HYDROLOGY STUDY FOR
GTM ENERGY PARTNERS, LLC.

MINE NO. 1
P-3822 / REVISION R-17
JACKSON COUNTY, ALABAMA

BY
PERC ENGINEERING CO., INC.
1606 HWY 78 WEST
JASPER, ALABAMA 35501

DETAILED DESIGN PLANS
PERMANENT WATER IMPOUNDMENT
PWI 001
ATTACHMENT III-B-2(a)

SEPTEMBER 20, 2010

PERC
ENGINEERING CO., INC.

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

September 20, 2010

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

RE: GTM Energy Partners, LLC
Mine No. 1
P-3822 / Revision R-17

Dear Gary:

I hereby certify the attached detailed design plans for PWI 001 for the above referenced mine are in accordance with the Regulations of the Alabama Surface Mining Commission as adopted by Act 81-435 of December 18, 1981 and amended to date, and are true and correct to the best of my knowledge and belief.

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

Sincerely,
PERC Engineering Co., Inc.

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

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

P.O. Box 1172 • Jasper, Alabama 35502 • 1606 Highway 78 West • Jasper, Alabama 35501

Pond Construction Criteria

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

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

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

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

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

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

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

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

8. The pool area of the basin will be cleared of timber and large undergrowth.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

embankment material not used to meet original contour, if non-toxic, shall be spread in thin layers within the permit area and vegetated as stated in the approved reclamation plan. All toxic material encountered in the basin disposal shall be buried and covered with 4 feet of non-toxic material and vegetated as stated in the approved reclamation plan.

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

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

Geotextiles

Geotextiles shall be used as a separator between the graded stone, the soil base and the abutments. Class I geotextile as specified in Table RD-3 below shall be used. Geotextile shall be placed immediately adjacent to the subgrade without any voids between the fabric and the subgrade.

Table RD-3 Requirements for Nonwoven Geotextile

Property	Test Method	Class I	Class II	Class III	Class IV[1]
Tensile strength(lb)[2]	ASTM D 4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure[2]	ASTM D 4632	≥50	≥50	≥50	≥50
Puncture (pounds)	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent opening size (AOS)	ASTM D 4751	As specified max. no. 40[3]	As specified max. no. 40[3]	As specified max. no. 40[3]	As specified max. no. 40[3]
Permittivity sec-1	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

Table copied from NRCS Material Specification 592.

1 Heat-bonded or resin-bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle-punched geotextile are required for all other classes.

2 Minimum average roll value (weakest principal direction).

3 U.S. Standard sieve size.

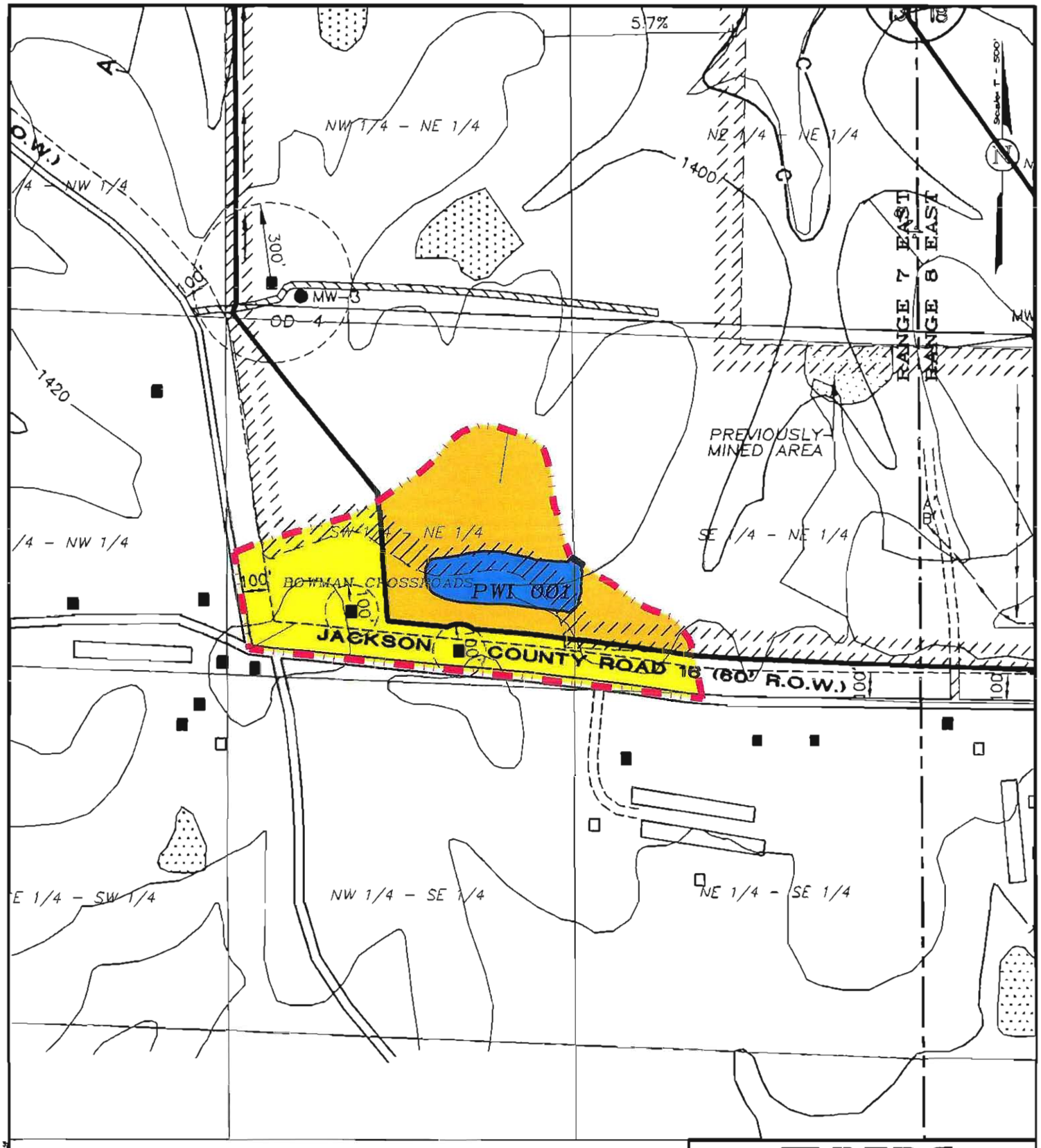
NOTES

1) The primary spillway of PWI 001 will consist of a 12 feet wide open channel lined with Class II Rip-Rap. The channel lining will extend back to the existing drainage course. A splash pad consisting of durable, non-erodible sandstone or limestone riprap, concrete pad, or consolidated bedrock will located at the discharge point of the primary and emergency spillways of permanent water impoundment PWI 001.

2) Geotextile fabric will be placed the bottom of the primary spillway, prior to the placement of the rip-rap, to prevent undercutting and erosion.

3) Due to permanent water impoundment PWI 001 being totally incised, no stability analysis is required.

4) Due to Permanent Water Impoundment, PWI 001 being constructed in spoil material, it shall be lined with 1.0 feet (minimum) of clay material with a permeability of no greater than 1×10^{-6} cm/sec up to the emergency spillway elevation to minimize infiltration and to provide a stable pool level with the clay placed in 6" lifts and compacted to 95% standard proctor.



LEGEND

- PERMIT BOUNDARY
- DRAINAGE DIVIDE
- DIVERSIONS
- PWI 001 — PERMANENT WATER IMPOUNDMENT

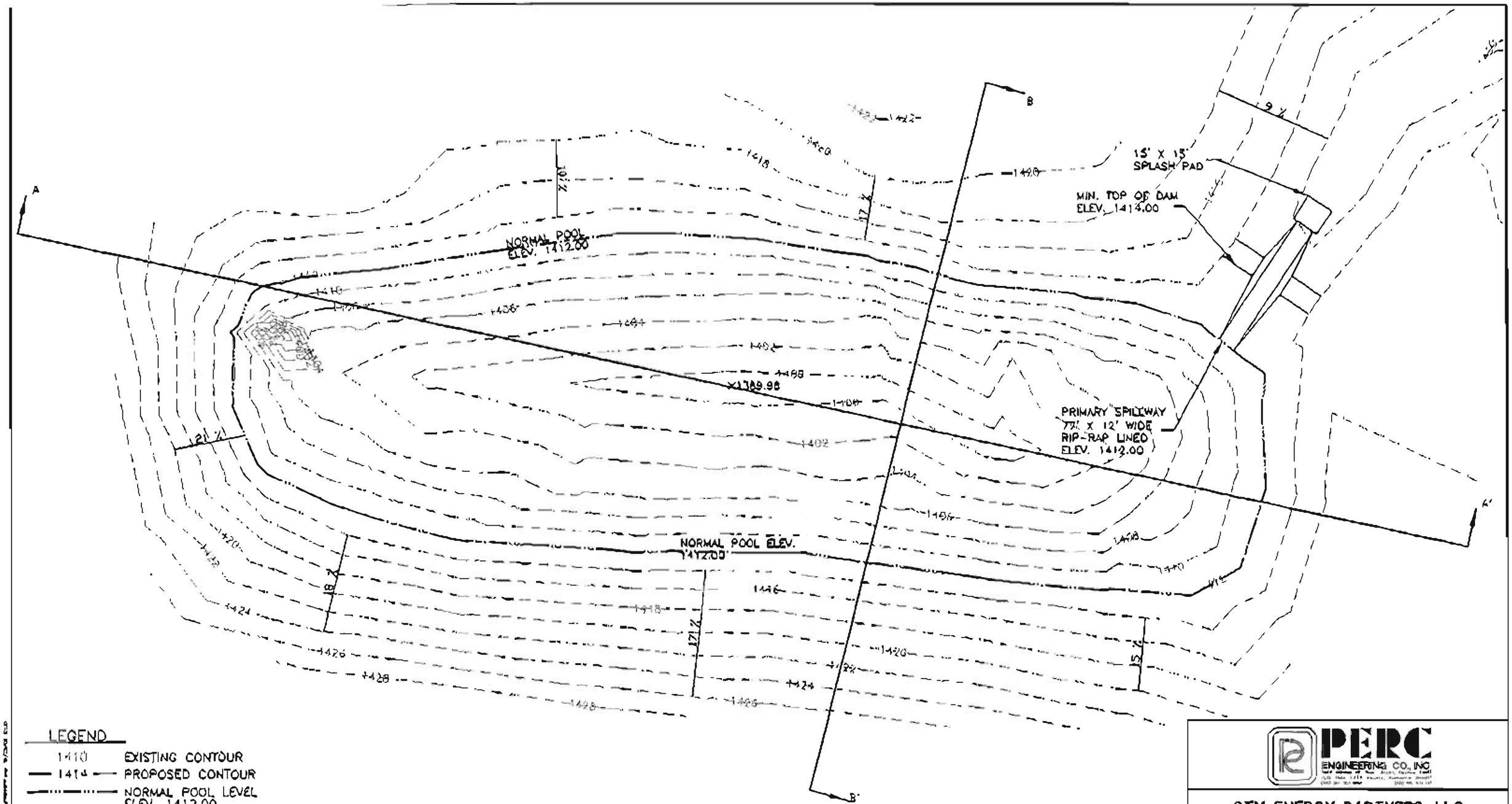
LANDUSE & CURVE NUMBER INFORMATION

- OPEN SPACES, PASTURE LAND & RESIDENTIAL AREAS, CURVE NUMBER, 75
- SEDIMENT BASIN, CURVE NUMBER, 100
- GRADED AND BARE, CURVE NUMBER, 87

PERC ENGINEERING CO., INC.

GTM ENERGY PARTNERS, LLC.
MINE NO. 1
P-3822 / REVISION R-17
ATTACHMENT III-B-2(a)

DRAWN BY: J.W.T. DWG. NAME: PWI001WS	DATE: 09/10/2010
APPROVED BY: L.G.S.	SCALE: 1"=500'



LEGEND

1410	EXISTING CONTOUR
1414	PROPOSED CONTOUR
	NORMAL POOL LEVEL ELEV. 1412.00

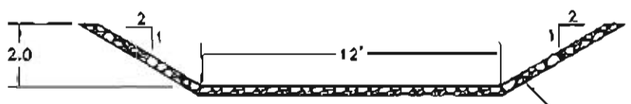
Note: Due to the basin being constructed in spoil, it shall be lined with 1.0 foot (minimum) of clay material with a permability no greater than 1 X 10^-6 cm/sec up to the emergency spillway elevation to minimize infiltration and to provide a stable pool level with the clay placed in 6" lifts compacted to 95% of standard proctor.

PERC ENGINEERING CO., INC.

GTM ENERGY PARTNERS, LLC.
MINE NO. 1
P-3822/ REVISION R-17
PLAN VIEW MAP
PWI 001P

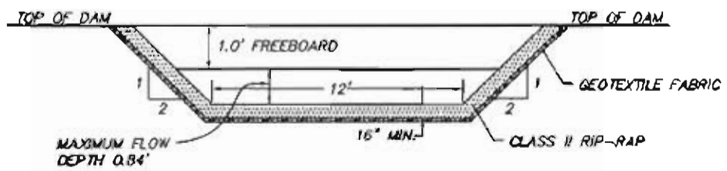
DRAWN BY:	JMT	DATE	10/23/2009
DWG. NAME	PWI001PV		
APPROVED BY:	LGB	SCALE:	1"=50'

Spillway Elev. 1412.0
Q Out 22.3 C.F.S.
V Out 2.2 FT/S



Spillway Control Section Gradient shall be Approximately 0.5%

CHANNEL LINING TO CONSIST OF CLASS II RIP-RAP



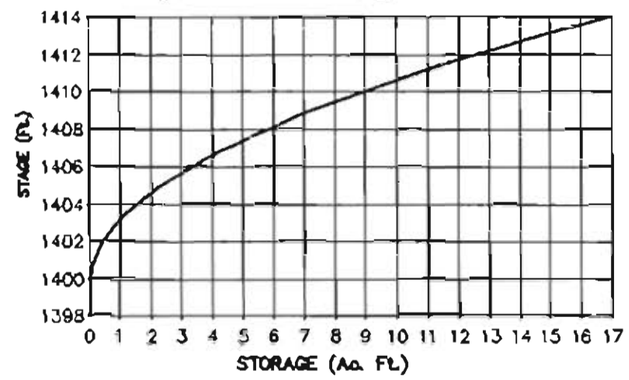
SPILLWAY CONTROL SECTION TYPICAL

N.T.S.

Notes:

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

Stage vs. Storage Curve

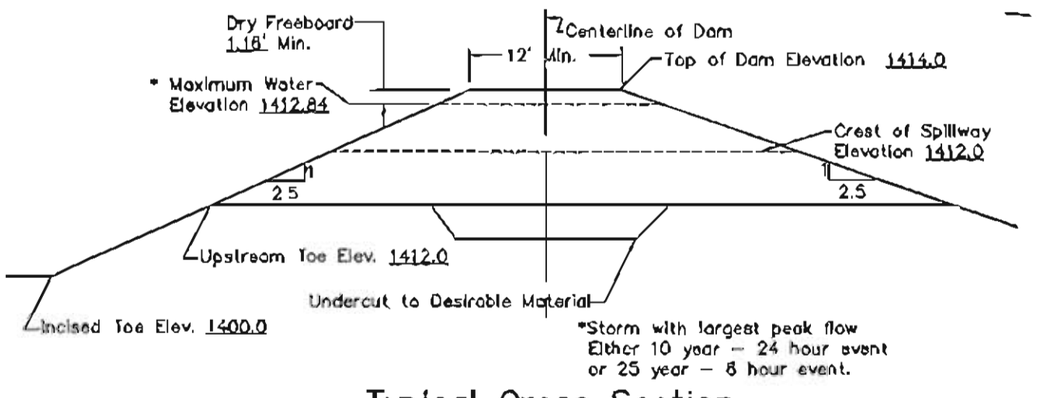


Storage Computation

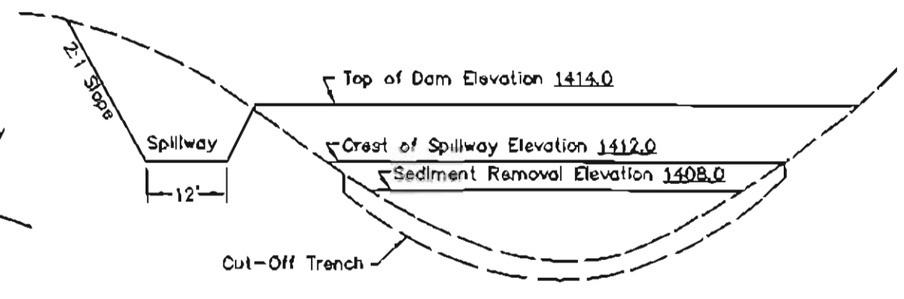
Elevation (feet)	Area (acres)	Avg. Area (acres)	Interval (feet)	Storage (ac.-ft.)	Acc. Storage (ac.-ft.)
1398	0.000				0.000
		0.047	2	0.035	
1400	0.094				0.035
		0.235	2	0.436	
1402	0.376				0.471
		0.551	2	1.146	
1404	0.725				1.563
		0.904	2	1.813	
1406	1.083				3.376
		1.227	2	2.451	
1408	1.371				5.827
		1.524	2	3.044	
1410	1.677				8.871
		1.842	2	3.679	
1412	2.007				12.550
		2.190	2	4.401	
1414	2.373				16.951

Key Basin Parameters

Drainage Area	22.7 Acres
Disturbed Area	10.0 Acres
Sediment Storage	5.8 Ac. Ft.
Detention Storage	6.7 Ac. Ft.
Permanent Pool Capacity	12.5 Ac. Ft.
Total Basin Capacity	14.4 Ac. Ft.
Peak Inflow	53.3 C.F.S.
Peak Outflow	22.3 C.F.S.



Typical Cross Section Along Spillway



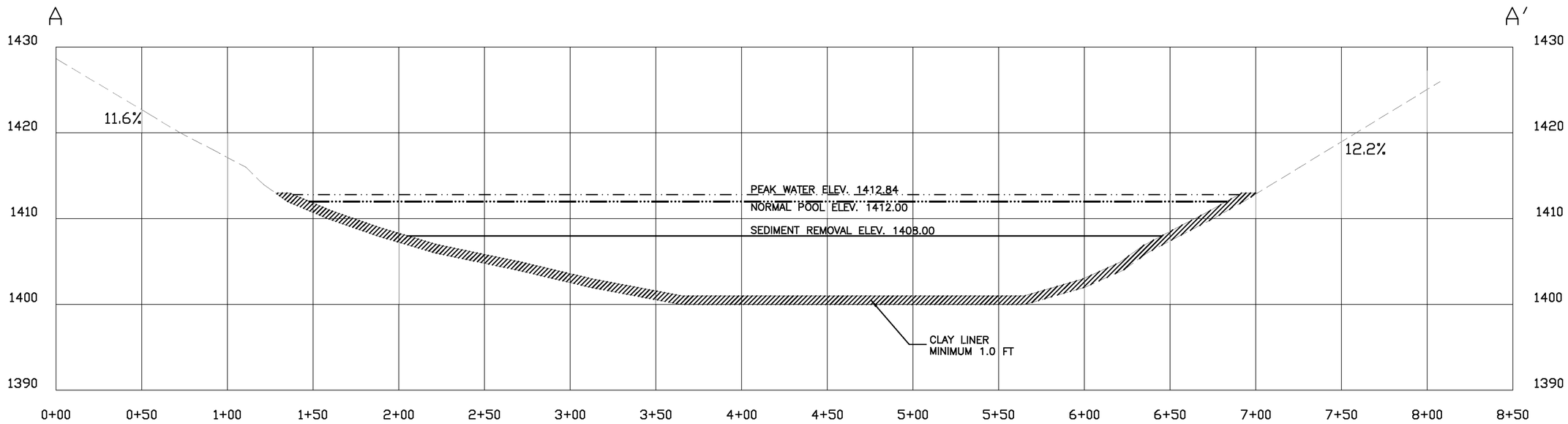
Typical Profile Looking Downstream

09/20/2010
Leslie G. Stephens, P.E. P.L.S. — Date
AL Registration. #16117-E

PERC ENGINEERING CO. INC.

GTM ENERGY PARTNERS
MINE NO. 1
P-3822 / REVISION R-17
PWI 001

DRAWN BY: J.W.Y. DWG. NAME: PW0001DT	DATE 09/10/2010
APPROVED BY: L.G.S.	SCALE NONE



HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'

LEGEND

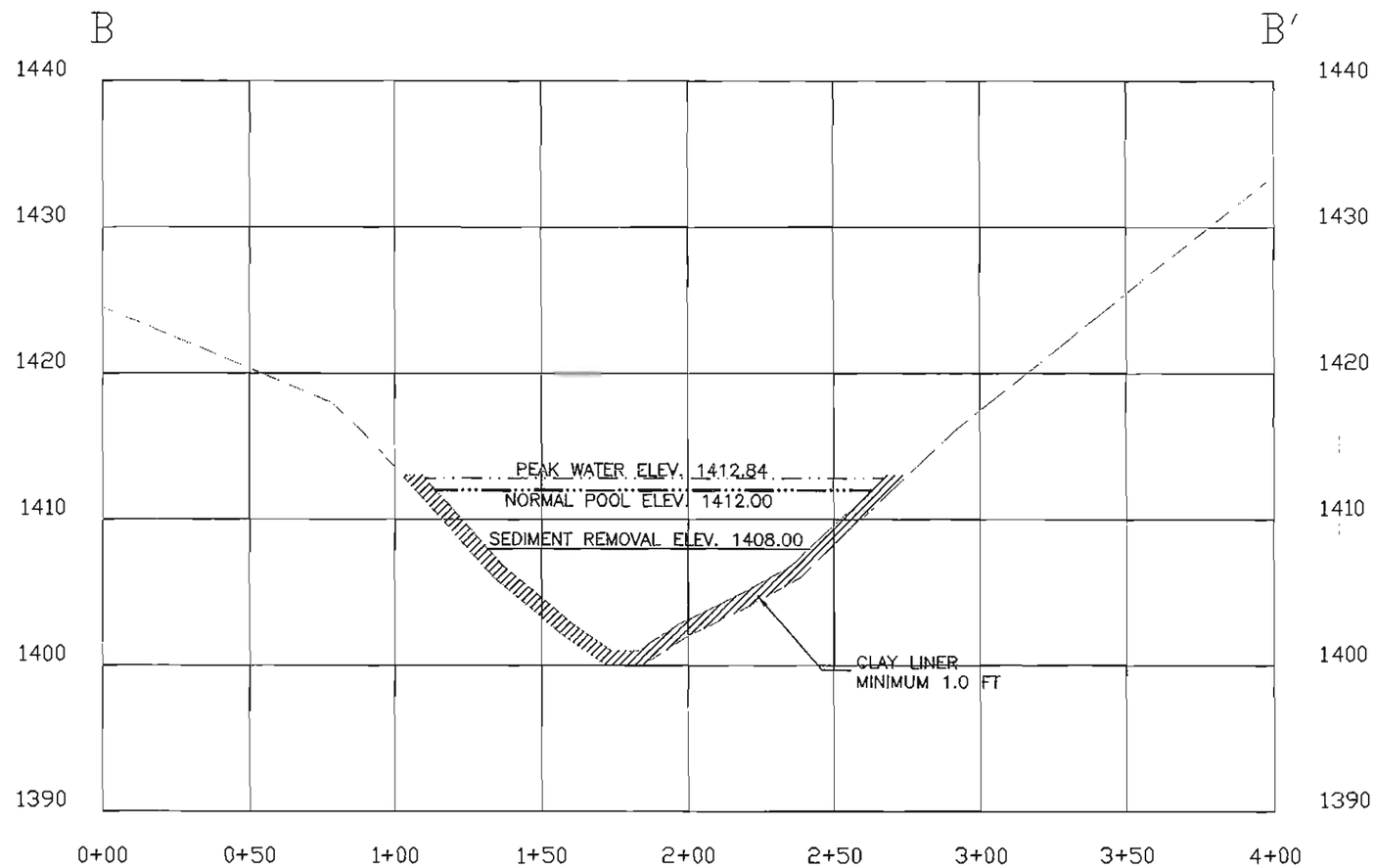
- EXISTING CONTOUR
- NORMAL POOL LEVEL ELEV. 1412.00
- PEAK WATER ELEV. 1412.84
- SEDIMENT REMOVAL ELEV. 1408.00
- CLAY LINER

Note: Due to the basin being constructed in spoil, it shall be lined with 1.0 feet (minimum) of clay material with a permability no greater than 1 X 10^-6 cm/sec up to the emergency spillway elevation to minimize infiltration and to provide a stable pool level with the clay placed in 6" lifts compacted to 95% of standard proctor.

PERC ENGINEERING CO., INC.
1606 Highway 78 West Jasper, Alabama 35501
P.O. Box 1712 Jasper, Alabama 35502
(205) 384-5553 Office (205) 295-3114 Fax

GTM ENERGY PARTNERS, LLC.
MINE NO. 1
P-3822/ REVISION R-17
PWI 001P
CROSS-SECTION A-A'

DRAWN BY:	JWT	DATE:	10/23/2009
DWG. NAME:	PWI001CSA		
APPROVED BY:	LGS	SCALE:	AS NOTED



HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'

LEGEND

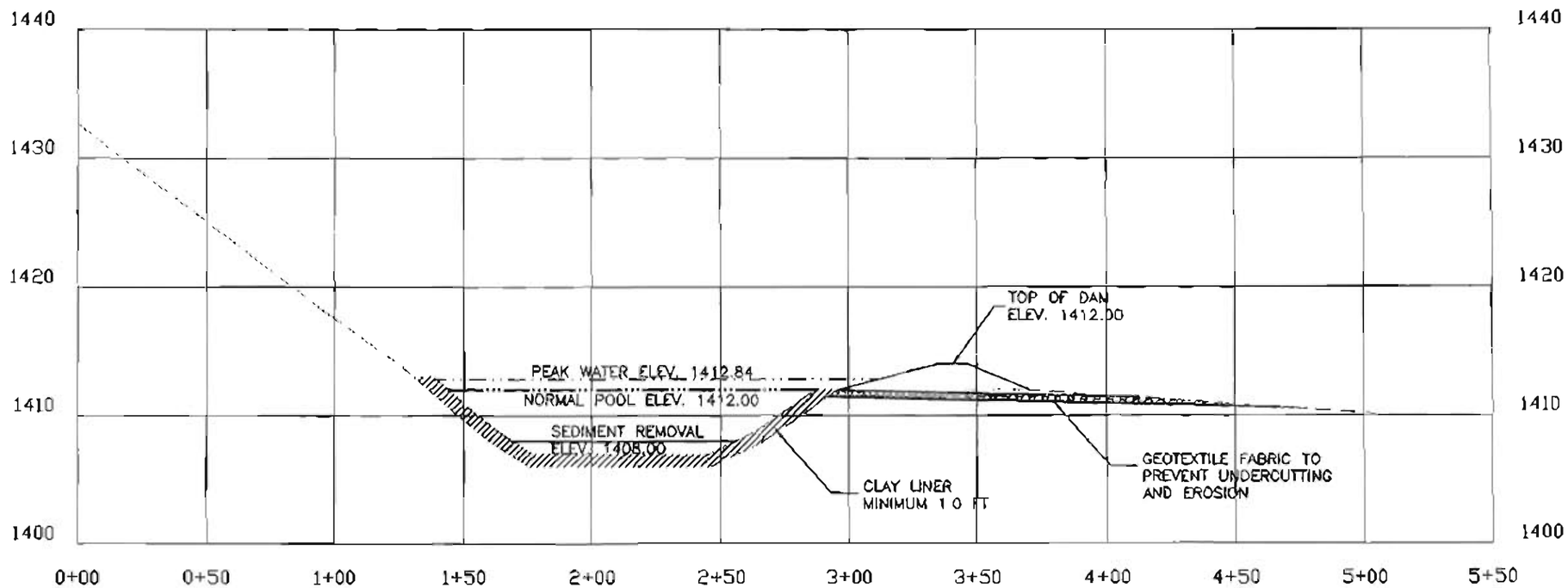
- EXISTING CONTOUR
- NORMAL POOL LEVEL ELEV. 1412.00
- PEAK WATER ELEV. 1412.84
- SEDIMENT REMOVAL ELEV. 1408.00
- CLAY LINER

Note: Due to the basin being constructed in spoil, it shall be lined with 1.0 feet (minimum) of clay material with a permability no greater than 1 X 10^-6 cm/sec up to the emergency spillway elevation to minimize infiltration and to provide a stable pool level with the clay placed in 6" lifts compacted to 95% of standard proctor.

PERC ENGINEERING CO., INC.

GTM ENERGY PARTNERS, LLC.
MINE NO. 1
P-3822/ REVISION R-17
PWI 001P
CROSS-SECTION B-B'

DRAWN BY:	JWT	DATE:	10/23/2009
DWG. NAME:	PWI001CSB		
APPROVED BY:	LGS	SCALE:	AS NOTED



LEGEND

- EXISTING CONTOUR
- PROPOSED FINISHED GRADE
- NORMAL POOL LEVEL ELEV. 1412.00
- PEAK WATER ELEV 1412.84
- SEDIMENT REMOVAL ELEV. 1408.00
- CLAY LINER

Note: Due to the basin being constructed in spoil, it shall be lined with 1.0 feet (minimum) of clay material with a permability no greater than 1 X 10^-6 cm/sec up to the emergency spillway elevation to minimize infiltration and to provide a stable pool level with the clay placed in 6" lifts compacted to 95% of standard proctor.

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'

PERC ENGINEERING CO., INC.

GTM ENERGY PARTNERS, LLC.
MINE NO. 1
P-3822/ REVISION R-17
PWI 001P
SPILLWAY CROSS-SECTION

DRAWN BY.	JWT	DATE	10/23/2008
DWG. NAME:	PWI001SWCS		
APPROVED BY.	LGS	SCALE:	AS NOTED

P-3822 PWI 001 Spillway Control Section

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	0.5	1.00		

Simons/OSM Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	22.34 cfs	
Depth:	0.77 ft	1.77 ft
Top Width:	15.07 ft	19.07 ft
Velocity:	2.15 fps	
X-Section Area:	10.39 sq ft	
Hydraulic Radius:	0.673 ft	
Froude Number:	0.46	
Manning's n:	0.0377	
Dmin:	2.00 in	
D50:	9.00 in	
Dmax:	12.00 in	

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GTM Energy Partners, LLC
Mine No. 1
P-3822/ Revision R-15
PWI 001

5.4 Inch, 10 Year - 24 Hour

DRN 58

JWT

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

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

General Information

Storm Information:

Storm Type:	DRN58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	5.400 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	PWI 001

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	22.700	22.700	22.31	5.47
	Out			17.01	5.47

Structure Detail:

Structure #1 (Pond)

PWI 001

Pond Inputs:

Initial Pool Elev:	1,412.00 ft
Initial Pool:	12.55 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
1,412.00	15.00	2.00:1	2.00:1	12.00

Pond Results:

Peak Elevation:	1,412.75 ft
Dewater Time:	0.51 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)
1,398.00	0.000	0.000	0.000	
1,398.50	0.000	0.000	0.000	
1,399.00	0.001	0.000	0.000	
1,399.50	0.029	0.006	0.000	
1,400.00	0.094	0.035	0.000	
1,400.50	0.146	0.095	0.000	
1,401.00	0.209	0.183	0.000	
1,401.50	0.286	0.306	0.000	
1,402.00	0.376	0.471	0.000	
1,402.50	0.457	0.679	0.000	
1,403.00	0.546	0.930	0.000	
1,403.50	0.632	1.224	0.000	
1,404.00	0.725	1.563	0.000	
1,404.50	0.816	1.948	0.000	
1,405.00	0.912	2.380	0.000	
1,405.50	0.996	2.857	0.000	
1,406.00	1.083	3.376	0.000	
1,406.50	1.153	3.935	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
1,407.00	1.225	4.529	0.000		
1,407.50	1.297	5.160	0.000		
1,408.00	1.371	5.827	0.000		
1,408.50	1.446	6.531	0.000		
1,409.00	1.522	7.273	0.000		
1,409.50	1.599	8.053	0.000		
1,410.00	1.677	8.871	0.000		
1,410.50	1.757	9.730	0.000		
1,411.00	1.838	10.628	0.000		
1,411.50	1.922	11.568	0.000		
1,412.00	2.007	12.550	0.000		Spillway #1
1,412.50	2.108	13.579	2.339	5.32*	
1,412.75	2.160	14.116	17.009	6.90	Peak Stage
1,413.00	2.212	14.659	31.829		
1,413.50	2.292	15.785	67.042		
1,414.00	2.373	16.951	112.953		

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

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
1,398.00	0.000	0.000
1,398.50	0.000	0.000
1,399.00	0.000	0.000
1,399.50	0.000	0.000
1,400.00	0.000	0.000
1,400.50	0.000	0.000
1,401.00	0.000	0.000
1,401.50	0.000	0.000
1,402.00	0.000	0.000
1,402.50	0.000	0.000
1,403.00	0.000	0.000
1,403.50	0.000	0.000
1,404.00	0.000	0.000
1,404.50	0.000	0.000
1,405.00	0.000	0.000
1,405.50	0.000	0.000
1,406.00	0.000	0.000

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
1,406.50	0.000	0.000
1,407.00	0.000	0.000
1,407.50	0.000	0.000
1,408.00	0.000	0.000
1,408.50	0.000	0.000
1,409.00	0.000	0.000
1,409.50	0.000	0.000
1,410.00	0.000	0.000
1,410.50	0.000	0.000
1,411.00	0.000	0.000
1,411.50	0.000	0.000
1,412.00	0.000	0.000
1,412.50	2.339	2.339
1,413.00	31.829	31.829
1,413.50	67.042	67.042
1,414.00	112.953	112.953

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	10.300	0.089	0.005	0.419	75.000	M	10.13	2.380
	2	10.000	0.015	0.000	0.000	71.000	F	8.79	2.016
	3	2.400	0.001	0.000	0.000	100.000	F	3.40	1.079
	Σ	**22.700**						**22.31**	**5.475**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	2.50	5.00	200.00	1.260	0.044
		8. Large gullies, diversions, and low flowing streams	1.38	8.00	578.00	3.520	0.045
#1	**1**	**Time of Concentration:**					**0.089**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	8.64	14.00	162.00	2.930	0.015
#1	**2**	**Time of Concentration:**					**0.015**

Subwatershed Muskingum Routing 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	8.64	14.00	162.00	8.810	0.005
#1	**1**	**Muskingum K:**					**0.005**

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GTM Energy Partners, LLC

Mine No. 1

P-3822/ Revision R-15

PWI 001

4.5 Inch, 25 Year - 6 Hour

SCS 6-Hour

JWT

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

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

General Information

Storm Information:

Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1580
1.00	0.3600
1.50	0.6080
2.00	1.0350
2.50	2.7000
3.00	3.1500
3.50	3.5100
4.00	3.7580
4.50	3.9830
5.00	4.1630
5.50	4.3430
6.00	4.5000

Peak 30-minute Intensity: 3.33 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	= = >	End	0.000	0.000	PWI 001

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	22.700	22.700	46.27	4.09
	Out			15.27	4.09

Structure Detail:

Structure #1 (Pond)

PWI 001

Pond Inputs:

Initial Pool Elev:	1,412.00 ft
Initial Pool:	12.55 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
1,412.00	15.00	2.00:1	2.00:1	12.00

Pond Results:

Peak Elevation:	1,412.72 ft
Dewater Time:	1.52 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)
1,398.00	0.000	0.000	0.000	
1,398.50	0.000	0.000	0.000	
1,399.00	0.001	0.000	0.000	
1,399.50	0.029	0.006	0.000	
1,400.00	0.094	0.035	0.000	
1,400.50	0.146	0.095	0.000	
1,401.00	0.209	0.183	0.000	
1,401.50	0.286	0.306	0.000	
1,402.00	0.376	0.471	0.000	
1,402.50	0.457	0.679	0.000	
1,403.00	0.546	0.930	0.000	
1,403.50	0.632	1.224	0.000	
1,404.00	0.725	1.563	0.000	
1,404.50	0.816	1.948	0.000	
1,405.00	0.912	2.380	0.000	
1,405.50	0.996	2.857	0.000	
1,406.00	1.083	3.376	0.000	
1,406.50	1.153	3.935	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
1,407.00	1.225	4.529	0.000		
1,407.50	1.297	5.160	0.000		
1,408.00	1.371	5.827	0.000		
1,408.50	1.446	6.531	0.000		
1,409.00	1.522	7.273	0.000		
1,409.50	1.599	8.053	0.000		
1,410.00	1.677	8.871	0.000		
1,410.50	1.757	9.730	0.000		
1,411.00	1.838	10.628	0.000		
1,411.50	1.922	11.568	0.000		
1,412.00	2.007	12.550	0.000		Spillway #1
1,412.50	2.108	13.579	2.339	32.75	
1,412.72	2.154	14.052	15.268	3.80	Peak Stage
1,413.00	2.212	14.659	31.829		
1,413.50	2.292	15.785	67.042		
1,414.00	2.373	16.951	112.953		

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
1,398.00	0.000	0.000
1,398.50	0.000	0.000
1,399.00	0.000	0.000
1,399.50	0.000	0.000
1,400.00	0.000	0.000
1,400.50	0.000	0.000
1,401.00	0.000	0.000
1,401.50	0.000	0.000
1,402.00	0.000	0.000
1,402.50	0.000	0.000
1,403.00	0.000	0.000
1,403.50	0.000	0.000
1,404.00	0.000	0.000
1,404.50	0.000	0.000
1,405.00	0.000	0.000
1,405.50	0.000	0.000
1,406.00	0.000	0.000
1,406.50	0.000	0.000
1,407.00	0.000	0.000

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
1,407.50	0.000	0.000
1,408.00	0.000	0.000
1,408.50	0.000	0.000
1,409.00	0.000	0.000
1,409.50	0.000	0.000
1,410.00	0.000	0.000
1,410.50	0.000	0.000
1,411.00	0.000	0.000
1,411.50	0.000	0.000
1,412.00	0.000	0.000
1,412.50	2.339	2.339
1,413.00	31.829	31.829
1,413.50	67.042	67.042
1,414.00	112.953	112.953

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	10.300	0.089	0.005	0.419	75.000	M	20.82	1.749
	2	10.000	0.015	0.000	0.000	71.000	F	17.40	1.446
	3	2.400	0.001	0.000	0.000	100.000	F	8.06	0.897
	$\sum$	**22.700**						**46.27**	**4.092**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	2.50	5.00	200.00	1.260	0.044
		8. Large gullies, diversions, and low flowing streams	1.38	8.00	578.00	3.520	0.045
#1	**1**	**Time of Concentration:**					**0.089**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	8.64	14.00	162.00	2.930	0.015
#1	**2**	**Time of Concentration:**					**0.015**

Subwatershed Muskingum Routing 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	8.64	14.00	162.00	8.810	0.005
#1	**1**	**Muskingum K:**					**0.005**