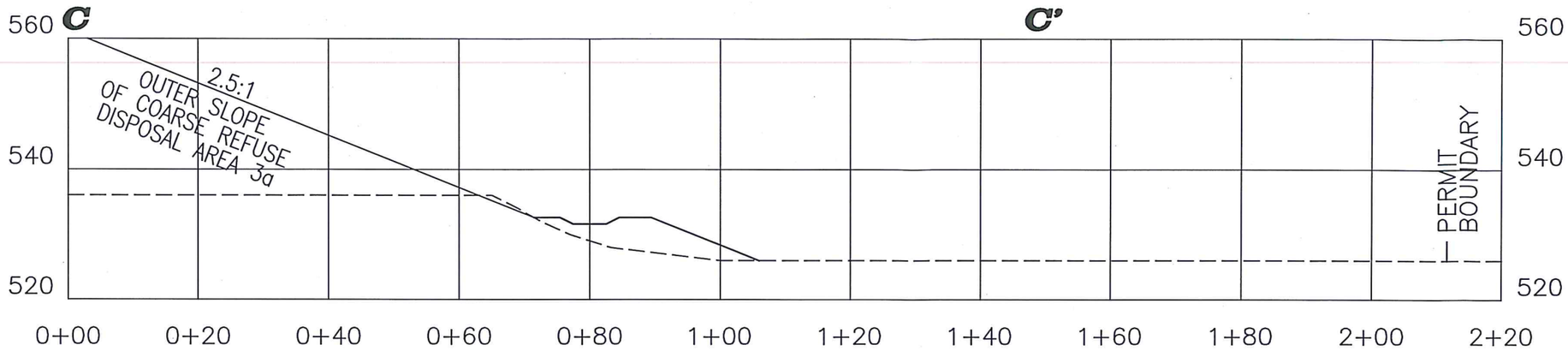

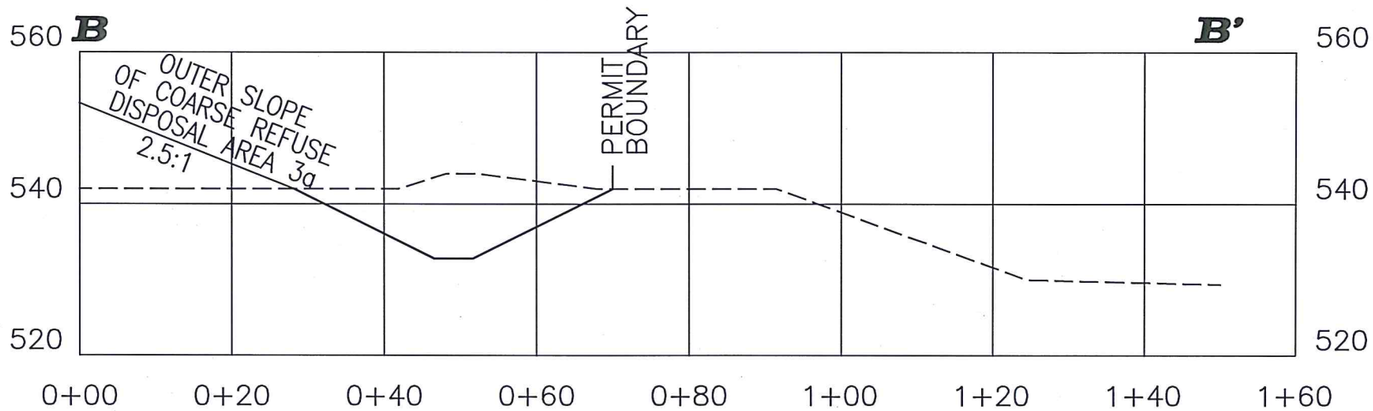

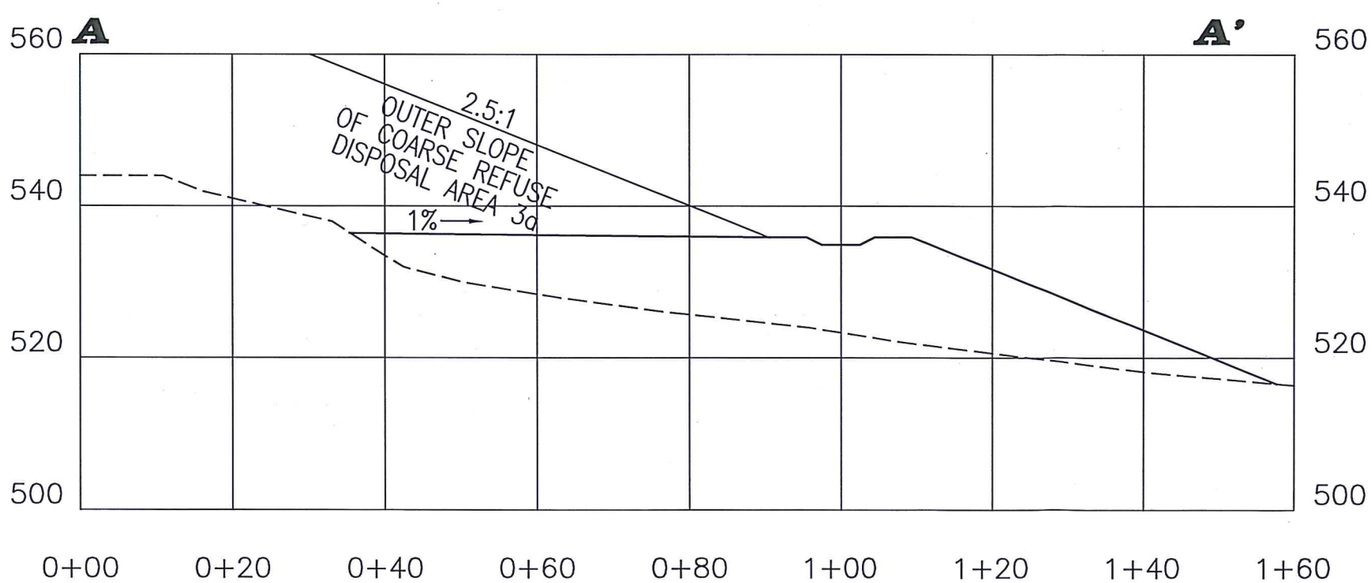

LEGEND

EXISTING GRADE

PROPOSED FINISHED GRADE

Horizontal Scale: 1"=200'
Vertical Scale: 1"=20'

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OAK GROVE RESOURCES, LLC.
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Diversion I-I'
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DRAWN BY:	S.A.E.	SCALE:	AS SHOWN
APPROVED BY:	L.G.S.	JOB NUMBER:	16-04527-004

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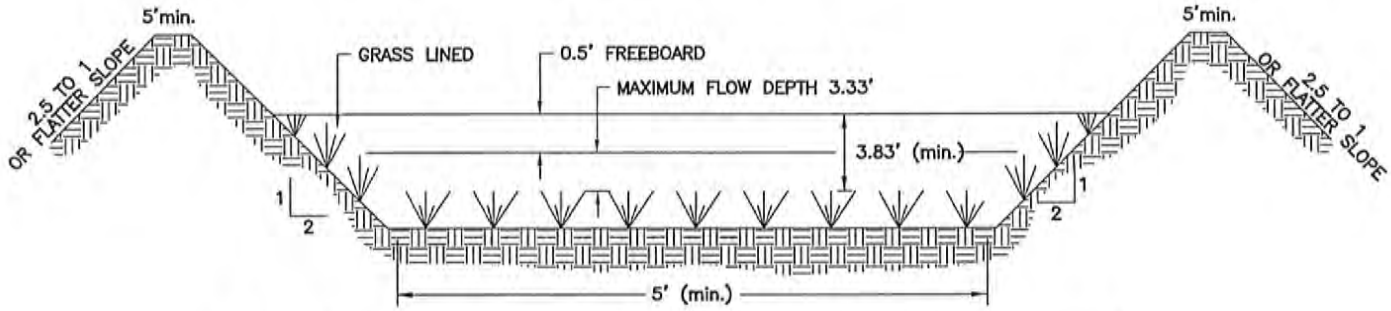

GRASS LINING TO CONSIST OF GRASS MIXTURE.

FILL SECTION

0+00 TO 3+05.98

AND

13+19.76 TO 14+55.66

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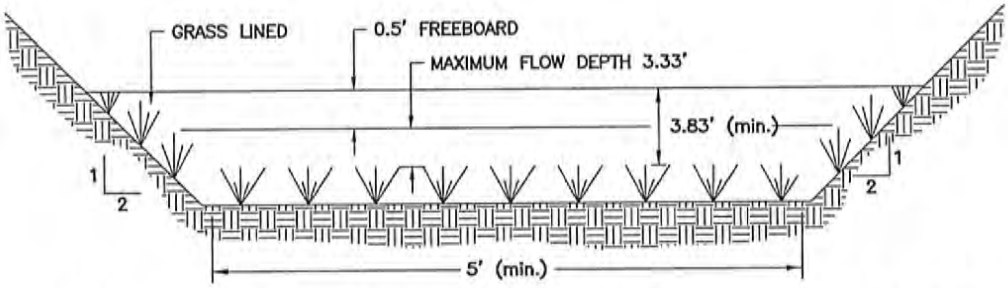
OAK GROVE RESOURCES, LLC.
CONCORD PREP PLANT
P-3233 R-26
Diversion I-I'

.DWG NAME:	Diversion I-I'	DATE:	12-17-15
DRAWN BY:	S.A.E.	SCALE:	AS SHOWN
APPROVED BY:	L.G.S.	JOB NUMBER:	15-03901-012



GRASS LINING TO CONSIST OF GRASS MIXTURE.

CUT SECTION

3+05.98 TO 13+19.76

AND

14+55.66 TO 19+66.35

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OAK GROVE RESOURCES, LLC.
CONCORD PREP PLANT
P-3233 R-26
Diversion I-I'

.DWG NAME:	Diversion I-I'	DATE:	12-17-15
DRAWN BY:	S.A.E.	SCALE:	AS SHOWN
APPROVED BY:	L.G.S.	JOB NUMBER:	15-03901-012

Oak Grove Resources LLC
Concord Prep. Plant
P-3233 Revision R-26
Diversion I-I'

4.25 Inch, 10 Year-6 Hour

NRCS Type II

LGS

PERC ENGINEERING CO., INC.
P. O. BOX 1712
1606 HIGHWAY 78 WEST
JASPER ALABAMA 35502

Phone: 205-384-5553
Email: LSTEPHENS@PERCENGINEERING.COM

General Information

Storm Information:

Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1900
1.00	0.3400
1.50	0.5740
2.00	0.9780
2.50	2.5500
3.00	2.9750
3.50	3.3150
4.00	3.5490
4.50	3.7610
5.00	3.9310
5.50	4.1010
6.00	4.2500

Peak 30-minute Intensity: 3.145 in/hr

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	End	0.000	0.000	Diversion I-I'

#1
Chan'l

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	30.300	30.300	58.86	5.68

Structure Detail:

Structure #1 (Vegetated Channel)

Diversion I-I'

Trapezoidal Vegetated Channel Inputs:

Material: Grass mixture

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Retardance Classes	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
5.00	2.0:1	2.0:1	0.3	D, B	0.50			5.0

Vegetated Channel Results:

	Stability Class D w/o Freeboard	Stability Class D w/ Freeboard	Capacity Class B w/o Freeboard	Capacity Class B w/ Freeboard
Design Discharge:	58.86 cfs		58.86 cfs	
Depth:	2.26 ft	2.76 ft	3.33 ft	3.83 ft
Top Width:	14.06 ft	16.06 ft	18.32 ft	20.32 ft
Velocity:	2.73 fps		1.52 fps	
X-Section Area:	21.57 sq ft		38.81 sq ft	
Hydraulic Radius:	1.426 ft		1.951 ft	
Froude Number:	0.39		0.18	
Roughness Coefficient:	0.0385		0.0854	

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	30.300	0.156	0.000	0.000	81.000	F	58.86	5.676
	Σ	**30.300**						**58.86**	**5.676**

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	1.00	5.00	500.00	1.000	0.138
		8. Large gullies, diversions, and low flowing streams	12.50	87.50	700.00	10.600	0.018
#1	**1**	**Time of Concentration:**					**0.156**