

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to: 13-083

Pamela A & Darrel E. Swisher
3786 Meathouse Rd
New Milton, WV 26411

2. Article Number
(Transfer from service label)

7011 0470 0000 8523 2655

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X *Pam Swisher*

Agent

Addressee

B. Received by (Printed Name)

PAM SWISHER

C. Date of Delivery

10-24-13

D. Is delivery address different from item 1? Yes
If YES, enter delivery address below: No

3. Service Type

Certified Mail

Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes

UNITED STATES POSTAL SERVICE



First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

• Sender: Please print your name, address, and ZIP+4 in this box •

FILED

2013 OCT 25 AM 11:41

BETH A. ROGERS
COUNTY CLERK
DOUGLASS COUNTY
DOUGLASS COUNTY

BETH A. ROGER
DOUGLASS CO. CLERK
118 EAST COURT ST.
ROOM 102
WEST UNION, WV 26456



**Doddridge County Sheriff
Flood Plain Ordinance Fund**

1066
69-217/515

DATE November 5, 2013

PAY TO THE ORDER OF THE HERALD RECORD \$ 108.70

One Hundred Eight dollars and 70/100----- 9-DOLLARS



Ralph S. Swisher
Beth A. Rogers
M. G. Sheriff MP

MEMO #: 2841-2842-2856-2857-2858

⑈001066⑈ ⑆051502175⑆ 1196499⑈

BLUE TRADITIONAL

- # 13-078
- # 13-077
- # 13-083
- # 13-079
- # 13-082

7011 0470 0002 8523 2655

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

For delivery information, visit our website at www.usps.com

OFFICER ROGERS

Postage	\$.46
Certified Fee	3.10
Return Receipt Fee (Endorsement Required)	2.55
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	\$ 6.11

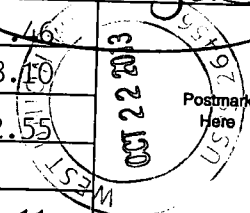
#13-083

Sent To Pamela A & Darrel E. Swisher

Street, Apt. No., or PO Box No. 3786 Meathouse Rd

City, State, ZIP+4 New Milton, WV 26411

PS Form 3800, August 2006 See Reverse for Instructions





ANTERO RESOURCES CORPORATION
 1625 17th STREET, SUITE 300
 DENVER, COLORADO 80202

Page 1 of 1

Vendor Name	Vendor No.	Date	Check Number	Check Total
DODDRIDGE COUNTY COMMISSION	43312	Oct-17-2013	40641	\$647.52

VOUCHER	VENDOR INV #	INV DATE	TOTAL AMOUNT	PRIOR PMTS & DISCOUNTS	NET AMOUNT
10-AP-10368	SNAKERUNPAD2	10/17/13	647.52	0.00	647.52
	SNAKE RUN PAD - FLOOD PLAIN PERMIT				
	TOTAL INVOICES PAID				647.52

*Antero - Snake Run Pad
 #13-083*

DETACH AND RETAIN FOR TAX PURPOSES

By: BH - MEH - AML
 Asst. Chief Tax Deputy

W. C. Underwood Jr.
 Sheriff of Doddridge County

The Person paying Money into the Treasury shall forthwith file one of these Receipts with the County Clerk

Doddridge County, West Virginia

No. 728

Date: October 21, 2013
 Customer copy

Received: #13-083 ANTERO - SNAKE RUN ROAD

\$647.52

In Payment For: 318 Building Permits (LP)

For: 12-Flood Plain Ordinance #20 Fund

By: BH - MEH - AML
 Asst. Chief Tax Deputy

W. C. Underwood Jr.
 Sheriff of Doddridge County

Doddridge County Flood Plain Application Fee Calculator (if in Flood Plain)**Snake Run Pad**

Estimated Construction Costs	\$29,503.54
Amount over \$100,000	-\$70,496.46
Drilling Oil and Gas Well Fee	\$1,000.00
\$5 per \$1,000 over \$100,000	-\$352.48
Amount Due with application	\$647.52

Legal Advertisement:
Doddridge County
Floodplain Permit Application

Please take notice that on the 21st day of October, 2013

**ANTERO RESOURCES APPALACHIAN CORPORATION –
SNAKE RUN PAD – #13-083**

filed an

application for a Floodplain Permit to develop land located at or
about: **SURFACE OWNERS: PAMELA A & DARREL E. SWISHER**
DEED BOOK 246 PG 469 & TAX MAP 13-26

The Application is on file with the Clerk of the County Court and
may be inspected or copied during regular business hours.

Any interested persons who desire to comment shall present
the same in writing by **November 9th, 2013.**

Delivered to the:
Clerk of the County Court
118 E. Court Street, West Union, WV 26456.

Beth A Rogers, Doddridge County Clerk
Dan Wellings, Doddridge County Flood Plain Manager



Antero Resources
1625 17th Street
Denver, Colorado 80202
Office 303.357.7310
Fax 303.357.7315

October 17, 2013

Doddridge County Commission
Attn: Dan Wellings, Doddridge County Floodplain Manager
118 East Court Street, Room 102
West Union, WV 26456

Mr. Wellings:

Antero Resources Corporation (Antero) would like to submit a Doddridge County Floodplain permit application for our Snake Run Drill Pad. Our project is located in Doddridge County, New Milton District. Per HEC-RAS study prepared by Navitus Engineering, on August 21, 2013, and FEMA Map 54017C0235C, the development associated with the entrance road will not change the 100 year base flood elevation and there will be no impacts to upstream and downstream properties along Meathouse Fork.

Attached you will find the following:

- Doddridge County Floodplain Permit Application and Permit Fee
- HEC-RAS Floodplain Study
- A detailed set of plans signed by a WV licensed professional engineer
- Adjacent Surface Owner Data

If you have any questions please feel free to contact me at (303) 357-6820. Thank you in advance for your consideration.

Sincerely,

Shauna Redican
Permit Representative
Antero Resources Corporation

Enclosures

2013 OCT 18 PM 3:10
BETH A. ROGERS
COUNTY CLERK
DODDRIDGE COUNTY, WV
FILED

13-083

DODDRIDGE COUNTY FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

SECTION 1: GENERAL PROVISIONS (APPLICANT TO READ AND SIGN)

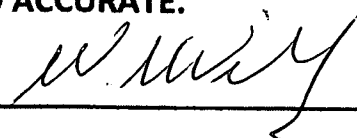
1. No work may start until a permit is issued.
2. The permit may be revoked if any false statements are made herein.
3. If revoked, all work must cease until permit is re-issued.
4. Development shall not be used or occupied until a Certificate of Compliance is issued.
5. The permit will expire if no work is commenced within six months of issuance.
6. Applicant is hereby informed that other permits may be required to fulfill local, state, and federal requirements.
7. Applicant hereby gives consent to the Floodplain Administrator/Manager or his/her representative to make inspections to verify compliance.
8. **I, THE APPLICANT CERTIFY THAT ALL STATEMENTS HEREIN AND IN ATTACHMENTS TO THIS APPLICATION ARE, TO THE BEST OF MY KNOWLEDGE, TRUE AND ACCURATE.**

BETH A. ROGERS
COUNTY CLERK
DODDRIDGE COUNTY, WY

2013 OCT 18 PM 3:10

FILED

APPLICANT'S SIGNATURE _____



DATE October 17, 2013

SECTION 2: PROPOSE DEVELOPMENT (TO BE COMPLETED BY APPLICANT).

IF THE APPLICANT IS NOT A NATURAL PERSON, THE NAME, ADDRESS, AND TELEPHONE NUMBER OF A NATURAL PERSON WHO SHALL BE APPOINTED BY THE APPLICANT TO RECEIVE NOTICE PURSUANT TO ANY PROVISION OF THE CURRENT DODDRIDGE COUNTY FLOODPLAIN ORDINANCE.

Antero Resources Corporation - Ward McNeilly, Vice President of
Engineering

APPLICANT'S NAME: _____

ADDRESS: 1625 17th Street, Denver, CO 80202

TELEPHONE NUMBER: Contact Shauna Redican: 303-357-6820

BUILDER'S NAME: Antero Resources Corporation
ADDRESS: 1625 17th Street, Denver, CO 80202
TELEPHONE NUMBER: (303) 357-7310

ENGINEER'S NAME: Navitus Engineering Inc - Cyrus Kump
ADDRESS: 151 Windy Hill Lane, Winchester, Virginia 22602
TELEPHONE NUMBER: 888-662-4185

PROJECT LOCATION:

NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) _____
Please see attached Firm Map with Landowner Tabulation

ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) _____
Please see attached Firm Map with Landowner Tabulation

DISTRICT: New Milton

DATE/FROM WHOM PROPERTY

PURCHASED: N/A

LAND BOOK DESCRIPTION: _____

DEED BOOK REFERENCE: Please see attached Firm Map with Landowner Tabulation

TAX MAP REFERENCE: _____

EXISTING BUILDINGS/USES OF PROPERTY: None

NAME OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY _____

ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY _____

To avoid delay in processing the application, please provide enough information to easily identify the project location.

DESCRIPTION OF WORK (CHECK ALL APPLICABLE BOXES)

A. STRUCTURAL DEVELOPMENT

ACTIVITY

STRUCTURAL TYPE

<input checked="" type="checkbox"/>	New Structure	<input type="checkbox"/>	Residential (1 – 4 Family)
<input type="checkbox"/>	Addition	<input type="checkbox"/>	Residential (more than 4 Family)
<input type="checkbox"/>	Alteration	<input type="checkbox"/>	Non-residential (floodproofing)
<input type="checkbox"/>	Relocation	<input type="checkbox"/>	Combined Use (res. & com.)
<input type="checkbox"/>	Demolition	<input type="checkbox"/>	Replacement
<input type="checkbox"/>	Manufactured/Mobil Home		

B. OTHER DEVELOPMENT ACTIVITIES:

- Fill Mining Drilling Pipelining
 - Grading
 - Excavation (except for STRUCTURAL DEVELOPMENT checked above)
 - Watercourse Altercation (including dredging and channel modification)
 - Drainage Improvements (including culvert work)
 - Road, Street, or Bridge Construction *Access Road Construction as shown on pages 8-10
 - Subdivision (including new expansion) of attached Snake Run Pad Design
 - Individual Water or Sewer System
 - Other (please specify)
-

C. STANDARD SITE PLAN OR SKETCH

1. SUBMIT ALL STANDARD SITE PLANS, IF ANY HAVE BEEN PREPARED.
2. IF STANDARD SITE PLANS HAVE NOT BEEN PREPARED:
 SKETCH ON A SEPARATE 8 ½ X 11 INCH SHEET OF PAPER THE SHAPE AND LOCATION OF THE LOT. SHOW THE LOCATION OF THE INTENDED CONSTRUCTION OR LAND USE INDICATING BUILDING SETBACKS, SIZE & HEIGHT. IDENTIFY EXISTING BUILDINGS, STRUCTURES OR LAND USES ON THE PROPERTY.
3. SIGN AND DATE THE SKETCH.

ACTUAL TOTAL CONSTRUCTION COSTS OF THE COMPLETE DEVELOPMENT IRRESPECTIVE OF WHETHER ALL OR ANY PART OF THE SUBJECT PROPOSED CONSTRUCTION PROJECT IS WITHIN THE FLOODPLAIN \$ 29,503.54

*See attached Floodplain Calculation Fee

D. ADJACENT AND/OR AFFECTED LANDOWNERS:

1. NAME AND ADDRESS OF ALL OWNERS OF SURFACE TRACTS ADJACENT TO THE AREA OF THE SURFACE TRACT (UP & DOWN STREAM) UPON WHICH THE PROPOSED ACTIVITY WILL OCCUR AND ALL OTHER SURFACE OWNERS UP & DOWN STREAM) WHO OWN PROPERTY THAT MAY BE AFFECTED BY FLOODING AS IS DEMONSTRATED BY A FLOODPLAIN STUDY OR SURVEY (IF ONE HAS BEEN COMPLETED).

NAME: Please see attached Firm Map with
ADDRESS: Landowner Tabulation

NAME: _____
ADDRESS: _____

NAME: _____
ADDRESS: _____

NAME: _____
ADDRESS: _____

1. NAME AND ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON ANY ADJACENT PROPERTY AT THE TIME THE FLOODPLAIN PERMIT APPLICATION IS FILED AND THE NAME AND ADDRESS OF AT LEAST ONE ADULT RESIDING IN ANY HOME ON ANY PROPERTY THAT MAY BE AFFECTED BY FLOODING AS IS DEMONSTRATED BY A FLOODPLAIN STUDY OR SURVEY.

NAME: N/A
ADDRESS: _____

NAME: _____
ADDRESS: _____

NAME: _____
ADDRESS: _____

NAME: _____
ADDRESS: _____

E. CONFIRMATION FORM

THE APPLICANT ACKNOWLEDGES, AGREES, AND CONFIRMS THAT HE/IT WILL PAY WITHIN 30 DAYS OF RECEIPT OF INVOICE BY THE COUNTY FOR ALL EXPENSES RELATIVE TO THE PERMIT APPLICATION PROCESS GREATER THAN THE REQUIRED DEPOSIT FOR EXPENSES INCLUDING:

- (A) PERSONAL SERVICE OF PROCESS BY THE DODDRIDGE COUNTY SHERIFF AT THE RATES PERMITTED BY LAW FOR SUCH SERVICE.
- (B) SERVICE BY CERTIFIED MAIL RETURN RECEIPT REQUESTED.
- (C) PUBLICATION.

- (D) COURT REPORTING SERVICES AT ANY HEARINGS REQUESTED BY THE APPLICANT.
- (E) CONSULTANTS AND/OR HEARING EXPERTS UTILIZED BY DODDRIDGE COUNTY FLOODPLAIN ADMINISTRATOR/MANAGER OR FLOODPLAIN APPEALS BOARD FOR REVIEW OF MATERIALS AND/OR TESTIMONY REGARDING THE EFFICACY OF GRANTING OR DENYING THE APPLICANT'S FLOODPLAIN PERMIT.

NAME (PRINT): Ward McNeilly

SIGNATURE: *W. McNeilly* DATE: October 17, 2013

After completing SECTION 2, APPLICANT should submit form to Floodplain Administrator/Manager or his/her representative for review.

SECTION 3: FLOODPLAIN DETERMINATION (to be completed by Floodplain Administrator/Manager or his/her representative)

THE PROPOSED DEVELOPMENT:

THE PROPOSED DEVELOPMENT IS LOCATED ON:

FIRM Panel: 235
 Dated: 10/04/2011

Is **NOT** located in a Specific Flood Hazard Area (Notify applicant that the application review is complete and **NO FLOODPLAIN DEVELOPMENT PERMIT IS REQUIRED**).

Is located in Special Flood Hazard Area.
 FIRM zone designation A
 100-Year flood elevation is: N/A NGVD ~~(MSL)~~

Unavailable

The proposed development is located in a floodway.
 FBFM Panel No. _____ Dated _____

See section 4 for additional instructions.

SIGNED Dan Wetzel

DATE 11/13/2013

SECTION 4: ADDITIONAL INFORMATION REQUIRED (To be completed by Floodplain Administrator/Manager or his/her representative)

The applicant must submit the documents checked below before the application can be processed.

- A plan showing the location of all existing structures, water bodies, adjacent roads, lot dimensions and proposed development.
- Development plans, drawn to scale, and specifications, including where applicable: details for anchoring structures, storage tanks, proposed elevation of lowest floor, (including basement or crawl space), types of water resistant materials used below the first floor, details of flood proffing of utilities located below the first floor and details of enclosures below the first floor. Also _____
- Subdivision or other development plans (If the subdivision or development exceeds 50 lots or 5 acres, whichever is the lesser, the applicant must provide 100-year flood elevations if they are not otherwise available).
- Plans showing the extent of watercourse relocation and/or landform alterations.
- Top of new fill elevation _____ Ft. NGVD (MSL).
For floodproofing structures applicant must attach certification from registered engineer or architect.
- Certification from a registered engineer that the proposed activity in a regulatory floodway will not result in any increase in the height of the 100-year flood. A copy of all data and calculations supporting this finding must also be submitted.
- Manufactured homes located in a floodplain area must have a West Virginia Contractor's License and a Manufactured Home Installation License as required by the Federal Emergency Management Agency (FEMA).

Other:

SECTION 5: PERMIT DETERMINATION (To be completed by Floodplain Administrator/Manager or his/her representative)

I have determined that the proposed activity **(type is or is not)** in conformance with provisions of the Floodplain Ordinance adopted by the County Commission of Doddridge County on May 21, 2013. The permit is issued subject to the conditions attached to and made part of this permit.

SIGNED _____ DATE _____

If the Floodplain Administrator/Manager found that the above was not in conformance with the provisions of the Doddridge County Floodplain Ordinance and/or denied that application, the applicant may complete an appealing process below.

APPEALS: Appealed to the County Commission of Doddridge County? Yes No
Hearing Date: _____
County Commission Decision - Approved Yes No

CONDITIONS: _____

SECTION 6: AS-BUILT ELEVATIONS (To be submitted by APPLICANT before Certificate of Compliance is issued).

The following information must be provided for project structures. This section must be completed by a registered professional engineer or a licensed land surveyor (or attach a certification to this application).

COMPLETE 1 OR 2 BELOW:

- 1 Actual (As-Built) Elevation of the top of the lowest floor (including basement or crawl space is _____ FT. NGVD (MSL)
- 2 Actual (As Built) elevation of floodproofing is _____ FT. NGVD (MSL)

Note: Any work performed prior to submittal of the above information is at risk of the applicant.

SECTION 7: COMPLIANCE ACTION (To be completed by the Floodplain Administrator/Manager or his/her representative).

The Floodplain Administrator/Manager or his/her representative will complete this section as applicable based on inspection of the project to ensure compliance with the Doddridge County Floodplain Ordinance.

INSPECTIONS:

DATE: 12/04/13 BY: Dan Wellman
DEFICIENCIES ? Y/N

COMMENTS Calvert extension complete

SECTION 8: CERTIFICATE OF COMPLIANCE (To be completed by Floodplain Administrator/Manager or his/her representative).

Certificate of Compliance issued: DATE: 12/06/13 BY: Dan Wellman

ANTERO RESOURCES CORPORATION

SCHEDULE OF QUANTITIES

CLEARING & GRUBBING; EROSION & SEDIMENT CONTROLS	SNAKE RUN WELL PAD & WATER CONTAINMENT PAD			
	QUANTITY	UNIT	UNIT PRICE	FINAL PRICE
MOBILIZATION	1.0	EA	\$17,510.00	\$17,510.00
CONSTRUCTION ENTRANCE	1.0	EA	\$2,517.00	\$2,517.00
CLEARING & GRUBBING (TREE REMOVAL 22.14 ACRES)	0.2	AC	\$3,821.00	\$764.20
JUTE MATTING - SLOPE MATTING	782.8	SY	\$2.10	\$1,643.88
12" COMPOST FILTER SOCK	0.0	LF	\$3.80	\$0.00
18" COMPOST FILTER SOCK	0.0	LF	\$7.90	\$0.00
24" COMPOST SOCK DIVERSION	0.0	LF	\$9.40	\$0.00
SUPER SILT FENCE	0.0	LF	\$8.60	\$0.00
TOTAL				\$22,435.08
SITE - UNCLASSIFIED EXCAVATION				
	QUANTITY	UNIT	UNIT PRICE	FINAL PRICE
WELL PAD	0.0	CY	\$3.80	\$0.00
ACCESS ROADS	955.0	CY	\$4.00	\$3,820.00
WATER CONTAINMENT PAD	0.0	CY	\$4.10	\$0.00
STAGING AREA	0.0	CY	\$7.00	\$0.00
EXCESS MATERIAL STOCKPILES	0.0	CY	\$3.90	\$0.00
TOPSOIL STOCKPILES	0.0	CY	\$3.90	\$0.00
TOTAL				\$3,820.00
SUMP(S) PER ANTERO RESOURCES STANDARD DETAIL				
	QUANTITY	UNIT	UNIT PRICE	FINAL PRICE
INSTALL 102" x 78" x 44" PRE CAST SUMP	0.0	EA		\$0.00
4" PVC CONNECTIVE PIPE (ANTERO SUMP DRAIN DETAIL)	0.0	LF		\$0.00
TOTAL				\$0.00
AGGREGATE SURFACING - SPREADING, COMPACTION, and/or INSTALLATION				
	QUANTITY	UNIT	UNIT PRICE	FINAL PRICE
WELL PAD 6" OR 4" MINUS CRUSHER RUN AGGREGATE (6" THICK)	0.0	TON	\$2.60	\$0.00
WELL PAD 1 1/2" or 3/4" CRUSHER RUN STONE (2" THICK)	0.0	TON	\$2.90	\$0.00
WELL PAD GEOTEXTILE FABRIC (US 200)	0.0	SY	\$0.80	\$0.00
ACCESS ROADS 6" OR 4" MINUS CRUSHER RUN AGGREGATE (8" THICK)	106.5	TON	\$2.80	\$298.20
ACCESS ROADS 1 1/2" OR 3/4" CRUSHER RUN STONE (2" THICK)	26.7	TON	\$2.90	\$77.43
ACCESS ROADS GEOTEXTILE FABRIC (US 200)	319.3	SY	\$0.70	\$223.51
*INSTALL TENSAR TX190 GEOGRID or EQUIVALENT		SY	\$1.90	\$0.00
WATER CONTAINMENT PADS 6" OR 4" MINUS CRUSHER RUN AGGREGATE (8" THICK)	0.0	TON	\$2.60	\$0.00
WATER CONTAINMENT PADS 1 1/2" or 3/4" CRUSHER RUN AGGREGATE (2" THICK)	0.0	TON	\$2.60	\$0.00
WATER CONTAINMENT PADS GEOTEXTILE FABRIC (US 200)	0.0	SY	\$0.70	\$0.00
*INSTALL TENSAR TX190 GEOGRID or EQUIVALENT		SY	\$2.10	\$0.00
STAGING AREA 6" OR 4" MINUS CRUSHER RUN AGGREGATE (8" THICK)	0.0	TON	\$3.80	\$0.00
STAGING AREA 1/2" or 3/4" CRUSHER RUN AGGREGATE (2" THICK)	0.0	TON	\$3.80	\$0.00
STAGING AREA GEOTEXTILE FABRIC (US 200)	0.0	SY	\$0.70	\$0.00
*INSTALL TENSAR TX190 GEOGRID or EQUIVALENT		SY	\$1.50	\$0.00
TOTAL				\$599.14

ANTERO RESOURCES CORPORATION

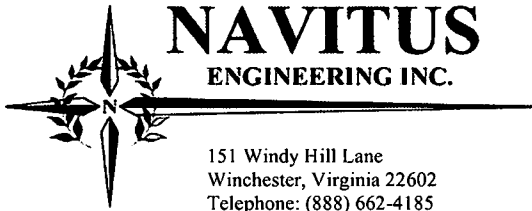
SCHEDULE OF QUANTITIES

ROAD CULVERTS				
	QUANTITY	UNIT	UNIT PRICE	FINAL PRICE
15" HDPE	94.0	LF	\$20.10	\$1,889.40
R4 RIP RAP (INLETS/OUTLETS)	3.0	TON	\$29.00	\$87.00
AASHTO #1 STONE (DITCH CHECKS)	0.0	TON	\$51.80	\$0.00
DITCH LINING - (ACCESS ROAD) SYNTHETIC MATTING (TRM)	0.0	SY	\$3.80	\$0.00
DITCH LINING - (ACCESS ROAD) ROCK-LINED DITCH (R4)	20.4	TON	\$16.80	\$342.72
TOTAL				\$2,319.12
SEEDING				
	QUANTITY	UNIT	UNIT PRICE	FINAL PRICE
SITE SEEDING (LIME, FERTILIZER, SEEDING, AND HYDRO-MULCH w/TACK (HYC-2 OR EQUAL))	0.1	AC	\$3,302.00	\$330.20
TOTAL				\$330.20
LINER SYSTEM				
	QUANTITY	UNIT	QUANTITY	UNIT
60 MIL TEXTURED PRIMARY LINER	0.0	SY		\$0.00
16 OZ. NON-WOVEN GEOTEXTILE FABRIC CUSHION	0.0	SY		\$0.00
TOTAL				\$0.00
NOTE: THE SQUARE YARDAGE FOR THE LINER SYSTEM DOES NOT ACCOUNT FOR MATERIAL OVERLAP AND WASTE.				
UNFORESEEN SITE CONDITIONS				
	QUANTITY	UNIT	UNIT PRICE	FINAL PRICE
*FRENCH DRAINS		FT		\$0.00
*PHASE 1 FENCING - STEEL CORRUGATED PANELS w/"T" POST (10 FT CENTERS) - WETLAND PROTECTION		LF		\$0.00
*PHASE 2 FENCING - SILT FENCE AND OR FILTER SOCK OUTSIDE OF PHASE 3 FENCING - WETLAND PROTECTION		LF		\$0.00
*PHASE 3 FENCING - ORANGE SAFETY FENCE w/"T" POST (10FT CENTERS) - WETLAND PROTECTION		LF		\$0.00
*SILT FENCE		LF		\$0.00
*TEMPORARY SEEDING		AC		\$0.00
*CONSTRUCTION STAKEOUT		HOUR		\$0.00
* 4 FT FARM FENCE (WOOD CORNER AND PULL POST & "T" POST - 10 FT SPACING)		LF		\$0.00
* 5 STRAND BARB WIRE FENCE (WOOD CORNER AND PULL POST & "T" POST - 10 FT SPACING)		LF		\$0.00
TOTAL				\$0.00

GRAND TOTAL	\$29,503.54
--------------------	--------------------

ANTERO RESOURCES WILL PROVIDE THE FOLLOWING:

- 102" x 78" x 44" PRE CAST SUMP
- VALVE FOR SUMP DISCHARGE
- TX 190 GEOGRID OR EQUIVALENT
- GEOTEXTILE FABRIC (US 200) OR EQUIVALENT
- ALL HDPE CULVERT PIPE
- ALL AGGREGATE



August 21, 2013

Doddridge County Commission
118 East Court Street
West Union, WV 26456

Attn: Dan Wellings, Doddridge County Floodplain Administrator

Re: Snake Run Well Pad - Floodplain Analysis

Dear Mr. Wellings:

Navitus Engineering has completed a floodplain analysis for the access road entrance to the Snake Run Well Pad along County Route 25, south of New Milton, in Doddridge County, West Virginia. The entrance to the proposed site is located within FEMA Flood Zone A, as shown on the Flood Insurance Rate Maps (FIRM) from the National Flood Insurance Program (NFIP), Map Number 54017C0235C dated October 4, 2011. Being that the site entrance is located in a Flood Zone A, base flood elevations for this area have not been established, detailed information for Meathouse Fork is found within the Flood Insurance Study for Doddridge County, dated October 4, 2011 and was used to compare 100 year flow rates calculated with this study in HEC-HMS.

A hydrologic and hydraulic analysis was performed as outlined in the current Doddridge County Floodplain Ordinance, enacted May 31st, 2013. Using field shot data, aerial mapping, 10-foot interval topography converted from 3 meter West Virginia GIS Technical Center DEM data, and information taken from USGS 7.5 Minute Series Topographic Maps, a drainage analysis was performed for the Meathouse Fork drainage shed. Calculated peak flows for the 100-year storm event were checked for accuracy with the Flood Insurance Study. A HEC-RAS river analysis was conducted for a section of Meathouse Fork adjacent to the Snake Run Well Pad site entrance area and Base Flood Elevations (BFE) were established. The resulting BFEs were used to establish adjusted floodplain boundaries for the segment of Meathouse Fork being studied. These boundaries are shown on the attached Floodplain Exhibit of this development site. The mapped existing 100 year BFEs do not impact the proposed site development entrance location, as such improvements were for the Snake Run Well Pad Site were located outside of the 100 year BFE. A proposed conditions model was not run as the proposed improvements are located outside of the mapped floodplain. The results of this analysis indicate that the proposed access road improvements will cause no impacts to the BFEs in this area and no upstream or downstream properties will be impacted.

Attached are the following documents associated with this submission:

- A Floodplain Analysis of Meathouse Fork documenting the methods used for the analysis, drainage computations, cross sections, and a narrative to describe the analysis. Included with this analysis are exhibits that identify the existing and proposed 100-year floodplain.
- The Snake Run Well Pad Site Plan, prepared by Navitus Engineering, Inc. which includes additional site design and construction specifications.

Engineering Dedicated to the Development and Transmission of Energy
Serving PA-WV-OH-NY
Engineering Surveying Environmental GIS
www.navituseng.com

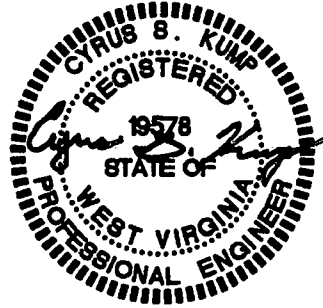
- Floodplain Permit Application Fee
- Doddridge County Improvement Location Permit Application

Should any questions or comments arise during the review, please let us know and we will work to address them. Please let me know if you should need additional information. You can reach me by phone (540) 336-9486 or email: dmurphy@navituseng.com.

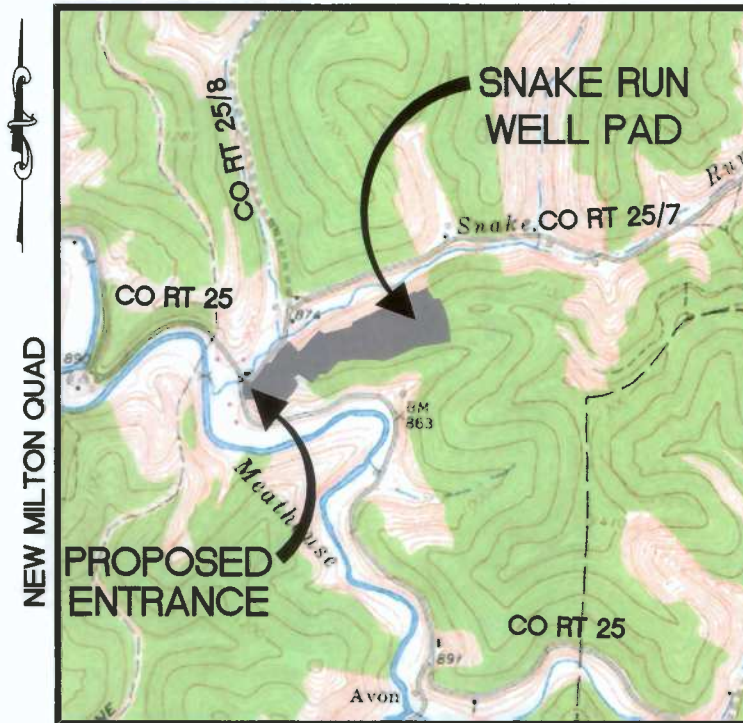
Sincerely,
Navitus Engineering, Inc.



Daniel E. Murphy, CFM



FLOODPLAIN ANALYSIS OF
MEATHOUSE FORK
SNAKE RUN
WELL PAD



VICINITY MAP

1" = 2,000'



Prepared For:



981 East Washington Avenue
Ellenboro, WV 26346
(304) 869-3405

Contacts:

Aaron Kunzler, Construction Supervisor
(405) 227-8344
Anthony Smith, Field Engineer
(304) 673-6196
Jack Bell, Land Agent
(304) 376-9682
Chris Brown, Water Resources
(304) 877-8233

Engineering ◀ Survey ◀ Environmental ◀ GIS

Designed By:
Navitus Engineering Inc.

Project Manager:
Dan Murphy, CFM
dmurphy@navituseng.com

Surface Owner (s)
Michael & William Duffelmeyer
Sharon D. Stilson & June M. Conley
Gibson L., III & Deana K. Clark

Tax Parcel:
Map 13 Parcel 33 & Parcel 26.3

Location:
New Milton District, Doddridge County
West Virginia



Date: August 21, 2013

FN# ANT056

1. Objective

The objective of this floodplain analysis was to establish boundaries for the existing and proposed conditions of the 100 year base flood elevations (BFE). The proposed condition includes the installation of an access road for a well pad where the entrance off of County Route 25 is within the FEMA floodplain.

2. Existing Conditions

2.1. *Property Description*

This site is located in Doddridge County, West Virginia along Meathouse Fork and County Route 25 south of New Milton. The proposed access road entrance is located on the north side of County Route 25.

2.2. *Floodplain Delineation*

The approximate limit of the 100-year floodplain (a flood event that has a 1% chance of being equaled or exceeded in any given year) is shown on FEMA Flood Insurance Rate Map (FIRM) for Doddridge County on panels 54017C0235C effective October 4, 2011. This floodplain is located in flood zone designation "A" as shown on the FIRM, and there has not been a detailed study analysis with whole foot base flood elevations established within the Doddridge County Flood Insurance Study (FIS) effective October 4, 2011.

2.3. *Floodplain Ordinance*

This site is administered under the Doddridge County Floodplain Ordinance, enacted May 31st, 2013.

Per Section 4.4.A of the ordinance, when a site is located in FEMA Flood Zone designation "A" the Floodplain Administrator shall use elevation and floodway information from Federal, State, or other acceptable sources when available to determine the elevation above which development will reasonably safe from flooding.

Per Section 4.4.B. of the ordinance, when data from an acceptable source is not available, the Floodplain Administrator shall review, or shall cause to be reviewed; all proposed development to determine (1) the amount being invested and (2) the specific flood risk at the site. The Floodplain Administrator shall then require the applicant to determine the elevation above which the development and adjacent properties including but not limited to existing buildings will be reasonably safe from flooding using hydrologic and hydraulic analyses or other techniques. When hydrologic and hydraulic analyses are required, they shall only be prepared by a registered professional engineer who shall certify that the methods used correctly reflect currently accepted technical concepts. The resulting study shall include a cover letter, signed by the responsible professional, providing a statement of findings in basic terms. In addition, studies, analyses, computations, etc. shall be submitted in sufficient detail to allow a thorough review by the Floodplain Administrator.

Per Section 4.4.C. of the ordinance, any development and/or use of land shall be permitted provided that all such uses, activities and/or development shall be undertaken in strict compliance with the flood-proofing and related provisions contained herein and in all other applicable Federal and State Laws, Ordinances and Regulations.

Per Section 4.4.D. of the ordinance, within any apportioned Floodplain Zone (Zone A) without Floodway Area, no new construction or development shall be allowed unless it is demonstrated that the cumulative impact of the proposed development, when combined with all other existing and anticipated development, will not increase the elevation of the 100-year flood more than one (1) foot at any point.

Per Section 5.1 of this ordinance, permits are required for the construction of the entrance to the well pad site. The format of the permit will coincide with the requirements set forth in Section 5.2 of the ordinance.

Per Section 6.1.E of this ordinance, any fill associated with the project shall be only used in manner which does not affect upstream and downstream properties. The access road entrance has been designed with this in mind and the entrance construction will consist only of excavation and proposes no fill within Flood Zone "A". Impacts to the 100 year are demonstrated later in this report, however, the entrance road is located outside of the existing 100 year BFE and did not cause a rise in the base flood elevations.

Per Section 6.1.I of this ordinance, no material or equipment storage shall be allowed within the vicinity of the entrance. The storage of all material and equipment shall be onsite and away from the entrance.

Per Section 6.1.K of this ordinance, an entrance culvert is proposed at the entrance to allow adequate drainage to the existing road side ditch.

All other specific requirements covered in Section 6.1 of this ordinance are not applicable to this design. (Sections 6.1.A, 6.1.B, 6.1.C, 6.1.D, 6.1.F, 6.1.G, 6.1.H, 6.1.J, and 6.1.L)

The developer shall conform with all administrative procedures as outline in Article 7 of this ordinance.

2.4. Meathouse Fork Characteristics

Meathouse Fork is located in several districts of Doddridge County and flows in a northwesterly direction. The drainage area flowing to Meathouse Fork at the access road entrance location is approximately 15,955 acres of forested and agricultural land with an average basin slope of 38.86%.

3. Analysis Information

3.1. *HEC-RAS*

A HEC-RAS hydraulic analysis was performed for the portion of the Meathouse Fork that has an impact on the BFE's across the property. HEC-RAS is designed to perform one-dimensional hydraulic calculations for a full network of natural and constructed channels. The steady flow system is designed for applications in floodplain management and flood insurance studies.

3.2. *Analysis Limits*

The analysis information is based upon two foot interval aerial shot topography by Blue Mountain Aerial Mapping. The upstream analysis limit for Meathouse Fork is located approximately 831 feet upstream from the proposed entrance location and represents the 22+37.459 section. The downstream analysis limit for Meathouse Fork is located approximately 359 feet downstream of the proposed entrance location and represents the 10+47.311 section. These limits were selected so that the HEC-RAS model would accurately determine the base flood elevations on site and off site.

3.3. *Flow Data*

The hydrologic analysis utilized USDA soil surveys for computation of drainage shed curve numbers, aerial topography and 3 meter West Virginia GIS Technical Center DEM to determine the drainage area(s) and time of concentration path(s). The peak 100-year discharge within the inundation area was determined through TR-55 SCS methodology. Time of concentration paths were calculated utilizing the SCS lag method. The hydrologic calculations for the drainage area were performed using HEC-HMS. See the table below for a summary of the flow conditions and see Supplement 1 for the complete Drainage Computations.

Stream	Drainage Area	Flow (cfs)	Note
Meathouse Fork	14,911 Ac.	5,866.7	Upper Reach
Snake Run	1,043 Ac.	1,089.1	Tributary to Meathouse Fork

3.4. *Cross Section Data*

The cross sections were employed at significant changes in site features. This includes major bends in the stream channel, areas of major contraction and expansion of the floodplain area, upstream and downstream of existing culverts, and at building obstructions (cross sections were compiled using Aerial Mapping by Blue Mountain Aerial Mapping).

3.5. *Manning's n-value*

The channel and overbank areas were assigned manning's n-values based on photographs and close inspection of existing aerial photography. The chart below describes the manning's n values used in this study.

Manning's n value	Description	Portion Used
.035	Clean, straight, full, no rifts or deep pools, some stones and weeds	Main Channel
.035	High grass	Floodplains
.05	Scattered brush, heavy weeds	Floodplains

4. Results

4.1. Existing Conditions

Since the site is in Zone "A" floodplain area as shown on the FIRM, there has not been a detailed study analysis with whole foot base flood elevations established within the Doddridge County Flood Insurance Study (FIS) effective October 4, 2011. An existing conditions model was prepared based upon aerial topography and existing drainage computations. This information was processed in HEC-RAS to determine the existing conditions of the Base Flood Elevations.

4.2. Proposed Conditions

A proposed conditions model was not run. Mapping the existing model indicated that the proposed entrance location to the well pad site was located outside of the existing 100 year BFE. Furthermore, construction of the access road to the well pad site would consist only of excavation and no fill would have been placed within the floodway. A summary of BFEs for the resulting study can be found below.

SNAKE RUN WELL PAD FLOODPLAIN STUDY SUMMARY OF COMPUTED ELEVATIONS		
CROSS SECTION STATION	RIVER NAME	100 Year Base Flood Elevation
		EXISTING CONDITIONS MODEL
2237.459	Meathouse Fork-Upper	858.2
2072.695	Meathouse Fork-Upper	858.1
1848.773	Meathouse Fork-Upper	857.9
1705.05	Meathouse Fork-Upper	857.6
1490.245	Meathouse Fork-Upper	857.7
1406.162	Meathouse Fork-Upper	857.6

1979.445	Snake Run	860.9
1706.299	Snake Run	859.9
1635.66	Snake Run	859.7
1524.031	Snake Run	859.8
1428.024	Snake Run	859.8
1406.067	Snake Run	Bridge
1364.057	Snake Run	857.4
1232.097	Snake Run	857.7
1145.071	Snake Run	857.7
1221.861	Meathouse Fork-Lower	857.5
1047.311	Meathouse Fork-Lower	857.2

5. Conclusion

The results of this floodplain analysis indicate that there will be no changes in the 100 year base flood elevation and no impacts to upstream and downstream properties along Meathouse Fork.

APPENDIX

Exhibit A	FIRM Panel 54017C0235C
Exhibit B	Existing Conditions Plan
Exhibit C	Proposed Conditions Plan
Supplement 1	Drainage Computations
Supplement 2	HEC-RAS Analysis –Existing Conditions Summary w/ Cross Sections

Exhibit A

FIRM Panel 54017C0235C

**CERTIFICATE OF COMPLIANCE
FOR DEVELOPMENT IN SPECIAL FLOOD HAZARD AREA
(OWNER MUST RETAIN)**

PERMIT NUMBER: 13-083

PERMIT DATE: 11/13/2013

PURPOSE - Calvert extension

CONSTRUCTION LOCATION: Meathouse Fork

OWNER'S ADDRESS: Antero Resources
1625 17TH STREET
Denver, CO. 80202

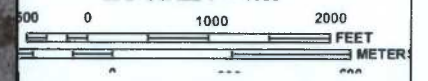
THE FOLLOWING MUST BE COMPLETED BY THE FLOODPLAIN ADMINISTRATOR/MANAGER OR HIS/HER AGENT.

COMPLIANCE IS HEREBY CERTIFIED WITH THE REQUIREMENT OF THE FLOODPLAIN ORDINANCE ADOPTED BY THE COUNTY COMMISSION OF DODDRIDGE COUNTY ON MAY 21, 2013.

SIGNED Dan Wells DATE 12/06/2013



MAP SCALE 1" = 1000'



PANEL 0235C


FIRM
FLOOD INSURANCE RATE MAP
DODDRIDGE COUNTY,
WEST VIRGINIA
AND INCORPORATED AREAS

PANEL 235 OF 325
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	54017C	0235C	






Notice to User: The Map Number shown below should be used when placing map orders, the Community Number shown above should be used on insurance applications for the subject community.


MAP NUMBER
54017C0235C
MAP REVISED
OCTOBER 4, 2011
 Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using FIRM OnLine. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Exhibit B
Existing Conditions Plan

LEGEND

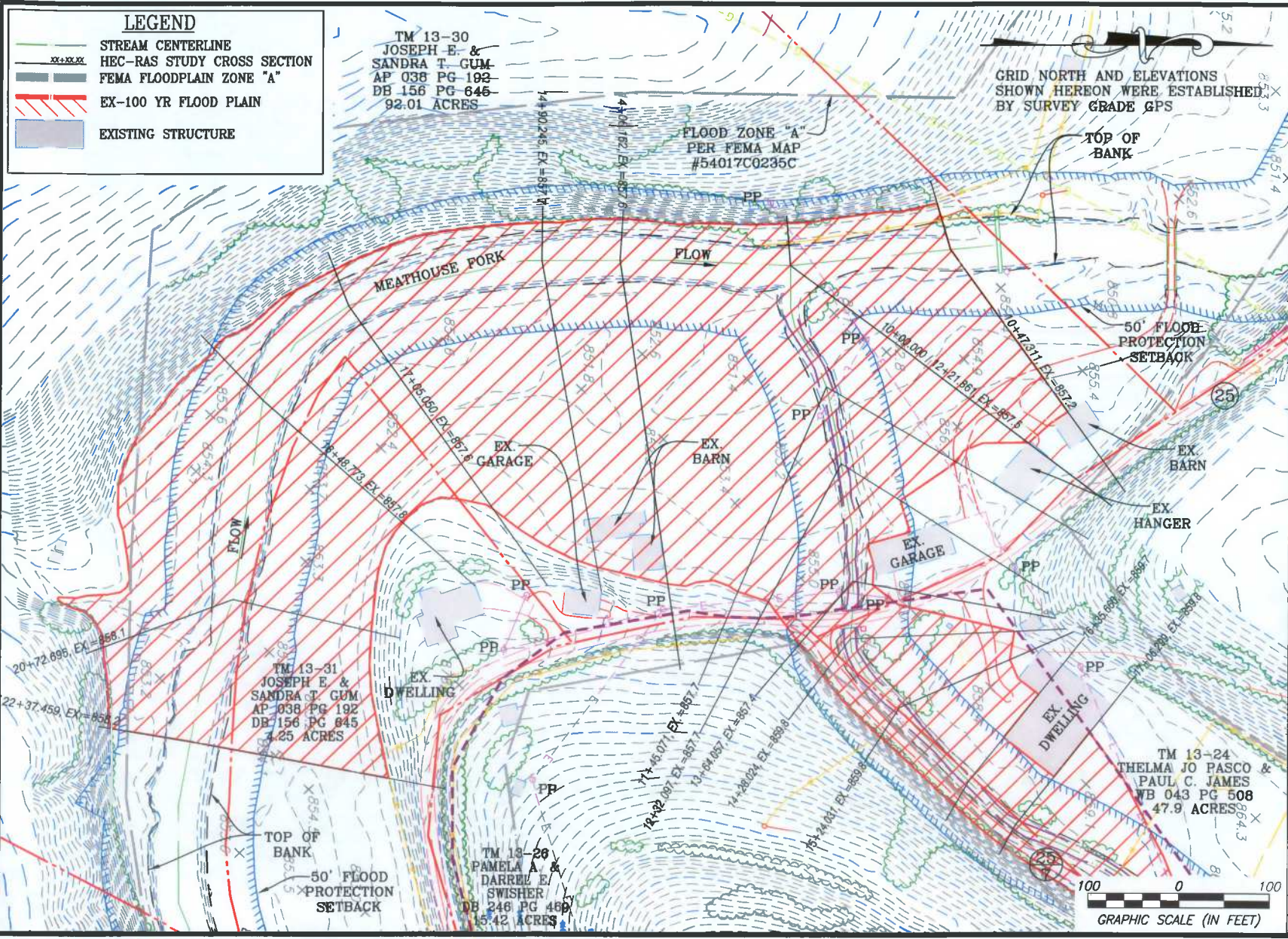
-  STREAM CENTERLINE
-  HEC-RAS STUDY CROSS SECTION
-  FEMA FLOODPLAIN ZONE "A"
-  EX-100 YR FLOOD PLAIN
-  EXISTING STRUCTURE

TM 13-30
JOSEPH E. &
SANDRA T. GUM
AP 038 PG 192
DB 156 PG 645
92.01 ACRES

FLOOD ZONE "A"
PER FEMA MAP
#54017C0235C

GRID NORTH AND ELEVATIONS
SHOWN HEREON WERE ESTABLISHED
BY SURVEY GRADE GPS

TOP OF
BANK



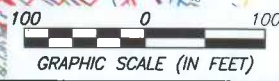
TM 13-31
JOSEPH E. &
SANDRA T. GUM
AP 038 PG 192
DB 156 PG 645
4.25 ACRES

TOP OF
BANK

50' FLOOD
PROTECTION
SETBACK

TM 13-26
PAMELA A. &
DARREL E.
SWISHER
DB 246 PG 489
15.42 ACRES

TM 13-24
THELMA JO PASCO &
PAUL C. JAMES
WB 043 PG 508
47.9 ACRES



NAVITUS
ENGINEERING INC.

151 Woods Hill Lane
Winchester, Virginia 22602
Telephone: (888) 662-4185
www.navituseng.com

Engineering Survey Environmental GIS

CIRCUIT 8, KUM
REGISTERED
1978
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

08/21/2013

ANTERO
RESOURCES

THIS DOCUMENT
WAS PREPARED
FOR:
ANTERO RESOURCES
CORPORATION

EXISTING CONDITIONS PLAN

**SNAKE RUN
FLOODPLAIN STUDY**

NEW MILTON DISTRICT
DODDRIDGE COUNTY, WV


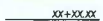



SCALE: 1" = 100'

SNAKE RUN
JOB NO. ANT056

DATE: 08/21/2013

Exhibit C
Proposed Conditions Plan

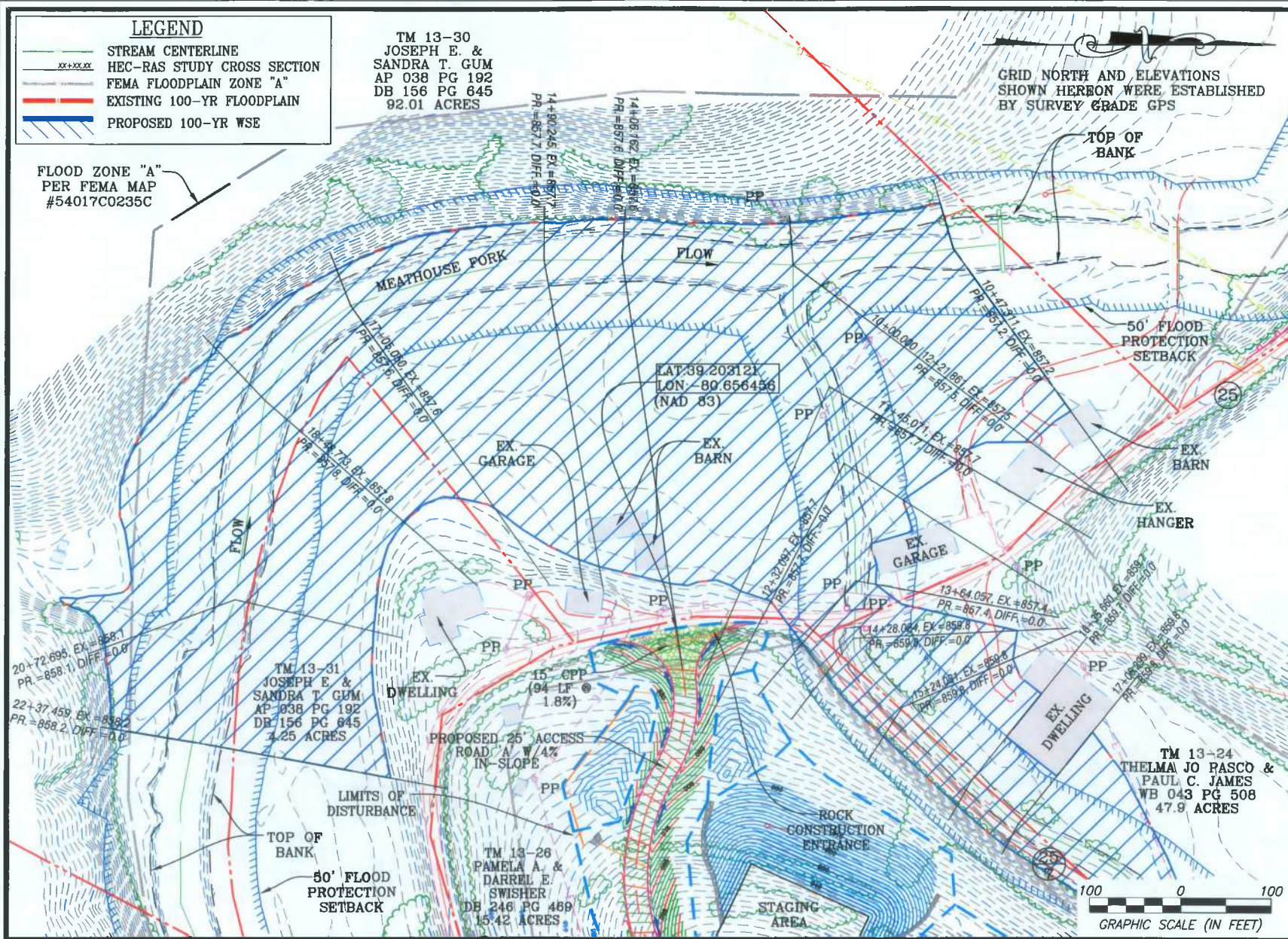
LEGEND

-  STREAM CENTERLINE
-  HEC-RAS STUDY CROSS SECTION
-  FEMA FLOODPLAIN ZONE "A"
-  EXISTING 100-YR FLOODPLAIN
-  PROPOSED 100-YR WSE

TM 13-30
JOSEPH E. &
SANDRA T. GUM
AP 038 PG 192
DB 156 PG 645
92.01 ACRES

GRID NORTH AND ELEVATIONS
SHOWN HEREON WERE ESTABLISHED
BY SURVEY GRADE GPS

FLOOD ZONE "A"
PER FEMA MAP
#54017C0235C



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CYRUS B. KUMAR
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STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

08/21/2013

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RESOURCES

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FOR:
ANTERO RESOURCES
CORPORATION

PROPOSED CONDITIONS PLAN

**SNAKE RUN
FLOODPLAIN STUDY**

NEW MILTON DISTRICT
DODDRIDGE COUNTY, WV

SCALE: 1" = 100'

SNAKE RUN
JOB NO. ANT056

DATE: 08/21/2013



Supplement 1
Drainage Computations

Project: Snake Run

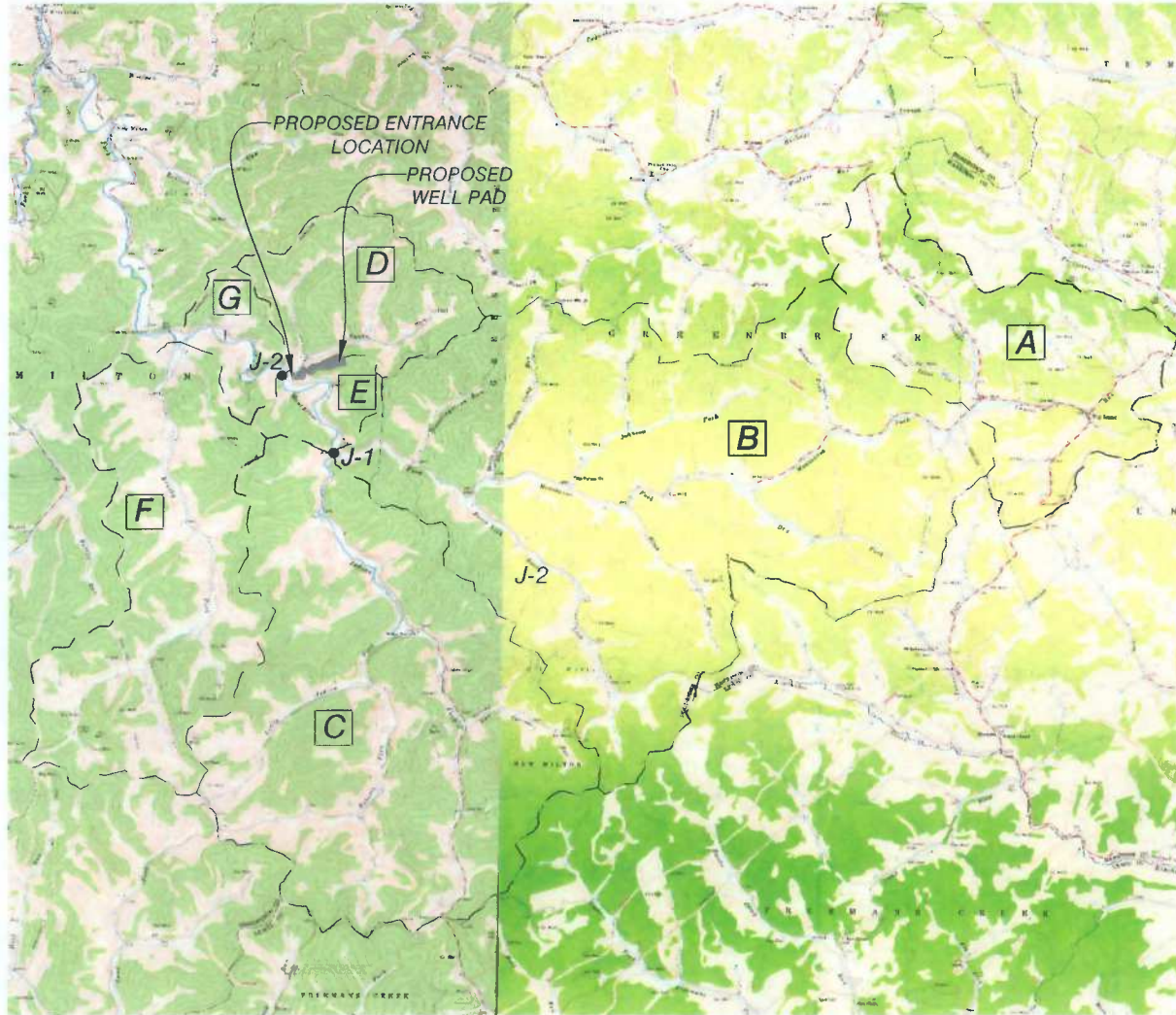
Simulation Run: Existing

Start of Run: 02Aug2013, 00:00
End of Run: 03Aug2013, 00:05
Compute Time: 02Aug2013, 08:20

Basin Model: Existing
Meteorologic Model: 100 YR
Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Upper Meathouse	11.19	2489.9	02Aug2013, 15:15	1176
Indian Run	7.86	2389.7	02Aug2013, 14:05	858.3
Big Isaac/Laurel	3.72	2013.9	02Aug2013, 12:50	419.4
Reach-3	3.72	2013.9	02Aug2013, 15:50	391
Junction-1	22.77	5730.7	02Aug2013, 15:45	2425.4
Reach-1	22.77	5728.2	02Aug2013, 16:15	2391
Snake Run	1.63	1089.1	02Aug2013, 12:35	184.9
Middle Meathouse	0.53	432.1	02Aug2013, 12:25	60.4
Junction-2	24.93	5866.7	02Aug2013, 16:15	2636.4
Reach-2	24.93	5858.9	02Aug2013, 16:50	2589.5
Brushy Creek	4.29	1630.1	02Aug2013, 13:30	475.9
Lower Meathouse	0.63	453.2	02Aug2013, 12:30	71.6
Downstream	29.85	6258.1	02Aug2013, 16:50	3137

DRAINAGE MAP



USGS 7.5 NEW MILTON QUAD MAP

USGS 7.5 BIG ISAAC QUAD MAP

WEST VIRGINIA STATE PLANE
 COORDINATE SYSTEM
 NORTH ZONE, NAD83
 ELEVATION BASED ON NAVD88
 ESTABLISHED BY SURVEY GRADE GPS
 & OPUS POST-PROCESSING

KEY	HYDROLOGIC ELEMENT	DRAINAGE AREA (SQ. MI.)
A	BIG ISAAC / LAUREL RUN	3.72
B	UPPER MEATHOUSE	11.19
C	INDIAN RUN	7.86
D	SNAKE RUN	1.63
E	MIDDLE MEATHOUSE	0.53
F	BRUSHY CREEK	4.29
G	LOWER MEATHOUSE	0.63
	TOTAL	29.85

J-1	JUNCTION 1
J-2	JUNCTION 2



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 CORPORATION

DRAINAGE MAP
**SNAKE RUN
 FLOODPLAIN STUDY**
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WV

SCALE: 1" = 5000'

SNAKE RUN
 JOB NO. ANT056

DATE: 08/21/2013

Supplement 2

HEC-RAS Analysis –Existing Conditions Summary w/ Cross Sections

Antero

13-083



Meat house Fork
near Darrell Swisher
residence

12/04/2013

DJW

SnakeRun.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X   X  XXXXXX   XXXX       XXXX   XX   XXXX
X   X  X       X   X       X  X   X  X   X
X   X  X       X           X  X   X  X   X
XXXXXXXX XXXX   X           XXX XXXX   XXXXXX   XXXX
X   X  X       X           X  X   X  X   X
X   X  X       X   X       X  X   X  X   X
X   X  XXXXXX   XXXX       X   X   X   X   XXXXXX
```

PROJECT DATA

Project Title: Snake Run
Project File : SnakeRun.prj
Run Date and Time: 8/7/2013 1:59:53 PM

Project in English units

PLAN DATA

Plan Title: Existing
Plan File : x:\Navitus Jobfiles\Antero Resources\ANT056-Snake Run\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\SnakeRun.p01

Geometry Title: Existing
Geometry File : x:\Navitus Jobfiles\Antero Resources\ANT056-Snake Run\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\SnakeRun.g01

Flow Title : Existing
Flow File : x:\Navitus Jobfiles\Antero Resources\ANT056-Snake Run\Engineering\Drainage Comp\Floodplain\Entrance Study\Computations\HEC-RAS\SnakeRun.f01

Plan Summary Information:

Number of:	Cross Sections =	10	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

water surface calculation tolerance =	0.01
critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Existing
Flow File : x:\Navitus Jobfiles\Antero Resources\ANT056-Snake Run\Engineering\Drainage Comp\Floodplain\Entrance
Study\Computations\HEC-RAS\SnakeRun.f01

Flow Data (cfs)

Table with 4 columns: River, Reach, RS, PF 1. Rows include Meathouse Fork and Snake Run at different reaches.

Boundary Conditions

Table with 4 columns: River, Reach, Profile, Upstream/Downstream. Includes boundary conditions for Meathouse Fork and Snake Run.

GEOMETRY DATA

Geometry Title: Existing
Geometry File : x:\Navitus Jobfiles\Antero Resources\ANT056-Snake Run\Engineering\Drainage Comp\Floodplain\Entrance
Study\Computations\HEC-RAS\SnakeRun.g01

Reach Connection Table

Table with 4 columns: River, Reach, Upstream Boundary, Downstream Boundary. Shows connections between reaches like Meathouse Fork and Snake Run.

JUNCTION INFORMATION

SnakeRun.rep

Name: 1
 Description:
 Energy computation Method

Length across Junction		Tributary		Reach	Length	Angle
River	Reach	River	Reach			
Meathouse Fork	Meathouse Fork	to Meathouse Fork	Lower		184.26	0
Snake Run	Snake Run	to Meathouse Fork	Lower		0	0

CROSS SECTION

RIVER: Meathouse Fork
 REACH: Meathouse Fork RS: 2237.459

INPUT

Description:

Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	870	1.13	868.84	1.93	868	2.4	867.54	4.02	866
6.03	864.1	6.14	864	6.41	863.74	8.24	862	9.65	860.65
10.33	860	11.6	858.79	14.52	856	18.63	855.67	19.81	855.62
28.09	855.03	53.21	854	60.22	854	60.33	853.98	60.43	853.97
60.53	853.95	60.91	853.89	72.94	852	72.99	851.79	73.49	850
73.65	849.44	74.11	848	74.32	846.91	74.35	846.79	74.38	846.71
74.41	846.71	98.93	846.98	118.29	847.21	122.95	848.86	126.16	850
131.59	851.94	131.74	852	133.77	852.07	137.06	852.18	190.05	854
290.7	854	296.56	854.9	299.73	855.38	303.97	856	310.6	856.98
317.56	858	321.21	859.18	323.61	860	329.01	861.97	329.09	862
329.16	862.03	333.28	864	334.49	864.59	337.39	866	338.7	866.66
341.4	868	343.1	868.89	345.16	870	347.22	871.13	348.76	872
351.95	873.21	353.61	873.81	360.52	872.96	362.92	872.67	368.27	872
372.32	872	373.34	872.97	374.42	874	375.28	874.82	376.52	876
377.17	876.62	378.61	878	378.99	878.36	380.71	880		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	72.94	.035	131.59	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	72.94	131.59		82.1	164.3	174.84	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

* E.G. Elev (ft)	* 858.46	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.27	* Wt. n-Val.	* 0.050	* 0.035	* 0.035
* W.S. Elev (ft)	* 858.18	* Reach Len. (ft)	* 82.10	* 164.30	* 174.84
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 226.29	* 620.25	* 782.69
* E.G. Slope (ft/ft)	*0.000695	* Area (sq ft)	* 226.29	* 620.25	* 782.69

SnakeRun.rep

```

* Q Total (cfs)          * 5866.70 * Flow (cfs)           * 421.06 * 3170.53 * 2275.11 *
* Top width (ft)        * 305.90 * Top width (ft)       * 60.71  * 58.65  * 186.54  *
* Vel Total (ft/s)      * 3.60   * Avg. Vel. (ft/s)    * 1.86   * 5.11   * 2.91   *
* Max Chl Dpth (ft)     * 11.47  * Hydr. Depth (ft)    * 3.73   * 10.58  * 4.20   *
* Conv. Total (cfs)     *222609.8 * Conv. (cfs)         * 15976.8 *120304.7 * 86328.4 *
* Length Wtd. (ft)     * 158.31 * Wetted Per. (ft)    * 61.79  * 63.52  * 186.91  *
* Min Ch El (ft)       * 846.71 * Shear (lb/sq ft)    * 0.16   * 0.42   * 0.18   *
* Alpha                 * 1.36   * Stream Power (lb/ft s) * 380.71 * 0.00   * 0.00   *
* Frctn Loss (ft)      * 0.11   * Cum Volume (acre-ft) * 3.93   * 14.37  * 14.85  *
* C & E Loss (ft)      * 0.00   * Cum SA (acres)      * 0.97   * 1.20   * 2.51   *
*****

```

CROSS SECTION

RIVER: Meathouse Fork
 REACH: Meathouse Fork RS: 2072.695

INPUT

Description:

Station Elevation Data num= 82

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	870	1.87	868.89	3.42	868	5.77	866.86	7.72	866
10.83	864.19	11.12	864	12.15	863.27	13.96	862	14.62	861.53
16.64	860	17.4	859.43	19.42	858	20.24	857.38	22.24	856
24.54	855.88	26.14	855.82	32.17	855.53	61.98	854	69.07	854
70.81	853.07	74.56	852.04	76.72	852.04	79.95	852.16	80.54	852.13
85.41	852.28	86.34	852.24	89.89	852.37	98	852.44	104.39	852.31
105.55	852.28	112.09	852.12	112.32	852.12	112.39	852.12	116	852
116.88	852	116.92	852	117.95	851.89	120.93	851.58	122.61	851.35
126.8	850.88	130.05	850.47	131.61	850.3	133.87	850	134.1	849.97
135.37	849.8	135.62	849.76	136.57	849.6	140.79	848.95	145.91	848
146.09	847.96	147.2	847.62	149.4	846.71	165.18	846.98	178.47	847.21
178.78	847.39	179.26	847.66	179.85	848	182.7	849.63	183.39	850
183.91	850.28	187.06	852	204.67	852.71	213.16	853.05	236.89	854
289.7	854	303.96	855.54	308.35	856	311.37	856.48	321.08	858
326.25	859.89	326.55	860	327.1	860.21	331.62	862	333.57	862.76
336.85	864	339.45	864.97	342.22	866	345.88	867.37	347.57	868
352.09	869.7	352.89	870						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	116.92	.035	187.06	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 116.92 187.06 374.93 223.92 99.39 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

 * E.G. Elev (ft) * 858.34 * Element * Left OB * Channel * Right OB *

SnakeRun.rep

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* Vel Head (ft)          * 0.28 * Wt. n-Val.          * 0.050 * 0.035 * 0.035 *
* W.S. Elev (ft)        * 858.06 * Reach Len. (ft)    * 374.93 * 223.92 * 99.39 *
* Crit w.s. (ft)        *          * Flow Area (sq ft)  * 428.08 * 660.15 * 537.46 *
* E.G. slope (ft/ft)    * 0.000750 * Area (sq ft)       * 428.08 * 660.15 * 537.46 *
* Q Total (cfs)         * 5866.70 * Flow (cfs)         * 926.89 * 3365.92 * 1573.90 *
* Top width (ft)        * 301.93 * Top width (ft)     * 97.59 * 70.14 * 134.20 *
* Vel Total (ft/s)      * 3.61 * Avg. Vel. (ft/s)   * 2.17 * 5.10 * 2.93 *
* Max Chl Dpth (ft)     * 11.35 * Hydr. Depth (ft)   * 4.39 * 9.41 * 4.01 *
* Conv. Total (cfs)     * 214169.6 * Conv. (cfs)        * 33836.9 * 122876.1 * 57456.6 *
* Length wtd. (ft)     * 203.05 * Wetted Per. (ft)   * 98.69 * 71.91 * 134.51 *
* Min Ch El (ft)       * 846.71 * Shear (lb/sq ft)   * 0.20 * 0.43 * 0.19 *
* Alpha                 * 1.38 * Stream Power (lb/ft s) * 352.89 * 0.00 * 0.00 *
* Frctn Loss (ft)      * 0.16 * Cum Volume (acre-ft) * 3.32 * 11.95 * 12.20 *
* C & E Loss (ft)      * 0.01 * Cum SA (acres)     * 0.82 * 0.95 * 1.87 *
*****

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CROSS SECTION

RIVER: Meathouse Fork
 REACH: Meathouse Fork RS: 1848.773

INPUT

Description:

Station Elevation Data		num= 97									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	870	3.03	868.04	3.08	868	6.06	866.07	6.17	866		
9.09	864.1	9.25	864	12.39	862.04	12.45	862	12.6	861.92		
16.12	860	17.69	859.23	21.15	858	21.32	857.95	22.6	857.55		
26.76	856.25	27.45	856	30.62	855.67	46.98	854	51.55	853.54		
57.15	853.03	68.45	852	72.3	851.01	76.37	850	76.44	849.95		
78.76	848	80.31	846.71	90.33	846.81	126.97	847.21	127.02	847.24		
127.1	847.29	128.12	847.85	128.41	848	130.91	849.38	132	850		
133.88	851.04	135.56	852	138.78	852.18	142.55	852.39	143.49	852.43		
148.86	852.72	149.98	852.75	154.48	852.98	159.84	853.25	163.01	853.41		
163.95	853.39	165.21	853.45	165.77	853.48	166.38	853.52	168.18	853.59		
168.79	853.61	236.56	854	274.47	854	287.42	855.5	291.79	856		
293.17	856.23	303.42	858	310.17	859.14	315.18	860	319.09	860.56		
324.23	861.27	330.28	862	332.28	862.24	337.01	862.84	344.28	863.56		
345.87	863.73	346.65	863.8	349.2	864	355.36	864.67	356.33	864.78		
358.26	864.99	361.68	865.34	365.26	865.79	365.68	865.83	366.91	866		
369.36	866.43	370.58	866.64	372.33	866.93	373.29	867.05	377.13	867.68		
377.6	867.74	378	867.79	379.15	868	382.69	868.3	385.38	868.52		
387.45	868.68	389.39	868.79	391.77	868.96	395.59	869.23	401.71	869.89		
401.97	869.91	402.08	869.92	402.72	870	402.81	870.01	404.32	870.19		
407.49	870.23	408.18	870.27								

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.05	68.45	.035	135.56	.035

SnakeRun.rep

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 68.45 135.56 164.92 140.43 77.8 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

```
*****
* E.G. Elev (ft) * 858.18 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.33 * Wt. n-Val. * 0.050 * 0.035 * 0.035 *
* W.S. Elev (ft) * 857.85 * Reach Len. (ft) * 164.92 * 140.43 * 77.80 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 165.46 * 670.94 * 645.33 *
* E.G. slope (ft/ft) *0.000799 * Area (sq ft) * 165.46 * 670.94 * 645.33 *
* Q Total (cfs) * 5866.70 * Flow (cfs) * 320.44 * 3641.01 * 1905.25 *
* Top width (ft) * 280.91 * Top width (ft) * 46.81 * 67.11 * 166.99 *
* Vel Total (ft/s) * 3.96 * Avg. Vel. (ft/s) * 1.94 * 5.43 * 2.95 *
* Max Chl Dpth (ft) * 11.14 * Hydr. Depth (ft) * 3.53 * 10.00 * 3.86 *
* Conv. Total (cfs) *207490.5 * Conv. (cfs) * 11333.1 *128773.4 * 67384.0 *
* Length wtd. (ft) * 117.96 * Wetted Per. (ft) * 47.29 * 69.80 * 167.30 *
* Min Ch El (ft) * 846.71 * Shear (lb/sq ft) * 0.17 * 0.48 * 0.19 *
* Alpha * 1.36 * Stream Power (lb/ft s) * 408.18 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.12 * Cum Volume (acre-ft) * 0.76 * 8.53 * 10.85 *
* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.20 * 0.60 * 1.53 *
*****
```

CROSS SECTION

RIVER: Meathouse Fork
 REACH: Meathouse Fork RS: 1705.050

INPUT

Description:

Station Elevation Data		num= 94	
Sta	Elev	Sta	Elev
0	870	3.32	868
9.98	864	11.77	862.96
17.71	859.45	18.05	859.26
27.23	855.69	35.59	854
41.51	850	42.87	848.75
68.07	847.01	83.1	847.21
86.58	850	89.86	851.88
109.9	854	152.38	854
247.56	853.96	248.18	854
278.26	856	280.26	856.09
303.45	856.89	309.2	857.06
323.99	857.38	326.94	857.43
332.95	857.52	336.33	857.58
354.31	857.83	355.44	857.84
380.8	858	382.38	858.14
397.99	860	406.78	861.08
415.66	862.28	416.4	862.49
423.07	864.46	424.37	864.93

434.65 868.45 438.33 869.16 441.32 869.73 442.8 870

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val

 0 .05 35.59 .035 89.86 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 35.59 89.86 236.69 214.02 58.43 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

 * E.G. Elev (ft) * 858.06 * Element * Left OB * Channel * Right OB *
 * Vel Head (ft) * 0.43 * Wt. n-Val. * 0.050 * 0.035 * 0.035 *
 * W.S. Elev (ft) * 857.62 * Reach Len. (ft) * 236.69 * 214.02 * 58.43 *
 * Crit w.s. (ft) * * * Flow Area (sq ft) * 29.70 * 524.89 * 776.50 *
 * E.G. slope (ft/ft) *0.001220 * Area (sq ft) * 29.70 * 524.89 * 776.50 *
 * Q Total (cfs) * 5866.70 * Flow (cfs) * 48.78 * 3368.31 * 2449.61 *
 * Top width (ft) * 318.72 * Top width (ft) * 14.44 * 54.27 * 250.01 *
 * Vel Total (ft/s) * 4.41 * Avg. Vel. (ft/s) * 1.64 * 6.42 * 3.15 *
 * Max Chl Dpth (ft) * 10.91 * Hydr. Depth (ft) * 2.06 * 9.67 * 3.11 *
 * Conv. Total (cfs) *167953.9 * Conv. (cfs) * 1396.6 * 96429.0 * 70128.3 *
 * Length wtd. (ft) * 136.49 * Wetted Per. (ft) * 14.93 * 58.31 * 250.27 *
 * Min Ch El (ft) * 846.71 * Shear (lb/sq ft) * 0.15 * 0.69 * 0.24 *
 * Alpha * 1.43 * Stream Power (lb/ft s) * 442.80 * 0.00 * 0.00 *
 * Frctn Loss (ft) * 0.11 * Cum Volume (acre-ft) * 0.39 * 6.60 * 9.58 *
 * C & E Loss (ft) * 0.07 * Cum SA (acres) * 0.08 * 0.41 * 1.16 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Meathouse Fork
 REACH: Meathouse Fork RS: 1490.245

INPUT

Description:

Station Elevation Data num= 82
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

 0 870 5.86 866 6.33 865.64 8.55 864 9.13 863.51
 10.88 862 11.82 861.2 13.23 860 15.45 858.65 16.35 858
 17.41 857.78 20.31 857.19 25.66 856 27.4 855.26 30.41 854
 34.3 852.02 34.33 852 34.49 851.91 37.59 850 38.29 849.32
 39.66 848 40.44 847.18 40.68 846.94 40.92 846.71 44.92 846.75
 81.46 847.21 81.71 847.37 82.07 847.6 82.73 848 84.83 849.32
 85.9 850 86.67 850.47 89.12 852 97.06 853.03 104.43 854
 114.06 854 126.37 853.66 128.74 853.58 133.79 853.41 137.92 853.27

SnakeRun.rep

145.98	852.97	150.43	852.8	170.82	852	220.41	852	227.59	852.19
228.77	852.21	241.22	852.45	249.56	852.57	253.63	852.65	260.3	852.75
266.44	852.88	273.01	853.01	279.74	853.16	283.81	853.25	296.43	853.57
311.65	854	315.65	854.14	319.41	854.21	321.31	854.26	344.86	854.89
349.09	855.01	356.92	855.21	364.11	855.41	377.58	855.76	386.83	856
395.39	856.67	396.1	856.72	397.32	856.82	399.53	857.01	410.79	858
414.41	859.27	416.41	860	416.78	860.2	420.23	862	420.5	862.14
424.19	864	426.33	865.13	427.98	866	431.1	867.29	431.92	867.62
432.74	868	435.16	869						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	25.66	.035	89.12	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

25.66	89.12	87.04	84.08	121.62	.1	.3
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
353.21	378.46	865

CROSS SECTION OUTPUT Profile #PF 1

* E.G. Elev (ft)	* 857.87	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.18	* Wt. n-Val.	* 0.050	* 0.035	* 0.035
* W.S. Elev (ft)	* 857.69	* Reach Len. (ft)	* 87.04	* 84.08	* 121.62
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 6.45	* 580.94	* 1248.46
* E.G. Slope (ft/ft)	*0.000565	* Area (sq ft)	* 6.45	* 580.94	* 1248.46
* Q Total (cfs)	* 5866.70	* Flow (cfs)	* 3.96	* 2457.96	* 3404.78
* Top Width (ft)	* 364.12	* Top width (ft)	* 7.80	* 63.46	* 292.87
* Vel Total (ft/s)	* 3.20	* Avg. Vel. (ft/s)	* 0.61	* 4.23	* 2.73
* Max Chl Dpth (ft)	* 10.98	* Hydr. Depth (ft)	* 0.83	* 9.15	* 4.26
* Conv. Total (cfs)	*246887.3	* Conv. (cfs)	* 166.5	*103437.8	*143283.0
* Length Wtd. (ft)	* 105.89	* Wetted Per. (ft)	* 7.98	* 67.64	* 297.62
* Min Ch El (ft)	* 846.71	* Shear (lb/sq ft)	* 0.03	* 0.30	* 0.15
* Alpha	* 1.16	* Stream Power (lb/ft s)	* 435.16	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.06	* Cum Volume (acre-ft)	* 0.30	* 3.89	* 8.22
* C & E Loss (ft)	* 0.00	* Cum SA (acres)	* 0.02	* 0.12	* 0.79

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Meathouse Fork
 REACH: Meathouse Fork RS: 1406.162

INPUT

Description:
 Station Elevation Data num= 102

SnakeRun.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	870	.97	868.72	1.5	868	2.91	866.14	3.02	866
3.05	865.96	4.56	864	5.18	863.2	6.03	862.11	6.12	862
6.48	861.63	8.1	860	9.07	859.02	10.07	858	10.72	857.33
12.02	856	13.66	854.65	14.7	854	18.91	852.92	22.51	852
25.78	850.8	27.82	850	28.36	849.57	30.27	848	30.73	847.62
31.86	846.71	55.27	847	72.67	847.21	73.89	847.9	74.03	848
76.98	849.86	77.2	850	77.26	850.04	79.99	852	83.38	852.52
92.96	854	95.48	854	102.31	853.65	103.18	853.64	108.7	853.38
108.99	853.36	110.8	853.28	111.58	853.22	150.73	852	240.6	852
291.71	853.43	297.37	853.56	314.81	853.96	316.63	854	316.73	854
343.5	854.56	351.33	854.69	356.14	854.78	394.07	855.83	395.27	855.86
396.51	855.89	397.44	855.91	400.55	856	406.61	856.48	410.22	856.77
417.1	857.32	421.9	857.7	425.6	858	426.08	858.14	427.94	858.71
432.15	860	434.69	860.76	438.9	862	440.83	862.46	446.63	864
449.81	864.47	454.3	865.12	455.03	865.22	455.44	865.28	455.72	865.32
456.81	865.35	457.21	865.34	462.78	865.09	469.38	864.77	470.05	864.75
470.83	864.71	472.02	864.46	473.53	864.18	474.48	864	478.68	864
480.14	865.87	480.24	866	480.4	866.22	481.76	868	483.14	869.81
483.28	870	483.44	870.26	484.23	871.42	484.64	872	486.8	872.42
492.95	873.63	493.79	873.79	494.85	874	495.41	874.1	506.55	876
510.97	876.59	517.6	877.47						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	22.51	.035	79.99	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

22.51	79.99	176.67	184.26	503.11	.1	.3
-------	-------	--------	--------	--------	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
336.79	404.193	865

CROSS SECTION OUTPUT Profile #PF 1

* E.G. Elev (ft)	* 857.81	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.18	* Wt. n-Val.	* 0.050	* 0.035	* 0.035
* W.S. Elev (ft)	* 857.64	* Reach Len. (ft)	* 184.26	* 184.26	* 184.26
* Crit w.s. (ft)	*	* Flow Area (sq ft)	* 44.75	* 567.78	* 1266.81
* E.G. Slope (ft/ft)	*0.000499	* Area (sq ft)	* 44.75	* 567.78	* 1266.81
* Q Total (cfs)	* 5866.70	* Flow (cfs)	* 65.37	* 2395.84	* 3405.49
* Top width (ft)	* 343.26	* Top width (ft)	* 12.09	* 57.48	* 273.69
* Vel Total (ft/s)	* 3.12	* Avg. Vel. (ft/s)	* 1.46	* 4.22	* 2.69
* Max chl Dpth (ft)	* 10.93	* Hydr. Depth (ft)	* 3.70	* 9.88	* 4.63
* Conv. Total (cfs)	*262760.5	* Conv. (cfs)	* 2927.8	*107306.0	*152526.8
* Length wtd. (ft)	* 184.26	* Wetted Per. (ft)	* 13.70	* 60.45	* 278.53
* Min Ch El (ft)	* 846.71	* Shear (lb/sq ft)	* 0.10	* 0.29	* 0.14
* Alpha	* 1.18	* Stream Power (lb/ft s)	* 517.60	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.10	* Cum Volume (acre-ft)	* 0.24	* 2.78	* 4.71

* C & E Loss (ft) * 0.01 * Cum SA (acres) * * * * *

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Meathouse Fork
 REACH: Lower RS: 1221.861

INPUT

Description:

Station Elevation Data		num= 118									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	870	2.18	868	3.12	867.19	4.45	866	4.96	865.02		
4.99	864.97	5.56	864	6.14	862.56	6.36	862	7.15	860.04		
7.17	860	7.22	859.87	8	858	9.38	856	12.45	854.54		
13.65	854	17.88	853.34	26.88	852	32.63	850.31	33.66	850		
33.96	849.74	36.23	848	36.67	847.65	38.06	846.71	56.81	846.93		
68.81	847.19	81.6	847.44	83.84	847.47	85.57	847.51	87.21	847.61		
88.36	847.69	90.08	847.8	93.42	848	97.1	848.75	99.5	849.21		
103.63	850	103.9	850	104.25	850.01	104.56	850.02	110.48	850.18		
111.46	850.21	117.97	850.38	141.22	850.9	143.84	850.97	145.73	851.01		
147.66	851.07	149.87	851.14	153.95	851.27	159.18	851.44	163.54	851.58		
164.68	851.61	169.38	851.76	175.08	851.8	176.84	852	178.03	852.03		
179.35	852.07	180.95	852.12	201.78	852.76	232.15	853.75	235.44	853.85		
237.06	853.91	239.91	854	266.02	854.93	273.89	855.21	283.1	855.51		
287.55	855.66	297.57	856	297.97	856	307.58	856.39	308.29	856.43		
308.69	856.43	309.05	856.44	311.82	856.49	326.38	856.76	328.39	856.79		
329.79	856.81	331.89	856.82	334.08	856.83	336.43	856.83	338.74	856.82		
341.01	856.87	373.33	856.99	386.2	857.21	389.82	857.18	397.61	857.18		
412.39	857.25	428.59	857.84	436.45	857.97	438.58	858	441.48	858.46		
447.13	860	447.38	860.12	448.35	860.6	451.23	862	454.62	863.54		
455.59	864	456.59	863.99	459.8	863.73	466.46	863.21	466.69	863.2		
474.01	863.02	475.18	864	476.52	865.49	477.04	866	478.64	867.9		
478.73	868	479.02	868.34	480.54	870	482.73	871.83	482.95	872		
483.16	872.12	486.19	874	487.48	874.74	489.54	876	491.56	877.16		
492.95	878	495.55	879.48	496.42	880						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.05	26.88	.035	104.25	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 26.88 104.25 160.47 174.55 21.52 .1 .3

Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
381.29	421.65	865	

SnakeRun.rep

CROSS SECTION OUTPUT Profile #PF 1

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*****
* E.G. Elev (ft)          * 857.71 * Element          * Left OB * Channel * Right OB *
* Vel Head (ft)          * 0.23  * wt. n-val.      * 0.050  * 0.035  * 0.035  *
* W.S. Elev (ft)         * 857.47 * Reach Len. (ft) * 160.47 * 174.55 * 21.52  *
* Crit W.S. (ft)         *        * Flow Area (sq ft) * 70.70  * 745.95 * 959.68 *
* E.G. Slope (ft/ft)     * 0.000600 * Area (sq ft)    * 70.70  * 745.95 * 959.68 *
* Q Total (cfs)          * 5866.70 * Flow (cfs)      * 119.85 * 3465.26 * 2281.59 *
* Top Width (ft)         * 372.93 * Top Width (ft)  * 18.52  * 77.37  * 277.04 *
* Vel Total (ft/s)       * 3.30  * Avg. Vel. (ft/s) * 1.70  * 4.65  * 2.38  *
* Max Chl Dpth (ft)      * 10.76 * Hydr. Depth (ft) * 3.82  * 9.64  * 3.46  *
* Conv. Total (cfs)      * 239577.8 * Conv. (cfs)     * 4894.3 * 141510.5 * 93172.9 *
* Length wtd. (ft)      * 118.24 * Wetted Per. (ft) * 19.89 * 78.97 * 277.51 *
* Min Ch El (ft)        * 846.71 * Shear (lb/sq ft) * 0.13  * 0.35  * 0.13  *
* Alpha                  * 1.38  * Stream Power (lb/ft s) * 496.42 * 0.00  * 0.00  *
* Frctn Loss (ft)       * 0.09  * Cum Volume (acre-ft) * 0.26  * 2.74  * 0.40  *
* C & E Loss (ft)       * 0.02  * Cum SA (acres)   * 0.07  * 0.29  * 0.11  *
*****

```

CROSS SECTION

RIVER: Meathouse Fork
 REACH: Lower

RS: 1047.311

INPUT

Description:

Station Elevation Data		num= 130	
Sta	Elev	Sta	Elev
0	870	4.67	868
13.71	864	15.9	863.04
21.98	859.85	24.98	858
31.59	854	36.97	853.29
53.49	850.44	56.89	850
69.44	846.93	69.79	846.71
104.26	847.07	106.26	847.99
114.64	850.03	114.78	850.04
126.62	850.54	131.02	850.74
141.48	851.16	146.92	851.34
156.99	851.68	157.72	851.7
169.91	852.17	170.93	852.23
184.23	853.09	187.27	853.21
194.71	853.57	195.01	853.58
204.91	853.92	206.78	854
232.78	855.05	233.79	855.1
256.66	855.94	257.3	855.93
272.63	856	276.18	856.01
279	856.03	279.31	856.03
296.86	856.25	302.48	856.31
340.65	857.6	343.47	857.67
		6.92	867.02
		18.22	862
		26.04	857.35
		46.83	852
		60.51	849.57
		70.98	846.7
		106.27	848
		114.98	850.04
		134.73	850.87
		148.97	851.41
		163.59	851.88
		175.6	852.57
		189.48	853.34
		198.4	853.69
		226.85	854.77
		243.19	855.62
		259.93	855.95
		276.56	856.01
		288.12	856.12
		305.22	856.35
		346.47	857.75
		9.19	866
		20.95	860.47
		28.24	856
		48.66	851.48
		67.44	848
		78.8	846.59
		106.56	848.08
		119.14	850.22
		137.16	850.97
		154.8	851.59
		163.82	851.88
		178.83	852.72
		192.45	853.45
		198.4	853.69
		226.85	854.77
		243.19	855.62
		260.72	855.96
		278.66	856.03
		289.31	856.15
		316.28	856.65
		350.51	857.82
		11.42	865.03
		21.73	860
		31.16	854.25
		51	851.02
		68.42	847.49
		102.78	846.31
		113.97	850
		124.81	850.47
		139.15	851.06
		156.05	851.64
		167.7	852
		181.94	852.93
		193.82	853.53
		204.57	853.91
		230.96	854.97
		254.84	855.86
		266.36	855.98
		278.76	856.03
		291	856.2
		325.25	856.85
		359.65	858

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360.32	858	363.58	859.45	364.51	860	365.18	860.42	367.83	862
368.76	862.58	371.13	864	372.08	864.57	384.05	864	391.44	864
391.82	864.41	393.33	866	394.5	867.2	395.3	868	395.95	868.65
397.31	870	398.56	871.19	399.39	872	400.6	872.85	402.23	874
404.23	875.4	405.09	876	407.57	877.73	407.96	878	410.82	880

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	46.83	.035	113.97	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

46.83	113.97	1	1	1	.1	.3
-------	--------	---	---	---	----	----

Blocked Obstructions num= 1

Sta L	Sta R	Elev
301.86	338.02	865

CROSS SECTION OUTPUT Profile #PF 1

* E.G. Elev (ft)	* 857.60	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.40	* Wt. n-Val.	* 0.050	* 0.035	* 0.035
* W.S. Elev (ft)	* 857.20	* Reach Len. (ft)	*	*	*
* Crit W.S. (ft)	* 853.85	* Flow Area (sq ft)	* 72.62	* 623.01	* 648.08
* E.G. Slope (ft/ft)	* 0.001032	* Area (sq ft)	* 72.62	* 623.01	* 648.08
* Q Total (cfs)	* 5866.70	* Flow (cfs)	* 155.72	* 3700.73	* 2010.25
* Top width (ft)	* 275.58	* Top width (ft)	* 20.55	* 67.14	* 187.89
* Vel Total (ft/s)	* 4.37	* Avg. Vel. (ft/s)	* 2.14	* 5.94	* 3.10
* Max Chl Dpth (ft)	* 10.89	* Hydr. Depth (ft)	* 3.53	* 9.28	* 3.45
* Conv. Total (cfs)	* 182637.0	* Conv. (cfs)	* 4847.7	* 115208.0	* 62581.3
* Length wtd. (ft)	*	* Wetted Per. (ft)	* 21.57	* 68.53	* 188.93
* Min Ch El (ft)	* 846.31	* Shear (lb/sq ft)	* 0.22	* 0.59	* 0.22
* Alpha	* 1.35	* Stream Power (lb/ft s)	* 410.82	* 0.00	* 0.00
* Frctn Loss (ft)	*	* Cum Volume (acre-ft)	*	*	*
* C & E Loss (ft)	*	* Cum SA (acres)	*	*	*

CROSS SECTION

RIVER: Snake Run
 REACH: Snake Run RS: 1232.097

INPUT

Description:

Station Elevation Data num= 132

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	890	5.02	889.09	11.08	888	15.21	887.27	22.25	886
24.34	885.62	33.27	884	37.02	883.35	37.53	883.26	38.05	883.17
44.76	882	45.88	881.82	57.05	880	62.24	879.2	69.82	878
75.36	877.09	81.99	876	87.95	874.93	91.12	874.36	92.99	874

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96.58	873.33	103.61	872	107.5	871.16	112.98	870	118.52	868.31
119.7	868	120.91	866.37	121.17	866	122.41	864.32	122.64	864
123.9	862.29	124.11	862	125.39	860.26	125.58	860	144.17	860
145.27	859.96	148.81	859.88	150.6	859.85	157.42	858.59	160.56	858
162.63	857.68	172.34	856	172.91	856	211.91	854.8	223.54	854.47
237.76	854.15	238.54	854.12	242.21	854	276.04	854	280.53	854
313.7	852.95	314.67	852.76	315.52	852.58	316.38	852.38	317.77	852
317.82	851.99	317.83	851.98	317.88	851.97	321.84	850.92	326.59	850
326.62	849.99	327.48	849.77	328.78	849.42	337.17	849.51	338.97	849.57
340.2	849.82	340.93	850	342.43	850.35	345.24	851.03	349.03	852
350.53	852.36	357.29	854	358.76	854.35	361.89	855.05	364.53	855.65
366.12	856	371.86	856.28	371.95	856.28	375.62	856.45	375.8	856.46
378.47	856.57	381.69	856.69	381.96	856.7	384.7	856.8	385.23	856.81
386.8	856.87	387.94	856.91	389.33	856.94	390.88	856.98	392.36	857.03
393.16	857	394.64	857.05	396.06	857.09	396.12	857.09	397.58	857.12
398.95	857.16	431.09	858	448.18	858	460.39	858.77	460.64	858.78
461.47	858.85	462.2	858.83	462.57	858.82	463.63	858.81	512.45	858.22
512.7	858.22	512.83	858.22	516.81	858.2	518.13	858.2	520.87	858.17
521.35	858.17	525.16	858.15	525.93	858.15	537.04	858.46	537.42	858.46
537.66	858.47	542.1	858.77	556.48	860	562.99	861.15	567.49	862
569.88	862.46	570.4	862.56	571.45	862.74	575.7	863.5	578.93	864
579.92	864.22	587.31	866	588.55	866.4	590.98	867.24	592.62	867.73
596.64	868.95	600.09	870						

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val

 0 .035 313.7 .035 350.53 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 313.7 350.53 53.35 87.01 75.15 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev

 408.935 460.203 865

CROSS SECTION OUTPUT Profile #PF 1

* E.G. Elev (ft)	* 857.74	* Element	* Left OB	* Channel	* Right OB
* Vel Head (ft)	* 0.03	* wt. n-Val.	* 0.035	* 0.035	* 0.035
* W.S. Elev (ft)	* 857.71	* Reach Len. (ft)	* 53.35	* 87.01	* 75.15
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 482.12	* 260.71	* 92.66
* E.G. Slope (ft/ft)	* 0.000147	* Area (sq ft)	* 482.12	* 260.71	* 92.66
* Q Total (cfs)	* 1089.10	* Flow (cfs)	* 536.85	* 487.93	* 64.32
* Top Width (ft)	* 246.49	* Top width (ft)	* 151.25	* 36.83	* 58.41
* Vel Total (ft/s)	* 1.30	* Avg. Vel. (ft/s)	* 1.11	* 1.87	* 0.69
* Max Chl Dpth (ft)	* 8.29	* Hydr. Depth (ft)	* 3.19	* 7.08	* 1.59
* Conv. Total (cfs)	* 89862.1	* Conv. (cfs)	* 44295.4	* 40259.6	* 5307.0
* Length wtd. (ft)	* 68.04	* Wetted Per. (ft)	* 151.44	* 37.58	* 59.14
* Min Ch El (ft)	* 849.42	* Shear (lb/sq ft)	* 0.03	* 0.06	* 0.01
* Alpha	* 1.30	* Stream Power (lb/ft s)	* 600.09	* 0.00	* 0.00
* Frctn Loss (ft)	* 0.01	* Cum Volume (acre-ft)	* 0.83	* 0.56	* 0.34

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* C & E Loss (ft) * 0.01 * Cum SA (acres) * 0.23 * 0.07 * 0.18 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Snake Run
 REACH: Snake Run RS: 1145.071

INPUT

Description:

Station Elevation Data		num= 128		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	880	11.84	878.08	12.34	878	12.59	877.97	27.25	876		
37.1	874.26	38.56	874	48.5	872.07	48.88	872	49.81	871.77		
56.48	870	57.15	869.13	58.02	868	58.91	866.85	59.56	866		
60.71	864.52	61.11	864	62.58	862.1	62.66	862	62.8	861.83		
62.99	861.65	65.37	860.21	65.57	860.23	66.44	860.31	66.95	860.35		
68.88	860.62	70.53	860.88	72.74	860.97	74.61	861.22	77.57	861.68		
80.87	861.73	83.77	861.77	87.53	861.86	88.98	861.84	99.21	860.32		
101.41	860	105.71	858.93	108.62	858.19	109.38	858	113.93	857.29		
122.2	856	126.29	855.83	136.05	855.46	157.08	854.65	163.67	854.4		
174.75	854	194.91	854	279.08	853.34	282.52	853.29	287.59	852.2		
288.5	852	334.93	852	336.15	851.42	343.38	850	343.58	849.93		
345.03	849.44	348.59	848.17	360.6	848.89	361.42	848.93	363.98	849.39		
365.87	849.75	367.17	850	369.12	850.87	370.11	851.32	370.54	851.53		
371.02	851.78	371.56	852	375.33	852.49	389.41	854	392.26	854		
398.04	854.36	406.07	854.7	409.18	854.84	414.42	855.06	417.54	855.17		
420.82	855.3	422.93	855.38	424.54	855.41	426.69	855.46	428.03	855.51		
429.05	855.55	432.83	855.6	447.24	856	447.61	856	448.35	856.03		
458.53	856.38	507.27	857.28	514.13	857.4	517.22	857.61	518.77	857.71		
523.43	858	524.12	858.04	529.37	858.39	531.9	858.17	534.11	858		
534.51	858	547.21	857.9	577.66	857.78	583.22	857.8	602.74	857.97		
604.3	858	624.3	859.75	626.81	860	627.41	860.18	629.36	860.76		
631.29	861.34	638.97	860.96	640.28	860.88	646.53	861.94	648.84	862		
651.81	862	653.59	863.05	655.11	864	657.03	865.04	658.87	866		
660.76	867.08	662.29	868	664.33	869.16	665.73	870	667.94	871.26		
669.18	872	671.64	873.42	672.6	874	675.49	875.67	676.04	876		
679.3	877.87	679.53	878	684.74	880						

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	334.93	.035	371.56	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	334.93	371.56		25.16	145.07		.1	.3

Blocked Obstructions num= 1

Sta L Sta R Elev

 568.77 607.76 865

CROSS SECTION OUTPUT Profile #PF 1

```

*****
* E.G. Elev (ft) * 857.73 * Element * Left OB * Channel * Right OB *
* Vel Head (ft) * 0.01 * Wt. n-Val. * 0.035 * 0.035 * 0.035 *
* W.S. Elev (ft) * 857.72 * Reach Len. (ft) * 0.00 * 0.00 * 0.00 *
* Crit W.S. (ft) * * * Flow Area (sq ft) * 880.00 * 297.57 * 298.93 *
* E.G. Slope (ft/ft) * 0.000044 * Area (sq ft) * 880.00 * 297.57 * 298.93 *
* Q Total (cfs) * 1089.10 * Flow (cfs) * 620.09 * 333.52 * 135.49 *
* Top width (ft) * 407.74 * Top width (ft) * 223.75 * 36.63 * 147.36 *
* Vel Total (ft/s) * 0.74 * Avg. Vel. (ft/s) * 0.70 * 1.12 * 0.45 *
* Max Chl Dpth (ft) * 9.55 * Hydr. Depth (ft) * 3.93 * 8.12 * 2.03 *
* Conv. Total (cfs) * 163342.4 * Conv. (cfs) * 93000.5 * 50021.3 * 20320.6 *
* Length wtd. (ft) * 0.00 * Wetted Per. (ft) * 224.06 * 37.77 * 147.54 *
* Min Ch El (ft) * 848.17 * Shear (lb/sq ft) * 0.01 * 0.02 * 0.01 *
* Alpha * 1.27 * Stream Power (lb/ft s) * 684.74 * 0.00 * 0.00 *
* Frctn Loss (ft) * 0.00 * Cum Volume (acre-ft) * * * *
* C & E Loss (ft) * 0.02 * Cum SA (acres) * * * *
*****
  
```

SUMMARY OF MANNING'S N VALUES

River:Meathouse Fork

```

*****
* Reach * River Sta. * n1 * n2 * n3 *
*****
*Meathouse Fork * 2237.459 * .05* .035* .035*
*Meathouse Fork * 2072.695 * .05* .035* .035*
*Meathouse Fork * 1848.773 * .05* .035* .035*
*Meathouse Fork * 1705.050 * .05* .035* .035*
*Meathouse Fork * 1490.245 * .05* .035* .035*
*Meathouse Fork * 1406.162 * .05* .035* .035*
*Lower * 1221.861 * .05* .035* .035*
*Lower * 1047.311 * .05* .035* .035*
*****
  
```

River:Snake Run

```

*****
* Reach * River Sta. * n1 * n2 * n3 *
*****
*Snake Run * 1232.097 * .035* .035* .035*
*Snake Run * 1145.071 * .035* .035* .035*
*****
  
```

SUMMARY OF REACH LENGTHS

River: Meathouse Fork

```
*****
* Reach * River Sta. * Left * Channel * Right *
*****
*Meathouse Fork * 2237.459 * 82.1* 164.3* 174.84*
*Meathouse Fork * 2072.695 * 374.93* 223.92* 99.39*
*Meathouse Fork * 1848.773 * 164.92* 140.43* 77.8*
*Meathouse Fork * 1705.050 * 236.69* 214.02* 58.43*
*Meathouse Fork * 1490.245 * 87.04* 84.08* 121.62*
*Meathouse Fork * 1406.162 * 176.67* 184.26* 503.11*
*Lower * 1221.861 * 160.47* 174.55* 21.52*
*Lower * 1047.311 * 1* 1* 1*
*****
```

River: Snake Run

```
*****
* Reach * River Sta. * Left * Channel * Right *
*****
*Snake Run * 1232.097 * 53.35* 87.01* 75.15*
*Snake Run * 1145.071 * 25.16* 145.07* 44.85*
*****
```

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Meathouse Fork

```
*****
* Reach * River Sta. * Contr. * Expan. *
*****
*Meathouse Fork * 2237.459* .1* .3*
*Meathouse Fork * 2072.695* .1* .3*
*Meathouse Fork * 1848.773* .1* .3*
*Meathouse Fork * 1705.050* .1* .3*
*Meathouse Fork * 1490.245* .1* .3*
*Meathouse Fork * 1406.162* .1* .3*
*Lower * 1221.861* .1* .3*
*Lower * 1047.311* .1* .3*
*****
```

River: Snake Run

```
*****
* Reach * River Sta. * Contr. * Expan. *
*****
*Snake Run * 1232.097* .1* .3*
*Snake Run * 1145.071* .1* .3*
*****
```

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ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : Existing

River: Meathouse Fork Reach: Meathouse Fork RS: 1705.050 Profile: PF 1

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: Meathouse Fork Reach: Meathouse Fork RS: 1490.245 Profile: PF 1

Warning:Divided flow computed for this cross-section.

River: Meathouse Fork Reach: Meathouse Fork RS: 1406.162 Profile: PF 1

Warning:Divided flow computed for this cross-section.

River: Snake Run Reach: Snake Run RS: 1232.097 Profile: PF 1

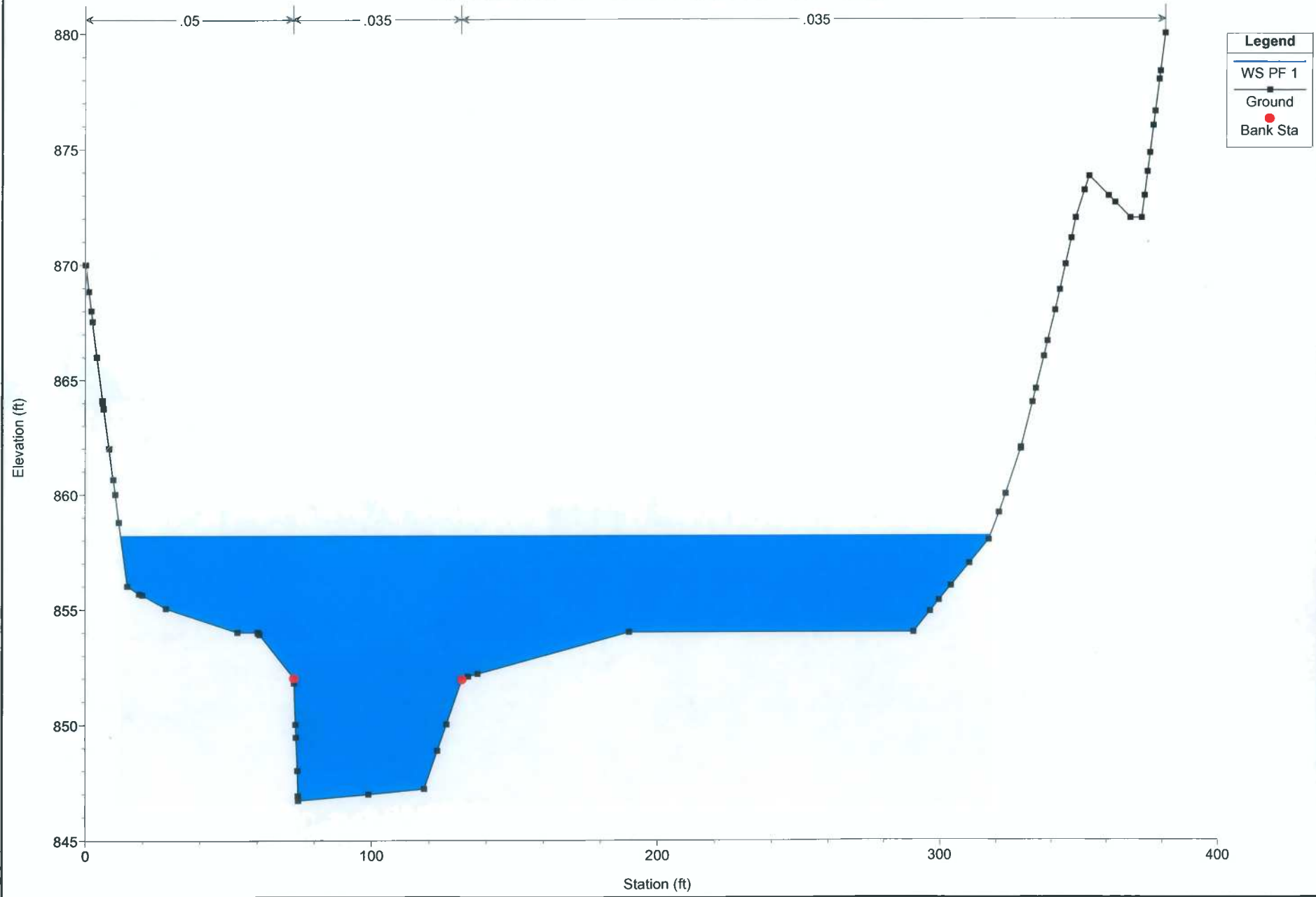
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Snake Run Plan: Existing

Geom: Existing Flow: Existing

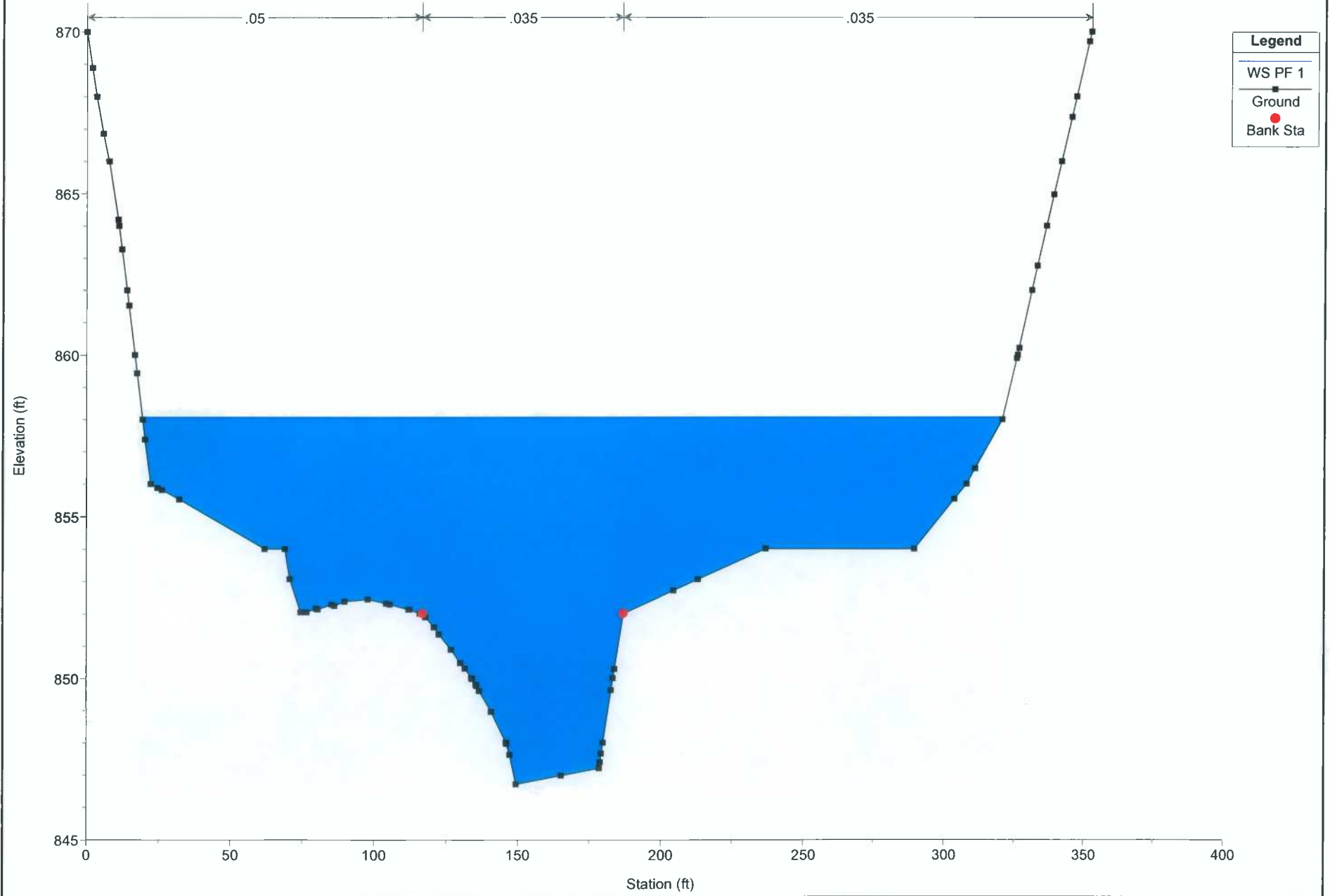
River = Meathouse Fork Reach = Meathouse Fork RS = 2237.459



Snake Run Plan: Existing

Geom: Existing Flow: Existing

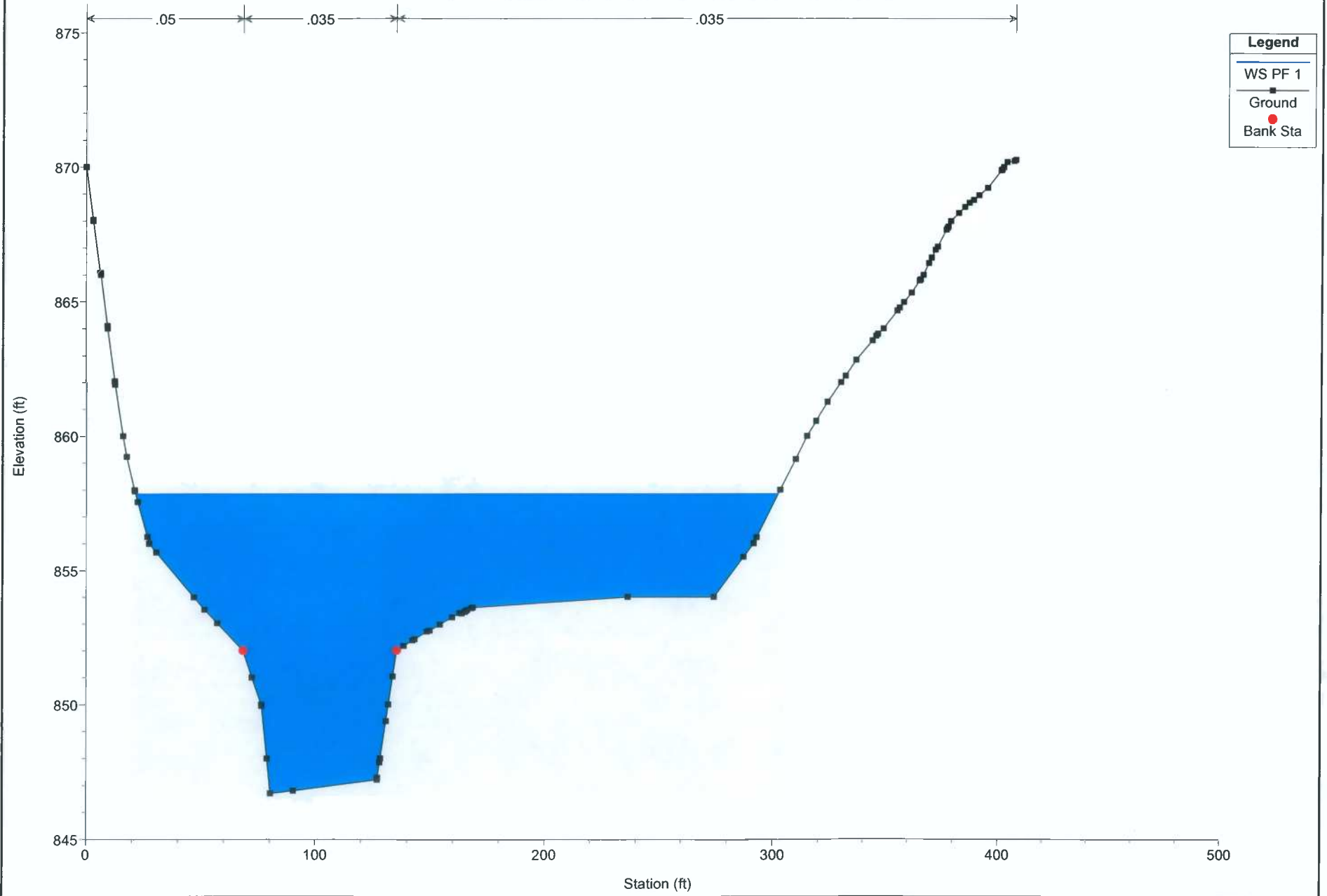
River = Meathouse Fork Reach = Meathouse Fork RS = 2072.695



Snake Run Plan: Existing

Geom: Existing Flow: Existing

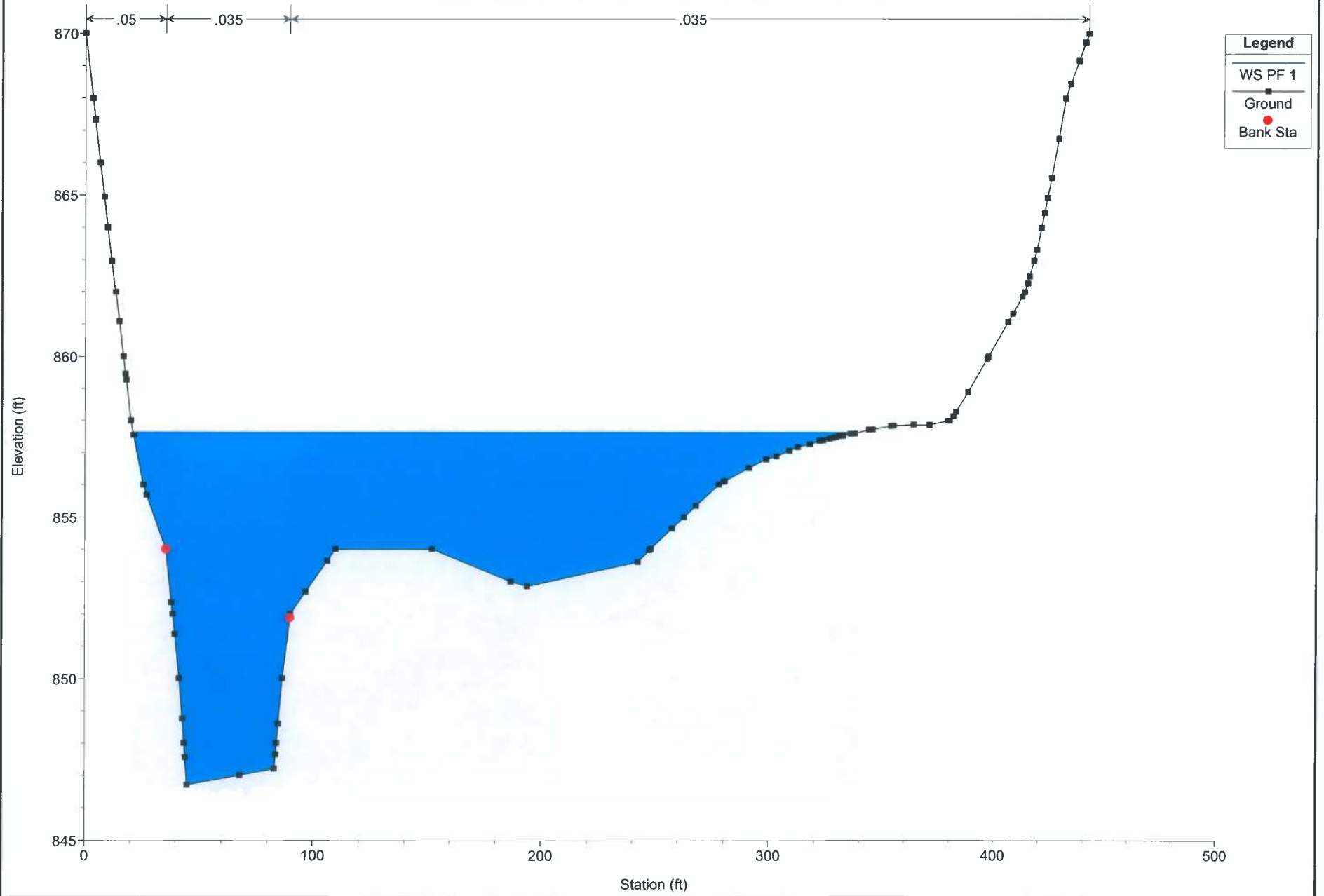
River = Meathouse Fork Reach = Meathouse Fork RS = 1848.773



Snake Run Plan: Existing

Geom: Existing Flow: Existing

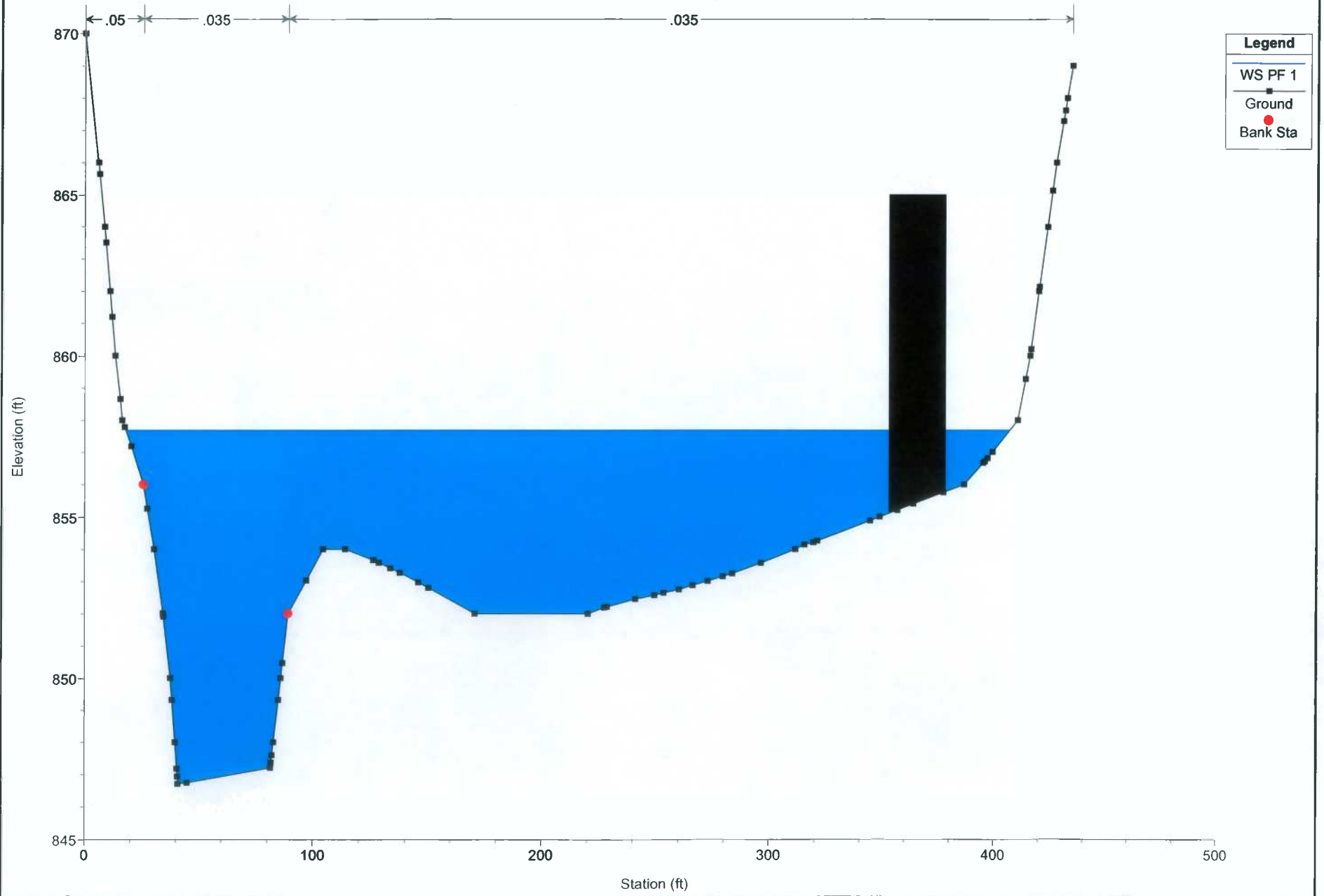
River = Meathouse Fork Reach = Meathouse Fork RS = 1705.050



Snake Run Plan: Existing

Geom: Existing Flow: Existing

River = Meathouse Fork Reach = Meathouse Fork RS = 1490.245

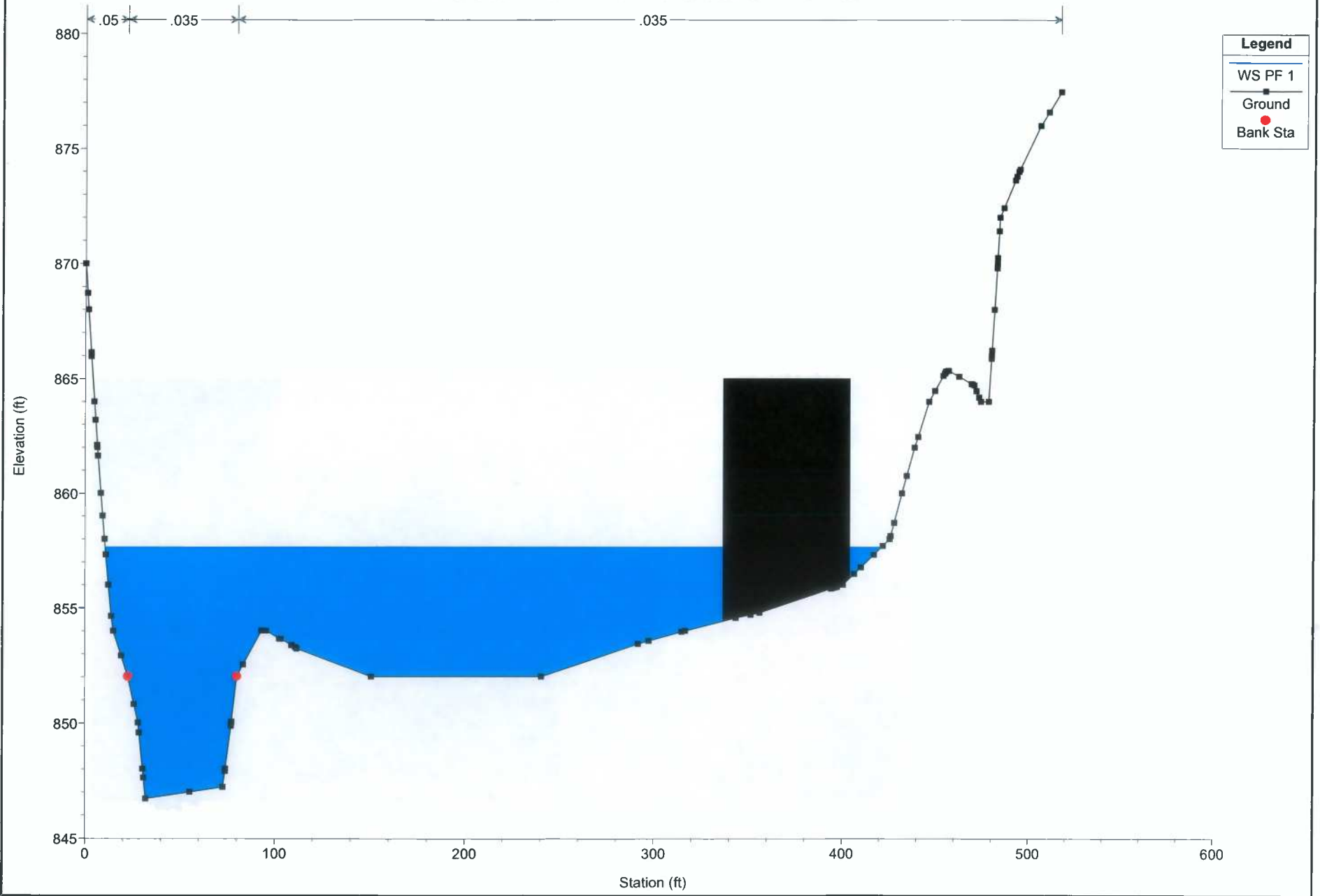


- Legend**
- WS PF 1
 - Ground
 - Bank Sta

Snake Run Plan: Existing

Geom: Existing Flow: Existing

River = Meathouse Fork Reach = Meathouse Fork RS = 1406.162

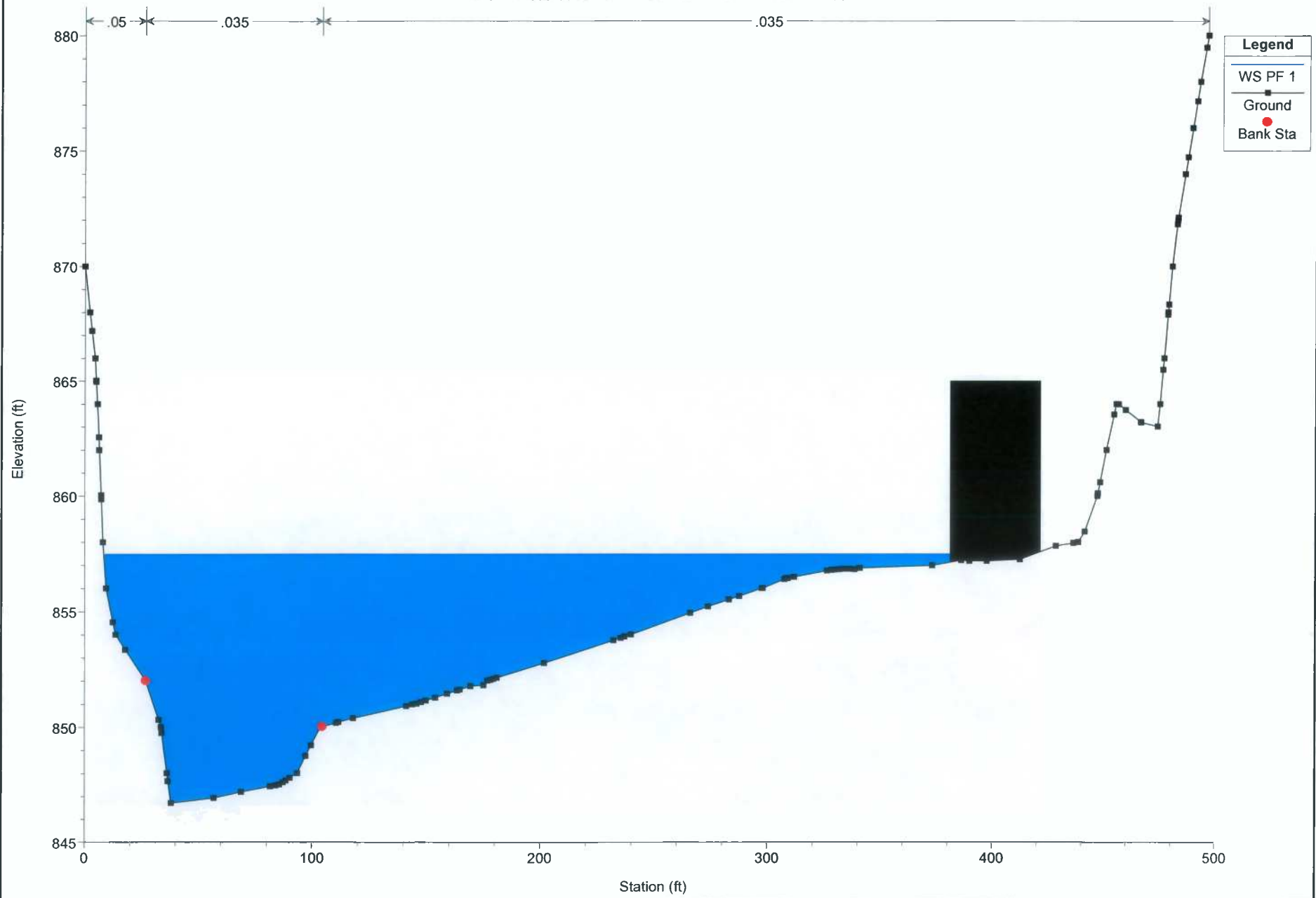


Legend	
WS PF 1	(Blue Area)
Ground	(Black Line)
Bank Sta	(Red Dot)

Snake Run Plan: Existing

Geom: Existing Flow: Existing

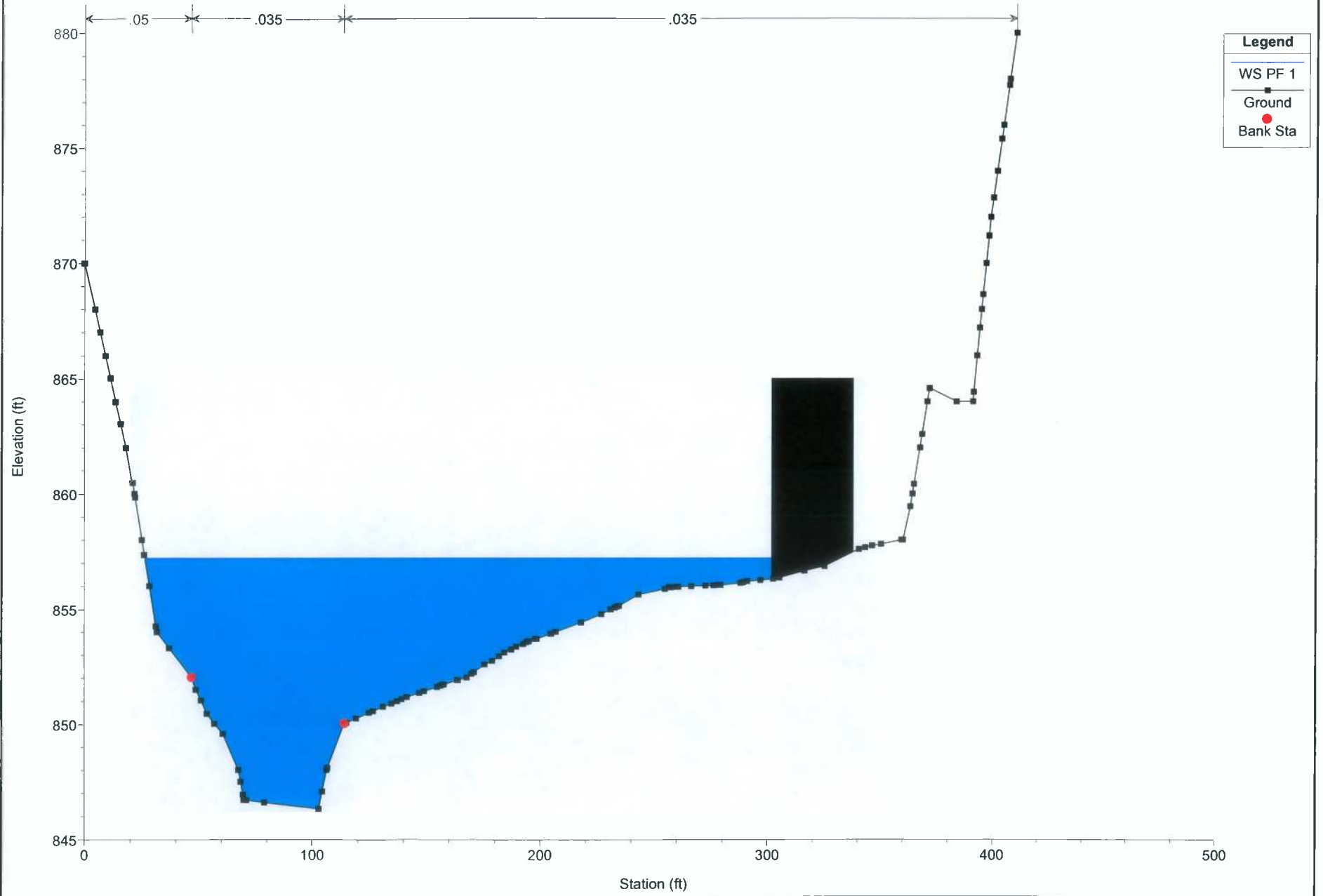
River = Meathouse Fork Reach = Lower RS = 1221.861



Snake Run Plan: Existing

Geom: Existing Flow: Existing

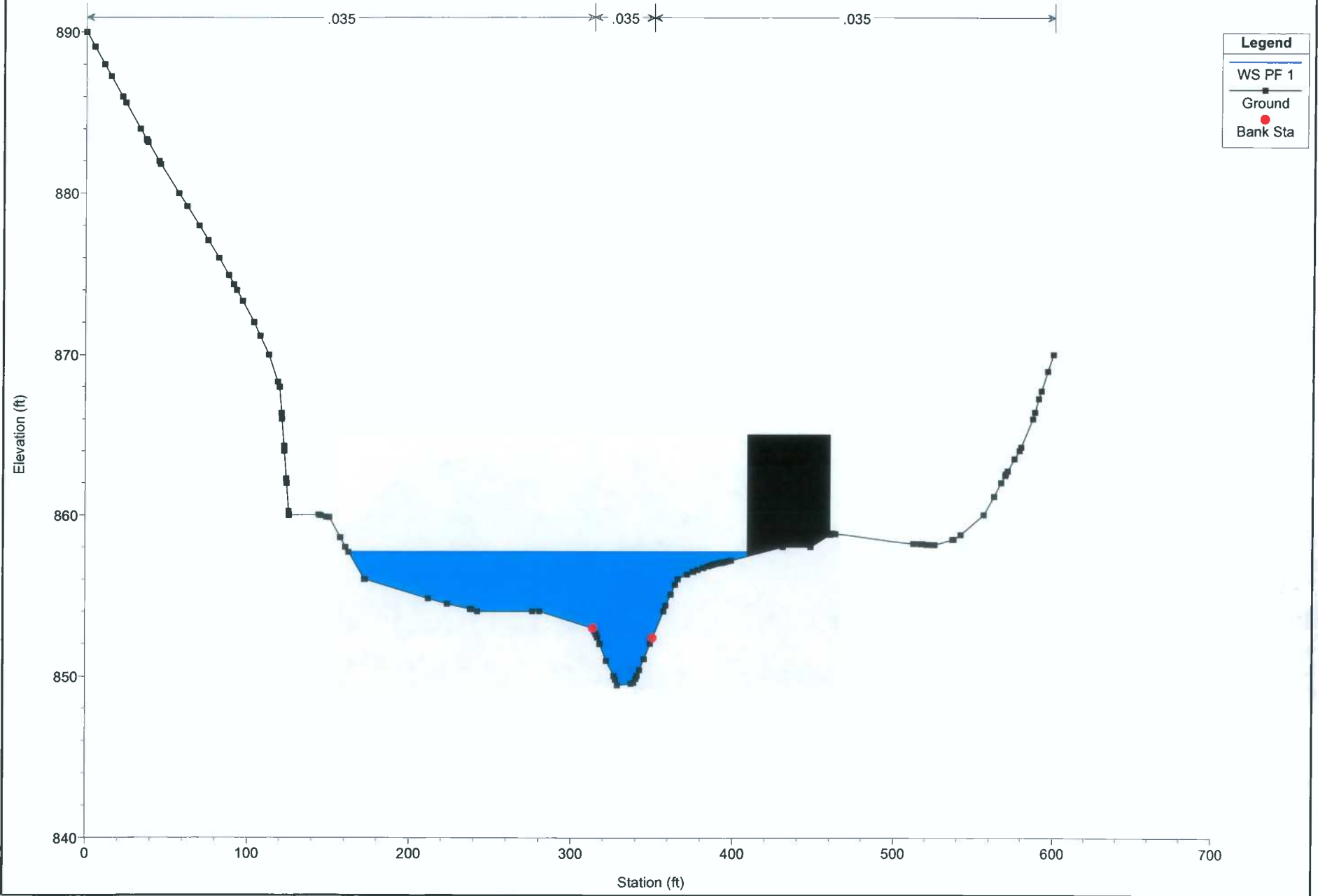
River = Meathouse Fork Reach = Lower RS = 1047.311



Snake Run Plan: Existing

Geom: Existing Flow: Existing

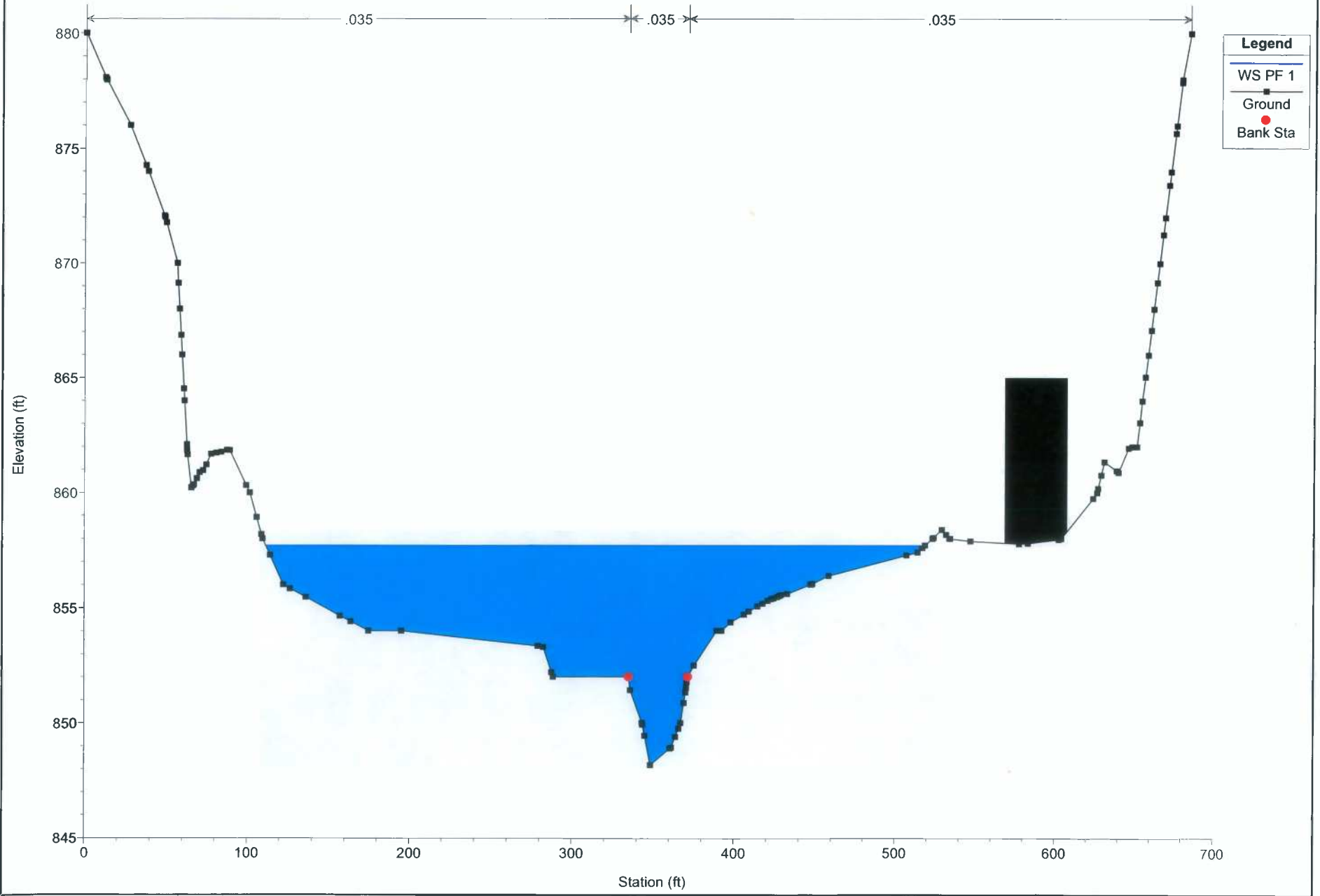
River = Snake Run Reach = Snake Run RS = 1232.097



Snake Run Plan: Existing

Geom: Existing Flow: Existing

River = Snake Run Reach = Snake Run RS = 1145.071



STATE OF WEST VIRGINIA,
COUNTY OF DODDRIDGE, TO WIT

I, Virginia Nicholson, Editor of THE
HERALD RECORD, a weekly newspaper
published regularly, in Doddridge County,
West Virginia, Do Hereby Certify Upon
Oath That the Accompanying Legal Notice
Entitled:

Floodplain Permit Application
13-083

was published in said paper for 1

successive weeks beginning with the issue
of *October 22* 2013 and

ending with the issue of
October 22 2013 and

that said notice contains *189*

WORD SPACE at *115* cents a word

amounts to the sum of \$ *21.74*

FOR FIRST PUBLICATION, SECOND
PUBLICATION IS 75% OF THE FIRST
PUBLICATION

\$ *0*
and each publication thereafter

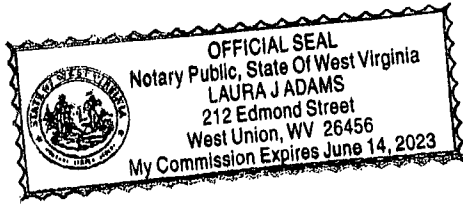
\$ *21.74* TOTAL

EDITOR
Virginia Nicholson

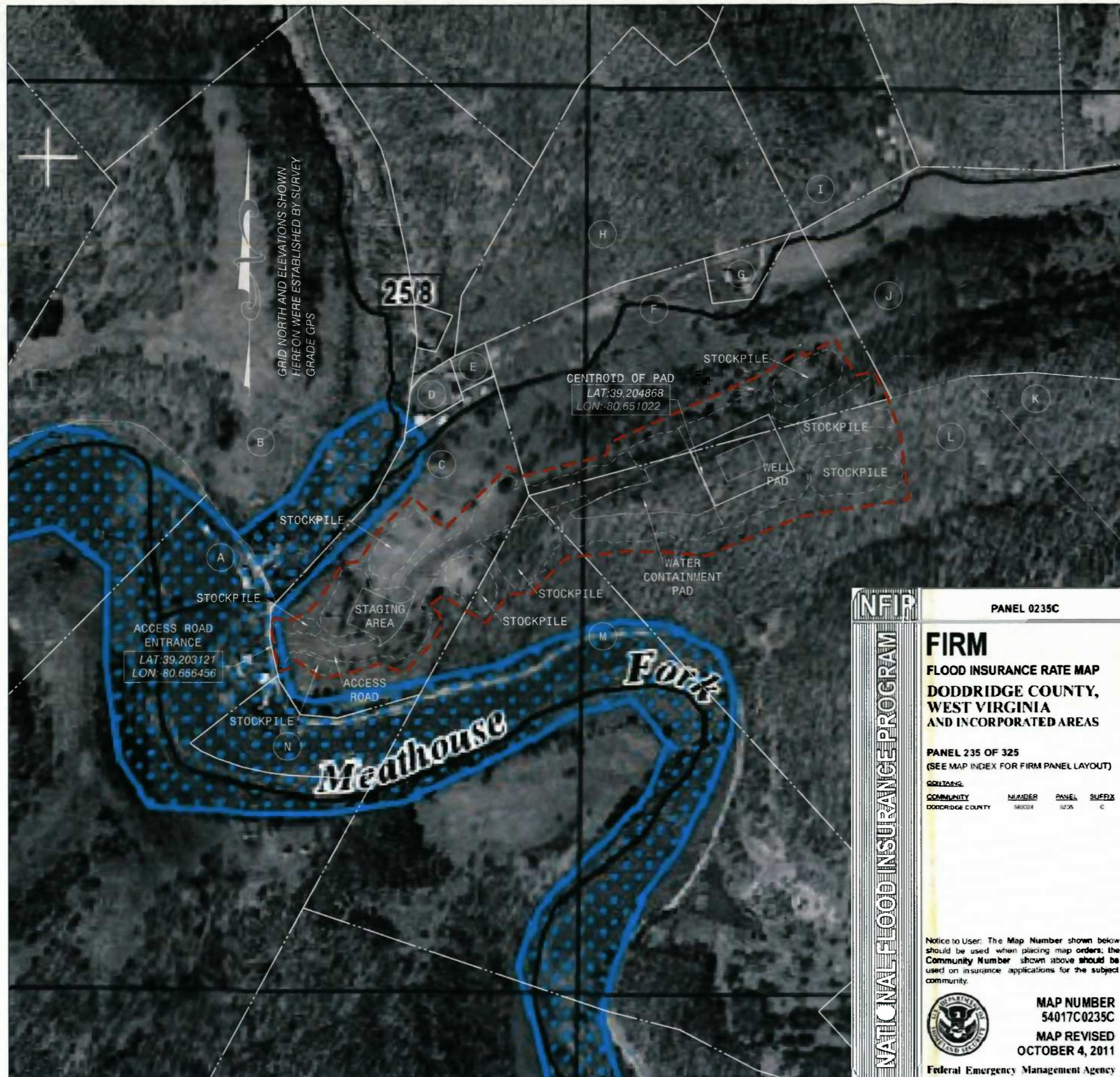
SWORN TO AND SUBSCRIBED
BEFORE ME THIS THE *24* DAY
OF *October* 2013

NOTARY PUBLIC
Laura J Adams

Legal Advertisement
Doddridge County
Floodplain Permit Application
Please take notice that on that on the 21st day of
October, 2013 ANTERO RESOURCES APPALACHIAN
CORPORATION - SNAKE RUN PAD - #13-083 filed an
application for a Floodplain Permit to develop land
located at or about: SURFACE OWNERS: PAMELA &
DARRELL E. SWISHER DEED BOOK 246 PG 469 &
TAX MAP 13-26
The Application is on file with the Clerk of the County
Court and may be inspected or copied during regular
business hours. Any interested persons who desire to
comment shall present the same in writing by November
9th, 2013.
Delivered to the:
Clerk of the County Court
118 E. Court Street, West Union, WV 26456
Beth A. Rogers, Doddridge County Clerk
Dan Wellings, Doddridge County Flood Plain Manager
10-22-13b



FIRM EXHIBIT



LANDOWNER TABULATION

A	TM 13-30 JOSEPH E. & SANDRA T. GUM AP 038 PG 192 DB 156 PG 645 92.01 ACRES 4850 MEATHOUSE FORK RD. NEW MILTON, WV 26411	J	TM 13-26.4 GIBSON L., III & DEANA K. CLARK DB 245 PG 236 26.5 ACRES RT 1 BOX 202A NEW MILTON, WV 26411
B	TM 13-24 THELMA JO PASCO & PAUL C. JAMES WB 043 PG 508 47.9 ACRES P.O. BOX 309 ELLENBORO, WV 26346	K	TM 13-27 MICHAEL B. DUFFELMEYER WILLIAM M. DUFFELMEYER SHARON D. STILSON WB 42 PG 316 241 MAPLE DR. WILLIAMSTOWN, WV 26187 125 RIGGINS RUN WEST UNION, WV 26456 315 FLORIDA AVE. NEW SMYRNA BEACH, FL 32169 JUSTINE P. HYRE DB 273 PG 570 715 LAWMAN AVE. BRIDGEPORT, WV 26330 15.5 ACRES
C	TM 13-26 PAMELA A. & DARREL E. SWISHER DB 246 PG 469 15.42 ACRES 3786 MEATHOUSE RD. NEW MILTON, WV 26411	L	TM 13-33 MICHAEL B. & WILLIAM M. DUFFELMEYER & SHARON D. STILSON WB 042 PG 316 & JUNE M. CONLEY, ET AL DB 273 PG 570 107 ACRES 241 MAPLE DR. WILLIAMSTOWN, WV 26187 125 RIGGINS RUN WEST UNION, WV 26456 715 LAWMAN AVE. BRIDGEPORT, WV 26330 315 FLORIDA AVE. NEW SMYRNA BEACH, FL 32169
D	TM 13-25 PAMELA A. & DARELL E. SWISHER DB 246 PG 469 0.5 ACRE RT 1 BOX 210 NEW MILTON, WV 26411	M	TM 13-32 MICHAEL B. & WILLIAM M. DUFFELMEYER & SHARON D. STILSON WB 042 PG 316 & JUNE M. CONLEY, ET AL DB 273 PG 570 56.6 ACRES 241 MAPLE DR. WILLIAMSTOWN, WV 26187 125 RIGGINS RUN WEST UNION, WV 26456 715 LAWMAN AVE. BRIDGEPORT, WV 26330 315 FLORIDA AVE. NEW SMYRNA BEACH, FL 32169
E	TM 13-26.2 PAMELA E. MOORE (SWISHER) DB 209 PG 293 0.75 ACRE 3786 MEATHOUSE RD. NEW MILTON, WV 26411	N	TM 13-31 JOSEPH E. & SANDRA T. GUM AP 038 PG 192 DB 156 PG 645 4.25 ACRES 4850 MEATHOUSE FORK RD. NEW MILTON, WV 26411
F	TM 13-26.3 GIBSON L., III & DEANA K. CLARK DB 245 PG 236 18.98 ACRES RT 1 BOX 202A NEW MILTON, WV 26411		
G	TM 13-26.1 GIBSON L., III & DEANA K. CLARK DB 204 PG 087 1.5 ACRES RT 1 BOX 202A NEW MILTON, WV 26411		
H	TM 13-24.1 HORTENSE P. SUTTON DB 250 PG 504 16.64 ACRES 613 SNAKE RUN RD. NEW MILTON, WV 26411		
I	TM 13-14 HORTENSE P. SUTTON DB 174 PG 277 13.69 ACRES 613 SNAKE RUN RD. NEW MILTON, WV 26411		

FIRM
FLOOD INSURANCE RATE MAP
DODDRIDGE COUNTY,
WEST VIRGINIA
AND INCORPORATED AREAS

PANEL 0235C

PANEL 235 OF 325
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	DODDRIDGE COUNTY	540024	0235	C

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
54017C0235C
MAP REVISED
OCTOBER 4, 2011

Federal Emergency Management Agency

FLOODPLAIN NOTE
THE PROPOSED SITE IS LOCATED IN FLOODPLAIN ZONES "X" & "A" PER FEMA MAP NUMBER #54017C0235C. THE SITE ENTRANCE IS LOCATED IN FLOODPLAIN ZONE "A". MINOR EXCAVATION IS REQUIRED FOR THE INSTALLATION OF THE ENTRANCE, AND E&S CONTROL IS THE ONLY DISTURBANCE PROPOSED IN ZONE "A". NO FILL IS PROPOSED IN ZONE "A".

08/21/2013
DATE: 08/21/2013
SCALE: 1" = 200'
SHEET 22 OF 22

NAVITUS ENGINEERING INC.
151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 665-4185
www.navituseng.com

Engineering
Survey
Environmental
GIS

REVISION	DATE

ANTERO RESOURCES
THIS DOCUMENT
WAS PREPARED
FOR
ANTERO RESOURCES
CORPORATION

FIRM EXHIBIT
SNAKE RUN
WELL PAD & WATER CONTAINMENT PAD
NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

08/21/2013

SNAKE RUN WELL PAD & WATER CONTAINMENT PAD SITE DESIGN & CONSTRUCTION PLAN, EROSION & SEDIMENT CONTROL PLANS

LOCATION COORDINATES

ACCESS ROAD ENTRANCE
LATITUDE: 39.203121 LONGITUDE: -80.656456 (NAD 83)
N 4339373.75 E 529662.79 (UTM ZONE 17 METERS)

CENTROID OF PAD
LATITUDE: 39.204868 LONGITUDE: -80.651022 (NAD 83)
N 4339569.36 E 530131.34 (UTM ZONE 17 METERS)

GENERAL DESCRIPTION

THE ACCESS ROAD(S), WATER CONTAINMENT PAD, AND WELL PAD ARE BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

FLOODPLAIN NOTE

THE PROPOSED SITE IS LOCATED IN FLOODPLAIN ZONES "X" & "A" PER FEMA MAP NUMBER #54017C0235C. THE SITE ENTRANCE IS LOCATED IN FLOODPLAIN ZONE "A". MINOR EXCAVATION IS REQUIRED FOR THE INSTALLATION OF THE ENTRANCE, AND E&S CONTROL IS THE ONLY DISTURBANCE PROPOSED IN ZONE "A". NO FILL IS PROPOSED IN ZONE "A".

MISS UTILITY STATEMENT

ANTERO RESOURCES CORPORATION WILL NOTIFY MISS UTILITY OF WEST VIRGINIA FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN; TICKET #1316943170. IN ADDITION, MISS UTILITY WILL BE CONTACTED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION FOR THIS PROJECT.

ENTRANCE PERMIT

ANTERO RESOURCES CORPORATION WILL OBTAIN AN ENCROACHMENT PERMIT (FORM MM-109) FROM THE WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES.

ENVIRONMENTAL NOTES

WETLAND DELINEATIONS WERE PERFORMED IN JUNE & JULY 2013 BY GAI CONSULTANTS, INC. TO REVIEW THE SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY WITHIN THE REGULATORY PURVIEW OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE JULY 9, 2013 RESOURCE LOCATION MAP (WDSIR) WAS PREPARED BY GAI CONSULTANTS, INC. AND SUMMARIZES THE RESULTS OF THE FIELD DELINEATION. THE REPORT DOES NOT, IN ANY WAY, REPRESENT A JURISDICTIONAL DETERMINATION OF THE LANDWARD LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USACE OR THE WVDEP.

GEOTECHNICAL NOTE

NO SOIL STUDIES OR SUBSURFACE INVESTIGATIONS WERE PERFORMED AND ANALYZED FOR THE DESIGN OF THIS SITE.

PROJECT CONTACTS

OPERATOR:
ANTERO RESOURCES CORPORATION
981 EAST WASHINGTON AVENUE
ELLENBORO, WV 26346
PHONE: (304) 869-3405
FAX: (304) 869-3408

ELI WAGONER - ENVIRONMENTAL ENGINEER
OFFICE: (304) 622-3842, EXT. 311 CELL: (304) 476-9770

JOHN KAWCAK - OPERATIONS SUPERINTENDENT
CELL: (817) 368-1553

AARON KUNZLER - CONSTRUCTION SUPERVISOR
CELL: (405) 227-8344

ANTHONY SMITH - FIELD ENGINEER
OFFICE: (304) 869-3405 CELL: (304) 673-8196

ROGER DUNLAP - SURVEYING COORDINATOR
OFFICE: (304) 869-3405 CELL: (304) 651-5588

JACK BELL - LAND AGENT
CELL: (304) 376-9682

ENGINEER/SURVEYOR:
NAVITUS ENGINEERING, INC.
CYRUS S. KUMP, PE - PROJECT MANAGER/ENGINEER
OFFICE: (888) 662-4185 CELL: (540) 686-6747

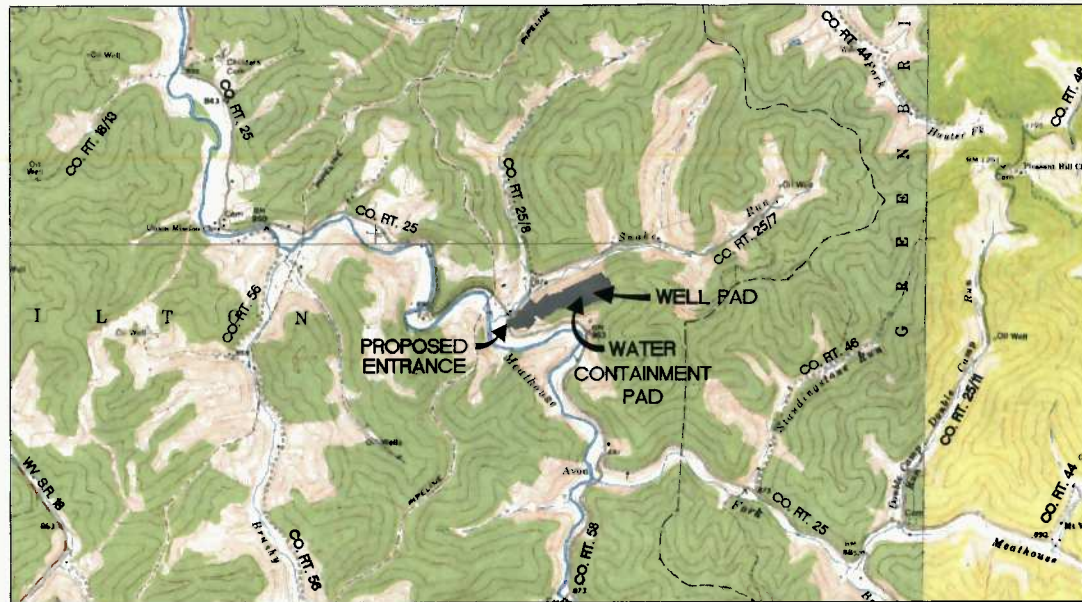
ENVIRONMENTAL:
GAI CONSULTANTS, INC.
JASON A. COOK - SENIOR ENVIRONMENTAL SPECIALIST
OFFICE: (304) 926-8100 CELL: (303) 709-3306

RESTRICTIONS NOTES:

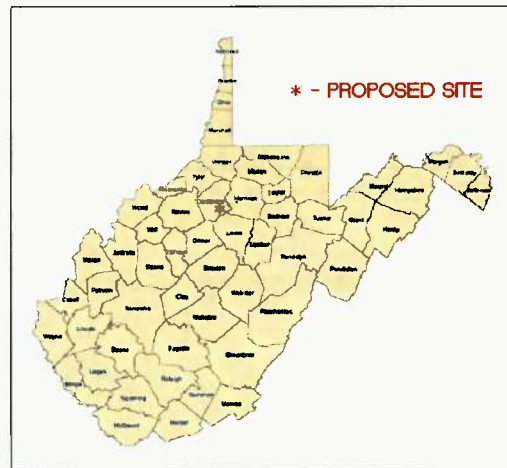
1. THERE ARE NO WETLANDS, LAKES, PONDS, OR RESERVOIRS WITHIN 100 FEET OF THE WELL PAD AND LOD. THERE IS A PERENNIAL STREAM ADJACENT TO THE ACCESS ROAD ENTRANCE THAT WILL REMAIN UNDISTURBED.
2. THERE ARE NO NATURALLY PRODUCING TROUT STREAMS WITHIN 300 FEET OF THE WELL PAD AND LOD.
3. THERE ARE NO GROUNDWATER INTAKE OR PUBLIC WATER SUPPLY FACILITIES WITHIN 1000 FEET OF THE WELL PAD AND LOD.
4. THERE ARE NO EXISTING WATER WELLS OR DEVELOPED SPRINGS WITHIN 250 FEET OF THE WELL(S) BEING DRILLED.
5. THERE ARE NO OCCUPIED DWELLING STRUCTURES WITHIN 625 FEET OF THE CENTER OF THE WELL PAD.
6. THERE ARE NO AGRICULTURAL BUILDINGS LARGER THAN 2,500 SQUARE FEET WITHIN 625 FEET OF THE CENTER OF THE WELL PAD.

NEW MILTON DISTRICT, DODDRIDGE COUNTY, WEST VIRGINIA
SNAKE RUN & MEATHOUSE FORK WATERSHEDS

USGS 7.5 NEW MILTON & BIG ISAAC QUAD MAPS

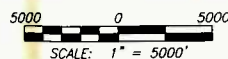
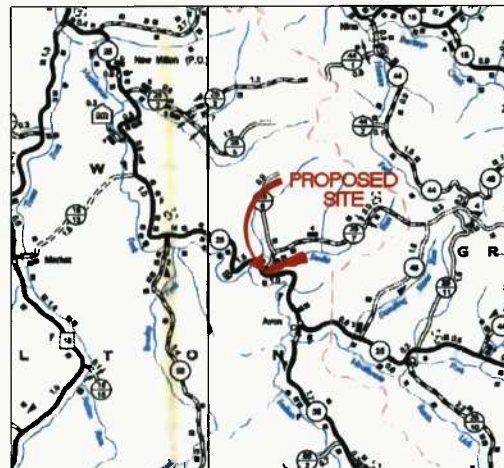


WEST VIRGINIA COUNTY MAP



(NOT TO SCALE)

WVDOH COUNTY ROAD MAP



MISS Utility of West Virginia
1-800-245-4848
West Virginia State Law
(Section XIV: Chapter 24-C)
Requires that you call two
business days before you dig in
the state of West Virginia.
IT'S THE LAW!!

DESIGN CERTIFICATION

THE DRAWINGS, CONSTRUCTION NOTES, AND REFERENCE DIAGRAM ATTACHED HERETO HAVE BEEN PREPARED IN ACCORDANCE WITH THE WEST VIRGINIA CODE OF STATE RULES, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS CRS 35-8.

WEST VIRGINIA STATE PLANE COORDINATE SYSTEM
NORTH ZONE, NAD83
ELEVATION BASED ON NAVD86
ESTABLISHED BY SURVEY GRADE GPS & OPUS
POST-PROCESSING

SHEET INDEX

- 1 - COVER SHEET
- 2 - CONSTRUCTION AND E&S CONTROL NOTES
- 3 - MATERIAL QUANTITIES
- 4 - EXISTING CONDITIONS
- 5 - OVERALL PLAN SHEET INDEX & VOLUMES
- 6 - ACCESS ROAD PLAN
- 7 - WELL PAD & WATER CONTAINMENT PAD PLAN
- 8 - ACCESS ROAD PROFILES
- 9-10 - ACCESS ROAD SECTIONS
- 11-13 - WELL PAD & WATER CONTAINMENT PAD SECTIONS
- 14-19 - CONSTRUCTION DETAILS
- 20 - ACCESS ROAD RECLAMATION PLAN
- 21 - WELL PAD & WATER CONTAINMENT RECLAMATION PLAN
- 22 - FIRM EXHIBIT

SNAKE RUN LIMITS OF DISTURBANCE AREA (AC)	
Total Site	
Access Road "A" (1,635')	4.79
Staging Area	1.66
Well Pad	4.35
Water Containment Pad	4.10
Excess/Topsoil Material Stockpiles	8.42
Total Affected Area	23.32
Total Wooded Acres Disturbed	22.14
Impacts to Pamela A. & Darrel E. Swisher TM 13-26	
Access Road "A" (1198')	3.35
Staging Area	1.66
Excess/Topsoil Material Stockpiles	2.24
Total Affected Area	7.25
Total Wooded Acres Disturbed	6.82
Impacts to Michael B. & William M. Duffelmeyer & Sharon D. Silson & June M. Conley, Et Al TM 13-32	
Access Road "A"	0.11
Water Containment Pad	0.07
Excess/Topsoil Material Stockpiles	1.56
Total Affected Area	1.74
Total Wooded Acres Disturbed	1.74
Impacts to Michael B. & William M. Duffelmeyer & Sharon D. Silson & June M. Conley, Et Al TM 13-33	
Access Road "A" (317')	0.61
Well Pad	2.85
Water Containment Pad	3.41
Excess/Topsoil Material Stockpiles	2.84
Total Affected Area	9.71
Total Wooded Acres Disturbed	9.71
Impacts to Gibson L., III & Deana K. Clark TM 13-26.3	
Access Road "A" (120')	0.72
Well Pad	1.50
Water Containment Pad	0.62
Excess/Topsoil Material Stockpiles	1.78
Total Affected Area	4.62
Total Wooded Acres Disturbed	3.87

Proposed Well Name	WV North NAD 27	WV North NAD 83	UTM (METERS) Zone 17	NAD 83 Lat & Long
Duffelmeyer Unit 1H	N 258846.74 E 1673934.96	N 258863.02 E 1642494.20	N 4339588.82 E 530179.00	LAT 39-12-18.1486 LONG -80-39-01.6881
Duffelmeyer Unit 2H	N 258842.64 E 1673925.84	N 258878.92 E 1642485.08	N 4339587.53 E 530176.24	LAT 39-12-18.1070 LONG -80-39-01.8033
Honey Unit 1H	N 258838.55 E 1673916.71	N 258874.83 E 1642475.96	N 4339586.24 E 530173.48	LAT 39-12-18.0653 LONG -80-39-01.9185
Honey Unit 2H	N 258834.45 E 1673907.59	N 258870.73 E 1642466.84	N 4339584.94 E 530170.72	LAT 39-12-18.0237 LONG -80-39-02.0337
Asena Unit 1H	N 258830.35 E 1673898.47	N 258866.63 E 1642457.72	N 4339583.64 E 530167.97	LAT 39-12-17.9820 LONG -80-39-02.1489
Asena Unit 2H	N 258826.25 E 1673889.35	N 258862.53 E 1642448.59	N 4339582.35 E 530165.21	LAT 39-12-17.9404 LONG -80-39-02.2641
Well Pad Elevation	1,081.0			

Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.

151 Windy Hill Lane
Martinsburg, WV 26105
Tel: (800) 400-4185
www.navituseng.com

REVISION	DATE

ANTERO RESOURCES CORPORATION

THIS DOCUMENT WAS PREPARED FOR ANTERO RESOURCES CORPORATION

COVER SHEET

SNAKE RUN

WELL PAD & WATER CONTAINMENT PAD

NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

Professional Engineer
Cyrus S. Kump, PE
No. 12345
State of West Virginia
08/21/2013

CONSTRUCTION AND E&S CONTROL NOTES

CONSTRUCTION NOTES:

- THE CONTRACTOR IS TO VERIFY FIELD CONDITIONS PRIOR TO AND DURING CONSTRUCTION AND WILL NOTIFY NAVITUS ENGINEERING AT (866) 862-4185 IMMEDIATELY OF ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THE APPROVED PLAN. ANY WORK PERFORMED BY THE CONTRACTOR AFTER THE FINDING OF SUCH DISCREPANCIES SHALL BE DONE AT THE CONTRACTOR'S RISK.
- METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS HEREIN SHALL CONFORM TO THE CURRENT COUNTY CONSTRUCTION STANDARDS AND SPECIFICATIONS AND/OR CURRENT WV DEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL STANDARDS AND SPECIFICATIONS. SHOULD A CONFLICT BETWEEN THE DESIGN, SPECIFICATIONS, AND PLANS OCCUR, THE MOST STRINGENT REQUIREMENT WILL APPLY. THE APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE DEVELOPER OR HIS AGENT OF THE RESPONSIBILITIES CONTAINED IN THE WV DEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.
- AN APPROVED SET OF PLANS AND ALL APPLICABLE PERMITS MUST BE AVAILABLE AT THE CONSTRUCTION SITE. ALSO, A REPRESENTATIVE OF THE DEVELOPER MUST BE AVAILABLE AT ALL TIMES.
- THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS OF CLEANING MUD FROM TRUCKS AND/OR OTHER EQUIPMENT PRIOR TO ENTERING PUBLIC STREETS, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, ALLAY DUST, AND TO TAKE WHATEVER MEASURES ARE NECESSARY TO INSURE THAT THE STREETS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES.
- THE LOCATION OF EXISTING UTILITIES SHOWN IN THESE PLANS ARE FROM FIELD LOCATIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES AS NEEDED PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY CONFLICTS ARISING FROM HIS EXISTING UTILITY VERIFICATION AND THE PROPOSED CONSTRUCTION.
- THE CONTRACTOR SHALL PROVIDE NOTIFICATION TO THE APPROPRIATE UTILITY COMPANY PRIOR TO CONSTRUCTION OF WATER AND/OR GAS PIPE LINES. INFORMATION SHOULD ALSO BE OBTAINED FROM THE APPROPRIATE AUTHORITY CONCERNING PERMITS, CUT SHEETS, AND CONNECTIONS TO EXISTING LINES.
- THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REPAIR OF ANY DAMAGES TO THE EXISTING STREETS AND UTILITIES WHICH OCCURS AS A RESULT OF HIS CONSTRUCTION PROJECT WITHIN OR CONTIGUOUS TO THE EXISTING RIGHT-OF-WAY.
- WHEN GRADING IS PROPOSED WITHIN EASEMENTS OF UTILITIES, LETTERS OF PERMISSION FROM ALL INVOLVED COMPANIES MUST BE OBTAINED PRIOR TO GRADING AND/OR SITE DEVELOPMENT.
- THE DEVELOPER WILL BE RESPONSIBLE FOR THE RELOCATION OF ANY UTILITIES WHICH IS REQUIRED AS A RESULT OF HIS PROJECT. THE RELOCATION SHOULD BE DONE PRIOR TO CONSTRUCTION.
- THESE PLANS IDENTIFY THE LOCATION OF ALL KNOWN GRAVESITES. GRAVESITES SHOWN ON THIS PLAN WILL BE PROTECTED IN ACCORDANCE WITH STATE LAW. IN THE EVENT GRAVESITES ARE DISCOVERED DURING CONSTRUCTION, THE OWNER AND ENGINEER MUST BE NOTIFIED IMMEDIATELY.
- THE CONTRACTOR(S) SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATING OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS, PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
- CONTRACTOR TO CONTACT OPERATOR AND ENGINEER IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION.
- THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE EROSION AND SEDIMENT CONTROL INSPECTOR 2 DAYS PRIOR TO THE START OF CONSTRUCTION.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL FILL MATERIAL TESTING REQUIRED DURING THE CONSTRUCTION OF THIS PROJECT. ALL MATERIAL TESTS SHALL BE CONDUCTED BY A CERTIFIED MATERIALS TESTING LABORATORY AND A CERTIFICATION OF THE MATERIALS TESTED SHALL BE PROVIDED BY A LICENSED PROFESSIONAL ENGINEER REPRESENTING THE LABORATORY. ALL TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER CERTIFYING THE CONSTRUCTED FACILITY. FAILURE TO CONDUCT THE DENSITY TEST SHALL BE CAUSE FOR NON-ACCEPTANCE OF THE CONSTRUCTED FACILITY.
- SATISFACTORY MATERIALS FOR USE AS FILL FOR PAD AREAS INCLUDE MATERIALS CLASSIFIED IN ASTM D-2487 AS GW, GP, GM, GC, SW, SP, SM, SC, ML, AND CL GROUPS. MOISTURE CONTENT WILL BE CONTROLLED IN ACCORDANCE WITH THE STANDARD PROCTOR TEST (ASTM-D698) RESULTS. GENERALLY, UNSATISFACTORY MATERIALS INCLUDE MATERIALS CLASSIFIED IN ASTM D-2487 AS PT, CH, MH, OL, OH, AND ANY SOIL TOO WET TO FACILITATE COMPACTION. CH AND MH SOILS MAY BE USED SUBJECT TO APPROVAL OF THE ENGINEER. SOILS SHALL HAVE A MINIMUM DRY DENSITY OF 92LB/CF PER ASTM D-698 AND SHALL HAVE A PLASTICITY INDEX LESS THAN 17.
- CONTRACTOR SHALL SUBMIT A GENERIC GROUNDWATER PROTECTION PLAN (GPP) TO THE WV DEP GROUNDWATER PROGRAM. THE GROUNDWATER PROTECTION PLAN SHALL BE ADHERED TO DURING CONSTRUCTION.
- THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING THE SITE IN ACCORDANCE WITH THE DESIGN PLANS AND CONSTRUCTION DOCUMENTS AND THE SCOPE OF WORK SHALL CONFORM WITH THE GRADES, BERMS, DEPTHS, DIMENSIONS, ETC. SHOWN HEREON.
- SUPER SILT FENCE CAN BE USED IN PLACE OF ANY COMPOST SOCK, IN MOST CASES. THE ON-SITE CONTRACTOR SHALL CONTACT THE DESIGN ENGINEER IF OTHER MEASURES ARE PROPOSED IN THE FIELD DURING CONSTRUCTION.

SITE CLEANUP & RECYCLE PROGRAM

- GARBAGE, FUELS OR ANY SUBSTANCE HARMFUL TO HUMAN, AQUATIC OR FISH LIFE, WILL BE PREVENTED FROM ENTERING SPRINGS, STREAMS, PONDS, LAKES, WETLANDS OR ANY WATER COURSE OR WATER BODY.
- OILS, FUELS, LUBRICANTS AND COOLANTS WILL BE PLACED IN SUITABLE CONTAINERS AND DISPOSED PROPERLY.
- ALL TRASH AND GARBAGE WILL BE COLLECTED AND DISPOSED PROPERLY.
- ALL SEDIMENT REMOVED FROM SEDIMENT CAPTURING DEVICES SHALL BE PLACED ON THE TOPSOIL STOCKPILE, THEN SEEDED AND MULCHED, AS NECESSARY. ALTERNATIVELY THE REMOVED SEDIMENT CAN BE TRANSPORTED TO A SITE WITH AN APPROVED PERMIT.
- ALL POLLUTION AND EMERGENCY SPILLS SHALL BE IMMEDIATELY REPORTED TO THE WV DEP OFFICE OF OIL AND GAS. (EMERGENCY #1-800-642-3074)

EROSION AND SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION: THE PURPOSE OF THIS PROJECT IS TO CONSTRUCT A GAS WELL DRILLING PAD AND WATER CONTAINMENT PAD TO AID IN THE DEVELOPMENT OF INDIVIDUAL GAS WELLS. THE ACCESS ROAD ENTRANCE TO THE PROPOSED SITE IS LOCATED ON THE EAST SIDE OF CO. RT. 25, 0.03 MILES SOUTH OF THE INTERSECTION OF CO. RT. 25/7 & CO. RT. 25 IN NEW MILTON DISTRICT, DODDRIDGE COUNTY, WEST VIRGINIA. THE TOTAL APPROXIMATE LAND DISTURBANCE ASSOCIATED WITH THIS PROJECT IS 23.32 ACRES.

EXISTING SITE CONDITIONS: THE EXISTING SITE IS APPROXIMATELY 94.9% WOODED. THE TOPOGRAPHY RANGES FROM MODERATE TO STEEP TERRAIN (2% TO 60% SLOPES). PRESENT ON SITE ARE OVERHEAD UTILITIES, AN EXISTING GASLINE, AND EXISTING STRUCTURES. 3 PERENNIAL STREAMS, 2 EPHEMERAL STREAMS, 1 INTERMITTENT STREAM, 1 POND AND 1 PEM WETLAND ARE LOCATED ONSITE. THE SITE IS LOCATED ON A RIDGE AND DRAINS TO SNAKE RUN AND MEATHOUSE FORK. NO EROSION WAS NOTICED ON SITE.

ADJACENT PROPERTY: THE SITE IS BORDERED BY CO. RT. 25 TO THE SOUTH AND WEST, AND CO. RT. 25/7 TO THE NORTH. TO THE EAST LIES FORESTED LAND. THERE ARE MULTIPLE EXISTING STRUCTURES NEAR THE SITE.

CRITICAL AREAS: THE AREA(S) SHOWN ALONG THE FIELD DELINEATED STREAMS, WETLANDS, AND PONDS, AS SHOWN ON THE PLANS, ARE DESIGNATED AS CRITICAL AREA(S). IF PRESENT, ALL 3:1 SLOPES AND STEEPER, DITCHES, AND OTHER CONTROLS SHALL BE CONSIDERED CRITICAL EROSION AREAS. THESE AREAS SHALL BE MONITORED AND MAINTAINED DAILY AND AFTER EACH RAINFALL OF 0.5 INCHES OR GREATER. COMPOST FILTER SOCKS ARE TO BE USED TO PROTECT THESE FIELD DELINEATED AREA(S) FROM SEDIMENT LEAVING THE SITE. ADDITIONALLY, ORANGE SAFETY FENCE IS RECOMMENDED TO BE INSTALLED ABOVE/AROUND THESE AREA(S) TO SERVE AS A PHYSICAL BARRIER, ENSURING THE AREA(S) ARE NOT DISTURBED. THE LOCAL GOVERNING AUTHORITY WILL HAVE THE AUTHORITY TO RECOMMEND THE PLACEMENT OF ADDITIONAL EROSION CONTROL MEASURES IN THESE AREAS IF IT BECOMES EVIDENT DURING CONSTRUCTION THAT THE ONES IN PLACE ARE NOT FUNCTIONING SUFFICIENTLY.

SOILS: NO SOIL STUDIES OR SUBSURFACE INVESTIGATIONS WERE PERFORMED AND ANALYZED FOR THE DESIGN OF THIS SITE.

OFF SITE AREAS: THERE ARE NO BORROW AREA(S) OR EXPORT STOCKPILE AREA(S) OUTSIDE OF THE PROPOSED LIMITS OF DISTURBANCE FOR THIS PROJECT.

EROSION AND SEDIMENT CONTROL MEASURES: UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE CURRENT WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

STRUCTURAL PRACTICES:

- INSTALL ORANGE SAFETY FENCE TO ENSURE NO DISTURBANCE TO THE DELINEATED AREA(S).
- INSTALL TEMPORARY CONSTRUCTION ENTRANCE.
- INSTALL COMPOST FILTER SOCKS AS SHOWN ON THE PLANS TO REMOVE SEDIMENT FROM RUNOFF. SELECTIVELY REMOVE TREES REQUIRED TO INSTALL COMPOST FILTER SOCK IN WOODED AREAS. CLEARING AND GRUBBING SHALL BE KEPT AT A MINIMUM TO INSTALL E&S CONTROLS.
- EROSION CONTROL BLANKETS (JUTE MATTING) SHALL BE PLACED ON ALL CRITICAL SLOPES (3:1 OR GREATER) AND AS NEEDED TO STABILIZE DISTURBED AREAS.
- FILL SLOPE SURFACE SHALL BE LEFT IN A ROUGHENED CONDITION TO REDUCE EROSION. CONTRACTOR SHALL REDIRECT RUNOFF AWAY FROM THE FILL SLOPE BY INSTALLING EARTHEN DIVERSION BERMS AND DIVERTING THE RUNOFF TO SEDIMENT TRAPPING DEVICES.
- INSTALL V-DITCHES, DITCH RELIEF CULVERTS, AND OUTLET PROTECTION (RIP-RAP APRONS) AS SHOWN ON THE PLANS.

DEVICES LISTED ABOVE ARE CONSIDERED MINIMUM EROSION AND SEDIMENT CONTROLS. ADDITIONAL CONTROL MEASURES MAY BE NECESSARY DUE TO CONTRACTOR PHASING OR OTHER UNFORESEEN CONDITIONS. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE CONTRACTOR SHALL IMPLEMENT APPROPRIATE BMP'S TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION. ALL MEASURES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE CURRENT WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

PERMANENT STABILIZATION: ALL AREAS LEFT UNCOVERED BY EITHER BUILDINGS OR PAVEMENT SHALL BE STABILIZED WITH PERMANENT SEEDING IMMEDIATELY FOLLOWING FINISH GRADING AND WITHIN SEVEN (7) DAYS. AT NO TIME SHALL LAND LAY DORMANT LONGER THAN TWENTY-ONE (21) DAYS.

MAINTENANCE PROGRAM: DURING CONSTRUCTION ACTIVITIES, ALL CONTROL MEASURES SHALL BE INSPECTED DAILY BY THE SITE SUPERINTENDENT OR HIS REPRESENTATIVE AND WITHIN TWENTY-FOUR (24) HOURS AFTER ANY SIGNIFICANT RAIN EVENT, WHICH SHALL BE DEFINED AS RAINFALL OF TWO (2) INCHES OR MORE IN A SIX (6) HOUR PERIOD. ONCE CONSTRUCTION ACTIVITIES HAVE CONCLUDED, THE SITE SHALL BE INSPECTED EVERY TWO (2) WEEKS FOR THE LIFE OF THE FACILITY AND WITHIN TWENTY-FOUR (24) HOURS OF A SIGNIFICANT RAIN EVENT AS DEFINED ABOVE. ANY DAMAGED STRUCTURAL MEASURES ARE TO BE REPAIRED, BY THE END OF THE DAY, OR AT THE EARLIEST TIME IN WHICH IT IS SAFE TO DO SO. SEEDED AREAS SHALL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND OF GRASS IS MAINTAINED. ALL AREAS SHALL BE FERTILIZED AND RESEDED AS NEEDED UNTIL GRASS IS ESTABLISHED.

TRAPPED SEDIMENT IS TO BE REMOVED AS REQUIRED TO MAINTAIN 50% TRAP AND/OR SOCK EFFICIENCY AND DISPOSED OF BY SPREADING ON THE STOCKPILE.

INLET OF DITCH RELIEF CULVERTS SHALL BE CHECKED REGULARLY FOR SEDIMENT BUILD-UP. IF THE GRAVEL OUTLET IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED IMMEDIATELY.

SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED OR SWEEPED INTO ANY ROADSIDE DITCH, CULVERT OR SURFACE WATER.

ANY DISTURBED AREAS ALONG THE ACCESS ROAD SHALL BE STABILIZED PRIOR TO THE END OF EACH DAY WITH EITHER ROCK STABILIZATION OR SEEDING AND MULCHING METHODS.

NOTE: THE WV DEP RETAINS THE RIGHT TO ADD AND/OR MODIFY THESE EROSION AND SEDIMENT CONTROL MEASURES DURING THE CONSTRUCTION PROCESS, WITHIN REASON, TO ENSURE ADEQUATE PROTECTION TO THE PUBLIC AND THE ENVIRONMENT.

SEEDING (SOIL STABILIZATION):

- CONTRACTOR SHALL APPLY SEED AND STABILIZATION IN ACCORDANCE WITH THE WV DEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, BASED UPON SITE SPECIFIC SOIL CHARACTERISTICS.
- WHEREVER SEEDING IS TO BE APPLIED TO STEEP SLOPES (> 3H:1V), SEED MIXTURES SHOULD BE SELECTED THAT ARE APPROPRIATE FOR STEEP SLOPES.

DUST CONTROL:

- TEMPORARY SEEDING SHALL BE APPLIED TO ALL DISTURBED AREAS SUBJECT TO LITTLE OR NO CONSTRUCTION TRAFFIC.
- ALL HAUL ROADS AND OTHER HEAVY TRAFFIC ROUTES SHALL BE SPRINKLED WITH WATER UNTIL THE SURFACE IS WET AND REPEATED AS NEEDED TO CONTROL DUST.

CONSTRUCTION SEQUENCE

THE DEVELOPMENT OF THIS SITE SHALL BE CONSISTENT WITH THE FOLLOWING GENERAL SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL IMPLEMENT, MAINTAIN, AND OPERATE ALL PROPOSED EROSION AND SEDIMENT CONTROL MEASURES TO EFFECTIVELY MITIGATE THE HAZARD OF ACCELERATED EROSION AND SEDIMENTATION TO ACCEPTABLE LEVELS. MINOR DEVIATIONS FROM THIS SEQUENCE SHALL BE EXECUTED BY THE PROJECT'S SUPERINTENDENT AS NEEDED TO ELIMINATE ANY POTENTIAL EROSION CONDITION THAT MAY ARISE FOR THE DURATION OF THE PROJECT. THE WV DEP OFFICE OF OIL AND GAS SHALL BE NOTIFIED OF ANY AND ALL SUCH DEVIATIONS FROM THE APPROVED PLANS.

- A PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTOR AND THE APPROPRIATE EROSION AND SEDIMENT CONTROL INSPECTOR 48 HOURS PRIOR TO BEGINNING WORK TO REVIEW THE CONSTRUCTION DRAWINGS AND PROVIDE ANY REQUESTED GUIDANCE.
- STAKE THE LIMITS OF CONSTRUCTION AND MARK ALL IDENTIFIED WETLANDS, STREAMS, AND OTHER AREAS OF CONCERN FOR CONSTRUCTION ACTIVITIES. INSTALL SIGNS TO DESIGNATE THE AREAS AND ORANGE SAFETY FENCE TO IDENTIFY IMPORTANT PROJECT ATTRIBUTES SUCH AS APPROVED ACCESS ROADS, NO REFUELING ZONES, WETLANDS/STREAM BOUNDS, ETC.
- CONSTRUCT THE ROCK CONSTRUCTION ENTRANCE. ALL VEHICLES ENTERING AND EXITING THE SITE SHALL DO SO VIA THE ROCK CONSTRUCTION ENTRANCE.
- CONSTRUCT ALL BMP'S AS SOON AS CLEARING AND GRUBBING OPERATIONS ALLOW. DIVERSIONS AND SEDIMENT TRAP(S)/BASIN(S) SHALL BE SEEDED AND MULCHED IMMEDIATELY.
- IF APPLICABLE, CONVEY UPSLOPE DRAINAGE AROUND THE ACCESS ROAD, WELL PAD, AND WATER CONTAINMENT PAD AREAS BY CONSTRUCTING ALL DIVERSION BERM(S) AND/OR COMPOST FILTER SOCK DIVERSION(S) AS SHOWN ON THE PLANS.
- CLEAR AND GRUB THE SITE. ALL WOODY MATERIAL, BRUSH, TREES, STUMPS, LARGE ROOTS, BOULDERS AND DEBRIS SHALL BE CLEARED FROM THE SITE AREA AND KEPT TO THE MINIMUM NECESSARY FOR PROPER CONSTRUCTION, INCLUDING THE INSTALLATION OF NECESSARY SEDIMENT CONTROLS. TREES SIX INCHES IN DIAMETER AND LARGER SHALL BE CUT AND LOGS STACKED. SMALLER TREES, BRUSH, & STUMPS SHALL BE CUT AND/OR GRUBBED AND WINDROWED IN APPROPRIATE AREAS FOR USE AS BRUSH PILE SEDIMENT BARRIERS (AS SHOWN ON THE PLANS), WILDLIFE HABITATS, BURNED (AS PER WV FOREST FIRE LAWS), REMOVED FROM SITE, OR DISPOSED OF BY OTHER METHODS APPROVED BY WV DEP.
- IF APPLICABLE, INSTALL ALL WETLAND OR STREAM CROSSINGS AS SHOWN ON THE PLANS.
- STRIP THE TOPSOIL FROM THE ACCESS ROAD. PRIOR TO PLACING ANY FILL, THE EXPOSED SUBGRADE SHALL BE COMPACTED AND PROOF ROLLED TO PRODUCE A STABLE AND UNYIELDING SITE. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURES SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, IF NECESSARY.
- CONSTRUCT THE ACCESS ROAD. ALL FILL AREAS, INCLUDING EXCESS MATERIAL STOCKPILES, SHALL BE "KEYED IN" AND COMPACTED IN HORIZONTAL LIFTS WITH A MAXIMUM LOOSE LIFT THICKNESS OF 12" AND MAXIMUM PARTICLE SIZE OF LESS THAN 6". ALL FILL SHALL BE COMPACTED BY A VIBRATING SHEEPSFOOT ROLLER TO 95% PER THE STANDARD PROCTOR TEST (ASTM-D698). MOISTURE CONTENT WILL BE CONTROLLED IN ACCORDANCE WITH THE STANDARD PROCTOR TEST (ASTM-D698) RESULTS. IT IS ALSO RECOMMENDED THAT EACH LIFT BE PROOF ROLLED WITH A LOADED HAUL TRUCK WHERE APPLICABLE. DITCH RELIEF CULVERTS SHALL BE INSTALLED AT A GRADE OF 1-8% TO MINIMIZE OUTLET VELOCITIES TO THE EXTENT POSSIBLE. INSTALL OUTLET PROTECTION ONCE DITCH RELIEF CULVERTS ARE INSTALLED, AS SHOWN ON THE PLANS. STABILIZE THE ROAD WITH GEOTEXTILE FABRIC & STONE AND SIDE SLOPES AS SPECIFIED WITH PERMANENT SEEDING. EXCESS MATERIAL SHALL BE STOCKPILED (IF NECESSARY) IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. TOPSOIL SHALL BE STRIPPED FROM ALL STOCKPILE AREAS PRIOR TO CONSTRUCTION STOCKPILES. AFTER STOCKPILES ARE CONSTRUCTED, TOPSOIL IS TO BE REAPPLIED AT A DEPTH OF 6". SLOPES SHALL BE TRACKED BY RUNNING TRACKED MACHINERY UP AND DOWN THE SLOPE, LEAVING TREAD MARKS PARALLEL TO THE CONTOUR. ALL DITCH LINES SHALL BE CLEANED PRIOR TO INSTALLATION OF LINED PROTECTION.
- STRIP THE TOPSOIL FROM THE WELL PAD AND WATER CONTAINMENT PAD. PRIOR TO PLACING ANY FILL, THE EXPOSED SUBGRADE SHALL BE COMPACTED AND PROOF ROLLED TO PRODUCE A STABLE AND UNYIELDING SITE. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURES SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, IF NECESSARY.
- GRADE THE WELL PAD AND WATER CONTAINMENT PAD AREAS AS SHOWN ON THE PLANS. INSTALL PAD SUMPS (WITH 4" PVC DRAIN PIPE AND OUTLET PROTECTION) AND CONTAINMENT BERM LINER SYSTEM. IMMEDIATELY STABILIZE THE OUTER AREAS OF THE WELL PAD AND WATER CONTAINMENT PAD. THE WELL PAD AND WATER CONTAINMENT PAD AREAS SHALL BE STABILIZED WITH GEOTEXTILE FABRIC & STONE AND THE SIDE SLOPES WITH EROSION CONTROL BLANKETING WHEN SLOPES ARE 3:1 OR GREATER. APPLY SEED AND MULCH TO ALL DISTURBED AREAS. THIS SHALL INCLUDE ALL AREAS THAT WILL NOT BE SUBJECT TO REGULAR TRAFFIC ACTIVITY (TO BE STABILIZED WITH STONE), OR ANY DISTURBED AREA THAT WILL NOT BE RE-DISTURBED BEFORE SITE RECLAMATION BEGINS.
- COMMENCE WELL DRILLING ACTIVITY.
- ALL BMP'S MUST REMAIN IN PLACE AND FUNCTIONAL UNTIL ALL AREAS WITHIN THE LIMIT OF DISTURBANCE ARE COMPLETE AND PERMANENTLY STABILIZED. MAINTENANCE MUST INCLUDE INSPECTION OF ALL EROSION AND SEDIMENT CONTROLS AFTER EACH RUNOFF EVENT IN EXCESS OF 0.5" AND ON A BIWEEKLY BASIS.
- THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. A NOTICE OF TERMINATION MUST BE FILED WITH THE WV DEP WHEN THE SITE REACHES FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT EITHER A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT THE SURFACE HAS BEEN STABILIZED BY HARD COVER SUCH AS PAVEMENT OR BUILDINGS. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE.
- ALL PERMANENT SEDIMENT CONTROL MEASURES CAN BE REMOVED AFTER THE SITE IS PERMANENTLY STABILIZED AND APPROVAL IS RECEIVED FROM THE WV DEP.
- ANY AREAS DISTURBED BY REMOVAL OF CONTROLS SHALL BE REPAIRED, STABILIZED, AND PERMANENTLY SEEDED.

Engineering
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Environmental
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ENGINEERING INC.



REVISION	DATE

ANTERO
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BY ANTERO
RESOURCES
CORPORATION

CONSTRUCTION AND E&S CONTROL NOTES

WELL PAD & WATER CONTAINMENT PAD

NEW MILTON DISTRICT

DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 08/21/2013

SCALE: N/A

SHEET 2 OF 22

REGISTERED PROFESSIONAL ENGINEER
STATE OF WEST VIRGINIA
NO. 1185

08/21/2013

MATERIAL QUANTITIES

REVISION	DATE	BY	CHECKED	APP'D	DATE



MATERIAL QUANTITIES
SLAKE RUN
WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



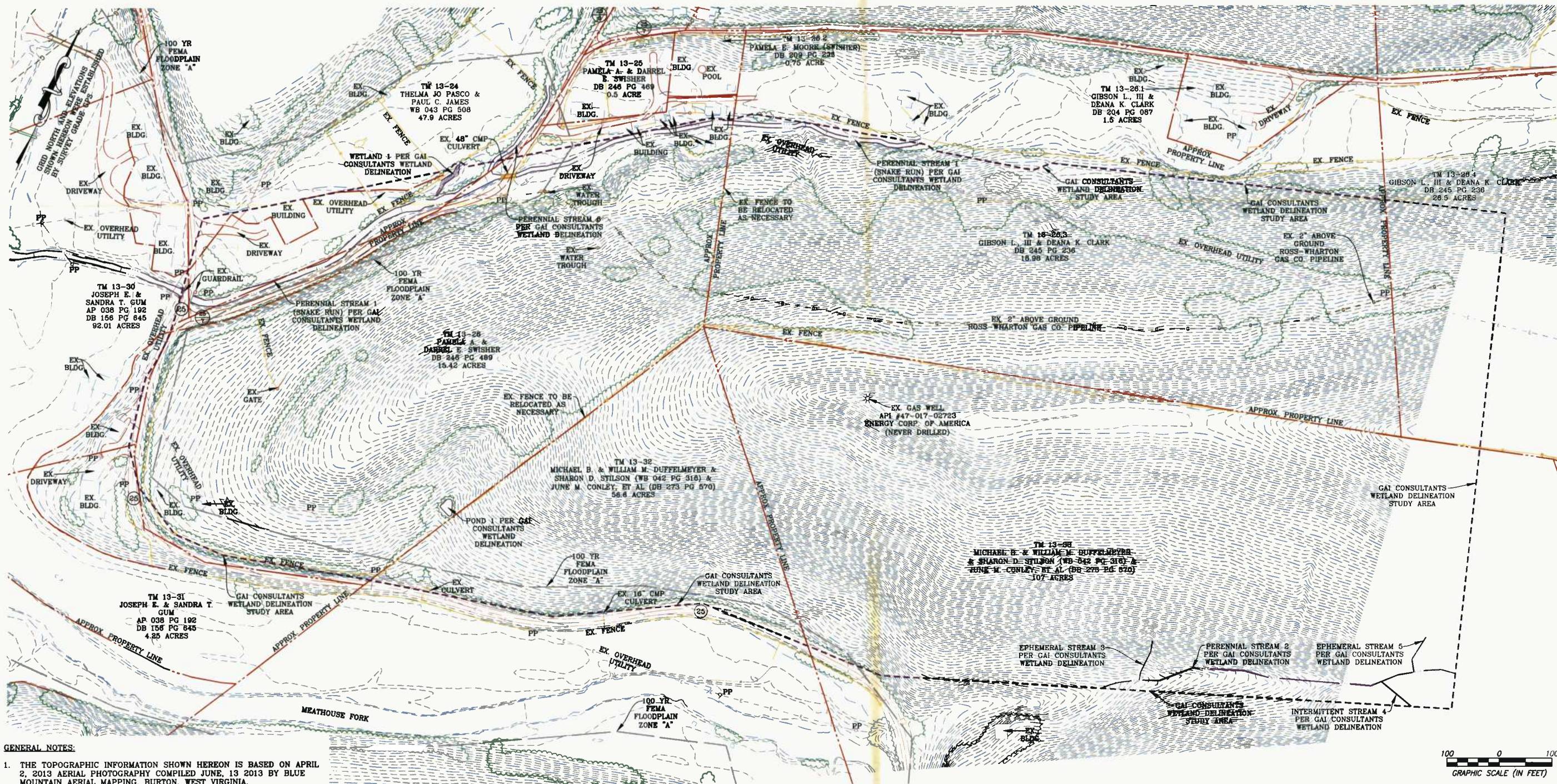
MATERIAL QUANTITIES				
WELL PAD & WATER CONTAINMENT PAD SITE: SNAKE RUN				
Item Description	Quantity	Unit	Unit Cost	Item Total
1.0 Mobilization				
(Limited to 10% of Total Base Bid)	1.0	LS	\$	\$
2.0 Erosion & Sediment Control				
2.1 Clearing and Grubbing				
2.1.1 Wooded	22.14	AC	\$	\$
2.1.2 Open Field	1.18	AC	\$	\$
2.2 Super Silt Fence	41.3	LF	\$	\$
2.3 12" Compost Filter Sock	3,580.2	LF	\$	\$
2.4 18" Compost Filter Sock	1,259.0	LF	\$	\$
2.5 24" Compost Sock Diversion	191.1	LF	\$	\$
2.6 Jute Matting - Slope Matting	569,428.7	SF	\$	\$
2.7 Ditch Lining - Synthetic Matting (TRM)	689.1	SF	\$	\$
3.0 Unclassified Earthwork				
3.1 Access Road "A"				
3.1.1 Topsoil Removal to Stockpile (Assume 6" Depth)	2,845.5	CY	\$	\$
3.1.2 Excavation (Cut to Compact Fill)	8,591.8	CY	\$	\$
3.1.3 Excavation (Export to Stockpile)	12,759.8	CY	\$	\$
3.2 Staging Area				
3.2.1 Topsoil Removal to Stockpile (Assume 6" Depth)	1,068.9	CY	\$	\$
3.2.2 Excavation (Cut to Compact Fill)	10,637.2	CY	\$	\$
3.2.3 Excavation (Import from Stockpile)	675.4	CY	\$	\$
3.3 Well Pad				
3.3.1 Topsoil Removal to Stockpile (Assume 6" Depth)	2,624.1	CY	\$	\$
3.3.2 Excavation (Cut to Compact Fill)	23,354.8	CY	\$	\$
3.3.3 Excavation (Export to Stockpile)	22,229.4	CY	\$	\$
3.4 Water Containment Pad				
3.4.1 Topsoil Removal to Stockpile (Assume 6" Depth)	2,546.3	CY	\$	\$
3.4.2 Excavation (Cut to Compact Fill)	21,664.4	CY	\$	\$
3.4.3 Excavation (Export to Stockpile)	9,406.4	CY	\$	\$
3.5 Excavation/Undiggable Material (Hammering)		CY	\$	\$
3.6 Excavation/Undiggable Material (Blasting)		CY	\$	\$

4.0 Stone and Aggregate Surfacing				
4.1 Construction Entrance				
4.1.1 6"-4" Crusher Run (10" Depth)	171.5	TONS	\$	\$
4.1.2 Geotextile Fabric (US 200 or Equal)	3,719.6	SF	\$	\$
4.2 Access Road "A"				
4.2.1 6"-4" Crusher Run (8" Depth)	1,587.8	TONS	\$	\$
4.2.2 3/4"-1 1/2" Crusher Run (2" Depth)	397.5	TONS	\$	\$
4.2.3 Geotextile Fabric (US 200 or Equal)	42,656.0	SF	\$	\$
4.3 Staging Area				
4.3.1 6"-4" Crusher Run (8" Depth)	990.0	TONS	\$	\$
4.3.2 3/4"-1 1/2" Crusher Run (2" Depth)	248.0	TONS	\$	\$
4.3.3 Geotextile Fabric (US 200 or Equal)	26,597.0	SF	\$	\$
4.4 Well Pad				
4.4.1 6"-4" Crusher Run (6" Depth)	1,792.6	TONS	\$	\$
4.4.2 3/4"-1 1/2" Crusher Run (2" Depth)	598.4	TONS	\$	\$
4.4.3 Geotextile Fabric (US 200 or Equal)	48,158.7	SF	\$	\$
4.5 Water Containment Pad				
4.5.1 6"-4" Crusher Run (8" Depth)	2,304.6	TONS	\$	\$
4.5.2 3/4"-1 1/2" Crusher Run (2" Depth)	577.1	TONS	\$	\$
4.5.3 Geotextile Fabric (US 200 or Equal)	61,914.6	SF	\$	\$
4.6 4" Rip Rap (Outlets/Level Spreaders) 18" Depth	567.7	TONS	\$	\$
4.7 4" Rip Rap (Rock-Lined Ditches) 6" Depth	355.5	TONS	\$	\$
4.8 Rock Fill Check Dams (#1 Stone)	16.4	TONS	\$	\$
5.0 Ditch Relief and Drainage Culverts				
5.1 15" HDPE (total)	382.0	LF	\$	\$
6.0 Well Pad Dewatering System				
6.1 102"x78"x54" Pre-Cast Low Profile Tank Catch Basins	4.0	EA	\$	\$
6.2 HDPE Pipe Riser (8" Minimum Dia., 60" Length) and 4" PVC Valve	4.0	EA	\$	\$
6.3 4" PVC Discharge Pipe	88.0	LF	\$	\$
6.4 Catch Basin Base (1-1/2" or 3/4" Crusher Run Stone) 12" Depth	26.4	TONS	\$	\$
6.5 4" Rip Rap (Discharge Pipe Outlets) 18" Depth	69.3	TONS	\$	\$
7.0 Liner System				
7.1 Well Pad Containment Berm				
7.1.1 Primary Liner (60 Mil Textured)	8,181.5	SF	\$	\$
7.1.2 Non-woven Geotextile Fabric Cushion (16 oz.)	8,181.5	SF	\$	\$
8.0 Miscellaneous				
8.1 Seeding and Mulching				
8.1.1 Temporary Seeding (Vegetation & Mulch)	0.0	AC	\$	\$
8.1.2 Permanent Seeding (Vegetation & Mulch / Fertilizer/ Lime)	19.8	AC	\$	\$
8.1.3 Lime, Fertilizer, Seeding, and Hydro-Mulch w/tack (HYC2 or Equal)		AC	\$	\$

NOTE:

1. THE SQUARE FOOTAGE FOR THE GEOTEXTILE FABRIC AND THE LINER SYSTEM DOES NOT ACCOUNT FOR MATERIAL OVERLAP AND WASTE.

EXISTING CONDITIONS



GENERAL NOTES:

1. THE TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON APRIL 2, 2013 AERIAL PHOTOGRAPHY COMPILED JUNE, 13 2013 BY BLUE MOUNTAIN AERIAL MAPPING, BURTON, WEST VIRGINIA.
2. THE PROPERTY LINES SHOWN HEREON DO NOT REPRESENT A BOUNDARY SURVEY ON ANY OF THE PARCELS SHOWN. PROPERTY CORNERS AND LINES PERTINENT TO WELL LOCATION ARE BASED ON A FIELD SURVEY. THE REMAINDER OF THE PROPERTY LINES ARE BASED ON COUNTY REAL ESTATE TAX MAPS, GIS INFORMATION AND DEEDS OF RECORD.
3. UTILITIES AND THEIR LOCATIONS AS SHOWN HEREON ARE BASED ON: A) OBSERVABLE EVIDENCE OF THOSE VISIBLE ABOVE-GROUND FACILITIES, FEATURES, AND MARKERS WHICH WERE FOUND ON THE SUBJECT PROPERTY AT THE TIME OF SURVEY PERFORMED BY NAVITUS ENGINEERING AND B) FIELD MARKINGS PLACED BY UTILITY COMPANIES IN RESPONSE TO THE WV 811 TICKET SUBMITTED BY NAVITUS ENGINEERING. NAVITUS ENGINEERING CANNOT GUARANTEE THE ACCURACY OF THE UTILITY MARKINGS PERFORMED BY OTHERS OR THAT ALL UTILITIES EXISTING WITHIN THE LIMITS OF THIS PLAN ARE SHOWN. ANY UTILITIES ENCOUNTERED SUBSEQUENT TO PLAN APPROVAL OR DURING CONSTRUCTION THAT ARE NOT SHOWN ON THE PLAN SHOULD BE REPORTED TO NAVITUS ENGINEERING AND ANTERO RESOURCES CORPORATION.



LEGEND

EX. INDEX CONTOUR	- - - - - 700
EX. INTERMEDIATE CONTOUR	- - - - -
EX. PROPERTY LINE	---
EX. ROAD EDGE OF GRAVEL/DIRT	---
EX. ROAD EDGE OF PAVEMENT	---
EX. ROAD CENTERLINE	---
EX. DITCHLINE	---
EX. CULVERT	---
EX. FENCELINE	---
EX. OVERHEAD UTILITY	---
EX. POWER POLE/GUY WIRE	---
EX. PIPELINE & WELL	---
EX. TREELINE	---
EX. DELINEATED STREAM	---
EX. DELINEATED WETLAND/POND	---
EX. BUILDING	---
DELINEATION STUDY AREA	---

REVISION	DATE



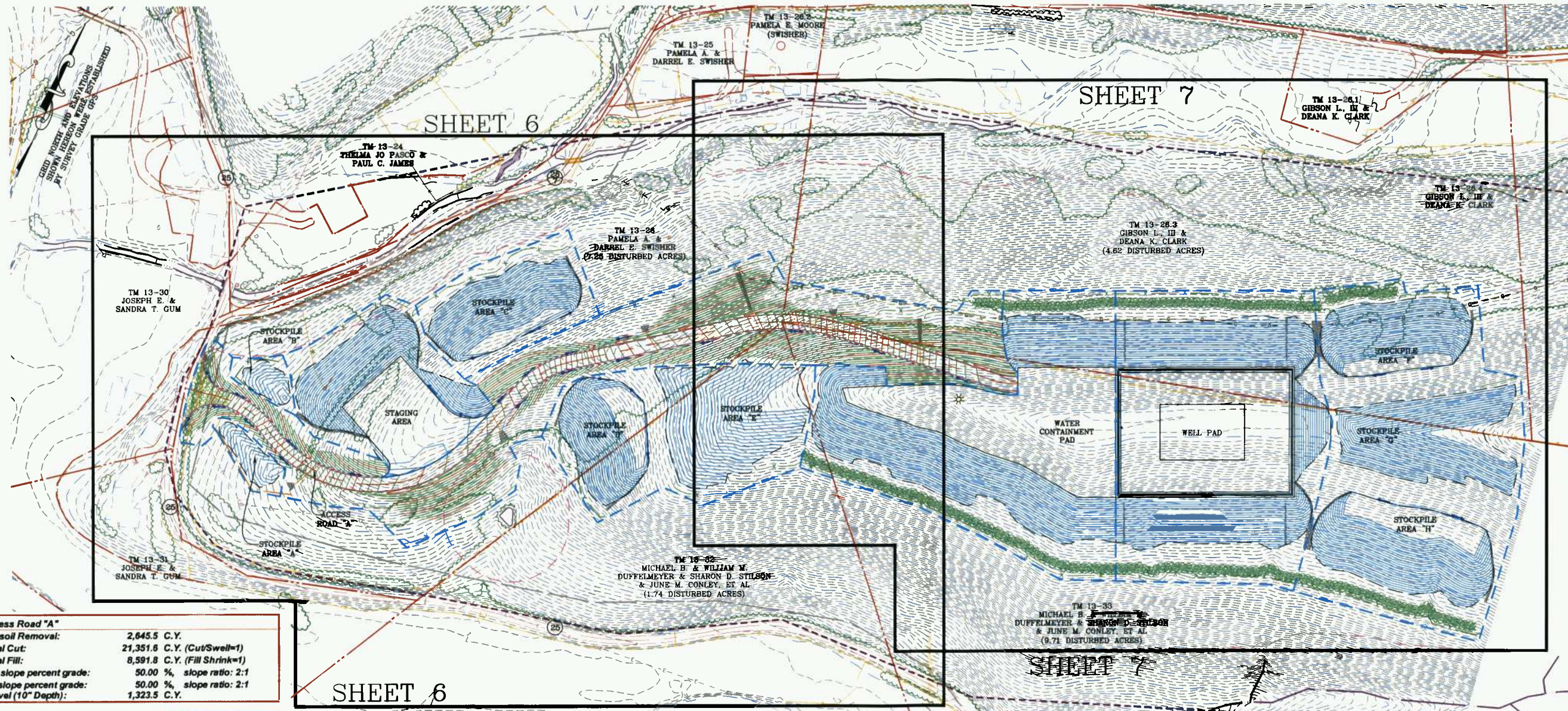
EXISTING CONDITIONS
SNAKE RUN
WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 08/21/2013
 SCALE: 1" = 100'
 SHEET 4 OF 22

NAVITUS ENGINEERING INC.
 Engineering Survey Environmental GIS
 151 Windy Hill Lane
 Winchester, Virginia 22602
 Telephone: (888) 662-4185
 www.navituseng.com

OVERALL PLAN SHEET INDEX & VOLUMES



Access Road "A"

Topsoil Removal:	2,645.5 C.Y.
Total Cut:	21,351.6 C.Y. (Cut/Swell=1)
Total Fill:	8,591.8 C.Y. (Fill Shrink=1)
Cut slope percent grade:	50.00 %, slope ratio: 2:1
Fill slope percent grade:	50.00 %, slope ratio: 2:1
Gravel (10" Depth):	1,323.5 C.Y.

Staging Area

Topsoil Removal:	1,068.9 C.Y.
Total Cut:	10,637.2 C.Y. (Cut/Swell=1)
Total Fill:	11,312.6 C.Y. (Fill Shrink=1)
Cut slope percent grade:	50.00 %, slope ratio: 2:1
Fill slope percent grade:	50.00 %, slope ratio: 2:1
Top of Pad Elevation:	944-942'
Gravel (10" Depth):	825.3 C.Y.

Well Pad

Topsoil Removal:	2,624.1 C.Y.
Total Cut:	45,584.2 C.Y. (Cut/Swell=1)
Total Fill:	23,354.8 C.Y. (Fill Shrink=1)
Cut slope percent grade:	50.00 %, slope ratio: 2:1
Fill slope percent grade:	50.00 %, slope ratio: 2:1
Top of Pad Elevation:	1,081.0'
Gravel (8" Depth):	1,594.0 C.Y.

Water Containment Pad

Topsoil Removal:	2,546.3 C.Y.
Total Cut:	31,070.8 C.Y. (Cut/Swell=1)
Total Fill:	21,664.4 C.Y. (Fill Shrink=1)
Cut slope percent grade:	50.00 %, slope ratio: 2:1
Fill slope percent grade:	50.00 %, slope ratio: 2:1
Top of Pad Elevation:	1,080.0'
Gravel (10" Depth):	1,921.1 C.Y.

SHAKE RUN WELL PAD & WATER CONTAINMENT PAD

Description	Cut (CY)	Fill (CY)	Spoil (CY)	Borrow (CY)	Max. Slope (%)	Length of Slope (FT)
Access Road "A"	21,351.6	8,591.8	12,759.8	0.0	20.0	87.5
Staging Area	10,637.2	11,312.6	0.0	675.4	n/a	n/a
Well Pad	45,584.2	23,354.8	22,229.4	0.0	n/a	n/a
Water Containment Pad	31,070.8	21,664.4	9,406.4	0.0	n/a	n/a
Stripped Topsoil (6")	8,884.8	0.0	8,884.8	0.0	n/a	n/a
Material Stockpiles	0.0	53,270.0	0.0	53,270.0	n/a	n/a
Totals	117,528.6	118,193.6	53,280.4	53,945.4	n/a	n/a
Total Spoil (CY) =			-685.0			

MATERIAL STOCKPILES

Name	Excess	Topsoil
A	0.0	590.0
B	0.0	479.0
C	5,600.0	0.0
D	7,720.0	0.0
E	0.0	8,000.0
F	8,280.0	0.0
G	7,380.0	0.0
H	15,230.0	0.0
TOTAL	44,210.0	9,060.0



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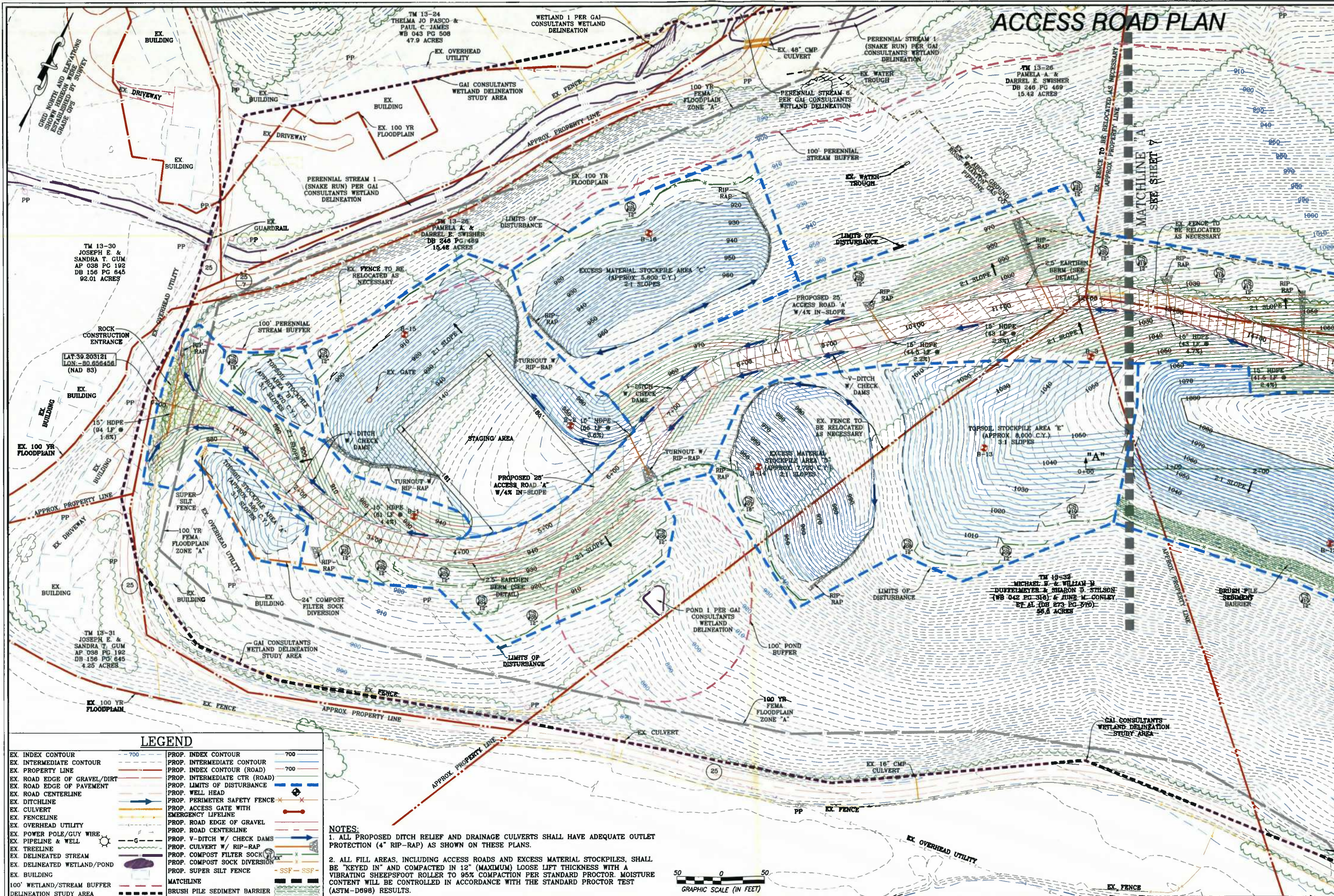
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OVERALL PLAN SHEET INDEX & VOLUMES
SHAKE RUN
WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 08/21/2013
 SCALE: 1" = 100'
 SHEET 5 OF 22

ACCESS ROAD PLAN



LEGEND	
EX. INDEX CONTOUR	700
EX. INTERMEDIATE CONTOUR	700
EX. PROPERTY LINE	700
EX. ROAD EDGE OF GRAVEL/DIRT	700
EX. ROAD EDGE OF PAVEMENT	700
EX. ROAD CENTERLINE	700
EX. DITCHLINE	700
EX. CULVERT	700
EX. FENCELINE	700
EX. OVERHEAD UTILITY	700
EX. POWER POLE/GUY WIRE	700
EX. PIPELINE & WELL	700
EX. TREELINE	700
EX. DELINEATED STREAM	700
EX. DELINEATED WETLAND/POND	700
EX. BUILDING	700
100' WETLAND/STREAM BUFFER DELINEATION STUDY AREA	700
PROP. INDEX CONTOUR	700
PROP. INTERMEDIATE CONTOUR	700
PROP. INDEX CONTOUR (ROAD)	700
PROP. INTERMEDIATE CTR (ROAD)	700
PROP. LIMITS OF DISTURBANCE	700
PROP. WELL HEAD	700
PROP. PERIMETER SAFETY FENCE	700
PROP. ACCESS GATE WITH EMERGENCY LIFELINE	700
PROP. ROAD EDGE OF GRAVEL	700
PROP. ROAD CENTERLINE	700
PROP. V-DITCH W/ CHECK DAMS	700
PROP. CULVERT W/ RIP-RAP	700
PROP. COMPOST FILTER SOCK	700
PROP. COMPOST SOCK DIVERSION	700
PROP. SUPER SILT FENCE	700
MATCHLINE	700
BRUSH PILE SEDIMENT BARRIER	700

NOTES:
 1. ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 2. ALL FILL AREAS, INCLUDING ACCESS ROADS AND EXCESS MATERIAL STOCKPILES, SHALL BE "KEYED IN" AND COMPACTED TO 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR. MOISTURE CONTENT WILL BE CONTROLLED IN ACCORDANCE WITH THE STANDARD PROCTOR TEST (ASTM-D698) RESULTS.



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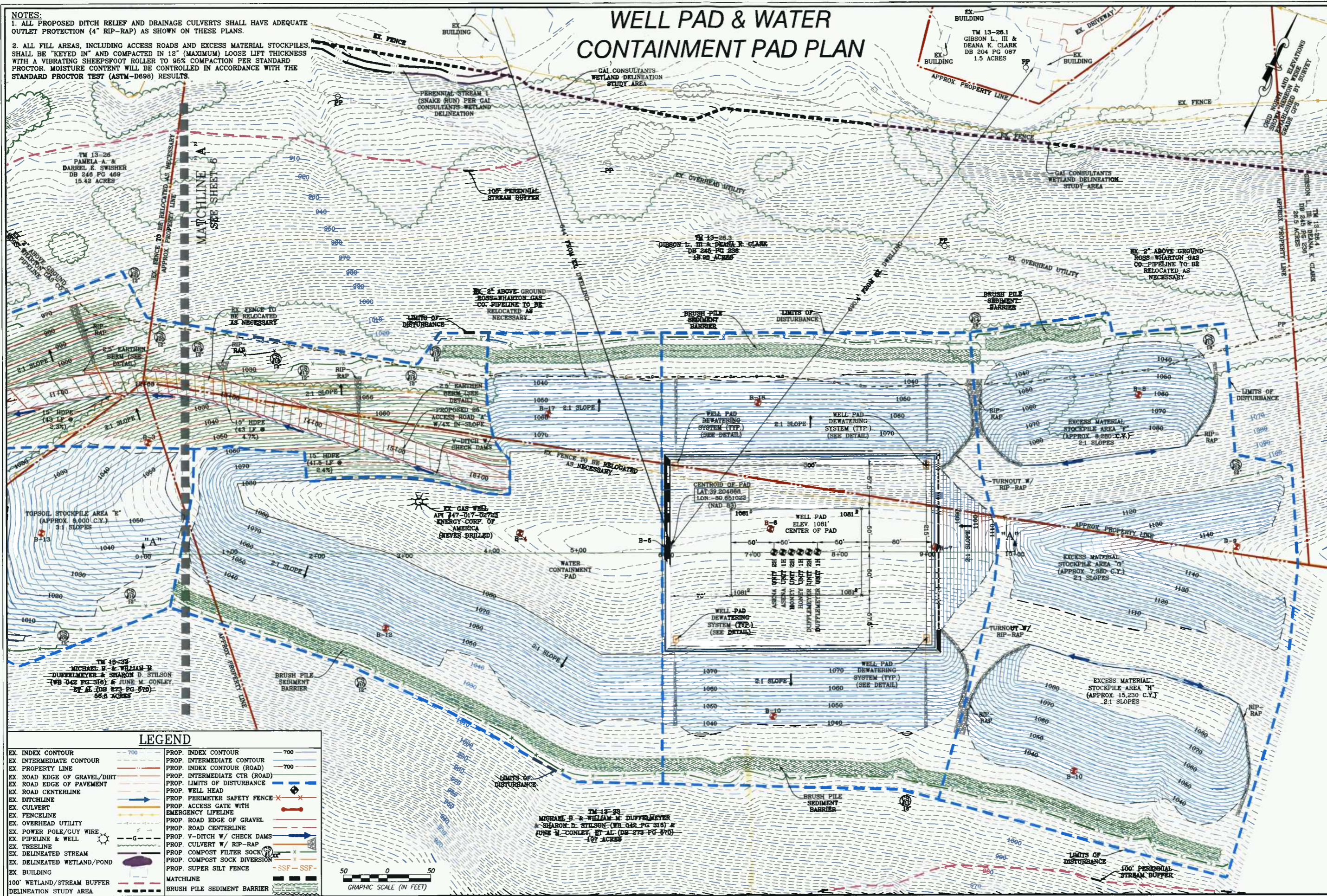
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ACCESS ROAD PLAN
SNAKE RUN
WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 08/21/2013
 SCALE: 1" = 50'
 SHEET 6 OF 22

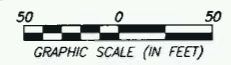
NOTES:
 1. ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 2. ALL FILL AREAS, INCLUDING ACCESS ROADS AND EXCESS MATERIAL STOCKPILES, SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR. MOISTURE CONTENT WILL BE CONTROLLED IN ACCORDANCE WITH THE STANDARD PROCTOR TEST (ASTM-D698) RESULTS.

WELL PAD & WATER CONTAINMENT PAD PLAN



LEGEND

EX. INDEX CONTOUR	700	PROP. INDEX CONTOUR	700
EX. INTERMEDIATE CONTOUR	700	PROP. INTERMEDIATE CONTOUR	700
EX. PROPERTY LINE	---	PROP. PROPERTY LINE (ROAD)	---
EX. ROAD EDGE OF GRAVEL/DIRT	---	PROP. INTERMEDIATE CTR (ROAD)	---
EX. ROAD EDGE OF PAVEMENT	---	PROP. LIMITS OF DISTURBANCE	---
EX. ROAD CENTERLINE	---	PROP. WELL HEAD	⊙
EX. DITCHLINE	---	PROP. PERIMETER SAFETY FENCE	⊗
EX. CULVERT	---	PROP. ACCESS GATE WITH EMERGENCY LIFELINE	⊕
EX. FENCELINE	---	PROP. ROAD EDGE OF GRAVEL	---
EX. OVERHEAD UTILITY	---	PROP. ROAD CENTERLINE	---
EX. POWER POLE/GUY WIRE	---	PROP. V-DITCH W/ CHECK DAMS	---
EX. PIPELINE & WELL	---	PROP. RIP-RAP	---
EX. TREELINE	---	PROP. COMPOST FILTER SOCK	---
EX. DELINEATED STREAM	---	PROP. COMPOST SOCK DIVERSION	---
EX. DELINEATED WETLAND/POND	---	PROP. SUPER SILT FENCE	SSF-SSF-
EX. BUILDING	---	MATCHLINE	---
100' WETLAND/STREAM BUFFER DELINEATION STUDY AREA	---	BRUSH PILE SEDIMENT BARRIER	---



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WELL PAD & WATER CONTAINMENT PAD PLAN
SNAKE RUN
 WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 08/21/2013
 SCALE: 1" = 50'
 SHEET 7 OF 22

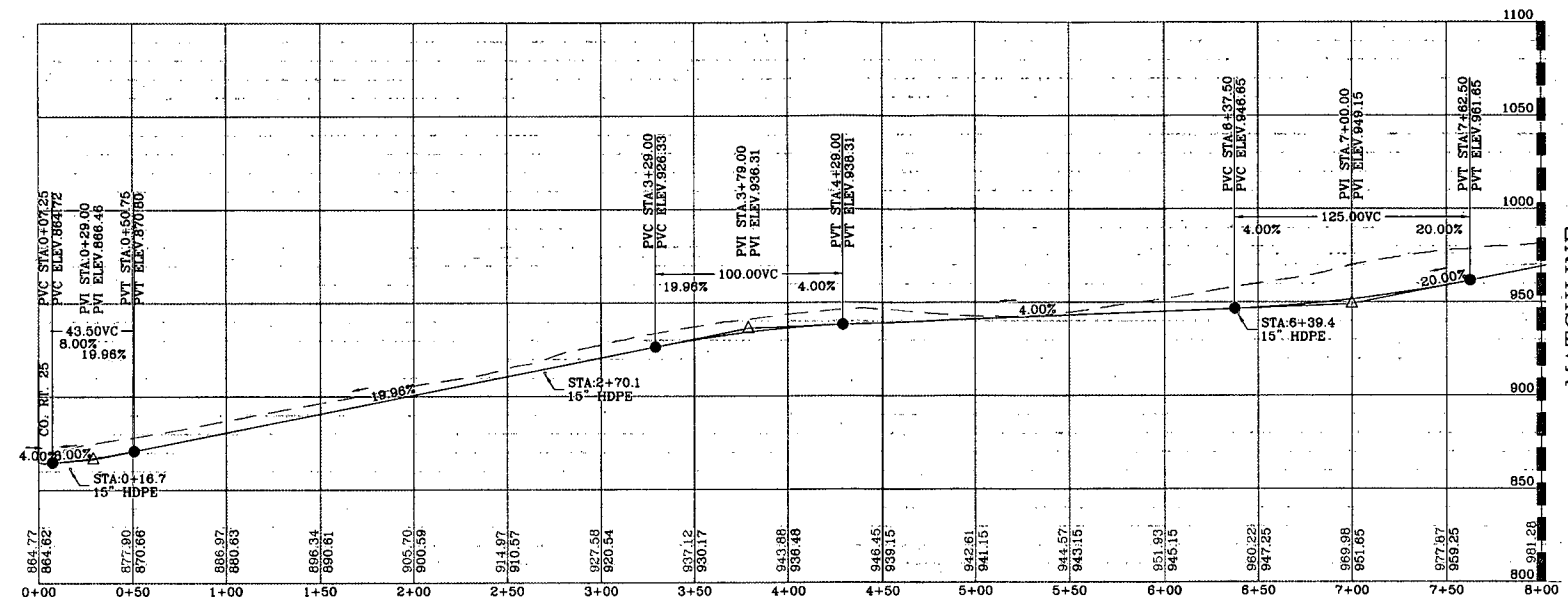
ACCESS ROAD PROFILES

LEGEND

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X-SECTION GRID INTERMEDIATE	---
X-SECTION PROPOSED GRADE	---
X-SECTION EXISTING GRADE	---
X-SECTION WATER SURFACE	---
MATCHLINE	---

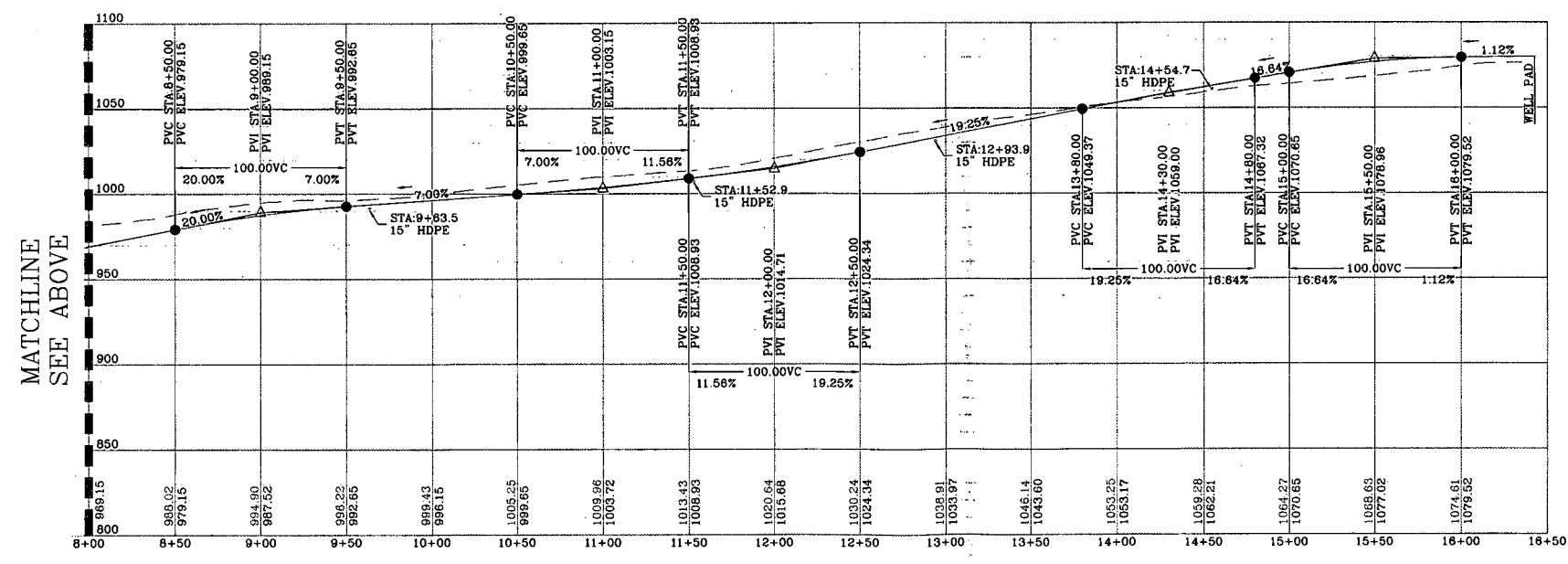
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ACCESS ROAD "A" PROFILE
 SCALE: HORIZ. 1" = 50' VERT. 1" = 50'

MATCHLINE
SEE BELOW



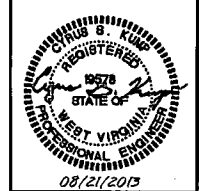
ACCESS ROAD "A" PROFILE
 SCALE: HORIZ. 1" = 50' VERT. 1" = 50'

MATCHLINE
SEE ABOVE

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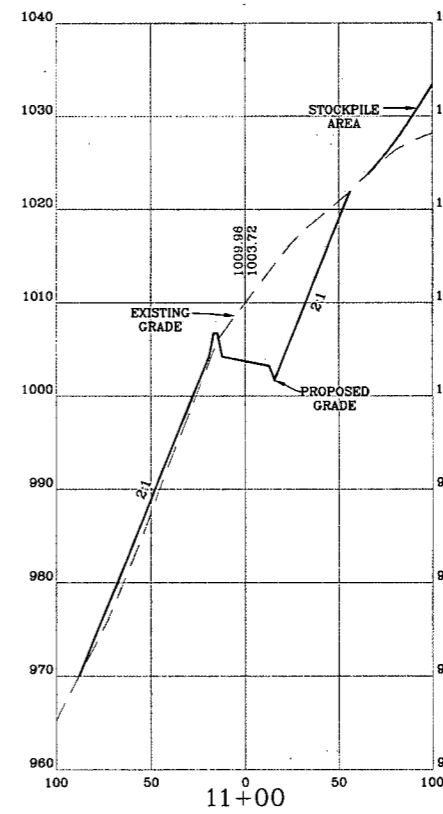
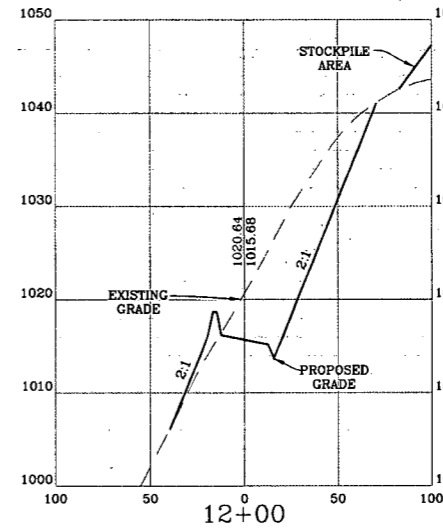
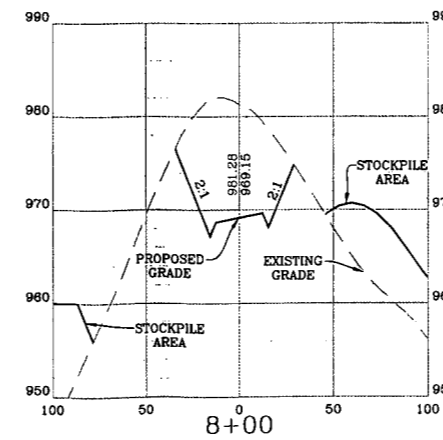
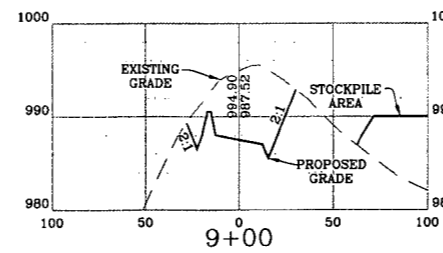
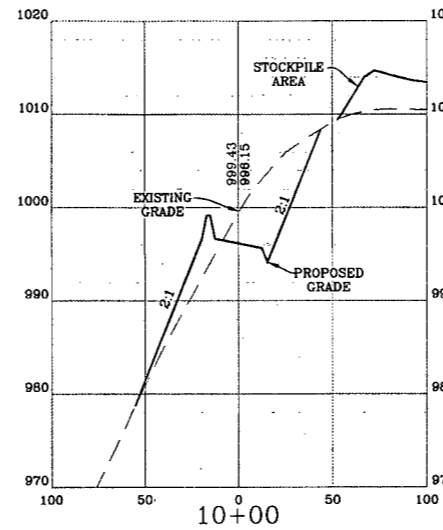
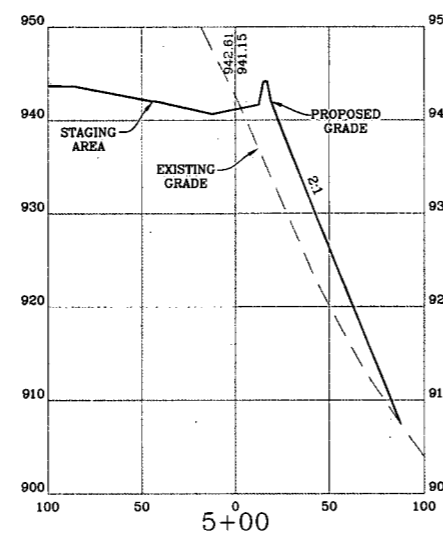
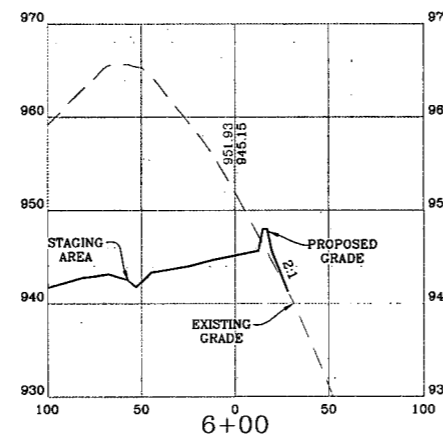
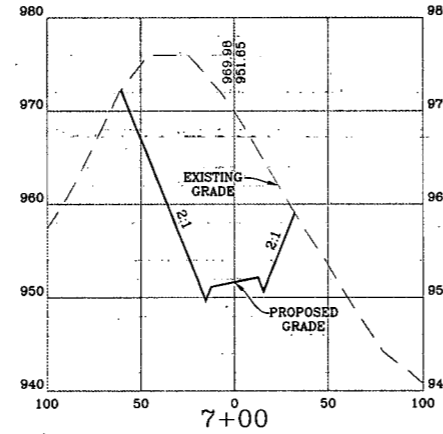
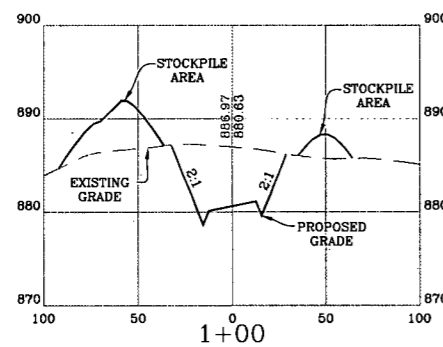
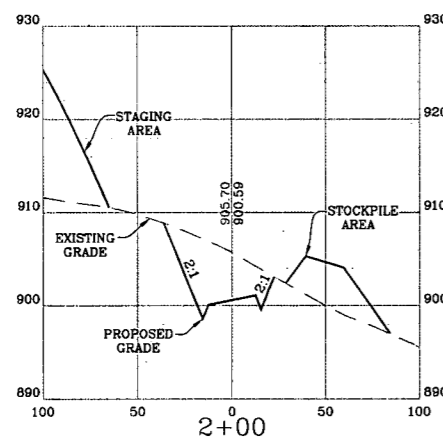
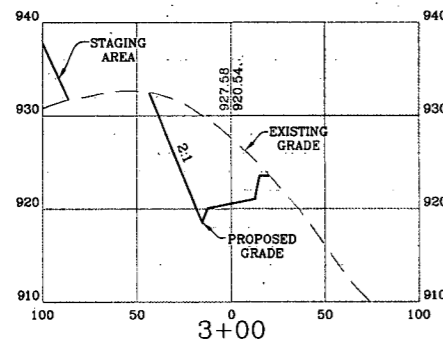
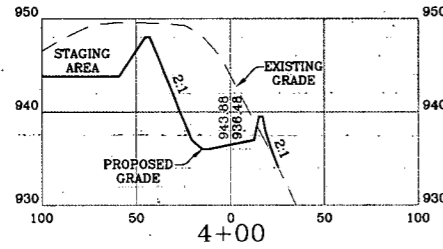
ACCESS ROAD PROFILES
SLAKE RUN
WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



ACCESS ROAD SECTIONS

ACCESS ROAD "A" CROSS-SECTIONS

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'

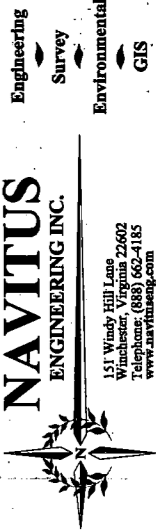


LEGEND

- X-SECTION GRID INDEX
- X-SECTION GRID INTERMEDIATE
- X-SECTION PROPOSED GRADE
- X-SECTION EXISTING GRADE
- X-SECTION WATER SURFACE
- MATCHLINE

NOTE:

1. ALL FILL AREAS, INCLUDING ACCESS ROADS AND EXCESS MATERIAL STOCKPILES, SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR. MOISTURE CONTENT WILL BE CONTROLLED IN ACCORDANCE WITH THE STANDARD PROCTOR TEST (ASTM-D698) RESULTS.
2. ALL CUT & FILL SLOPES SHALL BE 2:1 UNLESS STATED OTHERWISE.



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ACCESS ROAD SECTIONS
SNAKE RUN
WELL PAD & WATER CONTAINMENT PAD
NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

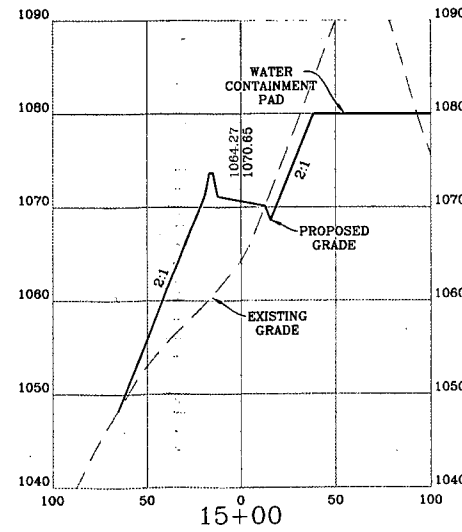
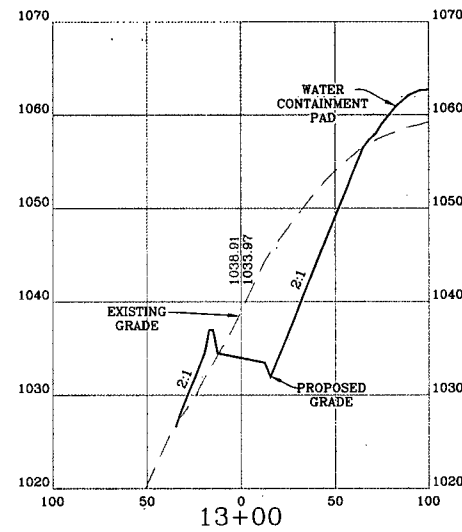
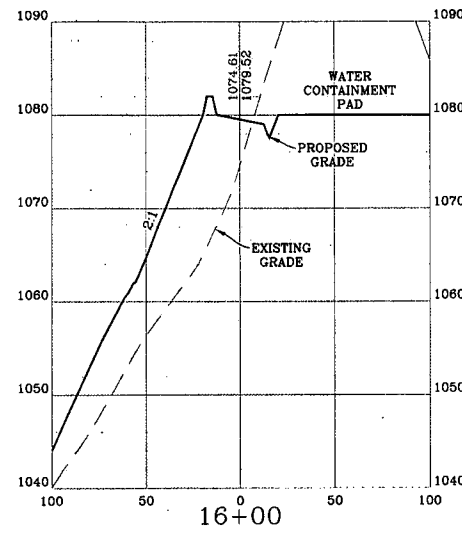
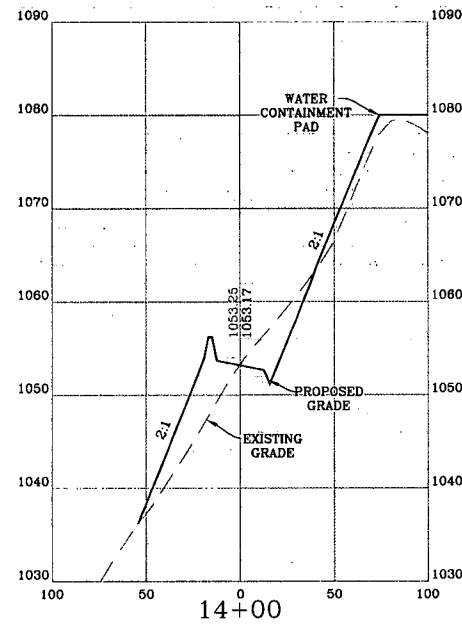


DATE: 08/21/2013
SCALE: AS SHOWN
SHEET 9 OF 22

ACCESS ROAD SECTIONS

ACCESS ROAD "A" CROSS-SECTIONS

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



LEGEND

- X-SECTION GRID INDEX
- X-SECTION GRID INTERMEDIATE
- X-SECTION PROPOSED GRADE
- X-SECTION EXISTING GRADE
- X-SECTION WATER SURFACE
- MATCHLINE

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ACCESS ROAD SECTIONS
SLAKE RUN
WELL PAD & WATER CONTAINMENT PAD
NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 08/21/2013
SCALE: AS SHOWN
SHEET 10 OF 22

WELL PAD & WATER CONTAINMENT PAD SECTIONS

LEGEND

- X-SECTION GRID INDEX
- X-SECTION GRID INTERMEDIATE
- X-SECTION PROPOSED GRADE
- X-SECTION EXISTING GRADE
- X-SECTION WATER SURFACE
- MATCHLINE

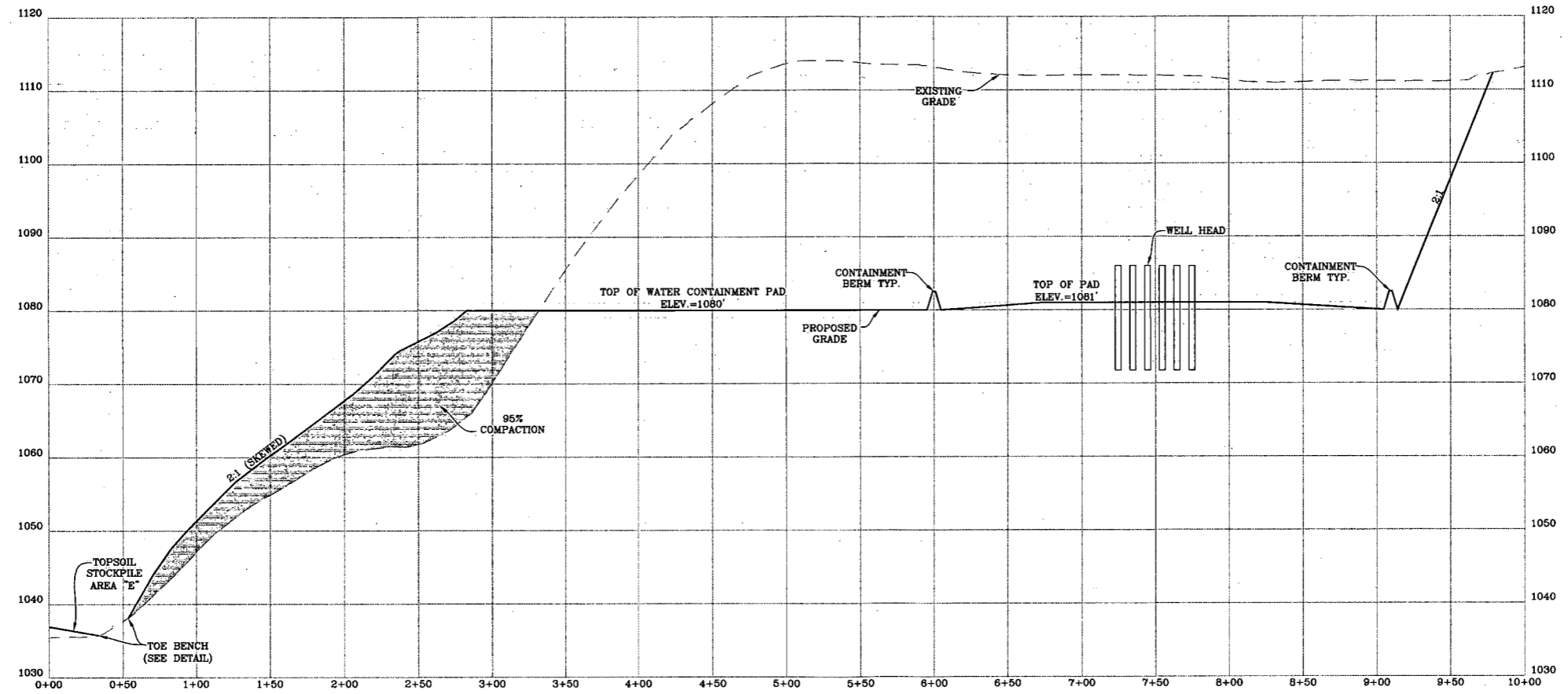
NOTE:

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WELL PAD CROSS-SECTION "A-A"

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



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WELL PAD & WATER CONTAINMENT PAD SECTIONS
SLAKE RUN
 WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA

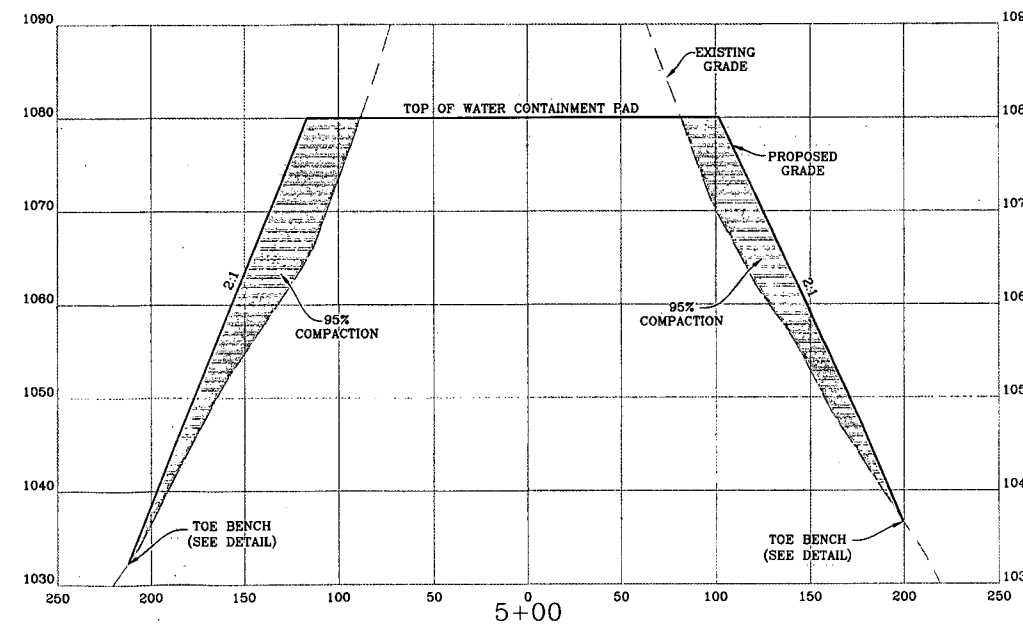
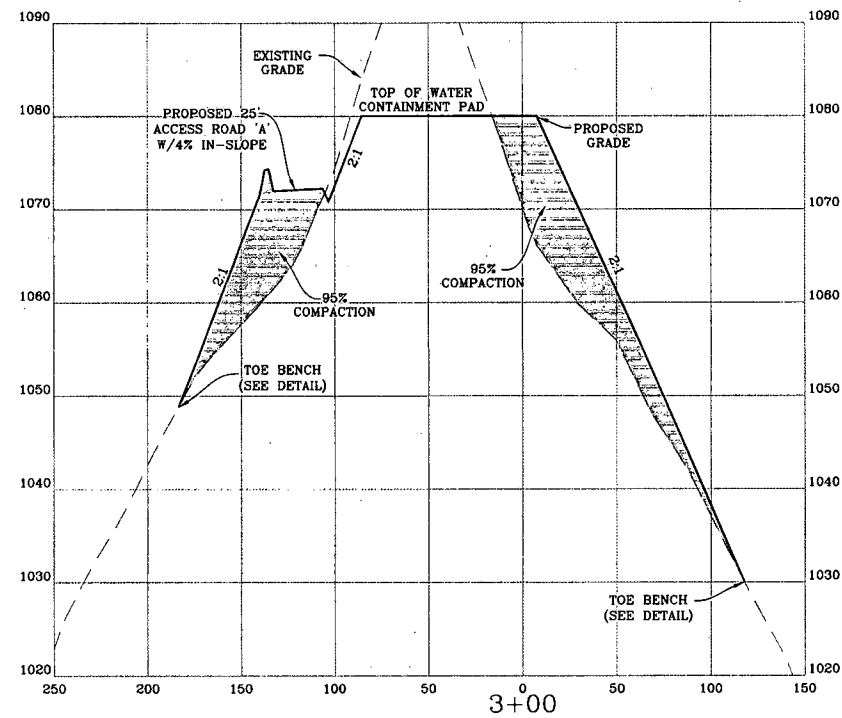
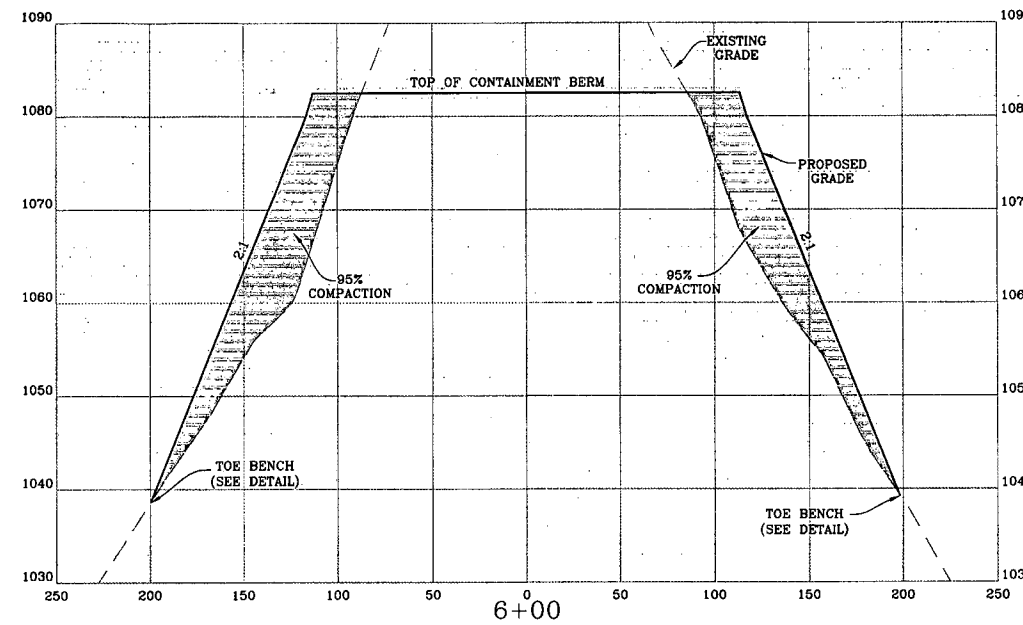
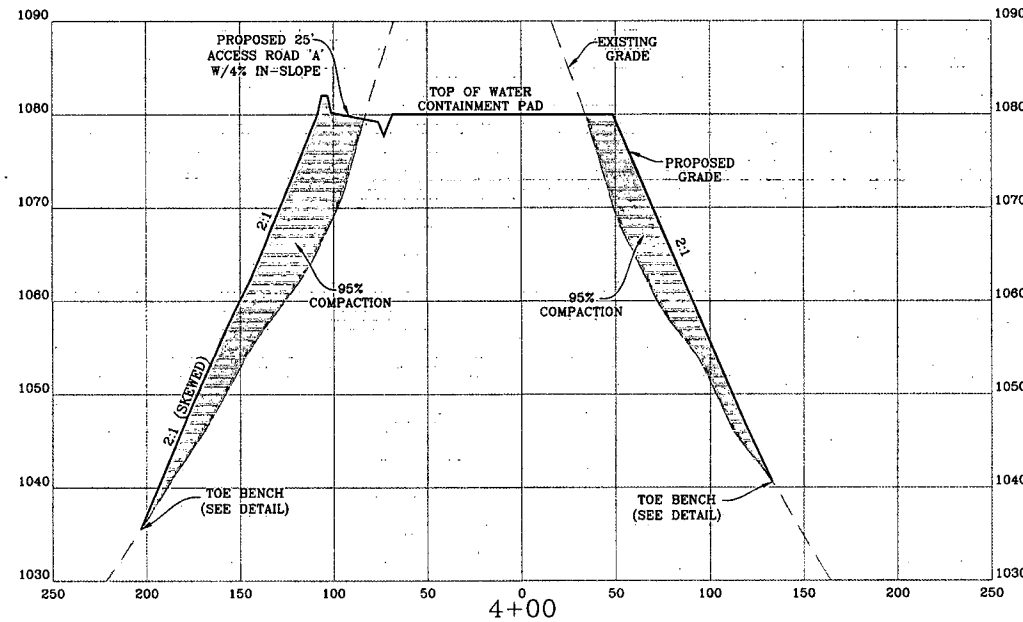


DATE: 08/21/2013
 SCALE: AS SHOWN
 SHEET 11 OF 22

WELL PAD & WATER CONTAINMENT PAD SECTIONS

WELL PAD CROSS-SECTIONS ALONG BASELINE "A-A"

SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



LEGEND

- X-SECTION GRID INDEX
- X-SECTION GRID INTERMEDIATE
- X-SECTION PROPOSED GRADE
- X-SECTION EXISTING GRADE
- X-SECTION WATER SURFACE
- MATCHLINE

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WELL PAD & WATER CONTAINMENT PAD SECTIONS

SNAKE RUN

WELL PAD & WATER CONTAINMENT PAD

NEW MILTON DISTRICT

DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 08/21/2013

SCALE: AS SHOWN

SHEET 12 OF 22

WELL PAD & WATER CONTAINMENT PAD SECTIONS

LEGEND

X-SECTION GRID INDEX	-----
X-SECTION GRID INTERMEDIATE	-----
X-SECTION PROPOSED GRADE	-----
X-SECTION EXISTING GRADE	-----
X-SECTION WATER SURFACE	-----
MATCHLINE	-----

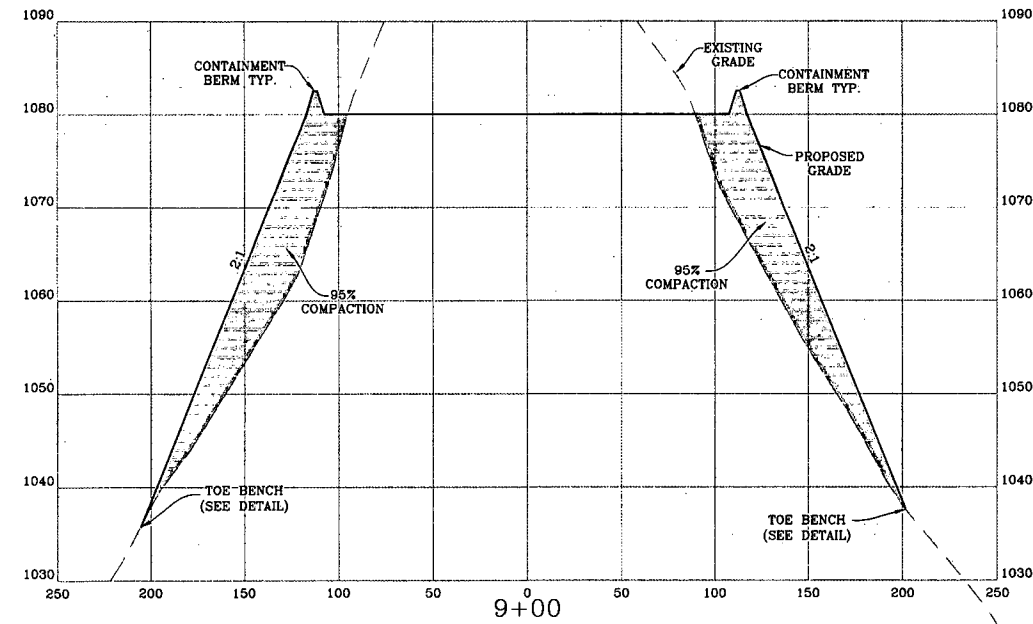
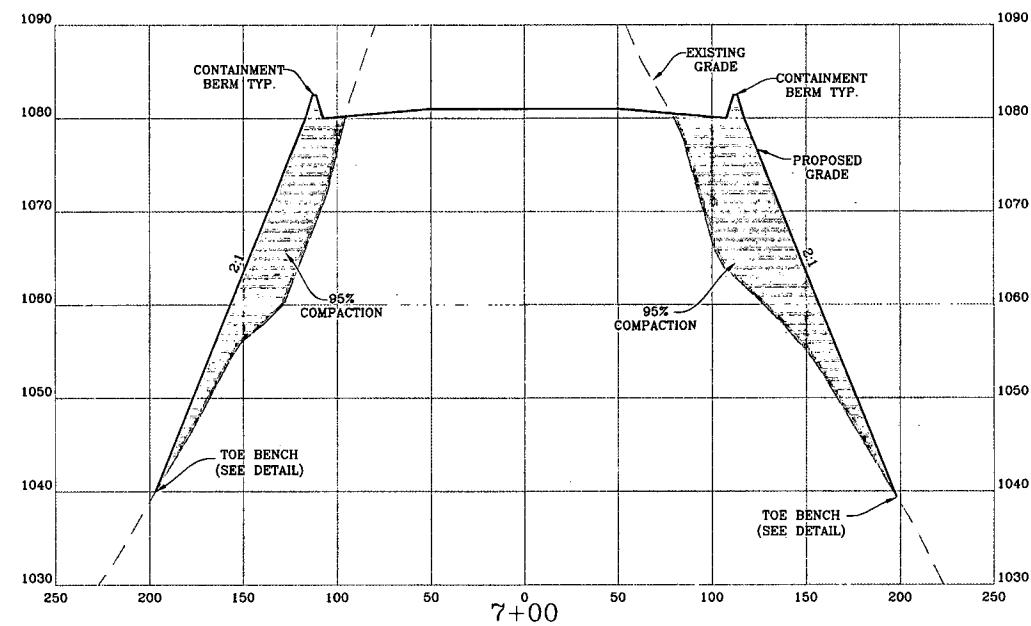
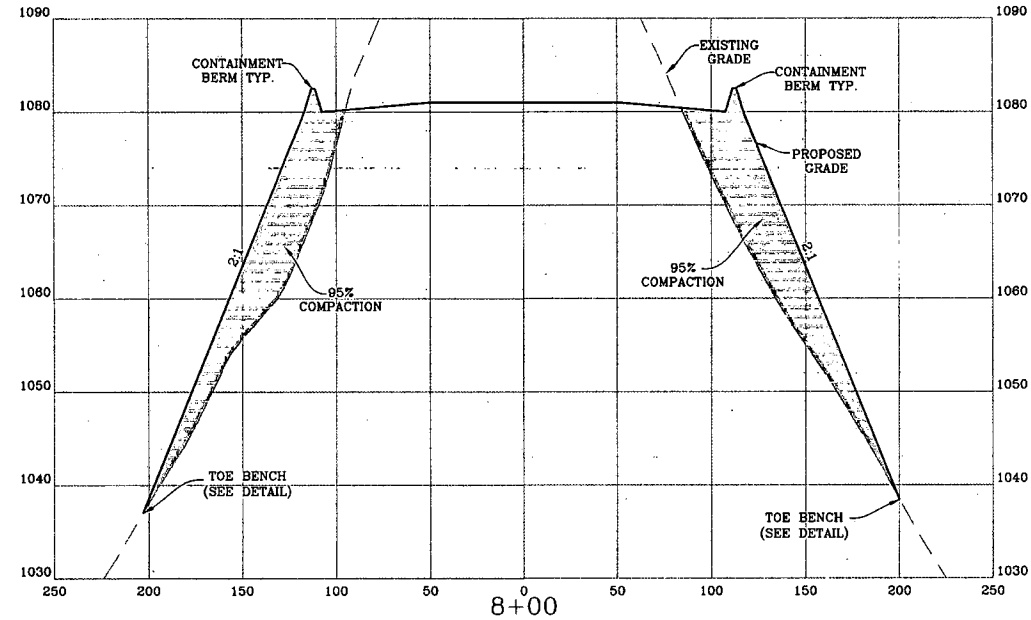
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WELL PAD CROSS-SECTIONS ALONG BASELINE "A-A"
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



NOTE:
1. ALL FILL AREAS, INCLUDING ACCESS ROADS AND EXCESS MATERIAL STOCKPILES, SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR. MOISTURE CONTENT WILL BE CONTROLLED IN ACCORDANCE WITH THE STANDARD PROCTOR TEST (ASTM-D698) RESULTS.
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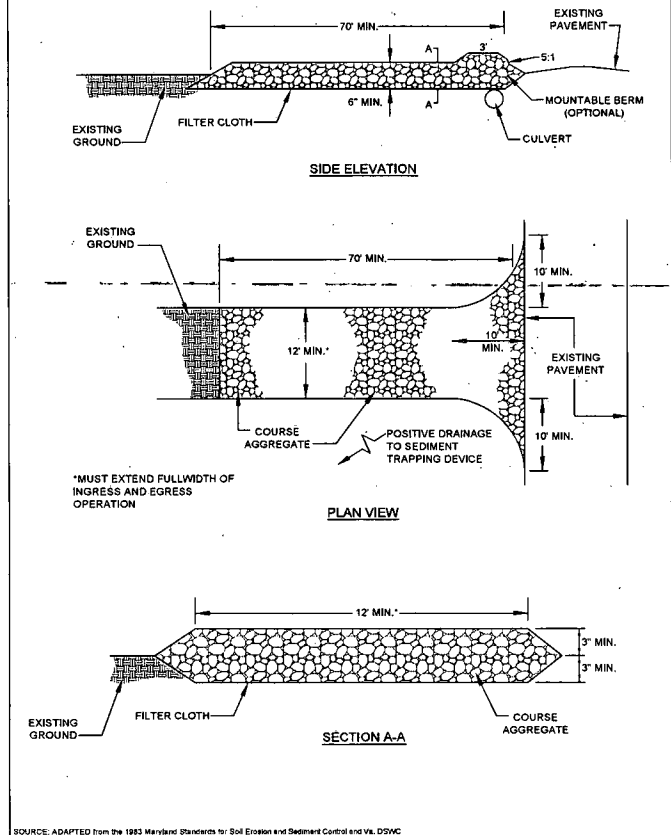
WELL PAD & WATER CONTAINMENT PAD SECTIONS
SLAKE RUN
WELL PAD & WATER CONTAINMENT PAD
NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



08/21/2013
DATE: 08/21/2013
SCALE: AS SHOWN
SHEET 13 OF 22

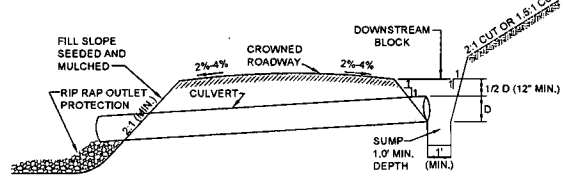
FIGURE 3.02.1

STONE CONSTRUCTION ENTRANCE

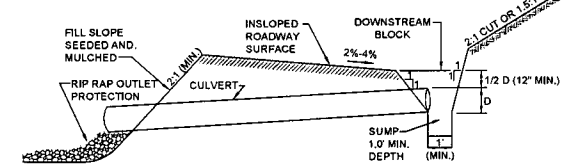


SOURCE: ADAPTED FROM THE 1983 MARYLAND STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL AND VA DSWC

CROWNED ROADWAY



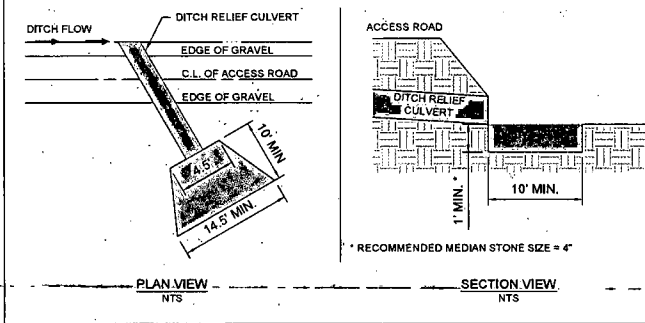
INSLOPED ROADWAY



Cut and fill slopes shall be stabilized immediately upon completion of roadway grading. These areas shall be blanketed wherever they are located within 50 feet of a surface water or within 100 feet of a surface water where a suitable vegetative filter strip does not exist. A durable top dressing shall be provided for soils having low strength. Roadside ditches shall be provided with adequate protective lining. Adequately sized culverts or other suitable cross drains shall be provided at all seeps, springs, and drainages. Roadway shall be inspected weekly and after each runoff event. Damaged roadways, ditches, or cross drains shall be repaired immediately.

SOURCE: PA DEPARTMENT OF ENVIRONMENTAL PROTECTION, BUREAU OF OIL AND GAS MANAGEMENT 3505/FM/00/11 APPENDIX 4 3&P CONSTRUCTION DETAILS (MODIFIED)

TYPICAL DITCH RELIEF CULVERT OUTLET TREATMENT

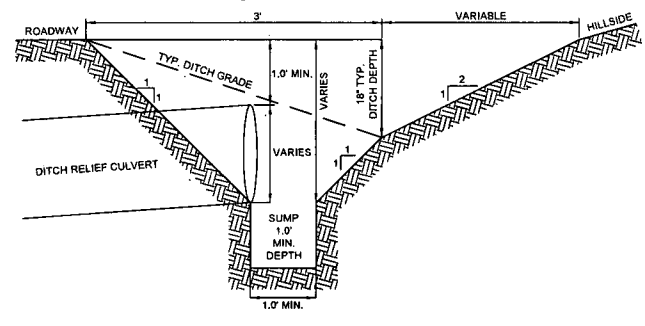


NOTE: ALL DITCH LINE PROTECTION SHALL BE INSTALLED AS RECOMMENDED IN THE WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL. DITCH LINE PROTECTION SHALL BE BASED ON THE FOLLOWING GRADES:

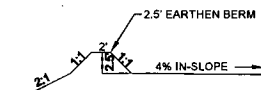
1. LESS THAN 3% - GRASSSED
2. 3-8% - GRASS WITH ROLLED EROSION CONTROL PRODUCTS (RECP)
3. GREATER THAN 8% - RIPRAP OR EQUIVALENT GEOTEXTILE

IF HIGH EROSION SOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE ENGINEER SHOULD BE CONTACTED FOR FURTHER EVALUATION.

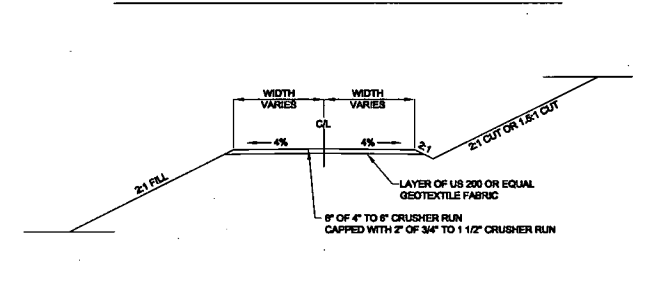
Modified Figure 3.1 - Typical Roadside Ditch Section Sump at Ditch Relief Culvert



ROAD BERM DETAIL



TYPICAL ROAD CROSS SECTION DETAIL



SOURCE: VA DCR-DSWC AND NORTH AMERICAN GREEN

TURNOUT

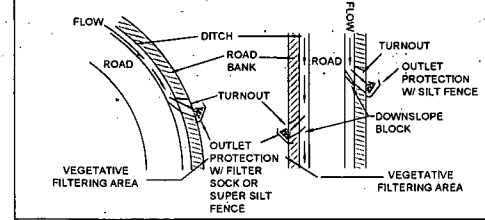
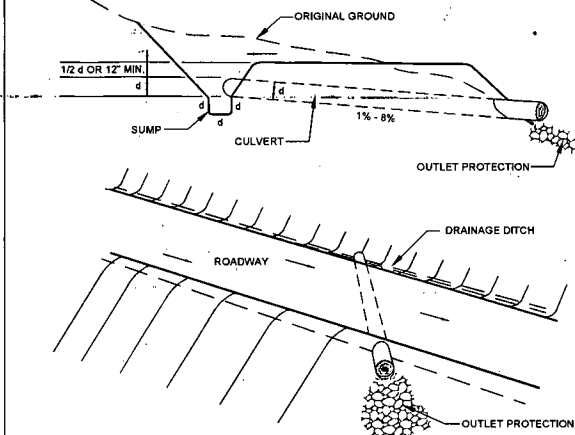


FIGURE II-4

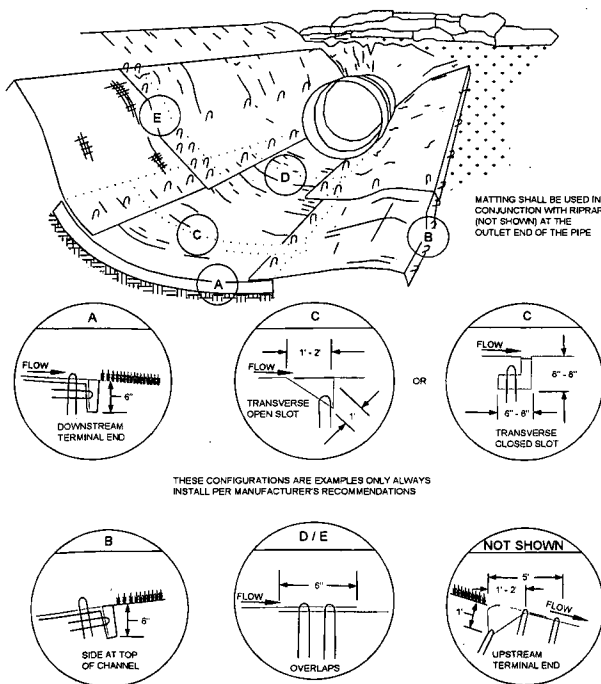
DITCH RELIEF CULVERT



SOURCE: West Virginia Erosion and Sediment Control Field Manual, Office of Oil and Gas

FIGURE 3.13.1

TYPICAL RECP CHANNEL INSTALLATION



THESE CONFIGURATIONS ARE EXAMPLES ONLY ALWAYS INSTALL PER MANUFACTURER'S RECOMMENDATIONS

Table II-6

Spacing of Culverts	
Road Grade %	Distance (Ft)
2-5	500-300
6-10	300-200
11-15	200-100
16-20	100

Table II-5

Pipe Sizes for Culverts Across Roads		
Drainage Area (Ac)	Pipe Diameter (In)	Pipe Capacity (Cfs)
10	15	5
20	18	9
30	21	12
50	24	18
80	27	24
100	30	29
300	36	60
500	42	85

FIGURE 3.05.1

ROCK CHECK DAM

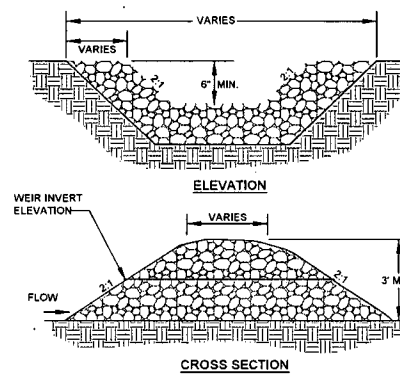
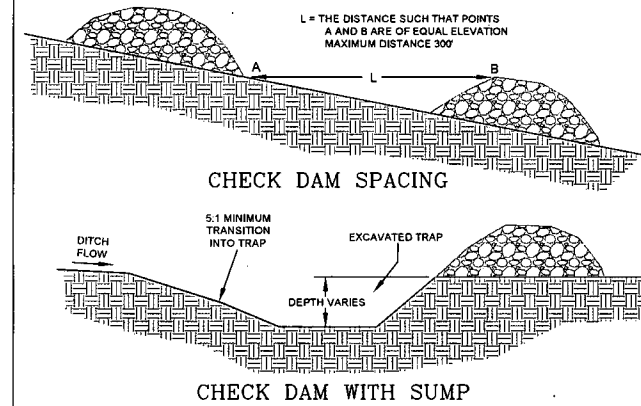


FIGURE 3.05.2

ROCK CHECK DAM



REVISION	DATE

ANTERO RESOURCES
 THIS DOCUMENT WAS PREPARED FOR:
ANTERO RESOURCES CORPORATION

CONSTRUCTION DETAILS
SLAKE RUN
WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



Table 4.1
Compost Sock Fabric Minimum Specifications

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MPP)	Heavy Duty Multi-Filament Polypropylene (HDMPP)
Material Characteristics	Photo-degradable	Photo-degradable	Bio-degradable	Photo-degradable	Photo-degradable
Sock Diameters	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
Mesh Opening	3/8"	3/8"	3/8"	3/8"	1/8"
Textile Strength	26 psi	26 psi	44 psi	202 psi	
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years

Two-ply systems

Inner Containment Netting	HDPE biaxial net
	Continuously wound
Outer Filtration Mesh	Fusion-welded junctures
	3/4" x 3/4" Max. aperture size
	Composite Polypropylene Fabric (Woven layer & non-woven fleece mechanically fused via needle punch)

3/16" Max. aperture size

Sox fabrics composed of burlap may be used on projects lasting 6 months or less.

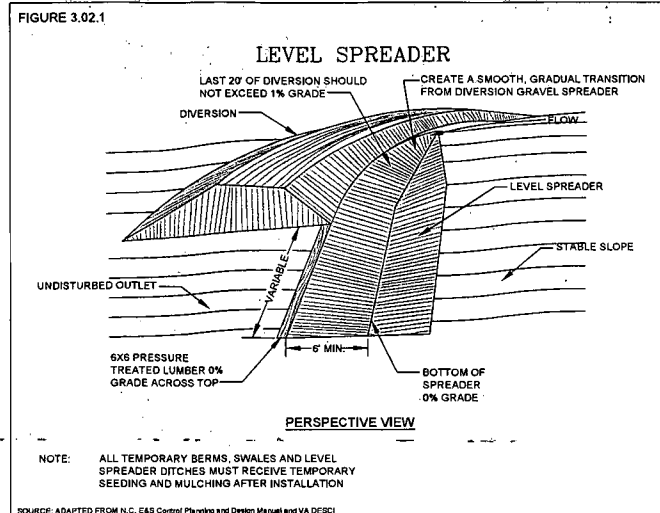
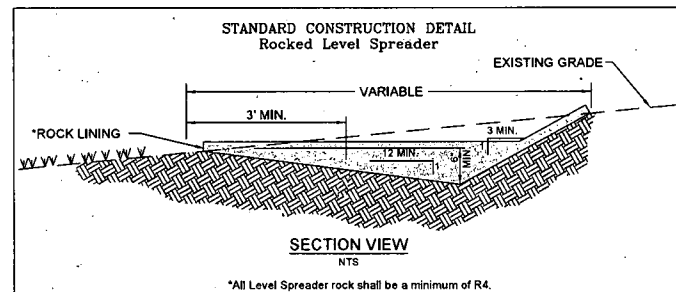
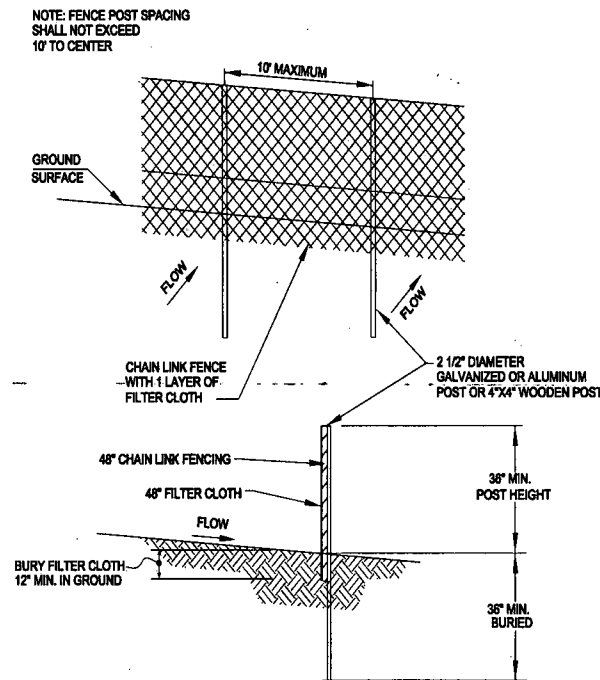
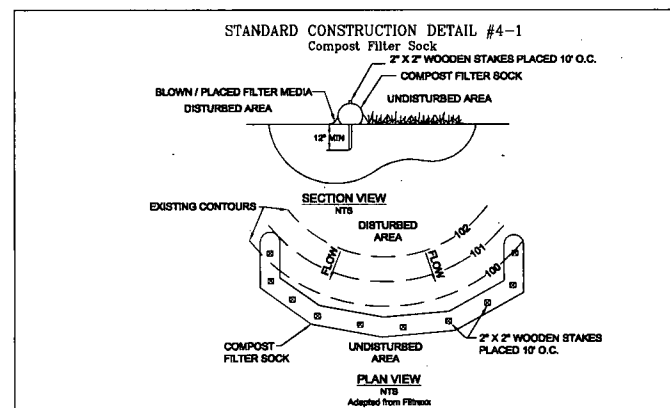
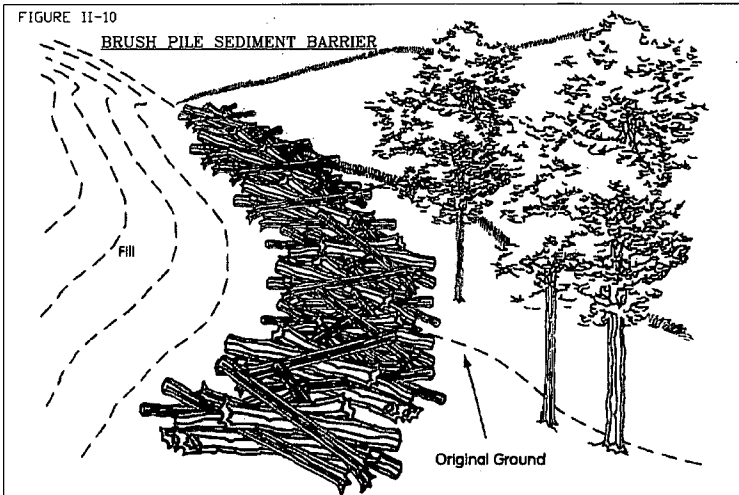
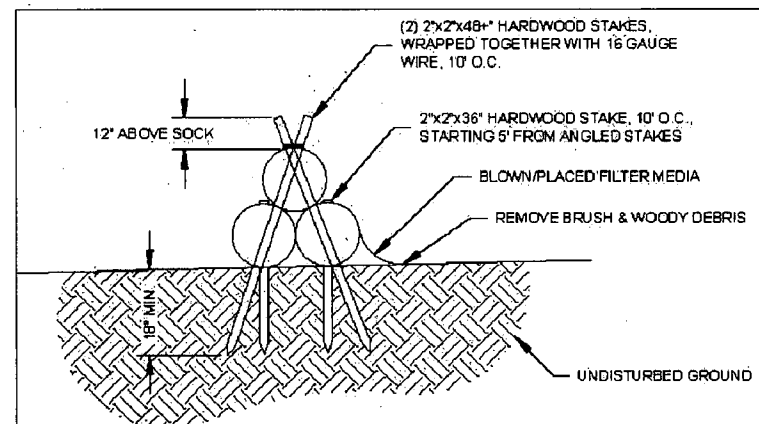


FIGURE II-11c
SUPER SILT FENCE



A SUPER SILT FENCE IS A TEMPORARY BARRIER OF GEOTEXTILE FABRIC OVER CHAIN LINK FENCE. SUPER SILT FENCE SHOULD BE PLACED AS CLOSE TO THE CONTOUR AS POSSIBLE. NO SECTION OF SUPER SILT FENCE SHOULD EXCEED A GRADE OF 5 PERCENT FOR MORE THAN A DISTANCE OF 20 FEET. CHAIN LINK FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES OR STAPLES. GEOTEXTILE FABRIC SHALL BE FASTENED SECURELY TO THE CHAIN LINK FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP AND MID SECTIONS. GEOTEXTILE FABRIC SHALL BE EXCEEDED A MINIMUM OF 12 INCHES INTO THE GROUND. WHEN 3 SECTIONS OF GEOTEXTILE FABRIC ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6 INCHES AND FOLDED. METAL POSTS AS SPECIFIED BY WY DOT CAN BE REPLACED BY PRESSURE-TREATED 4" X 4" POSTS. SUPER SILT FENCE SHOULD BE INSPECTED AT A MINIMUM ONCE EVERY 7 CALENDAR DAYS OR WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.



Sox fabric shall meet standards of Table 4.1. Compost shall meet the following standards:

Organic Matter Content	80% -100% (dry weight basis)
Organic Portion	Fibrous and elongated
pH	5.5-8.0
Moisture Content	35%-65%
Particle Size	98% pass through 1" screen
Soluble Salt Concentration	5.0 dS Maximum

Compost Filter Sock shall be placed at existing level grade. Both ends of the sock shall be extended at least 8 feet up the slope at 45 degrees to the main sock alignment. Maximum slope length above any sock shall not exceed manufacturer's maximum permissible slope length.

Traffic shall not be permitted to cross filter socks.

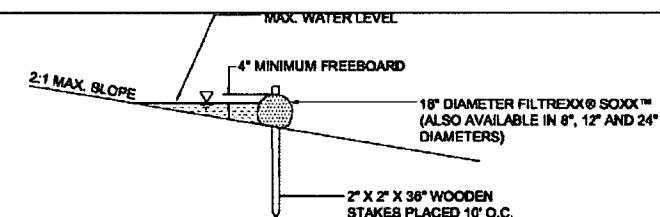
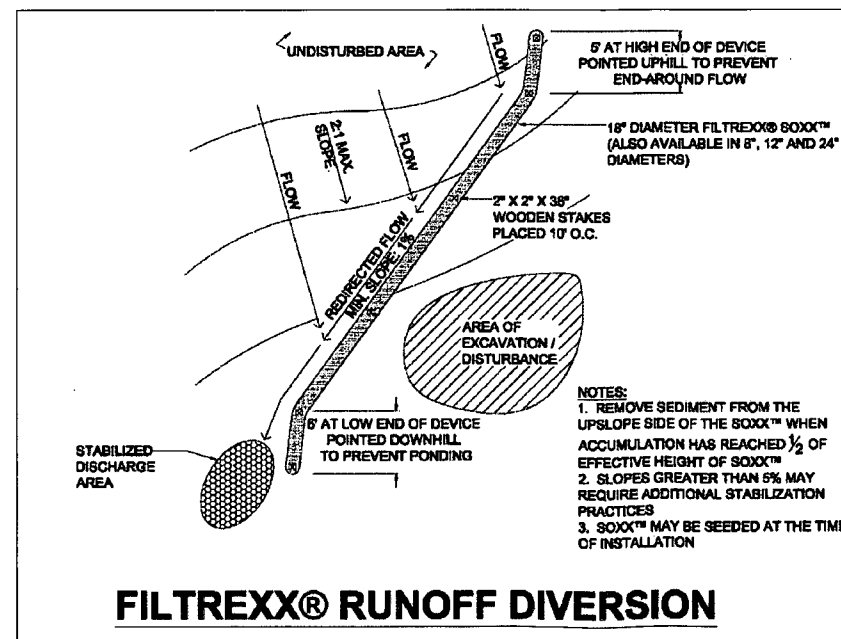
Accumulated Sediment shall be removed when it reaches 1/2 the above ground height of the sock and disposed in the manner described elsewhere in the plan.

Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired according to manufacturer's specifications or replaced within 24 hours of inspection.

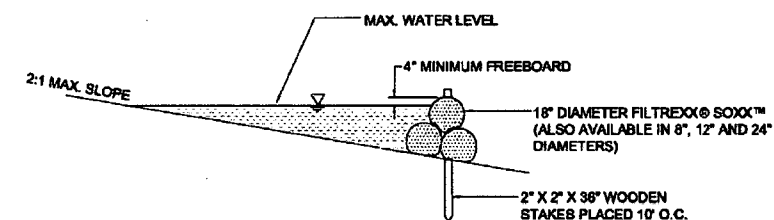
Biodegradable filter socks shall be replaced after 6 months; photodegradable socks after 1 year. Polypropylene socks shall be replaced according to manufacturer's recommendations.

Upon stabilization of the area tributary to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed. In the latter case, the mesh shall be cut open and the mulch spread as a soil supplement.

In the event the ground is frozen, #5 rebar with safety caps shall be used instead of wooden stakes to anchor the filter sock. Once the ground thaws the rebar anchors shall be removed and replaced with 2" x 2" wooden stakes and installed as shown in the detail above.



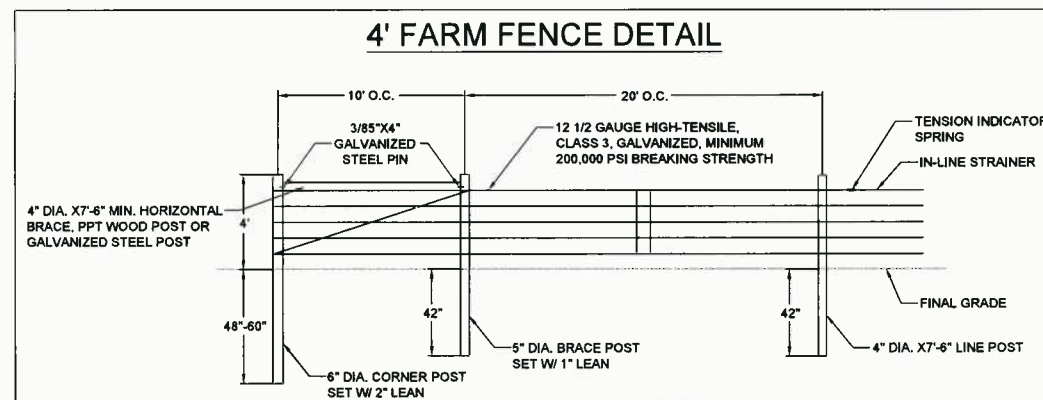
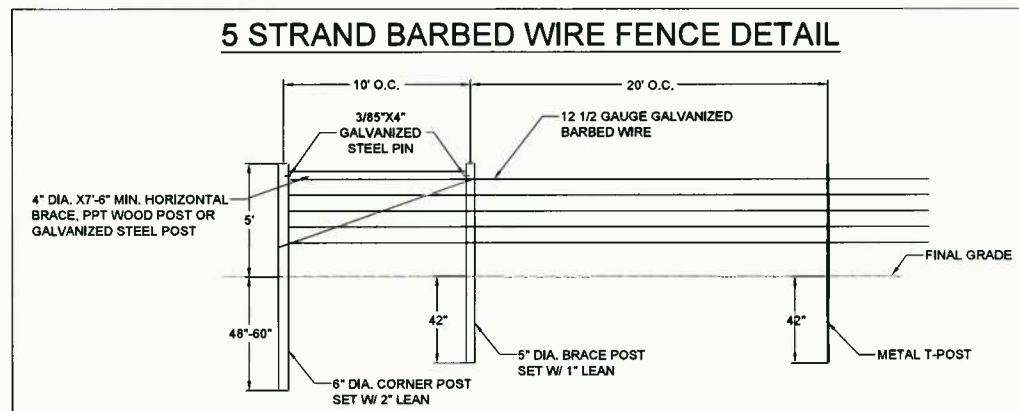
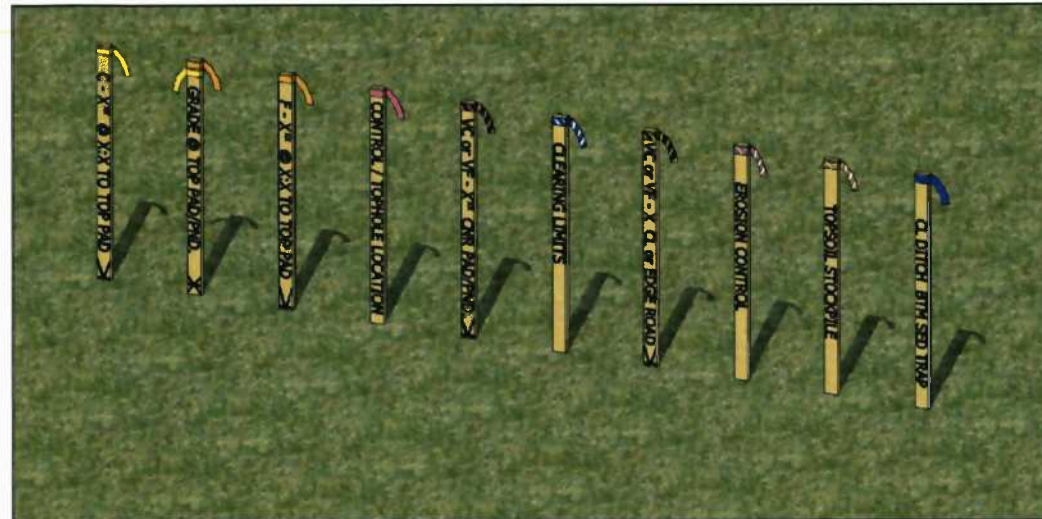
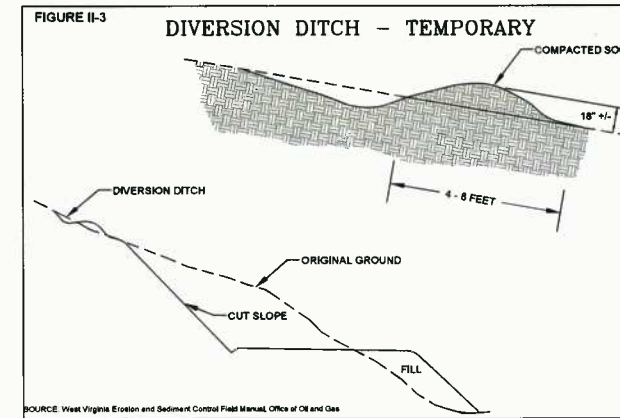
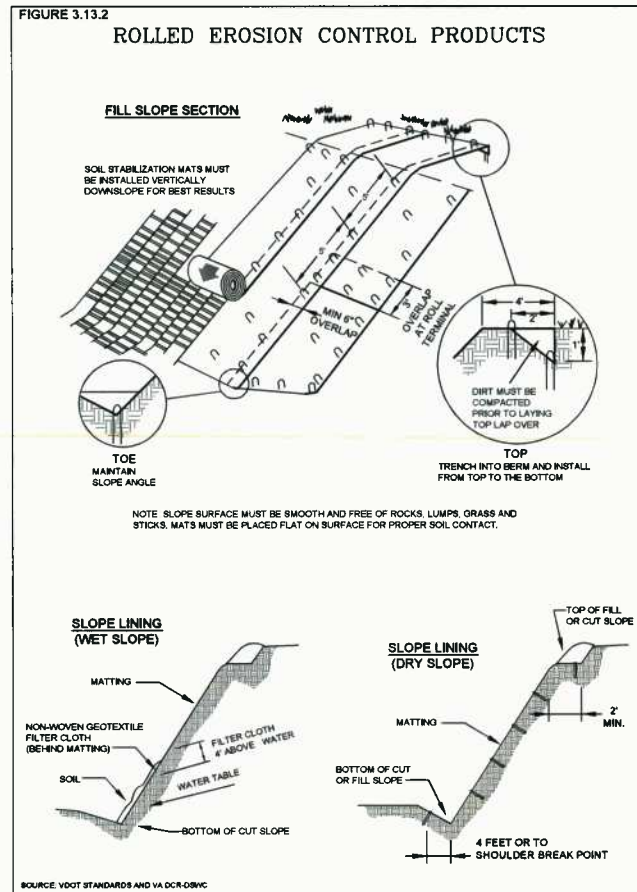
SINGLE INSTALLATION SECTION
NTS



PYRAMID INSTALLATION SECTION
NTS

FILTREXX® RUNOFF DIVERSION SECTIONS
NTS

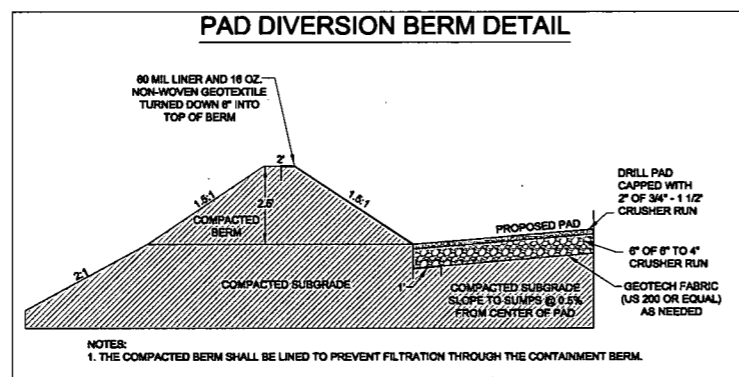
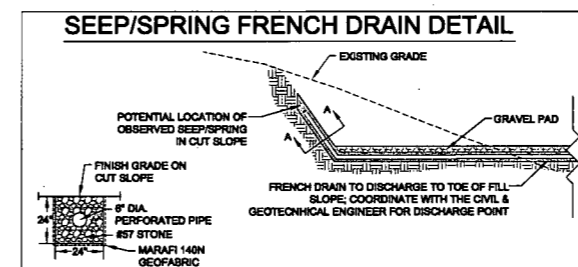
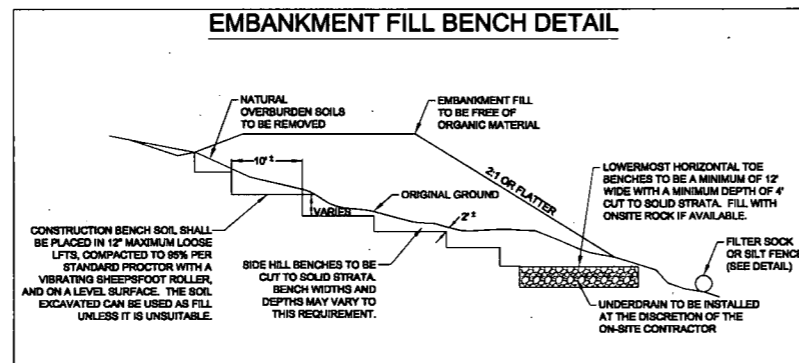
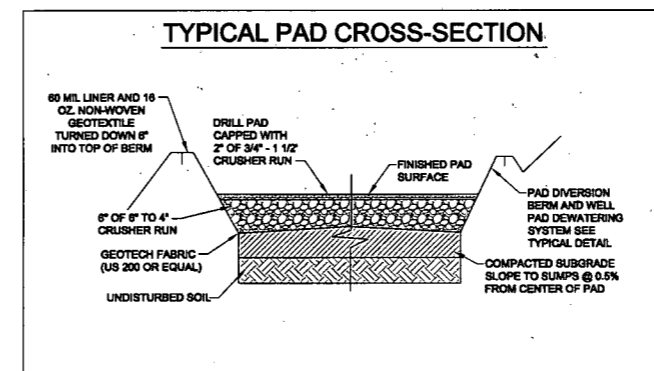
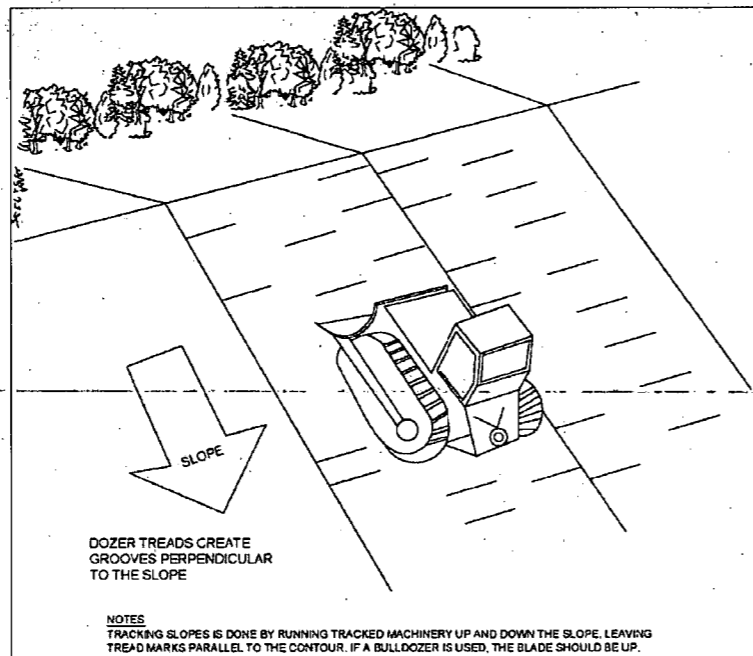
REVISION	DATE



	Yellow Ribbon: Yellow Ribbon used to indicate top of Cuts (C) Cut to be determined at time of stakeout Slope determined by site design
	Yellow & Orange Ribbon: Yellow and Orange Ribbon used to indicate Grade at Top of Pad/Pond/Pit
	Orange Ribbon: Orange Ribbon used to indicate toes of Fills (F) Fill to be determined at time of stakeout Slope determined by site design
	Pink Ribbon: Pink Ribbon used to indicate Top Hole Location Pink Ribbon used to indicate Survey Control Location
	Pink & Black Stripe Ribbon: Pink & Black Stripe Ribbon used to indicate Vertical Cut (VC) at Pad/Pond/Pit corner or edge Pink & Black Stripe Ribbon used to indicate Vertical Fill (VF) at Pad/Pond/Pit corner or edge Vertical Cut/Vertical Fill to be determined at time of stakeout
	Blue & White Stripe Ribbon: Blue & White Stripe Ribbon used to indicate clearing limits/construction limits
	Orange & Black Stripe Ribbon: Orange & Black Stripe Ribbon used to indicate Vertical Cut (VC) at Centerline or edge of access road Orange & Black Stripe Ribbon used to indicate Vertical Fill (VF) at centerline or edge of access road
	Pink & White Stripe Ribbon: Pink & White Stripe Ribbon used to indicate Erosion and Sediment Control Structures Silt Fence (SF) Reinforced Filter Fence (RFF) Super Silt Fence (SSF) Filter Sock (FS)
	Orange & White Stripe Ribbon: Orange & White Stripe Ribbon used to indicate Topsoil Stockpile Locations
	Blue Ribbon: Blue Ribbon used to indicate Centerline (G) Ditch Blue Ribbon used to indicate Bottom (BTM) Sediment Traps

ANTERO RESOURCES CORPORATION STANDARD RIBBON COLOR SCHEME
PROVIDED BY ANTERO RESOURCES CORPORATION

DATE	REVISION



REVISION	DATE

ANTERO RESOURCES
THIS DOCUMENT WAS PREPARED FOR:
ANTERO RESOURCES CORPORATION

CONSTRUCTION DETAILS

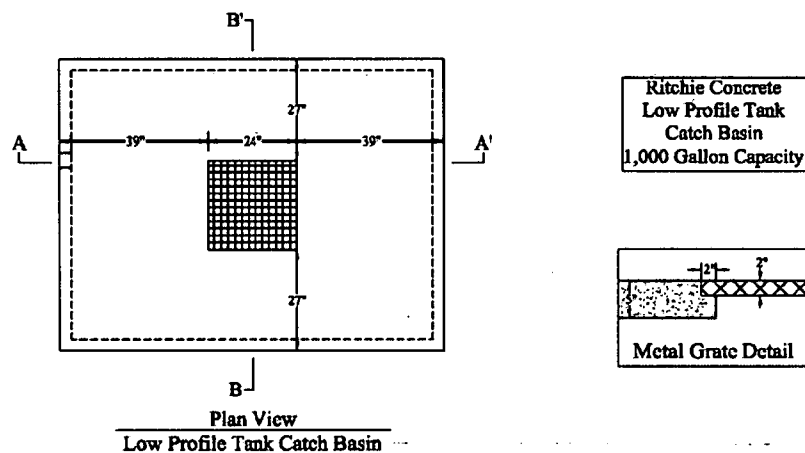
SLAKE RUN

WELL PAD & WATER CONTAINMENT PAD

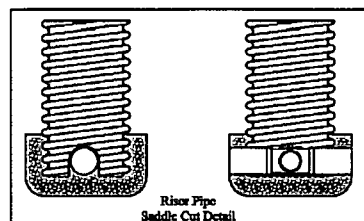
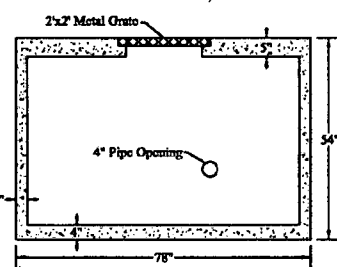
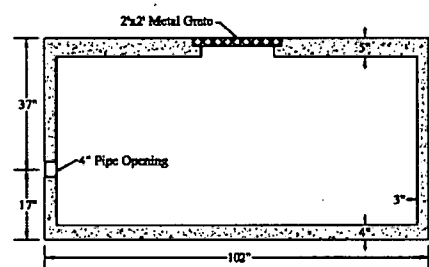
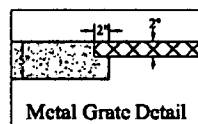
NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



WELL PAD DEWATERING SYSTEM SPECIFICATIONS



Ritchie Concrete
Low Profile Tank
Catch Basin
1,000 Gallon Capacity



Size of Tank

6½' Wide
8½' Long
4½' Tall

Hole Size

7½' Wide
9½' Long
5'-2" Tall

Mix Design

4000 psi

	lbs. yd.	Ab. vol.
	563	2.86
	270	4.33
	5%+1	1.35
	1222	7.42
	1770	11.04
		27.00cf

Outlet Lines

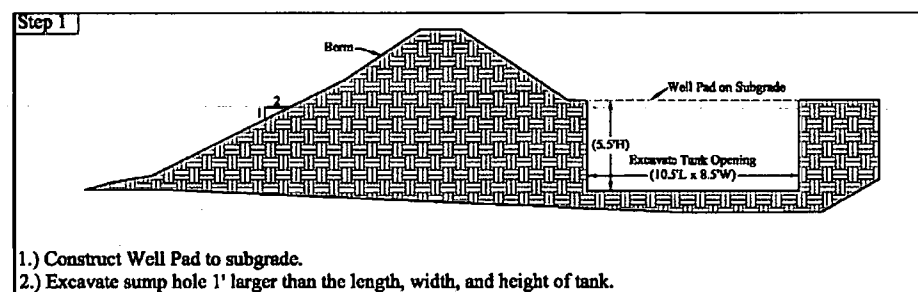
Outlet 17" from bottom of tank
Polylock Seals adaptable for 2, 3, & 4"

Thickness

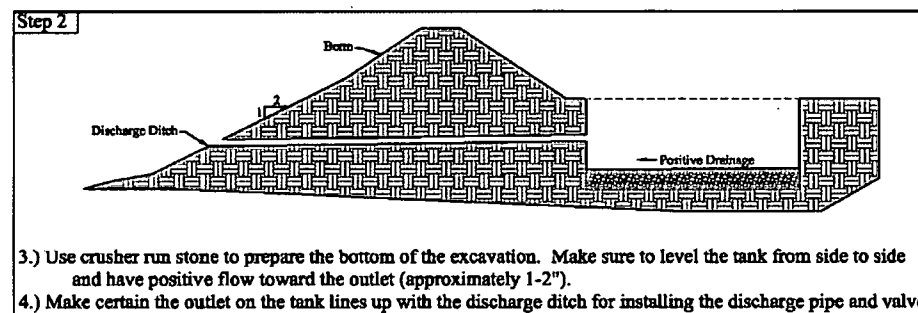
Walls 3"
6x6x10 gauge wire mesh
¾" Rebar on 18" Centers
Bottom 4"

All tanks are of durable construction and are state approved

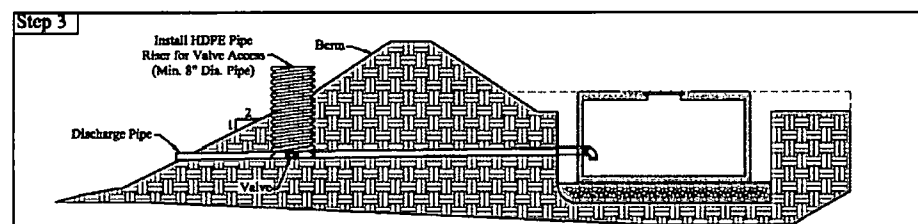
Tops with ½" Rebar on 14" Centers



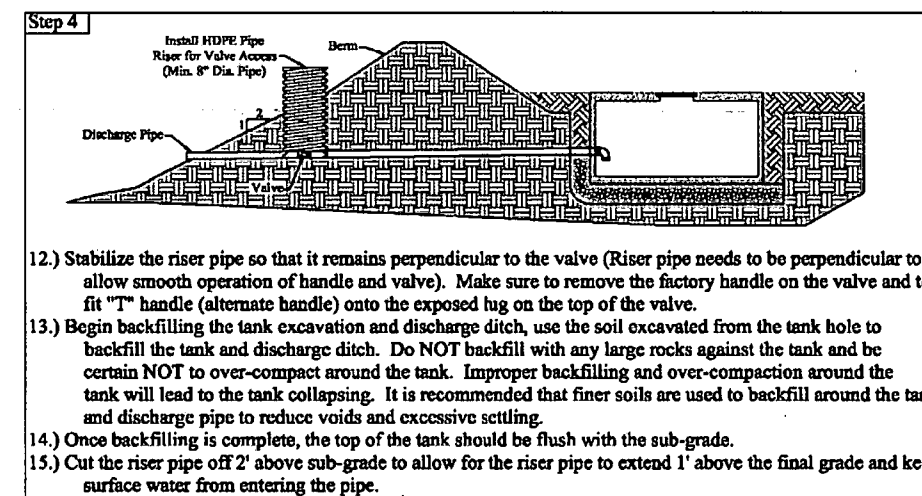
- 1.) Construct Well Pad to subgrade.
- 2.) Excavate sump hole 1' larger than the length, width, and height of tank.



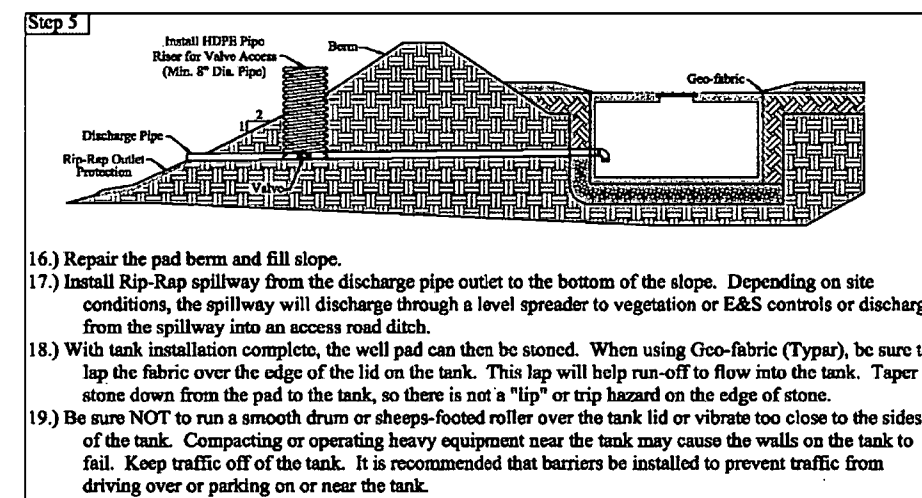
- 3.) Use crusher run stone to prepare the bottom of the excavation. Make sure to level the tank from side to side and have positive flow toward the outlet (approximately 1-2').
- 4.) Make certain the outlet on the tank lines up with the discharge ditch for installing the discharge pipe and valve



- 5.) Set the tank in the excavation and level.
- 6.) Install pipe section, (approximately 1-2' piece) into the outlet fitting on the tank. Use hydraulic cement around the connection to insure positive seal.
- 7.) Install 4" valve onto short section of the pipe with glue (make certain to clean and prime both valve and pipe before gluing connection).
- 8.) Install sections of pipe onto the outlet side of the valve until the pipe extends through the berm and slope approximately 1'. Leave the end of the pipe exposed (make certain to clean and prime the pipe and joints before gluing the connections).
- 9.) Make certain that the pipe is supported and maintains positive flow away from the valve. Use excavated soil from the discharge ditch to support the pipe.
- 10.) Install the riser for the valve. Use a section of HDPE pipe with a larger diameter than the valve (minimum 8" diameter HDPE pipe). Cut a "saddle" on the bottom of the riser pipe so that the riser pipe will rest on the discharge pipe, surrounding the valve and keeping dirt away from the operation of the valve.
- 11.) Fill around the valve with crusher run stone and 1' on the riser pipe to keep soil out.



- 12.) Stabilize the riser pipe so that it remains perpendicular to the valve (Riser pipe needs to be perpendicular to allow smooth operation of handle and valve). Make sure to remove the factory handle on the valve and to fit "T" handle (alternate handle) onto the exposed lug on the top of the valve.
- 13.) Begin backfilling the tank excavation and discharge ditch, use the soil excavated from the tank hole to backfill the tank and discharge ditch. Do NOT backfill with any large rocks against the tank and be certain NOT to over-compact around the tank. Improper backfilling and over-compaction around the tank will lead to the tank collapsing. It is recommended that finer soils are used to backfill around the tank and discharge pipe to reduce voids and excessive settling.
- 14.) Once backfilling is complete, the top of the tank should be flush with the sub-grade.
- 15.) Cut the riser pipe off 2' above sub-grade to allow for the riser pipe to extend 1' above the final grade and keep surface water from entering the pipe.



- 16.) Repair the pad berm and fill slope.
- 17.) Install Rip-Rap spillway from the discharge pipe outlet to the bottom of the slope. Depending on site conditions, the spillway will discharge through a level spreader to vegetation or E&S controls or discharge from the spillway into an access road ditch.
- 18.) With tank installation complete, the well pad can then be stoned. When using Geo-fabric (Tytar), be sure to lap the fabric over the edge of the lid on the tank. This lap will help run-off to flow into the tank. Taper stone down from the pad to the tank, so there is not a "lip" or trip hazard on the edge of stone.
- 19.) Be sure NOT to run a smooth drum or sheeps-footed roller over the tank lid or vibrate too close to the sides of the tank. Compacting or operating heavy equipment near the tank may cause the walls on the tank to fail. Keep traffic off of the tank. It is recommended that barriers be installed to prevent traffic from driving over or parking on or near the tank.

Operational Note:

The dewatering valve will remain closed during drilling and completion operations. Any water captured during the drilling and completion operations will be tested prior to being discharged or pumped by a commercial vendor. After drilling and completion operations are complete, the valve will be opened by a designated responsible person only.

NOTE:

1. THE WELL PAD DEWATERING SYSTEM DETAILS AND SPECIFICATIONS SHOWN ON THIS SHEET WERE PROVIDED BY ANTERO RESOURCES CORPORATION AND REFLECT THEIR CURRENT STANDARD, FOR ALL WELL PAD SITES, TO CONTROL POTENTIAL SPILLS DURING DRILLING AND COMPLETION OPERATIONS.

REVEGETATION

Taken from the
West Virginia Erosion and Sediment Control Field Manual
West Virginia Division of Environmental Protection Office of Oil and Gas
Charleston, W.Va.
Section IV

Temporary Seeding

a. General Conditions Where Practice Applies
Where exposed soil surfaces are not to be fine-graded or worked for periods longer than 21 days. Temporary vegetative cover with sediment controls must be established where runoff will go directly into a stream. Immediately upon construction of the site (site includes road and location), vegetation must be established on road bank and location slopes. A permanent vegetative cover shall be applied to areas that will be left un-worked for a period of more than six months.

b. Seed Mixtures and Planting Dates
Refer to Tables 2 through 4 for recommended dates to establish vegetative cover and the approved lists of temporary and permanent plant species, and planting rates. Table 3 gives recommended types of temporary vegetation, rates of application, and optimum seeding dates. In situations where another cover is desired, contact the local soil conservation district for seeding recommendations.

c. Seed Application
Apply seed by broadcasting, drilling, or by hydroseed according to the rates indicates in Table IV-3. Perform all planting operations at right angles to the slope. Necessary site preparation and roughening of the soil surface should be done just prior to seeding. Seedbed preparation may not be required on newly disturbed areas.

Permanent Seeding

a. General
Permanent vegetative cover will be established where no further soil disturbance is anticipated or needed. Soil fertility and pH level should be tested and adjusted according to seed species planted. Planting of permanent vegetative covers must be performed on all disturbed areas after completion of the drilling process. Any site that contains significant amounts of topsoil shall have the topsoil removed and stockpiled when feasible. Topsoil should not be added to slopes steeper than 2:1 unless a good bonding to the sub-layer can be achieved. After proper grading and seedbed preparation, the vegetation will reestablish ground cover for the control of surface water runoff erosion. All required seedbed preparation and loosening of soil by disking or dozer tracking should be performed just prior to seeding. If seedbed preparation is not feasible, 50% more seed shall be added to the recommended rates shown in Tables IV-3 and IV-4. When hydroseeding, seedbed preparation may not be necessary if adequate site preparation was performed. Incorporate the appropriate amount of lime and/or fertilizer in the slurry mix when hydroseeding.

When hydroseeding, first mix the lime, fertilizer, and hydro-mulch in the recommended amount of water. Mix the seed and inoculants together within one hour prior to planting, and add to the slurry just before seeding. Apply the slurry uniformly over the prepared site. Assure that agitation is continuous throughout the seeding operation and the mix is applied within one hour of initial mixing.

b. Lime and Fertilizer
1. Lime shall be applied to all permanent seedings. The pH of the soil is to be determined and lime applied accordingly. Once the pH is known, select the amount of lime to be applied from Table IV-5.
2. Fertilizer shall be applied in all permanent seedings. Apply the equivalent for 500 lbs. minimum 10-20-20 fertilizer per acre or use the amount of fertilizer and lime recommended by a certified soil test.
3. Application: For best results and maximum benefits, the lime and fertilizer are to be applied at the time of seedbed preparation.

c. Permanent Seed Mixtures
Planners should take into consideration the species makeup of the existing pasture and the landowner's future pasture management plans when recommending seed mixtures. Selection: From Tables IV 4a and b, Permanent Seeding Mixtures Suitable for Establishment in West Virginia.

Notes:
1. All legumes must be planted with the proper inoculants prior to seeding.
2. *Lathco* Flatpea is potentially poisonous to some livestock.
3. Only endophyte free varieties of Tall Fescue should be used. Tall Fescue and Crownvetch are also very invasive species, non-native to WV.
4. For unprepared seedbeds or seeding outside the optimum timeframes, add 50% more seed to the specified rate. Mixtures in Table 4b are more wildlife and farm friendly; those listed in bold are suitable for use in shaded woodland settings; Mixtures in italic are suitable for use in filter strips.

d. Seeding for Wildlife Habitat
Consider the use of the native plants or locally adapted plants when selecting cover types and species for wildlife habitat. Wildlife friendly species or mixes that have multiple values should be considered. See wildlife friendly species/mixtures in Table IV-4b. Consider selecting no or low maintenance long-lived plants adaptable to sites which may be difficult to maintain with equipment.

NOTE:
1. NO FESCUE OR TIMOTHY GRASS SHALL BE USED.

Mulching

a. General Organic Mulches
The application of straw, hay or other suitable materials to the soil surface to prevent erosion. Straw made from wheat or oats is the preferred mulch, the use of hay is permissible, but not encouraged due to the risk of spreading invasive species. Mulch must be applied to all temporary and permanent seeding on all disturbed areas. Depending on site conditions, in critical areas such as waterways or steep slopes, additional or substitute soil protective measures may be used if deemed necessary. Examples include jute mesh and soil stabilization blankets or erosion control matting. Areas that have been temporarily or permanently seeded should be mulched immediately following seeding. Mulches conserve desirable soil properties, reduce soil moisture loss, prevent crusting and sealing of the soil surface and provide a suitable microclimate for seed germination. Areas that cannot be seeded because of the season should be mulched to provide some protection to the soil surface. An organic mulch, straw or hay should be used and the area then seeded as soon as weather or seasonal conditions permit. Do not use fiber mulch (cellulose-hydroseed) alone for this practice; at normal application rates it will not give the soil protection of other types of mulch. Wood cellulose fiber mulch is used in hydroseeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over the top of (as a separate operation) newly seeded areas. Fiber mulch does not alone provide sufficient protection on highly erodible soils, or during less than favorable growing conditions. Fiber mulch should not be used alone during the dry summer months or when used for late fall mulch cover. Use straw mulch during these periods and fiber mulch may be used to tack (anchor) the straw mulch. Fiber mulch is well suited for steep slopes, critical areas and areas susceptible to wind.

b. Chemical Mulches, Soil Binders and Tackifiers
A wide range of synthetic spray on materials are marketed to stabilize and protect the soil surface. These are mixed with water and sprayed over the mulch and to the soil. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulch, straw or hay. When used alone most chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have.

c. Specifications
From Table IV-6 select the type of mulch and rate of application that will best suit the conditions at the site.

d. Anchoring
Depending on the field situation, mulch may not stay in place because of wind action or rapid water runoff. In such cases, mulch is to be anchored mechanically or with mulch netting.
1. Mechanical Anchoring
Apply mulch and pull mulch anchoring tool over the mulch. When a disk is used set the disk straight and pull across slope. Mulch material should be tucked into the soil about three inches.
2. Mulch netting
Follow manufacturer's recommendation when positioning and stapling the mulch netting in the soil.

**Table IV-1
Recommended Seeding Dates**

Planting Dates	Suitability
March 1 - April 15 and August 1 - October 1	Best Seeding Periods
April 15 - August 1	HIGH RISK - moisture stress likely
October 1 - December 1	HIGH RISK - freeze damage to young seedlings
December 1 - March 1	Good seeding period. Dormant seeding

**Table 2
Acceptable Fertilization Recommendation**

Species	N (lbs/ac)	P2O5 (lbs/ac)	Example Rec. (per acre)
Cool Season Grass	40	80	400 lbs. 10-20-20
CS Grass & Legume	30	60	300 lbs. 10-20-20
Temporary Cover	40	40	200 lbs. 19-19-19

**Table 3
Temporary Cover**

Species	Seeding Rate (lbs/acre)	Optimum Seeding Dates	Drainage	pH Range
Annual Ryegrass	40	3/1 - 6/15 or 8/15 - 9/15	Well - Poorly	5.5 - 7.5
Field Bromegrass	40	3/1 - 6/15 or 8/15 - 9/15	Well - Mod. Well	6.0 - 7.0
Spring Oats	96	3/1 - 6/15	Well - Poorly	5.5 - 7.0
Sundgrass	40	5/15 - 8/15	Well - Poorly	5.5 - 7.5
Winter Rye	168	8/15 - 10/15	Well - Poorly	5.5 - 7.5
Winter Wheat	180	8/15 - 11/15	Well - Mod. Well	5.5 - 7.0
Japanese Millet	30	6/15 - 8/15	Well	4.5 - 7.0
Redtop	5	3/1 - 6/15	Well	4.0 - 7.5
Annual Ryegrass	26	3/1 - 6/15	Well - Poorly	5.5 - 7.5
Spring Oats	64	3/1 - 6/15	Well - Poorly	5.5 - 7.5

NOTE: These rates should be increased by 50% if planted April 15 - August 1 and October 1 - March 1.

**Table 4a
Permanent Seeding Mixture**

Species/Mixture	Seeding Rate (lbs/acre)	Soil Drainage preference	pH Range
Crownvetch / Tall Fescue	10 - 15	Well - Mod. Well	5.0 - 7.5
Crownvetch / Perennial Ryegrass	10 - 15	Well - Mod. Well	5.0 - 7.5
Flatpea or Perennial Pea / Tall Fescue	20	Well - Mod. Well	4.0 - 8.0
Ladino Clover / Seresca Lespedeza / Tall Fescue	15	Well - Mod. Well	4.5 - 7.5
Ladino Clover / Redtop	30	Well - Mod. Well	5.0 - 7.5
Crownvetch / Tall Fescue	2	Well - Mod. Well	5.0 - 7.5
Ladino Clover / Redtop	40	Well - Mod. Well	5.0 - 7.5
Crownvetch / Tall Fescue	3	Well - Mod. Well	5.0 - 7.5
Birdsfoot Trefoil / Redtop	10	Well - Mod. Well	5.0 - 7.5
Seresca Lespedeza / Tall Fescue / Redtop	25	Well - Mod. Well	4.5 - 7.5
Redtop	30	Well - Mod. Well	5.0 - 7.5
Tall Fescue / Creeping Red / Tall Fescue	3	Well - Mod. Well	5.0 - 7.5
Perennial Ryegrass / Tall Fescue	50	Well - Poorly	4.5 - 7.5
Lathco Flatpea *	10	Well - Poorly	5.8 - 8.0

* *Lathco* Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.

Mixtures listed in bold are suitable for use in shaded woodland settings; those in italics are suitable for use in filter strips.

**Table 4b
Wildlife and Farm Friendly Seed Mixtures**

Species/Mixture	Seeding Rate (lbs/acre)	Soil Drainage preference	pH Range
KY Bluegrass / Redtop	20	Well - Mod. Well	5.5 - 7.5
Ladino Clover or Birdsfoot Trefoil	2 / 10	Well - Mod. Well	6.5 - 8.0
Timothy / Alfalfa	5	Well - Mod. Well	6.5 - 8.0
Timothy / Birdsfoot Trefoil	12	Well - Mod. Well	6.5 - 8.0
Orchardgrass / Ladino Clover / Redtop	5	Well - Poorly	5.5 - 7.5
Orchardgrass / Ladino Clover	8	Well - Mod. Well	5.5 - 7.5
Orchardgrass / Perennial Ryegrass	10	Well - Mod. Well	5.5 - 7.5
Creeping Red Fescue / Perennial Ryegrass	2	Well - Mod. Well	5.5 - 7.5
Orchardgrass or KY Bluegrass	20	Well - Mod. Well	5.5 - 7.5
Birdsfoot Trefoil / Redtop	10	Well - Mod. Well	6.0 - 7.5
Orchardgrass / Lathco Flatpea */ Perennial Ryegrass	5	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea */ Orchardgrass	20	Well - Mod. Well	5.5 - 7.5
Orchardgrass	30	Well - Mod. Well	5.5 - 7.5
Orchardgrass	20	Well - Mod. Well	5.5 - 7.5
Orchardgrass	30	Well - Mod. Well	5.5 - 7.5

* *Lathco* Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.

Mixtures listed in bold are suitable for use in shaded woodland settings; those in italic are suitable for use in filter strips.

**Table IV-5
Lime and Fertilizer Application Table**

pH of Soil	Lime in Tons per Acre	Fertilizer, Lbs., per Acre (10-20-20 or Equivalent)
Above 6.0	2	500
5.0 to 6.0	3	500
Below 5.0	4	500

The pH can be determined with a portable pH testing kit or by sending the soil samples to a soil testing laboratory. When 4 tons of lime per acre are applied it must be incorporated into the soil by disking, backblading or tracking up and down the slope.

**Table IV-6
Mulch Materials Rates and Uses**

Material	Minimum Rates per acre	Coverage	Remarks
Hay or Straw	2 to 3 Tons	Cover 75% to 90% of Surface	Subject to wind blowing or washing unless tied down
Wood Fiber	100 to 150 bales	Cover all	For hydroseeding
Pulp Fiber	1000 to 1500 lbs	Disturbed Areas	
Wood - Cellulose			
Recirculated Paper			

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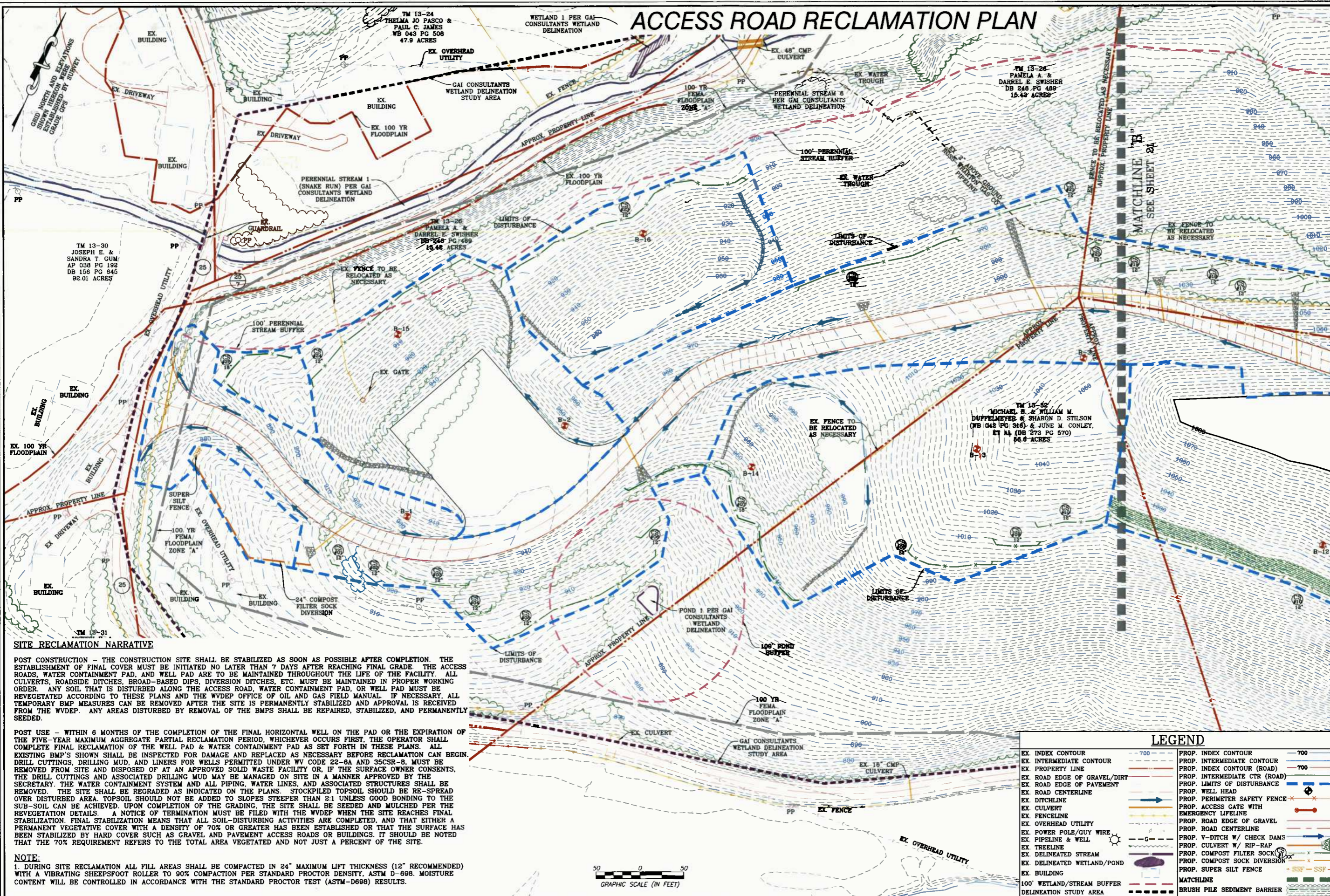


CONSTRUCTION DETAILS
SNAKE RUN
WELL PAD & WATER CONTAINMENT PAD
NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 08/21/2013
SCALE: N/A
SHEET 19 OF 22

ACCESS ROAD RECLAMATION PLAN

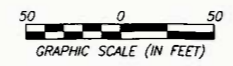


SITE RECLAMATION NARRATIVE

POST CONSTRUCTION - THE CONSTRUCTION SITE SHALL BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. THE ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. THE ACCESS ROADS, WATER CONTAINMENT PAD, AND WELL PAD ARE TO BE MAINTAINED THROUGHOUT THE LIFE OF THE FACILITY. ALL CULVERTS, ROADSIDE DITCHES, BROAD-BASED DIPS, DIVERSION DITCHES, ETC. MUST BE MAINTAINED IN PROPER WORKING ORDER. ANY SOIL THAT IS DISTURBED ALONG THE ACCESS ROAD, WATER CONTAINMENT PAD, OR WELL PAD MUST BE REVEGETATED ACCORDING TO THESE PLANS AND THE WVDEP OFFICE OF OIL AND GAS FIELD MANUAL. IF NECESSARY, ALL TEMPORARY BMP MEASURES CAN BE REMOVED AFTER THE SITE IS PERMANENTLY STABILIZED AND APPROVAL IS RECEIVED FROM THE WVDEP. ANY AREAS DISTURBED BY REMOVAL OF THE BMPs SHALL BE REPAIRED, STABILIZED, AND PERMANENTLY SEEDDED.

POST USE - WITHIN 6 MONTHS OF THE COMPLETION OF THE FINAL HORIZONTAL WELL ON THE PAD OR THE EXPIRATION OF THE FIVE-YEAR MAXIMUM AGGREGATE PARTIAL RECLAMATION PERIOD, WHICHEVER OCCURS FIRST, THE OPERATOR SHALL COMPLETE FINAL RECLAMATION OF THE WELL PAD & WATER CONTAINMENT PAD AS SET FORTH IN THESE PLANS. ALL EXISTING BMP'S SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. DRILL CUTTINGS, DRILLING MUD, AND LINERS FOR WELLS PERMITTED UNDER WV CODE 22-6A AND 35CSR-8, MUST BE REMOVED FROM SITE AND DISPOSED OF AT AN APPROVED SOLID WASTE FACILITY OR, IF THE SURFACE OWNER CONSENTS, THE DRILL CUTTINGS AND ASSOCIATED DRILLING MUD MAY BE MANAGED ON SITE IN A MANNER APPROVED BY THE SECRETARY. THE WATER CONTAINMENT SYSTEM AND ALL PIPING, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLANS. STOCKPILED TOPSOIL SHOULD BE RE-SPREAD OVER DISTURBED AREA. TOPSOIL SHOULD NOT BE ADDED TO SLOPES STEEPER THAN 2:1 UNLESS GOOD BONDING TO THE SUB-SOIL CAN BE ACHIEVED. UPON COMPLETION OF THE GRADING, THE SITE SHALL BE SEEDDED AND MULCHED PER THE REVEGETATION DETAILS. A NOTICE OF TERMINATION MUST BE FILED WITH THE WVDEP WHEN THE SITE REACHES FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT EITHER A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT THE SURFACE HAS BEEN STABILIZED BY HARD COVER SUCH AS GRAVEL AND PAVEMENT ACCESS ROADS OR BUILDINGS. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE.

NOTE:
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LEGEND

EX. INDEX CONTOUR	---	700	PROP. INDEX CONTOUR	---	700
EX. INTERMEDIATE CONTOUR	---	700	PROP. INTERMEDIATE CONTOUR	---	700
EX. PROPERTY LINE	---	700	PROP. INDEX CONTOUR (ROAD)	---	700
EX. ROAD EDGE OF GRAVEL/DIRT	---	700	PROP. INTERMEDIATE CTR (ROAD)	---	700
EX. ROAD CENTERLINE	---	700	PROP. LIMITS OF DISTURBANCE	---	700
EX. ROAD CENTERLINE	---	700	PROP. WELL HEAD	---	700
EX. DITCHLINE	---	700	PROP. PERIMETER SAFETY FENCE	---	700
EX. CULVERT	---	700	PROP. ACCESS GATE WITH EMERGENCY LIFELINE	---	700
EX. FENCELINE	---	700	PROP. ROAD EDGE OF GRAVEL	---	700
EX. OVERHEAD UTILITY	---	700	PROP. ROAD CENTERLINE	---	700
EX. POWER POLE/GUY WIRE	---	700	PROP. V-DITCH W/ CHECK DAMS	---	700
EX. PIPELINE & WELL	---	700	PROP. CULVERT W/ RIP-RAP	---	700
EX. TRELLINE	---	700	PROP. COMPOST FILTER SOCK	---	700
EX. DELINEATED STREAM	---	700	PROP. COMPOST SOCK DIVERSION	---	700
EX. DELINEATED WETLAND/POND	---	700	PROP. SUPER SILT FENCE	---	700
EX. BUILDING	---	700	MATCHLINE	---	700
100' WETLAND/STREAM BUFFER	---	700	BRUSH PILE SEDIMENT BARRIER	---	700
DELINEATED WETLAND STUDY AREA	---	700			

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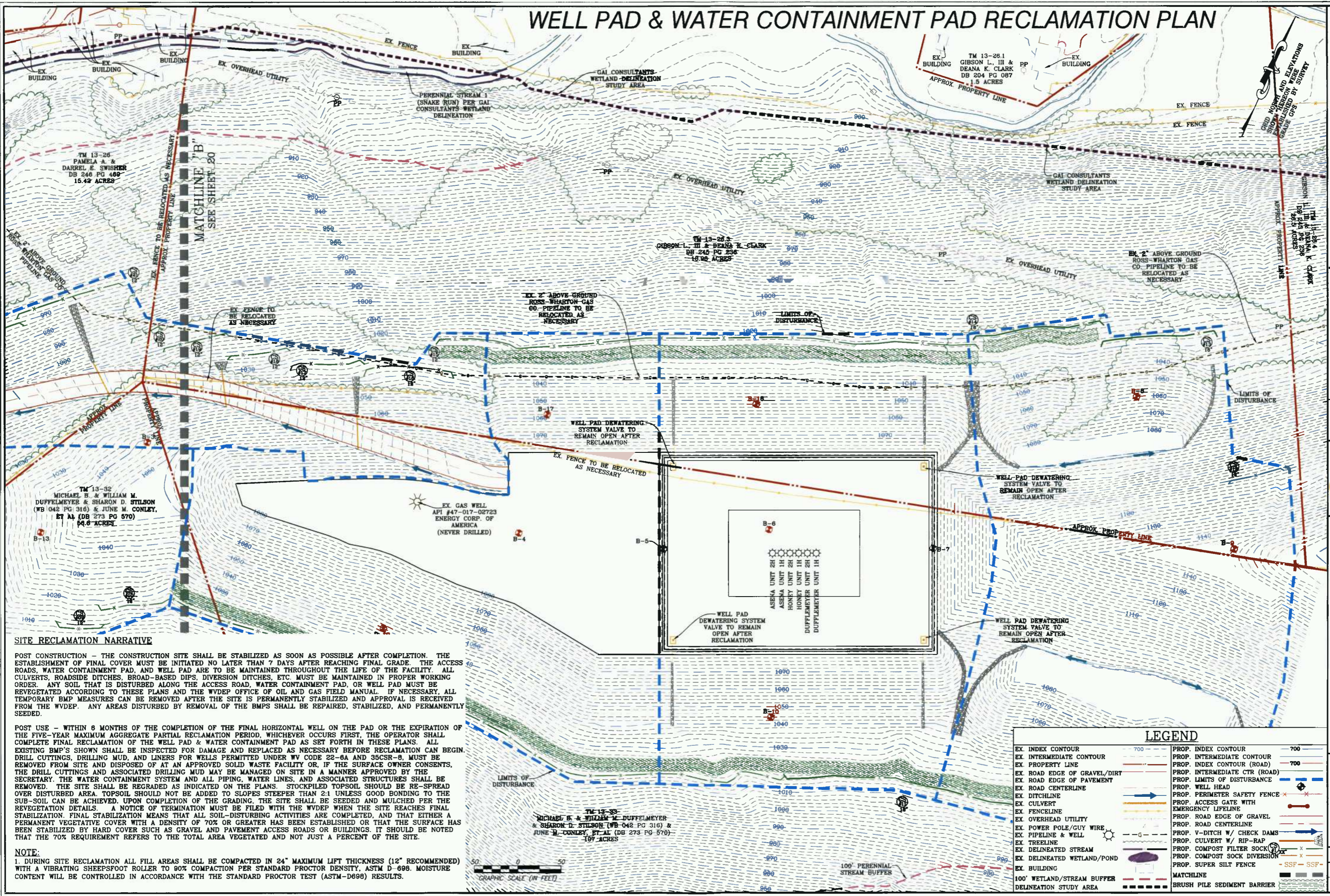
SNAKE RUN

WELL PAD & WATER CONTAINMENT PAD

NEW MILTON DISTRICT
DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 08/21/2013
 SCALE: 1" = 60'
 SHEET 20 OF 22

WELL PAD & WATER CONTAINMENT PAD RECLAMATION PLAN



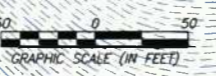
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TM 13-33
 MICHAEL B. & WILLIAM M. DUFFELMEYER
 & SHARON D. STILSON (WB 042 PG 316) &
 JUNE M. CONLEY, ET AL (DB 273 PG 570)
 167 ACRES



LEGEND			
EX. INDEX CONTOUR	700	PROP. INDEX CONTOUR	700
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DELINEATION STUDY AREA			

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WELL PAD & WATER CONTAINMENT PAD RECLAMATION PLAN

SLAKE RUN
 WELL PAD & WATER CONTAINMENT PAD
 NEW MILTON DISTRICT
 DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 08/21/2013
 SCALE: 1" = 50'
 SHEET 21 OF 22