



west virginia department of environmental protection

Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304
(304) 926-0450
(304) 926-0452 fax

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

PERMIT MODIFICATION APPROVAL

December 10, 2012

EQT PRODUCTION COMPANY
POST OFFICE BOX 280
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for API Number 8509951 , Well #: 513042 EQT PRODUCTIC
Bottom Hole, Casing, TD, FW and Coal Depth Changed, Stockpile Added

Oil and Gas Operator:

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,

Gene Smith
Regulatory/Compliance Manager
Office of Oil and Gas

85-9951
Mod

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
W.VA. CODE §22-6A - WELL WORK PERMIT APPLICATION

1) Well Operator: EQT Production Company

Operator ID	085	District	1	Quadrangle	539
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2) Operator's Well Number: 513042 Well Pad Name PEN16

3 Elevation, current ground: 787.0 Elevation, proposed post-construction: 795.0

4) Well Type: (a) Gas Oil
Other _____

(b) If Gas: Shallow Deep

Horizontal

5) Existing Pad? Yes or No: NO

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):

Target formation is Marcellus at a depth of 6064 with the anticipated thickness to be 51 feet and anticipated target pressure of 3651 PSI

7) Proposed Total Vertical Depth: 6,185

8) Formation at Total Vertical Depth: Onondaga

9) Proposed Total Measured Depth: 10,311

10) Approximate Fresh Water Strata Depths: 21, 94, 144, 367

11) Method to Determine Fresh Water Depth: By offset wells

12) Approximate Saltwater Depths: n/a

13) Approximate Coal Seam Depths: 816

14) Approximate Depth to Possible Void (coal mine, karst, other): n/a

15) Does land contain coal seams tributary or adjacent to, active mine? No

16) Describe proposed well work: Drill and complete a new horizontal well. The vertical drill to go down to approximately depth of 6185

Tagging the Onondaga not more than 100' then plug back to approximately 4903' and kick off the horizontal leg into the marcellus using a slick water frac.

17) Describe fracturing/stimulating methods in detail: _____

Hydraulic fracturing is completed in accordance with state regulations using water recycled from previously fractured wells and obtained from freshwater sources. This water is mixed with sand and a small percentage (less than 0.3%) of chemicals (including 15% Hydrochloric acid, gelling agent, gel breaker, friction reducer, biocide, and scale inhibitor). Stage lengths vary from 150 to 450 feet. Average approximately 400,000 gallons of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 400,000 pounds of sand per stage.

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 37.01

19) Area to be disturbed for well pad only, less access road (acres): 14.4

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WV Department of
Environmental Protection

5/3042

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CASING AND TUBING PROGRAM

20)

TYPE	Size	New or Used	Grade	Weight per ft.	FOOTAGE: for Drilling	INTERVALS: Left in Well	CEMENT: Fill-up (Cu.Ft.)
Conductor	26	New	Varies	Varies	71	71	87 CTS
Fresh Water	20	New	MC-50	81#	467	467	589 CTS
Coal	13 3/8	New	MC-50	54#	1,000	1,000	868 CTS
Intermediate	9 5/8	New	MC-50	40#	3,116	3,116	1,218 CTS
Production	5 1/2	New	P-110	20#	10,811	10,811	See Note 1
Tubing	2 3/8	—	J-55	4.6	—	—	will be set 100' less than TD
Liners							

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield
Conductor	26	30	0.5	—	construction	1.18
Fresh Water	20	24	0.635	1,640	1	1.2
Coal	13 3/8	17 1/2	0.38	2,480	1	1.21
Intermediate	9 5/8	12 3/8	0.395	3,590	1	1.21
Production	5 1/2	8 1/2	0.361	12,640	—	1.27/1.86
Tubing						
Liners						

Packers

Kind:	N/A		
Sizes:	N/A		
Depths Set:	N/A		

Note 1: EQT plans to bring the TOC on the production casing cement job 1,000' above kick off point so that the intermediate casing shoe can be monitored during stimulation and the well can be safely plugged and abandoned in the future.

Done
9-18-12

Office of the
Commissioner

SEP 24 2012

WV Department of
Environmental Protection

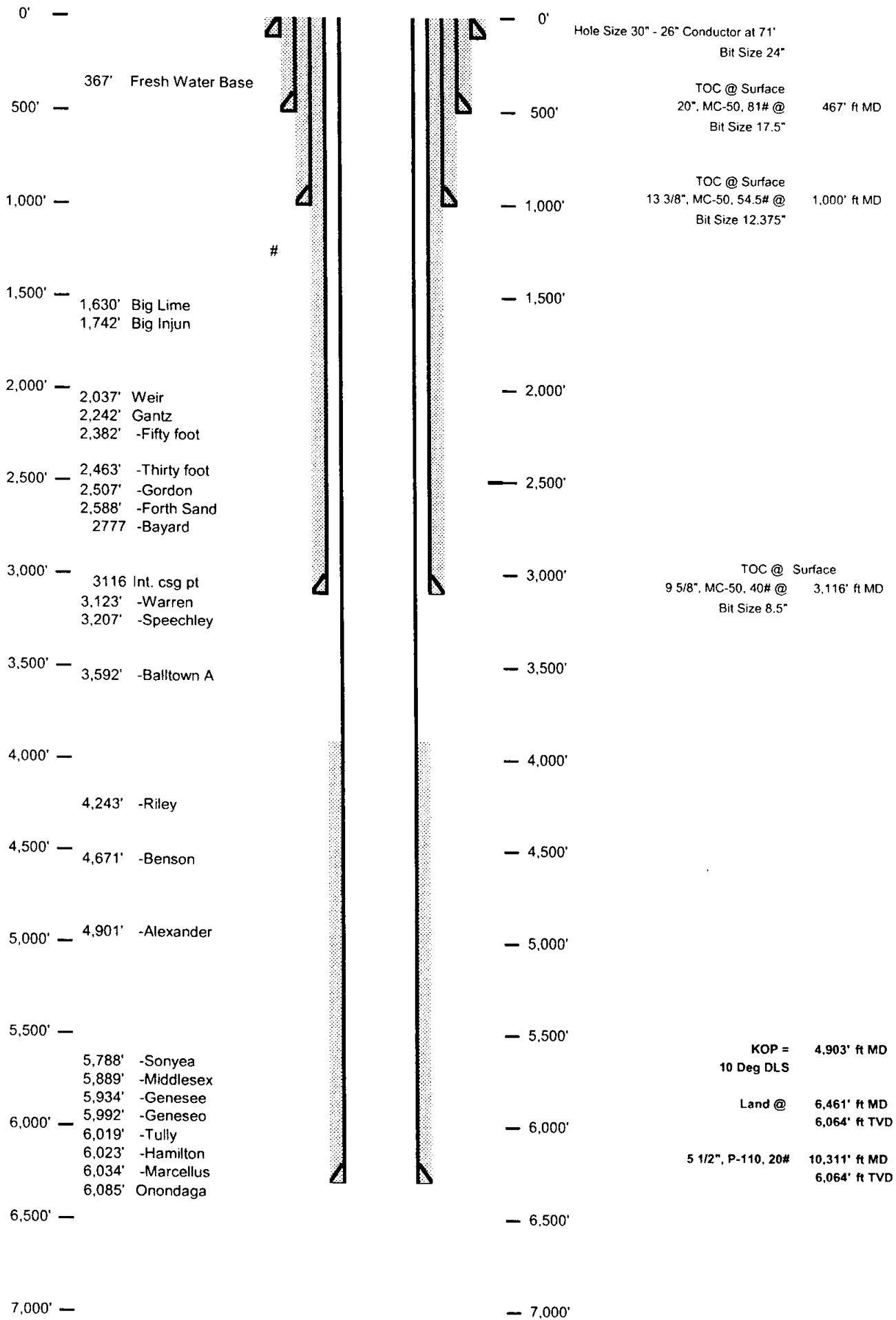
**Well Schematic
EQT Production**

85-04451

Well Name 513042 (PEN16H2)
County Ritchie
State West Virginia

Elevation KB:
Target
Prospect
Azimuth
Vertical Section

805
Marcellus
150
4258



8-2-2011

21) Describe centralizer placement for each casing string.

• Surface: Bow spring centralizers – One at the shoe and one spaced every 500'.

• Intermediate: Bow spring centralizers– One cent at the shoe and one spaced every 500'.

• Production: One spaced every 1000' from KOP to Int csg shoe

22) Describe all cement additives associated with each cement type.

Surface (Type 1 Cement): Salt is used in shallow,

low temperature formations to speed the setting of cement slurries. Loss Circulation Material (LCM) is used to combat the loss of

whole drilling fluid or cement slurry (not filtrate) to a thief zone.

Intermediate (Type 1 Cement): Salt is used in shallow, low temperature formations to speed the setting of cement

slurries. Loss Circulation Material (LCM) is used to combat the loss of whole drilling fluid or cement slurry (not filtrate) to a

thief zone.

Production:

Lead (Type 1 Cement): Salt is used in shallow, low temperature formations to speed the setting of cement slurries. Fluid additive

are used to control filtrate loss in low to moderate temperature application. A retarder increase the thickening time so that the

cement does not set early in these longer job (relative to the Surface & Intermediate)

Tail (Type H Cement): Loss Circulation Material (LCM) is used to combat the loss of whole drilling fluid or cement slurry

(not filtrate) to a thief zone. Fluid additive are used to control filtrate loss in low to moderate temperature application. A retarder

increase the thickening time so that the cement does not set early in these longer job (relative to the Surface & Intermediate).

A Friction Reducer, in the form of dispersants in cement slurries, reduces the apparent slurry viscosity allowing for more

dense slurries that are required in the longer production section.

23) Proposed borehole conditioning procedures. **Surface:** Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating

one full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5

minutes. To ensure that there is no fill, short trip two stands with no circulation. If there is fill, bring compressors back on

and circulate hole clean. A constant rate of higher than expected cuttings volume likely indicates washouts that will not clean up.

Intermediate: Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cuttings diminish at

surface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. If foam drilling, to enhance

hole cleaning use a soap sweep or increase injection rate & foam concentration.

Production: Pump marker sweep with nut plug to determine actual hole washout. Calculate a gauge holes bottoms up volume.

Perform a cleanup cycle by pumping 3-5 bottoms up or until the shakers are clean. Check volume of cuttings coming across

the shakers every 15 minutes.

*Note: Attach additional sheets as needed.

APPROVED
DATE: 08/27/2011
BY: [Signature]
ENVIRONMENTAL PROTECTION

Well 513042 (PEN16H2)
 EQT Production
 Pennsboro
 Ritchie

West Virginia
 Vertical Section 4258

Azimuth 150

85-951

85-019

TVD Depth (feet)	Geology	Vertical Section	Azimuth	Hole Size (inches)	Casing Type	Casing Size (inches)	WT (ppf)/Grade
250'	Base Fresh Water	367	150	30	Conductor	26	81#/MC-50
500'	Fresh Water Csg pt	467	4258	24	Surface	20	81#/MC-50
750'				17 1/2	Coal	13 3/8	54#/MC-50
1,000'	Coal Csg pt	1000					
1,250'							
1,500'	Big Lime	1630	1742				
1,750'	Big Injun	1742	2037				
2,000'	Weir	2037	2242				
2,250'	Gantz	2242	2382				
2,500'							
2,750'	-Bayard	2777	3066				
3,000'	Int. csg pt	3116		12 3/8	Intermediate	9 5/8	40#/MC-50
3,250'	-Warren	3123	3207				
3,500'	-Speechley	3207	3592				
3,750'							
4,000'	-Balltown A	3592	4243				
4,250'							
4,500'							
4,750'	-Benson	4671	4901				
5,000'	-Alexander	4901	4971				
5,250'	-Sonyea	5788	5889				
5,500'	-Middlesex	5889	5934				
5,750'	-Genesee	5934	5992				
6,000'	-Genesee	5992	6019				
	-Tully	6019	6023				
	-Hamilton	6023	6034				
	Marcellus top	6034					
	Target Inside Marcellus	6064					
	Marcellus Bottom	6085					

Land curve @ 6.064' ft TVD
 6.461' ft MD

Est. TD @ 6.064' ft TVD
 10.311' ft MD

3.850' ft Lateral

KOP @ 4,903'

8 1/2 Production Casing 5 1/2 20#/P-110

TD Pilot Hole @ 6185
 100' below top of Onondaga
 Run Logs. Plug back to KOP at 4903
 Kick off for horizontal well in Marcellus

SEP 24 2012
 WV Dept. of Environmental Protection

85-5951
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**INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)**

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

- (1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;
- (2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
Lease # 80617		1/8 min pd	
Lewis Maxwell & Sarah E. Maxwell	P.H. Gaffney & James McCoach		14/239
P.H. Gaffney & James McCoach	M. Keating		16/349
M. Keating & P.H. Gaffney and James McCoach	Eastern Oil Co.		18/506
Eastern Oil Co.	The Castle Brook Carbon Black Co.		20/274
The Castle Brook Carbon Black Co.	Columbian Carbon Black Co		32/414
Columbian Carbon Black Co	Cities Service Co.		74/17
Cities Service Co.	OXY USA, Inc.		205/614
OXY USA, Inc	Ashland Exploration, Inc.		161/644
Ashland Exploration, Inc.	Equitable Production Eastern States		unrecorded farmout

**Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: EQT Production Company
 By: *[Signature]*
 Its: Permitting Supervisor

Office of Oil and Gas
 SEP 24 2012
 WV Dept. of Environmental Protection

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STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS

CONSTRUCTION AND RECLAMATION PLAN AND SITE REGISTRATION APPLICATION FORM
GENERAL PERMIT FOR OIL AND GAS PIT WASTE DISCHARGE

Operator Name PEN16 OP Code _____

Watershed North Fork Hughes River Quadrangle Pennsboro 7.5

Elevation 795.0 County Ritchie District Clay

Description of anticipated Pit Waste: Drill water and various formation cuttings

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes No

Will a synthetic liner be used in the pit? Yes If so, what mil.? 40 Mil.

Proposed Disposal Method For Treated Pit Wastes:

- Land Application
- Underground Injection (UIC Permit Number 0014, 8462, 4037)
- Reuse (at API Number _____)
- Off Site Disposal (Supply form WW-9 for disposal location)
- Other (Explain _____)

Drilling medium anticipated for this well? Air, freshwater, oil based, etc. Air and water based mud

If oil based, what type? Synthetic, petroleum, etc _____

Additives to be used? MILBAR, Viscosifer, Alkalinity Control, Lime, Chloride Salts, Filtration Control, Deflocculant, Lubricant, Detergent, Defoaming, Walnut Shell, X-Cide, SOLTEX Terra Rate

Will closed loop system be used? No

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Landfill

If left in pit and plan to solidify what medium will be used? Cement, lime, n/a

Landfill or offsite name/permit number? See Attached List

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Company Official Signature *Victoria J. Roark*

Company Official (Typed Name) Victoria J. Roark

Company Official Title Permitting Supervisor

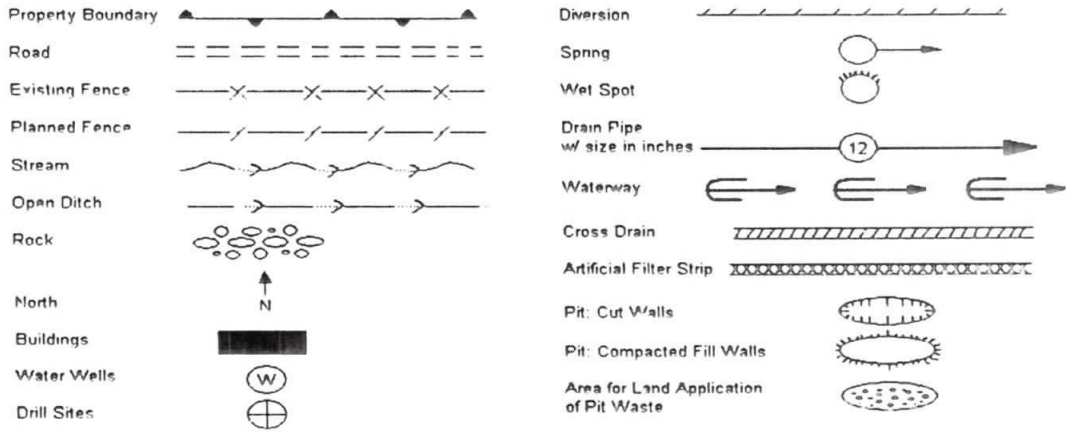
Subscribed and sworn before me this 14 day of SEPTEMBER, 20 12

[Signature] Notary Public

My commission expires 6/27/2018



OFFICE OF OIL AND GAS
SEP 24 2012
WV Department of Environmental Protection



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Proposed Revegetation Treatment: Acres Disturbed 37.01 Prevegetation pH 6.6
 Lime 3 Tons/acre or to correct to pH 6.5
 Fertilizer (10-20-20 or equivalent) 1/3 lbs/acre (500 lbs minimum)
 Mulch 2 Tons/acre

Seed Mixtures

Area I		Area II	
Seed Type	lbs/acre	Seed Type	lbs/acre
KY-31	40	Orchard Grass	15
Alsike Clover	5	Alsike Clover	5
Annual Rye	15		

Attach:
Drawing(s) of road, location, pit and proposed area for land application.

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: *David W. [Signature]*

Comments: *Pruned or mulch all out area. no less than 2000 per acre*

Title: *site supervisor* Date: *9-18-12*

Field Reviewed? () Yes () No

Office
SEP 24 2012
WV Dept. of Environmental Protection

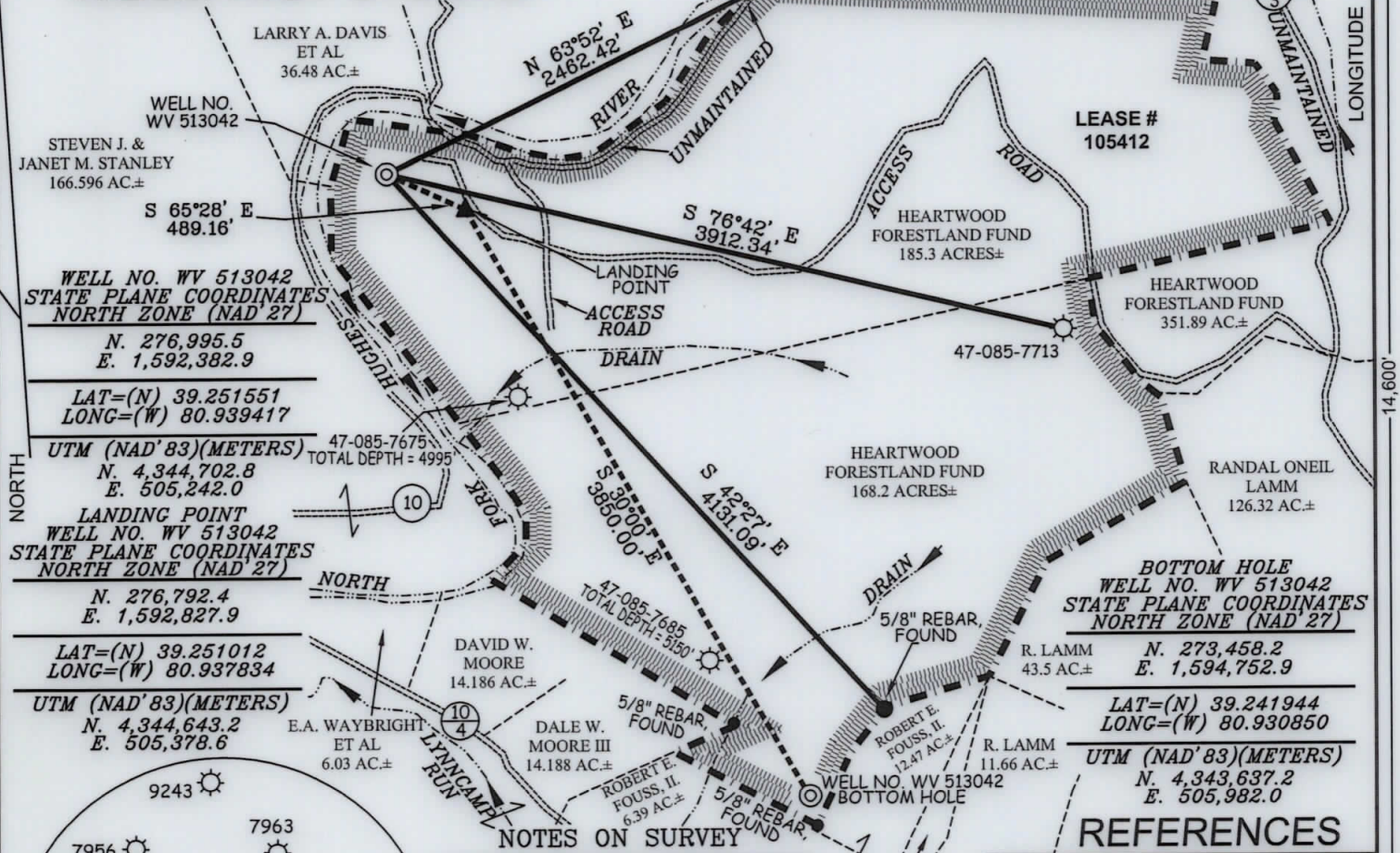
BROADWATER LEASE

360 ACRES ±

WELL NO. 513042

LATITUDE 39° 17' 30"

LONGITUDE 80° 55' 00"



WELL NO. WV 513042
STATE PLANE COORDINATES
NORTH ZONE (NAD 27)

N. 276,995.5
E. 1,592,382.9

LAT=(N) 39.251551
LONG=(W) 80.939417

UTM (NAD'83)(METERS)
N. 4,344,702.8
E. 505,242.0

LANDING POINT
WELL NO. WV 513042
STATE PLANE COORDINATES
NORTH ZONE (NAD 27)

N. 276,792.4
E. 1,592,827.9

LAT=(N) 39.251012
LONG=(W) 80.937834

UTM (NAD'83)(METERS)
N. 4,344,643.2
E. 505,378.6

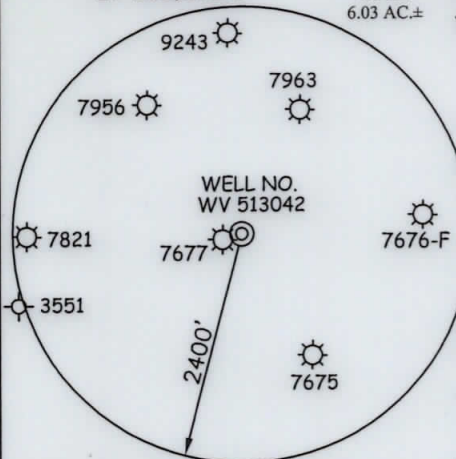
LEASE # 105412

BOTTOM HOLE
WELL NO. WV 513042
STATE PLANE COORDINATES
NORTH ZONE (NAD 27)

N. 273,458.2
E. 1,594,752.9

LAT=(N) 39.241944
LONG=(W) 80.930850

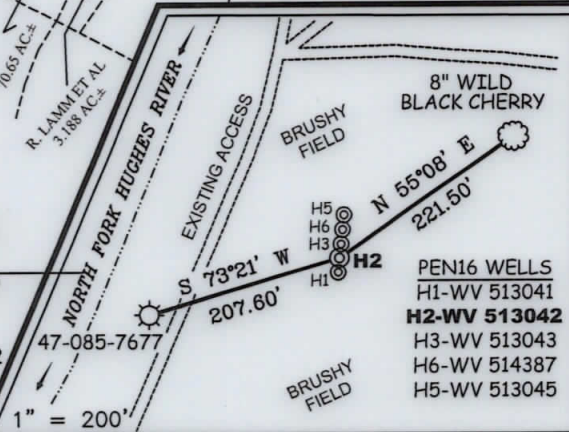
UTM (NAD'83)(METERS)
N. 4,343,637.2
E. 505,982.0



NOTES ON SURVEY

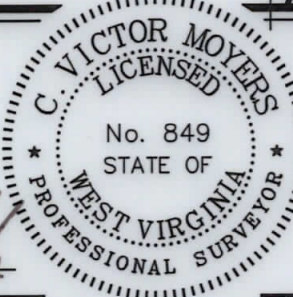
1. TIES TO WELLS, CORNERS & REFERENCES ARE BASED ON GRID NORTH FOR THE WV STATE PLANE COORDINATE SYSTEM NORTH ZONE NAD '27.
2. LEASE BOUNDARY SHOWN HEREON TAKEN FROM DEED BOOK 197 PAGE 568.
3. SURFACE OWNER AND ADJOINER INFORMATION TAKEN FROM THE ASSESSOR AND COUNTY CLERK RECORDS OF RITCHIE COUNTY IN JULY, 2010.
4. WELL LAT./LONG. (NAD'27) ESTABLISHED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK).
5. PLAT DATED 9/22/11 REVISED 9/20/12 TO SHOW NEW LANDING POINT & COORDINATES ETC.

REFERENCES



I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DIVISION OF ENVIRONMENTAL PROTECTION.

P.S. 677 *Gregory A. Smith*



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.
DATE SEPTEMBER 20, 20 12
OPERATORS WELL NO. WV 513042
API WELL NO. 47-85-9951H6A
STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1/200 FILE NO. 7566P513042EQT (329-36)
PROVEN SOURCE OF ELEVATION DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 1000'

STATE OF WEST VIRGINIA
DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS

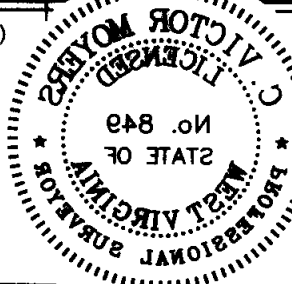
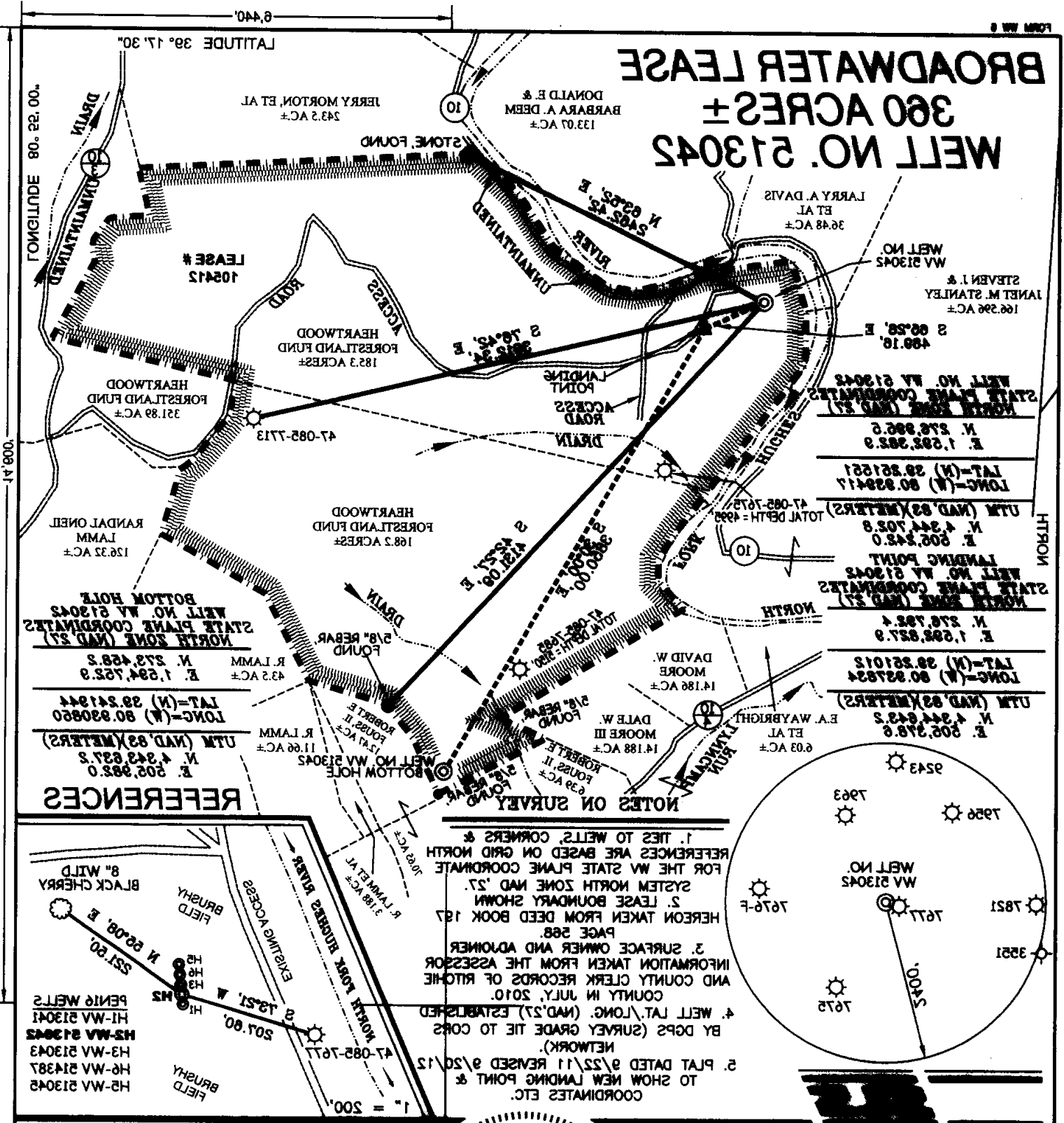
WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION STORAGE DEEP SHALLOW

LOCATION: ELEVATION 787' (GROUND) - 795' (PROPOSED) WATERSHED NORTH FORK HUGHES RIVER
DISTRICT CLAY COUNTY RITCHIE QUADRANGLE PENNSBORO 7.5'

SURFACE OWNER HEARTWOOD FORESTLAND FUND ACREAGE 185.3±
ROYALTY OWNER JEFFERSON BROADWATER HEIRS ET AL LEASE ACREAGE 360±
PROPOSED WORK: LEASE NO. 105412
DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION PERFORATE NEW FORMATION PLUG AND ABANDON CLEAN OUT AND REPLUG OTHER
PHYSICAL CHANGE IN WELL (SPECIFY) _____ TARGET FORMATION MARCELLUS
ESTIMATED DEPTH _____

WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT REX C. RAY
ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

BROADWATER LEASE 360 ACRES ± WELL NO. 213042



I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DIVISION OF ENVIRONMENTAL PROTECTION.

Victor Moyers

P. S. 877

DATE: SEPTEMBER 20, 2012
 OPERATORS WELL NO.: WV 213042
 COUNTY: PUTLAND
 STATE: WEST VIRGINIA
 WELL NO.: 47
 PERMIT NO.: 002142

OFFICE OF OIL AND GAS
 DIVISION OF ENVIRONMENTAL PROTECTION
 STATE OF WEST VIRGINIA

WELL OPERATOR: EQT PRODUCTION COMPANY
 ADDRESS: 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

DESIGNATED AGENT: REX C. RAY

PROPOSED WORK:
 DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION PERFORATE NEW FORMATION PLUG AND ABANDON CLEAN OUT AND REPLUG OTHER _____

PHYSICAL CHANGE IN WELL (SPECIFY): _____
 ESTIMATED DEPTH: _____
 TARGET FORMATION: MARCELLUS

SURFACE OWNER: HEARTWOOD FORESTLAND FUND
 DISTRICT: CLAY
 COUNTY: RITCHIE
 WATERSHED: NORTH FORK HUGHES RIVER

ROYALTY OWNER: JEFFERSON BROADWATER HEIRS ET AL
 LEASE ACREAGE: 360±
 SURFACE ACREAGE: 182.3±

PROVEN SOURCE: _____
 SCALE: 1" = 1000'
 FILE NO.: 2588213042EQT (328-38)

TYPE: OIL GAS LIQUID WASTE DISPOSAL STORAGE DEEP SHALLOW

LOCATION: _____
 ELEVATION: 787 (GROUND) - 785 (PROPOSED)
 COUNTY: RITCHIE
 QUADRANGLE: PENNSBORO 7.S

LEASE NO.: 102412

Adkins, Laura L

From: Adkins, Laura L
Sent: Tuesday, September 18, 2012 4:49 PM
To: Roark, Vicki (VRoark@eqt.com)
Subject: Modifications

Vicki,

The modifications you sent in for 85-09953 and 09951 do not have a modification request detailing what changes EQT would like to make...I do see that the surface location has changed and therefore would not be a modification, this would need to be submitted as a new permit application including the fees.

The question on the well work and site prep notice is still being discussed, I hope to have an answer for you tomorrow.

Best,
Laura

PLEASE INCLUDE THE INFORMATION IN THE SUBJECT LINE OF THIS EMAIL FOR ALL CORRESPONDENCE CONCERNING THIS PERMIT APPLICATION WHETHER IT BE BY EMAIL OR MAIL. THE ITEMS REQUESTED IN THIS EMAIL WILL NEED TO BE RECEIVED BY THE OFFICE OF OIL AND GAS WITHIN 10 DAYS TO AVOID THE PERMIT APPLICATION/APPLICATIONS BEING RETURNED.

Thank you

Surface location did not move per verification of
GPS coordinates for THole.

GCS
12/10/12

WW-6A5
(1/12)

Operator Well No. 513042

**STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE OF PLANNED OPERATION**

Notice Time Requirement: notice shall be provided no later than the filing date of permit application.

Date of Notice: _____ **Date Permit Application Filed:** _____

Delivery method pursuant to West Virginia Code § 22-6A-16(c)

CERTIFIED MAIL RETURN RECEIPT REQUESTED HAND DELIVERY

Pursuant to W. Va. Code § 22-6A-16(c), no later than the date for filing the permit application, an operator shall, by certified mail return receipt requested or hand delivery, give the surface owner whose land will be used for the drilling of a horizontal well notice of the planned operation. The notice required by this subsection shall include: (1) A copy of this code section; (2) The information required to be provided by subsection (b), section ten of this article to a surface owner whose land will be used in conjunction with the drilling of a horizontal well; and (3) A proposed surface use and compensation agreement containing an offer of compensation for damages to the surface affected by oil and gas operations to the extent the damages are compensable under article six-b of this chapter. (d) The notices required by this section shall be given to the surface owner at the address listed in the records of the sheriff at the time of notice.

Notice is hereby provided to the SURFACE OWNER(s)

(at the address listed in the records of the sheriff at the time of notice):

Name: Hearwood Forrest Fund IV (Greg Wilhelm) Name: _____ 0
Address: 3001 Emerson Ave. Address: _____ 0
Parkersburg, WV 26104 _____ 0

Notice is hereby given:

Pursuant to West Virginia Code § 22-6A-16(c), notice is hereby given that the undersigned well operator has developed a planned operation on the surface owner's land for the purpose of drilling a horizontal well on the tract of land as follows:

State: WV UTM NAD 83 Easting: 505,242.0
County: Ritchie Northing: 4,344,702.8
District: Clay Public Road Access: Rt. 4
Quadrangle: Pennsboro 7.5 Generally used farm name: Broadwater
Watershed: North Fork Hughes River

This Notice Shall Include:

Pursuant to West Virginia Code § 22-6A-16(c), this notice shall include: (1) A copy of this code section; (2) The information required to be provided by **W. Va. Code § 22-6A-10(b)** to a surface owner whose land will be used in conjunction with the drilling of a horizontal well; and (3) A proposed surface use and compensation agreement containing an offer of compensation for damages to the surface affected by oil and gas operations to the extent the damages are compensable under article six-b of this chapter. Additional information related to horizontal drilling may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57th Street, SE, Charleston, WV 25304 (304-926-0450) or by visiting www.dep.wv.gov/oil-and-gas/pages/default.aspx.

Well Operator: EQT Production Company Address: 115 Professional Place, P.O. Box 280
Telephone: 304-848-0082 Bridgeport, WV 26330
Email: vroark@eqt.com Facsimile: 304-848-0040

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

[Handwritten signatures and stamps]
SEP 14 2011
WV DEPARTMENT OF ENVIRONMENTAL PROTECTION

EQT
EQT Production
115 Professional Place
P. O. Box 280
Bridgeport, WV 26330

David Cowen
Rt. 1 Box 202
Hartsville, WV 26362

REPORT
10/11/2012
MEMPHIS
\$05.24
ZIP 38101
9411 103

**INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)**

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

- (1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;
- (2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
Lease 105412		1/8 Min Pd	
Creed Collins & Susan H. Collins	W.A. Flanagan		24/315
W.A. Flanagan	J.L. Newman		58/362
J.L. Newman	The Philadelphia Company of West Virginia		58/363
The Philadelphia Company of West Virginia	Pittsburgh & WV Gas Company		55/362
Pittsburgh & WV Gas Company	Equitable Gas Company		126/473
Equitable Gas Company	Equitrans Inc.		197/283
Equitrans Inc.	Equitrans L.P.		201/217
Equitrans L.P.	Equitable Production-Eastern States		234/830
Equitable Production-Eastern States	EQT Production Company		Cert 6/443

**Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: EQT Production Company
 By: *[Signature]*
 Its: Permitting Supervisor

NOV 17 2011
 DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES

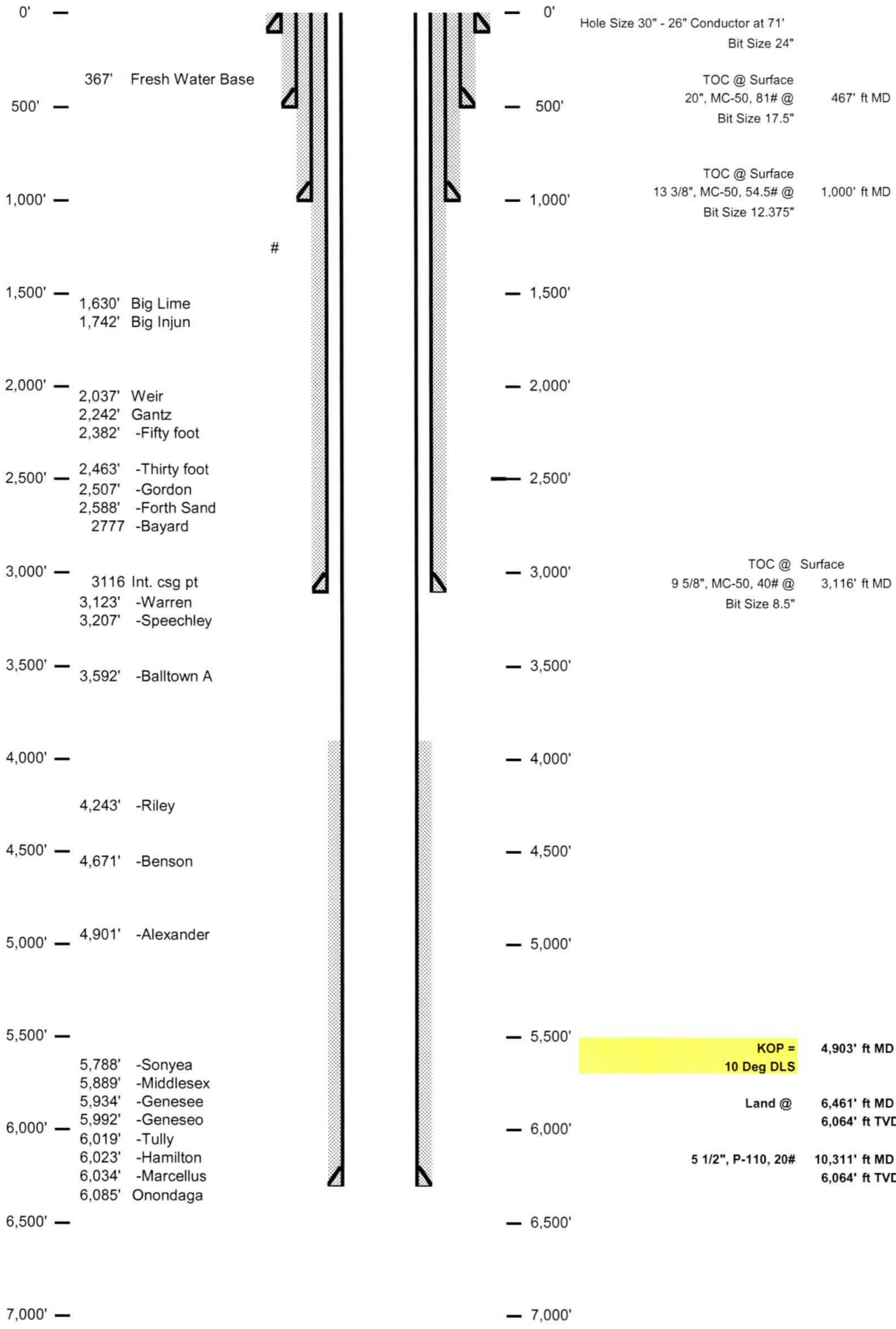
85-09951

Well Schematic
EQT Production

Well Name 513042 (PEN16H2)
County Ritchie
State West Virginia

Elevation KB:
Target
Prospect
Azimuth
Vertical Section

805
Marcellus
150
4258



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SEP 17 2012
WV Department of
Environmental Protection

85-0995

Well 513042 (PEN16H2)
 EQT Production
 Pennsboro
 Ritchie

West Virginia
 Azimuth 150
 Vertical Section 4258

TVD Depth (feet)	Geological Description	Azimuth	Vertical Section	Hole Size (inches)	Casing Type	Casing Size (inches)	WT (ppf)/Grade
0'				30	Conductor	26	
250'	Base Fresh Water	367		24	Surface	20	81#/MC-50
500'	Fresh Water Csg pl.	467		17 1/2	Coal	13 3/8	54#/MC-50
750'							
1,000'	Coal Csg pl.	1000	(1000')				
1,250'							
1,500'							
1,750'	Big Lime Big Injun	1630 - 1742 1742 - 2037	3903				
2,000'	Weir Gantz	2037 - 2242 2242 - 2382	(2000')				
2,250'							
2,500'							
2,750'	-Byard	2777 - 3066					
3,000'	Inl. csg pl. -Warren -Speechley	3116 3123 - 3207 3207 - 3592	(3000')	12 3/8	Intermediate	9 5/8	40#/MC-50
3,250'							
3,500'	-Balltown A	3592 - 4243					
3,750'							
4,000'							
4,250'							
4,500'	-Benson	4671 - 4901					
4,750'	-Alexander	4901 - 4971					
5,000'							
5,250'	-Sonyea -Middlesex -Genesee -Genesee	5788 - 5889 5889 - 5934 5934 - 5992 5992 - 6019					
5,500'	-Tully -Hamilton	6019 - 6023 6023 - 8034					
5,750'	Marcellus top	6034					
6,000'	Target inside Marcellus Marcellus Bottom	6064 6085		8 1/2	Production Casing	5 1/2	20#/P-110

Land curve @ 6,064' ft TVD
 6,461' ft MD

Est. TD @ 6,064' ft TVD
 10,311' ft MD

3,850' ft Lateral

KOP @ 4,903'

TD Pilot Hole @ 6185
 100' below top of Onondaga
 Run Logs. Plug back to KOP at 4903
 Kick off for horizontal well in Marcellus

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 Office of Oil & Gas
 SEP 17 2012
 WV Department of
 Environmental Protection

**STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE CERTIFICATION**

Date of Notice Certification: _____

API No. 47 - 085 - 0
Operator's Well No. 513042
Well Pad Name: PEN16

Notice has been given:

Pursuant to the provisions in West Virginia Code § 22-6A, the Operator has provided the required parties with the Notice Forms listed below for the tract of land as follows:

State: <u>WV</u>	UTM NAD 83 Easting: <u>505,242.0</u>
County: <u>Ritchie</u>	UTM NAD 83 Northing: <u>4,344,702.8</u>
District: <u>Clay</u>	Public Road Access: <u>Rt. 4</u>
Quadrangle: <u>Pennsboro 7.5</u>	Generally used farm name: <u>Broadwater</u>
Watershed: <u>North Fork Hughes River</u>	

Pursuant to West Virginia Code § 22-6A-7(b), every permit application filed under this section shall be on a form as may be prescribed by the secretary, shall be verified and shall contain the following information: (14) A certification from the operator that (i) it has provided the owners of the surface described in subdivisions (1), (2) and (4), subsection (b), section ten of this article, the information required by subsections (b) and (c), section sixteen of this article; (ii) that the requirement was deemed satisfied as a result of giving the surface owner notice of entry to survey pursuant to subsection (a), section ten of this article six-a; or (iii) the notice requirements of subsection (b), section sixteen of this article were waived in writing by the surface owner; and Pursuant to West Virginia Code § 22-6A-11(b), the applicant shall tender proof of and certify to the secretary that the notice requirements of section ten of this article have been completed by the applicant.

Pursuant to West Virginia Code § 22-6A, the Operator has attached proof to this Notice Certification that the Operator has properly served the required parties with the following:

*PLEASE CHECK ALL THAT APPLY

NOTICE OF SEISMIC ACTIVITY or NOTICE NOT REQUIRED BECAUSE NO SEISMIC ACTIVITY WAS CONDUCTED

NOTICE OF ENTRY FOR PLAT SURVEY or NO PLAT SURVEY WAS CONDUCTED

NOTICE OF INTENT TO DRILL or NOTICE NOT REQUIRED BECAUSE NOTICE OF ENTRY FOR PLAT SURVEY WAS CONDUCTED OR

WRITTEN WAIVER BY SURFACE OWNER (PLEASE ATTACH)

NOTICE OF PLANNED OPERATION

PUBLIC NOTICE

NOTICE OF APPLICATION

OOG OFFICE USE ONLY

RECEIVED/NOT REQUIRED

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RECEIVED/NOT REQUIRED

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RECEIVED

RECEIVED

Required Attachments:

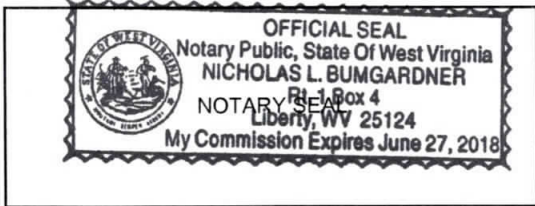
The Operator shall attach to this Notice Certification Form all Notice Forms and Certifications of Notice that have been provided to the required parties and/or any associated written waivers. For the Public Notice, the operator shall attach a copy of the Class II Legal Advertisement with publication date verification or the associated Affidavit of Publication. The attached Notice Forms and Certifications of Notice shall serve as proof that the required parties have been noticed as required under West Virginia Code § 22-6A. Pursuant to West Virginia Code § 22-6A-11(b), the Certification of Notice to the person may be made by affidavit of personal service, the return receipt card or other postal receipt for certified mailing.

Certification of Notice is hereby given:

THEREFORE, I *Victoria J. Roark*, have read and understand the notice requirements within West Virginia Code § 22-6A. I certify that as required under West Virginia Code § 22-6A, I have served the attached copies of the Notice Forms, identified above, to the required parties through personal service, by registered mail or by any method of delivery that requires a receipt or signature confirmation. I certify under penalty of law that I have personally examined and am familiar with the information submitted in this Notice Certification and all attachments, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator: EQT Production Company
By: Victoria J. Roark
Its: Permitting Supervisor
Telephone: 304-848-0076

Address: P.O. Box 280
Bridgeport, WV 26330
Facsimile: 304-848-0040
Email: vroark@eqt.com



Subscribed and sworn before me this 14 day of SEPTEMBER, 2012

Nicholas L. Bumgardner Notary Public
My Commission Expires 6/27/2018

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

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Office of Oil & Gas

SEP 17 2012

WV Department of
Environmental Protection

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STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE OF INTENT TO DRILL

*85-9957
Mod*

Pursuant to W. Va. Code § 22-6A-16(b), the Notice of Intent to Drill is only required if the notice requirements of W. Va. Code § 22-6A-10(a) have NOT been met or if the Notice of Intent to Drill requirement has NOT been waived in writing by the surface owner.

Notice Time Requirement: Notice shall be provided at least TEN (10) days prior to filing a permit application.

Date of Notice: _____ **Date Permit Application Filed:** _____

Delivery method pursuant to West Virginia Code § 22-6A-16(b)

HAND DELIVERY **CERTIFIED MAIL RETURN RECEIPT REQUESTED**

Pursuant to W. Va. Code § 22-6A-16(b), at least ten days prior to filing a permit application, an operator shall, by certified mail return receipt requested or hand delivery, give the surface owner notice of its intent to enter upon the surface owner's land for the purpose of drilling a horizontal well: Provided, That notice given pursuant to subsection (a), section ten of this article satisfies the requirements of this subsection as of the date the notice was provided to the surface owner: Provided, however, That the notice requirements of this subsection may be waived in writing by the surface owner. The notice, if required, shall include the name, address, telephone number, and if available, facsimile number and electronic mail address of the operator and the operator's authorized representative.

Notice is hereby provided to the SURFACE OWNER(s):

Name: Hearwood Forrest Fund IV (Greg Wilhelm) Name: _____ 0
Address: 3001 Emerson Ave. Address: _____ 0
Parkersburg, WV 26104 _____ 0

Notice is hereby given:

Pursuant to West Virginia Code § 22-6A-16(b), notice is hereby given that the undersigned well operator has an intent to enter upon the surface owner's land for the purpose of drilling a horizontal well on the tract of land as follows:

State: WV UTM NAD 83 Easting 505,242.0
County: Ritchie Northing 4,344,702.8
District: Clay Public Road Access: Rt. 4
Quadrangle: Pennsboro 7.5 Generally used farm name: Broadwater
Watershed: North Fork Hughes River

This Notice Shall Include:

Pursuant to West Virginia Code § 22-6A-16(b), this notice shall include the name, address, telephone number, and if available, facsimile number and electronic mail address of the operator and the operator's authorized representative. Additional information related to horizontal drilling may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57th Street, SE, Charleston, WV 25304 (304-926-0450) or by visiting www.dep.wv.gov/oil-and-gas/pages/default.aspx

Notice is hereby given by:

Well Operator: EQT Production Company Authorized Representative: Victoria Roark
Address: 115 Professional Place, P.O Box 280 Address: 115 Professional Place, P.O Box 280
Bridgeport, WV 26330 Bridgeport, WV 26330
Telephone: 304-848-0076 Telephone: 304-848-0076
Email: vroark@eqt.com Email: vroark@eqt.com
Facsimile: 304-848-0041 Facsimile: 304-848-0041

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

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SEP 17 2012
WV Department of
Environmental Protection

85-9951
Mod

7011 0470 0003 0568 4875

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

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

OFFICIAL USE

Postage	\$	
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		



Total Postage: _____

Heartwood Forest Fund IV
Greg Wilhelm
3001 Emerson Ave.
Parkersburg, WV 26104
 DEN16 - Intent to drill

PS Form 3800, August 2006 See Reverse for Instructions

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 Office of Oil & Gas
 SEP 17 2012
 WV Department of
 Environmental Protection

WW-6A7
(6-12)

RECEIVED DATE: _____

API 47-085-09951

OPERATOR: EQT Production Company

WELL: 513042 MOD

PAD NAME: PEN16

END COMMENT PERIOD: _____

PAD BUILT: _____ YES NO

DATE REVIEWED: _____ INT _____

REVIEWED BY (APPLICANT): Victi Roark

APPLICANT SIGNATURE: [Signature]

CHECKLIST FOR FILING A PERMIT HORIZONTAL 6A WELL

Please include these required elements in the Horizontal Well 6A applications, in order listed below.
Do not use staples.

N/A Fees

First Well		Subsequent Well	
10,250.00 with pit	<input type="checkbox"/>	5,250.00 with pit	<input type="checkbox"/>
10,150.00 no pit	<input type="checkbox"/>	5,150.00 no pit	<input type="checkbox"/>

N/A

Checklist / Cover letter

WW-6B _____ Field Approved

Well Bore Schematic

N/A WW-6A notarized w/ any attachments No changes

WW-6A1

N/A Road Crossing Letter No change

N/A Road Bonding Agreement / DOH Certification

WW-9 _____ Field Approved

Site Construction Plan _____ Field Approved

N/A Reclamation Plan No change _____ Field Approved

Erosion and Sediment Control Plan _____ Field Approved

Topographic Map w/ water purveyors showing access road

Mylar Plat (Signed and sealed) (Surface Owner matches WW-6A)

Revised 5/30/12

RECEIVED
Office of Oil & Gas

SEP 17 2012

WV Department of
Environmental Protection

WW-6A7
(6-12)

Paper Plat

WW-6AC Notice Certifications

N/A WW-2B1 Names, Addresses and Spotted on Topographical Map

N/A WW-6A3 Notice of Entry for Plat Survey

WW-6A4 Notice of Intent to Drill

WW-6A5 Notice of Planned Operation

N/A Registered Mail receipts, Affidavits of Personal Service or Waivers

Waiver for Surface Owner at Wellhead

Waiver for Surface Owner for Roads or other Disturbances

Waiver for Coal Owner, Operator or Lessee

Waiver for surface owner for Impoundment or Pit

Waiver for Surface Owner or Water Purveyor within 1500 feet of Center of Pad

Waiver for Natural gas Storage Field Operator

N/A WW-PN Public Notice (Dated copy of advertisement or Affidavit of Publication)

N/A Within a Municipality (Emergency Rule)

Class 1 Legal Advertisement for first permit on pad

Well Site Safety Plan

Field Approved

Water Management Plan

DWWM Approval

List of Chemical Names & CAS #s for Frac additives

Copy of To Scale Plans

Inspector packet mailed to inspector (Plat, Topographic Map, WW-6B, WW-9, All Plans)

Bond (\$250,000)

Revised 5/30/12

RECEIVED
SEP 17 2012
WV Department of
Environmental Protection

Operator is registered with the SOS

Workers Compensation / Unemployment Insurance account is OK

Professional Engineer/Company has COA

Mine Data Check

Floodplain Check

Well Restrictions

ND At Least 100 Feet from Pad and LOD (including any E&S Control Feature) to any Perennial Stream, Lake, Pond, Reservoir or Wetland *Exempt*

_____ DEP Waiver and Permit Conditions

At Least 300 Feet from Pad and LOD (including any E&S Control Feature) to any Naturally Producing Trout Stream

_____ DEP Waiver and Permit Conditions

At Least 1000 Feet from Pad and LOD (including any E&S Control Feature) to any Groundwater Intake or Public Water Supply

_____ DEP Waiver and Permit Conditions

At Least 250 Feet from an Existing Water Well or Developed Spring to Well Being Drilled

_____ Surface Owner Waiver and Recorded with County Clerk, OR

_____ DEP Variance and Permit Conditions

At Least 625 Feet from an Occupied Dwelling Structure to the Center of the Pad

_____ Surface Owner Waiver and Recorded with County Clerk, OR

_____ DEP Variance and Permit Conditions

At Least 625 Feet from Agricultural Buildings Larger than 2500 Square Feet to the Center of the Pad

_____ Surface Owner Waiver and Recorded with County Clerk, OR

_____ DEP Variance and Permit Conditions

Approved
John A. [unclear]
SEP 17 2010
VW Department of
Environmental Protection

85-9951 Prod



Where energy meets innovation.™

Well Site Safety Plan

Marcellus Well
513042 PEN16H2
Ritchie County, WV

DATE:
August 28, 2012

[Handwritten Signature]

Date 9-14-12

EQT Production

[Handwritten Signature]
Title

WVOOG

Date _____

Title

[Handwritten Signature]
9-18-12

Office
SEP 24 2012
WVDC
ENVIRONMENTAL PROTECTION

VI.



Where energy meets innovation.™

WELL SITE SAFETY PLAN RECEIPT ACKNOWLEDGMENT

This form letter is to be signed by the LEPC or CES representative to indicate they have received the Site Safety Plan for the following well site location and understand its use.

Site Location:

[Empty rounded rectangular box for site location]

I have received my copy of the Well Site Safety Plan for the above described location. I understand that this is a reference tool for emergency response and it is my responsibility to read and understand the Plan.

LEPC or CES Representative (printed)

Date _____

Representative Affiliation and Title

Representative Signature

EQT Representative (printed)

Date _____

EQT Environmental and Safety title

EQT Environmental and Safety Signature

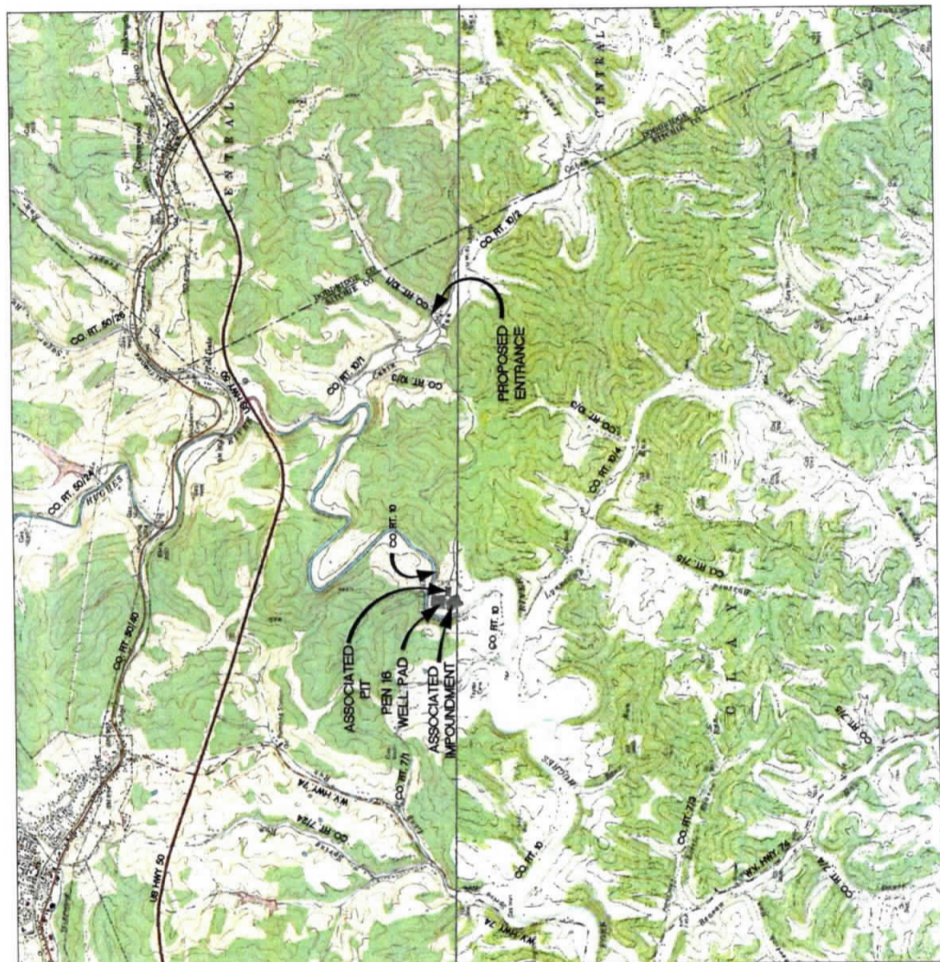
*Jul
9-18-12*

SEP 24 2012
L...

PEN 16 H1-H5 SITE PLAN EQT PRODUCTION COMPANY

(PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, WV 513045)
SITUATE ON THE WATERS OF THE NORTH FORK HUGHES RIVER AND CABIN RUN
IN CLAY DISTRICT, RITCHIE COUNTY, WEST VIRGINIA.

PENNSBORO QUAD



PROJECT INFORMATION

PROJECT NAME: PEN 16 H1-H5
 TAX PARCEL: CLAY DISTRICT MAP 51-14
 SURFACE OWNER: FORESTLAND FUND
 COUNTY: RITCHIE COUNTY, WV
 TOTAL PROPERTY AREA: 165.3 ± ACRES
 OIL AND GAS ROYALTY OWNER: JEFFERSON BROADWATER HEIRS ET AL
 COUNTY: RITCHIE COUNTY, WV
 TOTAL PROPERTY AREA: 366.0 ± ACRES
 LEASE NUMBER: 100412

SITE LOCATION
 THE PEN 16 SITE IS LOCATED IN A FIELD WEST OF CO. RT. 10/1, APPROXIMATELY 452 FT. SOUTH OF THE CO. RT. 10/1 AND US HWY 50 INTERSECTION.

LOCATION COORDINATES

PEN 16 WELL PAD ENTRANCE
 LATITUDE: 39.2520 LONGITUDE: -80.90654 (NAD 27)
 PEN 16 H1-H5 WELL PAD
 LATITUDE: 39.25151 LONGITUDE: -80.93942 (NAD 27)
 PEN 16 ASSOCIATED PIT
 LATITUDE: 39.25083 LONGITUDE: -80.93803 (NAD 83)
 PEN 16 ASSOCIATED IMPOUNDMENT
 LATITUDE: 39.25042 LONGITUDE: -80.93823 (NAD 83)

SITE DISTURBANCE COMPUTATIONS

PAD/PIT/IMPOUNDMENT AREA = 14.6 ± ACRES*
 TOTAL SITE DISTURBANCE = 37.3 ± ACRES
 *INCLUDES AREA OF PAD, IMPOUNDMENT, PIT, & STOCKPILES

ENTRANCE PERMIT

EQT PRODUCTION COMPANY WILL OBTAIN AN ENCROACHMENT PERMIT (FORM MA-109) FROM THE WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES.

FLOODPLAIN NOTE

THE PROPOSED LIMITS OF DISTURBANCE FOR THIS PROJECT IS LOCATED IN AN UNDEVELOPED AREA WITHIN THE FLOODPLAIN SHOWN ON THIS PLAN AS DELINEATED AS FLOOD ZONE A. THIS INFORMATION HAS BEEN OBTAINED FROM THE FLOOD INSURANCE RATE MAP (FIRM) NUMBERS 54070028C, 540700120C, & 540700115C DATED OCT. 04, 2011.

ENVIRONMENTAL NOTES

A WETLAND DELINEATION WAS PERFORMED ON JULY 08, 2011 BY POTESTA ENGINEERS AND ARCHITECTS, INC. FOR THE PROPOSED SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY TO BE AFFECTED BY THE PROPOSED CONSTRUCTION. THE DELINEATION WAS CONDUCTED WITHIN THE REGULATORY JURISDICTION OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE AUGUST 26, 2011 REPORT #010-11-0147-1601 WAS PREPARED BY POTESTA ENGINEERS AND ARCHITECTS, INC. FOR THE PROPOSED SITE. THE DELINEATION DETERMINED THE LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USE OR THE WYDEP IT IS STRONGLY RECOMMENDED THAT THE AFORESAID AGENCIES BE CONSULTED IN AN EFFORT TO OBTAIN WRITTEN CONFIRMATION OF THE DELINEATION DESCRIBED BY THIS REPORT. ANY CHANGING CONSTRUCTION ON THE SITE FROM THE DELINEATION DATE WILL OBTAIN THE APPROVAL OF THE FEDERAL AND/OR STATE REGULATORY AGENCIES PRIOR TO ANY PROPOSED IMPACTS TO WATERS OF THE U.S., INCLUDING WETLAND FILLS AND STREAM CROSSINGS.

GENERAL DESCRIPTION

THE WELL PAD, ASSOCIATED PIT & ASSOCIATED IMPOUNDMENT IS BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

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!

LIST OF DRAWINGS

- 1 - COVER SHEET
- 2 - NOTES
- 3 - OVERALL PLAN VIEW & VOLUMES
- 4 - WELL PAD, IMPOUNDMENT, AND PIT DETAILS
- 5 - ACCESS ROAD DETAILS
- 6 - ACCESS ROAD DETAILS
- 7 - ACCESS ROAD DETAILS
- 8 - ACCESS ROAD DETAILS
- 9 - ACCESS ROAD DETAILS
- 10 - ACCESS ROAD DETAILS
- 11 - WELL PAD, IMPOUNDMENT, AND PIT SECTIONS
- 12 - IMPOUNDMENT SECTIONS
- 13-21 - ACCESS ROAD PROFILES
- 22-29 - ACCESS ROAD SECTIONS
- 30 - STREAM CROSSING DETAILS
- 31 - WELL PAD, IMPOUNDMENT, AND PIT RECLAMATION PLAN
- 32 - CONSTRUCTION DETAILS
- 33 - CONSTRUCTION DETAILS
- 34 - CONSTRUCTION DETAILS
- 35 - CONSTRUCTION DETAILS

LEGEND

EX INDEX CONTOUR	PROP INDEX CONTOUR
EX INTERMEDIATE CONTOUR	PROP INTERMEDIATE CONTOUR
EX BOUNDARY LINE	PROP LIMITS OF DISTURBANCE
EX ROAD CENTERLINE	PROP WELL PAD
EX UTILITY	PROP WELL HEAD
EX GROUNDWATER	PROP SUMP DRAIN
EX FENCELINE	PROP CONTAINMENT BERM
EX OVERHEAD UTILITY N/W	PROP PIT/IMPOUNDMENT FENCE
EX POWER POLE	PROP ACCESS GATE WITH EMERGENCY LIFELINE
EX GASLINE	PROP ROCK CONSTRUCTION ENTRANCE
EX WATER WELL	PROP ROAD EDGE OF GRAVEL
EX TRAIL	PROP ROAD CENTERLINE
EX DELINEATED WETLAND	PROP V-DITCH W/ CHECK DAMS
EX BRIDGE	PROP DITCH BELIEF
	PROP REP-RAP OUTLET PROTECTION
	PROP ROCK LEVEL SPREADER
	PROP EARTHEN DIVERSION BERM
	PROP ORANGE SAFETY FENCE
	PROP SUPER SILT FENCE
	PROP COMPOSITE ROCK DIVERSION
	PROP GROUNDWATER DEWATERING TRENCH
	PROP DEWATERING PUMP
	SECTION LINE
	MATCHLINE
	X-SECTION GRID INDEX
	X-SECTION PROPOSED GRADE
	X-SECTION EXISTING GRADE
	X-SECTION WATER SURFACE
	SPOT ELEVATION

OPERATOR

EQT PRODUCTION COMPANY
 OPERATOR ID: 2046096
 115 PROFESSIONAL PLACE
 HUNTSVILLE, WV 25830
 PHONE: (204) 244-3870

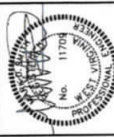
ENGINEER

NAVITUS ENGINEERING, INC.
 151 WINDY HILL LANE
 WINCHESTER, VA 22603
 PHONE: (949) 662-4185

SURVEYOR

SMITH LAND SURVEYING, INC.
 226 WEST MAIN STREET
 P.O. BOX 150
 WINCHESTER, VA 22603
 PHONE: (204) 462-5634

LOCATION MAP
 PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV



SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150
 226 W. Main Street
 Winchester, WV 25151
 PH: (204) 462-5634
 FAX: (204) 462-5636
 E-MAIL: sls@sls-survey.com

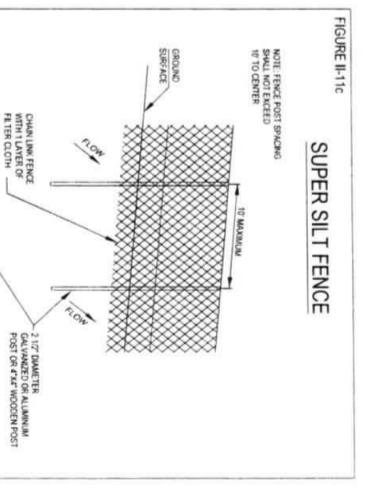
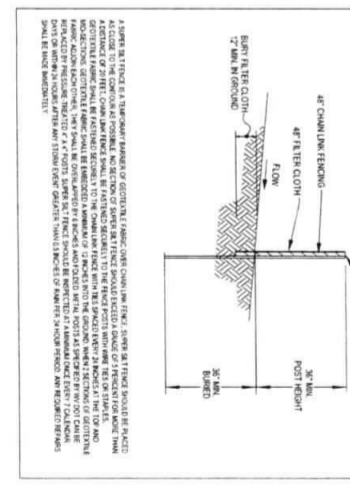
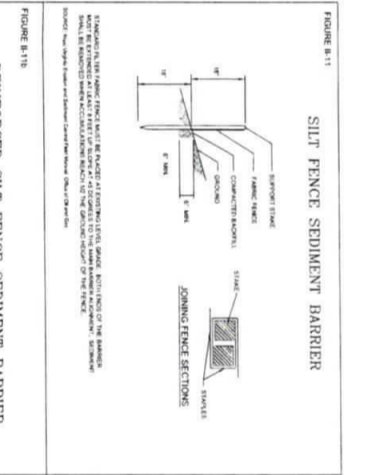
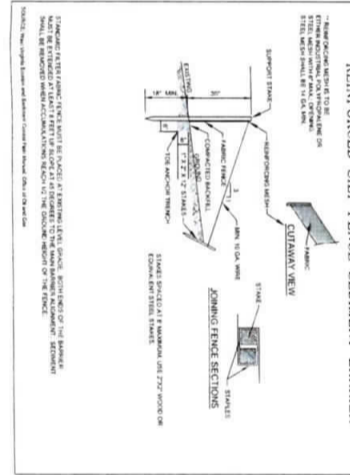
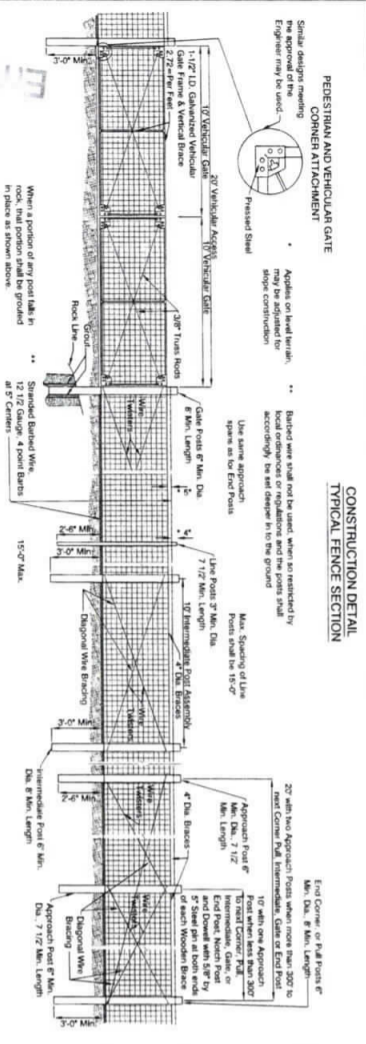
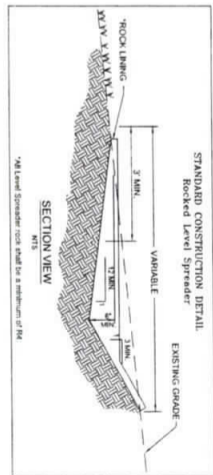
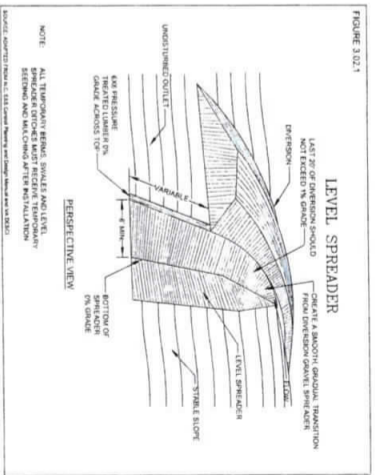
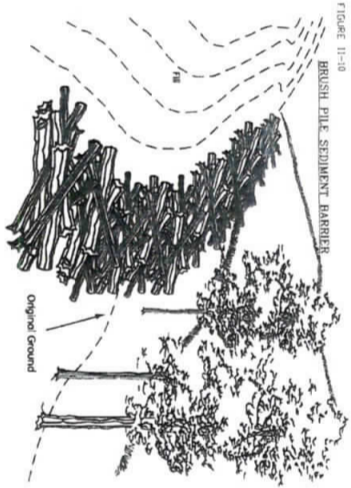
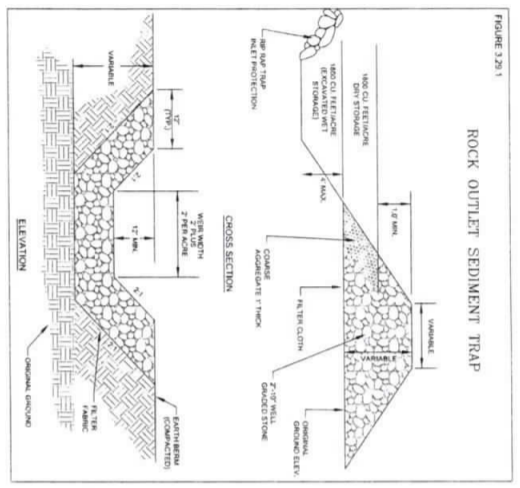
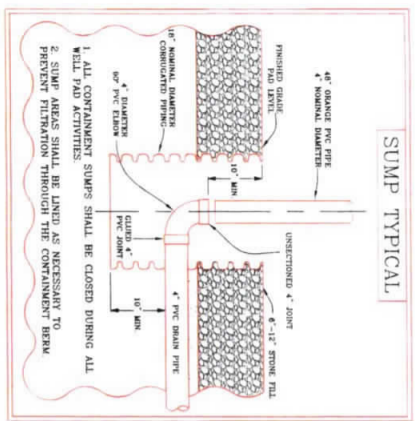
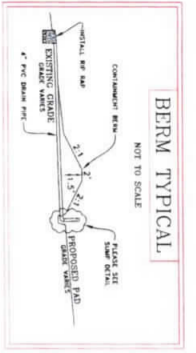
NAVITUS ENGINEERING, INC.
 151 Windy Hill Lane
 Winchester, VA 22603
 Telephone: (949) 662-4185
 www.navituseng.com

Engineering
 Survey
 Environmental
 GIS

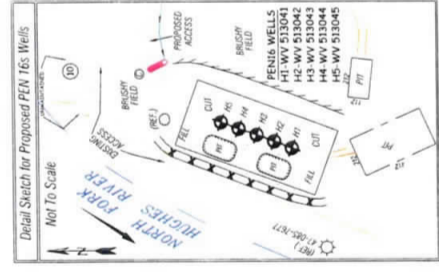
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 DESIGNED BY CSK/TVP
 FILE NO. 7566
 SHEET 1 OF 35
 REV: 09/08/2012
 DATE: 09/29/2011

Office
 SEP 24 2012
 WV Dept of Environmental Protection

David Wilson



OVERALL PLAN VIEW & VOLUMES



STOCKPILE VOLUMES	
STOCKPILE	CY
A TOPSOIL	6,800
B	21,600

Proposed Pit Access Road
 Total cut: 3,148.2 C.F., 116.6 C.Y. (Cut/Shrink=1)
 Total fill: 1,110.8 C.F., 41.177 C.Y. (Cut/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 50.00%, slope ratio: 2:1
 Gravel (6" depth): 1,530.9 C.F., 56.7 C.Y.

Proposed Impoundment Access Road
 Total cut: 0.0 C.F., 0.0 C.Y. (Cut/Shrink=1)
 Total fill: 1,660.5 C.F., 61.5 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 (6" depth): 494.1 C.F., 18.3 C.Y.

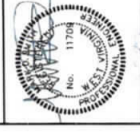
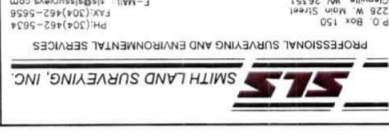
Proposed Pad
 Topsoil Removal: 26,622.9 C.F., 2,958.1 C.Y.
 Total cut: 168,037.8 C.F., 6,223.4 C.Y. (Cut/Shrink=1)
 Total fill: 1,110,169.8 C.F., 41,117.4 C.Y. (Cut/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 50.00%, slope ratio: 2:1
 Invertor slope percent grade: 33.33%, 50.00%, slope ratio: 3:1 & 2:1
 Top of dam elevation: 795.0'
 Gravel (6" depth): 42,481.8 C.F., 1,573.4 C.Y.

Proposed Associated Impoundment
 Total cut: 81,329.4 C.F., 3,012.2 C.Y.
 Total fill: 1,633,578.3 C.F., 60,502.9 C.Y. (Cut/Shrink=1, Fill/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 50.00%, slope ratio: 2:1
 Invertor slope percent grade: 50.00%, slope ratio: 2:1
 Top of dam elevation: 787.0'
 Bottom of pit elevation: 768.0'
 Top of dam width: 12.0'

Elevation	Barrel	Assoc. Vol.	Acres-Ft
765	7269	306153.7	0.33955
770	14830	627058.7	1.92437
771 (Invert)	22901	961844.9	2.95179
772	31208	1310756.8	4.02256
773	39458	1674032.3	5.13741
774	48555	2044452.2	6.30227
775	57415	2454452.0	7.50227
776	67115	2854452.0	8.75276
777	77889	3275452.1	10.05226
778	88434	3714220.5	11.39951
779	99255	4168696.3	12.79324
780	110457	4632028.4	14.23119
781	122049	5103314.4	15.71111
782	134111	5592317.4	17.23371
783	146614	6103718.5	18.81712
784	159201	6648438.3	20.51900
785 (Shrink)	172309	7240737.6	22.25006
786	186012	7812505.6	23.97967
787 (Top)	200071	8402984.4	25.78718

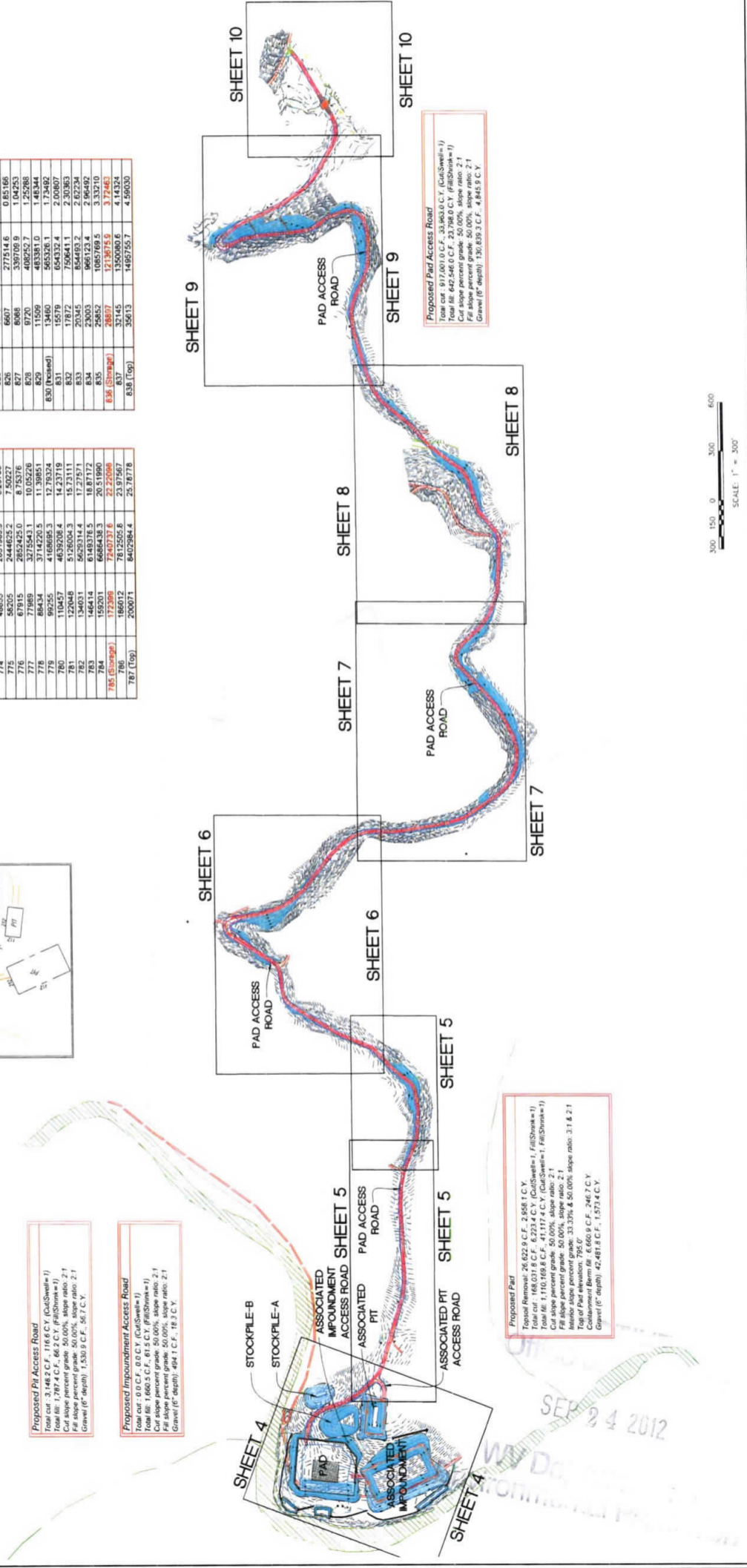
Proposed Associated Pit
 Topsoil Removal: 21,492.0 C.F., 766.0 C.Y.
 Total cut: 136,152.8 C.F., 5,042.7 C.Y. (Cut/Shrink=1, Fill/Shrink=1)
 Total fill: 34,856.4 C.F., 1,313.2 C.Y. (Cut/Shrink=1, Fill/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 33.33%, slope ratio: 3:1
 Invertor slope percent grade: 50.00%, slope ratio: 2:1
 Top of dam elevation: 838.0'
 Bottom of pit elevation: 818.0'
 Top of dam width: 12.0'

Elevation	Barrel	Assoc. Vol.	Acres-Ft
819	0	0.0	0.00000
820	575	24136.6	0.07407
821	1269	52298.5	0.16357
822	2060	87967.3	0.26812
823	3014	131265.8	0.40537
824	4158	181265.8	0.55252
825	5275	221422.5	0.67852
826	6067	271514.6	0.85166
827	6868	339709.9	1.04253
828	7920	408252.7	1.25288
829	11509	483381.0	1.48344
830 (Invert)	13460	563326.1	1.74302
831	15179	648441.1	2.00402
832	17872	750644.1	2.30383
833	20345	854493.2	2.62234
834	23003	966123.4	2.96492
835	25852	1085769.5	3.32710
836 (Shrink)	28957	1219075.9	3.72463
837	32145	1350080.6	4.14158
838 (Top)	35613	1495755.7	4.58038



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OVERALL PLAN VIEW & VOLUMES
 PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV
 DATE: 09/29/2011
 SCALE: 1" = 300'
 DESIGNED BY: CSW/TVP
 FILE NO: 75666
 SHEET 3 OF 35
 REV: 09/09/2012



JUC

WELL PAD, IMPOUNDMENT, AND PIT DETAILS

(PROPOSED WELLS NO. WW 513041, WW 513042, WW 513043, WW 513044, & WW 513045)

Engineering Survey GIS Environmental

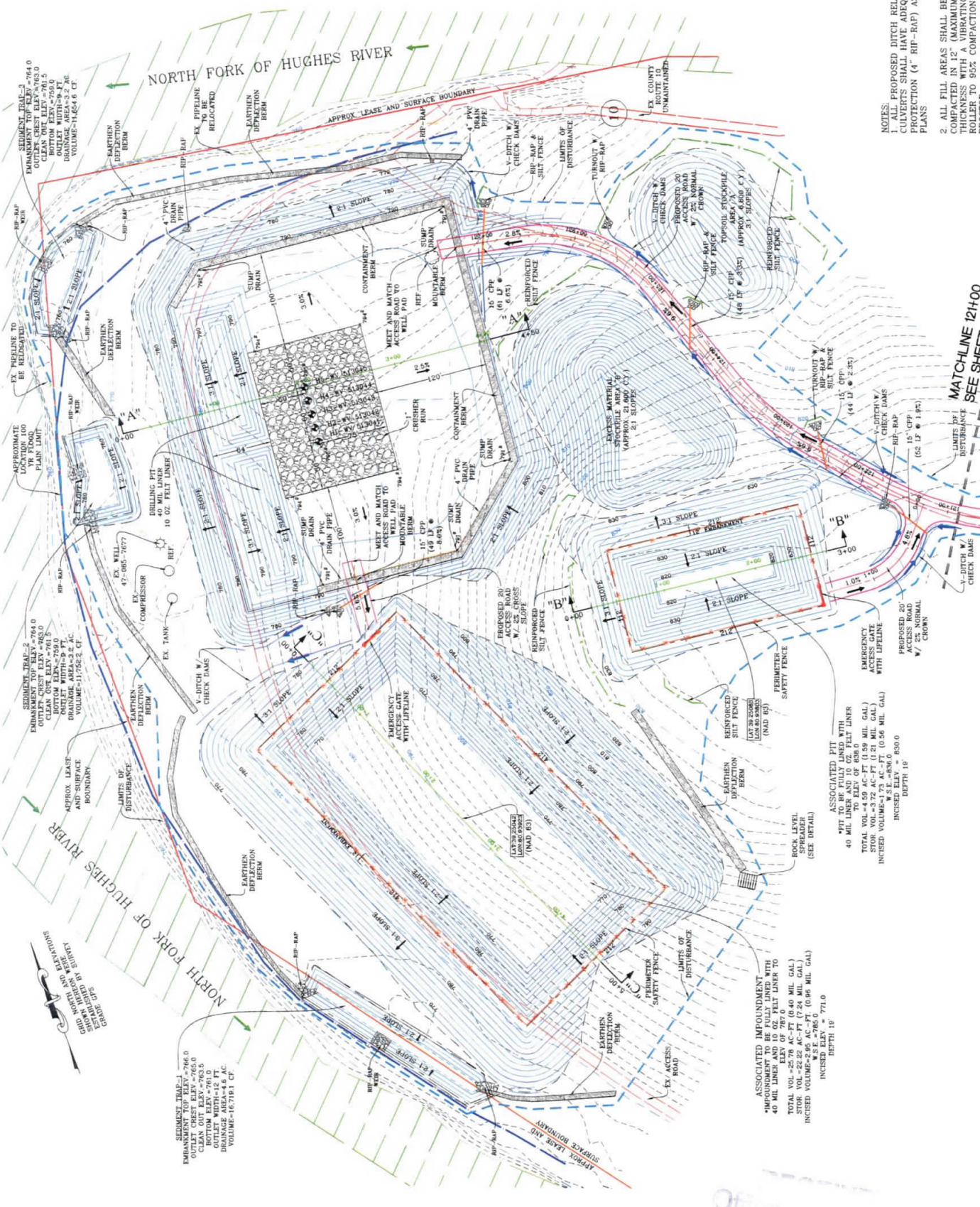
PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES



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WELLS PAD, IMPOUNDMENT, AND PIT DETAILS
 PEN 16
 CLAY DISTRICT
 RITCHEY COUNTY, MO

DATE 09/29/2011
 SCALE 1" = 50'
 DESIGNED BY CSK/TVP
 FILE NO. 7566
 SHEET 4 OF 35
 REV. 09/06/2012



- NOTES:
1. ALL PROPOSED DITCH RELIEF AND DRAINAGE SUBURBS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 2. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEETFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

MATCHLINE 12100
SEE SHEET 5

SEP 24 2012
 WW Design
 Environmental



ACCESS ROAD DETAILS
 (PROPOSED WELLS NO. WW 513041, WW 513042, WW 513043, WW 513044, & WW 513045)

NAVITUS ENGINEERING INC.
 131 Woods Hill Lane
 Fredericksburg, VA 22402
 Telephone: (540) 851-1115
 www.navitus.com

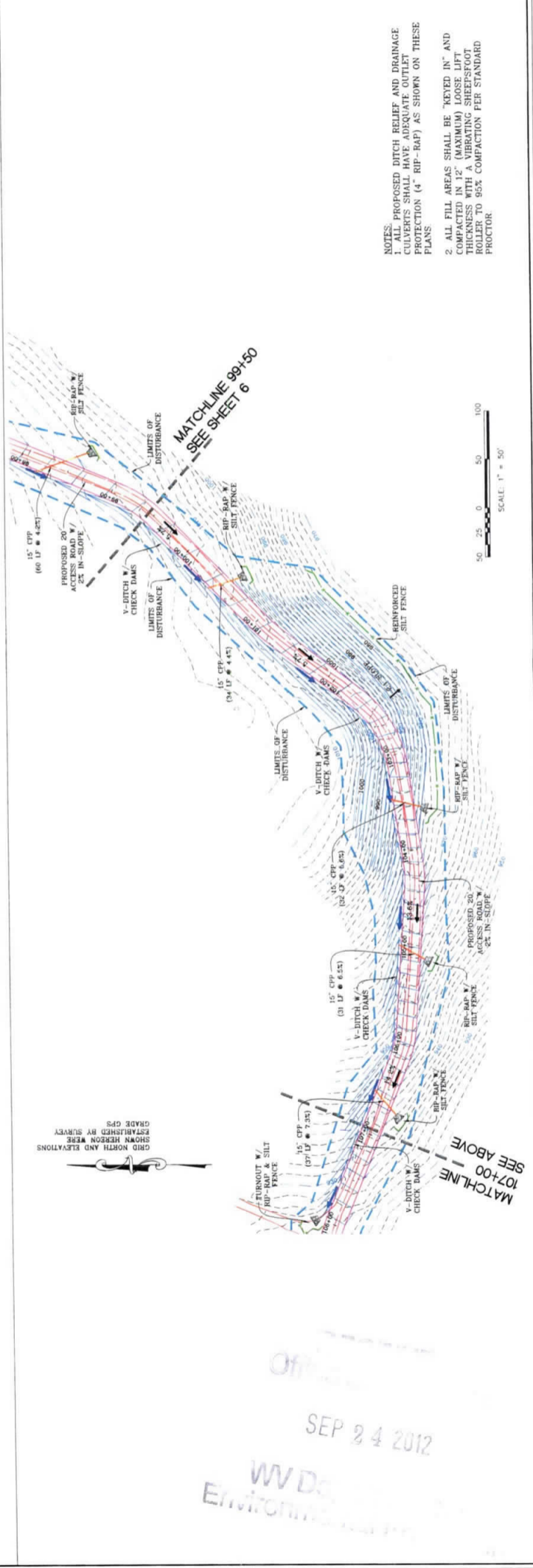
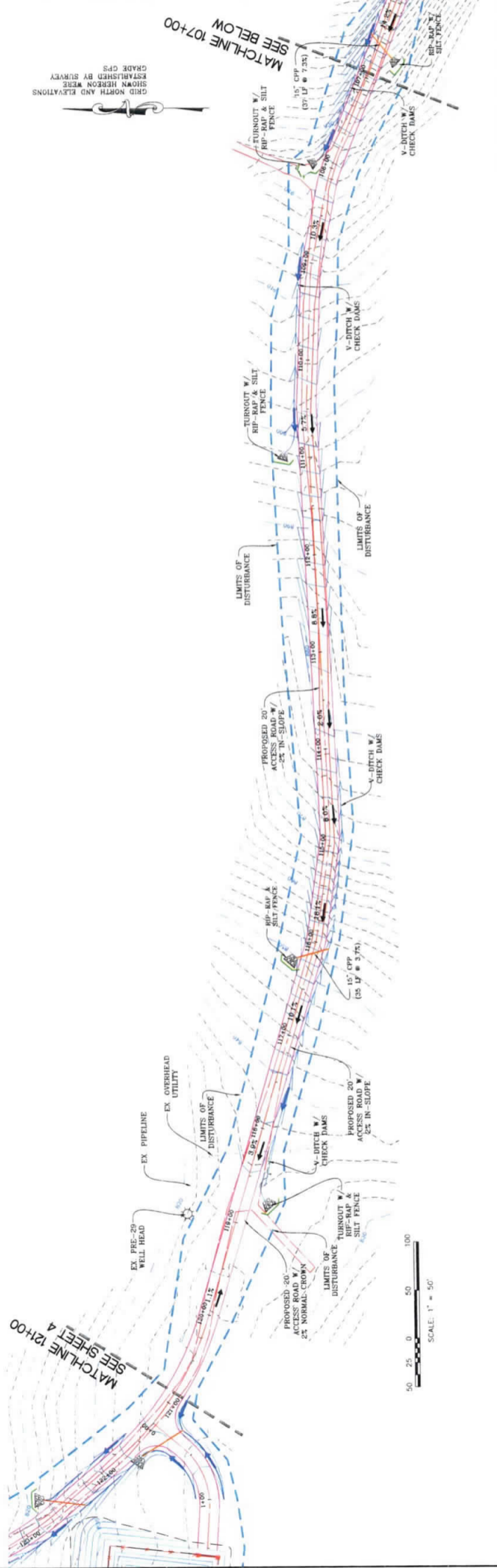
Engineering
 Survey
 Environmental
 GIS

SLS SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 200 Box 150
 325 W. Main Street
 Greenville, WV 26351
 E-MAIL: sls@sissurveys.com
 PH: (304) 462-5634
 FAX: (304) 462-5636



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 NAVITUS ENGINEERING
 FOR EYE PRODUCTION
 COMPANY

ACCESS ROAD DETAILS
 PEN 16
 CLAY DISTRICT
 W. VA.
 DATE: 09/29/2011
 SCALE: 1" = 50'
 DESIGNED BY: GSK/TVP
 FILE NO.: 7566
 SHEET 5 OF 35
 REV: 09/09/2012



- 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 SHALL BE "KEYED IN" AND COMPACTED TO 95% STANDARD PROCTOR WITH A VIBRATING SHEETPILE ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.

SEP 24 2012

WV Dept. of Environmental Protection

ACCESS ROAD DETAILS
 (PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)



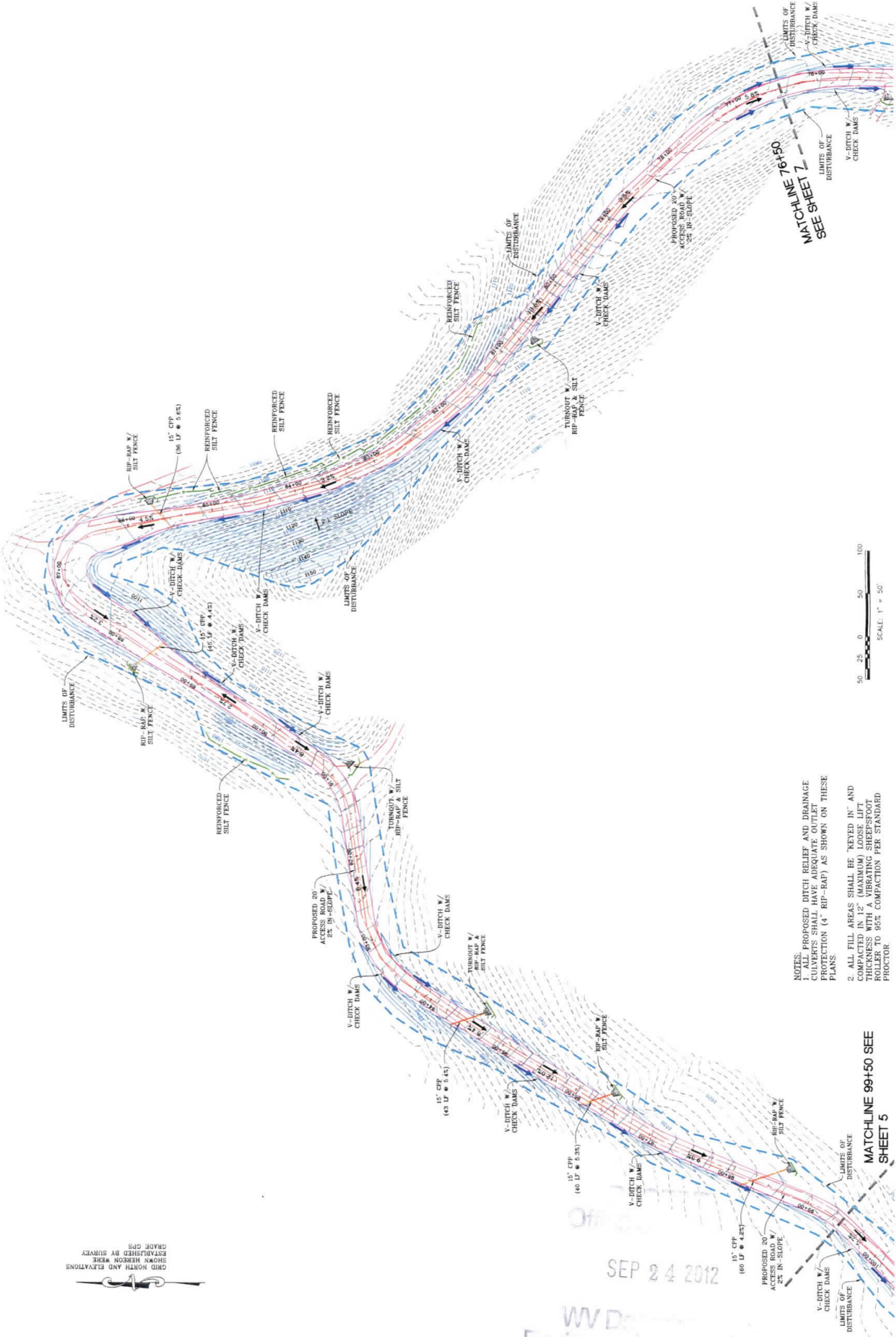
SLS
 SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150
 225 W. Main Street
 Glenview, WV 26531
 E-MAIL: sls@sls-survey.com
 PH: (304) 462-5634
 FAX: (304) 462-5634



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 PREPARED BY
 NAVITUS INC.
 FOR EST. PRODUCTION
 COMPANY

ACCESS ROAD DETAILS
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: 1" = 50'
DESIGNED BY: CSK/TVP
FILE NO: 7566
SHEET 6 OF 35
REV: 09/06/2012



- 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 SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR



SEP 24 2012

WV Dept of Environmental Protection

MATCHLINE 99+50 SEE SHEET 5

MATCHLINE 76+50 SEE SHEET 7

Handwritten initials: JMC

ACCESS ROAD DETAILS

(PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)

NAVITUS ENGINEERING INC.

111 Towne Hill Lane
Westport, VA 22672
Telephone: (888) 645-1141
www.navituseng.com

Engineering
Surveys
Environmental
GIS

SLS SMITH LAND SURVEYING, INC.

PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES

P.O. Box 150
228 W. Main Street
Greenville, WV 26331
PH: (304) 462-5534
FAX: (304) 462-5556
E-MAIL: sls@slsurvey.com



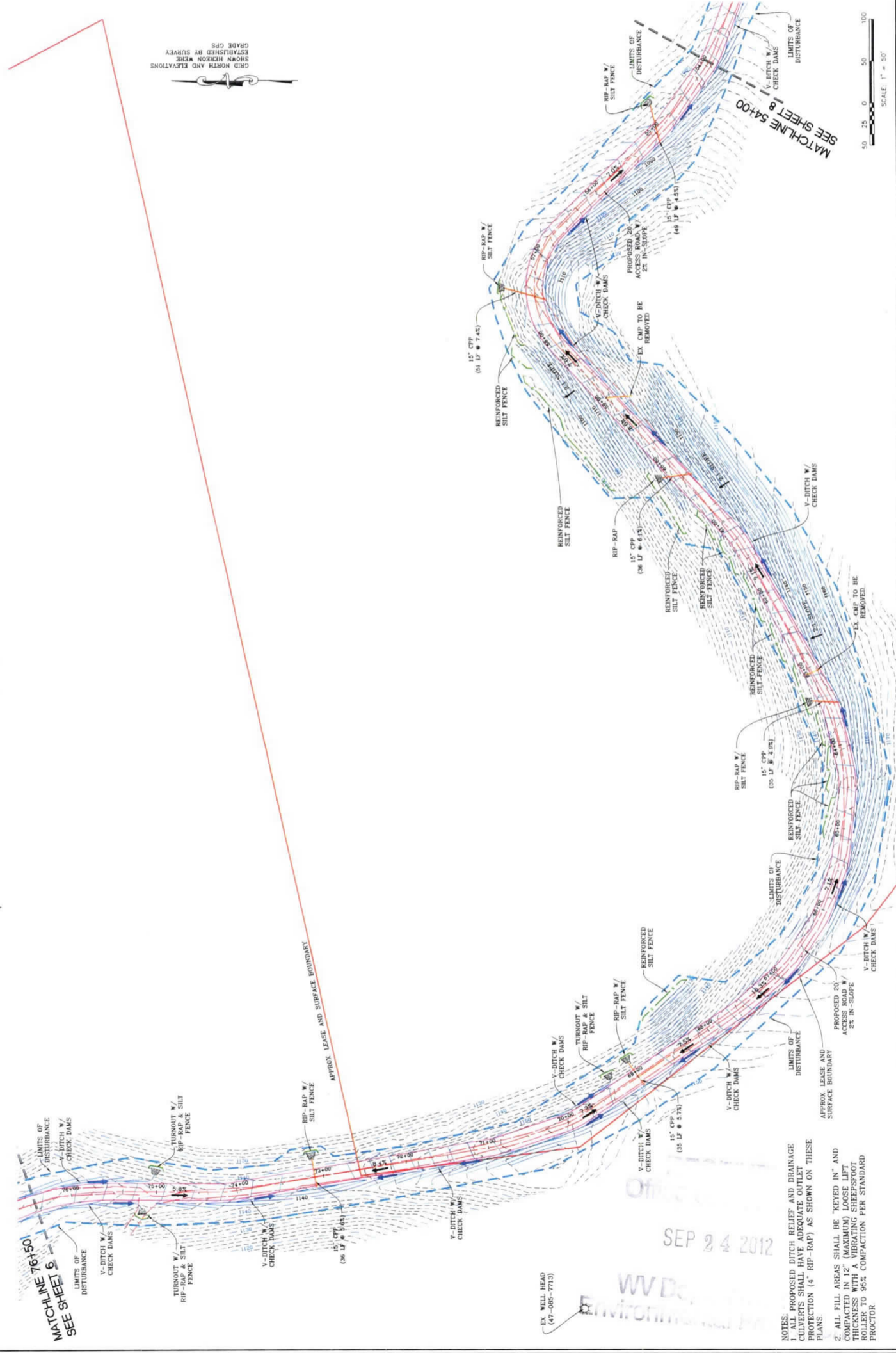
THIS DOCUMENT WAS PREPARED BY NAVITUS ENGINEERING FOR EBT PRODUCTION COMPANY

PEN 16

ACCESS ROAD DETAILS

CLAY DISTRICT
WV
RITCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: 1" = 50'
DESIGNED BY: CSW/TWP
FILE NO: 7566
SHEET 7 OF 35
REV: 09/06/2012



EX WELL HEAD
(47-085-7715)

SEP 24 2012

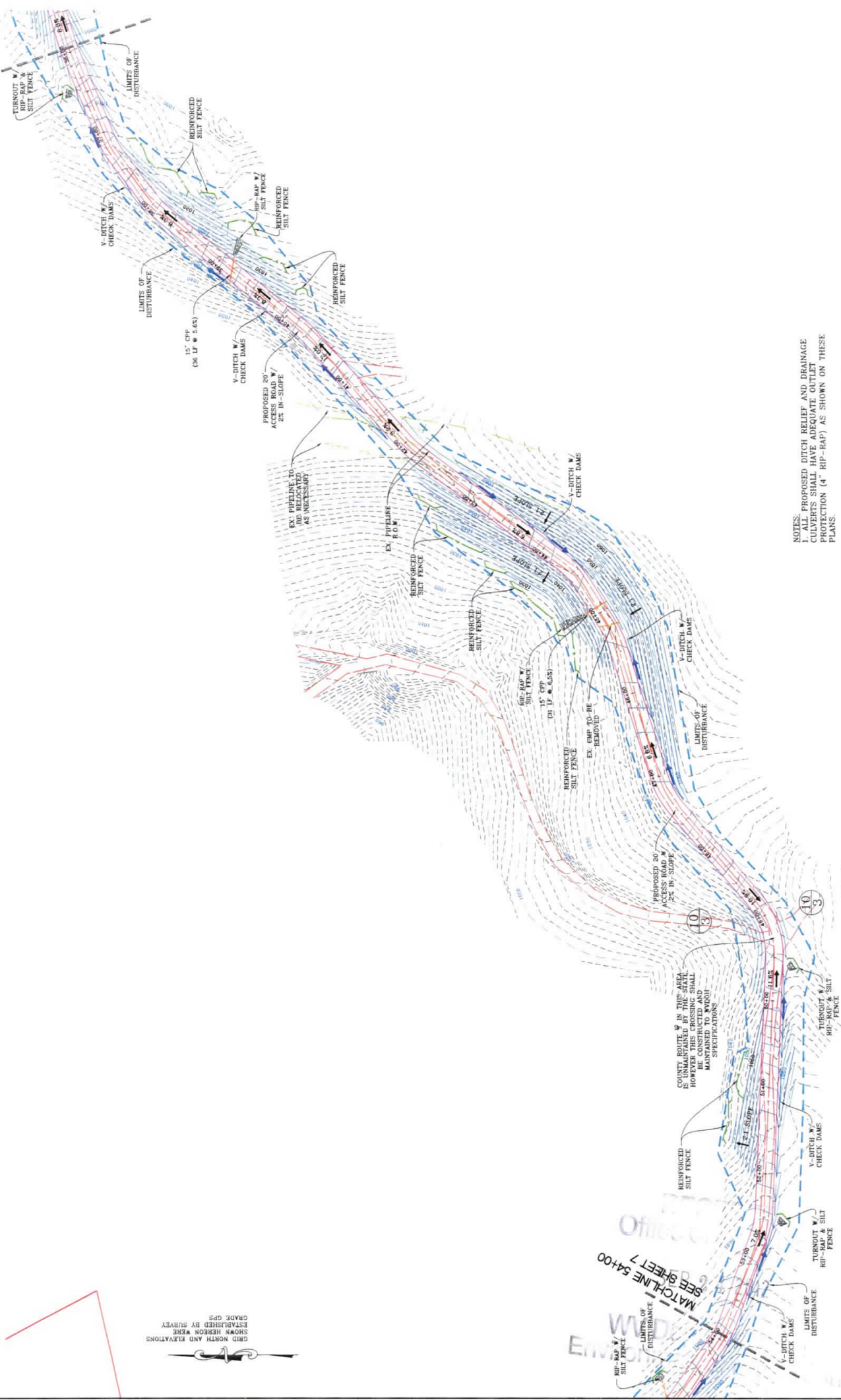
WV Dept of Environmental Protection

- 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 SHALL BE "KEYED IN" AND COMPACTED TO 95% PROCTOR LOOSE LIFT WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR

ACCESS ROAD DETAILS

(PROPOSED WELLS NO. WW 513041, WW 513042, WW 513043, WW 513044, & WW 513045)

MATCHLINE 36+00
SEE SHEET 9

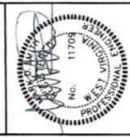


- NOTES:**
1. ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 2. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.



151 Woody Hill Lane
 Williamsport, PA 17740
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 www.navitus.com

SMITH LAND SURVEYING, INC.
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 P.O. Box 150
 225 W. Main Street
 Greentown, WV 26031
 Phone: (304) 462-5634
 Fax: (304) 462-5656
 E-MAIL: sls@slsurvey.com



THIS DOCUMENT WAS PREPARED BY NAVITUS INC. IN CONNECTION WITH THE CONSTRUCTION OF THIS PROJECT.

ACCESS ROAD DETAILS
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: 1" = 50'
DESIGNED BY: CSK/TWP
FILE NO: 7566
SHEET 6 OF 35
REV: 09/06/2012

ACCESS ROAD DETAILS
 (PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, WV 513045, & WV 513046)

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



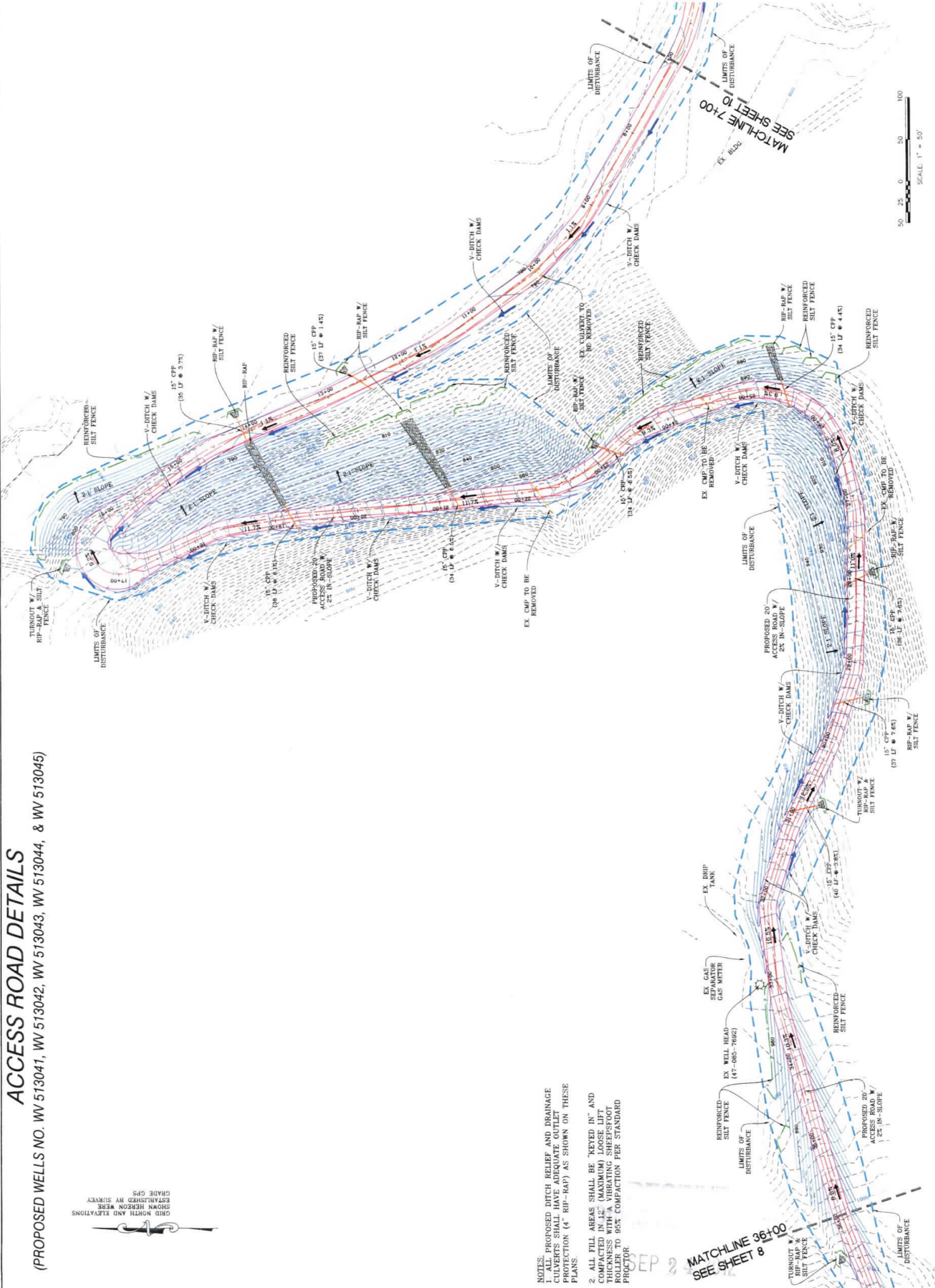
SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150
 225 W. Main Street
 Charming, WV 26331
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 FAX: (304) 462-5636
 E-MAIL: info@sls-surveys.com



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 FOR EST. PRODUCTION
 COMPART

ACCESS ROAD DETAILS
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
 SCALE: 1" = 50'
 DESIGNED BY CSK/TVP
 FILE NO. 7566
 SHEET 9 OF 35
 REV: 09/06/2012



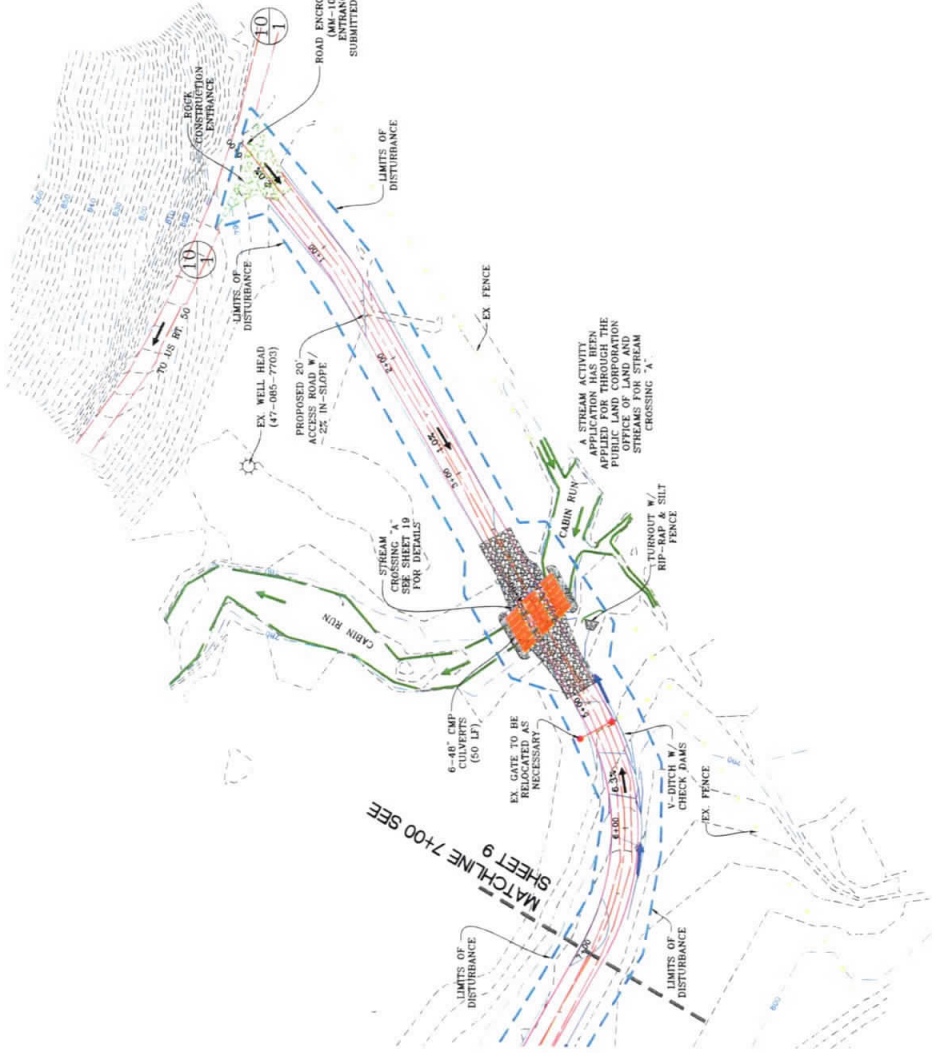
NOTES:
 1. PROPOSED DITCH RELIEF AND DRAINAGE
 CULVERTS SHALL HAVE ADEQUATE OUTLET
 PROTECTION (4" RIP-RAP) AS SHOWN ON THESE
 PLANS.
 2. ALL FILL AREAS SHALL BE "KEYED IN" AND
 COMPACTED IN 12" (MAXIMUM) LOOSE LIFT
 BENCHES WITH VIBRATING ROLLERS PER
 ROUTE TO 80% COMPACTION PER STANDARD
 PROCTOR.

SEP 2
 MATCHLINE 36100
 SEE SHEET 8

SCALE: 1" = 50'
 0 25 50 100

ACCESS ROAD DETAILS
 (PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)

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



SCALE: 1" = 50'

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 SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT LAYERS WITH A MINIMUM OF 10% MOISTURE HIGHER THAN STANDARD PER STANDARD PROCTOR

NAVITUS ENGINEERING INC.
 151 Woods Hill Lane
 Martinsburg, WV 26002
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Engineering
 Survey
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 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150
 225 W. Main Street
 Glenview, WV 26031
 PH: (304) 462-5634
 FAX: (304) 462-5636
 E-MAIL: sld@slsurvey.com



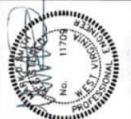
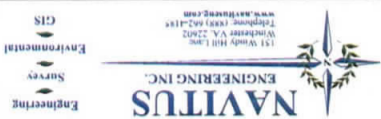
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ACCESS ROAD DETAILS
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
 SCALE: 1" = 50'
 DESIGNED BY: CSK/TVP
 FILE NO: 7566
 SHEET 10 OF 35
 REV: 09/06/2012

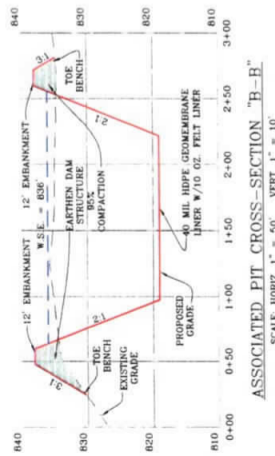
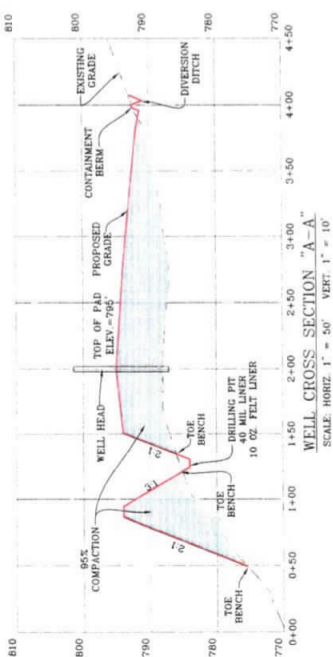
Office of Environmental Policy
 SEP 24 2012
 WV Dept. of Environmental Protection

WELL PAD, IMPOUNDMENT, AND PIT SECTIONS (PROPOSED WELLS NO. WW 513041, WW 513042, WW 513043, WW 513044, & WW 513045)

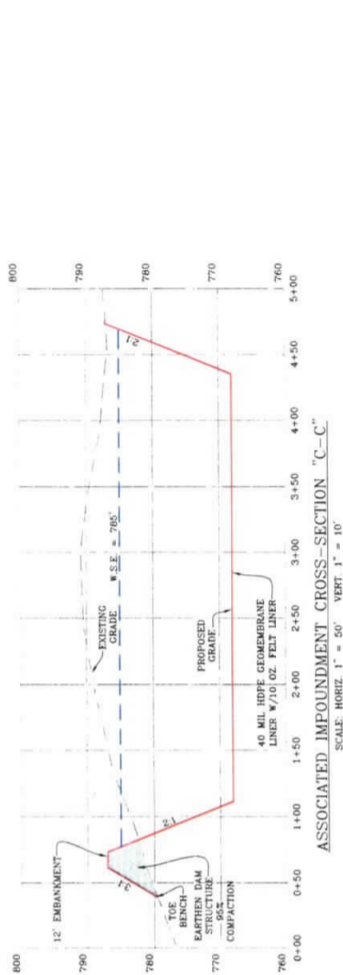
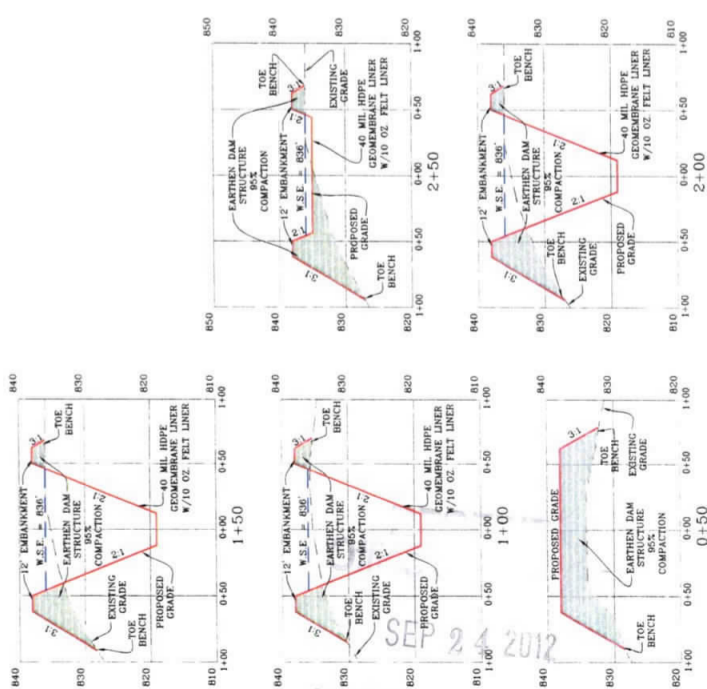


THIS DOCUMENT WAS
DESIGNED BY NAVITUS
ENGINEERING
FOR EBT PRODUCTION
COMPANY

WELL PAD, IMPOUNDMENT, AND PIT SECTIONS
CLAY DISTRICT, WV
RITCHIE COUNTY, WV
PEN 16
DATE: 09/29/2011
SCALE AS SHOWN
DESIGNED BY CSK/TWP
FILE NO. 7566
SHEET 11 OF 35
REV: 05/06/2012

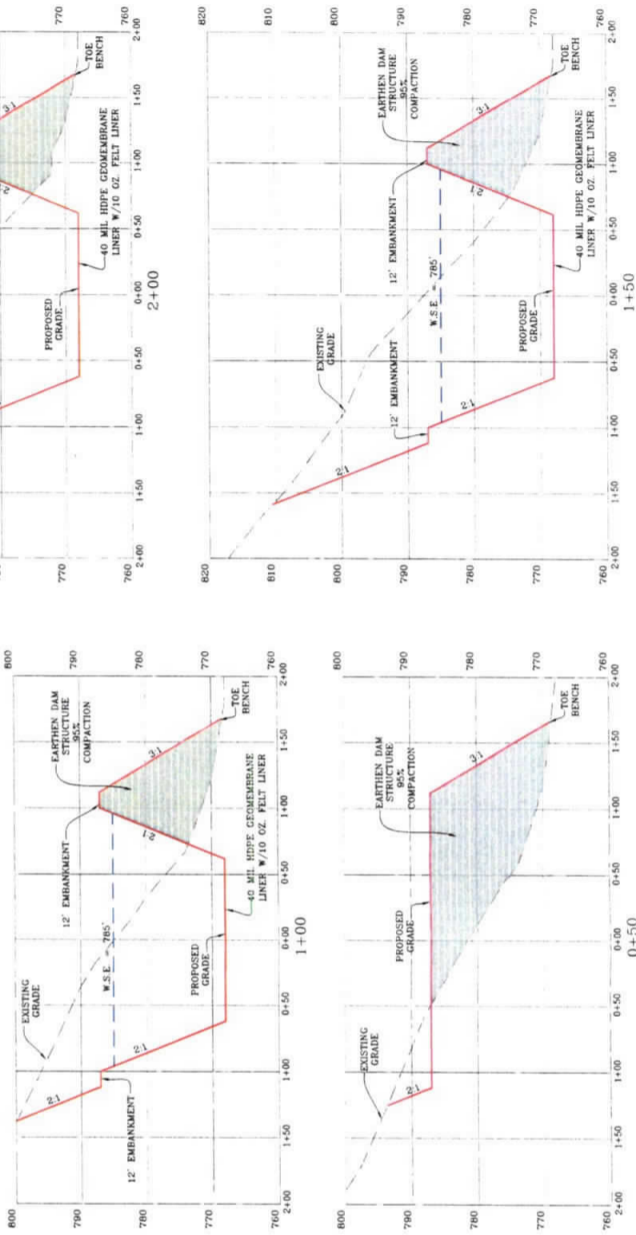


ASSOCIATED PIT CROSS-SECTIONS ALONG BASELINE "B-B"



NOTE:
1. ALL FILL AREAS SHALL BE "KEYED
IN" AND COMPACTED IN 12" (MAXIMUM)
LOOSE LIFT THICKNESS WITH A
VIBRATING SHEEPSFOOT ROLLER TO 95%
COMPACTION PER STANDARD PROCTOR.

ASSOCIATED IMPOUNDMENT CROSS-SECTIONS ALONG BASELINE "C-C"

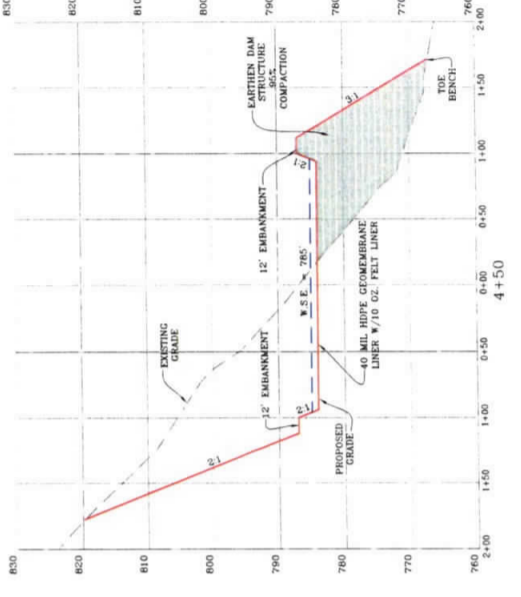
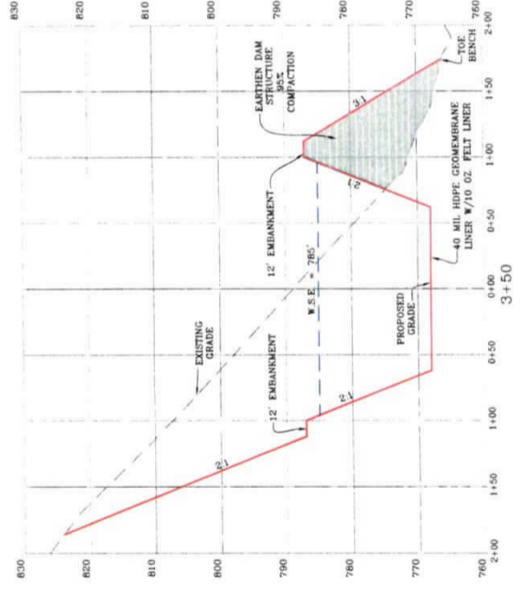
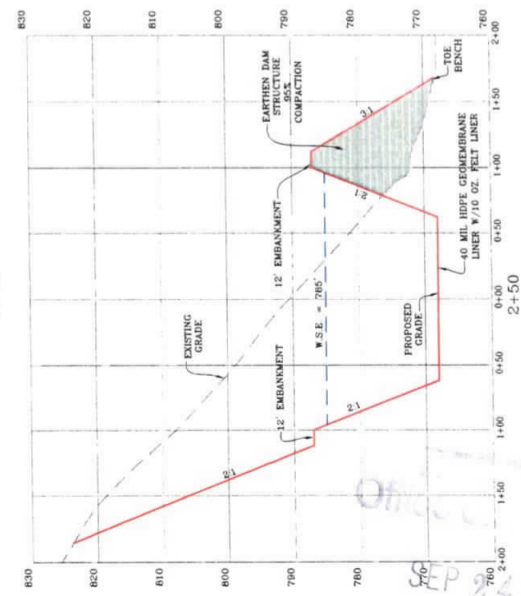
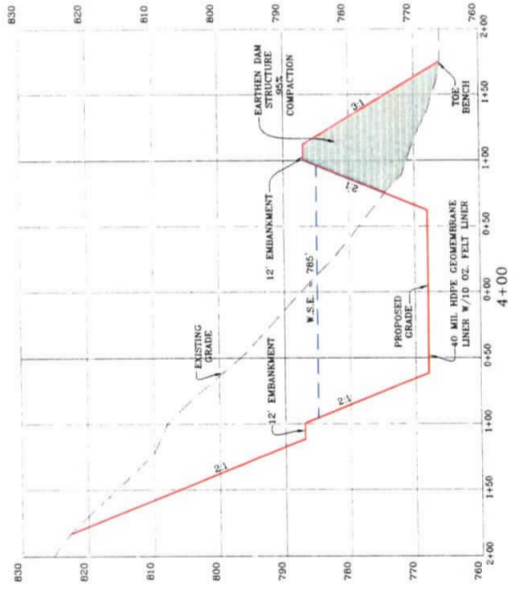
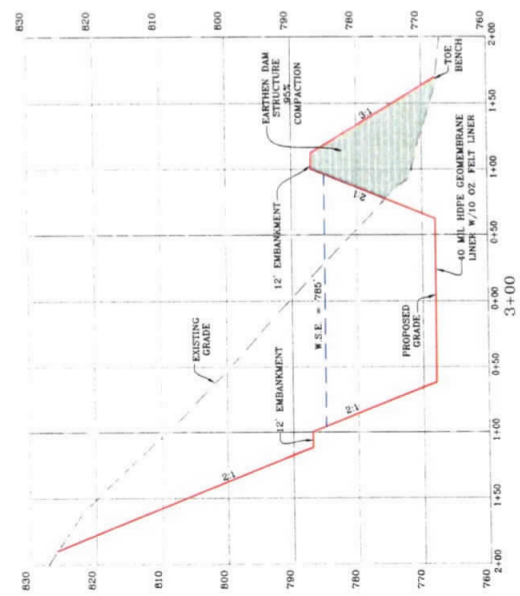


SEP 24 2012
WV Dept of Environmental Protection

IMPOUNDMENT SECTIONS

(PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)

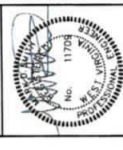
ASSOCIATED IMPOUNDMENT CROSS-SECTIONS ALONG BASELINE "C-C"
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



NOTE:
 1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR

NAVITUS ENGINEERING INC.
 151 Quince Hill Lane
 Winchester, VA 22601
 Telephone: (540) 861-1118
 www.navituseng.com

SLS SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150
 225 W. Main Street
 Greenville, W. Va. 26151
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PEN 16
 IMPOUNDMENT SECTIONS
 CLAY DISTRICT
 WV
 RTCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: AS SHOWN
DESIGNED BY: CSK/TYP
FILE NO: 7566
SHEET 12 OF 35
REV: 09/06/2012

WVDC
 Environmental
 SEP 28 2012

ROAD PROFILES



 Engineering Survey GIS

SLS SMITH LAND SURVEYING, INC.

 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES

 P.O. Box 150

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 Greenville, WV 26351

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ROAD PROFILES

PEN 16

 CLAY DISTRICT

 RITCHIE COUNTY, WV

DATE: 09/29/2011

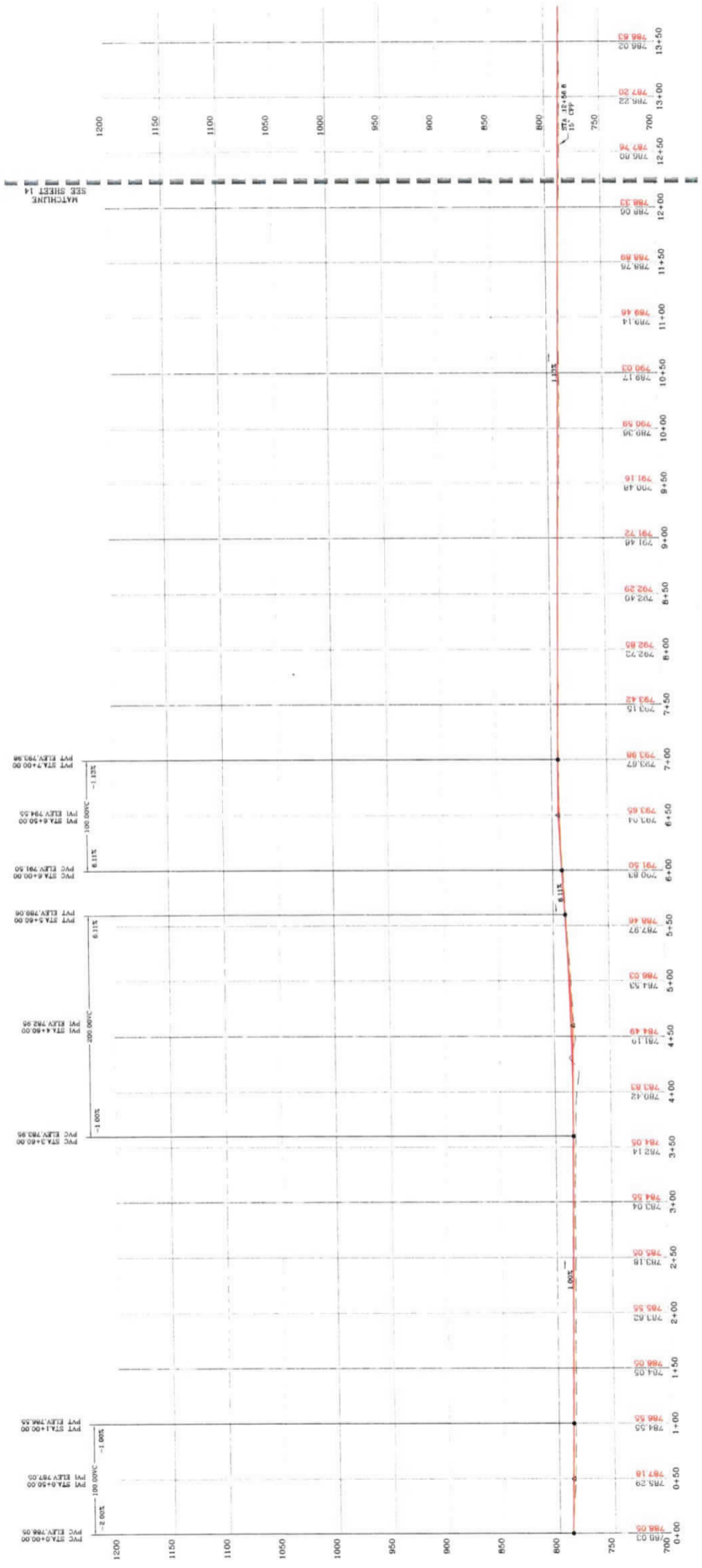
 SCALE: AS SHOWN

 DESIGNED BY: CSN/TYP

 FILE NO: 7566

 SHEET 13 OF 35

 REV 09/06/2012



WELL PAD ACCESS ROAD PROFILE

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

Off

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 WVD

 ENVIRONMENTAL

Handwritten initials: SLS

ROAD PROFILES

NAVITUS ENGINEERING INC.

 151 WINDY HILL LANE

 FREDERICK, MARYLAND 21702

 WWW.NAVITUS.COM

 Environmental Survey Engineering GIS

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 Glenville, WV 26031

 E-MAIL: sls@slsurveys.com

 PH: (304) 462-5634

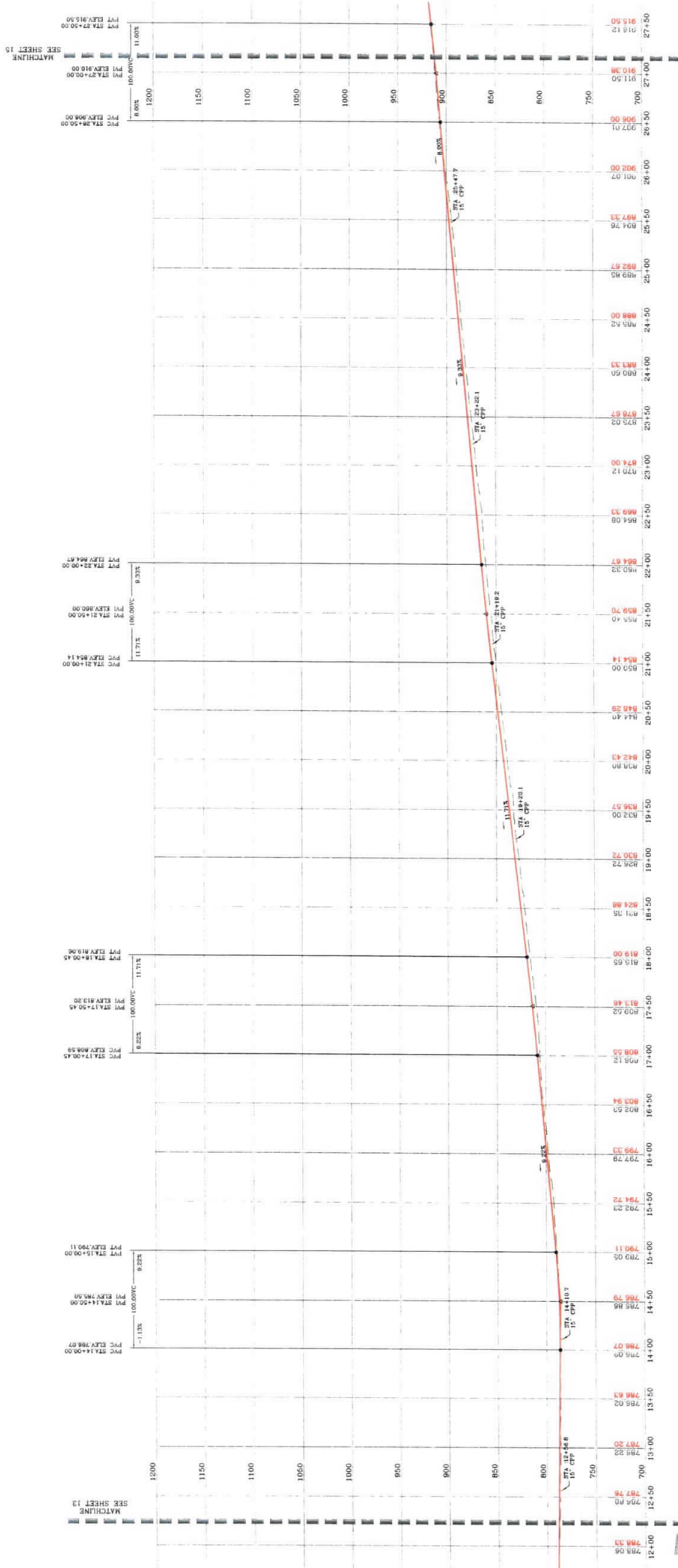
 FAX: (304) 462-5634



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ROAD PROFILES
 PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
 SCALE: AS SHOWN
 DESIGNED BY: CSK/TVP
 FILE NO: 7066
 SHEET 14 OF 35
 REV: 09/06/2012



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

WV Dept. of Environmental Protection
 SEP 24 2012

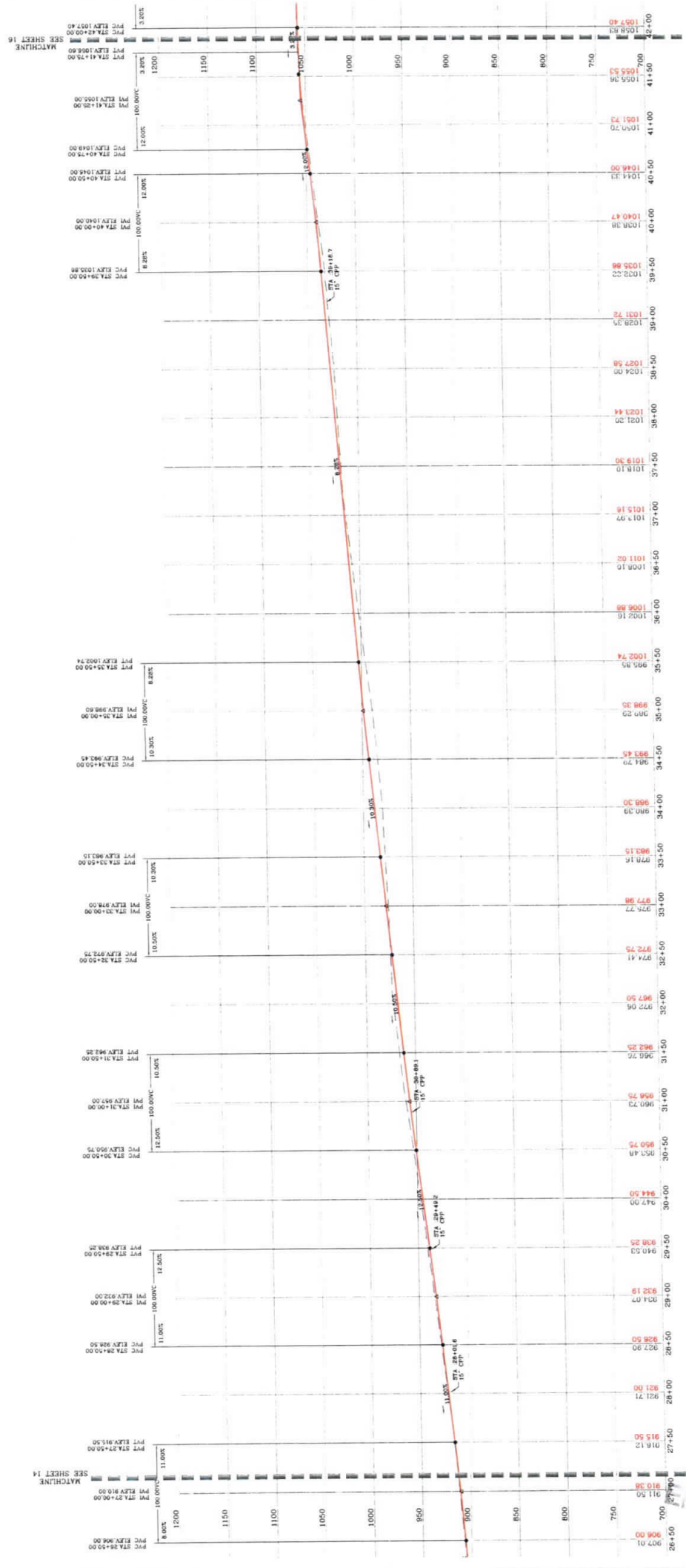


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ROAD PROFILES
PEN 16
 CLAY DISTRICT
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DATE: 09/29/2011
 SCALE: AS SHOWN
 DESIGNED BY: CSK/TYP
 FILE NO: 7566
 SHEET 15 OF 35
 REV: 09/06/2012

ROAD PROFILES



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

Office of the
 SEP 24 2012
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 Environmental

ROAD PROFILES


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 131 Woody Hill Lane
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 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150
 228 W. Main Street
 Clarksville, WV 26301
 E-MAIL: sls@slsinc.com
 PH: (304) 662-5314
 FAX: (304) 662-5358

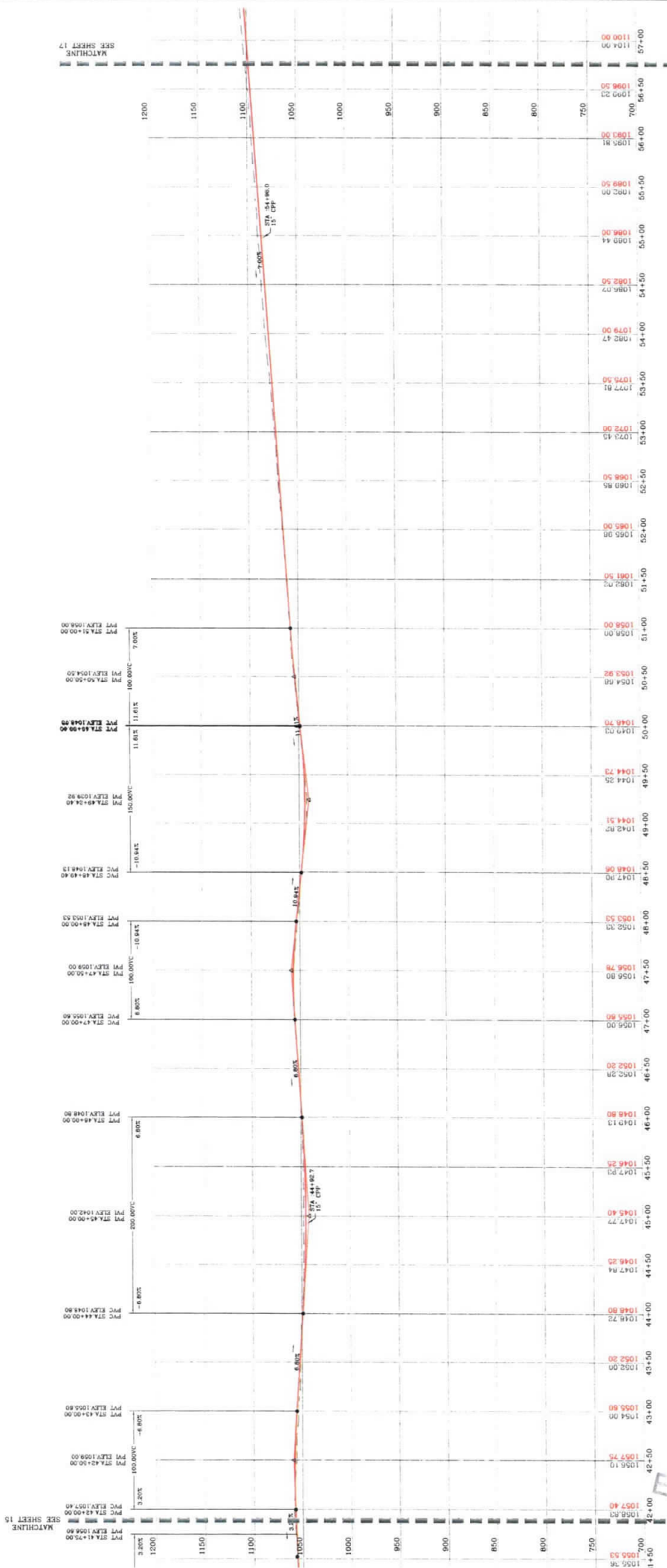


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ROAD PROFILES
PEN 16
 CLAY DISTRICT
 RTICHE COUNTY, WV

DATE: 09/29/2011
 SCALE: AS SHOWN
 DESIGNED BY: GSK/TVT
 FILE NO: 7566
 SHEET 16 OF 35
 REV: 06/09/2012

done



WELL PAD ACCESS ROAD PROFILE
 SCALE: HORIZ 1" = 50' VERT 1" = 50'

SEP 24 2012
 WV Dept of Environmental Protection

ROAD PROFILES



 NAVITUS ENGINEERING INC.

 131 WOODROW WILSON BLVD

 WASHINGTON, VA 22002

 TEL: (703) 661-1144

 WWW.NAVITUS.COM



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 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES

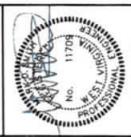
 P.O. Box 150

 Orange, VA 26351

 E-MAIL: SLS@SLSURV.COM

 PH: (304) 462-5824

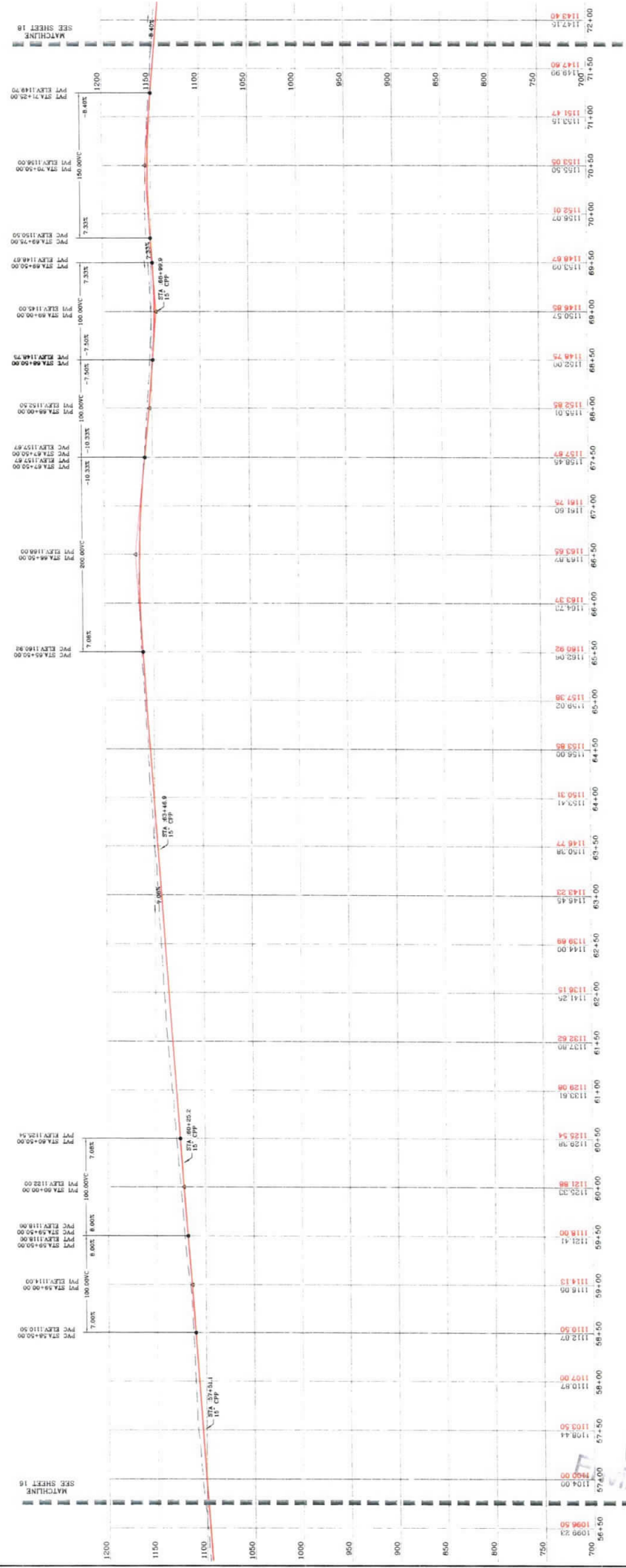
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ROAD PROFILES
PEN 16
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 SCALE: AS SHOWN
 DESIGNED BY: CSM/TVP
 FILE NO: 7566
 SHEET 17 OF 35
 REV: 05/06/2012



WELL PAD ACCESS ROAD PROFILE
 SCALE: HORIZ 1" = 50' VERT 1" = 50'

ORIGINAL
 SEP 24 2012
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ROAD PROFILES
PEN 16
CLAY DISTRICT
RTCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: AS SHOWN
DESIGNED BY: CSW/TYP
FILE NO: 7566
SHEET: 18 OF 35
REV: 09/06/2012

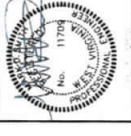
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www.navitus.com

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PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES

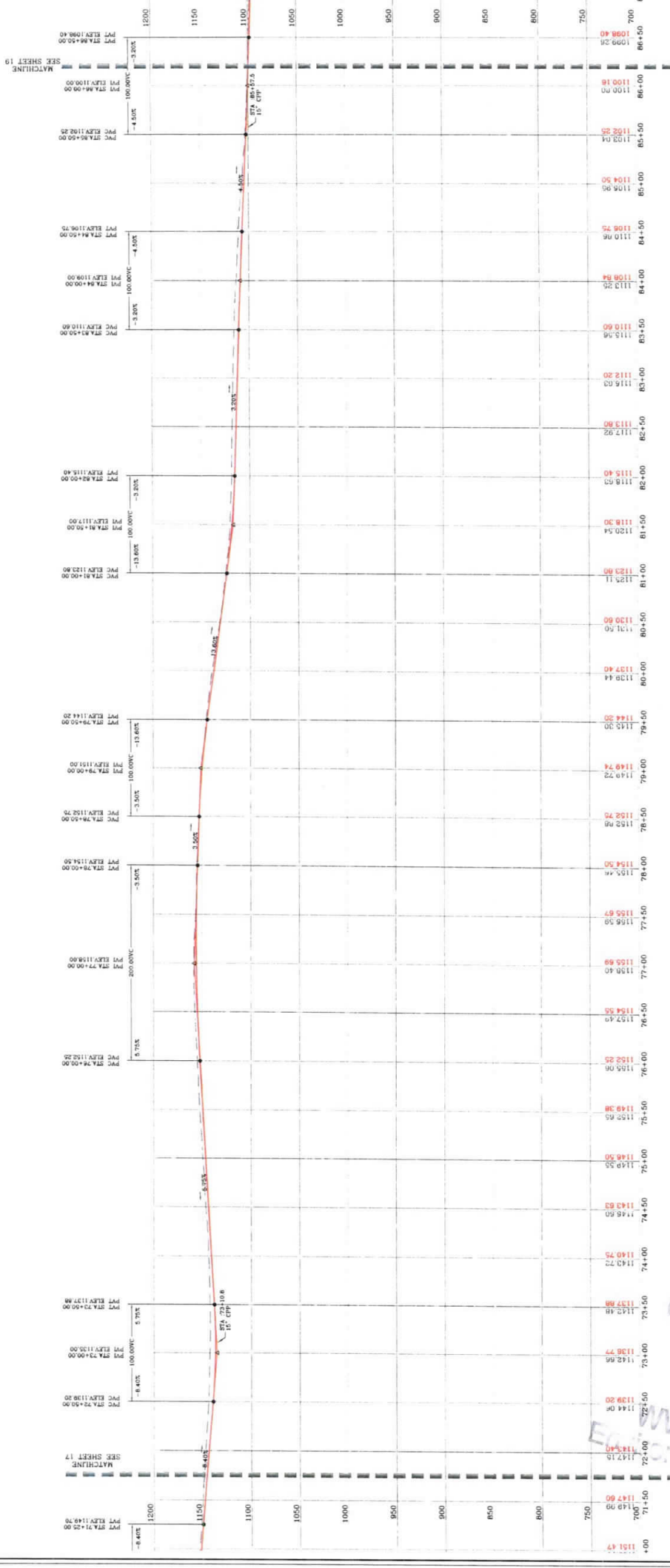
P.O. Box 130
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ROAD PROFILES



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

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WV DEPARTMENT OF ENVIRONMENTAL PROTECTION

W.E. Smith

ROAD PROFILES



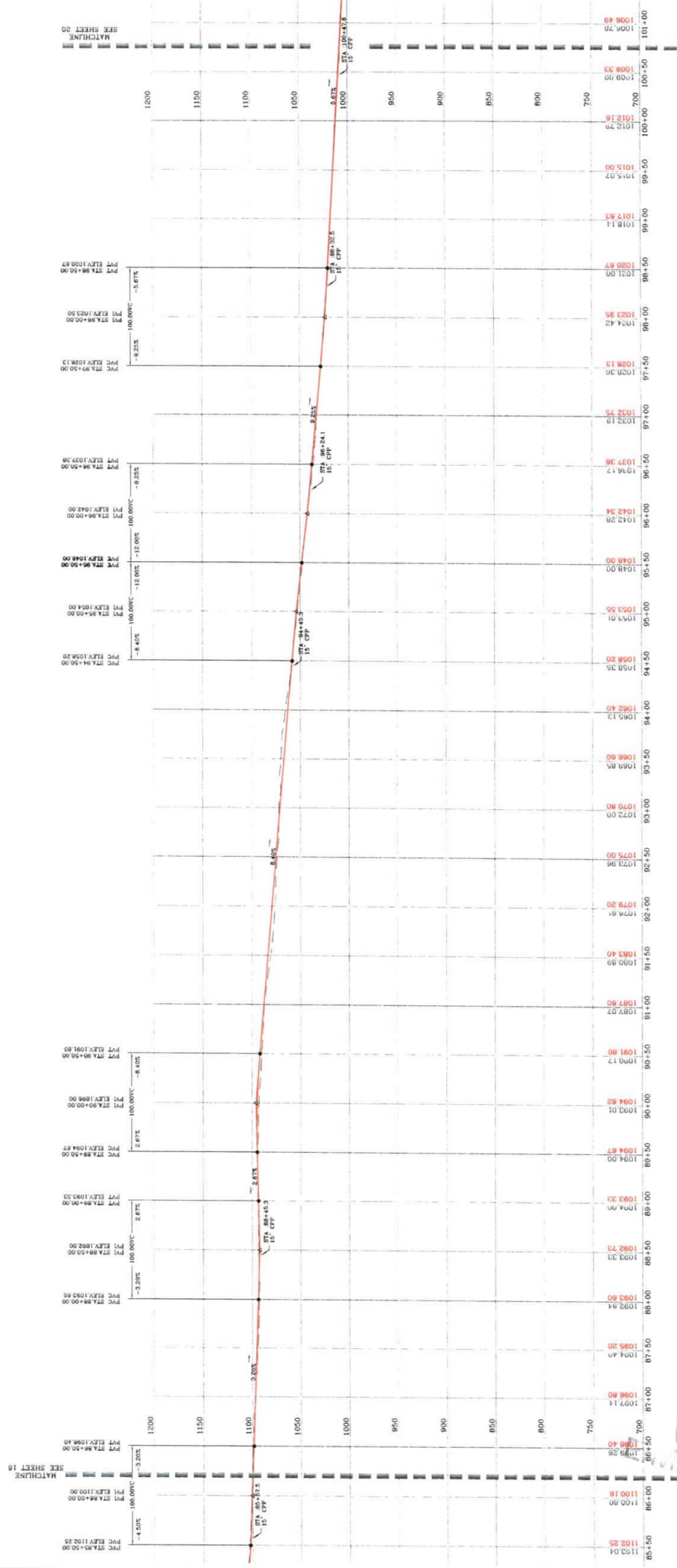
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ROAD PROFILES
PEN 16
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DATE: 09/29/2011
SCALE: AS SHOWN
DESIGNED BY: CSK/TPV
FILE NO: 7666
SHEET 19 OF 35
REV: 09/06/2012



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

SEP 24 2012
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SEE SHEET 18
MATCHLINE

SEE SHEET 20
MATCHLINE

ROAD PROFILES

151 WINDY HILL LANE
 FREDERICKSBURG, VA 22405
 WWW.NAVITUS.COM
 Telephone: (540) 525-1181

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 Environmental
 GIS

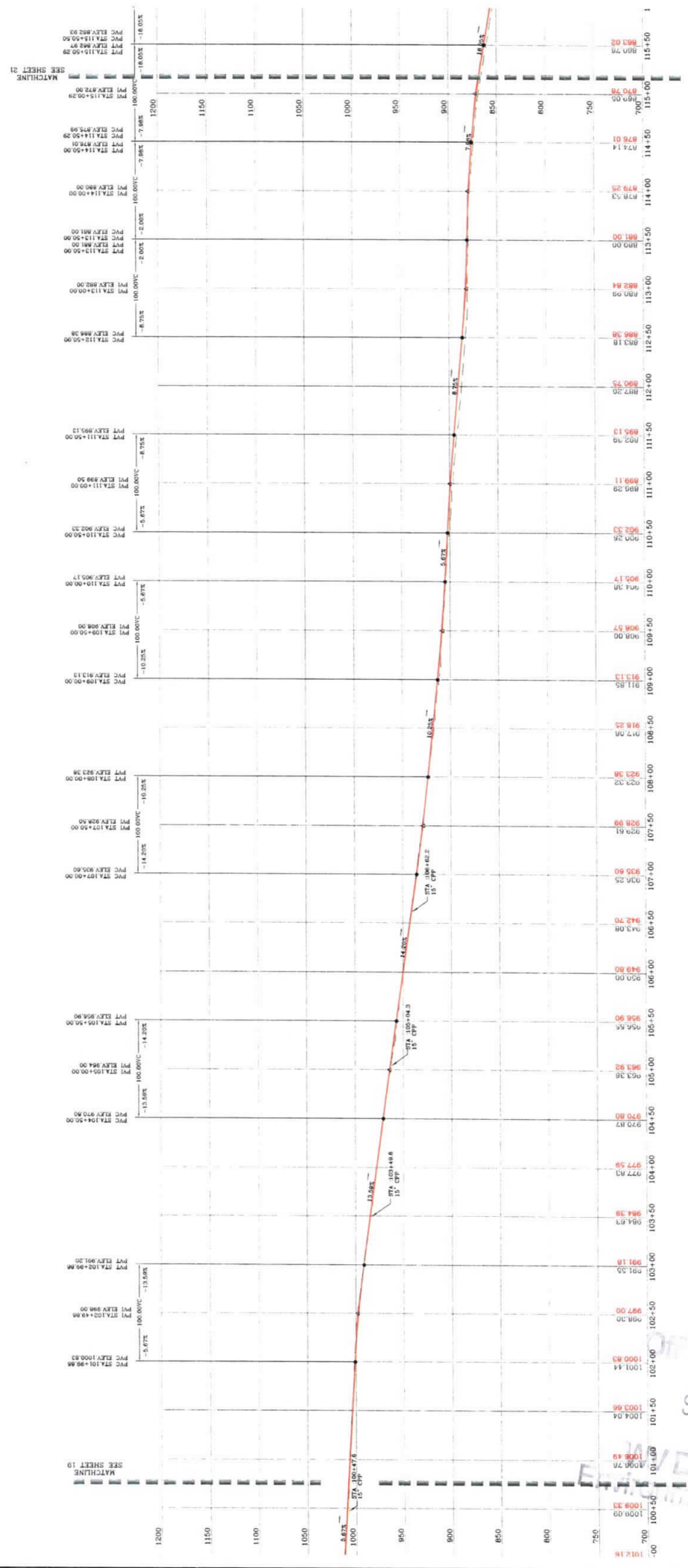
SLS
 SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
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 226 W. Main Street
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ROAD PROFILES
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
 SCALE: AS SHOWN
 DESIGNED BY: CSK/TVP
 FILE NO: 7566
 SHEET: 20 OF 35
 REV: 09/06/2012



WELL PAD ACCESS ROAD PROFILE

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

SEP 24 2012

pmc

ROAD PROFILES

NAVITUS ENGINEERING INC.
131 Woods Hill Lane
Winchester, VA 22602
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www.navituseng.com

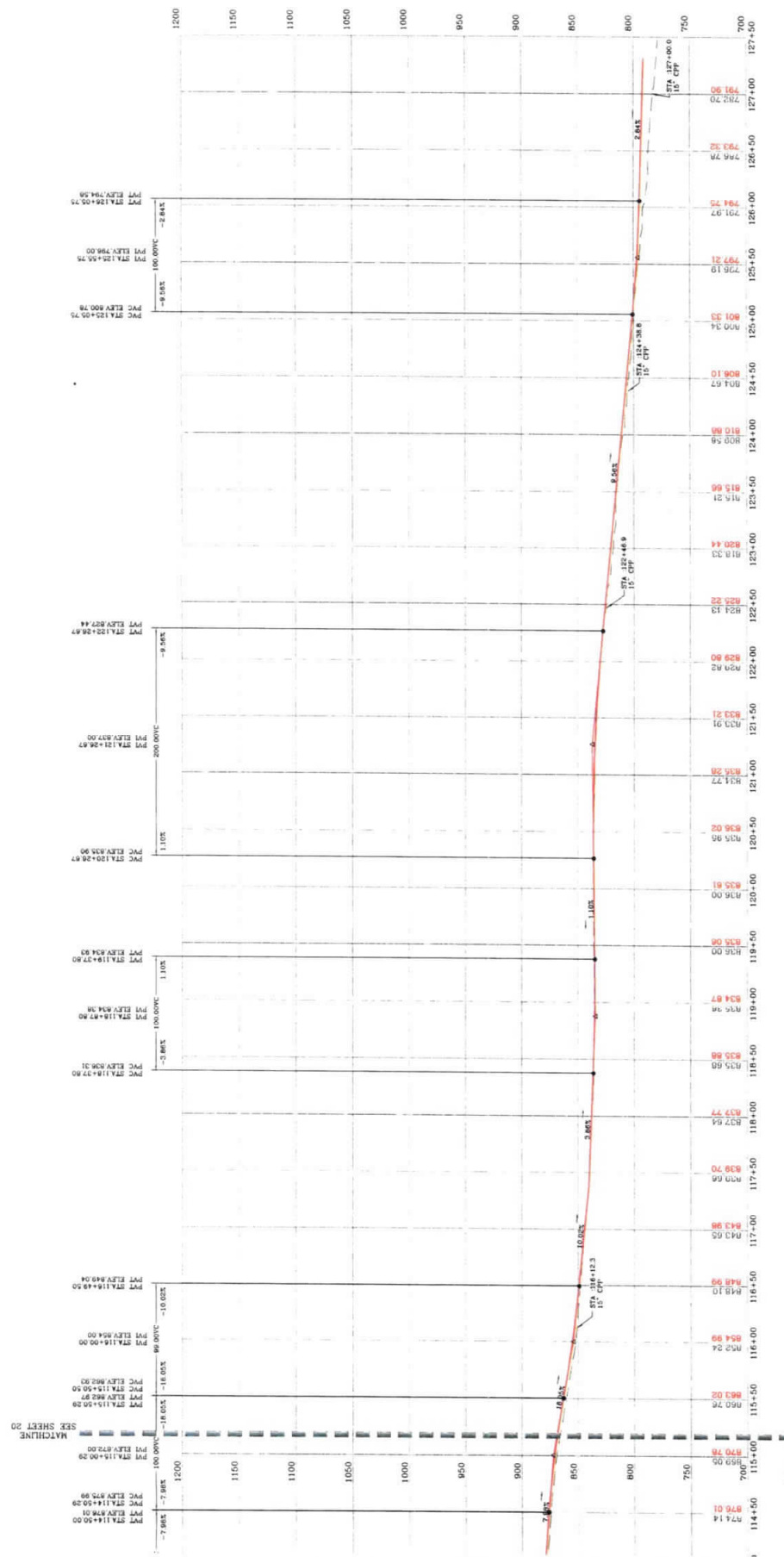
SLS SMITH LAND SURVEYING, INC.
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P.O. Box 150
226 W. Main Street
Charlottesville, VA 22902
PH: (304) 462-5534
FAX: (304) 462-5556
E-MAIL: sls@sissurvey.com

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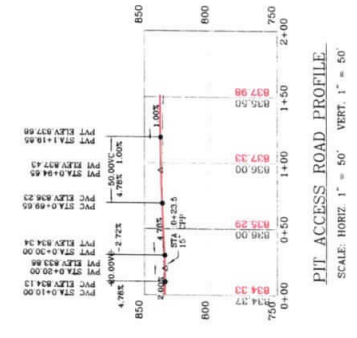
ROAD PROFILES
PEN 16
CLAY DISTRICT
RITCHIE COUNTY, WV

DESIGNED BY CSK/TVP
SCALE AS SHOWN
DATE: 09/29/2011

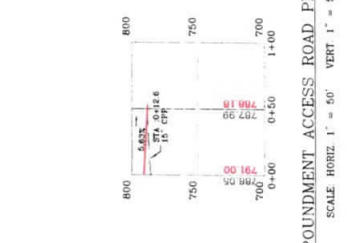
FILE NO. 7566
SHEET 21 OF 35
REV 09/06/2012



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



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



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

WVDC Environmental
SEP 24 2012

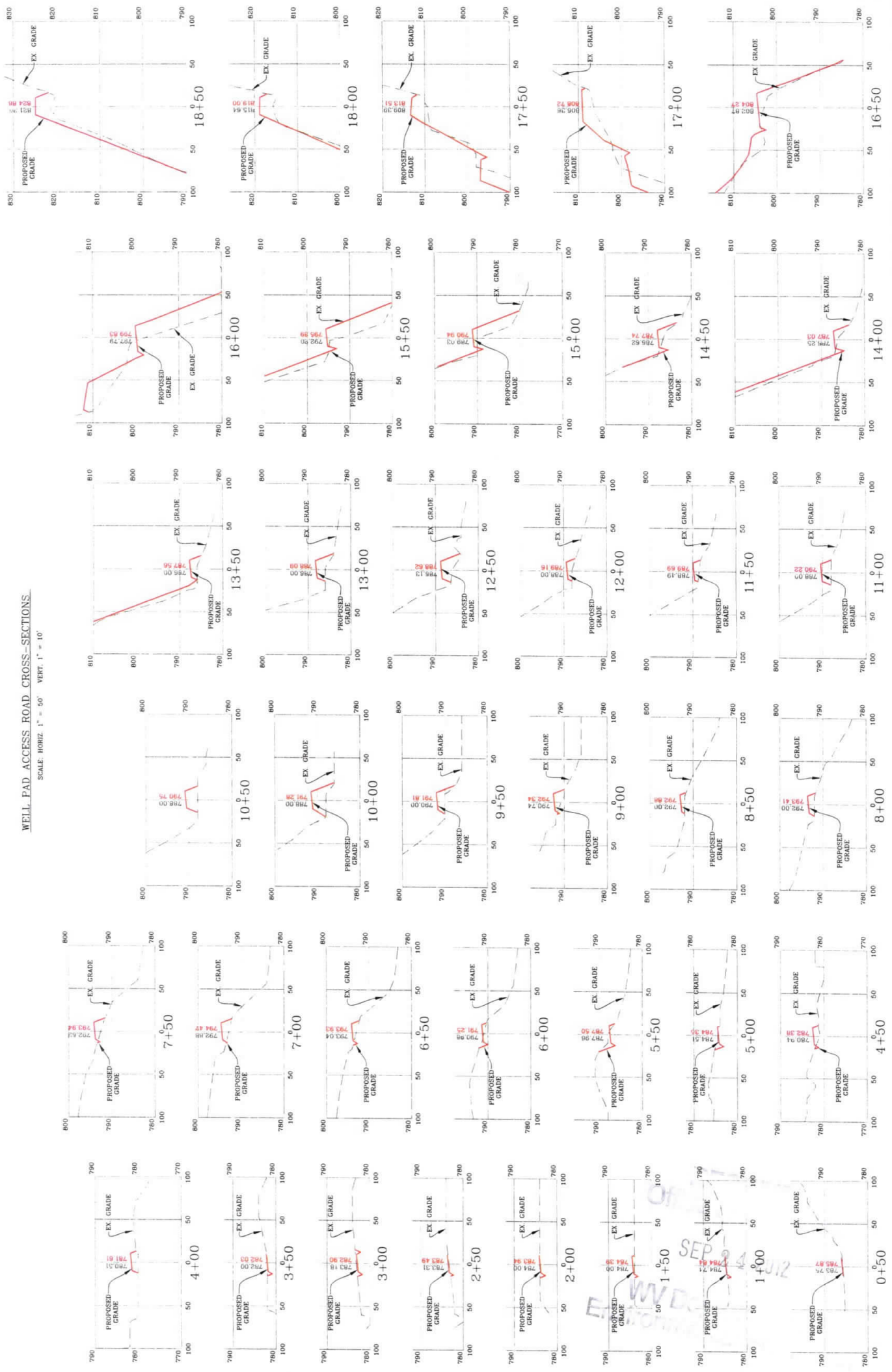
SEE SHEET 20
MATCHLINE

ACCESS ROAD SECTIONS

(PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)

WELL PAD ACCESS ROAD CROSS-SECTIONS
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'

NOTES:
1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.



Environmental Engineering Survey

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 Glenville, WV 26031

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 COMPANY

ROAD SECTIONS
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: AS SHOWN
DESIGNED BY: CSK/TFP
FILE NO: 7566
SHEET 22 OF 35
REV: 05/06/2012

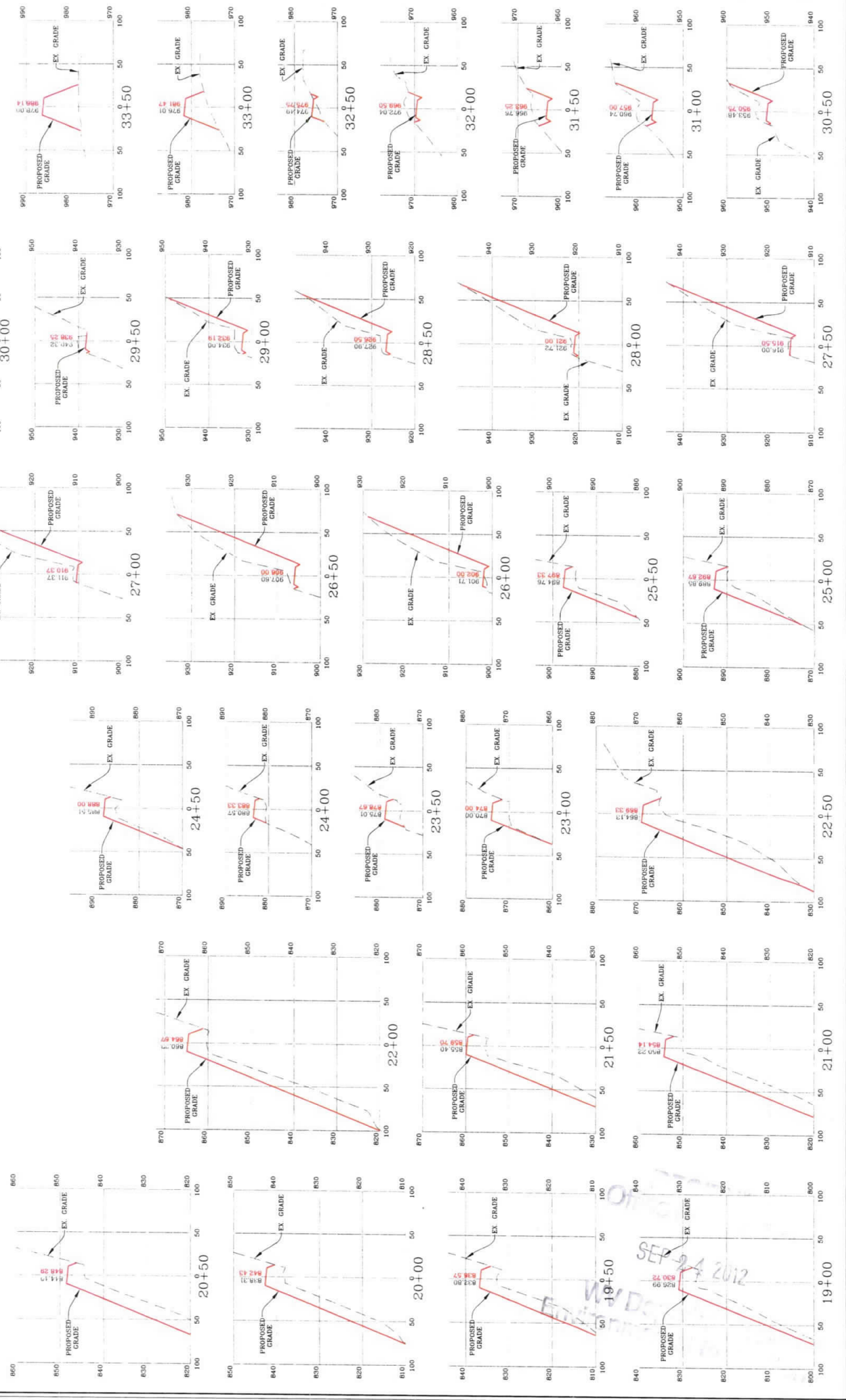
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ACCESS ROAD SECTIONS

(PROPOSED WELLS NO. WW 513041, WW 513042, WW 513043, WW 513044, & WW 513045)

WELL PAD ACCESS ROAD CROSS-SECTIONS
 SCALE: HORIZ. 1" = 50' VERT. 1" = 10'

NOTES:
 1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.



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 Grading, WV 26151
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 E-MAIL: sbs@slsusa.com

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RITCHIE COUNTY, WV
 CLAY DISTRICT
PEN 16
 ROAD SECTIONS

DATE: 09/29/2011

SCALE: AS SHOWN

DESIGNED BY: CSK/TVP

FILE NO: 7566

SHEET 23 OF 35

REV: 09/06/2012

Signature: *[Handwritten Signature]*

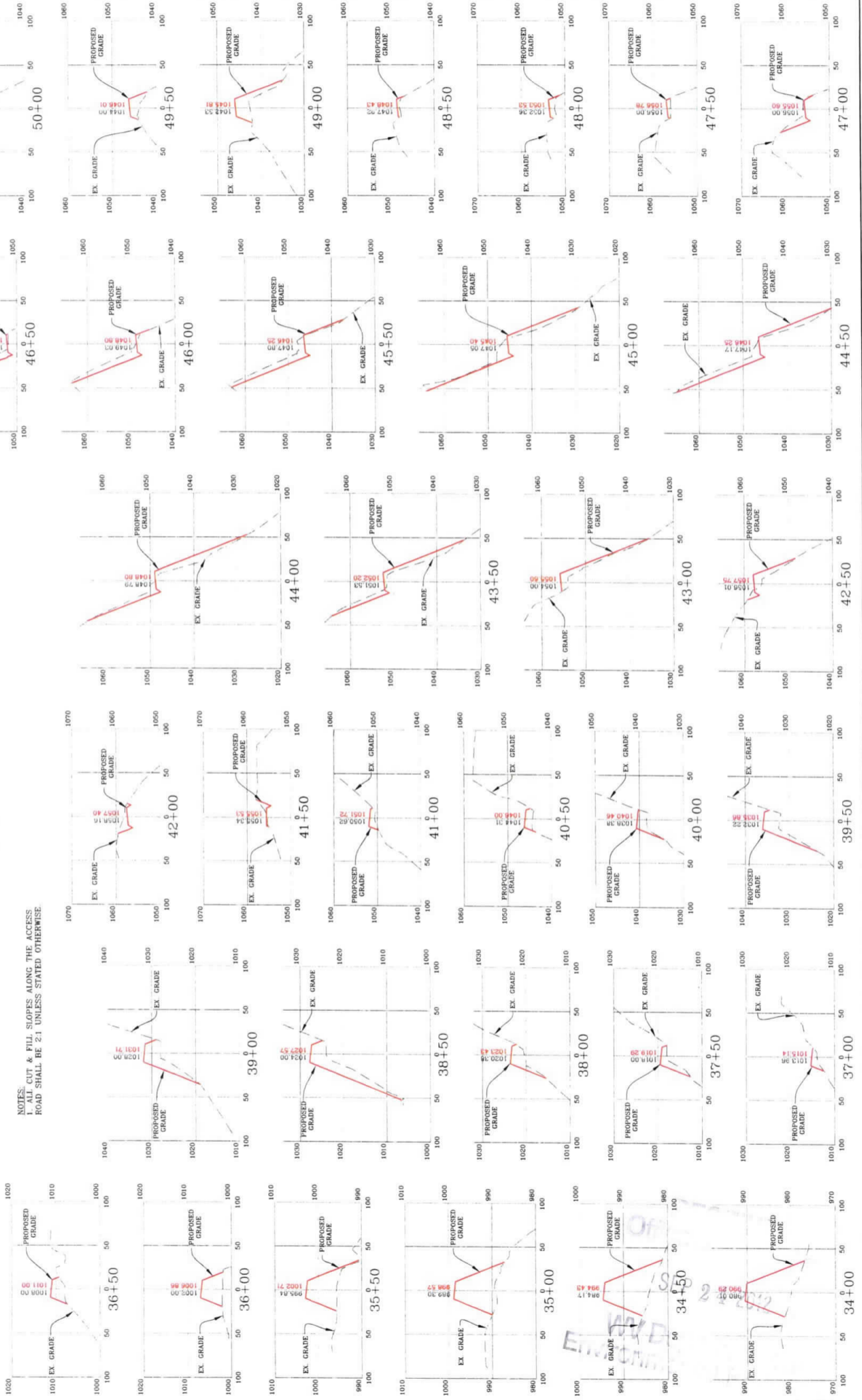
ACCESS ROAD SECTIONS

(PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)

WELL PAD ACCESS ROAD CROSS-SECTIONS

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

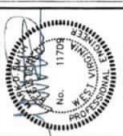
NOTES:
1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.



Engineering
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GIS

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ROAD SECTIONS
PEN 16
CLAY DISTRICT
RITCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: AS SHOWN
DESIGNED BY: CSK/TVP
FILE NO.: 7666
SHEET 24 OF 35
REV: 09/06/2012

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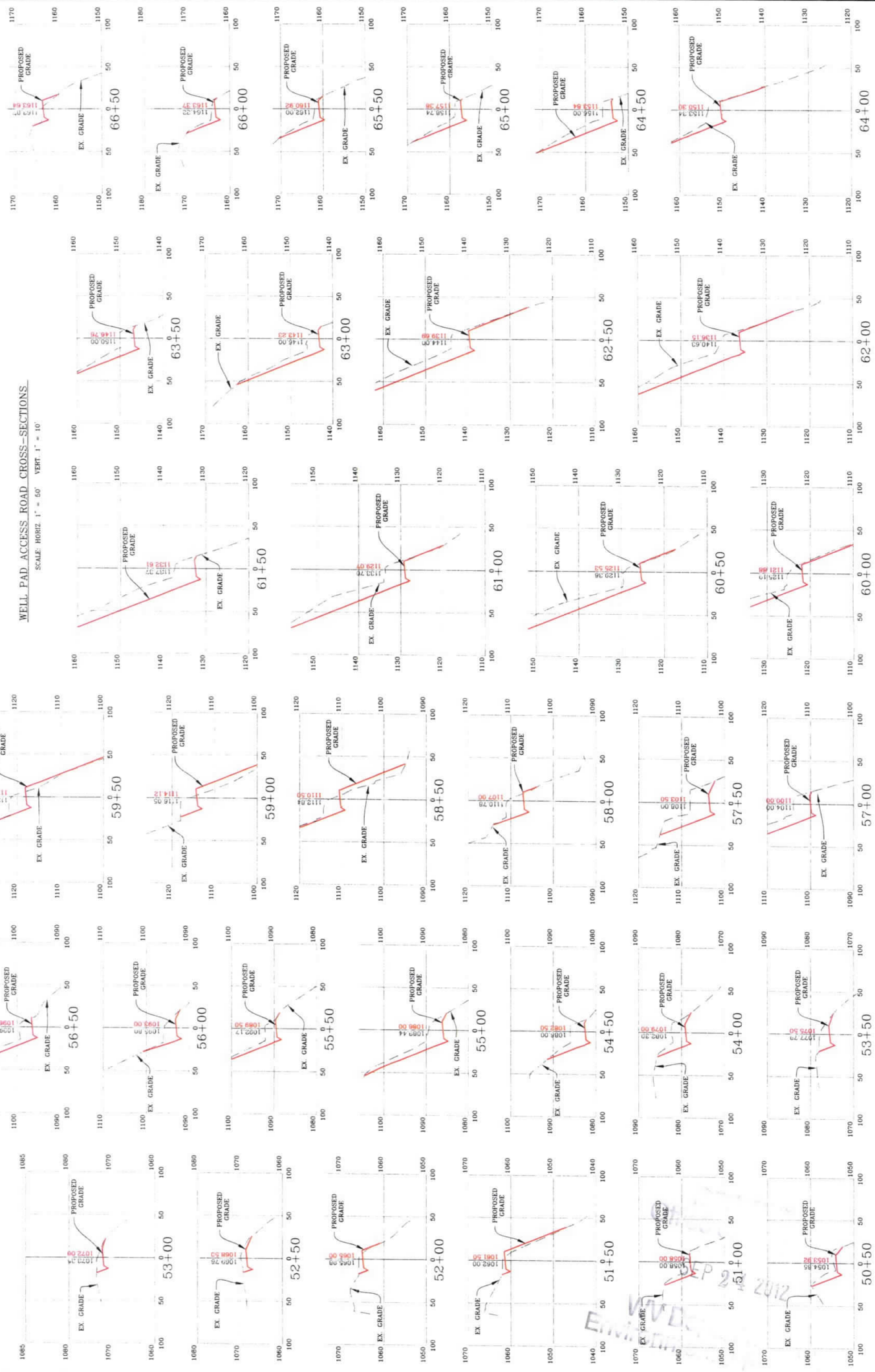
ACCESS ROAD SECTIONS

(PROPOSED WELLS NO. WY 513041, WY 513042, WY 513043, WY 513044, & WY 513045)

WELL PAD ACCESS ROAD CROSS-SECTIONS

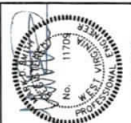
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'

NOTES:
1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.



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 E-MAIL: info@sls-survey.com



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ROAD SECTIONS
PEN 16
 CLAY DISTRICT
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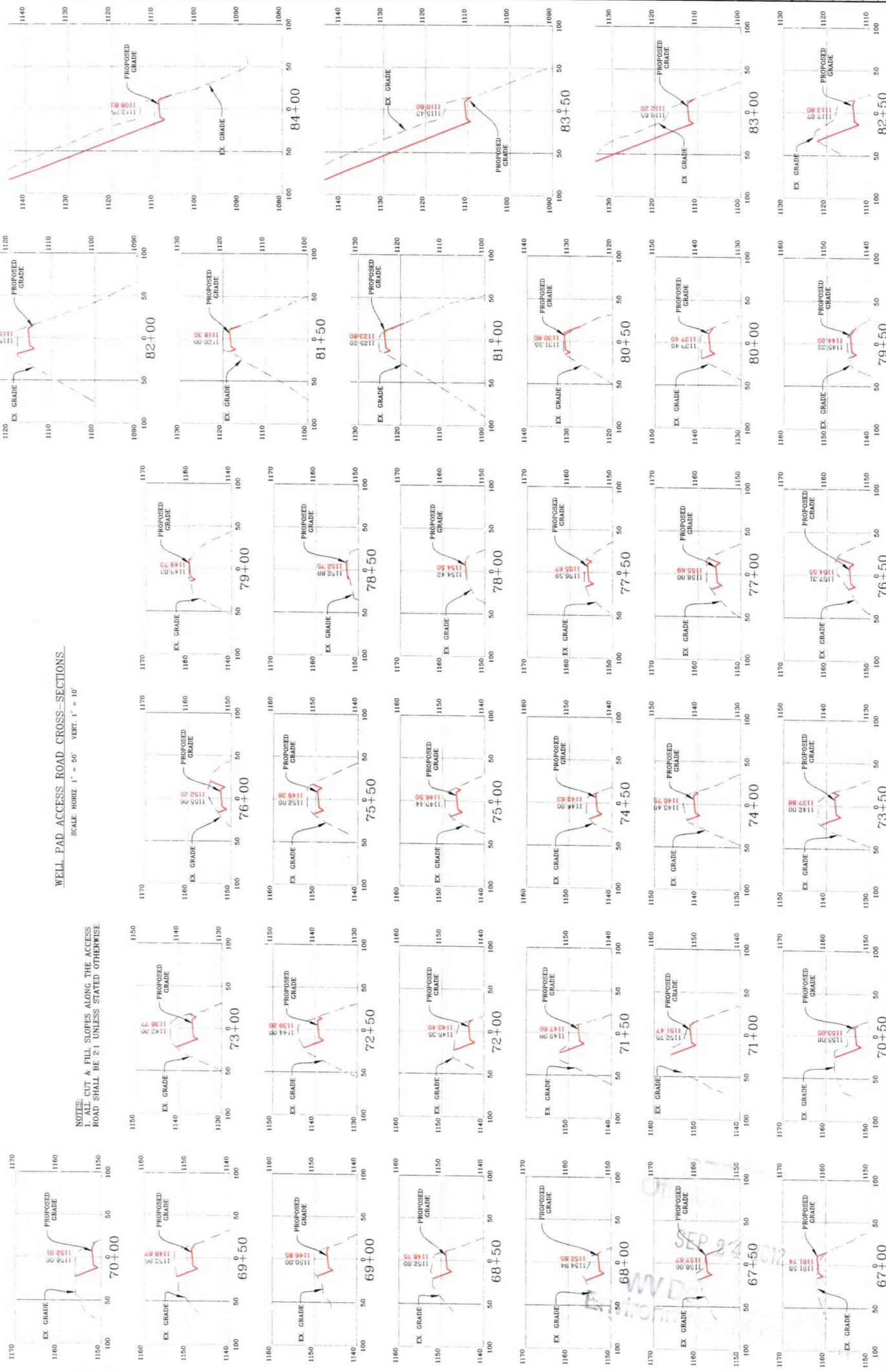
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 SCALE: AS SHOWN
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 FILE NO: 7566
 SHEET 26 OF 36
 REV: 09/06/2012

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ACCESS ROAD SECTIONS

(PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)



WELL PAD ACCESS ROAD CROSS-SECTIONS
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'

NOTES:
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Engineering Environmental GIS
NAVITUS ENGINEERING INC.
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 Tipton, KY 40381
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 P.O. Box 150
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ROAD SECTIONS
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV
 DATE: 09/29/2011
 SCALE: AS SHOWN
 DESIGNED BY: CSK/TVP
 FILE NO: 7566
 SHEET 26 OF 35
 REV: 09/06/2012

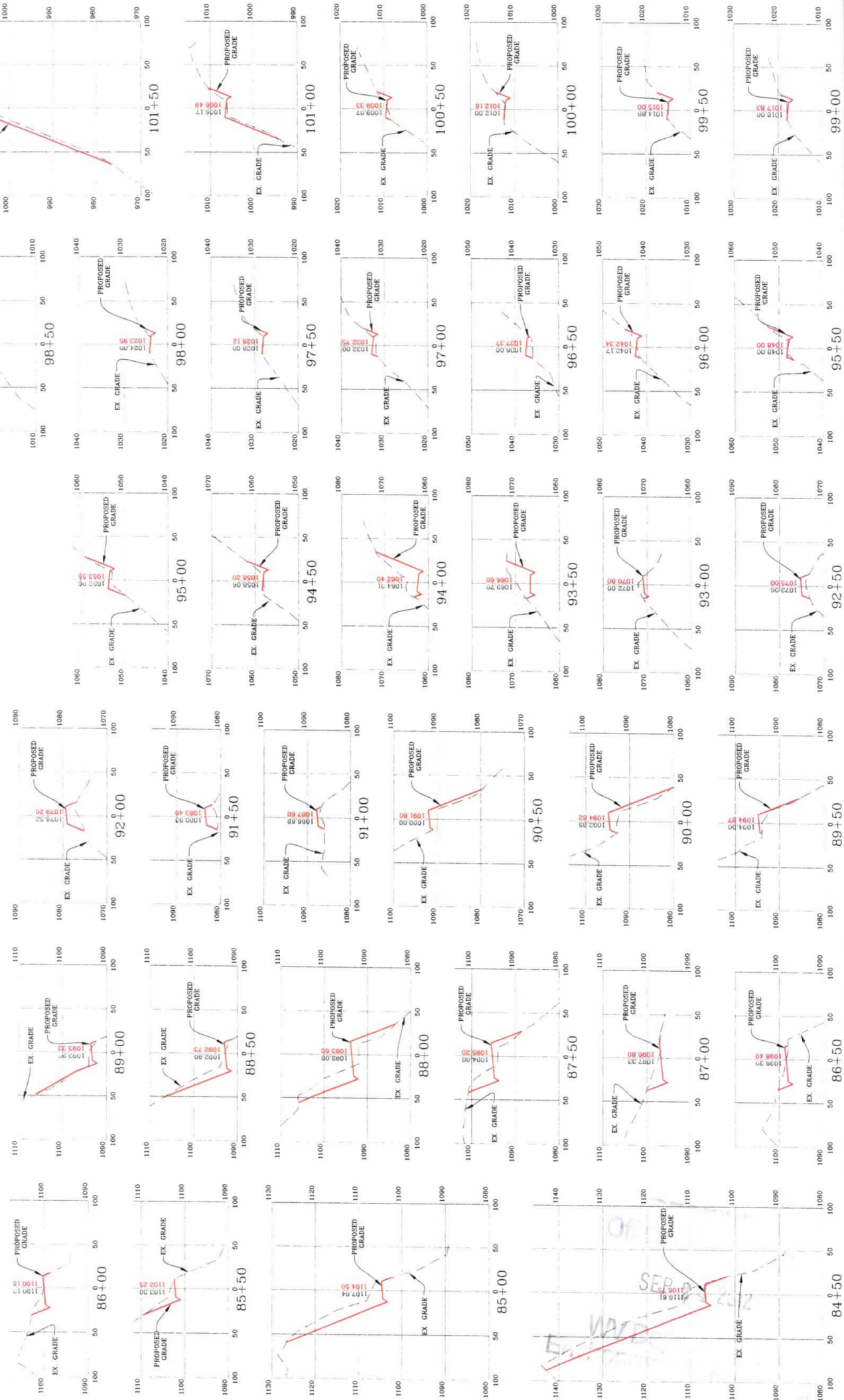
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ACCESS ROAD SECTIONS
(PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)

NOTES:
1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.

WELL PAD ACCESS ROAD CROSS-SECTIONS
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



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SEPT 2011
EGT
WV 513041



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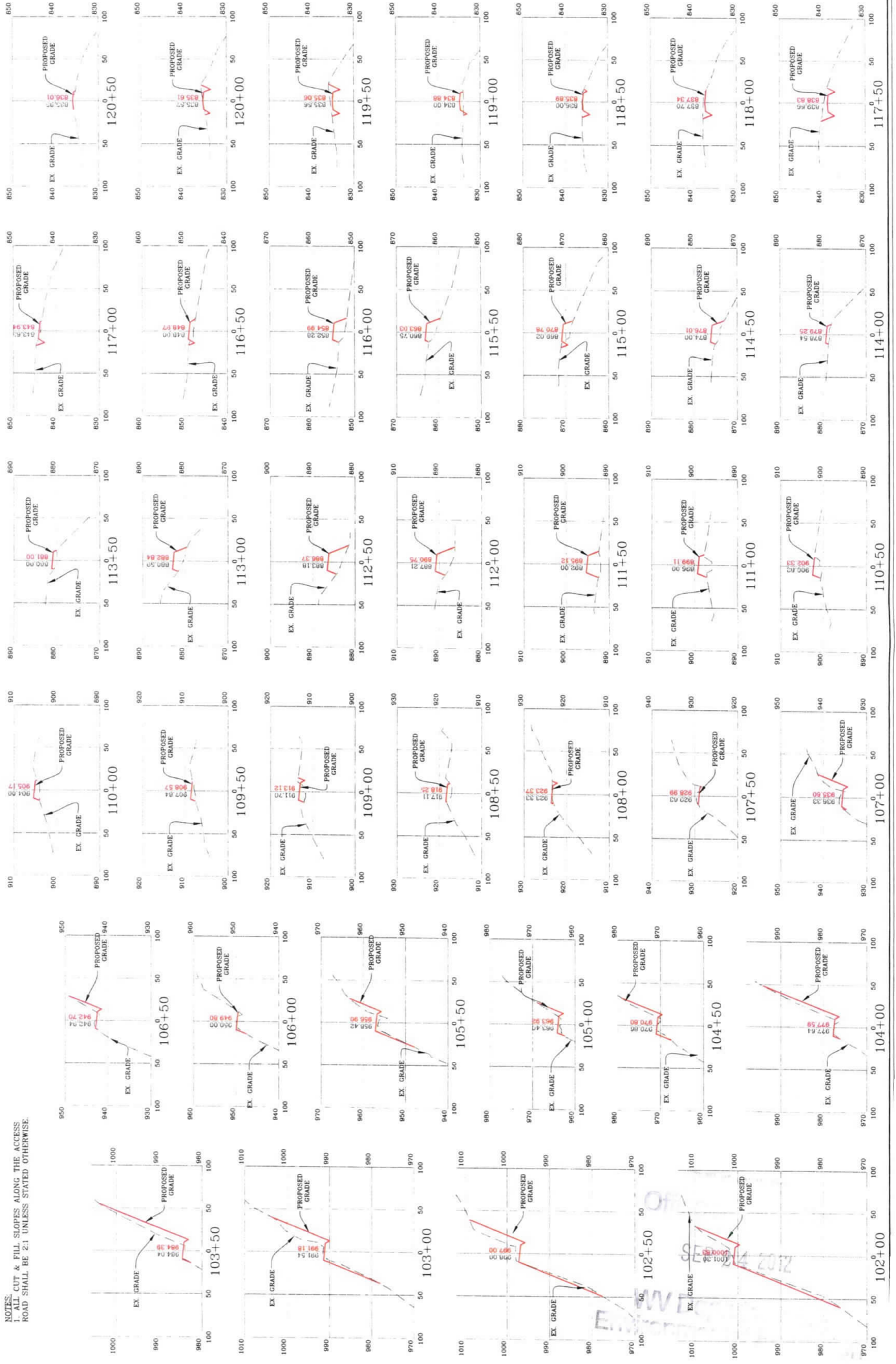
ROAD SECTIONS
PEN 16
CLAY DISTRICT
RITCHIE COUNTY, WV

DATE: 09/29/2011
SCALE: AS SHOWN
DESIGNED BY: CSK/TVP
FILE NO: 7566
SHEET 28 OF 35
REV: 09/06/2012

ACCESS ROAD SECTIONS
WELL PAD ACCESS ROAD CROSS-SECTIONS (PROPOSED WELLS NO. WV 513041, WV 513042, WV 513043, WV 513044, & WV 513045)

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

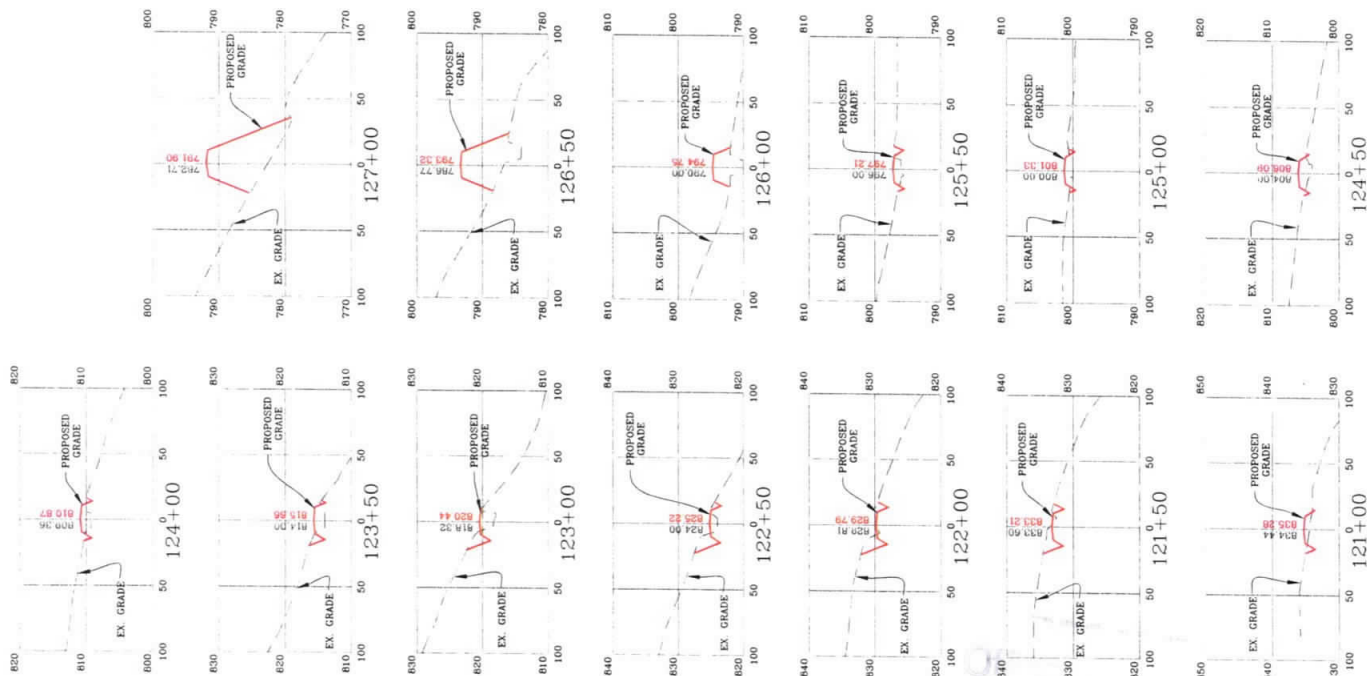
NOTES:
1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.



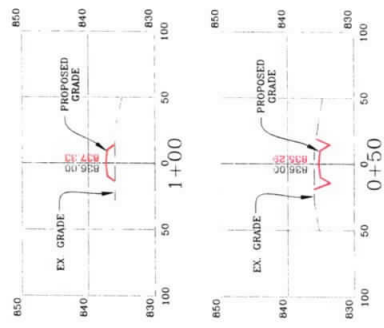
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ACCESS ROAD SECTIONS
 (PROPOSED WELLS NO. WW 513041, WW 513042, WW 513043, WW 513044, & WW 513045)

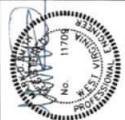
WELL PAD ACCESS ROAD CROSS-SECTIONS
 SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



ASSOCIATED PIT ACCESS ROAD CROSS-SECTIONS
 SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



NOTES:
 1. ALL CUT & FILL SLOPES ALONG THE ACCESS ROAD SHALL BE 2:1 UNLESS STATED OTHERWISE.



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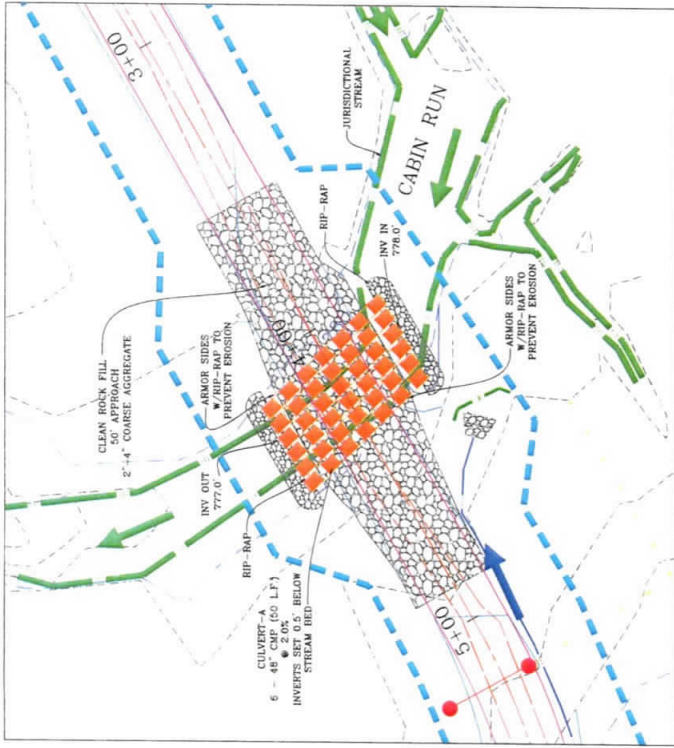
ROAD SECTIONS
 PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
 SCALE: AS SHOWN
 DESIGNED BY: CSK/TVP
 FILE NO: 7566
 SHEET 29 OF 35
 REV: 09/06/2012

DUC

SEP 24 2012
 WV Dept of Environmental Protection

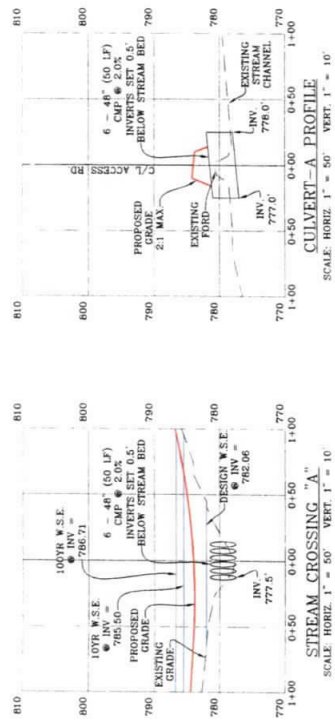
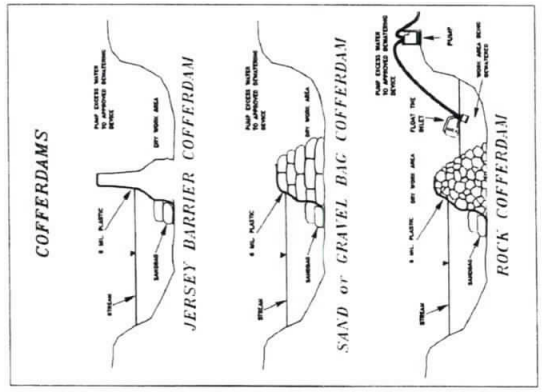
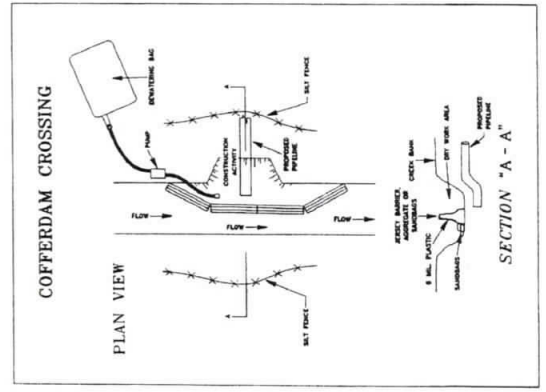
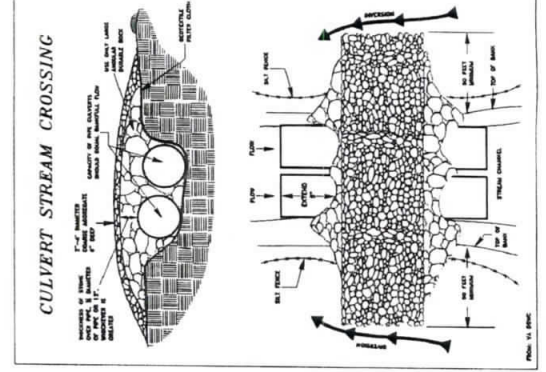
STREAM CROSSING DETAILS
 (PROPOSED WELLS NO. WW 513041, WW 513042, WW 513043, WW 513044, & WW 513045)



SCALE: 1" = 20'

- GENERAL NOTES:**
- 1) 2' to 4' coarse aggregate or larger shall be used to form the crossing. DO NOT USE ERODIBLE MATERIAL.
 - 2) DEPTH OF STONE COVER OVER THE CULVERTS SHALL BE EQUAL TO ONE-HALF THE CULVERT SIDES SHALL BE PROTECTED WITH RIPRAP TO PREVENT EROSION.
 - 3) CULVERTS SHALL EXTEND A MINIMUM OF 5' BEYOND THE UPSTREAM AND DOWNSTREAM TOE OF THE STREAMBANKS.
 - 4) CULVERTS SHALL BE PROTECTED WITH RIPRAP TO PREVENT EROSION.
 - 5) CULVERTS SHALL EXTEND A MINIMUM OF 5' BEYOND THE UPSTREAM AND DOWNSTREAM TOE OF THE STREAMBANKS.
 - 6) FILTER CLOTH SHALL BE PLACED ON THE STREAMBED AND STREAMBANKS PRIOR TO PLACEMENT OF THE PIPE CULVERTS AND AGGREGATE. THE FILTER CLOTH SHALL COVER THE STREAMBED, THE CULVERTS AND BEDDING MATERIAL. AND A MAXIMUM OF ONE FOOT BEYOND THE END OF THE CULVERTS AND BEDDING MATERIAL.
 - 7) A WATER DIVERTING SWALE SHALL BE CONSTRUCTED ACROSS THE ROADWAY ON EITHER SIDE OF THE STREAM CROSSING. CONTROLS SUCH AS SILT FENCE, SUPER SILT FENCE AND/OR SEDIMENT TRAPS SHALL BE EMPLOYED ALONG THE BANKS AND PARALLEL TO THE STREAMBED.
 - 8) LOW WATER CROSSINGS SHALL BE PROTECTED WHEN OVERFLOWING OCCURS BY USING ROCK AND CONCRETE.

SEP 24 2012



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

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

NAVITUS ENGINEERING INC.
 131 Windy Hill Lane
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Engineering
 Survey
 Environmental
 GIS

SLS SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150
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 Onwiah, WI 53051
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 FAX: (304) 462-5534
 E-MAIL: sls@slsvi.com



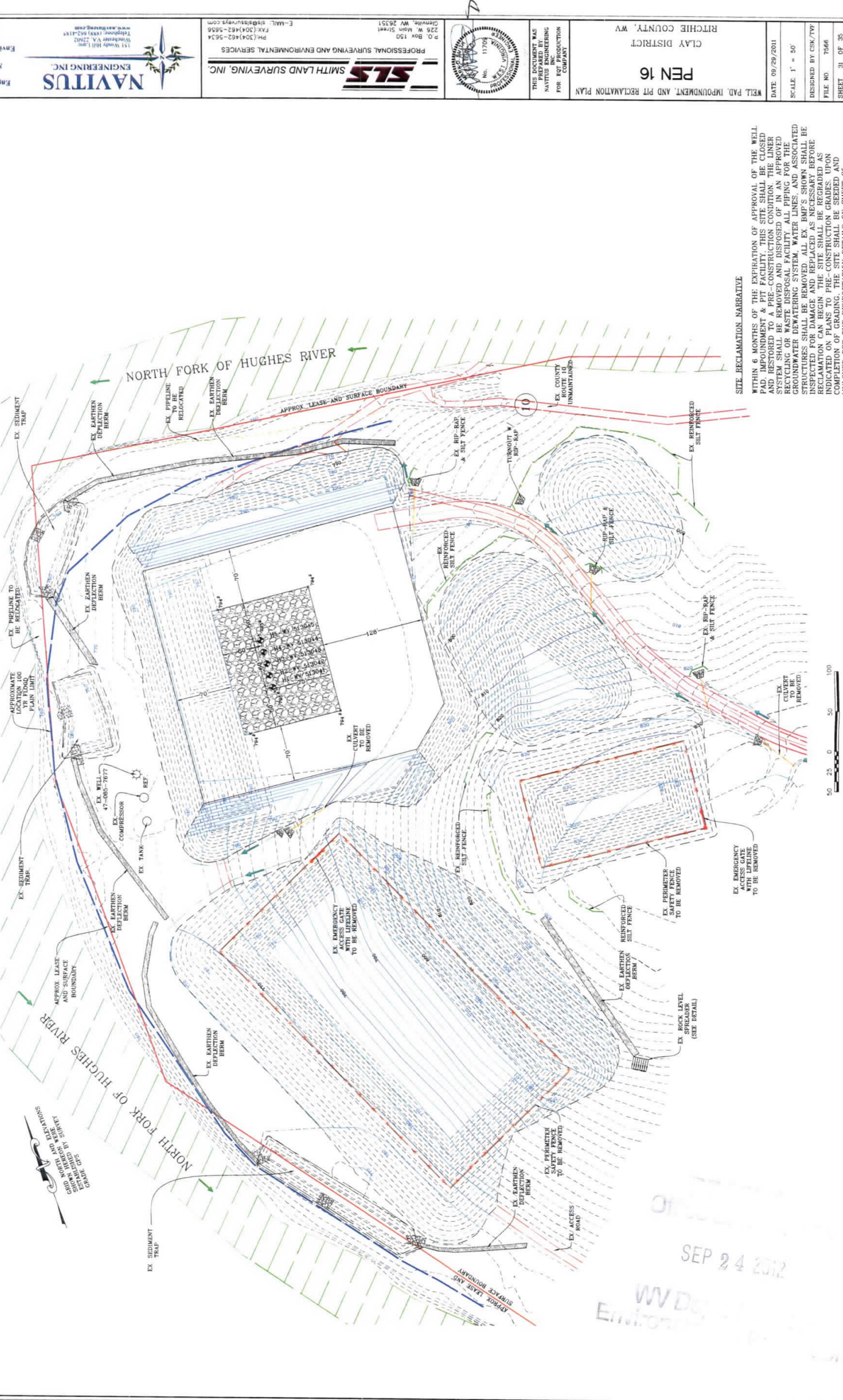
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STREAM CROSSING DETAILS
 PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV

DATE: 09/29/2011
 SCALE: AS SHOWN
 DESIGNED BY: CSK/TVP
 FILE NO.: 7566
 SHEET 30 OF 35
 REV: 09/06/2012

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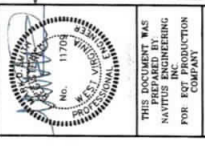
WELL PAD, IMPOUNDMENT, AND PIT RECLAMATION PLAN



SITE RECLAMATION NARRATIVE

WITHIN 6 MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, IMPOUNDMENT & PIT FACILITY, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. THE LINER SYSTEM SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED RECYCLING OR WASTE DISPOSAL SYSTEM. ALL EXISTING WATER LINES AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EX BMP'S SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON PLANS TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 35.

WELL PAD, IMPOUNDMENT, AND PIT RECLAMATION PLAN
 PEN 16
 CLAY DISTRICT
 RITCHEE COUNTY, WV



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 www.navituseng.com

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DATE: 09/29/2011
 SCALE: 1" = 50'
 DESIGNED BY: CSK/TVJ
 FILE NO: 7666
 SHEET 31 OF 35
 REV: 09/08/2012

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 WV Dept of Environmental Protection
 DIVISION OF PERMITS
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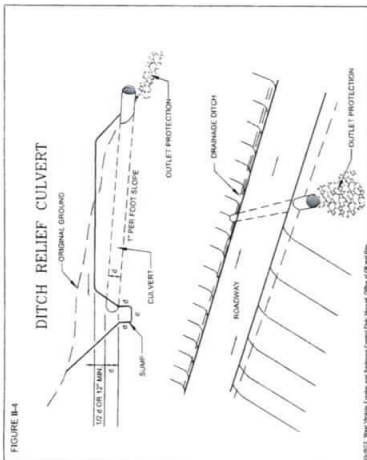
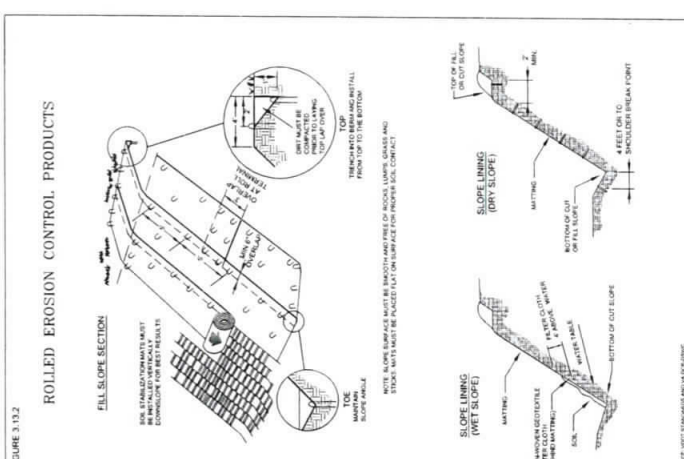
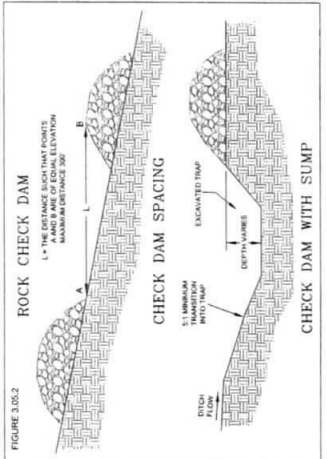
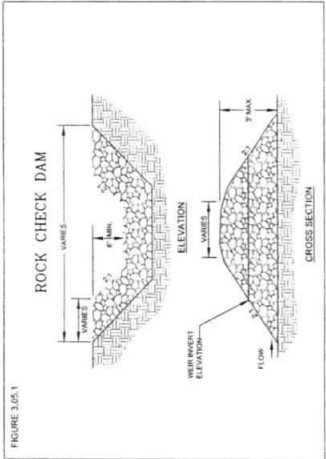
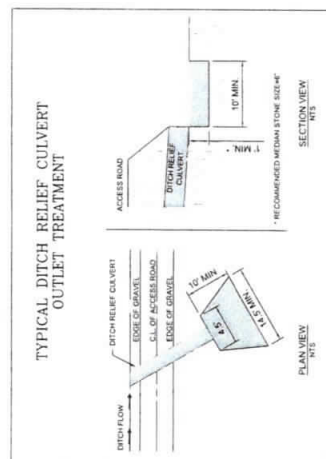
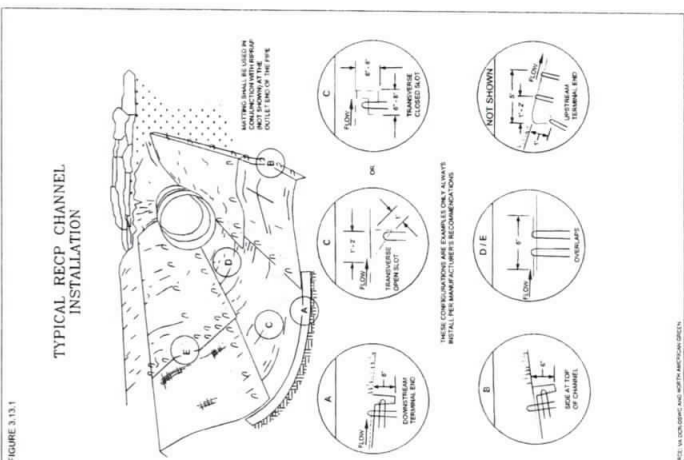


Table B.5
 Pipe Sizes for Culverts Across Roadways

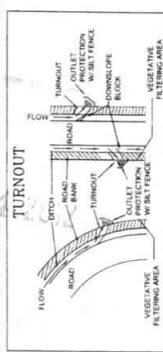
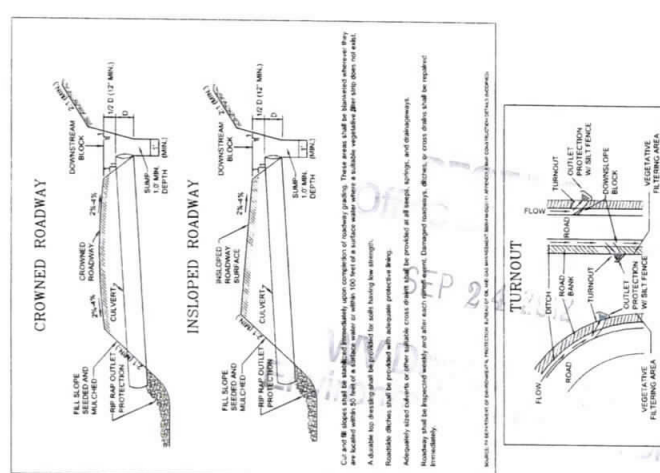
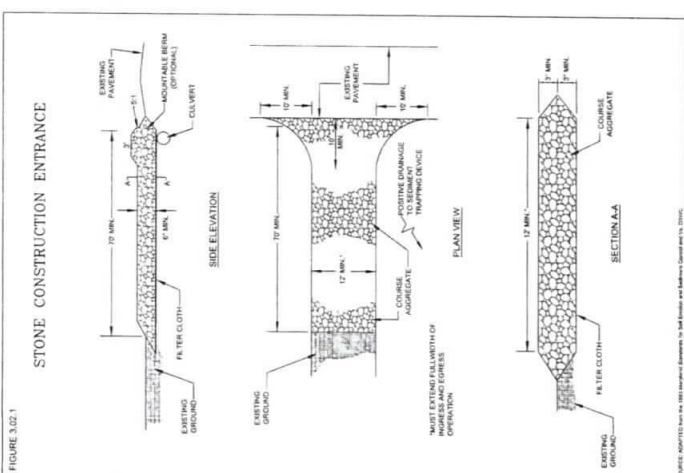
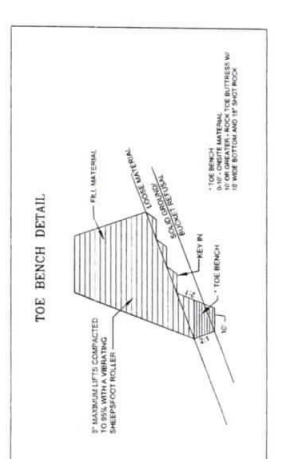
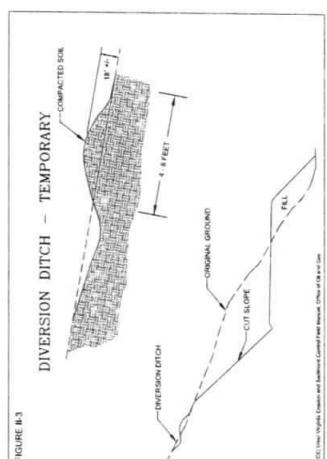
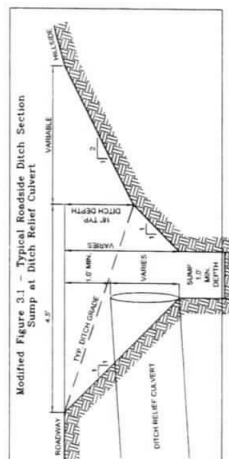
Drainage Area (Ac)	Pipe Diameter (ft)	Pipe Capacity (cfs)
10	15	5
20	18	9
30	21	12
40	24	16
50	27	24
100	30	28
150	36	38
200	38	40
300	42	48

Table B.6
 Spacing of Culverts

Road Grade %	Distance (ft)
2-4	500-500
4-10	300-300
11-15	200-200
16-20	100-100



NOTE:
 ALL DITCH LINE PROTECTION SHALL BE INSTALLED AS RECOMMENDED IN THE WEST MANUAL. DITCH LINE PROTECTION SHALL BE BASED ON THE FOLLOWING GRADES:
 1. LESS THAN 3% - GRASS
 2. 3-8% - GRASS WITH ROLLED EROSION CONTROL PRODUCTS (RECP)
 3. GREATER THAN 8% - RIPRAP OR EQUIVALENT GROTTOLE
 IF HIGH EROSION SOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE ENGINEER SHOULD BE CONTACTED FOR FURTHER EVALUATION.



Culvert blocks shall be installed immediately upon completion of roadway projects. These areas shall be maintained whenever they are located within 50 feet of a flowing water or within 100 feet of a surface water in a suitable riparian zone down from road. A suitable for drainage shall be installed for all such having flow through.

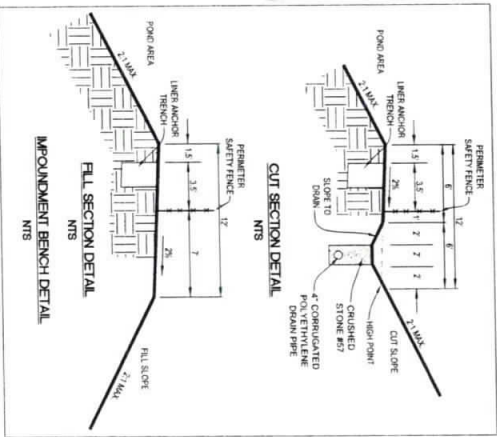
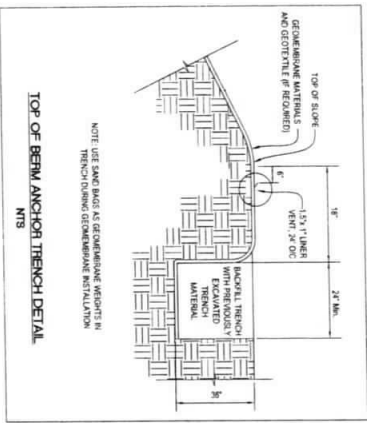
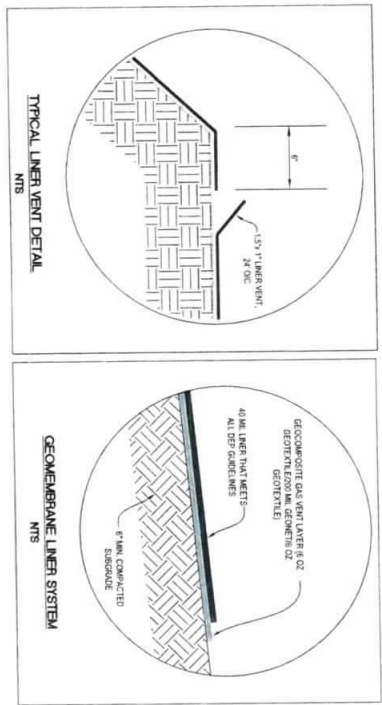
Additional notes shall be provided with applicable protection being.

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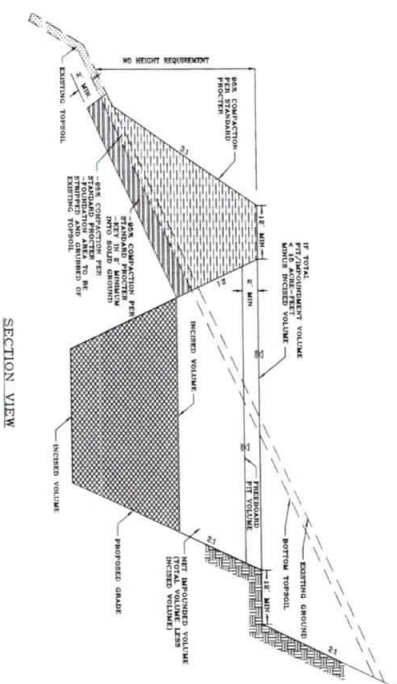
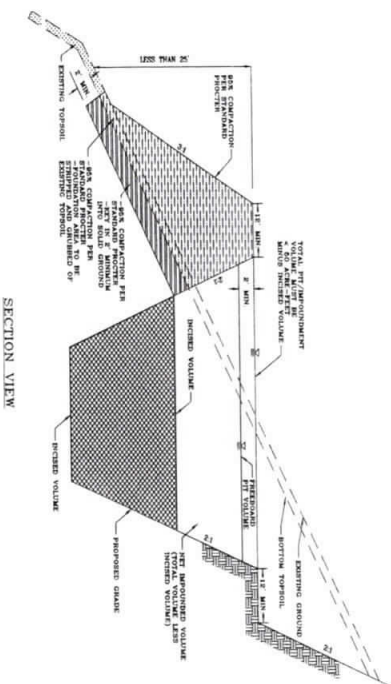
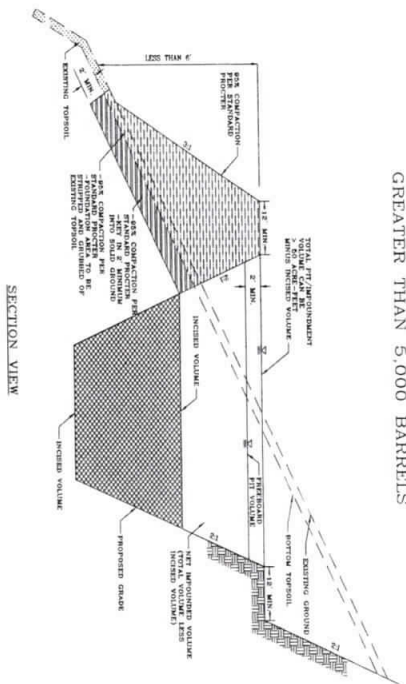
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WV DEPT OF ENVIRONMENT & NATURAL RESOURCES
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 OFFICE



WEST VIRGINIA CODE 35 CSR 4
 DESIGN AND CONSTRUCTION REQUIREMENTS
 FOR ASSOCIATED PITS, ASSOCIATED IMPONMENTS, &
 CENTRALIZED IMPONMENTS
 GREATER THAN 5,000 BARRELS



NOTES:
 1. ALL FILL SHOULD BE NEEDED IN TO ORIGINAL GROUND EVERY 2'-0" VERTICALLY OUTSIDE AND INSIDE DAMPMENT (FULL) SLOPES
 2. ALL FILL SHOULD BE NEEDED IN TO ORIGINAL GROUND EVERY 2'-0" VERTICALLY INSIDE AND OUTSIDE SLOPES MUST ADD UP TO 5H:1V
 NTS

<p>CONSTRUCTION DETAILS PEN 16 CLAY DISTRICT RITCHIE COUNTY, WV</p>		<p>THIS DOCUMENT WAS PREPARED BY NAVITUS ENGINEERING INC. FOR PLOT PRODUCTION (SCALE 1/4" = 1'-0")</p>	<p>SMITH LAND SURVEYING, INC. PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES P.O. Box 150 226 W. Main Street Glenville, WV 26351</p>	<p>NAVITUS ENGINEERING INC. 151 Wandy Hill Lane Winchester, VA, 22602 Telephone: (888) 662-1444 www.navituseng.com</p>	<p>Engineering Survey Environmental GIS</p>
<p>DATE: 09/29/2011 SCALE: N/A</p>	<p>DESIGNED BY: CSR/TWR FILE NO: 7566 SHEET: 34 OF 35 REV: 09/06/2012</p>	<p>PH: (304) 462-5634 FAX: (304) 462-5656 E-MAIL: sls@sls-surveys.com</p>			

True

REVEGETATION

Temporary Seeding

a General Conditions Where Practice Applies
 Periods longer than 21 days. Temporary vegetative cover will be established on exposed soil surfaces immediately upon construction of the site (site include road and location). Vegetation must be established on road bank and location slopes. A permanent vegetative cover shall be established on all exposed soil surfaces within a period of three months.

Mulchings

a General Organic Mulches
 The application of straw, hay or other suitable materials to the soil surface to prevent erosion. Straw materials are most desirable due to the risk of spreading invasive species. Mulch must be applied to all temporary and permanent seeding on all disturbed areas or steep slopes, additional or substitute soil protective measures may be used if deemed necessary. Example include: jute mesh and soil stabilization. Straw and hay should be applied in a layer 2-4 inches thick. Mulch should be applied immediately following seeding. Mulches conserve desirable soil properties, reduce soil erosion and provide a suitable microclimate for seed germination.

Permanent Seeding

Permanent vegetative cover will be established where no further soil preparation is required and the soil is in good condition. The pH level should be tested and adjusted according to seed species planted. Planting of permanent vegetative covers must be performed on all exposed soil surfaces. Topsoil shall have the topsoil removed and stockpiled when feasible. Topsoil should not be added to slopes steeper than 1:1. After proper grading and seedbed preparation, the vegetation will establish ground cover for the control of surface water runoff erosion preparation and loosening of soil by disking or dozer tracking should be performed just prior to seeding. If seeded preparation is not feasible, Soil Moisture P-3 and P-4. When hydroseeding, seeded preparation may not be necessary if adequate site preparation was performed. Incorporate fertilizer when hydroseeding amount of lime and/or fertilizer in the slurry mix when appropriate. When hydroseeding, firm mix the lime, fertilizer, and straw-mulch in the slurry mix. The slurry mix should be applied to the exposed soil surface within one hour of initial mixing. Application of fertilizer should be done within one hour of initial mixing.

Lime and Fertilizer
 Lime and fertilizer should 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 2. Fertilizer shall be applied in all permanent seedings. Apply the equivalent for 500 lbs. minimum 10-20-20-20 recommended for a certified soil test. Amount of fertilizer and lime recommended for a certified soil test. Fertilizer and lime should be applied in the same application. For best results and maximum benefits, the lime and fertilizer are to be applied at the time of seedbed preparation.

Permanent Seed Mixtures
 Permanent seed mixtures should be selected based on the species and the landowner's future position management plan when recommending seed mixtures. Selection From Tables IV-4a and b. Permanent Seeding Mixtures Suitable for Establishment in Various Regions.
 1 All legumes must be planted with the proper inoculants prior to seeding.
 2 All legumes are potentially poisonous to some livestock.
 3 Only endophyte-free varieties of Tall Fescue should be used. Tall Fescue and Crested Fescue are also very invasive species, non-native to West Virginia.
 4 For unprepared seedbeds or seeding outside the optimum lime/seed rate, add 50% more seed to the seedbed. The optimum lime/seed rate is 20 lbs. of seed per acre and 100 lbs. of lime per acre. In bold are suitable for use in shaded woodland settings. Mixtures in italic are suitable for use in filter strips.
 5 Seeding for Wildlife Habitat
 Consider the use of the native plants or locally adapted plants when selecting species for mixtures that have multiple values should be considered. See Wildlife-friendly species/mixtures in Table IV-4a. Consider selecting no. or low maintenance/long-lived equipment to sites which may be difficult to maintain long-term.

1 Chemical Mulches, Soil Binders and Treatments
 A wide range of synthetic spray on materials are marketed to stabilize and protect the soil surface. They may be used alone or in conjunction with temporary stabilizers or in conjunction with fiber mulch, straw or hay mulch. Mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have.

2 Mechanical Anchoring
 Mechanical anchoring 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. 3 Mechanical Anchoring
 Follow manufacturer's recommendation when positioning and staking the mulch matting in the soil.

Table 1 - Recommended Seeding Dates

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

Table 2 - Acceptable Fertilization Recommendation

Species	N (lb/acre)	P2O5 (lb/acre)	K2O (lb/acre) (per acre)
Cool Season Grass	40	80	400 (lb. 10-20-20)
CS Grass & Legume	30	60	300 (lb. 10-20-20)
Temporary Cover	40	40	200 (lb. 19-19-19)

Table 3 - Temporary Cover

Species	Seeding Rate (lb/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 - Poorly	6.0 - 7.0
Spring Oats	96	3/1 - 6/15	Well - Poorly	5.5 - 7.0
Sundargrass	40	5/15 - 8/15	Well - Poorly	5.5 - 7.5
Winter Rye	180	8/15 - 10/15	Well - Poorly	5.5 - 7.5
Winter Wheat	180	8/15 - 11/15	Well - Poorly	5.5 - 7.0
Japanese Millet	30	6/15 - 8/15	Well - Mod Well	4.5 - 7.0
Rodop	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 (lb/acre)	Soil Drainage Preference	pH Range
Cornwall / Tall Fescue	10 - 15	Well - Mod Well	5.0 - 7.5
Cornwall / Perennial Ryegrass	10 - 15	Well - Mod Well	5.0 - 7.5
Perennial Ryegrass / Tall Fescue	20	Well - Mod Well	4.0 - 8.0
Ladino Clover / Sericea Legumina	15	Well - Mod Well	4.5 - 7.5
Tall Fescue	2	Well - Mod Well	
Ladino Clover / Perennial Ryegrass	40	Well - Mod Well	5.0 - 7.5
Cornwall / Tall Fescue	3	Well - Mod Well	
Cornwall / Perennial Ryegrass	10	Well - Mod Well	5.0 - 7.5
Tall Fescue / Perennial Ryegrass	10	Well - Mod Well	5.0 - 7.5
Ladino Clover / Perennial Ryegrass	20	Well - Mod Well	5.8 - 8.0

Table 4b - Weights and Form Fertilizer Seed Mixtures

Species/Mixture	Seeding Rate (lb/acre)	Soil Drainage Preference	pH Range
RY Bluegrass / Ladino Clover or Birdfoot Trefoil	20	Well - Mod Well	5.5 - 7.5
Timothy / Alfalfa	2 / 10	Well - Mod Well	6.5 - 8.0
Birdfoot Trefoil / Orchardgrass / Ryegrass	5	Well - Poorly	5.5 - 7.5
Orchardgrass / Ryegrass	12	Well - Mod Well	5.5 - 7.5
Ladino Clover / Orchardgrass	2	Well - Mod Well	5.5 - 7.5
Ladino Clover / Perennial Ryegrass	10	Well - Mod Well	5.5 - 7.5
Orchardgrass / Ryegrass	20	Well - Mod Well	5.5 - 7.5
Orchardgrass or RY Bluegrass	20	Well - Mod Well	5.5 - 7.5
Birdfoot Trefoil / Ryegrass	10	Well - Mod Well	5.5 - 7.5
Ladino Clover / Perennial Ryegrass	20	Well - Mod Well	5.5 - 7.5
Ladino Clover / Orchardgrass	20	Well - Mod Well	5.5 - 7.5

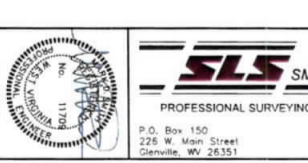
Table 5 - Lime and Fertilizer Application Table

Method	Rate (lb/acre)	Fertilizer (lb/acre)	Equivalent (lb/acre)
Hand Scatter	3	3	500
5.0 Dn to 6.0	2	3	500
Below 5.0	4	3	500

Table 4c - Match Materials Rates and Uses

Material	Minimum Rate per Acre	Coverage	Remarks
Hay or Straw	2 to 3 Tons	Cover 75% to 80%	Subject to wind blowing or washing unless tied down
Wood Fiber	100 to 150 lbs	Cover all	For hydroseeding
Pulp Fiber	1000 to 1500 lbs	Cover all	For hydroseeding
Wood - Cellulose		Disturbed Areas	
Recycled Paper		Disturbed Areas	

CONSTRUCTION DETAILS
PEN 16
 CLAY DISTRICT
 RITCHIE COUNTY, WV



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