Commercial/Industrial Floodplain Development Permit

Doddridge County, WV Floodplain Management

This permit has been issued to **Noble Energy**, and is for the approved commercial and/or industrial development project associated with this permit that impacts the FEMA-designated floodplain and/or floodway of Doddridge County, WV, pursuant to the rules and regulations established by all applicable Federal, State and local laws and ordinances, including the Doddridge County Floodplain Ordinance. This permit must be posted at the site of work as to be clearly visible, and must remain posted during entirety of development.

Permit: #15-333 ~ Noble Energy ~
OXF 98 Well Pad

Date Approved: 02/27/2015 **Expires: 02/27/2015**

Issued to: Noble Energy

POC: Michael Ogden, Rettew
412-446-1728

Company Address: One Robinson Plaza, Suite 200
6600 Steubenville Pike
Pittsburgh, PA 15205

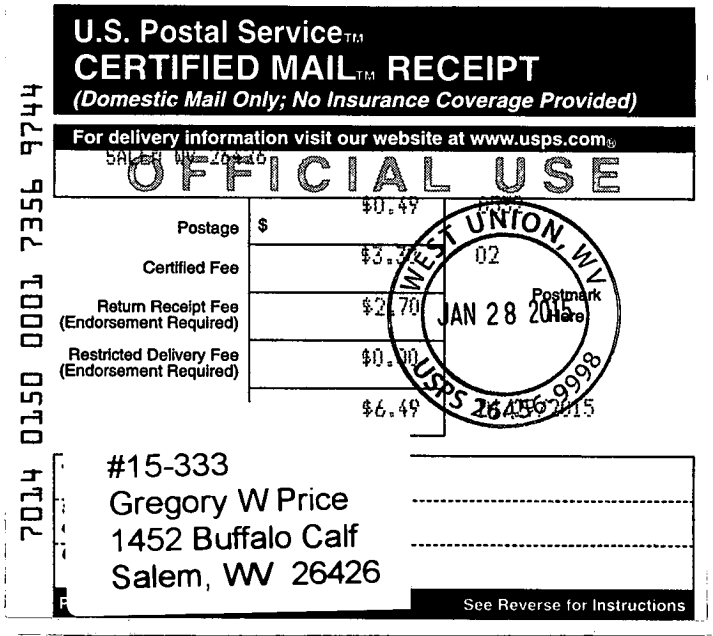
Project Address: West Union District
Lat/Long: 39.256383N/80.791869W to 39.253116N/80.799494W

Purpose of development: Well Pad Construction

Issued by: Edwin L. "Bo" Wriston, Doddridge County FPM (*or designee*)

Date: 02/27/2015

For additional information regarding this permit, please contact Doddridge County Floodplain Manager at 304.873.2631, or via email at doddridgecountyfpm@gmail.com
118 East Court Street; West Union, WV 26456



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Restricted Delivery Fee (Endorsement Required)	$0.00
	$6.49

02

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JAN 28 2015

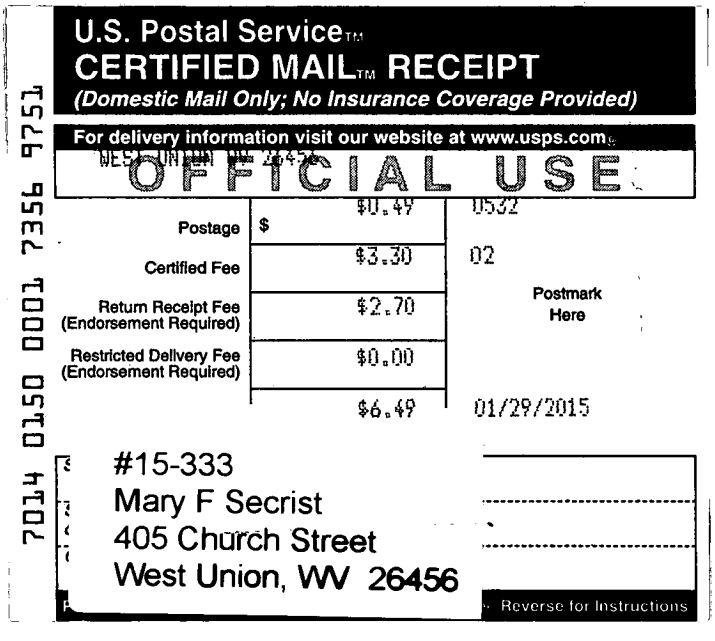
WEST UNION, WV

USPS 26456-9998

7014 0150 0001 7356 9744

#15-333
Gregory W Price
1452 Buffalo Calf
Salem, WV 26426

See Reverse for Instructions



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Return Receipt Fee (Endorsement Required)	$2.70
Restricted Delivery Fee (Endorsement Required)	$0.00
	$6.49

0532

02

Postmark Here

01/29/2015

7014 0150 0001 7356 9751

#15-333
Mary F Secrist
405 Church Street
West Union, WV 26456

Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

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

1. Article Addressed to:

#15-333
Gregory W Price
1452 Buffalo Calf
Salem, WV 26426

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X G Price ☐ Agent ☑ Addressee

B. Received by *(Printed Name)* G. Price
C. Date of Delivery 11/8/15

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

3. Service Type
☑ Certified Mail® ☐ Priority Mail Express™
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ Collect on Delivery

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Transfer from service label)* 7014 0150 0001 7356 9744

PS Form 3811, July 2013 Domestic Return Receipt

UNITED STATES POSTAL SERVICE

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

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

Doddridge County FPM
118 East Street STE 102
West Union, WV 26456-1262

Doddridge County, West Virginia

RECEIPT NO: 4536 DATE: 2015/04/20

FROM: RETTEW ASSOCIATES **AMOUNT:** $ 500.00

FIVE HUNDRED DOLLARS AND 00 CENTS

FOR: BUILDING PERMITS 15-333

00000037204 FP-BUILDING PERMITS 020-318 **TOTAL:** $500.00

MICHAEL HEADLEY
SHERIFF &TREASURER

PMS
CLERK

Customer Copy

#/15-333

FILED 2015 JAN 23 AM 9:00 COUNTY CLERK DODDRIDGE COUNTY, WV

DODDRIDGE COUNTY
FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

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

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

FILED 2015 JAN 23 AM 9:00 COUNTY CLERK DODDRIDGE COUNTY, WV

APPLICANT'S SIGNATURE [signature] MICHAEL DEDEN, AGENT FOR THE APPLICANT

DATE 11/20/14 910-338-7226

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

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

APPLICANT'S NAME: Noble Energy, Inc. :Nick Frosini , Senior Environmental Specialist

ADDRESS: 333 Technology Drive, Suite 116, Canonsburg, PA 15317

TELEPHONE NUMBER: 724-820-3526

CONTRACTOR NAME: To Be Determined

ADDRESS:

TELEPHONE #

WV CONTRACTOR LICENCE #

ENGINEER'S NAME: Rettew Associates, Inc.: Eric Hershey, P.E.

ADDRESS: One Robinson Plaza, 6600 Steubenville Pike, Suite 200, Pittsburgh, PA 15205

TELEHONE NUMBER: 412-446-1728

PROJECT LOCATION:

NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) Diane E. Bennett

ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT)

DISTRICT: West Union

LAND BOOK DESCRIPTION:

DEED BOOK REFERENCE: Book 288, Page 29

TAX MAP REFERENCE: 09-08-20-11

EXISTING BUILDINGS/USES OF PROPERTY: No Buildings, Existing vertical gas wells, access drive

NAME OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A - No Residences on property

ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A - No Residences on property

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

The project access road crosses the Left Fork Arnold Creek. Currently there is a stream ford there, but to handle truck traffic and adequate stream flow, a double box culvert will be installed. The access road to the project area is located the west side of Left Fork Run Road (Pumpkin Center Road)/ C.R. 11/4, West Union, Doddridge County, WV at NAD 83 coordinates 39.256383/ -80.791869. The access road is approximately 2.1 miles south of the intersection of US-50 and Arnold Creek Road.

DESCRIPTION OF WORK (CHECK ALL APPLICABLE BOXES)

A. STRUCTURAL DEVELOPMENT

	ACTIVITY		STRUCTURAL TYPE
[]	New Structure	[]	Residential (1 – 4 Family)
[]	Addition	[]	Residential (more than 4 Family)
[]	Alteration	[]	Non-residential (floodproofing)
[]	Relocation	[]	Combined Use (res. & com.)
[]	Demolition	[]	Replacement
[]	Manufactured/Mobil Home		

B. OTHER DEVELOPLMENT ACTIVITIES:

[X] Fill [] Mining [] Drilling [] Pipelining
[X] Grading
[X] Excavation (except for STRUCTURAL DEVELOPMENT checked above)
[] Watercourse Alteration (including dredging and channel modification)
[X] Drainage Improvements (including culvert work)
[X] Road, Street, or Bridge Construction
[] Subdivision (including new expansion)
[] Individual Water or Sewer System
[] Other (please specify)

_____

C. STANDARD SITE PLAN OR SKETCH

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

ACTUAL TOTAL CONSTRUCTION COSTS OF THE COMPLETE DEVELOPMENT/ PROPOSED CONSTRUCTION PROJECT WITHIN THE FLOODPLAIN

$ 40,000

D. ADJACENT AND/OR AFFECTED LANDOWNERS:

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

NAME: Gregory W. Price
ADDRESS: 1452 Buffalo Calf
Salem, WV 26426

NAME: Mary F. Secrist
ADDRESS: 405 Church Street
West Union, WV 26456

NAME: Hope Natural Gas Co.
ADDRESS: 625 Liberty Ave Mail Drop
Pittsburgh, PA 15221

NAME:
ADDRESS:

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

NAME: Mary F. Secrist
ADDRESS: 405 Church Street
West Union, WV 26456

NAME: Mary F. Secrist
ADDRESS: 405 Church Street
West Union, WV 26456

E. CONFIRMATION FORM

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

(A) PERSONAL SERVICE OF PROCESS BY THE DODDRIDGE COUNTY SHERIFF AT THE RATES PERMITTED BY LAW FOR SUCH SERVICE.

(B) SERVICE BY CERTIFIED MAIL RETURN RECEIPT REQUESTED.

(C) PUBLICATION.

(D) COURT REPORTING SERVICES AT ANY HEARINGS REQUESTED BY THE APPLICANT.

(E) CONSULTANTS AND/OR HEARING EXPERTS UTILIZED BY DODDRIDGE COUNTY FLOODPLAIN ADMINISTRATOR/MANAGER OR FLOODPLAIN APPEALS BOARD FOR REVIEW OF MATERIALS AND/OR TESTIMONY REGARDING THE EFFICACY OF GRANTING OR DENYING THE APPLICANT'S FLOODPLAIN PERMIT.

NAME (PRINT): MICHAEL OGDEN, AGENT FOR THE APPLICANT

SIGNATURE: _____ **DATE:** 11/20/14

After completing SECTION 2, APPLICANT should submit form and fees to Clerk of Doddridge County Court or his/her representative for review.

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

THE PROPOSED DEVELOPMENT:

THE PROPOSED DEVELOPMENT IS LOCATED ON:
FIRM Panel:_____
Dated:_____

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

[X] Is located in Special Flood Hazard Area.
FIRM zone designation_____
100-Year flood elevation is _____NGVD .
Stream name _____.
Profile # _____.

[] Unavailable

[] The proposed development is located in a floodway.

[] See section 4 for additional instructions.

SIGNED_____ **DATE**_____

SECTION 4: ADDITIONAL INFORMATION REQUIRED FOR DEVELOPMENT IN SPECIAL FLOOD HAZARD AREA (To be completed by Floodplain Administrator/Manager or his/her representative)

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

[] A plan showing the location of all existing structures, water bodies, adjacent roads and proposed development.

[] Development plans, drawn to scale, and specifications, including where applicable: details for anchoring structures, storage tanks, proposed elevation of lowest floor, (including basement or crawl space), types of water resistant materials used below the first floor, details of flood proofing of utilities located below the first floor and details of enclosures below the first floor. Also_____

_____

[] Subdivision or other development plans (If the subdivision or development exceeds 10 lots or 2 acres, whichever is the lesser, the applicant must provide 100-year flood elevations if they are not otherwise available).

[] Plans showing the extent of watercourse relocation and/or landform alterations.

[] Top of new fill elevation _____Ft. NGVD.
For floodproofing structures applicant must attach certification from registered engineer or architect.

[] Certification from a registered engineer that the proposed activity in a regulatory floodway will not result in any increase in the height of the 100-year flood. A copy of all data and calculations supporting this finding must also be submitted.

[] Manufactured homes located in a Flood Hazard Area must have a West Virginia Contractor's License and a Manufactured Home Installation License as required by the Federal Emergency Management Agency (FEMA).

[] Other:_____

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

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

SIGNED_____DATE_____

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

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

CONDITIONS:_____
_____
_____

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

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

COMPLETE 1 OR 2 BELOW:

1 Actual (As-Built) Elevation of the top of the lowest floor (including basement or crawl space is _____FT. NGVD.

2 Actual (As Built) elevation of floodproofing is _____FT. NGVD.

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

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

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

INSPECTIONS:

DATE:_____ **BY:**_____

DEFICIENCIES ? **Y/N**

COMMENTS_____

_____

_____

_____

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

Certificate of Compliance issued: DATE:_____ BY:_____

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

PERMIT NUMBER:_____
PERMIT DATE:_____

PURPOSE –

CONSTRUCTION LOCATION:_____

OWNER'S ADDRESS:_____
_____
_____

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

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

SIGNED_____**DATE**_____

Well Pad Location

Area of Investigation

West Union Tax District, Doddridge County, WV
West Union, WV 7.5' USGS Topographic Quadrangle

10/24/2014

Noble Energy, Inc

OXF 98 Well Pad

Figure 1 - Topographic Basemap

Project Number: 093842024

N W E S

0 1,000 2,000 Feet

1 inch = 2,000 feet

noble energy

RETTEW

W:\GIS_Projects\093841\093842024\MapDocs\NS Mapping\USFWS Sumission\093842024_OXF98_Well_Pad_Topo_8.5x11_20141022.mxd

FLOODPLAIN STUDY

OXF 98 WELL PAD

West Union Tax District, Doddridge County,
West Virginia

Owner/Operator:

noble energy

Noble Energy, Inc.
333 Technology Drive, Suite 116
Canonsburg, PA 15317

Published:
January 2015

Prepared By:

RETTEW

RETTEW Associates, Inc.
One Robinson Plaza
6600 Steubenville Pike, Suite 200
Pittsburgh, PA 15205

RETTEW Project Number: 093842024

TABLE OF CONTENTS

APPENDICES

Introduction

Construction and development of the OXF 98 well pad with access from the east will require a crossing of a perennial stream (Left Fork Arnold Creek) in West Union District, Doddridge County, West Virginia. Access to the pad will be from CR 11/4 and will utilize an existing gravel road with some upgrades for the initial portion of the access. The existing gravel road crosses Left Fork Arnold Creek approximately 450 feet from CR 11/4 via a gravel ford. RETTEW has completed Hydrologic and Hydraulic Analysis to determine a potential crossing geometry and the resulting impact to 100-yr flood elevations in the area in anticipation of obtaining approval in accordance with the Doddridge County Floodplain Ordinance. Left Fork Arnold's Creek in the project area is mapped on FEMA FIRM Panel 0120C (see Appendix A). The proposed crossing location is within a FEMA Zone A defined as a 100-year flood event area, however a detailed analysis with Base Flood Elevations or flood depths has not be performed previously by FEMA.

Hydrologic Analysis

The contributing drainage area to the proposed crossing location was determine from the USGS West Union, WV Quadrangle Map as 2,878.7 acres (4.5 square miles) (see Appendix B). Peak discharge flows were determined utilizing regression equations that have been developed for West Virginia and described in USGS Scientific Investigations Report 2010-5033 (Estimation of Flood-Frequency Discharges for Rural, Unregulated Streams in West Virginia), prepared in cooperation with the West Virginia Division of Highways. Specifically, equations developed for the Western Plateaus Region, which includes Doddridge County, were utilized (see Appendix B).

A summary of the peak discharge values are presented in the following table:

Peak Discharge Table		
Percent Annual Chance Flood	Equivalent Storm Event in Years	Peak Discharge (cfs)
90%	1.1-Year	179
50%	2-Year	387
10%	10-Year	835
4%	25-Year	1,100
1%*	100-Year	1,535

*Design storm

Hydraulic Analysis

To address the impact of the proposed crossing construction, hydraulic computations were completed for existing and proposed conditions using the U.S. Army Corps' of Engineers Hydraulic Engineering Center *River Analysis System Software* (HEC-RAS) version 4.1.0. Using the 100-yr peak discharge flow in conjunction with cross-sections based on existing topography, and horizontal and vertical geometry of the proposed crossing, existing and proposed water surface elevations and velocities for Left Fork Arnold Creek were determined.

The existing model was created using the LiDAR topography supplemented with field topography in the vicinity of the stream and crossing. Cross-sections were taken at the upstream and downstream ends of the crossing and at other locations upstream and downstream within the limits of the project area. There is no existing structure at the proposed crossing location. The existing model was then copied to create a proposed model which includes a proposed crossing. The total structure depth and top of roadway elevations were modelled appropriately to accurately represent the area of flow blockage.
Left Fork Arnold Creek in the project area is located within a relatively flat bottomed valley with steep sides. Given the large peak discharge values, flooding during the 100-yr event is anticipated to impact the approaches to the crossing location and potentially CR 11/4. The stream in the vicinity of the crossing is approximately 20 feet wide with a depth of approximately 2 feet. The flat approaches to the crossing location and need to limit the impact to 100-yr flood elevations dictates a low rise/long span crossing. The proposed structure would also preferably have an open bottom or the ability to re-establish existing bed material in the bottom to minimize permanent stream impacts for permitting purposes.

Two 10-foot by 4-foot concrete box culverts were modelled placed side by side at the crossing location to allow for a 2-foot high by 20-foot wide opening after countersinking the culverts below the existing stream bed and then re-establishing bed material at the crossing location. This crossing configuration raises the 100-yr flood elevation to less than 1-foot at the cross section immediately upstream of the box culverts, then returns to existing water surface elevations further upstream so as not to affect upstream properties. This crossing configuration will pass the 1.1-yr storm without flooding the roadway surface at the crossing or the approach causeways.

A summary table is provided below. Detailed reports can be found in Appendices C and D.

CROSS SECTION WATER SURFACE ELEVATION SUMMARY				
Cross Section	Pk 100-yr Flow (cfs)	Exist Cond WSE	Prop Cond WSE	Change in WSE
0+01.91	1,535	844.69	844.69	0.00
0+99.09	1,535	845.31	845.31	0.00
1+87.48	1,535	845.50	845.52	0.02
2+52.81	1,535	846.08	846.00	-0.08
3+74.41	1,535	846.35	847.18	0.83
4+16.48	1,535	847.10	847.80	0.70
5+56.91	1,535	847.87	848.36	0.49
7+17.16	1,535	848.10	848.49	0.39
9+01.87	1,535	849.14	849.21	0.07
10+64.40	1,535	849.55	849.59	0.04
11+89.88	1,535	849.25	849.26	0.01
13+28.74	1,535	850.90	850.90	0.00

APPENDIX A
FLOOD INSURANCE RATE MAPPING

MAP SCALE 1" = 1000'

500 0 1000 2000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0120C

FIRM

FLOOD INSURANCE RATE MAP

DODDRIDGE COUNTY, WEST VIRGINIA AND INCORPORATED AREAS

PANEL 120 OF 325

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0120	C
WEST UNION, TOWN OF	540025	0120	C

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

MAP NUMBER
54017C0120C

MAP REVISED
OCTOBER 4, 2011

Federal Emergency Management Agency

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

JOINS PANEL 0225

APPENDIX B
FLOW CALCULATIONS

PERENNIAL STREAM CROSSING
DRAINAGE AREA

OXF 98 WELL PAD

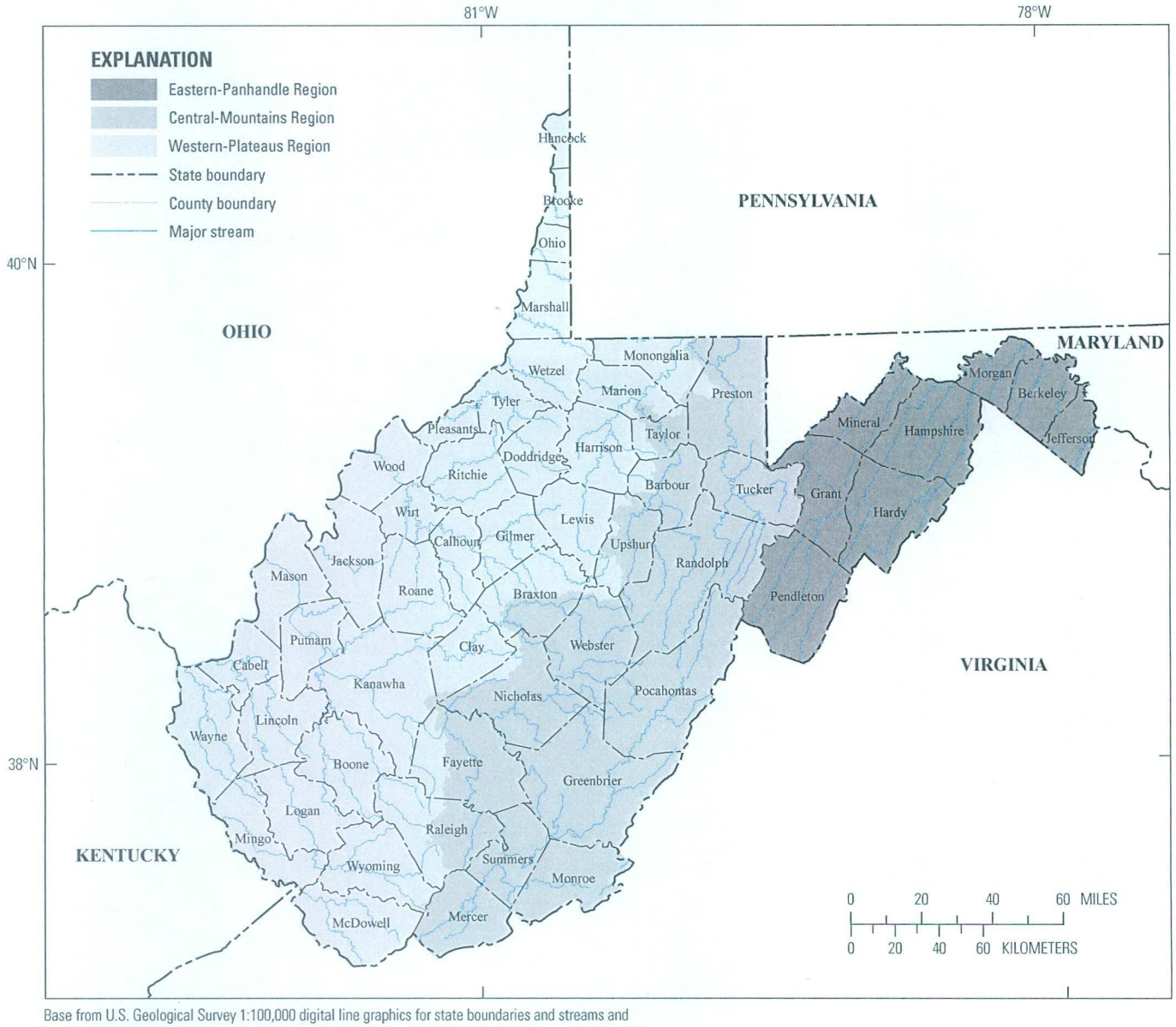
WEST UNION DISTRICT DODDRIDGE COUNTY, WV

RETTEW

RETTEW Associates, Inc.
One Robinson Plaza, 6600 Steubenville Pike, Suite 200, Pittsburgh, PA 15205
Phone (412) 446-1728 · Fax (412) 446-1733

Engineers • Planners • Surveyors • Landscape Architects
Environmental Consultants

DRAWN BY: ASN
DATE: 6/23/14
SCALE: 1"=1500'
DWG. NO. 093842024



Base from U.S. Geological Survey 1:100,000 digital line graphics for state boundaries and streams and from the West Virginia Department of Environmental Protection 1:24,000 digital data for county boundaries. Universal Transverse Mercator projection, zone 17, NAD 83.

Figure 4. The Eastern Panhandle, Central Mountains, and Western Plateaus Regions of West Virginia for which equations for estimation of flood frequency discharges were developed in this study.

Table 4. Equations used to estimate selected flood-frequency discharges for streams in the Eastern Panhandle, Central Mountains, and Western Plateaus Regions of West Virginia.

[PK(n_n), peak discharge in cubic feet per second for the (n.n)-year recurrence interval; PK(n), peak discharge in cubic feet per second for the (n)-year recurrence interval; %, percent; AOP, annual-occurrence probability; DRNAREA, drainage area in square miles]

Equation	Standard error of the model, in percent	Average standard error of sampling, in percent	Average prediction error, in percent	Equivalent years of record, unitless
Eastern Panhandle Region (Range in DRNAREA from 0.21 to 1,461 for 57 streamgage stations)				
PK1_1(90%AOP) = 29.6 DRNAREA $^{0.818}$	43.4	10.3	44.8	3.4
PK1_5(67%AOP) = 46.4 DRNAREA $^{0.828}$	35.7	8.9	36.9	3.3
PK2(50%AOP) = 59.8 DRNAREA $^{0.832}$	32.1	8.6	33.4	4.1
PK5(20%AOP) = 105 DRNAREA $^{0.838}$	25.6	8.9	27.2	10.6
PK10(10%AOP) = 145 DRNAREA $^{0.842}$	22.5	9.5	24.5	19.1
PK25(4%AOP) = 204 DRNAREA $^{0.848}$	19.7	10.3	22.4	34.1
PK50(2%AOP) = 254 DRNAREA $^{0.852}$	18.6	11.1	21.7	46.1
PK100(1%AOP) = 307 DRNAREA $^{0.855}$	18.3	11.6	21.7	56.7
PK200(0.5%AOP) = 365 DRNAREA $^{0.859}$	18.4	12.4	22.4	64.7
PK500(0.2%AOP) = 447 DRNAREA $^{0.864}$	19.4	13.5	23.8	70.9
Central Mountains Region (Range in DRNAREA from 0.10 to 1,619 for 83 streamgage stations)				
PK1_1(90%AOP) = 33.4 DRNAREA $^{0.914}$	40.0	8.3	41.0	2.4
PK1_5(67%AOP) = 53.8 DRNAREA $^{0.887}$	34.6	7.3	35.4	2.0
PK2(50%AOP) = 69.4 DRNAREA $^{0.873}$	33.4	7.3	34.2	2.1
PK5(20%AOP) = 116 DRNAREA $^{0.845}$	34.1	8.0	35.1	3.2
PK10(10%AOP) = 153 DRNAREA $^{0.831}$	36.3	8.6	37.4	4.0
PK25(4%AOP) = 206 DRNAREA $^{0.816}$	39.9	9.8	41.2	4.8
PK50(2%AOP) = 250 DRNAREA $^{0.807}$	42.9	10.6	44.4	5.3
PK100(1%AOP) = 297 DRNAREA $^{0.800}$	46.2	11.3	47.9	5.6
PK200(0.5%AOP) = 347 DRNAREA $^{0.793}$	49.7	12.0	51.5	5.9
PK500(0.2%AOP) = 420 DRNAREA $^{0.785}$	54.3	13.1	56.3	6.1
Western Plateaus Region (Range in DRNAREA from 0.13 to 1,516 for 106 streamgage stations)				
PK1_1(90%AOP) = 56.9 DRNAREA $^{0.763}$	38.2	7.6	39.1	3.8
PK1_5(67%AOP) = 97.8 DRNAREA $^{0.741}$	33.4	6.5	34.1	2.8
PK2(50%AOP) = 129 DRNAREA $^{0.730}$	31.6	6.1	32.2	2.8
PK5(20%AOP) = 221 DRNAREA $^{0.710}$	29.3	6.5	30.0	4.4
PK10(10%AOP) = 292 DRNAREA $^{0.699}$	28.9	6.5	29.7	5.9
PK25(4%AOP) = 391 DRNAREA $^{0.688}$	29.4	7.3	30.3	7.9
PK50(2%AOP) = 472 DRNAREA $^{0.681}$	30.2	7.6	31.3	9.1
PK100(1%AOP) = 557 DRNAREA $^{0.674}$	31.4	8.0	32.5	10.1
PK200(0.5%AOP) = 647 DRNAREA $^{0.668}$	32.7	8.3	33.9	10.8
PK500(0.2%AOP) = 775 DRNAREA $^{0.661}$	34.8	8.9	36.1	11.4

2,878.7 ac drain area = 4.498 sqmi
557*(4.498)^0.674 = 1,535 cfs

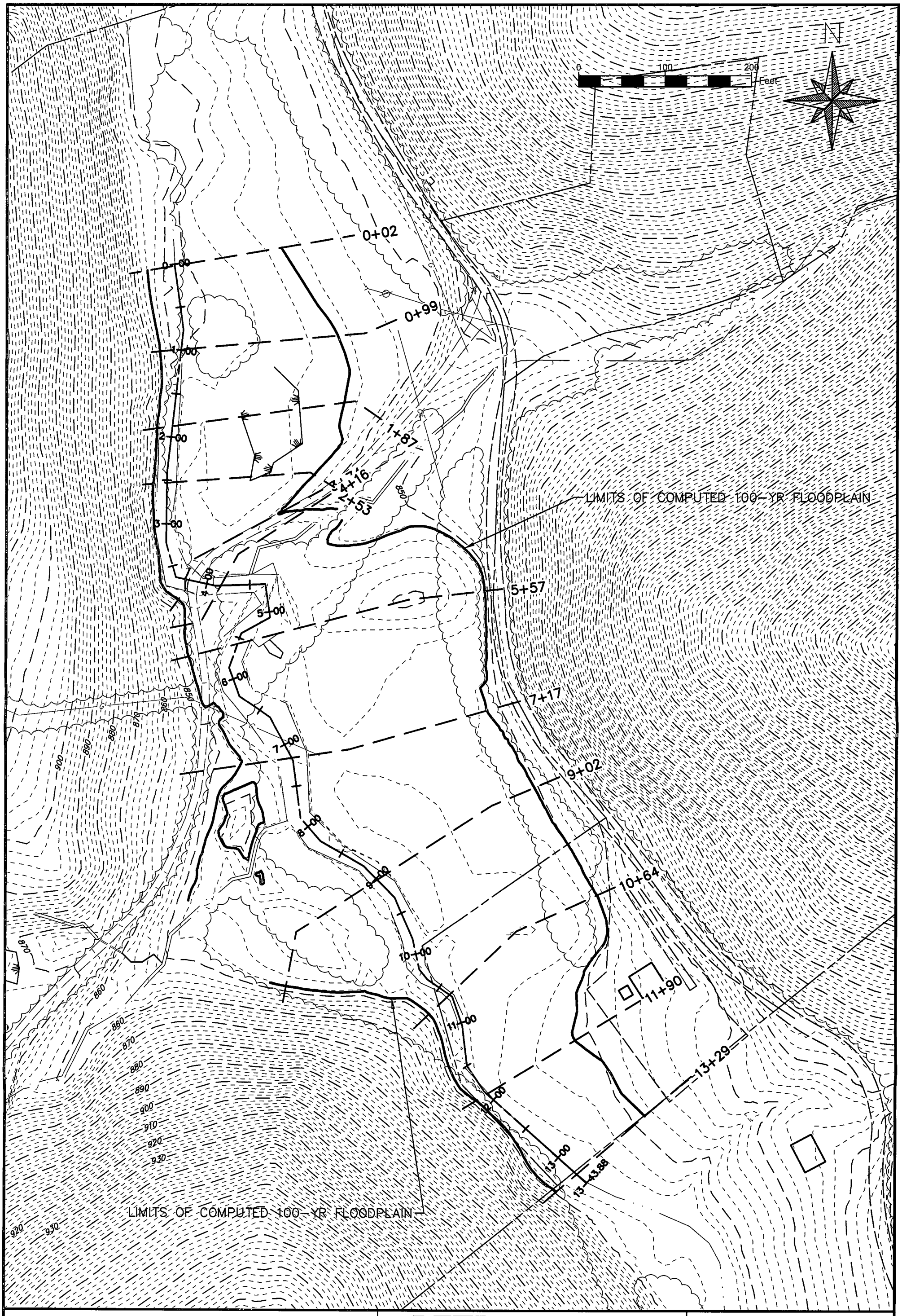
292*(4.498)^0.699 = 835 cfs

129*(4.498)^0.730 = 387 cfs

56.9*(4.498)^0.763 = 179 cfs

APPENDIX C
HEC-RAS EXISTING CONDITIONS ANALYSIS

C:\RETTEW PROJECTS\093842024-OXF 98\MODELS\093842024-LD-FLOOD STUDY-EXIST-REV.DWG



FLOODPLAIN ANALYSIS – EXISTING CONDITIONS

OXF 98 WELL PAD

WEST UNION DISTRICT

DODDRIDGE COUNTY, WV

RETTEW

RETTEW Associates, Inc.
One Robinson Plaza, 6600 Steubenville Pike, Suite 200, Pittsburgh, PA 15205
Phone (412) 446-1728 · Fax (412) 446-1733
Engineers · Planners · Surveyors · Landscape Architects
Environmental Consultants

DRAWN BY: KP

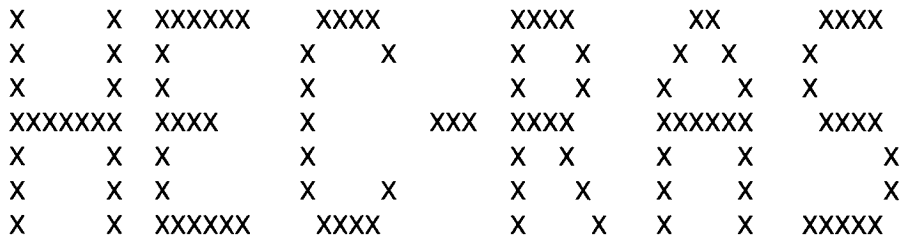
DATE: 01/08/15

SCALE: 1"=100'

DWG. NO. 093842024

ExistingCondition.rep

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



PROJECT DATA
Project Title: Existing Conditions
Project File : ExistingCondition.prj
Run Date and Time: 1/6/2015 3:26:02 PM

Project in English units

PLAN DATA

Plan Title: Existing Conditions
Plan File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ExistingCondition.p01

Geometry Title: Left Fork Arnolds Creek
Geometry File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ExistingCondition.g01

Flow Title : Left Fork Arnolds Creek
Flow File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ExistingCondition.f01

Plan Summary Information:

Number of:	Cross Sections	= 12	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

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

FLOW DATA

Flow Title: Left Fork Arnolds Creek
Flow File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ExistingCondition.f01

Flow Data (cfs)

River	Reach	RS	1.1 yr	2 yr	10 yr	100 yr
Left Fork Arnold	Left Fork Arnold	1328.74	179	387	835	1535

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Left Fork Arnold	Left Fork Arnold	1.1 yr	Normal S = 0.005	

GEOMETRY DATA

Geometry Title: Left Fork Arnolds Creek

Geometry File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ExistingCondition.g01

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 1328.74

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	858.98	.52	858.63	4.37	856.28	11.05	852.52	17.49	849.84
21.45	848.41	25.94	847.3	30.61	846.33	32	846.083	35.4	845.48
40.84	844.83	42.38	844.7	43.74	844.64	49.35	844.4	49.82	844.4
55.74	844.44	63.31	844.55	65	844.634	69.98	844.88	70.28	844.89
70.35	844.9	77.26	845.37	80.67	845.71	133.96	849.72	145.69	850.58
146.24	850.61	148.7	850.82	150.19	850.96	179.67	853.41	193.53	854.47
212.93	855.97	222.98	856.66						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	32	.045	65	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
32	65	138.86	138.86	138.86	.1	.3

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 1189.88

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	858.19	.75	857.84	1.07	857.67	2.14	856.98	12.9	850.01
19.21	846.58	22	845.394	22.48	845.19	24.54	844.89	32.99	844.62
33.64	844.59	36.18	844.37	37.02	844.43	37.67	844.51	43.38	845.05
48	845.496	56.13	846.28	58.18	846.44	59.46	846.52	63.09	846.63
65.32	846.7	91.56	847.79	93.87	847.88	95	847.91	96.66	847.96
135.45	848.8	141.01	849.02	161	849.68	175.86	850.2	182.37	850.52
204.06	851.75	209.11	852.14	217.44	852.67	240.09	853.99		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0      .1      22    .045      48      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            22      48           125.48  125.48  125.48             .1       .3

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 1064.4

INPUT
Description:
Station Elevation Data    num=      43
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  855.44     .35  855.36   12.57  852.03   14.12  851.59   25.07  847.97
   27.88  847.02   33.46  845.02   39.16  843.87   40.42  843.59      41  843.59
   41.64  843.59   56.52  843.67   58.64  843.68   69.17  843.97      73 844.128
   74.01  844.17    85.4  844.33   95.53  844.33   99.86   844.3  119.22  844.26
  126.62  844.36  160.49  843.96  162.52  843.98  168.26  843.98  172.67  843.94
  176.51  844.03  182.24  844.05  192.16   844.2  202.55  844.44  210.42   844.6
  214.95  844.84  222.85  845.44  234.61  846.44  247.48  847.66  261.64   849.6
  262.43   849.7  263.46  849.97  273.47  852.63  275.64  853.28  284.33  855.87
  284.54  855.92  284.99  856.01  287.29  856.45

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      41    .045      73      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            41      73           162.53  162.53  162.53             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  126.62  287.29  844.36       T
Right Levee     Station=  126.62      Elevation=  844.36

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 901.87

INPUT
Description:
Station Elevation Data    num=      59
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   854.6     .25   854.5    6.29  852.32   10.24  850.86   13.04     850
   20.23  847.86   29.35  846.16   30.22  845.99   38.62  845.11   42.46  844.73
```

50.2	844.06	54.52	843.81	60.19	843.44	64.2	843.3	70.18	843.3
74.63	843.32	82.13	843.24	85.68	843.16	95.09	843.04	107.37	843.17
109.98	843.61	121.76	845.96	123.23	846.22	123.36	846.24	130.1	847.2
154.31	847.11	168.32	846.35	178	845.532	179	845.448	180	845.363
180.27	845.34	181.61	844.76	184.22	843.71	193.22	843.56	199.18	843.47
207	843.26	207.39	843.25	208.19	845.04	209.28	847.11	210	847.119
211	847.132	220.97	847.26	232.71	847.69	244.88	845.98	253.15	844.82
260.18	845.01	273.01	845.38	295.9	846.02	315.8	846.5	351.15	847.49
358.16	847.68	392.5	848.57	394.14	848.64	396.91	848.7	403.36	849.43
408.86	850.04	410.14	850.21	434.27	854.4	435.56	854.64		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	179	.045	210	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
179	210	184.71	184.71	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	130.1	847.2	T
232.71	435.56	847.69	T

Left Levee Station= 130.1 Elevation= 847.2
Right Levee Station= 232.71 Elevation= 847.69

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 717.16

INPUT
Description:
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854.58	15.22	852.23	18.97	851.71	19.12	851.68	19.27	851.56
27.38	851.67	27.6	851.69	27.98	851.62	28.64	851.52	29.33	851.39
31.52	851.01	35.12	850.37	35.58	850.33	36.79	850.22	38.26	850.07
44.55	849.32	74.7	847.79	84.3	846.12	104	845.248	104.47	845.26
105.25	845.03	109.06	843.58	130.19	844.05	132.78	844.11	147.9	844.31
150	846.117	150.55	846.59	150.67	846.71	151.69	846.7	156.21	846.66
159.26	846.62	185.17	846.27	190.84	846.26	191.88	846.24	197.62	846.33
197.82	846.33	209.83	846.48	210.81	846.5	211.54	846.5	215.38	846.54
262.22	846.93	285.35	847.01	296.14	847.19	340.43	847.78	367.42	848.23
368.09	848.3	369.26	848.47	371.91	848.93	380.83	850.12	385.59	851.41
392.98	852.87	395.87	853.21	401.26	854.3	403.07	854.57		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0      .1     104    .045     150      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           104     150           160.25  160.25  160.25             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  150.67  403.07  846.71       T
Right Levee     Station=  150.67      Elevation=  846.71

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 556.91

INPUT
Description:
Station Elevation Data    num=      71
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  853.67    4.37  852.11    6.49  849.85    7.44  849.67    8.83   849.4
   26.91  845.86   29.91  845.27   31.71  844.92   31.84   844.9   31.95   844.9
   39.73  844.93   39.97  844.93   41.58  845.01      52 843.161   52.06  843.15
    63.3  841.64   64.74  842.26      65 842.276   78.38  843.11   88.34  843.73
   93.58  842.87   97.16  843.43      98  844.82  111.86  844.72     112 844.723
  122.71  844.98  147.16  845.61  152.37  846.04  164.15  844.67  170.85  843.94
   172.4  843.79  175.74  843.79  184.59   843.8     194  843.68  202.34  843.05
  217.79  842.36   222.5  842.16  237.61  841.15   238.2  841.12  239.76  841.04
   248.4   840.7  251.64  840.54  258.61  840.25  265.68  839.95  268.81  839.87
  277.18  839.63  278.63  839.62  279.02  839.63  279.71  839.62  281.94  839.66
  295.87   839.9  298.96  839.93  304.65  840.23  308.89  840.35  314.41  840.73
  318.82  841.04  325.85  841.66  328.75  841.92  330.98  842.17  338.68  843.01
  347.98  843.75  348.61   843.8  357.32  845.15  358.54  845.34  360.14  845.72
  368.47  847.64  374.87  850.28   378.4  851.78  385.85     854  391.17  855.41
  391.56  855.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      52    .045      98      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            52      98          140.43  140.43  140.43             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  152.37  391.56  846.04       T
Right Levee     Station=  152.37      Elevation=  846.04

CROSS SECTION
```

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 416.48

INPUT
Description:
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.72	1.32	850.41	22.48	844.87	26.26	844.4	30.16	844.38
30.75	844.51	32.63	844.35	34.51	844.33	35.54	844.39	44.13	844.57
51.37	844.66	59.85	844.32	68	843.005	69.77	842.72	71.66	841.7
82.63	841.65	85.1	841.63	93.21	841.25	97.7	842.37	97.77	843.96
98	843.987	113.55	845.81	124.22	845.73	128.24	845.72	143.47	845.79
147.47	845.4	148.05	845.41	151.84	845.41	159.85	845.35	163.75	845.43
183.31	845.82	193.27	846.02	196.12	846.18	197.41	846.2	197.44	846.2
198.91	846.28	199.77	846.29	200.43	846.36	200.97	846.34	240.47	848.51
241.59	848.59	242.24	848.58	242.34	848.6	242.5	848.59	243.42	848.67
243.77	848.69	244.29	848.69	244.48	848.68	244.63	848.69	245.58	848.75
251.76	849.01								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	68	.045	98	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
68	98	42.07	42.07	42.07	.1	.3

Left Levee Station= 51.37 Elevation= 844.66
Right Levee Station= 113.55 Elevation= 845.81

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 374.41

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.99	1.14	850.72	1.84	850.39	4.23	849.84	18.18	843.59
23.52	842.67	25	842.663	25.56	842.66	26.74	842.19	28.24	841.4
28.67	841.41	39.09	841.38	41.36	841.48	41.41	841.48	48.12	841.76
55.21	841.95	56.04	842.07	56.04	841.94	58.77	843.2	59	843.281
59.96	843.62	60.9	843.61	63.05	843.84	67.3	844.16	76.9	844.65
85.98	845.14	90.77	845.32	108.44	845.59	110.82	845.62	111.2	845.63
139.23	845.75	142.85	845.76	146.85	845.84	148.14	845.86	150.12	845.8
151.94	845.82	174.85	846.39	183.28	846.56	183.99	846.57	186.59	846.6
229.9	848.54	233.27	848.71	235.38	848.81				

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      25    .045      59      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            25      59             121.6   121.6   121.6             .1       .3

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 252.81

INPUT
Description:
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  852.09    2.19  850.81    7.73  847.66    9.47  846.83    9.92  846.36
      10 846.291   16.92  840.33   28.14  840.97   34.65  841.34   39.12  841.31
   39.82  841.72   43.95  844.06      44 844.061   50.66  844.19   63.64  844.31
   71.28  844.37   84.68  842.89   91.36  842.14   99.78  842.38  100.15  842.39
  100.41   842.4  100.67  842.41  101.26  842.42  150.25  843.52  150.97  843.53
  161.59  843.71  172.98  843.98  181.71  844.22  194.13  845.36  211.75  847.84
  219.54  849.21  222.57  849.37  226.88  849.55

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      10    .045      44      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            10      44             65.33   65.33   65.33             .1       .3
Right Levee     Station=   71.28      Elevation=  844.37

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 187.48

INPUT
Description:
Station Elevation Data    num=      31
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  852.88   10.14  848.38   12.78  847.41      13 847.145   17.96  841.17
    18.4  840.63   33.97  840.76   40.69  840.82      41  840.82   41.06  840.86
   42.34   841.9    42.9  842.34      43 842.351   43.09  842.36   51.19  843.38
   56.51  843.49   64.05  843.85   69.71     844   88.49  842.37   90.04  842.28
```

100.43	842.5	119.43	842.9	159.94	843.73	171.27	844.04	173.52	844.12
179.1	844.3	229.97	845.43	247.28	845.92	256.01	846.17	271.96	846.7
284.41	850.65								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	13	.045	43	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	43	88.39	88.39	.1	.3

Right Levee Station= 69.71 Elevation= 844

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 99.09

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	848.96	4.29	846.71	8.42	844.59	12	843.388	21.31	840.26
26.34	839.59	33.99	839.76	34.53	839.78	43.43	840.14	44	840.172
48.9	840.45	56.05	840.67	69.12	840.98	83.18	841.28	119.53	841.99
123.09	842.04	127.05	842.12	151.78	842.87	165.3	843.35	174.28	843.72
189.88	844.37	230.06	846.01	248.59	846.79	280.43	848.24	287.63	848.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	12	.045	44	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12	44	97.18	97.18	.1	.3

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 1.91

INPUT
Description:
Station Elevation Data num= 31

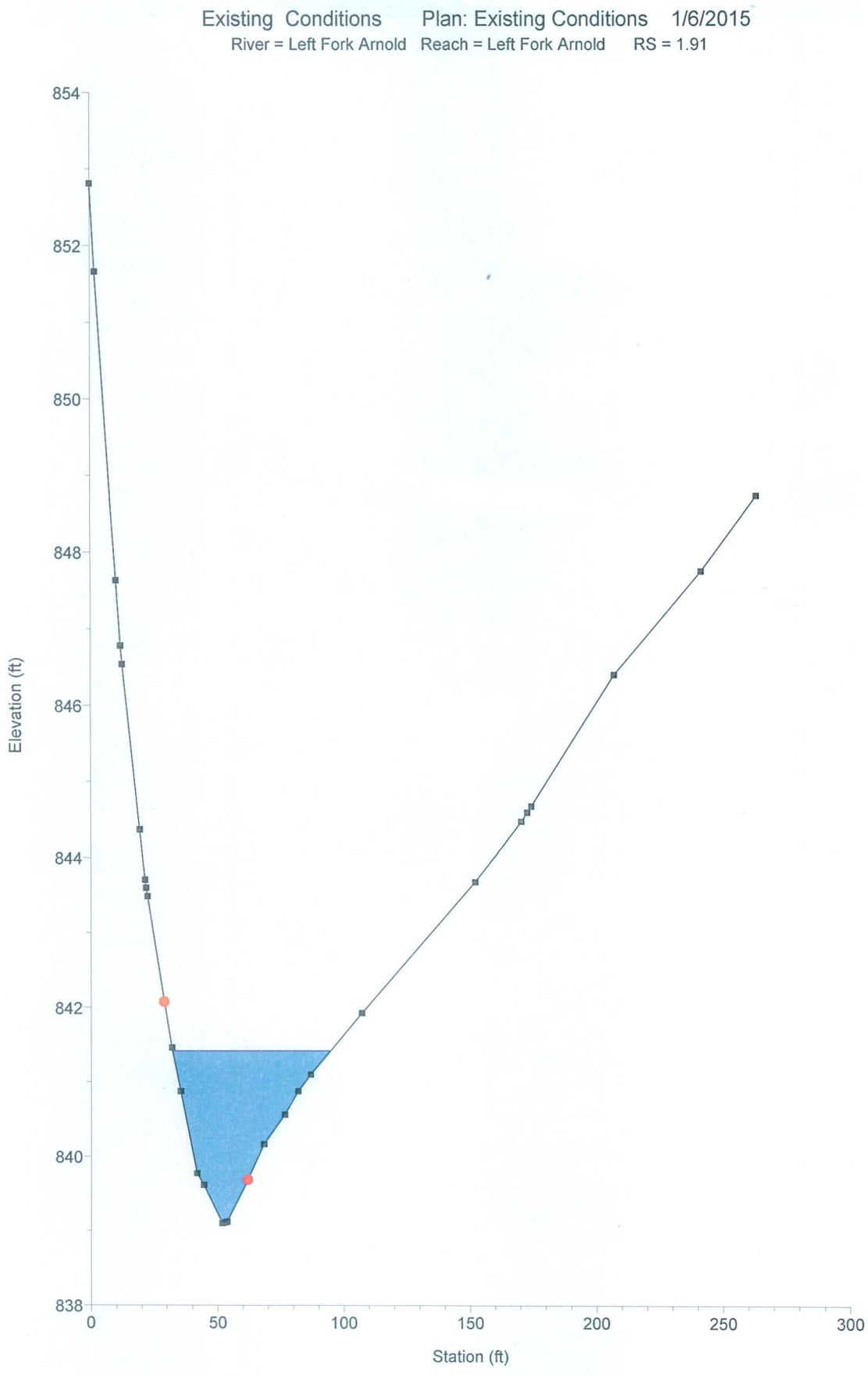
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.81	1.84	851.66	10.13	847.63	11.86	846.78	12.5	846.54
19.37	844.37	21.48	843.7	21.87	843.59	22.45	843.48	29	842.078
31.89	841.46	35.4	840.87	41.91	839.77	44.56	839.61	51.92	839.1

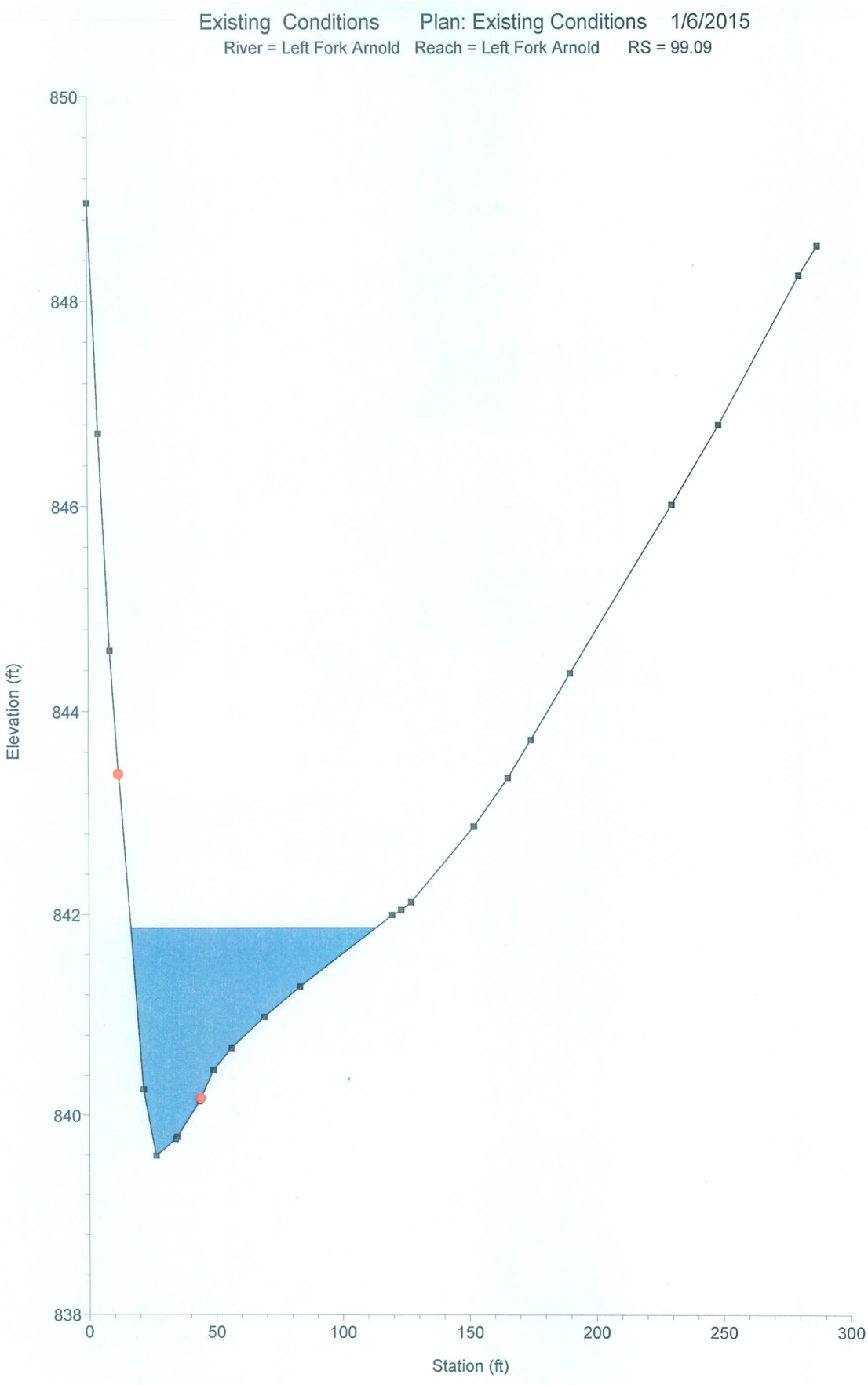
52.99	839.11	53.72	839.12	61.94	839.68	62	839.685	68.34	840.16
76.62	840.56	81.98	840.87	86.9	841.1	107.17	841.92	152.09	843.67
170.33	844.47	172.73	844.59	174.25	844.67	207.13	846.4	241.47	847.75
263.43	848.73								

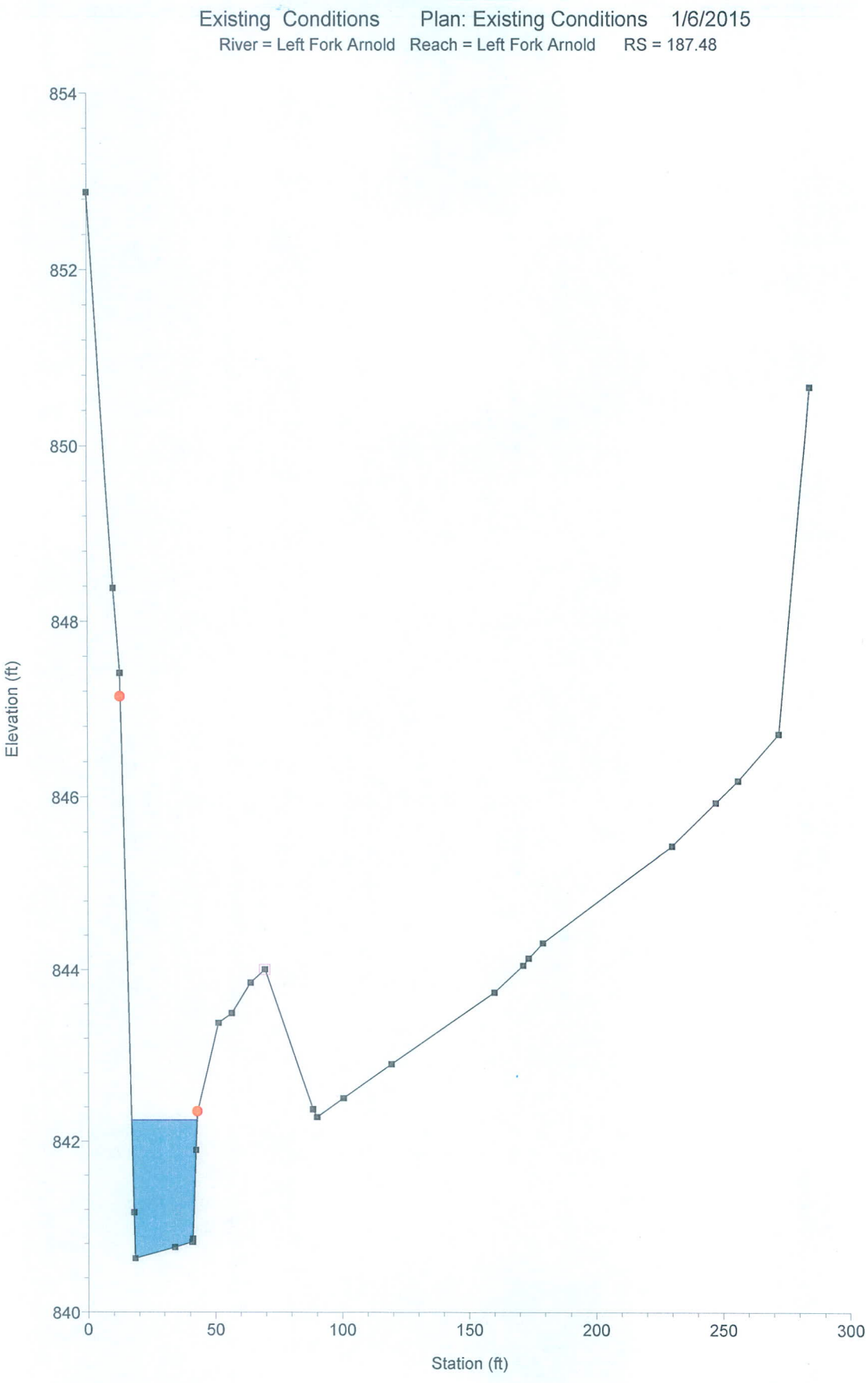
Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	29	.045	62	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
29	62	.1	.3


Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 1.91
Elevation (ft)
854
852
850
848
846
844
842
840
838
0
50
100
150
200
250
300
Station (ft)


Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 99.09
850
848
846
844
842
840
838
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)


Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 187.48
Elevation (ft)
Station (ft)
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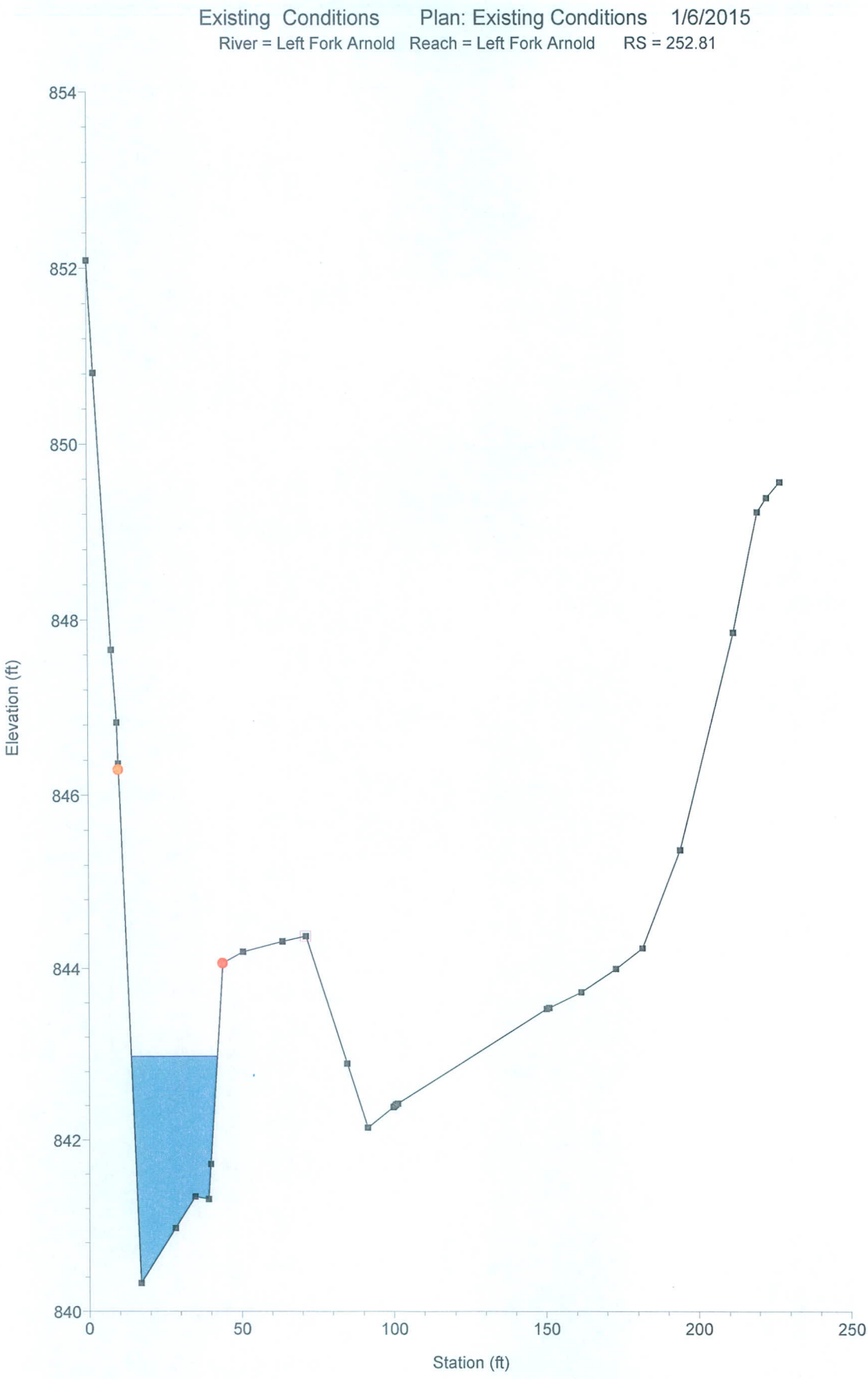
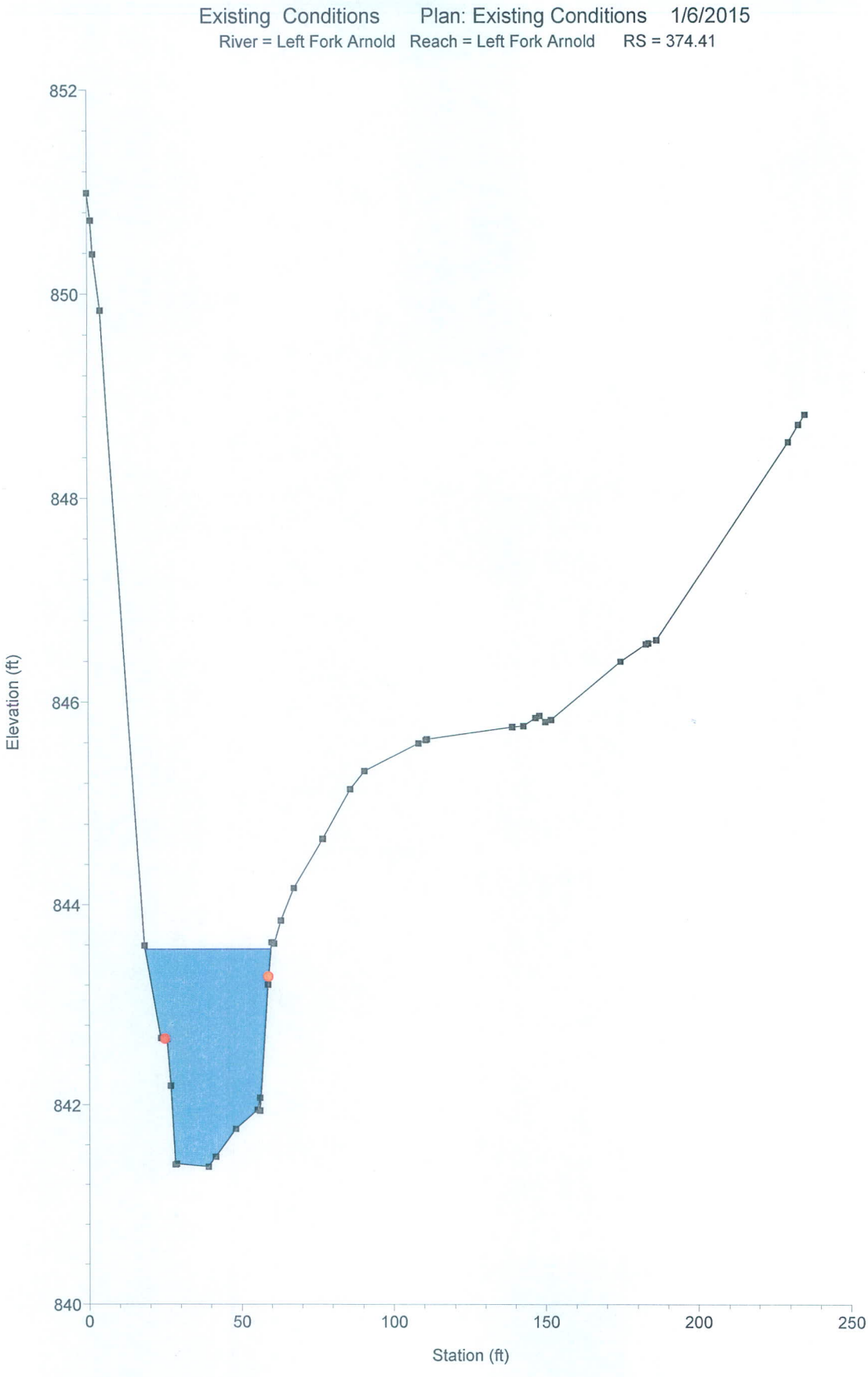
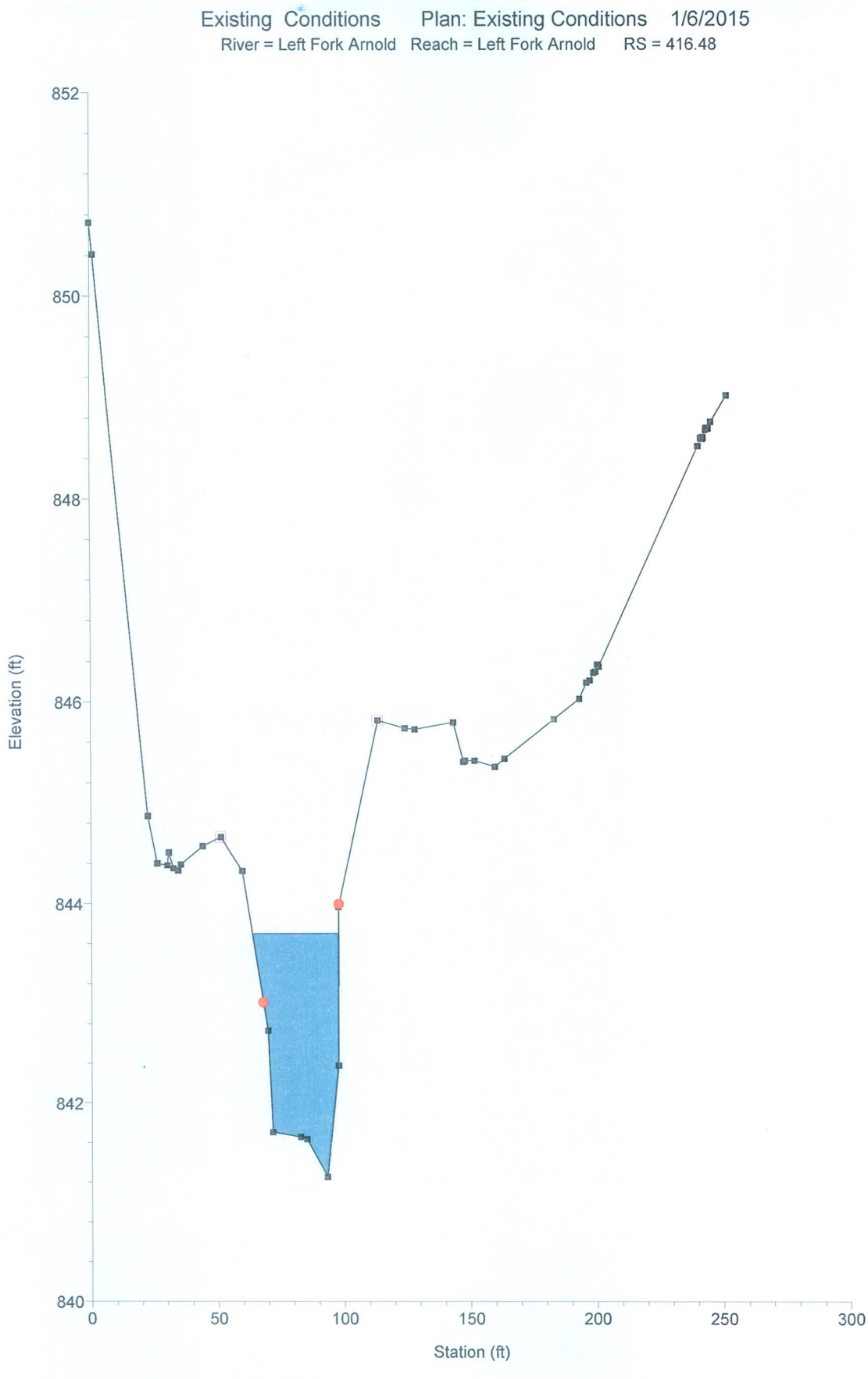
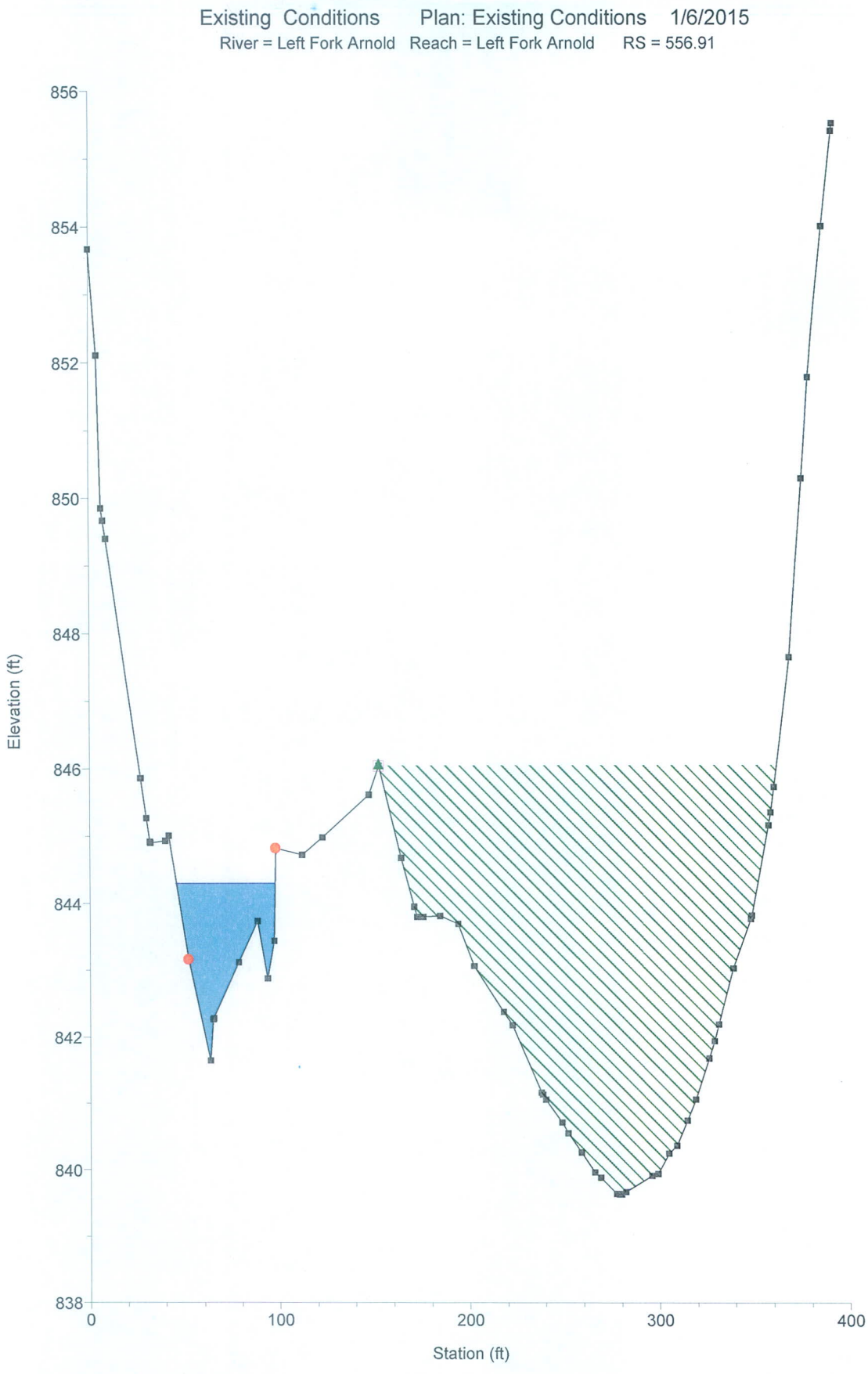
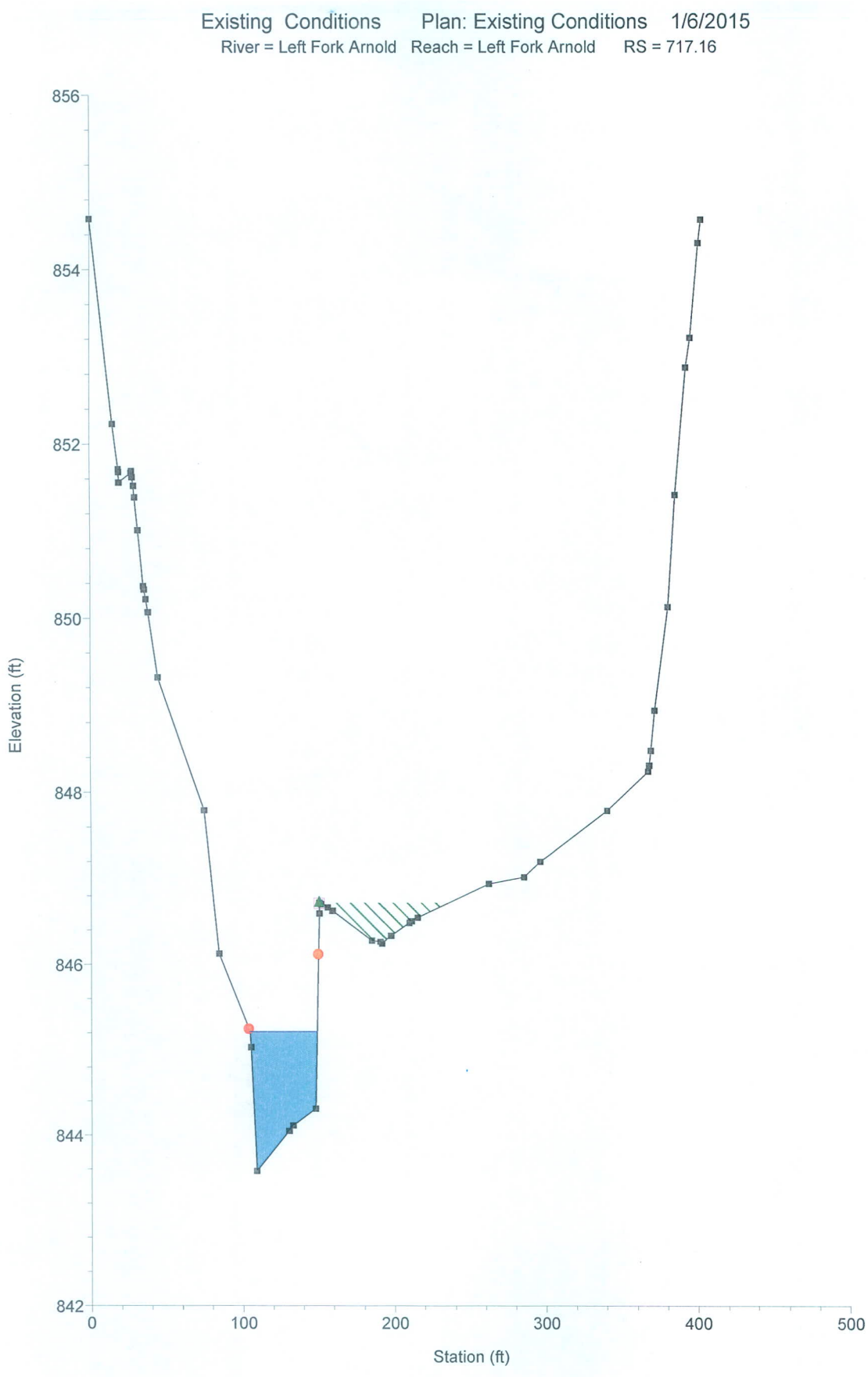
852
850
848
846
844
842
840
0
50
100
150
200
250
300

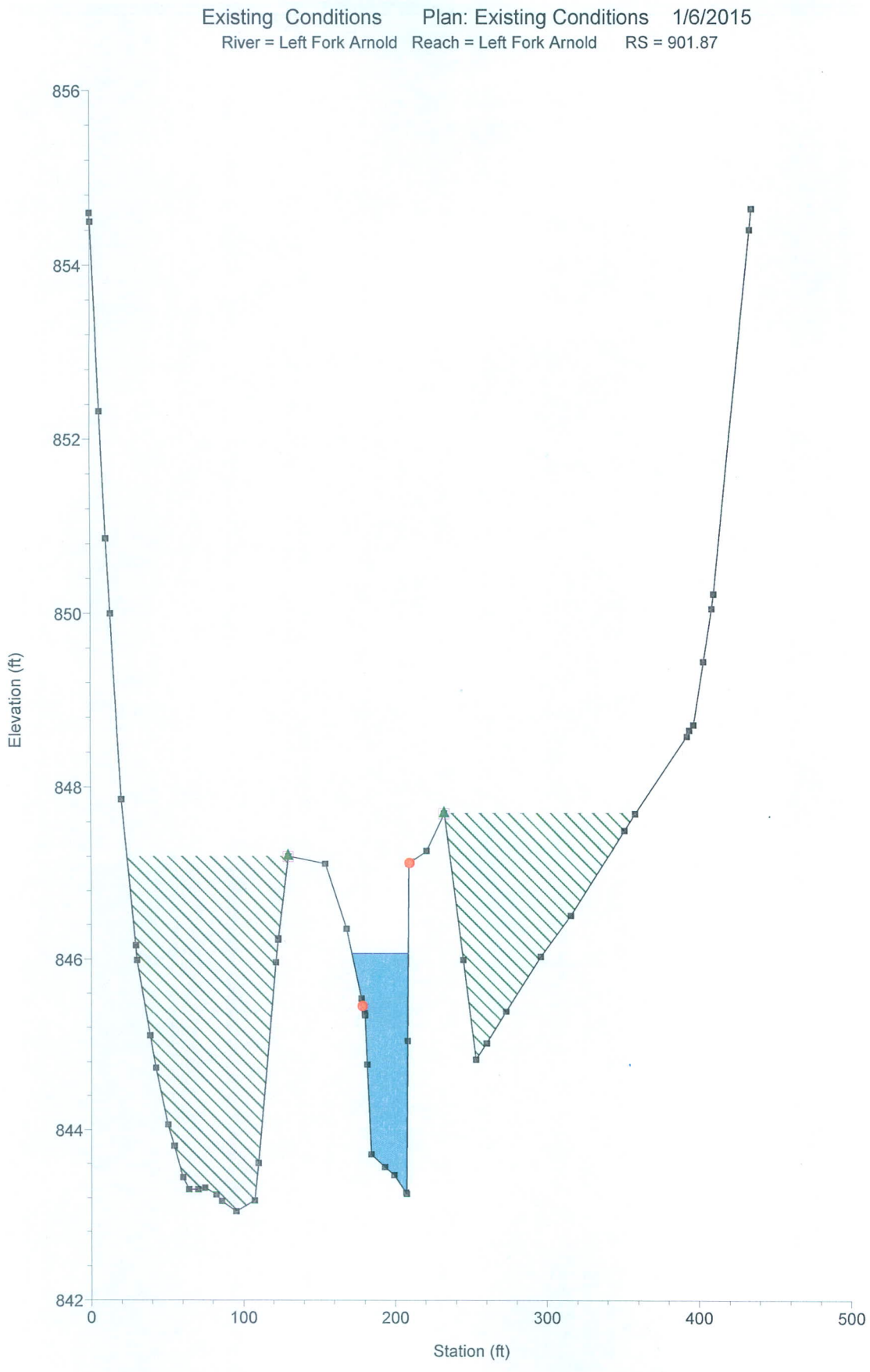

Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 252.81
Elevation (ft)
Station (ft)
854
852
850
848
846
844
842
840
0
50
100
150
200
250

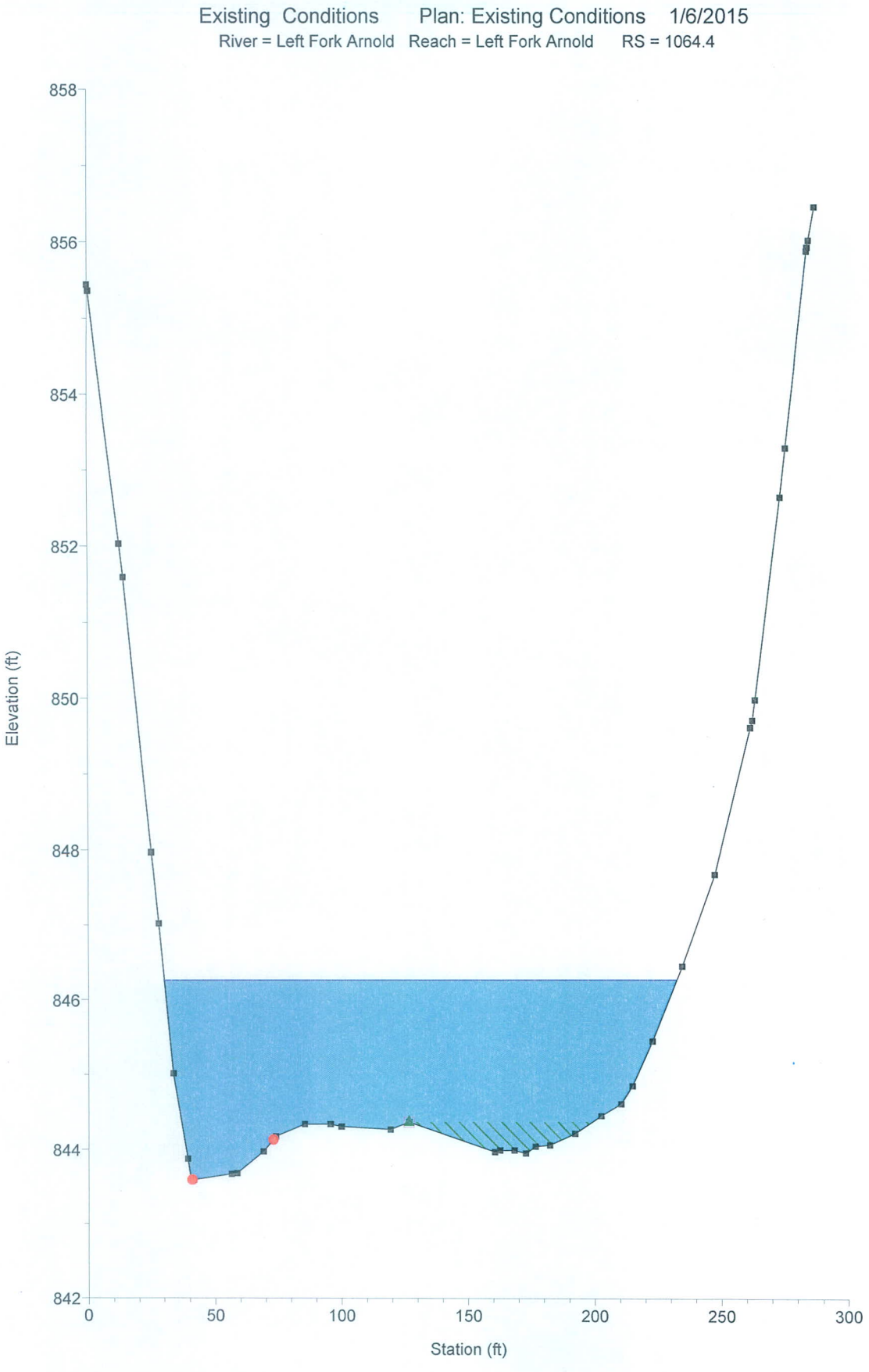

Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 374.41
852
850
848
846
844
842
840
Elevation (ft)
0
50
100
150
200
250
Station (ft)

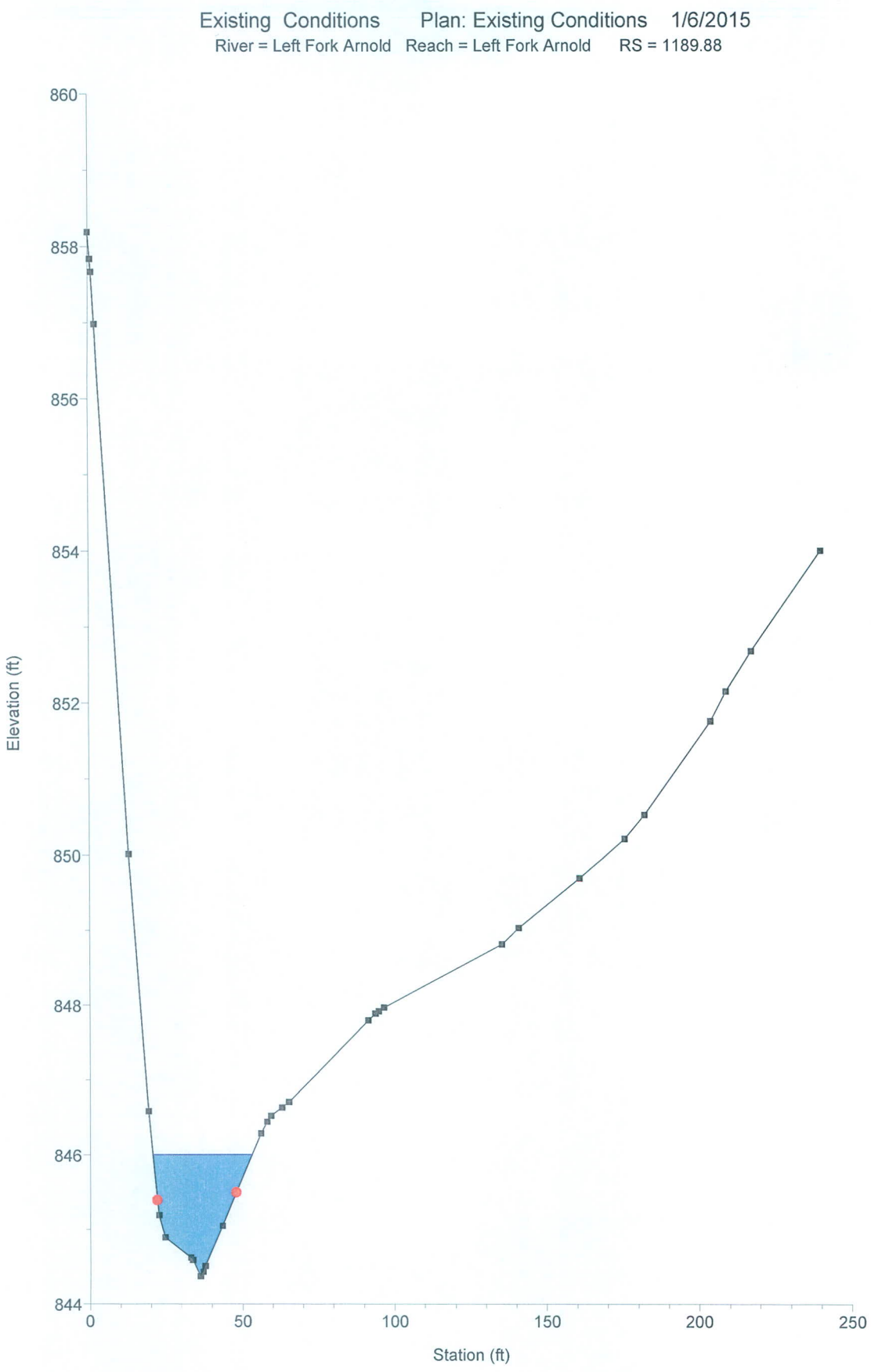

Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 416.48
Elevation (ft)
852
850
848
846
844
842
840
0
50
100
150
200
250
300
Station (ft)

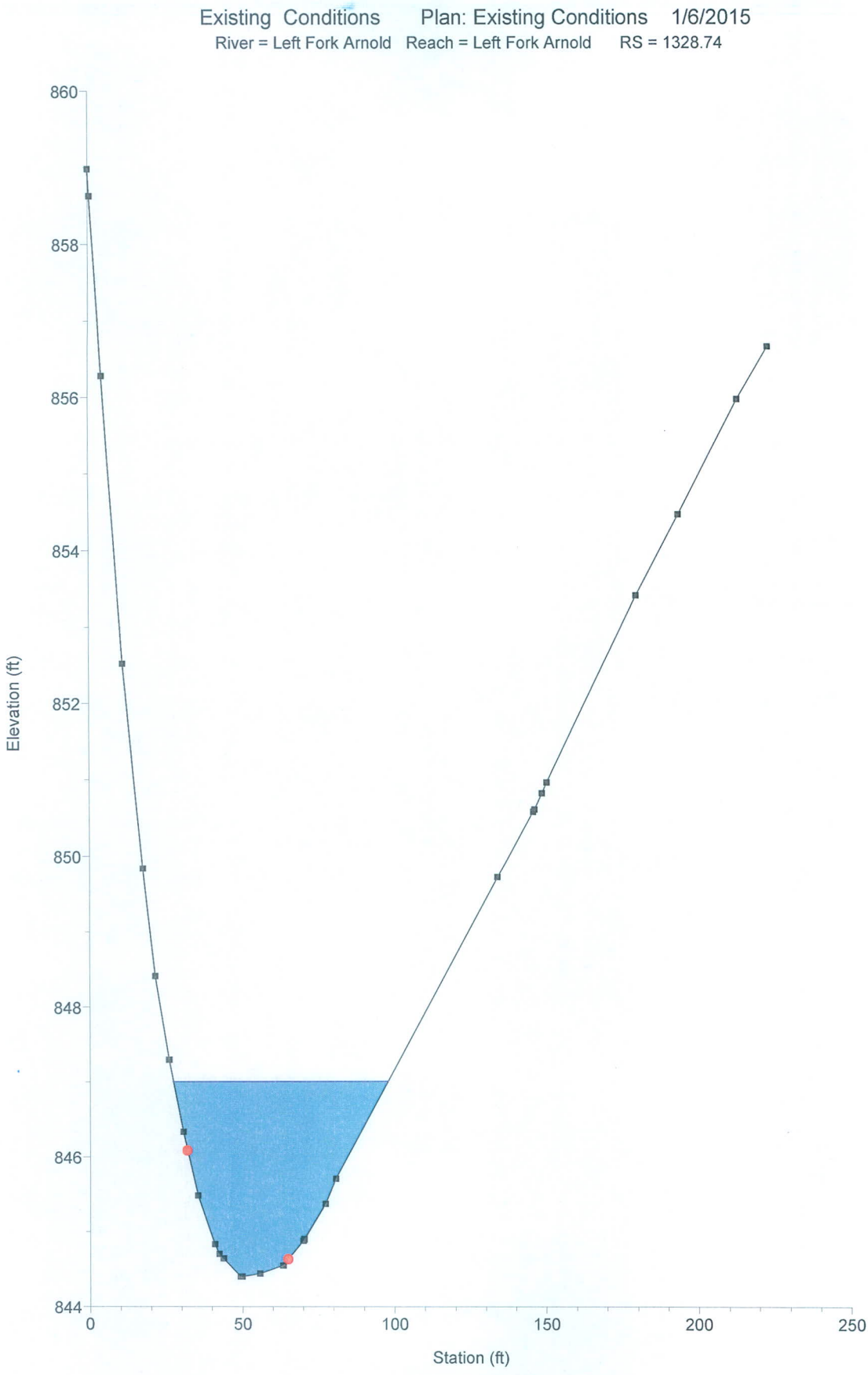

Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 556.91
Elevation (ft)
856
854
852
850
848
846
844
842
840
838
0
100
200
300
400
Station (ft)


Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 717.16
856
854
852
850
848
846
844
842
Elevation (ft)
0
100
200
300
400
500
Station (ft)

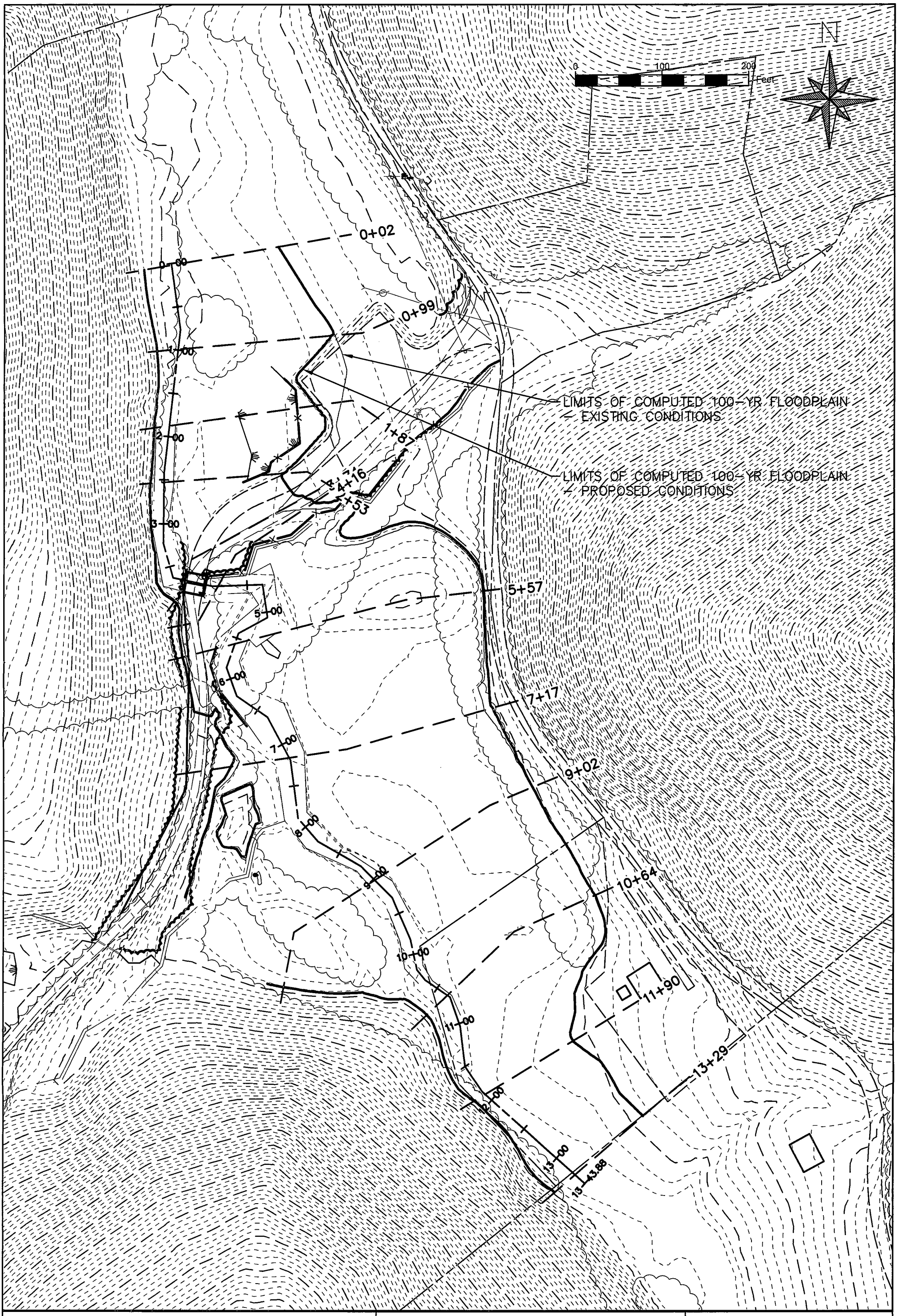

Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 901.87
Elevation (ft)
856
854
852
850
848
846
844
842
0
100
200
300
400
500
Station (ft)


Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 1064.4
Elevation (ft)
858
856
854
852
850
848
846
844
842
0
50
100
150
200
250
300
Station (ft)


Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 1189.88
Elevation (ft)
860
858
856
854
852
850
848
846
844
0
50
100
150
200
250
Station (ft)


Existing Conditions Plan: Existing Conditions 1/6/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 1328.74
Elevation (ft)
860
858
856
854
852
850
848
846
844
0
50
100
150
200
250
Station (ft)

APPENDIX D
HEC-RAS PROPOSED CONDITIONS ANALYSIS



FLOODPLAIN ANALYSIS – PROPOSED CONDITIONS

OXF 98 WELL PAD

WEST UNION DISTRICT

DODDRIDGE COUNTY, WV

RETTEW

RETTEW Associates, Inc.
One Robinson Plaza, 6600 Steubenville Pike, Suite 200, Pittsburgh, PA 15205
Phone (412) 446-1728 · Fax (412) 446-1733
Engineers · Planners · Surveyors · Landscape Architects
Environmental Consultants

DRAWN BY: KP

DATE: 01/08/15

SCALE: 1"=100'

DWG. NO. 093842024

ProposedConditions.rep

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

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

****

PROJECT DATA
Project Title: Proposed Conditions
Project File : ProposedConditions.prj
Run Date and Time: 1/7/2015 6:11:48 PM

Project in English units

****

PLAN DATA

Plan Title: Proposed Conditions
Plan File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ProposedConditions.p01

Geometry Title: Proposed Conditions
Geometry File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ProposedConditions.g01

Flow Title : Proposed Conditions
Flow File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ProposedConditions.f01

Plan Summary Information:

Number of:	Cross Sections	= 12	Multiple Openings	=	0
	Culverts	= 1	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

```
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

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


*****************************************************************************

FLOW DATA

Flow Title: Proposed Conditions
Flow File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS
Analysis\ProposedConditions.f01

Flow Data (cfs)
*****************************************************************************
************************
* River           Reach           RS      *          1.1 yr            2 yr
 10 yr          100 yr *
* Left Fork ArnoldLeft Fork Arnold1328.74 *             179             387
   835            1535 *
*****************************************************************************
************************

Boundary Conditions
*****************************************************************************
*******************
* River           Reach           Profile          *            Upstream
    Downstream    *
*****************************************************************************
*******************
* Left Fork ArnoldLeft Fork Arnold1.1 yr           *
 Normal S = 0.005 *
* Left Fork ArnoldLeft Fork Arnold2 yr             *
 Normal S = 0.005 *
* Left Fork ArnoldLeft Fork Arnold10 yr            *
 Normal S = 0.005 *
* Left Fork ArnoldLeft Fork Arnold100 yr           *
 Normal S = 0.005 *
*****************************************************************************
*******************
```

****

GEOMETRY DATA

Geometry Title: Proposed Conditions
Geometry File : C:\Rettew Projects\093842024\OXF Well Pad HEC-RAS Analysis\ProposedConditions.g01

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 1328.74

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	858.98	.52	858.63	4.37	856.28	11.05	852.52	17.49	849.84
21.45	848.41	25.94	847.3	30.61	846.33	32	846.083	35.4	845.48
40.84	844.83	42.38	844.7	43.74	844.64	49.35	844.4	49.82	844.4
55.74	844.44	63.31	844.55	65	844.634	69.98	844.88	70.28	844.89
70.35	844.9	77.26	845.37	80.67	845.71	133.96	849.72	145.69	850.58
146.24	850.61	148.7	850.82	150.19	850.96	179.67	853.41	193.53	854.47
212.93	855.97	222.98	856.66						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	32	.045	65	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
32	65	138.86	138.86	.1	.3

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 1189.88

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	858.19	.75	857.84	1.07	857.67	2.14	856.98	12.9	850.01

19.21	846.58	22	845.394	22.48	845.19	24.54	844.89	32.99	844.62
33.64	844.59	36.18	844.37	37.02	844.43	37.67	844.51	43.38	845.05
44	845.11	48	845.496	56.13	846.28	58.18	846.44	59.46	846.52
63.09	846.63	65.32	846.7	91.56	847.79	93.87	847.88	95	847.91
96.66	847.96	135.45	848.8	141.01	849.02	161	849.68	175.86	850.2
182.37	850.52	204.06	851.75	209.11	852.14	217.44	852.67	240.09	853.99

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	22	.045	48	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
22	48	125.48	125.48	.1	.3

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 1064.4

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855.44	.35	855.36	12.57	852.03	14.12	851.59	25.07	847.97
27.88	847.02	33.46	845.02	39.16	843.87	40.42	843.59	41	843.59
41.64	843.59	56.52	843.67	58.64	843.68	69.17	843.97	73	844.128
74.01	844.17	85.4	844.33	95.53	844.33	99.86	844.3	119.22	844.26
126.62	844.36	160.49	843.96	162.52	843.98	168.26	843.98	172.67	843.94
176.51	844.03	182.24	844.05	192.16	844.2	202.55	844.44	210.42	844.6
214.95	844.84	222.85	845.44	234.61	846.44	247.48	847.66	261.64	849.6
262.43	849.7	263.46	849.97	273.47	852.63	275.64	853.28	284.33	855.87
284.54	855.92	284.99	856.01	287.29	856.45				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	41	.045	73	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
41	73	162.53	162.53	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
126.62	287.29	844.36	T

Right Levee Station= 126.62 Elevation= 844.36

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 901.87

INPUT
Description:
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854.6	.25	854.5	6.29	852.32	10.24	850.86	13.04	850
20.23	847.86	29.35	846.16	30.22	845.99	38.62	845.11	42.46	844.73
50.2	844.06	54.52	843.81	60.19	843.44	64.2	843.3	70.18	843.3
74.63	843.32	82.13	843.24	85.68	843.16	95.09	843.04	107.37	843.17
109.98	843.61	121.76	845.96	123.23	846.22	123.36	846.24	130.1	847.2
154.31	847.11	168.32	846.35	179	845.447	180.27	845.34	181.61	844.76
184.22	843.71	193.22	843.56	199.18	843.47	207.39	843.25	208.19	845.04
209.28	847.11	210	847.119	220.97	847.26	232.71	847.69	244.88	845.98
253.15	844.82	260.18	845.01	273.01	845.38	295.9	846.02	315.8	846.5
351.15	847.49	358.16	847.68	392.5	848.57	394.14	848.64	396.91	848.7
403.36	849.43	408.86	850.04	410.14	850.21	434.27	854.4	435.56	854.64

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	179	.045	210	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
179	210	184.71	184.71	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	130.1	847.2	T
232.71	435.56	847.69	T

Left Levee Station= 130.1 Elevation= 847.2
Right Levee Station= 232.71 Elevation= 847.69

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 717.16

INPUT
Description:
Station Elevation Data num= 59

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	854.59	.12	854.56	.37	854.52	4.44	853.89	7.47	853.43
9.34	852.53	10.62	851.91	16.44	851.77	19.56	851.69	21.57	851.64
26.34	851.52	32.5	851.37	34.2	850.55	34.25	850.52	34.36	850.51
34.48	850.48	35.12	850.37	35.58	850.33	36.79	850.22	38.26	850.07
44.55	849.32	74.7	847.79	84.3	846.12	104	845.248	104.47	845.26
105.25	845.03	109.06	843.58	130.19	844.05	132.78	844.11	147.9	844.31
150	846.117	150.55	846.59	150.67	846.71	151.69	846.7	156.21	846.66
159.26	846.62	185.17	846.27	190.84	846.26	191.88	846.24	197.62	846.33
197.82	846.33	209.83	846.48	210.81	846.5	211.54	846.5	215.38	846.54
262.22	846.93	285.35	847.01	296.14	847.19	340.43	847.78	367.42	848.23
368.09	848.3	369.26	848.47	371.91	848.93	380.83	850.12	385.59	851.41
392.98	852.87	395.87	853.21	401.26	854.3	403.07	854.57		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	104	.045	150	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
104	150	160.25	160.25	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
150.67	403.07	846.71	T

Right Levee Station= 150.67 Elevation= 846.71

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 556.91

INPUT
Description:
Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853.67	4.37	852.11	6.49	849.85	7.44	849.67	8.83	849.4
11.55	848.86	13.8	848.43	17.46	846.6	19.51	845.58	24.07	845.48
30.02	845.36	35.67	845.25	40.53	845.15	40.76	845.03	41.2	844.81
43.27	844.71	43.39	844.69	52	843.161	52.06	843.15	63.3	841.64
64.74	842.26	78.38	843.11	88.34	843.73	93.58	842.87	97.16	843.43
98	844.82	111.86	844.72	122.71	844.98	147.16	845.61	152.37	846.04
164.15	844.67	170.85	843.94	172.4	843.79	175.74	843.79	184.59	843.8
194	843.68	202.34	843.05	217.79	842.36	222.5	842.16	237.61	841.15
238.2	841.12	239.76	841.04	248.4	840.7	251.64	840.54	258.61	840.25
265.68	839.95	268.81	839.87	277.18	839.63	278.63	839.62	279.02	839.63
279.71	839.62	281.94	839.66	295.87	839.9	298.96	839.93	304.65	840.23
308.89	840.35	314.41	840.73	318.82	841.04	325.85	841.66	328.75	841.92

330.98	842.17	338.68	843.01	347.98	843.75	348.61	843.8	357.32	845.15
358.54	845.34	360.14	845.72	368.47	847.64	374.87	850.28	378.4	851.78
385.85	854	391.17	855.41	391.56	855.52				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	52	.045	98	.1

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

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
52	98	140.43	140.43	140.43		.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
152.37	391.56	846.04	T

Right Levee Station= 152.37 Elevation= 846.04

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 416.48

INPUT
Description:
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.71	5.98	849.19	9.24	848.34	13.68	846.14	14.88	845.55
20.99	845.43	25.51	845.34	35.54	845.14	35.8	845.14	35.81	845.14
35.82	845.14	36.02	845.14	36.79	845.13	38.24	844.79	51.04	844.66
54.83	844.52	56.31	844.47	58.53	844.38	62.3	843.93	67.67	843.06
68	843.003	69.85	841.68	95.2	841.75	98	842.514	99.49	842.92
99.57	844.17	113.55	845.77	115.18	845.8	124.22	845.73	128.24	845.72
129	845.72	143.47	845.79	147.47	845.4	148.05	845.41	151.84	845.41
159.85	845.35	163.75	845.43	172.72	845.6	183.31	845.82	193.27	846.02
196.12	846.18	197.41	846.2	197.44	846.2	198.91	846.28	199.77	846.29
200.43	846.36	200.97	846.34	209.75	846.82	219.21	847.34	229.42	847.9
240.47	848.51	241.01	848.55	241.59	848.59	241.88	848.58	242.24	848.58
242.28	848.59	242.34	848.6	242.41	848.59	242.5	848.59	242.97	848.63
243.03	848.64	243.42	848.67	243.48	848.67	243.63	848.68	243.77	848.69
243.99	848.69	244.29	848.69	244.37	848.68	244.48	848.68	244.56	848.68
244.63	848.69	245.15	848.72	245.58	848.75	251.76	849.01		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	68	.045	98	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
68	98	42.07	42.07	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	59	845.34	T
116	251.76	845.8	T

CULVERT

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 393

INPUT
Description: Dual Box Culvert Crossing
Distance from Upstream XS = 14.48
Deck/Roadway Width = 24
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	845.34		1000	845.34	

Upstream Bridge Cross Section Data
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.71	5.98	849.19	9.24	848.34	13.68	846.14	14.88	845.55
20.99	845.43	25.51	845.34	35.54	845.14	35.8	845.14	35.81	845.14
35.82	845.14	36.02	845.14	36.79	845.13	38.24	844.79	51.04	844.66
54.83	844.52	56.31	844.47	58.53	844.38	62.3	843.93	67.67	843.06
68	843.003	69.85	841.68	95.2	841.75	98	842.514	99.49	842.92
99.57	844.17	113.55	845.77	115.18	845.8	124.22	845.73	128.24	845.72
129	845.72	143.47	845.79	147.47	845.4	148.05	845.41	151.84	845.41
159.85	845.35	163.75	845.43	172.72	845.6	183.31	845.82	193.27	846.02
196.12	846.18	197.41	846.2	197.44	846.2	198.91	846.28	199.77	846.29
200.43	846.36	200.97	846.34	209.75	846.82	219.21	847.34	229.42	847.9
240.47	848.51	241.01	848.55	241.59	848.59	241.88	848.58	242.24	848.58
242.28	848.59	242.34	848.6	242.41	848.59	242.5	848.59	242.97	848.63
243.03	848.64	243.42	848.67	243.48	848.67	243.63	848.68	243.77	848.69
243.99	848.69	244.29	848.69	244.37	848.68	244.48	848.68	244.56	848.68
244.63	848.69	245.15	848.72	245.58	848.75	251.76	849.01		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	68	.045	98	.1

Bank Sta: Left Right Coeff Contr. Expan.
68 98 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	59	845.34	T
116	251.76	845.8	T

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	845.34		1000	845.34	

Downstream Bridge Cross Section Data
Station Elevation Data num= 122

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	850.88	.02	850.87	5.18	849.03	7.26	848.48	10.86	846.87
30.25	844.85	31	844.826	32	841.38	41.36	841.48	41.41	841.48
49.63	841.76	50.63	843.76	52	843.809	52.03	843.81	55.91	844.25
57.94	844.48	59	844.6	60.68	844.79	60.77	844.8	61.08	844.84
62.06	844.94	63.99	845.13	66.67	845.14	67.3	845.14	71.6	845.2
74.12	845.24	76.53	845.27	81.18	845.34	81.28	845.34	87.56	845.42
87.68	845.42	91.3	845.47	93.48	845.5	93.71	845.5	94.65	845.51
94.84	845.51	97.21	845.54	98.48	845.56	98.64	845.56	100.43	845.57
105.26	845.62	108.52	845.64	108.68	845.65	108.69	845.65	111.08	845.66
111.17	845.67	111.64	845.67	111.76	845.67	111.88	845.67	113.81	845.68
115.49	845.69	126.73	845.73	126.78	845.73	128.77	845.74	128.87	845.74
128.98	845.74	130.69	845.75	136.73	845.77	136.83	845.77	138.53	845.77
140.09	845.78	140.17	845.78	141.7	845.78	141.87	845.78	141.94	845.78
143.32	845.79	143.47	845.79	149.9	845.81	151.29	845.81	152.64	845.81
152.72	845.81	153.39	845.81	153.42	845.81	154.07	845.81	154.11	845.81
154.15	845.81	154.23	845.81	155.61	845.82	167.7	845.86	168.06	845.87
168.08	845.87	169.24	845.88	169.32	845.88	170.87	845.9	172.56	845.93
184.27	846.28	185.92	846.32	186.71	846.34	187.63	846.37	189.41	846.43
196.57	846.66	197.9	846.71	198.31	846.73	198.33	846.73	200.19	846.8
200.28	846.81	200.36	846.81	207.51	847.04	208.32	847.08	208.36	847.08
208.4	847.08	209.33	847.13	211.14	847.21	218.41	847.45	218.49	847.45
218.85	847.47	218.93	847.47	220.33	847.54	222.01	847.61	229.56	847.86
229.63	847.86	231.25	847.94	231.65	847.95	231.91	847.96	231.95	847.96
232.79	847.99	233.18	848.02	233.25	848.02	233.3	848.02	234.25	848.07
234.76	848.09	235.38	848.12						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	31	.045	52	.1

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
            31      52             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      30  844.88       T
      53  235.38  843.93       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box       4      10
FHWA Chart # 58- Rectangular concrete
FHWA Scale # 1 - Side tapered; Less favorable edges
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
              14.48      24     .011     .045        2                    .4
      1
Number of Barrels =  2
Upstream   Elevation =  839.51
Centerline Stations
    Sta.    Sta.
  77.165  88.835
Downstream Elevation =  839.51
Centerline Stations
    Sta.    Sta.
  35.665  47.335

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 374.41

INPUT
Description:
Station Elevation Data    num=     122
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
```

0	850.88	.02	850.87	5.18	849.03	7.26	848.48	10.86	846.87
30.25	844.85	31	844.826	32	841.38	41.36	841.48	41.41	841.48
49.63	841.76	50.63	843.76	52	843.809	52.03	843.81	55.91	844.25
57.94	844.48	59	844.6	60.68	844.79	60.77	844.8	61.08	844.84
62.06	844.94	63.99	845.13	66.67	845.14	67.3	845.14	71.6	845.2
74.12	845.24	76.53	845.27	81.18	845.34	81.28	845.34	87.56	845.42
87.68	845.42	91.3	845.47	93.48	845.5	93.71	845.5	94.65	845.51
94.84	845.51	97.21	845.54	98.48	845.56	98.64	845.56	100.43	845.57
105.26	845.62	108.52	845.64	108.68	845.65	108.69	845.65	111.08	845.66
111.17	845.67	111.64	845.67	111.76	845.67	111.88	845.67	113.81	845.68
115.49	845.69	126.73	845.73	126.78	845.73	128.77	845.74	128.87	845.74
128.98	845.74	130.69	845.75	136.73	845.77	136.83	845.77	138.53	845.77
140.09	845.78	140.17	845.78	141.7	845.78	141.87	845.78	141.94	845.78
143.32	845.79	143.47	845.79	149.9	845.81	151.29	845.81	152.64	845.81
152.72	845.81	153.39	845.81	153.42	845.81	154.07	845.81	154.11	845.81
154.15	845.81	154.23	845.81	155.61	845.82	167.7	845.86	168.06	845.87
168.08	845.87	169.24	845.88	169.32	845.88	170.87	845.9	172.56	845.93
184.27	846.28	185.92	846.32	186.71	846.34	187.63	846.37	189.41	846.43
196.57	846.66	197.9	846.71	198.31	846.73	198.33	846.73	200.19	846.8
200.28	846.81	200.36	846.81	207.51	847.04	208.32	847.08	208.36	847.08
208.4	847.08	209.33	847.13	211.14	847.21	218.41	847.45	218.49	847.45
218.85	847.47	218.93	847.47	220.33	847.54	222.01	847.61	229.56	847.86
229.63	847.86	231.25	847.94	231.65	847.95	231.91	847.96	231.95	847.96
232.79	847.99	233.18	848.02	233.25	848.02	233.3	848.02	234.25	848.07
234.76	848.09	235.38	848.12						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	31	.045	52	.1

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

31	52	121.6	121.6	121.6	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	30	844.88	T
53	235.38	843.93	T

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 252.81

INPUT
Description:
Station Elevation Data num= 70

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	852.09	2.19	850.81	7.73	847.66	9.47	846.83	9.92	846.36
10	846.291	16.92	840.33	28.14	840.97	34.65	841.34	39.12	841.31
39.82	841.72	43.95	844.06	44	844.061	50.66	844.19	63.64	844.31
71.28	844.37	84.68	842.89	91.36	842.14	99.78	842.38	100.15	842.39
100.41	842.4	100.45	842.4	100.5	842.4	100.57	842.4	100.67	842.41
100.79	842.41	100.87	842.41	100.96	842.41	101.18	842.42	101.25	842.42
101.45	842.42	137.81	843.24	140.09	843.29	142.68	843.35	145.67	843.42
149.23	843.5	153.54	843.58	154.4	843.59	157.57	844.23	157.87	844.29
158.62	844.45	161.15	845.02	163.35	845.52	165.45	846.03	165.75	846.11
167.09	846.45	168.25	846.52	168.58	846.53	173.37	846.81	174.1	846.85
174.44	846.87	176.82	847.01	178.74	847.11	180.79	847.23	184.4	847.42
188.4	847.63	190.4	847.74	190.42	847.74	193.23	847.89	194.13	847.93
194.77	847.95	200.54	848.15	200.9	848.16	201.05	848.17	201.15	848.17
212.74	848.46	217.85	848.59	221.59	848.68	221.82	848.69	226.88	848.82

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	10	.045	44	.1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	44	65.33	65.33	.1	.3

Right Levee Station= 71.28 Elevation= 844.37

CROSS SECTION

RIVER: Left Fork Arnold
REACH: Left Fork Arnold RS: 187.48

INPUT
Description:
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	852.88	10.14	848.38	12.78	847.41	13	847.145	17.96	841.17
18.4	840.63	33.97	840.76	40.69	840.82	41	840.82	41.06	840.86
42.34	841.9	42.9	842.34	43	842.351	43.09	842.36	51.19	843.38
56.51	843.49	64.05	843.85	69.71	844	88.49	842.37	90.04	842.28
100.43	842.5	119.43	842.9	159.94	843.73	171.09	844.04	172.55	844.09
173.52	844.12	174.1	844.14	174.72	844.16	175.37	844.18	176.05	844.2
176.77	844.22	177.52	844.25	178.3	844.27	179.1	844.3	180.13	844.32
181.15	844.34	182.12	844.36	182.96	844.38	191.12	844.56	198.79	844.73
202.08	846.15	207.38	848.42	209.89	849.5	211.41	850.15	211.88	850.16
212.01	850.17	216.93	850.43	219.13	850.54	247.28	852.03	261.62	852.48
262.12	852.5	262.57	852.51	263.44	852.54	272.45	852.83	281.93	853.13
282.77	853.16	284.41	853.21						

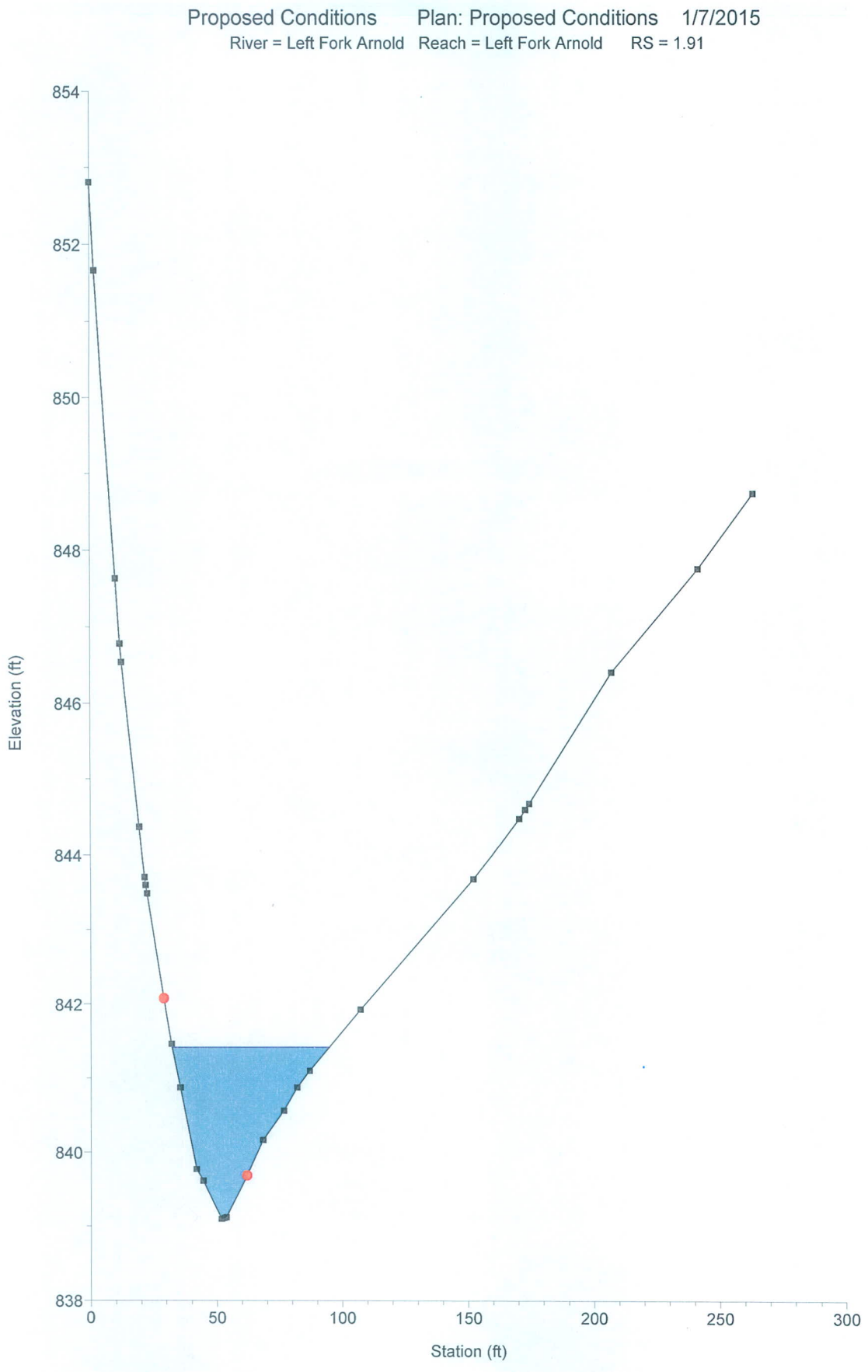
```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0      .1      13    .045      43      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            13      43            88.39   88.39   88.39            .1       .3
Right Levee     Station=   69.71      Elevation=     844

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 99.09

INPUT
Description:
Station Elevation Data    num=      40
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*************************************************************************************
       0  848.96    4.29  846.71    8.42  844.59      12 843.388   21.31  840.26
   26.34  839.59   33.99  839.76   34.53  839.78   43.43  840.14      44 840.172
    48.9  840.45   56.05  840.67   69.12  840.98   83.18  841.28  119.53  841.99
  123.09  842.04  127.05  842.12  151.78  842.87   165.3  843.35  174.28  843.72
  187.12  844.26  189.88  844.37  198.41  844.72  210.92  845.23  215.01  845.39
  222.15  847.78  222.98  848.06  229.52  850.25  237.01  852.76   239.3  853.52
  239.95  853.56  240.15  853.57  248.59  854.01  255.95   854.4  261.71  854.71
  270.51  855.19  280.71  855.73  280.96  855.73  281.24  855.73  287.63  852.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0      .1      12    .045      44      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            12      44            97.18   97.18   97.18            .1       .3

CROSS SECTION


RIVER: Left Fork Arnold
REACH: Left Fork Arnold   RS: 1.91

INPUT
Description:
Station Elevation Data    num=      31
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

0	852.81	1.84	851.66	10.13	847.63	11.86	846.78	12.5	846.54
19.37	844.37	21.48	843.7	21.87	843.59	22.45	843.48	29	842.078
31.89	841.46	35.4	840.87	41.91	839.77	44.56	839.61	51.92	839.1
52.99	839.11	53.72	839.12	61.94	839.68	62	839.685	68.34	840.16
76.62	840.56	81.98	840.87	86.9	841.1	107.17	841.92	152.09	843.67
170.33	844.47	172.73	844.59	174.25	844.67	207.13	846.4	241.47	847.75
263.43	848.73								

Manning's n Values num= 3

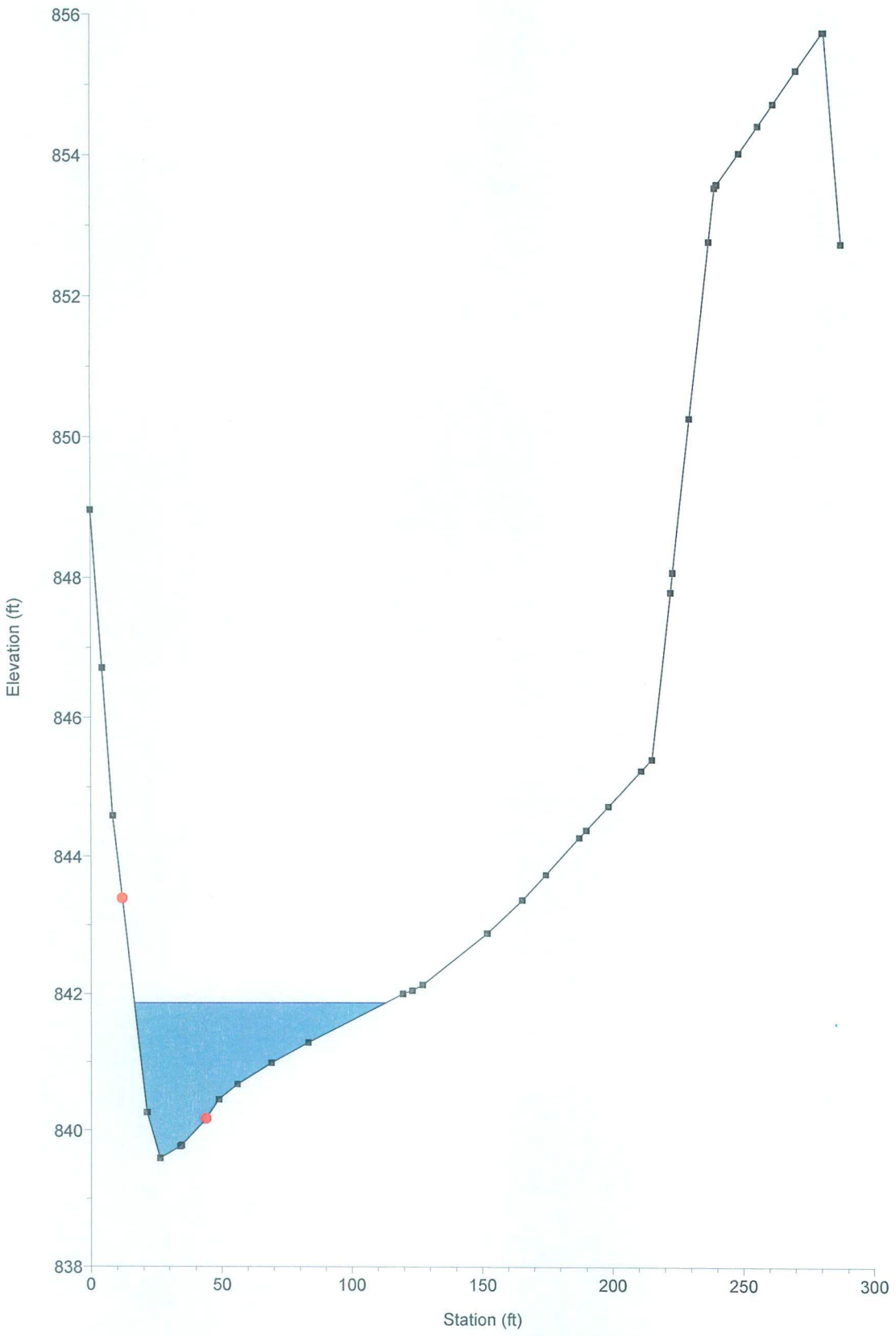
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	29	.045	62	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
29	62	.1	.3


Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 1.91
Elevation (ft)
854
852
850
848
846
844
842
840
838
0
50
100
150
200
250
300
Station (ft)

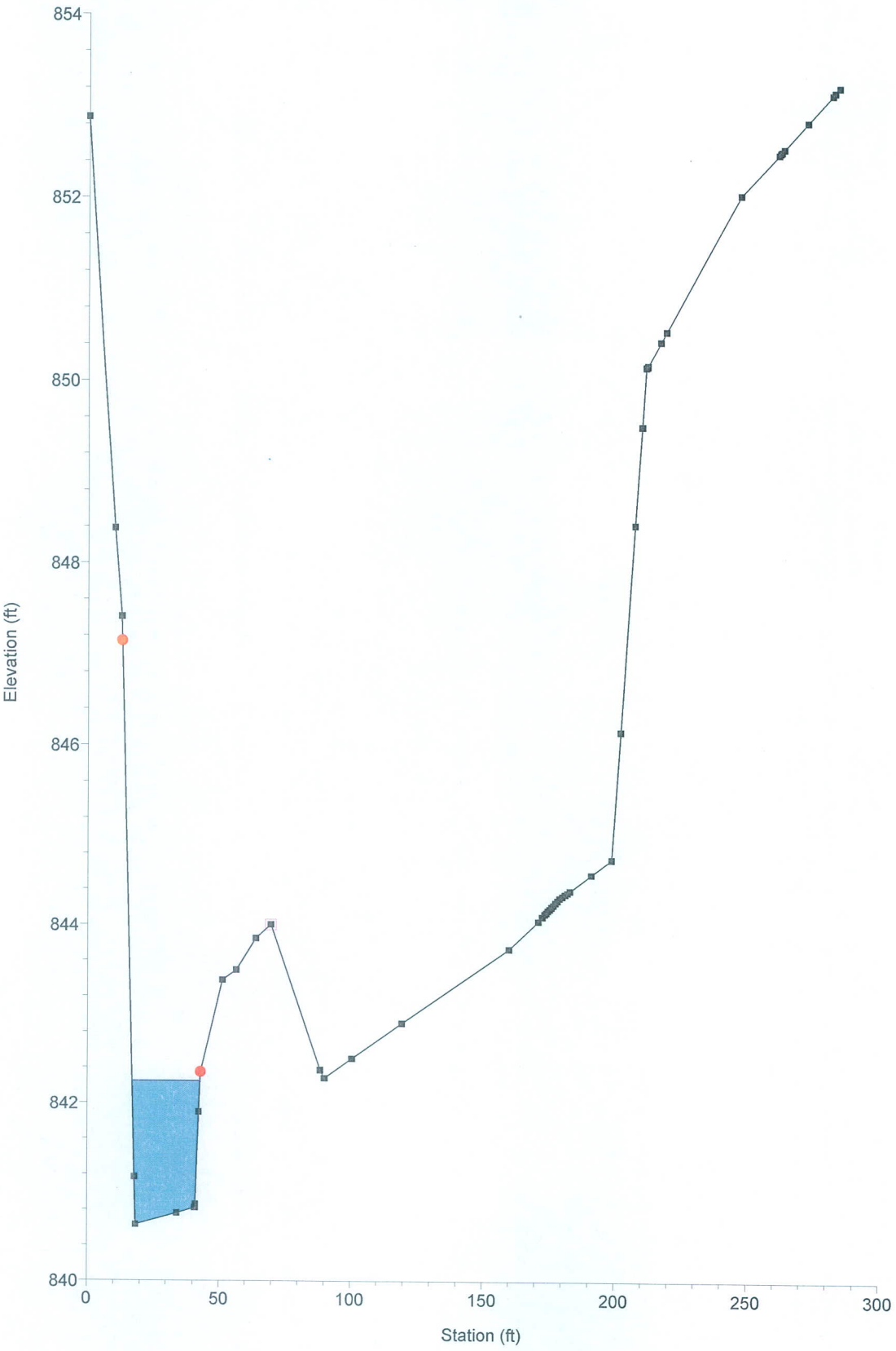
Proposed Conditions Plan: Proposed Conditions 1/7/2015

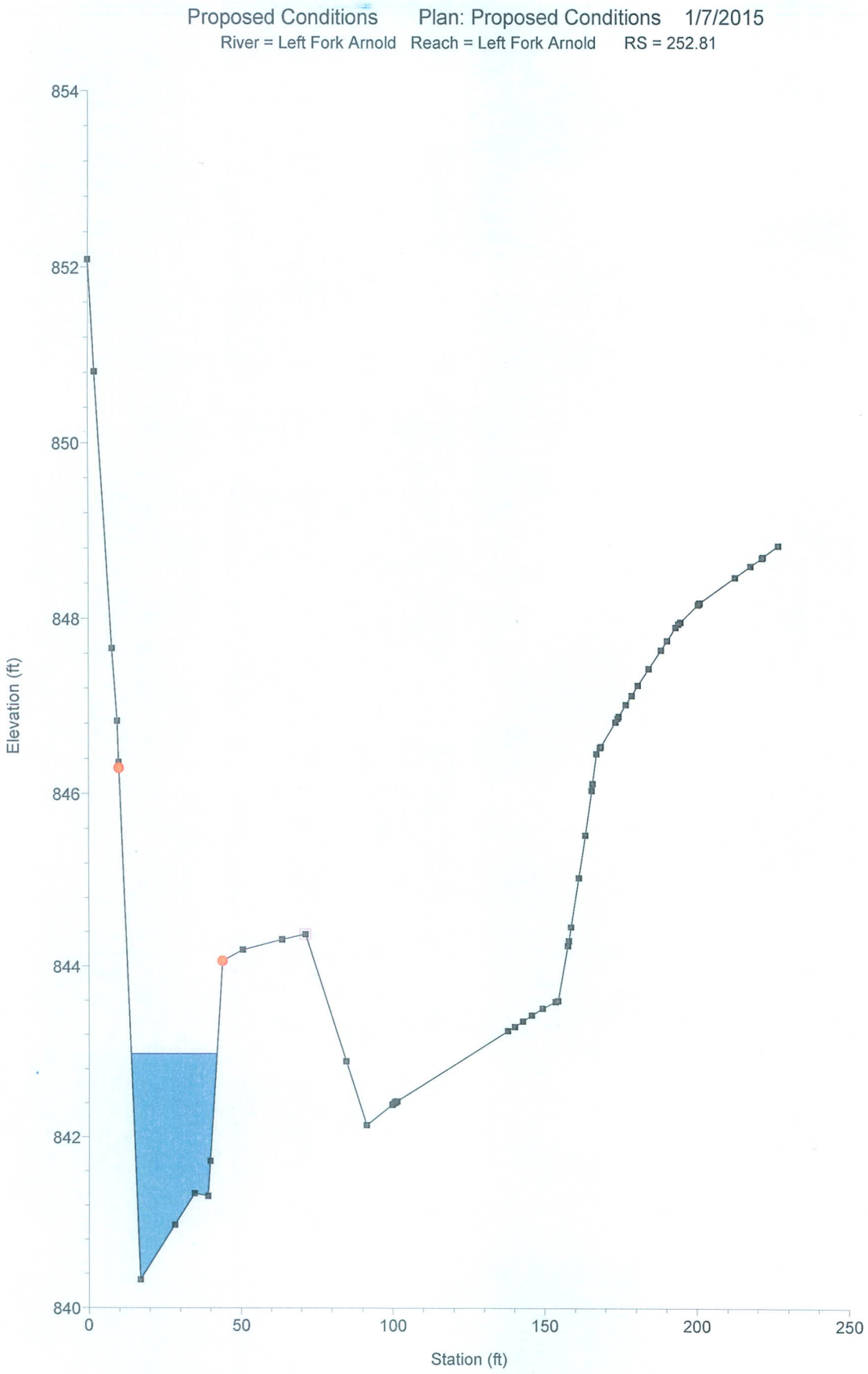
River = Left Fork Arnold Reach = Left Fork Arnold RS = 99.09

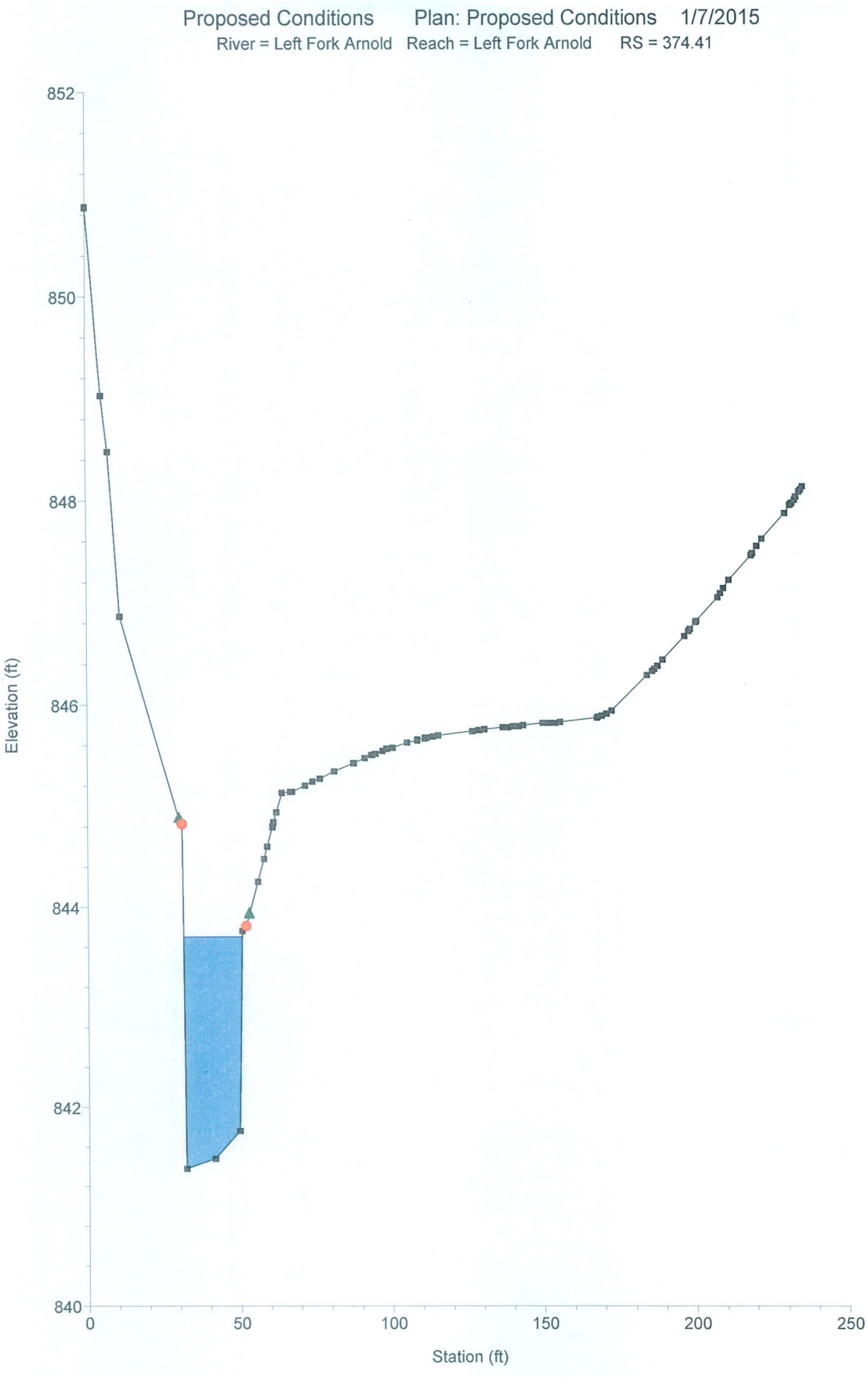


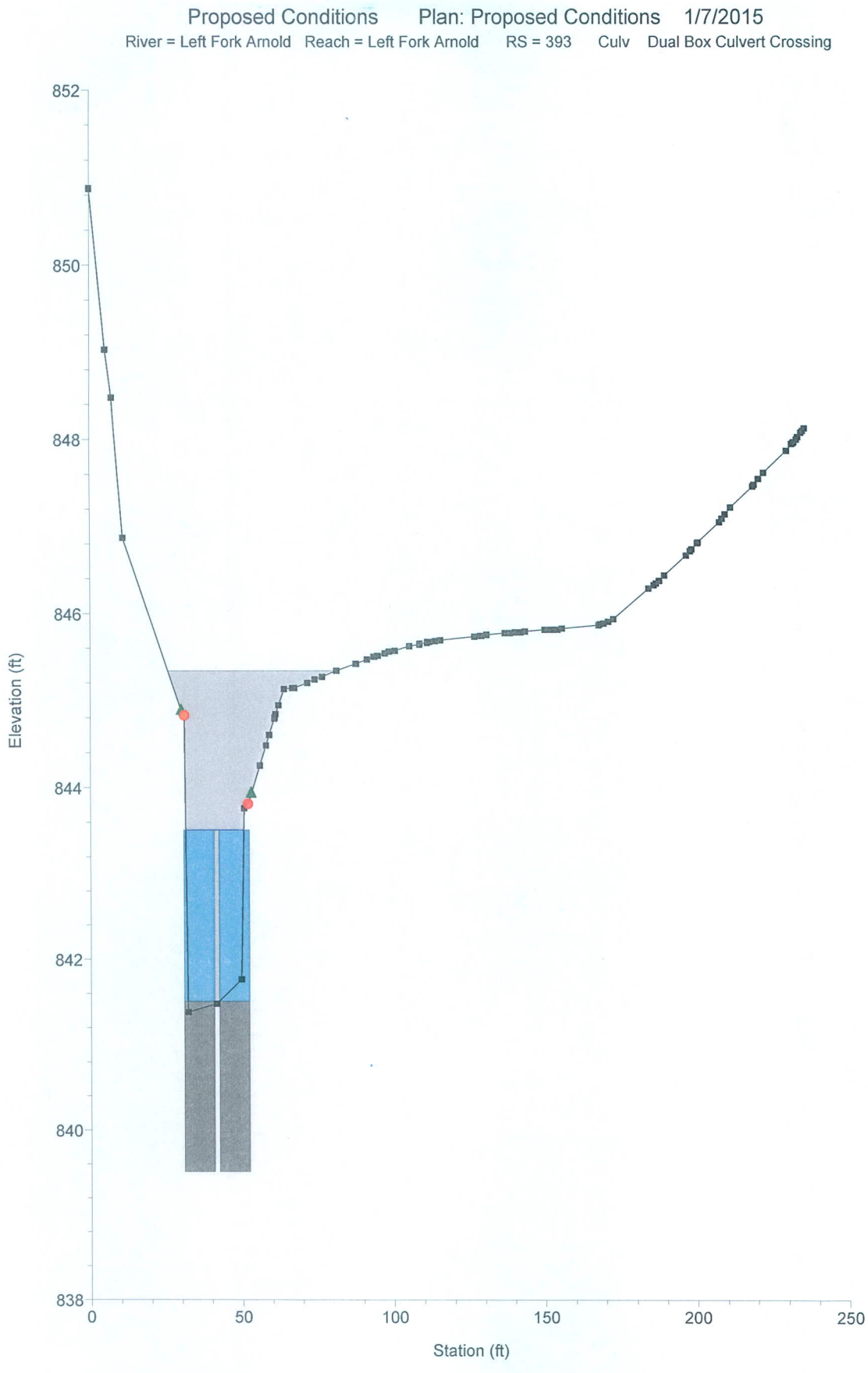
Proposed Conditions Plan: Proposed Conditions 1/7/2015

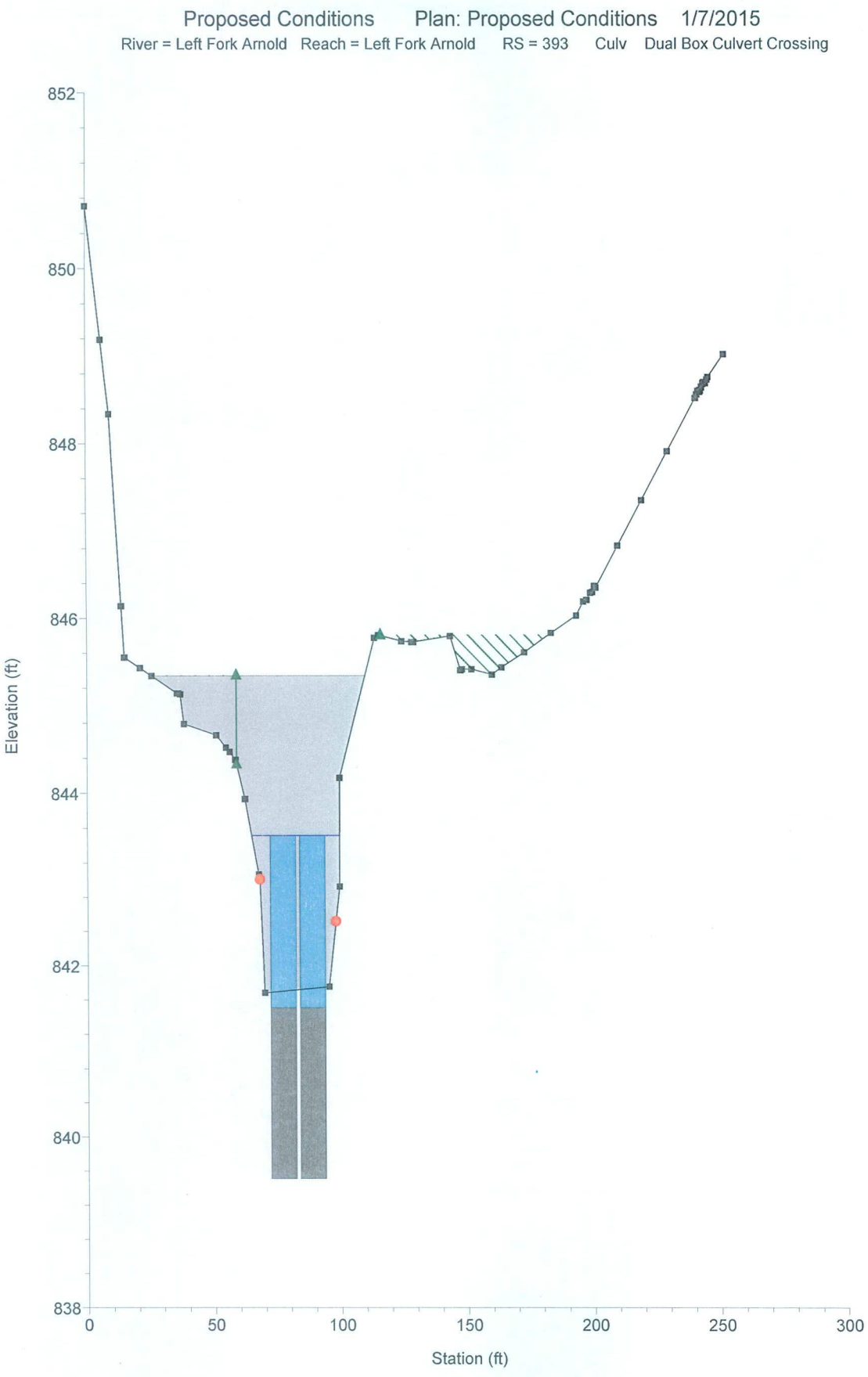
River = Left Fork Arnold Reach = Left Fork Arnold RS = 187.48




Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 252.81
Elevation (ft)
854
852
850
848
846
844
842
840
0
50
100
150
200
250
Station (ft)

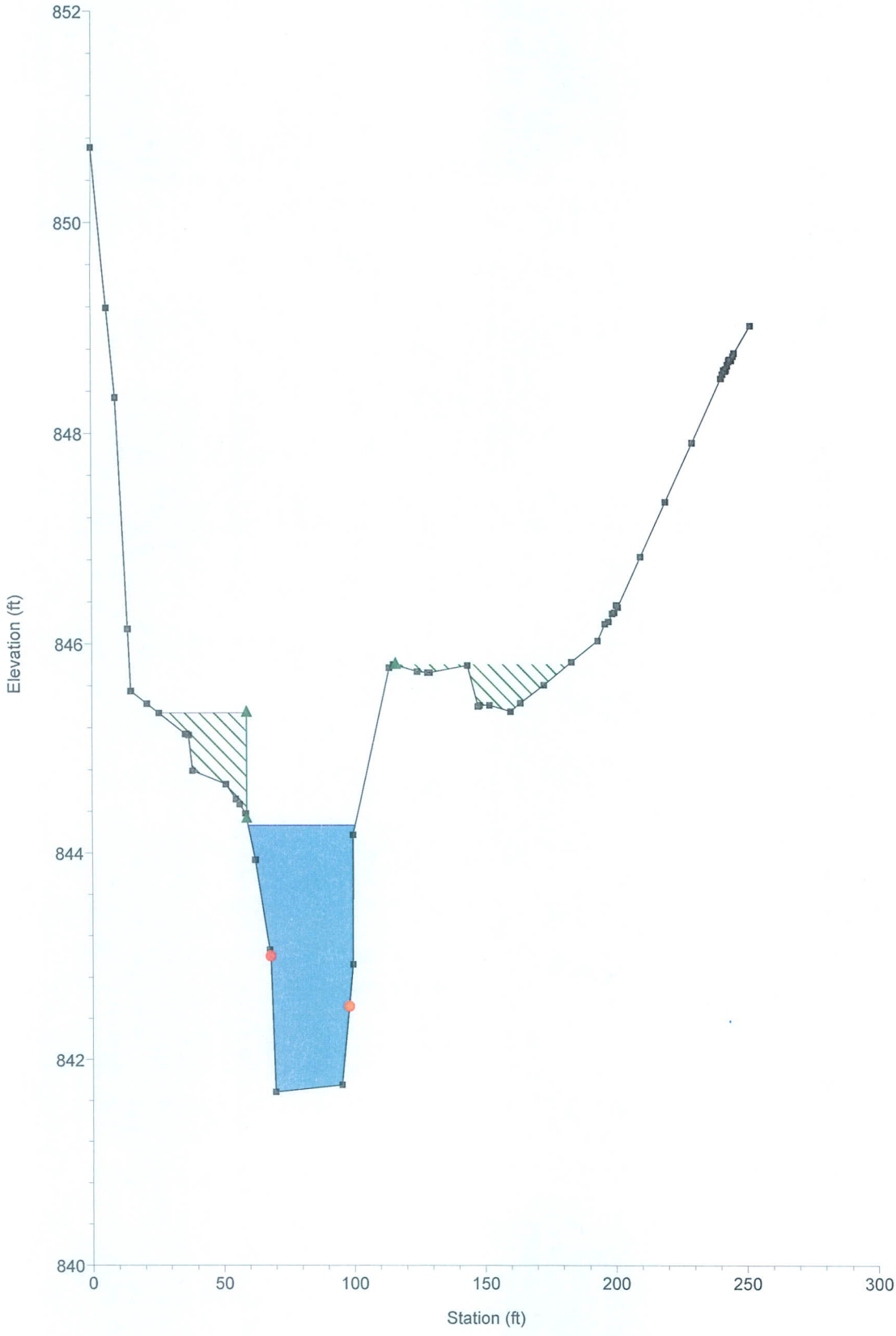

Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 374.41
852
850
848
846
844
842
840
Elevation (ft)
0
50
100
150
200
250
Station (ft)

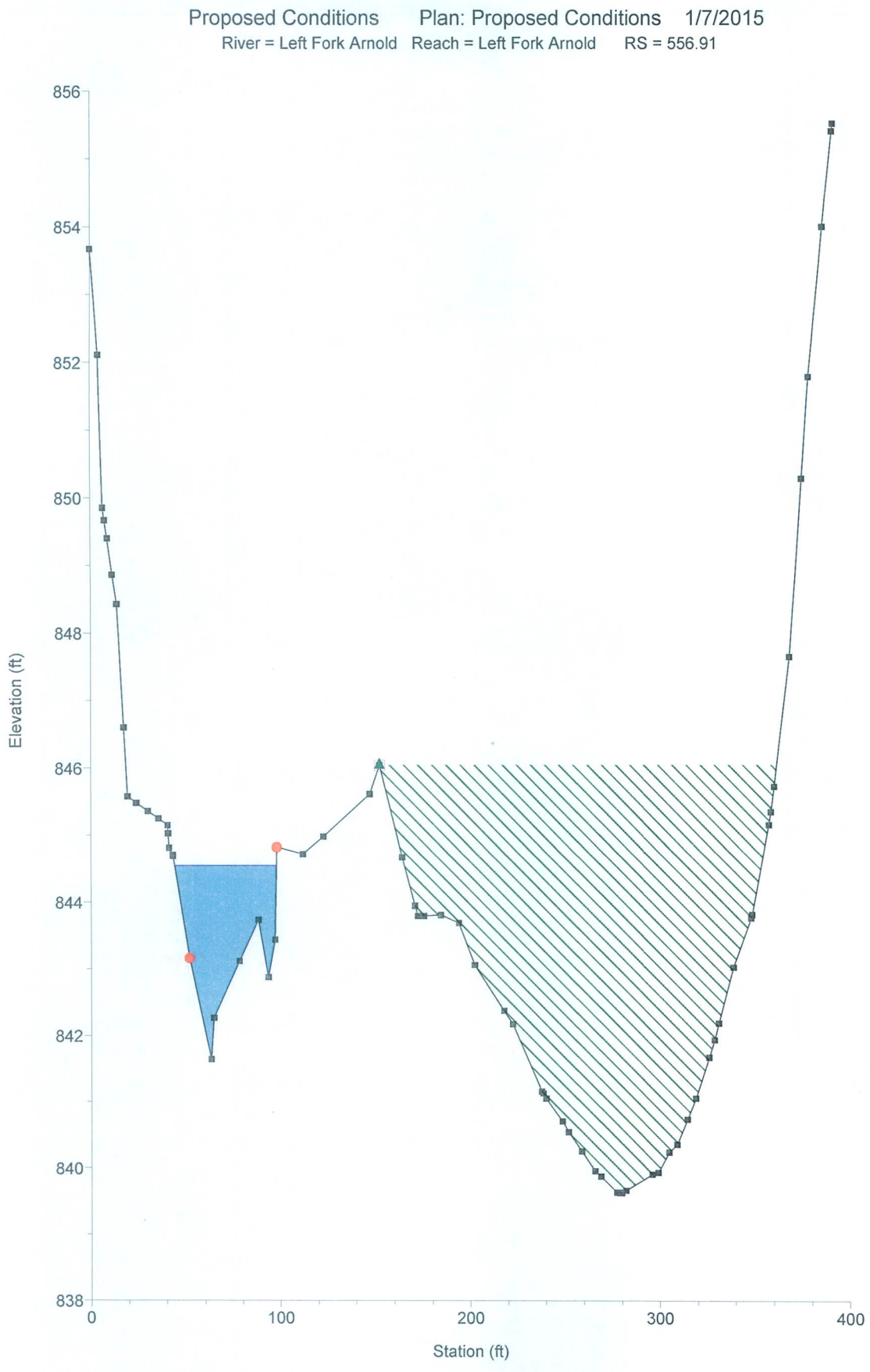

Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 393 Culv Dual Box Culvert Crossing
852
850
848
846
844
842
840
838
Elevation (ft)
0
50
100
150
200
250
Station (ft)

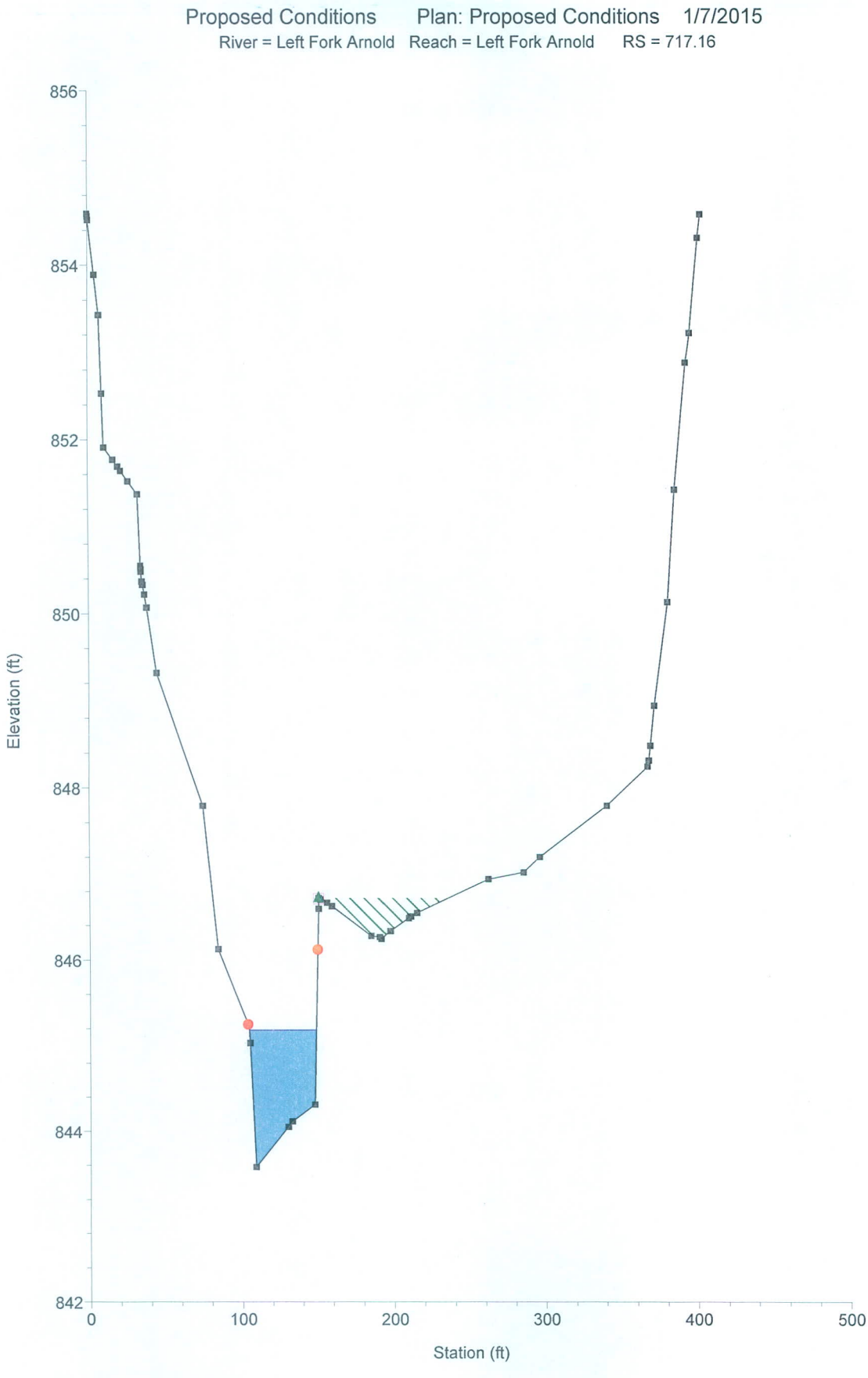

Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 393 Culv Dual Box Culvert Crossing
852
850
848
846
844
842
840
838
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)

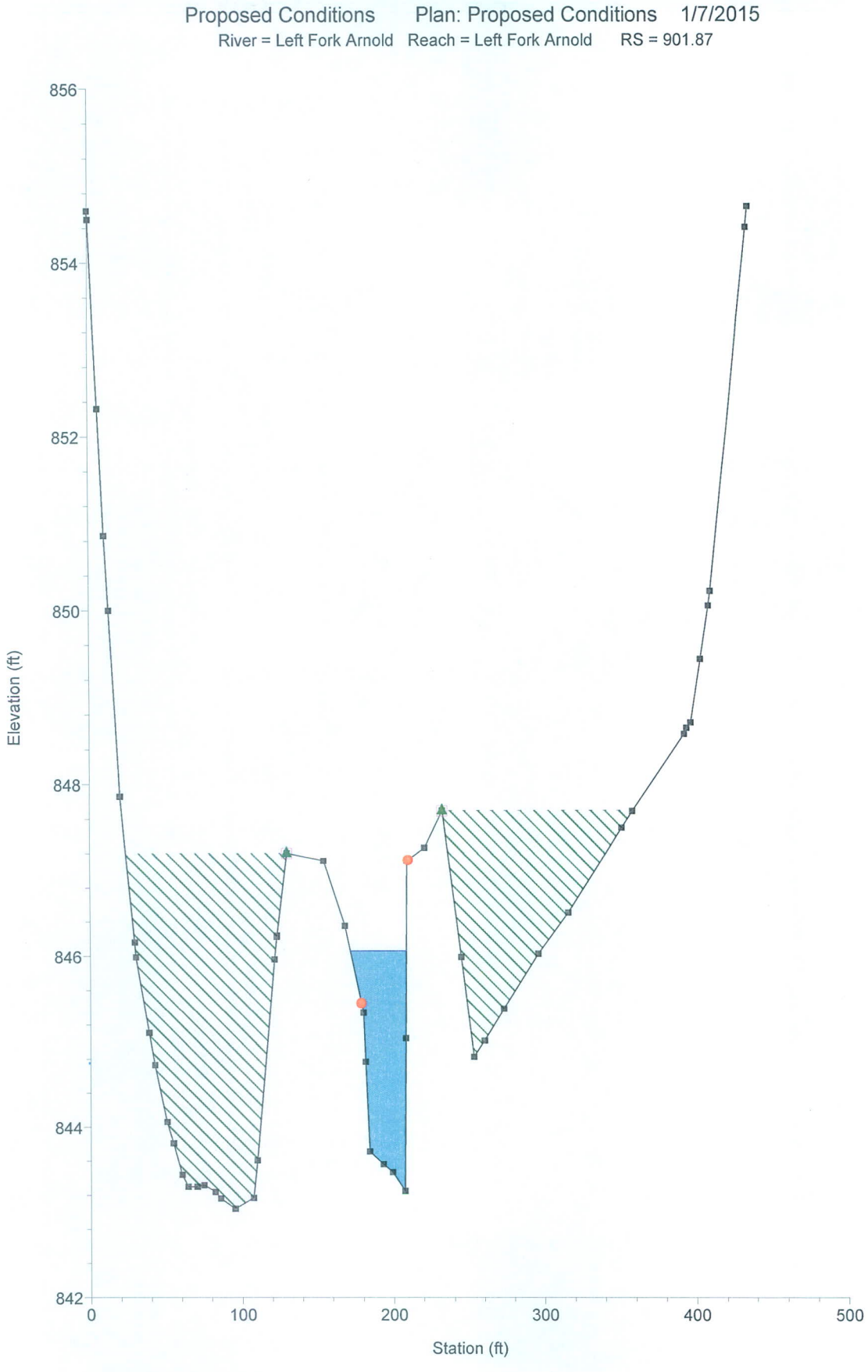
Proposed Conditions Plan: Proposed Conditions 1/7/2015

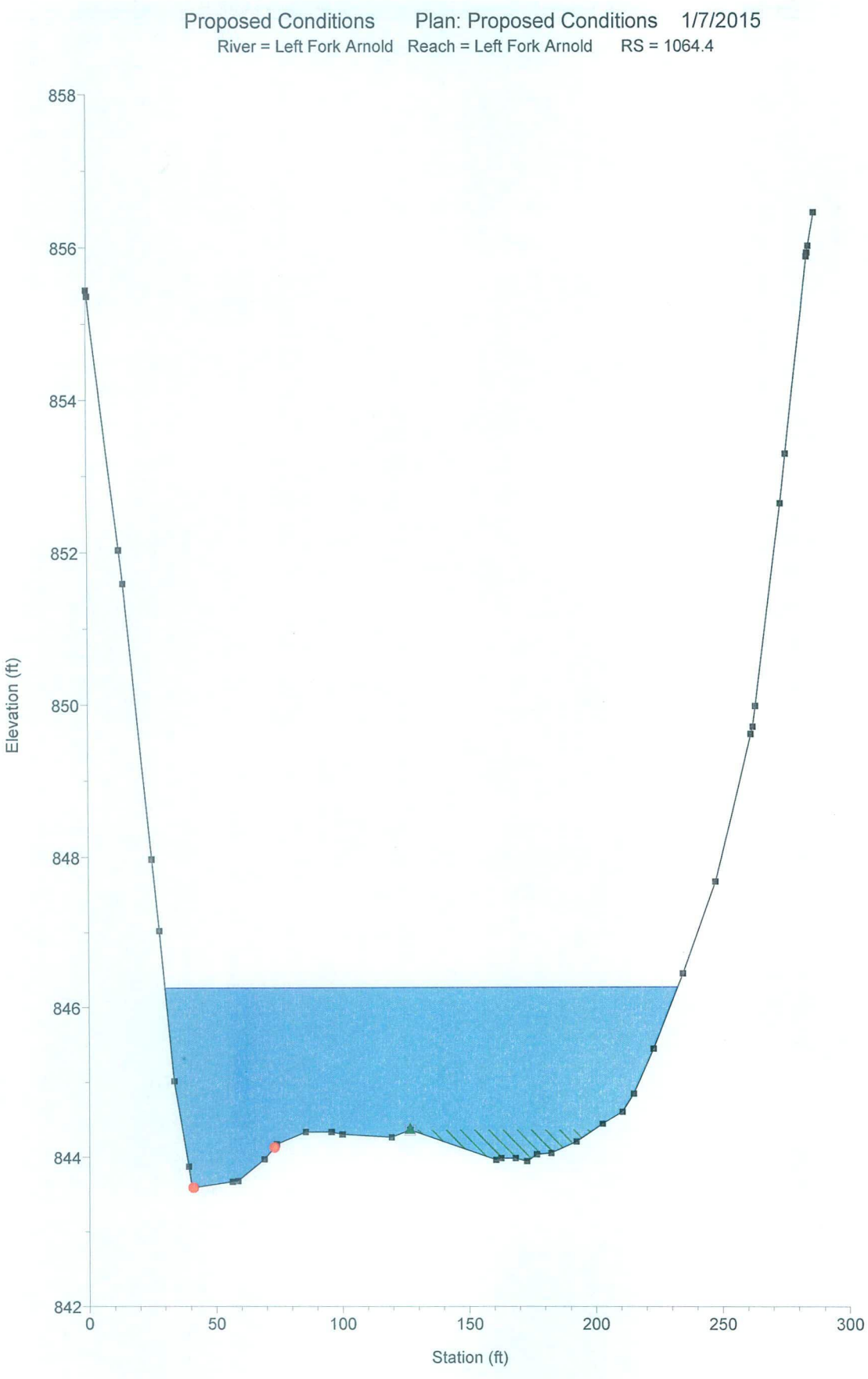
River = Left Fork Arnold Reach = Left Fork Arnold RS = 416.48




Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 556.91
Elevation (ft)
856
854
852
850
848
846
844
842
840
838
0
100
200
300
400
Station (ft)

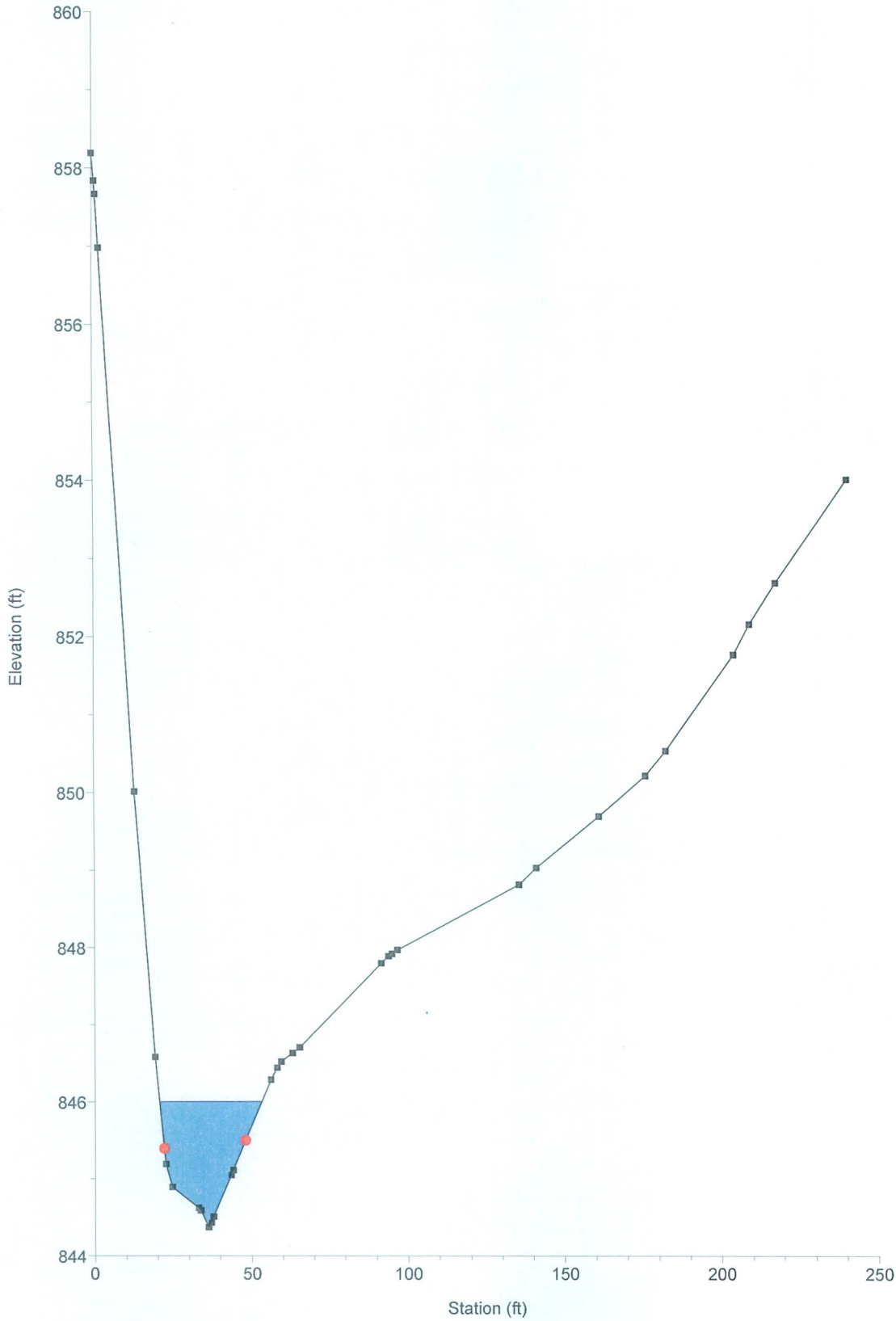

Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 717.16
856
854
852
850
848
846
844
842
Elevation (ft)
0
100
200
300
400
500
Station (ft)

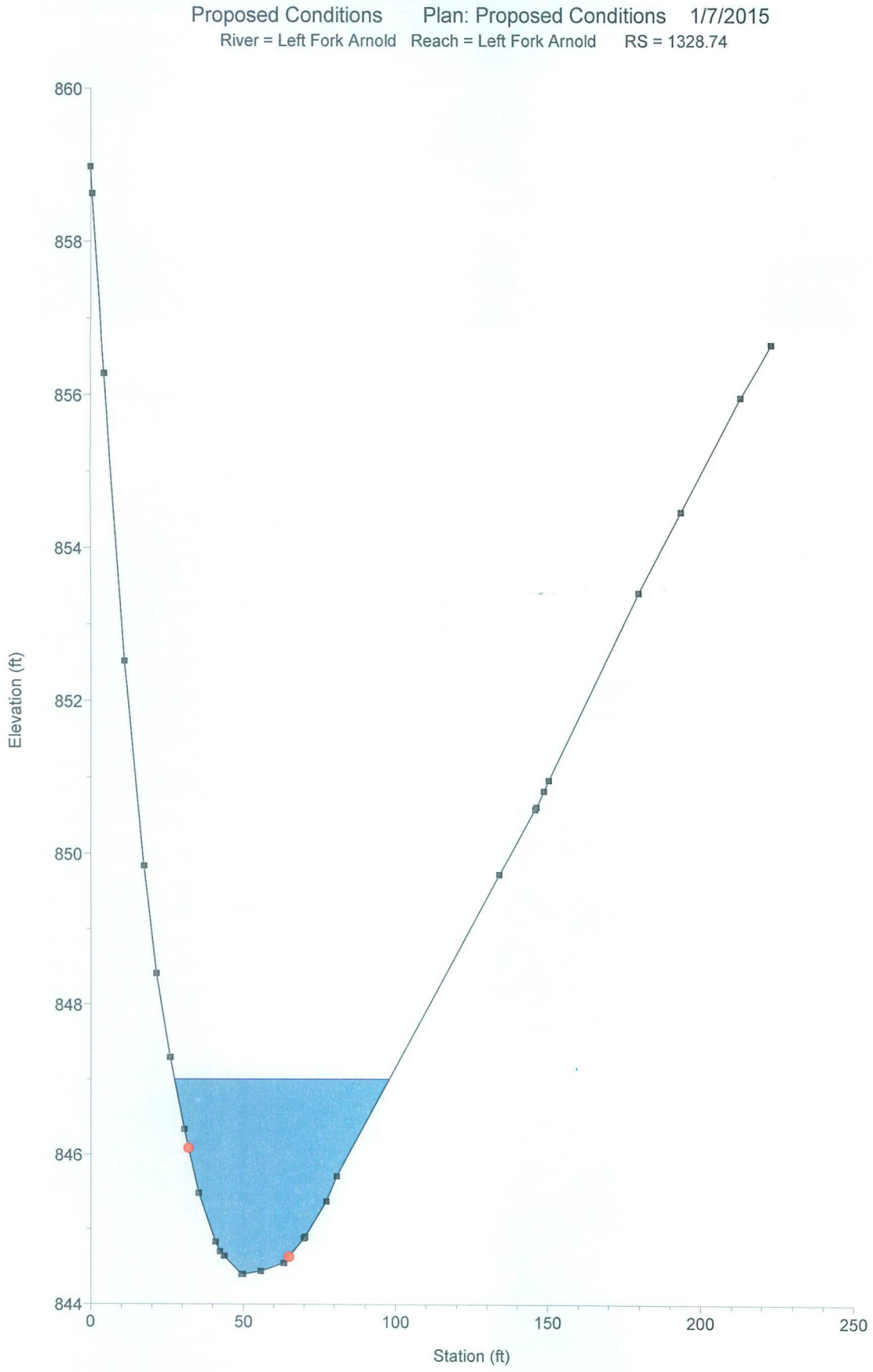

Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 901.87
856
854
852
850
848
846
844
842
Elevation (ft)
0
100
200
300
400
500
Station (ft)


Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 1064.4
Elevation (ft)
858
856
854
852
850
848
846
844
842
0
50
100
150
200
250
300
Station (ft)

Proposed Conditions Plan: Proposed Conditions 1/7/2015

River = Left Fork Arnold Reach = Left Fork Arnold RS = 1189.88




Proposed Conditions Plan: Proposed Conditions 1/7/2015
River = Left Fork Arnold Reach = Left Fork Arnold RS = 1328.74
Elevation (ft)
860
858
856
854
852
850
848
846
844
0
50
100
150
200
250
Station (ft)

APPENDIX E
EROSION & SEDIMENT CONTROL PLANS

RETTEW
We answer to you.
One Robinson Plaza, Ste. 200, Pittsburgh, PA 15205
Phone: (412) 446-1728
E-mail: rettew@rettew.com • Web site: rettew.com

LETTER OF TRANSMITTAL

TO: Floodplain Manager
Doddridge County
Doddridge County Courthouse
18 East Court Street
West Union, WV 26456

DATE: 2/25/2015 **JOB #:** 093842024 **PH #:** 717

RE: Noble Energy - OXF 98
Doddridge County, WV

We are sending you: ☒ Enclosed ☐ Under separate cover via: ☒ Mail ☐ Messenger, the following items:

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Change Order
☐ Specifications ☐ Sketches ☐ Copy: Letter/Contract ☐ Computer Disk
☐ Data Sheets ☐ Brochures ☒ As Noted ☐

Copies	Date	No.	Description
1	2/19/15		US ACOE - PCN Authorization
1	1/13/15		WV DNR Stream Activity Permit/Right-of Entry

FILED
2015 FEB 26 PM 2:14
COUNTY CLERK
DODDRIDGE COUNTY, WV

These are transmitted as checked below:

☐ As requested ☐ Reviewed ☐ Resubmit _____ copies for approval
☒ For your use ☐ Furnish as Corrected ☐ Submit _____ copies for distribution
☐ For review & comment ☐ Revise and Resubmit ☐ Return _____ corrected prints
☐ For your information ☐ Rejected ☐
☐ For Bids Due: ☐ Prints returned after loan to us.

Remarks: Bo - As a follow-up to my voicemails.....enclosed are copies of the other required permits associated with the Floodplain Permit for Noble-OXF 98. Please let us know if you need anything else for permit issuance.

Thank you for your assistance.

Signed: Michael Ogden (910-338-7226)

Copy to:

If enclosures are not as noted, kindly notify us at once.

DEPARTMENT OF THE ARMY
HUNTINGTON DISTRICT, CORPS OF ENGINEERS
502 EIGHTH STREET
HUNTINGTON, WEST VIRGINIA 25701-2070

REPLY TO
ATTENTION OF

FEB 19 2015

Regulatory Division
Energy Resource Branch
LRH-2014-01095-OHR-Left Fork Arnold Creek

Mr. Nicholas Frosini
Noble Energy, Inc
333 Technology Drive, Suite 116
Canonsburg, Pennsylvania 15317

Dear Mr. Frosini:

I refer to the Pre-Construction Notification (PCN) requesting a Department of the Army (DA) authorization to discharge dredged and/or fill material into waters of the United States (U.S.) in association with the construction of the OXF 98 Well Pad Access Road Project. The proposed OXF 98 Well Pad Access Road Project will include upgrading approximately 0.65 miles (3,438 linear feet [lf]) of an existing dirt access road and constructing approximately 0.76 miles (4,037 lf) of new access road. The proposed access road will facilitate heavy equipment and large truck traffic required as part to normal drilling operations. On-site waters flow into Left Fork Arnold Creek, a tributary Middle Island Creek, a traditional navigable water (TNW) of the U.S. The proposed project is located approximately 2.6 aerial miles southwest of West Union, in Doddridge County, West Virginia. The center of the proposed project is located at 39.251863°North, 80.800636°West. The PCN has been assigned the following file number: LRH-2014-01095-OHR-Left Fork Arnold Creek. Please reference this number on all future correspondence related to this project.

The U.S. Army Corps of Engineers (Corps) authority to regulate waters of the U.S. is based on the definitions and limits of jurisdiction contained in 33 CFR 328 and 33 CFR 329. Section 404 of the Clean Water Act (Section 404) requires a DA permit be obtained prior to discharging dredged or fill material into waters of the U.S., including wetlands. Section 10 of the Rivers and Harbors Act of 1899 (Section 10) requires a DA permit be obtained for any work in, on, over or under a navigable water.

Based on a review of the *OXF 98 Well Pad, Nationwide Permit 14 Pre-Construction Notification*, submitted to our office on November 25, 2014, with final information received on February 18, 2015, a field verification conducted on January 28, 2015, and other data available to us, this office has determined that both jurisdictional waters and non-jurisdictional features are present within the delineation boundary; therefore, the enclosed *OXF 98 Well Pad Delineation Map* has been labeled with a preliminary JD (PJD) boundary and an approved JD (AJD) boundary. Our December 2, 2008 headquarters guidance entitled "Revised Guidance on Clean Water Act Jurisdiction Following the United States Supreme Court Decision in Rapanos v.

United States and Carabell v. United States" was followed in the final verification of Clean Water Act jurisdiction.

Preliminary Jurisdictional Determination Boundary:

The PJD boundary contains seven (7) streams (Streams 2, 3, 4, 5, 6, 7, and 8), totaling 1045 lf, and three (3) wetlands (Wetlands 1, 4, and 5), totaling 0.0218 acres, as described in the enclosed PJD form. On-site waters flow into Left Fork Arnold Creek, a tributary Middle Island Creek, a traditional navigable water (TNW) of the U.S. Refer to the enclosed PJD Form and the *OXF 98 Well Pad Delineation Map* for a detailed description of jurisdictional waters.

This office has determined that these waters **may** be jurisdictional waters of the U.S. in accordance with the Regulatory Guidance Letter for Jurisdictional Determinations issued by the Corps on June 26, 2008 (RGL No. 08-02). As indicated in the guidance, this PJD is non-binding and cannot be appealed (33 C.F.R. 331.2) and only provides a written indication that waters of the United States, including wetlands, may be present on-site.

You have declined to exercise the option to obtain an approved jurisdictional determination in this instance and at this time for the area within the preliminary JD boundary. For the purposes of the determination of impacts, compensatory mitigation, and other resource protection measures for activities that require authorization from this office, the streams and wetlands described in the attached *Preliminary Jurisdictional Determination Form* will be evaluated as if they are waters of the U.S. Attached please find two copies of the PJD. If you agree with the findings of this PJD and understand your options regarding the same, please sign and date one copy of the form and return it to this office within 30 days of receipt of this letter. You should submit the signed copy via email to Audrey.M.Richter@usace.army.mil or to the following address:

U.S. Army Corps of Engineers
Huntington District, Regulatory Division
Energy Resource Branch
Attn: Audrey Richter (LRH-2014-01095)
502 Eighth Street
Huntington, West Virginia 25701

Approved Jurisdictional Determination Boundary:

The approved JD contains one (1) non-jurisdictional drainage features (Drainage-Features 1), totaling 195 lf. During a site investigation conducted on 28 January 2015, this office determined that Drainage Feature 1 is a non-relatively permanent water and part of an existing roadside drainage ditch created in uplands. Flow in Drainage Feature 1 was not observed during the aforementioned site visit. Refer to the enclosed *OXF 98 Well Pad Approved JD Table* and *OXF 98 Well Pad Delineation Map* for a detailed summary of the non-jurisdictional feature.

Therefore, based on the information described above, the aforementioned non-jurisdictional drainage feature does not meet the definition of a water of the United States (U.S.), as described in the definitions and limits of jurisdiction contained in 33 CFR 328 and 33 CFR 329, and is considered a non-jurisdictional feature.

If you object to the AJD, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the Great Lakes and Ohio River Division Office at the following address:

U.S. Army Corps of Engineers
Great Lakes and Ohio River Division
550 Main Street, Room 10524
Cincinnati, OH 45202-3222
Phone: (513) 684-7261
Fax: (513) 684-2460

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by APR 20 2015. **It is not necessary to submit an RFA form to the Division office if you do not object to the determination in this letter.**

Nationwide Permit Determination:

The proposed project, as described in the submitted information, has been reviewed in accordance with Section 404 and Section 10. Based on your description of the proposed work, and other information available to us, it has been determined that this project will not involve activities subject to the requirements of Section 10. However, this project will include the discharge of dredged or fill material into waters of the U.S. subject to the requirements of Section 404.

In the PCN received in this office, you have requested a DA authorization to discharge dredged and/or fill material into 85 lf of stream, involving two (2) single and complete projects, associated with the construction of the proposed OXF 98 Well Pad Access Road Project, as described in Table 1 enclosed with this letter.

Based on your description of the proposed work, it has been determined the proposed discharge of dredged and/or fill material into waters of the U.S., as described on Table 1 enclosed with this letter, for the construction of the OXF 98 Well Pad Access Road Project, meets the criteria for authorization under Nationwide Permit (NWP) #14 (enclosed) under the February 21, 2012 Federal Register, Notice of Reissuance of NWPs (77 FR 10184) provided you comply with all terms and conditions of the enclosed material, the enclosed special conditions, and the 401 Water Quality Certification (WQC) issued by the West Virginia Department of Environmental Protection (WVDEP). A copy of this NWP can be found on our website at http://www.lrh.usace.army.mil/Missions/Regulatory.aspx.

In view of the above, your linear transportation project is authorized subject to the terms and conditions of the enclosed material, including the enclosed special conditions. It is your responsibility to ensure that your work conforms to all of the environmental management

conditions listed within the enclosed material. Please be aware this NWP verification does not obviate the requirement to obtain any state or local assent required by law for the activities.

A copy of this NWP and verification letter must be supplied to your project engineer responsible for construction activities. A copy of the verification letter must be kept at the site during construction. Upon completion of the work, the enclosed certification must be signed and returned to this office. If you have any questions concerning the above, please contact Ms. Audrey Richter at (304) 399-5257 or by email at Audrey.M.Richter@usace.army.mil.

Sincerely,

Samantha Dailey
Regulatory Project Manager
Energy Resource Branch

Enclosures

CF: (w/out encls)

Ms. Rose Aures
RETTEW
27 Trovata Street;Suite #1
Bridgeport, WV 26330
rose.aures@rettew.com

Nationwide Permit 14 Verification Special Conditions
Noble Energy Inc.,
OXF 98 Well Pad Access Road Project
LRH-2014-01095-OHR- Left Fork Arnold Creek

1. Should new information regarding the scope and/or impacts of the project become available that was not submitted to this office during our review of the proposal, the permittee will submit written information concerning proposed modification(s) to this office for review and evaluation, as soon as practicable.

2. Section 7 obligations under Endangered Species Act must be reconsidered if new information reveals impacts of the project that may affect federally listed species or critical habitat in a manner not previously considered, the proposed project is subsequently modified to include activities which were not considered during Section 7 consultation with the United States Fish and Wildlife Service, or new species are listed or critical habitat designated that might be affected by the subject project.

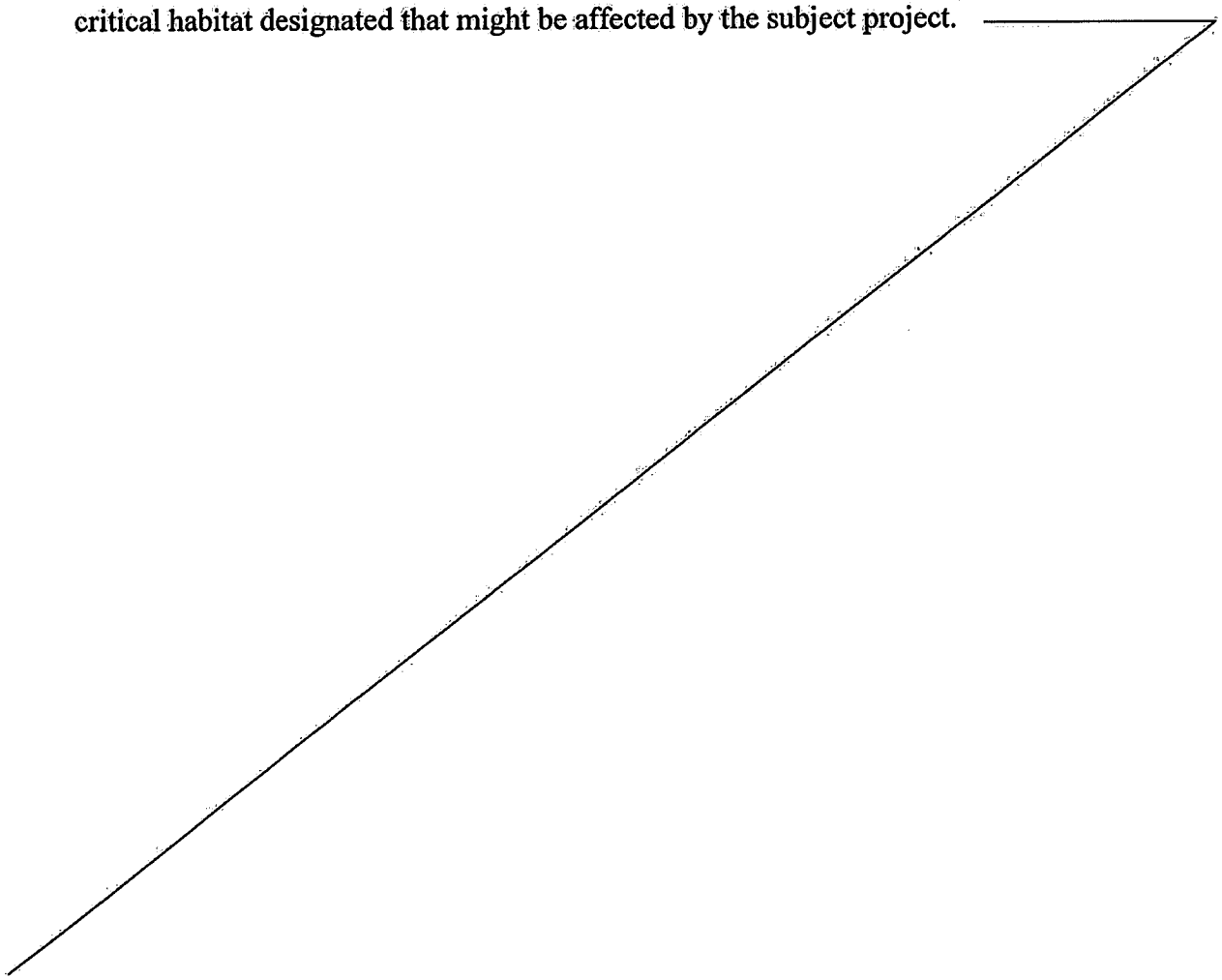


Table 1. Authorized discharge of dredged and/or fill material into waters of the United States associated with the construction of the Noble Energy, Inc.-OXF 98 Well Pad Access Road Project
LRH-2014-01095-OHR- Left Fork Arnold Creek

Site number	Latitude °N	& Longitude °W	Flow Regime or Cowardin Class	Length (lf) or area (acre) of Fill	Area (ac) of Fill	Other Pertinent Information
STR-2	39.252327	80.795735	Ephemeral	44	0.0010	Maintenance - Access Road- Culvert Upgrade
STR-3	39.252516	80.795308	Ephemeral	6	0.0077	Permanent- Access Road- Culvert Installation
				21	0.0095	Temporary- Dewatering (if required)
STR-6	39.252702	80.794963	Ephemeral	6	0.0003	Permanent- Access Road- Culvert Installation
				28	0.0013	Temporary- Dewatering (if required)
STR-8	39.255545	80.793076	Perennial	29	0.0123	Access Road- Box Culvert Installation
				34	0.0114	Temporary Access- Dewatering

DIVISION OF NATURAL RESOURCES
324 Fourth Avenue, Room 200
South Charleston WV 25303-1228
TDD (304) 558-1439
TDD 1-800-354-6087
Fax (304) 558-6048
Telephone (304) 558-3225

Earl Ray Tomblin
Governor

Robert A. Fala
Director

January 13, 2015

Division of Natural Resources
RIGHT OF ENTRY
AMENDED FEBRURAY 18, 2015

Re: LS-14-VI/09-1694

Noble Energy, Inc.
333 Technology Drive
Suite 116
Canonsburg, PA 15317-3077

Dear Sir or Madam:

The Division of Natural Resources hereby grants to you for a period of ten (10) years from the date hereof, a Right of Entry for the purpose of installing and maintaining an eighteen inch by six foot (18"x6') culvert in the streambed, twenty one feet (21') temporary pump around impact and eleven feet (11') outfall protection at one (1) location; two (2) ten foot by four foot (10'x4') box culverts in the streambed and thirty-four feet (34') temporary pump around impact at one (1) location; an eighteen inch by six foot (18"x6') culvert in the streambed, twenty-eight feet (28') temporary pump around impact and eleven feet (11') outfall protection at one (1) location ; and extending an existing twenty-four inch by thirty-nine foot (24"x39') culvert in the streambed by five feet (5') and twenty feet (20') temporary pump around impact at one (1) location (OXF 98 Well Pad) along Left Fork Arnold Creek and unnamed tributaries of Left Fork Arnold Creek near West Union in Doddridge County, West Virginia.

This Right of Entry is subject to the following terms and conditions:

1. No in stream work during the fish-spawning season (April 1-June 30).

2. Work should be completed as quickly as possible during low flows in designated work areas only.

3. All shore areas disturbed by this operation must be reshaped, seeded and mulched immediately upon completion of work. The prompt establishment of vegetative cover will reduce future damage from high water levels.

4. Green concrete must not be put in the stream (highly toxic to aquatic life).

5. Guidance should be obtained from NRCS (formerly SCS) and a registered engineer for the design and construction. Must allow for passage of at least ten-year flood flow.

6. Best management practices should be followed; measures such as hay bales must be used to reduce downstream siltation.

7. Applicant is responsible for removing debris from in and around the installation periodically to prevent stream flow obstruction.

8. Durable head walls of logs, rock, or concrete shall be constructed at both the upstream and downstream ends of crossing to prevent erosion of fill material into the stream.

9. The State's issuance of this Right-of-Entry does not provide for the applicant to work outside the requested boundaries nor does the State assume any liability for the applicant's/landowner's construction activities. By accepting this Right-of-Entry, the applicant/landowner assumes liability for any/all damages caused by this activity to both upstream and downstream landowners.

Guidelines of Best Management Practices for Sediment and Erosion Control as outlined by the Section of Water Resources, Division of Environmental Protection must be followed. Copies of those guidelines are available from the Section of Water Resources, 601 57th Street S.E., Charleston, West Virginia 25304-2345, Telephone No. (304) 926-0440.

The issuance of this Right of Entry by the Division of Natural Resources does not preclude the necessity to obtain a permit from the Corps of Engineers or any other state or federal permits which may be required by law, nor does this Right of Entry negate the need to comply with the West Virginia Water Pollution Control Act and/or the State Environmental Quality Board's administrative regulations, applicant is also responsible for determining if the proposed activity is located within an identified flood plain and it is the applicant's responsibility for contacting the local governmental agency in charge of that program and obtaining a flood plain development permit for it. This Right of Entry does not grant any rights or privileges, or permission to enter upon or to cross the property of any other person, nor is permission granted to remove any material that lies upon the property of any other persons. Work should be completed in as brief a period as possible and within one year from the date of this letter. In the event you fail or refuse to comply with any of the terms or conditions herein, this Right of Entry will be canceled and considered null and void and the Division will reject further applications.

Your payment is now due and payable in the amount of $400.00 to the Division of Natural Resources covering the first year's annual fee of this agreement. Your agreement will be effective upon receipt of your payment in full. You must notify this office in writing when this installation has been removed.

Sincerely,

Joe T. Scarberry, Supervisor
Office of Land and Streams

JTS:cb
pc: DNR Fish Biologist
Jeremy Bandy, Environmental Enforcement
DNR Conservation Officers

RETTEW SM

We answer to you.

MICHAEL R. OGDEN, P.E.
Project Manager
Land Development Services

Twin Towers • 4955 Steubenville Pike, Suite 305
Pittsburgh, PA 15205 • Mobile: (910) 338-7226
(412) 446-1728, Ext. 3393 • Fax: (412) 446-1733
E-mail: mogden@rettew.com • Web site: rettew.com

x3515

Engineers
Planners
Surveyors
Landscape Architects
Environmental Consultants

Legal Advertisement:

Doddridge County

Floodplain Permit Application

Please take notice that on the 20th day of January, 2015

Noble Energy

filed an application for a Floodplain Permit to develop land located at or about:

West Union District

39.256383N/80.791869W to 39.253116N/80.799494W

Permit #15-333 OXF 98 Well Pad

The Application is on file with the Clerk of the County Court and may be inspected or copied during regular business hours. Any interested persons who desire to comment shall present the same in writing by **February 23, 2015,** delivered to:

Clerk of the County Court

118 E. Court Street, West Union, WV 26456

Beth A Rogers, Doddridge County Clerk

Edwin L. "Bo" Wriston. Doddridge County Flood Plain Manager

LEGAL ADVERTISEMENT:
Doddridge County
Floodplain Permit Application

Please take notice that on the 20th day of January, 2015 Noble Energy filed an application for a Floodplain Permit to develop land located at or about: West Union District 39.256383N/80.791869W to 39.253116N/80.799494W Permit #15-333 OXF 98 Well Pad The Application is on file with the Clerk of the County Court and may be inspected or copied during regular business hours. As this project is outside the FEMA identified floodplain of Doddridge County, Doddridge County Floodplain Management has no regulatory authority. Any interested persons who desire to comment shall present the same in writing by February 23, 2015.

Delivered to the:
Clerk of the County Court
118 E. Court Street, West Union, WV 26456
Beth A. Rogers, Doddridge County Clerk
Edwin L. "Bo" Wriston, Doddridge County Flood Plain Manager

2-3-2xb

STATE OF WEST VIRGINIA,
COUNTY OF DODDRIDGE, TO WIT

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

Floodplain Permit Application # 15-333

was published in said paper for 2

successive weeks beginning with the issue of February 3rd **2015 and ending with the issue of** February 10th **2015 and that said notice contains** 210

WORD SPACE at 115 **cents a word amounts to the sum of $** 24.15

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

$ 18.12

and each publication thereafter

$ 42.24 **TOTAL**

EDITOR

Virginia Nicholson

SWORN TO AND SUBSCRIBED BEFORE ME THIS THE 12th **DAY OF** February **2015**

NOTARY PUBLIC

Laura J Stickel

OFFICIAL SEAL
Notary Public, State Of West Virginia
LAURA J STICKEL
212 Edmond Street
West Union, WV 26456

The Doddridge Independent

The Doddridge Independent

PUBLISHER'S CERTIFICATE

I, Michael D. Zorn, Publisher of The Doddridge Independent, A newspaper of general circulation published in the town of West Union, Doddridge County, West Virginia, do hereby certify that:

Noble Energy

filed an application for a Floodplain Permit to develop land located at or about:

West Union District

39.256383N/80.791869W to 39.253116N/80.799494W

Permit #15-333 OXF 98 Well Pad

was published in The Doddridge Independent
2 times commencing on Friday, February 6, 2015 and
Ending on Friday, February 13, 2015 at the request of:

Edwin Wriston, Doddridge County Floodplain Manager& Doddridge County Commission

Given under my hand this Tuesday, February 17, 2015

The publisher's fee for said publication is:

$ 25.27 1st Run/$ 18.95 Subsequent Runs

This Legal Ad Total: $ 44.22

Michael D. Zorn
Publisher of The Doddridge Independent

Subscribed to and sworn to before me on
this date: 2/17/2015

Notary Public in and for Doddridge County
My Commission expires on
The 16 day of May 20 19

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
ROBERT E. BURNSIDE
100 SCHOOL ST.
WEST UNION, WV 26456
My commission expires May 16, 2019

Legal Advertisement: 2/6-2/13
Doddridge County
Floodplain Permit Application

Please take notice that on the 20th day of January, 2015
Noble Energy
filed an application for a Floodplain Permit to develop land located at or about:
West Union District
39.256383N/80.791869W to 39.253116N/80.799494W
Permit #15-333 OXF 98 Well Pad

The Application is on file with the Clerk of the County Court and may be inspected or copied during regular business hours. Any interested persons who desire to comment shall present the same in writing by February 23, 2015, delivered to:

Clerk of the County Court
118 E. Court Street, West Union, WV 26456
Beth A Rogers, Doddridge County Clerk
Edwin L. "Bo" Wriston, Doddridge County Flood Plain Manager

EROSION & SEDIMENT CONTROL PLAN
FOR
OXF 98 WELL PAD
WEST UNION DISTRICT, DODDRIDGE COUNTY, WV

GENERAL NOTES

1. THE TOPOGRAPHIC SURVEY UTILIZED FOR THIS BASE MAPPING WAS PERFORMED BY RETTEW ASSOCIATES, INC IN OCTOBER 2013.
2. PROPERTY BOUNDARIES, LANDOWNER INFORMATION AND ROAD NETWORKS SHOWN ON THIS PLAN ARE BASED ON SURVEY PERFORMED BY RETTEW ASSOCIATES, INC IN JULY 2014. PROPERTY LINES WITHIN THE VICINITY OF THE PROPOSED PAD SITE SHOWN HERON ARE BASED ON DEEDS OF RECORD ALONG WITH SITE EVIDENCE FOUND AND LOCATED BY SURVEY GRADE GPS UNIT AND A CONVENTIONAL DIGITAL TOTAL STATION. MERIDIAN BASED ON TRUE NORTH ACCORDING TO GPS OBSERVATION AND PROCESSED DATA THROUGH THE NATIONAL GEODETIC SURVEY ONLINE POSITIONING USER SERVICE. DATUM PROCESSED IN WEST VIRGINIA NORTH STATE PLANE COORDINATE SYSTEM IN NAD83.
3. EXISTING STRUCTURES, TREE LINES AND ROADWAYS HAVE BEEN LOCATED PER AVAILABLE ONLINE AERIAL PHOTOGRAPHY AND SUPPLEMENTED WITH FIELD SURVEY IN SELECT LOCATIONS.
4. THE HORIZONTAL DATUM IS WEST VIRGINIA STATE PLANE, NORTH AMERICAN DATUM 1983 (NAD 83), NORTH ZONE.
5. THE VERTICAL DATUM IS WEST VIRGINIA STATE PLANE, NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).
6. THE UTILITIES SHOWN ON THIS PLAN ARE FOR REFERENCE PURPOSES ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXACT LOCATION PRIOR TO ANY EXCAVATION BY NOTIFYING MISS UTILITY OF WEST VIRGINIA AT 1-800-245-4848.
7. A WETLANDS PRESENCE/ABSENCE SURVEY WAS PERFORMED BY RETTEW ASSOCIATES IN SEPTEMBER AND OCTOBER 2013.
8. CONTRACTOR TO PROTECT ALL WETLANDS, NO WETLAND IMPACTS ARE PROPOSED IN THIS PLAN.
9. THE CUT & FILL SUMMARY CALCULATIONS PRESENTED ON THIS PLAN ARE FOR PERMITTING AND INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO VERIFY EXISTING GRADES AND TO VERIFY EARTHWORK VOLUMES, METHODS AND PROCEDURES. ANY ISSUES ARE TO BE BROUGHT TO THE ENGINEER'S AND OWNER'S ATTENTION PRIOR TO COMMENCEMENT OF WORK.
10. ALL EXISTING UTILITIES HAVE BEEN SHOWN IN ACCORDANCE WITH THE BEST AVAILABLE INFORMATION.
11. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL ABOVE AND BELOW GROUND UTILITIES AND STRUCTURES AND WILL BE RESPONSIBLE FOR THE PROTECTION OF THESE UTILITIES AND STRUCTURES AT ALL TIMES.
12. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE EXISTING UTILITIES AND MAINTAIN UNINTERRUPTED SERVICE AND ANY DAMAGE DUE TO THE CONTRACTORS NEGLIGENCE SHALL BE REPAIRED IMMEDIATELY AND COMPLETELY AT HIS EXPENSE.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPLACEMENT OF DAMAGED OR DESTROYED LANDSCAPE AND LAWNS.
14. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE PROJECT SITE PRIOR TO THE START OF CONSTRUCTION.
15. CONTRACTOR TO RELOCATE UTILITIES AS REQUIRED.
16. CONTRACTOR MAY WIDEN ACCESS ROAD DUE TO STEEP SLOPES IF DEEMED NECESSARY AND PER APPROVAL BY THE OWNER AND ENGINEER.
17. PROPOSED ROCK CONSTRUCTION ENTRANCE TO BE BUILT SUCH THAT RUNOFF FROM PROPOSED ACCESS WILL NOT SHEET FLOW ON TO PUBLIC ROAD.
18. SEED AND MULCH ALL DISTURBED AREAS PER DETAILS IN THIS PLAN.
19. ALL CLEARED TREE GRINDINGS SHALL BE PLACED ON UPHILL SIDE OF COMPOST FILTER SOCKS AND NOT STOCKPILED ON-SITE.
20. CONTRACTOR SHALL STOP WORK IMMEDIATELY AND CONTACT NOBLE ENERGY AND APPROPRIATE RESPONSIBLE AUTHORITIES SHOULD ANY HISTORICAL ARTIFACTS (I.E. BONES, POTTERY, ETC.) BE ENCOUNTERED DURING CONSTRUCTION.
21. NO WORK SHALL BE DONE OUTSIDE THE LIMITS OF DISTURBANCE OR IN PROTECTED AREAS.

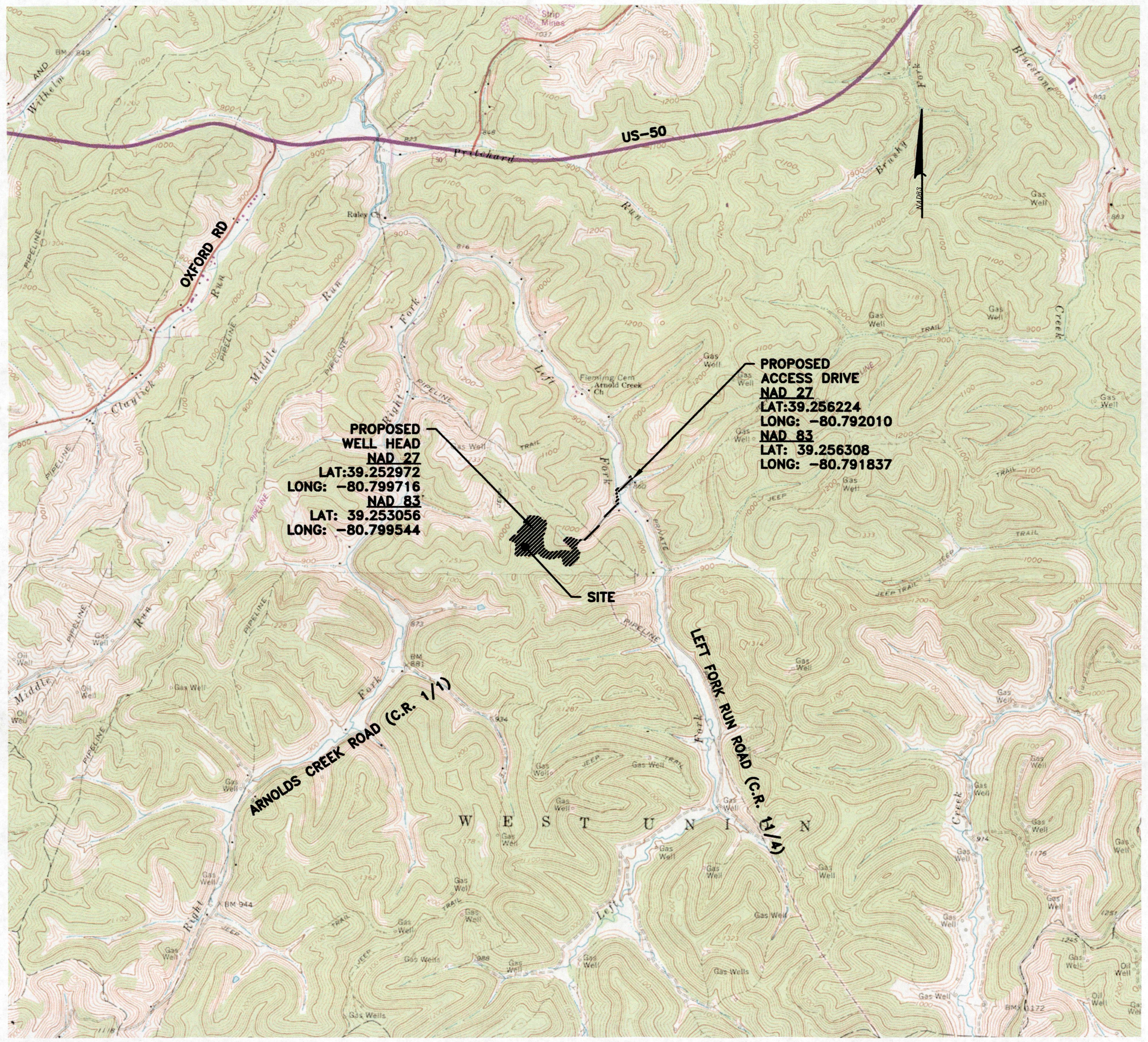
DIRECTIONS TO THE SITE

FROM US 50: GO SOUTH ON ARNOLDS CREEK ROAD FOR 0.7 MILES KEEP STRAIGHT ON LEFT FORK RUN ROAD (C.R. 11/4) FOR 1.4 MILES. SITE WILL BE ON W SIDE OF ROAD.

CUT & FILL

	WELL PAD	ACCESS DRIVE	SPOIL	TOTAL SITE
CUT	+68.380 C.Y.	+42,460 C.Y.	+ 0 C.Y.	+110,840 C.Y.
STONE	+ 3,403 C.Y.	+ 2,718 C.Y.	+ 0 C.Y.	+ 6,121 C.Y.
FILL	−19,584 C.Y.	− 6,991 C.Y.	−67,225 C.Y.	− 93,800 C.Y.
10% COMPACTION	− 6,838 C.Y.	− 4,246 C.Y.	− 0 C.Y.	− 11,084 C.Y.
TOPSOIL	− 5,132 C.Y.	− 6,945 C.Y.	− 0 C.Y.	− 12,077 C.Y.
NET	+40,229 C.Y.	+26,996 C.Y.	−67,225 C.Y.	+ 0 C.Y.

NOTES:
1. THE ASSUMED TOPSOIL DEPTH IS 8".
2. THE CUT & FILL SUMMARY CALCULATIONS PRESENTED ON THIS PLAN ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO VERIFY EXISTING GRADES AND VERIFY EARTHWORK VOLUMES, METHODS AND PROCEDURES. ANY ISSUES ARE TO BE BROUGHT TO THE ENGINEER'S AND OWNER'S ATTENTION PRIOR TO COMMENCEMENT OF WORK.



7.5 MIN. QUADRANGLE MAP: WEST UNION, WV

LOCATION MAP
SCALE – 1"=2000'

WEST VIRGINIA 811

CALL BEFORE YOU DIG! Dial 811 or 800.245.4848
Miss Utility of West Virginia

AT LEAST 48 HOURS, BUT NOT MORE THAN 10 WORKING DAYS (EXCLUDING WEEKENDS AND HOLIDAYS), PRIOR TO TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THESE ACTIVITIES SHALL CONTACT MISS UTILITY OF WEST VIRGINIA AT 811 OR 1-800-245-4848.
TICKET #: 1334391013 DATE: 12/9/2013

SOILS CLASSIFICATION

GsE: GILPIN-PEABODY COMPLEX, 15% TO 35% SLOPES, VERY STONY
GsF: GILPIN-PEABODY COMPLEX, 35% TO 70% SLOPES, VERY STONY
Se: SENSABAUGH SILT LOAM
SeB: SENSABAUGH SILT LOAM, 3% TO 8% SLOPES, RARELY FLOODED
VaD: VANDALIA SILT LOAM, 15% TO 25% SLOPES

LIST OF DRAWINGS

DISTURBANCE SUMMARY

TOTAL LIMITS OF DISTURBANCE = 21.2 ACRES
CLEARING REQUIRED = 15.0 ACRES
PAD DISTURBANCE = 10.9 ACRES

ISSUED FOR PERMIT

SCALE AS SHOWN

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN | CHKD BY: MRO
DRAWN BY: ASN | CHKD BY: MRO
SURV. CHIEF: | FIELDBOOK NO. DATA COLLECTOR

CLIENT
NOBLE ENERGY
333 TECHNOLOGY DRIVE, SUITE 116
CANONSBURG, PA 15317-3077
BEN DEREUME, PE
(724) 820-3000
noble energy

RETTEW
RETTEW Associates, Inc.
Twin Towers, 4955 Steubenville Pk, Ste 305, Pittsburgh, PA 15205
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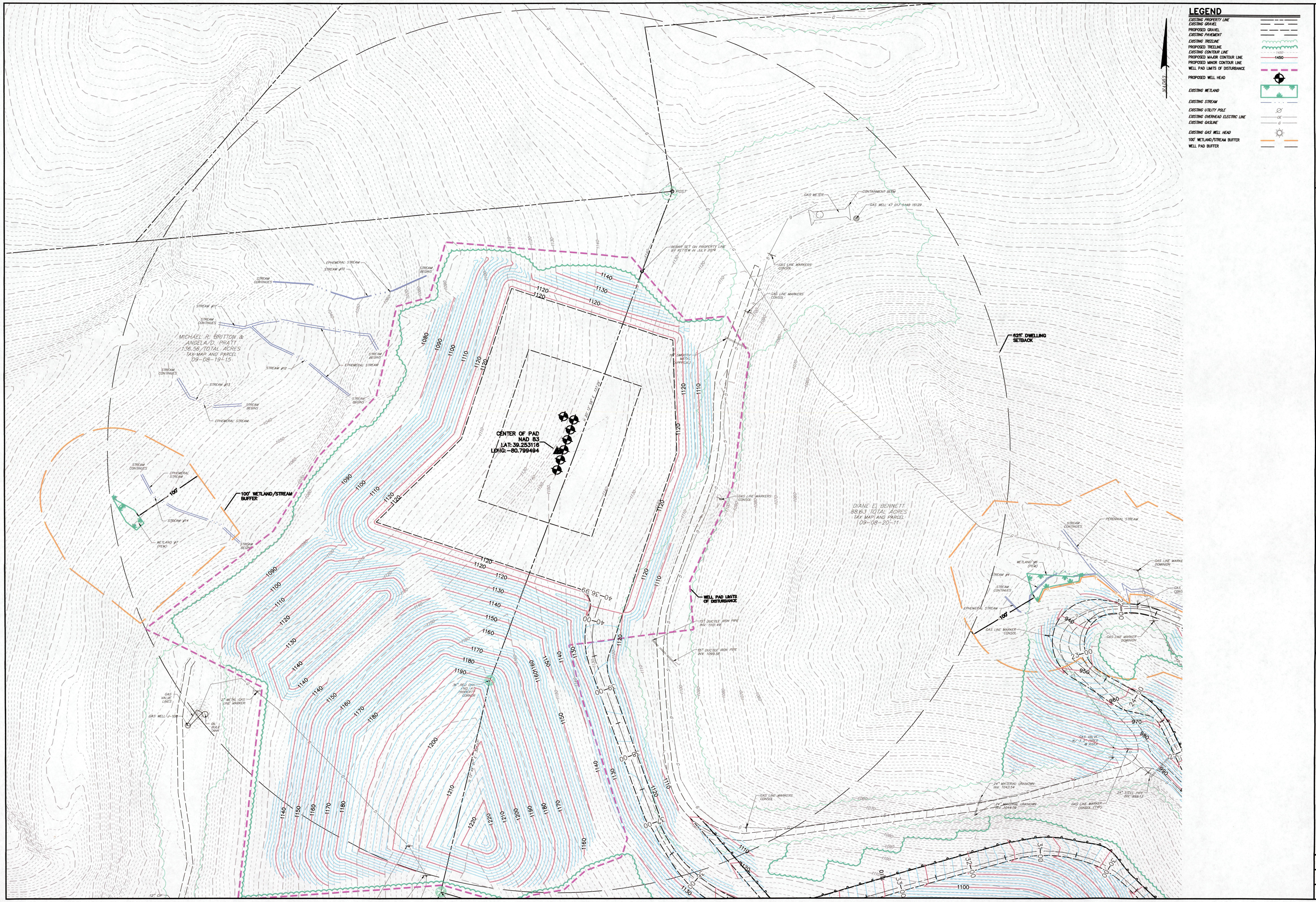
Website: www.rettew.com
Engineers • Planners • Surveyors • Landscape Architects
Environmental Consultants

COVER SHEET
FOR
OXF 98 WELL PAD
WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 1 OF 23
DWG. NO. 093842024



NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

MANAGER: MICHAEL R. OGDEN	
DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
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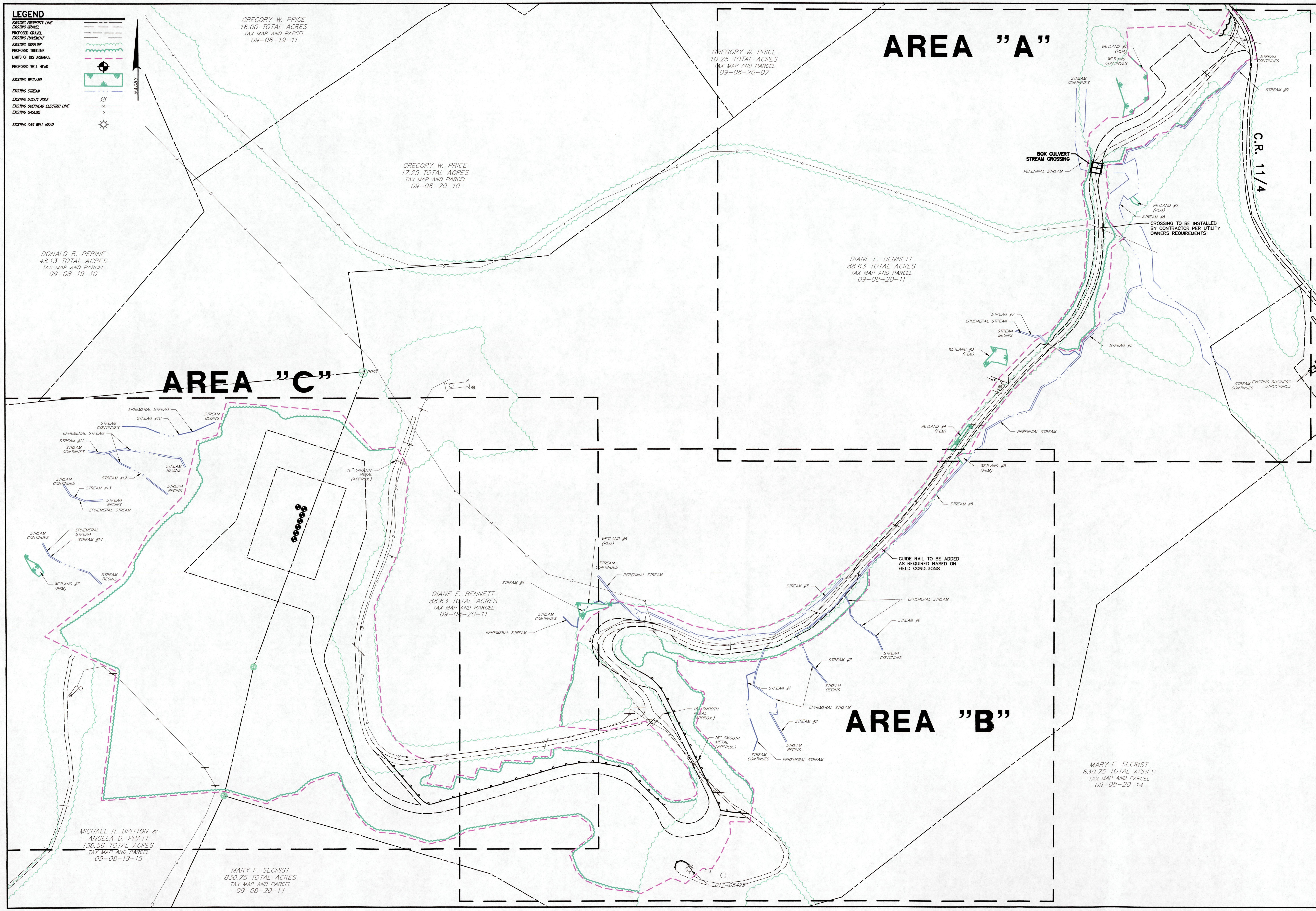
ENVIRONMENTAL RESOURCES BUFFER PLAN
FOR
OXF 98 WELL PAD
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 2 OF 23
DWG. NO. 093842024



LEGEND
EXISTING PROPERTY LINE
EXISTING GRAVEL
PROPOSED GRAVEL
EXISTING PAVEMENT
EXISTING TREELINE
PROPOSED TREELINE
LIMITS OF DISTURBANCE
PROPOSED WELL HEAD
EXISTING WETLAND
EXISTING STREAM
EXISTING UTILITY POLE
EXISTING OVERHEAD ELECTRIC LINE
EXISTING GASLINE
EXISTING GAS WELL HEAD
AREA "A"
AREA "B"
AREA "C"
C.R. 11/4
GREGORY W. PRICE
16.00 TOTAL ACRES
TAX MAP AND PARCEL
09-08-19-11
GREGORY W. PRICE
10.25 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-07
GREGORY W. PRICE
17.25 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-10
DONALD R. PERINE
48.13 TOTAL ACRES
TAX MAP AND PARCEL
09-08-19-10
DIANE E. BENNETT
88.63 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-11
MICHAEL R. BRITTON &
ANGELA D. PRATT
136.56 TOTAL ACRES
TAX MAP AND PARCEL
09-08-19-15
MARY F. SECRIST
830.75 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-14
BOX CULVERT
STREAM CROSSING
PERENNIAL STREAM
CROSSING TO BE INSTALLED
BY CONTRACTOR PER UTILITY
OWNERS REQUIREMENTS
GUIDE RAIL TO BE ADDED
AS REQUIRED BASED ON
FIELD CONDITIONS
EXISTING BUSINESS
STRUCTURES
STREAM CONTINUES
STREAM BEGINS
EPHEMERAL STREAM
WETLAND #1 (PEM)
WETLAND #2 (PEM)
WETLAND #3 (PEM)
WETLAND #4 (PEM)
WETLAND #5 (PEM)
WETLAND #6 (PEM)
WETLAND #7 (PEM)
STREAM #1
STREAM #2
STREAM #3
STREAM #4
STREAM #5
STREAM #6
STREAM #7
STREAM #8
STREAM #9
STREAM #10
STREAM #11
STREAM #12
STREAM #13
STREAM #14
16" SMOOTH METAL (APPROX.)

SCALE 1"=100'
0 50' 100' 200' 300'

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY
REGISTERED
19074
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN | CHKD BY: MRO
DRAWN BY: ASN | CHKD BY: MRO
SURV. CHIEF: | FIELDBOOK NO. | DATA COLLECTOR

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NOBLE ENERGY
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BEN DEREUME, PE
(724) 820-3000

noble energy

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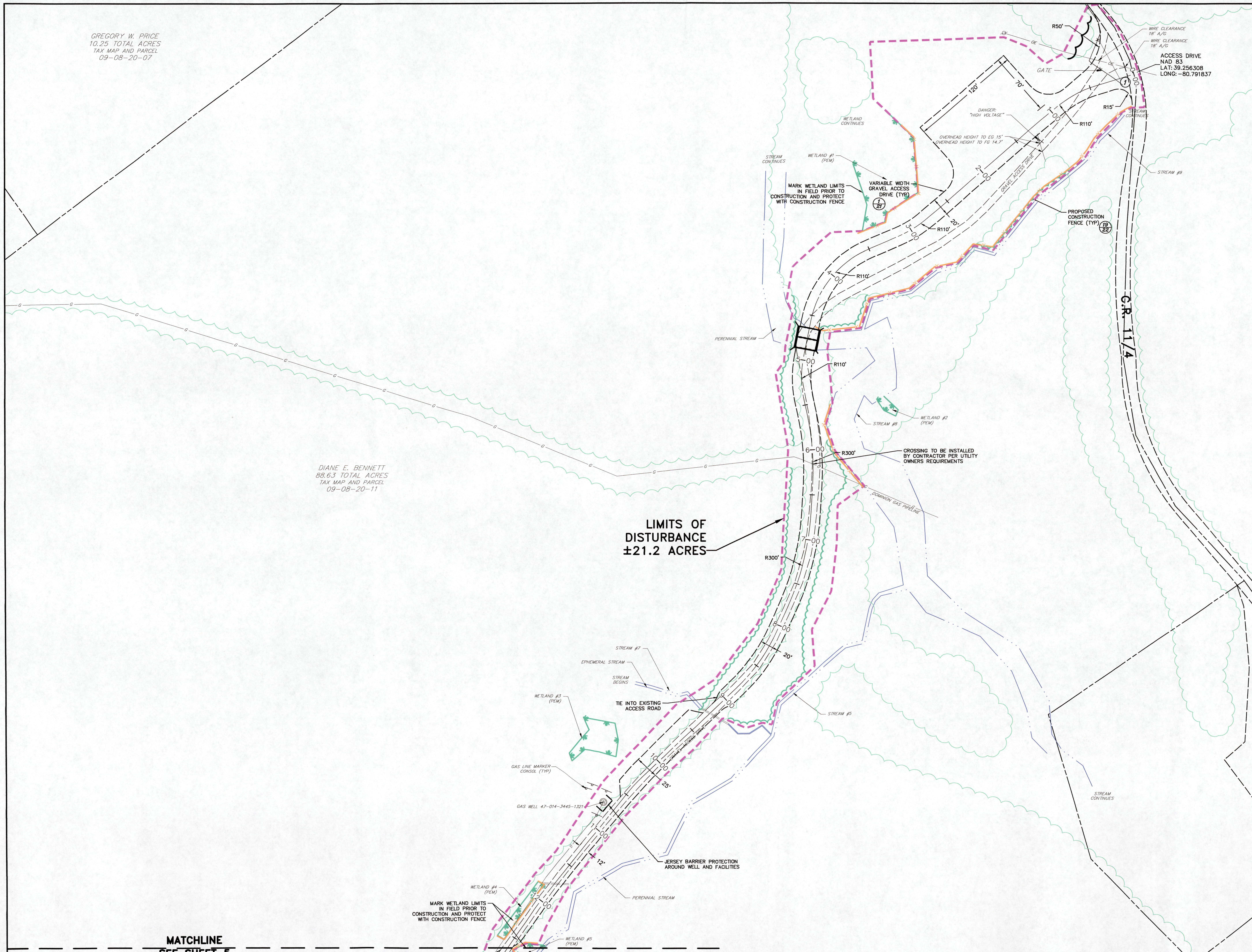
Environmental Consultants

OVERALL SITE PLAN
FOR
OXF 98 WELL PAD
WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 3 OF 23
DWG. NO. 093842024



SITE ACCESS NOTE:
ACCESS TO THE SITE VIA THE SITE ACCESS DRIVE AND CR 11/4 MAY BE LIMITED DURING PERIODS OF HIGH WATER ASSOCIATED WITH FLOODING OF LEFT FORK ARNOLD'S CREEK.

NO.	DATE	REVISION

SCALE 1"=50'

FOR RETTEW ASSOCIATES BY:
ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN — CHKD BY: MRO
DRAWN BY: ASN — CHKD BY: MRO
SURV. CHIEF: — FIELDBOOK NO. DATA COLLECTOR

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Environmental Consultants

AREA "A" LAYOUT PLAN FOR OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 4 OF 23
DWG. NO. 093842024

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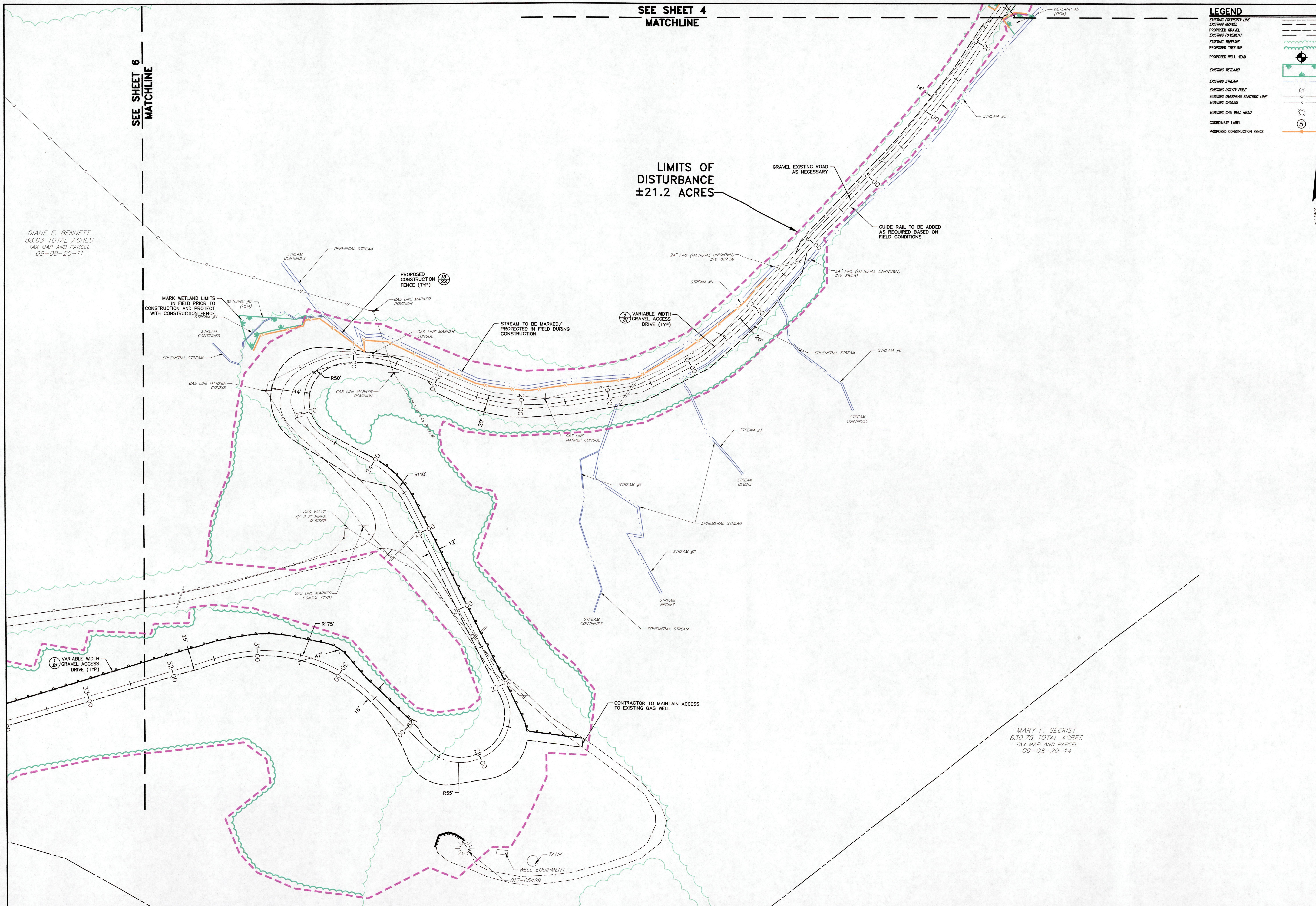
SEE SHEET 4
MATCHLINE
SEE SHEET 6
MATCHLINE
LEGEND
EXISTING PROPERTY LINE
EXISTING GRAVEL
PROPOSED GRAVEL
EXISTING PAVEMENT
EXISTING TREELINE
PROPOSED TREELINE
PROPOSED WELL HEAD
EXISTING WETLAND
EXISTING STREAM
EXISTING UTILITY POLE
EXISTING OVERHEAD ELECTRIC LINE
EXISTING GASLINE
EXISTING GAS WELL HEAD
COORDINATE LABEL
PROPOSED CONSTRUCTION FENCE
SCALE
1"=50'
0
25'
50'
100'
150'
NAD83
LIMITS OF
DISTURBANCE
±21.2 ACRES
GRAVEL EXISTING ROAD
AS NECESSARY
GUIDE RAIL TO BE ADDED
AS REQUIRED BASED ON
FIELD CONDITIONS
DIANE E. BENNETT
88.63 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-11
MARY F. SECRIST
830.75 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-14
MARK WETLAND LIMITS
IN FIELD PRIOR TO
CONSTRUCTION AND PROTECT
WITH CONSTRUCTION FENCE
PROPOSED
CONSTRUCTION
FENCE (TYP)
STREAM TO BE MARKED/
PROTECTED IN FIELD DURING
CONSTRUCTION
VARIABLE WIDTH
GRAVEL ACCESS
DRIVE (TYP)
CONTRACTOR TO MAINTAIN ACCESS
TO EXISTING GAS WELL
PERENNIAL STREAM
EPHEMERAL STREAM
STREAM CONTINUES
STREAM BEGINS
STREAM #1
STREAM #2
STREAM #3
STREAM #4
STREAM #5
STREAM #6
WETLAND #5 (PEM)
WETLAND #6 (PEM)
24" PIPE (MATERIAL UNKNOWN)
GAS LINE MARKER DOMINION
GAS LINE MARKER CONSOL
GAS LINE MARKER CONSOL (TYP)
GAS VALVE W/ 3 2" PIPES @ RISER
TANK
WELL EQUIPMENT
017-05429
R50'
R110'
R175'
R55'
44'
47'
20'
12'
14'
16'
25'
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00
NO.
DATE
REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY
REGISTERED PROFESSIONAL ENGINEER
19074
STATE OF WEST VIRGINIA

MANAGER: MICHAEL R. OGDEN

DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. DATA COLLECTOR

CLIENT

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(724) 820-3000

noble energy

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Email: rettew@rettew.com
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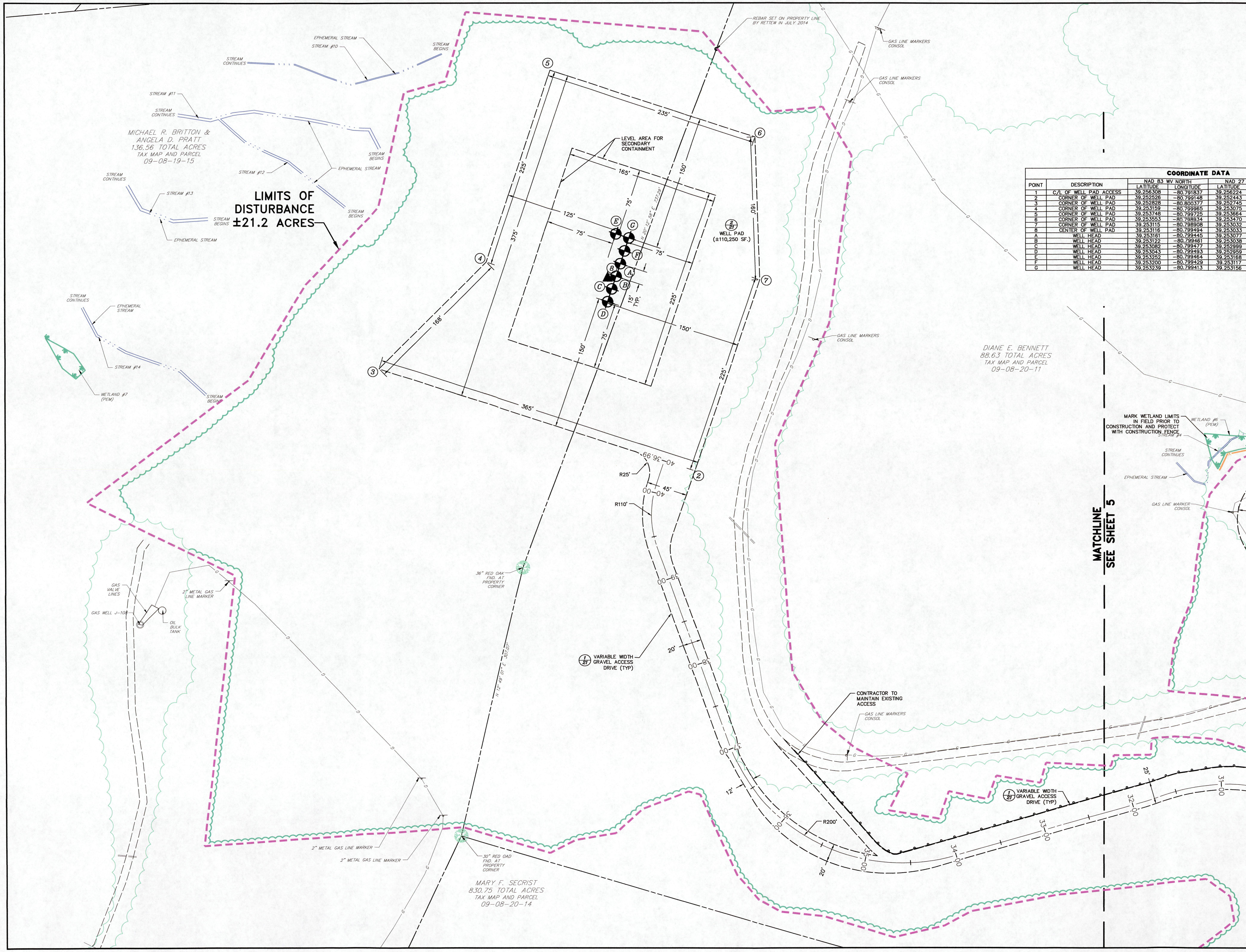
AREA "B" LAYOUT PLAN FOR OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014

SHEET NO. 5 OF 23

DWG. NO. 093842024



LEGEND

- EXISTING PROPERTY LINE
- EXISTING GRAVEL
- PROPOSED GRAVEL
- EXISTING PAVEMENT
- EXISTING TREELINE
- PROPOSED TREELINE
- PROPOSED WELL HEAD
- EXISTING WETLAND
- EXISTING STREAM
- EXISTING UTILITY POLE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING GASLINE
- EXISTING GAS WELL HEAD
- COORDINATE LABEL
- PROPOSED CONSTRUCTION FENCE

SCALE 1"=50'

COORDINATE DATA

POINT	DESCRIPTION	NAD 83 WV NORTH		NAD 27 WV NORTH		UTM NAD83 ZONE 17 METERS	
		LATITUDE	LONGITUDE	LATITUDE	LONGITUDE	NORTHING	EASTING
1	C/L OF WELL PAD ACCESS	39.256308	-80.791837	39.256224	-80.792010	4345240.587	517959.979
2	CORNER OF WELL PAD	39.252526	-80.799148	39.252443	-80.799320	4344819.518	517330.153
3	CORNER OF WELL PAD	39.252828	-80.800377	39.252745	-80.800549	4344852.825	517224.046
4	CORNER OF WELL PAD	39.253159	-80.799965	39.253075	-80.800137	4344889.587	517259.537
5	CORNER OF WELL PAD	39.253748	-80.799725	39.253664	-80.799897	4344954.996	517280.069
6	CORNER OF WELL PAD	39.253553	-80.798934	39.253470	-80.799106	4344933.552	517348.384
7	CORNER OF WELL PAD	39.253115	-80.798908	39.253032	-80.799081	4344884.927	517350.685
8	CENTER OF WELL PAD	39.253116	-80.799494	39.253033	-80.799667	4344884.946	517300.102
A	WELL HEAD	39.253161	-80.799445	39.253077	-80.799618	4344889.894	517304.342
B	WELL HEAD	39.253122	-80.799461	39.253038	-80.799634	4344885.533	517302.973
C	WELL HEAD	39.253082	-80.799477	39.252999	-80.799650	4344881.172	517301.604
D	WELL HEAD	39.253043	-80.799493	39.252959	-80.799666	4344876.812	517300.235
E	WELL HEAD	39.253252	-80.799464	39.253168	-80.799636	4344899.984	517302.719
F	WELL HEAD	39.253200	-80.799429	39.253117	-80.799602	4344894.254	517305.711
G	WELL HEAD	39.253239	-80.799413	39.253156	-80.799586	4344898.615	517307.079

NO. | DATE | REVISION

FOR RETTEW ASSOCIATES BY:

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN — CHKD BY: MRO
DRAWN BY: ASN — CHKD BY: MRO
SURV. CHIEF: — FIELDBOOK NO. DATA COLLECTOR

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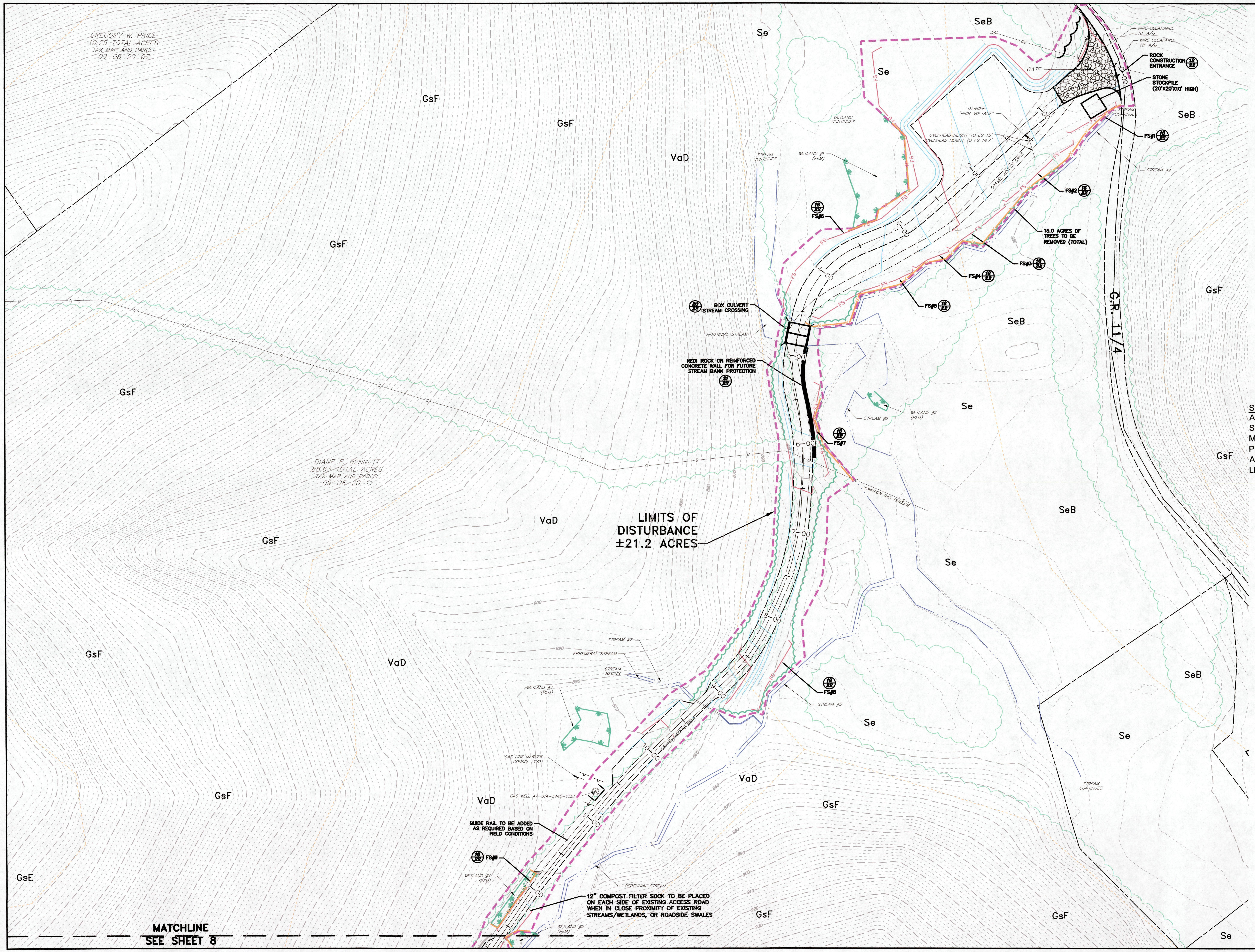
AREA "C" LAYOUT PLAN FOR OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 6 OF 23
DWG. NO. 093842024



LEGEND

EXISTING PROPERTY LINE	
EXISTING GRAVEL	
PROPOSED GRAVEL	
EXISTING PAVEMENT	
EXISTING TREELINE	
PROPOSED TREELINE	
EXISTING CONTOUR LINE	1450
PROPOSED MAJOR CONTOUR LINE	1450
PROPOSED MINOR CONTOUR LINE	
LIMITS OF DISTURBANCE	
PROPOSED WELL HEAD	
EXISTING WETLAND	
EXISTING STREAM	
EXISTING UTILITY POLE	
EXISTING OVERHEAD ELECTRIC LINE	OE
EXISTING GASLINE	G
EXISTING GAS WELL HEAD	
PROPOSED FILTER SOCK	FS
PROPOSED CONTAINMENT BERM	
TEMPORARY ROCK CONSTRUCTION ENTRANCE	
PROPOSED SLOPE LINING	
PROPOSED TOE BENCH	
PROPOSED CHECK DAM	
CHANNEL LINING	
SOIL TYPE BOUNDARY LINE	
SOIL TYPE DESIGNATION	WhB
PROPOSED CONSTRUCTION FENCE	

NOTE:
REFER TO SHEET 17 FOR FILTER SOCK LENGTH AND SIZE.

SITE ACCESS NOTE:
ACCESS TO THE SITE VIA THE SITE ACCESS DRIVE AND CR 11/4 MAY BE LIMITED DURING PERIODS OF HIGH WATER ASSOCIATED WITH FLOODING OF LEFT FORK ARNOLD'S CREEK.

NAD83

SCALE 1"=50'
0 25' 50' 100' 150'

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:
ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

MANAGER: MICHAEL R. OGDEN	
DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. DATA COLLECTOR

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AREA "A"
EROSION & SEDIMENT CONTROL PLAN FOR OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 7 OF 23
DWG. NO. 093842024

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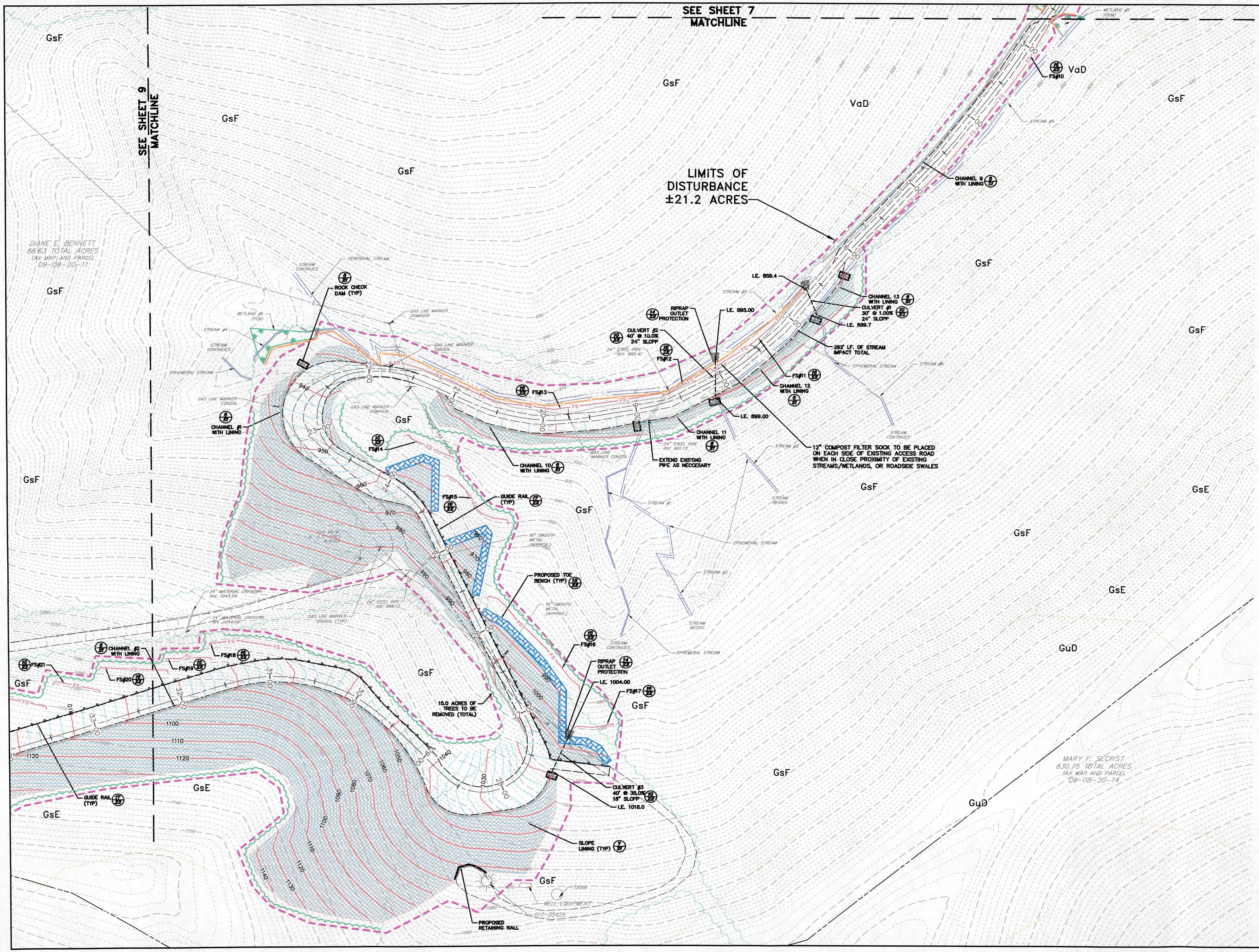

LEGEND

- EXISTING PROPERTY LINE
- EXISTING GRAVEL
- PROPOSED GRAVEL
- EXISTING PAVEMENT
- EXISTING TREELINE
- PROPOSED TREELINE
- EXISTING CONTOUR LINE (1450)
- PROPOSED MAJOR CONTOUR LINE (1450)
- PROPOSED MINOR CONTOUR LINE
- LIMITS OF DISTURBANCE
- PROPOSED WELL HEAD
- EXISTING WETLAND
- EXISTING STREAM
- EXISTING UTILITY POLE
- EXISTING OVERHEAD ELECTRIC LINE (OE)
- EXISTING GASLINE (G)
- EXISTING GAS WELL HEAD
- PROPOSED FILTER SOCK (FS)
- PROPOSED CONTAINMENT BERM
- TEMPORARY ROCK CONSTRUCTION ENTRANCE
- PROPOSED SLOPE LINING
- PROPOSED TOE BENCH
- PROPOSED CHECK DAM
- CHANNEL LINING
- SOIL TYPE BOUNDARY LINE
- SOIL TYPE DESIGNATION (WhB)
- PROPOSED CONSTRUCTION FENCE

NOTE:
REFER TO SHEET 17 FOR FILTER SOCK LENGTH AND SIZE.

SCALE 1"=50'
0 25' 50' 100' 150'

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN — CHKD BY: MRO
DRAWN BY: ASN — CHKD BY: MRO
SURV. CHIEF: — FIELDBOOK NO. DATA COLLECTOR

NAD83

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BEN DEREUME, PE
(724) 820-3000
noble energy

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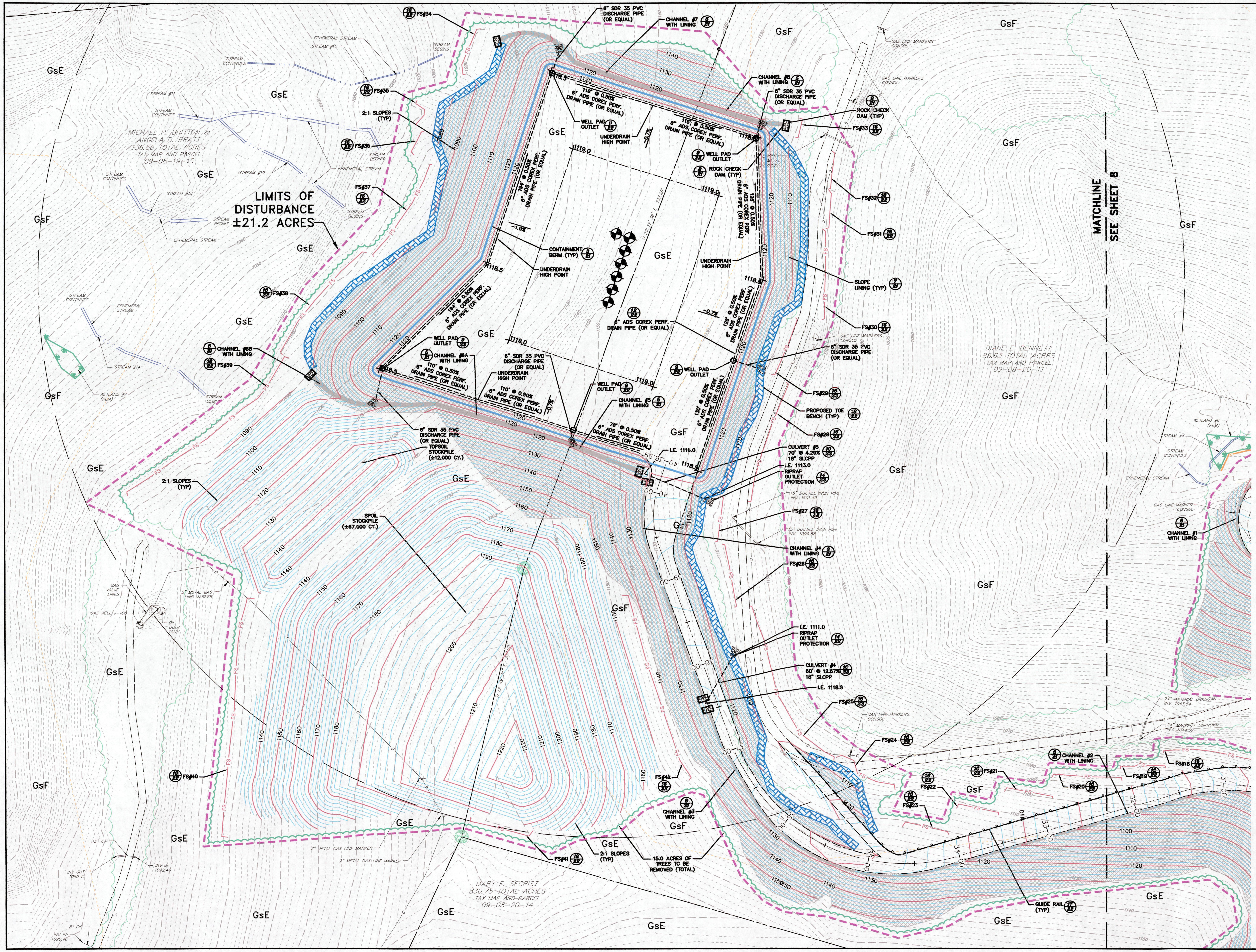
AREA "B" EROSION & SEDIMENT CONTROL PLAN FOR OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 8 OF 23
DWG. NO. 093842024



LEGEND

- EXISTING PROPERTY LINE
- EXISTING GRAVEL
- PROPOSED GRAVEL
- EXISTING PAVEMENT
- EXISTING TREELINE
- PROPOSED TREELINE
- EXISTING CONTOUR LINE
- PROPOSED MAJOR CONTOUR LINE
- PROPOSED MINOR CONTOUR LINE
- LIMITS OF DISTURBANCE
- PROPOSED WELL HEAD
- EXISTING WETLAND
- EXISTING STREAM
- EXISTING UTILITY POLE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING GASLINE
- EXISTING GAS WELL HEAD
- PROPOSED FILTER SOCK
- PROPOSED CONTAINMENT BERM
- TEMPORARY ROCK CONSTRUCTION ENTRANCE
- PROPOSED SLOPE LINING
- PROPOSED TOE BENCH
- PROPOSED CHECK DAM
- CHANNEL LINING
- SOIL TYPE BOUNDARY LINE
- SOIL TYPE DESIGNATION — WhB
- PROPOSED CONSTRUCTION FENCE

NOTE:
REFER TO SHEET 17 FOR FILTER SOCK LENGTH AND SIZE.

SCALE 1"=50'

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

MANAGER: MICHAEL R. OGDEN		
DESIGN BY: ASN	CHKD BY: MRO	
DRAWN BY: ASN	CHKD BY: MRO	
SURV. CHIEF:	FIELDBOOK NO.	DATA COLLECTOR

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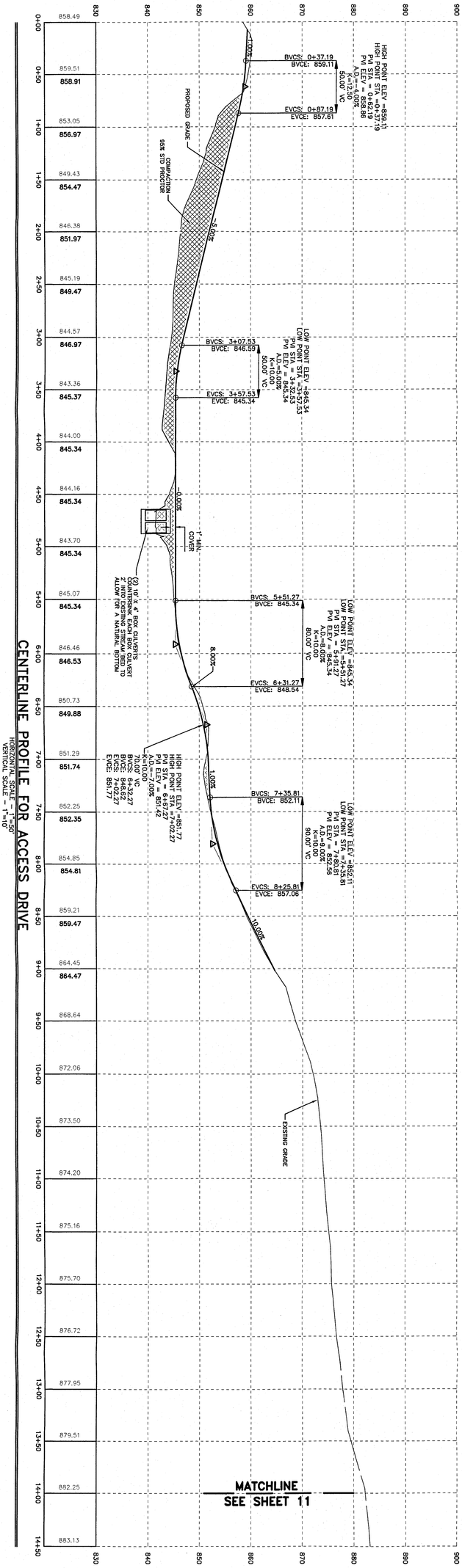
AREA "C"
EROSION & SEDIMENT CONTROL PLAN
FOR
OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 9 OF 23
DWG. NO. 093842024



ACCESS DRIVE PROFILES
EROSION & SEDIMENT CONTROL PLAN
FOR
OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 10 OF 23
DWG. NO. 093842024

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MANAGER: MICHAEL R. OGDEN	
DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. / DATA COLLECTOR

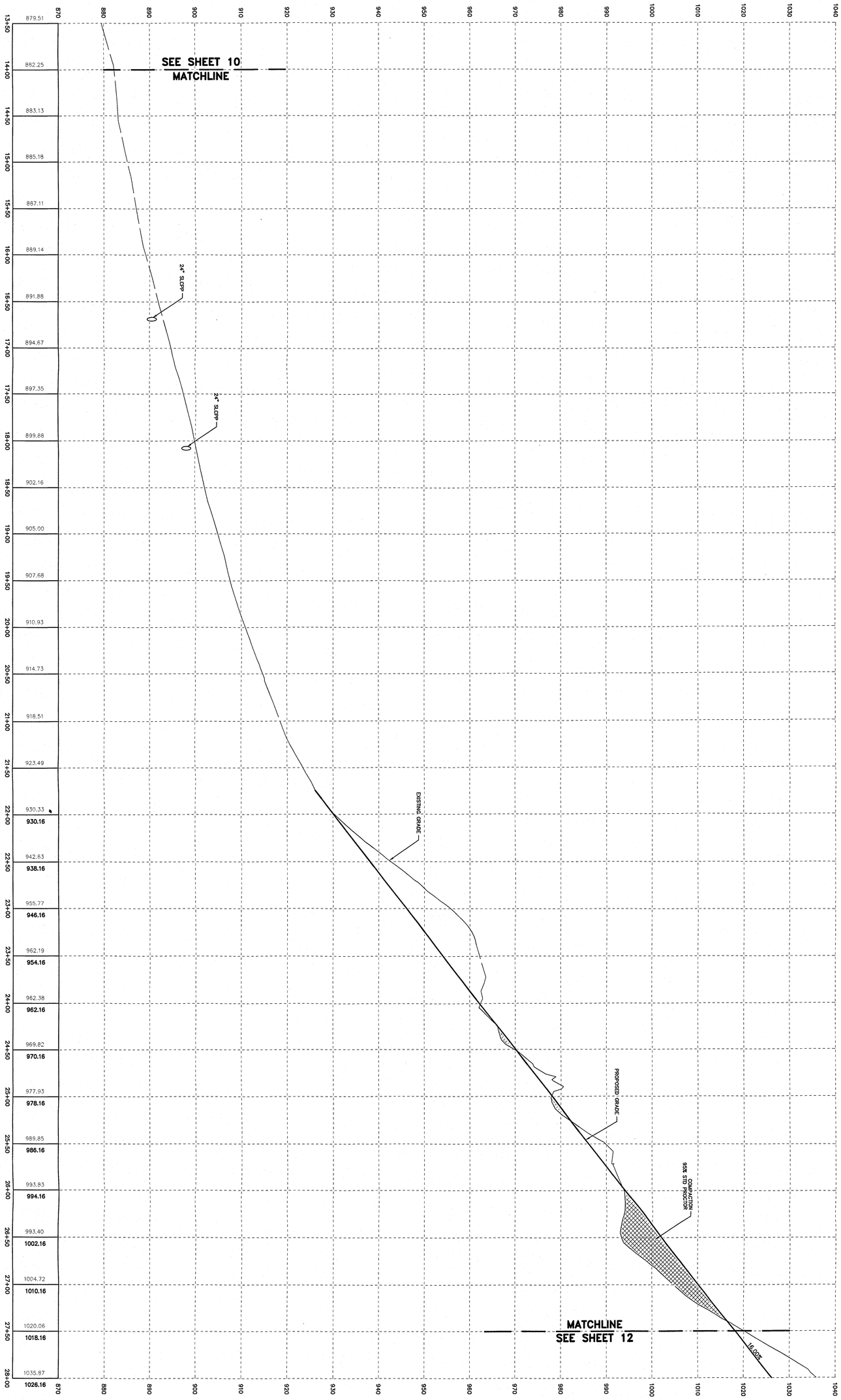
FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

SCALE
AS SHOWN

NO.	DATE	REVISION

C:_RettewVault\WIP\093842024-OXF 98\Sheets\LD\DWS\093842024-DWS Plan.dwg



ACCESS DRIVE PROFILES
EROSION & SEDIMENT CONTROL PLAN
FOR
OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 11 OF 23
DWG. NO. 093842024

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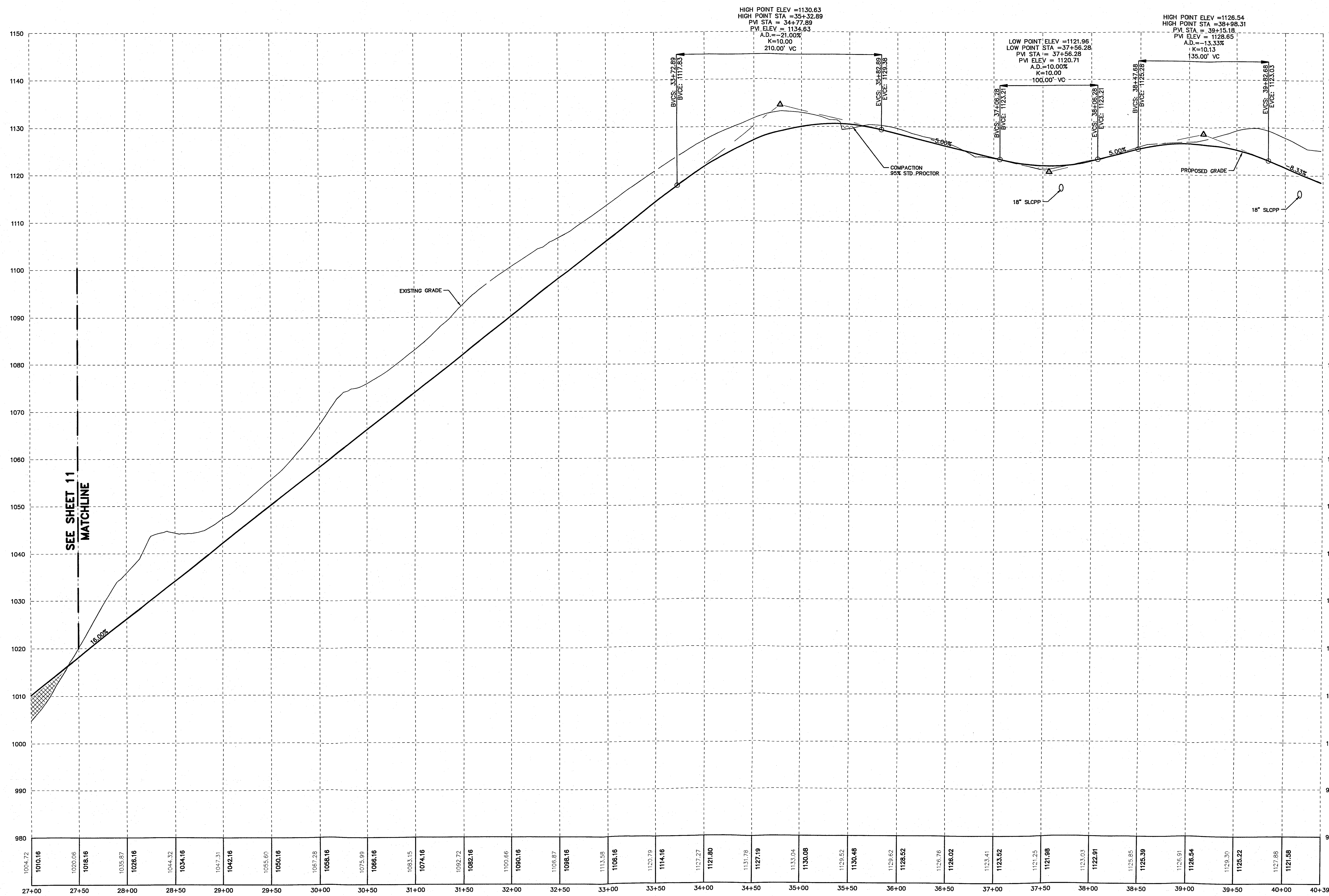
MANAGER: MICHAEL R. OGDEN	
DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. DATA COLLECTOR

FOR RETTEW ASSOCIATES BY:
ERIC N. HENRY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

SCALE
AS SHOWN

NO.	DATE	REVISION

C:_RettewVaultWP\093842024-OXF 98\Sheets\LD\ENS\093842024-ENS Plan.dwg



CENTERLINE PROFILE FOR ACCESS DRIVE

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

SCALE: AS SHOWN

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY, REGISTERED PROFESSIONAL ENGINEER, 19074, STATE OF WEST VIRGINIA

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN — CHKD BY: MRO
DRAWN BY: ASN — CHKD BY: MRO
SURV. CHIEF: FIELDBOOK NO. DATA COLLECTOR

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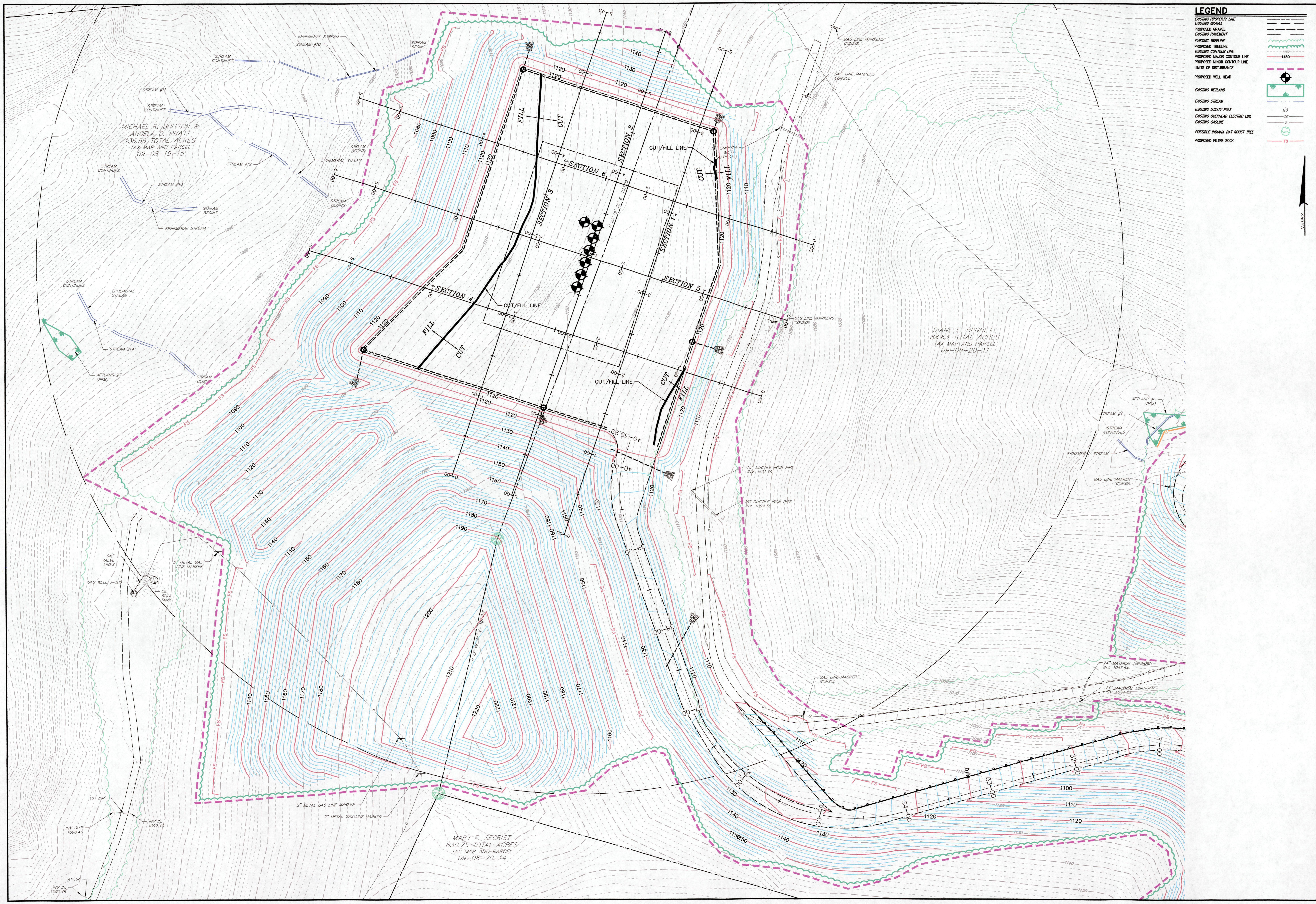
ACCESS DRIVE PROFILES
EROSION & SEDIMENT CONTROL PLAN FOR
OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 12 OF 23
DWG. NO. 093842024



LEGEND
EXISTING PROPERTY LINE
EXISTING GRAVEL
PROPOSED GRAVEL
EXISTING PAVEMENT
EXISTING TREELINE
PROPOSED TREELINE
EXISTING CONTOUR LINE
PROPOSED MAJOR CONTOUR LINE
PROPOSED MINOR CONTOUR LINE
LIMITS OF DISTURBANCE
PROPOSED WELL HEAD
EXISTING WETLAND
EXISTING STREAM
EXISTING UTILITY POLE
EXISTING OVERHEAD ELECTRIC LINE
EXISTING GASLINE
POSSIBLE INDIANA BAT ROOST TREE
PROPOSED FILTER SOCK
MICHAEL R. BRITTON & ANGELA D. PRATT
136.56 TOTAL ACRES
TAX MAP AND PARCEL
09-08-19-15
DIANE E. BENNETT
88.63 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-11
MARY F. SECRIST
830.75 TOTAL ACRES
TAX MAP AND PARCEL
09-08-20-14
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
SECTION 6
CUT/FILL LINE
CUT
FILL
NAD83

SCALE 1" = 50'

0 25' 50' 100' 150'

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

MANAGER: MICHAEL R. OGDEN	
DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. DATA COLLECTOR

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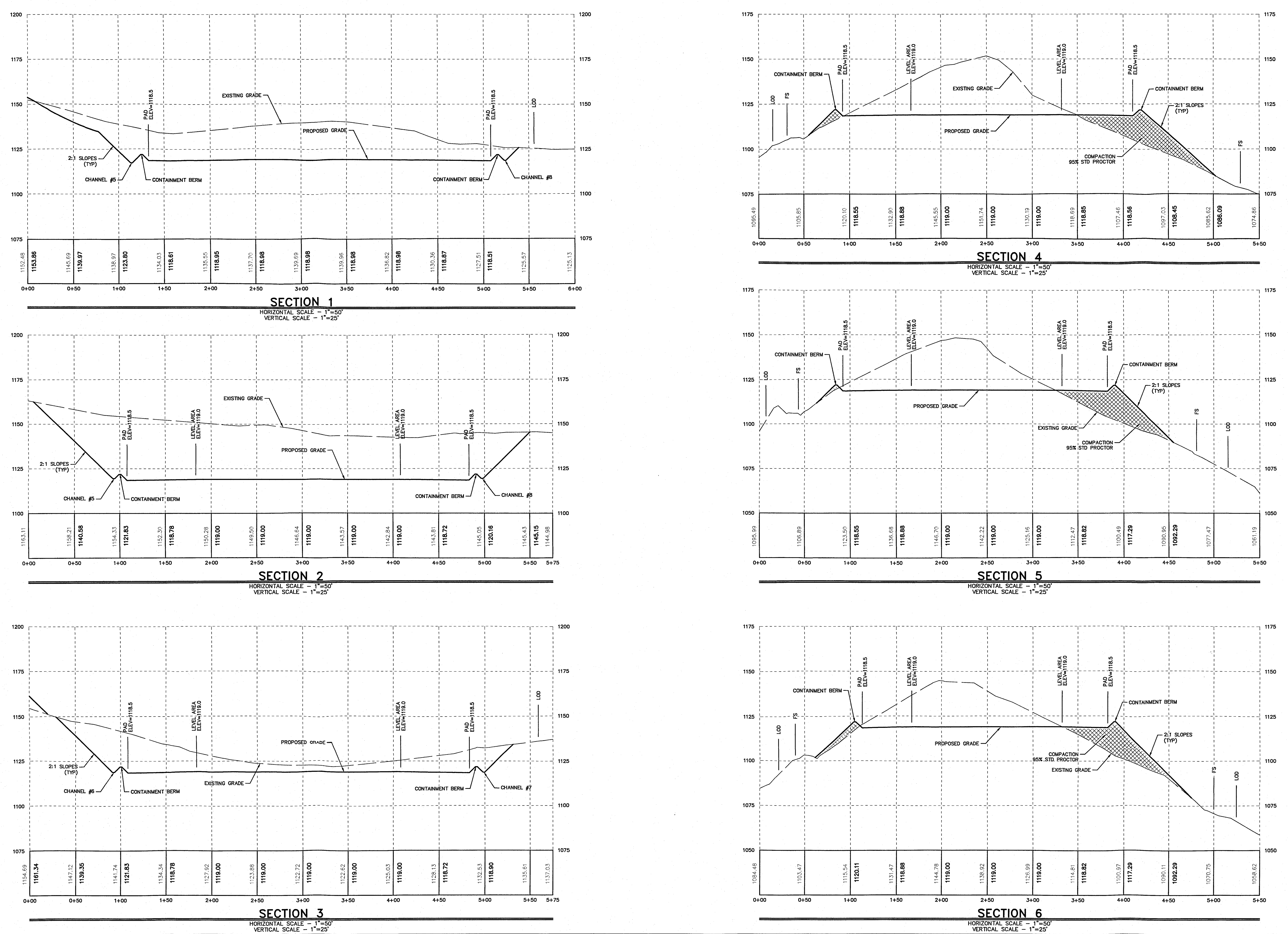
WELL PAD CROSS SECTIONS PLAN VIEW FOR OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014

SHEET NO. 13 OF 23

DWG. NO. 093842024



SCALE AS SHOWN

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

MANAGER: MICHAEL R. OGDEN

DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. DATA COLLECTOR

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WELL PAD CROSS SECTIONS FOR OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014

SHEET NO. 14 OF 23

DWG. NO. 093842024

DWG. NO. 093842024

SHEET NO. 15 OF 23

DATE: 10/14/2014

ACCESS DRIVE CROSS SECTIONS PLAN VIEW FOR OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

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MANAGER: MICHAEL R. OGDEN	
DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. DATA COLLECTOR

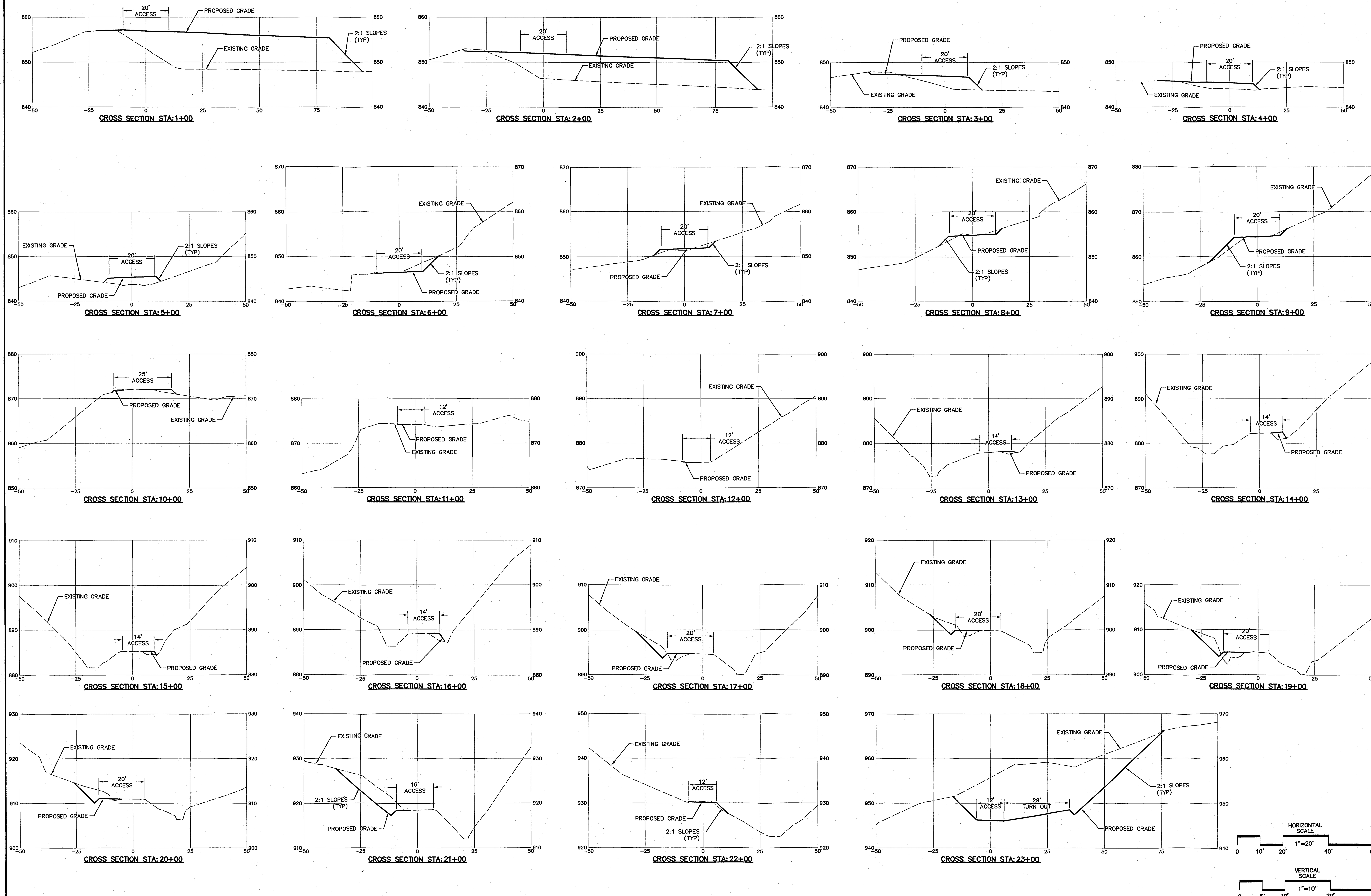
FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

SCALE 1"=100' (0, 50', 100', 200', 300')

NO.	DATE	REVISION

C:_RettewVault\WP_093842024-OXF 98\Sheets\LD\ENS\093842024-ENS Plan.dwg



SCALE AS SHOWN

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED PROFESSIONAL ENGINEER 19074 STATE OF WEST VIRGINIA

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN — CHKD BY: MRO
DRAWN BY: ASN — CHKD BY: MRO
SURV. CHIEF: — FIELDBOOK NO. DATA COLLECTOR

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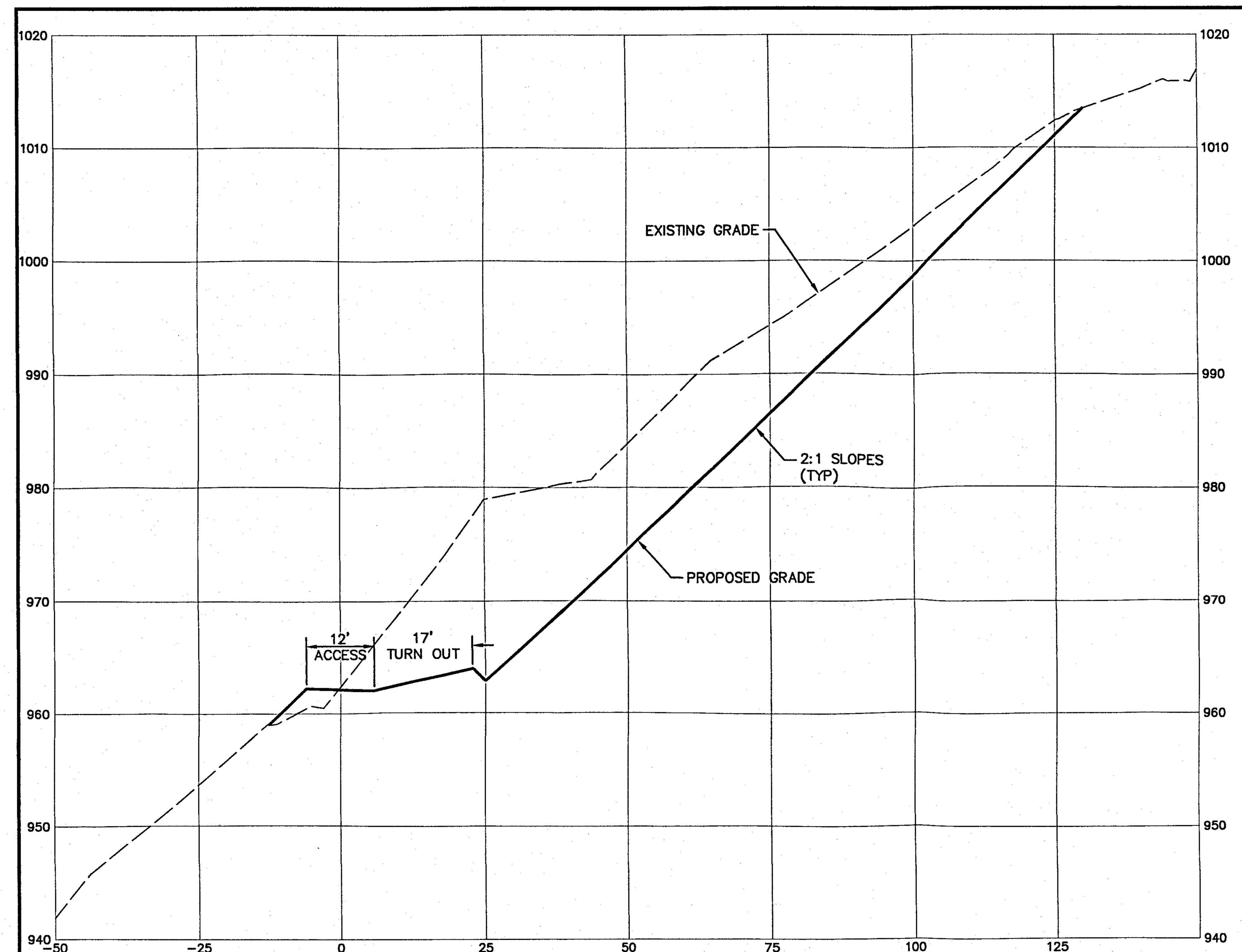
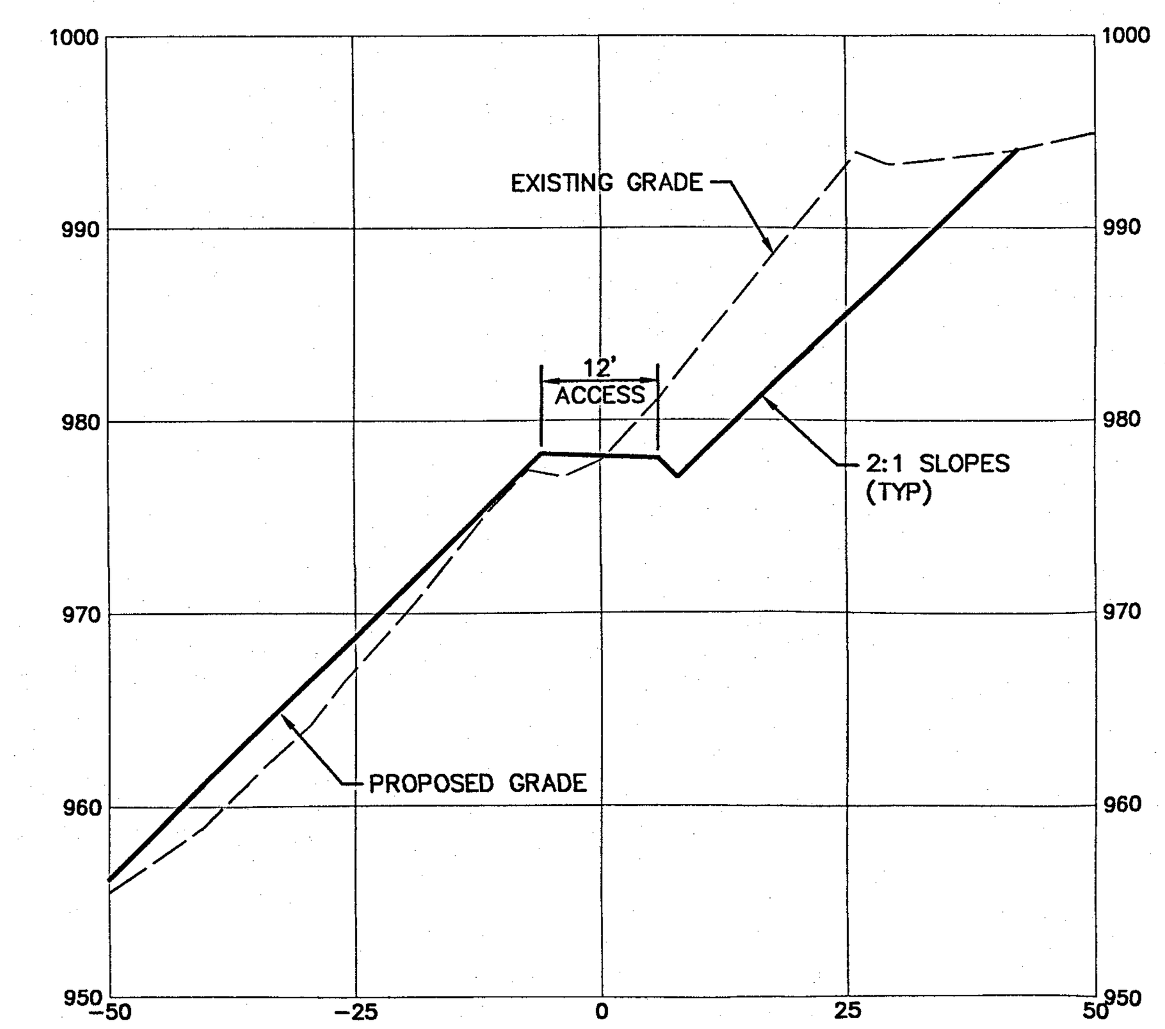
ACCESS DRIVE CROSS SECTIONS FOR OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 16 OF 23
DWG. NO. 093842024



CROSS SECTION STA: 24+00



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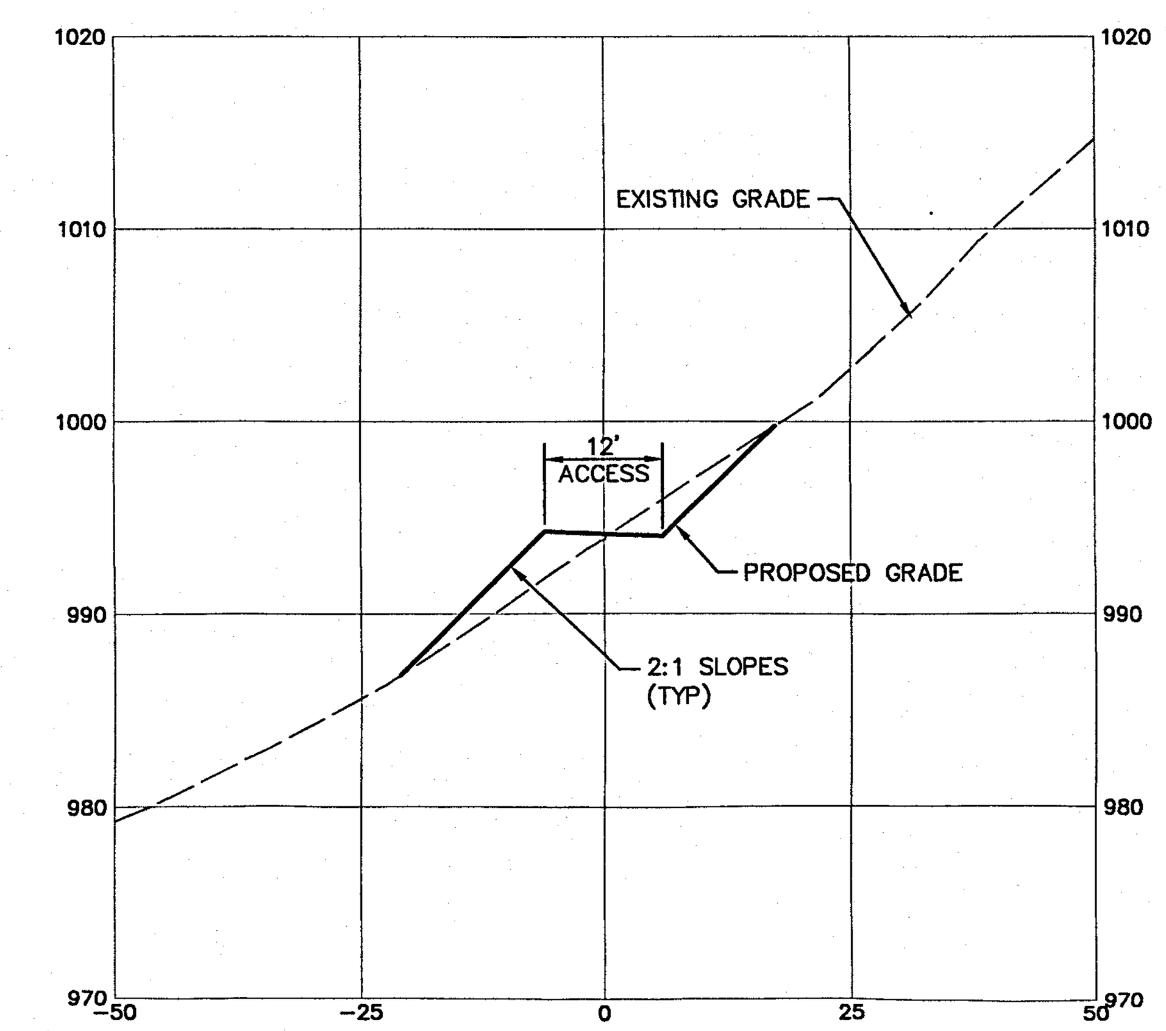

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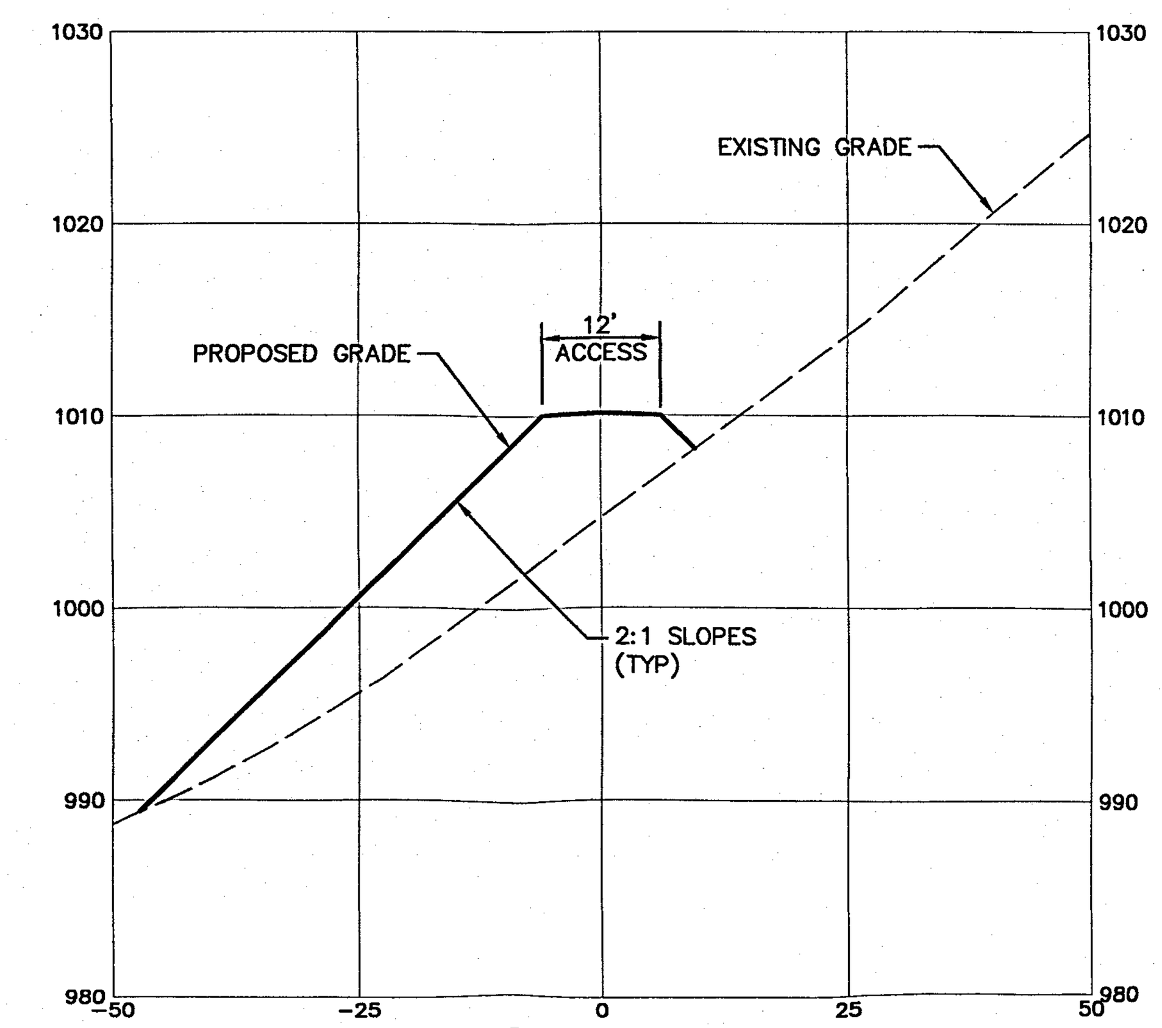

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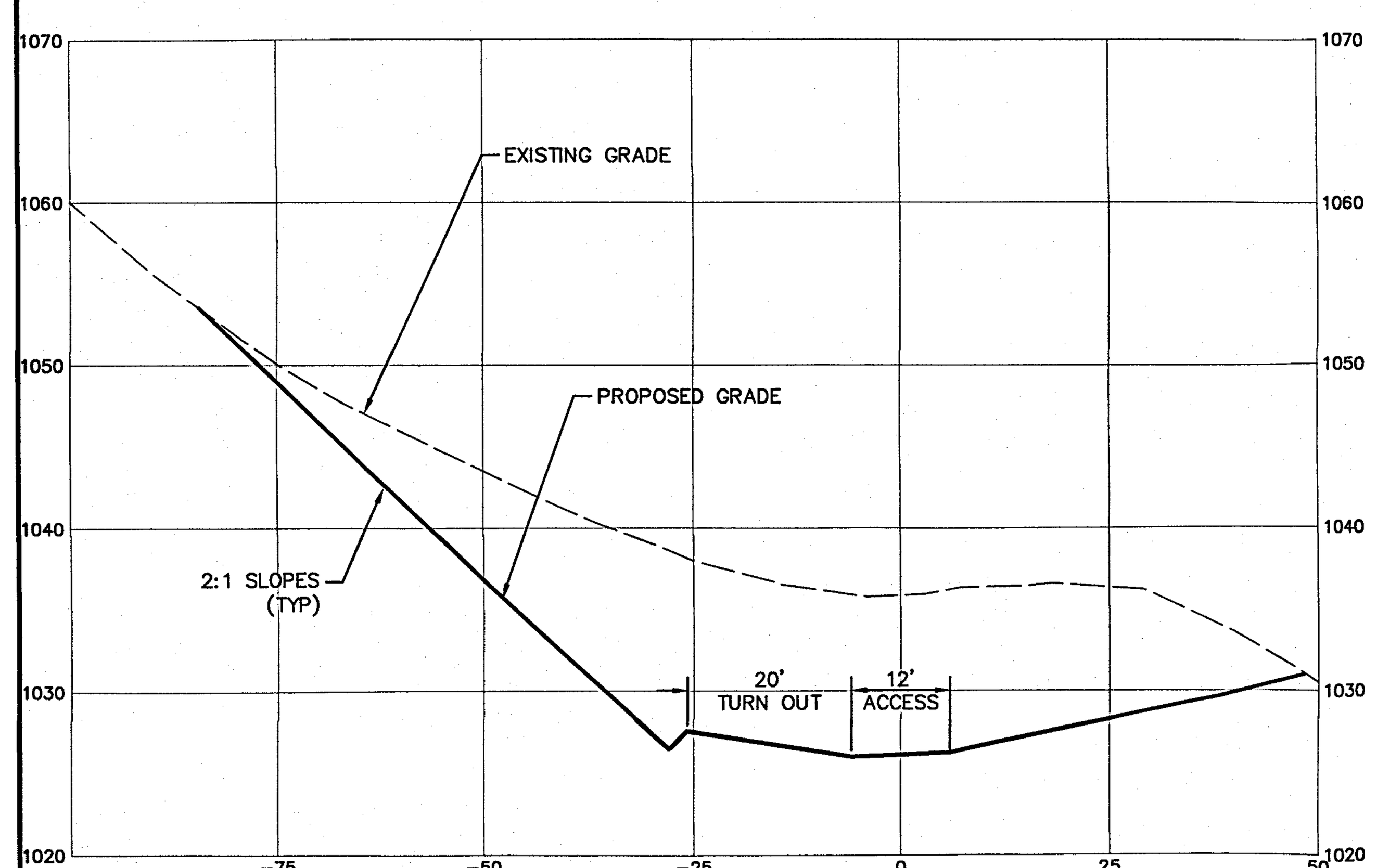

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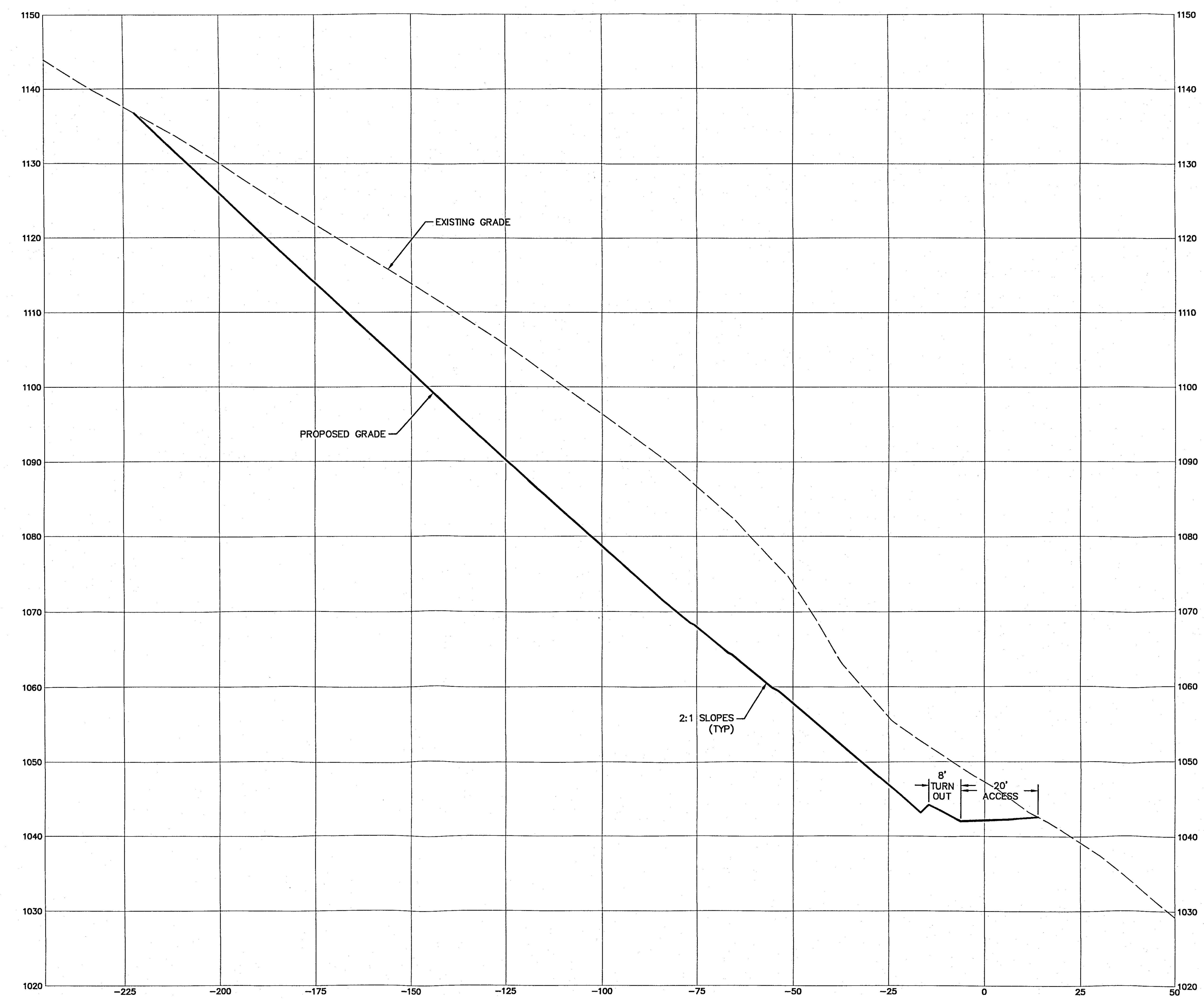
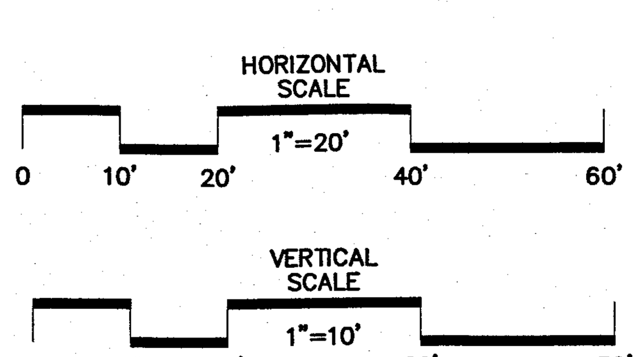


CROSS SECTION STA: 29+00



SCALE AS SHOWN

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN | CHKD BY: MRO
DRAWN BY: ASN | CHKD BY: MRO
SURV. CHIEF: | FIELDBOOK NO. DATA COLLECTOR

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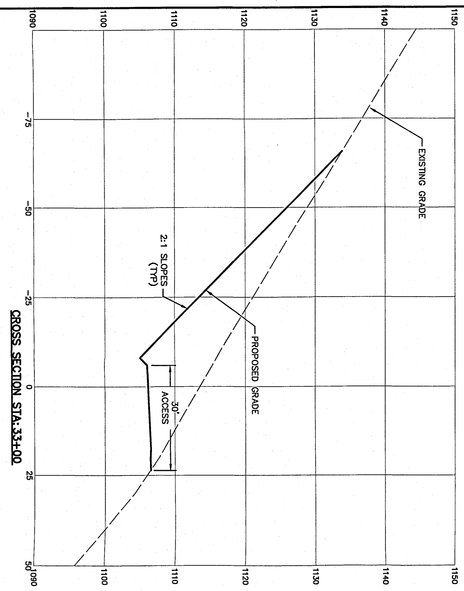
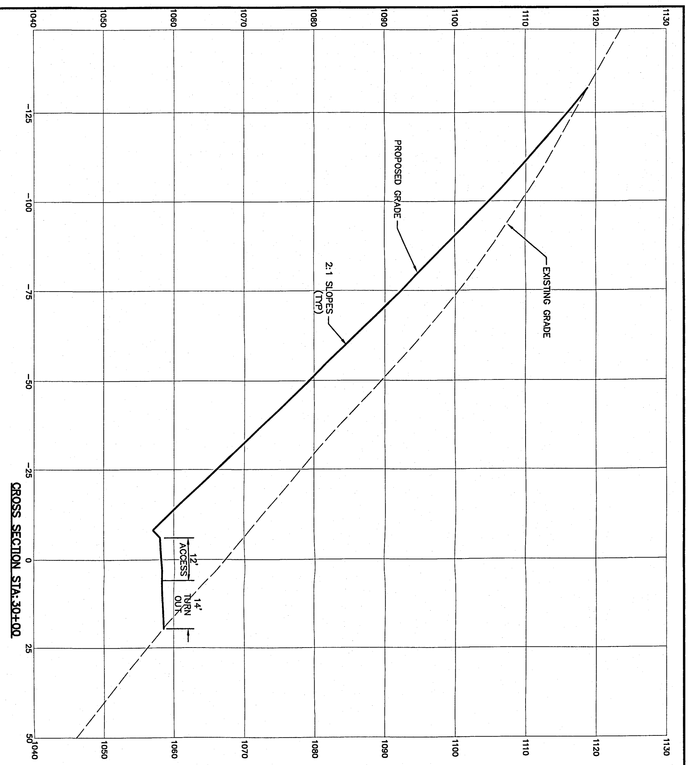
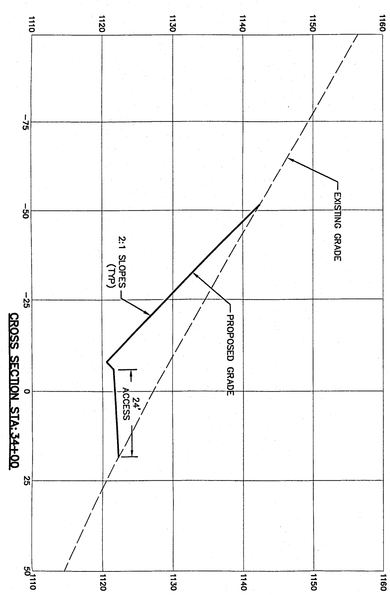
ACCESS DRIVE CROSS SECTIONS FOR OXF 98 WELL PAD

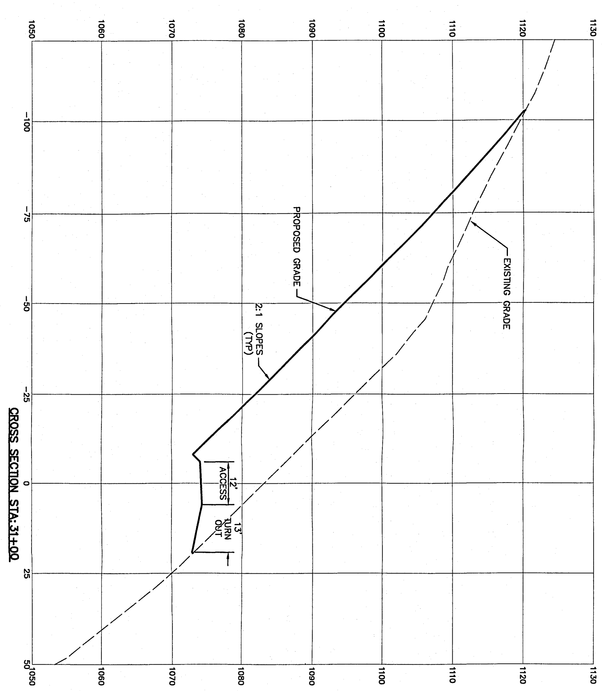
WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

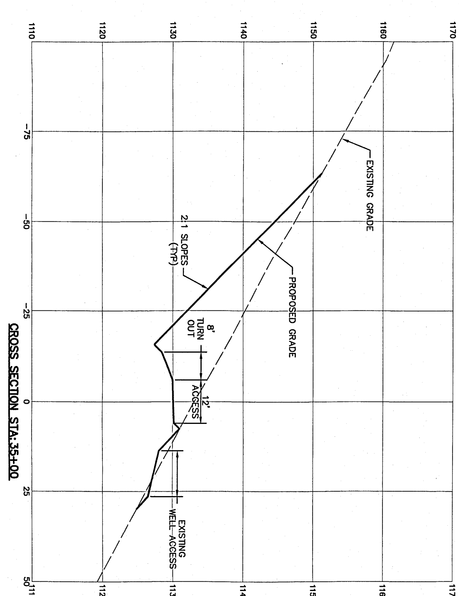
DATE: 10/14/2014
SHEET NO. 17 OF 23
DWG. NO. 093842024

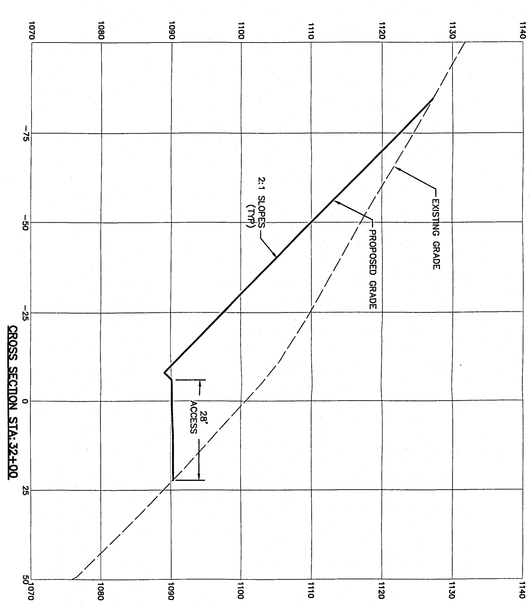












VERTICAL SCALE
0 5' 10' 1"=10' 20' 30'

HORIZONTAL SCALE
0 10' 20' 1"=20' 40' 60'

ACCESS DRIVE CROSS SECTIONS
FOR
OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 18 OF 23
DWG. NO. 093842024

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noble energy

MANAGER: MICHAEL R. OGDEN	
DESIGN BY: ASN	CHKD BY: MRO
DRAWN BY: ASN	CHKD BY: MRO
SURV. CHIEF:	FIELDBOOK NO. DATA COLLECTOR

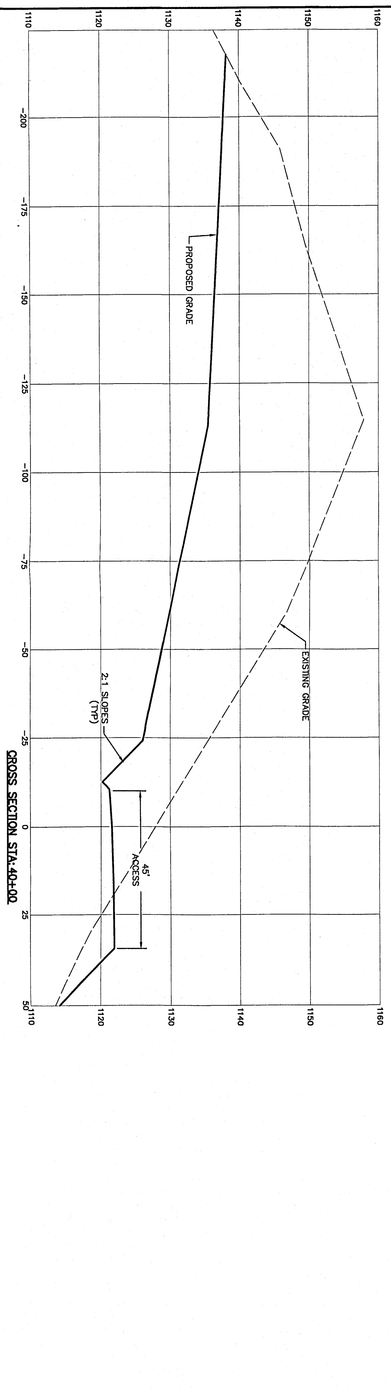
FOR RETTEW ASSOCIATES BY:

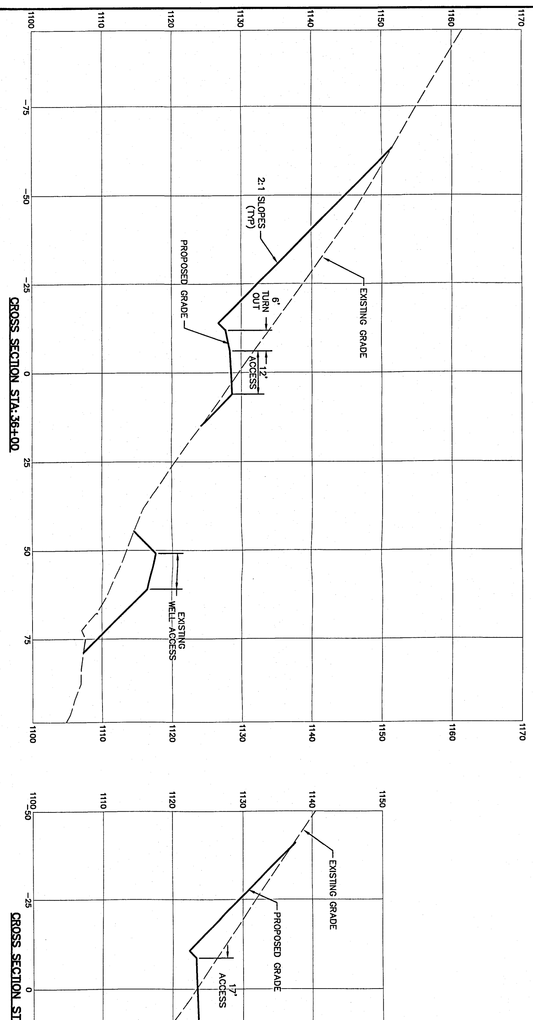
ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

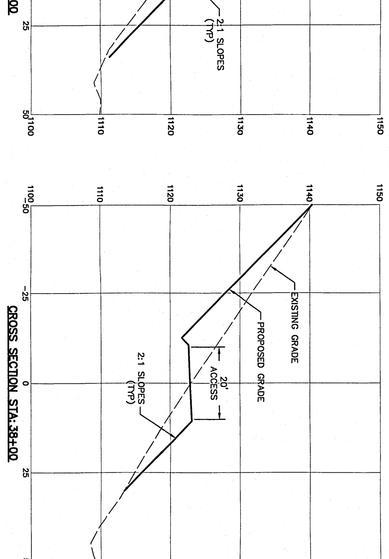
SCALE
AS SHOWN

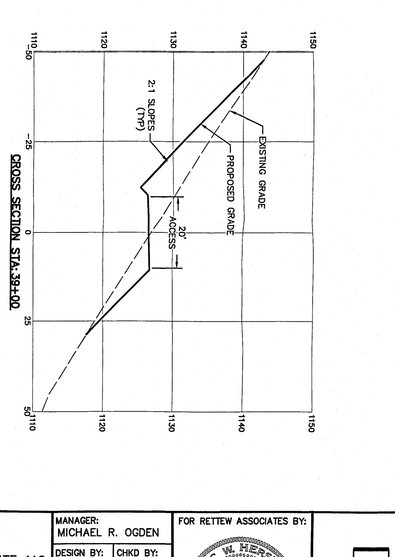
NO.	DATE	REVISION

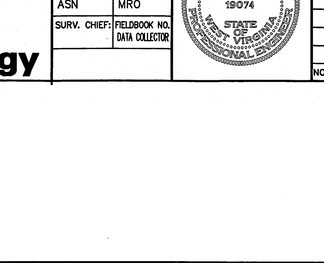
C:_RettewVaultWIP\093842024-OXF 98\Sheets\LD\ENS\093842024-ENS Plan.dwg











ACCESS DRIVE CROSS SECTIONS
FOR
OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 19 OF 23
DWG NO. 093842024

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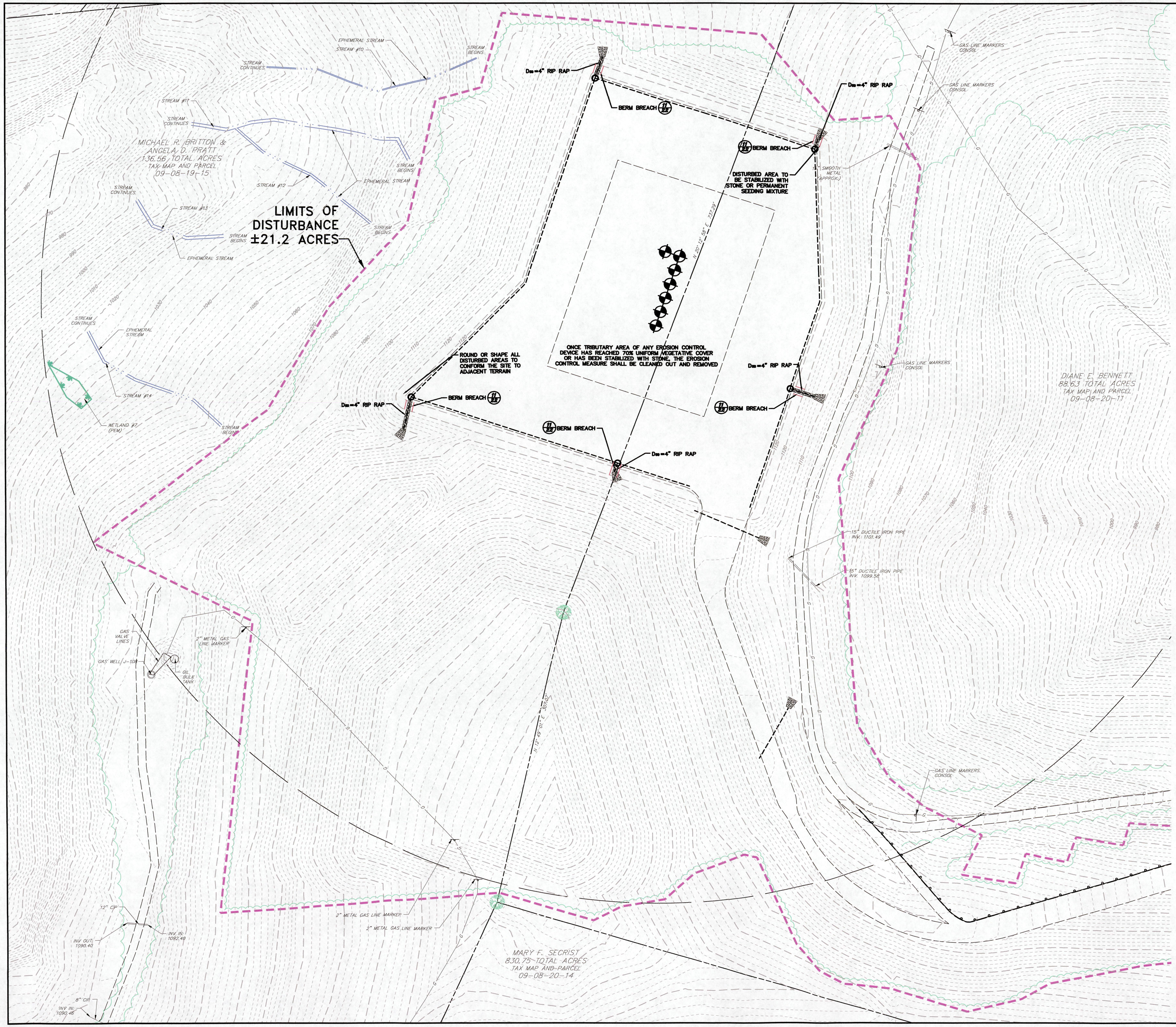
FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY REGISTERED 19074 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

SCALE AS SHOWN

NO.	DATE	REVISION

C:_RettewVaultWIP\093842024-OXF 98\Sheets\LD\ENS\093842024-ENS Plan.dwg



LEGEND

- EXISTING PROPERTY LINE
- EXISTING GRAVEL
- EXISTING PAVEMENT
- EXISTING TREELINE
- EXISTING CONTOUR LINE
- PROPOSED MAJOR CONTOUR LINE
- PROPOSED MINOR CONTOUR LINE
- LIMITS OF DISTURBANCE
- EXISTING WELL HEAD
- EXISTING WETLAND
- EXISTING STREAM
- EXISTING UTILITY POLE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING GASLINE
- POSSIBLE INDIANA BAT ROOST TREE

RECLAMATION NOTES:

1. CONTAINMENT BERMS AROUND PADS TO BE BREACHED POST DRILLING AND PRIOR TO PRODUCTION ACTIVITIES.
2. DISTURBED AREA TO BE STABILIZED WITH STONE OR PERMANENT SEEDING MIXTURE.
3. ROUND OR SHAPE ALL DISTURBED AREAS TO CONFORM THE SITE TO ADJACENT TERRAIN.
4. ONCE TRIBUTARY AREA OF ANY EROSION CONTROL DEVICE HAS REACHED 70% UNIFORM VEGETATIVE COVER OR HAS BEEN STABILIZED WITH STONE, THE EROSION CONTROL MEASURE SHALL BE CLEANED OUT AND REMOVED.
5. WELL PAD SUMPS ARE TO REMAIN. FAILURE TO MAINTAIN PROPER OPERATIONS MAY RESULT IN A NOTICE OF VIOLATION AND/OR FINE FROM WVDEP.

RESTORATION OF PLANTED AREAS

IF EARTH DISTURBANCE OCCURS DURING THE MONTHS OF NOVEMBER THROUGH MARCH, THEN TEMPORARY SEED MIXTURE SHALL BE APPLIED TO DISTURBED AREAS. IF STABILIZATION CANNOT BE ACHIEVED WITH TEMPORARY SEED, THEN MULCH WITH TACKIFIER SHALL BE APPLIED TO DISTURBED AREAS. MULCH SHALL BE CLEAN OAT OR WHEAT STRAW AND SHALL BE APPLIED PER TABLE IV-4. TACKIFIER SHALL BE APPLIED AT THE MANUFACTURER'S APPLIED RATE. AREAS THAT LOSE THE MULCH COVER SHALL BE REMULCHED.

1. FINAL RESTORATION SHALL BE PERFORMED NO LATER THAN THE START OF THE NEXT PLANTING SEASON FOLLOWING CONSTRUCTION. THE PLANTING SEASON SHALL BE AS ESTABLISHED BY THE U.S. AGRICULTURAL SERVICE FOR THE AREA OF CONSTRUCTION.
2. TOPSOIL SHALL BE FREE FROM SUBSOIL, BRUSH, WEEDS, OR OTHER LITTER, CLAY LUMPS AND STONES, BUT MAY CONTAIN DECAYING VEGETABLE MATTER AS IS PRESENT IN GOOD TOPSOIL.
3. PRECAUTIONS SHALL BE EXERCISED AS NECESSARY TO CONFORM WITH LAWS RELATING TO EROSION AND SEDIMENT CONTROL.
4. SEED SHALL BE NOT MORE THAN ONE (1) YEAR OLD. GERMINATION TESTS OF SEEDS SHALL BE MADE NOT MORE THAN SIX (6) MONTHS PRIOR TO SEEDING. SEED THAT HAS BECOME WET, MOLDY, OR OTHERWISE DAMAGED SHALL NOT BE USED.
5. TEMPORARY AND PERMANENT SEEDING SHALL ADHERE TO THE SPECIFICATIONS PROVIDED IN THIS PLAN.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRODUCING A STAND OF GRASS IN ALL SEEDED OR SODDED AREAS. EROSION, DROUGHT, OR ANY OTHER CONDITION ENCOUNTERED SHALL NOT RELIEVE THE CONTRACTOR OF THIS REQUIREMENT.

POST-USE RECLAMATION

IF THE CURRENT OWNER/OPERATOR/PERMITTEE NO LONGER OWNS, OR OPERATES THE FACILITY THEN THE FUTURE OWNER/OPERATOR SHALL FULLY RECLAIM THE SITE TO ITS PRE-CONSTRUCTION CONDITION. FUTURE OWNER/OPERATORS SHALL COMPLY WITH ALL W.V. DEP REGULATIONS.

ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE. EACH STAGE SHALL BE COMPLETED BEFORE ANY FOLLOWING STAGE IS INITIATED. CLEARING AND GRUBBING SHALL BE LIMITED ONLY TO THOSE AREAS DESCRIBED IN EACH STAGE.

IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO ELIMINATE THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION. ANY MODIFICATIONS TO THE EROSION & SEDIMENT CONTROLS SHALL BE FIRST APPROVED BY THE OWNER OR ENGINEER.

1. THE ENGINEER SHALL FIELD MARK ALL LIMITS OF DISTURBANCE AND ALL IDENTIFIED WATERWAYS, WETLANDS, AND AREAS OF CONCERN FOR CONSTRUCTION ACTIVITIES.
2. INSTALL ROCK CONSTRUCTION ENTRANCE, PERIMETER FILTER SOCK AND SUPER SILT FENCE. ALL VEHICLES ENTERING THE SITE SHALL DO SO VIA THE ROCK CONSTRUCTION ENTRANCE. ALL MUD OR SEDIMENT TRACKED ONTO EXISTING ROADWAYS SHALL BE REMOVED BY THE CONTRACTOR AT THE END OF EACH WORKING DAY. WASHING OF THE ROADWAY IS NOT PERMITTED.
3. INSTALL ALL PERIMETER EROSION AND SEDIMENT CONTROL DEVICES AS AS NEEDED TO PROTECT THE ADJACENT ENVIRONMENT. PRIOR TO LEAVING A RECLAMATION SITE, SURFACE WATER RUNOFF FROM DISTURBED AREAS SHALL PASS THROUGH A SEDIMENT BASIN/TRAP OR OTHER APPROPRIATE AND APPROVED SEDIMENT REMOVAL BMP. BMPS INTENDED TO TRAP SEDIMENT ON SITE SHALL BE CONSTRUCTED AS ONE OF THE FIRST STEPS IN GRADING. THESE BMPS SHALL BE FUNCTIONAL BEFORE OTHER LAND DISTURBING ACTIVITIES TAKE PLACE.
4. BEGIN RECLAMATION OF SITE FROM THE FURTHEST POINT AWAY FROM DRIVE/EXIT. DURING RECLAMATION OF PAD FILL SLOPES, PLACE SUITABLE BACKFILL MATERIAL IN 6" LIFTS AND COMPACT, FILL MATERIAL SHALL BE FREE OF ROOTS, SOD, AND OTHER ORGANIC MATERIAL, FROZEN SOIL AND ROCK GREATER THAN 3" AND DISCARDED CONSTRUCTION MATERIAL. THE FILL SHALL BE PLACED IN LAYERS BEING COMPACTED PRIOR TO THE NEXT LAYER BEING PLACED. WHEN THE AREA REACHES PRESCRIBED ELEVATION, THE BACKFILL SHOULD BE THOROUGHLY ROLLED AND COMPACTED TO ELIMINATE SOFT OR UNSETTLED AREAS. AS WORK PROGRESSES, PERMANENTLY STABILIZE FILL WITH TOPSOIL, SEED, AND MULCH OR MATTING TO PROTECT FROM ACCELERATED EROSION AND SEDIMENTATION.

POST-USE RECLAMATION

5. BRING THE SITE BACK TO PRE-CONSTRUCTION GRADE ROUND AND SHAPE ALL DISTURBED EARTH TO MATCH THE ADJACENT TERRAIN. ENSURE ALL NATURAL DRAINAGE PATTERNS ARE RESTORED.
6. THE DUFF LAYER, NATIVE TOPSOIL, AND NATURAL VEGETATION SHALL BE REPLACED AND SCARIFIED.
7. DURING CONSTRUCTION ALL EROSION AND SEDIMENT CONTROL BMPS MUST BE MAINTAINED AS PRESCRIBED IN THE SCHEDULE OF MAINTENANCE NOTES.
8. ALL BMP'S MUST REMAIN IN PLACE AND FUNCTIONAL UNTIL ALL AREAS WITHIN THE LIMIT OF DISTURBANCE ARE COMPLETED AND PERMANENTLY STABILIZED. MAINTENANCE MUST INCLUDE INSPECTION OF ALL EROSION AND SEDIMENT CONTROLS AFTER EACH RAIN EVENT IN EXCESS OF 2" IN 6 HOURS AND ON A WEEKLY BASIS UNTIL CONSTRUCTION IS COMPLETE.
9. THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. A NOTICE OF TERMINATION MUST BE FILED WITH THE DEP WHEN THE SITE REACHES FINAL STABILIZATION. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT EITHER A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT THE SURFACE HAS BEEN STABILIZED BY HARD COVER SUCH AS PAVEMENT OR BUILDINGS. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE.
10. ALL PERIMETER SEDIMENT CONTROL MEASURES CAN BE REMOVED AFTER THE SITE IS PERMANENTLY STABILIZED AND APPROVAL IS RECEIVED FROM THE WVDEP.
11. ANY AREAS DISTURBED BY REMOVAL OF CONTROLS SHALL BE REPAIRED, STABILIZED AND PERMANENTLY SEEDED.

SCALE 1"=50' — 0, 25', 50', 100', 150'

NO.	DATE	REVISION

FOR RETTEW ASSOCIATES BY:

ERIC W. HERSHEY — REGISTERED PROFESSIONAL ENGINEER 19074 — STATE OF WEST VIRGINIA

MANAGER: MICHAEL R. OGDEN	
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WELL PAD RECLAMATION PLAN FOR OXF 98 WELL PAD

WEST UNION DISTRICT — DODDRIDGE COUNTY, WV.

DATE: 10/14/2014

SHEET NO. 20 OF 23

DWG. NO. 093842024

EROSION AND SEDIMENTATION CONTROL NOTES

EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE IMPLEMENTED DURING THE CONSTRUCTION AND POST CONSTRUCTION PERIOD TO PREVENT SOIL EROSION, SEDIMENTATION, AND OTHER POLLUTANTS FROM ENTERING STREAMS, NEIGHBORING PROPERTY, ROADS, ETC. THESE MEASURES INCLUDE FILTER SOCKS, TOPSOIL STOCKPILES, ROCK CONSTRUCTION ENTRANCE, ETC. AS SHOWN ON THE DRAWINGS.

THE CONTRACTOR WILL BE REQUIRED TO INCORPORATE ALL APPLICABLE EROSION AND SEDIMENTATION CONTROL FEATURES INTO THE PROJECT AT THE EARLIEST PRACTICAL TIME.

TEMPORARY EROSION CONTROL MEASURES

1. TEMPORARY VEGETATION SHALL BE ESTABLISHED ON ALL SLOPES, ON STOCKPILED TOPSOIL, AND ON ALL DISTURBED AREAS LEFT UNSTABILIZED, OR DISCONTINUED EARTHMOVING ACTIVITY, WILL BE STABILIZED WITHIN 21 DAYS.
2. DURING CONSTRUCTION, THE AMOUNT OF DISTURBED SOILS SHALL BE KEPT TO A MINIMUM AND, WHENEVER POSSIBLE, A SUITABLE VEGETATIVE BUFFER WILL BE MAINTAINED AROUND ALL CONSTRUCTION AREAS.
3. ALL EARTHMOVING ACTIVITIES SHALL BE CARRIED OUT IN SUCH A MANNER AS TO MINIMIZE THE AMOUNT OF DISTURBED AREA.
4. ALL SOIL STOCKPILES ARE TO BE SEEDED WITH A TEMPORARY GRASS COVER WITHIN 21 DAYS.
5. UPON GENERAL COMPLETION OF THE FINAL GRADING, TOPSOIL SHALL BE PLACED AND FINAL-GRADING PASSES SHALL BE MADE PARALLEL TO THE DIRECTION OF RUNOFF.
6. RE-SEED AND REESTABLISH ANY BARREN AND DISTURBED AREAS NOT HAVING ESTABLISHED GROUND COVER.
7. SILT SOCK SHALL BE PLACED AT CRITICAL EROSION AREAS, AS SHOWN ON THE PLAN, IN ORDER TO PREVENT SEDIMENT FROM ENTERING INTO ADJACENT PROPERTIES, ROADWAY AND WATERWAYS.
8. SILT SOCK SHALL BE INSTALLED AND MAINTAINED PER THE SUPPLIER'S INSTRUCTIONS.
9. WHERE DUST OR WIND EROSION IS A PROBLEM, THE UNSTABLE SURFACE(S) SHALL BE SPRINKLED WITH WATER OR OTHER SUITABLE DUST SUPPRESSOR; HOWEVER, WASHING OF ROADWAYS IS NOT PERMITTED.
10. ANY WATER PUMPED FROM ANY EXCAVATION, FOR ANY REASON, SHALL BE DIRECTED THROUGH A SEDIMENT FILTER BAG (DIRT BAG).
11. THE CONTRACTOR SHALL EMPLOY MEASURES DURING CONSTRUCTION TO PREVENT SPILLS OF FUELS OR LUBRICANTS. IF A SPILL OCCURS, IT SHALL BE CONTROLLED IMMEDIATELY TO PREVENT ITS ENTRY INTO NEARBY WATERWAYS. OWNER SHALL BE NOTIFIED IMMEDIATELY IF ANY SPILLS OCCUR.

CONSTRUCTION SEQUENCE

DESCRIBED BELOW ARE THE MAJOR CONSTRUCTION ACTIVITIES THAT ARE THE SUBJECT OF THE EROSION AND SEDIMENTATION POLLUTION CONTROL PLAN. THEY ARE PRESENTED IN THE ORDER (OR SEQUENCE) THAT THEY ARE EXPECTED TO BEGIN, BUT EACH ACTIVITY WILL NOT NECESSARILY BE COMPLETED BEFORE THE NEXT BEGINS. ALSO, THESE ACTIVITIES COULD OCCUR IN A DIFFERENT ORDER IF NECESSARY TO MAINTAIN ADEQUATE EROSION AND SEDIMENT CONTROL. THE OWNER OR ENGINEER MUST APPROVE DEVIATIONS FROM THE APPROVED PLAN AND CONSTRUCTION SEQUENCE.

A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES.

AT LEAST 48 HOURS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITY, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY MISS UTILITY OF WEST VIRGINIA AT 1-800-245-4848 FOR LOCATION OF EXISTING UNDERGROUND UTILITIES.

ALL EARTH DISTURBANCE ACTIVITIES ARE EXPECTED TO PROCEED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE. SPECIFIC SITE RESTRICTIONS MAY NECESSITATE THE ACTIVITIES PROCEEDING IN A DIFFERENT ORDER TO MAINTAIN ADEQUATE EROSION AND SEDIMENT CONTROL.

1. INSTALL THE CONSTRUCTION ENTRANCE WHERE INDICATED ON THE PLAN. MAINTAIN ACCORDING TO PLAN REQUIREMENTS. NOTE: NO CONSTRUCTION VEHICLES ARE PERMITTED TO LEAVE THE SITE OTHER THAN VIA THE CONSTRUCTION ENTRANCE.
2. THE ACCESS ROAD, TANK PAD AND WELL PAD AREAS SHOULD BE CLEARED AND GRUBBED ACCORDING TO THE LIMITS OF DISTURBANCE SHOWN ON THE PLANS.
3. CONSTRUCT THE ACCESS ROAD FROM THE POINT OF ACCESS TOWARDS THE WELL PAD. INSTALL EROSION AND SEDIMENTATION DEVICES AS NEEDED.
4. THE TANK PAD AND WELL PAD LOCATIONS WILL THEN BE CONSTRUCTED. FINAL GRADING SHALL BE COMPLETED, AND GRAVEL SHOULD BE PLACED ON THE PAD AREA AND ACCESS ROAD.
5. ALL AREAS PREVIOUSLY DISTURBED BY CONSTRUCTION THAT ARE NOT ALREADY STABILIZED BY SEED, MULCH, OR CLEAN STONE SHALL BE SEEDED AND MULCHED ACCORDING TO THE SEEDING SCHEDULE ON THE PLAN.

SCHEDULE OF MAINTENANCE OF EROSION & SEDIMENTATION CONTROLS

THE SOIL EROSION AND SEDIMENTATION CONTROLS UTILIZED IN THE DEVELOPMENT OF THIS PLAN SHALL BE MAINTAINED AND REPAIRED IN ORDER TO KEEP THEM IN EFFECTIVE CONDITION UNTIL PERMANENT STABILIZATION OCCURS. THE CONTRACTOR SHALL PERFORM CERTAIN PERIODIC DUTIES IN ORDER TO ASSURE PROPER FUNCTION. MAINTENANCE OF THE CONTROLS SHALL INCLUDE, AT A MINIMUM, THE FOLLOWING MAINTENANCE PROCEDURES FOR UTILIZED CONTROLS:

ROCK CONSTRUCTION ENTRANCE

1. THE STRUCTURE'S THICKNESS WILL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSION BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL WILL BE MAINTAINED ON SITE FOR THIS PURPOSE. AT THE END OF EACH CONSTRUCTION DAY, ALL SEDIMENT DEPOSITED ON PUBLIC ROADWAYS, WILL BE REMOVED AND RETURNED TO THE SITE. WASHING OF THE ROADWAY IS NOT PERMITTED.
2. STABILIZED CONSTRUCTION ENTRANCES SHALL BE CLEANED AND REDRESSED WHEN VOIDS BECOME CHOKED WITH MUD AND SEDIMENT.
3. FILTER CLOTH WILL BE INSTALLED UNDER ALL ROCK CONSTRUCTION ENTRANCES.

ROCK CHECK DAM

1. ROCK CHECK DAMS SHALL NOT BE USED IN CHANNELS OF LESS THAN 1 FOOT TOTAL DEPTH.
2. THE CHECK DAM SHALL BE EQUAL IN HEIGHT TO 1/2 THE TOTAL DEPTH OF THE CHANNEL WITH A 6" DEPRESSION IN THE CENTER.
3. A ONE FOOT THICK LAYER OF AASHTO #57 OR SMALLER STONE SHALL BE PLACED ON THE UPSTREAM SIDE OF THE CHECK DAM. NOTE: FILTER FABRIC AND STRAW BALES SHALL NOT BE USED IN ROCK FILTERS.
4. ROCK CHECK DAMS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT.
5. CLOGGED FILTER STONE (AASHTO #57) SHALL BE REPLACED.
6. NEEDED REPAIRS SHALL BE INITIATED IMMEDIATELY AFTER THE INSPECTION.

SILT SOCK

1. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE SILT SOCK. ANY SECTION OF THE SILT SOCK BARRIER WHICH HAS BEEN UNDERMINED OR TOPPED MUST BE IMMEDIATELY REPLACED WITH ROCK FILTER OUTLET.

TABLE IV-1
TEMPORARY SEEDING FOR CRITICAL AREAS

SEED	RATES IN lbs PER ACRE	RECOMMENDED DATA
ANNUAL RYEGRASS	40	MAR. 1 TO JUNE 1 AUG. 15 TO SEPT. 15
SPRING OATS	96	MAR. 1 TO JUNE 15
RYE GRAIN	140	AUG. 15 TO OCT. 15
ANNUAL RYEGRASS	26	MAR. 1 TO JUNE 15
SPRING OATS	64	MAR. 1 TO JUNE 15

TABLE IV-2
PERMANENT SEEDING FOR ALL DISTURBED AREAS

SEED	RATES IN lbs PER ACRE
WHITE CLOVER	15
RED TOP	15
ORCHARD GRASS	20

SEEDING IS NOT RECOMMENDED DURING THE MONTH OF NOVEMBER
USE ONLY ENDOPHYTE-FREE VARIETY OF TALL FESCUE
INOCULATE ALL LEGUME SEEDS
USE 4 TIMES THE INOCULATE WHEN HYDROSEEDING

TABLE IV-3
LIME AND FERTILIZER APPLICATION TABLE

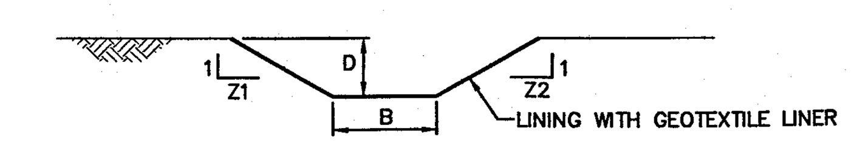
pH OF SOIL	LIME IN TONS PER ACRE	FERTILIZER, lbs, PER ACRE 10-20-20 OR EQUIVALENT
ABOVE 6.0	2	500
5.0 TO 6.0	3	500
BELOW 5.0	4	500

THE pH CAN BE DETERMINED WITH A PORTABLE TESTING KIT OR BY SENDING THE SOIL SAMPLES TO A SOIL TESTING LABORATORY.

WHEN 4 TONS OF LIME PER ACRE ARE APPLIED, IT MUST BE INCORPORATED INTO THE SOIL BY DISKING, BACKBLADING OR TRACKING UP AND DOWN THE SLOPE.

TABLE IV-4
MULCH MATERIALS RATES AND USES

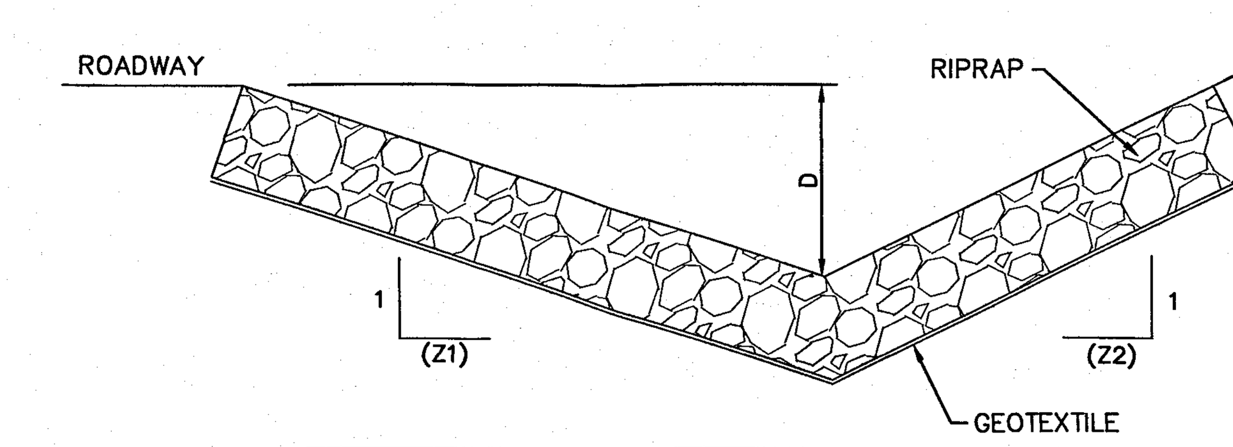
MATERIAL	MINIMUM RATES PER ACRE	COVERAGE	REMARKS
HAY OR STRAW	2 TO 3 TONS 100 TO 150 BALES	COVER 75 TO 90% OF SURFACE	SUBJECT TO WIND BLOWING OR WASHING UNLESS TIED DOWN
WOOD FIBER PULP FIBER WOOD-CELLULOSE RECIRCULATED PAPER	1000 TO 1500 lbs.	COVER ALL DISTURBED AREAS	FOR HYDROSEEDING



CHANNEL CROSS-SECTION

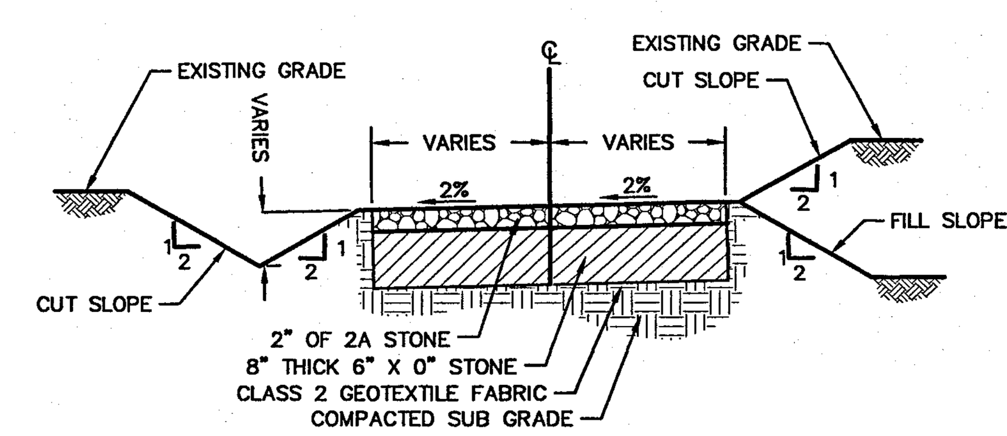
CHANNEL NO.	LENGTH (FT.)	BOTTOM WIDTH B (FT.)	DEPTH D (FT.)	Z1 (F.)	Z2 (FT.)	LINING*
5	84	2	2	2	2	NAG S75
6A	150	2	2	2	2	NAG S75
6B	142	2	2	2	2	15" ROCK
7	217	2	2	2	2	NAG S75
8	113	2	2	2	2	NAG S75

5/21 CHANNEL DETAIL
NOT TO SCALE



CHANNEL NO.	LENGTH (FT.)	DEPTH D (FT.)	Z1 (F.)	Z2 (FT.)	LINING*
1	532	1	2	2	9" ROCK
2	831	1	2	2	9" ROCK
3	224	1	2	2	9" ROCK
4	245	1	2	2	9" ROCK
9	376	1	2	2	9" ROCK
10	225	1	2	2	9" ROCK
11	64	1	2	2	9" ROCK
12	133	1	2	2	9" ROCK

6/21 ROADSIDE V-DITCH
NOT TO SCALE
ES\WV007



1/21 ACCESS DRIVE SECTION
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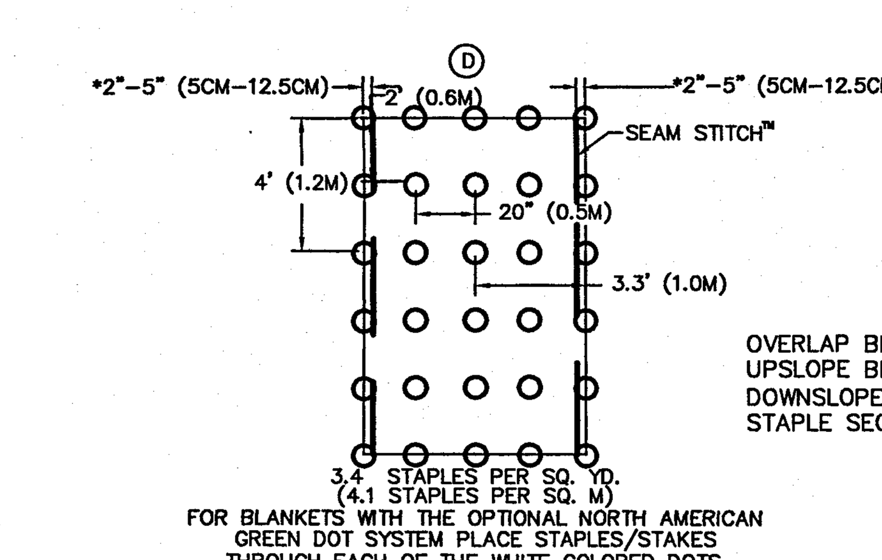
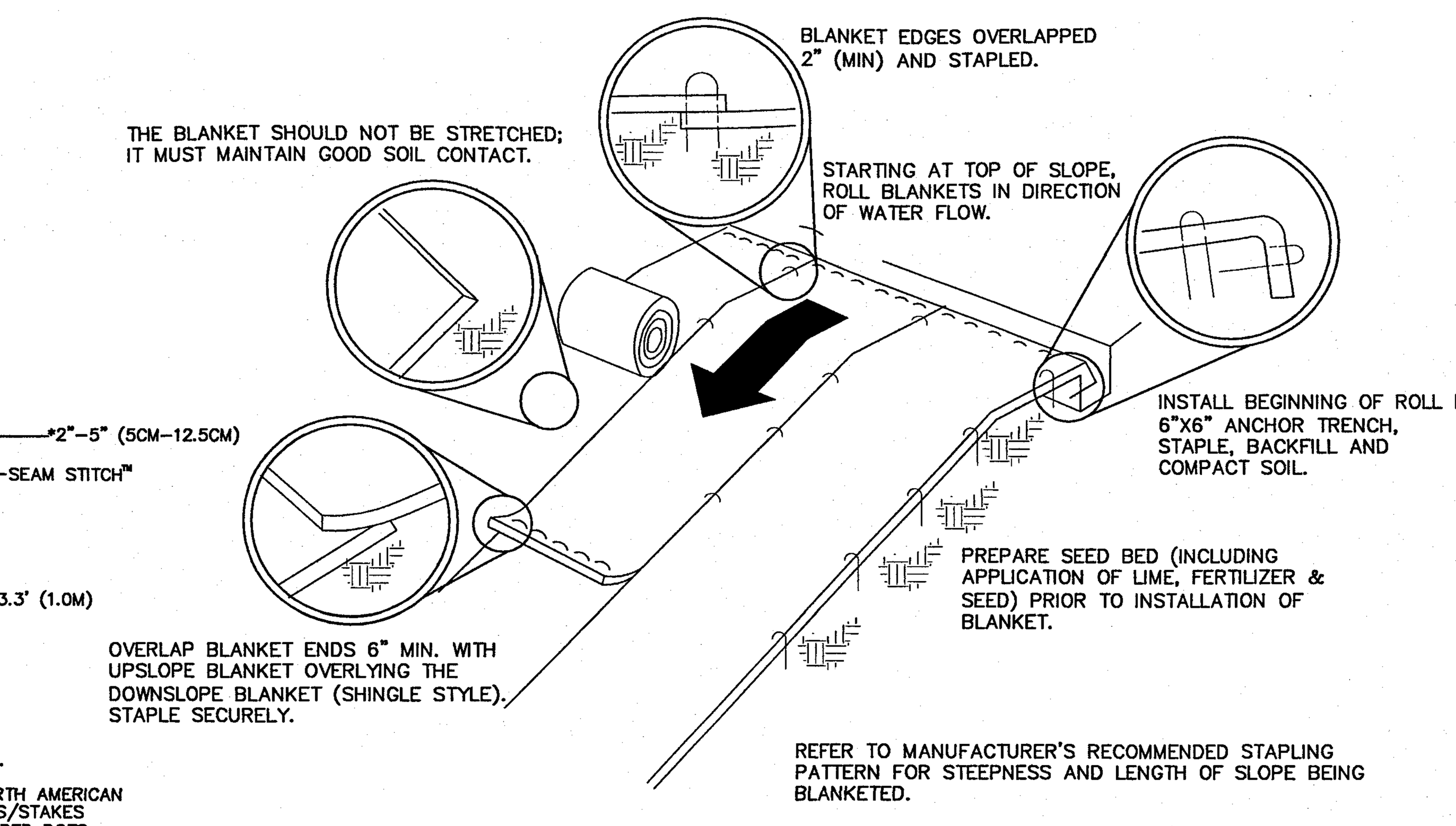


*LOCATION OF SEAM STITCH WILL VARY DEPENDING ON NORTH AMERICAN GREEN PRODUCT TYPE:

7/21 STAPLE PATTERN GUIDE
NOT TO SCALE



7/21 SLOPE INSTALLATION
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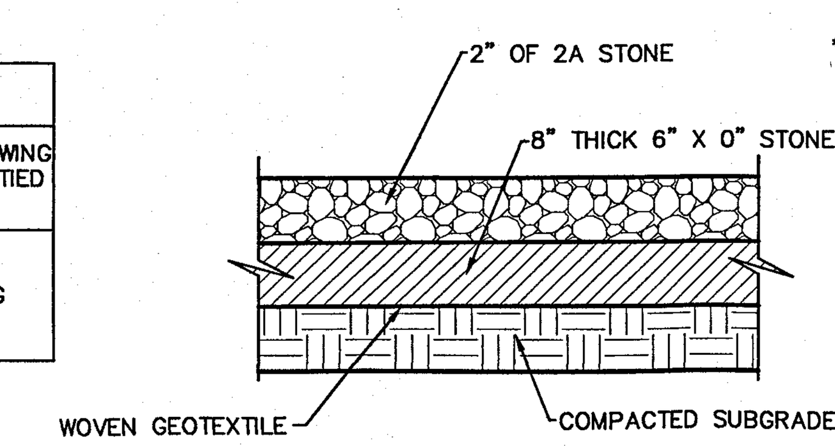
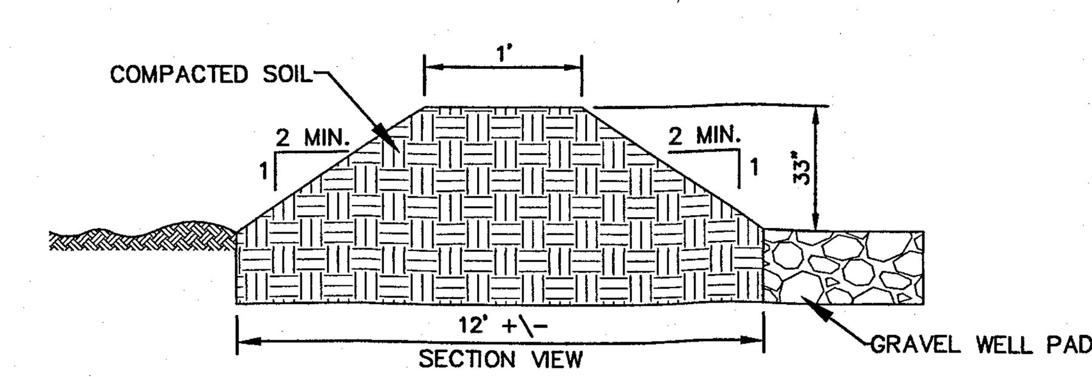
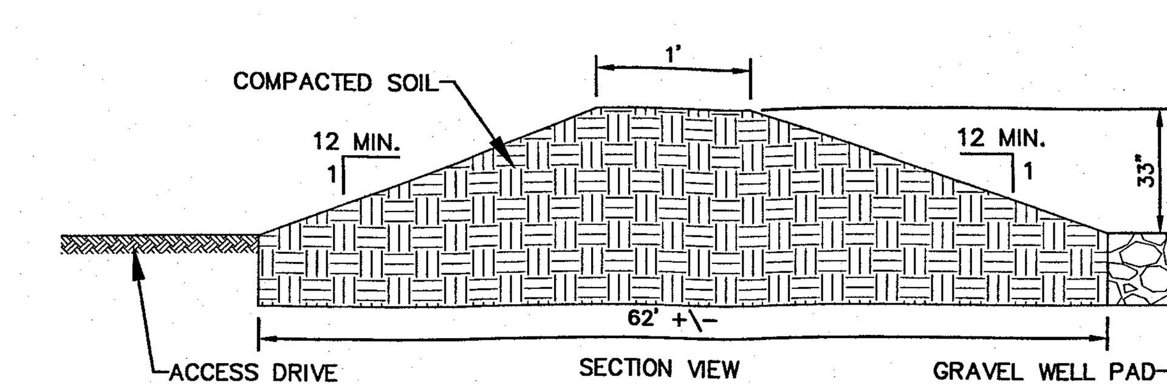


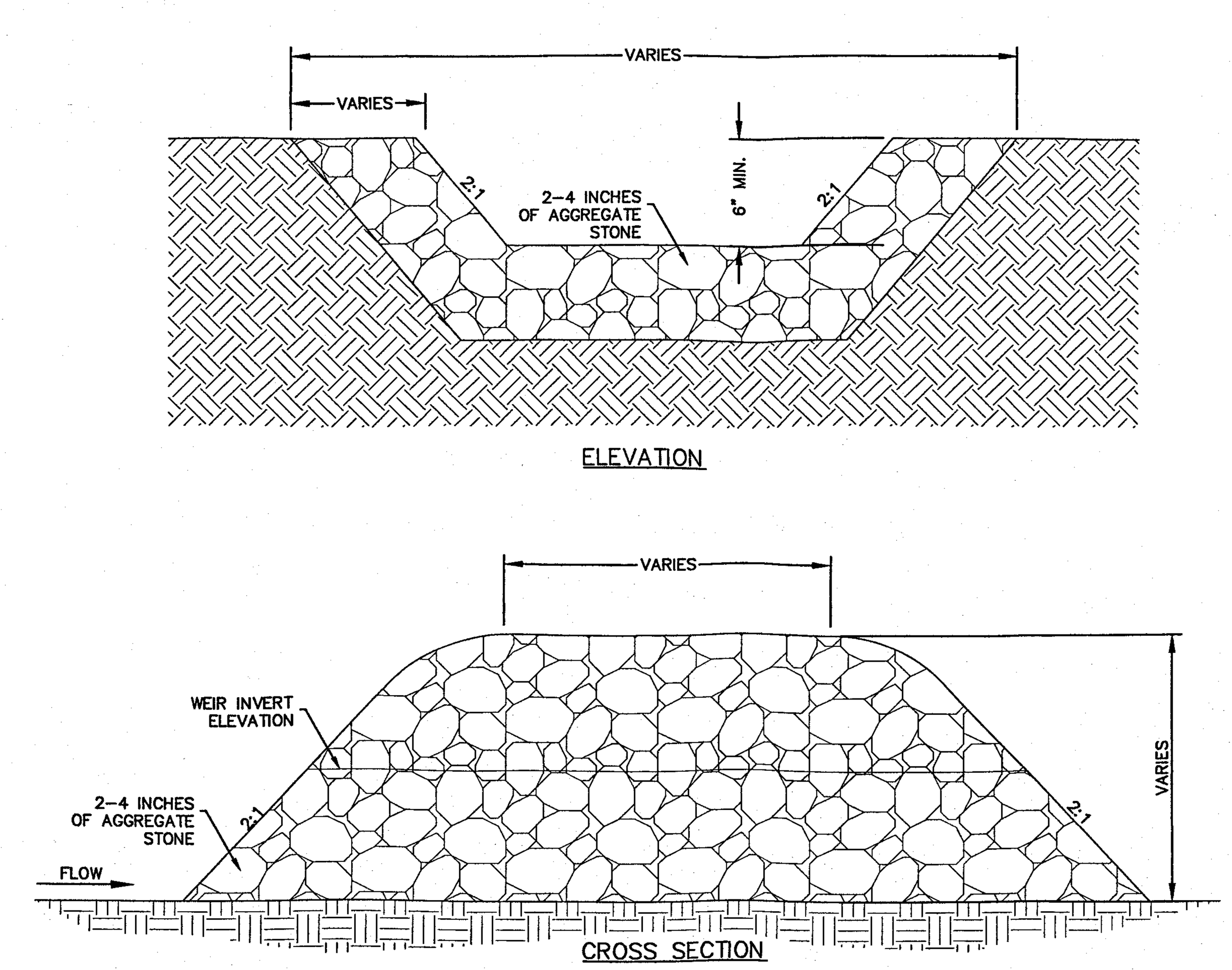
2/21 PAD CROSS-SECTION
NOT TO SCALE



3/21 CONTAINMENT BERM
NOT TO SCALE



4/21 CONTAINMENT BERM AT PAD ACCESS ROAD
NOT TO SCALE



8/21 ROCK CHECK DAM
NOT TO SCALE

SCALE AS SHOWN

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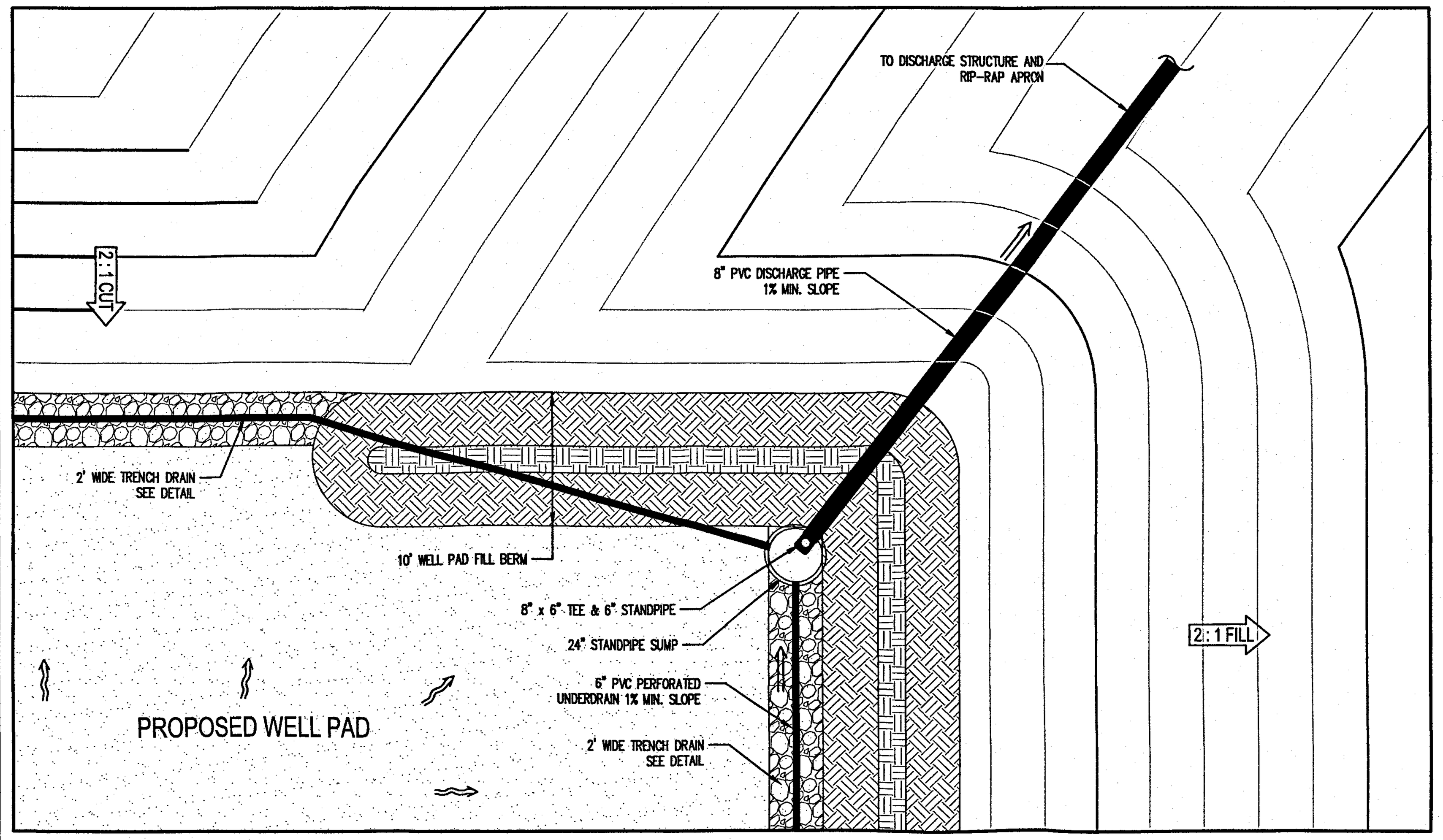
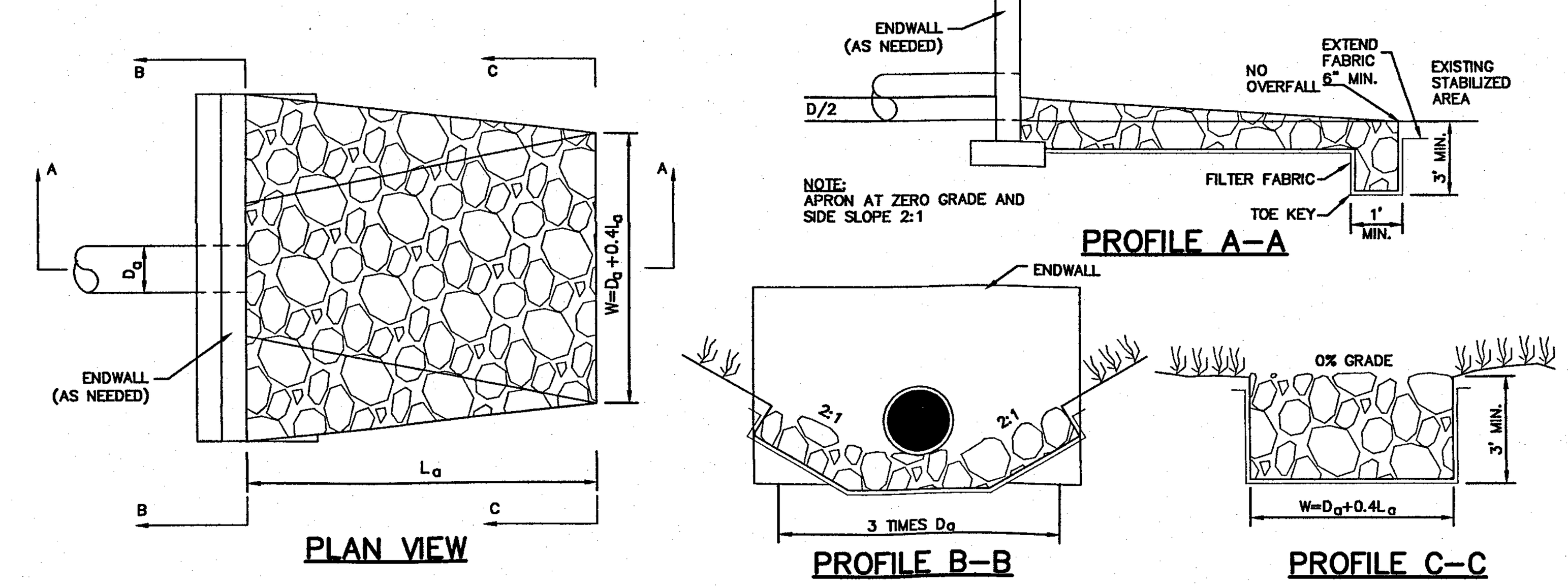
NOTES & DETAILS FOR
OXF 98 WELL PAD
WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 21 OF 23
DWG. NO. 093842024

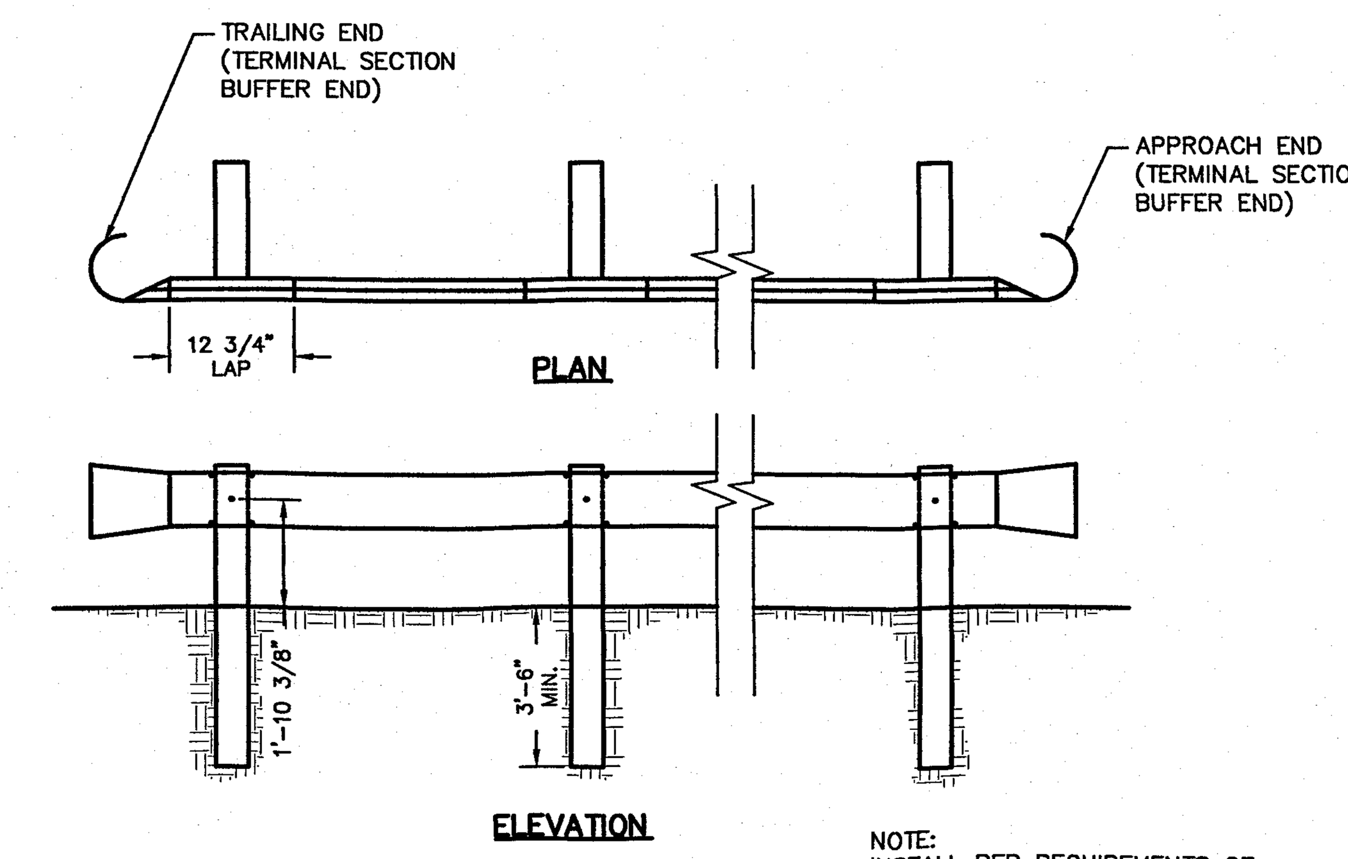




NOTES:
1. THE SUBGRADE FOR THE FILTER, RIPRAP, OR GABION SHALL BE PREPARED TO THE REQUIRED LINES AND GRADES. ANY FILL REQUIRED IN THE SUBGRADE SHALL BE COMPACTED TO A DENSITY OF APPROXIMATELY THAT OF THE SURROUNDING UNDISTURBED MATERIAL.
2. THE ROCK OR GRAVEL SHALL CONFORM TO THE SPECIFIED GRADING LIMITS WHEN INSTALLED RESPECTIVELY IN THE RIPRAP OR FILTER.
3. FILTER CLOTH SHALL BE PROTECTED FROM PUNCHING, CUTTING, OR TEARING. ANY DAMAGE OTHER THAN AN OCCASIONAL SMALL HOLE SHALL BE REPAIRED BY PLACING ANOTHER PIECE OF CLOTH OVER THE DAMAGED PART OR BY COMPLETELY REPLACING THE CLOTH. ALL OVERLAPS, WHETHER FOR REPAIRS OR FOR JOINING TWO PIECES OF CLOTH SHALL BE A MINIMUM OF 1'.
4. STONE FOR THE RIPRAP OR GABION OUTLETS MAY BE PLACED BY EQUIPMENT. BOTH SHALL BE CONSTRUCTED TO THE FULL COURSE IN ONE OPERATION AND IN SUCH A MANNER AS TO VOID DISPLACEMENT OF UNDERLYING MATERIALS. THE STONE FOR RIPRAP OR GABION OUTLETS SHALL BE DELIVERED AND PLACED IN A MANNER THAT WILL ENSURE THAT IT IS REASONABLY HOMOGENEOUS WITH THE SMALLER STONES AND SPALLS FILLING THE VOIDS BETWEEN THE LARGER STONES. RIPRAP SHALL BE PLACED IN A MANNER TO PREVENT DAMAGE TO THE FILTER BLANKET OR FILTER CLOTH. HAND PLACEMENT WILL BE REQUIRED TO THE EXTENT NECESSARY TO PREVENT DAMAGE TO THE PERMANENT WORKS.

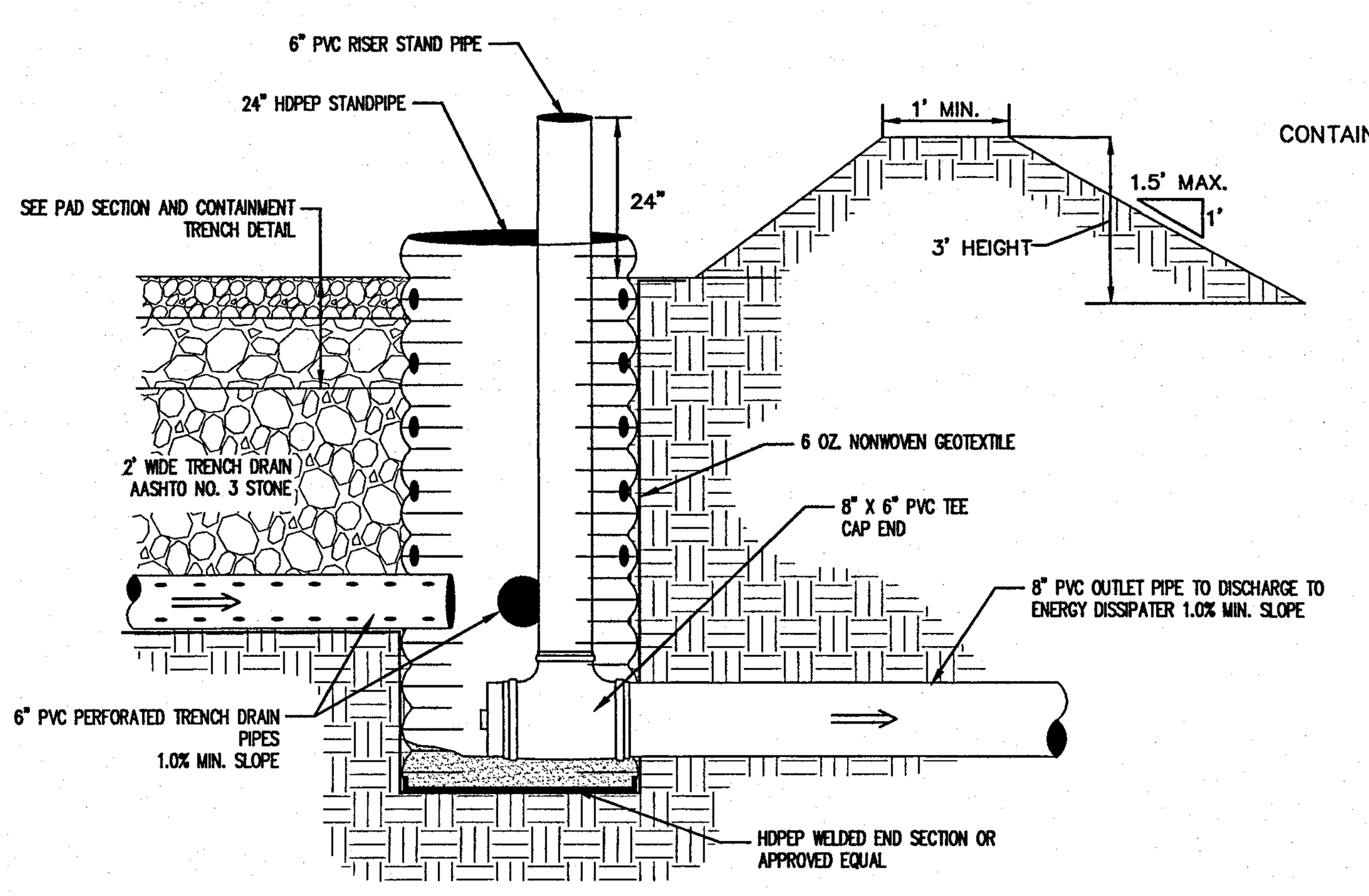
OUTLET NO.	PIPE DIA Pd (IN)	RIPRAP	APRON	
		D50 SIZE (IN.)	LENGTH (FT)	TERMINAL WIDTH (FT)
1	18	6	8	14
2	18	6	8	14
3	18	6	8	14
4	18	6	8	14

14/22 OUTLET PROTECTION
NOT TO SCALE

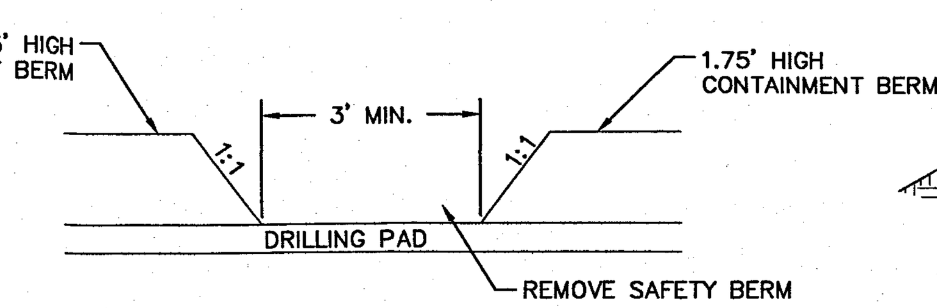


NOTE:
INSTALL PER REQUIREMENTS OF WEST VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARD DETAIL BOOK VOLUME 1, DRAWINGS GR-1 AND GR-2.

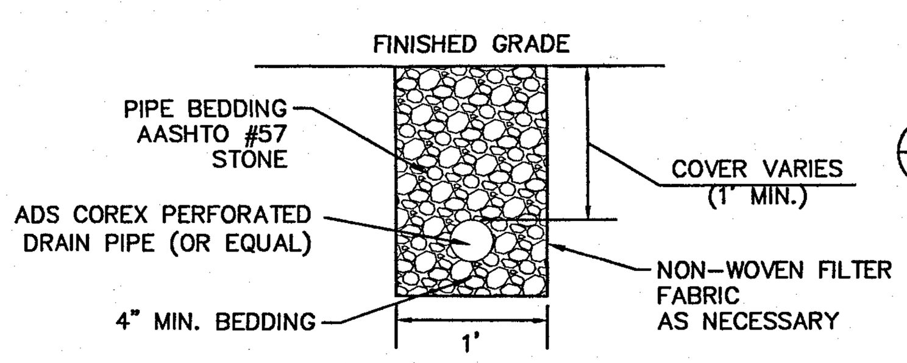
17/22 GUIDE RAIL DETAIL
NOT TO SCALE



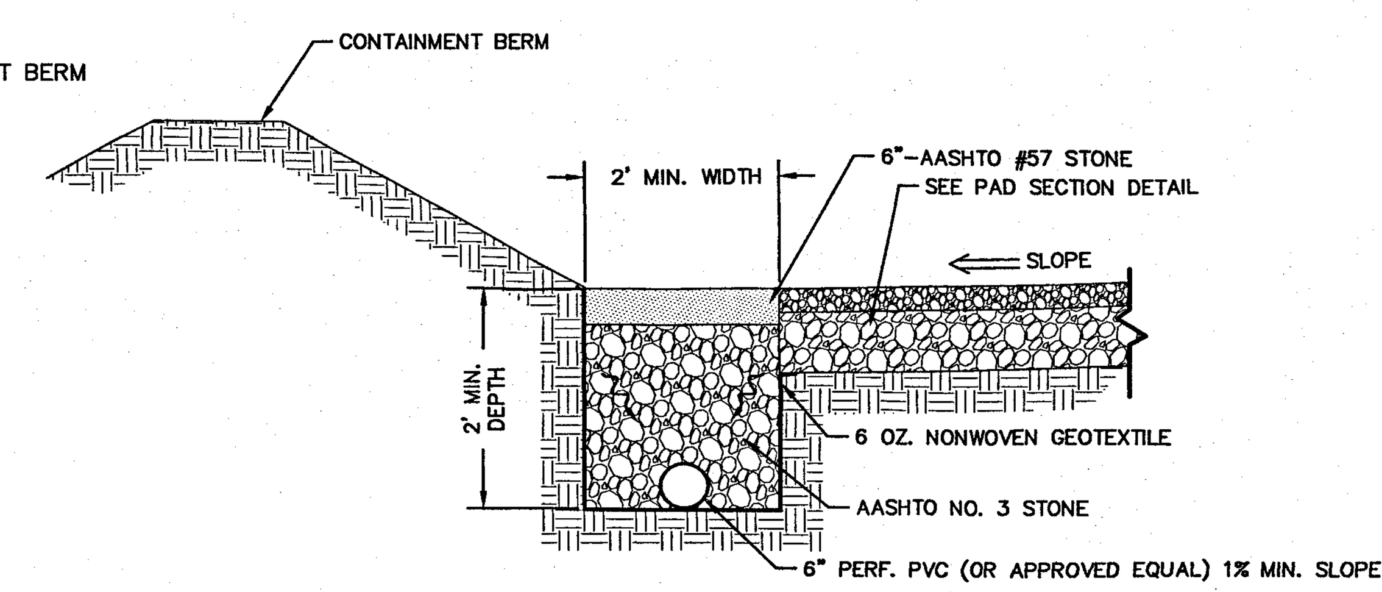
9/22 WELL PAD DRAINAGE STRUCTURE
NOT TO SCALE



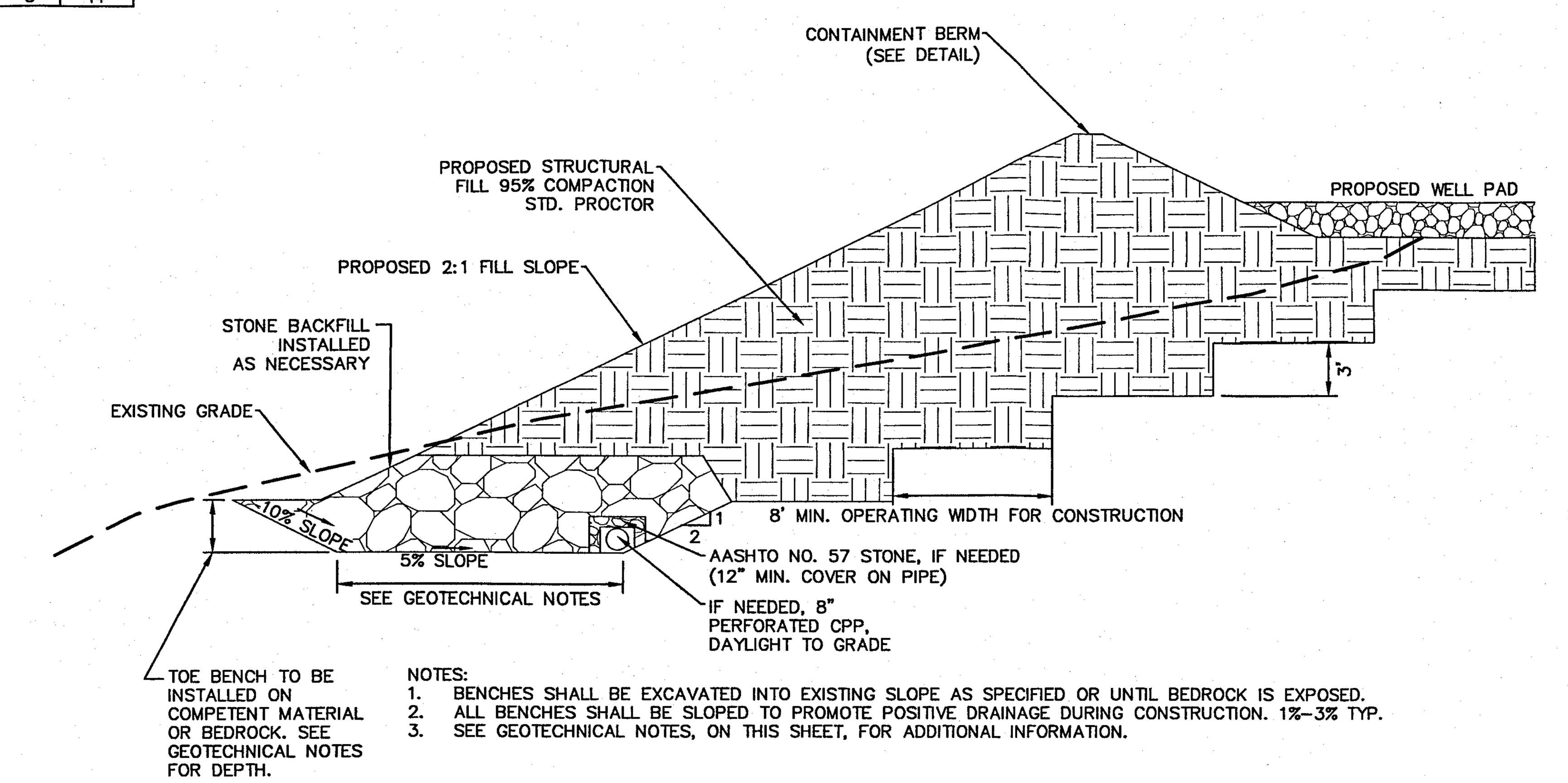
11/22 BERM BREACH
NOT TO SCALE



12/22 WELL PAD UNDERDRAIN TRENCH
NOT TO SCALE

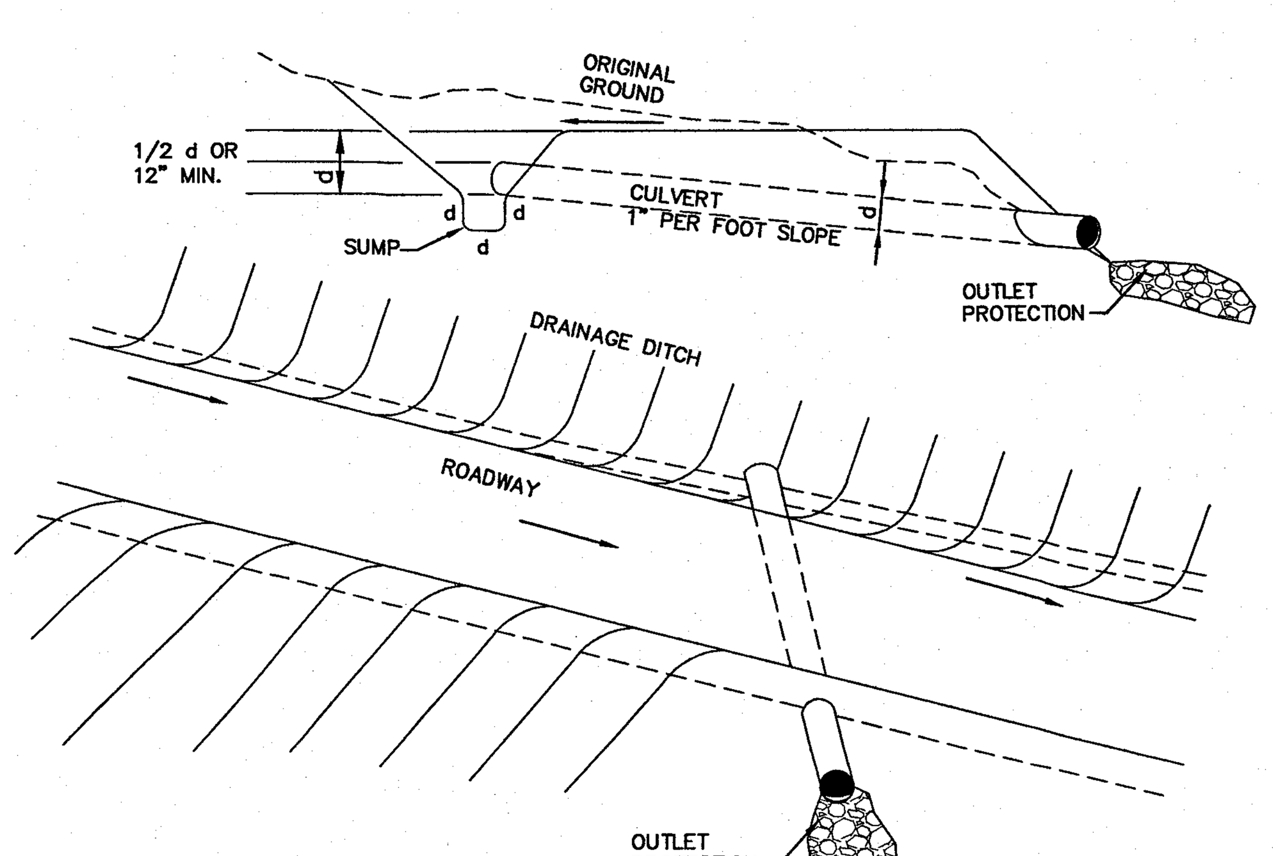


15/22 WELL PAD CONTAINMENT TRENCH DETAIL
NOT TO SCALE



NOTES:
1. BENCHES SHALL BE EXCAVATED INTO EXISTING SLOPE AS SPECIFIED OR UNTIL BEDROCK IS EXPOSED.
2. ALL BENCHES SHALL BE SLOPED TO PROMOTE POSITIVE DRAINAGE DURING CONSTRUCTION. 1%-3% TYP.
3. SEE GEOTECHNICAL NOTES, ON THIS SHEET, FOR ADDITIONAL INFORMATION.

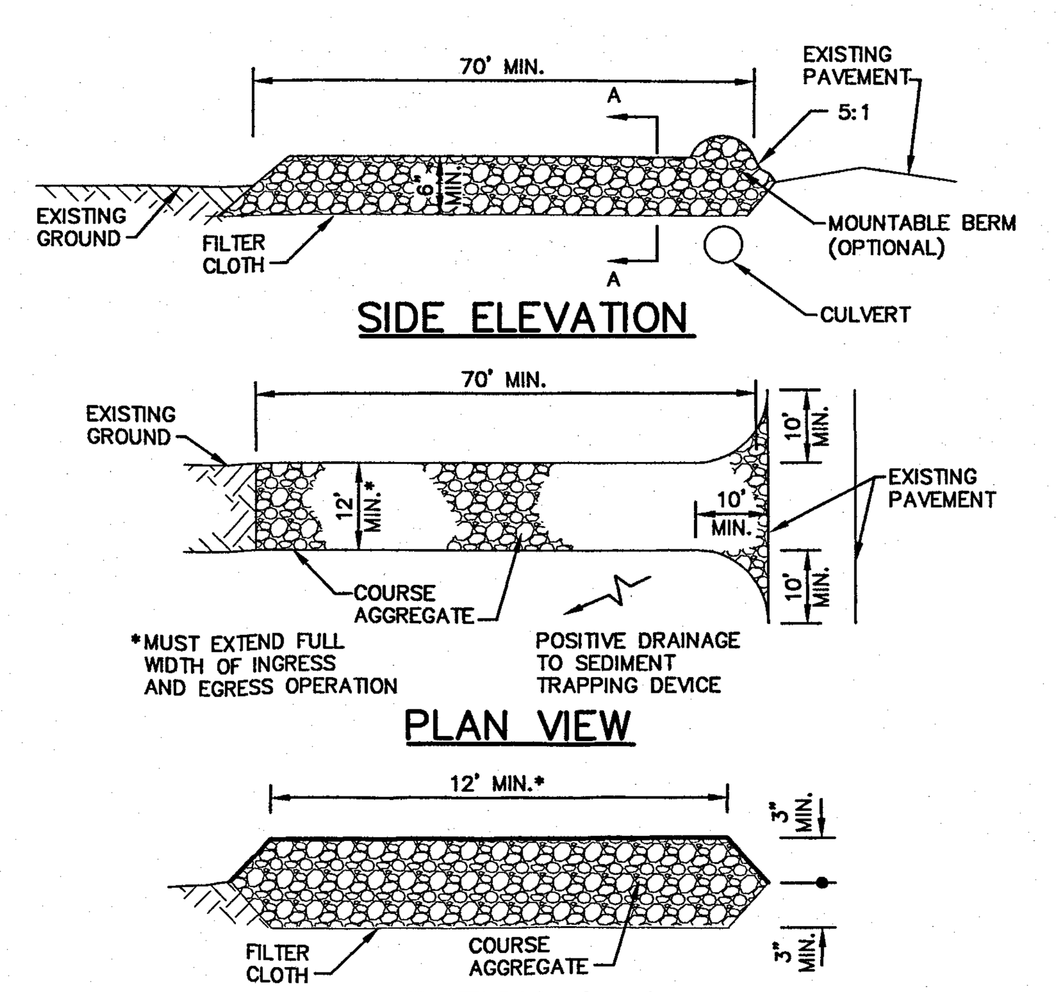
18/22 CONTROLLED FILL EMBANKMENT
NOT TO SCALE



NOTES:
1. CULVERTS WILL BE INSTALLED TO SPECIFIED LINE AND GRADE.
2. DITCH SHALL BE EXCAVATED TO A DEPTH AND GRADE TO ENSURE PROPER COVER FOR THE CULVERT.
3. DITCH BOTTOM WILL HAVE A FIRM FOUNDATION FOR THE CULVERT. GRAVEL MAY BE USED TO STABILIZE THE DITCH BOTTOM.
4. THE CULVERT WILL BE BACKFILLED WITH MATERIAL FREE OF LARGE ROCKS, WHICH MAY CAUSE DAMAGE TO IT.
5. STONE MAY BE NEEDED FOR FURTHER SURFACE STABILIZATION.
6. RECOMMENDED INSTALLATION IS WITH A BACKHOE RATHER THAN A DOZER.
7. CULVERTS WILL HAVE OUTLET PROTECTION (I.E. FIELD ROCK OR RIPRAP, AND SEDIMENT BARRIERS) AS WELL AS NATURAL FILTER STRIP AREAS.

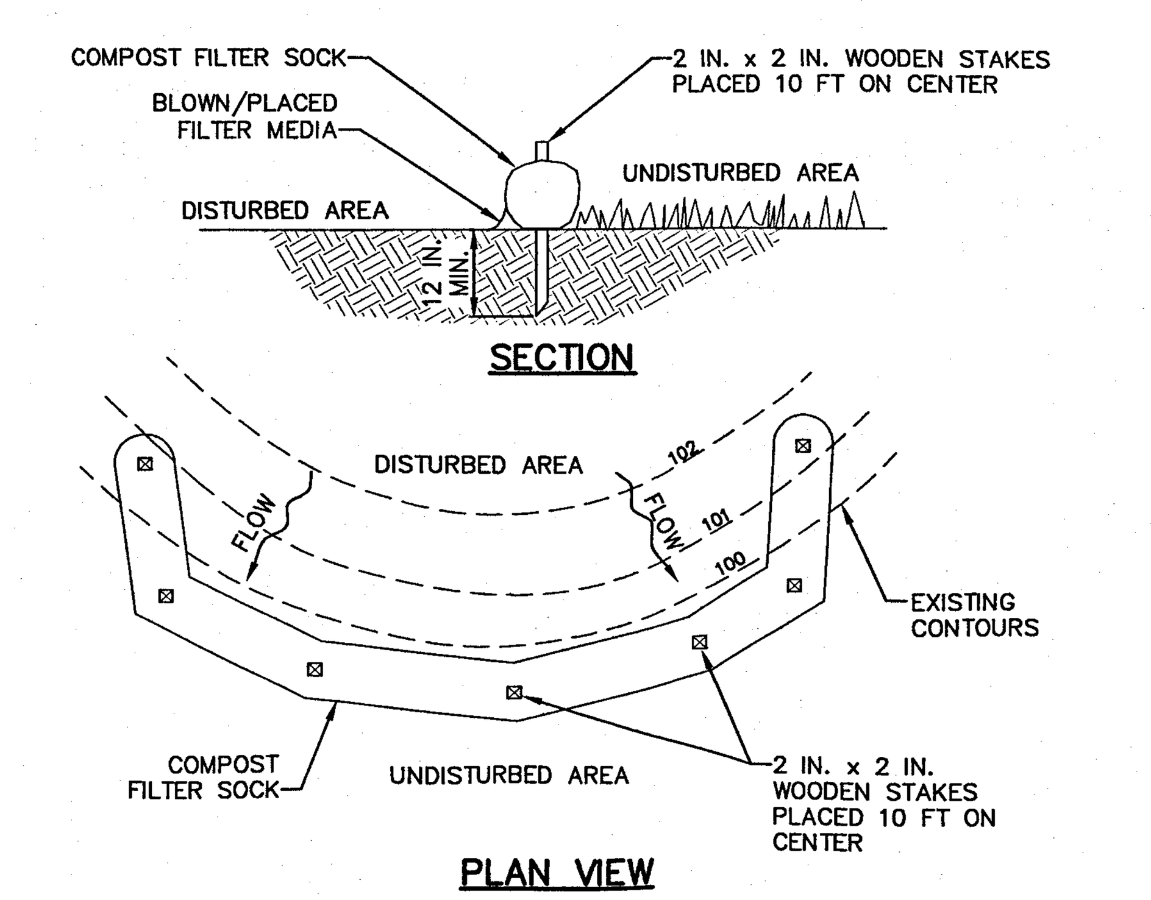
CULVERT #	SIZE(IN)	LENGTH(FT.)	TYPE	INV. IN	INV. OUT	SLOPE
1	24	30	SLCPP	889.7	889.4	1.00%
2	24	40	SLCPP	899.0	895.0	10.00%
3	18	40	SLCPP	1018.0	1004.0	35.00%
4	18	60	SLCPP	1118.6	1111.0	12.67%
5	18	70	SLCPP	1116.0	1115.6	4.29%

10/22 DITCH RELIEF CULVERT
NOT TO SCALE



NOTES:
1. USE 2–4" STONE FOR LOW VOLUME ENTRANCES, LARGER STONE (4–6") FOR HEAVY USE OR MATERIAL DELIVERY ENTRANCES.
2. LENGTH IS AS REQUIRED, BUT NOT LESS THAN 70' (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30' MIN. LENGTH WOULD APPLY).
3. THICKNESS SHOULD BE NOT LESS THAN 6".
4. THE WIDTH SHALL BE A MIN. OF 10', BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS AND EGRESS OCCURS.
5. GEOTEXTILE FABRIC SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE, IF A CULVERT IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES SHALL BE USED.
7. IF NECESSARY, DIVERT ANY WATER RUNNING DOWN ACCESS ROAD TO A SEDIMENT TRAP LOCATED ON EITHER SIDE OF THE STABILIZED CONSTRUCTION ENTRANCE.

13/22 STABILIZED CONSTRUCTION ENTRANCE
NOT TO SCALE



NOTES:

SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.

COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY BARRIER SHALL NOT EXCEED THAT SPECIFIED FOR THE SIZE OF THE SOCK AND THE SLOPE OF ITS TRIBUTARY AREA.

TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.

ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.

COMPOST FILTER SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.

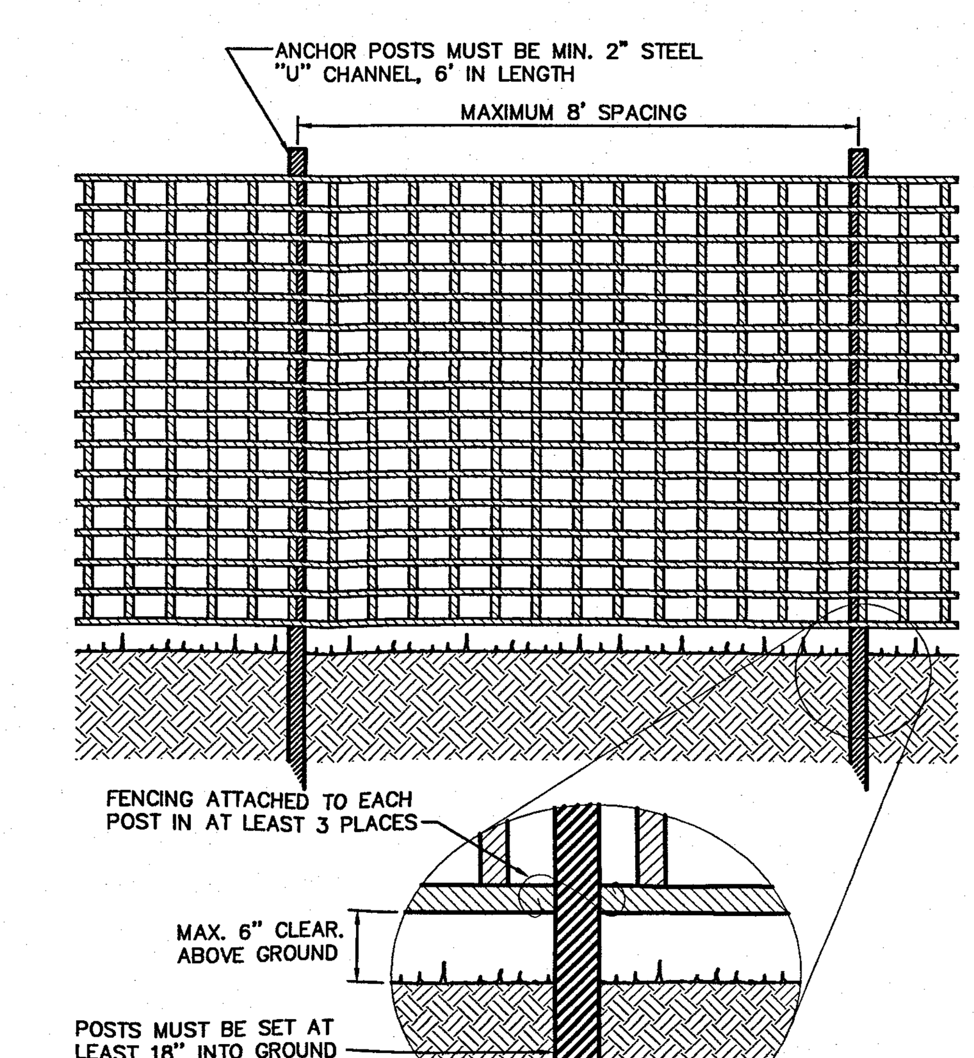
BIODEGRADABLE COMPOST FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

16/22 STANDARD CONSTRUCTION DETAIL #4–1
COMPOST FILTER SOCK
NOT TO SCALE

COMPOST FILTER SOCK TABLE

FS#	SIZE(IN.)	LENGTH(FT.)
1	18	67
2	18	107
3	18	82
4	18	46
5	18	125
6	18	388
7	18	114
8	18	96
9	18	81
10	18	463
11	18	157
12	18	59
13	18	396
14	18	63
15	18	94
16	18	149
17	18	47
18	18	103
19	18	53
20	18	81
21	18	57
22	18	53
23	18	56
24	18	83
25	18	203
26	18	74
27	18	54
28	18	144
29	18	76
30	18	104
31	18	96
32	18	45
33	18	26
34	18	61
35	18	36
36	18	32
37	18	124
38	18	152
39	18	243
40	18	300
41	18	85
42	18	225



NOTES:
1. PROTECTION BARRIER SHALL BE 4' HIGH, CONSTRUCTED OF DURABLE AND HIGHLY VISIBLE MATERIAL (PLASTIC ORANGE CONSTRUCTION FENCE AND SNOW–FENCE MAY BE USED).
2. PROTECTION BARRIERS SHALL BE MAINTAINED THROUGHOUT THE DURATION OF THE WORK AT THE SITE.
3. ADDITIONAL WARNING SIGNS SHOULD ALSO BE PLACED ON THE FENCING AND IN APPROPRIATE AREAS NEAR THE WORK ZONE.

19/22 CONSTRUCTION FENCE DETAIL
NOT TO SCALE

SCALE AS SHOWN

NO. | DATE | REVISION

FOR RETTEW ASSOCIATES BY:

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN | CHKD BY: MRO
DRAWN BY: ASN | CHKD BY: MRO
SURV. CHIEF: FIELDBOOK NO. DATA COLLECTOR

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Engineers · Planners · Surveyors · Landscape Architects
Environmental Consultants

DETAILS FOR
OXF 98 WELL PAD

WEST UNION DISTRICT DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 22 OF 23
DWG. NO. 093842024

GEOTECHNICAL NOTES

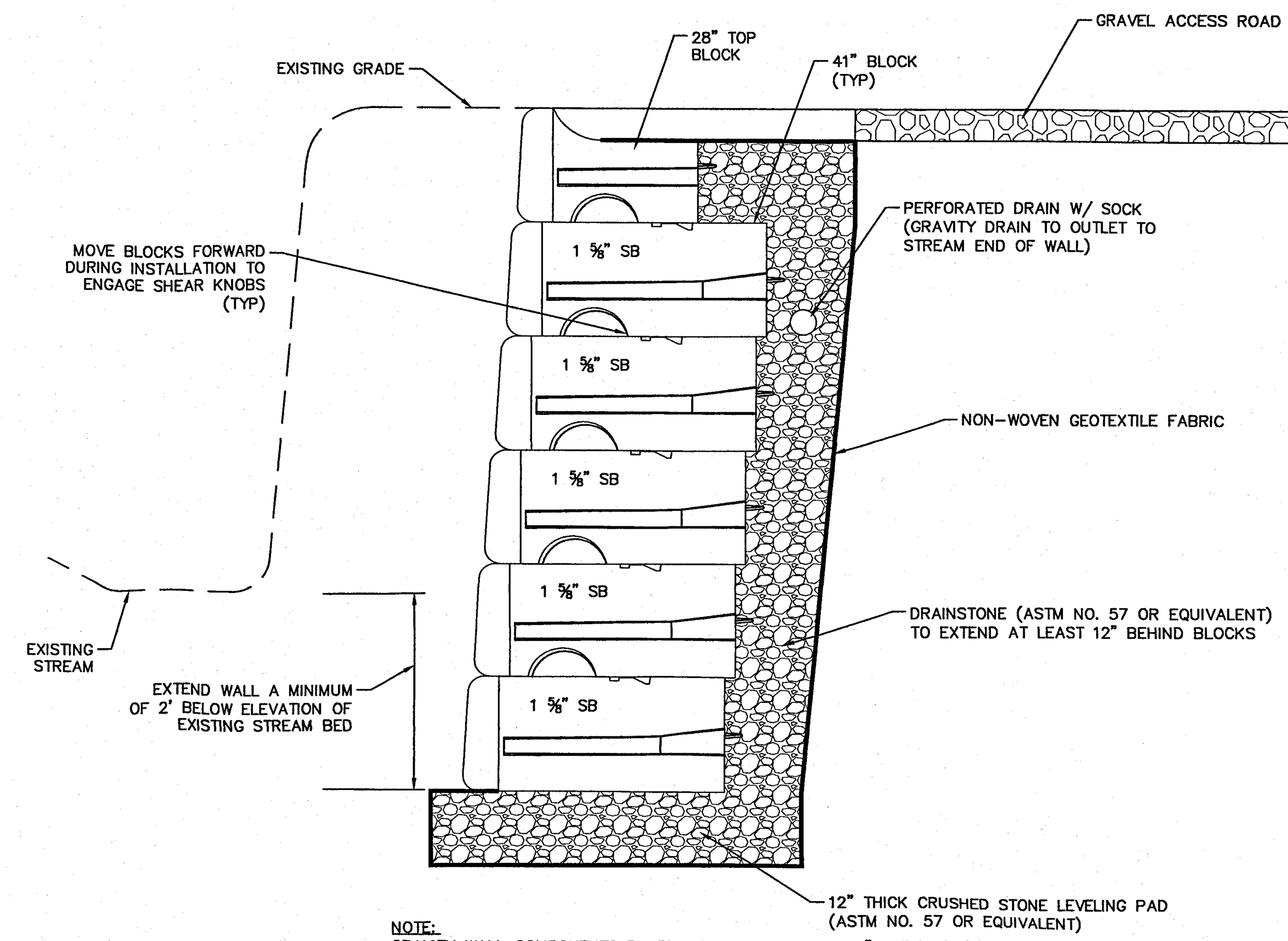
1. CLEARING, GRUBBING, THE STRIPPING OF ORGANIC SURFACE SOILS, AND THE REMOVAL OF UNSUITABLE/UNSTABLE SOILS SHALL BE PERFORMED IN ALL STRUCTURAL AREAS.
2. AFTER STRIPPING HAS BEEN COMPLETED, THE RESULTING SUBGRADE SHALL BE PROOFROLLED WITH A FULLY LOADED TANDEM AXLE DUMP TRUCK PRIOR TO STRUCTURAL FILL PLACEMENT. SUBGRADE SOILS IDENTIFIED AS BEING UNSUITABLE OR UNSTABLE, INCLUDING UNSTABLE COLLUVIAL SOILS, SHALL BE UNDERCUT TO A STABLE SOIL STRATUM AND BACKFILLED WITH CONTROLLED, COMPACTED SOIL FILL, OR ROCK FILL WHERE INDICATED ON THE PLANS. ALL UNSUITABLE SOIL CONTAINING EXCESSIVE ORGANICS OR DEBRIS SHALL BE WASTED.
3. PROVIDE DRAINAGE MEASURES FOR OTHER SPRINGS OR PERCHED WATER THAT ARE ENCOUNTERED DURING CONSTRUCTION. THE TREATMENT, WHICH WILL BE DETERMINED IN THE FIELD DEPENDING ON THE CONDITIONS, MAY INCLUDE PLACEMENT OF DRAIN TILE, MATTRESS DRAINS, INTERCEPTOR TRENCHES, AND/OR SUMPS TO COLLECT THE WATER. ALL WATER SHALL BE OUTLET BY GRAVITY OUTSIDE OF THE LIMITS OF THE PAD SLOPES.
4. THE EXCAVATION CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR EVALUATING THE EXCAVATION EFFORT REQUIRED FOR THE HIGHLY WEATHERED TO COMPETENT ROCK STRATA AND TO PROVIDE ROCK FILL MATERIAL THAT COMPLIES WITH WVDOH CONSTRUCTION MANUAL 2002, SECTION 207.7 ROCK EMBANKMENT, AND HAS A MAXIMUM PARTICLE SIZE AND LIFT THICKNESS OF 18 INCHES. ROCKFILL SHALL CONSIST OF SANDSTONE OR DURABLE SILTSTONE OR SHALE. CLAYSTONE AND NON-DURABLE SILTSTONE OR SHALE WILL NOT BE PERMITTED FOR USE AS ROCKFILL. SEQUENCE GRADING OPERATIONS TO STOCKPILE ROCK FILL FOR USE IN EMBANKMENT SLOPE CONSTRUCTION.
5. PROVIDE ON-SITE EXCAVATED ROCK FILL MEETING THE SPECIFICATIONS OF WVDOH CONSTRUCTION MANUAL 2002, SECTION 207.7 ROCK EMBANKMENT WITH A MAXIMUM PARTICLE SIZE OF 18 INCHES. ROCKFILL SHALL CONSIST OF SANDSTONE OR DURABLE SILTSTONE OR SHALE. CLAYSTONE AND NON-DURABLE SILTSTONE OR SHALE WILL NOT BE PERMITTED FOR USE AS ROCKFILL. PROVIDE ON-SITE CRUSHING AND BLENDING AS NECESSARY TO MEET ACCEPTABLE GRADATIONS. WHERE EMBANKMENT SOIL FILL OR NATIVE SOILS ARE LOCATED AGAINST ROCK FILL, CREATE A SUITABLE ROCK FILL GRADATION TO PREVENT SOIL MIGRATION BY BLENDING THE ROCK FILL WITH SOIL OR CHOKING THE ROCKFILL WITH IMPORTED AGGREGATE.
6. ON-SITE SOILS MEETING USCS DESIGNATIONS OF CL, ML, OR MORE GRANULAR WITH A MAXIMUM PARTICLE SIZE OF SIX INCHES SHALL BE USED AS SOIL FILL. UNSUITABLE MATERIALS WITH UNACCEPTABLE FRACTIONS OF ORGANICS OR DEBRIS ARE NOT PERMITTED. IF COAL IS ENCOUNTERED DURING EXCAVATION, IMMEDIATELY CONTACT THE CLIENT AND ENGINEER.
7. PLACE ALL FILL ON A STABLE, NEARLY LEVEL SUBGRADE. COMPACTION EQUIPMENT SHALL CONSIST OF LARGE (20 TON MINIMUM) VIBRATORY, SELF-PROPELLED SHEEPSFOOT ROLLERS FOR COHESIVE SOILS AND SMOOTH-DRUM ROLLERS FOR GRANULAR SOILS. SMOOTH-DRUM ROLLERS ARE NOT PERMITTED FOR THE INITIAL COMPACTION OF COHESIVE SOILS.
8. COMPACT STRUCTURAL FILL TO THE FOLLOWING MINIMUMRE
9. SPECIFICATIONS:
   - SOIL FILL BELOW THE UPPER TWO FEET OF PAD SUBGRADE -MAXIMUM NINE INCH LOOSE LIFTS COMPACTED TO 95% OF MAXIMUM DRY DENSITY AND WITHIN THREE PERCENTAGE POINTS OF THE OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D-698.
   - SOIL FILL WITHIN THE UPPER TWO FEET OF PAD SUBGRADE -MAXIMUM NINE INCH LOOSE LIFTS COMPACTED TO 98% OF MAXIMUM DRY DENSITY AND WITHIN TWO PERCENTAGE POINTS OF THE OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D-698.
   - ROCK FILL -MAXIMUM 18 INCH LOOSE LIFTS COMPACTED TO NON-MOVEMENT UNDER COMPACTION EQUIPMENT.

   IT IS NOT RECOMMENDED TO USE SOIL FILL THAT IS MORE THAN THREE PERCENTAGE POINTS ABOVE THE OPTIMUM MOISTURE CONTENT. IF THE CLIENT DECIDES TO USE SOIL EXCEEDING THREE PERCENTAGE POINTS ABOVE THE OPTIMUM MOISTURE CONTENT, THE FOLLOWING MEASURES SHALL BE PROVIDED.

   - COMPACTION SHALL BE CONTROLLED BY DETERMINING THE MAXIMUM ACHIEVABLE COMPACTION FROM A CONTROL STRIP.
   - WET SOIL SHALL NOT BE PLACED IN EMBANKMENT SLOPES, WITHIN THE UPPER THREE FEET OF THE PAD SURFACE, OR UNDER AREAS OF THE PAD THAT WILL SUPPORT RIG LOADS. CONSULT THE ENGINEER FOR AREAS OF FILL PLACEMENT.
   - ENSURE THE MAXIMUM RECOMMENDED LIFT THICKNESS IS MAINTAINED TO ALLOW FOR MAXIMUM ACHIEVABLE COMPACTION.
   - DRY SOILS BY MIXING WITH DRIER SOIL AND/OR ROCK.
   - SEQUENCE CONSTRUCTION TO ALLOW FOR SOME MOISTURE REDUCTION BY NATURAL DRYING OR AERATING.
   - STATIC COMPACTION METHODS MAY BE SPECIFIED TO REDUCE INSTABILITY.
   - PROVIDE MASS GRADING OBSERVATION AND TESTING TO MAKE SURE THAT THE CONTRACTOR IS CONTROLLING MATERIAL PLACEMENT AND COMPACTION IN THE MOST EFFECTIVE MANNER.
9. FILL SLOPES CONSTRUCTED WITH SOIL FILL SHALL BE CONSTRUCTED TWO TO THREE FEET WIDER THAN NECESSARY AND THEN CUT BACK TO THE REQUIRED GRADE. UPON COMPLETION OF THE FINAL GRADING, THE SLOPES SHALL BE TRACKED DOWN WITH TRACKED EQUIPMENT PRIOR TO PLACING TOPSOIL.
10. TOE BENCHES ARE REQUIRED FOR EACH FILL SLOPE IN ACCORDANCE WITH THE BENCHING AND TRANSITION DETAIL. DIFFERENT BENCH DIMENSIONS AND CONFIGURATIONS MAY BE NECESSARY AS DICTATED BY SUBSURFACE CONDITIONS, SUCH AS UNSTABLE COLLUVIAL SOILS, REVEALED DURING GRADING. DRAINAGE GALLERIES SHALL BE IMPLEMENTED IN THE TOE BENCH AS INDICATED ON THE BENCHING AND TRANSITION DETAIL. DRAINAGE GALLERIES SHALL BE OUTLETTED VIA GRAVITY LATERALS AT MAXIMUM INTERVALS OF 100 FEET.
11. CONSTRUCT BONDING BENCHES WHERE SLOPES ARE PLACED OVER EXISTING SLOPES 5H:1V OR STEEPER. BONDING BENCHES SHALL BE IN ACCORDANCE WITH THE BENCHING AND TRANSITION DETAIL.
12. REFER TO THE FOLLOWING TABLE FOR A SUMMARY OF THE EMBANKMENT CONSTRUCTION MEASURES.

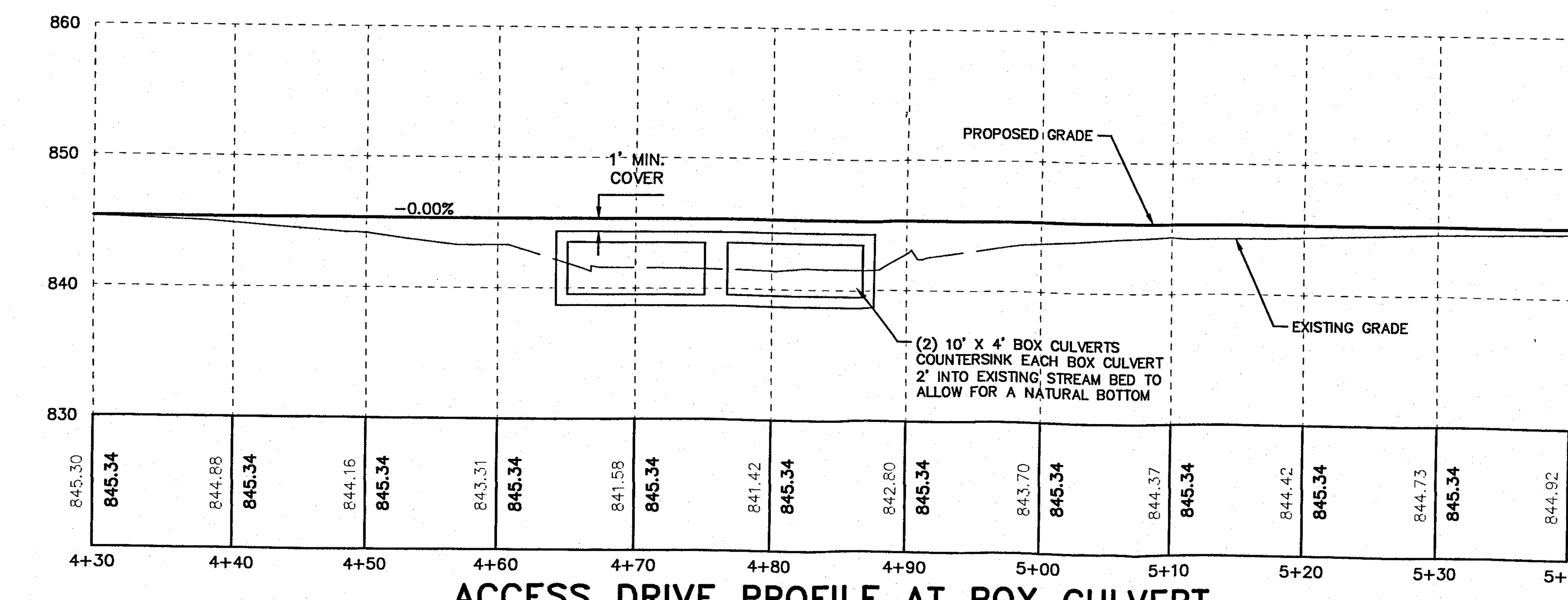
SLOPE STATIONING	MAXIMUM NATURAL SLOPE	PROPOSED SLOPE	MAXIMUM TOE BENCH DIMENSIONS	DRAINAGE MEASURES REQUIRED	BONDING BENCHES REQUIRED	ROCKFILL ELEVATION
4+20 TO 5+35	7H:1V	2H:1V FILL	6' DEEP X 10' WIDE	TOE DRAIN AT REAR; OTHER DRAINS AS NECESSARY	NONE REQUIRED	NONE REQUIRED
5+35 TO 9+00	5H:1V	2H:1V FILL	8' DEEP X 10' WIDE	TOE DRAIN AT REAR; OTHER DRAINS AS NECESSARY	INSTALL TO EL 1100	ROCKFILL TO EL 1080
9+00 TO 10+06	25H:1V	2H:1V FILL	6' DEEP X 10' WIDE	TOE DRAIN AT REAR; OTHER DRAINS AS NECESSARY	NONE REQUIRED	NONE REQUIRED
10+06 TO 13+20	10H:1V	2H:1V FILL	6' DEEP X 10' WIDE	TOE DRAIN AT REAR; OTHER DRAINS AS NECESSARY	NONE REQUIRED	NONE REQUIRED
13+20 TO 14+80	13H:1V	2H:1V FILL	6' DEEP X 10' WIDE	TOE DRAIN AT REAR; OTHER DRAINS AS NECESSARY	NONE REQUIRED	NONE REQUIRED

13. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SLOPING AND/OR BRACING TO PROVIDE STABLE EXCAVATIONS AND SAFE WORKING CONDITIONS FOR WORKERS AND INSPECTION PERSONNEL. ALL APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) SAFETY STANDARDS SHALL BE FOLLOWED.
14. PROOF-ROLL THE FINAL PAD SURFACE WITH A LOADED TRIAXLE DUMP TRUCK TO IDENTIFY ANY AREAS OF UNSTABLE SOILS. UNSTABLE SOILS SHALL BE REMOVED BY OVEREXCAVATION AND REPLACEMENT WITH CONTROLLED COMPACTED SOIL OR ROCK FILL. PROVIDE A CUT/FILL TRANSITION ZONE AND PLACE SUBSURFACE DRAINS AT THE TRANSITION ZONE AS DIRECTED BY THE ENGINEER IN ACCORDANCE WITH THE CUT/FILL TRANSITION DETAIL.
15. THE SUBGRADE SHALL BE SEALED ON A DAILY BASIS TO MINIMIZE DISTURBANCE AND MOISTURE INTRUSION.
16. EARTHWORK OPERATIONS SHALL BE OBSERVED AND TESTED ON A FULL-TIME BASIS BY A SOILS TECHNICIAN UNDER THE SUPERVISION OF A GEOTECHNICAL ENGINEER. THE OBSERVATION AND TESTING SHALL INCLUDE OBSERVATION OF STABILITY OF TOE AND BONDING BENCHES, INCLUDING PRESENCE OF UNSTABLE COLLUVIAL SOILS; INSTALLATION OF DRAINAGE MEASURES, LIFT THICKNESS OF MATERIAL, COMPACTIVE EFFORT, TYPE AND MOISTURE OF SOIL, GRADATION OF THE ROCKFILL AND, MOISTURE AND DENSITY OF COMPACTION. ALL COMPACTIVE EFFORT SHALL BE VERIFIED BY IN-PLACE DENSITY TESTING ON EACH LIFT AT A MAXIMUM 100-FOOT GRID PATTERN.

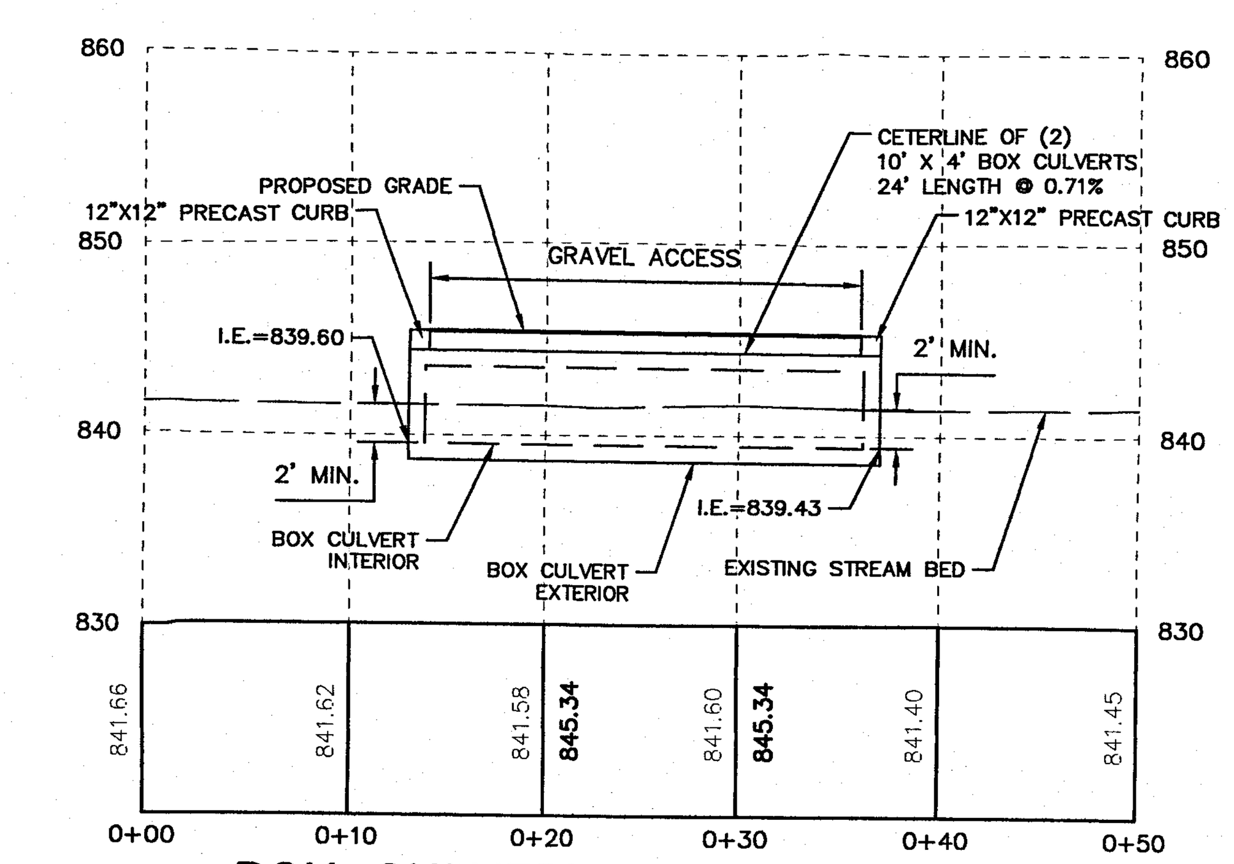


NOTE:
GRAVITY WALL COMPONENTS BY REDI ROCK, STANDARD 41" SERIES BLOCKS.
TEXTURE = LIMESTONE, COLOR = GREY.
CONSTRUCT WALL IN ACCORDANCE WITH MANUFACTURER SPECIFICATIONS.

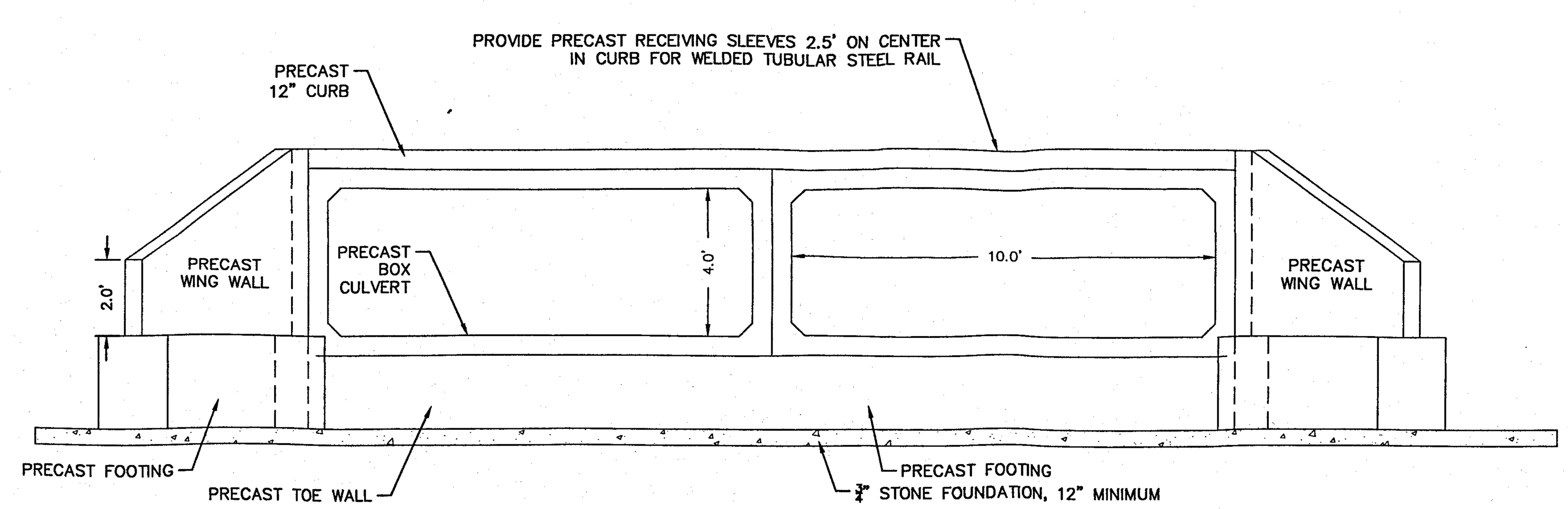
(21/23) **REDI ROCK GRAVITY WALL**
NOT TO SCALE



ACCESS DRIVE PROFILE AT BOX CULVERT
HORIZONTAL SCALE – 1"=10'
VERTICAL SCALE – 1"=10'



BOX CULVERT CROSS SECTION
HORIZONTAL SCALE – 1"=10'
VERTICAL SCALE – 1"=10'



NOTE:
1. TYPICAL PRECAST COMPONENTS ARE: WING WALLS, CURB, FOOTINGS AND TOE WALL.
2. PROVIDE SHOP DRAWINGS FOR REVIEW AND APPROVAL PRIOR TO FABRICATING PRECAST BOX CULVERT AND ASSOCIATED COMPONENTS INCLUDING REINFORCING STEEL SCHEDULE.
3. PROVIDE TIE HOLES ALONG COMMON SIDE OF ADJACENT BOX CULVERTS FOR ANCHORING.
4. JOINTS FOR PRECAST SECTIONS SHALL BE TONGUE AND GROOVE TYPE AND SHALL BE SEALED WITH MASTIC OR SAND/CEMENT GROUT.
5. LIFTING HOLES SHALL BE FILLED WITH CONCRETE PLUGS AND MASTIC AFTER THE CONCRETE BOX CULVERT SECTIONS ARE IN PLACE.

(20/23) **BOX CULVERT SECTION**
NOT TO SCALE

SCALE AS SHOWN

NO. | DATE | REVISION

FOR RETTEW ASSOCIATES BY:

MANAGER: MICHAEL R. OGDEN
DESIGN BY: ASN | CHKD BY: MRO
DRAWN BY: ASN | CHKD BY: MRO
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Engineers • Planners • Surveyors • Landscape Architects
Environmental Consultants

DETAILS
FOR
OXF 98 WELL PAD
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV.

DATE: 10/14/2014
SHEET NO. 23 OF 23
DWG. NO. 093842024