SHANNON, LLC

ATTACHMENT III-B-5(b)

SHANNON MINE NO. 3

P-3948

JEFFERSON COUNTY, ALABAMA

BY

DRUMMOND COMPANY, INC.

POST OFFICE BOX 1549

JASPER, ALABAMA 35502

MARCH 31, 2012

Post Office Box 1549
Jasper, Alabama 35502-1549

Telephone: (205) 387-0501

DRUMMOND COMPANY, INC.

March 29, 2012

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

RE: Shannon, LLC
Shannon Mine No. 3
P- 3948

Dear Michael:

I hereby certify the attached detailed design plans for Primary Roads 14P, 15P, 16P, and 17P for the above referenced mine are in accordance with current prudent engineering practices and the Regulations of the Alabama Surface Mining Commission 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.

Steven R. Ingle, P.E.
Alabama Registration No. 18213

Applicant: Shannon, LLC
Mine Name: Shannon Mine No. 3
Permit Number: P-3948, Revision R-5

SPECIFICATIONS FOR THE CONSTRUCTION, MAINTENANCE AND RECLAMATION OF PRIMARY ROADS

1. Primary roads shall be designed by or under the direction of a registered professional engineer in accordance with the Alabama Surface Mining Commission rules and regulations and prudent engineering practice.

2. Each roadway embankment will be designed and constructed so as to have a minimum static safety factor of 1.3.

3. To the extent possible, roads will be located on ridges or on the most stable available slopes to prevent or minimize erosion, downstream sedimentation and flooding in an effort to prevent adverse effects to fish, wildlife and related environmental values.

4. To the extent possible, roads will be located above the sediment basins to be constructed for the mining operation in an effort to control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area and to comply with State and Federal water quality standards applicable to receiving waters and avoid the alteration of the normal flow of water in streambeds or drainage channels while preventing or controlling damage to public or private property. Where it is not possible or is impractical to locate roads in this manner, sediment control devices such as silt fencing, hay bale check dams and rock filter check dams will be used as necessary to maintain water quality. No fording of intermittent or perennial streams will be conducted unless specifically approved by the Alabama Surface Mining Commission as temporary routes to be used during road construction.

5. Prior to construction, the roadway will be cleared, grubbed and will have the topsoil removed. The clearing limits will be kept to the minimum necessary to accommodate the roadbed and associated ditch construction.

6. Roads will be constructed of suitable compacted subgrade material. The material will be free of sod, roots, stones over 12 inches in diameter, and other objectionable materials. The material will be placed and spread over the entire fill area, starting at the lowest point in layers not to exceed 12 inches in thickness. The material will be compacted to 95 percent of the density, based on standard proctor as outlined in ASTM.

7. Primary roads will have a minimum width of eighteen feet and a maximum width necessary to accommodate the largest equipment traveling the road.

8. Roadbeds will be cut to consolidated non-erodible material or will be surfaced with durable non-toxic, non-acid forming substances. The wearing surface will consist of durable sandstone, chert, crushed limestone, crushed concrete, crushed asphalt, red rock, ironore refuse, gravel, or other durable non-toxic, non-acid forming material approved by the Regulatory Authority. The wearing surface will be placed on the roadbed to a depth of four inches.

9. No sustained grades will exceed ten percent unless deemed necessary, in which case appropriate sediment control facilities will be constructed. If grades in excess of fifteen percent are required, cross drains, ditch relief drains and road drainways will be located at a minimum distance of three-hundred feet.

10. Roads will be constructed so as to have adequate drainage utilizing ditches, culverts, cross drains and ditch relief drains designed to safely pass the peak runoff from a ten year, six hour precipitation event. Drainage pipes and culverts shall be installed as designed and will be maintained in a free and operating condition to prevent and control erosion at inlets and outlets. Culverts have been designed to support the load of the heaviest equipment to travel the road and are based on the Handbook of Steel Drainage and Highway Construction Products by the American Iron and Steel Institute and the equipment specifications. Drainage ditches will be constructed and maintained in accordance with the approved design to prevent uncontrolled drainage over the road surface and embankment. Roads will not be located in the channel of an intermittent or perennial stream unless specifically approved by the Alabama Surface Mining Commission. Additionally, no relocation and/or alteration of an intermittent or perennial stream will be done unless specifically approved by the Alabama Surface Mining Commission. In the event that it becomes evident that any drainage structures including culverts, bridges and/or low water crossings will be required in order to cross an intermittent or perennial stream, the structure will be designed and constructed in accordance with Alabama Surface Mining Commission requirements and prudent engineering practice and the approval of the design(s) will be acquired prior to the commencement of construction. Hay bale check dams and silt fences will be used at strategic locations when necessary to control sediment runoff. Immediately upon completion of construction, the side slopes of the road embankments and/or cuts will be fertilized, seeded with annual and perennial grasses and mulch will be added to aid in the prevention of erosion and to enhance seed germination. The seed mix will consist of, but is not limited to, some combination of the following species: bermuda grass, fescue, lespedeza, rye grass, brown top millet, clover and vetch. The particular species to be planted will vary with the planting

season at the time of seed application. Upon completion of construction of each phase of the roadway the construction will be certified to the Alabama Surface Mining Commission as having been done in accordance with the approved plans for the roadway and associated facilities.

11. Routine maintenance will be required to assure that the road continually meets performance standards and will consist of periodic grading, resurfacing, dust suppression and maintenance of sediment control facilities. Dust suppression will consist of the application of water, chemical binders and/or other dust suppressants. No oil will be utilized in this process. Spot seeding, fertilizing and mulching will be performed as necessary to improve vegetative cover on roadway slopes. A road damaged by a catastrophic event shall be repaired as soon as practicable after the damage has occurred.

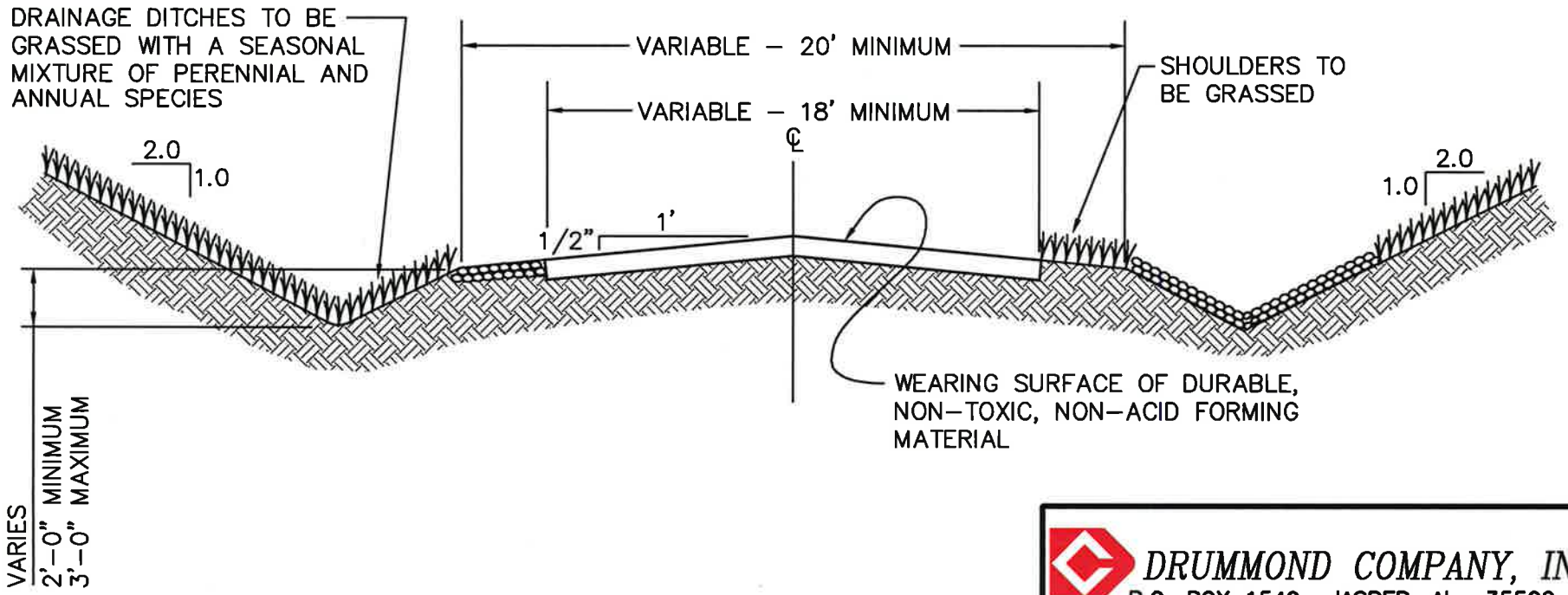
12. Roads not to be retained as part of the post mine land use shall be reclaimed in accordance with the approved reclamation plan for this permit as soon as practicable after they are no longer needed as part of the mining and reclamation operation, using the following procedures:

    a. The road will be closed to traffic.
    b. All bridges, culverts and other drainage structures not approved as part of the post mine land use will be removed.
    c. All road surfacing materials that are not compatible with the post mine land use or revegetation requirements will be properly disposed of on-site or removed from the site for re-use.
    d. Roadway cut and fill slopes shall be regraded and reshaped to be compatible with the post mine land use and to compliment the natural drainage pattern of the surrounding terrain.
    e. The natural drainage patterns shall be protected from surface runoff and erosion utilizing the installation of dikes and/or cross drains as necessary.
    f. The roadbed shall be ripped or scarified as necessary, the topsoil or substitute or approved growing medium shall be replaced and revegetated in accordance with the approved reclamation plan for this permit.

13. The drawings and data contained in the specific design plans illustrate typical roadbed configurations for primary roads as well as site specific design of drainage structures, stability analysis and ditch sections. See attached Typical Primary Road Drawing for an illustration of the typical roadbed configurations.

TYPICAL HAUL ROAD
CUT SECTION

NO SCALE



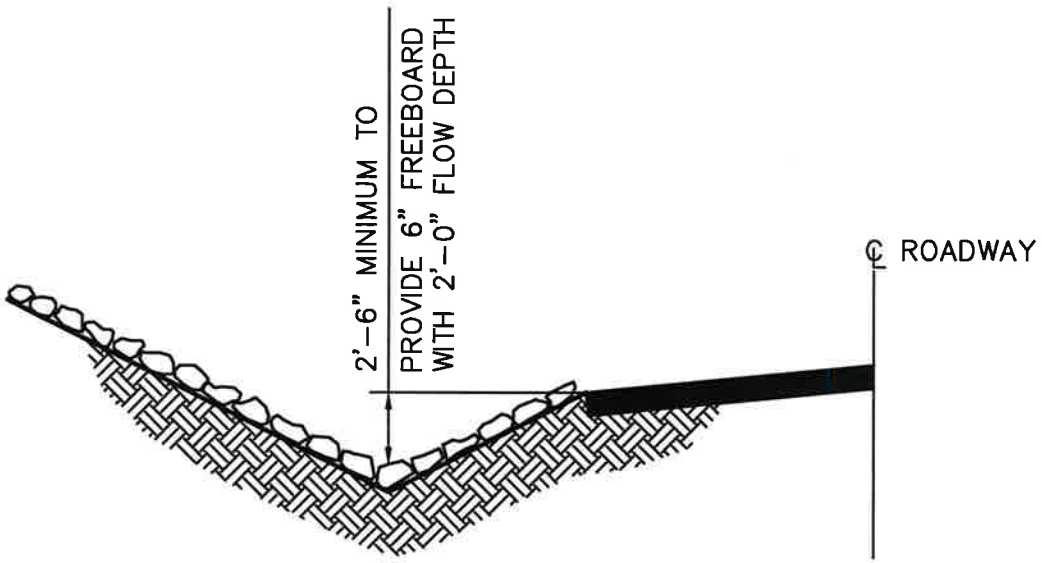
ATTACHMENT III.–B.–5.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502

TYPICAL CUT SECTION
PRIMARY HAUL ROAD

DRAWN BY: P.T.O. DWG. NAME: PRIMARY ROAD TYPICALS	DATE: 2–22–11
APPROVED BY: –	SCALE: NONE

C:\Todd Odom\P11D\S\Drummond ASMC Typical Dwgs\Primary Road Typicals.dwg 12/13/11 10:42



DITCH GRADIENT 5% TO 10%

DITCH CHANNEL TO BE LINED WITH NON-ERODIBLE NON-TOXIC, NON-ACID FORMING SANDSTONE OR LIMESTONE RIP-RAP. THE RIP-RAP WILL BE "CLASS 1" RIP-RAP AND HAVE A MINIMUM THICKNESS OF 12".

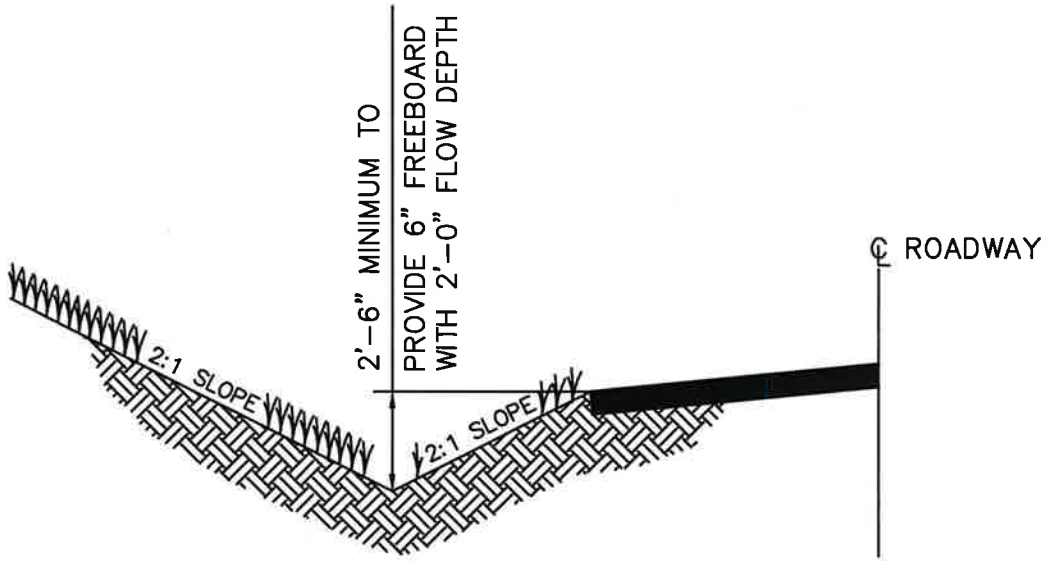
ATTACHMENT III.-B.-5.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502

TYPICAL PRIMARY ROADWAY DITCH CROSS SECTION

DRAWN BY: P.T.O. DWG. NAME: PRIMARY ROAD TYPICALS	DATE: 2-22-11
APPROVED BY: -	SCALE: NONE

G:\Todd Odom\PTO\S\Drummond ASMC Typical Dwgs\Primary Road Typicals.dwg 12/13/11 10:42



MINIMUM DITCH GRADIENT = 1%

MAXIMUM DITCH GRADIENT = 5%

DITCH CHANNEL TO BE VEGETATED WITH A MIXTURE OF BERMUDA GRASS, FESCUE, AND LESPEDEZA TO CONFORM TO CLASS "D" RETARDANT CLASS.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502

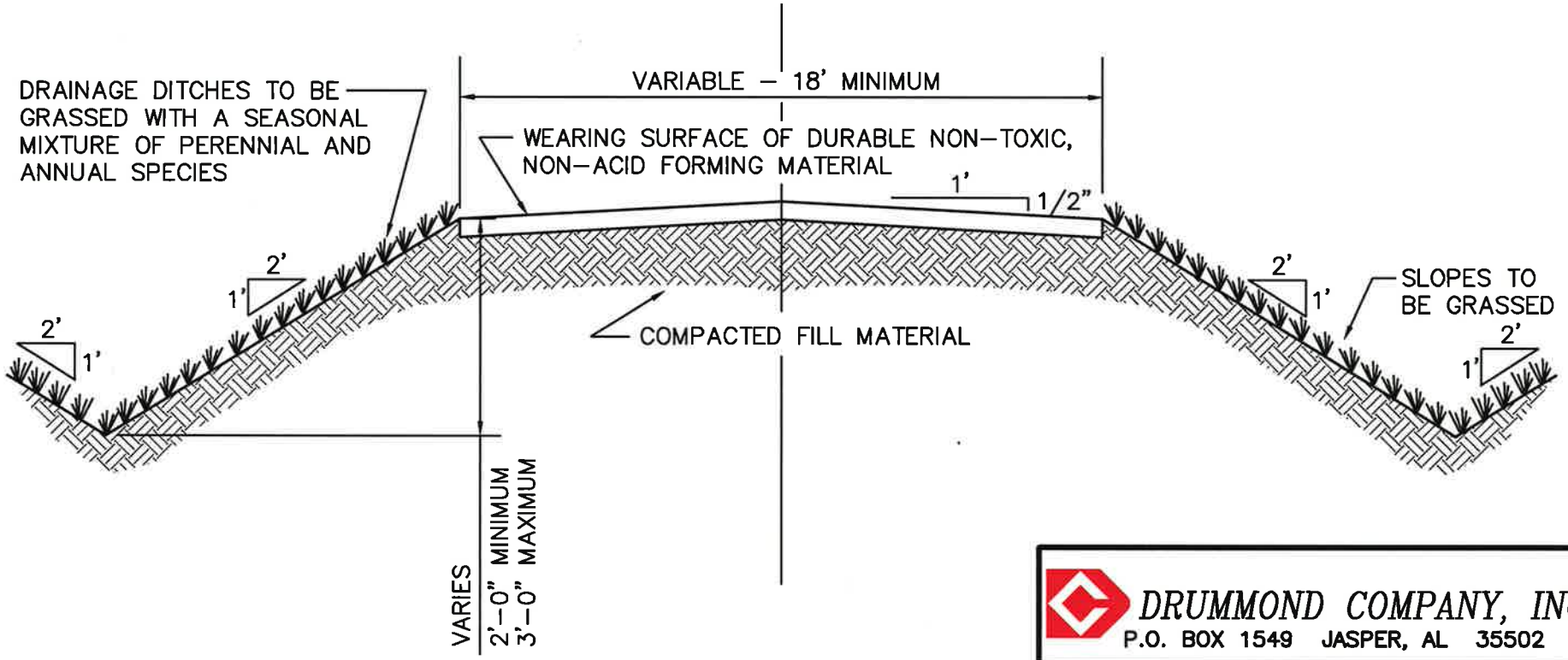
TYPICAL PRIMARY ROADWAY DITCH CROSS SECTION

DRAWN BY: P.T.O. DWG. NAME: PRIMARY ROAD TYPICALS	DATE: 2-22-11
APPROVED BY: -	SCALE: NONE

ATTACHMENT III.-B.-5.

TYPICAL HAUL ROAD
FILL SECTION

NO SCALE



DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502

TYPICAL FILL SECTION
PRIMARY HAUL ROAD

DRAWN BY: P.T.O. DWG. NAME: PRIMARY ROAD TYPICALS	DATE: 2–22–11
APPROVED BY: –	SCALE: NONE

ATTACHMENT III.–B.–5.

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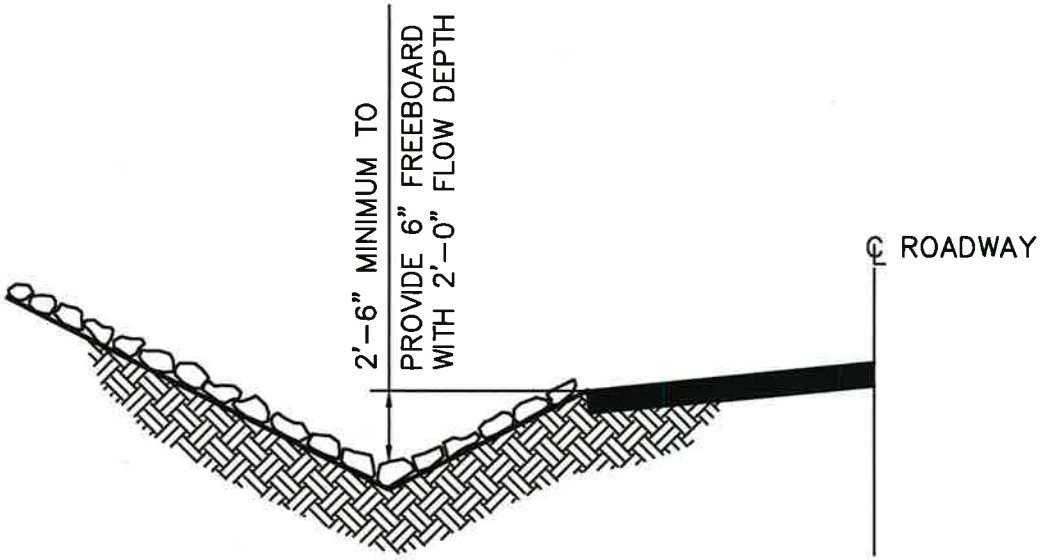


DITCH GRADIENT 11% TO 17%

DITCH CHANNEL TO BE LINED WITH NON-ERODIBLE NON-TOXIC, NON-ACID FORMING SANDSTONE OR LIMESTONE RIP-RAP. THE RIP-RAP WILL BE "CLASS 2" RIP-RAP AND HAVE A MINIMUM THICKNESS OF 16".

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502

TYPICAL PRIMARY ROADWAY DITCH CROSS SECTION

DRAWN BY: P.T.O. DWG. NAME: PRIMARY ROAD TYPICALS	DATE: 2-22-11
APPROVED BY: -	SCALE: NONE

ATTACHMENT III.-B.-5.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

drawn by:	HOCUTT	job number:	–
checked by:	S.R.I.	initial date:	
scale:	1"=600'	f.b./page:	–
diskette no:	–	dwg name:	SM3-HLM
rev no./date:	–	rev no./date:	4-19-12

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Location Map

NOTES

1) Drainage Structure DS14P 58+70 is a low water crossing across Blue Creek used to transport personnel, equipment, supplies, and as general access for Shannon Mine No. 3, P-3948. The low water crossing will only be used during times when the crossing is not inundated by Blue Creek.

2) The flow rate of Blue Creek used in the design of Drainage Structure DS14P 58+70, 148.7 cfs, was based on the maximum flow reported from a stream monitoring site, 4T for permits P-3534, P-3630, and P-3925. Attached is a table showing the historic flow data for the site from January 1980 to October 2011. From the reported flow data for 4T on file at the ASMC it was determined that the maximum flow, 148.7 cfs, was observed on 3/28/96. The drainage area for 4T was calculated to be 6,720 acres while the drainage area of Drainage Structure DS14P 58+70 was calculated to be 8,891 acres. With this increase in drainage area in mind, the maximum reported flow was increased by a factor of 1.323 to produce the design flow of 196.7 cfs.

The $7Q_2$ method of estimating stream flow was also evaluated to determine the base flow at Drainage Structure DS14P 58+70.

$7Q_2$ = flow rate cfs = $0.24 \times 10^{-4} (G-30)^{1.07} (A)^{0.94} (P-30)^{1.51}$
G = Stream Flow Resession Index = 65
A = Drainage Area, mi^2 = 13.9
P = Mean Annual Rainfall = 56 inches

$7Q_2$ = flow rate cfs = $0.24 \times 10^{-4} (65-30)^{1.07} (13.9)^{0.94} (56-30)^{1.51}$
$7Q_2$ = flow rate cfs = 1.751 cfs

With the above information in mind, a flow rate of 196.7 cfs was used to size Drainage Structure DS14P 58+70. It was determined that 4 - 48 inch diameter reinforced concrete pipes will be used to carry the base flow of Blue Creek. In either case, the proposed 4 - 48 inch diameter reinforced concrete pipes will maintain the flow without producing full pipe flow. In the case with a discharge of 1.751 cfs, the water level within the pipes will be 0.1 feet. In the case with a discharge of 196.7 cfs, the water level within the pipes will be 3.6 feet. Attached is a photo showing the crossing site. It shows an existing crossing consisting of 4 - 48 inch diameter reinforced concrete pipes. It should be noted that the ordinary high water level of Blue Creek is near or slightly above the top of the existing culverts. With this photo in mind and the fact that peak water level during the design flow of 196.7 cfs is only 3.6 feet, Drainage Structure DS14P 58+70 will not result in an increase in the existing ordinary high water level of Blue Creek.

Drainage Structure DS14P 58+70 was also designed to carry the peak flow from a 25 year - 6 hour precipitation event, 748.5 cfs. The roadway surface of Drainage Structure DS14P 58+70 will be surfaced with 12 inches of concrete reinforced with

2 layers of #5 rebar on 6 inch centers, while the side slopes will be surfaced with 4 inches of concrete reinforced with standard concrete reinforcement wire. With this surfacing in mind, the crossing was treated as a spillway system and will safely convey the peak flow predicted from the design event.

4) In an effort to control siltation from the roadway surface and road ditches of Road 14P, sediment traps consisting of sumps approximately 10' X 10' X 3' will be placed at the corner of the approaches of Drainage Structure DS14P 58+70. The sediment traps will be inspected weekly. Maintenance will be performed as necessary to ensure that the sediment traps are functioning properly. When the sumps fill with sediment, the sediment will be removed and transported back to the permit area within drainage control.

5) Any debris, mud, or dust accumulated upon the roadway surface along Drainage Structure DS14P 58+70 will be periodically removed and transported back to the permit area within drainage control to prevent it entering Blue Creek during periods of inundation.

6) Roadway safety rails will be placed along the side slopes of the embankment of Drainage Structure DS14P 58+70 as per Mine Safety and Health Administration regulations. The safety rails will consist of steel post and cables of sufficient size to retain the vehicles traveling the road and be placed at the a spacing which will not impede flow when the crossing in inundated and placed at a height equal to the height of the axle of the largest vehicle traveling the roadway. The height is anticipated to be approximately 4 feet.

7) Due to the Drainage Structure DS14P 58+70 affecting less than 3,300 linear feet of stream channel during the peak flow of the 25 year - 6 hour precipitation event, which is very small as compared to the large total length of the stream channel, and due to there being no floodplains associated with the stream channel along the impacted section, and the fact that there are no structures located along the impacted area or within the entire reach of the stream channel, and the fact that the property along the impacted area is controlled by Shannon, LLC there will be no adverse impacts to the stream channel or adjacent properties either upstream or downstream of the proposed crossing as a result of its construction.

8) Due to Drainage Structure DS14P 58+70 being the most adverse drainage structure at the Shannon Mine No. 3 a stability analysis was performed to prove its safety.

Historical Flow Information for Site 4T		
Date	Flow CFS	
1/15/1980	0	
2/15/1980	0	
5/15/1980	0	
7/15/1980	0	
8/15/1980	0	
9/15/1980	0	
10/15/1980	6.7	
11/15/1980	18.1	
12/15/1980	8.3	
1/15/1981	7.17	
2/15/1981	29.7	
3/15/1981	10.4	
4/15/1981	13.6	
5/15/1981	14.8	
6/15/1981	6.7	
7/15/1981	6.8	
9/15/1981	5.2	
10/15/1981	0	
11/15/1981	0	
12/15/1981	0	
1/15/1982	0	
2/15/1982	0	
3/15/1982	0	
4/15/1982	0	
5/15/1982	0	
6/15/1982	0	
7/15/1982	0	
8/15/1982	0	
11/15/1982	4.8	
12/15/1982	100	
3/15/1983	17.8	
6/15/1983	16.5	
1/3/1984	5	
3/26/1984	20.5	
9/28/1984	5	
12/15/1984	7.38	
3/15/1985	9.29	
6/26/1985	7.17	
9/25/1985	6.03	
12/27/1985	8.44	
3/26/1986	10.9	
6/25/1986	6.88	
12/10/1986	125	
3/23/1987	23.8	
6/25/1987	17.9	
9/9/1987	5.32	
12/10/1987	7.73	
3/7/1988	15.6	
6/24/1988	0	
8/19/1988	0	
11/7/1988	23.4	
2/1/1989	58	
5/25/1989	10.9	
8/18/1989	8.56	

Historical Flow Information for Site 4T		
Date	Flow CFS	
12/29/1989	45.4	
12/30/1993	1.47	
3/29/1994	66.02	
6/7/1997	0.74	
9/29/1994	0.75	
12/8/1994	21.29	
3/20/1995	10.9	
6/15/1995	0.94	
9/14/1995	0	
12/29/1995	8.82	
3/28/1996	148.67	
6/28/1996	0.12	
9/25/1996	0.21	
12/30/1996	4.02	
3/21/1997	0.44	
5/15/1997	1.15	
8/7/1997	1.84	
11/5/1997	0.7	
2/16/1996	19.08	
4/24/1998	0.82	
7/25/1998	0	
10/26/1998	0	
1/22/1999	3.34	
5/11/1999	0.83	
7/12/1999	0.81	
10/6/1999	0.09	
1/22/2009	11.55	
2/19/2009	11.53	
3/24/2009	8.728	
6/4/2009	4.139	
9/15/2009	1.355	
10/29/2009	4.586	
3/19/2010	12.06	
7/15/2010	0.585	
12/3/2010	2.72	
3/21/2011	3.208	
5/9/2011	1.558	
9/15/2011	2.72	
10/10/2011	0.31	
Minimum Flow	0.00	
Maximum Flow	148.67	
Average Flow	11.32	

Madison, Keith

From: Madison, Keith
Sent: Wednesday, November 02, 2011 10:19 AM
To: Courtney M. Shea (courtney.m.shea@usace.army.mil)
Cc: Ingle, Steve
Subject: Proposed Blue Creek Crossing - Shannon Mine No. 3
Attachments: Shannon Mine No. 3 Creek Crossing Map.pdf

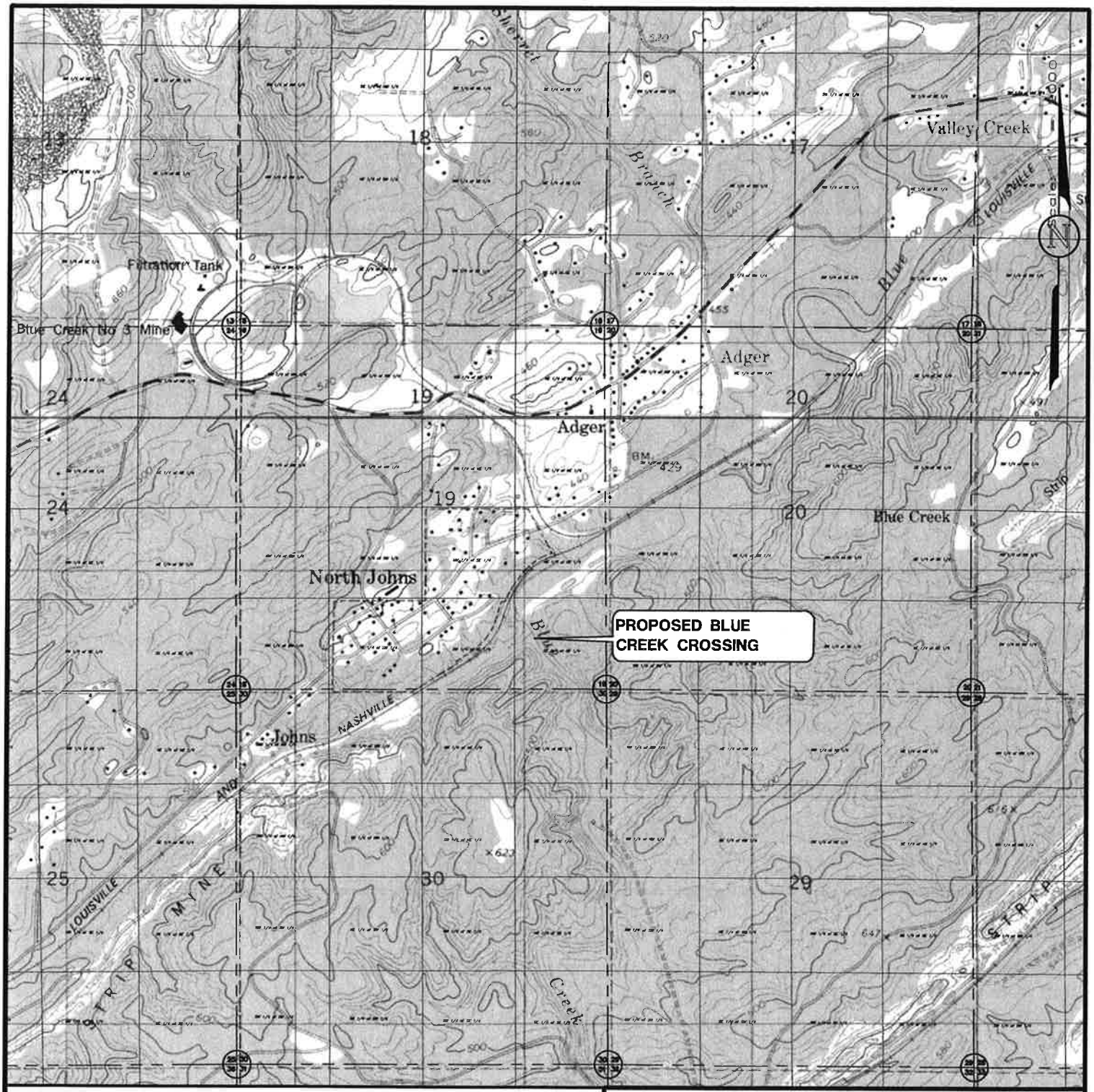
Ms. Shea,

Please accept this e-mail as notification of Shannon, LLC's intention to construct a temporary low water crossing on Blue Creek near North Johns, Alabama. The purpose of this crossing is to move mining equipment from one area to another. The crossing is located in the SE ¼ of SE ¼ of Section 19, Township 19 South, Range 5 West, Jefferson County, Alabama, at Latitude 33 Degrees 21 Minutes, 59 Seconds and Longitude 87 Degrees 05 Minutes, 47 Seconds. The crossing will disturb less than 0.1 acres of Blue Creek. Also, there are no wetlands adjacent to Blue Creek at the proposed crossing location. Please see attached map for the location of the crossing.

Please notify me of your decision. Your prompt consideration will be appreciated.

Thanks

Keith Madison
Drummond Company, Inc.
3000 Highway 78 East
Jasper, AL 35501
email: kmadison@drummondco.com
Phone: (205)387-0501
Direct : (205)384-2470
Fax: (205)384-2322



Twin Pines, LLC
74 Industrial Parkway
P.O. Box 621 Jasper, Alabama 35502
(205) 295-0995 Office (205) 295-0799 Fax

SHANNON, LLC
SHANNON MINE NO. 3
PROPOSED BLUE CREEK CROSSING

LATITUDE 33°-21'-59"
LONGITUDE 87°-05'-47"

DRAWN BY: P.T.O. DWG. NAME: TPSM3COPR	DATE: 10-31-11
APPROVED BY: W.K.M.	SCALE: 1"=2000'

G:\Todd Odom\PTO\WKM\TPSM3CORP.dwg 10/31/11 14:10

Madison, Keith

From: Shea, Courtney M. SAM [Courtney.M.Shea@usace.army.mil]
Sent: Monday, November 07, 2011 1:14 PM
To: Madison, Keith
Cc: Ingle, Steve
Subject: RE: Proposed Blue Creek Crossing - Shannon Mine No. 3 (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Thanks Keith. In accordance with 33 CFR 323.4(a)(6), this activity is exempt provided the activity meets the conditions outlined in the regulation:

(6) Construction or maintenance of farm roads, forest roads, or temporary roads for moving mining equipment, where such roads are constructed and maintained in accordance with best management practices (BMPs) to assure that flow and circulation patterns and chemical and biological characteristics of waters of the United States are not impaired, that the reach of the waters of the United States is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized. These BMPs which must be applied to satisfy this provision shall include those detailed BMPs described in the State's approved program description pursuant to the requirements of 40 CFR 233.22(i), and shall also include the following baseline provisions:
(i) Permanent roads (for farming or forestry activities), temporary access roads (for mining, forestry, or farm purposes) and skid trails (for logging) in waters of the U.S. shall be held to the minimum feasible number, width, and total length consistent with the purpose of specific farming, silvicultural or mining operations, and local topographic and climatic conditions;
(ii) All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters of the U.S.;
(iii) The road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows;
(iv) The fill shall be properly stabilized and maintained during and following construction to prevent erosion;
(v) Discharges of dredged or fill material into waters of the United States to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers, or other heavy equipment within waters of the United States (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself;
(vi) In designing, constructing, and maintaining roads, vegetative disturbance in the waters of the U.S. shall be kept to a minimum;
(vii) The design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body;
(viii) Borrow material shall be taken from upland sources whenever feasible;
(ix) The discharge shall not take, or jeopardize the continued existence of, a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species;
(x) Discharges into breeding and nesting areas for migratory waterfowl, spawning areas, and wetlands shall be avoided if practical alternatives exist;
(xi) The discharge shall not be located in the proximity of a public water supply intake;
(xii) The discharge shall not occur in areas of concentrated shellfish production;
(xiii) The discharge shall not occur in a component of the National Wild and Scenic River System;
(xiv) The discharge of material shall consist of suitable material free from toxic pollutants in toxic amounts; and
(xv) All temporary fills shall be removed in their entirety and the area restored to its original elevation.

Courtney Shea
Biologist - Project Manager
U.S. Army Corps of Engineers
Regulatory Division
Mobile District - Birmingham Field Office
218 Summit Parkway, Suite 222
Homewood, AL 35209
205-290-9096 Office
205-945-7591 Direct Line
205-941-9809 Fax

-----Original Message-----
From: Madison, Keith [mailto:Kmadison@drummondco.com]
Sent: Wednesday, November 02, 2011 10:19 AM
To: Shea, Courtney M. SAM
Cc: Ingle, Steve
Subject: Proposed Blue Creek Crossing - Shannon Mine No. 3

Ms. Shea,

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Please notify me of your decision. Your prompt consideration will be appreciated.

Thanks

Keith Madison

Drummond Company, Inc.

3000 Highway 78 East

Jasper, AL 35501

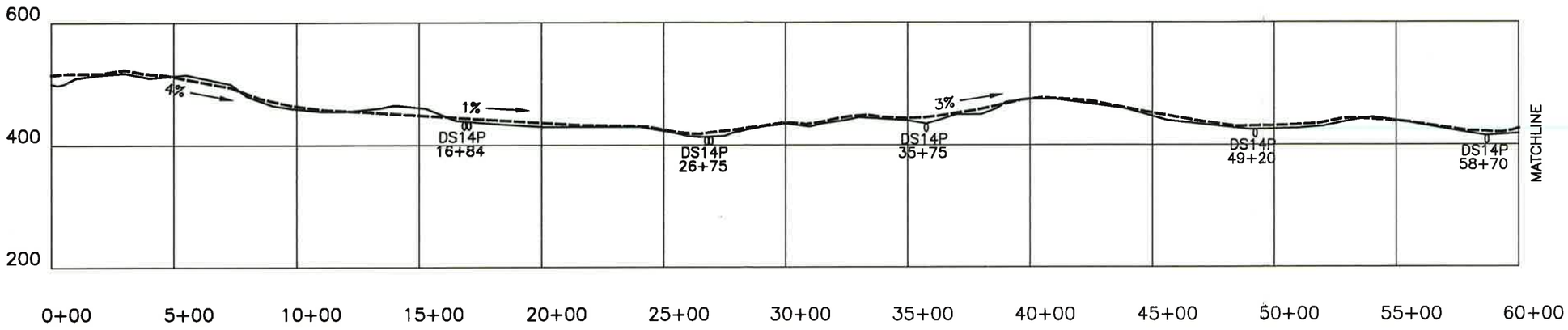
email: kmadison@drummondco.com

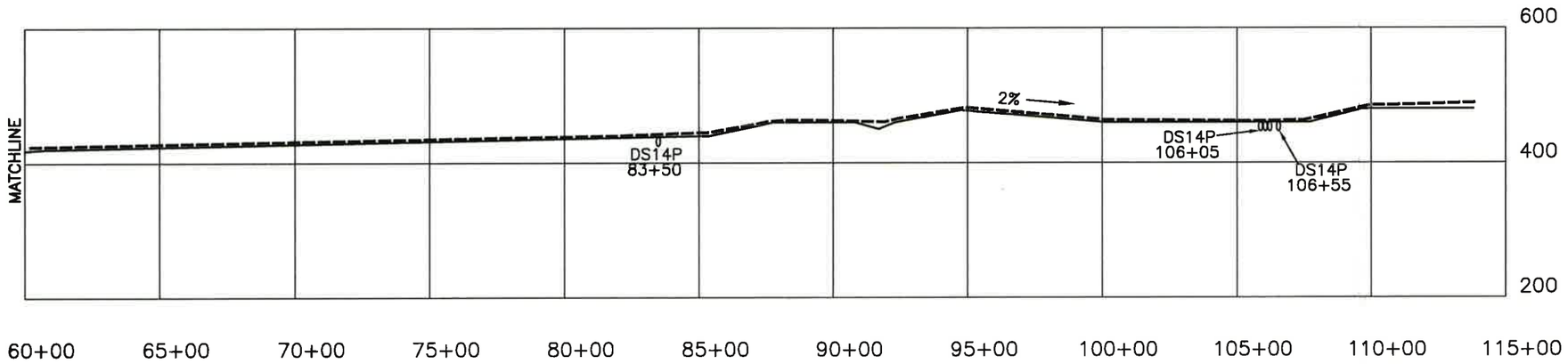
Phone: (205)387-0501

Direct : (205)384-2470

Fax: (205)384-2322

Classification: UNCLASSIFIED
Caveats: NONE





Road No. 14P

1"=500' HORZ.
1"=200' VERT.

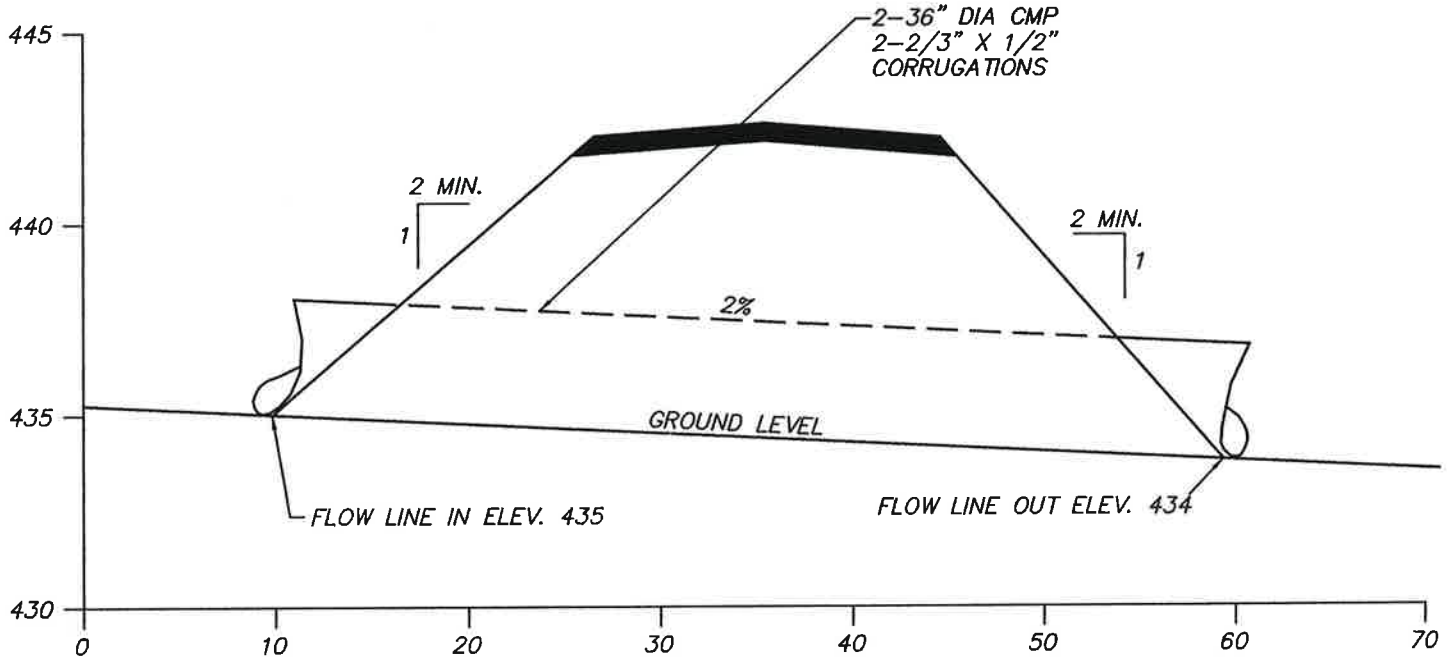
EXISTING GRADE
PROPOSED FINISHED GRADE

NOTE:
1: FINISHED GRADES SHOWN HEREON MAY MAY VARY FROM BETWEEN 0% AND 17%.
2: SEE INDIVIDUAL CROSS SECTIONS SHEETS FOR SPECIFIC DRAINAGE STRUCTURE INFORMATION.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Road 14P Profile

DRAWN BY: P.T.O. DWG. NAME: DCSM314PPR	DATE: 1-17-12
APPROVED BY: S.W.	SCALE: AS NOTED



HYDRAULICS INFORMATION

DRAINAGE AREA = 71.0 ACRES
10 YR.-6YR., Q = 140.5 C,F,S.
MAXIMUM WATER ELEV. = 442.2
MINIMUM FILL ELEV. = 443.2
MAXIMUM ALLOWABLE COVER 36" C.M.P. = 83'
MINIMUM ALLOWABLE COVER 36" C.M.P. = 1"
WALL THICKNESS = .064
MINIMUM FREEBOARD = 1'

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Cross-Section
DS14P 16+84

DRAWN BY: P.T.O. DWG. NAME: DCSM3DS14PHRC	DATE: 3-1-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC

Shannon Mine No. 3

P-3948

Drainage Structure DS14P 16+84

4.3 Inches, 10 Year - 6 Hour

SCS 6 Hour

SEW

General Information

Storm Information:

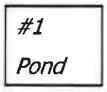
Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1510
1.00	0.3440
1.50	0.5810
2.00	0.9890
2.50	2.5800
3.00	3.0100
3.50	3.3540
4.00	3.5910
4.50	3.8060
5.00	3.9780
5.50	4.1500
6.00	4.3000

Peak 30-minute Intensity: 3.182 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Drainage Structure DS14P 16+84



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	71.000	71.000	140.54	13.54
	Out			140.17	13.54

Structure Detail:

Structure #1 (Pond)

Drainage Structure DS14P 16+84

Pond Inputs:

Initial Pool Elev:	435.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0240	435.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0240	435.01	0.90	0.00

Pond Results:

Peak Elevation:	442.23 ft
Dewater Time:	0.16 days

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)	
435.00	0.000	0.000	0.000		
435.01	0.000	0.000	0.000		Spillway #1 Spillway #2
435.50	0.000	0.000	4.313	0.30	
436.00	0.000	0.000	12.388	0.05	
436.50	0.000	0.000	22.853	1.50	
437.00	0.001	0.000	35.286	1.05	
437.50	0.001	0.001	49.363	0.70	
438.00	0.001	0.001	64.955	0.15	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
438.50	0.002	0.002	81.712	0.05	
439.00	0.003	0.003	95.132	0.05	
439.50	0.003	0.005	107.065		
440.00	0.004	0.007	114.371		
440.50	0.005	0.009	120.646		
441.00	0.006	0.011	126.599		
441.50	0.007	0.015	132.293		
442.00	0.008	0.018	137.753		
442.23	0.008	0.020	140.168	0.05	Peak Stage
442.50	0.009	0.022	142.993		
443.00	0.010	0.027	148.058		

Detailed Discharge Table

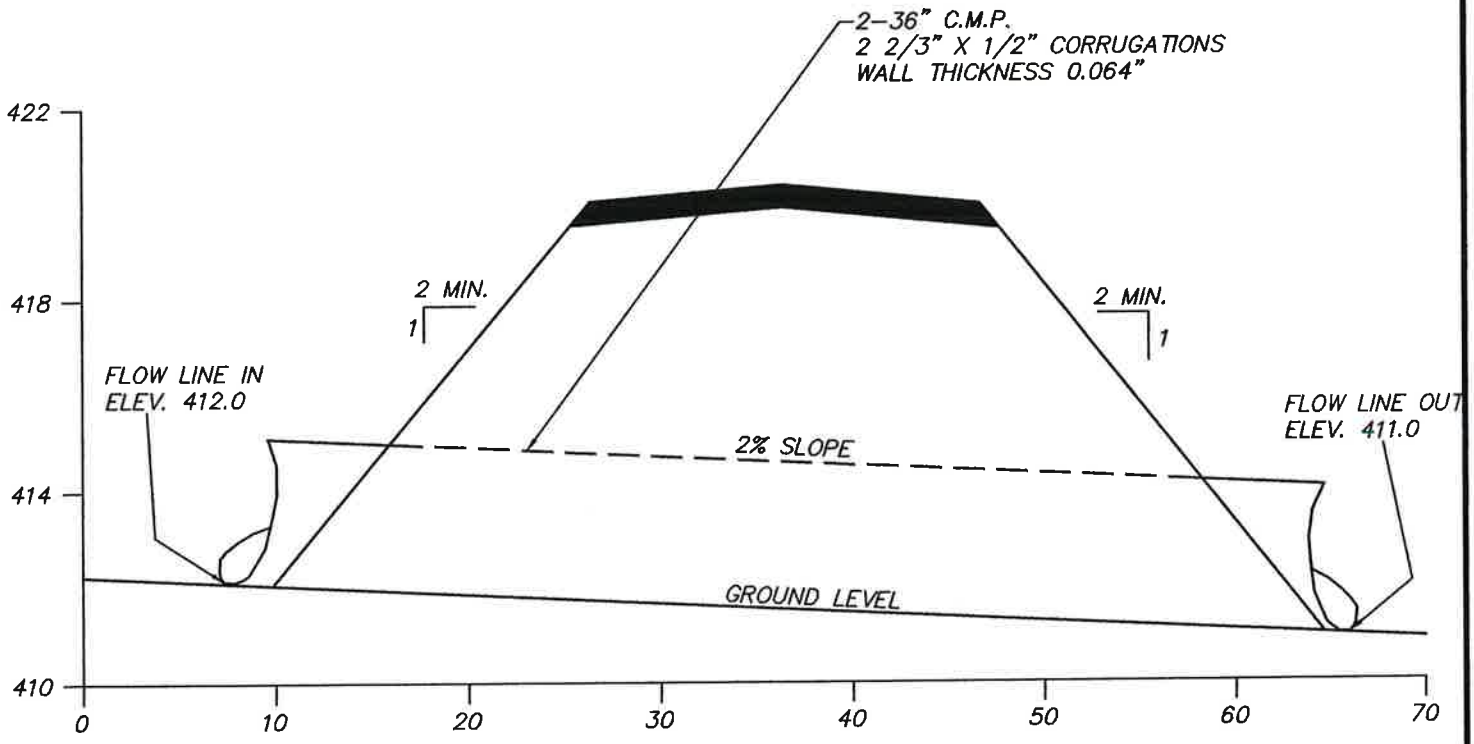
Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
435.00	0.000	0.000	0.000
435.01	0.000	0.000	0.000
435.50	(3)>2.156	(3)>2.156	4.313
436.00	(3)>6.194	(3)>6.194	12.388
436.50	(3)>11.427	(3)>11.427	22.853
437.00	(3)>17.643	(3)>17.643	35.286
437.50	(3)>24.682	(3)>24.682	49.363
438.00	(3)>32.477	(3)>32.477	64.955
438.50	(3)>40.856	(3)>40.856	81.712
439.00	(5)>47.566	(5)>47.566	95.132
439.50	(5)>53.533	(5)>53.533	107.065
440.00	(6)>57.185	(6)>57.185	114.371
440.50	(6)>60.323	(6)>60.323	120.646
441.00	(6)>63.299	(6)>63.299	126.599
441.50	(6)>66.147	(6)>66.147	132.293
442.00	(6)>68.876	(6)>68.876	137.753
442.50	(6)>71.497	(6)>71.497	142.993
443.00	(6)>74.029	(6)>74.029	148.058

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	71.000	0.125	0.000	0.000	81.000	F	140.54	13.544
	Σ	**71.000**						**140.54**	**13.544**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	4.29	120.00	2,800.00	6.210	0.125
#1	**1**	**Time of Concentration:**					**0.125**



HYDRAULICS INFORMATION

DRAINAGE AREA = 97.0 ACRES
10 YR.-6 YR., Q = 192.0
MAXIMUM WATER ELEV. = 419.0
MINIMUM FILL ELEV. = 420.0
MAXIMUM ALLOWABLE COVER 36" C.M.P. = 83'
MINIMUM ALLOWABLE COVER 36" C.M.P. = 12"
MINIMUM FREEBOARD = 1'

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Cross-Section
DS14P 26+75

DRAWN BY: P.T.O. DWG. NAME: TPSM3DS14P	DATE: 2-7-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC

Shannon Mine No. 3

P-3948

Drainage Structure DS14P 26+75

4.3 Inches, 10 Year - 6 Hour

SCS 6 Hour

SEW

General Information

Storm Information:

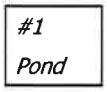
Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1510
1.00	0.3440
1.50	0.5810
2.00	0.9890
2.50	2.5800
3.00	3.0100
3.50	3.3540
4.00	3.5910
4.50	3.8060
5.00	3.9780
5.50	4.1500
6.00	4.3000

Peak 30-minute Intensity: 3.182 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Drainage Structure DS14P 26+75



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	97.000	97.000	192.01	18.50
	Out			153.40	18.50

Structure Detail:

Structure #1 (Pond)

Drainage Structure DS14P 26+75

Pond Inputs:

Initial Pool Elev:	412.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0150	412.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0150	412.01	0.90	0.00

Pond Results:

Peak Elevation:	418.93 ft
Dewater Time:	0.16 days

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)	
412.00	0.000	0.000	0.000		
412.01	0.000	0.000	0.000		Spillway #1 Spillway #2
412.50	0.004	0.001	4.313	0.25	
413.00	0.014	0.005	12.388	0.05	
413.50	0.029	0.015	22.853	0.10	
414.00	0.051	0.035	35.286	1.95	
414.50	0.079	0.067	49.363	0.55	
415.00	0.113	0.115	64.955	0.55	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
415.50	0.152	0.181	81.712	0.05	
416.00	0.198	0.268	95.132	0.05	
416.50	0.250	0.380	107.349	0.05	
417.00	0.307	0.519	118.315	0.05	
417.50	0.371	0.688	128.346		
418.00	0.441	0.891	137.650	0.05	
418.50	0.517	1.130	146.355	0.05	
418.93	0.588	1.371	153.396	0.10	Peak Stage
419.00	0.598	1.409	154.505		
419.50	0.686	1.730	162.324		
420.00	0.780	2.096	169.819		

Detailed Discharge Table

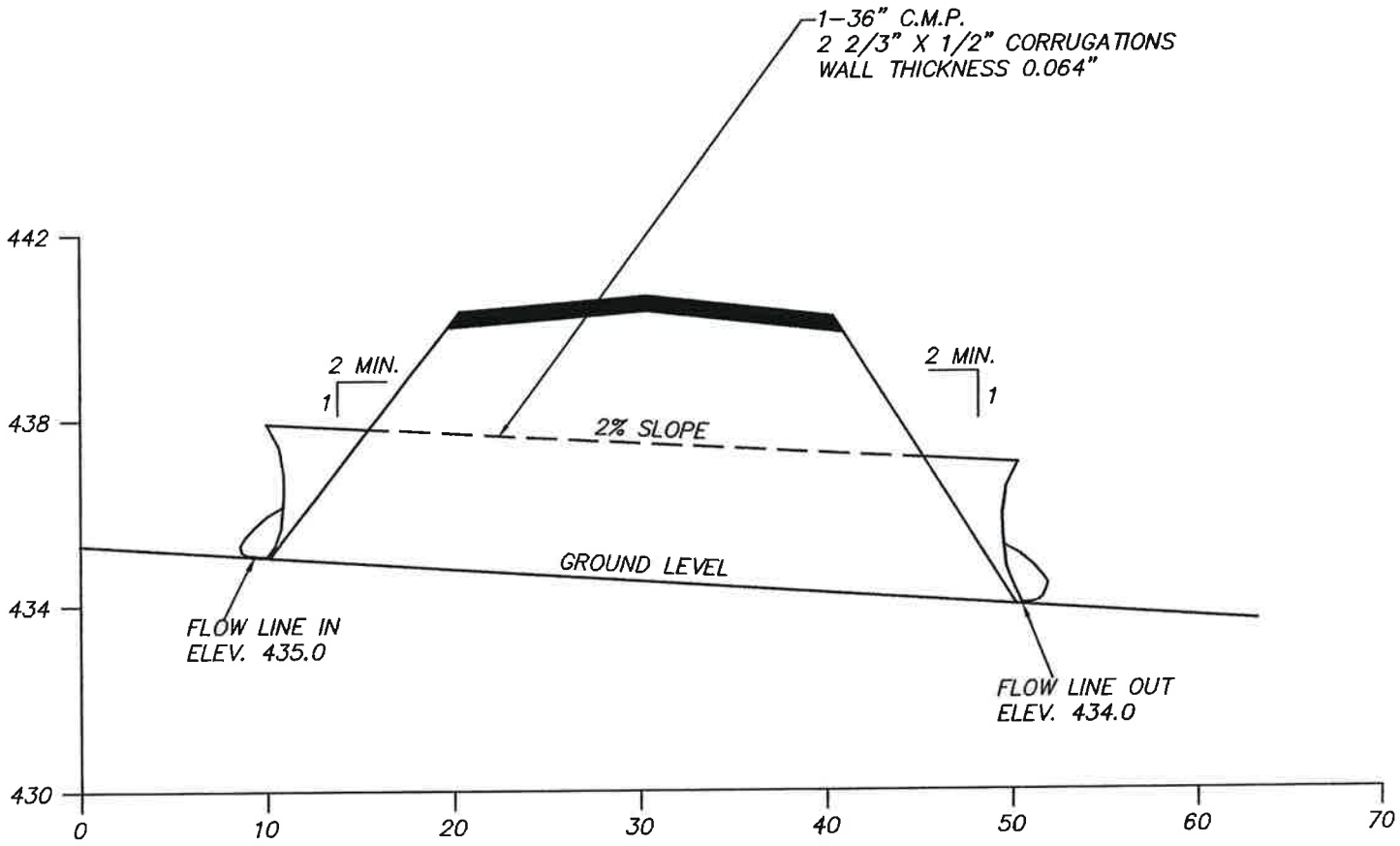
Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
412.00	0.000	0.000	0.000
412.01	0.000	0.000	0.000
412.50	(3)>2.156	(3)>2.156	4.313
413.00	(3)>6.194	(3)>6.194	12.388
413.50	(3)>11.427	(3)>11.427	22.853
414.00	(3)>17.643	(3)>17.643	35.286
414.50	(3)>24.682	(3)>24.682	49.363
415.00	(3)>32.477	(3)>32.477	64.955
415.50	(3)>40.856	(3)>40.856	81.712
416.00	(5)>47.566	(5)>47.566	95.132
416.50	(5)>53.675	(5)>53.675	107.349
417.00	(5)>59.157	(5)>59.157	118.315
417.50	(5)>64.173	(5)>64.173	128.346
418.00	(5)>68.825	(5)>68.825	137.650
418.50	(5)>73.177	(5)>73.177	146.355
419.00	(5)>77.253	(5)>77.253	154.505
419.50	(5)>81.162	(5)>81.162	162.324
420.00	(5)>84.910	(5)>84.910	169.819

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	97.000	0.125	0.000	0.000	81.000	F	192.01	18.504
	Σ	**97.000**						**192.01**	**18.504**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	4.29	120.00	2,800.00	6.210	0.125
#1	**1**	**Time of Concentration:**					**0.125**



HYDRAULICS INFORMATION

DRAINAGE AREA = 25.0 ACRES
10 YR.-6YR., Q = 49.0
MAXIMUM WATER ELEV. = 439.2
MINIMUM FILL ELEV. = 440.2
MAXIMUM ALLOWABLE COVER 36" C.M.P. = 83'
MINIMUM ALLOWABLE COVER 36" C.M.P. = 12"
MINIMUM FREEBOARD = 1'

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Cross-Section
DS14P 35+75

DRAWN BY: P.T.O. DWG. NAME: TPSM3DS14P	DATE: 2-7-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC

Shannon Mine No. 3

P-3948

Drainage Structure DS14P 35+75

4.3 Inches, 10 Year - 6 Hour

SCS 6 Hour

SEW

General Information

Storm Information:

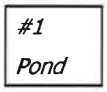
Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1510
1.00	0.3440
1.50	0.5810
2.00	0.9890
2.50	2.5800
3.00	3.0100
3.50	3.3540
4.00	3.5910
4.50	3.8060
5.00	3.9780
5.50	4.1500
6.00	4.3000

Peak 30-minute Intensity: 3.182 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Drainage Structure DS14P 35+75



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	25.000	25.000	49.49	4.77
	Out			49.35	4.77

Structure Detail:

Structure #1 (Pond)

Drainage Structure DS14P 35+75

Pond Inputs:

Initial Pool Elev:	435.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0150	435.01	0.90	0.00

Pond Results:

Peak Elevation:	439.15 ft
Dewater Time:	0.16 days

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)	
435.00	0.000	0.000	0.000		
435.01	0.000	0.000	0.000		Spillway #1
435.50	0.000	0.000	2.156	0.30	
436.00	0.000	0.000	6.194	0.15	
436.50	0.000	0.000	11.427	2.40	
437.00	0.000	0.000	17.643	0.75	
437.50	0.001	0.001	24.682	0.20	
438.00	0.001	0.001	32.477	0.05	
438.50	0.001	0.001	40.856		
439.00	0.002	0.002	47.566	0.05	
439.15	0.002	0.002	49.348	0.05	Peak Stage
439.50	0.002	0.003	53.675		
440.00	0.003	0.004	59.157		
440.50	0.003	0.006	64.173		
441.00	0.004	0.007	68.825		
441.50	0.004	0.009	73.177		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
442.00	0.005	0.012	77.253	
442.50	0.006	0.014	81.162	
443.00	0.006	0.017	84.910	
443.50	0.007	0.021	88.460	
444.00	0.008	0.025	91.879	
444.50	0.009	0.029	95.204	
445.00	0.010	0.034	98.389	

Detailed Discharge Table

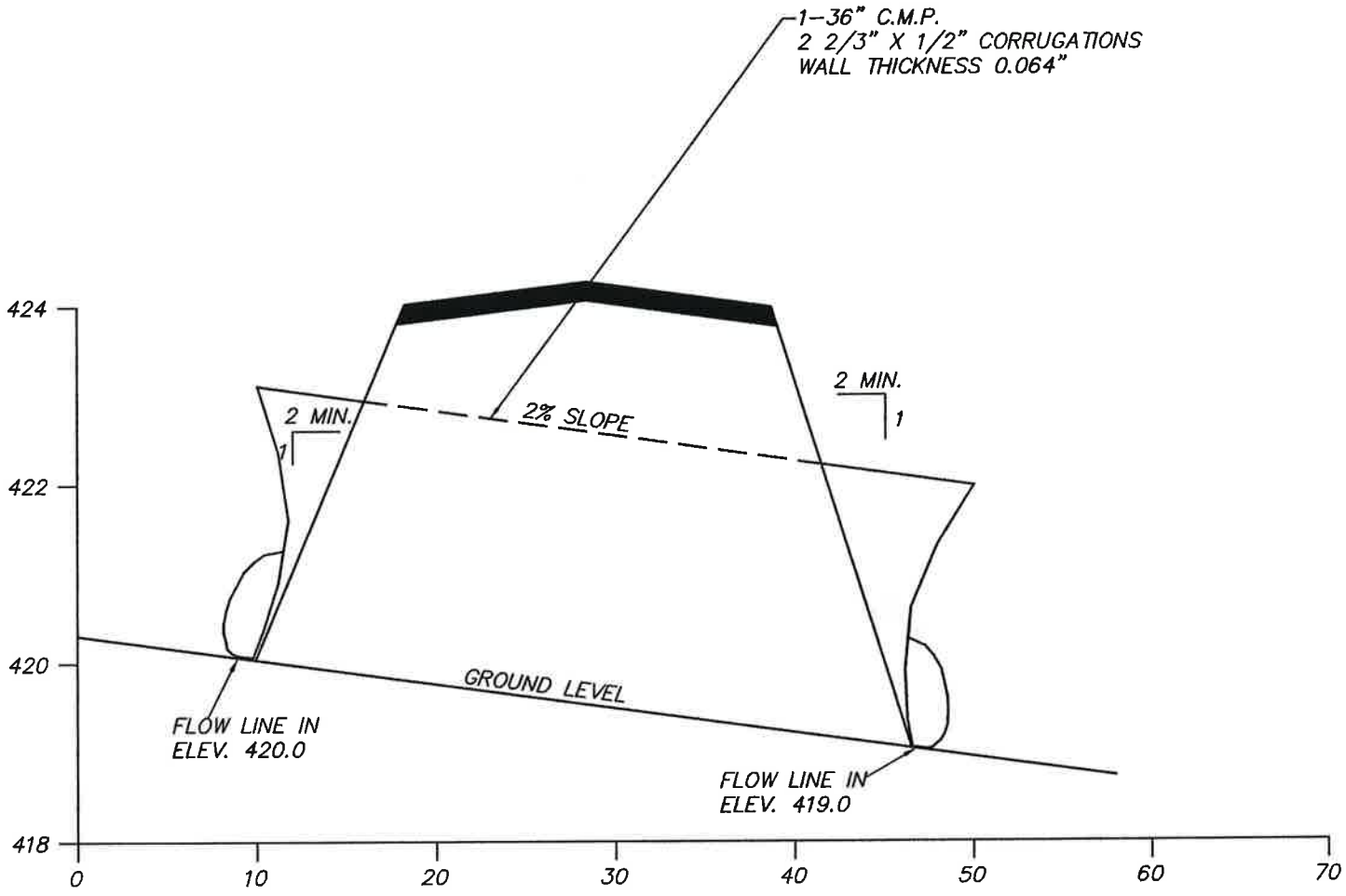
Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
435.00	0.000	0.000
435.01	0.000	0.000
435.50	(3)>2.156	2.156
436.00	(3)>6.194	6.194
436.50	(3)>11.427	11.427
437.00	(3)>17.643	17.643
437.50	(3)>24.682	24.682
438.00	(3)>32.477	32.477
438.50	(3)>40.856	40.856
439.00	(5)>47.566	47.566
439.50	(5)>53.675	53.675
440.00	(5)>59.157	59.157
440.50	(5)>64.173	64.173
441.00	(5)>68.825	68.825
441.50	(5)>73.177	73.177
442.00	(5)>77.253	77.253
442.50	(5)>81.162	81.162
443.00	(5)>84.910	84.910
443.50	(5)>88.460	88.460
444.00	(5)>91.879	91.879
444.50	(5)>95.204	95.204
445.00	(5)>98.389	98.389

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	25.000	0.125	0.000	0.000	81.000	F	49.49	4.769
	Σ	**25.000**						**49.49**	**4.769**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	4.29	120.00	2,800.00	6.210	0.125
#1	**1**	**Time of Concentration:**					**0.125**



HYDRAULICS INFORMATION

DRAINAGE AREA = 30.0 ACRES
10 YR.-6YR., Q = 20.2
MAXIMUM WATER ELEV. = 422.2
MINIMUM FILL ELEV. = 424.0
MAXIMUM ALLOWABLE COVER 36" C.M.P. = 83'
MINIMUM ALLOWABLE COVER 36" C.M.P. = 12"
MINIMUM FREEBOARD = 1'

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Cross-Section
DS14P 49+20

DRAWN BY: P.T.O. DWG. NAME: TPSM3DS14P	DATE: 2-7-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC
Shannon Mine No. 3
P-3948
Drainage Structure DS14P 49+20

4.3 Inches, 10 Year - 6 Hour

SCS 6 Hour

SEW

General Information

Storm Information:

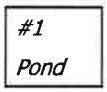
Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1510
1.00	0.3440
1.50	0.5810
2.00	0.9890
2.50	2.5800
3.00	3.0100
3.50	3.3540
4.00	3.5910
4.50	3.8060
5.00	3.9780
5.50	4.1500
6.00	4.3000

Peak 30-minute Intensity: 3.182 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Drainage Structure DS14P 49+20



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	30.000	30.000	20.21	2.59
	Out			20.16	2.59

Structure Detail:

Structure #1 (Pond)

Drainage Structure DS14P 49+20

Pond Inputs:

Initial Pool Elev:	420.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0150	420.01	0.90	0.00

Pond Results:

Peak Elevation:	422.18 ft
Dewater Time:	0.23 days

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)	
420.00	0.000	0.000	0.000		
420.01	0.000	0.000	0.000		Spillway #1
420.50	0.000	0.000	2.156	1.85	
421.00	0.001	0.000	6.194	1.95	
421.50	0.002	0.001	11.427	1.45	
422.00	0.003	0.002	17.643	0.15	
422.18	0.004	0.003	20.162	0.10	Peak Stage
422.50	0.005	0.004	24.682		
423.00	0.007	0.008	32.477		
423.50	0.010	0.012	40.856		
424.00	0.013	0.018	47.566		
424.50	0.016	0.025	53.675		
425.00	0.020	0.034	59.157		

Detailed Discharge Table

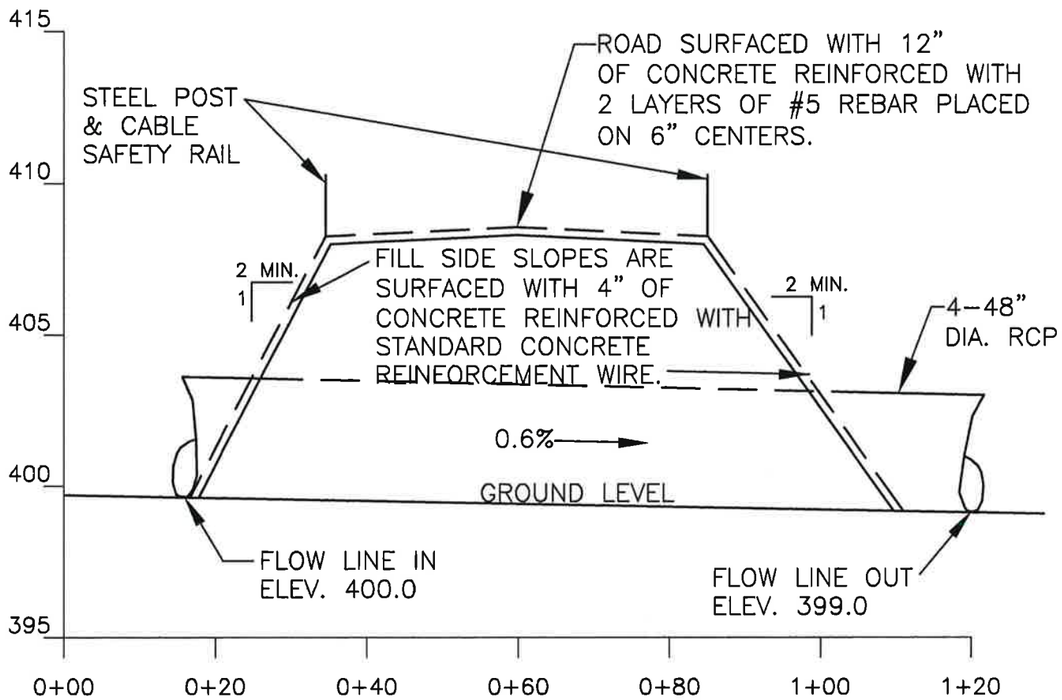
Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
420.00	0.000	0.000
420.01	0.000	0.000
420.50	(3)>2.156	2.156
421.00	(3)>6.194	6.194
421.50	(3)>11.427	11.427
422.00	(3)>17.643	17.643
422.50	(3)>24.682	24.682
423.00	(3)>32.477	32.477
423.50	(3)>40.856	40.856
424.00	(5)>47.566	47.566
424.50	(5)>53.675	53.675
425.00	(5)>59.157	59.157

Subwatershed Hydrology Detail:

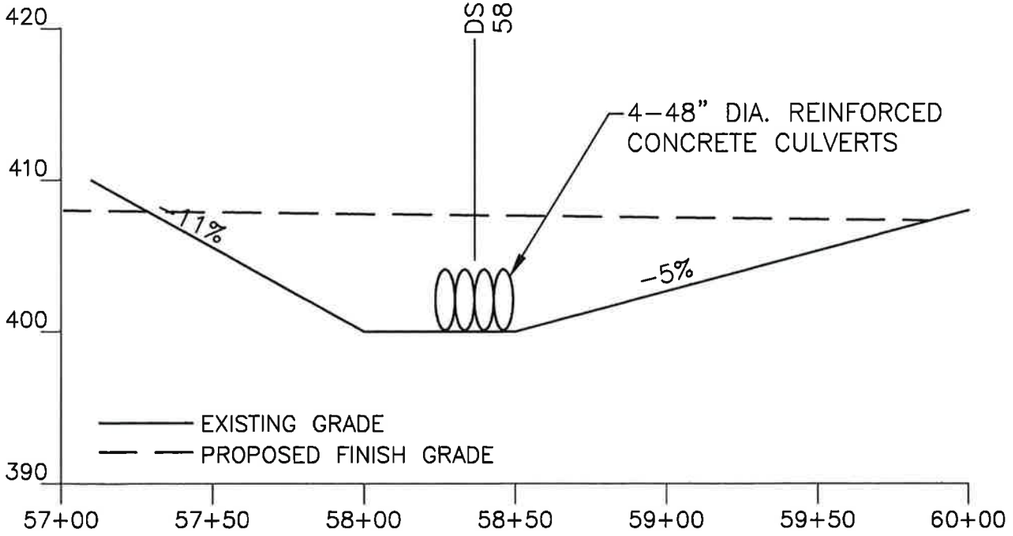
Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	30.000	0.125	0.000	0.000	70.000	S	20.21	2.586
	Σ	**30.000**						**20.21**	**2.586**

Subwatershed Time of Concentration Details:

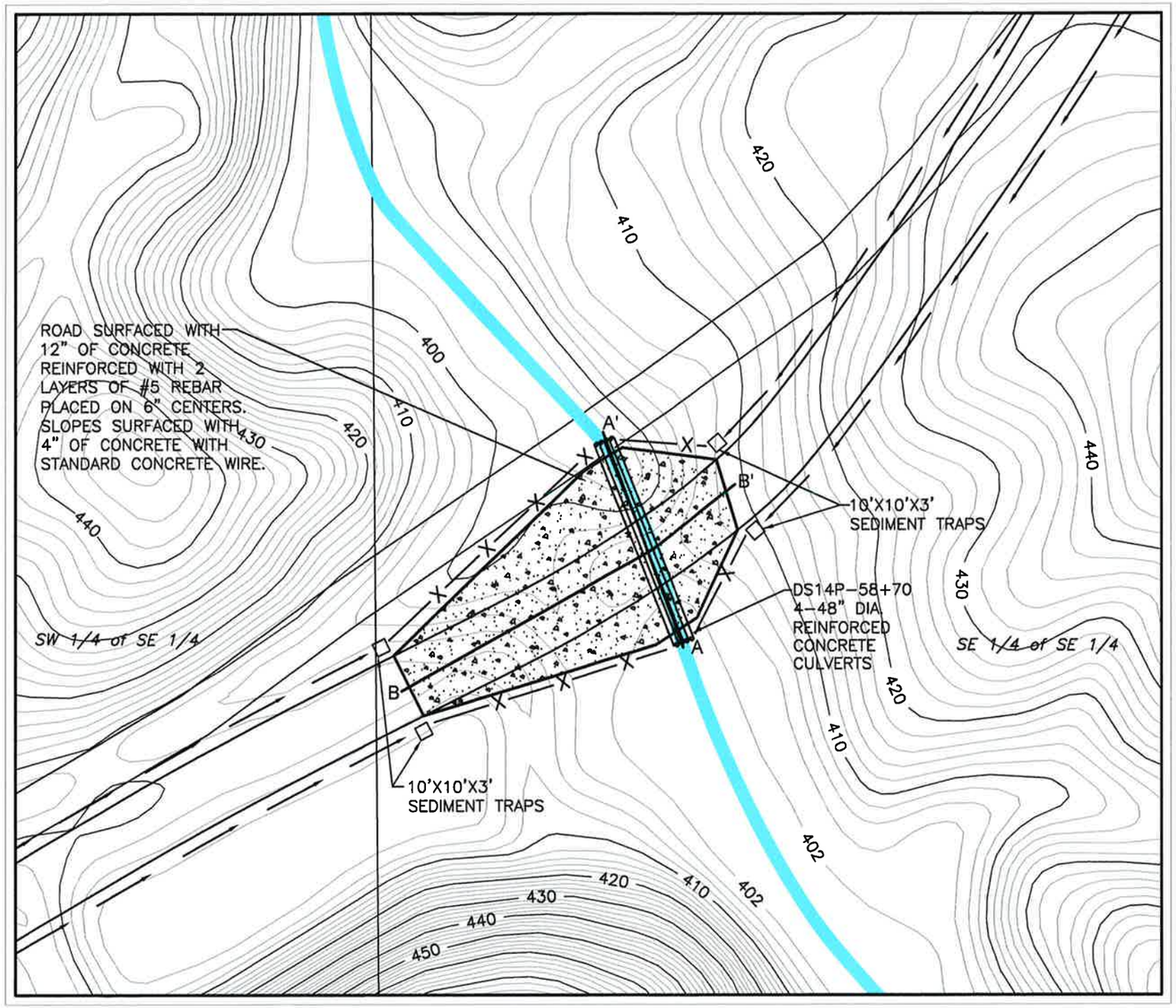
Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	4.29	120.00	2,800.00	6.210	0.125
#1	**1**	**Time of Concentration:**					**0.125**



CROSS SECTION A-A'



CROSS SECTION B-B'



MAP LEGEND

—X—X— SILT FENCE

——→ ROAD DITCH

PLAN VIEW
SCALE: 1"=100'

HYDRAULICS INFORMATION

DRAINAGE AREA = 8,891 ACRES
NORMAL FLOW = 196.7 CFS
NORMAL WATER ELEV. = 403.6
MAXIMUM FILL ELEV. = 408

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

SHANNON, LLC
SHANNON MINE NO. 3
P-3948
DRAINAGE STRUCTURE DS14P-58+70

DRAWN BY: HOCUTT DWG. NAME: DCSM3-DS14P	DATE: 4-10-12
APPROVED BY: S.R.I.	SCALE: AS NOTED

Shannom, LLC, Shannon Mine No. 3, P-3948, Drainage Structure DS14P 58+70

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Straight Pipe (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
400.00	0.000	0.000	0.000	0.000	0.000
400.01	0.000	0.000	0.000	0.000	0.000
400.50	(1)>2.814	(1)>2.814	(1)>2.814	(1)>2.814	11.258
401.00	(1)>9.501	(1)>9.501	(1)>9.501	(1)>9.501	38.002
401.50	(1)>16.730	(1)>16.730	(1)>16.730	(1)>16.730	66.921

Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Straight Pipe (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
402.00	(1)>23.323	(1)>23.323	(1)>23.323	(1)>23.323	93.292
402.50	(1)>29.229	(1)>29.229	(1)>29.229	(1)>29.229	116.916
403.00	(1)>36.407	(1)>36.407	(1)>36.407	(1)>36.407	145.628
403.50	(1)>46.446	(1)>46.446	(1)>46.446	(1)>46.446	185.783
404.00	(1)>57.806	(1)>57.806	(1)>57.806	(1)>57.806	231.223
404.50	(1)>69.235	(1)>69.235	(1)>69.235	(1)>69.235	276.938
405.00	(6)>78.120	(6)>78.120	(6)>78.120	(6)>78.120	312.479
405.50	(6)>89.596	(6)>89.596	(6)>89.596	(6)>89.596	358.384
406.00	(6)>99.731	(6)>99.731	(6)>99.731	(6)>99.731	398.926
406.50	(6)>108.920	(6)>108.920	(6)>108.920	(6)>108.920	435.680
407.00	(6)>117.388	(6)>117.388	(6)>117.388	(6)>117.388	469.551
407.50	(6)>125.310	(6)>125.310	(6)>125.310	(6)>125.310	501.239
408.00	(6)>132.738	(6)>132.738	(6)>132.738	(6)>132.738	530.951
408.50	(6)>139.799	(6)>139.799	(6)>139.799	(6)>139.799	559.195
409.00	(6)>146.487	(6)>146.487	(6)>146.487	(6)>146.487	585.947
409.50	(6)>152.899	(6)>152.899	(6)>152.899	(6)>152.899	611.596
410.00	(6)>159.063	(6)>159.063	(6)>159.063	(6)>159.063	636.250

Shannon, LLC
Shannon Mine No. 3
P-3948
Drainage Structure DS14P 58+70

4.8 Inches, 25 Year-6 Hour,

SCS 6 Hour

sri

General Information

Storm Information:

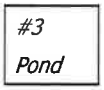
Storm Type:	Rainfall Event

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

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#3	==>	End	0.000	0.000	Drainage Structure DS14P 58+70



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#3	In	8,891.000	8,891.000	808.35	879.85
	Out			807.94	879.85

Structure Detail:

Structure #3 (Pond)

Drainage Structure DS14P 58+70

Pond Inputs:

Initial Pool Elev:	400.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
48.00	100.00	0.00	0.0160	400.01	0.90	0.00

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
408.00	50.00	2.00:1	2.00:1	50.00

Pond Results:

Peak Elevation:	409.45 ft
Dewater Time:	1.68 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

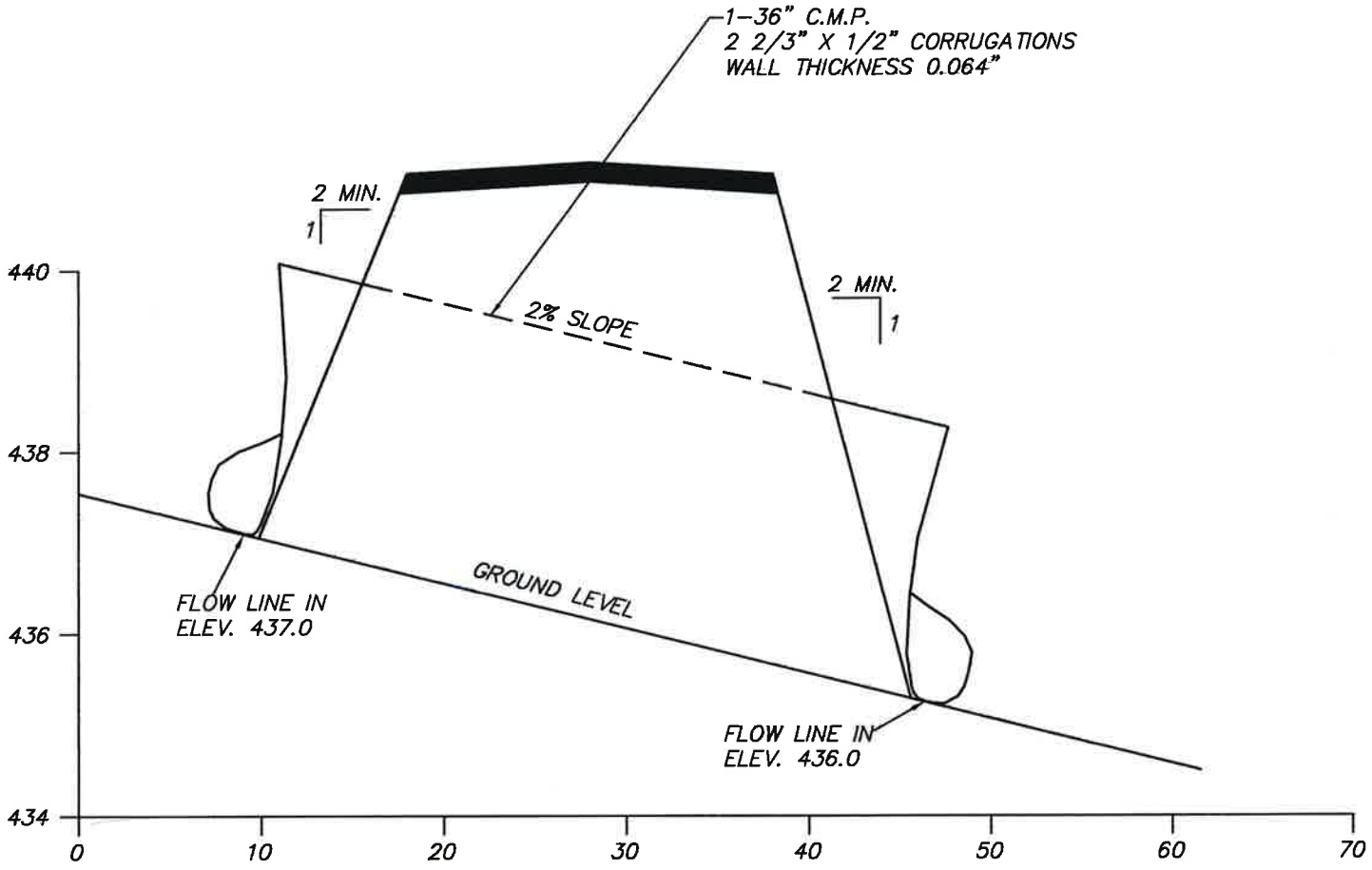
Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
400.00	0.000	0.000	0.000		
400.01	0.000	0.000	0.000		Spillway #1 Spillway #2 Spillway #3 Spillway #4
400.50	0.003	0.001	11.258	0.05	
401.00	0.011	0.004	38.002	10.40	
401.50	0.024	0.013	66.921	15.05	
402.00	0.042	0.029	93.292	1.05	
402.50	0.065	0.056	116.916	0.55	
403.00	0.093	0.095	145.628	0.55	
403.50	0.126	0.150	185.783	0.70	
404.00	0.163	0.222	231.223	0.85	
404.50	0.206	0.314	276.938	0.80	
405.00	0.253	0.428	312.479	0.65	
405.50	0.306	0.568	358.384	0.80	
406.00	0.363	0.735	398.926	0.70	
406.50	0.426	0.932	435.680	0.65	
407.00	0.493	1.161	469.551	0.60	
407.50	0.565	1.426	501.239	0.55	
408.00	0.642	1.727	530.951	0.60	Spillway #5
408.50	0.724	2.069	605.267	1.35	
409.00	0.811	2.452	678.090	1.35	
409.45	0.894	2.834	807.941	3.10	Peak Stage
409.50	0.903	2.881	823.823		
410.00	1.000	3.356	978.082		

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Straight Pipe (cfs)	Straight Pipe (cfs)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
400.00	0.000	0.000	0.000	0.000	0.000	0.000
400.01	0.000	0.000	0.000	0.000	0.000	0.000
400.50	(1)>2.814	(1)>2.814	(1)>2.814	(1)>2.814	0.000	11.258
401.00	(1)>9.501	(1)>9.501	(1)>9.501	(1)>9.501	0.000	38.002
401.50	(1)>16.730	(1)>16.730	(1)>16.730	(1)>16.730	0.000	66.921
402.00	(1)>23.323	(1)>23.323	(1)>23.323	(1)>23.323	0.000	93.292
402.50	(1)>29.229	(1)>29.229	(1)>29.229	(1)>29.229	0.000	116.916
403.00	(1)>36.407	(1)>36.407	(1)>36.407	(1)>36.407	0.000	145.628
403.50	(1)>46.446	(1)>46.446	(1)>46.446	(1)>46.446	0.000	185.783
404.00	(1)>57.806	(1)>57.806	(1)>57.806	(1)>57.806	0.000	231.223
404.50	(1)>69.235	(1)>69.235	(1)>69.235	(1)>69.235	0.000	276.938
405.00	(6)>78.120	(6)>78.120	(6)>78.120	(6)>78.120	0.000	312.479
405.50	(6)>89.596	(6)>89.596	(6)>89.596	(6)>89.596	0.000	358.384
406.00	(6)>99.731	(6)>99.731	(6)>99.731	(6)>99.731	0.000	398.926
406.50	(6)>108.920	(6)>108.920	(6)>108.920	(6)>108.920	0.000	435.680
407.00	(6)>117.388	(6)>117.388	(6)>117.388	(6)>117.388	0.000	469.551
407.50	(6)>125.310	(6)>125.310	(6)>125.310	(6)>125.310	0.000	501.239
408.00	(6)>132.738	(6)>132.738	(6)>132.738	(6)>132.738	0.000	530.951
408.50	(6)>139.799	(6)>139.799	(6)>139.799	(6)>139.799	46.072	605.267
409.00	(6)>146.487	(6)>146.487	(6)>146.487	(6)>146.487	92.143	678.090
409.50	(6)>152.899	(6)>152.899	(6)>152.899	(6)>152.899	212.226	823.823
410.00	(6)>159.063	(6)>159.063	(6)>159.063	(6)>159.063	341.832	978.082

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)
#3	1	8,891.000	8.244	0.000	0.000	70.000	S	808.35	879.851
	Σ	**8,891.000**						**808.35**	**879.851**



HYDRAULICS INFORMATION

DRAINAGE AREA = 46.0 ACRES
10 YR.-6YR., Q = 31.0
MAXIMUM WATER ELEV. = 439.9
MINIMUM FILL ELEV. = 441.0
MAXIMUM ALLOWABLE COVER 36" C.M.P. = 83'
MINIMUM ALLOWABLE COVER 36" C.M.P. = 12"
MINIMUM FREEBOARD = 1'

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Cross-Section
DS14P 83+50

DRAWN BY: HOCUTT DWG. NAME: DCSM3DS14P	DATE: 4-19-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC
Shannon Mine No. 3
P-3948
Drainage Structure DS14P 83+50

4.3 Inches, 10 Year - 6 Hour

SCS 6 Hour

SEW

General Information

Storm Information:

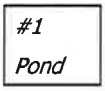
Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1510
1.00	0.3440
1.50	0.5810
2.00	0.9890
2.50	2.5800
3.00	3.0100
3.50	3.3540
4.00	3.5910
4.50	3.8060
5.00	3.9780
5.50	4.1500
6.00	4.3000

Peak 30-minute Intensity: 3.182 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Drainage Structure DS14P 83+50



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	46.000	46.000	30.98	3.97
	Out			30.89	3.97

Structure Detail:

Structure #1 (Pond)

Drainage Structure DS14P 83+50

Pond Inputs:

Initial Pool Elev:	437.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0150	437.01	0.90	0.00

Pond Results:

Peak Elevation:	439.90 ft
Dewater Time:	0.23 days

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)	
437.00	0.000	0.000	0.000		
437.01	0.000	0.000	0.000		Spillway #1
437.50	0.000	0.000	2.156	1.80	
438.00	0.001	0.000	6.194	0.25	
438.50	0.002	0.001	11.427	2.35	
439.00	0.003	0.002	17.643	0.90	
439.50	0.005	0.004	24.682	0.15	
439.90	0.007	0.007	30.893	0.10	Peak Stage
440.00	0.007	0.008	32.477		
440.50	0.010	0.012	40.856		
441.00	0.013	0.018	47.566		
441.50	0.016	0.025	53.675		
442.00	0.020	0.034	59.157		

Detailed Discharge Table

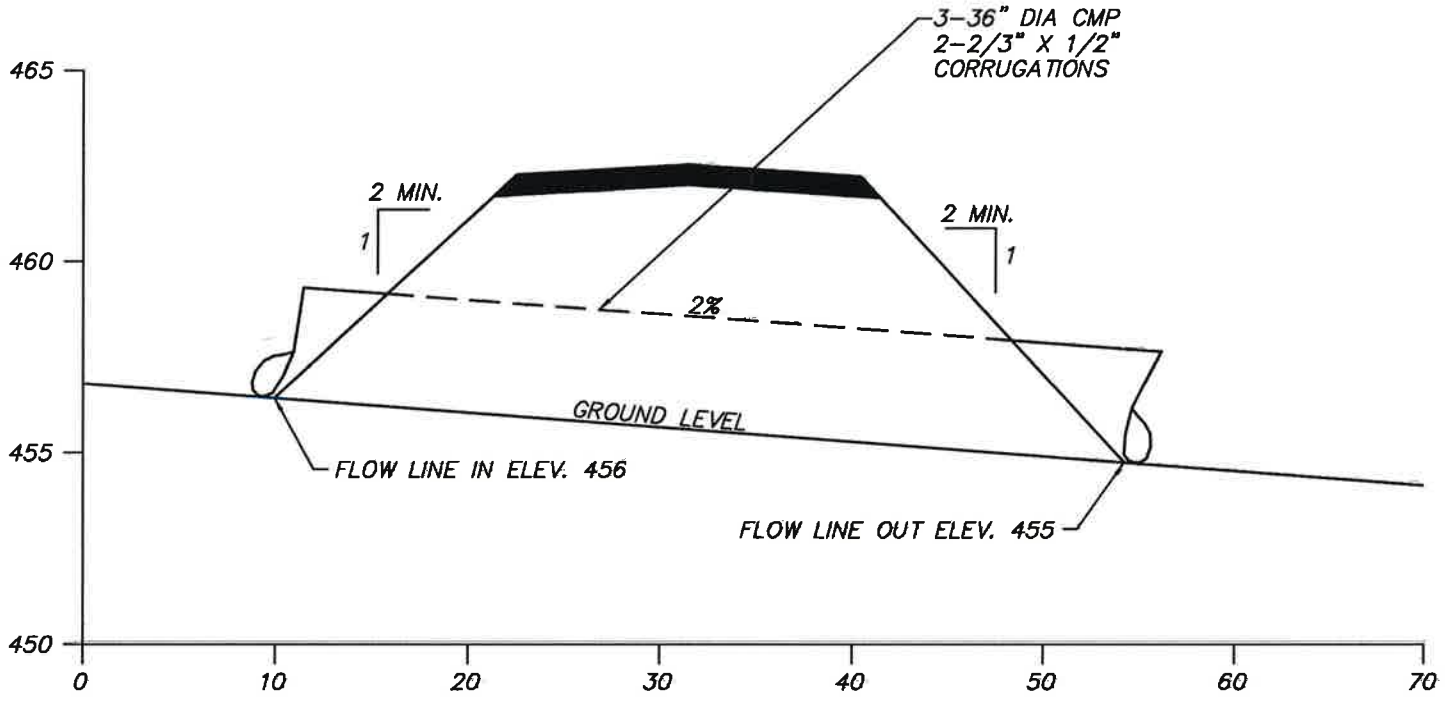
Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
437.00	0.000	0.000
437.01	0.000	0.000
437.50	(3)>2.156	2.156
438.00	(3)>6.194	6.194
438.50	(3)>11.427	11.427
439.00	(3)>17.643	17.643
439.50	(3)>24.682	24.682
440.00	(3)>32.477	32.477
440.50	(3)>40.856	40.856
441.00	(5)>47.566	47.566
441.50	(5)>53.675	53.675
442.00	(5)>59.157	59.157

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	46.000	0.125	0.000	0.000	70.000	S	30.98	3.965
	Σ	**46.000**						**30.98**	**3.965**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	4.29	120.00	2,800.00	6.210	0.125
#1	**1**	**Time of Concentration:**					**0.125**



HYDRAULICS INFORMATION

DRAINAGE AREA = 452.0 ACRES
10 YR.-6YR., Q = 182.0 C,F,S.
MAXIMUM WATER ELEV. = 461.5
MINIMUM FILL ELEV. = 462.5
MAXIMUM ALLOWABLE COVER 36" C.M.P. = 83'
MINIMUM ALLOWABLE COVER 36" C.M.P. = 1"
WALL THICKNESS = .064
MINIMUM FREEBOARD = 1'

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Cross-Section
DS14P 106+05

DRAWN BY: HOCUTT DWG. NAME: DCSM3DS14PHRC	DATE: 4-19-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC

Shannon Mine No. 3

P-3948

Drainage Structure DS14P 106+05

4.3 Inches, 10 Year - 6 Hour

SCS 6 Hour

SEW

General Information

Storm Information:

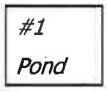
Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1510
1.00	0.3440
1.50	0.5810
2.00	0.9890
2.50	2.5800
3.00	3.0100
3.50	3.3540
4.00	3.5910
4.50	3.8060
5.00	3.9780
5.50	4.1500
6.00	4.3000

Peak 30-minute Intensity: 3.182 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Drainage Structure DS14P 106+05



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	452.000	452.000	182.04	38.64
	Out			181.70	38.64

Structure Detail:

Structure #1 (Pond)

Drainage Structure DS14P 106+05

Pond Inputs:

Initial Pool Elev:	456.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0240	456.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0240	456.01	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
36.00	100.00	2.00	0.0240	456.01	0.90	0.00

Pond Results:

Peak Elevation:	461.54 ft
Dewater Time:	0.36 days

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)	
456.00	0.000	0.000	0.000		
456.01	0.000	0.000	0.000		Spillway #1 Spillway #2 Spillway #3
456.50	0.000	0.000	6.469	3.25	
457.00	0.000	0.000	18.582	1.30	
457.50	0.001	0.000	34.280	0.40	
458.00	0.001	0.001	52.929	0.25	
458.50	0.002	0.002	74.045	0.50	
459.00	0.003	0.003	97.432	1.70	
459.50	0.003	0.004	122.568	0.55	
460.00	0.005	0.006	142.698	0.20	
460.50	0.006	0.009	160.598	0.20	
461.00	0.007	0.012	171.556	0.10	
461.50	0.008	0.016	180.969	0.25	
461.54	0.009	0.016	181.700	0.05	Peak Stage
462.00	0.010	0.020	189.898		

Detailed Discharge Table

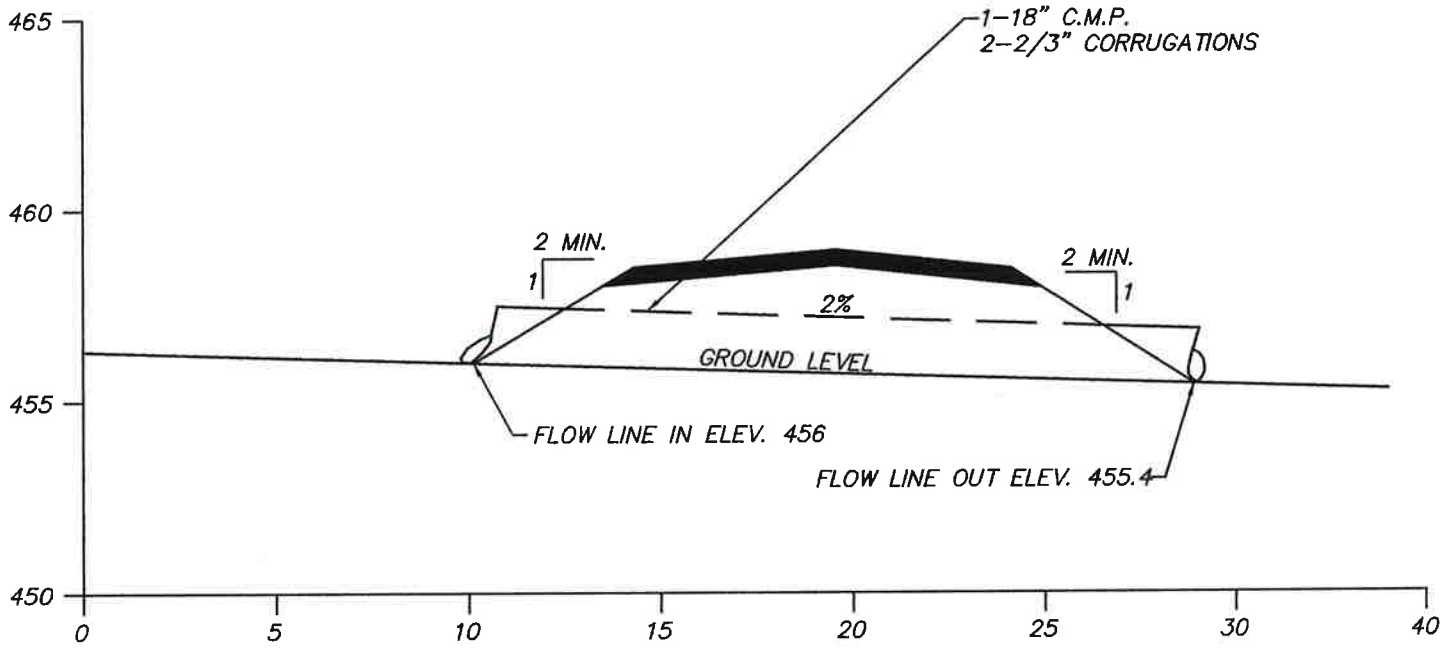
Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
456.00	0.000	0.000	0.000	0.000
456.01	0.000	0.000	0.000	0.000
456.50	(3)>2.156	(3)>2.156	(3)>2.156	6.469
457.00	(3)>6.194	(3)>6.194	(3)>6.194	18.582
457.50	(3)>11.427	(3)>11.427	(3)>11.427	34.280
458.00	(3)>17.643	(3)>17.643	(3)>17.643	52.929
458.50	(3)>24.682	(3)>24.682	(3)>24.682	74.045
459.00	(3)>32.477	(3)>32.477	(3)>32.477	97.432
459.50	(3)>40.856	(3)>40.856	(3)>40.856	122.568
460.00	(5)>47.566	(5)>47.566	(5)>47.566	142.698
460.50	(5)>53.533	(5)>53.533	(5)>53.533	160.598
461.00	(6)>57.185	(6)>57.185	(6)>57.185	171.556
461.50	(6)>60.323	(6)>60.323	(6)>60.323	180.969
462.00	(6)>63.299	(6)>63.299	(6)>63.299	189.898

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	452.000	0.478	0.000	0.000	70.000	S	182.04	38.639
	Σ	**452.000**						**182.04**	**38.639**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	1.94	140.00	7,200.00	4.180	0.478
#1	**1**	**Time of Concentration:**					**0.478**



HYDRAULICS INFORMATION

DRAINAGE AREA = 4.0 ACRES
10 YR.-6YR., Q = 6.0 C,F,S.
MAXIMUM WATER ELEV. = 457.7
MINIMUM FILL ELEV. = 458.5
MAXIMUM ALLOWABLE COVER 18" C.M.P. = 166'
MINIMUM ALLOWABLE COVER 18" C.M.P. = 1"
WALL THICKNESS = .064
MINIMUM FREEBOARD = 1'

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502

Shannon, LLC
Shannon Mine No. 3
P-3948
Haulroad Cross-Section
DS14P 106+55

DRAWN BY: P.T.O. DWG. NAME: DCSM3DS14PHRC	DATE: 3-1-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC
Shannon Mine No. 3
P-3948
Drainage Structure DS14P 106+55

4.3 Inches, 10 Year - 6 Hour

SCS 6 Hour

SEW

General Information

Storm Information:

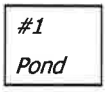
Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1510
1.00	0.3440
1.50	0.5810
2.00	0.9890
2.50	2.5800
3.00	3.0100
3.50	3.3540
4.00	3.5910
4.50	3.8060
5.00	3.9780
5.50	4.1500
6.00	4.3000

Peak 30-minute Intensity: 3.182 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Drainage Structure DS14P 106+55



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	4.000	4.000	6.13	0.51
	Out			6.11	0.51

Structure Detail:

Structure #1 (Pond)

Drainage Structure DS14P 106+55

Pond Inputs:

Initial Pool Elev:	456.01 ft
Initial Pool:	0.00 ac-ft

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
18.00	100.00	2.00	0.0240	456.01	0.90	0.00

Pond Results:

Peak Elevation:	457.67 ft
Dewater Time:	0.14 days

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)	
456.00	0.000	0.000	0.000		
456.01	0.000	0.000	0.000		Spillway #1
456.50	0.000	0.000	1.079	1.50	
457.00	0.000	0.000	3.094		
457.50	0.001	0.000	5.177		
457.67	0.001	0.001	6.112	1.95	Peak Stage
458.00	0.001	0.001	7.977		
458.50	0.002	0.002	8.914		
459.00	0.003	0.003	9.595		
459.50	0.003	0.004	10.209		
460.00	0.005	0.006	10.802		
460.50	0.006	0.009	11.361		
461.00	0.007	0.012	11.892		
461.50	0.008	0.016	12.404		
462.00	0.010	0.020	12.892		

Detailed Discharge Table

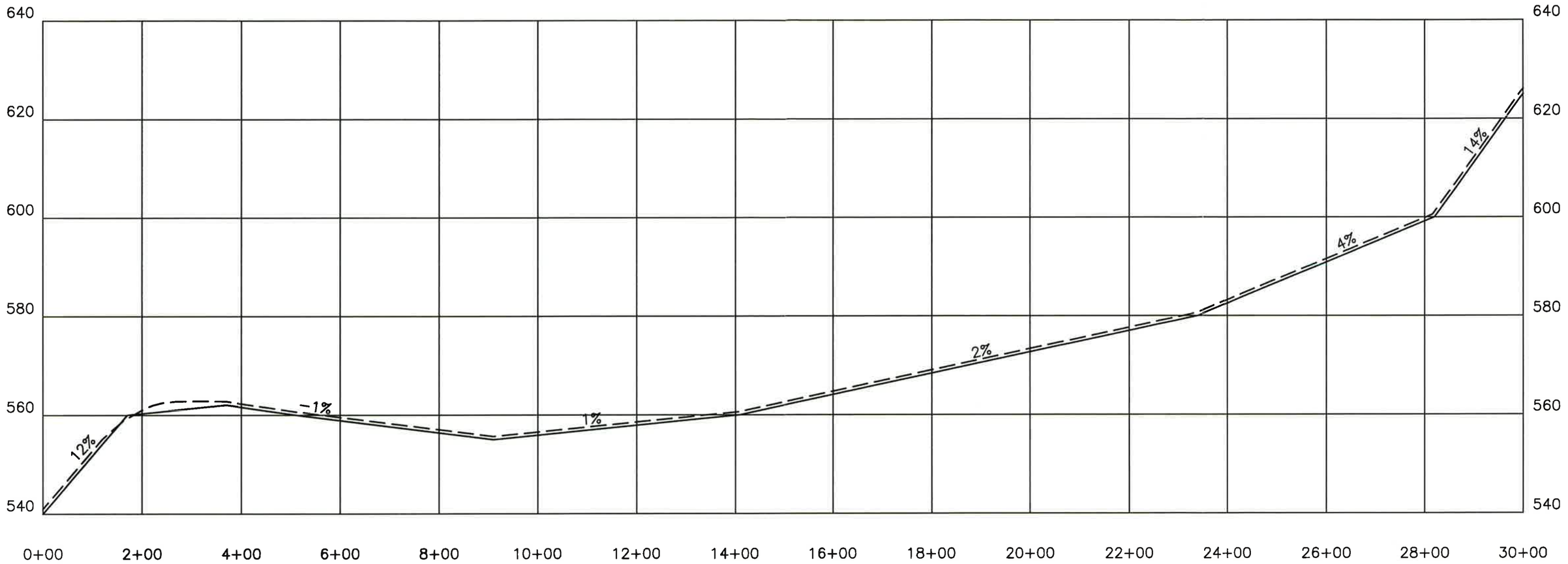
Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
456.00	0.000	0.000
456.01	0.000	0.000
456.50	(3)>1.079	1.079
457.00	(3)>3.094	3.094
457.50	(2)>5.177	5.177
458.00	(5)>7.977	7.977
458.50	(6)>8.914	8.914
459.00	(6)>9.595	9.595
459.50	(6)>10.209	10.209
460.00	(6)>10.802	10.802
460.50	(6)>11.361	11.361
461.00	(6)>11.892	11.892
461.50	(6)>12.404	12.404
462.00	(6)>12.892	12.892

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	4.000	0.075	0.000	0.000	70.000	S	6.13	0.508
	Σ	**4.000**						**6.13**	**0.508**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	1.36	60.00	4,400.00	3.500	0.349
#1	**1**	**Time of Concentration:**					**0.075**



Road No. 15P

1"=200' HORZ.
1"=20' VERT.

——— EXISTING GRADE
— — — PROPOSED FINISHED GRADE

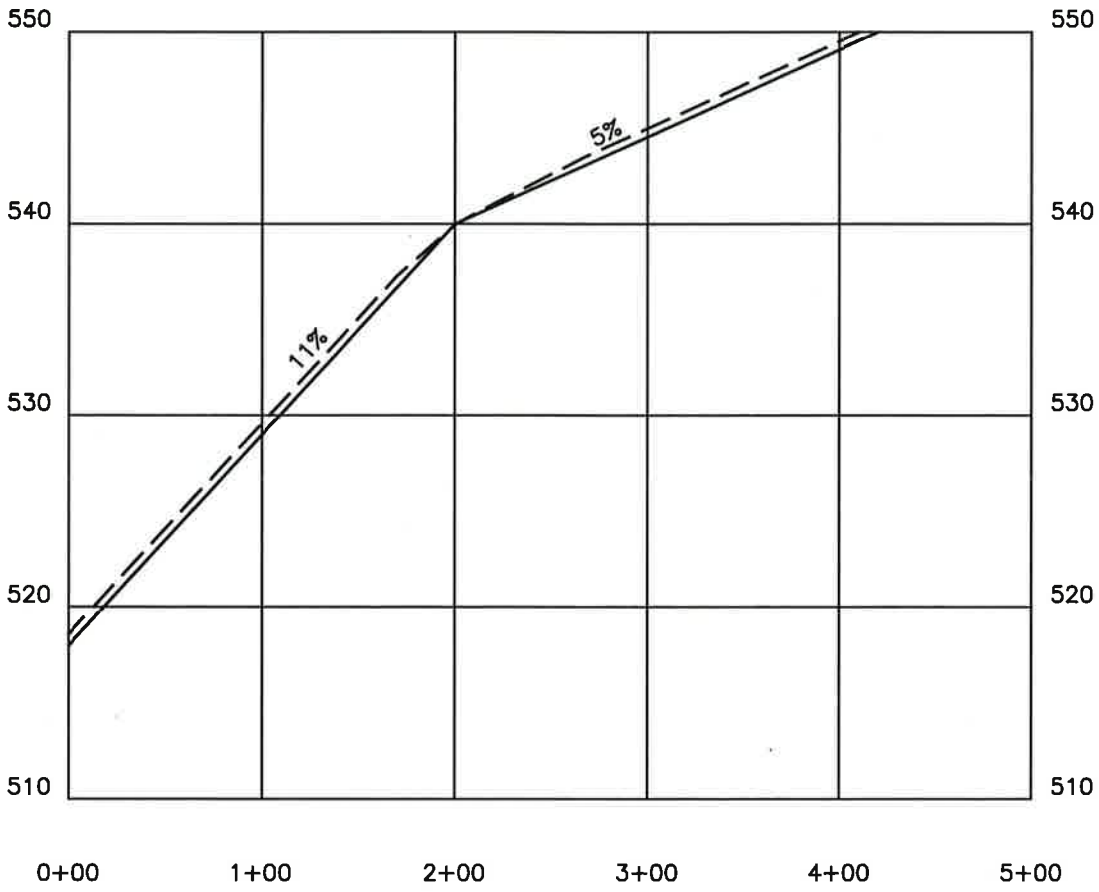
NOTE:
1: FINISHED GRADES SHOWN HEREON MAY MAY VARY FROM BETWEEN 0% AND 17%.
2: SEE INDIVIDUAL CROSS SECTIONS SHEETS FOR SPECIFIC DRAINAGE STRUCTURE INFORMATION.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Road 15P Profile

DRAWN BY: P.T.O. DWG. NAME: DCSM315PPR	DATE: 1-13-12
APPROVED BY: S.W.	SCALE: AS NOTED

G:\Todd Odom\PTO\SW\DCSM315PPR.dwg 01/13/12 10:09



Road No. 16P

1"=100' HORZ.
1"=10' VERT.

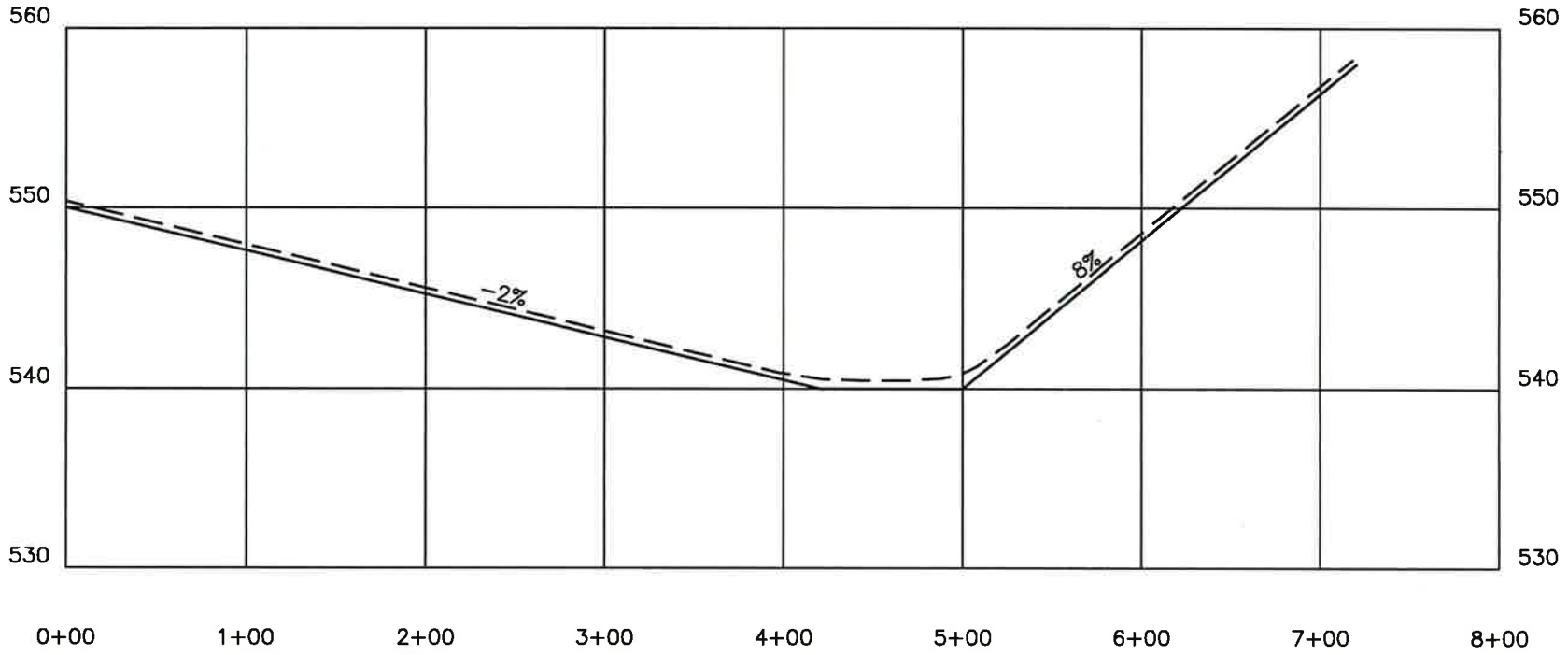
EXISTING GRADE
PROPOSED FINISHED GRADE

NOTE:
1: FINISHED GRADES SHOWN HEREON MAY MAY VARY FROM BETWEEN 0% AND 17%.
2: SEE INDIVIDUAL CROSS SECTIONS SHEETS FOR SPECIFIC DRAINAGE STRUCTURE INFORMATION.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Road 16P Profile

DRAWN BY: P.T.O. DWG. NAME: DCSM316PPR	DATE: 1-13-12
APPROVED BY: S.W.	SCALE: AS NOTED



Road No. 17P

1"=100' HORZ.
1"=10' VERT.

——— *EXISTING GRADE*
— — — *PROPOSED FINISHED GRADE*

NOTE:
1: FINISHED GRADES SHOWN HEREON MAY MAY VARY FROM BETWEEN 0% AND 17%.
2: SEE INDIVIDUAL CROSS SECTIONS SHEETS FOR SPECIFIC DRAINAGE STRUCTURE INFORMATION.

DRUMMOND COMPANY, INC.
P.O. BOX 1549 JASPER, AL 35502
205-387-0501 OFFICE

Shannon, LLC
Shannon Mine No. 3
P-3948
Road 17P Profile

DRAWN BY: P.T.O. DWG. NAME: DCSM317PPR	DATE: 1-13-12
APPROVED BY: S.W.	SCALE: AS NOTED

Shannon, LLC
Shannon Mine No. 3
P-3948
Soil Classification

Shannon, LLC
Shannon Mine No. 3
P-3948

STABILITY ANALYSIS DATA

METHODOLOGY

Due to the fill at Drainage Structure DS14P 58+70 being the most adverse fill sections of the haulroads at the Shannon Mine No. 3, a stability analysis was performed to prove their safety. The static loading stability analysis was 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 types used in the construction of the fill section of Drainage Structure DS14P 58+70 (ML) and the soil types (soil classification) of the material between the proposed fill and stiff base of Drainage Structure DS14P 58+70 (Bed Rock) were taken from the design plans of Basin 025A of P-3948. Basin 025A is adjacent to the proposed Drainage Structure DS14P 58+70 therefore the fill material will be similar. The material was sampled and analyzed by PERC Engineering Co., Inc. The soil properties used in the stability analysis (ML) type soils, were 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. FRICTION	DESIGN DENSITY (PCF)
Drainage Structure DS14P 58+70 Fill Material	ML	100.8	29.7	129.5
Drainage Structure DS14P 58+70 Foundation Material	Bedrock	10,000.0	45.0	170.0

*United States Department of Interior Bureau of Reclamation Design of Small Dams page 137.

STABILITY ANALYSIS DATA

(Continued)

DESIGN DATA

1) Safety factors for embankments with 2 H:1V slopes.
2) DMIN = 0.00
3) Pore pressure ration = .1.

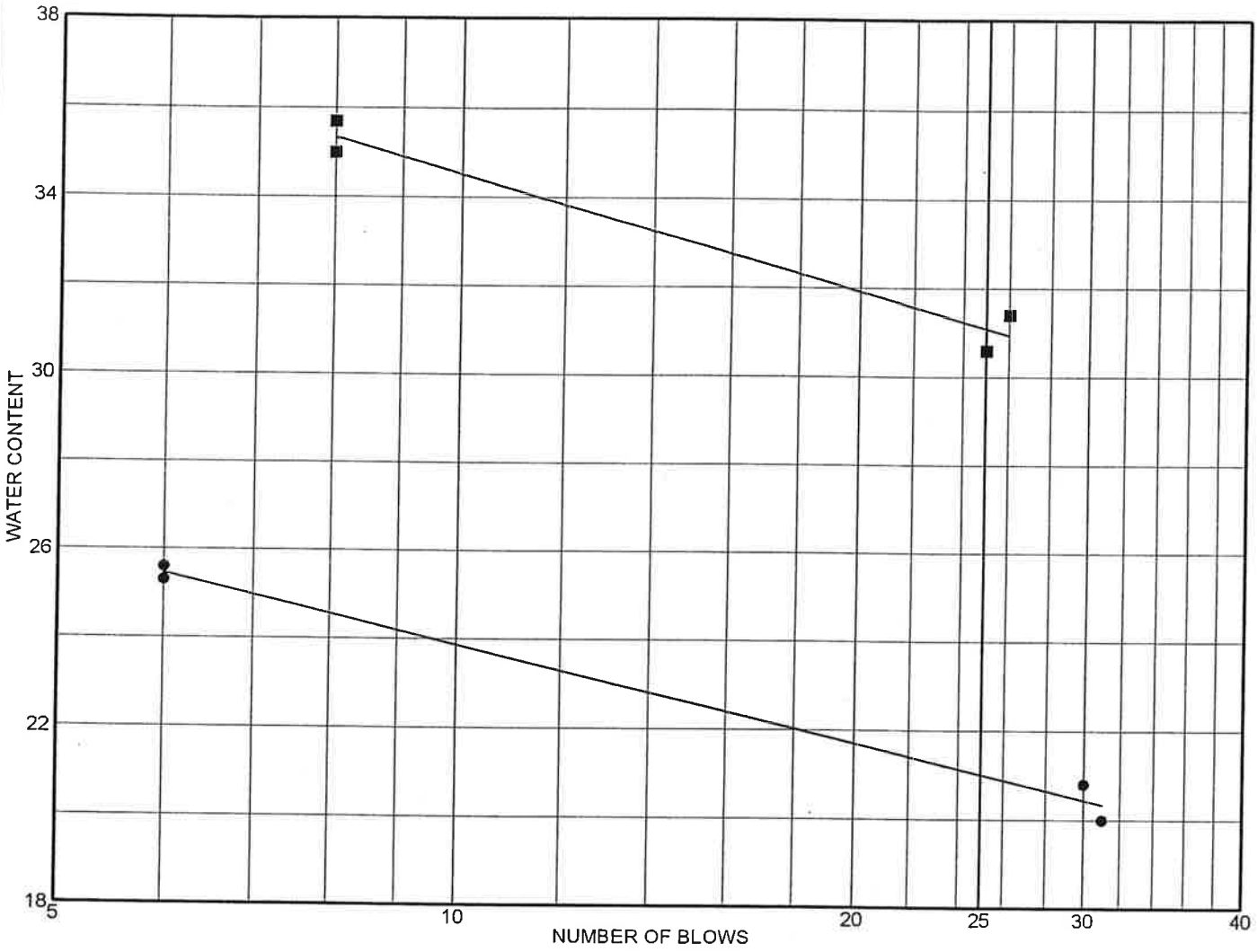
SAFETY FACTORS

DRAINAGE STRUCTURE NUMBER	STATIC SAFETY FACTOR
Drainage Structure DS14P 58+70	2.150

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
●	Sandy silt	21	18	3	96.60	65.5	ML
■	Silty sand	31	28	3	70.88	49.8	SM

Project No. **Client:** Twin Pines Coal

Project: Basin 025A

Basin 025A

● **Location:** Shannon Mine No.3

■ **Location:** Shannon Mine No.3

Remarks:

● Dam Material

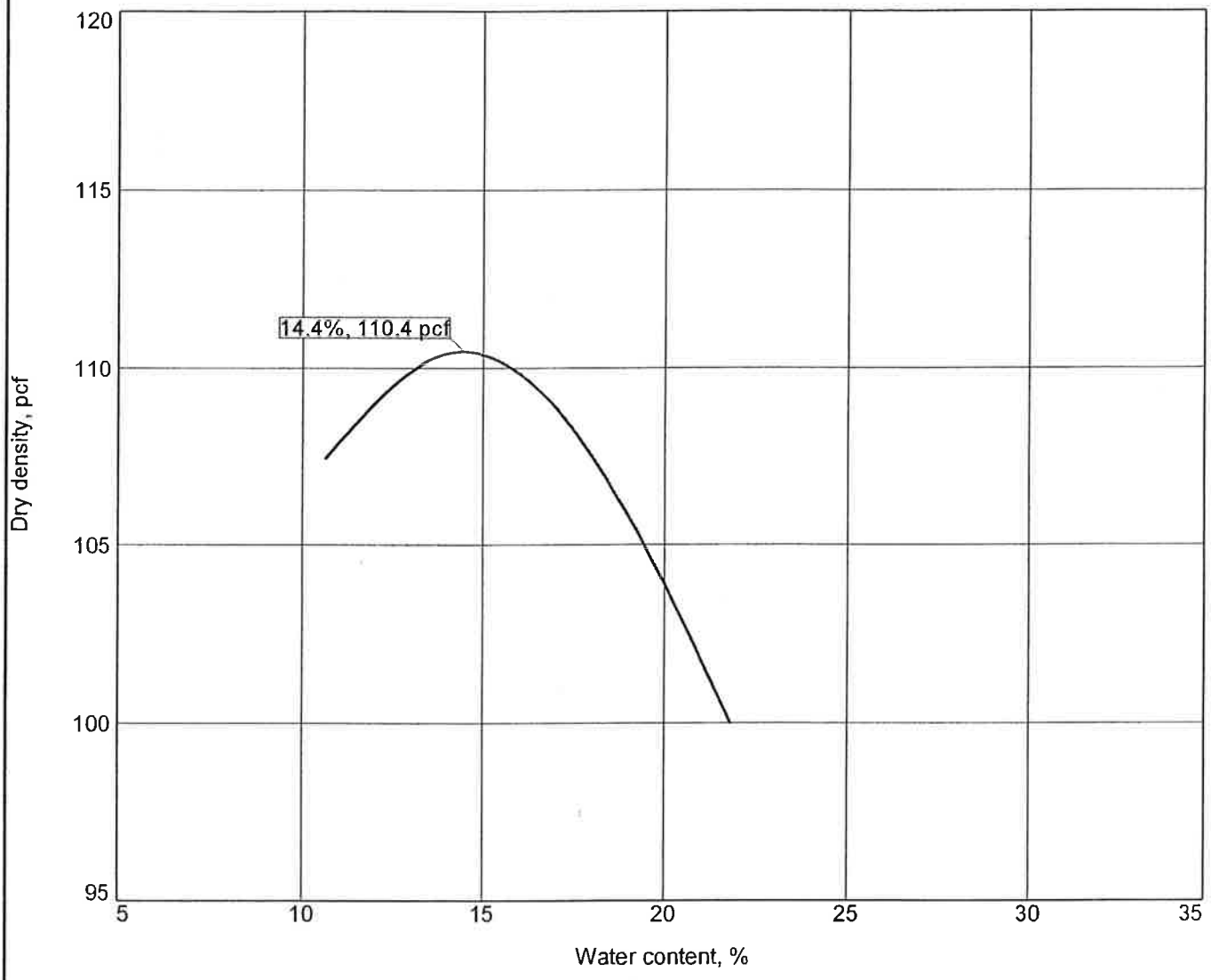
■ Foundation Material

PERC ENGINEERING CO., INC.

Jasper, Alabama

Date 11-4-10

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						
	ML				21	3		65.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 110.4 pcf Optimum moisture = 14.4 %	Sandy silt

Project No. **Client:** Twin Pines Coal

Project: Basin 025A

Date:

○ **Location:** Shannon Mine No.3

PERC ENGINEERING CO., INC.

Jasper, Alabama

Remarks:
Dam Material

Date 11-9-10

Tested By: JC **Checked By:** LS

Shannon, LLC
Shannon Mine No. 3
P-3948
Drainage Structure DS14P 58+70
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

Shannon, LLC Shannon Mine No. 3 P-3948 Drainage Structure DS14P 58+70 Static

Number of cases to be analyzed 1

Case Number 1

Number of boundary lines= 3
Number of points on boundary lines are: 2 4 6

On boundary line no. 1 Point no. and coordinates are:
1 100.000 414.500 2 400.000 413.300

On boundary line no. 2 Point no. and coordinates are:
1 100.000 414.900 2 200.000 414.500 3 282.661 414.169 4 400.000 413.700

On boundary line no. 3 Point no. and coordinates are:
1 100.000 414.900 2 200.000 414.500 3 216.000 422.500 4 266.000 422.500 5 282.661 414.169
6 400.000 413.700

Line no. and slope of each segment are:
1 -.004
2 -.004 -.004 -.004
3 -.004 .500 .000 -.500 -.004

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	10000.000	45.000	170.000
2	100.800	29.700	129.500

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

Pore pressure ratio= .100

point1=(280.000, 425.000) point2=(300.000, 425.000) point3=(300.000, 450.000) NJ= 4 NI= 5
Automatic search will follow after grid with XINC= 10.000 and YINC= 12.000

****WARNING AT NEXT CENTER**** When radius is 10.857
center of circle lies below ground line or circle does not intercept ground line properly, or the circle cuts the slope
very slightly, so a large factor of safety is assigned.

At point (280.000, 425.000) under seepage 1,the radius and the corresponding factor of safety are:

11.220	46.561	10.675	2.631	10.131	2.982	9.586	3.729
9.042	6.064						
11.038	38.212	10.857**********		10.494	2.725	10.312	2.839

Lowest factor of safety= 2.631 and occurs at radius = 10.675

At point (285.000, 425.000) under seepage 1,the radius and the corresponding factor of safety are:
11.240 476.991
Lowest factor of safety= 476.991 and occurs at radius = 11.240

At point (290.000, 425.000) under seepage 1,the radius and the corresponding factor of safety are:
11.260 56819.000
Lowest factor of safety= 56819.000 and occurs at radius = 11.260

At point (295.000, 425.000) under seepage 1,the radius and the corresponding factor of safety are:
11.280 56817.240
Lowest factor of safety= 56817.240 and occurs at radius = 11.280

At point (300.000, 425.000) under seepage 1,the radius and the corresponding factor of safety are:
11.300 56780.030
Lowest factor of safety= 56780.030 and occurs at radius = 11.300

At point (280.000, 430.000) under seepage 1,the radius and the corresponding factor of safety are:
16.220 35.141 15.570 2.323 14.920 2.616 14.270 3.241
13.619 5.198
16.003 26.374 15.786 2.259 15.353 2.401 15.136 2.496

Lowest factor of safety= 2.259 and occurs at radius = 15.786

At point (285.000, 430.000) under seepage 1,the radius and the corresponding factor of safety are:
16.240 166.869
Lowest factor of safety= 166.869 and occurs at radius = 16.240

At point (290.000, 430.000) under seepage 1,the radius and the corresponding factor of safety are:
16.260 56298.650
Lowest factor of safety= 56298.650 and occurs at radius = 16.260

At point (295.000, 430.000) under seepage 1,the radius and the corresponding factor of safety are:
16.280 56286.840
Lowest factor of safety= 56286.840 and occurs at radius = 16.280

At point (300.000, 430.000) under seepage 1,the radius and the corresponding factor of safety are:
16.300 56369.500
Lowest factor of safety= 56369.500 and occurs at radius = 16.300

At point (280.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:

21.220 31.316 20.464 2.186 19.709 2.382 18.953 2.891
18.197 4.592
20.968 21.406 20.716 2.150 20.212 2.233 19.960 2.296

Lowest factor of safety= 2.150 and occurs at radius = 20.716

****WARNING AT NEXT CENTER**** When radius is 20.927
center of circle lies below ground line or circle does not intercept ground line properly, or the circle cuts the slope
very slightly, so a large factor of safety is assigned.

At point (285.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:

21.240 91.484 20.927**********
Lowest factor of safety= 91.484 and occurs at radius = 21.240

At point (290.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:

21.260 56014.850
Lowest factor of safety= 56014.850 and occurs at radius = 21.260

At point (295.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:

21.280 56022.540
Lowest factor of safety= 56022.540 and occurs at radius = 21.280

At point (300.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:

21.300 56017.350
Lowest factor of safety= 56017.350 and occurs at radius = 21.300

At point (280.000, 440.000) under seepage 1,the radius and the corresponding factor of safety are:

26.220 30.660 25.359 2.242 24.497 2.393 23.636 2.756
22.775 4.045
25.933 18.637 25.646 2.214 25.071 2.279 24.784 2.328

Lowest factor of safety= 2.214 and occurs at radius = 25.646

****WARNING AT NEXT CENTER**** When radius is 25.822
center of circle lies below ground line or circle does not intercept ground line properly, or the circle cuts the slope
very slightly, so a large factor of safety is assigned.

At point (285.000, 440.000) under seepage 1,the radius and the corresponding factor of safety are:
26.240 60.673 25.822**********
Lowest factor of safety= 60.673 and occurs at radius = 26.240

At point (290.000, 440.000) under seepage 1,the radius and the corresponding factor of safety are:
26.260 55892.510
Lowest factor of safety= 55892.510 and occurs at radius = 26.260

At point (295.000, 440.000) under seepage 1,the radius and the corresponding factor of safety are:
26.280 55903.420
Lowest factor of safety= 55903.420 and occurs at radius = 26.280

At point (300.000, 440.000) under seepage 1,the radius and the corresponding factor of safety are:
26.300 55874.390
Lowest factor of safety= 55874.390 and occurs at radius = 26.300

At point (280.000, 445.000) under seepage 1,the radius and the corresponding factor of safety are:
31.220 30.962 30.253 2.357 29.286 2.508 28.319 2.858
27.352 3.998
30.897 15.674 30.575 2.327 29.931 2.395 29.608 2.444

Lowest factor of safety= 2.327 and occurs at radius = 30.575

****WARNING AT NEXT CENTER**** when RADIUS is 30.891
either the OVERTURNING or the RESISTING MOMENT is 0, so a large factor of safety is assigned

At point (285.000, 445.000) under seepage 1,the radius and the corresponding factor of safety are:

31.240 49.577 30.716 2.407 30.193 2.747 29.669 3.523
29.145 6.048
31.065 40.988 30.891********** 30.542 2.495 30.367 2.606

Lowest factor of safety= 2.407 and occurs at radius = 30.716

At point (290.000, 445.000) under seepage 1,the radius and the corresponding factor of safety are:
31.260 55781.830
Lowest factor of safety= 55781.830 and occurs at radius = 31.260

At point (295.000, 445.000) under seepage 1,the radius and the corresponding factor of safety are:
31.280 55749.950
Lowest factor of safety= 55749.950 and occurs at radius = 31.280

At point (300.000, 445.000) under seepage 1,the radius and the corresponding factor of safety are:
31.300 55756.510
Lowest factor of safety= 55756.510 and occurs at radius = 31.300

At point (280.000, 450.000) under seepage 1,the radius and the corresponding factor of safety are:
36.220 31.672 35.147 2.493 34.075 2.662 33.003 3.052
31.930 4.310
35.862 12.906 35.505 2.459 34.790 2.536 34.432 2.591

Lowest factor of safety= 2.459 and occurs at radius = 35.505

At point (285.000, 450.000) under seepage 1,the radius and the corresponding factor of safety are:
36.240 45.398 35.611 2.374 34.981 2.635 34.352 3.191
33.723 5.015
36.030 34.712 35.820 2.317 35.401 2.443 35.191 2.528

Lowest factor of safety= 2.317 and occurs at radius = 35.820

At point (290.000, 450.000) under seepage 1,the radius and the corresponding factor of safety are:
36.260 55674.740

Lowest factor of safety= 55674.740 and occurs at radius = 36.260

At point (295.000, 450.000) under seepage 1,the radius and the corresponding factor of safety are:
36.280 55696.700
Lowest factor of safety= 55696.700 and occurs at radius = 36.280

At point (300.000, 450.000) under seepage 1,the radius and the corresponding factor of safety are:
36.300 55648.600
Lowest factor of safety= 55648.600 and occurs at radius = 36.300

For pore pressure ratio .100

At point (280.000, 435.000) ,RADIUS 20.716
the minimum factor of safety is 2.150

At point (280.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:
21.220 31.316 20.464 2.186 19.709 2.382 18.953 2.891
18.197 4.592
20.968 21.406 20.716 2.150 20.212 2.233 19.960 2.296

Lowest factor of safety= 2.150 and occurs at radius = 20.716

At point (290.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:
21.260 56014.850
Lowest factor of safety= 56014.850 and occurs at radius = 21.260

At point (270.000, 435.000) under seepage 1,the radius and the corresponding factor of safety are:
21.180 27.141 19.569 3.451 17.958 3.574 16.347 3.935
14.735 5.297
20.643 3.422 20.106 3.433 19.032 3.478 18.495 3.517

Lowest factor of safety= 3.422 and occurs at radius = 20.643

At point (280.000, 447.000) under seepage 1,the radius and the corresponding factor of safety are:

33.220 31.213 32.211 2.409 31.202 2.566 30.193 2.928
29.184 4.091
32.883 14.967 32.547 2.378 31.874 2.449 31.538 2.500

Lowest factor of safety= 2.378 and occurs at radius = 32.547

At point (280.000, 423.000) under seepage 1,the radius and the corresponding factor of safety are:

9.220 53.733 8.718 2.817 8.215 3.197 7.713 4.006
7.211 6.535
9.053 45.268 8.885 27.624 8.550 2.918 8.383 3.042

Lowest factor of safety= 2.817 and occurs at radius = 8.718

At point (282.500, 435.000) under seepage 1,the radius and the corresponding factor of safety are:

21.230 44.232 20.696 2.426 20.162 2.807 19.628 3.592
19.094 6.000
21.052 35.756 20.874 19.149 20.518 2.529 20.340 2.653

Lowest factor of safety= 2.426 and occurs at radius = 20.696

At point (277.500, 435.000) under seepage 1,the radius and the corresponding factor of safety are:

21.210 26.757 20.233 2.258 19.255 2.358 18.278 2.645
17.301 3.768
20.884 13.722 20.558 2.243 19.907 2.280 19.581 2.312

Lowest factor of safety= 2.243 and occurs at radius = 20.558

At point (280.000, 438.000) under seepage 1,the radius and the corresponding factor of safety are:

24.220 30.721 23.401 2.209 22.582 2.370 21.763 2.763
20.944 4.278
23.947 19.640 23.674 2.178 23.128 2.249 22.855 2.301

Lowest factor of safety= 2.178 and occurs at radius = 23.674

At point (280.000, 432.000) under seepage 1,the radius and the corresponding

factor of safety are:

18.220	32.881	17.528	2.233	16.835	2.509	16.143	3.095
15.451	4.931						
17.989	23.933	17.758	2.180	17.297	2.302	17.066	2.392

Lowest factor of safety= 2.180 and occurs at radius = 17.758

For pore pressure ratio .100

At point (280.000, 435.000) ,RADIUS 20.716
the minimum factor of safety is 2.150

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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 2.150