Doddridge County Sheriff
Flood Plain Ordinance Fund

1066
69-217/515

DATE November 5, 2013

PAY TO THE ORDER OF THE HERALD RECORD $ 108.70

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

Security features included. Details on back.

CORNERSTONE BANK
West Union, WV 26456

Ralph Sandy
Beth A. Rogers

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

Sheriff MP

⑈001066⑈ ⑆051502175⑆ ⑈9649⑈

BLUE TRADITIONAL

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

SENDER: *COMPLETE THIS SECTION*

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

1. Article Addressed to: #13-077

Mary Holland Est. %
Jane Hardin
225 Watching Fork
Westfield, NJ 07090

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) D Hardin
C. Date of Delivery 10/12/13

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

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7011 0470 0000 8523 2600

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

7011 0470 0000 8523 2600

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

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

WEST UNION WV OCT - 9 2013 Postmark Here USPS 26456

#13-077

Sent To Mary Holland Est. %
Street, Apt. No.; or PO Box No. Jane Hardin 225 Watching Fork
City, State, ZIP+4 Westfield, NJ 07090

PS Form 3800, August 2006 See Reverse for Instructions

7011 0470 0000 8523 2617

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

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

B Rogers WEST UN Postmark Here OCT - 9 2013

13-077

Sent To Ruth M. Pierce & Tom Davies
Street, Apt. No.; or PO Box No. 1104 Greenmont Circle
City, State, ZIP+4 Vienna, WV 26105

PS Form 3800, August 2006 See 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: 13-077

Ruth M. Pierce & Tom Davies
1104 Greenmont Circle
Vienna, WV 26105

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* TOM DAVIS C. Date of Delivery 10/10/10

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

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

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

2. Article Number
(Transfer from service label) 7011 0470 0000 8523 2617

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

UNITED STATES POSTAL SERVICE

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

FILED
2013 OCT 15 PM 12: 14
BETH A. ROGERS
COUNTY CLERK
DODDRIDGE COUNTY, WV

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

118 East Q Street
#102
West Union WV 26456

Asst. Chief Tax Deputy

Sheriff of Doddridge County

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

Doddridge County, West Virginia

No. 715

Date: October 21, 2013
*****Customer copy*****

Received: #13-077 SMITH LAND (EQT WELL SITE WEU 51) **$1,500.00**

In Payment For: 318 Building Permits (LP)

For: 12-Flood Plain Ordinance #20 Fund

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

W. C .Underwood Jr.
Sheriff of Doddridge County

Legal Advertisement:

Doddridge County

Floodplain Permit Application

Please take notice that on the 8th October, 2013

EQT PRODUCTION COMPANY – WELL 51 SITE (BLUESTONE CREEK)

PERMIT # 13-077 filed an

application for a Floodplain Permit to develop land located at or about: **SURFACE OWNERS: MARY HOLLAND EST. %JANE HARDIN, BLUESTONE 1207.637 AC INT. O&G, D/B 286/313, TAX MAP 23-04.**

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 **October 28, 2013.**

Delivered to the:

Clerk of the County Court

118 E. Court Street, West Union, WV 26456.

Beth A Rogers, Doddridge County Clerk

Dan Wellings, Doddridge County Flood Plain Manager

SLS SMITH LAND SURVEYING, INC.
P.O. BOX 150, GLENVILLE, WV 26351
(304) 462-5634 • FAX (304) 462-5656

LETTER OF TRANSMITTAL

DATE	JOB NO.
10/4/13	8051
ATTENTION: Dan Wellings	
RE: EQT WEU 51	

TO: Doddridge County Floodplain Coordinator
118 East Court Street
West Union, WV 26456

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1 set			WEU 51 Floodplain Permit with attachments
1			SLS Check #17808 for Permit Fees

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☒ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 20____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

COPY TO SLS Files; EQT Production Company

SIGNED: Deanna McVicker

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

PERMIT NO. 13-077

DODDRIDGE COUNTY

FLOODPLAIN DEVELOPMENT

PERMIT

PURPOSE FOR PERMIT: CULVERT CROSSING - WELL 51 Access Road

ISSUED TO EQT Production Co.
115 Professional Place

ADDRESS: Bridgeport, WV 26330

PROJECT ADDRESS: Bluestone - Holland Estate

ISSUED BY: Dan Weltner

DATE: 11/04/2013

CONSTRUCTION MUST START WITHIN 180 DAYS FROM ISSUED DATE. PERMIT EXPIRES IN 12 MONTHS FROM ISSUED DATE. IF EXTENTION IS NEEDED A REQUEST MUST BE MADE IN WRITING STATING A REASON FOR THE EXTENTION.

THIS PERMIT MUST BE POSTED ON THE PREMISES IN A CONSPICUOUS PLACE SO AS TO BE CLEARLY VISIBLE FROM THE STREET.

EQT Well Site Permit #
WEU 51
13-077

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.**

APPLICANT'S SIGNATURE _____

DATE 10/1/13

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

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

APPLICANT'S NAME: EQT Production Company
ADDRESS: 115 Professional Place P.O. Box 280 Bridgeport, WV 26330
TELEPHONE NUMBER: 304-848-0076

BUILDER'S NAME: EQT Production Company

ADDRESS: 115 Professional Place P.O. Box 280 Bridgeport, WV 26330

TELEPHONE NUMBER: 304-848-0076

ENGINEER'S NAME: Cyrus S. Kump/ Navitus Engineering Inc.

ADDRESS: 151 Windy Hill Lane Winchester, VA 22602

TELEHONE NUMBER: 888-662-4185

PROJECT LOCATION:

NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) Mary H. Holland Estate of Mary Holland % Jane Holland

ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) 225 Watching Fork Westfield, NJ 07090

DISTRICT: West Union

DATE/FROM WHOM PROPERTY PURCHASED: Property came out of estate of Mary Holland

LAND BOOK DESCRIPTION: Digital Courthouse- Bluestone 1207.637 Ac Int O&G

DEED BOOK REFERENCE: 286/313

TAX MAP REFERENCE: Tax map 23-04

EXISTING BUILDINGS/USES OF PROPERTY: hunting cabin

NAME OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A

ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY N/A

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

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 DEVEOPLMENT ACTIVITIES:

[x] Fill [] Mining [x] Drilling [] Pipelining
[x] Grading
[] Excavation (except for STRUCTURAL DEVELOPMENT checked above)
[] Watercourse Altercation (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.**
2. **IF STANDARD SITE PLANS HAVE NOT BEEN PREPARED:**
   SKETCH ON A SEPARATE 8 ½ X 11 INCH SHEET OF PAPER THE SHAPE AND LOCATION OF THE LOT. SHOW THE LOCATION OF THE INTENDED CONSTRUCTION OR LAND USE INDICATING BUILDING SETBACKS, SIZE & HEIGHT. IDENTIFY EXISTING BUILDINGS, STRUCTURES OR LAND USES ON THE PROPERTY.
3. **SIGN AND DATE THE SKETCH.**

ACTUAL TOTAL CONSTRUCTION COSTS OF THE COMPLETE DEVELOPMENT IRRESPECTIVE OF WHETHER ALL OR ANY PART OF THE SUBJECT PROPOSED CONSTRUCTION PROJECT IS WITHIN THE FLOODPLAIN $ 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: Mary Holland Estate % Jane Hardin
ADDRESS: 225 Watching Fork
Westfield, NJ 07090

NAME: Charles Jr. and Barbara Wellings
ADDRES5: Hc 68 Box 3
West Union, WV 26456

NAME: Pierce Ruth M. & Tom Davies
ADDRESS: 1104 Greenmont Circle
Vienna, WV 26105

NAME: Charles P. Heaster ET AL
ADDRESS: Rr 1 Box 57
West Union, WV 264S6

NAME: I. L. Morris
ADDRESS: P.O. Box 397
Glenville, WV 26351

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: James S. Donley
ADDRESS: 1406 Doe Run
West Union, WV 26456

NAME: Mary Farr
ADDRESS: Rt 1 Box 56A
West Union, WV 26456

NAME: Charles P. Heaster
ADDRESS: Rr 1 Box 57
West Union, WV 26456

NAME:
ADDRESS:

E. CONFIRMATION FORM

THE APPLICANT ACKNOWLEDGES, AGREES, AND CONFIRMS THAT HE/IT WILL PAY WITHIN 30 DAYS OF RECEIPT OF INVOICE BY THE COUNTY FOR ALL EXPENSES RELATIVE TO

THE PERMIT APPLICATION PROCESS GREATER THAN THE REQUIRED DEPOSIT FOR EXPENSES INCLUDING:

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

(B) SERVICE BY CERTIFIED MAIL RETURN RECEIPT REQUESTED.

(C) PUBLICATION.

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

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

NAME (PRINT): Megan E. Lindfried

SIGNATURE: Megan E. Lindfried **DATE:** 10/1/13

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

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

THE PROPOSED DEVELOPMENT:

THE PROPOSED DEVELOPMENT IS LOCATED ON:

FIRM Panel: 120

Dated: 10/04/2011

[ ] 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.

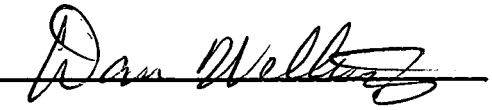
FIRM zone designation A

100-Year flood elevation is: N/A NGVD (MSL)

[X] Unavailable

[] The proposed development is located in a floodway.
FBFM Panel No._____ Dated_____

[] See section 4 for additional instructions.

SIGNED  **DATE** 11/04/2013

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

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

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

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

[] Subdivision or other development plans (If the subdivision or development exceeds 50 lots or 5 acres, whichever is the lesser, the applicant must provide 100-year flood elevations if they are not otherwise available).

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

[] Top of new fill elevation_____Ft. NGVD (MSL).
For floodproofing structures applicant must attach certification from registered engineer or architect.

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

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

[] Other:

_____

_____

_____

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

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

SIGNED_____DATE_____

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

APPEALS: Appealed to the County Commission of Doddridge County? [] Yes {} No

Hearing Date:_____

County Commission Decision - Approved [] Yes [] No

CONDITIONS:_____

_____

_____

_____

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

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

COMPLETE 1 OR 2 BELOW:

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

2 Actual (As Built) elevation of floodproofing is_____FT. NGVD (MSL)

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

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

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

INSPECTIONS:

DATE: 12/06/13 **BY:** Dan Wellman

DEFICIENCIES ? Y/(N)

COMMENTS Can not access Bluestone crossing yet.

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**_____

EQT 13-077

Maxwell Ridge
Proposed road entrance
to Bluestone Creek Crossing.

12/06/2013

DJ. 2N

Permit # 13-77
EQT-Wellsite
WEU 51

PROFESSIONAL ENERGY CONSULTANTS

A DIVISION OF SMITH LAND SURVEYING, INC.

October 4, 2013

Mr. Dan Wellings
Doddridge County Floodplain Coordinator
118 East Court Street
West Union, WV 26456

Re: Proposed EQT Production Company- WEU 51 Proposed Well Pad and Access Road Enhancement

Mr. Wellings;

On behalf of EQT Production Company, LLC, we are applying for a Doddridge County Floodplain permit for the project referenced above. The access road passes through a portion of Zone A as indicated on FEMA Panel 54017C0120C. Please see the attached Exhibit A, which has the proposed limits of disturbance and the access roadway overlaid. We have also included the proposed project site plans and hydraulic study for the project. As indicated in the attached hydraulic study the project will not raise the BFE more than 0.96 feet. No downstream properties will be affected. The proposed plans show a permanent stream crossing consisting of 4-15" aluminum culverts and a temporary portable bridge over Blve Stone Run. The itemized cost breakdown for the construction cost is also attached. This will cause no impact to downstream properties.

Please find attached: Site plans, Exhibit A, Doddridge floodplain application and check in the amount of $1,500. The $1,500.00 check is for the $500.00 application fee and $1,000.00 escrow money for expenses related to the application process.

If you have any questions, please call.

Leslie Pierce
Smith Land Surveying, Inc.
226 West Main
Glenville, WV 26351
(304) 462-5634 lpierce@slssurveys.com

EQT WEU-51
FEMA FLOOD ZONE
EXHIBIT A

N

ZONE A

WEU-51
PAD SITE

LOD

FEMA FLOOD ZONE

COUNTY ROUTE 13

LOD

FEMA FLOOD ZONE

STREAM CROSSING
LOCATION

LOD

FEMA PANEL #54017C0120C

FEMA PANEL #54017C0140C

SCALE
1 INCH=400-FEET

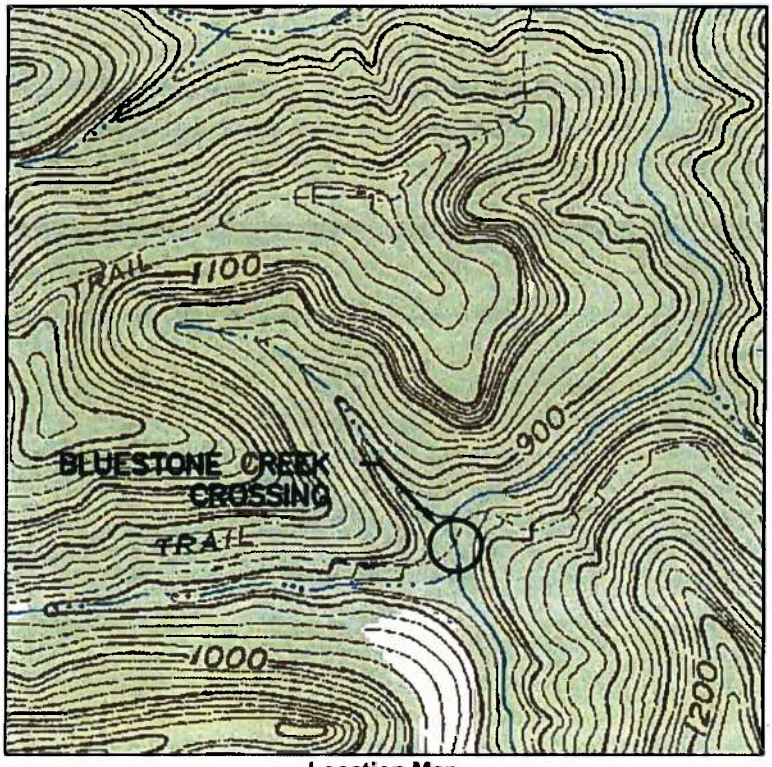
0′ 400′ 800′ 1200′

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
226 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634
36061 Diles Bottom Road
Shadyside, OH 43947
(740) 671-9311
HONESTY, INTEGRITY, QUALITY

FILE NO.	DATE	CADD FILE:
8051	9-16-13	WEU-51 FLOOD EXHIBIT A.DWG

EQT Well Site - WEU 51
(Bluestone Creek)

Hydrologic and Hydraulic Report



Location Map
1" = 1,000
(West Union, WV USGS Quad; West Union District, Doddridge County)
Coordinates: 39°15'12.50"N, 80°45'14.60"W

Prepared For/Operator:

EQT Production Company
Operator # 306686
115 Professional Place
Bridgeport, WV 26330
(304) 348-3870

Prepared By:

Stantec

111 Elkins Street
Fairmont, WV 26554

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING

SURVEYORS
PROJECT MGMT.
SLS
ENGINEERS
ENVIRONMENTAL

226 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634

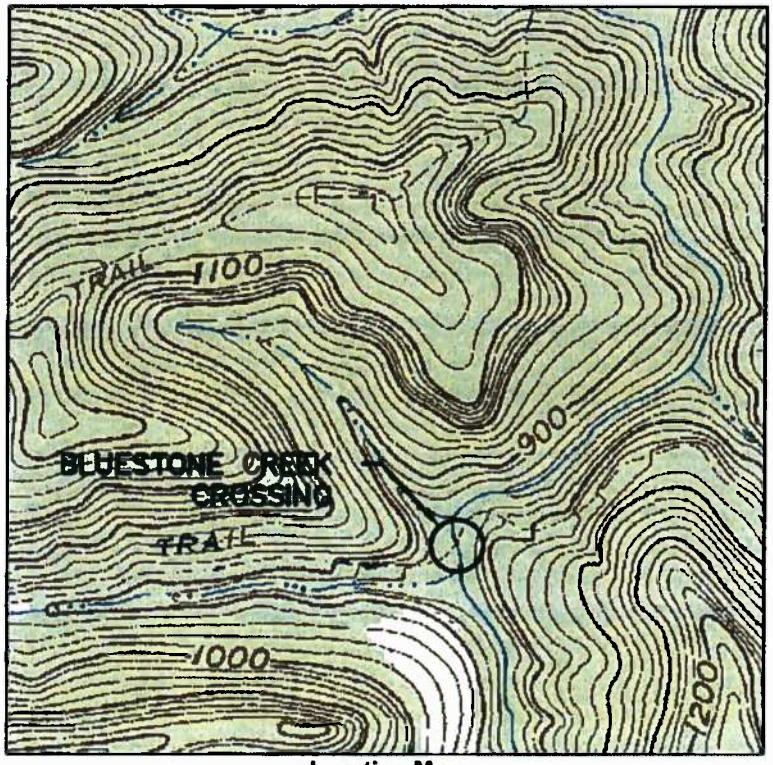
56065 Dilles Bottom Road
Shadyside, OH 43947
(740) 671-9911

HONESTY, INTEGRITY, QUALITY

Prepared: September 2013

EQT Well Site - WEU 51
(Bluestone Creek)

Hydrologic and Hydraulic Report



Location Map
1" = 1,000
(West Union, WV USGS Quad; West Union District, Doddridge County)
Coordinates: 39°15'12.50"N, 80°45'14.60"W

Prepared For/Operator:

EQT Production Company
Operator # 306686
115 Professional Place
Bridgeport, WV 26330
(304) 348-3870

Prepared By:

Stantec

111 Elkins Street
Fairmont, WV 26554

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING

SURVEYORS
PROJECT MGMT.
SLS
ENGINEERS
ENVIRONMENTAL

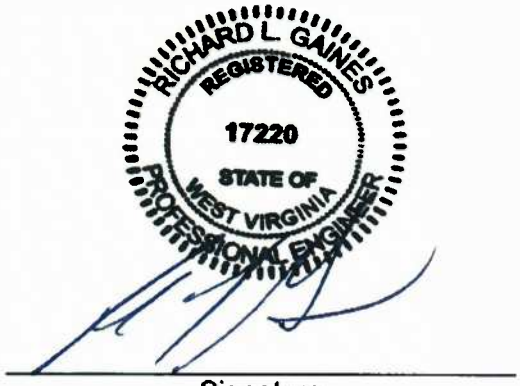
226 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634

56065 Dilles Bottom Road
Shadyside, OH 43947
(740) 671-9911

HONESTY, INTEGRITY, QUALITY

Prepared: September 2013

CERTIFICATION OF THE ENGINEER



Signature

9-13-13

Date

Printed Name:	Richard L. Gaines, PE
Company:	Stantec Consulting, Inc.
Address:	111 Elkins Street Fairmont, WV 26554
Phone:	(304) 367-9401

TABLE OF CONTENTS

OVERVIEW

This project includes the construction of a site for a natural gas well site access. The proposed site is located approximately 0.4 miles west of the intersection of and old jeep trail and CR 13 (Maxwell Ridge Road) Latitude 39°15'12.50"N Longitude 80°45'14.60"W.

DRAINAGE NARRATIVE

Based upon the drainage area at the site and the rural characteristics of the watershed, the USGS Water Resources Investigation Report (WRIR) 00-4080 method for Estimating Magnitude and Frequency of Peak Discharges for Rural, Unregulated Streams in West Virginia was utilized to determine the 2- through 100-year storm events for the watershed.

Stream base-flow discharge was determined using estimated flow depth measurements witnessed by Stantec staff during a site visit on July 31, 2013 From the above mentioned site visit, a range of flow depths (0.30' to 0.60) was measured in the project vicinity.

The drainage area consisted mostly of forested area comprised 2,967 acres or 4.64 square miles at the crossing site. The Bluestone Creek is located in the Upper Middle Island Creek Watershed. The crossing is located within a FEMA Floodplain Zone A. See Appendix A for peak discharge calculations and resulting flows.

A flood plain analysis was performed utilizing the US Army Corp of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS). Bluestone Creek is approximately 20 feet wide at the proposed site and varies up to 25 feet wide up and down stream. The overbank slopes (looking downstream) are sloped approximately 2:1 to 3:1. The main stream channel can be described as a stony bottom with some weeds. A Mannings 'n' value of 0.035 was used for the main stream channel. The overbank areas are described as vegetated with trees and underbrush. A Mannings 'n' value of 0.055 was used for the overbank areas.

Both the existing and proposed conditions were modeled for the stream crossing location. Supporting background information for the HEC-RAS model can be found in Appendix B.

Existing Conditions Model

The creek was modeled utilizing existing conditions to establish a baseline in which to compare the proposed scenarios with a temporary stream crossing and a permanent stream crossing installed at separate times. The model assumes the temporary crossing will be removed before the permanent low water crossing is installed fifteen cross sections, as shown in the provided exhibits, covering about 1100 linear feet of stream

channel were used for the HEC-RAS model. See Appendix B for the existing condition HEC-RAS Model.

Proposed Conditions Model with Temporary Bridge

The proposed condition model consisted of filling a portion of the right overbank for a future compressor station. This assumes placing a 40' long x 13.5' wide temporary bridge over the existing stream with a 35 foot opening between the timber abutments. (Bridge Deck elevation of 849.30. In comparing the proposed model to the existing model, the proposed improvements results in less than a 1-foot increase in the 100-yr water surface elevation. See Table 1 below. See Appendix C for the temporary bridge condition HEC-RAS Model.

TABLE 1

HEC-RAS CROSS SECTION	EXISTING 100-YR WSEL	PROPOSED 100-YR WSEL	INCREASE IN 100-YR WSEL
1500	854.88	854.86	-0.02
1400	854.64	854.62	-0.02
1300	854.32	854.29	-0.03
1200	854.02	853.99	-0.03
1100	853.11	852.83	-0.28
1000	852.93	852.57	-0.36
900	852.08	852.21	0.13
800	852.70	852.70	0.00
700	851.99	851.99	0.00
600	851.95	851.95	0.00
500	851.92	851.92	0.00
400	850.89	850.89	0.00
300	849.93	849.93	0.00
200	848.51	848.51	0.00
100	847.25	847.25	0.00

Proposed Conditions Model with Permanent Low Water Crossing

The proposed condition model consisted of filling a portion of the stream with four 15" CMP (Aluminum) pipes and a low water crossing for a future well access road. This assumes placing approximately two feet of fill on the pipes (minimum pad elevation of

849.30. This scenario provides adequate capacity to pass the computed stream base-flow discharge. In comparing the proposed model to the existing model, the proposed improvements results in less than a 1-foot increase in the 100-yr water surface elevation at any place along the stream which was modeled. See Table 2 below. See Appendix D for the temporary bridge condition HEC-RAS Model.

TABLE 2

HEC-RAS CROSS SECTION	EXISTING 100-YR WSEL	PROPOSED 100-YR WSEL	INCREASE IN 100-YR WSEL
1500	854.88	854.90	0.02
1400	854.64	854.67	0.03
1300	854.32	854.35	0.03
1200	854.02	854.06	0.04
1100	853.11	853.26	0.15
1000	852.93	853.11	0.18
900	852.08	853.04	0.96
800	852.70	852.68	-0.02
700	851.99	851.95	-0.04
600	851.95	851.90	-0.05
500	851.92	851.87	-0.05
400	850.89	850.85	-0.04
300	849.93	849.93	0.00
200	848.51	848.51	0.00
100	847.25	847.24	-0.01

CONCLUSIONS

The proposed fill in the existing floodplain will not impact the upstream water surface elevation more than 0.96 feet as shown in the model for either condition.

Appendix A

Stantec Consulting Services Inc.
111 Elkins Street
Fairmont WV 26554
Tel: (304) 367-9401

Stantec

Drainage Calculations for WEU 51 - Crossing
Stream: Bluestone Creek

Located on an old jeep trail off of Maxwell Ridge Road (CR 13)

Doddridge County, West Virginia
Coordinates: 39°15'12.50"N, 80°45'14.60"W
Located in a FEMA Flood Zone A; (No base flood elevation determined)

Located in rural area, unregulated, no gaging stations near site
Use WRIR 00-4080 to Estimate Peak Discharge

- Located in North Region (Figure 7)
- Use Regression Equations for an ungaged stream (Table 4)

Upstream to Stream Station 13+00

Drainage area = 2575.92 Acres = 4.025 Square Mile

$Q_2 = 138\,A^{0.724} = 138(4.025)^{0.724} = 378.21$ CFS

$Q_{10} = 341\,A^{0.653} = 341(4.025)^{0.653} = 846.58$ CFS

$Q_{25} = 478\,A^{0.626} = 478\,(4.025)^{0.626} = 1{,}142.91$CFS

$Q_{50} = 594\,A^{0.609} = 594\,(4.025)^{0.609} = 1{,}387.04$ CFS

$Q_{100} = 722\,A^{0.594} = 722\,(4.025)^{0.594} = 1{,}651.08$ CFS

Stream Station 13+00 and Downstream

Drainage area = 2966.92 Acres = 4.64 Square Mile

$Q_2 = 138\,A^{0.724} = 138(4.6359)^{0.724} = 418.95$ CFS

$Q_{10} = 341\,A^{0.653} = 341(4.6359)^{0.653} = 928.41$ CFS

$Q_{25} = 478\,A^{0.626} = 478\,(4.63594.025)^{0.626} = 1{,}248.61$ CFS

$Q_{50} = 594\,A^{0.609} = 594\,(4.6359)^{0.609} = 1{,}511.69$ CFS

$Q_{100} = 722\,A^{0.594} = 722\,(4.6359)^{0.594} = 1{,}795.65$ CFS

USGS
science for a changing world

In cooperation with the
West Virginia Department of Transportation
Division of Highways

Estimating Magnitude and Frequency of Peak Discharges for Rural, Unregulated, Streams in West Virginia

Water-Resources Investigation Report 00-4080

U.S. Department of the Interior
U.S. Geological Survey

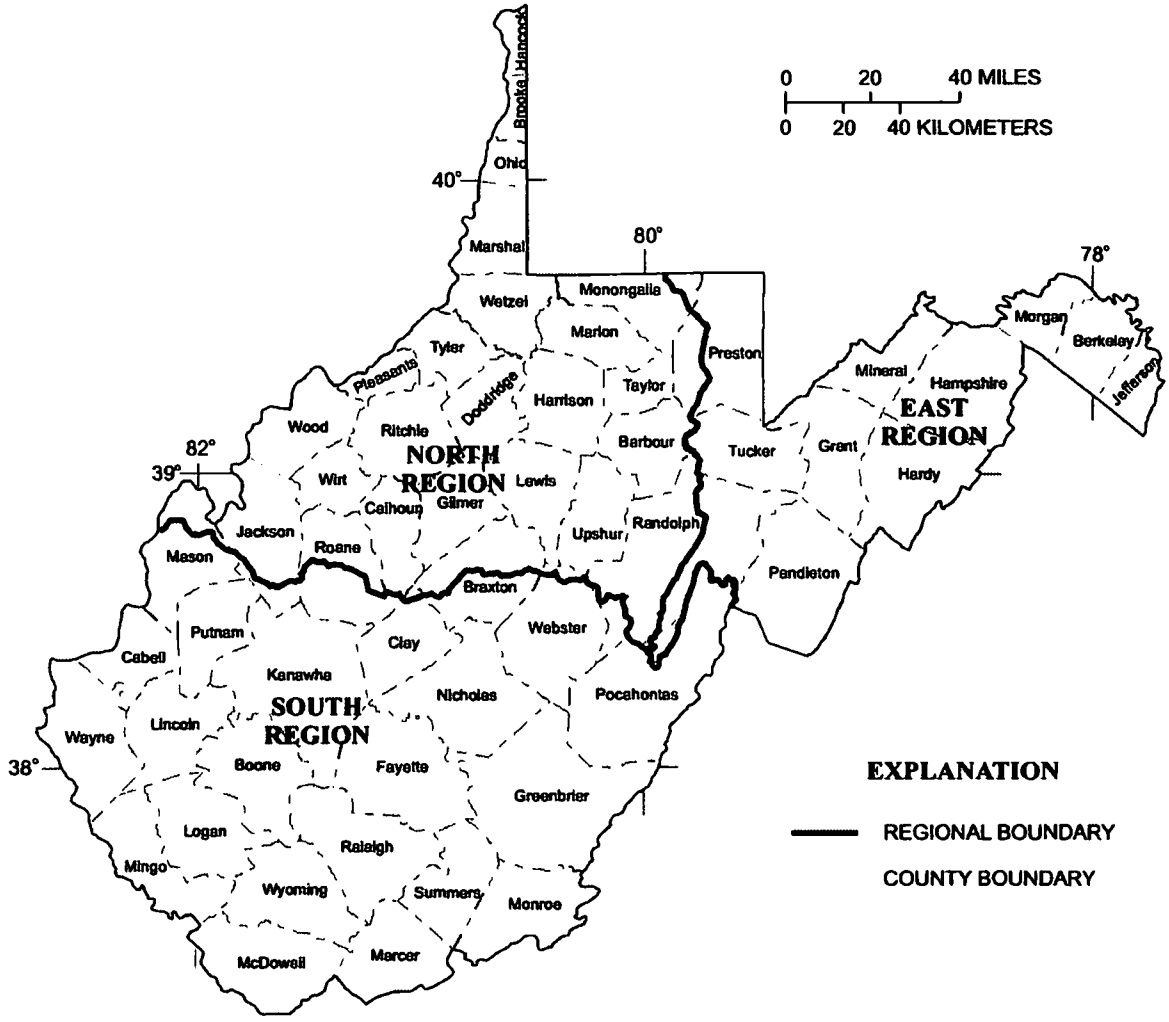


Figure 7. Regional boundaries for the estimating equations.

representative of frequency discharges expected in West Virginia. Log_{10}-transformed drainage area was determined as the most significant independent variable. An areal plot of residuals did not indicate additional subregions. A generalized least-squares regression model was executed with log_{10}-transformed drainage area as the independent variable to determine frequency-discharge equations for the North Region (table 4).

South Region.-Regional regression procedures for the log_{10}-transformed 100-year discharge were completed for the South Region. The number of gaging stations included in the analysis of the South Region was reduced from 110 to 100 by the exclusion of 10 Virginia stations. Stations 03207400, 03207500, 03207800, 03208500, 03208950, and 03209000 were not used because high regression residuals for these headwater streams of the Levisa Fork, which tend to be more rocky than the sandy streams common in the South Region, indicated that stations in this geographic area were not representative of frequency discharges expected in West Virginia. Stations 02009500, 02011400, and 02011460 were excluded because a high regression residual resulted for station 02009500, and Bisese (1995, p. 45) had omitted all three of these stations from the regional regression analysis for Virginia. Station 02012950 was excluded because it is located in carbonate rock (D.C. Hayes, U.S. Geological Survey, oral commun., 1999) (the equations developed for West Virginia are not applicable in karst areas

Table 4. Estimating equations and regression statistics determined from the regional regression analysis

[Q(n) is the discharge in cubic feet per second for the (n)-year recurrence interval; A is the drainage area in square miles.]

Regression equation	Standard error of the model, in percent	Average standard error of sampling, in percent	Average perdiction error, in percent	Equivalent years of record	Number of streamflow stations	Range of drainage area, in square miles
			East Region			
$Q(2)=62.6A^{0.842}$	37.7	8.3	38.8	2.3	74	0.22-1,486
$Q(5)=102A^{0.849}$	32.4	8.9	33.7	5.2		
$Q(10)=133A^{0.855}$	30.7	9.5	32.3	8.3		
$Q(25)=174A^{0.863}$	30.3	10.6	32.3	12.6		
$Q(50)=206A^{0.869}$	31.0	11.3	33.2	33.2		
$Q(100)=240A^{0.875}$	32.2	12.0	34.6	17.4		
$Q(200)=276A^{0.881}$	34.0	12.9	36.6	18.8		
$Q(500)=326A^{0.889}$	36.8	14.1	39.8	20.0		
			North Region			
$Q(2)=138A^{0.724}$	27.0	6.9	28.0	3.3	62	0.13-1,516
$Q(5)=249A^{0.678}$	26.6	7.3	27.7	4.7		
$Q(10)=341A^{0.653}$	26.7	8.0	28.0	6.3		
$Q(25)=478A^{0.626}$	27.6	8.6	29.0	8.3		
$Q(50)=594A^{0.609}$	28.5	8.9	29.9	9.5		
$Q(100)=722A^{0.594}$	29.7	9.5	31.3	10.5		
$Q(200)=862A^{0.580}$	31.1	10.3	32.9	11.2		
$Q(500)=1069A^{0.563}$	33.2	11.1	35.2	11.8		
			South Region			
$Q(2)=95.4A^{0.785}$	38.4	7.3	39.2	1.6	100	0.10-8,371
$Q(5)=153A^{0.772}$	35.8	7.3	36.6	2.7		
$Q(10)=197A^{0.766}$	35.3	8.0	36.3	3.8		
$Q(25)=257A^{0.759}$	35.9	8.6	37.0	5.3		
$Q(50)=305A^{0.755}$	37.0	8.9	38.2	6.2		
$Q(100)=355A^{0.751}$	38.5	9.5	39.9	6.9		
$Q(200)=408A^{0.748}$	40.3	10.0	41.7	7.4		
$Q(500)=481A^{0.744}$	43.1	10.8	44.7	7.9		

Appendix B

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: Bluestone Creek WEU 51
Project File : existing.prj
Run Date and Time: 9/13/2013 7:30:15 AM

Project in English units

PLAN DATA

Plan Title: Plan 20
Plan File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.p20

Geometry Title: Existing Stream
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g01

Flow Title : Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Plan Summary Information:

Number of:	Cross Sections	= 15	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

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

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

FLOW DATA

Flow Title: Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Flow Data (cfs)

River	Reach	RS	2 Year	10 Year	25 Year	50 Year	100 Year
Bluestone Creek	1	1500	378	847	1143	1387	1651
Bluestone Creek	1	1300	419	928	1249	1512	1796

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Bluestone Creek	1	2 Year		Critical
Bluestone Creek	1	10 Year		Critical
Bluestone Creek	1	25 Year		Critical
Bluestone Creek	1	50 Year		Critical
Bluestone Creek	1	100 Year		Critical

GEOMETRY DATA

Geometry Title: Existing Stream
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g01

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1500

INPUT
Description: X-1500
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	867	23	855	47	854	68	854	77	853
94	852	99	849	107	849	115	849	129	850
137	854	142	855	159	868				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	97	101	105	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.39	Element	Left OB	Channel
Right OB Vel Head (ft)	0.22	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	852.18	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	0.27	101.51
E.G. Slope (ft/ft)	0.002277	Area (sq ft)	0.27	101.51
Q Total (cfs)	378.00	Flow (cfs)	0.07	377.93
Top Width (ft)	42.40	Top Width (ft)	3.04	39.36
Vel Total (ft/s)	3.71	Avg. Vel. (ft/s)	0.26	3.72
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	0.09	2.58
Conv. Total (cfs)	7921.8	Conv. (cfs)	1.5	7920.4
Length Wtd. (ft)	100.96	Wetted Per. (ft)	3.05	40.74
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.01	0.35
Alpha 0.00	1.00	Stream Power (lb/ft s)	159.00	0.00
Frctn Loss (ft) 0.16	0.29	Cum Volume (acre-ft)	0.07	1.82
C & E Loss (ft) 0.13	0.01	Cum SA (acres)	0.15	0.76

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.86	Element	Left OB	Channel
Right OB Vel Head (ft)	0.45	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.41	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	16.15	151.32
E.G. Slope (ft/ft)	0.003137	Area (sq ft)	16.15	151.32
Q Total (cfs)	847.00	Flow (cfs)	20.70	826.30
Top Width (ft)	62.47	Top Width (ft)	20.66	41.81
Vel Total (ft/s)	5.06	Avg. Vel. (ft/s)	1.28	5.46
Max Chl Dpth (ft)	4.41	Hydr. Depth (ft)	0.78	3.62
Conv. Total (cfs)	15123.0	Conv. (cfs)	369.7	14753.4
Length Wtd. (ft)	100.63	Wetted Per. (ft)	20.71	43.48
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.15	0.68

Alpha	1.14	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.59	2.92
0.45				
C & E Loss (ft)	0.00	Cum SA (acres)	0.50	0.81
0.35				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.99	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	29.61	175.85
E.G. Slope (ft/ft)	0.003451	Area (sq ft)	29.61	175.85
Q Total (cfs)	1143.00	Flow (cfs)	51.32	1091.68
Top Width (ft)	68.83	Top Width (ft)	25.86	42.97
Vel Total (ft/s)	5.56	Avg. Vel. (ft/s)	1.73	6.21
Max Chl Dpth (ft)	4.98	Hydr. Depth (ft)	1.14	4.09
Conv. Total (cfs)	19457.8	Conv. (cfs)	873.6	18584.2
Length Wtd. (ft)	100.48	Wetted Per. (ft)	25.95	44.78
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	0.85
Alpha	1.19	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.95	3.40
0.69				
C & E Loss (ft)	0.01	Cum SA (acres)	0.62	0.82
0.47				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	855.08	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.67	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.42	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	51.74	194.48
0.44				
E.G. Slope (ft/ft)	0.003550	Area (sq ft)	51.74	194.48
0.44				
Q Total (cfs)	1387.00	Flow (cfs)	77.97	1308.78
0.24				
Top Width (ft)	102.12	Top Width (ft)	57.03	43.00
2.09				

Vel Total (ft/s)	5.62	Avg. Vel. (ft/s)	1.51	6.73
0.56				
Max Chl Dpth (ft)	5.42	Hydr. Depth (ft)	0.91	4.52
0.21				
Conv. Total (cfs)	23280.2	Conv. (cfs)	1308.7	21967.4
4.1				
Length Wtd. (ft)	100.39	Wetted Per. (ft)	57.13	44.81
2.13				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.20	0.96
0.05				
Alpha	1.36	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	1.26	3.72
0.87				
C & E Loss (ft)	0.03	Cum SA (acres)	0.73	0.82
0.51				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.71	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.88	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	80.59	214.30
1.93				
E.G. Slope (ft/ft)	0.003406	Area (sq ft)	80.59	214.30
1.93				
Q Total (cfs)	1651.00	Flow (cfs)	142.03	1507.23
1.74				
Top Width (ft)	115.49	Top Width (ft)	68.10	43.00
4.40				
Vel Total (ft/s)	5.56	Avg. Vel. (ft/s)	1.76	7.03
0.90				
Max Chl Dpth (ft)	5.88	Hydr. Depth (ft)	1.18	4.98
0.44				
Conv. Total (cfs)	28288.6	Conv. (cfs)	2433.6	25825.3
29.8				
Length Wtd. (ft)	100.27	Wetted Per. (ft)	68.20	44.81
4.48				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	1.02
0.09				
Alpha	1.47	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	1.60	4.03
1.05				
C & E Loss (ft)	0.04	Cum SA (acres)	0.81	0.82
0.56				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1400

INPUT
Description: X-1400

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	863	17	855	48	853	57	851	85	852
101	852	110	848	117	848	126	849	135	854
142	855	168	868						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	101	.035	135	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
101	135	120	109	100 .1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	851.76	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	9.30	78.32
E.G. Slope (ft/ft)	0.003599	Area (sq ft)	9.30	78.32
Q Total (cfs)	378.00	Flow (cfs)	7.86	370.14
Top Width (ft)	54.00	Top Width (ft)	24.59	29.41
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	0.85	4.73
Max Chl Dpth (ft)	3.76	Hydr. Depth (ft)	0.38	2.66
Conv. Total (cfs)	6301.2	Conv. (cfs)	131.1	6170.1
Length Wtd. (ft)	109.23	Wetted Per. (ft)	24.68	30.98
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.08	0.57
Alpha	1.18	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)	0.06	1.61
0.16				
C & E Loss (ft)	0.03	Cum SA (acres)	0.12	0.68
0.13				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.01	Reach Len. (ft)	120.00	109.00
100.00				

Crit W.S. (ft)		Flow Area (sq ft)	67.27	117.06
E.G. Slope (ft/ft)	0.003983	Area (sq ft)	67.27	117.06
Q Total (cfs)	847.00	Flow (cfs)	133.92	713.08
Top Width (ft)	85.29	Top Width (ft)	53.08	32.21
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)	1.99	6.09
Max Chl Dpth (ft)	5.01	Hydr. Depth (ft)	1.27	3.63
Conv. Total (cfs)	13420.6	Conv. (cfs)	2122.0	11298.6
Length Wtd. (ft)	110.89	Wetted Per. (ft)	53.32	34.15
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.31	0.85
Alpha	1.51	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.49	2.61
0.45				
C & E Loss (ft)	0.01	Cum SA (acres)	0.42	0.72
0.35				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.65	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	104.51	138.10
E.G. Slope (ft/ft)	0.003836	Area (sq ft)	104.51	138.10
Q Total (cfs)	1143.00	Flow (cfs)	244.34	898.66
Top Width (ft)	96.39	Top Width (ft)	63.02	33.36
Vel Total (ft/s)	4.71	Avg. Vel. (ft/s)	2.34	6.51
Max Chl Dpth (ft)	5.65	Hydr. Depth (ft)	1.66	4.14
Conv. Total (cfs)	18454.2	Conv. (cfs)	3945.0	14509.2
Length Wtd. (ft)	111.52	Wetted Per. (ft)	63.28	35.47
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.40	0.93
Alpha	1.55	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	0.80	3.03
0.69				
C & E Loss (ft)	0.00	Cum SA (acres)	0.52	0.73
0.47				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.14	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	137.40	154.72
0.07				
E.G. Slope (ft/ft)	0.003615	Area (sq ft)	137.40	154.72
0.07				
Q Total (cfs)	1387.00	Flow (cfs)	346.86	1040.12
0.02				
Top Width (ft)	105.62	Top Width (ft)	70.65	34.00
0.97				
Vel Total (ft/s)	4.75	Avg. Vel. (ft/s)	2.52	6.72
0.27				
Max Chl Dpth (ft)	6.14	Hydr. Depth (ft)	1.94	4.55
0.07				
Conv. Total (cfs)	23068.1	Conv. (cfs)	5768.9	17298.9
0.3				
Length Wtd. (ft)	111.87	Wetted Per. (ft)	70.92	36.20
0.98				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.44	0.96
0.02				
Alpha	1.57	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	1.05	3.32
0.87				
C & E Loss (ft)	0.00	Cum SA (acres)	0.59	0.73
0.51				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.64	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	174.92	171.83
1.44				
E.G. Slope (ft/ft)	0.003317	Area (sq ft)	174.92	171.83
1.44				
Q Total (cfs)	1651.00	Flow (cfs)	463.36	1186.59
1.05				
Top Width (ft)	116.94	Top Width (ft)	78.45	34.00
4.49				
Vel Total (ft/s)	4.74	Avg. Vel. (ft/s)	2.65	6.91
0.72				
Max Chl Dpth (ft)	6.64	Hydr. Depth (ft)	2.23	5.05
0.32				
Conv. Total (cfs)	28667.3	Conv. (cfs)	8045.6	20603.5
18.1				
Length Wtd. (ft)	112.13	Wetted Per. (ft)	78.74	36.20
4.54				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.46	0.98
0.07				

Alpha	1.61	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	1.31	3.58
1.04				
C & E Loss (ft)	0.01	Cum SA (acres)	0.65	0.73
0.55				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1300

INPUT
Description: X-1300
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	860	45	852	66	851	80	851	100	850
110	848	116	848	123	848	129	851	147	854
183	876								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	100	.035	129	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	129	95	88	88	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.46	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.67	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	850.78	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)	850.53	Flow Area (sq ft)	6.12	61.73
E.G. Slope (ft/ft)	0.009134	Area (sq ft)	6.12	61.73
Q Total (cfs)	419.00	Flow (cfs)	8.44	410.56
Top Width (ft)	44.21	Top Width (ft)	15.65	28.56
Vel Total (ft/s)	6.18	Avg. Vel. (ft/s)	1.38	6.65
Max Chl Dpth (ft)	2.78	Hydr. Depth (ft)	0.39	2.16
Conv. Total (cfs)	4384.1	Conv. (cfs)	88.4	4295.8
Length Wtd. (ft)	88.07	Wetted Per. (ft)	15.67	29.42
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.22	1.20
Alpha	1.14	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.04	1.44
0.16				
C & E Loss (ft)	0.14	Cum SA (acres)	0.07	0.61
0.13				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.03	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.45	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	80.07	110.17
6.34				
E.G. Slope (ft/ft)	0.004402	Area (sq ft)	80.07	110.17
6.34				
Q Total (cfs)	928.00	Flow (cfs)	178.66	740.23
9.11				
Top Width (ft)	95.28	Top Width (ft)	57.56	29.00
8.73				
Vel Total (ft/s)	4.72	Avg. Vel. (ft/s)	2.23	6.72
1.44				
Max Chl Dpth (ft)	4.45	Hydr. Depth (ft)	1.39	3.80
0.73				
Conv. Total (cfs)	13987.3	Conv. (cfs)	2692.8	11157.1
137.4				
Length Wtd. (ft)	88.72	Wetted Per. (ft)	57.64	29.91
8.85				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.38	1.01
0.20				
Alpha	1.66	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.26	Cum Volume (acre-ft)	0.29	2.32
0.44				
C & E Loss (ft)	0.06	Cum SA (acres)	0.27	0.65
0.34				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.24	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	126.92	132.91
15.03				
E.G. Slope (ft/ft)	0.003468	Area (sq ft)	126.92	132.91
15.03				
Q Total (cfs)	1249.00	Flow (cfs)	325.15	898.30
25.54				
Top Width (ft)	104.40	Top Width (ft)	61.97	29.00

13.43				
Vel Total (ft/s)	4.54	Avg. Vel. (ft/s)	2.56	6.76
1.70				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	2.05	4.58
1.12				
Conv. Total (cfs)	21207.9	Conv. (cfs)	5521.0	15253.1
433.7				
Length Wtd. (ft)	89.02	Wetted Per. (ft)	62.12	29.91
13.62				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.44	0.96
0.24				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.48	2.69
0.68				
C & E Loss (ft)	0.02	Cum SA (acres)	0.35	0.65
0.45				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.77	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	160.84	148.41
23.07				
E.G. Slope (ft/ft)	0.003128	Area (sq ft)	160.84	148.41
23.07				
Q Total (cfs)	1512.00	Flow (cfs)	443.82	1025.24
42.94				
Top Width (ft)	110.61	Top Width (ft)	64.97	29.00
16.64				
Vel Total (ft/s)	4.55	Avg. Vel. (ft/s)	2.76	6.91
1.86				
Max Chl Dpth (ft)	5.77	Hydr. Depth (ft)	2.48	5.12
1.39				
Conv. Total (cfs)	27035.0	Conv. (cfs)	7935.6	18331.6
767.8				
Length Wtd. (ft)	89.18	Wetted Per. (ft)	65.18	29.91
16.87				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.48	0.97
0.27				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	0.64	2.94
0.84				
C & E Loss (ft)	0.00	Cum SA (acres)	0.40	0.65
0.49				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
0.055				

W.S. Elev (ft)	854.32	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	197.13	164.23
32.81				
E.G. Slope (ft/ft)	0.002826	Area (sq ft)	197.13	164.23
32.81				
Q Total (cfs)	1796.00	Flow (cfs)	574.00	1153.82
68.18				
Top Width (ft)	115.56	Top Width (ft)	68.04	29.00
18.52				
Vel Total (ft/s)	4.56	Avg. Vel. (ft/s)	2.91	7.03
2.08				
Max Chl Dpth (ft)	6.32	Hydr. Depth (ft)	2.90	5.66
1.77				
Conv. Total (cfs)	33782.7	Conv. (cfs)	10796.9	21703.3
1282.5				
Length Wtd. (ft)	89.32	Wetted Per. (ft)	68.29	29.91
18.86				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.51	0.97
0.31				
Alpha	1.67	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.80	3.16
1.00				
C & E Loss (ft)	0.01	Cum SA (acres)	0.44	0.65
0.52				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1200

INPUT
Description: X-1200
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	27	856	58	854	79	852	94	851
102	848	115	847	125	848	134	848	137	850
149	855	190	876						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	35	44	47	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.79	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)		116.65
0.75				
E.G. Slope (ft/ft)	0.001926	Area (sq ft)		116.65
0.75				

Q Total (cfs)	419.00	Flow (cfs)		418.54
0.46				
Top Width (ft)	44.35	Top Width (ft)		42.45
1.90				
Vel Total (ft/s)	3.57	Avg. Vel. (ft/s)		3.59
0.61				
Max Chl Dpth (ft)	3.79	Hydr. Depth (ft)		2.75
0.40				
Conv. Total (cfs)	9547.7	Conv. (cfs)		9537.3
10.4				
Length Wtd. (ft)	44.00	Wetted Per. (ft)		43.65
2.06				
Min Ch El (ft)	847.00	Shear (lb/sq ft)		0.32
0.04				
Alpha	1.01	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.03	1.26
0.16				
C & E Loss (ft)	0.03	Cum SA (acres)	0.05	0.54
0.13				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.37	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.34	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	13.13	182.95
6.55				
E.G. Slope (ft/ft)	0.002053	Area (sq ft)	13.13	182.95
6.55				
Q Total (cfs)	928.00	Flow (cfs)	12.76	906.81
8.43				
Top Width (ft)	67.14	Top Width (ft)	18.53	43.00
5.61				
Vel Total (ft/s)	4.58	Avg. Vel. (ft/s)	0.97	4.96
1.29				
Max Chl Dpth (ft)	5.34	Hydr. Depth (ft)	0.71	4.25
1.17				
Conv. Total (cfs)	20480.0	Conv. (cfs)	281.6	20012.3
186.0				
Length Wtd. (ft)	43.82	Wetted Per. (ft)	18.58	44.24
6.07				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.09	0.53
0.14				
Alpha	1.15	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	0.19	2.02
0.43				
C & E Loss (ft)	0.04	Cum SA (acres)	0.19	0.57
0.32				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	853.05	Reach Len. (ft)	35.00	44.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)	29.08	213.72	11.17
E.G. Slope (ft/ft)	0.002116	Area (sq ft)	29.08	213.72	11.17
Q Total (cfs)	1249.00	Flow (cfs)	38.82	1192.74	17.45
Top Width (ft)	76.37	Top Width (ft)	26.04	43.00	7.32
Vel Total (ft/s)	4.92	Avg. Vel. (ft/s)	1.33	5.58	1.56
Max Chl Dpth (ft)	6.05	Hydr. Depth (ft)	1.12	4.97	1.53
Conv. Total (cfs)	27153.5	Conv. (cfs)	843.8	25930.3	379.3
Length Wtd. (ft)	43.66	Wetted Per. (ft)	26.13	44.24	7.93
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.15	0.64	0.19
Alpha	1.23	Stream Power (lb/ft s)	190.00	0.00	0.00
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	0.31	2.34	0.65
C & E Loss (ft)	0.05	Cum SA (acres)	0.25	0.58	0.43

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	853.55	Reach Len. (ft)	35.00	44.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)	43.24	234.98	15.09
E.G. Slope (ft/ft)	0.002180	Area (sq ft)	43.24	234.98	15.09
Q Total (cfs)	1512.00	Flow (cfs)	67.60	1417.97	26.43
Top Width (ft)	82.75	Top Width (ft)	31.23	43.00	8.51

Vel Total (ft/s)	5.15	Avg. Vel. (ft/s)	1.56	6.03
1.75				
Max Chl Dpth (ft)	6.55	Hydr. Depth (ft)	1.38	5.46
1.77				
Conv. Total (cfs)	32385.3	Conv. (cfs)	1447.9	30371.2
566.2				
Length Wtd. (ft)	43.54	Wetted Per. (ft)	31.34	44.24
9.22				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.19	0.72
0.22				
Alpha	1.29	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.41	2.55
0.80				
C & E Loss (ft)	0.06	Cum SA (acres)	0.29	0.58
0.46				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.02	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	59.25	255.40
19.40				
E.G. Slope (ft/ft)	0.002246	Area (sq ft)	59.25	255.40
19.40				
Q Total (cfs)	1796.00	Flow (cfs)	104.88	1653.61
37.51				
Top Width (ft)	88.97	Top Width (ft)	36.32	43.00
9.65				
Vel Total (ft/s)	5.38	Avg. Vel. (ft/s)	1.77	6.47
1.93				
Max Chl Dpth (ft)	7.02	Hydr. Depth (ft)	1.63	5.94
2.01				
Conv. Total (cfs)	37899.4	Conv. (cfs)	2213.2	34894.7
791.5				
Length Wtd. (ft)	43.42	Wetted Per. (ft)	36.45	44.24
10.45				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.23	0.81
0.26				
Alpha	1.34	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.52	2.74
0.95				
C & E Loss (ft)	0.07	Cum SA (acres)	0.33	0.58
0.49				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1100

INPUT
Description: X-1100
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	53	856	67	854	92	852	113	850
118	847	127	848	140	848	142	849	148	850
158	856	171	869						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	113	.035	148	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
113	148	80	58	55	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.52	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.29	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.43	72.02
0.07				
E.G. Slope (ft/ft)	0.007496	Area (sq ft)	0.43	72.02
0.07				
Q Total (cfs)	419.00	Flow (cfs)	0.27	418.69
0.04				
Top Width (ft)	38.48	Top Width (ft)	3.01	35.00
0.48				
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	0.64	5.81
0.58				
Max Chl Dpth (ft)	3.29	Hydr. Depth (ft)	0.14	2.06
0.14				
Conv. Total (cfs)	4839.4	Conv. (cfs)	3.2	4835.8
0.5				
Length Wtd. (ft)	58.01	Wetted Per. (ft)	3.02	36.21
0.56				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.07	0.93
0.06				
Alpha	1.01	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.03	1.16
0.15				
C & E Loss (ft)	0.08	Cum SA (acres)	0.05	0.50
0.13				

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

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	852.52				
Vel Head (ft)	0.81	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.72	Reach Len. (ft)	80.00	58.00	55.00
Crit W.S. (ft)		Flow Area (sq ft)	15.45	122.04	2.45
E.G. Slope (ft/ft)	0.005904	Area (sq ft)	15.45	122.04	2.45
Q Total (cfs)	928.00	Flow (cfs)	28.86	894.99	4.15
Top Width (ft)	55.87	Top Width (ft)	18.01	35.00	2.86
Vel Total (ft/s)	6.63	Avg. Vel. (ft/s)	1.87	7.33	1.69
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)	0.86	3.49	0.86
Conv. Total (cfs)	12077.0	Conv. (cfs)	375.6	11647.4	54.0
Length Wtd. (ft)	58.34	Wetted Per. (ft)	18.09	36.21	3.33
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.31	1.24	0.27
Alpha	1.18	Stream Power (lb/ft s)	171.00	0.00	0.00
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.18	1.87	0.42
C & E Loss (ft)	0.08	Cum SA (acres)	0.17	0.54	0.32

CROSS SECTION OUTPUT Profile #25 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	853.32				
Vel Head (ft)	0.97	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.35	Reach Len. (ft)	80.00	58.00	55.00
Crit W.S. (ft)		Flow Area (sq ft)	29.04	144.15	4.59
E.G. Slope (ft/ft)	0.005832	Area (sq ft)	29.04	144.15	4.59
Q Total (cfs)	1249.00	Flow (cfs)	65.44	1174.05	9.51
Top Width (ft)	64.25	Top Width (ft)	25.34	35.00	3.91
Vel Total (ft/s)	7.03	Avg. Vel. (ft/s)	2.25	8.14	2.07
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	1.15	4.12	1.17
Conv. Total (cfs)	16355.1	Conv. (cfs)	856.9	15373.6	124.6
Length Wtd. (ft)	58.64	Wetted Per. (ft)	25.45	36.21	4.56

Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.42	1.45
0.37				
Alpha	1.27	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.29	2.16
0.64				
C & E Loss (ft)	0.07	Cum SA (acres)	0.23	0.54
0.43				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.87	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.12	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.75	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.17	Flow Area (sq ft)	40.26	158.25
6.30				
E.G. Slope (ft/ft)	0.006038	Area (sq ft)	40.26	158.25
6.30				
Q Total (cfs)	1512.00	Flow (cfs)	101.71	1395.52
14.76				
Top Width (ft)	69.96	Top Width (ft)	30.37	35.00
4.58				
Vel Total (ft/s)	7.38	Avg. Vel. (ft/s)	2.53	8.82
2.34				
Max Chl Dpth (ft)	5.75	Hydr. Depth (ft)	1.33	4.52
1.37				
Conv. Total (cfs)	19458.7	Conv. (cfs)	1309.0	17959.7
190.0				
Length Wtd. (ft)	58.86	Wetted Per. (ft)	30.50	36.21
5.34				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.50	1.65
0.44				
Alpha	1.33	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.29	Cum Volume (acre-ft)	0.38	2.35
0.79				
C & E Loss (ft)	0.07	Cum SA (acres)	0.27	0.54
0.46				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.29	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.11	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.61	Flow Area (sq ft)	52.15	170.99
8.08				
E.G. Slope (ft/ft)	0.006351	Area (sq ft)	52.15	170.99
8.08				
Q Total (cfs)	1796.00	Flow (cfs)	146.32	1628.59
21.10				
Top Width (ft)	75.12	Top Width (ft)	34.93	35.00

5.19				
Vel Total (ft/s)	7.77	Avg. Vel. (ft/s)	2.81	9.52
2.61				
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)	1.49	4.89
1.56				
Conv. Total (cfs)	22536.2	Conv. (cfs)	1836.0	20435.5
264.7				
Length Wtd. (ft)	59.09	Wetted Per. (ft)	35.07	36.21
6.05				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.59	1.87
0.53				
Alpha	1.38	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.48	2.52
0.94				
C & E Loss (ft)	0.06	Cum SA (acres)	0.30	0.54
0.49				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1000

INPUT
Description: X-1000
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	9	856	17	855	35	853	60	851
62	847	91	847	95	850	111	853	125	863

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	60	.035	95	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60	95	25	69	95	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.25	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.25	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)		104.04
0.17				
E.G. Slope (ft/ft)	0.002319	Area (sq ft)		104.04
0.17				
Q Total (cfs)	419.00	Flow (cfs)		418.94
0.06				
Top Width (ft)	35.98	Top Width (ft)		34.63
1.36				
Vel Total (ft/s)	4.02	Avg. Vel. (ft/s)		4.03
0.33				
Max Chl Dpth (ft)	3.25	Hydr. Depth (ft)		3.00
0.13				
Conv. Total (cfs)	8700.4	Conv. (cfs)		8699.3
1.2				

Length Wtd. (ft)	68.86	Wetted Per. (ft)		37.64
1.38				
Min Ch El (ft)	847.00	Shear (lb/sq ft)		0.40
0.02				
Alpha	1.00	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.03	1.04
0.15				
C & E Loss (ft)	0.04	Cum SA (acres)	0.04	0.45
0.12				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.64	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	2.60	152.57
7.21				
E.G. Slope (ft/ft)	0.003190	Area (sq ft)	2.60	152.57
7.21				
Q Total (cfs)	928.00	Flow (cfs)	1.86	916.59
9.55				
Top Width (ft)	51.83	Top Width (ft)	8.06	35.00
8.77				
Vel Total (ft/s)	5.72	Avg. Vel. (ft/s)	0.72	6.01
1.32				
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)	0.32	4.36
0.82				
Conv. Total (cfs)	16429.6	Conv. (cfs)	32.9	16227.6
169.1				
Length Wtd. (ft)	67.57	Wetted Per. (ft)	8.08	38.47
8.92				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.06	0.79
0.16				
Alpha	1.09	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.16	1.69
0.41				
C & E Loss (ft)	0.04	Cum SA (acres)	0.15	0.49
0.31				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.74	Wt. n-Val.	0.055	0.035

0.055				
W.S. Elev (ft)	852.24	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	9.64	173.47
13.40				
E.G. Slope (ft/ft)	0.003649	Area (sq ft)	9.64	173.47
13.40				
Q Total (cfs)	1249.00	Flow (cfs)	11.43	1214.23
23.34				
Top Width (ft)	62.48	Top Width (ft)	15.53	35.00
11.96				
Vel Total (ft/s)	6.36	Avg. Vel. (ft/s)	1.19	7.00
1.74				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	0.62	4.96
1.12				
Conv. Total (cfs)	20676.4	Conv. (cfs)	189.2	20100.8
386.3				
Length Wtd. (ft)	67.21	Wetted Per. (ft)	15.58	38.47
12.17				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.14	1.03
0.25				
Alpha	1.18	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.25	1.95
0.63				
C & E Loss (ft)	0.06	Cum SA (acres)	0.19	0.49
0.42				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.90	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.61	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	16.23	186.39
18.18				
E.G. Slope (ft/ft)	0.004099	Area (sq ft)	16.23	186.39
18.18				
Q Total (cfs)	1512.00	Flow (cfs)	24.25	1450.61
37.14				
Top Width (ft)	69.07	Top Width (ft)	20.14	35.00
13.93				
Vel Total (ft/s)	6.85	Avg. Vel. (ft/s)	1.49	7.78
2.04				
Max Chl Dpth (ft)	5.61	Hydr. Depth (ft)	0.81	5.33
1.31				
Conv. Total (cfs)	23616.7	Conv. (cfs)	378.7	22657.8
580.1				
Length Wtd. (ft)	66.88	Wetted Per. (ft)	20.21	38.47
14.17				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.21	1.24
0.33				

Alpha	1.24	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	0.33	2.12
0.77				
C & E Loss (ft)	0.05	Cum SA (acres)	0.22	0.49
0.45				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.02	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.09	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.93	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	23.33	197.63
22.93				
E.G. Slope (ft/ft)	0.004634	Area (sq ft)	23.33	197.63
22.93				
Q Total (cfs)	1796.00	Flow (cfs)	41.85	1700.36
53.79				
Top Width (ft)	74.79	Top Width (ft)	24.15	35.00
15.64				
Vel Total (ft/s)	7.36	Avg. Vel. (ft/s)	1.79	8.60
2.35				
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	0.97	5.65
1.47				
Conv. Total (cfs)	26384.4	Conv. (cfs)	614.8	24979.3
790.3				
Length Wtd. (ft)	66.64	Wetted Per. (ft)	24.23	38.47
15.91				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.28	1.49
0.42				
Alpha	1.30	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	0.41	2.28
0.92				
C & E Loss (ft)	0.04	Cum SA (acres)	0.25	0.50
0.47				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 900

INPUT
Description: X-900
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846	87	846	100	850	128	852

148	854	157	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	100	20	34	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.19	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.65	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	849.54	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	849.13	Flow Area (sq ft)	2.63	64.05
E.G. Slope (ft/ft)	0.008345	Area (sq ft)	2.63	64.05
Q Total (cfs)	419.00	Flow (cfs)	2.71	416.29
Top Width (ft)	38.23	Top Width (ft)	9.73	28.51
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)	1.03	6.50
Max Chl Dpth (ft)	3.54	Hydr. Depth (ft)	0.27	2.25
Conv. Total (cfs)	4586.7	Conv. (cfs)	29.6	4557.1
Length Wtd. (ft)	35.65	Wetted Per. (ft)	9.74	29.53
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.14	1.13
Alpha	1.06	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.03	0.91
0.15				
C & E Loss (ft)	0.16	Cum SA (acres)	0.04	0.40
0.12				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.83	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.84	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	850.60	Flow Area (sq ft)	26.07	102.60
4.90				
E.G. Slope (ft/ft)	0.007815	Area (sq ft)	26.07	102.60

4.90				
Q Total (cfs)	928.00	Flow (cfs)	67.88	853.58
6.54				
Top Width (ft)	64.53	Top Width (ft)	22.81	30.00
11.71				
Vel Total (ft/s)	6.95	Avg. Vel. (ft/s)	2.60	8.32
1.33				
Max Chl Dpth (ft)	4.84	Hydr. Depth (ft)	1.14	3.42
0.42				
Conv. Total (cfs)	10497.6	Conv. (cfs)	767.9	9655.8
73.9				
Length Wtd. (ft)	37.25	Wetted Per. (ft)	22.91	31.09
11.74				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.56	1.61
0.20				
Alpha	1.33	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.15	1.49
0.40				
C & E Loss (ft)	0.26	Cum SA (acres)	0.14	0.44
0.29				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.32	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.23	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	851.23	Flow Area (sq ft)	35.58	114.50
10.65				
E.G. Slope (ft/ft)	0.009216	Area (sq ft)	35.58	114.50
10.65				
Q Total (cfs)	1249.00	Flow (cfs)	116.04	1112.99
19.98				
Top Width (ft)	72.36	Top Width (ft)	25.09	30.00
17.27				
Vel Total (ft/s)	7.77	Avg. Vel. (ft/s)	3.26	9.72
1.88				
Max Chl Dpth (ft)	5.23	Hydr. Depth (ft)	1.42	3.82
0.62				
Conv. Total (cfs)	13010.7	Conv. (cfs)	1208.7	11593.9
208.1				
Length Wtd. (ft)	37.88	Wetted Per. (ft)	25.23	31.09
17.31				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.81	2.12
0.35				
Alpha	1.41	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.24	1.72
0.60				
C & E Loss (ft)	0.35	Cum SA (acres)	0.18	0.44
0.38				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.41	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.67	Reach Len. (ft)	20.00	34.00	75.00
Crit W.S. (ft)	851.67	Flow Area (sq ft)	46.97	127.48	19.43
E.G. Slope (ft/ft)	0.008785	Area (sq ft)	46.97	127.48	19.43
Q Total (cfs)	1512.00	Flow (cfs)	168.91	1299.60	43.48
Top Width (ft)	80.90	Top Width (ft)	27.58	30.00	23.32
Vel Total (ft/s)	7.80	Avg. Vel. (ft/s)	3.60	10.19	2.24
Max Chl Dpth (ft)	5.67	Hydr. Depth (ft)	1.70	4.25	0.83
Conv. Total (cfs)	16131.5	Conv. (cfs)	1802.1	13865.5	463.9
Length Wtd. (ft)	38.36	Wetted Per. (ft)	27.75	31.09	23.38
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.93	2.25	0.46
Alpha	1.49	Stream Power (lb/ft s)	157.00	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.31	1.87	0.73
C & E Loss (ft)	0.37	Cum SA (acres)	0.21	0.44	0.41

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water

surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	853.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.50	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.08	Reach Len. (ft)	20.00	34.00	75.00
Crit W.S. (ft)	852.08	Flow Area (sq ft)	58.77	139.80	30.17
E.G. Slope (ft/ft)	0.008494	Area (sq ft)	58.77	139.80	30.17
Q Total (cfs)	1796.00	Flow (cfs)	228.39	1490.19	77.42
Top Width (ft)	88.71	Top Width (ft)	29.94	30.00	28.77
Vel Total (ft/s)	7.85	Avg. Vel. (ft/s)	3.89	10.66	2.57
Max Chl Dpth (ft)	6.08	Hydr. Depth (ft)	1.96	4.66	1.05
Conv. Total (cfs)	19487.3	Conv. (cfs)	2478.1	16169.2	840.1
Length Wtd. (ft)	38.81	Wetted Per. (ft)	30.15	31.09	28.84
Min Ch El (ft)	846.00	Shear (lb/sq ft)	1.03	2.38	0.55
Alpha	1.57	Stream Power (lb/ft s)	157.00	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.38	2.01	0.86
C & E Loss (ft)	0.39	Cum SA (acres)	0.23	0.44	0.42

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 800

INPUT
Description: X-800
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	19	852	39	850	63	848	80	847
89	846.2	97	846.2	107	848	163	850	188	851
216	856	233	858	245	859				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	63	.035	107	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
63	107	90	48	15	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.83	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	20.08	124.99
46.85				
E.G. Slope (ft/ft)	0.001159	Area (sq ft)	20.08	124.99
46.85				
Q Total (cfs)	419.00	Flow (cfs)	17.36	361.06
40.58				
Top Width (ft)	117.17	Top Width (ft)	21.95	44.00
51.22				
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)	0.86	2.89
0.87				
Max Chl Dpth (ft)	3.63	Hydr. Depth (ft)	0.91	2.84
0.91				
Conv. Total (cfs)	12309.0	Conv. (cfs)	509.9	10607.0
1192.1				
Length Wtd. (ft)	47.27	Wetted Per. (ft)	22.03	44.23
51.25				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.07	0.20
0.07				
Alpha	1.53	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.02	0.84
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	0.37
0.08				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.36	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	65.92	192.37
154.09				
E.G. Slope (ft/ft)	0.000918	Area (sq ft)	65.92	192.37
154.09				
Q Total (cfs)	928.00	Flow (cfs)	78.23	659.41
190.36				

Top Width (ft)	164.63	Top Width (ft)	37.61	44.00
83.02				
Vel Total (ft/s)	2.25	Avg. Vel. (ft/s)	1.19	3.43
1.24				
Max Chl Dpth (ft)	5.16	Hydr. Depth (ft)	1.75	4.37
1.86				
Conv. Total (cfs)	30627.9	Conv. (cfs)	2582.0	21763.2
6282.7				
Length Wtd. (ft)	45.38	Wetted Per. (ft)	37.76	44.23
83.11				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.10	0.25
0.11				
Alpha	1.73	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.13	1.37
0.26				
C & E Loss (ft)	0.03	Cum SA (acres)	0.12	0.41
0.21				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.17	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.89	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	87.37	215.82
199.11				
E.G. Slope (ft/ft)	0.000998	Area (sq ft)	87.37	215.82
199.11				
Q Total (cfs)	1249.00	Flow (cfs)	119.40	832.57
297.03				
Top Width (ft)	172.94	Top Width (ft)	42.94	44.00
86.00				
Vel Total (ft/s)	2.49	Avg. Vel. (ft/s)	1.37	3.86
1.49				
Max Chl Dpth (ft)	5.69	Hydr. Depth (ft)	2.03	4.90
2.32				
Conv. Total (cfs)	39545.1	Conv. (cfs)	3780.3	26360.4
9404.5				
Length Wtd. (ft)	44.55	Wetted Per. (ft)	43.11	44.23
86.14				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.13	0.30
0.14				
Alpha	1.72	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.21	1.60
0.42				
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	0.41
0.30				

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

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	852.48				
Vel Head (ft)	0.18	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.29	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	105.36	233.45	234.04
E.G. Slope (ft/ft)	0.001034	Area (sq ft)	105.36	233.45	234.04
Q Total (cfs)	1512.00	Flow (cfs)	156.80	966.17	389.03
Top Width (ft)	179.05	Top Width (ft)	46.80	44.00	88.25
Vel Total (ft/s)	2.64	Avg. Vel. (ft/s)	1.49	4.14	1.66
Max Chl Dpth (ft)	6.09	Hydr. Depth (ft)	2.25	5.31	2.65
Conv. Total (cfs)	47022.4	Conv. (cfs)	4876.2	30047.5	12098.7
Length Wtd. (ft)	43.98	Wetted Per. (ft)	46.99	44.23	88.42
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.14	0.34	0.17
Alpha	1.71	Stream Power (lb/ft s)	245.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.28	1.73	0.52
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.41	0.31

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	852.89				
Vel Head (ft)	0.20	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.68	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	124.37	250.64	268.93
E.G. Slope (ft/ft)	0.001069	Area (sq ft)	124.37	250.64	268.93
Q Total (cfs)	1796.00	Flow (cfs)	199.73	1105.81	490.46
Top Width (ft)	184.94	Top Width (ft)	50.51	44.00	90.44
Vel Total (ft/s)	2.79	Avg. Vel. (ft/s)	1.61	4.41	1.82

Max Chl Dpth (ft)	6.48	Hydr. Depth (ft)	2.46	5.70
2.97				
Conv. Total (cfs)	54934.7	Conv. (cfs)	6109.1	33823.6
15001.9				
Length Wtd. (ft)	43.49	Wetted Per. (ft)	50.73	44.23
90.64				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.16	0.38
0.20				
Alpha	1.69	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.34	1.86
0.60				
C & E Loss (ft)	0.06	Cum SA (acres)	0.21	0.41
0.32				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 700

INPUT
Description: X-700
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853	15	857	20	857	33	850	35	849
39	847	53	846	66	846	72	850	85	850
110	850	160	852	183	856	195	860		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	72	95	67	8	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
W.S. Elev (ft)	849.62	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)		107.47
E.G. Slope (ft/ft)	0.002214	Area (sq ft)		107.47
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	37.67	Top Width (ft)		37.67
Vel Total (ft/s)	3.90	Avg. Vel. (ft/s)		3.90

Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		2.85
Conv. Total (cfs)	8904.0	Conv. (cfs)		8904.0
Length Wtd. (ft)	66.98	Wetted Per. (ft)		39.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)		0.38
Alpha	1.00	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.00	0.71
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.33
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.43	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.97	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.87	159.76
48.51				
E.G. Slope (ft/ft)	0.002679	Area (sq ft)	0.87	159.76
48.51				
Q Total (cfs)	928.00	Flow (cfs)	0.69	869.86
57.45				
Top Width (ft)	103.00	Top Width (ft)	1.80	39.00
62.21				
Vel Total (ft/s)	4.44	Avg. Vel. (ft/s)	0.79	5.44
1.18				
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)	0.48	4.10
0.78				
Conv. Total (cfs)	17930.9	Conv. (cfs)	13.3	16807.5
1110.1				
Length Wtd. (ft)	61.94	Wetted Per. (ft)	2.04	40.95
62.22				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.07	0.65
0.13				
Alpha	1.42	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.06	1.18
0.23				
C & E Loss (ft)	0.01	Cum SA (acres)	0.08	0.36
0.18				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.59	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.35	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.70	174.76

74.29				
E.G. Slope (ft/ft)	0.003342	Area (sq ft)	1.70	174.76
74.29				
Q Total (cfs)	1249.00	Flow (cfs)	1.88	1128.48
118.65				
Top Width (ft)	113.34	Top Width (ft)	2.51	39.00
71.82				
Vel Total (ft/s)	4.98	Avg. Vel. (ft/s)	1.11	6.46
1.60				
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	0.68	4.48
1.03				
Conv. Total (cfs)	21604.5	Conv. (cfs)	32.5	19519.7
2052.3				
Length Wtd. (ft)	58.29	Wetted Per. (ft)	2.85	40.95
71.85				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.89
0.22				
Alpha	1.53	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.12	1.38
0.38				
C & E Loss (ft)	0.01	Cum SA (acres)	0.12	0.37
0.27				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.69	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.66	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	2.54	186.56
97.16				
E.G. Slope (ft/ft)	0.003710	Area (sq ft)	2.54	186.56
97.16				
Q Total (cfs)	1512.00	Flow (cfs)	3.39	1325.71
182.90				
Top Width (ft)	121.46	Top Width (ft)	3.07	39.00
79.39				
Vel Total (ft/s)	5.28	Avg. Vel. (ft/s)	1.33	7.11
1.88				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)	0.83	4.78
1.22				
Conv. Total (cfs)	24823.8	Conv. (cfs)	55.7	21765.3
3002.8				
Length Wtd. (ft)	55.90	Wetted Per. (ft)	3.49	40.95
79.42				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.17	1.06
0.28				
Alpha	1.60	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.16	1.50
0.46				
C & E Loss (ft)	0.04	Cum SA (acres)	0.14	0.37
0.28				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.80	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.95	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	3.53	198.08
121.70				
E.G. Slope (ft/ft)	0.004040	Area (sq ft)	3.53	198.08
121.70				
Q Total (cfs)	1796.00	Flow (cfs)	5.48	1528.73
261.79				
Top Width (ft)	129.39	Top Width (ft)	3.62	39.00
86.77				
Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)	1.55	7.72
2.15				
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)	0.98	5.08
1.40				
Conv. Total (cfs)	28255.6	Conv. (cfs)	86.3	24050.8
4118.6				
Length Wtd. (ft)	53.85	Wetted Per. (ft)	4.11	40.95
86.81				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.22	1.22
0.35				
Alpha	1.67	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.21	1.61
0.53				
C & E Loss (ft)	0.07	Cum SA (acres)	0.16	0.37
0.29				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 600

INPUT
Description: X-600
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	859	16	857	36	856	45	852	54	846
64	845	74	847	81	849	92	850	144	850
190	850	210	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	45	.035	81	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
45	81	63	43	1	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.		0.035
0.055				

W.S. Elev (ft)	849.32	Reach Len. (ft)	63.00	43.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)		88.96	0.57
E.G. Slope (ft/ft)	0.003345	Area (sq ft)		88.96	0.57
Q Total (cfs)	419.00	Flow (cfs)		418.74	0.26
Top Width (ft)	35.52	Top Width (ft)		31.98	3.54
Vel Total (ft/s)	4.68	Avg. Vel. (ft/s)		4.71	0.46
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.78	0.16
Conv. Total (cfs)	7244.9	Conv. (cfs)		7240.4	4.5
Length Wtd. (ft)	43.02	Wetted Per. (ft)		33.52	3.55
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.55	0.03
Alpha	1.01	Stream Power (lb/ft s)	210.00	0.00	0.00
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.00	0.56	0.11
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.28	0.07

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.66	Reach Len. (ft)	63.00	43.00	1.00
Crit W.S. (ft)	849.57	Flow Area (sq ft)		133.18	78.03
E.G. Slope (ft/ft)	0.003720	Area (sq ft)		133.18	78.03
Q Total (cfs)	928.00	Flow (cfs)		825.93	102.07
Top Width (ft)	144.10	Top Width (ft)		33.99	110.10
Vel Total (ft/s)	4.39	Avg. Vel. (ft/s)		6.20	1.31
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		3.92	0.71
Conv. Total (cfs)	15214.2	Conv. (cfs)		13540.9	1673.4
Length Wtd. (ft)	39.78	Wetted Per. (ft)		35.93	110.33
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.86	0.16
Alpha	1.78	Stream Power (lb/ft s)	210.00	0.00	0.00
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.06	0.95	0.22
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.31	0.17

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.73	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.17	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		150.69
134.34				
E.G. Slope (ft/ft)	0.003722	Area (sq ft)		150.69
134.34				
Q Total (cfs)	1249.00	Flow (cfs)		998.02
250.98				
Top Width (ft)	145.71	Top Width (ft)		34.76
110.95				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)		6.62
1.87				
Max Chl Dpth (ft)	6.17	Hydr. Depth (ft)		4.34
1.21				
Conv. Total (cfs)	20473.7	Conv. (cfs)		16359.6
4114.1				
Length Wtd. (ft)	35.98	Wetted Per. (ft)		36.85
111.32				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.95
0.28				
Alpha	1.86	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.12	1.13
0.36				
C & E Loss (ft)	0.02	Cum SA (acres)	0.12	0.31
0.25				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.54	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		163.62
175.42				
E.G. Slope (ft/ft)	0.003677	Area (sq ft)		163.62
175.42				
Q Total (cfs)	1512.00	Flow (cfs)		1124.50
387.50				
Top Width (ft)	146.88	Top Width (ft)		35.31
111.57				
Vel Total (ft/s)	4.46	Avg. Vel. (ft/s)		6.87
2.21				
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)		4.63
1.57				
Conv. Total (cfs)	24933.3	Conv. (cfs)		18543.4
6390.0				
Length Wtd. (ft)	33.79	Wetted Per. (ft)		37.52
112.04				

Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.00
0.36				
Alpha	1.83	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.16	1.23
0.43				
C & E Loss (ft)	0.03	Cum SA (acres)	0.14	0.31
0.26				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.90	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		176.31
215.32				
E.G. Slope (ft/ft)	0.003652	Area (sq ft)		176.31
215.32				
Q Total (cfs)	1796.00	Flow (cfs)		1254.85
541.15				
Top Width (ft)	148.01	Top Width (ft)		35.85
112.16				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)		7.12
2.51				
Max Chl Dpth (ft)	6.90	Hydr. Depth (ft)		4.92
1.92				
Conv. Total (cfs)	29720.1	Conv. (cfs)		20765.2
8954.9				
Length Wtd. (ft)	32.05	Wetted Per. (ft)		38.16
112.73				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.05
0.44				
Alpha	1.77	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.21	1.32
0.50				
C & E Loss (ft)	0.03	Cum SA (acres)	0.15	0.31
0.27				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 500

INPUT
Description: X-500
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	856	50	850	70	848.5	80	846.77	95	845.64
100	846.5	106	849.5	163	850	185	850.45	215	850
223	852	240	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.055	70	.035	106	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	106	85	68	5	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.47	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	849.01	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.74	76.84
E.G. Slope (ft/ft)	0.005935	Area (sq ft)	1.74	76.84
Q Total (cfs)	419.00	Flow (cfs)	1.45	417.55
Top Width (ft)	41.83	Top Width (ft)	6.81	35.02
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	0.84	5.43
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	0.26	2.19
Conv. Total (cfs)	5438.9	Conv. (cfs)	18.8	5420.0
Length Wtd. (ft)	68.03	Wetted Per. (ft)	6.82	35.88
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.09	0.79
Alpha	1.03	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.00	0.48
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.24
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	849.78	Flow Area (sq ft)	25.79	129.85
56.40				
E.G. Slope (ft/ft)	0.004133	Area (sq ft)	25.79	129.85
56.40				
Q Total (cfs)	928.00	Flow (cfs)	46.78	818.85
62.37				
Top Width (ft)	171.04	Top Width (ft)	24.08	36.00
110.96				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)	1.81	6.31
1.11				
Max Chl Dpth (ft)	4.85	Hydr. Depth (ft)	1.07	3.61
0.51				
Conv. Total (cfs)	14435.8	Conv. (cfs)	727.8	12737.8

970.2				
Length Wtd. (ft)	64.91	Wetted Per. (ft)	24.17	36.97
111.03				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.28	0.91
0.13				
Alpha	1.85	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.04	0.82
0.22				
C & E Loss (ft)	0.05	Cum SA (acres)	0.06	0.27
0.16				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.09	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.64	Flow Area (sq ft)	41.74	151.45
123.68				
E.G. Slope (ft/ft)	0.003397	Area (sq ft)	41.74	151.45
123.68				
Q Total (cfs)	1249.00	Flow (cfs)	83.39	959.38
206.23				
Top Width (ft)	178.44	Top Width (ft)	29.08	36.00
113.36				
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)	2.00	6.33
1.67				
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)	1.44	4.21
1.09				
Conv. Total (cfs)	21429.9	Conv. (cfs)	1430.8	16460.6
3538.5				
Length Wtd. (ft)	59.76	Wetted Per. (ft)	29.20	36.97
113.50				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.30	0.87
0.23				
Alpha	2.03	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	0.09	0.98
0.35				
C & E Loss (ft)	0.06	Cum SA (acres)	0.09	0.27
0.25				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.49	Reach Len. (ft)	85.00	68.00	5.00
Crit W.S. (ft)	850.91	Flow Area (sq ft)	54.09	165.90	169.53
E.G. Slope (ft/ft)	0.003104	Area (sq ft)	54.09	165.90	169.53
Q Total (cfs)	1512.00	Flow (cfs)	114.16	1067.61	330.22
Top Width (ft)	183.39	Top Width (ft)	32.43	36.00	114.96
Vel Total (ft/s)	3.88	Avg. Vel. (ft/s)	2.11	6.44	1.95
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	1.67	4.61	1.47
Conv. Total (cfs)	27137.6	Conv. (cfs)	2049.0	19161.7	5926.9
Length Wtd. (ft)	56.72	Wetted Per. (ft)	32.57	36.97	115.16
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.32	0.87	0.29
Alpha	2.02	Stream Power (lb/ft s)	240.00	0.00	0.00
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.12	1.07	0.43
C & E Loss (ft)	0.06	Cum SA (acres)	0.11	0.28	0.26

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.87	Reach Len. (ft)	85.00	68.00	5.00
Crit W.S. (ft)		Flow Area (sq ft)	66.98	179.55	213.39
E.G. Slope (ft/ft)	0.002921	Area (sq ft)	66.98	179.55	213.39
Q Total (cfs)	1796.00	Flow (cfs)	148.62	1181.49	465.89
Top Width (ft)	188.07	Top Width (ft)	35.58	36.00	116.48
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.22	6.58	2.18
Max Chl Dpth (ft)	6.23	Hydr. Depth (ft)	1.88	4.99	1.83
Conv. Total (cfs)	33229.9	Conv. (cfs)	2749.8	21860.2	8619.9
Length Wtd. (ft)	54.36	Wetted Per. (ft)	35.75	36.97	

116.72				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.34	0.89
0.33				
Alpha	1.98	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.16	1.15
0.50				
C & E Loss (ft)	0.07	Cum SA (acres)	0.13	0.28
0.27				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 400

INPUT
Description: X-400
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	875	7	859	22	851	36	851	42	847
48	846	55	845.52	67	846	72	849	83	849
108	849	141	851	168	849	170	850	175	852
190	860								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	36	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36	72	125	105	45	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	848.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.		0.035
W.S. Elev (ft)	848.39	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)		Flow Area (sq ft)		67.38
E.G. Slope (ft/ft)	0.008031	Area (sq ft)		67.38
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	31.05	Top Width (ft)		31.05
Vel Total (ft/s)	6.22	Avg. Vel. (ft/s)		6.22
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		2.17
Conv. Total (cfs)	4675.5	Conv. (cfs)		4675.5

Length Wtd. (ft)	105.00	Wetted Per. (ft)		32.24
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.05
Alpha	1.00	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)		0.36
0.11				
C & E Loss (ft)	0.04	Cum SA (acres)		0.19
0.07				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	850.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.03	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.58	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	849.58	Flow Area (sq ft)		106.31
26.03				
E.G. Slope (ft/ft)	0.008968	Area (sq ft)		106.31
26.03				
Q Total (cfs)	928.00	Flow (cfs)		886.58
41.42				
Top Width (ft)	88.29	Top Width (ft)		33.86
54.42				
Vel Total (ft/s)	7.01	Avg. Vel. (ft/s)		8.34
1.59				
Max Chl Dpth (ft)	4.06	Hydr. Depth (ft)		3.14
0.48				
Conv. Total (cfs)	9799.5	Conv. (cfs)		9362.1
437.4				
Length Wtd. (ft)	102.85	Wetted Per. (ft)		35.58
54.60				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.67
0.27				
Alpha	1.35	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	0.02	0.64
0.21				
C & E Loss (ft)	0.01	Cum SA (acres)	0.04	0.22
0.15				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.06	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.16	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.16	Flow Area (sq ft)		126.41	63.43
E.G. Slope (ft/ft)	0.008144	Area (sq ft)		126.41	63.43
Q Total (cfs)	1249.00	Flow (cfs)		1105.86	143.14
Top Width (ft)	108.00	Top Width (ft)		34.74	73.26
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)		8.75	2.26
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		3.64	0.87
Conv. Total (cfs)	13840.2	Conv. (cfs)		12254.1	1586.1
Length Wtd. (ft)	98.42	Wetted Per. (ft)		36.64	73.61
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.75	0.44
Alpha	1.58	Stream Power (lb/ft s)	190.00	0.00	0.00
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.05	0.76	0.34
C & E Loss (ft)	0.03	Cum SA (acres)	0.07	0.22	0.24

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.54	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.54	Flow Area (sq ft)		139.58	93.27
E.G. Slope (ft/ft)	0.007912	Area (sq ft)		139.58	93.27
Q Total (cfs)	1512.00	Flow (cfs)		1270.14	241.86
Top Width (ft)	120.79	Top Width (ft)		35.31	85.48

Vel Total (ft/s)	6.49	Avg. Vel. (ft/s)		9.10
2.59				
Max Chl Dpth (ft)	5.02	Hydr. Depth (ft)		3.95
1.09				
Conv. Total (cfs)	16998.2	Conv. (cfs)		14279.1
2719.1				
Length Wtd. (ft)	95.71	Wetted Per. (ft)		37.32
85.92				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.85
0.54				
Alpha	1.68	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	0.07	0.83
0.41				
C & E Loss (ft)	0.03	Cum SA (acres)	0.08	0.22
0.25				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.02	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.17	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.85	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	850.85	Flow Area (sq ft)		150.61
121.36				
E.G. Slope (ft/ft)	0.008098	Area (sq ft)		150.61
121.36				
Q Total (cfs)	1796.00	Flow (cfs)		1444.17
351.83				
Top Width (ft)	131.34	Top Width (ft)		35.77
95.56				
Vel Total (ft/s)	6.60	Avg. Vel. (ft/s)		9.59
2.90				
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)		4.21
1.27				
Conv. Total (cfs)	19958.3	Conv. (cfs)		16048.5
3909.8				
Length Wtd. (ft)	93.76	Wetted Per. (ft)		37.88
96.09				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		2.01
0.64				
Alpha	1.73	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.09	0.89
0.48				
C & E Loss (ft)	0.02	Cum SA (acres)	0.09	0.22
0.26				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 300

INPUT
Description: X-300
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	885	7	878	9	849	21	850	26	848
33	848	37	845	49	844	57	845	64	848
84	848	88	849	112	848	126	849	152	849
162	853	180	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	64	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	64	125	98	20	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	847.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.		0.035
W.S. Elev (ft)	846.81	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	846.81	Flow Area (sq ft)		52.28
E.G. Slope (ft/ft)	0.015301	Area (sq ft)		52.28
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	26.65	Top Width (ft)		26.65
Vel Total (ft/s)	8.01	Avg. Vel. (ft/s)		8.01
Max Chl Dpth (ft)	2.81	Hydr. Depth (ft)		1.96
Conv. Total (cfs)	3387.3	Conv. (cfs)		3387.3
Length Wtd. (ft)	81.71	Wetted Per. (ft)		27.73
Min Ch El (ft)	844.00	Shear (lb/sq ft)		1.80
Alpha	1.00	Stream Power (lb/ft s)	180.00	0.00
0.00				

Frctn Loss (ft)	0.66	Cum Volume (acre-ft)	0.22
0.11			
C & E Loss (ft)	0.23	Cum SA (acres)	0.12
0.07			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	848.58	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	848.58	Flow Area (sq ft)	4.46	104.41
18.57				
E.G. Slope (ft/ft)	0.008644	Area (sq ft)	4.46	104.41
18.57				
Q Total (cfs)	928.00	Flow (cfs)	7.26	893.27
27.47				
Top Width (ft)	83.71	Top Width (ft)	8.44	31.00
44.27				
Vel Total (ft/s)	7.28	Avg. Vel. (ft/s)	1.63	8.56
1.48				
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	0.53	3.37
0.42				
Conv. Total (cfs)	9981.4	Conv. (cfs)	78.1	9607.9
295.4				
Length Wtd. (ft)	81.24	Wetted Per. (ft)	8.56	32.72
44.37				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.28	1.72
0.23				
Alpha	1.33	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.01	0.38
0.19				
C & E Loss (ft)	0.20	Cum SA (acres)	0.03	0.14
0.10				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	850.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.38	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	849.38	Flow Area (sq ft)	12.85	129.15	74.25
E.G. Slope (ft/ft)	0.006228	Area (sq ft)	12.85	129.15	74.25
Q Total (cfs)	1249.00	Flow (cfs)	28.16	1080.74	140.10
Top Width (ft)	134.92	Top Width (ft)	14.98	31.00	88.94
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	2.19	8.37	1.89
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)	0.86	4.17	0.83
Conv. Total (cfs)	15826.9	Conv. (cfs)	356.9	13694.8	1775.3
Length Wtd. (ft)	78.24	Wetted Per. (ft)	15.61	32.72	89.19
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.32	1.53	0.32
Alpha	1.83	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.03	0.46	0.27
C & E Loss (ft)	0.10	Cum SA (acres)	0.04	0.14	0.15

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	850.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.70	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	849.70	Flow Area (sq ft)	18.40	139.09	102.88
E.G. Slope (ft/ft)	0.006282	Area (sq ft)	18.40	139.09	102.88
Q Total (cfs)	1512.00	Flow (cfs)	43.16	1228.10	240.74
Top Width (ft)	140.38	Top Width (ft)	19.64	31.00	89.74
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)	2.35	8.83	2.34
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)	0.94	4.49	1.15
Conv. Total (cfs)	19076.9	Conv. (cfs)	544.5	15494.9	3037.5
Length Wtd. (ft)	76.59	Wetted Per. (ft)	20.65	32.72	90.05
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.35	1.67	0.45
Alpha	1.91	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.04	0.49	0.31
C & E Loss (ft)	0.07	Cum SA (acres)	0.05	0.14	0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	851.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.12	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.93	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	849.93	Flow Area (sq ft)	23.39	146.34	123.95
E.G. Slope (ft/ft)	0.006844	Area (sq ft)	23.39	146.34	123.95
Q Total (cfs)	1796.00	Flow (cfs)	59.62	1395.20	341.18
Top Width (ft)	144.38	Top Width (ft)	23.05	31.00	

90.33					
Vel Total (ft/s)	6.12	Avg. Vel. (ft/s)	2.55	9.53	2.75
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	1.01	4.72	1.37
Conv. Total (cfs)	21710.1	Conv. (cfs)	720.7	16865.1	4124.2
Length Wtd. (ft)	75.20	Wetted Per. (ft)	24.33	32.72	90.68
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.41	1.91	0.58
Alpha	1.93	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.06	0.53	0.35
C & E Loss (ft)	0.07	Cum SA (acres)	0.06	0.14	0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 200

INPUT
Description: X-200
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	873	8	857	23	848	31	847	35	844
44	843	50	845	62	847	68	848	81	847
84	847	93	845	109	844	117	844	123	848
141	850	156	852	172	860				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	31	.035	62	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
31	62	115	105	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	846.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	846.53	Reach Len. (ft)	115.00	105.00	

75.00				
Crit W.S. (ft)	845.76	Flow Area (sq ft)		53.69
62.72				
E.G. Slope (ft/ft)	0.005017	Area (sq ft)		53.69
62.72				
Q Total (cfs)	419.00	Flow (cfs)		244.03
174.97				
Top Width (ft)	62.21	Top Width (ft)		27.54
34.67				
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)		4.55
2.79				
Max Chl Dpth (ft)	3.53	Hydr. Depth (ft)		1.95
1.81				
Conv. Total (cfs)	5915.6	Conv. (cfs)		3445.3
2470.3				
Length Wtd. (ft)	91.70	Wetted Per. (ft)		28.89
35.63				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		0.58
0.55				
Alpha	1.18	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		0.10
0.09				
C & E Loss (ft)	0.04	Cum SA (acres)		0.06
0.06				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	848.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	847.72	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	846.73	Flow Area (sq ft)	2.08	89.86
114.30				
E.G. Slope (ft/ft)	0.005393	Area (sq ft)	2.08	89.86
114.30				
Q Total (cfs)	928.00	Flow (cfs)	2.08	551.42
374.50				
Top Width (ft)	92.06	Top Width (ft)	5.77	31.00
55.29				
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	1.00	6.14
3.28				
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)	0.36	2.90
2.07				
Conv. Total (cfs)	12637.1	Conv. (cfs)	28.4	7509.0
5099.7				
Length Wtd. (ft)	91.64	Wetted Per. (ft)	5.82	32.55
56.75				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.12	0.93
0.68				
Alpha	1.32	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	0.00	0.16

0.16					
C & E Loss (ft)	0.07	Cum SA (acres)	0.01	0.07	
0.08					

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	848.59	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.63	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	847.96	Reach Len. (ft)	115.00	105.00	
75.00					
Crit W.S. (ft)	847.10	Flow Area (sq ft)	3.72	97.38	
128.31					
E.G. Slope (ft/ft)	0.007417	Area (sq ft)	3.72	97.38	
128.31					
Q Total (cfs)	1249.00	Flow (cfs)	5.29	739.33	
504.39					
Top Width (ft)	98.97	Top Width (ft)	7.71	31.00	
60.26					
Vel Total (ft/s)	5.44	Avg. Vel. (ft/s)	1.42	7.59	
3.93					
Max Chl Dpth (ft)	4.96	Hydr. Depth (ft)	0.48	3.14	
2.13					
Conv. Total (cfs)	14502.5	Conv. (cfs)	61.4	8584.5	
5856.5					
Length Wtd. (ft)	91.76	Wetted Per. (ft)	7.77	32.55	
61.83					
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.22	1.39	
0.96					
Alpha	1.36	Stream Power (lb/ft s)	172.00	0.00	
0.00					
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	0.01	0.20	
0.22					
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07	
0.12					

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	849.00	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.76	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	848.24	Reach Len. (ft)	115.00	105.00	
75.00					

Crit W.S. (ft)	847.51	Flow Area (sq ft)	5.93	105.79 145.10
E.G. Slope (ft/ft)	0.008200	Area (sq ft)	5.93	105.79 145.10
Q Total (cfs)	1512.00	Flow (cfs)	11.39	892.49 608.12
Top Width (ft)	102.51	Top Width (ft)	8.39	31.00 63.12
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)	1.92	8.44 4.19
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	0.71	3.41 2.30
Conv. Total (cfs)	16697.5	Conv. (cfs)	125.8	9856.0 6715.7
Length Wtd. (ft)	91.54	Wetted Per. (ft)	8.52	32.55 64.71
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.36	1.66 1.15
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	0.01	0.22 0.26
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07 0.12

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	849.39	Element	Left OB	Channel Right OB
Vel Head (ft)	0.87	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	848.51	Reach Len. (ft)	115.00	105.00 75.00
Crit W.S. (ft)	847.83	Flow Area (sq ft)	8.32	114.38 162.93
E.G. Slope (ft/ft)	0.008588	Area (sq ft)	8.32	114.38 162.93
Q Total (cfs)	1796.00	Flow (cfs)	19.67	1040.27 736.06
Top Width (ft)	105.46	Top Width (ft)	8.85	31.00 65.61
Vel Total (ft/s)	6.29	Avg. Vel. (ft/s)	2.37	9.09 4.52
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	0.94	3.69 2.48
Conv. Total (cfs)	19379.8	Conv. (cfs)	212.3	11225.0 7942.5
Length Wtd. (ft)	91.24	Wetted Per. (ft)	9.06	32.55 67.22
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.49	1.88 1.30
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)	0.01	0.24 0.29
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07

0.13

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 100

INPUT
Description: X-100
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	861	23	846	26	845	38	843	45	844
50	846	72	846	90	846	94	844	116	844
126	844	136	851	141	852	160	856	172	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	23	.035	50	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23	50	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	845.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.28	Reach Len. (ft)		
Crit W.S. (ft)	845.28	Flow Area (sq ft)		29.91
43.65				
E.G. Slope (ft/ft)	0.022329	Area (sq ft)		29.91
43.65				
Q Total (cfs)	419.00	Flow (cfs)		222.54
196.46				
Top Width (ft)	59.40	Top Width (ft)		23.02
36.38				
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		7.44
4.50				
Max Chl Dpth (ft)	2.28	Hydr. Depth (ft)		1.30
1.20				
Conv. Total (cfs)	2804.0	Conv. (cfs)		1489.3
1314.7				
Length Wtd. (ft)		Wetted Per. (ft)		23.55
37.08				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		1.77
1.64				
Alpha	1.20	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	847.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.15	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.95	Reach Len. (ft)		
Crit W.S. (ft)	845.95	Flow Area (sq ft)		46.72
69.01				
E.G. Slope (ft/ft)	0.028303	Area (sq ft)		46.72
69.01				
Q Total (cfs)	928.00	Flow (cfs)		475.06
452.94				
Top Width (ft)	65.43	Top Width (ft)		26.74
38.69				
Vel Total (ft/s)	8.02	Avg. Vel. (ft/s)		10.17
6.56				
Max Chl Dpth (ft)	2.95	Hydr. Depth (ft)		1.75
1.78				
Conv. Total (cfs)	5516.1	Conv. (cfs)		2823.8
2692.3				
Length Wtd. (ft)		Wetted Per. (ft)		27.51
39.77				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		3.00
3.07				
Alpha	1.15	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	847.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.86	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	846.78	Reach Len. (ft)		
Crit W.S. (ft)	846.78	Flow Area (sq ft)	0.47	69.14
133.03				
E.G. Slope (ft/ft)	0.014462	Area (sq ft)	0.47	69.14
133.03				
Q Total (cfs)	1249.00	Flow (cfs)	0.73	648.21
600.06				
Top Width (ft)	108.18	Top Width (ft)	1.20	27.00
79.98				
Vel Total (ft/s)	6.16	Avg. Vel. (ft/s)	1.54	9.38
4.51				
Max Chl Dpth (ft)	3.78	Hydr. Depth (ft)	0.39	2.56
1.66				

Conv. Total (cfs)	10385.8	Conv. (cfs)	6.0	5390.1 4989.7
Length Wtd. (ft)		Wetted Per. (ft)	1.43	27.78 81.32
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.30	2.25 1.48
Alpha	1.46	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	847.99	Element	Left OB	Channel Right OB
Vel Head (ft)	0.97	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	847.02	Reach Len. (ft)		
Crit W.S. (ft)	847.02	Flow Area (sq ft)	0.79	75.49 151.90
E.G. Slope (ft/ft)	0.014734	Area (sq ft)	0.79	75.49 151.90
Q Total (cfs)	1512.00	Flow (cfs)	1.48	757.56 752.97
Top Width (ft)	108.87	Top Width (ft)	1.56	27.00 80.31
Vel Total (ft/s)	6.63	Avg. Vel. (ft/s)	1.86	10.03 4.96
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)	0.51	2.80 1.89
Conv. Total (cfs)	12456.4	Conv. (cfs)	12.2	6241.0 6203.2
Length Wtd. (ft)		Wetted Per. (ft)	1.86	27.78 81.74
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.39	2.50 1.71
Alpha	1.43	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	848.34	Element	Left OB	Channel Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	847.25	Reach Len. (ft)		
Crit W.S. (ft)	847.25	Flow Area (sq ft)	1.19	81.62 170.16
E.G. Slope (ft/ft)	0.015134	Area (sq ft)	1.19	81.62

170.16				
Q Total (cfs)	1796.00	Flow (cfs)	2.56	874.37
919.07				
Top Width (ft)	109.55	Top Width (ft)	1.91	27.00
80.64				
Vel Total (ft/s)	7.10	Avg. Vel. (ft/s)	2.15	10.71
5.40				
Max Chl Dpth (ft)	4.25	Hydr. Depth (ft)	0.62	3.02
2.11				
Conv. Total (cfs)	14599.3	Conv. (cfs)	20.8	7107.6
7470.9				
Length Wtd. (ft)		Wetted Per. (ft)	2.28	27.78
82.13				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.49	2.78
1.96				
Alpha	1.40	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

SUMMARY OF MANNING'S N VALUES

River:Bluestone Creek

Reach	River Sta.	n1	n2	n3
1	1500	.055	.035	.055
1	1400	.055	.035	.055
1	1300	.055	.035	.055
1	1200	.055	.035	.055
1	1100	.055	.035	.055
1	1000	.055	.035	.055
1	900	.055	.035	.055
1	800	.055	.035	.055
1	700	.055	.035	.055
1	600	.055	.035	.055
1	500	.055	.035	.055
1	400	.055	.035	.055
1	300	.055	.035	.055
1	200	.055	.035	.055
1	100	.055	.035	.055

SUMMARY OF REACH LENGTHS

River: Bluestone Creek

Reach	River Sta.	Left	Channel	Right
1	1500	97	101	105
1	1400	120	109	100
1	1300	95	88	88
1	1200	35	44	47
1	1100	80	58	55
1	1000	25	69	95

1	900	20	34	75
1	800	90	48	15
1	700	95	67	8
1	600	63	43	1
1	500	85	68	5
1	400	125	105	45
1	300	125	98	20
1	200	115	105	75
1	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Bluestone Creek

Reach	River Sta.	Contr.	Expan.
1	1500	.1	.3
1	1400	.1	.3
1	1300	.1	.3
1	1200	.1	.3
1	1100	.1	.3
1	1000	.1	.3
1	900	.1	.3
1	800	.1	.3
1	700	.1	.3
1	600	.1	.3
1	500	.1	.3
1	400	.1	.3
1	300	.1	.3
1	200	.1	.3
1	100	.1	.3

HEC-RAS Plan: 19 River: Bluestone Creek Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	1500	2 Year	378.00	849.00	852.18		852.39	0.002277	3.72	101.78	42.40	0.41
1	1500	10 Year	847.00	849.00	853.41		853.86	0.003137	5.46	167.47	62.47	0.51
1	1500	25 Year	1143.00	849.00	853.99		854.56	0.003451	6.21	205.47	68.83	0.54
1	1500	50 Year	1387.00	849.00	854.42		855.08	0.003550	6.73	246.66	102.12	0.56
1	1500	100 Year	1651.00	849.00	854.88		855.58	0.003406	7.03	296.82	115.49	0.56
1	1400	2 Year	378.00	848.00	851.76		852.10	0.003599	4.73	87.62	54.00	0.51
1	1400	10 Year	847.00	848.00	853.01		853.50	0.003983	6.09	184.33	85.29	0.56
1	1400	25 Year	1143.00	848.00	853.65		854.18	0.003836	6.51	242.61	96.39	0.56
1	1400	50 Year	1387.00	848.00	854.14		854.69	0.003615	6.72	292.19	105.62	0.56
1	1400	100 Year	1651.00	848.00	854.64		855.20	0.003317	6.91	348.19	116.94	0.54
1	1300	2 Year	419.00	848.00	850.78	850.53	851.46	0.009134	6.65	67.85	44.21	0.80
1	1300	10 Year	928.00	848.00	852.45		853.03	0.004402	6.72	196.59	95.28	0.61
1	1300	25 Year	1249.00	848.00	853.24		853.78	0.003468	6.76	274.86	104.40	0.56
1	1300	50 Year	1512.00	848.00	853.77		854.31	0.003128	6.91	332.32	110.61	0.54
1	1300	100 Year	1796.00	848.00	854.32		854.86	0.002826	7.03	394.18	115.56	0.52
1	1200	2 Year	419.00	847.00	850.79		850.99	0.001926	3.59	117.40	44.35	0.38
1	1200	10 Year	928.00	847.00	852.34		852.71	0.002053	4.96	202.64	67.14	0.42
1	1200	25 Year	1249.00	847.00	853.05		853.51	0.002116	5.58	253.98	76.37	0.44
1	1200	50 Year	1512.00	847.00	853.55		854.08	0.002180	6.03	293.32	82.75	0.45
1	1200	100 Year	1796.00	847.00	854.02		854.62	0.002246	6.47	334.05	88.97	0.47
1	1100	2 Year	419.00	847.00	850.29		850.81	0.007496	5.81	72.52	38.48	0.71
1	1100	10 Year	928.00	847.00	851.72		852.52	0.005904	7.33	139.94	55.87	0.69
1	1100	25 Year	1249.00	847.00	852.35		853.32	0.005832	8.14	177.79	64.25	0.71
1	1100	50 Year	1512.00	847.00	852.75	852.17	853.87	0.006038	8.82	204.81	69.96	0.73
1	1100	100 Year	1796.00	847.00	853.11	852.61	854.40	0.006351	9.52	231.23	75.12	0.76
1	1000	2 Year	419.00	847.00	850.25		850.51	0.002319	4.03	104.21	35.98	0.41
1	1000	10 Year	928.00	847.00	851.64		852.20	0.003190	6.01	162.38	51.83	0.51
1	1000	25 Year	1249.00	847.00	852.24		852.98	0.003649	7.00	196.52	62.48	0.55
1	1000	50 Year	1512.00	847.00	852.61		853.52	0.004099	7.78	220.80	69.07	0.59
1	1000	100 Year	1796.00	847.00	852.93		854.02	0.004634	8.60	243.89	74.79	0.64
1	900	2 Year	419.00	846.00	849.54	849.13	850.19	0.008345	6.50	66.68	38.23	0.76
1	900	10 Year	928.00	846.00	850.84	850.60	851.83	0.007815	8.32	133.58	64.53	0.79
1	900	25 Year	1249.00	846.00	851.23	851.23	852.56	0.009216	9.72	160.73	72.36	0.88
1	900	50 Year	1512.00	846.00	851.67	851.67	853.08	0.008785	10.19	193.88	80.90	0.87
1	900	100 Year	1796.00	846.00	852.08	852.08	853.57	0.008494	10.66	228.74	88.71	0.87
1	800	2 Year	419.00	846.20	849.83		849.94	0.001159	2.89	191.91	117.17	0.30
1	800	10 Year	928.00	846.20	851.36		851.50	0.000918	3.43	412.38	164.63	0.29
1	800	25 Year	1249.00	846.20	851.89		852.06	0.000998	3.86	502.30	172.94	0.31
1	800	50 Year	1512.00	846.20	852.29		852.48	0.001034	4.14	572.85	179.05	0.32
1	800	100 Year	1796.00	846.20	852.68		852.89	0.001069	4.41	643.93	184.94	0.33
1	700	2 Year	419.00	846.00	849.62		849.86	0.002214	3.90	107.47	37.67	0.41
1	700	10 Year	928.00	846.00	850.97		851.40	0.002679	5.44	209.14	103.00	0.47
1	700	25 Year	1249.00	846.00	851.35		851.94	0.003342	6.46	250.75	113.34	0.54
1	700	50 Year	1512.00	846.00	851.66		852.35	0.003710	7.11	286.27	121.46	0.57
1	700	100 Year	1796.00	846.00	851.95		852.75	0.004040	7.72	323.32	129.39	0.60
1	600	2 Year	419.00	845.00	849.32		849.67	0.003345	4.71	89.53	35.52	0.50
1	600	10 Year	928.00	845.00	850.66	849.57	851.20	0.003720	6.20	211.20	144.10	0.55
1	600	25 Year	1249.00	845.00	851.17		851.73	0.003722	6.62	285.04	145.71	0.56
1	600	50 Year	1512.00	845.00	851.54		852.11	0.003677	6.87	339.04	146.88	0.56
1	600	100 Year	1796.00	845.00	851.90		852.48	0.003652	7.12	391.63	148.01	0.57
1	500	2 Year	419.00	845.64	849.01		849.47	0.005935	5.43	78.57	41.83	0.65
1	500	10 Year	928.00	845.64	850.49	849.78	851.04	0.004133	6.31	212.05	171.04	0.59
1	500	25 Year	1249.00	845.64	851.09	850.64	851.58	0.003397	6.33	316.87	178.44	0.54
1	500	50 Year	1512.00	845.64	851.49	850.91	851.96	0.003104	6.44	389.51	183.39	0.53
1	500	100 Year	1796.00	845.64	851.87		852.34	0.002921	6.58	459.92	188.07	0.52
1	400	2 Year	419.00	845.52	848.39		848.99	0.008031	6.22	67.38	31.05	0.74
1	400	10 Year	928.00	845.52	849.58	849.58	850.61	0.008968	8.34	132.34	88.29	0.83
1	400	25 Year	1249.00	845.52	850.16	850.16	851.22	0.008144	8.75	189.85	108.00	0.81
1	400	50 Year	1512.00	845.52	850.54	850.54	851.63	0.007912	9.10	232.86	120.79	0.81
1	400	100 Year	1796.00	845.52	850.85	850.85	852.02	0.008098	9.59	271.97	131.34	0.82
1	300	2 Year	419.00	844.00	846.81	846.81	847.81	0.015301	8.01	52.28	26.65	1.01
1	300	10 Year	928.00	844.00	848.58	848.58	849.67	0.008544	8.56	127.44	83.71	0.82
1	300	25 Year	1249.00	844.00	849.38	849.38	850.32	0.006228	8.37	216.25	134.92	0.72
1	300	50 Year	1512.00	844.00	849.70	849.70	850.70	0.006282	8.83	260.36	140.38	0.73

HEC-RAS Plan: 19 River: Bluestone Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	300	100 Year	1796.00	844.00	849.93	849.93	851.05	0.006844	9.53	293.68	144.38	0.77
1	200	2 Year	419.00	843.00	846.53	845.76	846.77	0.005017	4.55	116.41	62.21	0.57
1	200	10 Year	928.00	843.00	847.72	846.73	848.14	0.005393	6.14	206.25	92.06	0.64
1	200	25 Year	1249.00	843.00	847.96	847.10	848.59	0.007417	7.59	229.41	98.97	0.75
1	200	50 Year	1512.00	843.00	848.24	847.51	849.00	0.008200	8.44	256.82	102.51	0.80
1	200	100 Year	1796.00	843.00	848.51	847.83	849.39	0.008588	9.09	285.63	105.46	0.83
1	100	2 Year	419.00	843.00	845.28	845.28	845.88	0.022329	7.44	73.56	59.40	1.15
1	100	10 Year	928.00	843.00	845.95	845.95	847.10	0.028303	10.17	115.73	65.43	1.36
1	100	25 Year	1249.00	843.00	846.78	846.78	847.64	0.014462	9.38	202.64	108.18	1.03
1	100	50 Year	1512.00	843.00	847.02	847.02	847.99	0.014734	10.03	228.19	108.87	1.06
1	100	100 Year	1796.00	843.00	847.25	847.25	848.34	0.015134	10.71	252.96	109.55	1.09

Appendix C

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: Bluestone Creek WEU 51
Project File : existing.prj
Run Date and Time: 9/13/2013 7:31:51 AM

Project in English units

PLAN DATA

Plan Title: Plan 21
Plan File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.p21

Geometry Title: Proposed Temporary Bridge Crossing
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g05

Flow Title : Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Plan Summary Information:

Number of:	Cross Sections	= 15	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 1	Lateral Structures	=	0

Computational Information

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

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

FLOW DATA

Flow Title: Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Flow Data (cfs)

River	Reach	RS	2 Year	10 Year	25 Year	50 Year	100 Year
Bluestone Creek	1	1500	378	847	1143	1387	1651
Bluestone Creek	1	1300	419	928	1249	1512	1796

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Bluestone Creek	1	2 Year		Critical
Bluestone Creek	1	10 Year		Critical
Bluestone Creek	1	25 Year		Critical
Bluestone Creek	1	50 Year		Critical
Bluestone Creek	1	100 Year		Critical

GEOMETRY DATA

Geometry Title: Proposed Temporary Bridge Crossing
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g05

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1500

INPUT
Description: X-1500
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	867	23	855	47	854	68	854	77	853
94	852	99	849	107	849	115	849	129	850
137	854	142	855	159	868				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	97	101	105	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.21	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	852.18	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.28	101.57
E.G. Slope (ft/ft)	0.002272	Area (sq ft)	0.28	101.57
Q Total (cfs)	378.00	Flow (cfs)	0.07	377.93
Top Width (ft)	42.43	Top Width (ft)	3.07	39.36
Vel Total (ft/s)	3.71	Avg. Vel. (ft/s)	0.26	3.72
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	0.09	2.58
Conv. Total (cfs)	7930.1	Conv. (cfs)	1.5	7928.6
Length Wtd. (ft)	100.96	Wetted Per. (ft)	3.07	40.74
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.01	0.35
Alpha	1.00	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.11	1.94
0.16				
C & E Loss (ft)	0.01	Cum SA (acres)	0.23	0.77
0.14				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.45	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.41	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	16.24	151.50
E.G. Slope (ft/ft)	0.003125	Area (sq ft)	16.24	151.50
Q Total (cfs)	847.00	Flow (cfs)	20.83	826.17
Top Width (ft)	62.52	Top Width (ft)	20.69	41.82
Vel Total (ft/s)	5.05	Avg. Vel. (ft/s)	1.28	5.45
Max Chl Dpth (ft)	4.41	Hydr. Depth (ft)	0.78	3.62
Conv. Total (cfs)	15152.4	Conv. (cfs)	372.6	14779.8
Length Wtd. (ft)	100.63	Wetted Per. (ft)	20.75	43.49
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.15	0.68

Alpha	1.14	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.63	2.95
0.43				
C & E Loss (ft)	0.00	Cum SA (acres)	0.52	0.81
0.33				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.98	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	29.43	175.55
E.G. Slope (ft/ft)	0.003471	Area (sq ft)	29.43	175.55
Q Total (cfs)	1143.00	Flow (cfs)	51.02	1091.98
Top Width (ft)	68.76	Top Width (ft)	25.80	42.96
Vel Total (ft/s)	5.58	Avg. Vel. (ft/s)	1.73	6.22
Max Chl Dpth (ft)	4.98	Hydr. Depth (ft)	1.14	4.09
Conv. Total (cfs)	19401.1	Conv. (cfs)	866.0	18535.1
Length Wtd. (ft)	100.49	Wetted Per. (ft)	25.88	44.76
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	0.85
Alpha	1.19	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.97	3.40
0.66				
C & E Loss (ft)	0.01	Cum SA (acres)	0.63	0.82
0.44				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	855.07	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.67	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.40	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	50.79	193.76
0.40				
E.G. Slope (ft/ft)	0.003602	Area (sq ft)	50.79	193.76
0.40				
Q Total (cfs)	1387.00	Flow (cfs)	76.51	1310.27
0.22				
Top Width (ft)	101.64	Top Width (ft)	56.63	43.00
2.01				

Vel Total (ft/s)	5.66	Avg. Vel. (ft/s)	1.51	6.76
0.55				
Max Chl Dpth (ft)	5.40	Hydr. Depth (ft)	0.90	4.51
0.20				
Conv. Total (cfs)	23110.8	Conv. (cfs)	1274.9	21832.2
3.7				
Length Wtd. (ft)	100.39	Wetted Per. (ft)	56.72	44.81
2.05				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.20	0.97
0.04				
Alpha	1.35	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	1.27	3.70
0.81				
C & E Loss (ft)	0.03	Cum SA (acres)	0.74	0.82
0.48				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.71	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.86	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	79.58	213.66
1.87				
E.G. Slope (ft/ft)	0.003448	Area (sq ft)	79.58	213.66
1.87				
Q Total (cfs)	1651.00	Flow (cfs)	140.41	1508.91
1.67				
Top Width (ft)	115.06	Top Width (ft)	67.74	43.00
4.32				
Vel Total (ft/s)	5.59	Avg. Vel. (ft/s)	1.76	7.06
0.89				
Max Chl Dpth (ft)	5.86	Hydr. Depth (ft)	1.17	4.97
0.43				
Conv. Total (cfs)	28116.5	Conv. (cfs)	2391.3	25696.8
28.5				
Length Wtd. (ft)	100.27	Wetted Per. (ft)	67.84	44.81
4.41				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	1.03
0.09				
Alpha	1.46	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	1.60	3.99
0.96				
C & E Loss (ft)	0.04	Cum SA (acres)	0.81	0.82
0.51				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1400

INPUT
Description: X-1400

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	863	17	855	48	853	57	851	85	852
101	852	110	848	117	848	126	849	135	854
142	855	168	868						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	101	.035	135	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
101	135	120	109	100	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	851.76	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	9.38	78.42
E.G. Slope (ft/ft)	0.003584	Area (sq ft)	9.38	78.42
Q Total (cfs)	378.00	Flow (cfs)	7.94	370.06
Top Width (ft)	54.13	Top Width (ft)	24.70	29.43
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	0.85	4.72
Max Chl Dpth (ft)	3.76	Hydr. Depth (ft)	0.38	2.66
Conv. Total (cfs)	6314.1	Conv. (cfs)	132.7	6181.5
Length Wtd. (ft)	109.31	Wetted Per. (ft)	24.80	31.00
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.08	0.57
Alpha	1.18	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	0.09	1.73
0.16				
C & E Loss (ft)	0.01	Cum SA (acres)	0.20	0.69
0.14				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.02	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	67.80	117.39
E.G. Slope (ft/ft)	0.003941	Area (sq ft)	67.80	117.39

Q Total (cfs)	847.00	Flow (cfs)	134.72	712.28
Top Width (ft)	85.46	Top Width (ft)	53.23	32.23
Vel Total (ft/s)	4.57	Avg. Vel. (ft/s)	1.99	6.07
Max Chl Dpth (ft)	5.02	Hydr. Depth (ft)	1.27	3.64
Conv. Total (cfs)	13491.8	Conv. (cfs)	2145.9	11345.9
Length Wtd. (ft)	110.92	Wetted Per. (ft)	53.47	34.17
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.31	0.85
Alpha	1.51	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	0.53	2.64
0.43				
C & E Loss (ft)	0.01	Cum SA (acres)	0.44	0.73
0.33				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.63	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	103.77	137.70
E.G. Slope (ft/ft)	0.003879	Area (sq ft)	103.77	137.70
Q Total (cfs)	1143.00	Flow (cfs)	243.26	899.74
Top Width (ft)	96.18	Top Width (ft)	62.84	33.34
Vel Total (ft/s)	4.73	Avg. Vel. (ft/s)	2.34	6.53
Max Chl Dpth (ft)	5.63	Hydr. Depth (ft)	1.65	4.13
Conv. Total (cfs)	18352.5	Conv. (cfs)	3905.8	14446.7
Length Wtd. (ft)	111.51	Wetted Per. (ft)	63.10	35.45
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.40	0.94
Alpha	1.55	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	0.83	3.04
0.66				
C & E Loss (ft)	0.00	Cum SA (acres)	0.53	0.73
0.44				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.11	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	135.62	153.86
0.05				
E.G. Slope (ft/ft)	0.003699	Area (sq ft)	135.62	153.86
0.05				
Q Total (cfs)	1387.00	Flow (cfs)	344.59	1042.40
0.01				
Top Width (ft)	105.05	Top Width (ft)	70.26	34.00
0.79				
Vel Total (ft/s)	4.79	Avg. Vel. (ft/s)	2.54	6.78
0.24				
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)	1.93	4.53
0.06				
Conv. Total (cfs)	22805.1	Conv. (cfs)	5665.8	17139.1
0.2				
Length Wtd. (ft)	111.85	Wetted Per. (ft)	70.53	36.20
0.80				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.44	0.98
0.01				
Alpha	1.57	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	1.06	3.30
0.81				
C & E Loss (ft)	0.00	Cum SA (acres)	0.59	0.73
0.47				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.19	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.62	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	173.34	171.14
1.35				
E.G. Slope (ft/ft)	0.003373	Area (sq ft)	173.34	171.14
1.35				
Q Total (cfs)	1651.00	Flow (cfs)	461.45	1188.58
0.97				
Top Width (ft)	116.49	Top Width (ft)	78.14	34.00
4.35				
Vel Total (ft/s)	4.77	Avg. Vel. (ft/s)	2.66	6.95
0.72				
Max Chl Dpth (ft)	6.62	Hydr. Depth (ft)	2.22	5.03
0.31				
Conv. Total (cfs)	28428.9	Conv. (cfs)	7945.9	20466.4
16.7				
Length Wtd. (ft)	112.12	Wetted Per. (ft)	78.43	36.20
4.40				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.47	1.00
0.06				
Alpha	1.61	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	1.32	3.55

0.95					
C & E Loss (ft)	0.01	Cum SA (acres)		0.65	0.74
0.50					

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1300

INPUT
Description: X-1300
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	860	45	852	66	851	80	851	100	850
110	848	116	848	123	848	129	851	147	854
183	876								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	100	.035	129	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	129	95	88	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.48	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.11	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)	850.53	Flow Area (sq ft)	13.94	71.24
0.04				
E.G. Slope (ft/ft)	0.005610	Area (sq ft)	13.94	71.24
0.04				
Q Total (cfs)	419.00	Flow (cfs)	14.87	404.11
0.01				
Top Width (ft)	66.02	Top Width (ft)	36.35	29.00
0.67				
Vel Total (ft/s)	4.92	Avg. Vel. (ft/s)	1.07	5.67
0.29				
Max Chl Dpth (ft)	3.11	Hydr. Depth (ft)	0.38	2.46
0.06				
Conv. Total (cfs)	5593.9	Conv. (cfs)	198.6	5395.2
0.1				
Length Wtd. (ft)	88.12	Wetted Per. (ft)	36.38	29.91
0.68				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.13	0.83
0.02				
Alpha	1.29	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.06	1.54
0.16				
C & E Loss (ft)	0.10	Cum SA (acres)	0.11	0.62
0.14				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.05	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.51	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	83.06	111.68
6.81				
E.G. Slope (ft/ft)	0.004144	Area (sq ft)	83.06	111.68
6.81				
Q Total (cfs)	928.00	Flow (cfs)	183.66	734.63
9.71				
Top Width (ft)	95.88	Top Width (ft)	57.85	29.00
9.04				
Vel Total (ft/s)	4.60	Avg. Vel. (ft/s)	2.21	6.58
1.43				
Max Chl Dpth (ft)	4.51	Hydr. Depth (ft)	1.44	3.85
0.75				
Conv. Total (cfs)	14416.5	Conv. (cfs)	2853.1	11412.5
150.8				
Length Wtd. (ft)	88.74	Wetted Per. (ft)	57.94	29.91
9.16				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.37	0.97
0.19				
Alpha	1.66	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.33	2.35
0.42				
C & E Loss (ft)	0.06	Cum SA (acres)	0.29	0.65
0.32				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.21	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	125.43	132.21
14.71				
E.G. Slope (ft/ft)	0.003550	Area (sq ft)	125.43	132.21
14.71				
Q Total (cfs)	1249.00	Flow (cfs)	323.02	900.87
25.11				
Top Width (ft)	104.12	Top Width (ft)	61.83	29.00
13.29				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)	2.58	6.81
1.71				

Max Chl Dpth (ft)	5.21	Hydr. Depth (ft)	2.03	4.56
1.11				
Conv. Total (cfs)	20962.3	Conv. (cfs)	5421.3	15119.6
421.4				
Length Wtd. (ft)	89.01	Wetted Per. (ft)	61.99	29.91
13.47				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.45	0.98
0.24				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.51	2.70
0.64				
C & E Loss (ft)	0.02	Cum SA (acres)	0.36	0.65
0.43				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.29	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.73	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	158.27	147.26
22.41				
E.G. Slope (ft/ft)	0.003237	Area (sq ft)	158.27	147.26
22.41				
Q Total (cfs)	1512.00	Flow (cfs)	440.51	1029.46
42.03				
Top Width (ft)	110.15	Top Width (ft)	64.75	29.00
16.40				
Vel Total (ft/s)	4.61	Avg. Vel. (ft/s)	2.78	6.99
1.88				
Max Chl Dpth (ft)	5.73	Hydr. Depth (ft)	2.44	5.08
1.37				
Conv. Total (cfs)	26577.3	Conv. (cfs)	7743.1	18095.4
738.8				
Length Wtd. (ft)	89.17	Wetted Per. (ft)	64.95	29.91
16.63				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.49	0.99
0.27				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.66	2.92
0.78				
C & E Loss (ft)	0.00	Cum SA (acres)	0.41	0.66
0.46				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.84	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.29	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	195.19	163.41

32.29				
E.G. Slope (ft/ft)	0.002890	Area (sq ft)	195.19	163.41
32.29				
Q Total (cfs)	1796.00	Flow (cfs)	571.83	1156.93
67.24				
Top Width (ft)	115.35	Top Width (ft)	67.88	29.00
18.47				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)	2.93	7.08
2.08				
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)	2.88	5.63
1.75				
Conv. Total (cfs)	33409.1	Conv. (cfs)	10637.2	21521.1
1250.7				
Length Wtd. (ft)	89.32	Wetted Per. (ft)	68.13	29.91
18.80				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.52	0.99
0.31				
Alpha	1.67	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	0.82	3.13
0.91				
C & E Loss (ft)	0.01	Cum SA (acres)	0.45	0.66
0.48				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1200

INPUT
Description: X-1200
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	27	856	58	854	79	852	94	851
102	848	115	847	125	848	134	848	137	850
149	855	190	876						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	35	44	47	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.16	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.13	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.12	130.90
1.52				
E.G. Slope (ft/ft)	0.001332	Area (sq ft)	0.12	130.90
1.52				
Q Total (cfs)	419.00	Flow (cfs)	0.02	418.01
0.97				
Top Width (ft)	47.58	Top Width (ft)	1.88	43.00

2.70				
Vel Total (ft/s)	3.16	Avg. Vel. (ft/s)	0.16	3.19
0.64				
Max Chl Dpth (ft)	4.13	Hydr. Depth (ft)	0.06	3.04
0.56				
Conv. Total (cfs)	11481.0	Conv. (cfs)	0.5	11454.0
26.5				
Length Wtd. (ft)	43.97	Wetted Per. (ft)	1.89	44.24
2.93				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.01	0.25
0.04				
Alpha	1.02	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.05	1.34
0.15				
C & E Loss (ft)	0.02	Cum SA (acres)	0.07	0.54
0.14				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.36	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.39	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	14.15	185.27
6.85				
E.G. Slope (ft/ft)	0.001963	Area (sq ft)	14.15	185.27
6.85				
Q Total (cfs)	928.00	Flow (cfs)	13.84	905.40
8.76				
Top Width (ft)	67.83	Top Width (ft)	19.10	43.00
5.74				
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	0.98	4.89
1.28				
Max Chl Dpth (ft)	5.39	Hydr. Depth (ft)	0.74	4.31
1.20				
Conv. Total (cfs)	20947.3	Conv. (cfs)	312.5	20437.1
197.7				
Length Wtd. (ft)	43.80	Wetted Per. (ft)	19.15	44.24
6.21				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.09	0.51
0.14				
Alpha	1.15	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.22	2.05
0.41				
C & E Loss (ft)	0.04	Cum SA (acres)	0.20	0.58
0.31				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	853.03	Reach Len. (ft)	35.00	44.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)	28.39	212.58	10.98
E.G. Slope (ft/ft)	0.002158	Area (sq ft)	28.39	212.58	10.98
Q Total (cfs)	1249.00	Flow (cfs)	37.94	1193.84	17.22
Top Width (ft)	76.02	Top Width (ft)	25.76	43.00	7.26
Vel Total (ft/s)	4.96	Avg. Vel. (ft/s)	1.34	5.62	1.57
Max Chl Dpth (ft)	6.03	Hydr. Depth (ft)	1.10	4.94	1.51
Conv. Total (cfs)	26887.8	Conv. (cfs)	816.8	25700.4	370.6
Length Wtd. (ft)	43.67	Wetted Per. (ft)	25.85	44.24	7.87
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.15	0.65	0.19
Alpha	1.23	Stream Power (lb/ft s)	190.00	0.00	0.00
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.34	2.35	0.61
C & E Loss (ft)	0.06	Cum SA (acres)	0.26	0.58	0.41

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	853.50	Reach Len. (ft)	35.00	44.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)	41.85	233.05	14.71
E.G. Slope (ft/ft)	0.002248	Area (sq ft)	41.85	233.05	14.71
Q Total (cfs)	1512.00	Flow (cfs)	65.67	1420.38	25.95
Top Width (ft)	82.17	Top Width (ft)	30.76	43.00	8.40
Vel Total (ft/s)	5.22	Avg. Vel. (ft/s)	1.57	6.09	1.76
Max Chl Dpth (ft)	6.50	Hydr. Depth (ft)	1.36	5.42	

1.75				
Conv. Total (cfs)	31888.6	Conv. (cfs)	1385.0	29956.3
547.3				
Length Wtd. (ft)	43.57	Wetted Per. (ft)	30.87	44.24
9.10				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.19	0.74
0.23				
Alpha	1.29	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.44	2.54
0.74				
C & E Loss (ft)	0.07	Cum SA (acres)	0.30	0.58
0.43				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.61	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.99	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	58.07	253.98
19.08				
E.G. Slope (ft/ft)	0.002293	Area (sq ft)	58.07	253.98
19.08				
Q Total (cfs)	1796.00	Flow (cfs)	103.32	1655.60
37.08				
Top Width (ft)	88.44	Top Width (ft)	35.87	43.00
9.57				
Vel Total (ft/s)	5.42	Avg. Vel. (ft/s)	1.78	6.52
1.94				
Max Chl Dpth (ft)	6.99	Hydr. Depth (ft)	1.62	5.91
1.99				
Conv. Total (cfs)	37504.4	Conv. (cfs)	2157.5	34572.6
774.4				
Length Wtd. (ft)	43.47	Wetted Per. (ft)	36.00	44.24
10.37				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.23	0.82
0.26				
Alpha	1.34	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	0.54	2.71
0.86				
C & E Loss (ft)	0.09	Cum SA (acres)	0.34	0.58
0.45				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1100

INPUT
Description: X-1100
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	53	856	67	854	92	852	113	850
118	847	127	848	140	848	142	849	148	850
158	856	171	869						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	113	.035	148	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
113	148	80	58	55	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.31	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.87	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	4.00	92.54
0.63				
E.G. Slope (ft/ft)	0.003193	Area (sq ft)	4.00	92.54
0.63				
Q Total (cfs)	419.00	Flow (cfs)	3.50	415.00
0.50				
Top Width (ft)	45.61	Top Width (ft)	9.16	35.00
1.45				
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	0.88	4.48
0.79				
Max Chl Dpth (ft)	3.87	Hydr. Depth (ft)	0.44	2.64
0.44				
Conv. Total (cfs)	7414.7	Conv. (cfs)	61.9	7343.9
8.9				
Length Wtd. (ft)	58.09	Wetted Per. (ft)	9.20	36.21
1.70				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.09	0.51
0.07				
Alpha	1.07	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.05	1.22
0.15				
C & E Loss (ft)	0.04	Cum SA (acres)	0.07	0.50
0.14				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.84	Reach Len. (ft)	80.00	58.00	55.00
Crit W.S. (ft)		Flow Area (sq ft)	17.76	126.38	2.82
E.G. Slope (ft/ft)	0.005204	Area (sq ft)	17.76	126.38	2.82
Q Total (cfs)	928.00	Flow (cfs)	32.64	890.67	4.69
Top Width (ft)	57.38	Top Width (ft)	19.31	35.00	3.07
Vel Total (ft/s)	6.31	Avg. Vel. (ft/s)	1.84	7.05	1.66
Max Chl Dpth (ft)	4.84	Hydr. Depth (ft)	0.92	3.61	0.92
Conv. Total (cfs)	12863.6	Conv. (cfs)	452.5	12346.1	65.0
Length Wtd. (ft)	58.40	Wetted Per. (ft)	19.40	36.21	3.58
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.30	1.13	0.26
Alpha	1.20	Stream Power (lb/ft s)	171.00	0.00	0.00
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.21	1.89	0.40
C & E Loss (ft)	0.07	Cum SA (acres)	0.19	0.54	0.30

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.02	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.27	Reach Len. (ft)	80.00	58.00	55.00
Crit W.S. (ft)	851.70	Flow Area (sq ft)	27.12	141.44	4.29
E.G. Slope (ft/ft)	0.006255	Area (sq ft)	27.12	141.44	4.29
Q Total (cfs)	1249.00	Flow (cfs)	62.03	1177.96	9.01
Top Width (ft)	63.15	Top Width (ft)	24.37	35.00	3.78
Vel Total (ft/s)	7.23	Avg. Vel. (ft/s)	2.29	8.33	2.10
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)	1.11	4.04	1.13
Conv. Total (cfs)	15792.3	Conv. (cfs)	784.4	14894.0	113.9
Length Wtd. (ft)	58.60	Wetted Per. (ft)	24.48	36.21	4.41
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.43	1.53	0.38
Alpha	1.26	Stream Power (lb/ft s)	171.00	0.00	

0.00				
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.32	2.17
0.61				
C & E Loss (ft)	0.07	Cum SA (acres)	0.24	0.54
0.40				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.25	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.56	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.17	Flow Area (sq ft)	34.76	151.66
5.47				
E.G. Slope (ft/ft)	0.007080	Area (sq ft)	34.76	151.66
5.47				
Q Total (cfs)	1512.00	Flow (cfs)	91.00	1407.77
13.23				
Top Width (ft)	67.29	Top Width (ft)	28.02	35.00
4.27				
Vel Total (ft/s)	7.88	Avg. Vel. (ft/s)	2.62	9.28
2.42				
Max Chl Dpth (ft)	5.56	Hydr. Depth (ft)	1.24	4.33
1.28				
Conv. Total (cfs)	17969.2	Conv. (cfs)	1081.4	16730.5
157.3				
Length Wtd. (ft)	58.75	Wetted Per. (ft)	28.14	36.21
4.98				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.55	1.85
0.49				
Alpha	1.30	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	0.41	2.34
0.73				
C & E Loss (ft)	0.07	Cum SA (acres)	0.28	0.54
0.42				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.52	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.83	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.61	Flow Area (sq ft)	42.62	160.92
6.66				
E.G. Slope (ft/ft)	0.007999	Area (sq ft)	42.62	160.92
6.66				
Q Total (cfs)	1796.00	Flow (cfs)	126.07	1651.65
18.28				
Top Width (ft)	71.04	Top Width (ft)	31.33	35.00
4.71				
Vel Total (ft/s)	8.54	Avg. Vel. (ft/s)	2.96	10.26
2.75				

Max Chl Dpth (ft)	5.83	Hydr. Depth (ft)	1.36	4.60	1.41
Conv. Total (cfs)	20081.7	Conv. (cfs)	1409.7	18467.7	204.4
Length Wtd. (ft)	58.89	Wetted Per. (ft)	31.46	36.21	5.49
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.68	2.22	0.61
Alpha	1.34	Stream Power (lb/ft s)	171.00	0.00	0.00
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	0.50	2.50	0.85
C & E Loss (ft)	0.06	Cum SA (acres)	0.31	0.54	0.44

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1000

INPUT
Description: X-1000
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	9	856	17	855	35	853	60	851
62	847	91	847	95	850	111	853	125	863

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	60	.035	95	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60	95	25	69	95	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.86	Reach Len. (ft)	25.00	69.00	95.00
Crit W.S. (ft)		Flow Area (sq ft)		124.97	1.95
E.G. Slope (ft/ft)	0.001283	Area (sq ft)		124.97	1.95
Q Total (cfs)	419.00	Flow (cfs)		417.94	1.06
Top Width (ft)	39.49	Top Width (ft)		34.93	4.57
Vel Total (ft/s)	3.30	Avg. Vel. (ft/s)		3.34	0.54
Max Chl Dpth (ft)	3.86	Hydr. Depth (ft)		3.58	0.43
Conv. Total (cfs)	11698.8	Conv. (cfs)		11669.2	29.6
Length Wtd. (ft)	68.07	Wetted Per. (ft)		38.31	4.65
Min Ch El (ft)	847.00	Shear (lb/sq ft)		0.26	

0.03				
Alpha	1.02	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.04	1.08
0.15				
C & E Loss (ft)	0.00	Cum SA (acres)	0.06	0.46
0.13				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.29	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.52	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.78	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	3.76	157.14
8.41				
E.G. Slope (ft/ft)	0.002875	Area (sq ft)	3.76	157.14
8.41				
Q Total (cfs)	928.00	Flow (cfs)	2.89	913.99
11.12				
Top Width (ft)	54.16	Top Width (ft)	9.69	35.00
9.47				
Vel Total (ft/s)	5.48	Avg. Vel. (ft/s)	0.77	5.82
1.32				
Max Chl Dpth (ft)	4.78	Hydr. Depth (ft)	0.39	4.49
0.89				
Conv. Total (cfs)	17307.7	Conv. (cfs)	53.9	17046.5
207.3				
Length Wtd. (ft)	67.65	Wetted Per. (ft)	9.72	38.47
9.63				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.07	0.73
0.16				
Alpha	1.11	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.19	1.70
0.39				
C & E Loss (ft)	0.01	Cum SA (acres)	0.16	0.49
0.30				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.93	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.77	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.16	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	8.38	170.54
12.42				
E.G. Slope (ft/ft)	0.003883	Area (sq ft)	8.38	170.54
12.42				
Q Total (cfs)	1249.00	Flow (cfs)	9.78	1217.47
21.75				
Top Width (ft)	60.99	Top Width (ft)	14.48	35.00
11.51				

Vel Total (ft/s)	6.53	Avg. Vel. (ft/s)	1.17	7.14 1.75
Max Chl Dpth (ft)	5.16	Hydr. Depth (ft)	0.58	4.87 1.08
Conv. Total (cfs)	20042.7	Conv. (cfs)	157.0	19536.7 349.0
Length Wtd. (ft)	67.48	Wetted Per. (ft)	14.52	38.47 11.71
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.14	1.07 0.26
Alpha	1.17	Stream Power (lb/ft s)	125.00	0.00 0.00
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.29	1.96 0.59
C & E Loss (ft)	0.02	Cum SA (acres)	0.21	0.49 0.39

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.40	Element	Left OB	Channel Right OB
Vel Head (ft)	1.01	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	852.40	Reach Len. (ft)	25.00	69.00 95.00
Crit W.S. (ft)		Flow Area (sq ft)	12.18	178.86 15.31
E.G. Slope (ft/ft)	0.004780	Area (sq ft)	12.18	178.86 15.31
Q Total (cfs)	1512.00	Flow (cfs)	17.86	1462.26 31.88
Top Width (ft)	65.23	Top Width (ft)	17.45	35.00 12.78
Vel Total (ft/s)	7.33	Avg. Vel. (ft/s)	1.47	8.18 2.08
Max Chl Dpth (ft)	5.40	Hydr. Depth (ft)	0.70	5.11 1.20
Conv. Total (cfs)	21870.6	Conv. (cfs)	258.3	21151.1 461.1
Length Wtd. (ft)	67.37	Wetted Per. (ft)	17.50	38.47 13.00
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.21	1.39 0.35
Alpha	1.21	Stream Power (lb/ft s)	125.00	0.00 0.00
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	0.37	2.12 0.72
C & E Loss (ft)	0.03	Cum SA (acres)	0.24	0.50 0.41

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	853.87	Element	Left OB	Channel Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	852.57	Reach Len. (ft)	25.00	69.00

95.00				
Crit W.S. (ft)	851.76	Flow Area (sq ft)	15.43	184.99
17.63				
E.G. Slope (ft/ft)	0.005949	Area (sq ft)	15.43	184.99
17.63				
Q Total (cfs)	1796.00	Flow (cfs)	27.31	1725.75
42.94				
Top Width (ft)	68.35	Top Width (ft)	19.64	35.00
13.71				
Vel Total (ft/s)	8.24	Avg. Vel. (ft/s)	1.77	9.33
2.44				
Max Chl Dpth (ft)	5.57	Hydr. Depth (ft)	0.79	5.29
1.29				
Conv. Total (cfs)	23285.0	Conv. (cfs)	354.1	22374.2
556.7				
Length Wtd. (ft)	67.31	Wetted Per. (ft)	19.70	38.47
13.95				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.29	1.79
0.47				
Alpha	1.24	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)	0.45	2.27
0.83				
C & E Loss (ft)	0.03	Cum SA (acres)	0.26	0.50
0.43				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 900

INPUT
Description: X-900
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846.2	87	846.2	100	849	128	852
148	854	157	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	100	20	34	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	850.93	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.19	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.74	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	849.14	Flow Area (sq ft)	23.85	102.55
14.10				
E.G. Slope (ft/ft)	0.001521	Area (sq ft)	23.85	102.55
14.10				
Q Total (cfs)	419.00	Flow (cfs)	26.26	379.26

13.48				
Top Width (ft)	68.47	Top Width (ft)	22.24	30.00
16.22				
Vel Total (ft/s)	2.98	Avg. Vel. (ft/s)	1.10	3.70
0.96				
Max Chl Dpth (ft)	4.54	Hydr. Depth (ft)	1.07	3.42
0.87				
Conv. Total (cfs)	10742.3	Conv. (cfs)	673.4	9723.3
345.6				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	22.34	30.72
16.32				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.10	0.32
0.08				
Alpha	1.40	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.03	0.90
0.13				
C & E Loss (ft)	0.04	Cum SA (acres)	0.05	0.41
0.11				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.59	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	850.51	Flow Area (sq ft)	45.01	128.24
31.42				
E.G. Slope (ft/ft)	0.003046	Area (sq ft)	45.01	128.24
31.42				
Q Total (cfs)	928.00	Flow (cfs)	93.59	778.90
55.51				
Top Width (ft)	81.39	Top Width (ft)	27.17	30.00
24.22				
Vel Total (ft/s)	4.53	Avg. Vel. (ft/s)	2.08	6.07
1.77				
Max Chl Dpth (ft)	5.39	Hydr. Depth (ft)	1.66	4.27
1.30				
Conv. Total (cfs)	16815.3	Conv. (cfs)	1695.9	14113.7
1005.8				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	27.33	30.72
24.35				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.31	0.79
0.25				
Alpha	1.54	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.17	1.48
0.35				
C & E Loss (ft)	0.04	Cum SA (acres)	0.15	0.44
0.26				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)

is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.70	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.94	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	851.10	Flow Area (sq ft)	54.86	138.72
40.45				
E.G. Slope (ft/ft)	0.004001	Area (sq ft)	54.86	138.72
40.45				
Q Total (cfs)	1249.00	Flow (cfs)	142.18	1017.71
89.11				
Top Width (ft)	86.66	Top Width (ft)	29.18	30.00
27.48				
Vel Total (ft/s)	5.34	Avg. Vel. (ft/s)	2.59	7.34
2.20				
Max Chl Dpth (ft)	5.74	Hydr. Depth (ft)	1.88	4.62
1.47				
Conv. Total (cfs)	19744.8	Conv. (cfs)	2247.6	16088.5
1408.7				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	29.37	30.72
27.63				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.47	1.13
0.37				
Alpha	1.58	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.27	1.72
0.54				
C & E Loss (ft)	0.03	Cum SA (acres)	0.20	0.44
0.35				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.90	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.15	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	851.50	Flow Area (sq ft)	60.85	144.76
46.17				
E.G. Slope (ft/ft)	0.004922	Area (sq ft)	60.85	144.76
46.17				
Q Total (cfs)	1512.00	Flow (cfs)	182.57	1211.76
117.66				
Top Width (ft)	89.79	Top Width (ft)	30.34	30.00
29.45				
Vel Total (ft/s)	6.01	Avg. Vel. (ft/s)	3.00	8.37
2.55				
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)	2.01	4.83

1.57				
Conv. Total (cfs)	21552.2	Conv. (cfs)	2602.4	17272.6
1677.2				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	30.55	30.72
29.62				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.61	1.45
0.48				
Alpha	1.60	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.35	1.87
0.65				
C & E Loss (ft)	0.02	Cum SA (acres)	0.22	0.44
0.37				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	853.42	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.21	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.21	Reach Len. (ft)	2.00	2.00
2.00				
Crit W.S. (ft)	851.88	Flow Area (sq ft)	62.94	146.82
48.22				
E.G. Slope (ft/ft)	0.006552	Area (sq ft)	62.94	146.82
48.22				
Q Total (cfs)	1796.00	Flow (cfs)	220.94	1431.36
143.69				
Top Width (ft)	90.87	Top Width (ft)	30.73	30.00
30.14				
Vel Total (ft/s)	6.96	Avg. Vel. (ft/s)	3.51	9.75
2.98				
Max Chl Dpth (ft)	6.01	Hydr. Depth (ft)	2.05	4.89
1.60				
Conv. Total (cfs)	22188.8	Conv. (cfs)	2729.7	17683.8
1775.3				
Length Wtd. (ft)	2.00	Wetted Per. (ft)	30.95	30.72
30.31				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.83	1.95
0.65				
Alpha	1.61	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.42	2.00
0.76				
C & E Loss (ft)	0.00	Cum SA (acres)	0.25	0.45
0.38				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

BRIDGE

RIVER: Bluestone Creek
REACH: 1 RS: 810

INPUT
Description: New Crossing
Distance from Upstream XS = 2
Deck/Roadway Width = 13.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 8

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	852	0	60	849	0
75	849	847.25	110	849	847.25
200	850.5	0	216	852	0
233	854	0	245	856	

Upstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846.2	87	846.2	100	849	128	852
148	854	157	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Coeff Contr.	Expan.
70	100	.1	.3

Downstream Deck/Roadway Coordinates
num= 8

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	852	0	60	849	0
75	849	847.25	110	849	847.25
200	850.5	0	216	852	0
233	854	0	245	856	

Downstream Bridge Cross Section Data
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	19	852	39	850	63	848	80	847
89	846	97	846	107	848	163	850	188	851
216	856	233	858	245	859				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	63	.035	107	.055

Bank Sta: Left	Right	Coeff Contr.	Expan.
63	107	.1	.3

Upstream Embankment side slope = 4 horiz. to 1.0 vertical
Downstream Embankment side slope = 6 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins = 849
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #2 Year

E.G. US. (ft)	850.93	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	850.74	E.G. Elev (ft)	850.88
850.23			
Q Total (cfs)	419.00	W.S. Elev (ft)	850.30
849.85			
Q Bridge (cfs)	40.30	Crit W.S. (ft)	850.30
849.85			
Q Weir (cfs)		Max Chl Dpth (ft)	4.10
3.85			
Weir Sta Lft (ft)		Vel Total (ft/s)	5.74
4.54			
Weir Sta Rgt (ft)		Flow Area (sq ft)	73.01
92.25			
Weir Submerg		Froude # Chl	0.54
0.45			
Weir Max Depth (ft)		Specif Force (cu ft)	154.65
155.09			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	1.18
0.80			
Min El Prs (ft)	847.25	W.P. Total (ft)	92.70
170.91			
Delta EG (ft)	0.99	Conv. Total (cfs)	2379.8
2298.1			
Delta WS (ft)	0.91	Top Width (ft)	61.80
115.69			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.43
0.06			
BR Open Vel (ft/s)	3.45	C & E Loss (ft)	0.06
0.08			
Coef of Q		Shear Total (lb/sq ft)	1.52
1.12			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #10 Year

E.G. US. (ft)	852.09	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	851.59	E.G. Elev (ft)	852.03
851.53			
Q Total (cfs)	928.00	W.S. Elev (ft)	851.16
851.39			
Q Bridge (cfs)	36.67	Crit W.S. (ft)	851.16
850.41			
Q Weir (cfs)		Max Chl Dpth (ft)	4.96
5.39			
Weir Sta Lft (ft)		Vel Total (ft/s)	7.04
2.95			
Weir Sta Rgt (ft)		Flow Area (sq ft)	131.82
314.34			
Weir Submerg		Froude # Chl	0.59
0.23			
Weir Max Depth (ft)		Specif Force (cu ft)	375.97
481.94			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	1.76
1.90			
Min El Prs (ft)	847.25	W.P. Total (ft)	105.81
220.36			
Delta EG (ft)	0.59	Conv. Total (cfs)	5510.8
13110.7			
Delta WS (ft)	0.23	Top Width (ft)	74.79
165.02			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.13
0.03			
BR Open Vel (ft/s)	3.14	C & E Loss (ft)	0.22
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.21
0.45			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a

valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #25 Year

E.G. US. (ft)	852.64	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	851.94	E.G. Elev (ft)	852.60
852.09			
Q Total (cfs)	1249.00	W.S. Elev (ft)	851.58
851.94			
Q Bridge (cfs)	35.69	Crit W.S. (ft)	851.58
850.68			
Q Weir (cfs)		Max Chl Dpth (ft)	5.38
5.94			
Weir Sta Lft (ft)		Vel Total (ft/s)	7.58
3.07			
Weir Sta Rgt (ft)		Flow Area (sq ft)	164.68
407.43			
Weir Submerg		Froude # Chl	0.61
0.23			
Weir Max Depth (ft)		Specif Force (cu ft)	533.84
714.06			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	2.03
2.35			
Min El Prs (ft)	847.25	W.P. Total (ft)	112.22
229.01			
Delta EG (ft)	0.59	Conv. Total (cfs)	7540.2
19401.4			
Delta WS (ft)	0.05	Top Width (ft)	81.15
173.59			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.12
0.03			
BR Open Vel (ft/s)	3.05	C & E Loss (ft)	0.26
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.51
0.46			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #50 Year

E.G. US. (ft)	853.04	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	852.15	E.G. Elev (ft)	853.00
852.51			
Q Total (cfs)	1512.00	W.S. Elev (ft)	851.88
852.35			
Q Bridge (cfs)	35.27	Crit W.S. (ft)	851.88
850.88			
Q Weir (cfs)		Max Chl Dpth (ft)	5.68
6.35			
Weir Sta Lft (ft)		Vel Total (ft/s)	7.97
3.15			
Weir Sta Rgt (ft)		Flow Area (sq ft)	189.68
480.60			
Weir Submerg		Froude # Chl	0.63
0.23			
Weir Max Depth (ft)		Specif Force (cu ft)	670.75
926.78			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	2.21
2.67			
Min El Prs (ft)	847.25	W.P. Total (ft)	116.79
235.35			
Delta EG (ft)	0.56	Conv. Total (cfs)	9190.9
24896.6			
Delta WS (ft)	-0.15	Top Width (ft)	85.67
179.88			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.11
0.03			
BR Open Vel (ft/s)	3.02	C & E Loss (ft)	0.29
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.74
0.47			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #100 Year

E.G. US. (ft)	853.42	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	852.21	E.G. Elev (ft)	853.40
852.92			
Q Total (cfs)	1796.00	W.S. Elev (ft)	852.20
852.75			
Q Bridge (cfs)	34.50	Crit W.S. (ft)	852.20
851.08			
Q Weir (cfs)		Max Chl Dpth (ft)	6.00
6.75			
Weir Sta Lft (ft)		Vel Total (ft/s)	8.25
3.24			
Weir Sta Rgt (ft)		Flow Area (sq ft)	217.61
554.46			
Weir Submerg		Froude # Chl	0.63
0.22			
Weir Max Depth (ft)		Specif Force (cu ft)	825.47
1168.86			
Min El Weir Flow (ft)	849.01	Hydr Depth (ft)	2.40
2.98			
Min El Prs (ft)	847.25	W.P. Total (ft)	121.74
241.51			
Delta EG (ft)	0.54	Conv. Total (cfs)	11125.4
30869.8			
Delta WS (ft)	-0.47	Top Width (ft)	90.58
185.97			
BR Open Area (sq ft)	11.68	Frctn Loss (ft)	0.10
0.03			
BR Open Vel (ft/s)	2.95	C & E Loss (ft)	0.31
0.00			
Coef of Q		Shear Total (lb/sq ft)	2.91
0.49			
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00
0.00			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 800

INPUT
Description: X-800
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	19	852	39	850	63	848	80	847
89	846	97	846	107	848	163	850	188	851
216	856	233	858	245	859				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	63	.035	107	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
63	107	90	48	15	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.94	Element	Left OB	Channel Right OB
Vel Head (ft)	0.11	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	849.83	Reach Len. (ft)	90.00	48.00 15.00
Crit W.S. (ft)		Flow Area (sq ft)	20.13	128.59 46.96
E.G. Slope (ft/ft)	0.001068	Area (sq ft)	20.13	128.59 46.96
Q Total (cfs)	419.00	Flow (cfs)	16.72	363.19 39.09
Top Width (ft)	117.26	Top Width (ft)	21.98	44.00 51.28
Vel Total (ft/s)	2.14	Avg. Vel. (ft/s)	0.83	2.82 0.83
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)	0.92	2.92 0.92
Conv. Total (cfs)	12818.5	Conv. (cfs)	511.6	11111.1 1195.9
Length Wtd. (ft)	47.30	Wetted Per. (ft)	22.05	44.28 51.31
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.06	0.19 0.06
Alpha	1.53	Stream Power (lb/ft s)	245.00	0.00 0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.02	0.84 0.11
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	0.37 0.08

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

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.36	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	65.93	195.89
154.12				
E.G. Slope (ft/ft)	0.000880	Area (sq ft)	65.93	195.89
154.12				
Q Total (cfs)	928.00	Flow (cfs)	76.63	664.91
186.46				
Top Width (ft)	164.63	Top Width (ft)	37.61	44.00
83.02				
Vel Total (ft/s)	2.23	Avg. Vel. (ft/s)	1.16	3.39
1.21				
Max Chl Dpth (ft)	5.36	Hydr. Depth (ft)	1.75	4.45
1.86				
Conv. Total (cfs)	31278.3	Conv. (cfs)	2582.7	22410.9
6284.7				
Length Wtd. (ft)	45.41	Wetted Per. (ft)	37.76	44.28
83.11				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.10	0.24
0.10				
Alpha	1.74	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.13	1.37
0.26				
C & E Loss (ft)	0.03	Cum SA (acres)	0.12	0.41
0.21				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.16	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.89	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	87.38	219.32
199.12				
E.G. Slope (ft/ft)	0.000963	Area (sq ft)	87.38	219.32
199.12				
Q Total (cfs)	1249.00	Flow (cfs)	117.34	839.73
291.93				
Top Width (ft)	172.94	Top Width (ft)	42.94	44.00
86.00				
Vel Total (ft/s)	2.47	Avg. Vel. (ft/s)	1.34	3.83
1.47				
Max Chl Dpth (ft)	5.89	Hydr. Depth (ft)	2.04	4.98
2.32				

Conv. Total (cfs)	40240.4	Conv. (cfs)	3780.6	27054.5 9405.3
Length Wtd. (ft)	44.58	Wetted Per. (ft)	43.11	44.28 86.14
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.30 0.14
Alpha	1.73	Stream Power (lb/ft s)	245.00	0.00 0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.21	1.60 0.42
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	0.41 0.30

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	852.29	Reach Len. (ft)	90.00	48.00 15.00
Crit W.S. (ft)		Flow Area (sq ft)	105.36	236.95 234.04
E.G. Slope (ft/ft)	0.001003	Area (sq ft)	105.36	236.95 234.04
Q Total (cfs)	1512.00	Flow (cfs)	154.40	974.50 383.10
Top Width (ft)	179.05	Top Width (ft)	46.80	44.00 88.25
Vel Total (ft/s)	2.62	Avg. Vel. (ft/s)	1.47	4.11 1.64
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)	2.25	5.39 2.65
Conv. Total (cfs)	47750.5	Conv. (cfs)	4876.2	30775.5 12098.7
Length Wtd. (ft)	44.02	Wetted Per. (ft)	46.99	44.28 88.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.14	0.33 0.17
Alpha	1.71	Stream Power (lb/ft s)	245.00	0.00 0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.28	1.73 0.52
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.41 0.31

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.89	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.68	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	124.36	254.13
268.92				
E.G. Slope (ft/ft)	0.001040	Area (sq ft)	124.36	254.13
268.92				
Q Total (cfs)	1796.00	Flow (cfs)	197.00	1115.25
483.76				
Top Width (ft)	184.94	Top Width (ft)	50.51	44.00
90.44				
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)	1.58	4.39
1.80				
Max Chl Dpth (ft)	6.68	Hydr. Depth (ft)	2.46	5.78
2.97				
Conv. Total (cfs)	55694.5	Conv. (cfs)	6108.9	34584.1
15001.5				
Length Wtd. (ft)	43.52	Wetted Per. (ft)	50.73	44.28
90.64				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.16	0.37
0.19				
Alpha	1.70	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.34	1.86
0.60				
C & E Loss (ft)	0.06	Cum SA (acres)	0.21	0.41
0.32				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 700

INPUT
Description: X-700
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853	15	857	20	857	33	850	35	849
39	847	53	846	66	846	72	850	85	850
110	850	160	852	183	856	195	860		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	72	95	67	8	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
W.S. Elev (ft)	849.62	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)		107.47
E.G. Slope (ft/ft)	0.002214	Area (sq ft)		107.47
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	37.67	Top Width (ft)		37.67
Vel Total (ft/s)	3.90	Avg. Vel. (ft/s)		3.90
Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		2.85
Conv. Total (cfs)	8904.0	Conv. (cfs)		8904.0
Length Wtd. (ft)	66.98	Wetted Per. (ft)		39.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)		0.38
Alpha	1.00	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.00	0.71
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.33
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.43	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.97	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.87	159.76
48.51				
E.G. Slope (ft/ft)	0.002679	Area (sq ft)	0.87	159.76
48.51				
Q Total (cfs)	928.00	Flow (cfs)	0.69	869.86
57.45				
Top Width (ft)	103.00	Top Width (ft)	1.80	39.00
62.21				
Vel Total (ft/s)	4.44	Avg. Vel. (ft/s)	0.79	5.44
1.18				
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)	0.48	4.10
0.78				
Conv. Total (cfs)	17930.9	Conv. (cfs)	13.3	16807.5
1110.1				
Length Wtd. (ft)	61.94	Wetted Per. (ft)	2.04	40.95
62.22				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.07	0.65
0.13				
Alpha	1.42	Stream Power (lb/ft s)	195.00	0.00
0.00				

Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.06	1.18
0.23				
C & E Loss (ft)	0.01	Cum SA (acres)	0.08	0.36
0.18				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.59	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.35	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.70	174.76
74.29				
E.G. Slope (ft/ft)	0.003342	Area (sq ft)	1.70	174.76
74.29				
Q Total (cfs)	1249.00	Flow (cfs)	1.88	1128.48
118.65				
Top Width (ft)	113.34	Top Width (ft)	2.51	39.00
71.82				
Vel Total (ft/s)	4.98	Avg. Vel. (ft/s)	1.11	6.46
1.60				
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	0.68	4.48
1.03				
Conv. Total (cfs)	21604.5	Conv. (cfs)	32.5	19519.7
2052.3				
Length Wtd. (ft)	58.29	Wetted Per. (ft)	2.85	40.95
71.85				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.89
0.22				
Alpha	1.53	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.12	1.38
0.38				
C & E Loss (ft)	0.01	Cum SA (acres)	0.12	0.37
0.27				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.69	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.66	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	2.54	186.56
97.16				
E.G. Slope (ft/ft)	0.003710	Area (sq ft)	2.54	186.56
97.16				
Q Total (cfs)	1512.00	Flow (cfs)	3.39	1325.71
182.90				
Top Width (ft)	121.46	Top Width (ft)	3.07	39.00
79.39				
Vel Total (ft/s)	5.28	Avg. Vel. (ft/s)	1.33	7.11
1.88				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)	0.83	4.78

1.22					
Conv. Total (cfs)	24823.8	Conv. (cfs)	55.7	21765.3	3002.8
Length Wtd. (ft)	55.90	Wetted Per. (ft)	3.49	40.95	79.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.17	1.06	0.28
Alpha	1.60	Stream Power (lb/ft s)	195.00	0.00	0.00
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.16	1.50	0.46
C & E Loss (ft)	0.04	Cum SA (acres)	0.14	0.37	0.28

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	851.95	Reach Len. (ft)	95.00	67.00	8.00
Crit W.S. (ft)		Flow Area (sq ft)	3.53	198.08	121.70
E.G. Slope (ft/ft)	0.004040	Area (sq ft)	3.53	198.08	121.70
Q Total (cfs)	1796.00	Flow (cfs)	5.48	1528.73	261.79
Top Width (ft)	129.39	Top Width (ft)	3.62	39.00	86.77
Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)	1.55	7.72	2.15
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)	0.98	5.08	1.40
Conv. Total (cfs)	28255.6	Conv. (cfs)	86.3	24050.8	4118.6
Length Wtd. (ft)	53.85	Wetted Per. (ft)	4.11	40.95	86.81
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.22	1.22	0.35
Alpha	1.67	Stream Power (lb/ft s)	195.00	0.00	0.00
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.21	1.61	0.53
C & E Loss (ft)	0.07	Cum SA (acres)	0.16	0.37	0.29

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 600

INPUT
Description: X-600
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	859	16	857	36	856	45	852	54	846

64	845	74	847	81	849	92	850	144	850
190	850	210	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	45	.035	81	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
45	81	63	43	1	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.32	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		88.96
0.57				
E.G. Slope (ft/ft)	0.003345	Area (sq ft)		88.96
0.57				
Q Total (cfs)	419.00	Flow (cfs)		418.74
0.26				
Top Width (ft)	35.52	Top Width (ft)		31.98
3.54				
Vel Total (ft/s)	4.68	Avg. Vel. (ft/s)		4.71
0.46				
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.78
0.16				
Conv. Total (cfs)	7244.9	Conv. (cfs)		7240.4
4.5				
Length Wtd. (ft)	43.02	Wetted Per. (ft)		33.52
3.55				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.55
0.03				
Alpha	1.01	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.00	0.56
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.28
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.53	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.66	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)	849.57	Flow Area (sq ft)		133.18
78.03				
E.G. Slope (ft/ft)	0.003720	Area (sq ft)		133.18
78.03				
Q Total (cfs)	928.00	Flow (cfs)		825.93
102.07				
Top Width (ft)	144.10	Top Width (ft)		33.99
110.10				

Vel Total (ft/s)	4.39	Avg. Vel. (ft/s)		6.20
1.31				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		3.92
0.71				
Conv. Total (cfs)	15214.2	Conv. (cfs)		13540.9
1673.4				
Length Wtd. (ft)	39.78	Wetted Per. (ft)		35.93
110.33				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.86
0.16				
Alpha	1.78	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.06	0.95
0.22				
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.31
0.17				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.73	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.17	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		150.69
134.34				
E.G. Slope (ft/ft)	0.003722	Area (sq ft)		150.69
134.34				
Q Total (cfs)	1249.00	Flow (cfs)		998.02
250.98				
Top Width (ft)	145.71	Top Width (ft)		34.76
110.95				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)		6.62
1.87				
Max Chl Dpth (ft)	6.17	Hydr. Depth (ft)		4.34
1.21				
Conv. Total (cfs)	20473.7	Conv. (cfs)		16359.6
4114.1				
Length Wtd. (ft)	35.98	Wetted Per. (ft)		36.85
111.32				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.95
0.28				
Alpha	1.86	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.12	1.13
0.36				
C & E Loss (ft)	0.02	Cum SA (acres)	0.12	0.31
0.25				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.54	Reach Len. (ft)	63.00	43.00

1.00				
Crit W.S. (ft)		Flow Area (sq ft)		163.62
175.42				
E.G. Slope (ft/ft)	0.003677	Area (sq ft)		163.62
175.42				
Q Total (cfs)	1512.00	Flow (cfs)		1124.50
387.50				
Top Width (ft)	146.88	Top Width (ft)		35.31
111.57				
Vel Total (ft/s)	4.46	Avg. Vel. (ft/s)		6.87
2.21				
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)		4.63
1.57				
Conv. Total (cfs)	24933.3	Conv. (cfs)		18543.4
6390.0				
Length Wtd. (ft)	33.79	Wetted Per. (ft)		37.52
112.04				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.00
0.36				
Alpha	1.83	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.16	1.23
0.43				
C & E Loss (ft)	0.03	Cum SA (acres)	0.14	0.31
0.26				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.90	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		176.31
215.32				
E.G. Slope (ft/ft)	0.003652	Area (sq ft)		176.31
215.32				
Q Total (cfs)	1796.00	Flow (cfs)		1254.85
541.15				
Top Width (ft)	148.01	Top Width (ft)		35.85
112.16				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)		7.12
2.51				
Max Chl Dpth (ft)	6.90	Hydr. Depth (ft)		4.92
1.92				
Conv. Total (cfs)	29720.1	Conv. (cfs)		20765.2
8954.9				
Length Wtd. (ft)	32.05	Wetted Per. (ft)		38.16
112.73				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.05
0.44				
Alpha	1.77	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.21	1.32
0.50				
C & E Loss (ft)	0.03	Cum SA (acres)	0.15	0.31
0.27				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 500

INPUT
Description: X-500
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	856	50	850	70	848.5	80	846.77	95	845.64
100	846.5	106	849.5	163	850	185	850.45	215	850
223	852	240	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	106	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	106	85	68	5	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.47	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	849.01	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.74	76.84
E.G. Slope (ft/ft)	0.005935	Area (sq ft)	1.74	76.84
Q Total (cfs)	419.00	Flow (cfs)	1.45	417.55
Top Width (ft)	41.83	Top Width (ft)	6.81	35.02
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	0.84	5.43
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	0.26	2.19
Conv. Total (cfs)	5438.9	Conv. (cfs)	18.8	5420.0
Length Wtd. (ft)	68.03	Wetted Per. (ft)	6.82	35.88
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.09	0.79
Alpha	1.03	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.00	0.48
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.24
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.04	Element	Left OB	Channel
Right OB				

Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	849.78	Flow Area (sq ft)	25.79	129.85
56.40				
E.G. Slope (ft/ft)	0.004133	Area (sq ft)	25.79	129.85
56.40				
Q Total (cfs)	928.00	Flow (cfs)	46.78	818.85
62.37				
Top Width (ft)	171.04	Top Width (ft)	24.08	36.00
110.96				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)	1.81	6.31
1.11				
Max Chl Dpth (ft)	4.85	Hydr. Depth (ft)	1.07	3.61
0.51				
Conv. Total (cfs)	14435.8	Conv. (cfs)	727.8	12737.8
970.2				
Length Wtd. (ft)	64.91	Wetted Per. (ft)	24.17	36.97
111.03				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.28	0.91
0.13				
Alpha	1.85	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.04	0.82
0.22				
C & E Loss (ft)	0.05	Cum SA (acres)	0.06	0.27
0.16				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.09	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.64	Flow Area (sq ft)	41.74	151.45
123.68				
E.G. Slope (ft/ft)	0.003397	Area (sq ft)	41.74	151.45
123.68				
Q Total (cfs)	1249.00	Flow (cfs)	83.39	959.38
206.23				
Top Width (ft)	178.44	Top Width (ft)	29.08	36.00
113.36				
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)	2.00	6.33
1.67				
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)	1.44	4.21
1.09				
Conv. Total (cfs)	21429.9	Conv. (cfs)	1430.8	16460.6
3538.5				
Length Wtd. (ft)	59.76	Wetted Per. (ft)	29.20	36.97
113.50				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.30	0.87
0.23				
Alpha	2.03	Stream Power (lb/ft s)	240.00	0.00

0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	0.09	0.98
0.35				
C & E Loss (ft)	0.06	Cum SA (acres)	0.09	0.27
0.25				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.91	Flow Area (sq ft)	54.09	165.90
169.53				
E.G. Slope (ft/ft)	0.003104	Area (sq ft)	54.09	165.90
169.53				
Q Total (cfs)	1512.00	Flow (cfs)	114.16	1067.61
330.22				
Top Width (ft)	183.39	Top Width (ft)	32.43	36.00
114.96				
Vel Total (ft/s)	3.88	Avg. Vel. (ft/s)	2.11	6.44
1.95				
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	1.67	4.61
1.47				
Conv. Total (cfs)	27137.6	Conv. (cfs)	2049.0	19161.7
5926.9				
Length Wtd. (ft)	56.72	Wetted Per. (ft)	32.57	36.97
115.16				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.32	0.87
0.29				
Alpha	2.02	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.12	1.07
0.43				
C & E Loss (ft)	0.06	Cum SA (acres)	0.11	0.28
0.26				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				

W.S. Elev (ft)	851.87	Reach Len. (ft)	85.00	68.00	5.00
Crit W.S. (ft)		Flow Area (sq ft)	66.98	179.55	213.39
E.G. Slope (ft/ft)	0.002921	Area (sq ft)	66.98	179.55	213.39
Q Total (cfs)	1796.00	Flow (cfs)	148.62	1181.49	465.89
Top Width (ft)	188.07	Top Width (ft)	35.58	36.00	116.48
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.22	6.58	2.18
Max Chl Dpth (ft)	6.23	Hydr. Depth (ft)	1.88	4.99	1.83
Conv. Total (cfs)	33229.9	Conv. (cfs)	2749.8	21860.2	8619.9
Length Wtd. (ft)	54.36	Wetted Per. (ft)	35.75	36.97	116.72
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.34	0.89	0.33
Alpha	1.98	Stream Power (lb/ft s)	240.00	0.00	0.00
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.16	1.15	0.50
C & E Loss (ft)	0.07	Cum SA (acres)	0.13	0.28	0.27

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 400

INPUT
Description: X-400
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	875	7	859	22	851	36	851	42	847
48	846	55	845.52	67	846	72	849	83	849
108	849	141	851	168	849	170	850	175	852
190	860								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	36	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36	72	125	105	45	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	848.99	Element	Left OB	Channel
Vel Head (ft)	0.60	Wt. n-Val.		0.035

W.S. Elev (ft)	848.39	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)		Flow Area (sq ft)		67.38
E.G. Slope (ft/ft)	0.008031	Area (sq ft)		67.38
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	31.05	Top Width (ft)		31.05
Vel Total (ft/s)	6.22	Avg. Vel. (ft/s)		6.22
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		2.17
Conv. Total (cfs)	4675.5	Conv. (cfs)		4675.5
Length Wtd. (ft)	105.00	Wetted Per. (ft)		32.24
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.05
Alpha	1.00	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)		0.36
0.11				
C & E Loss (ft)	0.04	Cum SA (acres)		0.19
0.07				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	850.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.03	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.58	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	849.58	Flow Area (sq ft)		106.31
26.03				
E.G. Slope (ft/ft)	0.008968	Area (sq ft)		106.31
26.03				
Q Total (cfs)	928.00	Flow (cfs)		886.58
41.42				
Top Width (ft)	88.29	Top Width (ft)		33.86
54.42				
Vel Total (ft/s)	7.01	Avg. Vel. (ft/s)		8.34
1.59				
Max Chl Dpth (ft)	4.06	Hydr. Depth (ft)		3.14
0.48				
Conv. Total (cfs)	9799.5	Conv. (cfs)		9362.1
437.4				
Length Wtd. (ft)	102.85	Wetted Per. (ft)		35.58
54.60				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.67
0.27				
Alpha	1.35	Stream Power (lb/ft s)	190.00	0.00
0.00				

Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	0.02	0.64
0.21				
C & E Loss (ft)	0.01	Cum SA (acres)	0.04	0.22
0.15				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.06	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.16	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	850.16	Flow Area (sq ft)		126.41
63.43				
E.G. Slope (ft/ft)	0.008144	Area (sq ft)		126.41
63.43				
Q Total (cfs)	1249.00	Flow (cfs)		1105.86
143.14				
Top Width (ft)	108.00	Top Width (ft)		34.74
73.26				
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)		8.75
2.26				
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		3.64
0.87				
Conv. Total (cfs)	13840.2	Conv. (cfs)		12254.1
1586.1				
Length Wtd. (ft)	98.42	Wetted Per. (ft)		36.64
73.61				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.75
0.44				
Alpha	1.58	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.05	0.76
0.34				
C & E Loss (ft)	0.03	Cum SA (acres)	0.07	0.22
0.24				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.63	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.10	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.54	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	850.54	Flow Area (sq ft)		139.58
93.27				
E.G. Slope (ft/ft)	0.007912	Area (sq ft)		139.58
93.27				
Q Total (cfs)	1512.00	Flow (cfs)		1270.14
241.86				
Top Width (ft)	120.79	Top Width (ft)		35.31
85.48				
Vel Total (ft/s)	6.49	Avg. Vel. (ft/s)		9.10
2.59				
Max Chl Dpth (ft)	5.02	Hydr. Depth (ft)		3.95
1.09				
Conv. Total (cfs)	16998.2	Conv. (cfs)		14279.1
2719.1				
Length Wtd. (ft)	95.71	Wetted Per. (ft)		37.32
85.92				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.85
0.54				
Alpha	1.68	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	0.07	0.83
0.41				
C & E Loss (ft)	0.03	Cum SA (acres)	0.08	0.22
0.25				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.02	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.17	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.85	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	850.85	Flow Area (sq ft)		150.61
121.36				
E.G. Slope (ft/ft)	0.008098	Area (sq ft)		150.61
121.36				
Q Total (cfs)	1796.00	Flow (cfs)		1444.17
351.83				
Top Width (ft)	131.34	Top Width (ft)		35.77
95.56				

Vel Total (ft/s)	6.60	Avg. Vel. (ft/s)			9.59
2.90					
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)			4.21
1.27					
Conv. Total (cfs)	19958.3	Conv. (cfs)			16048.5
3909.8					
Length Wtd. (ft)	93.76	Wetted Per. (ft)			37.88
96.09					
Min Ch El (ft)	845.52	Shear (lb/sq ft)			2.01
0.64					
Alpha	1.73	Stream Power (lb/ft s)		190.00	0.00
0.00					
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)		0.09	0.89
0.48					
C & E Loss (ft)	0.02	Cum SA (acres)		0.09	0.22
0.26					

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 300

INPUT
Description: X-300
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	885	7	878	9	849	21	850	26	848
33	848	37	845	49	844	57	845	64	848
84	848	88	849	112	848	126	849	152	849
162	853	180	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	64	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	64	125	98	20	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	847.81	Element		Left OB	Channel
Right OB					
Vel Head (ft)	1.00	Wt. n-Val.			0.035
W.S. Elev (ft)	846.81	Reach Len. (ft)		125.00	98.00
20.00					
Crit W.S. (ft)	846.81	Flow Area (sq ft)			52.28
E.G. Slope (ft/ft)	0.015301	Area (sq ft)			52.28

Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	26.65	Top Width (ft)		26.65
Vel Total (ft/s)	8.01	Avg. Vel. (ft/s)		8.01
Max Chl Dpth (ft)	2.81	Hydr. Depth (ft)		1.96
Conv. Total (cfs)	3387.3	Conv. (cfs)		3387.3
Length Wtd. (ft)	81.71	Wetted Per. (ft)		27.73
Min Ch El (ft)	844.00	Shear (lb/sq ft)		1.80
Alpha	1.00	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)		0.22
0.11				
C & E Loss (ft)	0.23	Cum SA (acres)		0.12
0.07				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	848.58	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	848.58	Flow Area (sq ft)	4.46	104.41
18.57				
E.G. Slope (ft/ft)	0.008644	Area (sq ft)	4.46	104.41
18.57				
Q Total (cfs)	928.00	Flow (cfs)	7.26	893.27
27.47				
Top Width (ft)	83.71	Top Width (ft)	8.44	31.00
44.27				
Vel Total (ft/s)	7.28	Avg. Vel. (ft/s)	1.63	8.56
1.48				
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	0.53	3.37
0.42				
Conv. Total (cfs)	9981.4	Conv. (cfs)	78.1	9607.9

295.4				
Length Wtd. (ft)	81.24	Wetted Per. (ft)	8.56	32.72
44.37				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.28	1.72
0.23				
Alpha	1.33	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.01	0.38
0.19				
C & E Loss (ft)	0.20	Cum SA (acres)	0.03	0.14
0.10				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	850.32	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.95	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.38	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	849.38	Flow Area (sq ft)	12.85	129.15
74.25				
E.G. Slope (ft/ft)	0.006228	Area (sq ft)	12.85	129.15
74.25				
Q Total (cfs)	1249.00	Flow (cfs)	28.16	1080.74
140.10				
Top Width (ft)	134.92	Top Width (ft)	14.98	31.00
88.94				
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	2.19	8.37
1.89				
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)	0.86	4.17
0.83				
Conv. Total (cfs)	15826.9	Conv. (cfs)	356.9	13694.8
1775.3				
Length Wtd. (ft)	78.24	Wetted Per. (ft)	15.61	32.72
89.19				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.32	1.53
0.32				
Alpha	1.83	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.03	0.46
0.27				
C & E Loss (ft)	0.10	Cum SA (acres)	0.04	0.14
0.15				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	850.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.70	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	849.70	Flow Area (sq ft)	18.40	139.09	102.88
E.G. Slope (ft/ft)	0.006282	Area (sq ft)	18.40	139.09	102.88
Q Total (cfs)	1512.00	Flow (cfs)	43.16	1228.10	240.74
Top Width (ft)	140.38	Top Width (ft)	19.64	31.00	89.74
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)	2.35	8.83	2.34
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)	0.94	4.49	1.15
Conv. Total (cfs)	19076.9	Conv. (cfs)	544.5	15494.9	3037.5
Length Wtd. (ft)	76.59	Wetted Per. (ft)	20.65	32.72	90.05
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.35	1.67	0.45
Alpha	1.91	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.04	0.49	0.31
C & E Loss (ft)	0.07	Cum SA (acres)	0.05	0.14	0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	851.05	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.12	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.93	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	849.93	Flow Area (sq ft)	23.39	146.34
123.95				
E.G. Slope (ft/ft)	0.006844	Area (sq ft)	23.39	146.34
123.95				
Q Total (cfs)	1796.00	Flow (cfs)	59.62	1395.20
341.18				
Top Width (ft)	144.38	Top Width (ft)	23.05	31.00
90.33				
Vel Total (ft/s)	6.12	Avg. Vel. (ft/s)	2.55	9.53
2.75				
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	1.01	4.72
1.37				
Conv. Total (cfs)	21710.1	Conv. (cfs)	720.7	16865.1
4124.2				
Length Wtd. (ft)	75.20	Wetted Per. (ft)	24.33	32.72
90.68				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.41	1.91
0.58				
Alpha	1.93	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.06	0.53
0.35				
C & E Loss (ft)	0.07	Cum SA (acres)	0.06	0.14
0.16				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 200

INPUT
Description: X-200
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	873	8	857	23	848	31	847	35	844
44	843	50	845	62	847	68	848	81	847
84	847	93	845	109	844	117	844	123	848

141	850	156	852	172	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	31	.035	62	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
31	62	115	105	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	846.77	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	846.53	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	845.76	Flow Area (sq ft)		53.69
62.72				
E.G. Slope (ft/ft)	0.005017	Area (sq ft)		53.69
62.72				
Q Total (cfs)	419.00	Flow (cfs)		244.03
174.97				
Top Width (ft)	62.21	Top Width (ft)		27.54
34.67				
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)		4.55
2.79				
Max Chl Dpth (ft)	3.53	Hydr. Depth (ft)		1.95
1.81				
Conv. Total (cfs)	5915.6	Conv. (cfs)		3445.3
2470.3				
Length Wtd. (ft)	91.70	Wetted Per. (ft)		28.89
35.63				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		0.58
0.55				
Alpha	1.18	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		0.10
0.09				
C & E Loss (ft)	0.04	Cum SA (acres)		0.06
0.06				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	848.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	847.72	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	846.73	Flow Area (sq ft)	2.08	89.86
114.30				
E.G. Slope (ft/ft)	0.005393	Area (sq ft)	2.08	89.86
114.30				

Q Total (cfs)	928.00	Flow (cfs)	2.08	551.42 374.50
Top Width (ft)	92.06	Top Width (ft)	5.77	31.00 55.29
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	1.00	6.14 3.28
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)	0.36	2.90 2.07
Conv. Total (cfs)	12637.1	Conv. (cfs)	28.4	7509.0 5099.7
Length Wtd. (ft)	91.64	Wetted Per. (ft)	5.82	32.55 56.75
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.12	0.93 0.68
Alpha	1.32	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	0.00	0.16 0.16
C & E Loss (ft)	0.07	Cum SA (acres)	0.01	0.07 0.08

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	848.59	Element	Left OB	Channel Right OB
Vel Head (ft)	0.63	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	847.96	Reach Len. (ft)	115.00	105.00 75.00
Crit W.S. (ft)	847.10	Flow Area (sq ft)	3.72	97.38 128.31
E.G. Slope (ft/ft)	0.007417	Area (sq ft)	3.72	97.38 128.31
Q Total (cfs)	1249.00	Flow (cfs)	5.29	739.33 504.39
Top Width (ft)	98.97	Top Width (ft)	7.71	31.00 60.26
Vel Total (ft/s)	5.44	Avg. Vel. (ft/s)	1.42	7.59 3.93
Max Chl Dpth (ft)	4.96	Hydr. Depth (ft)	0.48	3.14 2.13
Conv. Total (cfs)	14502.5	Conv. (cfs)	61.4	8584.5 5856.5
Length Wtd. (ft)	91.76	Wetted Per. (ft)	7.77	32.55 61.83
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.22	1.39 0.96
Alpha	1.36	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	0.01	0.20

0.22					
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07	
0.12					

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	849.00	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.76	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	848.24	Reach Len. (ft)	115.00	105.00	
75.00					
Crit W.S. (ft)	847.51	Flow Area (sq ft)	5.93	105.79	
145.10					
E.G. Slope (ft/ft)	0.008200	Area (sq ft)	5.93	105.79	
145.10					
Q Total (cfs)	1512.00	Flow (cfs)	11.39	892.49	
608.12					
Top Width (ft)	102.51	Top Width (ft)	8.39	31.00	
63.12					
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)	1.92	8.44	
4.19					
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	0.71	3.41	
2.30					
Conv. Total (cfs)	16697.5	Conv. (cfs)	125.8	9856.0	
6715.7					
Length Wtd. (ft)	91.54	Wetted Per. (ft)	8.52	32.55	
64.71					
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.36	1.66	
1.15					
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00	
0.00					
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	0.01	0.22	
0.26					
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07	
0.12					

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	849.39	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.87	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	848.51	Reach Len. (ft)	115.00	105.00	
75.00					
Crit W.S. (ft)	847.83	Flow Area (sq ft)	8.32	114.38	
162.93					
E.G. Slope (ft/ft)	0.008588	Area (sq ft)	8.32	114.38	
162.93					
Q Total (cfs)	1796.00	Flow (cfs)	19.67	1040.27	
736.06					

Top Width (ft)	105.46	Top Width (ft)	8.85	31.00	65.61
Vel Total (ft/s)	6.29	Avg. Vel. (ft/s)	2.37	9.09	4.52
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	0.94	3.69	2.48
Conv. Total (cfs)	19379.8	Conv. (cfs)	212.3	11225.0	7942.5
Length Wtd. (ft)	91.24	Wetted Per. (ft)	9.06	32.55	67.22
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.49	1.88	1.30
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00	0.00
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)	0.01	0.24	0.29
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07	0.13

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 100

INPUT
Description: X-100
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	861	23	846	26	845	38	843	45	844
50	846	72	846	90	846	94	844	116	844
126	844	136	851	141	852	160	856	172	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	23	.035	50	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23	50	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	845.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	845.28	Reach Len. (ft)			
Crit W.S. (ft)	845.28	Flow Area (sq ft)		29.91	43.65
E.G. Slope (ft/ft)	0.022329	Area (sq ft)		29.91	43.65
Q Total (cfs)	419.00	Flow (cfs)		222.54	196.46
Top Width (ft)	59.40	Top Width (ft)		23.02	36.38

Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		7.44
4.50				
Max Chl Dpth (ft)	2.28	Hydr. Depth (ft)		1.30
1.20				
Conv. Total (cfs)	2804.0	Conv. (cfs)		1489.3
1314.7				
Length Wtd. (ft)		Wetted Per. (ft)		23.55
37.08				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		1.77
1.64				
Alpha	1.20	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	847.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.15	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.95	Reach Len. (ft)		
Crit W.S. (ft)	845.95	Flow Area (sq ft)		46.72
69.01				
E.G. Slope (ft/ft)	0.028303	Area (sq ft)		46.72
69.01				
Q Total (cfs)	928.00	Flow (cfs)		475.06
452.94				
Top Width (ft)	65.43	Top Width (ft)		26.74
38.69				
Vel Total (ft/s)	8.02	Avg. Vel. (ft/s)		10.17
6.56				
Max Chl Dpth (ft)	2.95	Hydr. Depth (ft)		1.75
1.78				
Conv. Total (cfs)	5516.1	Conv. (cfs)		2823.8
2692.3				
Length Wtd. (ft)		Wetted Per. (ft)		27.51
39.77				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		3.00
3.07				
Alpha	1.15	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	847.64	Element	Left OB	Channel

Right OB				
Vel Head (ft)	0.86	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	846.78	Reach Len. (ft)		
Crit W.S. (ft)	846.78	Flow Area (sq ft)	0.47	69.14
133.03				
E.G. Slope (ft/ft)	0.014462	Area (sq ft)	0.47	69.14
133.03				
Q Total (cfs)	1249.00	Flow (cfs)	0.73	648.21
600.06				
Top Width (ft)	108.18	Top Width (ft)	1.20	27.00
79.98				
Vel Total (ft/s)	6.16	Avg. Vel. (ft/s)	1.54	9.38
4.51				
Max Chl Dpth (ft)	3.78	Hydr. Depth (ft)	0.39	2.56
1.66				
Conv. Total (cfs)	10385.8	Conv. (cfs)	6.0	5390.1
4989.7				
Length Wtd. (ft)		Wetted Per. (ft)	1.43	27.78
81.32				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.30	2.25
1.48				
Alpha	1.46	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	847.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.97	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	847.02	Reach Len. (ft)		
Crit W.S. (ft)	847.02	Flow Area (sq ft)	0.79	75.49
151.90				
E.G. Slope (ft/ft)	0.014734	Area (sq ft)	0.79	75.49
151.90				
Q Total (cfs)	1512.00	Flow (cfs)	1.48	757.56
752.97				
Top Width (ft)	108.87	Top Width (ft)	1.56	27.00
80.31				
Vel Total (ft/s)	6.63	Avg. Vel. (ft/s)	1.86	10.03
4.96				
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)	0.51	2.80
1.89				
Conv. Total (cfs)	12456.4	Conv. (cfs)	12.2	6241.0
6203.2				
Length Wtd. (ft)		Wetted Per. (ft)	1.86	27.78
81.74				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.39	2.50
1.71				
Alpha	1.43	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		

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

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	848.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	847.25	Reach Len. (ft)			
Crit W.S. (ft)	847.25	Flow Area (sq ft)	1.19	81.62	170.16
E.G. Slope (ft/ft)	0.015134	Area (sq ft)	1.19	81.62	170.16
Q Total (cfs)	1796.00	Flow (cfs)	2.56	874.37	919.07
Top Width (ft)	109.55	Top Width (ft)	1.91	27.00	80.64
Vel Total (ft/s)	7.10	Avg. Vel. (ft/s)	2.15	10.71	5.40
Max Chl Dpth (ft)	4.25	Hydr. Depth (ft)	0.62	3.02	2.11
Conv. Total (cfs)	14599.3	Conv. (cfs)	20.8	7107.6	7470.9
Length Wtd. (ft)		Wetted Per. (ft)	2.28	27.78	82.13
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.49	2.78	1.96
Alpha	1.40	Stream Power (lb/ft s)	172.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Bluestone Creek

Reach	River Sta.	n1	n2	n3
1	1500	.055	.035	.055
1	1400	.055	.035	.055
1	1300	.055	.035	.055
1	1200	.055	.035	.055
1	1100	.055	.035	.055
1	1000	.055	.035	.055
1	900	.055	.035	.055
1	810	Bridge		
1	800	.055	.035	.055
1	700	.055	.035	.055
1	600	.055	.035	.055
1	500	.055	.035	.055
1	400	.055	.035	.055
1	300	.055	.035	.055

1	200	.055	.035	.055
1	100	.055	.035	.055

SUMMARY OF REACH LENGTHS

River: Bluestone Creek

Reach	River Sta.	Left	Channel	Right
1	1500	97	101	105
1	1400	120	109	100
1	1300	95	88	88
1	1200	35	44	47
1	1100	80	58	55
1	1000	25	69	95
1	900	20	34	75
1	810	Bridge		
1	800	90	48	15
1	700	95	67	8
1	600	63	43	1
1	500	85	68	5
1	400	125	105	45
1	300	125	98	20
1	200	115	105	75
1	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Bluestone Creek

Reach	River Sta.	Contr.	Expan.
1	1500	.1	.3
1	1400	.1	.3
1	1300	.1	.3
1	1200	.1	.3
1	1100	.1	.3
1	1000	.1	.3
1	900	.1	.3
1	810	Bridge	
1	800	.1	.3
1	700	.1	.3
1	600	.1	.3
1	500	.1	.3
1	400	.1	.3
1	300	.1	.3
1	200	.1	.3
1	100	.1	.3

HEC-RAS Plan: 19 River: Bluestone Creek Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	1500	2 Year	378.00	849.00	852.18		852.40	0.002272	3.72	101.85	42.43	0.41
1	1500	10 Year	847.00	849.00	853.41		853.86	0.003125	5.45	167.74	62.52	0.50
1	1500	25 Year	1143.00	849.00	853.98		854.55	0.003471	6.22	204.98	68.76	0.54
1	1500	50 Year	1387.00	849.00	854.40		855.07	0.003602	6.76	244.95	101.64	0.56
1	1500	100 Year	1651.00	849.00	854.86		855.58	0.003448	7.06	295.11	115.06	0.56
1	1400	2 Year	378.00	848.00	851.76		852.10	0.003584	4.72	87.80	54.13	0.51
1	1400	10 Year	847.00	848.00	853.02		853.51	0.003941	6.07	185.19	85.46	0.56
1	1400	25 Year	1143.00	848.00	853.63		854.17	0.003879	6.53	241.47	96.18	0.57
1	1400	50 Year	1387.00	848.00	854.11		854.67	0.003699	6.78	289.52	105.05	0.56
1	1400	100 Year	1651.00	848.00	854.62		855.19	0.003373	6.95	345.83	116.49	0.55
1	1300	2 Year	419.00	848.00	851.11	850.53	851.69	0.005610	5.67	85.22	66.02	0.64
1	1300	10 Year	928.00	848.00	852.51		853.05	0.004144	6.58	201.55	95.88	0.59
1	1300	25 Year	1249.00	848.00	853.21		853.76	0.003550	6.81	272.35	104.12	0.56
1	1300	50 Year	1512.00	848.00	853.73		854.29	0.003237	6.99	327.94	110.15	0.55
1	1300	100 Year	1796.00	848.00	854.29		854.84	0.002890	7.08	390.88	115.35	0.53
1	1200	2 Year	419.00	847.00	851.13		851.28	0.001332	3.19	132.54	47.58	0.32
1	1200	10 Year	928.00	847.00	852.39		852.75	0.001963	4.89	206.28	67.83	0.41
1	1200	25 Year	1249.00	847.00	853.03		853.49	0.002158	5.62	251.96	76.02	0.45
1	1200	50 Year	1512.00	847.00	853.50		854.05	0.002248	6.09	289.61	82.17	0.46
1	1200	100 Year	1796.00	847.00	853.99		854.60	0.002293	6.52	331.13	88.44	0.47
1	1100	2 Year	419.00	847.00	850.87		851.18	0.003193	4.48	97.17	45.61	0.49
1	1100	10 Year	928.00	847.00	851.84		852.58	0.005204	7.05	146.96	57.38	0.65
1	1100	25 Year	1249.00	847.00	852.27	851.70	853.29	0.006255	8.33	172.84	63.15	0.73
1	1100	50 Year	1512.00	847.00	852.56	852.17	853.81	0.007080	9.28	191.89	67.29	0.79
1	1100	100 Year	1796.00	847.00	852.83	852.61	854.34	0.007999	10.26	210.19	71.04	0.84
1	1000	2 Year	419.00	847.00	850.86		851.03	0.001283	3.34	126.92	39.49	0.31
1	1000	10 Year	928.00	847.00	851.78		852.29	0.002875	5.82	169.30	54.16	0.48
1	1000	25 Year	1249.00	847.00	852.16		852.93	0.003883	7.14	191.34	60.99	0.57
1	1000	50 Year	1512.00	847.00	852.40		853.40	0.004780	8.18	206.34	65.23	0.64
1	1000	100 Year	1796.00	847.00	852.57	851.76	853.87	0.005949	9.33	218.05	68.35	0.72
1	900	2 Year	419.00	846.20	850.74	849.14	850.93	0.001521	3.70	140.50	68.47	0.35
1	900	10 Year	928.00	846.20	851.59	850.51	852.09	0.003046	6.07	204.67	81.39	0.52
1	900	25 Year	1249.00	846.20	851.94	851.10	852.64	0.004001	7.34	234.03	86.66	0.60
1	900	50 Year	1512.00	846.20	852.15	851.50	853.04	0.004922	8.37	251.78	89.79	0.67
1	900	100 Year	1796.00	846.20	852.21	851.88	853.42	0.006552	9.75	257.98	90.87	0.78
1	810		Bridge									
1	800	2 Year	419.00	846.00	849.83		849.94	0.001068	2.82	195.67	117.26	0.29
1	800	10 Year	928.00	846.00	851.36		851.50	0.000880	3.39	415.94	164.63	0.28
1	800	25 Year	1249.00	846.00	851.89		852.06	0.000963	3.83	505.82	172.94	0.30
1	800	50 Year	1512.00	846.00	852.29		852.48	0.001003	4.11	576.35	179.05	0.31
1	800	100 Year	1796.00	846.00	852.68		852.89	0.001040	4.39	647.42	184.94	0.32
1	700	2 Year	419.00	846.00	849.62		849.86	0.002214	3.90	107.47	37.67	0.41
1	700	10 Year	928.00	846.00	850.97		851.40	0.002679	5.44	209.14	103.00	0.47
1	700	25 Year	1249.00	846.00	851.35		851.94	0.003342	6.46	250.75	113.34	0.54
1	700	50 Year	1512.00	846.00	851.66		852.35	0.003710	7.11	286.27	121.46	0.57
1	700	100 Year	1796.00	846.00	851.95		852.75	0.004040	7.72	323.32	129.39	0.60
1	600	2 Year	419.00	845.00	849.32		849.67	0.003345	4.71	89.53	35.52	0.50
1	600	10 Year	928.00	845.00	850.66	849.57	851.20	0.003720	6.20	211.20	144.10	0.55
1	600	25 Year	1249.00	845.00	851.17		851.73	0.003722	6.62	285.04	145.71	0.56
1	600	50 Year	1512.00	845.00	851.54		852.11	0.003677	6.87	339.04	146.88	0.56
1	600	100 Year	1796.00	845.00	851.90		852.48	0.003652	7.12	391.63	148.01	0.57
1	500	2 Year	419.00	845.64	849.01		849.47	0.005935	5.43	78.57	41.83	0.65
1	500	10 Year	928.00	845.64	850.49	849.78	851.04	0.004133	6.31	212.05	171.04	0.59
1	500	25 Year	1249.00	845.64	851.09	850.64	851.58	0.003397	6.33	316.87	178.44	0.54
1	500	50 Year	1512.00	845.64	851.49	850.91	851.96	0.003104	6.44	389.51	183.39	0.53
1	500	100 Year	1796.00	845.64	851.87		852.34	0.002921	6.58	459.92	188.07	0.52
1	400	2 Year	419.00	845.52	848.39		848.99	0.008031	6.22	67.38	31.05	0.74
1	400	10 Year	928.00	845.52	849.58	849.58	850.61	0.008968	8.34	132.34	88.29	0.83
1	400	25 Year	1249.00	845.52	850.16	850.16	851.22	0.008144	8.75	189.85	108.00	0.81
1	400	50 Year	1512.00	845.52	850.54	850.54	851.63	0.007912	9.10	232.86	120.79	0.81
1	400	100 Year	1796.00	845.52	850.85	850.85	852.02	0.008098	9.59	271.97	131.34	0.82
1	300	2 Year	419.00	844.00	846.81	846.81	847.81	0.015301	8.01	52.28	26.65	1.01
1	300	10 Year	928.00	844.00	848.58	848.58	849.67	0.008644	8.56	127.44	83.71	0.82

HEC-RAS Plan: 19 River: Bluestone Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	300	25 Year	1249.00	844.00	849.38	849.38	850.32	0.006228	8.37	216.25	134.92	0.72
1	300	50 Year	1512.00	844.00	849.70	849.70	850.70	0.006282	8.83	260.36	140.38	0.73
1	300	100 Year	1796.00	844.00	849.93	849.93	851.05	0.006844	9.53	293.68	144.38	0.77
1	200	2 Year	419.00	843.00	846.53	845.76	846.77	0.005017	4.55	116.41	62.21	0.57
1	200	10 Year	928.00	843.00	847.72	846.73	848.14	0.005393	6.14	206.25	92.06	0.64
1	200	25 Year	1249.00	843.00	847.96	847.10	848.59	0.007417	7.59	229.41	98.97	0.75
1	200	50 Year	1512.00	843.00	848.24	847.51	849.00	0.008200	8.44	256.82	102.51	0.80
1	200	100 Year	1796.00	843.00	848.51	847.83	849.39	0.008588	9.09	285.63	105.46	0.83
1	100	2 Year	419.00	843.00	845.28	845.28	845.88	0.022329	7.44	73.56	59.40	1.15
1	100	10 Year	928.00	843.00	845.95	845.95	847.10	0.028303	10.17	115.73	65.43	1.36
1	100	25 Year	1249.00	843.00	846.78	846.78	847.64	0.014462	9.38	202.64	108.18	1.03
1	100	50 Year	1512.00	843.00	847.02	847.02	847.99	0.014734	10.03	228.19	108.87	1.06
1	100	100 Year	1796.00	843.00	847.25	847.25	848.34	0.015134	10.71	252.96	109.55	1.09

Appendix D

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: Bluestone Creek WEU 51
Project File : existing.prj
Run Date and Time: 9/13/2013 7:25:26 AM

Project in English units

PLAN DATA

Plan Title: Plan 19
Plan File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.p19

Geometry Title: Proposed 15" Pipe Low Water Crossing
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g03

Flow Title : Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Plan Summary Information:

Number of:	Cross Sections	= 15	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: Existing
Flow File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.f01

Flow Data (cfs)

River	Reach	RS	2 Year	10 Year	25 Year	50 Year	100 Year
Bluestone Creek	1	1500	378	847	1143	1387	1651
Bluestone Creek	1	1300	419	928	1249	1512	1796

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Bluestone Creek	1	2 Year		Critical
Bluestone Creek	1	10 Year		Critical
Bluestone Creek	1	25 Year		Critical
Bluestone Creek	1	50 Year		Critical
Bluestone Creek	1	100 Year		Critical

GEOMETRY DATA

Geometry Title: Proposed 15" Pipe Low Water Crossing
Geometry File : u:\2027051372\Project\Task #20 EQT WEU 51\HEC-RAS\existing.g03

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1500

INPUT
Description: X-1500
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	867	23	855	47	854	68	854	77	853
94	852	99	849	107	849	115	849	129	850
137	854	142	855	159	868				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	97	101	105	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.41	Element	Left OB	Channel
Right OB Vel Head (ft)	0.21	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	852.20	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	0.33	102.27
E.G. Slope (ft/ft)	0.002224	Area (sq ft)	0.33	102.27
Q Total (cfs)	378.00	Flow (cfs)	0.09	377.91
Top Width (ft)	42.77	Top Width (ft)	3.37	39.40
Vel Total (ft/s)	3.68	Avg. Vel. (ft/s)	0.27	3.70
Max Chl Dpth (ft)	3.20	Hydr. Depth (ft)	0.10	2.60
Conv. Total (cfs)	8016.0	Conv. (cfs)	1.9	8014.0
Length Wtd. (ft)	100.95	Wetted Per. (ft)	3.37	40.78
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.01	0.35
Alpha 0.00	1.01	Stream Power (lb/ft s)	159.00	0.00
Frctn Loss (ft) 0.15	0.28	Cum Volume (acre-ft)	0.13	2.04
C & E Loss (ft) 0.18	0.01	Cum SA (acres)	0.25	0.77

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.88	Element	Left OB	Channel
Right OB Vel Head (ft)	0.44	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.44	Reach Len. (ft)	97.00	101.00
105.00 Crit W.S. (ft)		Flow Area (sq ft)	16.90	152.83
E.G. Slope (ft/ft)	0.003035	Area (sq ft)	16.90	152.83
Q Total (cfs)	847.00	Flow (cfs)	21.74	825.26
Top Width (ft)	62.86	Top Width (ft)	20.98	41.88
Vel Total (ft/s)	4.99	Avg. Vel. (ft/s)	1.29	5.40
Max Chl Dpth (ft)	4.44	Hydr. Depth (ft)	0.81	3.65
Conv. Total (cfs)	15374.7	Conv. (cfs)	394.5	14980.2
Length Wtd. (ft)	100.62	Wetted Per. (ft)	21.03	43.56
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.15	0.66

Alpha	1.14	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	0.65	3.10
0.37				
C & E Loss (ft)	0.00	Cum SA (acres)	0.53	0.81
0.39				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.	0.055	0.035
0.000				
W.S. Elev (ft)	854.03	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	31.20	177.59
0.00				
E.G. Slope (ft/ft)	0.003430	Area (sq ft)	31.20	177.59
0.00				
Q Total (cfs)	1143.00	Flow (cfs)	37.20	1105.80
0.00				
Top Width (ft)	90.74	Top Width (ft)	47.61	43.00
0.13				
Vel Total (ft/s)	5.47	Avg. Vel. (ft/s)	1.19	6.23
0.08				
Max Chl Dpth (ft)	5.03	Hydr. Depth (ft)	0.66	4.13
0.01				
Conv. Total (cfs)	19517.0	Conv. (cfs)	635.2	18881.8
0.0				
Length Wtd. (ft)	100.49	Wetted Per. (ft)	47.69	44.81
0.13				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.14	0.85
Alpha	1.25	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	1.00	3.58
0.58				
C & E Loss (ft)	0.02	Cum SA (acres)	0.66	0.82
0.51				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	855.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.65	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.45	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	53.61	195.87
0.51				
E.G. Slope (ft/ft)	0.003450	Area (sq ft)	53.61	195.87
0.51				
Q Total (cfs)	1387.00	Flow (cfs)	80.82	1305.89
0.29				
Top Width (ft)	103.07	Top Width (ft)	57.81	43.00
2.25				

Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)	1.51	6.67
0.58				
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)	0.93	4.56
0.23				
Conv. Total (cfs)	23612.3	Conv. (cfs)	1375.9	22231.4
5.0				
Length Wtd. (ft)	100.38	Wetted Per. (ft)	57.91	44.81
2.30				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.20	0.94
0.05				
Alpha	1.36	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	1.27	3.90
0.71				
C & E Loss (ft)	0.04	Cum SA (acres)	0.74	0.82
0.54				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	855.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.70	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.90	Reach Len. (ft)	97.00	101.00
105.00				
Crit W.S. (ft)		Flow Area (sq ft)	81.90	215.12
2.02				
E.G. Slope (ft/ft)	0.003353	Area (sq ft)	81.90	215.12
2.02				
Q Total (cfs)	1651.00	Flow (cfs)	144.11	1505.06
1.83				
Top Width (ft)	116.05	Top Width (ft)	68.56	43.00
4.49				
Vel Total (ft/s)	5.52	Avg. Vel. (ft/s)	1.76	7.00
0.91				
Max Chl Dpth (ft)	5.90	Hydr. Depth (ft)	1.19	5.00
0.45				
Conv. Total (cfs)	28511.2	Conv. (cfs)	2488.7	25991.0
31.5				
Length Wtd. (ft)	100.26	Wetted Per. (ft)	68.66	44.81
4.58				
Min Ch El (ft)	849.00	Shear (lb/sq ft)	0.25	1.00
0.09				
Alpha	1.47	Stream Power (lb/ft s)	159.00	0.00
0.00				
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	1.59	4.21
0.85				
C & E Loss (ft)	0.04	Cum SA (acres)	0.82	0.82
0.58				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1400

INPUT
Description: X-1400

existing.rep

Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	863	17	855	48	853	57	851	85	852
101	852	110	848	117	848	126	849	135	854
142	855	168	868						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	101	.035	135	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
101	135	120	109	100 .1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	852.12	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.33	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	851.79	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	10.27	79.45
E.G. Slope (ft/ft)	0.003439	Area (sq ft)	10.27	79.45
Q Total (cfs)	378.00	Flow (cfs)	8.77	369.23
Top Width (ft)	55.40	Top Width (ft)	25.83	29.57
Vel Total (ft/s)	4.21	Avg. Vel. (ft/s)	0.85	4.65
Max Chl Dpth (ft)	3.79	Hydr. Depth (ft)	0.40	2.69
Conv. Total (cfs)	6445.8	Conv. (cfs)	149.6	6296.2
Length Wtd. (ft)	109.49	Wetted Per. (ft)	25.94	31.15
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.09	0.55
Alpha	1.19	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	0.12	1.83
0.15				
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.69
0.18				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.09	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	71.59	119.66
E.G. Slope (ft/ft)	0.003661	Area (sq ft)	71.59	119.66

Q Total (cfs)	847.00	Flow (cfs)	140.23	706.77
Top Width (ft)	86.68	Top Width (ft)	54.32	32.35
Vel Total (ft/s)	4.43	Avg. Vel. (ft/s)	1.96	5.91
Max Chl Dpth (ft)	5.09	Hydr. Depth (ft)	1.32	3.70
Conv. Total (cfs)	13999.1	Conv. (cfs)	2317.7	11681.4
Length Wtd. (ft)	111.05	Wetted Per. (ft)	54.56	34.32
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.30	0.80
Alpha	1.52	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	0.55	2.78
0.37				
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	0.72
0.39				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	854.23	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.50	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	853.73	Reach Len. (ft)	120.00	109.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	109.96	140.96
E.G. Slope (ft/ft)	0.003544	Area (sq ft)	109.96	140.96
Q Total (cfs)	1143.00	Flow (cfs)	252.12	890.88
Top Width (ft)	97.87	Top Width (ft)	64.35	33.52
Vel Total (ft/s)	4.56	Avg. Vel. (ft/s)	2.29	6.32
Max Chl Dpth (ft)	5.73	Hydr. Depth (ft)	1.71	4.21
Conv. Total (cfs)	19199.5	Conv. (cfs)	4234.9	14964.5
Length Wtd. (ft)	111.60	Wetted Per. (ft)	64.61	35.65
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.38	0.87
Alpha	1.56	Stream Power (lb/ft s)	168.00	0.00
0.00				
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	0.84	3.21
0.58				
C & E Loss (ft)	0.01	Cum SA (acres)	0.54	0.73
0.51				

CROSS SECTION OUTPUT Profile #50 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	854.72				
Vel Head (ft)	0.53	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	854.19	Reach Len. (ft)	120.00	109.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	140.81	156.35	0.12
E.G. Slope (ft/ft)	0.003462	Area (sq ft)	140.81	156.35	0.12
Q Total (cfs)	1387.00	Flow (cfs)	351.13	1035.83	0.04
Top Width (ft)	106.70	Top Width (ft)	71.39	34.00	1.31
Vel Total (ft/s)	4.67	Avg. Vel. (ft/s)	2.49	6.63	0.32
Max Chl Dpth (ft)	6.19	Hydr. Depth (ft)	1.97	4.60	0.09
Conv. Total (cfs)	23571.5	Conv. (cfs)	5967.3	17603.5	0.7
Length Wtd. (ft)	111.90	Wetted Per. (ft)	71.67	36.20	1.32
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.42	0.93	0.02
Alpha	1.58	Stream Power (lb/ft s)	168.00	0.00	0.00
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	1.06	3.49	0.71
C & E Loss (ft)	0.01	Cum SA (acres)	0.60	0.73	0.54

CROSS SECTION OUTPUT Profile #100 Year

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	855.22				
Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	854.67	Reach Len. (ft)	120.00	109.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	176.95	172.71	1.56
E.G. Slope (ft/ft)	0.003247	Area (sq ft)	176.95	172.71	1.56
Q Total (cfs)	1651.00	Flow (cfs)	465.79	1184.06	1.15
Top Width (ft)	117.53	Top Width (ft)	78.85	34.00	4.67
Vel Total (ft/s)	4.70	Avg. Vel. (ft/s)	2.63	6.86	0.74
Max Chl Dpth (ft)	6.67	Hydr. Depth (ft)	2.24	5.08	0.33
Conv. Total (cfs)	28974.3	Conv. (cfs)	8174.5	20779.6	20.2
Length Wtd. (ft)	112.14	Wetted Per. (ft)	79.14	36.20	4.72
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.45	0.97	0.07
Alpha	1.61	Stream Power (lb/ft s)	168.00	0.00	0.00
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	1.30	3.76	

0.84					
C & E Loss (ft)	0.01	Cum SA (acres)		0.66	0.73
0.57					

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1300

INPUT
Description: X-1300
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	860	45	852	66	851	80	851	100	850
110	848	116	848	123	848	129	851	147	854
183	876								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	100	.035	129	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	129	95	88	88	.1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.72	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.37	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.35	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	23.34	78.26
0.38				
E.G. Slope (ft/ft)	0.003862	Area (sq ft)	23.34	78.26
0.38				
Q Total (cfs)	419.00	Flow (cfs)	26.72	392.08
0.20				
Top Width (ft)	72.55	Top Width (ft)	41.43	29.00
2.12				
Vel Total (ft/s)	4.11	Avg. Vel. (ft/s)	1.14	5.01
0.52				
Max Chl Dpth (ft)	3.35	Hydr. Depth (ft)	0.56	2.70
0.18				
Conv. Total (cfs)	6742.4	Conv. (cfs)	430.0	6309.2
3.2				
Length Wtd. (ft)	88.23	Wetted Per. (ft)	41.46	29.91
2.15				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.14	0.63
0.04				
Alpha	1.40	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.07	1.64
0.15				
C & E Loss (ft)	0.07	Cum SA (acres)	0.12	0.61
0.18				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	853.16	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.70	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	94.38	117.30
8.67				
E.G. Slope (ft/ft)	0.003331	Area (sq ft)	94.38	117.30
8.67				
Q Total (cfs)	928.00	Flow (cfs)	201.17	714.81
12.02				
Top Width (ft)	98.14	Top Width (ft)	58.94	29.00
10.20				
Vel Total (ft/s)	4.21	Avg. Vel. (ft/s)	2.13	6.09
1.39				
Max Chl Dpth (ft)	4.70	Hydr. Depth (ft)	1.60	4.04
0.85				
Conv. Total (cfs)	16080.1	Conv. (cfs)	3485.9	12385.9
208.3				
Length Wtd. (ft)	88.83	Wetted Per. (ft)	59.05	29.91
10.34				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.33	0.82
0.17				
Alpha	1.67	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.32	2.48
0.36				
C & E Loss (ft)	0.04	Cum SA (acres)	0.29	0.65
0.38				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.48	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.38	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	135.81	137.04
17.01				
E.G. Slope (ft/ft)	0.003030	Area (sq ft)	135.81	137.04
17.01				
Q Total (cfs)	1249.00	Flow (cfs)	337.26	883.59
28.15				
Top Width (ft)	106.05	Top Width (ft)	62.77	29.00
14.29				
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	2.48	6.45
1.66				
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)	2.16	4.73
1.19				
Conv. Total (cfs)	22690.1	Conv. (cfs)	6126.9	16051.8
511.4				

Length Wtd. (ft)	89.07	Wetted Per. (ft)	62.94	29.91
14.48				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.41	0.87
0.22				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.50	2.86
0.56				
C & E Loss (ft)	0.02	Cum SA (acres)	0.36	0.65
0.49				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.36	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.51	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.85	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	165.58	150.52
24.29				
E.G. Slope (ft/ft)	0.002940	Area (sq ft)	165.58	150.52
24.29				
Q Total (cfs)	1512.00	Flow (cfs)	449.73	1017.67
44.61				
Top Width (ft)	111.45	Top Width (ft)	65.38	29.00
17.07				
Vel Total (ft/s)	4.44	Avg. Vel. (ft/s)	2.72	6.76
1.84				
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	2.53	5.19
1.42				
Conv. Total (cfs)	27884.1	Conv. (cfs)	8293.8	18767.7
822.6				
Length Wtd. (ft)	89.21	Wetted Per. (ft)	65.59	29.91
17.31				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.46	0.92
0.26				
Alpha	1.68	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.64	3.10
0.68				
C & E Loss (ft)	0.00	Cum SA (acres)	0.41	0.65
0.52				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.53	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.35	Reach Len. (ft)	95.00	88.00
88.00				
Crit W.S. (ft)		Flow Area (sq ft)	199.58	165.28
33.48				
E.G. Slope (ft/ft)	0.002749	Area (sq ft)	199.58	165.28
33.48				
Q Total (cfs)	1796.00	Flow (cfs)	576.69	1149.95

69.37				
Top Width (ft)	115.82	Top Width (ft)	68.24	29.00
18.58				
Vel Total (ft/s)	4.51	Avg. Vel. (ft/s)	2.89	6.96
2.07				
Max Chl Dpth (ft)	6.35	Hydr. Depth (ft)	2.92	5.70
1.80				
Conv. Total (cfs)	34255.8	Conv. (cfs)	10999.4	21933.4
1323.0				
Length Wtd. (ft)	89.33	Wetted Per. (ft)	68.50	29.91
18.93				
Min Ch El (ft)	848.00	Shear (lb/sq ft)	0.50	0.95
0.30				
Alpha	1.66	Stream Power (lb/ft s)	183.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.79	3.34
0.80				
C & E Loss (ft)	0.01	Cum SA (acres)	0.45	0.65
0.54				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1200

INPUT
Description: X-1200
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	27	856	58	854	79	852	94	851
102	848	115	847	125	848	134	848	137	850
149	855	190	876						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	94	.035	137	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
94	137	35	44	47	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.36	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.95	140.77
2.20				
E.G. Slope (ft/ft)	0.001042	Area (sq ft)	0.95	140.77
2.20				
Q Total (cfs)	419.00	Flow (cfs)	0.26	417.33
1.41				
Top Width (ft)	51.58	Top Width (ft)	5.33	43.00
3.25				
Vel Total (ft/s)	2.91	Avg. Vel. (ft/s)	0.28	2.96
0.64				
Max Chl Dpth (ft)	4.36	Hydr. Depth (ft)	0.18	3.27

0.68				
Conv. Total (cfs)	12981.8	Conv. (cfs)	8.1	12930.2
43.5				
Length Wtd. (ft)	43.94	Wetted Per. (ft)	5.34	44.24
3.52				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.01	0.21
0.04				
Alpha	1.03	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.04	1.41
0.15				
C & E Loss (ft)	0.01	Cum SA (acres)	0.07	0.54
0.18				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.92	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.32	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.59	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	18.21	193.94
8.06				
E.G. Slope (ft/ft)	0.001665	Area (sq ft)	18.21	193.94
8.06				
Q Total (cfs)	928.00	Flow (cfs)	18.10	899.89
10.01				
Top Width (ft)	70.43	Top Width (ft)	21.21	43.00
6.22				
Vel Total (ft/s)	4.21	Avg. Vel. (ft/s)	0.99	4.64
1.24				
Max Chl Dpth (ft)	5.59	Hydr. Depth (ft)	0.86	4.51
1.30				
Conv. Total (cfs)	22744.6	Conv. (cfs)	443.6	22055.5
245.4				
Length Wtd. (ft)	43.73	Wetted Per. (ft)	21.27	44.24
6.74				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.09	0.46
0.12				
Alpha	1.18	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.20	2.17
0.34				
C & E Loss (ft)	0.03	Cum SA (acres)	0.21	0.57
0.36				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.43	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.21	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	33.28	220.44
12.35				
E.G. Slope (ft/ft)	0.001887	Area (sq ft)	33.28	220.44
12.35				
Q Total (cfs)	1249.00	Flow (cfs)	44.07	1186.11
18.83				
Top Width (ft)	78.38	Top Width (ft)	27.68	43.00
7.70				
Vel Total (ft/s)	4.69	Avg. Vel. (ft/s)	1.32	5.38
1.52				
Max Chl Dpth (ft)	6.21	Hydr. Depth (ft)	1.20	5.13
1.60				
Conv. Total (cfs)	28752.0	Conv. (cfs)	1014.4	27304.2
433.4				
Length Wtd. (ft)	43.59	Wetted Per. (ft)	27.77	44.24
8.34				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.14	0.59
0.17				
Alpha	1.25	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	0.32	2.50
0.53				
C & E Loss (ft)	0.04	Cum SA (acres)	0.27	0.58
0.47				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	854.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.51	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.63	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	45.84	238.51
15.80				
E.G. Slope (ft/ft)	0.002061	Area (sq ft)	45.84	238.51
15.80				
Q Total (cfs)	1512.00	Flow (cfs)	71.14	1413.54
27.32				
Top Width (ft)	83.80	Top Width (ft)	32.09	43.00
8.71				
Vel Total (ft/s)	5.04	Avg. Vel. (ft/s)	1.55	5.93
1.73				
Max Chl Dpth (ft)	6.63	Hydr. Depth (ft)	1.43	5.55
1.81				
Conv. Total (cfs)	33302.3	Conv. (cfs)	1566.9	31133.7
601.7				
Length Wtd. (ft)	43.49	Wetted Per. (ft)	32.21	44.24
9.43				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.18	0.69

0.22				
Alpha	1.30	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.41	2.71
0.64				
C & E Loss (ft)	0.05	Cum SA (acres)	0.30	0.58
0.49				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.65	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.59	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	854.06	Reach Len. (ft)	35.00	44.00
47.00				
Crit W.S. (ft)		Flow Area (sq ft)	60.76	257.16
19.80				
E.G. Slope (ft/ft)	0.002188	Area (sq ft)	60.76	257.16
19.80				
Q Total (cfs)	1796.00	Flow (cfs)	106.71	1651.25
38.05				
Top Width (ft)	89.71	Top Width (ft)	36.96	43.00
9.75				
Vel Total (ft/s)	5.32	Avg. Vel. (ft/s)	1.76	6.42
1.92				
Max Chl Dpth (ft)	7.06	Hydr. Depth (ft)	1.64	5.98
2.03				
Conv. Total (cfs)	38391.5	Conv. (cfs)	2281.0	35297.2
813.3				
Length Wtd. (ft)	43.39	Wetted Per. (ft)	37.09	44.24
10.56				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.22	0.79
0.26				
Alpha	1.35	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	0.50	2.91
0.75				
C & E Loss (ft)	0.06	Cum SA (acres)	0.34	0.58
0.51				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1100

INPUT

Description: X-1100
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	53	856	67	854	92	852	113	850
118	847	127	848	140	848	142	849	148	850
158	856	171	869						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	113	.035	148	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
113	148	80	58	55	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.42	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.17	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	7.22	103.03
1.15				
E.G. Slope (ft/ft)	0.002197	Area (sq ft)	7.22	103.03
1.15				
Q Total (cfs)	419.00	Flow (cfs)	6.38	411.70
0.92				
Top Width (ft)	49.26	Top Width (ft)	12.31	35.00
1.95				
Vel Total (ft/s)	3.76	Avg. Vel. (ft/s)	0.88	4.00
0.80				
Max Chl Dpth (ft)	4.17	Hydr. Depth (ft)	0.59	2.94
0.59				
Conv. Total (cfs)	8939.6	Conv. (cfs)	136.1	8784.0
19.6				
Length Wtd. (ft)	58.16	Wetted Per. (ft)	12.36	36.21
2.28				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.08	0.39
0.07				
Alpha	1.11	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.04	1.29
0.14				
C & E Loss (ft)	0.03	Cum SA (acres)	0.07	0.50
0.17				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.79	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.59	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.20	Reach Len. (ft)	80.00	58.00
55.00				

Crit W.S. (ft)		Flow Area (sq ft)	25.35	138.85
4.02				
E.G. Slope (ft/ft)	0.003695	Area (sq ft)	25.35	138.85
4.02				
Q Total (cfs)	928.00	Flow (cfs)	43.72	877.94
6.34				
Top Width (ft)	62.10	Top Width (ft)	23.45	35.00
3.66				
Vel Total (ft/s)	5.52	Avg. Vel. (ft/s)	1.72	6.32
1.58				
Max Chl Dpth (ft)	5.20	Hydr. Depth (ft)	1.08	3.97
1.10				
Conv. Total (cfs)	15265.9	Conv. (cfs)	719.2	14442.4
104.2				
Length Wtd. (ft)	58.57	Wetted Per. (ft)	23.55	36.21
4.27				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.25	0.88
0.22				
Alpha	1.25	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.18	2.00
0.34				
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.53
0.36				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.80	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.68	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	38.27	155.92
6.00				
E.G. Slope (ft/ft)	0.004356	Area (sq ft)	38.27	155.92
6.00				
Q Total (cfs)	1249.00	Flow (cfs)	80.86	1156.39
11.75				
Top Width (ft)	69.01	Top Width (ft)	29.54	35.00
4.47				
Vel Total (ft/s)	6.24	Avg. Vel. (ft/s)	2.11	7.42
1.96				
Max Chl Dpth (ft)	5.68	Hydr. Depth (ft)	1.30	4.45
1.34				
Conv. Total (cfs)	18924.2	Conv. (cfs)	1225.2	17521.1
178.0				
Length Wtd. (ft)	58.84	Wetted Per. (ft)	29.66	36.21
5.22				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.35	1.17
0.31				
Alpha	1.32	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.29	2.31
0.52				
C & E Loss (ft)	0.05	Cum SA (acres)	0.24	0.54
0.46				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.99	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.96	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	47.05	165.74
7.32				
E.G. Slope (ft/ft)	0.005070	Area (sq ft)	47.05	165.74
7.32				
Q Total (cfs)	1512.00	Flow (cfs)	114.23	1381.25
16.52				
Top Width (ft)	72.99	Top Width (ft)	33.05	35.00
4.94				
Vel Total (ft/s)	6.87	Avg. Vel. (ft/s)	2.43	8.33
2.26				
Max Chl Dpth (ft)	5.96	Hydr. Depth (ft)	1.42	4.74
1.48				
Conv. Total (cfs)	21234.9	Conv. (cfs)	1604.2	19398.7
232.0				
Length Wtd. (ft)	59.01	Wetted Per. (ft)	33.18	36.21
5.76				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.45	1.45
0.40				
Alpha	1.36	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.37	2.51
0.63				
C & E Loss (ft)	0.06	Cum SA (acres)	0.28	0.54
0.48				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.45	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.19	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.26	Reach Len. (ft)	80.00	58.00
55.00				
Crit W.S. (ft)	852.63	Flow Area (sq ft)	57.52	176.23
8.88				
E.G. Slope (ft/ft)	0.005658	Area (sq ft)	57.52	176.23
8.88				
Q Total (cfs)	1796.00	Flow (cfs)	157.04	1616.39
22.57				
Top Width (ft)	77.24	Top Width (ft)	36.80	35.00
5.44				
Vel Total (ft/s)	7.40	Avg. Vel. (ft/s)	2.73	9.17
2.54				
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	1.56	5.04
1.63				
Conv. Total (cfs)	23877.7	Conv. (cfs)	2087.8	21489.9
300.1				
Length Wtd. (ft)	59.20	Wetted Per. (ft)	36.94	36.21
6.34				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.55	1.72
0.49				

Alpha	1.40	Stream Power (lb/ft s)	171.00	0.00
0.00				
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.45	2.69
0.74				
C & E Loss (ft)	0.06	Cum SA (acres)	0.31	0.54
0.51				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 1000

INPUT
Description: X-1000
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	857	9	856	17	855	35	853	60	851
62	847	91	847	95	850	111	853	125	863

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	60	.035	95	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60	95	25	69	95	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.15	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.16	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.16	135.56
3.58				
E.G. Slope (ft/ft)	0.000979	Area (sq ft)	0.16	135.56
3.58				
Q Total (cfs)	419.00	Flow (cfs)	0.02	416.90
2.08				
Top Width (ft)	43.17	Top Width (ft)	1.99	35.00
6.18				
Vel Total (ft/s)	3.01	Avg. Vel. (ft/s)	0.16	3.08
0.58				
Max Chl Dpth (ft)	4.16	Hydr. Depth (ft)	0.08	3.87
0.58				
Conv. Total (cfs)	13393.5	Conv. (cfs)	0.8	13326.2
66.5				
Length Wtd. (ft)	67.88	Wetted Per. (ft)	1.99	38.47
6.29				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.00	0.22
0.03				
Alpha	1.04	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.03	1.13
0.14				
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	0.46
0.17				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.43	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.15	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	8.20	170.09
12.27				
E.G. Slope (ft/ft)	0.002164	Area (sq ft)	8.20	170.09
12.27				
Q Total (cfs)	928.00	Flow (cfs)	7.09	904.93
15.98				
Top Width (ft)	60.76	Top Width (ft)	14.32	35.00
11.44				
Vel Total (ft/s)	4.87	Avg. Vel. (ft/s)	0.86	5.32
1.30				
Max Chl Dpth (ft)	5.15	Hydr. Depth (ft)	0.57	4.86
1.07				
Conv. Total (cfs)	19947.1	Conv. (cfs)	152.4	19451.2
343.5				
Length Wtd. (ft)	67.44	Wetted Per. (ft)	14.36	38.47
11.64				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.08	0.60
0.14				
Alpha	1.17	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	0.15	1.79
0.33				
C & E Loss (ft)	0.02	Cum SA (acres)	0.15	0.49
0.35				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.62	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.60	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	16.06	186.11
18.07				
E.G. Slope (ft/ft)	0.002813	Area (sq ft)	16.06	186.11
18.07				
Q Total (cfs)	1249.00	Flow (cfs)	19.82	1198.67
30.51				
Top Width (ft)	68.92	Top Width (ft)	20.04	35.00
13.88				
Vel Total (ft/s)	5.67	Avg. Vel. (ft/s)	1.23	6.44
1.69				
Max Chl Dpth (ft)	5.60	Hydr. Depth (ft)	0.80	5.32
1.30				
Conv. Total (cfs)	23548.2	Conv. (cfs)	373.6	22599.4
575.2				
Length Wtd. (ft)	67.22	Wetted Per. (ft)	20.10	38.47
14.12				

Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.14	0.85
0.22				
Alpha	1.24	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.24	2.08
0.51				
C & E Loss (ft)	0.04	Cum SA (acres)	0.20	0.49
0.45				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.66	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.81	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.85	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	21.38	194.74
21.65				
E.G. Slope (ft/ft)	0.003474	Area (sq ft)	21.38	194.74
21.65				
Q Total (cfs)	1512.00	Flow (cfs)	32.25	1436.58
43.16				
Top Width (ft)	73.32	Top Width (ft)	23.12	35.00
15.20				
Vel Total (ft/s)	6.36	Avg. Vel. (ft/s)	1.51	7.38
1.99				
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	0.92	5.56
1.42				
Conv. Total (cfs)	25652.9	Conv. (cfs)	547.2	24373.4
732.3				
Length Wtd. (ft)	67.09	Wetted Per. (ft)	23.19	38.47
15.46				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.20	1.10
0.30				
Alpha	1.28	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.31	2.27
0.61				
C & E Loss (ft)	0.06	Cum SA (acres)	0.23	0.49
0.47				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	854.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.11	Reach Len. (ft)	25.00	69.00
95.00				
Crit W.S. (ft)		Flow Area (sq ft)	27.83	203.89
25.79				
E.G. Slope (ft/ft)	0.004104	Area (sq ft)	27.83	203.89
25.79				
Q Total (cfs)	1796.00	Flow (cfs)	50.29	1685.54
60.17				
Top Width (ft)	77.15	Top Width (ft)	26.00	35.00

16.16				
Vel Total (ft/s)	6.97	Avg. Vel. (ft/s)	1.81	8.27
2.33				
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)	1.07	5.83
1.60				
Conv. Total (cfs)	28035.6	Conv. (cfs)	785.1	26311.2
939.3				
Length Wtd. (ft)	66.96	Wetted Per. (ft)	26.09	38.47
16.47				
Min Ch El (ft)	847.00	Shear (lb/sq ft)	0.27	1.36
0.40				
Alpha	1.32	Stream Power (lb/ft s)	125.00	0.00
0.00				
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.38	2.44
0.71				
C & E Loss (ft)	0.08	Cum SA (acres)	0.25	0.50
0.49				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 900

INPUT
Description: X-900
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846.2	87	846.2	100	849	128	852
148	854	157	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
70	100	20	34	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	851.24	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.15	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.09	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	849.14	Flow Area (sq ft)	32.06	113.13
20.41				
E.G. Slope (ft/ft)	0.001030	Area (sq ft)	32.06	113.13
20.41				
Q Total (cfs)	419.00	Flow (cfs)	33.35	367.50
18.15				
Top Width (ft)	73.79	Top Width (ft)	24.27	30.00
19.52				
Vel Total (ft/s)	2.53	Avg. Vel. (ft/s)	1.04	3.25
0.89				
Max Chl Dpth (ft)	4.89	Hydr. Depth (ft)	1.32	3.77
1.05				
Conv. Total (cfs)	13058.0	Conv. (cfs)	1039.3	11453.0

565.7				
Length Wtd. (ft)	34.00	Wetted Per. (ft)	24.40	30.72
19.63				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.08	0.24
0.07				
Alpha	1.46	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.02	0.94
0.11				
C & E Loss (ft)		Cum SA (acres)	0.04	0.40
0.14				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	852.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.36	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.06	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	850.51	Flow Area (sq ft)	58.15	142.07
43.57				
E.G. Slope (ft/ft)	0.002003	Area (sq ft)	58.15	142.07
43.57				
Q Total (cfs)	928.00	Flow (cfs)	109.24	749.20
69.56				
Top Width (ft)	88.38	Top Width (ft)	29.82	30.00
28.56				
Vel Total (ft/s)	3.81	Avg. Vel. (ft/s)	1.88	5.27
1.60				
Max Chl Dpth (ft)	5.86	Hydr. Depth (ft)	1.95	4.74
1.53				
Conv. Total (cfs)	20735.9	Conv. (cfs)	2440.9	16740.6
1554.3				
Length Wtd. (ft)	34.00	Wetted Per. (ft)	30.02	30.72
28.72				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.24	0.58
0.19				
Alpha	1.59	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.13	1.55
0.26				
C & E Loss (ft)		Cum SA (acres)	0.14	0.44
0.30				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	853.01	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.48	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.52	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	851.10	Flow Area (sq ft)	72.71	156.08
58.01				
E.G. Slope (ft/ft)	0.002459	Area (sq ft)	72.71	156.08
58.01				

Q Total (cfs)	1249.00	Flow (cfs)	165.76	971.01
112.24				
Top Width (ft)	95.73	Top Width (ft)	32.51	30.00
33.23				
Vel Total (ft/s)	4.35	Avg. Vel. (ft/s)	2.28	6.22
1.93				
Max Chl Dpth (ft)	6.32	Hydr. Depth (ft)	2.24	5.20
1.75				
Conv. Total (cfs)	25189.5	Conv. (cfs)	3342.9	19583.0
2263.6				
Length Wtd. (ft)	34.00	Wetted Per. (ft)	32.75	30.72
33.41				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.34	0.78
0.27				
Alpha	1.64	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.21	1.81
0.42				
C & E Loss (ft)		Cum SA (acres)	0.18	0.44
0.40				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	853.38	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.61	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	852.77	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	851.50	Flow Area (sq ft)	80.97	163.55
66.58				
E.G. Slope (ft/ft)	0.002965	Area (sq ft)	80.97	163.55
66.58				
Q Total (cfs)	1512.00	Flow (cfs)	211.58	1152.61
147.81				
Top Width (ft)	99.65	Top Width (ft)	33.94	30.00
35.72				
Vel Total (ft/s)	4.86	Avg. Vel. (ft/s)	2.61	7.05
2.22				
Max Chl Dpth (ft)	6.57	Hydr. Depth (ft)	2.39	5.45
1.86				
Conv. Total (cfs)	27768.3	Conv. (cfs)	3885.8	21168.0
2714.5				
Length Wtd. (ft)	34.00	Wetted Per. (ft)	34.20	30.72
35.91				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.44	0.99
0.34				
Alpha	1.66	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.28	1.98
0.52				
C & E Loss (ft)		Cum SA (acres)	0.21	0.44
0.42				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	853.78	Element	Left OB	Channel

Right OB				
Vel Head (ft)	0.74	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	853.04	Reach Len. (ft)	20.00	34.00
75.00				
Crit W.S. (ft)	851.88	Flow Area (sq ft)	90.45	171.73
76.70				
E.G. Slope (ft/ft)	0.003407	Area (sq ft)	90.45	171.73
76.70				
Q Total (cfs)	1796.00	Flow (cfs)	264.61	1340.41
190.98				
Top Width (ft)	103.95	Top Width (ft)	35.51	30.00
38.44				
Vel Total (ft/s)	5.30	Avg. Vel. (ft/s)	2.93	7.81
2.49				
Max Chl Dpth (ft)	6.84	Hydr. Depth (ft)	2.55	5.72
2.00				
Conv. Total (cfs)	30768.3	Conv. (cfs)	4533.1	22963.3
3271.8				
Length Wtd. (ft)	34.00	Wetted Per. (ft)	35.80	30.72
38.66				
Min Ch El (ft)	846.20	Shear (lb/sq ft)	0.54	1.19
0.42				
Alpha	1.69	Stream Power (lb/ft s)	157.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.34	2.14
0.60				
C & E Loss (ft)		Cum SA (acres)	0.23	0.44
0.43				

CULVERT

RIVER: Bluestone Creek
REACH: 1 RS: 810

INPUT
Description: New Crossing
Distance from Upstream XS = 2
Deck/Roadway Width = 30
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 7

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	852	0	60	849.3	0	100	849.3	0
200	851	0	216	852.5	0	233	854	0
245	856							

Upstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	855	19	854	29	854	52	850	70	849
71	849	80	846.2	87	846.2	100	849	128	852
148	854	157	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	100	.055

Bank Sta: Left	Right	Coeff Contr.	Expan.
70	100	.1	.3

```
Downstream  Deck/Roadway Coordinates
    num=       7
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0      852       0      60   849.3       0     100   849.3       0
     200      851       0     216   852.5       0     233     854       0
     245      856

Downstream Bridge Cross Section Data
Station Elevation Data    num=      13
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0      854      19      852      39      850      63      848      80      847
      89      846      97      846     107      848     163      850     188      851
     216      856     233      858     245      859

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .055      63    .035     107    .055

Bank Sta: Left   Right    Coeff Contr.   Expan.
            63     107             .1       .3

Upstream Embankment side slope                =       4 horiz. to 1.0 vertical
Downstream Embankment side slope              =       6 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins           =   849.3
Energy head used in spillway design           =
Spillway height used in design                =
Weir crest shape                              = Broad Crested

Number of Culverts =  4

Culvert Name     Shape      Rise    Span
Culvert #3      Circular    1.25
FHWA Chart # 55-  Circular Culvert
FHWA Scale # 1 - Smooth tapered inlet throat
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                2      30     .012     .012        0                    .5
      1
Upstream   Elevation =  846.2
           Centerline Station =  80
Downstream Elevation =  846
           Centerline Station =  89

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.25
FHWA Chart # 55-  Circular Culvert
FHWA Scale # 1 - Smooth tapered inlet throat
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                2      30     .012     .012        0                    .5
      1
Upstream   Elevation =  846.2
           Centerline Station =  82.5
Downstream Elevation =  846
           Centerline Station =  91.5

Culvert Name     Shape      Rise    Span
Culvert #2      Circular    1.25
FHWA Chart # 55-  Circular Culvert
```

FHWA Scale # 1 - Smooth tapered inlet throat
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
1	2	30	.012	.012	0	.4	

Upstream Elevation = 846.2
Centerline Station = 85
Downstream Elevation = 846
Centerline Station = 94

Culvert Name	Shape	Rise	Span
Culvert #4	Circular	1.25	

FHWA Chart # 55- Circular Culvert
FHWA Scale # 1 - Smooth tapered inlet throat
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
1	2	30	.012	.012	0	.5	

Upstream Elevation = 846.2
Centerline Station = 87.5
Downstream Elevation = 846
Centerline Station = 96.5

CULVERT OUTPUT Profile #2 Year Culv Group: Culvert #3

Q Culv Group (cfs)	8.09	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	6.60
Q Barrel (cfs)	8.09	Culv Vel DS (ft/s)	6.60
E.G. US. (ft)	851.24	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	851.09	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	849.94	Culv Frctn Ls (ft)	0.40
W.S. DS (ft)	849.83	Culv Exit Loss (ft)	0.57
Delta EG (ft)	1.30	Culv Entr Loss (ft)	0.34
Delta WS (ft)	1.26	Q Weir (cfs)	386.46
E.G. IC (ft)	848.18	Weir Sta Lft (ft)	44.90
E.G. OC (ft)	851.25	Weir Sta Rgt (ft)	120.86
Culvert Control	Outlet	Weir Submerg	0.21
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	1.94
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	1.52
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	115.69
Culv Crt Depth (ft)	1.12	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #10 Year Culv Group: Culvert #3

Q Culv Group (cfs)	7.00	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.71
Q Barrel (cfs)	7.00	Culv Vel DS (ft/s)	5.71
E.G. US. (ft)	852.41	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.06	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	851.50	Culv Frctn Ls (ft)	0.29
W.S. DS (ft)	851.36	Culv Exit Loss (ft)	0.37
Delta EG (ft)	0.92	Culv Entr Loss (ft)	0.25
Delta WS (ft)	0.69	Q Weir (cfs)	899.90
E.G. IC (ft)	847.96	Weir Sta Lft (ft)	38.11
E.G. OC (ft)	852.42	Weir Sta Rgt (ft)	132.16
Culvert Control	Outlet	Weir Submerg	0.58
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.12
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.30
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	215.97
Culv Crt Depth (ft)	1.06	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #25 Year Culv Group: Culvert #3

Q Culv Group (cfs)	7.20	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.87
Q Barrel (cfs)	7.20	Culv Vel DS (ft/s)	5.87
E.G. US. (ft)	853.01	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.52	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.06	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	851.89	Culv Exit Loss (ft)	0.37
Delta EG (ft)	0.95	Culv Entr Loss (ft)	0.27
Delta WS (ft)	0.63	Q Weir (cfs)	1220.10
E.G. IC (ft)	848.00	Weir Sta Lft (ft)	34.89
E.G. OC (ft)	853.01	Weir Sta Rgt (ft)	137.75
Culvert Control	Outlet	Weir Submerg	0.63
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.68
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.63
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	271.02
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #50 Year Culv Group: Culvert #3

Q Culv Group (cfs)	7.12	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.81
Q Barrel (cfs)	7.12	Culv Vel DS (ft/s)	5.81
E.G. US. (ft)	853.38	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.77	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.48	Culv Frctn Ls (ft)	0.30
W.S. DS (ft)	852.29	Culv Exit Loss (ft)	0.34
Delta EG (ft)	0.91	Culv Entr Loss (ft)	0.26
Delta WS (ft)	0.48	Q Weir (cfs)	1484.30
E.G. IC (ft)	847.99	Weir Sta Lft (ft)	32.54
E.G. OC (ft)	853.39	Weir Sta Rgt (ft)	141.84
Culvert Control	Outlet	Weir Submerg	0.66
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.08
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.88
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	314.38
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #100 Year Culv Group: Culvert #3

Q Culv Group (cfs)	7.16	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.83
Q Barrel (cfs)	7.16	Culv Vel DS (ft/s)	5.83
E.G. US. (ft)	853.79	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	853.04	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.89	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	852.68	Culv Exit Loss (ft)	0.33
Delta EG (ft)	0.90	Culv Entr Loss (ft)	0.26
Delta WS (ft)	0.36	Q Weir (cfs)	1768.81
E.G. IC (ft)	847.99	Weir Sta Lft (ft)	30.24
E.G. OC (ft)	853.79	Weir Sta Rgt (ft)	145.85
Culvert Control	Outlet	Weir Submerg	0.69
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.49
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	3.11
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	359.47
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #2 Year Culv Group: Culvert #1

Q Culv Group (cfs)	8.09	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	6.60
Q Barrel (cfs)	8.09	Culv Vel DS (ft/s)	6.60
E.G. US. (ft)	851.24	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	851.09	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	849.94	Culv Frctn Ls (ft)	0.40
W.S. DS (ft)	849.83	Culv Exit Loss (ft)	0.57
Delta EG (ft)	1.30	Culv Entr Loss (ft)	0.34
Delta WS (ft)	1.26	Q Weir (cfs)	386.46
E.G. IC (ft)	848.18	Weir Sta Lft (ft)	44.90
E.G. OC (ft)	851.25	Weir Sta Rgt (ft)	120.86
Culvert Control	Outlet	Weir Submerg	0.21
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	1.94
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	1.52
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	115.69
Culv Crt Depth (ft)	1.12	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #10 Year Culv Group: Culvert #1

Q Culv Group (cfs)	7.00	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.71
Q Barrel (cfs)	7.00	Culv Vel DS (ft/s)	5.71
E.G. US. (ft)	852.41	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.06	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	851.50	Culv Frctn Ls (ft)	0.29
W.S. DS (ft)	851.36	Culv Exit Loss (ft)	0.37
Delta EG (ft)	0.92	Culv Entr Loss (ft)	0.25
Delta WS (ft)	0.69	Q Weir (cfs)	899.90
E.G. IC (ft)	847.96	Weir Sta Lft (ft)	38.11
E.G. OC (ft)	852.42	Weir Sta Rgt (ft)	132.16
Culvert Control	Outlet	Weir Submerg	0.58
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.12
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.30
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	215.97
Culv Crt Depth (ft)	1.06	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #25 Year Culv Group: Culvert #1

Q Culv Group (cfs)	7.20	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.87
Q Barrel (cfs)	7.20	Culv Vel DS (ft/s)	5.87
E.G. US. (ft)	853.01	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.52	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.06	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	851.89	Culv Exit Loss (ft)	0.37
Delta EG (ft)	0.95	Culv Entr Loss (ft)	0.27
Delta WS (ft)	0.63	Q Weir (cfs)	1220.10
E.G. IC (ft)	848.00	Weir Sta Lft (ft)	34.89
E.G. OC (ft)	853.01	Weir Sta Rgt (ft)	137.75
Culvert Control	Outlet	Weir Submerg	0.63
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.68
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.63
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	271.02
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #50 Year Culv Group: Culvert #1

Q Culv Group (cfs)	7.13	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.81

Q Barrel (cfs)	7.13	Culv Vel DS (ft/s)	5.81
E.G. US. (ft)	853.38	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.77	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.48	Culv Frctn Ls (ft)	0.30
W.S. DS (ft)	852.29	Culv Exit Loss (ft)	0.34
Delta EG (ft)	0.91	Culv Entr Loss (ft)	0.26
Delta WS (ft)	0.48	Q Weir (cfs)	1484.30
E.G. IC (ft)	847.99	Weir Sta Lft (ft)	32.54
E.G. OC (ft)	853.39	Weir Sta Rgt (ft)	141.84
Culvert Control	Outlet	Weir Submerg	0.66
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.08
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.88
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	314.38
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #100 Year Culv Group: Culvert #1

Q Culv Group (cfs)	7.16	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.83
Q Barrel (cfs)	7.16	Culv Vel DS (ft/s)	5.83
E.G. US. (ft)	853.79	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	853.04	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.89	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	852.68	Culv Exit Loss (ft)	0.33
Delta EG (ft)	0.90	Culv Entr Loss (ft)	0.26
Delta WS (ft)	0.36	Q Weir (cfs)	1768.81
E.G. IC (ft)	847.99	Weir Sta Lft (ft)	30.24
E.G. OC (ft)	853.79	Weir Sta Rgt (ft)	145.85
Culvert Control	Outlet	Weir Submerg	0.69
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.49
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	3.11
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	359.47
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #2 Year Culv Group: Culvert #2

Q Culv Group (cfs)	8.26	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	6.73
Q Barrel (cfs)	8.26	Culv Vel DS (ft/s)	6.73
E.G. US. (ft)	851.24	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	851.09	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	849.94	Culv Frctn Ls (ft)	0.43
W.S. DS (ft)	849.83	Culv Exit Loss (ft)	0.59
Delta EG (ft)	1.30	Culv Entr Loss (ft)	0.28
Delta WS (ft)	1.26	Q Weir (cfs)	386.46
E.G. IC (ft)	848.21	Weir Sta Lft (ft)	44.90
E.G. OC (ft)	851.23	Weir Sta Rgt (ft)	120.86
Culvert Control	Outlet	Weir Submerg	0.21
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	1.94
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	1.52
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	115.69
Culv Crt Depth (ft)	1.13	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #10 Year Culv Group: Culvert #2

Q Culv Group (cfs)	7.10	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.78
Q Barrel (cfs)	7.10	Culv Vel DS (ft/s)	5.78
E.G. US. (ft)	852.41	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.06	Culv Inv El Dn (ft)	846.00

E.G. DS (ft)	851.50	Culv Frctn Ls (ft)	0.33
W.S. DS (ft)	851.36	Culv Exit Loss (ft)	0.38
Delta EG (ft)	0.92	Culv Entr Loss (ft)	0.21
Delta WS (ft)	0.69	Q Weir (cfs)	899.90
E.G. IC (ft)	847.98	Weir Sta Lft (ft)	38.11
E.G. OC (ft)	852.40	Weir Sta Rgt (ft)	132.16
Culvert Control	Outlet	Weir Submerg	0.58
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.12
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.30
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	215.97
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #25 Year Culv Group: Culvert #2

Q Culv Group (cfs)	7.30	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.95
Q Barrel (cfs)	7.30	Culv Vel DS (ft/s)	5.95
E.G. US. (ft)	853.01	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.52	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.06	Culv Frctn Ls (ft)	0.34
W.S. DS (ft)	851.89	Culv Exit Loss (ft)	0.39
Delta EG (ft)	0.95	Culv Entr Loss (ft)	0.22
Delta WS (ft)	0.63	Q Weir (cfs)	1220.10
E.G. IC (ft)	848.02	Weir Sta Lft (ft)	34.89
E.G. OC (ft)	852.99	Weir Sta Rgt (ft)	137.75
Culvert Control	Outlet	Weir Submerg	0.63
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.68
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.63
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	271.02
Culv Crt Depth (ft)	1.08	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #50 Year Culv Group: Culvert #2

Q Culv Group (cfs)	7.21	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.88
Q Barrel (cfs)	7.21	Culv Vel DS (ft/s)	5.88
E.G. US. (ft)	853.38	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.77	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.48	Culv Frctn Ls (ft)	0.34
W.S. DS (ft)	852.29	Culv Exit Loss (ft)	0.35
Delta EG (ft)	0.91	Culv Entr Loss (ft)	0.21
Delta WS (ft)	0.48	Q Weir (cfs)	1484.30
E.G. IC (ft)	848.00	Weir Sta Lft (ft)	32.54
E.G. OC (ft)	853.36	Weir Sta Rgt (ft)	141.84
Culvert Control	Outlet	Weir Submerg	0.66
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.08
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.88
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	314.38
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #100 Year Culv Group: Culvert #2

Q Culv Group (cfs)	7.25	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.91
Q Barrel (cfs)	7.25	Culv Vel DS (ft/s)	5.91
E.G. US. (ft)	853.79	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	853.04	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.89	Culv Frctn Ls (ft)	0.34
W.S. DS (ft)	852.68	Culv Exit Loss (ft)	0.34
Delta EG (ft)	0.90	Culv Entr Loss (ft)	0.22

Delta WS (ft)	0.36	Q Weir (cfs)	1768.81
E.G. IC (ft)	848.01	Weir Sta Lft (ft)	30.24
E.G. OC (ft)	853.76	Weir Sta Rgt (ft)	145.85
Culvert Control	Outlet	Weir Submerg	0.69
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.49
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	3.11
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	359.47
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #2 Year Culv Group: Culvert #4

Q Culv Group (cfs)	8.09	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	6.60
Q Barrel (cfs)	8.09	Culv Vel DS (ft/s)	6.60
E.G. US. (ft)	851.24	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	851.09	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	849.94	Culv Frctn Ls (ft)	0.40
W.S. DS (ft)	849.83	Culv Exit Loss (ft)	0.57
Delta EG (ft)	1.30	Culv Entr Loss (ft)	0.34
Delta WS (ft)	1.26	Q Weir (cfs)	386.46
E.G. IC (ft)	848.18	Weir Sta Lft (ft)	44.90
E.G. OC (ft)	851.25	Weir Sta Rgt (ft)	120.86
Culvert Control	Outlet	Weir Submerg	0.21
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	1.94
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	1.52
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	115.69
Culv Crt Depth (ft)	1.12	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #10 Year Culv Group: Culvert #4

Q Culv Group (cfs)	7.00	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.71
Q Barrel (cfs)	7.00	Culv Vel DS (ft/s)	5.71
E.G. US. (ft)	852.41	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.06	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	851.50	Culv Frctn Ls (ft)	0.29
W.S. DS (ft)	851.36	Culv Exit Loss (ft)	0.37
Delta EG (ft)	0.92	Culv Entr Loss (ft)	0.25
Delta WS (ft)	0.69	Q Weir (cfs)	899.90
E.G. IC (ft)	847.96	Weir Sta Lft (ft)	38.11
E.G. OC (ft)	852.42	Weir Sta Rgt (ft)	132.16
Culvert Control	Outlet	Weir Submerg	0.58
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.12
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.30
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	215.97
Culv Crt Depth (ft)	1.06	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #25 Year Culv Group: Culvert #4

Q Culv Group (cfs)	7.20	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.87
Q Barrel (cfs)	7.20	Culv Vel DS (ft/s)	5.87
E.G. US. (ft)	853.01	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.52	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.06	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	851.89	Culv Exit Loss (ft)	0.37
Delta EG (ft)	0.95	Culv Entr Loss (ft)	0.27
Delta WS (ft)	0.63	Q Weir (cfs)	1220.10
E.G. IC (ft)	848.00	Weir Sta Lft (ft)	34.89
E.G. OC (ft)	853.01	Weir Sta Rgt (ft)	137.75

Culvert Control	Outlet	Weir Submerg	0.63
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	3.68
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.63
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	271.02
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #50 Year Culv Group: Culvert #4

Q Culv Group (cfs)	7.13	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.81
Q Barrel (cfs)	7.13	Culv Vel DS (ft/s)	5.81
E.G. US. (ft)	853.38	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	852.77	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.48	Culv Frctn Ls (ft)	0.30
W.S. DS (ft)	852.29	Culv Exit Loss (ft)	0.34
Delta EG (ft)	0.91	Culv Entr Loss (ft)	0.26
Delta WS (ft)	0.48	Q Weir (cfs)	1484.30
E.G. IC (ft)	847.99	Weir Sta Lft (ft)	32.54
E.G. OC (ft)	853.39	Weir Sta Rgt (ft)	141.84
Culvert Control	Outlet	Weir Submerg	0.66
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.08
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	2.88
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	314.38
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CULVERT OUTPUT Profile #100 Year Culv Group: Culvert #4

Q Culv Group (cfs)	7.16	Culv Full Len (ft)	30.00
# Barrels	1	Culv Vel US (ft/s)	5.83
Q Barrel (cfs)	7.16	Culv Vel DS (ft/s)	5.83
E.G. US. (ft)	853.79	Culv Inv El Up (ft)	846.20
W.S. US. (ft)	853.04	Culv Inv El Dn (ft)	846.00
E.G. DS (ft)	852.89	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	852.68	Culv Exit Loss (ft)	0.33
Delta EG (ft)	0.90	Culv Entr Loss (ft)	0.26
Delta WS (ft)	0.36	Q Weir (cfs)	1768.81
E.G. IC (ft)	847.99	Weir Sta Lft (ft)	30.24
E.G. OC (ft)	853.79	Weir Sta Rgt (ft)	145.85
Culvert Control	Outlet	Weir Submerg	0.69
Culv WS Inlet (ft)	847.45	Weir Max Depth (ft)	4.49
Culv WS Outlet (ft)	847.25	Weir Avg Depth (ft)	3.11
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	359.47
Culv Crt Depth (ft)	1.07	Min El Weir Flow (ft)	849.31

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 800

INPUT
Description: X-800
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	854	19	852	39	850	63	848	80	847
89	846	97	846	107	848	163	850	188	851
216	856	233	858	245	859				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.055	63	.035	107	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
63	107	90	48	15	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	849.83	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	20.13	128.59
46.96				
E.G. Slope (ft/ft)	0.001068	Area (sq ft)	20.13	128.59
46.96				
Q Total (cfs)	419.00	Flow (cfs)	16.72	363.19
39.09				
Top Width (ft)	117.26	Top Width (ft)	21.98	44.00
51.28				
Vel Total (ft/s)	2.14	Avg. Vel. (ft/s)	0.83	2.82
0.83				
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)	0.92	2.92
0.92				
Conv. Total (cfs)	12818.5	Conv. (cfs)	511.6	11111.1
1195.9				
Length Wtd. (ft)	47.30	Wetted Per. (ft)	22.05	44.28
51.31				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.06	0.19
0.06				
Alpha	1.53	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.02	0.84
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	0.37
0.08				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.36	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	65.93	195.89
154.12				
E.G. Slope (ft/ft)	0.000880	Area (sq ft)	65.93	195.89
154.12				
Q Total (cfs)	928.00	Flow (cfs)	76.63	664.91
186.46				
Top Width (ft)	164.63	Top Width (ft)	37.61	44.00
83.02				
Vel Total (ft/s)	2.23	Avg. Vel. (ft/s)	1.16	3.39

1.21				
Max Chl Dpth (ft)	5.36	Hydr. Depth (ft)	1.75	4.45
1.86				
Conv. Total (cfs)	31278.3	Conv. (cfs)	2582.7	22410.9
6284.7				
Length Wtd. (ft)	45.41	Wetted Per. (ft)	37.76	44.28
83.11				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.10	0.24
0.10				
Alpha	1.74	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.13	1.37
0.26				
C & E Loss (ft)	0.03	Cum SA (acres)	0.13	0.41
0.21				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	852.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.16	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.89	Reach Len. (ft)	90.00	48.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	87.38	219.32
199.12				
E.G. Slope (ft/ft)	0.000963	Area (sq ft)	87.38	219.32
199.12				
Q Total (cfs)	1249.00	Flow (cfs)	117.34	839.73
291.93				
Top Width (ft)	172.94	Top Width (ft)	42.94	44.00
86.00				
Vel Total (ft/s)	2.47	Avg. Vel. (ft/s)	1.34	3.83
1.47				
Max Chl Dpth (ft)	5.89	Hydr. Depth (ft)	2.04	4.98
2.32				
Conv. Total (cfs)	40240.4	Conv. (cfs)	3780.6	27054.5
9405.3				
Length Wtd. (ft)	44.58	Wetted Per. (ft)	43.11	44.28
86.14				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.30
0.14				
Alpha	1.73	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.21	1.60
0.42				
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	0.41
0.30				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.29	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	105.36	236.95	234.04
E.G. Slope (ft/ft)	0.001003	Area (sq ft)	105.36	236.95	234.04
Q Total (cfs)	1512.00	Flow (cfs)	154.40	974.50	383.10
Top Width (ft)	179.05	Top Width (ft)	46.80	44.00	88.25
Vel Total (ft/s)	2.62	Avg. Vel. (ft/s)	1.47	4.11	1.64
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)	2.25	5.39	2.65
Conv. Total (cfs)	47750.5	Conv. (cfs)	4876.2	30775.5	12098.7
Length Wtd. (ft)	44.02	Wetted Per. (ft)	46.99	44.28	88.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.14	0.33	0.17
Alpha	1.71	Stream Power (lb/ft s)	245.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.28	1.73	0.52
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.41	0.31

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	852.68	Reach Len. (ft)	90.00	48.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)	124.36	254.13	268.92
E.G. Slope (ft/ft)	0.001040	Area (sq ft)	124.36	254.13	268.92
Q Total (cfs)	1796.00	Flow (cfs)	197.00	1115.25	483.76
Top Width (ft)	184.94	Top Width (ft)	50.51	44.00	90.44
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)	1.58	4.39	1.80
Max Chl Dpth (ft)	6.68	Hydr. Depth (ft)	2.46	5.78	2.97
Conv. Total (cfs)	55694.5	Conv. (cfs)	6108.9	34584.1	

15001.5				
Length Wtd. (ft)	43.52	Wetted Per. (ft)	50.73	44.28
90.64				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.16	0.37
0.19				
Alpha	1.70	Stream Power (lb/ft s)	245.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.34	1.86
0.60				
C & E Loss (ft)	0.06	Cum SA (acres)	0.21	0.41
0.32				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 700

INPUT
Description: X-700
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	853	15	857	20	857	33	850	35	849
39	847	53	846	66	846	72	850	85	850
110	850	160	852	183	856	195	860		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	72	95	67	8	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
W.S. Elev (ft)	849.62	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)		107.47
E.G. Slope (ft/ft)	0.002214	Area (sq ft)		107.47
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	37.67	Top Width (ft)		37.67
Vel Total (ft/s)	3.90	Avg. Vel. (ft/s)		3.90
Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		2.85
Conv. Total (cfs)	8904.0	Conv. (cfs)		8904.0

Length Wtd. (ft)	66.98	Wetted Per. (ft)		39.42
Min Ch El (ft)	846.00	Shear (lb/sq ft)		0.38
Alpha	1.00	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.00	0.71
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.33
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.43	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	850.97	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.87	159.76
48.51				
E.G. Slope (ft/ft)	0.002679	Area (sq ft)	0.87	159.76
48.51				
Q Total (cfs)	928.00	Flow (cfs)	0.69	869.86
57.45				
Top Width (ft)	103.00	Top Width (ft)	1.80	39.00
62.21				
Vel Total (ft/s)	4.44	Avg. Vel. (ft/s)	0.79	5.44
1.18				
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)	0.48	4.10
0.78				
Conv. Total (cfs)	17930.9	Conv. (cfs)	13.3	16807.5
1110.1				
Length Wtd. (ft)	61.94	Wetted Per. (ft)	2.04	40.95
62.22				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.07	0.65
0.13				
Alpha	1.42	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.06	1.18
0.23				
C & E Loss (ft)	0.01	Cum SA (acres)	0.08	0.36
0.18				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.59	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.35	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.70	174.76
74.29				
E.G. Slope (ft/ft)	0.003342	Area (sq ft)	1.70	174.76
74.29				

Q Total (cfs)	1249.00	Flow (cfs)	1.88	1128.48
118.65				
Top Width (ft)	113.34	Top Width (ft)	2.51	39.00
71.82				
Vel Total (ft/s)	4.98	Avg. Vel. (ft/s)	1.11	6.46
1.60				
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	0.68	4.48
1.03				
Conv. Total (cfs)	21604.5	Conv. (cfs)	32.5	19519.7
2052.3				
Length Wtd. (ft)	58.29	Wetted Per. (ft)	2.85	40.95
71.85				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.12	0.89
0.22				
Alpha	1.53	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.12	1.38
0.38				
C & E Loss (ft)	0.01	Cum SA (acres)	0.12	0.37
0.27				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.69	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.66	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	2.54	186.56
97.16				
E.G. Slope (ft/ft)	0.003710	Area (sq ft)	2.54	186.56
97.16				
Q Total (cfs)	1512.00	Flow (cfs)	3.39	1325.71
182.90				
Top Width (ft)	121.46	Top Width (ft)	3.07	39.00
79.39				
Vel Total (ft/s)	5.28	Avg. Vel. (ft/s)	1.33	7.11
1.88				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)	0.83	4.78
1.22				
Conv. Total (cfs)	24823.8	Conv. (cfs)	55.7	21765.3
3002.8				
Length Wtd. (ft)	55.90	Wetted Per. (ft)	3.49	40.95
79.42				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.17	1.06
0.28				
Alpha	1.60	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.16	1.50
0.46				
C & E Loss (ft)	0.04	Cum SA (acres)	0.14	0.37
0.28				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.75	Element	Left OB	Channel

Right OB				
Vel Head (ft)	0.80	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.95	Reach Len. (ft)	95.00	67.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	3.53	198.08
121.70				
E.G. Slope (ft/ft)	0.004040	Area (sq ft)	3.53	198.08
121.70				
Q Total (cfs)	1796.00	Flow (cfs)	5.48	1528.73
261.79				
Top Width (ft)	129.39	Top Width (ft)	3.62	39.00
86.77				
Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)	1.55	7.72
2.15				
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)	0.98	5.08
1.40				
Conv. Total (cfs)	28255.6	Conv. (cfs)	86.3	24050.8
4118.6				
Length Wtd. (ft)	53.85	Wetted Per. (ft)	4.11	40.95
86.81				
Min Ch El (ft)	846.00	Shear (lb/sq ft)	0.22	1.22
0.35				
Alpha	1.67	Stream Power (lb/ft s)	195.00	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.21	1.61
0.53				
C & E Loss (ft)	0.07	Cum SA (acres)	0.16	0.37
0.29				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 600

INPUT
Description: X-600
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	859	16	857	36	856	45	852	54	846
64	845	74	847	81	849	92	850	144	850
190	850	210	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	45	.035	81	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
45	81	63	43	1	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.32	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		88.96

0.57				
E.G. Slope (ft/ft)	0.003345	Area (sq ft)		88.96
0.57				
Q Total (cfs)	419.00	Flow (cfs)		418.74
0.26				
Top Width (ft)	35.52	Top Width (ft)		31.98
3.54				
Vel Total (ft/s)	4.68	Avg. Vel. (ft/s)		4.71
0.46				
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.78
0.16				
Conv. Total (cfs)	7244.9	Conv. (cfs)		7240.4
4.5				
Length Wtd. (ft)	43.02	Wetted Per. (ft)		33.52
3.55				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.55
0.03				
Alpha	1.01	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.00	0.56
0.11				
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.28
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.53	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	850.66	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)	849.57	Flow Area (sq ft)		133.18
78.03				
E.G. Slope (ft/ft)	0.003720	Area (sq ft)		133.18
78.03				
Q Total (cfs)	928.00	Flow (cfs)		825.93
102.07				
Top Width (ft)	144.10	Top Width (ft)		33.99
110.10				
Vel Total (ft/s)	4.39	Avg. Vel. (ft/s)		6.20
1.31				
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		3.92
0.71				
Conv. Total (cfs)	15214.2	Conv. (cfs)		13540.9
1673.4				
Length Wtd. (ft)	39.78	Wetted Per. (ft)		35.93
110.33				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.86
0.16				
Alpha	1.78	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.06	0.95
0.22				
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.31
0.17				

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.73	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.17	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		150.69
134.34				
E.G. Slope (ft/ft)	0.003722	Area (sq ft)		150.69
134.34				
Q Total (cfs)	1249.00	Flow (cfs)		998.02
250.98				
Top Width (ft)	145.71	Top Width (ft)		34.76
110.95				
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)		6.62
1.87				
Max Chl Dpth (ft)	6.17	Hydr. Depth (ft)		4.34
1.21				
Conv. Total (cfs)	20473.7	Conv. (cfs)		16359.6
4114.1				
Length Wtd. (ft)	35.98	Wetted Per. (ft)		36.85
111.32				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		0.95
0.28				
Alpha	1.86	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.12	1.13
0.36				
C & E Loss (ft)	0.02	Cum SA (acres)	0.12	0.31
0.25				

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	852.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.56	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.54	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		163.62
175.42				
E.G. Slope (ft/ft)	0.003677	Area (sq ft)		163.62
175.42				
Q Total (cfs)	1512.00	Flow (cfs)		1124.50
387.50				
Top Width (ft)	146.88	Top Width (ft)		35.31
111.57				
Vel Total (ft/s)	4.46	Avg. Vel. (ft/s)		6.87
2.21				
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)		4.63
1.57				
Conv. Total (cfs)	24933.3	Conv. (cfs)		18543.4
6390.0				
Length Wtd. (ft)	33.79	Wetted Per. (ft)		37.52
112.04				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.00
0.36				
Alpha	1.83	Stream Power (lb/ft s)	210.00	0.00

0.00				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.16	1.23
0.43				
C & E Loss (ft)	0.03	Cum SA (acres)	0.14	0.31
0.26				

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	851.90	Reach Len. (ft)	63.00	43.00
1.00				
Crit W.S. (ft)		Flow Area (sq ft)		176.31
215.32				
E.G. Slope (ft/ft)	0.003652	Area (sq ft)		176.31
215.32				
Q Total (cfs)	1796.00	Flow (cfs)		1254.85
541.15				
Top Width (ft)	148.01	Top Width (ft)		35.85
112.16				
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)		7.12
2.51				
Max Chl Dpth (ft)	6.90	Hydr. Depth (ft)		4.92
1.92				
Conv. Total (cfs)	29720.1	Conv. (cfs)		20765.2
8954.9				
Length Wtd. (ft)	32.05	Wetted Per. (ft)		38.16
112.73				
Min Ch El (ft)	845.00	Shear (lb/sq ft)		1.05
0.44				
Alpha	1.77	Stream Power (lb/ft s)	210.00	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.21	1.32
0.50				
C & E Loss (ft)	0.03	Cum SA (acres)	0.15	0.31
0.27				

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 500

INPUT
Description: X-500
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	856	50	850	70	848.5	80	846.77	95	845.64
100	846.5	106	849.5	163	850	185	850.45	215	850
223	852	240	862						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	70	.035	106	.055

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

70 106 85 68 5 .1 .3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	849.47	Element	Left OB	Channel
Right OB Vel Head (ft)	0.46	Wt. n-Val.	0.055	0.035
W.S. Elev (ft)	849.01	Reach Len. (ft)	85.00	68.00
5.00 Crit W.S. (ft)		Flow Area (sq ft)	1.74	76.84
E.G. Slope (ft/ft)	0.005935	Area (sq ft)	1.74	76.84
Q Total (cfs)	419.00	Flow (cfs)	1.45	417.55
Top Width (ft)	41.83	Top Width (ft)	6.81	35.02
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	0.84	5.43
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	0.26	2.19
Conv. Total (cfs)	5438.9	Conv. (cfs)	18.8	5420.0
Length Wtd. (ft)	68.03	Wetted Per. (ft)	6.82	35.88
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.09	0.79
Alpha	1.03	Stream Power (lb/ft s)	240.00	0.00
0.00 Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.00	0.48
0.11 C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.24
0.07				

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	851.04	Element	Left OB	Channel
Right OB Vel Head (ft)	0.55	Wt. n-Val.	0.055	0.035
0.055 W.S. Elev (ft)	850.49	Reach Len. (ft)	85.00	68.00
5.00 Crit W.S. (ft)	849.78	Flow Area (sq ft)	25.79	129.85
56.40 E.G. Slope (ft/ft)	0.004133	Area (sq ft)	25.79	129.85
56.40 Q Total (cfs)	928.00	Flow (cfs)	46.78	818.85
62.37 Top Width (ft)	171.04	Top Width (ft)	24.08	36.00
110.96 Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)	1.81	6.31
1.11 Max Chl Dpth (ft)	4.85	Hydr. Depth (ft)	1.07	3.61
0.51 Conv. Total (cfs)	14435.8	Conv. (cfs)	727.8	12737.8
970.2 Length Wtd. (ft)	64.91	Wetted Per. (ft)	24.17	36.97
111.03				

Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.28	0.91
0.13				
Alpha	1.85	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.04	0.82
0.22				
C & E Loss (ft)	0.05	Cum SA (acres)	0.06	0.27
0.17				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.49	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.09	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.64	Flow Area (sq ft)	41.74	151.45
123.68				
E.G. Slope (ft/ft)	0.003397	Area (sq ft)	41.74	151.45
123.68				
Q Total (cfs)	1249.00	Flow (cfs)	83.39	959.38
206.23				
Top Width (ft)	178.44	Top Width (ft)	29.08	36.00
113.36				
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)	2.00	6.33
1.67				
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)	1.44	4.21
1.09				
Conv. Total (cfs)	21429.9	Conv. (cfs)	1430.8	16460.6
3538.5				
Length Wtd. (ft)	59.76	Wetted Per. (ft)	29.20	36.97
113.50				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.30	0.87
0.23				
Alpha	2.03	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	0.09	0.98
0.35				
C & E Loss (ft)	0.06	Cum SA (acres)	0.09	0.27
0.25				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035

0.055				
W.S. Elev (ft)	851.49	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)	850.91	Flow Area (sq ft)	54.09	165.90
169.53				
E.G. Slope (ft/ft)	0.003104	Area (sq ft)	54.09	165.90
169.53				
Q Total (cfs)	1512.00	Flow (cfs)	114.16	1067.61
330.22				
Top Width (ft)	183.39	Top Width (ft)	32.43	36.00
114.96				
Vel Total (ft/s)	3.88	Avg. Vel. (ft/s)	2.11	6.44
1.95				
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	1.67	4.61
1.47				
Conv. Total (cfs)	27137.6	Conv. (cfs)	2049.0	19161.7
5926.9				
Length Wtd. (ft)	56.72	Wetted Per. (ft)	32.57	36.97
115.16				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.32	0.87
0.29				
Alpha	2.02	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	0.12	1.07
0.43				
C & E Loss (ft)	0.06	Cum SA (acres)	0.11	0.28
0.26				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	851.87	Reach Len. (ft)	85.00	68.00
5.00				
Crit W.S. (ft)		Flow Area (sq ft)	66.98	179.55
213.39				
E.G. Slope (ft/ft)	0.002921	Area (sq ft)	66.98	179.55
213.39				
Q Total (cfs)	1796.00	Flow (cfs)	148.62	1181.49
465.89				
Top Width (ft)	188.07	Top Width (ft)	35.58	36.00
116.48				
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.22	6.58
2.18				
Max Chl Dpth (ft)	6.23	Hydr. Depth (ft)	1.88	4.99
1.83				
Conv. Total (cfs)	33229.9	Conv. (cfs)	2749.8	21860.2
8619.9				
Length Wtd. (ft)	54.36	Wetted Per. (ft)	35.75	36.97
116.72				
Min Ch El (ft)	845.64	Shear (lb/sq ft)	0.34	0.89
0.33				

Alpha	1.98	Stream Power (lb/ft s)	240.00	0.00
0.00				
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.16	1.15
0.50				
C & E Loss (ft)	0.07	Cum SA (acres)	0.13	0.28
0.27				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 400

INPUT
Description: X-400
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	875	7	859	22	851	36	851	42	847
48	846	55	845.52	67	846	72	849	83	849
108	849	141	851	168	849	170	850	175	852
190	860								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	36	.035	72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
36	72	125	105	45	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	848.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.		0.035
W.S. Elev (ft)	848.39	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)		Flow Area (sq ft)		67.38
E.G. Slope (ft/ft)	0.008031	Area (sq ft)		67.38
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	31.05	Top Width (ft)		31.05
Vel Total (ft/s)	6.22	Avg. Vel. (ft/s)		6.22
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		2.17
Conv. Total (cfs)	4675.5	Conv. (cfs)		4675.5
Length Wtd. (ft)	105.00	Wetted Per. (ft)		32.24
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.05

Alpha	1.00	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)		0.36
0.11				
C & E Loss (ft)	0.04	Cum SA (acres)		0.19
0.07				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	850.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.03	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	849.58	Reach Len. (ft)	125.00	105.00
45.00				
Crit W.S. (ft)	849.58	Flow Area (sq ft)		106.31
26.03				
E.G. Slope (ft/ft)	0.008968	Area (sq ft)		106.31
26.03				
Q Total (cfs)	928.00	Flow (cfs)		886.58
41.42				
Top Width (ft)	88.29	Top Width (ft)		33.86
54.42				
Vel Total (ft/s)	7.01	Avg. Vel. (ft/s)		8.34
1.59				
Max Chl Dpth (ft)	4.06	Hydr. Depth (ft)		3.14
0.48				
Conv. Total (cfs)	9799.5	Conv. (cfs)		9362.1
437.4				
Length Wtd. (ft)	102.85	Wetted Per. (ft)		35.58
54.60				
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.67
0.27				
Alpha	1.35	Stream Power (lb/ft s)	190.00	0.00
0.00				
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	0.02	0.64
0.21				
C & E Loss (ft)	0.01	Cum SA (acres)	0.04	0.22
0.16				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	851.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.06	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.16	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.16	Flow Area (sq ft)		126.41	63.43
E.G. Slope (ft/ft)	0.008144	Area (sq ft)		126.41	63.43
Q Total (cfs)	1249.00	Flow (cfs)		1105.86	143.14
Top Width (ft)	108.00	Top Width (ft)		34.74	73.26
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)		8.75	2.26
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		3.64	0.87
Conv. Total (cfs)	13840.2	Conv. (cfs)		12254.1	1586.1
Length Wtd. (ft)	98.42	Wetted Per. (ft)		36.64	73.61
Min Ch El (ft)	845.52	Shear (lb/sq ft)		1.75	0.44
Alpha	1.58	Stream Power (lb/ft s)	190.00	0.00	0.00
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.05	0.76	0.34
C & E Loss (ft)	0.03	Cum SA (acres)	0.07	0.22	0.24

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	851.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.		0.035	0.055
W.S. Elev (ft)	850.54	Reach Len. (ft)	125.00	105.00	45.00
Crit W.S. (ft)	850.54	Flow Area (sq ft)		139.58	93.27
E.G. Slope (ft/ft)	0.007912	Area (sq ft)		139.58	93.27
Q Total (cfs)	1512.00	Flow (cfs)		1270.14	241.86
Top Width (ft)	120.79	Top Width (ft)		35.31	85.48
Vel Total (ft/s)	6.49	Avg. Vel. (ft/s)		9.10	2.59
Max Chl Dpth (ft)	5.02	Hydr. Depth (ft)		3.95	

1.09					
Conv. Total (cfs)	16998.2	Conv. (cfs)			14279.1
2719.1					
Length Wtd. (ft)	95.71	Wetted Per. (ft)			37.32
85.92					
Min Ch El (ft)	845.52	Shear (lb/sq ft)			1.85
0.54					
Alpha	1.68	Stream Power (lb/ft s)	190.00		0.00
0.00					
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	0.07		0.83
0.41					
C & E Loss (ft)	0.03	Cum SA (acres)	0.08		0.22
0.25					

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	852.02	Element	Left OB		Channel
Right OB					
Vel Head (ft)	1.17	Wt. n-Val.			0.035
0.055					
W.S. Elev (ft)	850.85	Reach Len. (ft)	125.00		105.00
45.00					
Crit W.S. (ft)	850.85	Flow Area (sq ft)			150.61
121.36					
E.G. Slope (ft/ft)	0.008098	Area (sq ft)			150.61
121.36					
Q Total (cfs)	1796.00	Flow (cfs)			1444.17
351.83					
Top Width (ft)	131.34	Top Width (ft)			35.77
95.56					
Vel Total (ft/s)	6.60	Avg. Vel. (ft/s)			9.59
2.90					
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)			4.21
1.27					
Conv. Total (cfs)	19958.3	Conv. (cfs)			16048.5
3909.8					
Length Wtd. (ft)	93.76	Wetted Per. (ft)			37.88
96.09					
Min Ch El (ft)	845.52	Shear (lb/sq ft)			2.01
0.64					
Alpha	1.73	Stream Power (lb/ft s)	190.00		0.00
0.00					
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.09		0.89
0.48					
C & E Loss (ft)	0.02	Cum SA (acres)	0.09		0.22
0.26					

Warning: The energy equation could not be balanced within the specified number of

iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 300

INPUT
Description: X-300
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	885	7	878	9	849	21	850	26	848
33	848	37	845	49	844	57	845	64	848
84	848	88	849	112	848	126	849	152	849
162	853	180	860						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	33	.035	64	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33	64	125	98	20	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	847.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.00	Wt. n-Val.		0.035
W.S. Elev (ft)	846.81	Reach Len. (ft)	125.00	98.00
20.00				
Crit W.S. (ft)	846.81	Flow Area (sq ft)		52.28
E.G. Slope (ft/ft)	0.015301	Area (sq ft)		52.28
Q Total (cfs)	419.00	Flow (cfs)		419.00
Top Width (ft)	26.65	Top Width (ft)		26.65
Vel Total (ft/s)	8.01	Avg. Vel. (ft/s)		8.01
Max Chl Dpth (ft)	2.81	Hydr. Depth (ft)		1.96
Conv. Total (cfs)	3387.3	Conv. (cfs)		3387.3
Length Wtd. (ft)	81.71	Wetted Per. (ft)		27.73
Min Ch El (ft)	844.00	Shear (lb/sq ft)		1.80
Alpha	1.00	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)		0.22
0.11				
C & E Loss (ft)	0.23	Cum SA (acres)		0.12

0.07

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	849.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	848.58	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	848.58	Flow Area (sq ft)	4.46	104.41	18.57
E.G. Slope (ft/ft)	0.008644	Area (sq ft)	4.46	104.41	18.57
Q Total (cfs)	928.00	Flow (cfs)	7.26	893.27	27.47
Top Width (ft)	83.71	Top Width (ft)	8.44	31.00	44.27
Vel Total (ft/s)	7.28	Avg. Vel. (ft/s)	1.63	8.56	1.48
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	0.53	3.37	0.42
Conv. Total (cfs)	9981.4	Conv. (cfs)	78.1	9607.9	295.4
Length Wtd. (ft)	81.25	Wetted Per. (ft)	8.56	32.72	44.37
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.28	1.72	0.23
Alpha	1.33	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.01	0.38	0.19
C & E Loss (ft)	0.21	Cum SA (acres)	0.03	0.14	0.10

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	850.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	849.38	Reach Len. (ft)	125.00	98.00	20.00
Crit W.S. (ft)	849.38	Flow Area (sq ft)	12.85	129.15	74.25
E.G. Slope (ft/ft)	0.006228	Area (sq ft)	12.85	129.15	74.25
Q Total (cfs)	1249.00	Flow (cfs)	28.16	1080.74	140.10
Top Width (ft)	134.92	Top Width (ft)	14.98	31.00	88.94
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	2.19	8.37	1.89
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)	0.86	4.17	0.83
Conv. Total (cfs)	15826.9	Conv. (cfs)	356.9	13694.8	1775.3
Length Wtd. (ft)	78.24	Wetted Per. (ft)	15.61	32.72	89.19
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.32	1.53	0.32
Alpha	1.83	Stream Power (lb/ft s)	180.00	0.00	0.00
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.03	0.46	0.27
C & E Loss (ft)	0.10	Cum SA (acres)	0.04	0.14	0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	850.70	Element	Left OB	Channel	Right OB

Vel Head (ft)	1.00	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	849.70	Reach Len. (ft)	125.00	98.00 20.00
Crit W.S. (ft)	849.70	Flow Area (sq ft)	18.40	139.09 102.88
E.G. Slope (ft/ft)	0.006282	Area (sq ft)	18.40	139.09 102.88
Q Total (cfs)	1512.00	Flow (cfs)	43.16	1228.10 240.74
Top Width (ft)	140.38	Top Width (ft)	19.64	31.00 89.74
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)	2.35	8.83 2.34
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)	0.94	4.49 1.15
Conv. Total (cfs)	19076.9	Conv. (cfs)	544.5	15494.9 3037.5
Length Wtd. (ft)	76.59	Wetted Per. (ft)	20.65	32.72 90.05
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.35	1.67 0.45
Alpha	1.91	Stream Power (lb/ft s)	180.00	0.00 0.00
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.04	0.49 0.31
C & E Loss (ft)	0.07	Cum SA (acres)	0.05	0.14 0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	851.05	Element	Left OB	Channel Right OB
Vel Head (ft)	1.12	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	849.93	Reach Len. (ft)	125.00	98.00 20.00
Crit W.S. (ft)	849.93	Flow Area (sq ft)	23.39	146.34 123.95
E.G. Slope (ft/ft)	0.006844	Area (sq ft)	23.39	146.34 123.95
Q Total (cfs)	1796.00	Flow (cfs)	59.62	1395.20 341.18
Top Width (ft)	144.38	Top Width (ft)	23.05	31.00 90.33
Vel Total (ft/s)	6.12	Avg. Vel. (ft/s)	2.55	9.53 2.75

Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	1.01	4.72
1.37				
Conv. Total (cfs)	21710.1	Conv. (cfs)	720.7	16865.1
4124.2				
Length Wtd. (ft)	75.20	Wetted Per. (ft)	24.33	32.72
90.68				
Min Ch El (ft)	844.00	Shear (lb/sq ft)	0.41	1.91
0.58				
Alpha	1.93	Stream Power (lb/ft s)	180.00	0.00
0.00				
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.06	0.53
0.35				
C & E Loss (ft)	0.07	Cum SA (acres)	0.06	0.14
0.16				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water
surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 200

INPUT
Description: X-200
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	873	8	857	23	848	31	847	35	844
44	843	50	845	62	847	68	848	81	847
84	847	93	845	109	844	117	844	123	848
141	850	156	852	172	860				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	31	.035	62	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
31	62	115	105	75	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	846.77	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	846.53	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	845.76	Flow Area (sq ft)		53.69
62.72				

E.G. Slope (ft/ft)	0.005017	Area (sq ft)			53.69
62.72					
Q Total (cfs)	419.00	Flow (cfs)			244.03
174.97					
Top Width (ft)	62.21	Top Width (ft)			27.54
34.67					
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)			4.55
2.79					
Max Chl Dpth (ft)	3.53	Hydr. Depth (ft)			1.95
1.81					
Conv. Total (cfs)	5915.6	Conv. (cfs)			3445.3
2470.3					
Length Wtd. (ft)	91.70	Wetted Per. (ft)			28.89
35.63					
Min Ch El (ft)	843.00	Shear (lb/sq ft)			0.58
0.55					
Alpha	1.18	Stream Power (lb/ft s)		172.00	0.00
0.00					
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)			0.10
0.09					
C & E Loss (ft)	0.04	Cum SA (acres)			0.06
0.06					

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	848.18	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.40	Wt. n-Val.	0.055	0.035	
0.055					
W.S. Elev (ft)	847.78	Reach Len. (ft)	115.00	105.00	
75.00					
Crit W.S. (ft)	846.71	Flow Area (sq ft)	2.45	91.75	
117.71					
E.G. Slope (ft/ft)	0.005025	Area (sq ft)	2.45	91.75	
117.71					
Q Total (cfs)	928.00	Flow (cfs)	2.50	551.08	
374.42					
Top Width (ft)	93.80	Top Width (ft)	6.26	31.00	
56.54					
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)	1.02	6.01	
3.18					
Max Chl Dpth (ft)	4.78	Hydr. Depth (ft)	0.39	2.96	
2.08					
Conv. Total (cfs)	13091.2	Conv. (cfs)	35.2	7774.1	
5281.9					
Length Wtd. (ft)	91.66	Wetted Per. (ft)	6.31	32.55	
58.03					
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.12	0.88	
0.64					
Alpha	1.33	Stream Power (lb/ft s)	172.00	0.00	
0.00					
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)	0.00	0.16	
0.16					
C & E Loss (ft)	0.09	Cum SA (acres)	0.01	0.07	
0.08					

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	848.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.63	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	847.97	Reach Len. (ft)	115.00	105.00	75.00
Crit W.S. (ft)	847.10	Flow Area (sq ft)	3.73	97.43	128.41
E.G. Slope (ft/ft)	0.007403	Area (sq ft)	3.73	97.43	128.41
Q Total (cfs)	1249.00	Flow (cfs)	5.31	739.30	504.39
Top Width (ft)	99.02	Top Width (ft)	7.72	31.00	60.29
Vel Total (ft/s)	5.44	Avg. Vel. (ft/s)	1.42	7.59	3.93
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)	0.48	3.14	2.13
Conv. Total (cfs)	14516.2	Conv. (cfs)	61.7	8592.3	5862.2
Length Wtd. (ft)	91.76	Wetted Per. (ft)	7.78	32.55	61.86
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.22	1.38	0.96
Alpha	1.36	Stream Power (lb/ft s)	172.00	0.00	0.00
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	0.01	0.20	0.22
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07	0.12

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	849.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.76	Wt. n-Val.	0.055	0.035	0.055
W.S. Elev (ft)	848.24	Reach Len. (ft)	115.00	105.00	75.00

Crit W.S. (ft)	847.51	Flow Area (sq ft)	5.93	105.81
145.14				
E.G. Slope (ft/ft)	0.008194	Area (sq ft)	5.93	105.81
145.14				
Q Total (cfs)	1512.00	Flow (cfs)	11.40	892.45
608.15				
Top Width (ft)	102.52	Top Width (ft)	8.39	31.00
63.12				
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)	1.92	8.43
4.19				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	0.71	3.41
2.30				
Conv. Total (cfs)	16703.2	Conv. (cfs)	125.9	9859.0
6718.3				
Length Wtd. (ft)	91.54	Wetted Per. (ft)	8.52	32.55
64.72				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.36	1.66
1.15				
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	0.01	0.22
0.26				
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07
0.12				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	849.39	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.87	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	848.51	Reach Len. (ft)	115.00	105.00
75.00				
Crit W.S. (ft)	847.83	Flow Area (sq ft)	8.32	114.39
162.94				
E.G. Slope (ft/ft)	0.008587	Area (sq ft)	8.32	114.39
162.94				
Q Total (cfs)	1796.00	Flow (cfs)	19.68	1040.25
736.07				
Top Width (ft)	105.47	Top Width (ft)	8.85	31.00
65.61				
Vel Total (ft/s)	6.29	Avg. Vel. (ft/s)	2.37	9.09
4.52				
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	0.94	3.69
2.48				
Conv. Total (cfs)	19381.6	Conv. (cfs)	212.3	11225.9
7943.3				
Length Wtd. (ft)	91.24	Wetted Per. (ft)	9.06	32.55
67.22				
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.49	1.88
1.30				
Alpha	1.42	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)	0.01	0.24
0.29				
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	0.07

0.13

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Bluestone Creek
REACH: 1 RS: 100

INPUT
Description: X-100
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	861	23	846	26	845	38	843	45	844
50	846	72	846	90	846	94	844	116	844
126	844	136	851	141	852	160	856	172	860

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	23	.035	50	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23	50	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2 Year

E.G. Elev (ft)	845.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.28	Reach Len. (ft)		
Crit W.S. (ft)	845.28	Flow Area (sq ft)		29.91
43.65				
E.G. Slope (ft/ft)	0.022329	Area (sq ft)		29.91
43.65				
Q Total (cfs)	419.00	Flow (cfs)		222.54
196.46				
Top Width (ft)	59.40	Top Width (ft)		23.02
36.38				
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		7.44
4.50				
Max Chl Dpth (ft)	2.28	Hydr. Depth (ft)		1.30
1.20				
Conv. Total (cfs)	2804.0	Conv. (cfs)		1489.3
1314.7				
Length Wtd. (ft)		Wetted Per. (ft)		23.55
37.08				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		1.77
1.64				
Alpha	1.20	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 Year

E.G. Elev (ft)	847.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.27	Wt. n-Val.		0.035
0.055				
W.S. Elev (ft)	845.87	Reach Len. (ft)		
Crit W.S. (ft)	845.87	Flow Area (sq ft)		44.44
65.69				
E.G. Slope (ft/ft)	0.032794	Area (sq ft)		44.44
65.69				
Q Total (cfs)	928.00	Flow (cfs)		476.28
451.72				
Top Width (ft)	64.66	Top Width (ft)		26.26
38.40				
Vel Total (ft/s)	8.43	Avg. Vel. (ft/s)		10.72
6.88				
Max Chl Dpth (ft)	2.87	Hydr. Depth (ft)		1.69
1.71				
Conv. Total (cfs)	5124.5	Conv. (cfs)		2630.0
2494.4				
Length Wtd. (ft)		Wetted Per. (ft)		27.00
39.43				
Min Ch El (ft)	843.00	Shear (lb/sq ft)		3.37
3.41				
Alpha	1.15	Stream Power (lb/ft s)	172.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25 Year

E.G. Elev (ft)	847.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.86	Wt. n-Val.	0.055	0.035
0.055				
W.S. Elev (ft)	846.78	Reach Len. (ft)		
Crit W.S. (ft)	846.78	Flow Area (sq ft)	0.47	69.07
132.84				
E.G. Slope (ft/ft)	0.014520	Area (sq ft)	0.47	69.07
132.84				
Q Total (cfs)	1249.00	Flow (cfs)	0.72	648.47
599.81				
Top Width (ft)	108.17	Top Width (ft)	1.20	27.00
79.97				
Vel Total (ft/s)	6.17	Avg. Vel. (ft/s)	1.54	9.39
4.52				
Max Chl Dpth (ft)	3.78	Hydr. Depth (ft)	0.39	2.56
1.66				

Conv. Total (cfs)	10365.2	Conv. (cfs)	6.0	5381.5 4977.7
Length Wtd. (ft)		Wetted Per. (ft)	1.43	27.78 81.32
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.30	2.25 1.48
Alpha	1.46	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #50 Year

E.G. Elev (ft)	847.99	Element	Left OB	Channel Right OB
Vel Head (ft)	0.97	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	847.02	Reach Len. (ft)		
Crit W.S. (ft)	847.02	Flow Area (sq ft)	0.79	75.47 151.83
E.G. Slope (ft/ft)	0.014752	Area (sq ft)	0.79	75.47 151.83
Q Total (cfs)	1512.00	Flow (cfs)	1.47	757.64 752.88
Top Width (ft)	108.87	Top Width (ft)	1.56	27.00 80.31
Vel Total (ft/s)	6.63	Avg. Vel. (ft/s)	1.86	10.04 4.96
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)	0.51	2.80 1.89
Conv. Total (cfs)	12448.6	Conv. (cfs)	12.1	6237.8 6198.6
Length Wtd. (ft)		Wetted Per. (ft)	1.86	27.78 81.73
Min Ch El (ft)	843.00	Shear (lb/sq ft)	0.39	2.50 1.71
Alpha	1.43	Stream Power (lb/ft s)	172.00	0.00 0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	848.34	Element	Left OB	Channel Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.055	0.035 0.055
W.S. Elev (ft)	847.24	Reach Len. (ft)		
Crit W.S. (ft)	847.24	Flow Area (sq ft)	1.19	81.61 170.14
E.G. Slope (ft/ft)	0.015139	Area (sq ft)	1.19	81.61

170.14					
Q Total (cfs)	1796.00	Flow (cfs)		2.56	874.40
919.04					
Top Width (ft)	109.54	Top Width (ft)		1.91	27.00
80.64					
Vel Total (ft/s)	7.10	Avg. Vel. (ft/s)		2.15	10.71
5.40					
Max Chl Dpth (ft)	4.24	Hydr. Depth (ft)		0.62	3.02
2.11					
Conv. Total (cfs)	14596.9	Conv. (cfs)		20.8	7106.6
7469.5					
Length Wtd. (ft)		Wetted Per. (ft)		2.28	27.78
82.13					
Min Ch El (ft)	843.00	Shear (lb/sq ft)		0.49	2.78
1.96					
Alpha	1.40	Stream Power (lb/ft s)		172.00	0.00
0.00					
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Bluestone Creek

Reach	River Sta.	n1	n2	n3
1	1500	.055	.035	.055
1	1400	.055	.035	.055
1	1300	.055	.035	.055
1	1200	.055	.035	.055
1	1100	.055	.035	.055
1	1000	.055	.035	.055
1	900	.055	.035	.055
1	810	Culvert		
1	800	.055	.035	.055
1	700	.055	.035	.055
1	600	.055	.035	.055
1	500	.055	.035	.055
1	400	.055	.035	.055
1	300	.055	.035	.055
1	200	.055	.035	.055
1	100	.055	.035	.055

SUMMARY OF REACH LENGTHS

River: Bluestone Creek

Reach	River Sta.	Left	Channel	Right
1	1500	97	101	105
1	1400	120	109	100
1	1300	95	88	88
1	1200	35	44	47
1	1100	80	58	55

1	1000	25	69	95
1	900	20	34	75
1	810	Culvert		
1	800	90	48	15
1	700	95	67	8
1	600	63	43	1
1	500	85	68	5
1	400	125	105	45
1	300	125	98	20
1	200	115	105	75
1	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Bluestone Creek

Reach	River Sta.	Contr.	Expan.
1	1500	.1	.3
1	1400	.1	.3
1	1300	.1	.3
1	1200	.1	.3
1	1100	.1	.3
1	1000	.1	.3
1	900	.1	.3
1	810	Culvert	
1	800	.1	.3
1	700	.1	.3
1	600	.1	.3
1	500	.1	.3
1	400	.1	.3
1	300	.1	.3
1	200	.1	.3
1	100	.1	.3

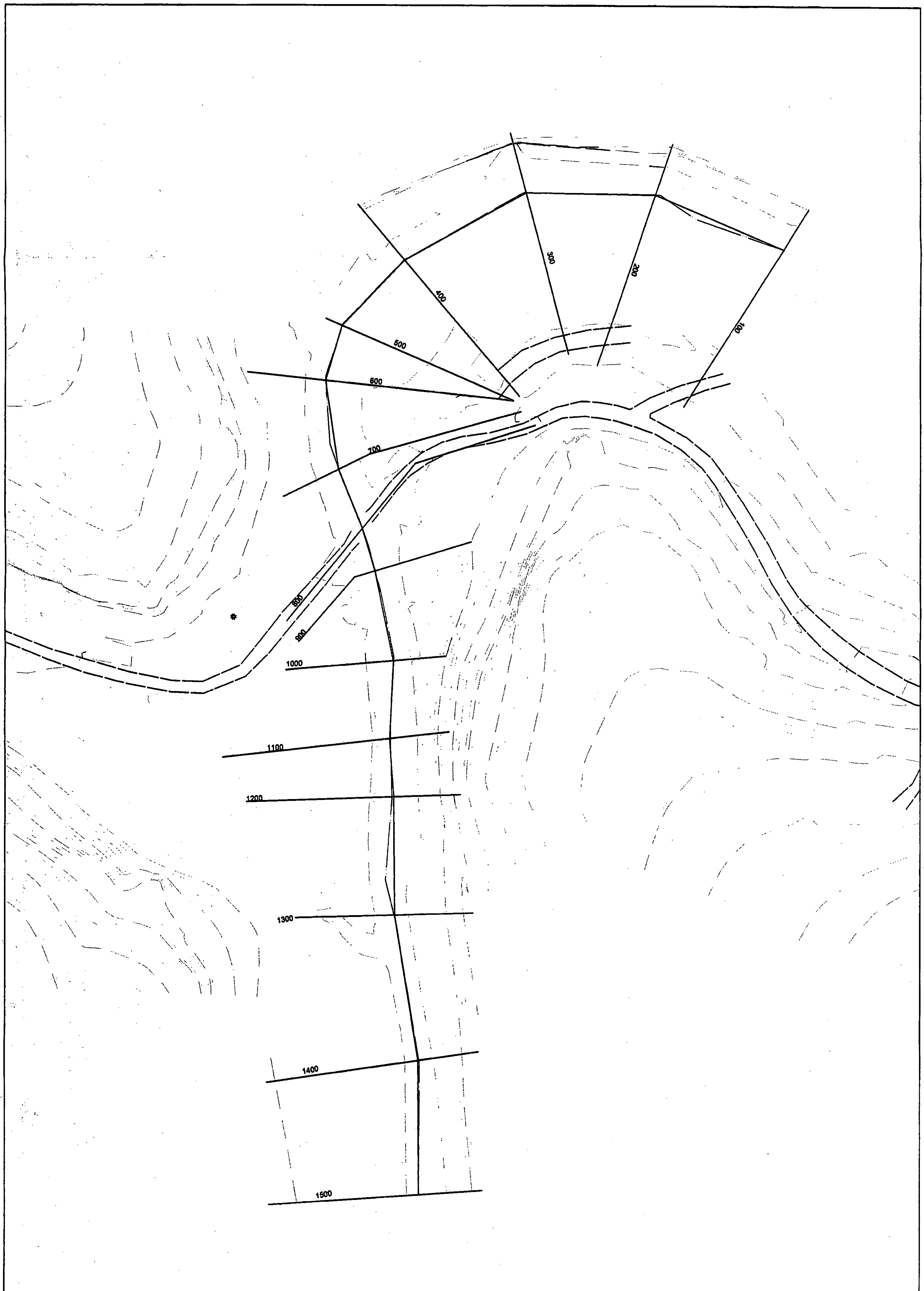
HEC-RAS Plan: Plan 18 River: Bluestone Creek Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	1500	2 Year	378.00	849.00	852.20		852.41	0.002224	3.70	102.60	42.77	0.40
1	1500	10 Year	847.00	849.00	853.44		853.88	0.003035	5.40	169.73	62.86	0.60
1	1500	25 Year	1143.00	849.00	854.03		854.61	0.003430	6.23	208.79	90.74	0.54
1	1500	50 Year	1387.00	849.00	854.45		855.10	0.003450	6.67	249.99	103.07	0.55
1	1500	100 Year	1651.00	849.00	854.90		855.60	0.003353	7.00	299.04	116.05	0.55
1	1400	2 Year	378.00	848.00	851.79		852.12	0.003439	4.65	89.72	55.40	0.50
1	1400	10 Year	847.00	848.00	853.09		853.55	0.003661	5.91	191.24	86.68	0.54
1	1400	25 Year	1143.00	848.00	853.73		854.23	0.003544	6.32	250.92	97.87	0.54
1	1400	50 Year	1387.00	848.00	854.19		854.72	0.003462	6.63	297.27	106.70	0.54
1	1400	100 Year	1651.00	848.00	854.67		855.22	0.003247	6.86	351.22	117.63	0.54
1	1300	2 Year	419.00	848.00	851.35		851.72	0.003862	5.01	101.98	72.55	0.54
1	1300	10 Year	928.00	848.00	852.70		853.16	0.003331	6.09	220.36	98.14	0.53
1	1300	25 Year	1249.00	848.00	853.38		853.86	0.003030	6.45	289.86	106.05	0.52
1	1300	50 Year	1512.00	848.00	853.85		854.36	0.002940	6.76	340.39	111.45	0.52
1	1300	100 Year	1796.00	848.00	854.35		854.88	0.002749	6.96	398.34	115.82	0.51
1	1200	2 Year	419.00	847.00	851.36		851.49	0.001042	2.96	143.93	51.58	0.29
1	1200	10 Year	928.00	847.00	852.59		852.92	0.001665	4.64	220.22	70.43	0.39
1	1200	25 Year	1249.00	847.00	853.21		853.64	0.001887	5.38	266.08	78.38	0.42
1	1200	50 Year	1512.00	847.00	853.63		854.14	0.002061	5.93	300.14	83.80	0.44
1	1200	100 Year	1796.00	847.00	854.06		854.65	0.002188	6.42	337.72	89.71	0.46
1	1100	2 Year	419.00	847.00	851.17		851.42	0.002197	4.00	111.39	49.26	0.41
1	1100	10 Year	928.00	847.00	852.20		852.79	0.003695	6.32	168.21	62.10	0.56
1	1100	25 Year	1249.00	847.00	852.68		853.48	0.004356	7.42	200.18	69.01	0.62
1	1100	50 Year	1512.00	847.00	852.96		853.96	0.005070	8.33	220.10	72.99	0.67
1	1100	100 Year	1796.00	847.00	853.26	852.63	854.45	0.005658	9.17	242.64	77.24	0.72
1	1000	2 Year	419.00	847.00	851.16		851.31	0.000979	3.08	139.30	43.17	0.28
1	1000	10 Year	928.00	847.00	852.15		852.57	0.002164	5.32	190.56	60.76	0.43
1	1000	25 Year	1249.00	847.00	852.60		853.22	0.002813	6.44	220.24	68.92	0.49
1	1000	50 Year	1512.00	847.00	852.85		853.66	0.003474	7.38	237.78	73.32	0.55
1	1000	100 Year	1796.00	847.00	853.11		854.11	0.004104	8.27	257.50	77.15	0.60
1	900	2 Year	419.00	846.20	851.09	849.14	851.24	0.001030	3.25	165.60	73.79	0.29
1	900	10 Year	928.00	846.20	852.06	850.51	852.41	0.002003	5.27	243.79	88.38	0.43
1	900	25 Year	1249.00	846.20	852.52	851.10	853.01	0.002459	6.22	286.80	95.73	0.48
1	900	50 Year	1512.00	846.20	852.77	851.50	853.38	0.002965	7.05	311.10	99.65	0.53
1	900	100 Year	1796.00	846.20	853.04	851.88	853.78	0.003407	7.81	338.88	103.95	0.57
1	810		Culvert									
1	800	2 Year	419.00	846.00	849.83		849.94	0.001068	2.62	195.67	117.26	0.29
1	800	10 Year	928.00	846.00	851.36		851.50	0.000880	3.39	415.94	164.63	0.28
1	800	25 Year	1249.00	846.00	851.89		852.06	0.000963	3.83	505.82	172.94	0.30
1	800	50 Year	1512.00	846.00	852.29		852.48	0.001003	4.11	576.35	179.05	0.31
1	800	100 Year	1796.00	846.00	852.68		852.89	0.001040	4.39	647.42	184.94	0.32
1	700	2 Year	419.00	846.00	849.62		849.86	0.002214	3.90	107.47	37.67	0.41
1	700	10 Year	928.00	846.00	850.97		851.40	0.002679	5.44	209.14	103.00	0.47
1	700	25 Year	1249.00	846.00	851.35		851.94	0.003342	6.46	250.75	113.34	0.54
1	700	50 Year	1512.00	846.00	851.66		852.35	0.003710	7.11	286.27	121.46	0.57
1	700	100 Year	1796.00	846.00	851.95		852.75	0.004040	7.72	323.32	129.39	0.60
1	600	2 Year	419.00	845.00	849.32		849.67	0.003345	4.71	89.53	35.52	0.50
1	600	10 Year	928.00	845.00	850.66	849.57	851.20	0.003720	6.20	211.20	144.10	0.55
1	600	25 Year	1249.00	845.00	851.17		851.73	0.003722	6.62	285.04	145.71	0.56
1	600	50 Year	1512.00	845.00	851.54		852.11	0.003677	6.87	339.04	146.88	0.56
1	600	100 Year	1796.00	845.00	851.90		852.48	0.003652	7.12	391.63	148.01	0.57
1	600	2 Year	419.00	845.64	849.01		849.47	0.005935	5.43	78.57	41.83	0.65
1	500	10 Year	928.00	845.64	850.49	849.78	851.04	0.004133	6.31	212.05	171.04	0.59
1	600	25 Year	1249.00	845.64	851.09	850.64	851.58	0.003397	6.33	316.87	178.44	0.54
1	500	50 Year	1512.00	845.64	851.49	850.91	851.96	0.003104	6.44	389.51	183.39	0.53
1	500	100 Year	1796.00	845.64	851.87		852.34	0.002921	6.58	459.92	188.07	0.52
1	400	2 Year	419.00	845.52	848.39		848.99	0.008031	6.22	67.38	31.05	0.74
1	400	10 Year	928.00	845.52	849.58	849.58	850.61	0.008968	8.34	132.34	88.29	0.83
1	400	25 Year	1249.00	845.52	850.16	850.16	851.22	0.008144	8.75	189.85	108.00	0.81
1	400	50 Year	1512.00	845.52	850.54	850.54	851.63	0.007912	9.10	232.86	120.79	0.81
1	400	100 Year	1796.00	845.52	850.85	850.85	852.02	0.008098	9.59	271.97	131.34	0.82
1	300	2 Year	419.00	844.00	846.81	846.81	847.81	0.015301	8.01	52.28	26.65	1.01
1	300	10 Year	928.00	844.00	848.58	848.58	849.67	0.008644	8.56	127.44	83.71	0.82

HEC-RAS Plan: Plan 18 River: Bluestone Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	300	25 Year	1249.00	844.00	849.38	849.38	850.32	0.006228	8.37	216.25	134.92	0.72
1	300	50 Year	1512.00	844.00	849.70	849.70	850.70	0.006282	8.83	260.36	140.38	0.73
1	300	100 Year	1796.00	844.00	849.93	849.93	851.05	0.006844	9.53	293.68	144.38	0.77
1	200	2 Year	419.00	843.00	846.53	845.76	846.77	0.005017	4.55	116.41	62.21	0.57
1	200	10 Year	928.00	843.00	847.78	846.71	848.18	0.005025	6.01	211.92	93.80	0.62
1	200	25 Year	1249.00	843.00	847.97	847.10	848.59	0.007403	7.59	229.57	99.02	0.75
1	200	50 Year	1512.00	843.00	848.24	847.51	849.00	0.008194	8.43	256.89	102.52	0.80
1	200	100 Year	1796.00	843.00	848.51	847.83	849.39	0.008587	9.09	285.65	105.47	0.83
1	100	2 Year	419.00	843.00	845.28	845.28	845.88	0.022329	7.44	73.56	59.40	1.15
1	100	10 Year	928.00	843.00	845.87	845.87	847.14	0.032794	10.72	110.13	64.66	1.45
1	100	25 Year	1249.00	843.00	846.78	846.78	847.64	0.014520	9.39	202.38	108.17	1.03
1	100	50 Year	1512.00	843.00	847.02	847.02	847.99	0.014752	10.04	228.10	108.87	1.06
1	100	100 Year	1796.00	843.00	847.24	847.24	848.34	0.015139	10.71	252.94	109.54	1.09

Appendix E



DATE: 08/11/2013	**BLUESTONE CREEK HEC-RAS STUDY**
SCALE: AS SHOWN	WEST UNION DISTRICT
DESIGNED BY: RLG	DODDRIDGE COUNTY, WV
FILE NO: SLS-7000	
SHEET OF	
REV:	

THIS DOCUMENT WAS PREPARED BY: STANTEC, INC. EQT PRODUCTION COMPANY

Professional Energy Consultants
SURVEYORS · PROJECT MGMT. · SLS · ENGINEERS · ENVIRONMENTAL
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

Appendix F

280000 FT

39° 15' 00"

80° 45' 00"

JOINS PANEL 0225

1605000 FT

1610000 FT

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

Legal Advertisement
Doddridge County

Floodplain Permit Application

Please take notice that on the 8th day of October, 2013 EQT PRODUCTION COMPANY - WELL 51 SITE (BLUESTONE CREEK) (PERMIT #13-077) filed an application for a Floodplain Permit to develop land located at or about: SURFACE OWNERS: MARY HOLLAND EST. % JANE HARDIN, BLUESTONE 1207.637 AC INT:O&G, D/B 286/313, TAX MAP 23-04.

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 October 28, 2013.

Delivered to the:
Clerk of the County Court
118 E. Court Street, West Union, WV 26456
Beth A Rogers, Doddridge County Clerk
Dan Wellings, Doddridge County Flood Plain Manager
10-15-1xb

STATE OF WEST VIRGINIA,
COUNTY OF DODDRIDGE, TO WIT

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

Floodplain Permit Application #13-077

was published in said paper for 1

successive weeks beginning with the issue of October 15 2013 and

ending with the issue of

October 15 2013 and

that said notice contains 189

WORD SPACE at .115 cents a word

amounts to the sum of $ 21.74

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

$ Ø

and each publication thereafter

$ 21.74 TOTAL

EDITOR
Virginia Nicholson

SWORN TO AND SUBSCRIBED

BEFORE ME THIS THE 17 DAY

OF October 2013

NOTARY PUBLIC
Laura J Adams

OFFICIAL SEAL
Notary Public, State Of West Virginia
LAURA J ADAMS
212 Edmond Street
West Union, WV 26456
My Commission Expires June 14, 2023

EQT WEU 51 SITE PLAN
EQT PRODUCTION COMPANY
(PROPOSED WELL NO. H1-WV 514661, H2-WV 514662, H3-WV 514663, H4-WV 514664, H5-WV 514665)

PROJECT INFORMATION
PROJECT NAME: EQT WEU 51

TAX PARCEL:
WEST UNION DISTRICT, DODDRIDGE COUNTY, WV
TAX MAP 23-02

SURFACE OWNER:
JANE HARDIN (TRUSTEE) OF MARY HOLLAND TRUST
WEST UNION DISTRICT
DODDRIGE COUNTY, WV
TOTAL PROPERTY AREA: 1,557.637 +/- ACRES
TOTAL DISTURBANCE AREA: 51.8 +/- ACRES

OIL AND GAS ROYALTY OWNER:
LEEMAN MAXWELL HEIRS
WEST UNION DISTRICT
DODDRIGE COUNTY, WV
LEASE ACREAGE: 1,000 +/- ACRES

SITE LOCATION:
THE EQT WEU 51 SITE ENTRANCE IS LOCATED 1.6 MI+/- SOUTH OF THE JUNCTION OF WV 18 AND CR 13. THE WELL PAD IS LOCATED 1.4 MILES +/- SOUTHWEST OF THE JUNCTION OF WV 18 AND CR 13.

LOCATION COORDINATES
EQT WEU 51 WELL PAD CENTER
LATITUDE: 39.255748 LONGITUDE: 80.763153 (NAD 83)

EQT WEU 51 ASSOCIATED IMPOUNDMENT CENTER
LATITUDE: 39.254970 LONGITUDE: 80.761271 (NAD 83)

EQT WEU 51 ASSOCIATED PIT CENTER
LATITUDE: 39.254852 LONGITUDE: 80.763071 (NAD 83)

EQT WEU 51 ACCESS ROAD AT CR 13
LATITUDE: 39.252144 LONGITUDE: 80.745033 (NAD 83)

GENERAL DESCRIPTION
THE WELL PAD, ACCESS ROAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT ARE BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

SITE DISTURBANCE COMPUTATIONS
WELL PAD/ASSOCIATED PIT/ASSOCIATED IMPOUNDMENT AREA = 11.5 +/- ACRES
ACCESS ROAD AREA = 40.3 +/- ACRES
TOTAL SITE DISTURBANCE AREA = 51.8 +/- ACRES

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

MISS UTILITY STATEMENT
MISS UTILITY OF WEST VIRGINIA WAS NOTED FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN; TICKET #1324866542. IN ADDITION, MISS UTILITY WILL BE CONTACTED PRIOR TO START OF THE PROJECT.

ENVIRONMENTAL NOTES
A WETLAND DELINEATION WAS PERFORMED BY POTESTA & ASSOCIATES TO REVIEW THE SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY WITHIN THE REGULATORY PURVIEW OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE SEPTEMBER 9, 2013 REPORT FOR EQT 51 PREPARED BY POTESTA & ASSOCIATES, INC., SUMMARIZES THE RESULTS OF THE FIELD DELINEATION. THE REPORT DOES NOT, IN ANY WAY, REPRESENT A JURISDICTIONAL DETERMINATION OF THE LANDWARD LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USACE OR THE WVDEP. IT IS STRONGLY RECOMMENDED THAT THE AFOREMENTIONED AGENCIES BE CONSULTED IN AN EFFORT TO GAIN WRITTEN CONFIRMATION OF THE DELINEATION DESCRIBED BY THIS REPORT PRIOR TO ENGAGING CONSTRUCTION ON THE PROPERTY DESCRIBED HEREIN. THE DEVELOPER SHALL OBTAIN THE APPROPRIATE PERMITS FROM THE FEDERAL AND/OR STATE REGULATORY AGENCIES PRIOR TO ANY PROPOSED IMPACTS TO WATERS OF THE U.S., INCLUDING WETLAND FILLS AND STREAM CROSSINGS.

GEOTECHNICAL NOTES
A SUBSURFACE GEOTECHNICAL INVESTIGATION HAS NOT BEEN PERFORMED AT THIS SITE.

RESTRICTIONS NOTES
1. THERE ARE PERENNIAL STREAMS, LAKES, PONDS, OR RESERVOIRS WITHIN 100 FEET OF THE PROJECT LOD. THERE ARE WETLANDS WITHIN 100 FEET OF THE PAD AND LOD, AND A WAIVER FROM THE WVDEP WILL BE APPLIED FOR THROUGH THE ARMY CORPS OF ENGINEERS.
2. THERE ARE NO NATURALLY PRODUCING TROUT STREAMS WITHIN 300 FEET OF THE PAD AND LOD.
3. THERE ARE NO GROUNDWATER INTAKE OR PUBLIC WATER SUPPLY FACILITIES WITHIN 1000 FEET OF THE PAD AND LOD.
4. THERE ARE NO KNOWN EXISTING WATER WELLS OR DEVELOPED SPRINGS WITHIN 250 FEET OF THE WELL(S) BEING DRILLED. STANTEC IS NOT RESPONSIBLE FOR ANY EXISTING WATER WELL OR DEVELOPED SPRING DISCOVERED DURING CONSTRUCTION.
5. THERE ARE NO OCCUPIED DWELLING STRUCTURES WITHIN 625 FEET OF THE CENTER OF THE PAD.
6. THERE ARE NO AGRICULTURAL BUILDINGS LARGER THAN 2,500 SQUARE FEET WITHIN 625 FEET OF THE CENTER OF THE PAD.

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

NEW MILTON, OXFORD, SMITHBURG AND WEST UNION QUADRANGLE
WEST VIRGINIA
7.5 MINUTE SERIES

2000' 0' 2000'

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

LIST OF DRAWINGS

LEGEND

EX. INDEX CONTOUR	1550	PROP. INDEX CONTOUR	1550
EX. INTERMEDIATE CONTOUR		PROP. INTERMEDIATE CONTOUR	
EX. BOUNDARY LINE		PROP. CUT LINE	C
EX. EDGE OF ROAD PAVEMENT		PROP. FILL LINE	F
EX. GUARDRAIL		PROP. LIMITS OF DISTURBANCE	
EX. FENCELINE		PROP. WELL HEAD	
EX. GATE		PROP. CONTAINMENT BERM	
EX. OVERHEAD UTILITY	E	PROP. PERIMETER SAFETY FENCE	
EX. OVERHEAD UTILITY R/W		PROP. ACCESS GATE WITH EMERGENCY LIFELINE	
EX. UTILITY POLE		PROP. ROAD CENTERLINE	
EX. GUY WIRE		PROP. FLAT BOTTOM DITCH WITH CHECK DAMS	
EX. TELEPHONE LINE	T	PROP. V-DITCH WITH CHECK DAMS	
EX. GASLINE	G	PROP. CULVERT	
EX. GASLINE R/W		PROP. RIP-RAP OUTLET PROTECTION	
EX. WATERLINE	W	PROP. RIP-RAP INLET PROTECTION	
EX. WATER WELL		PROP. COMPOST FILTERSOCK	CF
EX. GAS WELL		PROP. TREELINE	
EX. TREELINE		PROP. ROCK CONSTRUCTION ENTRANCE	
EX. REFERENCE TREE	1	X-SECTION GRID INDEX	
EX. DELINEATED STREAM		X-SECTION GRID INTERMEDIATE	
EX. DELINEATED WETLAND		X-SECTION PROPOSED GRADE	
EX. BUILDING		X-SECTION EXISTING GRADE	

OPERATOR
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OPERATOR ID: 306686
P.O. BOX 280
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FAIRMONT, WV 26554
PHONE: (304) 367-9401

SURVEYOR
SMITH LAND SURVEYING, INC.
PO BOX 150
226 WEST MAIN STREET
GLENVILLE, WV 26351
PHONE: (304) 462-5634

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
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PROJECT MGMT. ENVIRONMENTAL
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(304) 462-5634
56068 Dilles Bottom Road
Shadyside, OH 43947
(740) 671-9911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
9/16/13
DATE

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

TITLE SHEET
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 1 OF 57
REV:

CONSTRUCTION NOTES

1. THE CONTRACTOR IS TO VERIFY FIELD CONDITIONS PRIOR TO AND DURING CONSTRUCTION AND WILL NOTIFY STANTEC AT (304) 367-9401 OR SMITH LAND SURVEYING AT (304) 462-5634 IMMEDIATELY OF ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THE APPROVED PLAN. ANY WORK PERFORMED BY THE CONTRACTOR AFTER THE FINDING OF SUCH DISCREPANCIES, SHALL BE DONE AT THE CONTRACTOR'S RISK.

2. METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS HEREIN SHALL CONFORM TO THE CURRENT COUNTY CONSTRUCTION STANDARDS AND SPECIFICATIONS AND/OR CURRENT WVDEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL STANDARDS AND SPECIFICATIONS. SHOULD A CONFLICT BETWEEN THE DESIGN, SPECIFICATIONS, AND PLANS OCCUR, THE MOST STRINGENT REQUIREMENT WILL APPLY. THE APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE DEVELOPER OR HIS AGENT OF THE RESPONSIBILITIES CONTAINED IN THE WVDEP EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

3. AN APPROVED SET OF PLANS AND ALL APPLICABLE PERMITS MUST BE AVAILABLE AT THE CONSTRUCTION SITE. ALSO, A REPRESENTATIVE OF THE DEVELOPER MUST BE AVAILABLE AT ALL TIMES.

4. THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS OF CLEANING MUD FROM TRUCKS AND/OR OTHER EQUIPMENT PRIOR TO ENTERING PUBLIC STREETS, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, ALLAY DUST, AND TO TAKE WHATEVER MEASURES ARE NECESSARY TO ENSURE THAT THE STREETS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES.

5. THE LOCATION OF EXISTING UTILITIES SHOWN IN THESE PLANS ARE FROM FIELD LOCATIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES AS NEEDED PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL INFORM THE ENGINEER OF ANY CONFLICTS ARISING FROM HIS EXISTING UTILITY VERIFICATION AND THE PROPOSED CONSTRUCTION.

6. THE CONTRACTOR SHALL PROVIDE NOTIFICATION TO THE APPROPRIATE UTILITY COMPANY PRIOR TO CONSTRUCTION OF WATER AND/OR GAS PIPE LINES. INFORMATION SHOULD ALSO BE OBTAINED FROM THE APPROPRIATE AUTHORITY CONCERNING PERMITS, CUT SHEETS, AND CONNECTIONS TO EXISTING LINES.

7. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REPAIR OF ANY DAMAGES TO THE EXISTING STREETS AND UTILITIES WHICH OCCURS AS A RESULT OF HIS CONSTRUCTION PROJECT WITHIN OR CONTIGUOUS TO THE EXISTING RIGHT-OF-WAY.

8. WHEN GRADING IS PROPOSED WITHIN EASEMENTS OF UTILITIES, LETTERS OF PERMISSION FROM ALL INVOLVED COMPANIES MUST BE OBTAINED PRIOR TO GRADING AND/OR SITE DEVELOPMENT.

9. THE DEVELOPER WILL BE RESPONSIBLE FOR THE RELOCATION OF ANY UTILITIES WHICH IS REQUIRED AS A RESULT OF HIS PROJECT. THE RELOCATION SHOULD BE DONE PRIOR TO CONSTRUCTION.

10. THESE PLANS IDENTIFY THE LOCATION OF ALL KNOWN GRAVESITES. GRAVESITES SHOWN ON THIS PLAN WILL BE PROTECTED IN ACCORDANCE WITH STATE LAW. IN THE EVENT GRAVESITES ARE DISCOVERED DURING CONSTRUCTION, THE OWNER AND ENGINEER MUST BE NOTIFIED IMMEDIATELY.

11. THE CONTRACTOR(S) SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATING OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS, PRIOR TO COMMENCEMENT OF EXCAVATING OR DEMOLITION.

12. THE CONTRACTOR IS TO CONTACT THE OPERATOR AND ENGINEER IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION. THE ENGINEER OR SURVEYOR IS NOT RESPONSIBLE FOR ANY BURIED WATER WELLS, SPRINGS OR ANY OTHER FEATURES UNCOVERED DURING CONSTRUCTION.

13. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE EROSION AND SEDIMENT CONTROL INSPECTOR TWO DAYS PRIOR TO THE START OF CONSTRUCTION.

14. THE CONTRACTOR IS RESPONSIBLE FOR ALL FILL MATERIAL TESTING REQUIRED DURING THE CONSTRUCTION OF THIS PROJECT. ALL MATERIAL TESTS SHALL BE CONDUCTED BY A CERTIFIED MATERIALS TESTING LABORATORY AND A CERTIFICATION OF THE MATERIALS TESTED SHALL BE PROVIDED BY A LICENSED PROFESSIONAL ENGINEER REPRESENTING THE LABORATORY. ALL TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER CERTIFYING THE CONSTRUCTED FACILITY. FAILURE TO CONDUCT THE DENSITY TEST SHALL BE CAUSE FOR NON-ACCEPTANCE OF THE CONSTRUCTED FACILITY.

15. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING THE SITE IN ACCORDANCE WITH THE DESIGN PLANS AND CONSTRUCTION DOCUMENTS AND THE SCOPE OF WORK SHALL CONFORM WITH THE GRADES, BERMS, DEPTHS, DIMENSIONS, ETC. SHOWN HEREON.

MAINTENANCE PROGRAM

1. BMPS WILL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH MEASUREABLE RAINFALL EVENT DURING THE ACTIVE CONSTRUCTION PHASE OF THE PROJECT.

2. ALL REVEGETATED ACCESS ROADS AND FACILITIES ARE TO BE MAINTAINED THROUGHOUT THE LIFE OF THE PROJECT.

3. CULVERTS, ROAD DITCHES, BROAD-BASED DIPS, DIVERSION DITCHES, AND ROCK CHECK DAMS MUST BE MAINTAINED IN PROPER WORKING ORDER AND WILL BE CLEANED OUT, REPAIRED, OR REPLACED AS NECESSARY.

4. SEDIMENT SHOULD BE REMOVED FROM COMPOST FILTER SOCK WHERE ACCUMULATIONS REACH HALF THE ABOVE GROUND HEIGHT OF THE FILTER SOCK. REPLACE SECTIONS OF FAILED FILTER SOCK IMMEDIATELY. REMOVE ENTIRE FILTER SOCK UPON COMPLETION OF PROJECT AND ESTABLISHMENT OF VEGETATIVE GROWTH.

5. ALL AREAS OF EARTH DISTURBANCE WILL BE REPAIRED WHERE SIGNS OF ACCELERATED EROSION ARE DETECTED.

6. SEEDING AND MULCHING WILL BE REPEATED IN THOSE AREAS THAT APPEAR TO BE FAILING OR HAVE FAILED.

CONSTRUCTION SEQUENCE

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

1. HOLD A PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTOR AND THE APPROPRIATE EROSION AND SEDIMENT CONTROL INSPECTOR 48 HOURS PRIOR TO BEGINNING WORK TO REVIEW THE CONSTRUCTION DRAWING AND PROVIDE ANY REQUESTED GUIDANCE.

2. STAKE THE LIMITS OF CONSTRUCTION.

3. INSTALL THE ROCK CONSTRUCTION ENTRANCE AS SHOWN ON THE PLANS.

4. INSTALL ALL BMPS NECESSARY TO BEGIN CLEARING AND GRUBBING OF THE SITE AS SHOWN ON THE PLANS AND DETAILS.

5. CLEAR AND GRUB THE ACCESS ROAD AND PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT AREAS. ALL WOODY MATERIAL, BRUSH, TREES, STUMPS, LARGE ROOTS, BOULDERS, AND DEBRIS SHALL BE CLEARED FROM THE SITE AREA AND KEPT TO THE MINIMUM NECESSARY FOR PROPER CONSTRUCTION, INCLUDING THE INSTALLATION OF ANY NECESSARY SEDIMENT CONTROLS. TREES SIX INCHES IN DIAMETER AND LARGER SHALL BE CUT AND LOGS STACKED. SMALLER TREES, BRUSH, AND STUMPS SHALL BE CUT AND/OR GRUBBED AND WINDROWED IN APPROPRIATE AREAS FOR USE AS SEDIMENT BARRIERS AT WATER DRAINAGE OUTLETS, WINDROWED BELOW THE WELL SITE, USED FOR WILDLIFE HABITAT, BURNED (AS PER WV FOREST FIRE LAWS), REMOVED FROM THE SITE, OR DISPOSED OF BY OTHER METHODS APPROVED BY DEP.

6. STRIP THE TOPSOIL FROM THE ACCESS ROAD AREAS, WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT AREAS. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED ON AREAS SHOWN ON THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURES SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, IF NECESSARY.

7. CONSTRUCT THE ACCESS ROAD, PROPOSED CROSS CULVERTS AND ROAD SIDE DITCHES. AS ACCESS ROAD CONSTRUCTION PROGRESSES, BEGIN WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT CONSTRUCTION TO GENERATE EXCESS MATERIAL REQUIRED FOR ACCESS ROAD CONSTRUCTION. AS FILL SLOPES ARE CONSTRUCTED, INSTALL SLOPE INTERRUPTION COMPOST FILTER SOCK AS LABELED ON THE PLANS AND SHOWN ON THE DETAILS.

8. INSTALL DITCH RELIEF CULVERTS AT A MINIMUM SLOPE OF 1% AND APPROXIMATELY 30 DEGREES DOWNGRADE TO THE CENTERLINE OF THE DITCH. INSTALL OUTLET PROTECTION AS SHOWN ON PLANS AND DETAILS AS CROSS CULVERTS ARE INSTALLED AND IMMEDIATELY STABILIZE ROAD SIDE DITCHES WITH ROCK. STABILIZE THE ROAD WITH GEOTEXTILE FABRIC AND STONE AND SIDE SLOPES AS SPECIFIED WITH PERMANENT SEEDING. STOCKPILE AND STABILIZE EXCESS MATERIAL ALONG THE ACCESS ROAD, AS NEEDED.

9. ALL DITCH LINES SHALL BE CLEANED PRIOR TO INSTALLATION OF LINED PROTECTION. ALL DITCHES SHALL BE ROCK LINED WITH D50 = 6" MIN. SIZED RIPRAP UNLESS SPECIFIED OTHERWISE.

10. FINALIZE GRADING OF THE WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT. IMMEDIATELY STABILIZE THE OUTER AREAS OF THE WELL PAD, PIT, AND IMPOUNDMENT. THE WELL PAD AND MANIFOLD PAD AND TURNAROUND AREA(S) SHALL BE STABILIZED WITH GEOTEXTILE FABRIC AND STONE. STABILIZE ALL SIDE SLOPES WITH COCONUT EROSION CONTROL BLANKETS. APPLY SEED AND MULCH TO ALL DISTURBED AREAS. THIS SHALL BE INCLUDED IN ALL AREAS THAT WILL NOT BE SUBJECT TO REGULAR TRAFFIC ACTIVITY (TO BE STABILIZED WITH STONE), OR ANY DISTURBED AREA THAT WILL NOT BE RE-DISTURBED BEFORE SITE RECLAMATION BEGINS.

11. PRIOR TO THE INSTALLATION OF THE ASSOCIATED PIT AND ASSOCIATED IMPOUNDMENT LINER SYSTEM, THE CONTRACTOR SHALL CONTACT THE ENGINEER/SURVEYOR TO COMPLETE AN AS-BUILT SURVEY OF THE CONSTRUCTED PIT/IMPOUNDMENT/BERM TO ENSURE CONFORMANCE WITH THE DESIGN DRAWINGS. THE AS-BUILT WILL BE REVIEWED BY THE ENGINEER AND THE CONTRACTOR IS RESPONSIBLE FOR ANY CORRECTIVE ACTION DEEMED NECESSARY BY THE ENGINEER FOR ANY DEVIATION(S) FROM THE DESIGN DRAWINGS.

12. INSTALL THE LINER SYSTEM AND PERIMETER SAFETY FENCE WITH GATE AND EMERGENCY LIFE LINE AS SHOWN ON THE PLANS.

13. PREVIOUSLY DISTURBED AREAS AND IMMEDIATE DOWN SLOPE AREAS SHALL BE INSPECTED AFTER EACH RAINFALL STORM EVENT AND MONITORED WEEKLY FOR SIGNS OF ACCELERATED EROSION. IMPLEMENT ADDITIONAL BMPS AS DEEMED NECESSARY. THESE INSPECTIONS SHALL CONTINUE DURING THE DURATION OF THE PROJECT AND SUBSEQUENT SITE RECLAMATION.

14. ONCE THE ASSOCIATED PIT AND ASSOCIATED IMPOUNDMENT HAS BEEN CONSTRUCTED AND LINER SYSTEMS COMPLETED, SUBMIT THE AS-BUILT CERTIFICATION FOR THE FACILITIES TO THE WVDEP OFFICE OF OIL AND GAS PRIOR TO PLACING FLUIDS IN EITHER STRUCTURE.

15. COMMENCE THE DRILLING ACTIVITY.

16. ONCE DISTURBED AREAS HAVE BEEN RE-VEGETATED AND STABILIZED FOLLOWING RECLAMATION, THE TEMPORARY BMPS IN THOSE AREAS MAY BE REMOVED. CONTINUE TO MONITOR THESE AREAS TO ENSURE A UNIFORM RATE OF 70% VEGETATIVE COVERAGE IS MAINTAINED. ANY AREAS FOUND TO BE DEFFICIENT SHALL BE RE-SEEDED AND MULCHED.

ASSOCIATED PIT/IMPOUNDMENT CONSTRUCTION STANDARDS

THE DESIGN, CONSTRUCTION, AND REMOVAL OF EMBANKMENTS ASSOCIATED WITH ASSOCIATED PITS/IMPOUNDMENTS FOR OIL AND GAS WELLS MUST BE ACCOMPLISHED IN SUCH A MANNER AS TO PROTECT THE HEALTH AND SAFETY OF THE PEOPLE, THE NATURAL RESOURCES, AND ENVIRONMENT OF THE STATE. THE PIT/IMPOUNDMENT EMBANKMENTS SHALL BE DESIGNED, CONSTRUCTED, AND MAINTAINED TO BE STRUCTURALLY SOUND AND REASONABLY PROTECTED FROM UNAUTHORIZED ACTS OF THIRD PARTIES.

1. THE FOUNDATION FOR AN ASSOCIATED PIT/IMPOUNDMENT EMBANKMENT MUST BE STRIPPED AND GRUBBED TO A MINIMUM DEPTH OF 2 FEET PRIOR TO PLACEMENT AND COMPACTION OF EARTHEN FILL MATERIAL. NO EMBANKMENT FILL SHALL BE PLACED ON FROZEN MATERIAL.

2. ANY SPRINGS ENCOUNTERED WITHIN THE FOUNDATION AREA SHALL BE DRAINED TO OUTSIDE/DOWNSTREAM TOE OF EMBANKMENT. CONSTRUCTED DRAIN SECTION SHALL BE AN EXCAVATED 2' X 2' TRENCH AND BACK FILLED WITH TYPE A SAND, COMPACTED BY HAND TAMPER. NO GEOTEXTILES SHALL BE USED TO LINE TRENCH. THE LAST 3 FEET OF DRAIN AT THE DOWNSTREAM END SHALL BE CONSTRUCTED WITH AASHTO #8 MATERIAL.

3. SOILS FOR EARTHEN EMBANKMENT CONSTRUCTION SHALL BE LIMITED TO TYPES GC, GM, SC, SM, CL, OR ML (ASTMD-2487 - UNIFIED SOILS CLASSIFICATION). SOILS MUST CONTAIN A MINIMUM OF 20% PF PLUS NO. 200 SIEVE AND BE "WELL GRADED" MATERIAL WITH NO COBBLES OR BOULDER SIZE MATERIAL MIXED WITH CLAY. A MINIMUM OF THREE SAMPLES SHALL BE CLASSIFIED.

4. THE EARTHEN EMBANKMENT SHALL BE COMPACTED BY A VIBRATING SHEEPSFOOT ROLLER. THE LIFTS MUST BE IN HORIZONTAL LAYERS WITH A MAXIMUM LOOSE LIFT THICKNESS OF 12" AND MAXIMUM PARTICLE SIZE LESS THAN 6". ALL FILL SHALL BE COMPACTED TO 95% PER THE STANDARD PROCTOR TEST (ASTMD-698).

5. THE PLACEMENT OF ALL FILL MATERIAL SHALL BE FREE OF WOOD, STUMPS AND ROOTS, LARGE ROCKS AND BOULDERS, AND ANY OTHER NONCOMPACTABLE SOIL MATERIAL. THE EMBANKMENT SHALL BE COMPACTED TO A MINIMUM OF VISIBLE NON-MOVEMENT, HOWEVER, THE COMPACTION EFFORT SHALL NOT EXCEED THE OPTIMUM MOISTURE LIMITS.

6. THE EMBANKMENT TOP SHALL BE A MINIMUM OF 15 FEET IN WIDTH.

7. THE MINIMUM INSIDE SIDESLOPES SHALL BE 3H:1V AND OUTSIDE SIDESLOPES SHALL BE 2H:1V, UNLESS OTHERWISE SPECIFIED.

8. ALL EXPOSED EMBANKMENT SLOPES NOT COVERED BY COMPACTED ROCKFILL OR RIPRAP SHALL BE LIMED, FERTILIZED, SEEDED AND MULCHED. PERMANENT VEGETATIVE GROUND COVER IN COMPLIANCE WITH THE WVDEP EROSION AND SEDIMENT CONTROL FIELD MANUAL MUST BE ESTABLISHED UPON THE COMPLETION OF THE PIT CONSTRUCTION. EMBANKMENTS SHALL BE MAINTAINED WITH A GRASSY VEGETATIVE COVER AND FREE OF BRUSH AND/OR TREES.

9. A MINIMUM OF 2 FEET OF FREEBOARD SHALL BE MAINTAINED AT ALL TIMES DURING THE OPERATION OF THE PIT/IMPOUNDMENT.

10. ALL EMBANKMENT CONSTRUCTION AND COMPACTION TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

ASSOCIATED PIT/IMPOUNDMENT LINER SYSTEM NOTES

THE DESIGNED PIT/IMPOUNDMENT FACILITY SHALL BE FULLY LINED WITH A GEOSYNTHETIC LINER SYSTEM. LINERS SHALL BE INSTALLED IN ACCORDANCE TO MANUFACTURER'S SPECIFICATIONS.

1. THE SUB-BASE SHALL BEAR THE WEIGHT OF THE LINER SYSTEM, WATER, AND EQUIPMENT OPERATING ON THE PIT OR IMPOUNDMENT WITHOUT CAUSING OR ALLOWING A FAILURE OF THE LINER SYSTEM.

2. THE SUB-BASE SHALL BE COMPACTED TO ACCOMODATE POTENTIAL SETTLEMENT WITHOUT DAMAGE TO THE LINER SYSTEM.

3. THE UPPER 6" OF THE SUB-BASE SHALL BE COMPACTED TO A STANDARD PROCTOR DENSITY OF AT LEAST 95%.

4. THE SUB-BASE SHALL BE HARD, UNIFORM, SMOOTH AND FREE OF DEBRIS, ROCK FRAGMENTS, PLANT MATERIAL AND OTHER FOREIGN MATERIAL.

5. THE SUB-BASE SHALL BE COVERED WITH NON-WOVEN GEOTEXTILE FABRIC TO CUSHION THE PRIMARY LINER AND ALLOW FOR ADEQUATE VENTING BETWEEN THE PRIMARY LINER AND THE SUB-BASE TO PREVENT THE ENTRAPMENT OF GASES BENEATH THE LINER SYSTEM.

6. THE PIT/IMPOUNDMENT AREA SHALL BE DRAINED AND COMPLETELY DRY PRIOR TO THE PLACEMENT OF THE PRIMARY LINER. THE PRIMARY LINER SHALL MEET ALL WVDEP GUIDELINES FOR MINIMUM THICKNESS AND SHALL PREVENT THE MIGRATION OF WATER THROUGH THE LINER TO THE GREATEST DEGREE THAT IS TECHNOLOGICALLY POSSIBLE.

7. THE PRIMARY LINER SHALL FULLY COVER THE BOTTOM AND SIDEWALLS OF THE PIT/IMPOUNDMENT.

8. AN ANCHOR TRENCH SHALL BE EXCAVATED COMPLETELY AROUND THE PERIMETER OF THE PIT/IMPOUNDMENT AREA AT THE PLANNED ELEVATION OF THE TOP OF THE LINING. THE TRENCH SHALL BE A MINIMUM 36 INCHES DEEP AND 24 INCHES WIDE.

9. ALL ELEMENTS OF THE LINER SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. ALL SEAMS AND SEALS AROUND ANY PROJECTIONS SHALL BE SEALED AND TESTED IN A METHOD APPROVED BY THE MANUFACTURER.

10. GAS RELIEF VENTS SHALL BE PROVIDED ALONG THE TOP OF THE LINER AND WITHIN ONE FOOT OF THE PERIMETER OF THE PIT TO ALLOW GASES TO ESCAPE FROM UNDER THE GEOMEMBRANE. MAXIMUM SPACING FOR VENTS SHALL BE 30 FEET.

11. WATER LEVEL MARKINGS SHALL BE CLEARLY PAINTED (1' INCREMENTS) ON THE LINER SYSTEM TO IDENTIFY THE WATER SURFACE ELEVATION.

SITE CLEANUP & RECYCLE PROGRAM

1. GARBAGE, FUELS OR ANY SUBSTANCE HARMFUL TO HUMAN, AQUATIC OR FISH LIFE, WILL BE PREVENTED FROM ENTERING SPRINGS, STREAMS, PONDS, LAKES, WETLANDS OR ANY WATER COURSE OR WATER BODY.

2. OILS, FUELS, LUBRICANTS AND COOLANTS WILL BE PLACED IN SUITABLE CONTAINERS AND DISPOSED PROPERLY.

3. ALL TRASH AND GARBAGE WILL BE COLLECTED AND DISPOSED PROPERLY.

4. ALL SEDIMENT REMOVED FROM SEDIMENT CAPTURING DEVICES SHALL BE PLACED ON THE TOPSOIL STOCKPILE, THEN SEEDED AND MULCHED, AS NECESSARY. ALTERNATIVELY, THE REMOVED SEDIMENT CAN BE TRANSPORTED TO A SITE WITH AN APPROVED PERMIT.

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Professional Energy Consultants
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SURVEYORS · PROJECT MGMT. · ENGINEERS · ENVIRONMENTAL
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES · REGISTERED · 17220 · STATE OF WEST VIRGINIA · PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

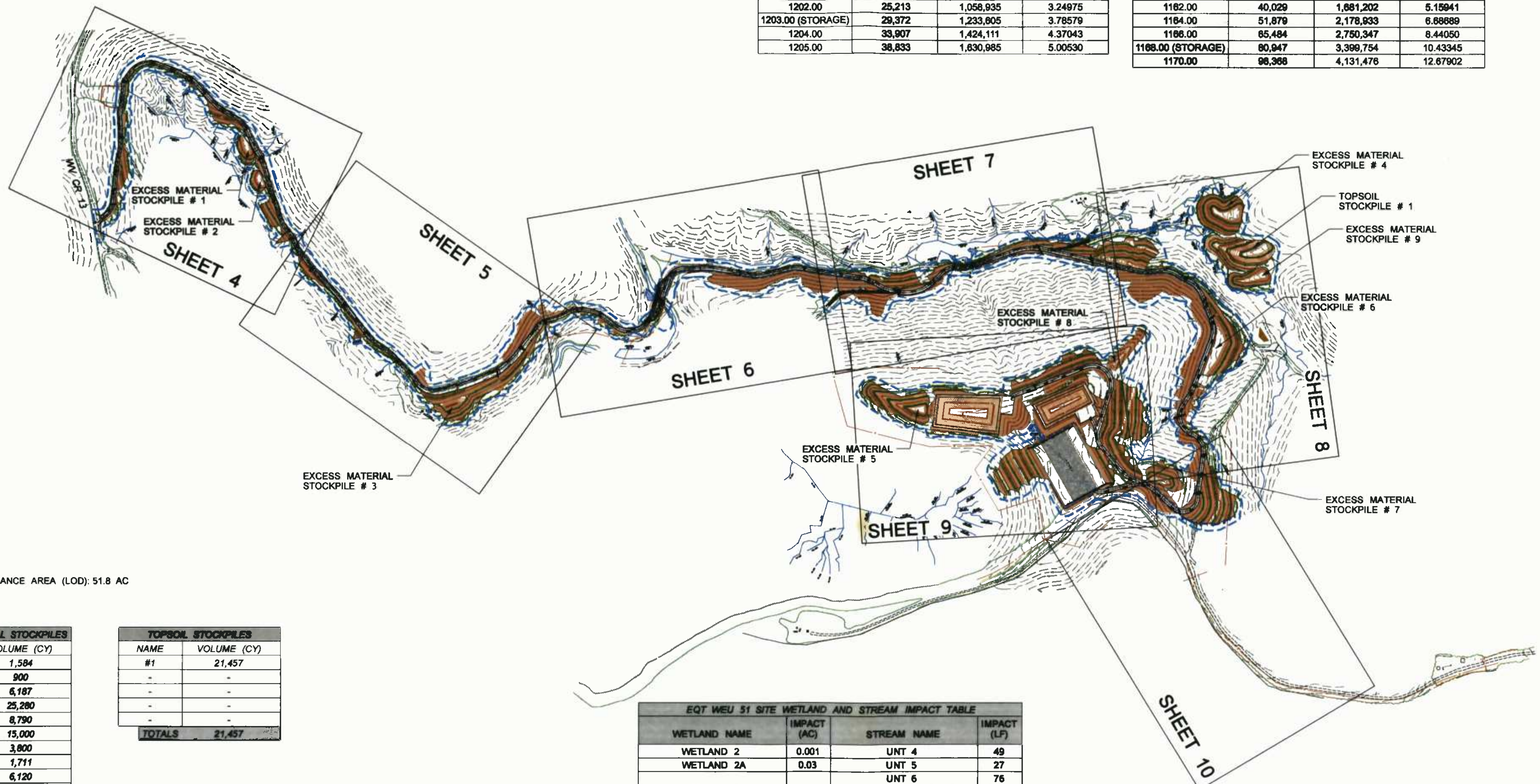
GENERAL NOTES
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-6051
SHEET 2 OF 57
REV:

ASSOCIATED PIT CUMULATIVE STORAGE VOLUME SUMMARY			
ELEVATION	BARRELS	GALLONS	ACRE-FT
1190.00	0.0	0	0.0
1192.00	1,502	63,091	0.19362
1194.00	3,947	165,791	0.50879
1196.00	7,438	312,409	0.95875
1198.00	12,078	507,261	1.55673
1200.00	17,968	754,665	2.31598
1202.00	25,213	1,058,935	3.24975
1203.00 (STORAGE)	29,372	1,233,605	3.78579
1204.00	33,907	1,424,111	4.37043
1205.00	38,833	1,630,985	5.00530

ASSOCIATED IMPOUNDMENT CUMULATIVE STORAGE VOLUME SUMMARY			
ELEVATION	BARRELS	GALLONS	ACRE-FT
1150.00	0.0	0.0	0.0
1152.00	3,486	146,431	0.44938
1154.00	8,110	340,610	1.04529
1156.00	13,973	586,854	1.80099
1158.00	21,178	889,486	2.72973
1160.00	29,829	1,252,830	3.84479
1162.00	40,029	1,681,202	5.15941
1164.00	51,879	2,178,933	6.68689
1166.00	65,484	2,750,347	8.44050
1168.00 (STORAGE)	80,947	3,399,754	10.43345
1170.00	98,368	4,131,476	12.67902

NORTH



LIMIT OF DISTURBANCE AREA (LOD): 51.8 AC

EXCESS MATERIAL STOCKPILES	
NAME	VOLUME (CY)
#1	1,584
#2	900
#3	6,187
#4	25,280
#5	8,790
#6	15,000
#7	3,800
#8	1,711
#9	6,120
TOTALS	69,372

TOPSOIL STOCKPILES	
NAME	VOLUME (CY)
#1	21,457
-	-
-	-
-	-
-	-
TOTALS	21,457

EQT WEU 51 SITE EARTHWORK SUMMARY						
DESCRIPTION	CUT (CY)	FILL (CY)	SPOIL (CY)	BORROW (CY)	MAX SLOPE (%)	LENGTH OF SLOPE (FT)
ACCESS ROADS	47,206	117,271	0	70,065	20.0	241
WELL PAD	49,320	15,664	33,656	0	N/A	N/A
ASSOCIATED PIT	28,483	2,181	26,302	0	N/A	N/A
ASSOCIATED IMPOUNDMENT	80,982	1,503	79,479	0	N/A	N/A
STRIPPED TOPSOIL (6")	21,457	0	21,457	0	N/A	N/A
MATERIAL STOCKPILES *	0	90,829	0	90,829	N/A	N/A
TOTALS	227,448	227,448	160,894	160,894		
EXCESS MATERIAL	0 CY					

* INCLUDES TOPSOIL STOCKPILE AREAS

EQT WEU 51 SITE WETLAND AND STREAM IMPACT TABLE			
WETLAND NAME	IMPACT (AC)	STREAM NAME	IMPACT (LF)
WETLAND 2	0.001	UNT 4	49
WETLAND 2A	0.03	UNT 5	27
		UNT 6	76
		UNT 7	40
		UNT 9	63
		UNT 10	10
		UNT 11	5
		UNT 12	101
		UNT 13	60
		UNT 14	36
		UNT 15	40
		UNT 16	47
		UNT 17	60
		UNT 18	81
		UNT 19	67
		UNT 24	35
		UNT 25	70
		UNT 26	55
		UNT 26A	149
		UNT 27A	36
		UNT 28A	158
		UNT 30	146
		UNT 33	67
TOTAL	0.031	TOTAL	1,478

THE EARTHWORK QUANTITIES PROVIDED ARE AN ESTIMATE FOR CONSIDERATION. THE QUANTITIES SHOWN ARE CALCULATED USING A 1:1 CUT/SWELL AND FILL/SHRINK FACTOR. THE QUANTITIES SHOWN MAY BE GREATER OR LESSER THAN ACTUALLY EXCAVATED. THE ENGINEER IS NOT RESPONSIBLE FOR VARIANCES FROM THE ESTIMATED QUANTITIES AND DOES NOT CERTIFY TO THEIR ACCURACY.

0' 300' 600' 900'

HORIZONTAL SCALE

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111 ELKINS STREET
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HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

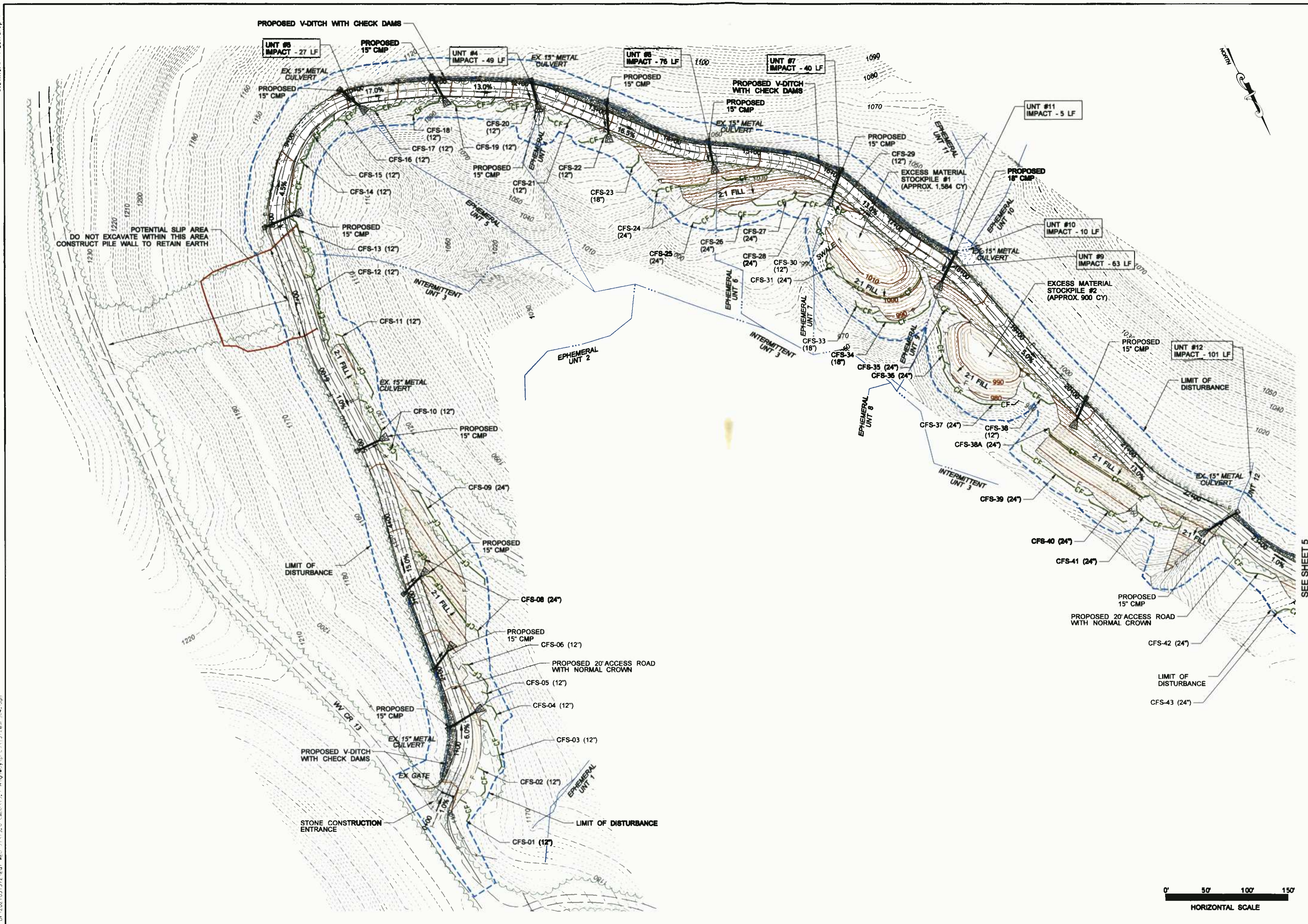
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

OVERALL PLAN SHEET INDEX

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO.: SLS-8051	
SHEET	3 OF 57
REV:	



PROPOSED V-DITCH WITH CHECK DAMS
UNT #5 IMPACT - 27 LF
PROPOSED 15" CMP
UNT #4 IMPACT - 49 LF
EX. 15" METAL CULVERT
UNT #6 IMPACT - 76 LF
UNT #7 IMPACT - 40 LF
PROPOSED V-DITCH WITH CHECK DAMS
UNT #11 IMPACT - 5 LF
EXCESS MATERIAL STOCKPILE #1 (APPROX. 1,584 CY)
PROPOSED 18" CMP
UNT #10 IMPACT - 10 LF
UNT #9 IMPACT - 63 LF
EXCESS MATERIAL STOCKPILE #2 (APPROX. 900 CY)
UNT #12 IMPACT - 101 LF
LIMIT OF DISTURBANCE
POTENTIAL SLIP AREA
DO NOT EXCAVATE WITHIN THIS AREA
CONSTRUCT PILE WALL TO RETAIN EARTH
EPHEMERAL UNT 5
INTERMITTENT UNT 3
EPHEMERAL UNT 2
EPHEMERAL UNT 6
EPHEMERAL UNT 7
EPHEMERAL UNT 8
EPHEMERAL UNT 1
2:1 FILL
SWALE
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
STONE CONSTRUCTION ENTRANCE
EX. GATE
WV CR 13
SEE SHEET 5
NORTH
0' 50' 100' 150'
HORIZONTAL SCALE

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HONESTY, INTEGRITY, QUALITY

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REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

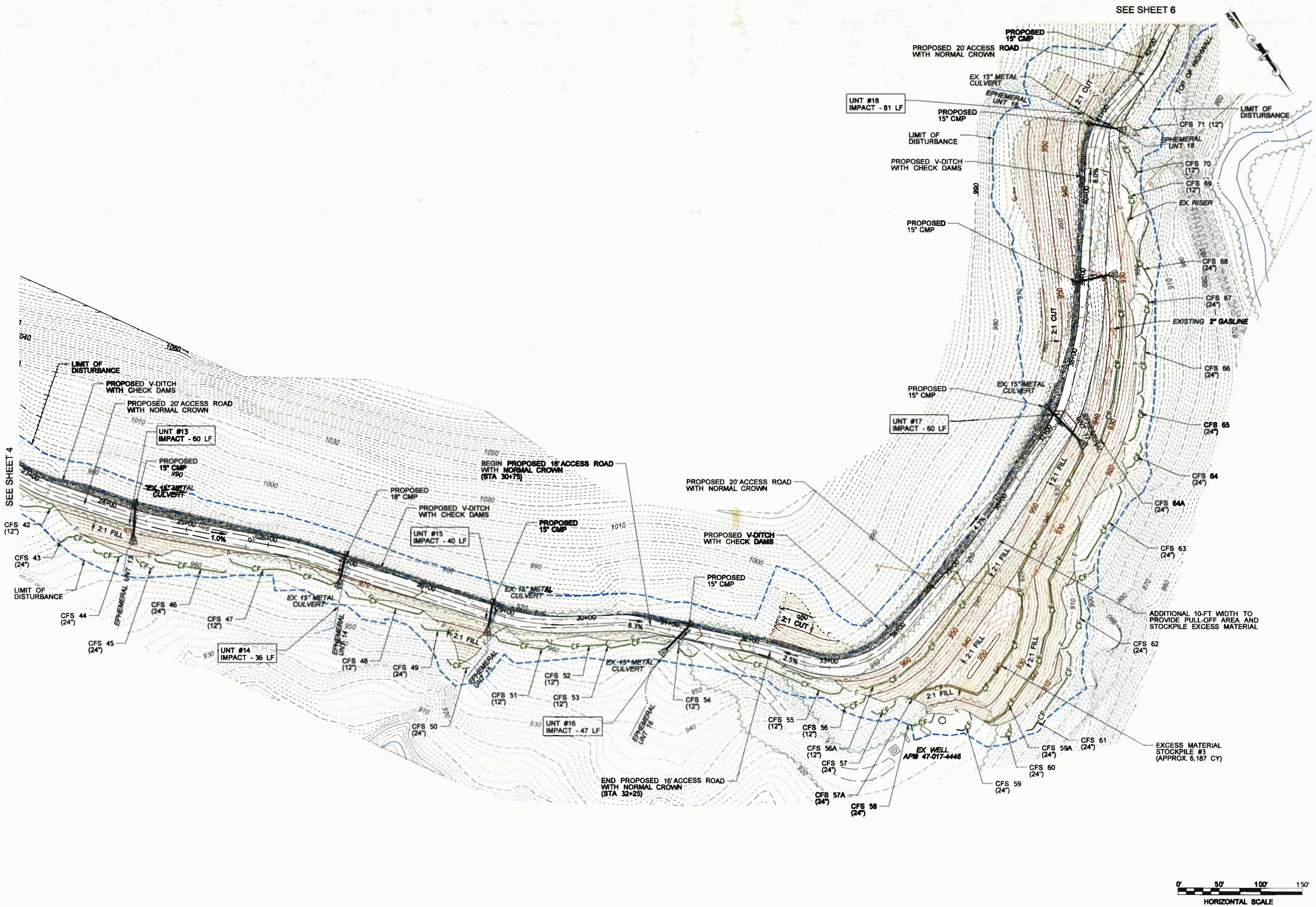
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD LAYOUT

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 4 OF 57
REV:


SEE SHEET 6
SEE SHEET 4
NORTH
PROPOSED 15" CMP
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
EX. 15" METAL CULVERT
EPHEMERAL UNT 18
UNT #18 IMPACT - 81 LF
PROPOSED 15" CMP
LIMIT OF DISTURBANCE
PROPOSED V-DITCH WITH CHECK DAMS
TOP OF HIGHWALL
CFS 71 (12")
CFS 70 (12")
CFS 69 (12")
EX. RISER
PROPOSED 15" CMP
CFS 68 (24")
CFS 67 (24")
EXISTING 2" GASLINE
CFS 66 (24")
PROPOSED 15" CMP
EX. 15" METAL CULVERT
UNT #17 IMPACT - 60 LF
CFS 65 (24")
CFS 64 (24")
CFS 64A (24")
CFS 63 (24")
2:1 CUT
2:1 FILL
8.0%
4.3%
ADDITIONAL 10-FT WIDTH TO PROVIDE PULL-OFF AREA AND STOCKPILE EXCESS MATERIAL
CFS 62 (24")
EXCESS MATERIAL STOCKPILE #3 (APPROX. 6,187 CY)
CFS 61 (24")
CFS 59A (24")
CFS 60 (24")
CFS 59 (24")
EX. WELL API# 47-017-4446
CFS 58 (24")
CFS 57A (24")
CFS 57 (24")
CFS 56A (12")
CFS 56 (12")
CFS 55 (12")
END PROPOSED 16' ACCESS ROAD WITH NORMAL CROWN (STA 32+25)
CFS 54 (12")
UNT #16 IMPACT - 47 LF
EPHEMERAL UNT 16
EX. 15" METAL CULVERT
PROPOSED 15" CMP
2.5%
8.3%
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
BEGIN PROPOSED 16' ACCESS ROAD WITH NORMAL CROWN (STA 30+75)
PROPOSED 15" CMP
EX. 15" METAL CULVERT
UNT #15 IMPACT - 40 LF
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 18" CMP
CFS 53 (12")
CFS 52 (12")
CFS 51 (12")
CFS 50 (24")
CFS 49 (24")
CFS 48 (12")
EPHEMERAL UNT 15
EPHEMERAL UNT 14
UNT #14 IMPACT - 36 LF
EX. 15" METAL CULVERT
CFS 47 (12")
CFS 46 (24")
CFS 45 (24")
CFS 44 (24")
EPHEMERAL UNT 13
LIMIT OF DISTURBANCE
CFS 43 (24")
CFS 42 (12")
2:1 FILL
1.0%
EX. 15" METAL CULVERT
PROPOSED 15" CMP
UNT #13 IMPACT - 60 LF
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
PROPOSED V-DITCH WITH CHECK DAMS
LIMIT OF DISTURBANCE
0' 50' 100' 150'
HORIZONTAL SCALE

Stantec

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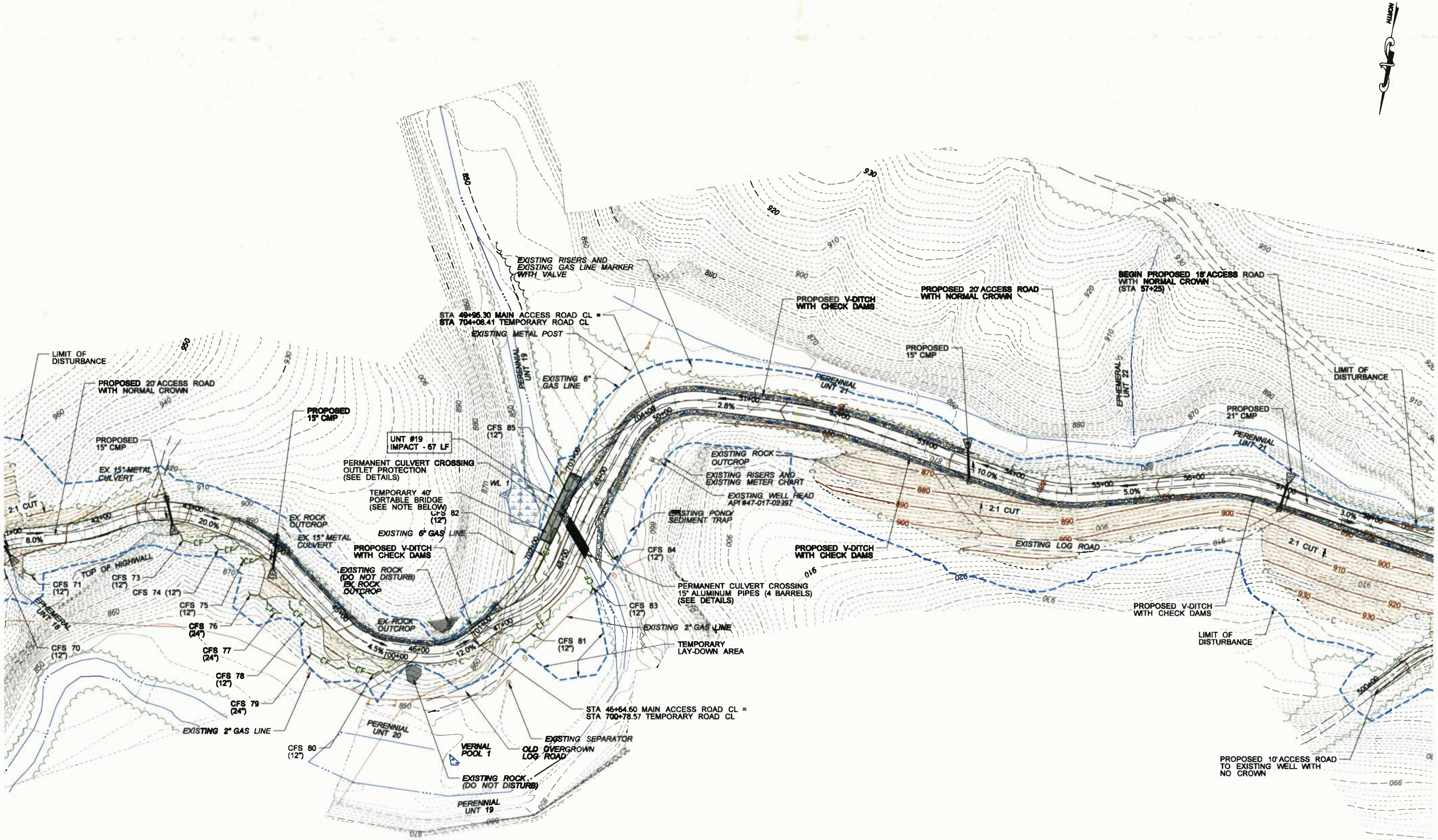
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO. SLS-8051
SHEET 5 OF 57
REV:



NORTH
SEE SHEET 5
SEE SHEET 7
LIMIT OF DISTURBANCE
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
PROPOSED 15" CMP
EX 15" METAL CULVERT
2:1 CUT
8.0%
20.0%
TOP OF HIGHWALL
EPHEMERAL UNT 18
CFS 70 (12")
CFS 71 (12")
CFS 73 (12")
CFS 74 (12")
CFS 75 (12")
CFS 76 (24")
CFS 77 (24")
CFS 78 (12")
CFS 79 (24")
CFS 80 (12")
CFS 81 (12")
CFS 82 (12")
CFS 83 (12")
CFS 84 (12")
CFS 85 (12")
EXISTING 2" GAS LINE
EX ROCK OUTCROP
EX 15" METAL CULVERT
EXISTING 6" GAS LINE
PROPOSED V-DITCH WITH CHECK DAMS
EXISTING ROCK (DO NOT DISTURB)
EX ROCK OUTCROP
UNT #19 IMPACT - 67 LF
PERMANENT CULVERT CROSSING OUTLET PROTECTION (SEE DETAILS)
TEMPORARY 40' PORTABLE BRIDGE (SEE NOTE BELOW)
WL 1
PERENNIAL UNT 19
PERENNIAL UNT 20
VERNAL POOL 1
OLD OVERGROWN LOG ROAD
EXISTING ROCK (DO NOT DISTURB)
EXISTING SEPARATOR
4.5%
12.0%
STA 45+64.60 MAIN ACCESS ROAD CL = STA 700+78.57 TEMPORARY ROAD CL
TEMPORARY LAY-DOWN AREA
EXISTING 2" GAS LINE
PERMANENT CULVERT CROSSING 15" ALUMINUM PIPES (4 BARRELS) (SEE DETAILS)
EXISTING POND/ SEDIMENT TRAP
EXISTING RISERS AND EXISTING GAS LINE MARKER WITH VALVE
STA 49+95.30 MAIN ACCESS ROAD CL = STA 704+08.41 TEMPORARY ROAD CL
EXISTING METAL POST
EXISTING 6" GAS LINE
EXISTING ROCK OUTCROP
EXISTING RISERS AND EXISTING METER CHART
EXISTING WELL HEAD API #47-017-02397
PROPOSED V-DITCH WITH CHECK DAMS
PERENNIAL UNT 21
2.8%
10.0%
5.0%
3.0%
PROPOSED 15" CMP
PROPOSED 20' ACCESS ROAD WITH NORMAL CROWN
BEGIN PROPOSED 18' ACCESS ROAD WITH NORMAL CROWN (STA 57+25)
EPHEMERAL UNT 22
EXISTING LOG ROAD
PROPOSED 21" CMP
LIMIT OF DISTURBANCE
PROPOSED V-DITCH WITH CHECK DAMS
LIMIT OF DISTURBANCE
PROPOSED 10' ACCESS ROAD TO EXISTING WELL WITH NO CROWN

NOTE:
REMOVE THE TEMPORARY PORTABLE BRIDGE PRIOR TO CONSTRUCTION OF THE LOW WATER CROSSING

0' 50' 100' 150'
HORIZONTAL SCALE

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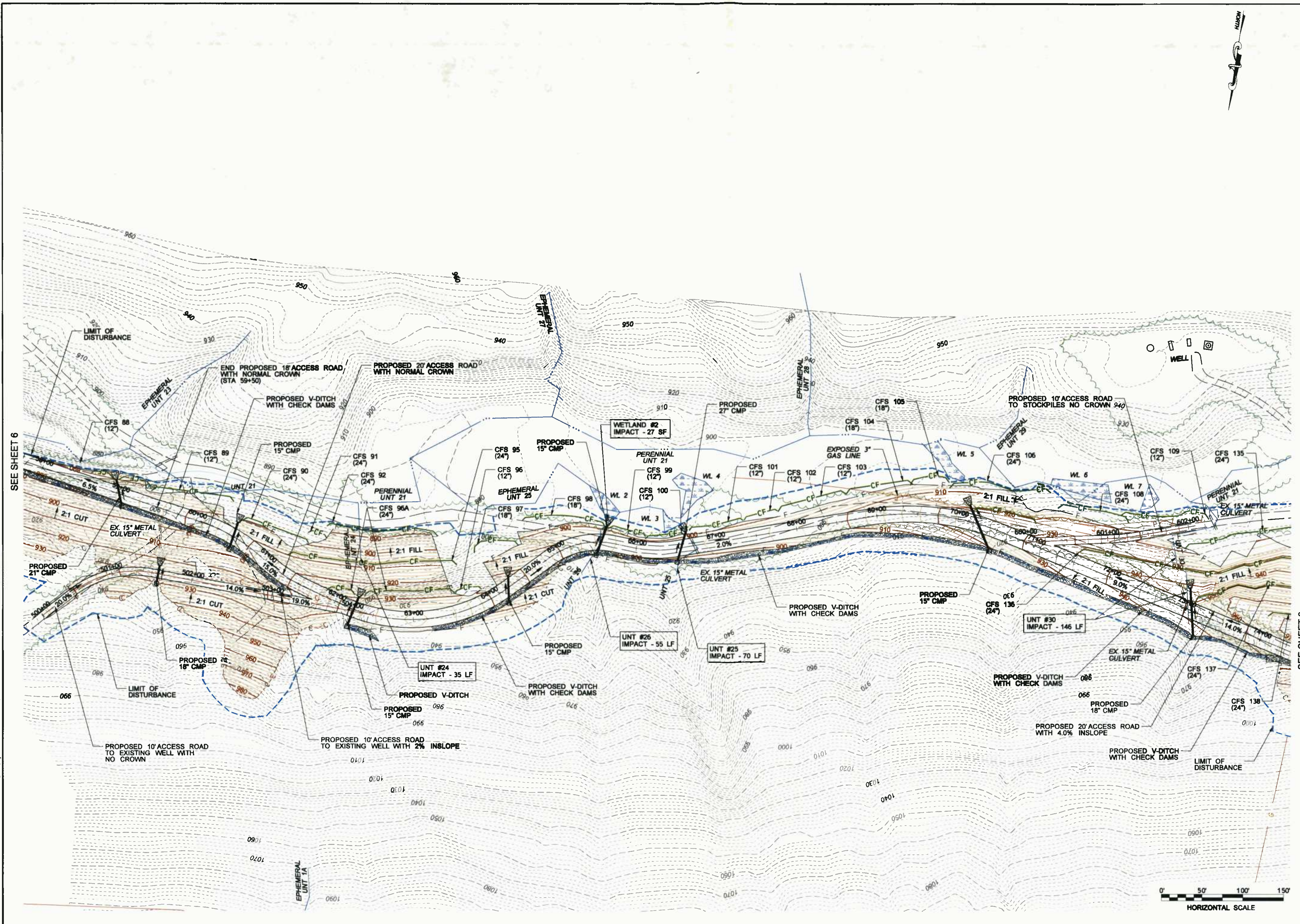
SHEET 6 OF 57
REV:



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ACCESS ROAD LAYOUT

EQT WEU 51

WEST UNION DISTRICT

DODDRIDGE COUNTY, WV

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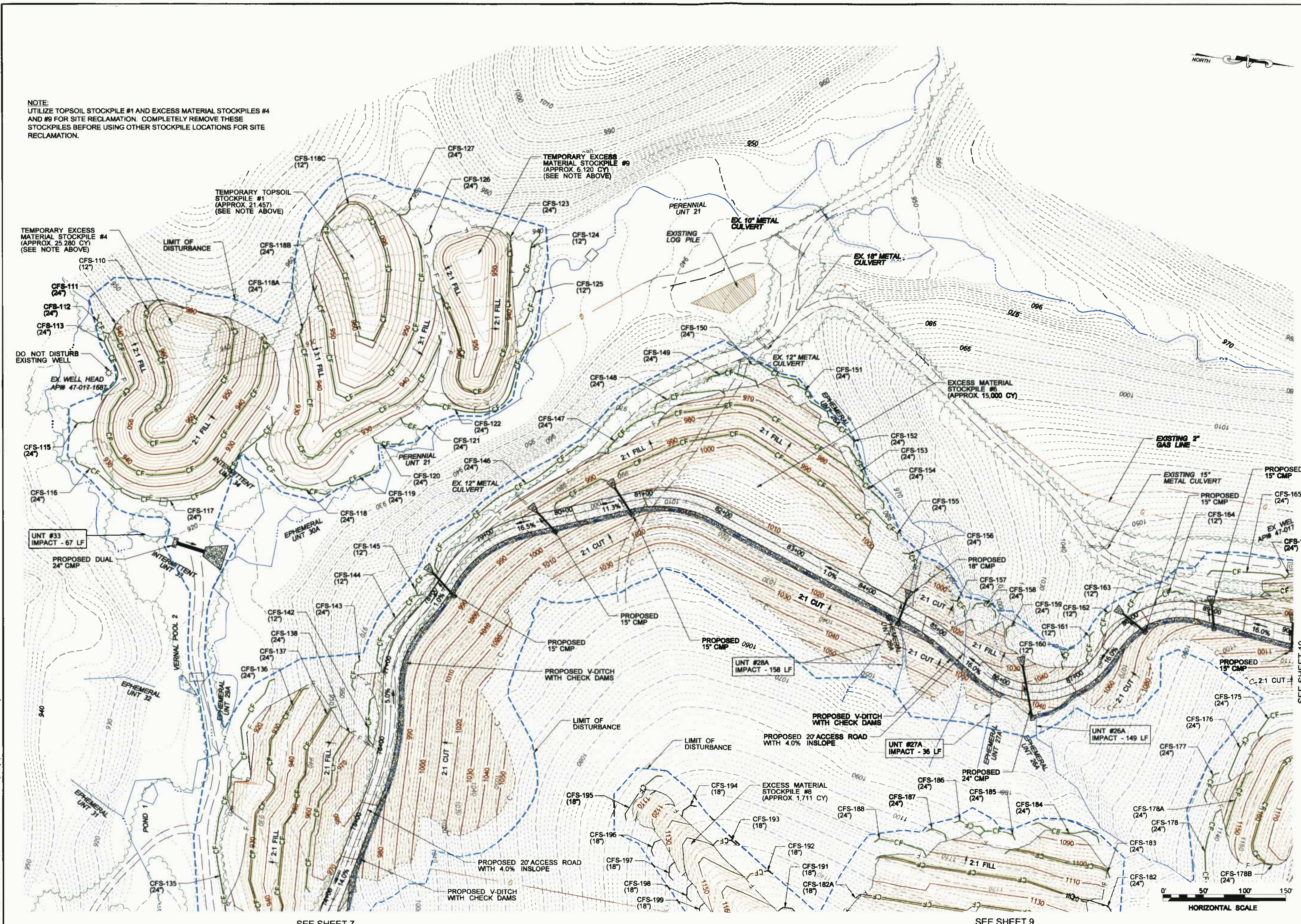
FILE NO.: SLS-8051

SHEET 7 OF 57

REV:



NOTE:
UTILIZE TOPSOIL STOCKPILE #1 AND EXCESS MATERIAL STOCKPILES #4 AND #9 FOR SITE RECLAMATION. COMPLETELY REMOVE THESE STOCKPILES BEFORE USING OTHER STOCKPILE LOCATIONS FOR SITE RECLAMATION.
NORTH
TEMPORARY EXCESS MATERIAL STOCKPILE #4 (APPROX. 25,280 CY) (SEE NOTE ABOVE)
TEMPORARY TOPSOIL STOCKPILE #1 (APPROX. 21,457) (SEE NOTE ABOVE)
TEMPORARY EXCESS MATERIAL STOCKPILE #9 (APPROX. 6,120 CY) (SEE NOTE ABOVE)
LIMIT OF DISTURBANCE
DO NOT DISTURB EXISTING WELL
EX. WELL HEAD API# 47-017-1687
PERENNIAL UNT 21
EX. 10" METAL CULVERT
EXISTING LOG PILE
EX. 18" METAL CULVERT
EX. 12" METAL CULVERT
EXCESS MATERIAL STOCKPILE #6 (APPROX. 15,000 CY)
EXISTING 2" GAS LINE
EXISTING 15" METAL CULVERT
PROPOSED 15" CMP
PROPOSED 18" CMP
PROPOSED 24" CMP
UNT #33 IMPACT - 67 LF
PROPOSED DUAL 24" CMP
INTERMITTENT UNT 33
VERNAL POOL 2
EPHEMERAL UNT 30A
EPHEMERAL UNT 32
EPHEMERAL UNT 29A
EPHEMERAL UNT 31
POND 1
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 20' ACCESS ROAD WITH 4.0% INSLOPE
UNT #28A IMPACT - 158 LF
UNT #27A IMPACT - 36 LF
UNT #26A IMPACT - 149 LF
EXCESS MATERIAL STOCKPILE #8 (APPROX. 1,711 CY)
2:1 FILL
3:1 FILL
2:1 CUT
SEE SHEET 7
SEE SHEET 9
SEE SHEET 10
HORIZONTAL SCALE
0' 50' 100' 150'

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RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

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ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
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FILE NO.: SLS-8051
SHEET 8 OF 57
REV:

NOTE:
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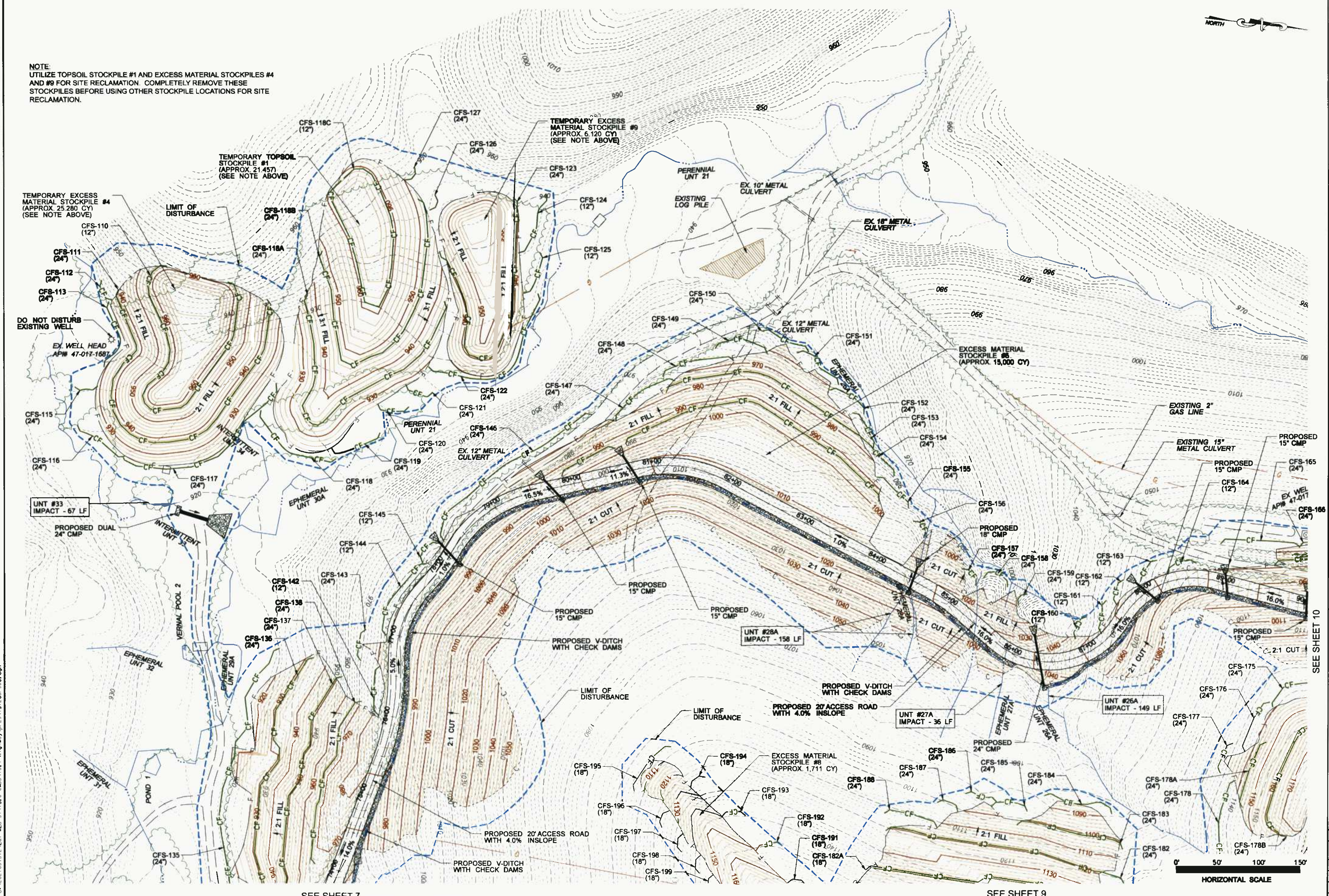

NORTH
TEMPORARY EXCESS MATERIAL STOCKPILE #4 (APPROX. 25,280 CY) (SEE NOTE ABOVE)
TEMPORARY TOPSOIL STOCKPILE #1 (APPROX. 21,457) (SEE NOTE ABOVE)
TEMPORARY EXCESS MATERIAL STOCKPILE #9 (APPROX. 6,120 CY) (SEE NOTE ABOVE)
LIMIT OF DISTURBANCE
DO NOT DISTURB EXISTING WELL
EX. WELL HEAD API# 47-017-1687
PERENNIAL UNT 21
EX. 10" METAL CULVERT
EXISTING LOG PILE
EX. 18" METAL CULVERT
EX. 12" METAL CULVERT
EXCESS MATERIAL STOCKPILE #8 (APPROX. 15,000 CY)
EXISTING 2" GAS LINE
EXISTING 15" METAL CULVERT
PROPOSED 15" CMP
PROPOSED 18" CMP
PROPOSED 24" CMP
UNT #33 IMPACT - 67 LF
PROPOSED DUAL 24" CMP
INTERMITTENT UNT 33
INTERMITTENT UNT 34
EPHEMERAL UNT 30A
EPHEMERAL UNT 32
EPHEMERAL UNT 31
EPHEMERAL UNT 29A
VERNAL POOL 2
POND 1
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 20' ACCESS ROAD WITH 4.0% INSLOPE
UNT #28A IMPACT - 158 LF
UNT #27A IMPACT - 36 LF
UNT #26A IMPACT - 149 LF
EPHEMERAL UNT 27A
EPHEMERAL UNT 26A
EXCESS MATERIAL STOCKPILE #8 (APPROX. 1,711 CY)
2:1 FILL
3:1 FILL
2:1 CUT
EX. WELL API# 47-017
SEE SHEET 7
SEE SHEET 9
SEE SHEET 10
0' 50' 100' 150'
HORIZONTAL SCALE

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ACCESS ROAD LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

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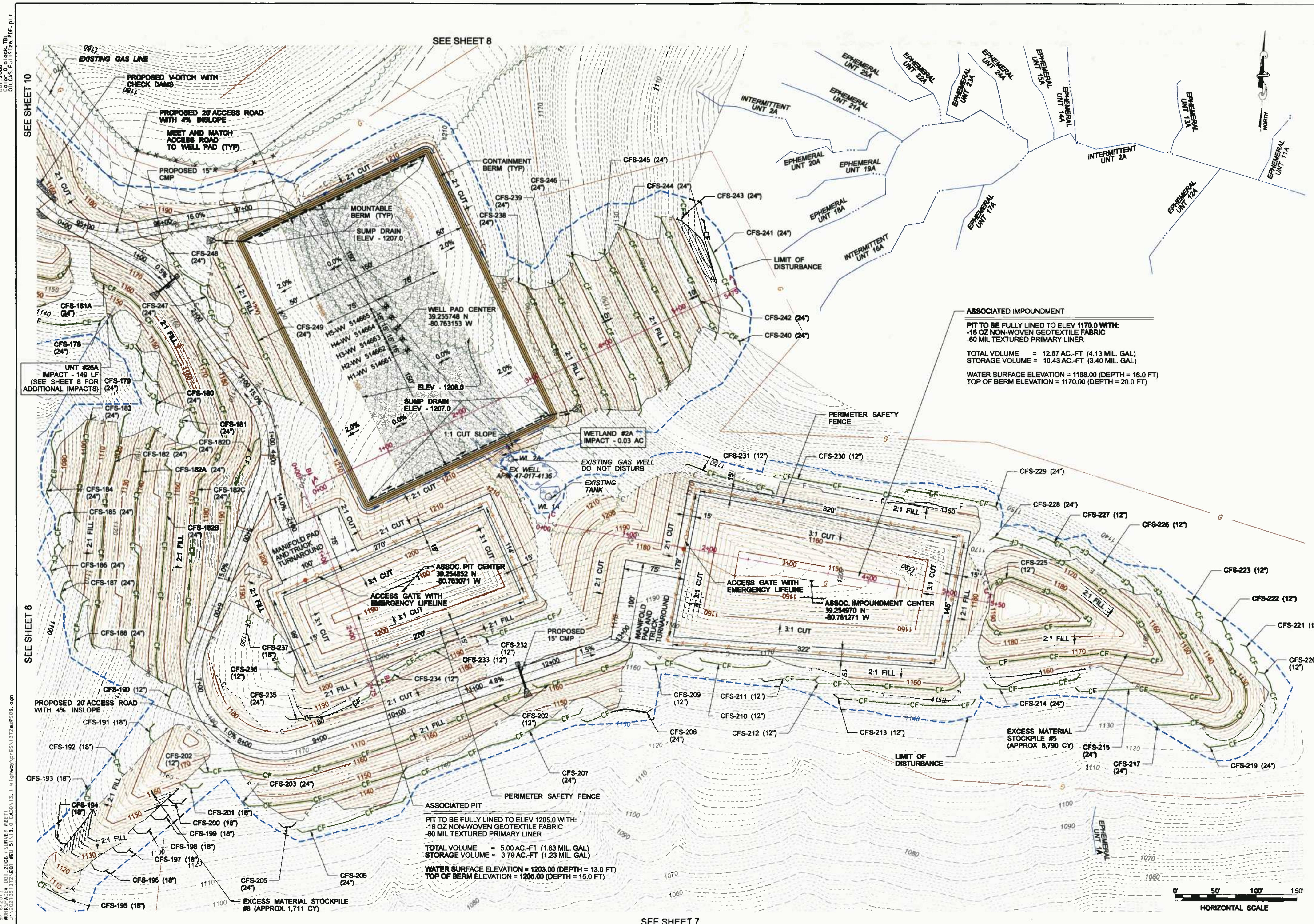
SHEET 8 OF 57
REV:



SEE SHEET 8
SEE SHEET 10
SEE SHEET 8
SEE SHEET 7
EXISTING GAS LINE
PROPOSED V-DITCH WITH CHECK DAMS
PROPOSED 20' ACCESS ROAD WITH 4% INSLOPE
MEET AND MATCH ACCESS ROAD TO WELL PAD (TYP)
PROPOSED 15" CMP
CONTAINMENT BERM (TYP)
MOUNTABLE BERM (TYP)
SUMP DRAIN ELEV - 1207.0
WELL PAD CENTER 39.255748 N -80.763153 W
H5-WV 514665
H4-WV 514664
H3-WV 514663
H2-WV 514662
H1-WV 514661
ELEV - 1208.0
SUMP DRAIN ELEV - 1207.0
1:1 CUT SLOPE
WETLAND #2A IMPACT - 0.03 AC
EXISTING GAS WELL DO NOT DISTURB
EX WELL API# 47-017-4136
EXISTING TANK
UNT #26A IMPACT - 149 LF (SEE SHEET 8 FOR ADDITIONAL IMPACTS)
LIMIT OF DISTURBANCE
MANIFOLD PAD AND TRUCK TURNAROUND
ASSOC. PIT CENTER 39.254852 N -80.763071 W
ACCESS GATE WITH EMERGENCY LIFELINE
PROPOSED 15" CMP
PERIMETER SAFETY FENCE
ASSOCIATED IMPOUNDMENT
PIT TO BE FULLY LINED TO ELEV 1170.0 WITH:
-16 OZ NON-WOVEN GEOTEXTILE FABRIC
-60 MIL TEXTURED PRIMARY LINER
TOTAL VOLUME = 12.67 AC.-FT (4.13 MIL. GAL)
STORAGE VOLUME = 10.43 AC.-FT (3.40 MIL. GAL)
WATER SURFACE ELEVATION = 1168.00 (DEPTH = 18.0 FT)
TOP OF BERM ELEVATION = 1170.00 (DEPTH = 20.0 FT)
ASSOC. IMPOUNDMENT CENTER 39.254970 N -80.761271 W
MANIFOLD PAD AND TRUCK TURNAROUND
EXCESS MATERIAL STOCKPILE #5 (APPROX 8,790 CY)
PROPOSED 20' ACCESS ROAD WITH 4% INSLOPE
ASSOCIATED PIT
PIT TO BE FULLY LINED TO ELEV 1205.0 WITH:
-16 OZ NON-WOVEN GEOTEXTILE FABRIC
-60 MIL TEXTURED PRIMARY LINER
TOTAL VOLUME = 5.00 AC.-FT (1.63 MIL. GAL)
STORAGE VOLUME = 3.79 AC.-FT (1.23 MIL. GAL)
WATER SURFACE ELEVATION = 1203.00 (DEPTH = 13.0 FT)
TOP OF BERM ELEVATION = 1205.00 (DEPTH = 15.0 FT)
EXCESS MATERIAL STOCKPILE #6 (APPROX. 1,711 CY)
INTERMITTENT UNT 2A
EPHEMERAL UNT 25A
EPHEMERAL UNT 22A
EPHEMERAL UNT 23A
EPHEMERAL UNT 24A
EPHEMERAL UNT 15A
EPHEMERAL UNT 14A
EPHEMERAL UNT 13A
EPHEMERAL UNT 21A
EPHEMERAL UNT 20A
EPHEMERAL UNT 19A
EPHEMERAL UNT 18A
INTERMITTENT UNT 16A
EPHEMERAL UNT 17A
INTERMITTENT UNT 2A
EPHEMERAL UNT 12A
EPHEMERAL UNT 11A
EPHEMERAL UNT 1A
NORTH
0' 50' 100' 150'
HORIZONTAL SCALE

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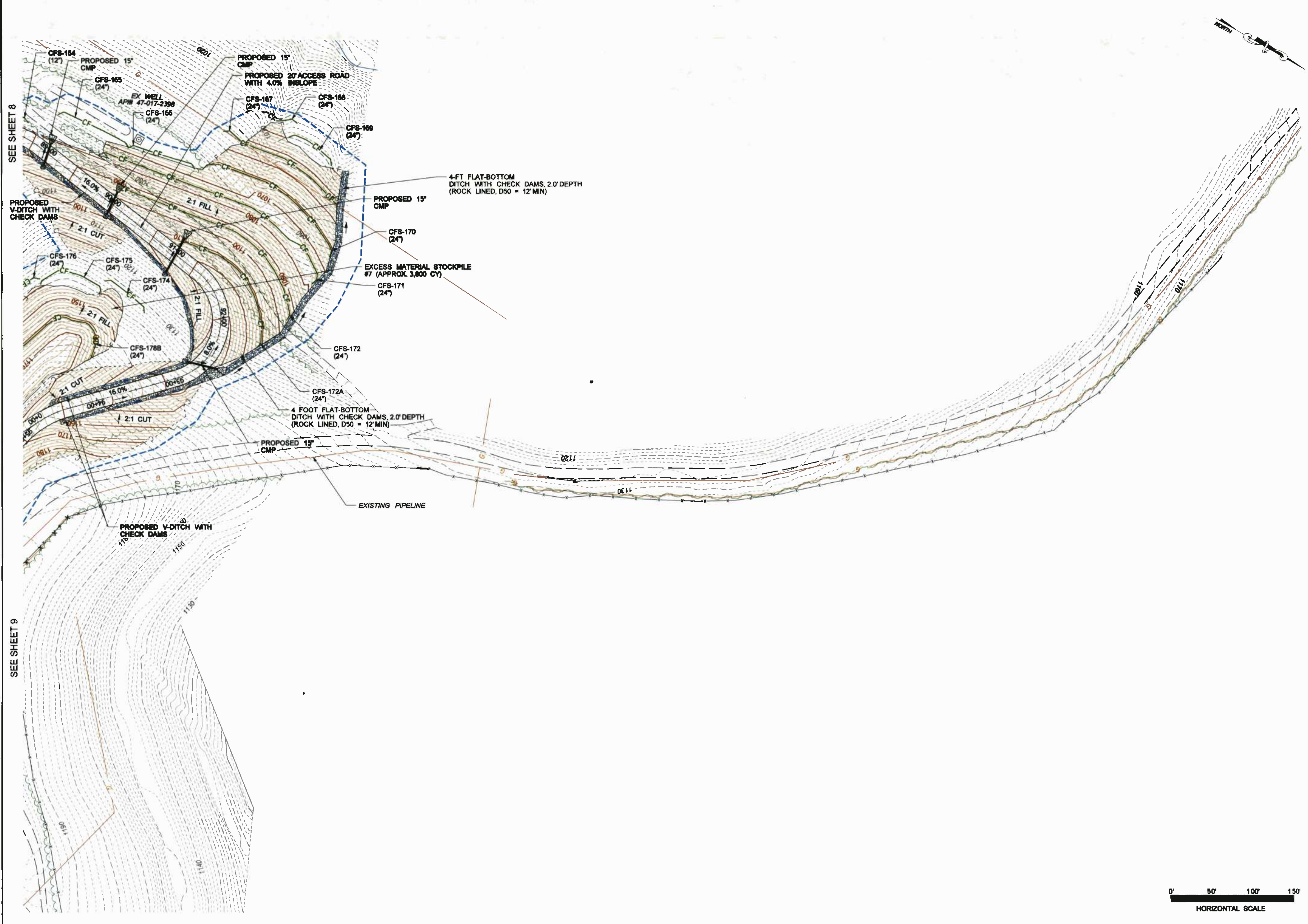
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD AND WELL SITE LAYOUT
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 9 OF 57
REV:



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ACCESS ROAD AND WELL SITE LAYOUT

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

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SHEET 10 OF 57
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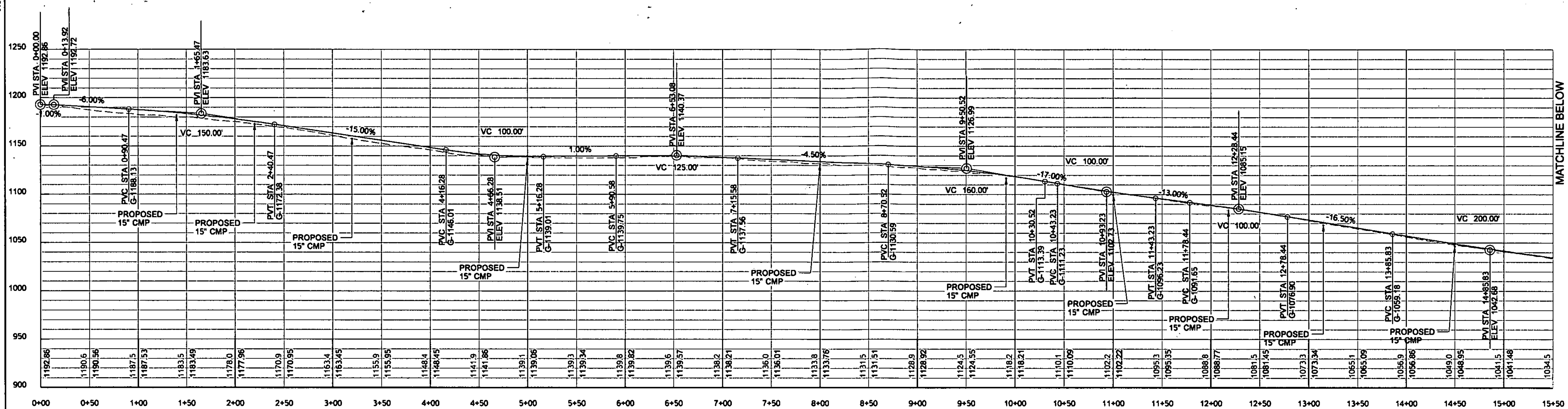
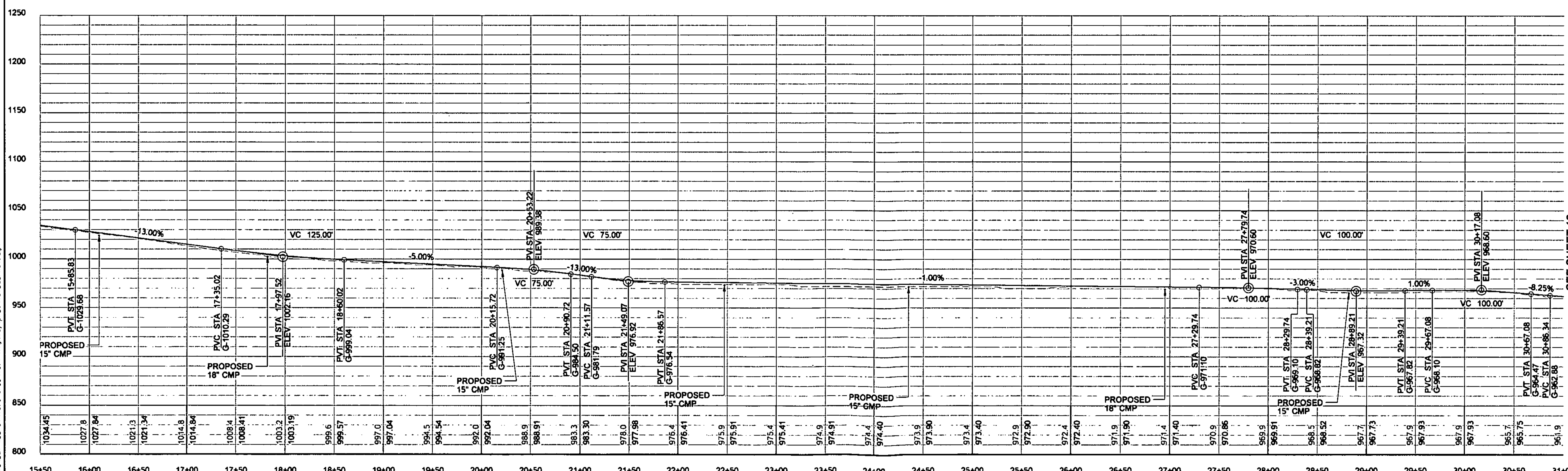


WELL PAD ACCESS ROAD PROFILE



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EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
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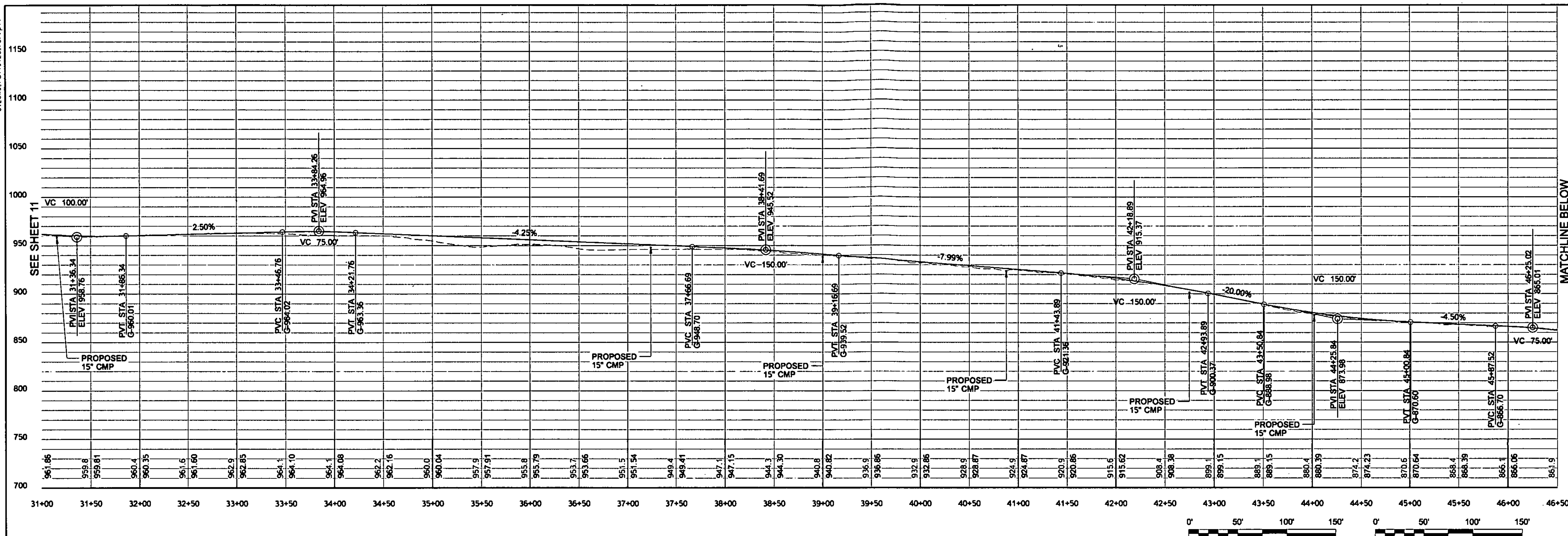
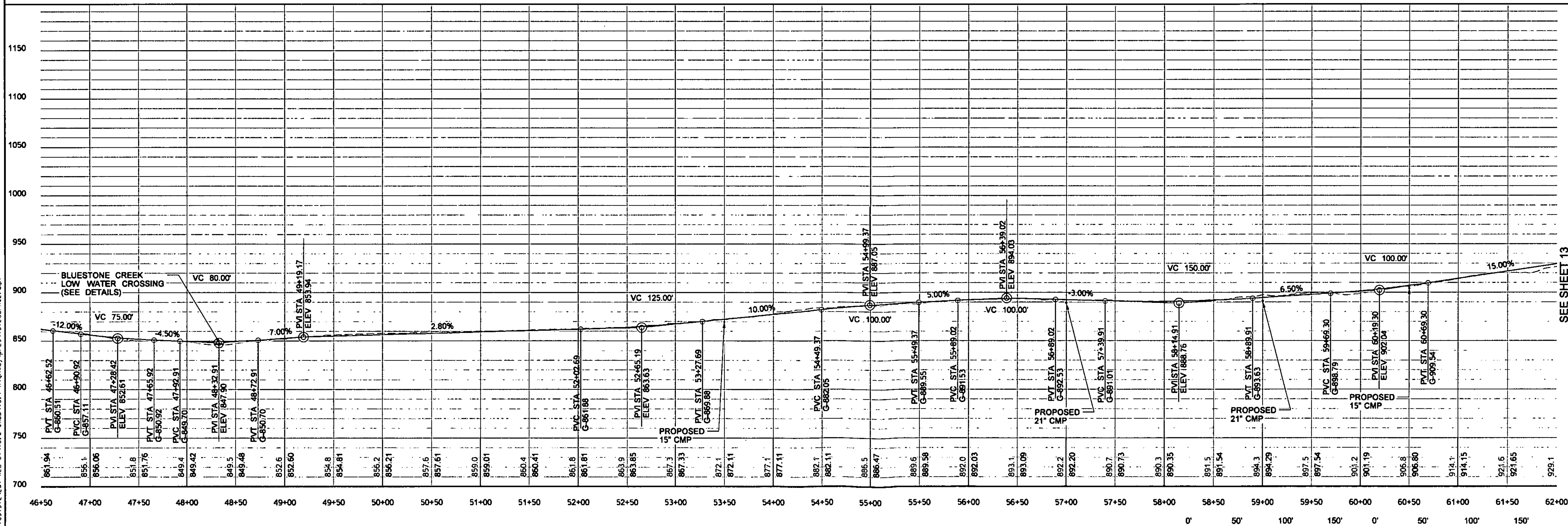
SHEET 11 OF 57	
REV:	



WELL PAD ACCESS ROAD PROFILE



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SHEET 12 OF 57
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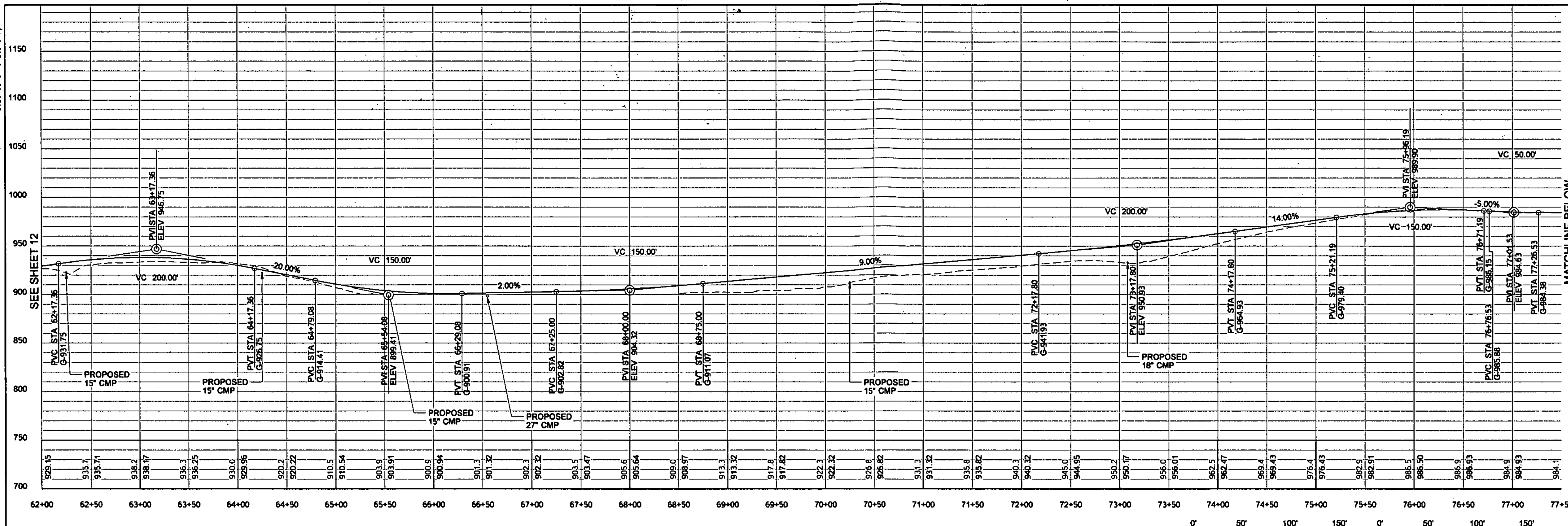

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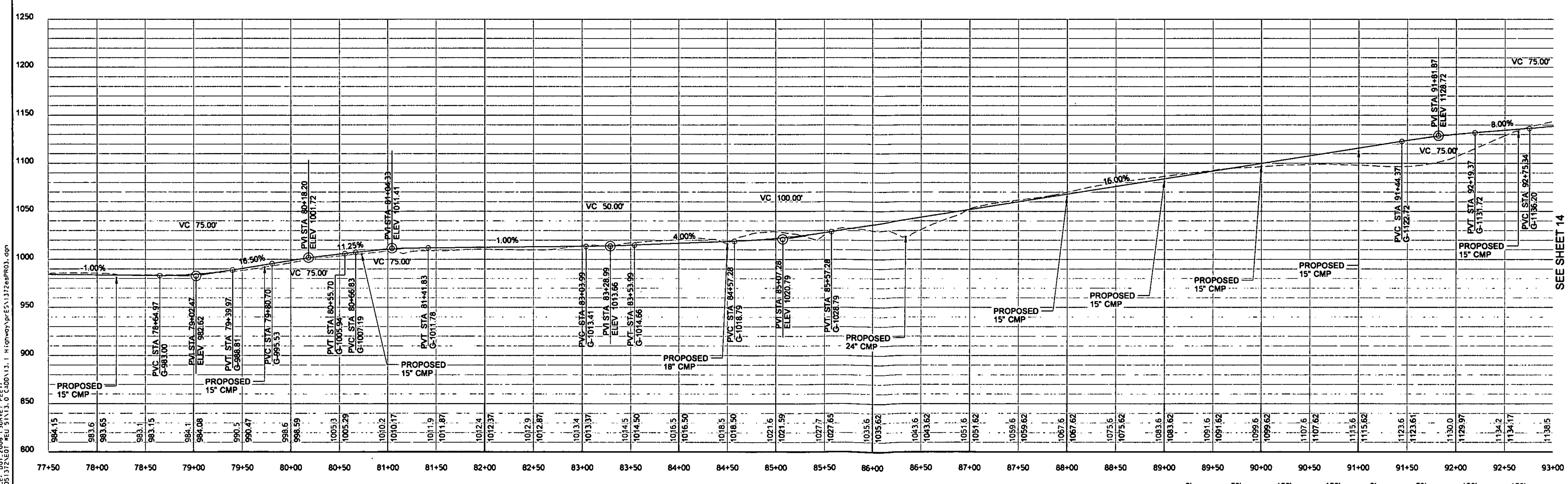

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SHEET 13 OF 57

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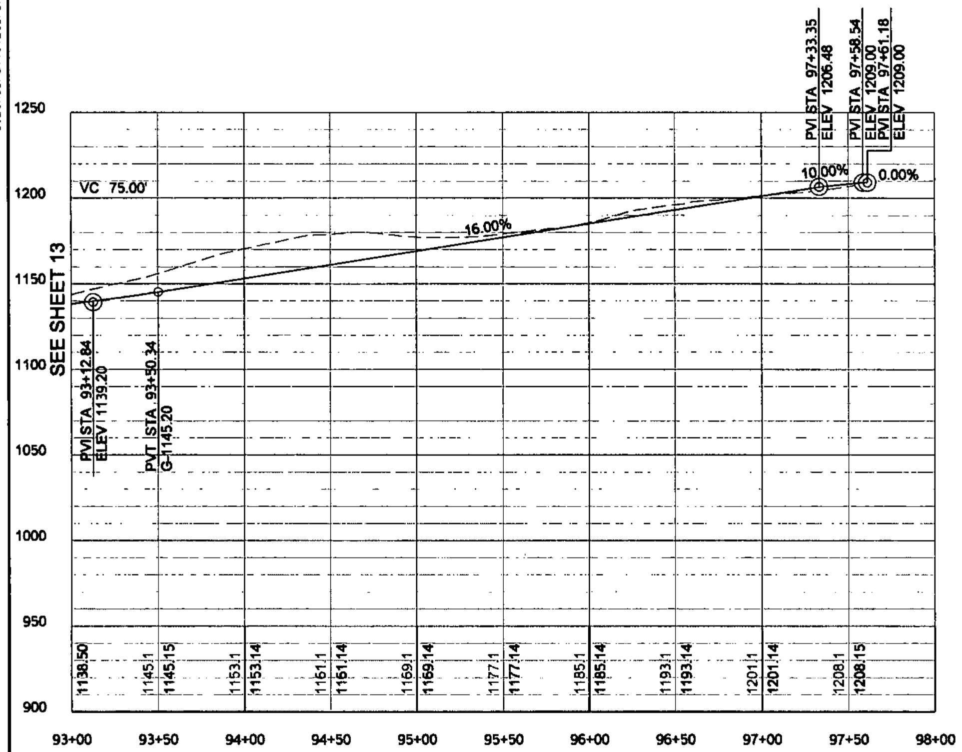
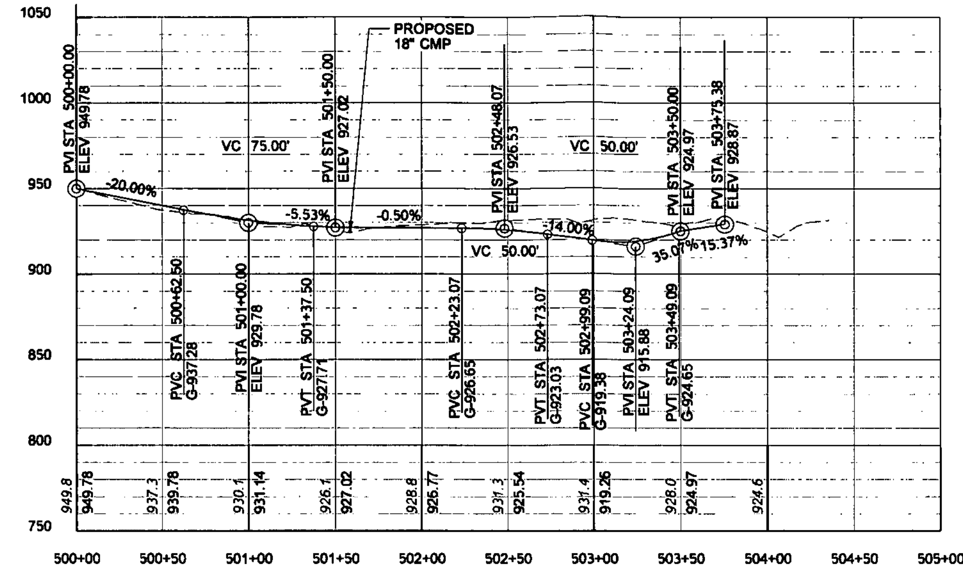
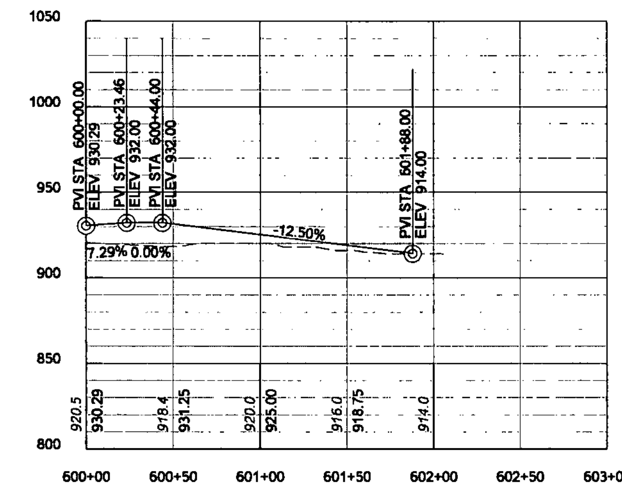


WELL PAD ACCESS ROAD PROFILE



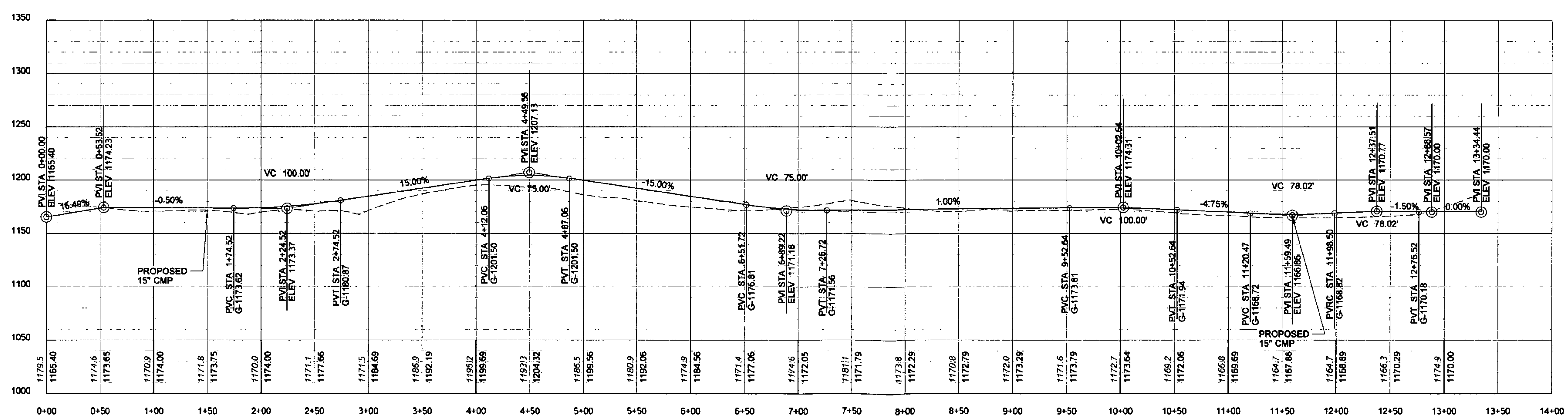
EXISTING WELL ROAD PROFILE



STOCKPILE ACCESS ROAD PROFILE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 50' 100' 150'
VERTICAL SCALE



PIT / IMPOUNDMENT ACCESS ROAD PROFILE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 50' 100' 150'
VERTICAL SCALE

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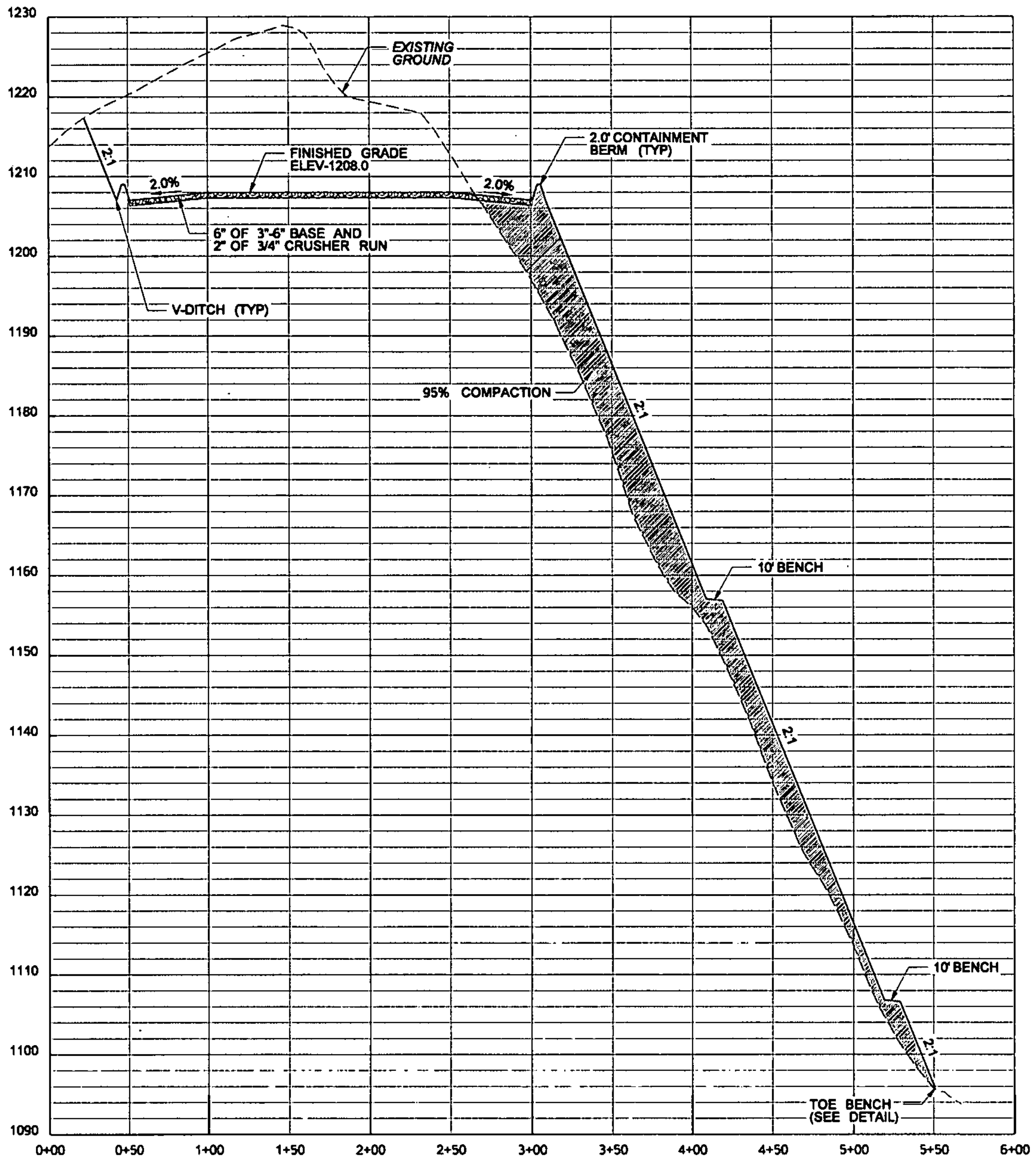
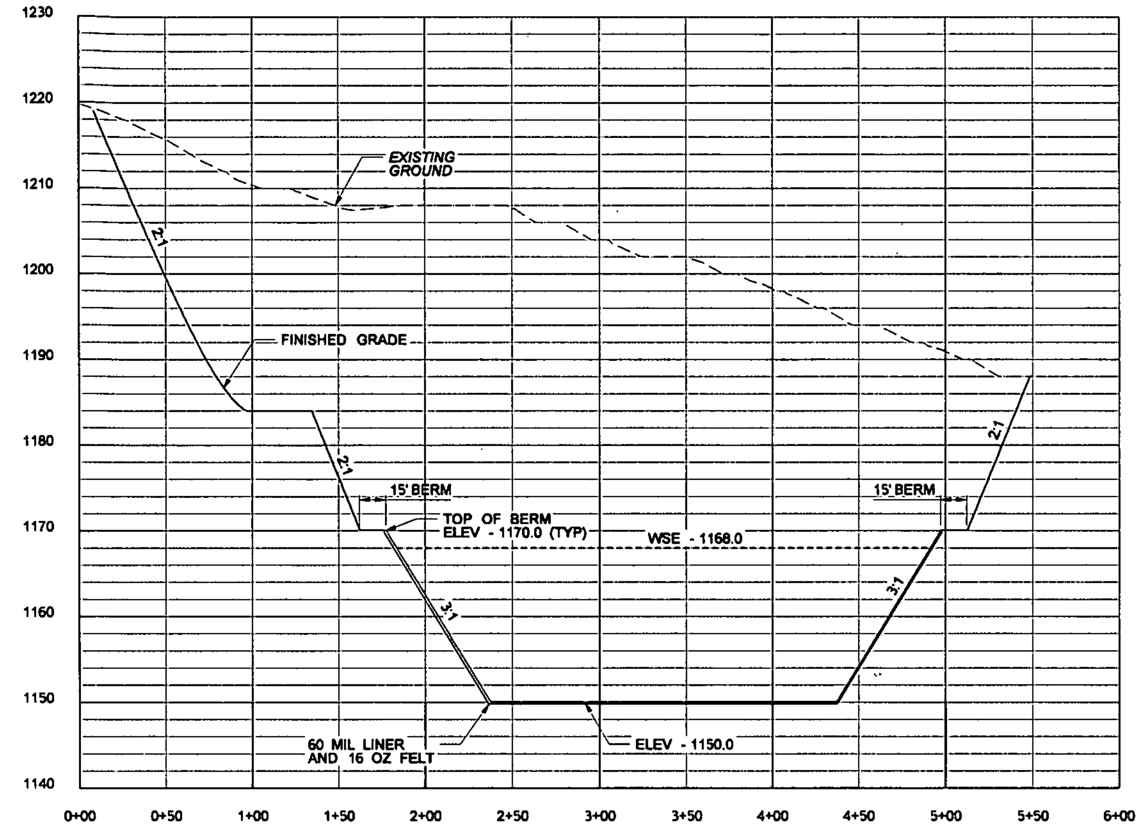
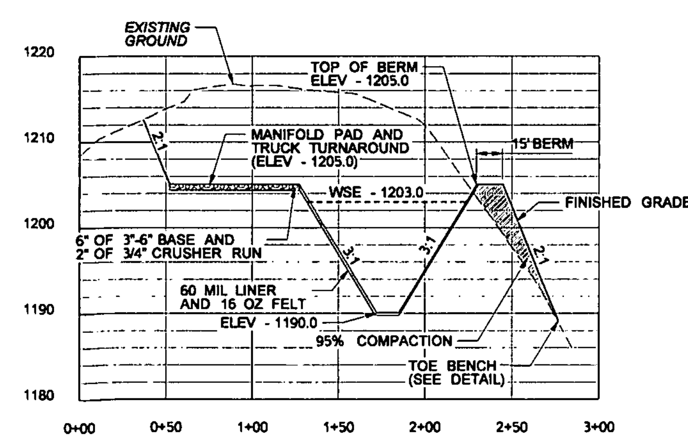


WELL PAD CROSS SECTION A-A



ASSOCIATED IMPOUNDMENT SECTION C-C



ASSOCIATED PIT SECTION B-B

NOTE:

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

HORIZONTAL SCALE: 0' 50' 100' 150'

VERTICAL SCALE: 0' 10' 20' 30'

Stantec

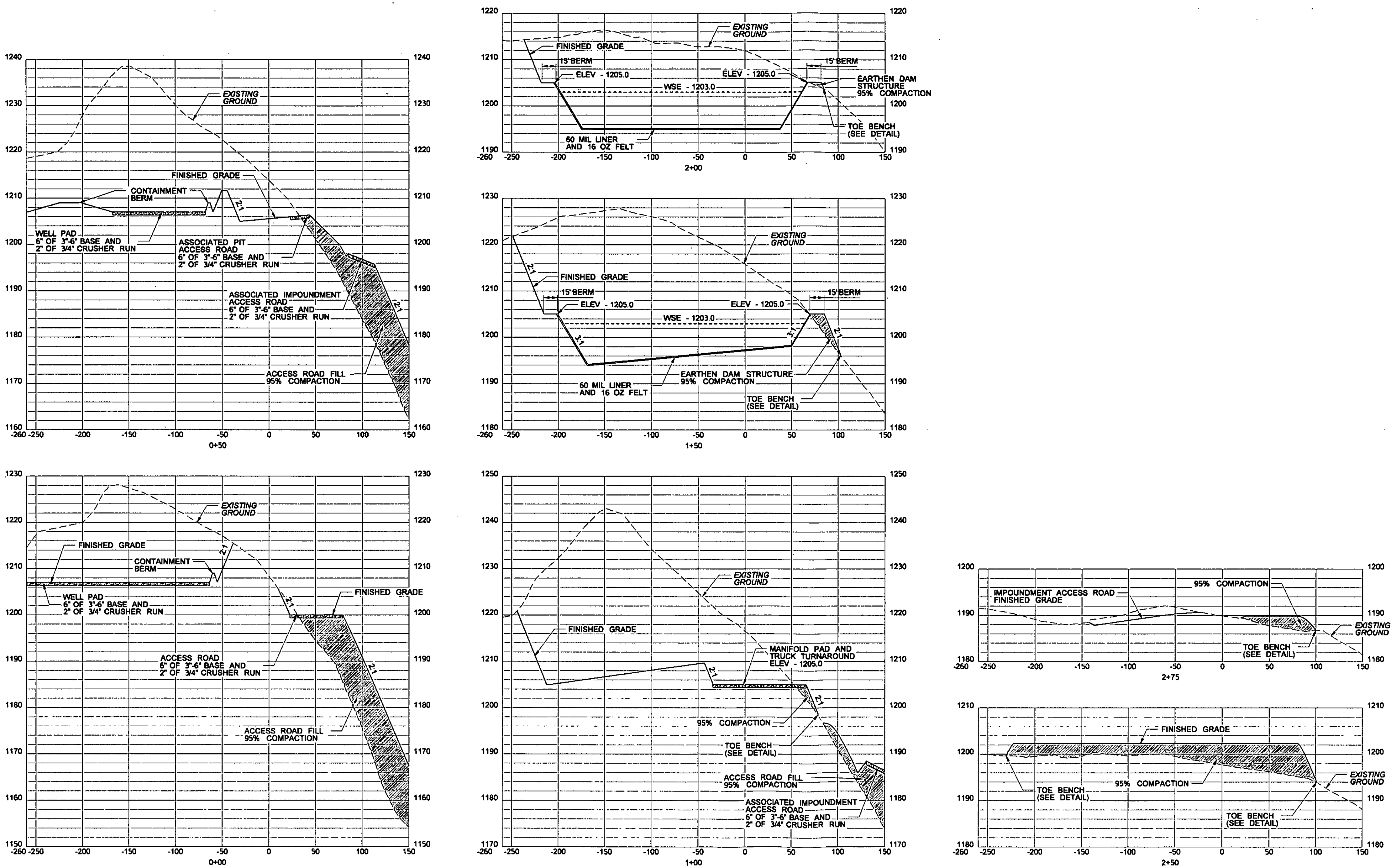
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SLS

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO.: SLS-8051	
SHEET 15 OF 57	
REV:	



NOTE:

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

ASSOCIATED PIT CROSS SECTIONS ALONG SECTION LINE B-B

HORIZONTAL SCALE: 0' 50' 100' 150'

VERTICAL SCALE: 0' 10' 20' 30'

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Professional Energy Consultants

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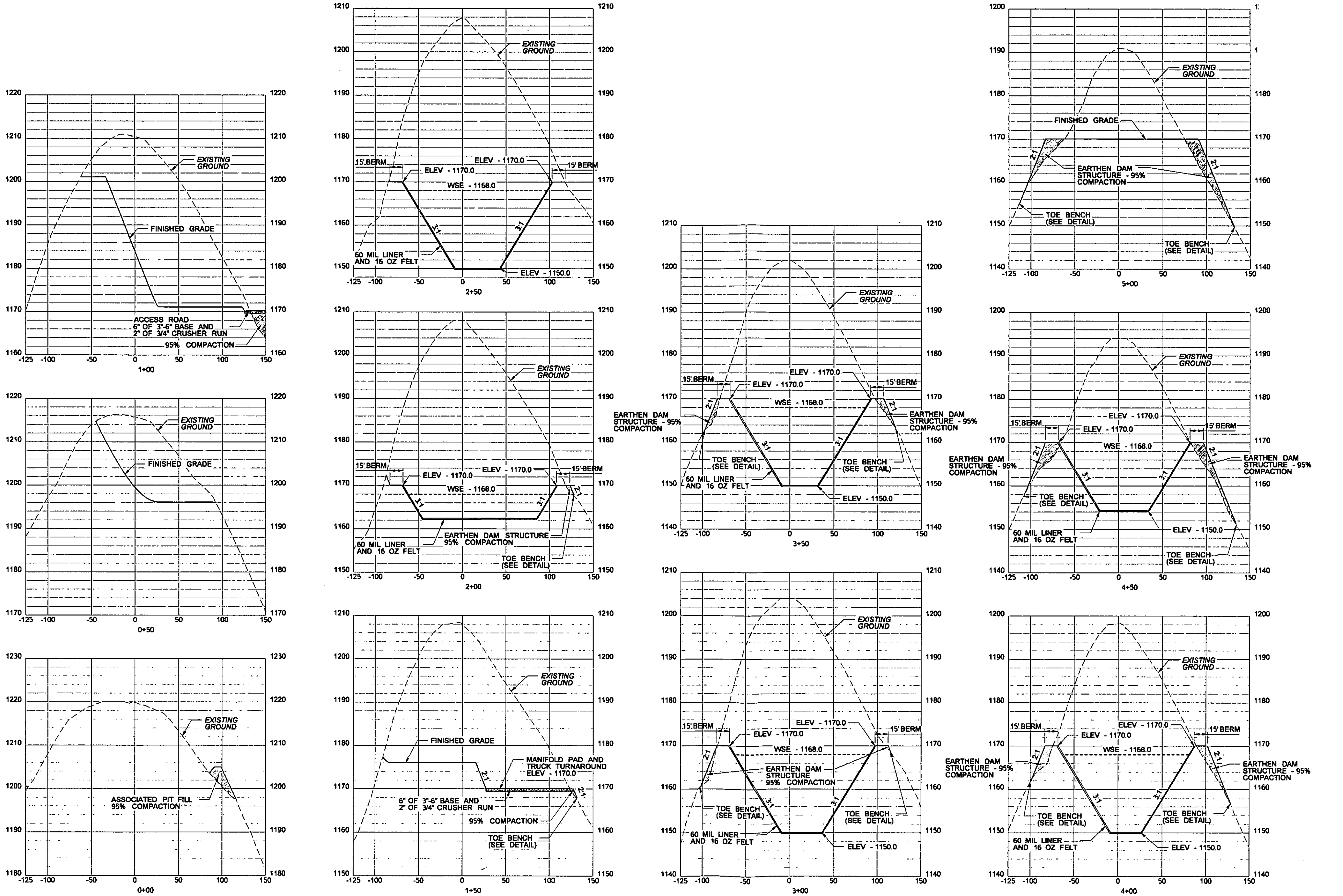
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT SECTIONS

EQT WEU 51

WEST UNION DISTRICT DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO.: SLS-8051	
SHEET 16 OF 57	
REV:	



NOTE:

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

ASSOCIATED IMPOUNDMENT CROSS SECTIONS ALONG SECTION LINE C-C

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

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HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

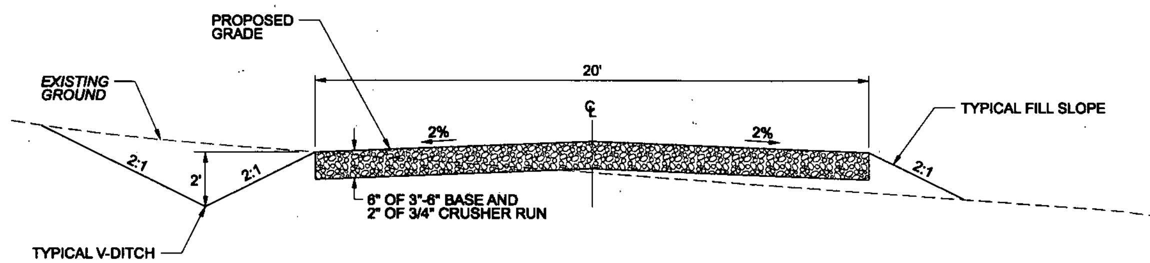
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

WELL PAD, ASSOCIATED PIT, AND ASSOCIATED IMPOUNDMENT SECTIONS

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

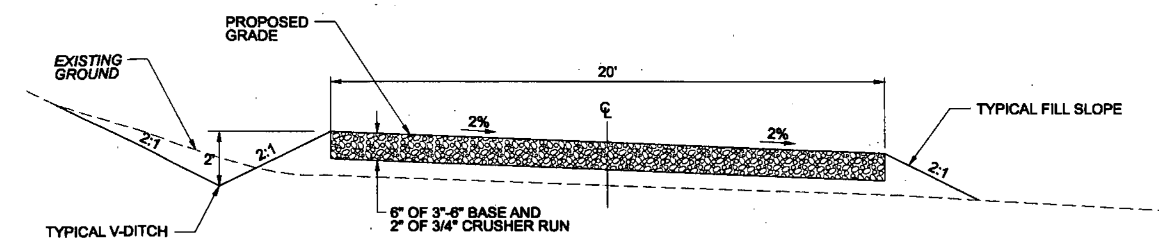
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 17 OF 57
REV:



MAIN ACCESS ROAD TYPICAL SECTION - CROWNED

NOT TO SCALE

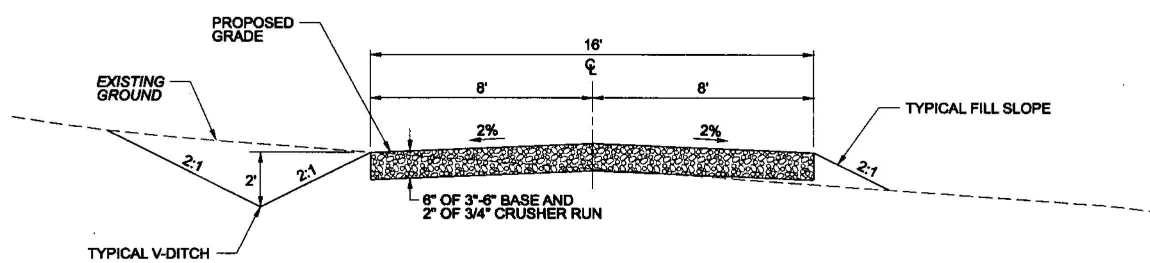
STA 0+00 TO STA 8+00
STA 12+50 TO STA 30+75
STA 32+25 TO STA 41+15
STA 46+75 TO STA 57+25
STA 59+50 TO STA 73+25
STA 92+50 TO STA 94+50
STA 96+00 TO STA 97+64



MAIN ACCESS ROAD TYPICAL SECTION - INSLOPED RIGHT

NOT TO SCALE

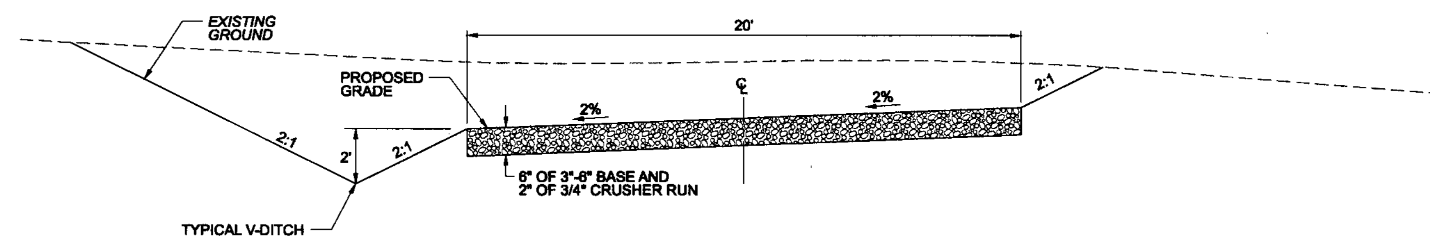
STA 8+00 TO STA 12+50
STA 41+15 TO STA 46+75
STA 73+25 TO STA 92+50



MAIN ACCESS ROAD TYPICAL SECTION - CROWNED

NOT TO SCALE

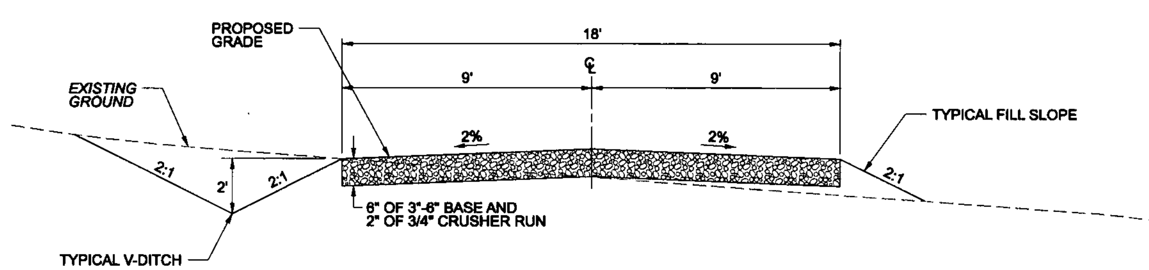
STA 30+75 TO STA 32+25



MAIN ACCESS ROAD TYPICAL SECTION - INSLOPED LEFT

NOT TO SCALE

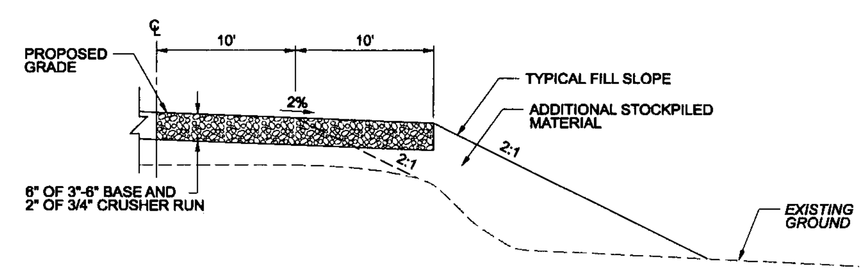
STA 94+50 TO STA 96+00



MAIN ACCESS ROAD TYPICAL SECTION - CROWNED

NOT TO SCALE

STA 57+25 TO STA 59+50



ALTERNATE FILL SECTION

NOT TO SCALE

STA 34+00 TO STA 40+50 RT

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PHONE: 304-367-9401

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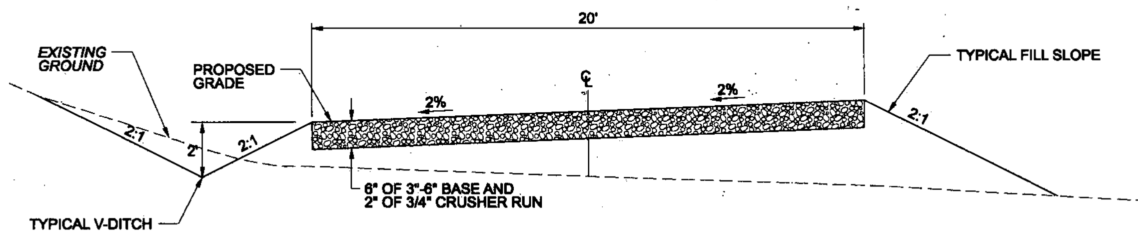
226 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
56065 Dilles Bottom Road Shadyside, OH 43947 (740) 671-9911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD TYPICAL SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

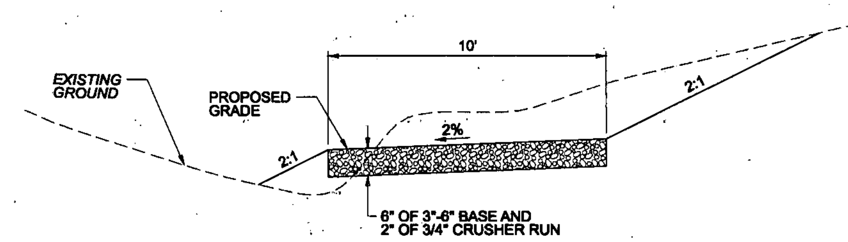
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 18 OF 57
REV:



PIT/IMPOUNDMENT ACCESS ROAD - INSLOPED LEFT

NOT TO SCALE

STA 1+50 TO STA 5+00
STA 6+50 TO STA 13+00

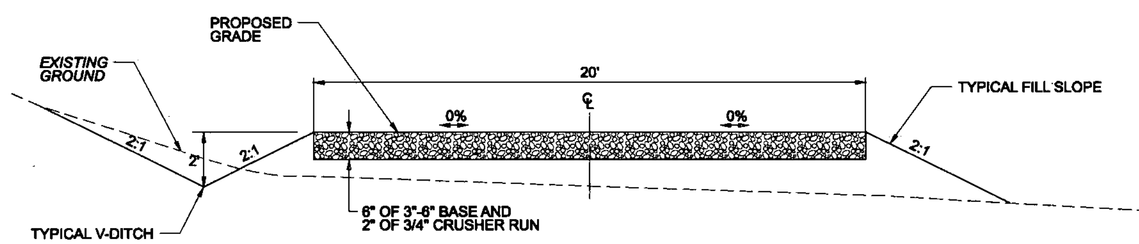


EXISTING WELL ACCESS ROAD

NOT TO SCALE

STA 500+00 TO STA 504+38

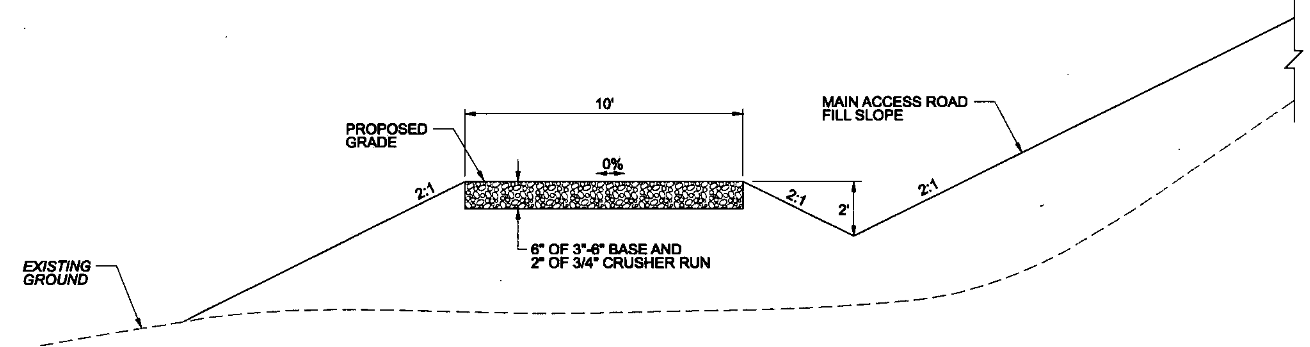
NOTE:
STATION LIMITS PROVIDED ABOVE ARE APPROXIMATE AND CAN BE FIELD ADJUSTED AS DIRECTED BY THE CONSTRUCTION INSPECTOR.



PIT/IMPOUNDMENT ACCESS ROAD

NOT TO SCALE

STA 0+00 TO STA 1+50 (TRANSITION FROM MAIN ACCESS ROAD)
STA 5+00 TO STA 6+50



ACCESS ROAD TO STOCKPILES

NOT TO SCALE

STA 600+00 TO STA 602+08

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HONESTY, INTEGRITY, QUALITY

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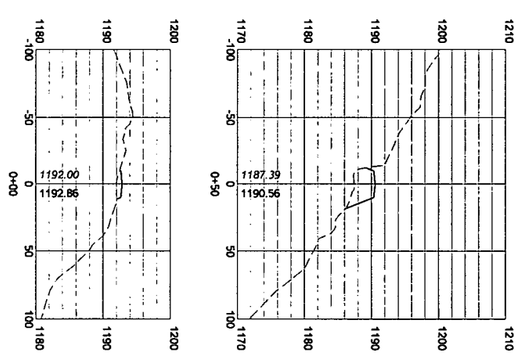
ACCESS ROAD TYPICAL SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

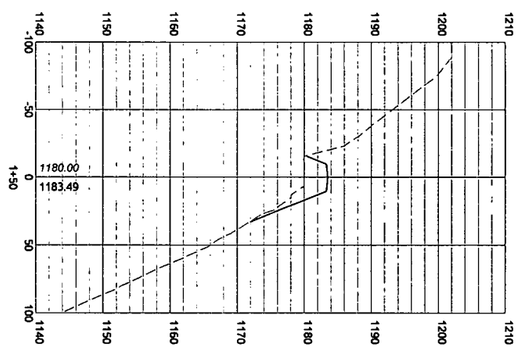
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 19 OF 57
REV:

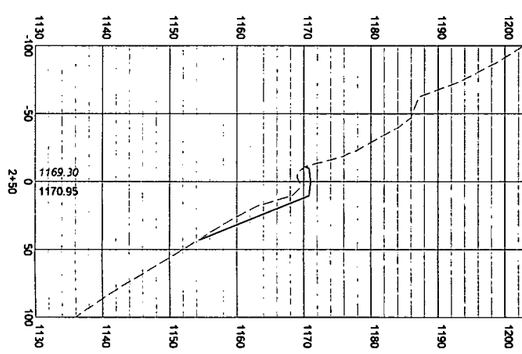
LEGEND

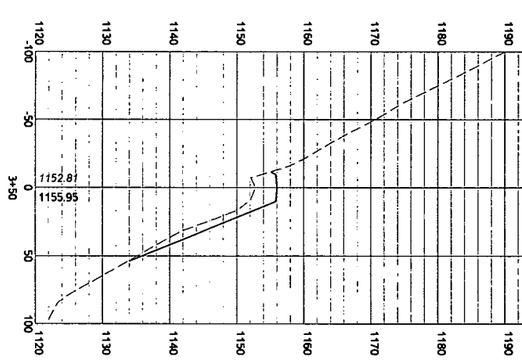
PROPOSED GRADE

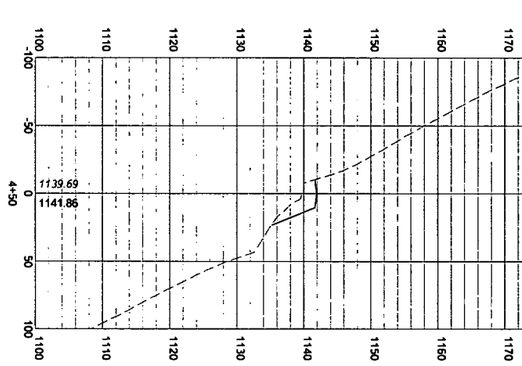
EXISTING GRADE











HORIZONTAL SCALE

0' 50' 100' 150'

VERTICAL SCALE

0' 10' 20' 30'

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: SLS-8051
SHEET 20 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY:
FOR:
EQT PRODUCTION COMPANY

RICHARD J. HOLSTEIN
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

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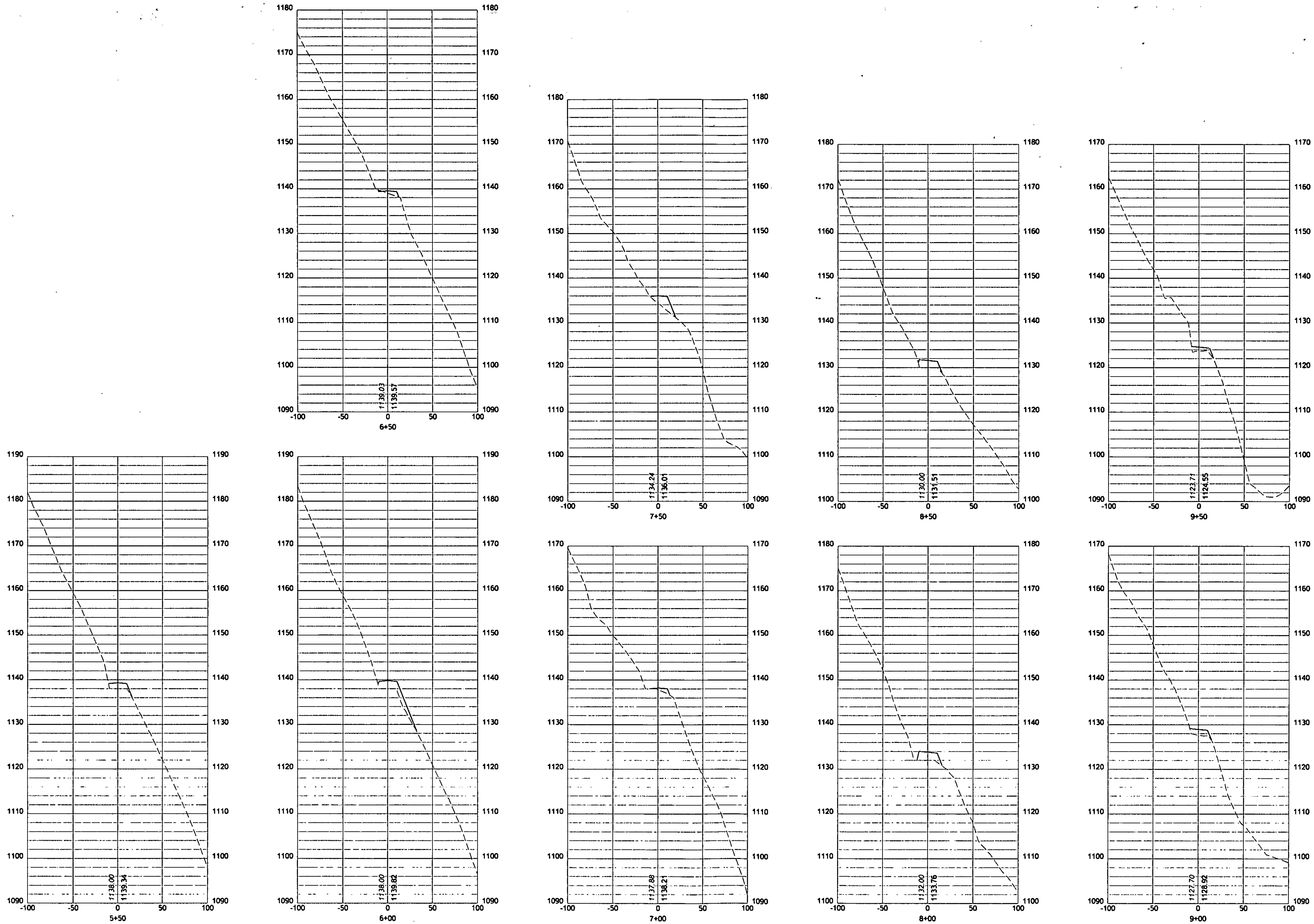
229 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-8634
35083 Cliffs Bottom Road
Shelbyville, OH 43947
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401



LEGEND

——— PROPOSED GRADE

- - - - EXISTING GRADE

HORIZONTAL SCALE: 0' 50' 100' 150'

VERTICAL SCALE: 0' 10' 20' 30'

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FAIRMONT, WV 26554
PHONE: 304-367-0401

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226 West Main St.
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(304) 462-5634

56563 Olive Bottom Road
Steubenville, OH 43947
(740) 671-0911

HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO.: SLS-8051	
SHEET 21 OF 57	
REV:	

DOT_2006
Color_0_block_18;
OILGAS_FullSize_PDF.plt

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
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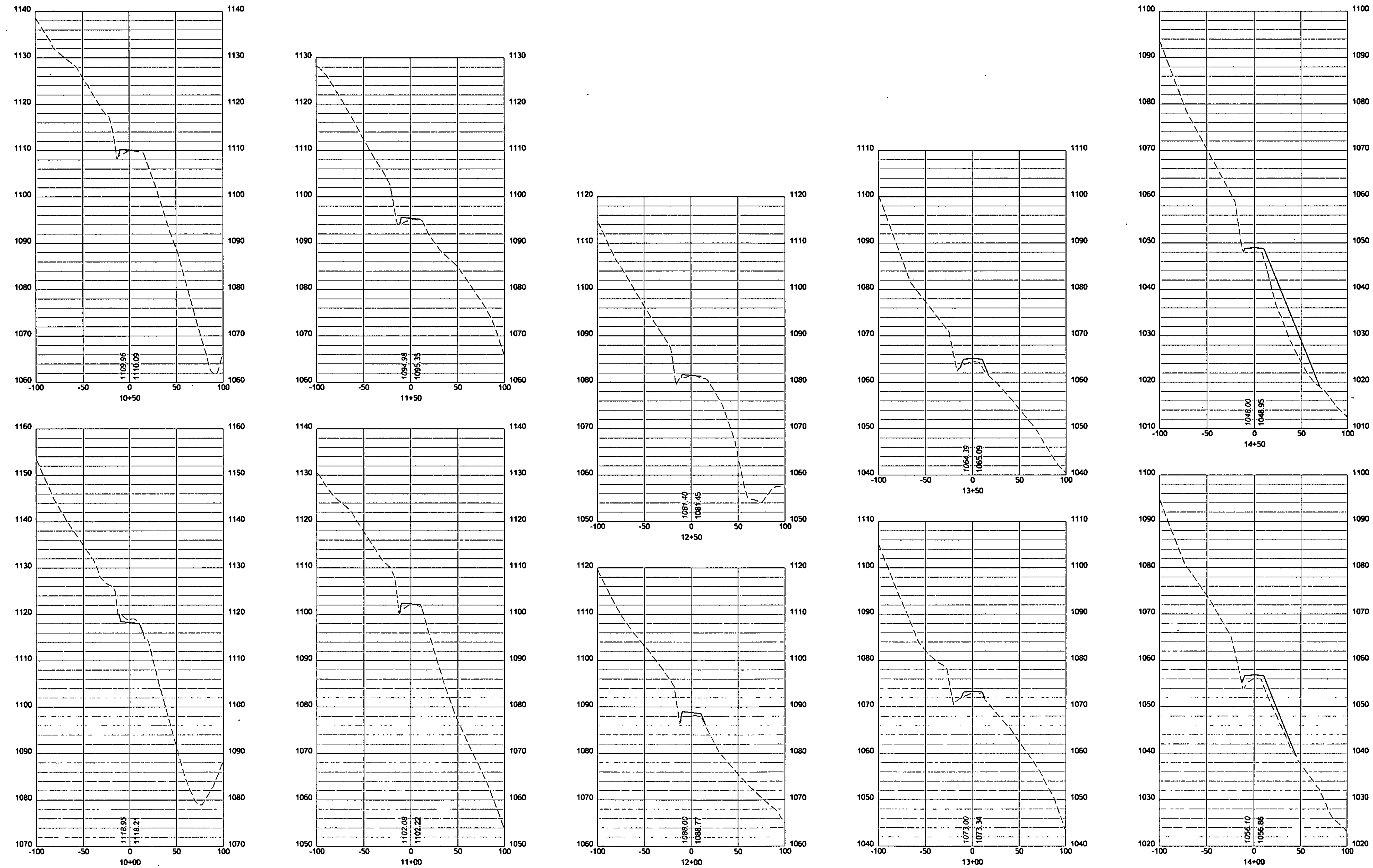

LEGEND

——— PROPOSED GRADE

– – – EXISTING GRADE

0' 50' 100' 150' HORIZONTAL SCALE

0' 10' 20' 30' VERTICAL SCALE

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111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

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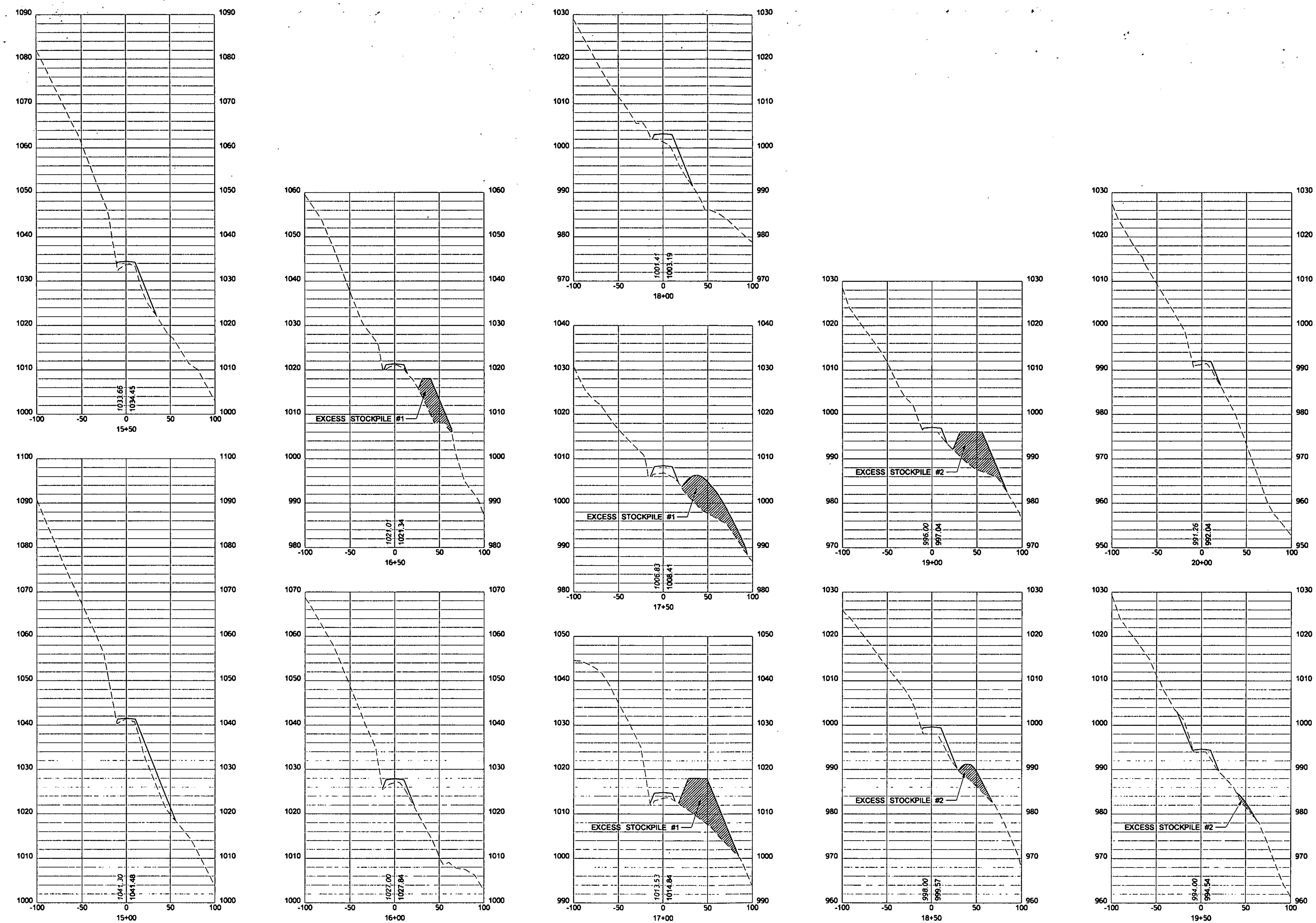
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
226 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
56065 Dillon Bottom Road Shadyside, OH 43947 (740) 671-0911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 22 OF 57
REV:



LEGEND

- PROPOSED GRADE
- EXISTING GRADE

HORIZONTAL SCALE: 0' 50' 100' 150'

VERTICAL SCALE: 0' 10' 20' 30'

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SLS

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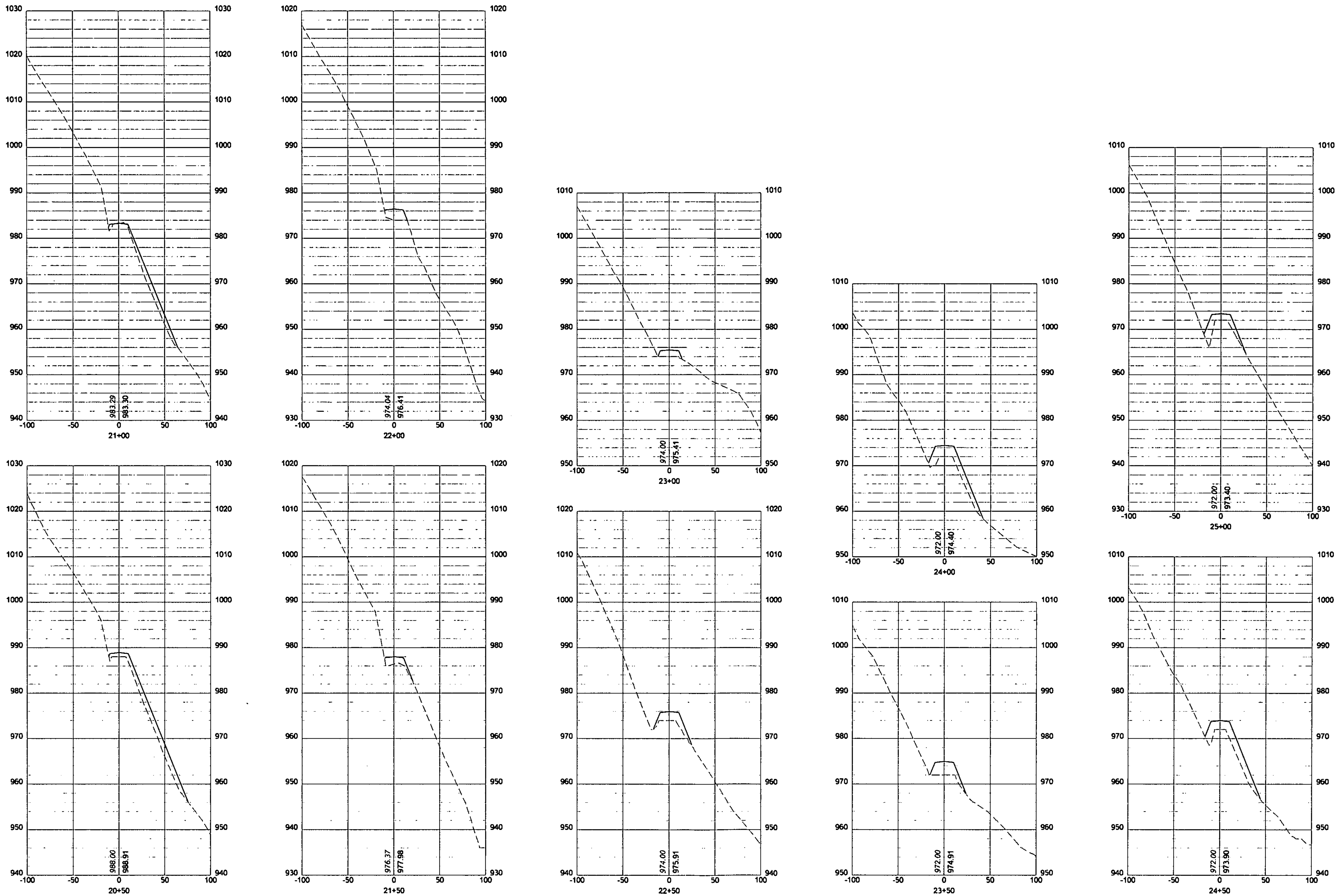
MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO.: SLS-8051	
SHEET 23 OF 57	
REV:	



LEGEND

—— PROPOSED GRADE
– – – EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
u:\202705137\EQT WEU 51\13.0 CADD\13.1 Highway\prES\137esxS01.dgn
DOT_2006
Color_0_black.TBL
OILGAS_FullSize_PDF.plt

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111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

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226 West Main St.
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Glenville, WV 26351
(304) 462-5634
56065 Dilles Bottom Road
Shadyside, OH 43947
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
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17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY:RJH/JMR	
FILE NO.:SLS-8051	
SHEET 24 OF 57	
REV:	

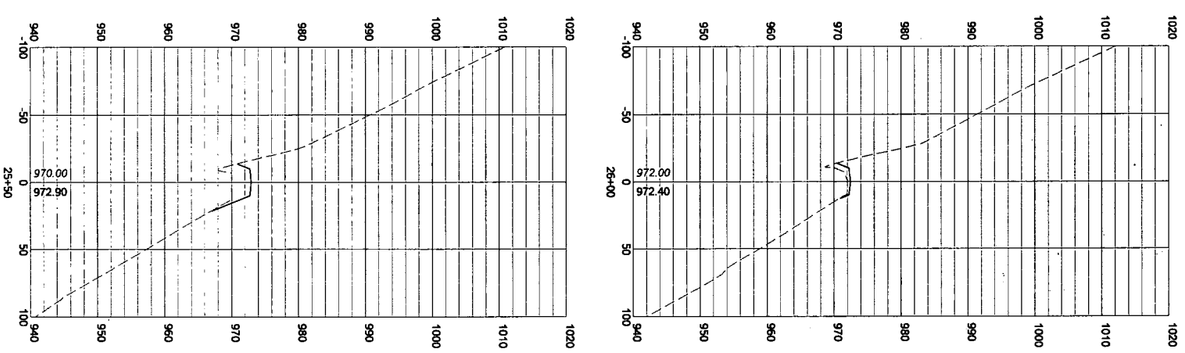
9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
U:\2027051372\EQT WEU 51\13.0 CADD\13.1 Highway\prFS\1372esX501.dgn

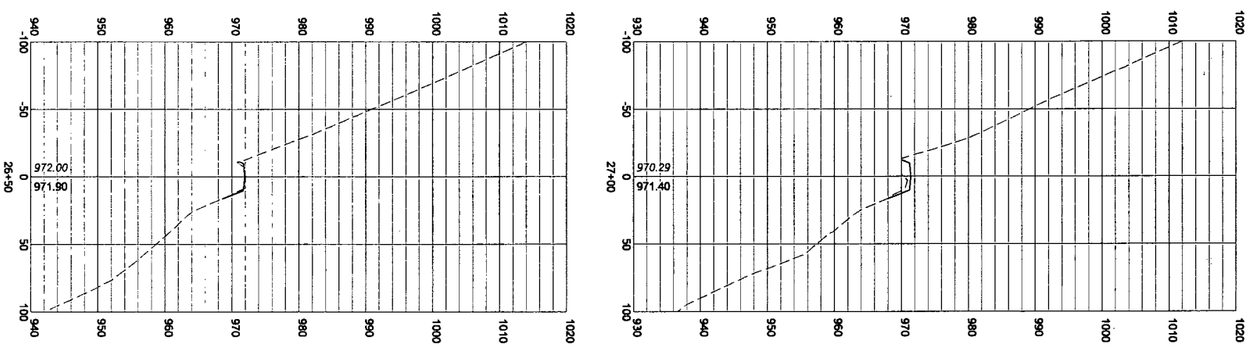
DOT_2006
Color_0_black.TBL
OILGAS_Full1Size.POF.plt

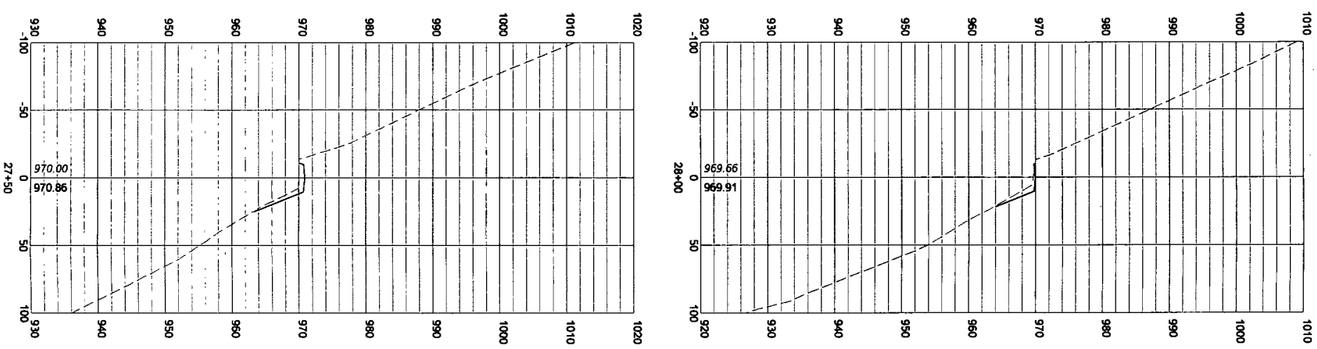
LEGEND

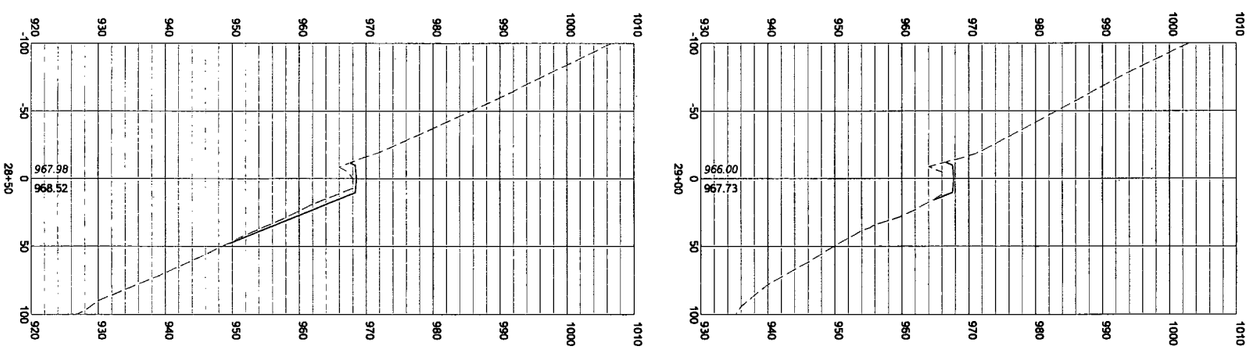
PROPOSED GRADE

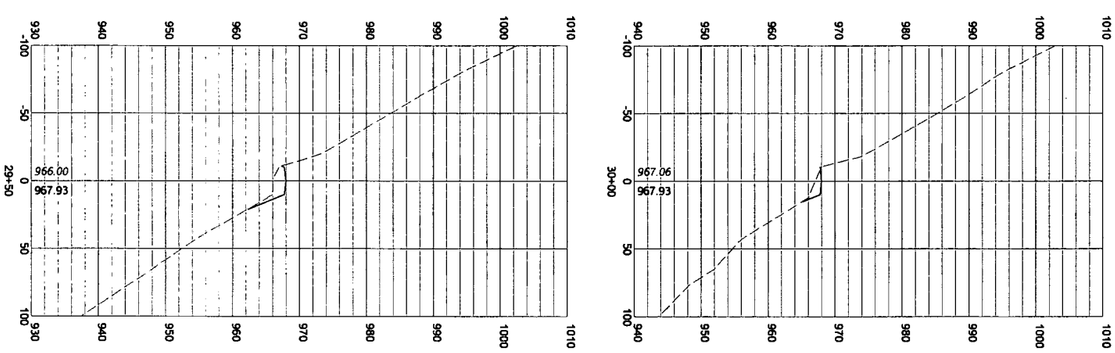
EXISTING GRADE











HORIZONTAL SCALE

0' 50' 100' 150'

VERTICAL SCALE

0' 10' 20' 30'

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51

WEST UNION DISTRICT

DODDRIDGE COUNTY, WV

DATE: 9/16/2013

SCALE: AS SHOWN

DESIGNED BY: RJH/MR

FILE NO: SLS-8251

SHEET 25 OF 57

REV:

THIS DOCUMENT WAS PREPARED BY SLS FOR EQT PRODUCTION COMPANY

RICHARD J. HARRIS 17220 STATE OF WEST VIRGINIA REGISTERED PROFESSIONAL ENGINEER

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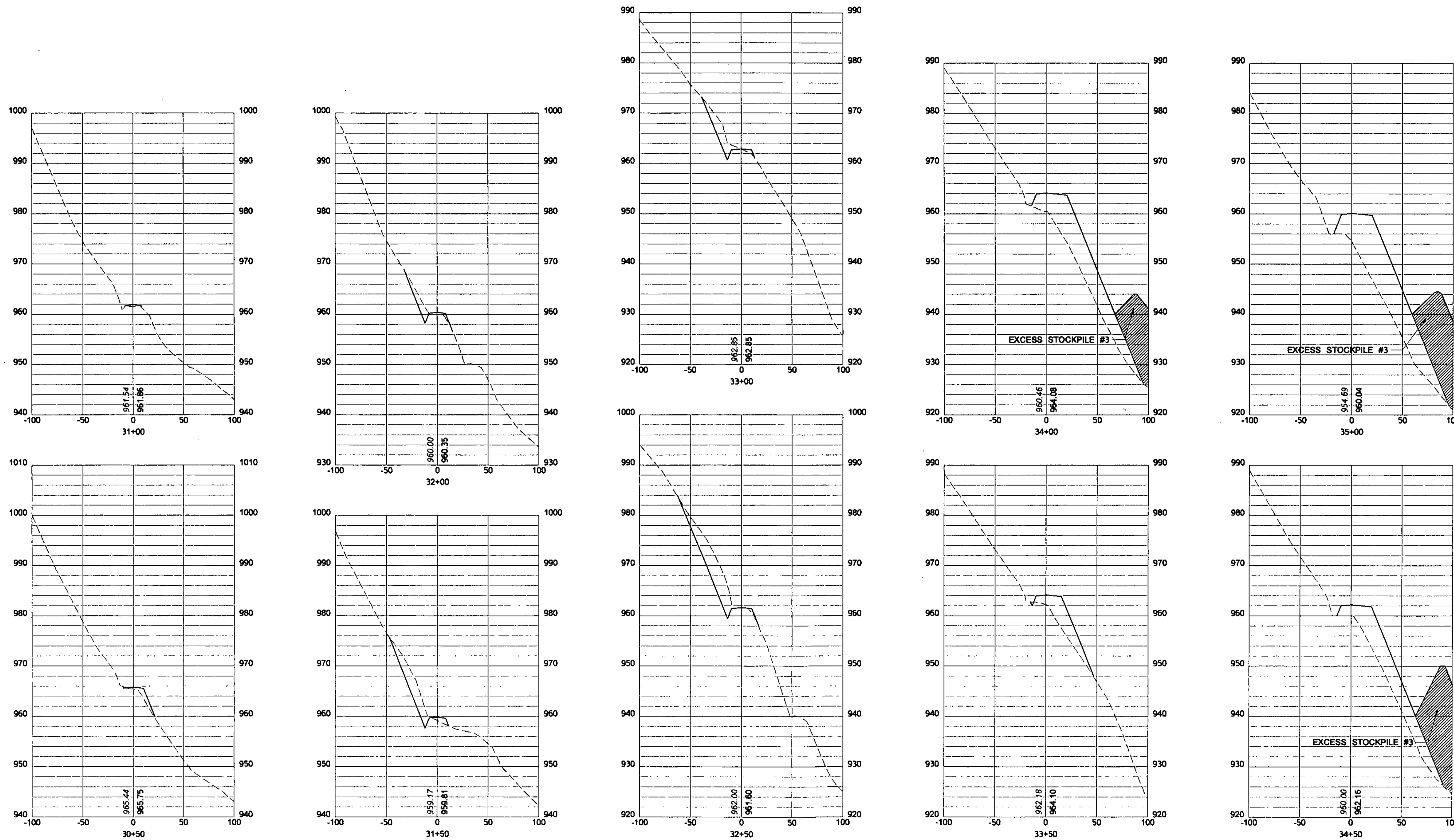
325 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
56063 Dilles Bottom Road Shadyside, OH 43947 (740) 671-0911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-357-9401



LEGEND

- PROPOSED GRADE
- *EXISTING GRADE*

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
U:\2027051372\EQT WEU 51\3.0 CADD\3.1 Highway\pre\51372esXS01.dgn

DOT_2006
Color_0_black.tbl
OILGAS-FullSize_PDF.plt

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

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SURVEYORS ENGINEERS
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226 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634
56065 Dilles Bottom Road
Shadyside, OH 43947
(740) 671-9911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

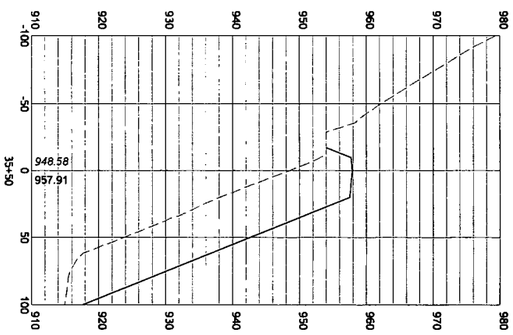
MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

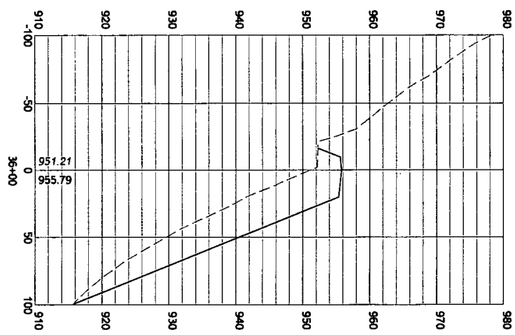
DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY:RJH/JMR	
FILE NO.:SLS-6051	
SHEET 26 OF 57	
REV:	

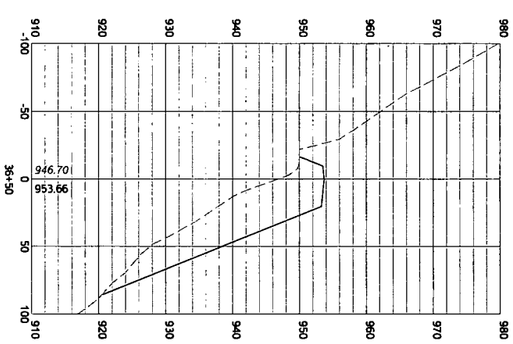
LEGEND

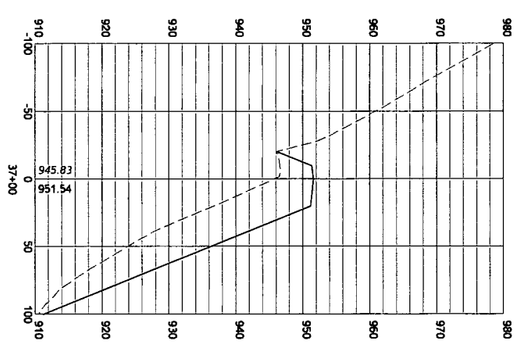
PROPOSED GRADE

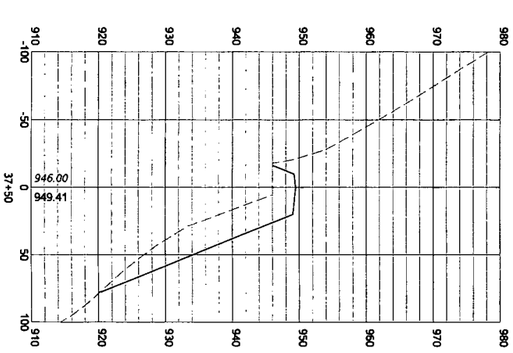
EXISTING GRADE

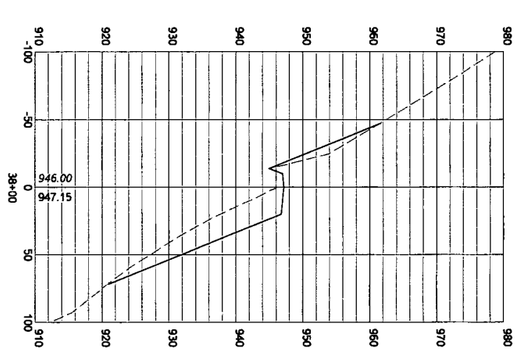


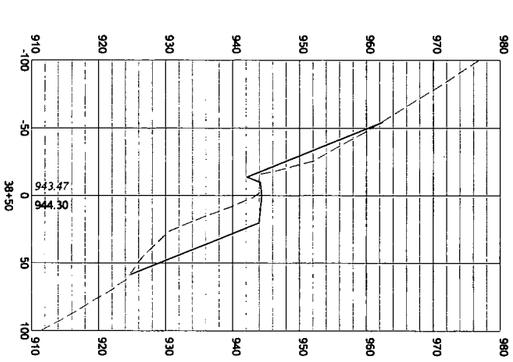


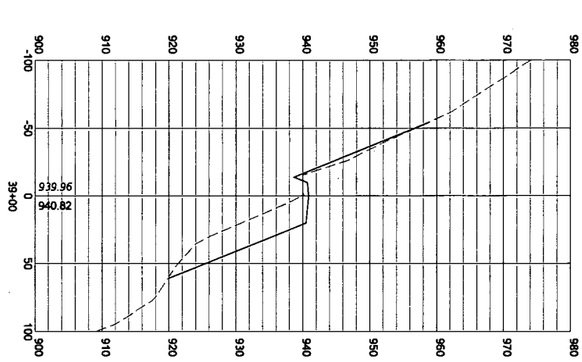


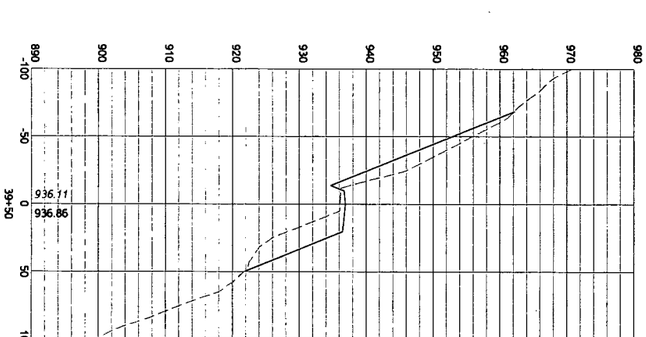


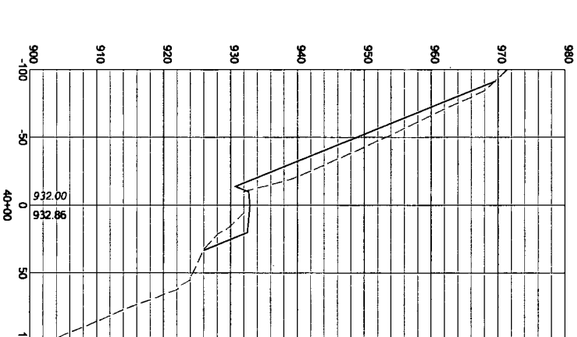












HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

DATE: 9/16/2013	MAIN ACCESS ROAD CROSS SECTIONS
SCALE: AS SHOWN	EQT WEU 51
DESIGNED BY: RJH/JMR	WEST UNION DISTRICT
FILE NO: SLS-8051	DODDRIDGE COUNTY, WV
SHEET 27 OF 57	
REV:	

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

RICHARD J. HEDGES, 17220, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
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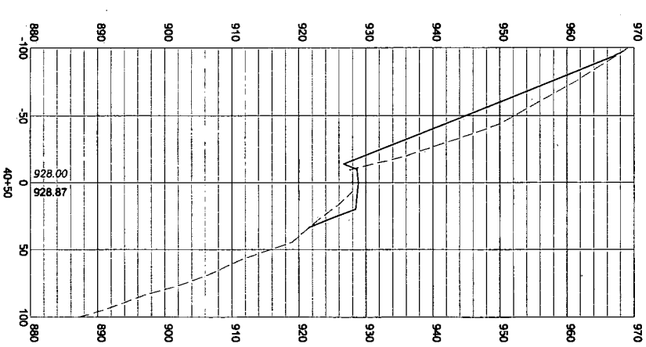
225 West Main St. P.O. Box 100 Glenville, WV 26351 (304) 462-5634
59065 Dilles Bottom Road Shadyside, OH 43947 (740) 671-0911
HONESTY, INTEGRITY, QUALITY

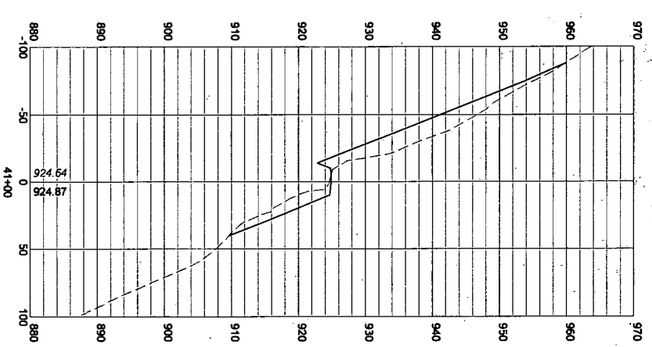
Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

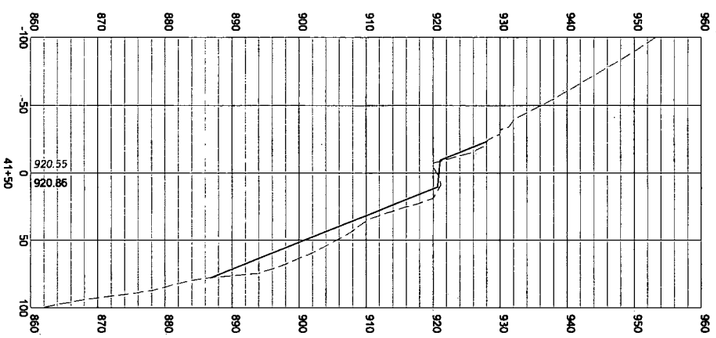
LEGEND

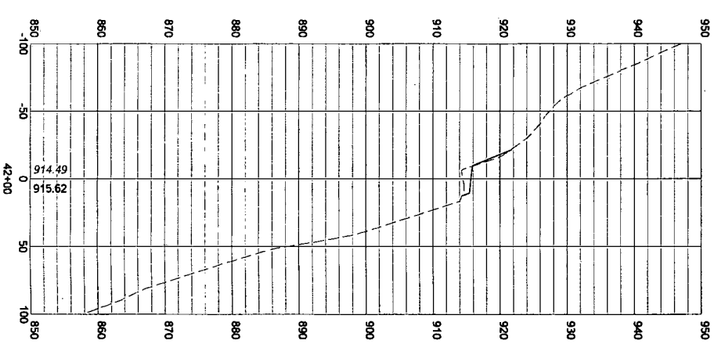
PROPOSED GRADE

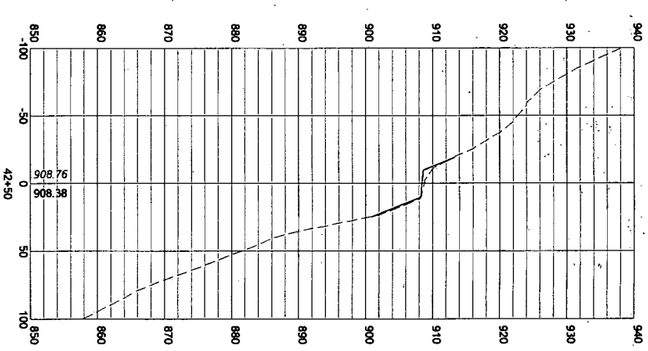
EXISTING GRADE

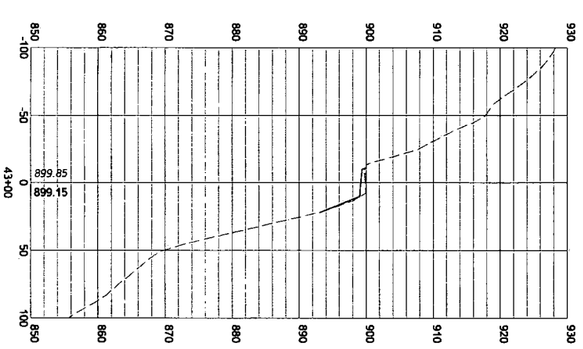


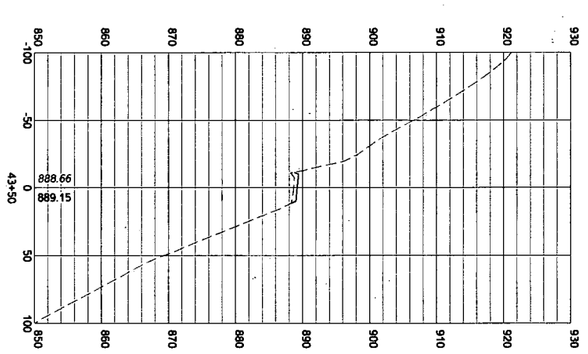


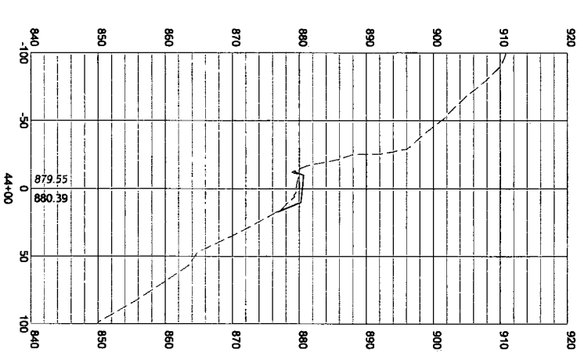


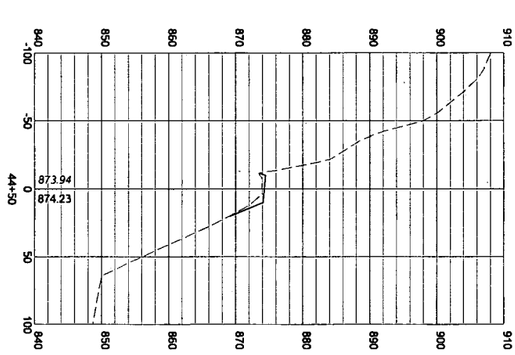












HORIZONTAL SCALE

VERTICAL SCALE

DATE: 9/16/2013	MAIN ACCESS ROAD CROSS SECTIONS EQT WEU 51 WEST UNION DISTRICT DODDRIDGE COUNTY, WV
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO: SLS-8051	
SHEET 28 OF 57	
REV:	

THIS DOCUMENT WAS PREPARED BY: SLS FOR: EQT PRODUCTION COMPANY

RICHARD J. HOLMES — REG. NO. 17220 — STATE OF WEST VIRGINIA — PROFESSIONAL ENGINEER

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
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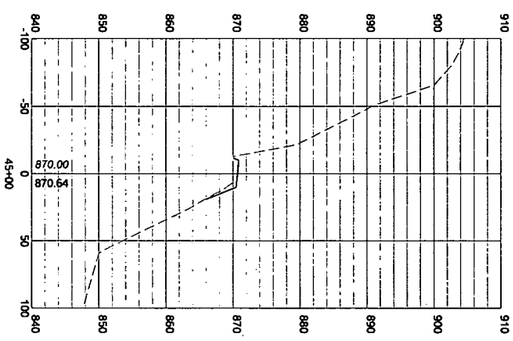
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

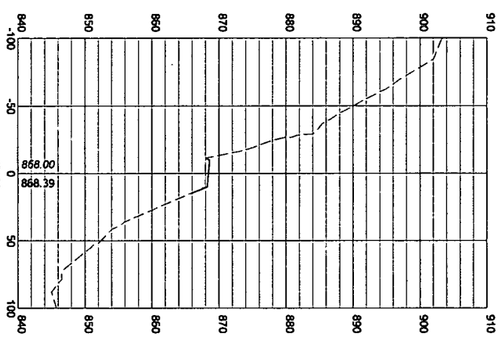
Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

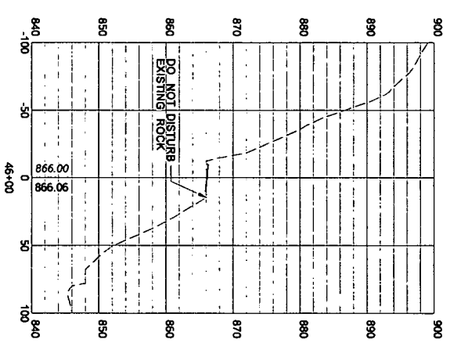
LEGEND

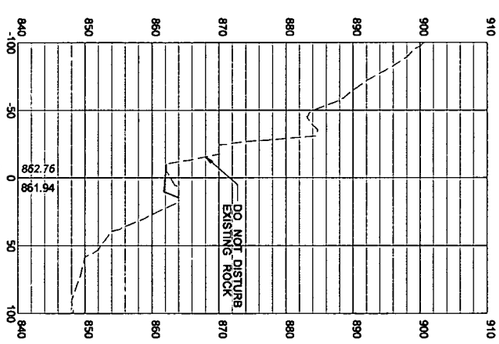
PROPOSED GRADE

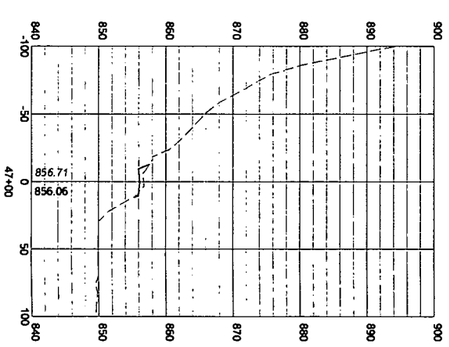
EXISTING GRADE

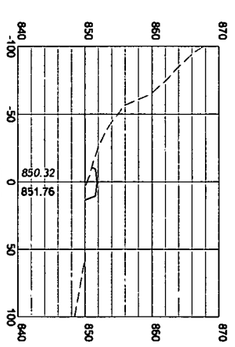


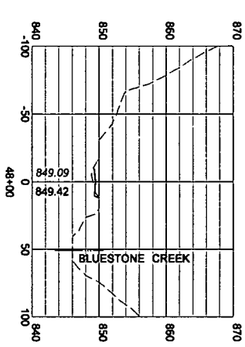


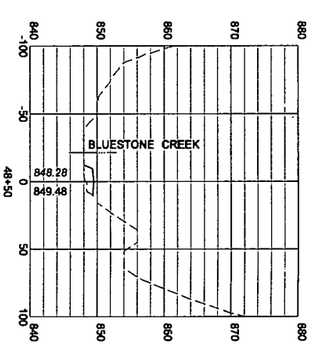


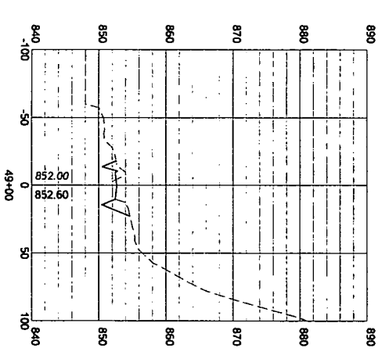


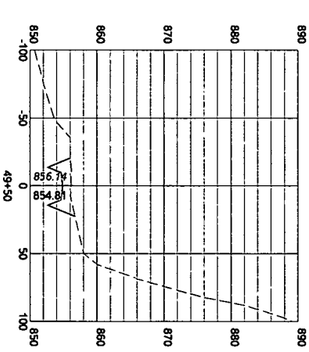


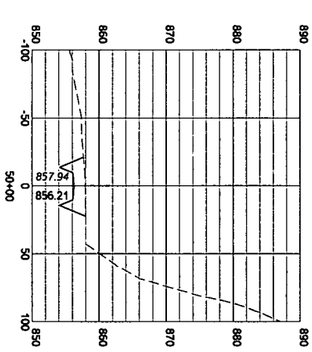


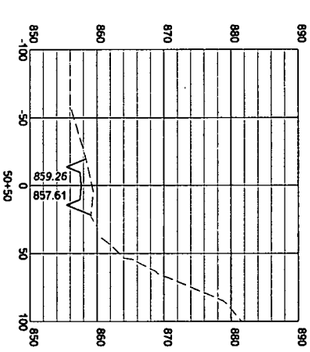


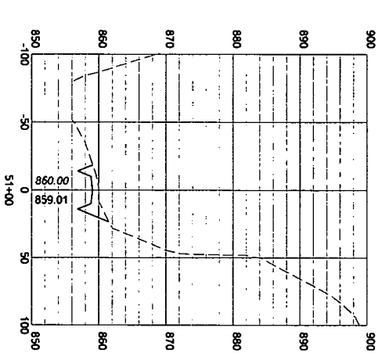


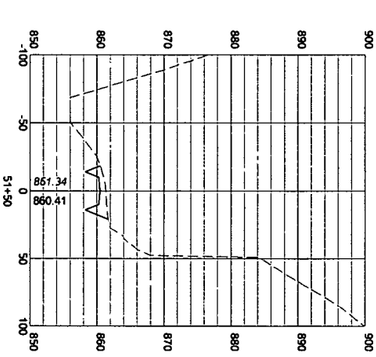


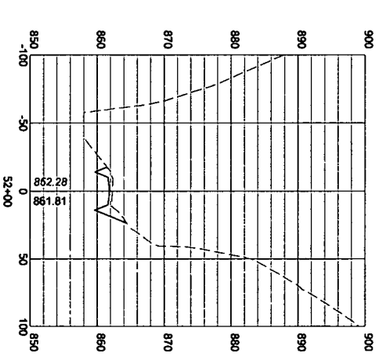












DATE: 9/16/2013

SCALE: AS SHOWN

DESIGNED BY: RJH/JMR

FILE NO: 3S-3-8051

SHEET 29 OF 57

REV:

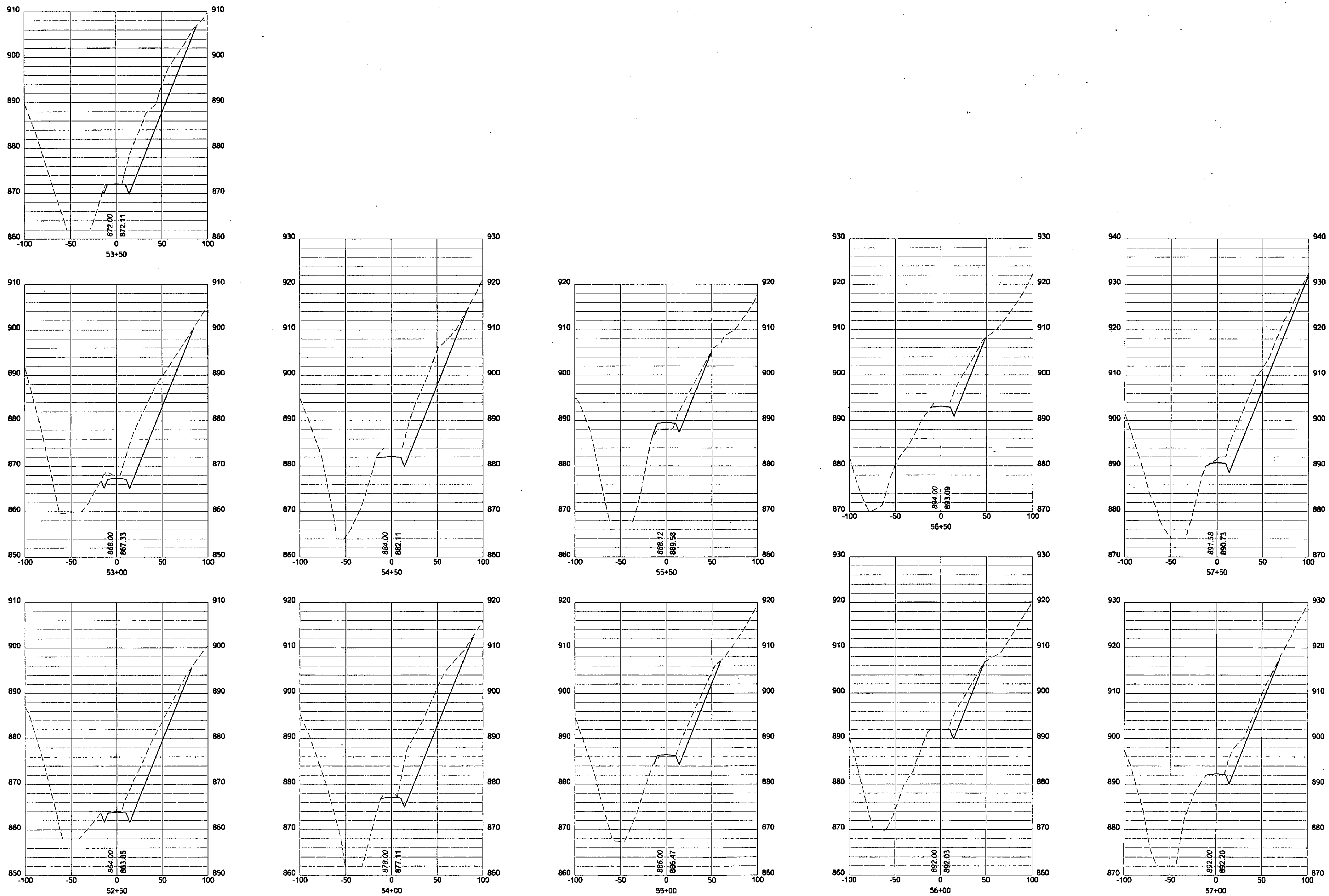
MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

THIS DOCUMENT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

REGISTERED PROFESSIONAL ENGINEER — STATE OF WEST VIRGINIA — 17220

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
226 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634
38003 Dillon Bottom Road
Shadyside, OH 43947
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-357-9401



LEGEND

——— PROPOSED GRADE

– – – EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS · ENGINEERS
PROJECT MGMT. · ENVIRONMENTAL
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 30 OF 57
REV:

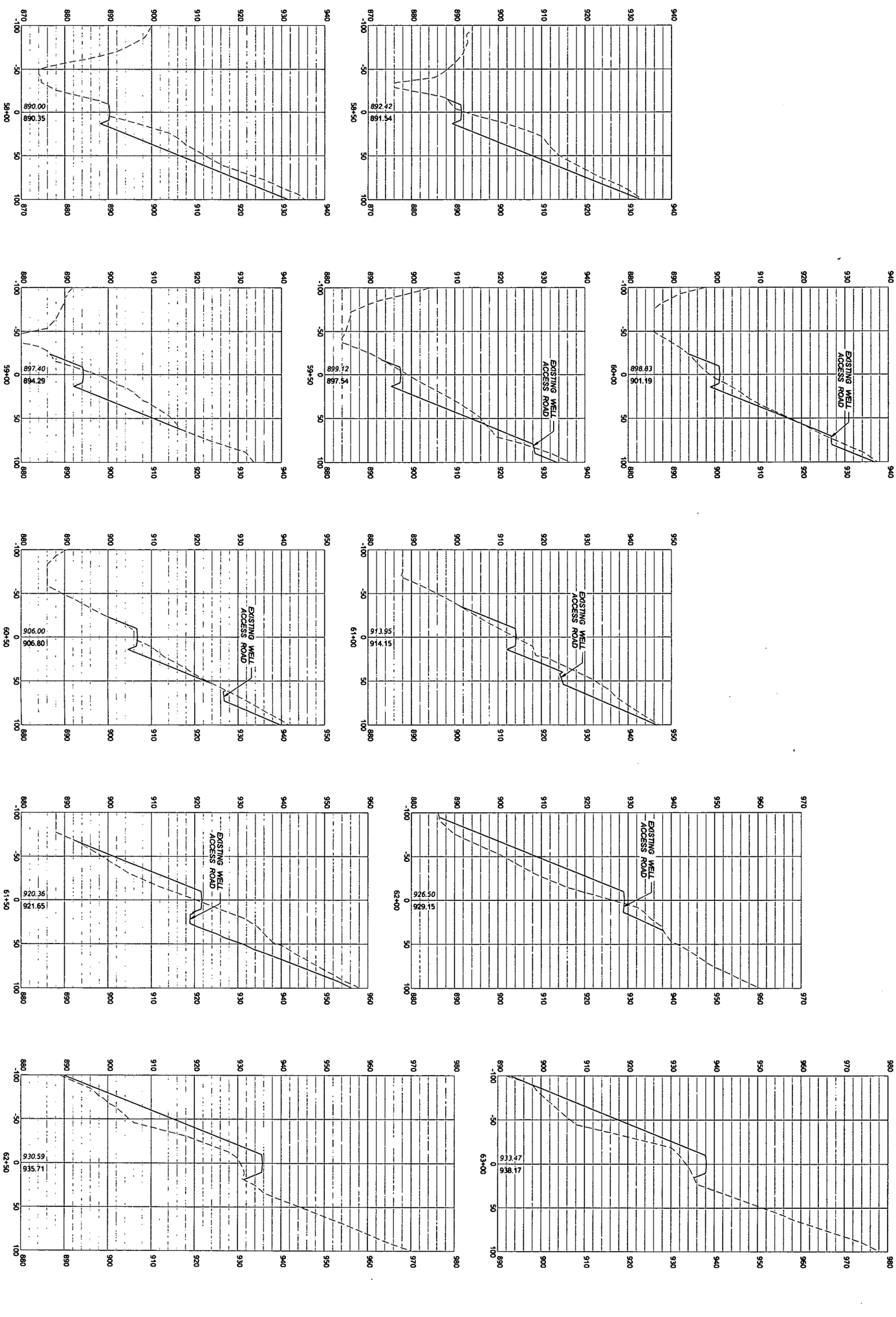
9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)

DOT_2006
Color_0_block_TBL
OILGAS:FullSize_PDF.plt

LEGEND

PROPOSED GRADE

EXISTING GRADE



HORIZONTAL SCALE

0' 50' 100' 150'

VERTICAL SCALE

0' 10' 20' 30'

DATE: 9/16/2013

SCALE: AS SHOWN

DESIGNED: BY:RJH/MR

FILE NO.:35-5-8051

SHEET: 31 OF 57

REV:

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51

WEST UNION DISTRICT

DODDRIDGE COUNTY, WV

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

RICHARD J. HOLSTEIN 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

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270 West Main St. P.O. Box 130 Glenville, WV 26351 (304) 462-5634

69083 Otts Bottom Road Shadyside, OH 43947 (740) 671-0911

HONESTY, INTEGRITY, QUALITY

Stantec

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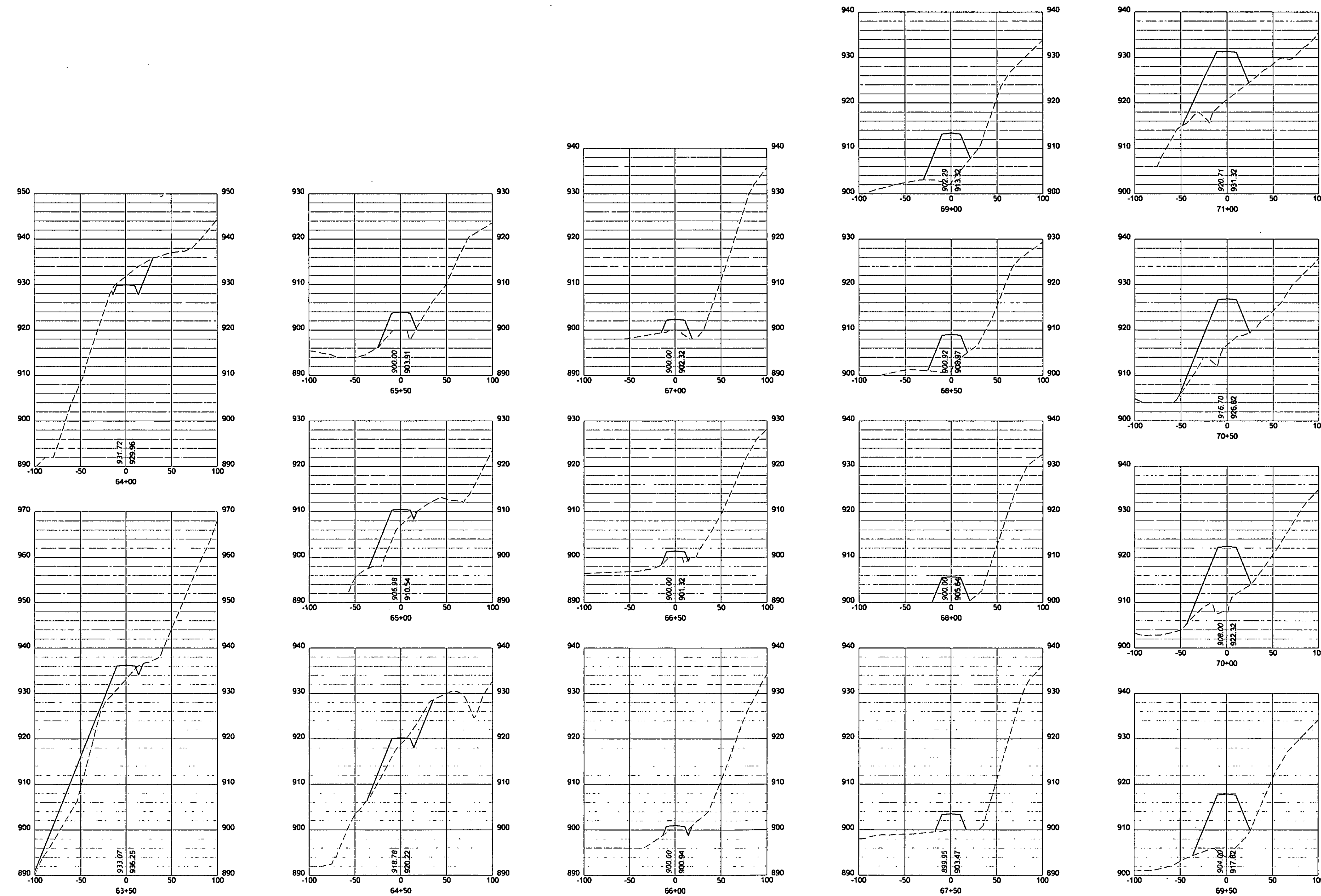
FAIRMONT, WV 26554
PHONE: 304-367-9401



LEGEND

——— PROPOSED GRADE

– – – EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

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FAIRMONT, WV 26554
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56065 Dilles Bottom Road Shadyside, OH 43947 (740) 671-0911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD CROSS SECTIONS EQT WEU 51

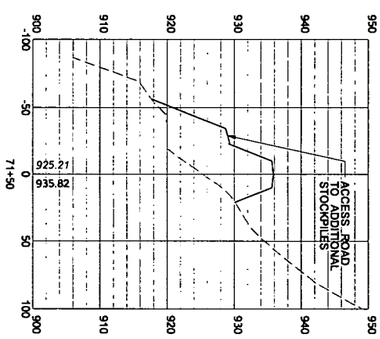
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

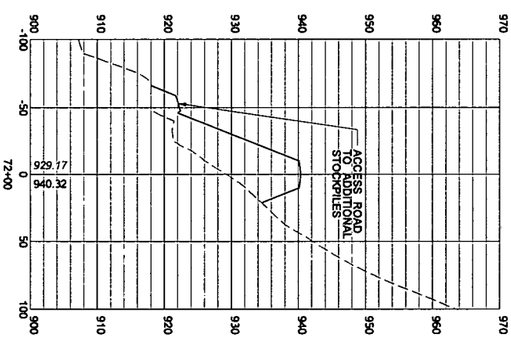
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 32 OF 57
REV:

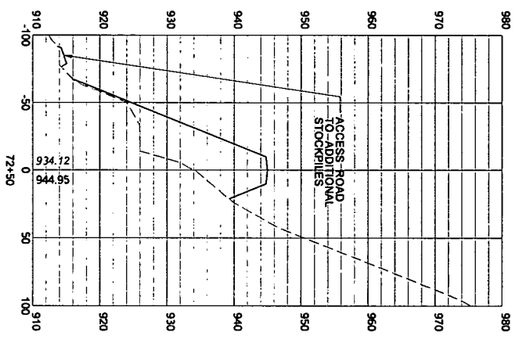
LEGEND

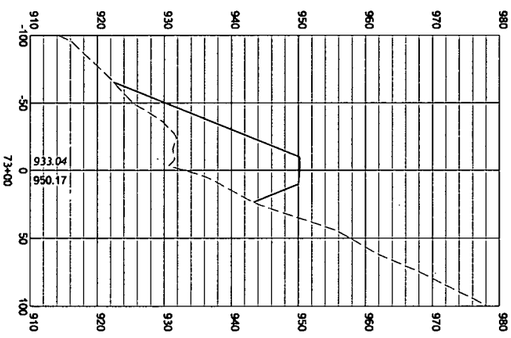
PROPOSED GRADE

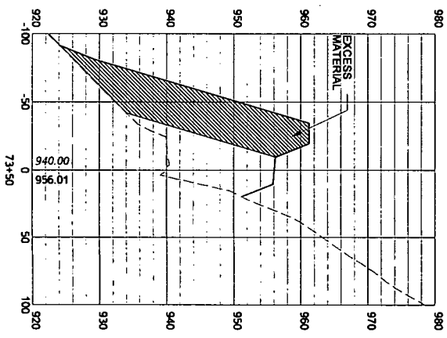
EXISTING GRADE

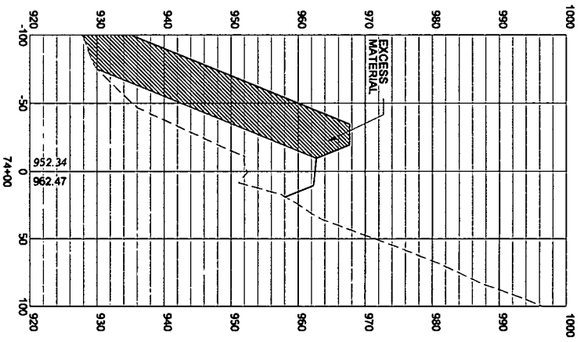


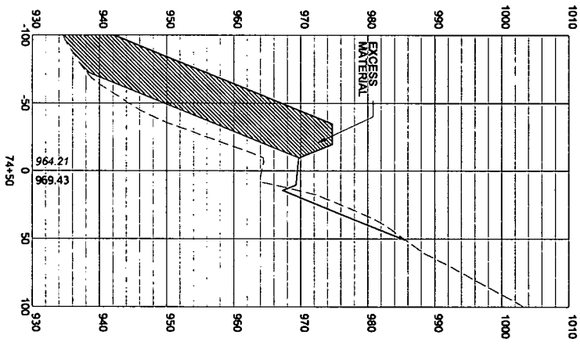


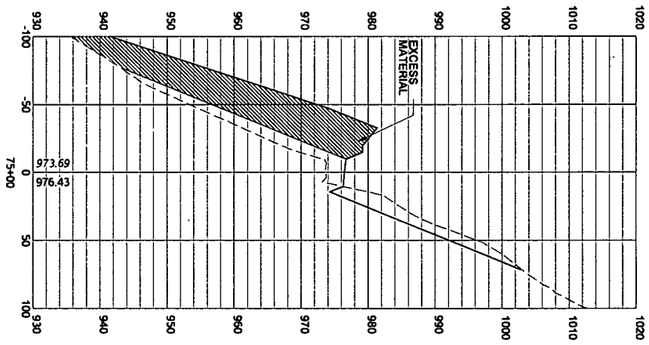


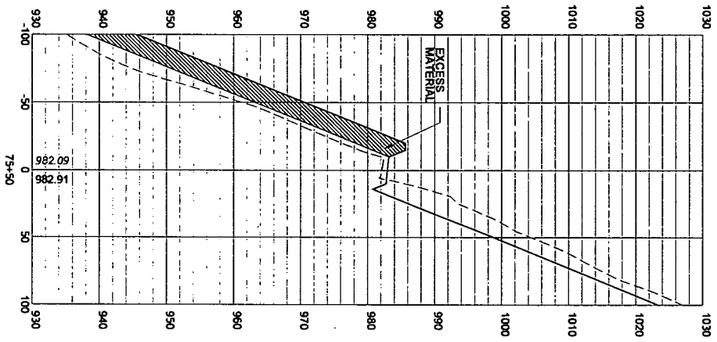












HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/MR
FILE NO: SLS-5051
SHEET 33 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY SLS FOR EQT PRODUCTION COMPANY

RICHARD J. HAMRICK REGISTERED PROFESSIONAL ENGINEER STATE OF WEST VIRGINIA 17220

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326 West Main St. P.O. Box 190 Glenville, WV 26351 (304) 462-5634
36083 Office Bottom Road Shelbyville, OH 43947 (740) 671-0911
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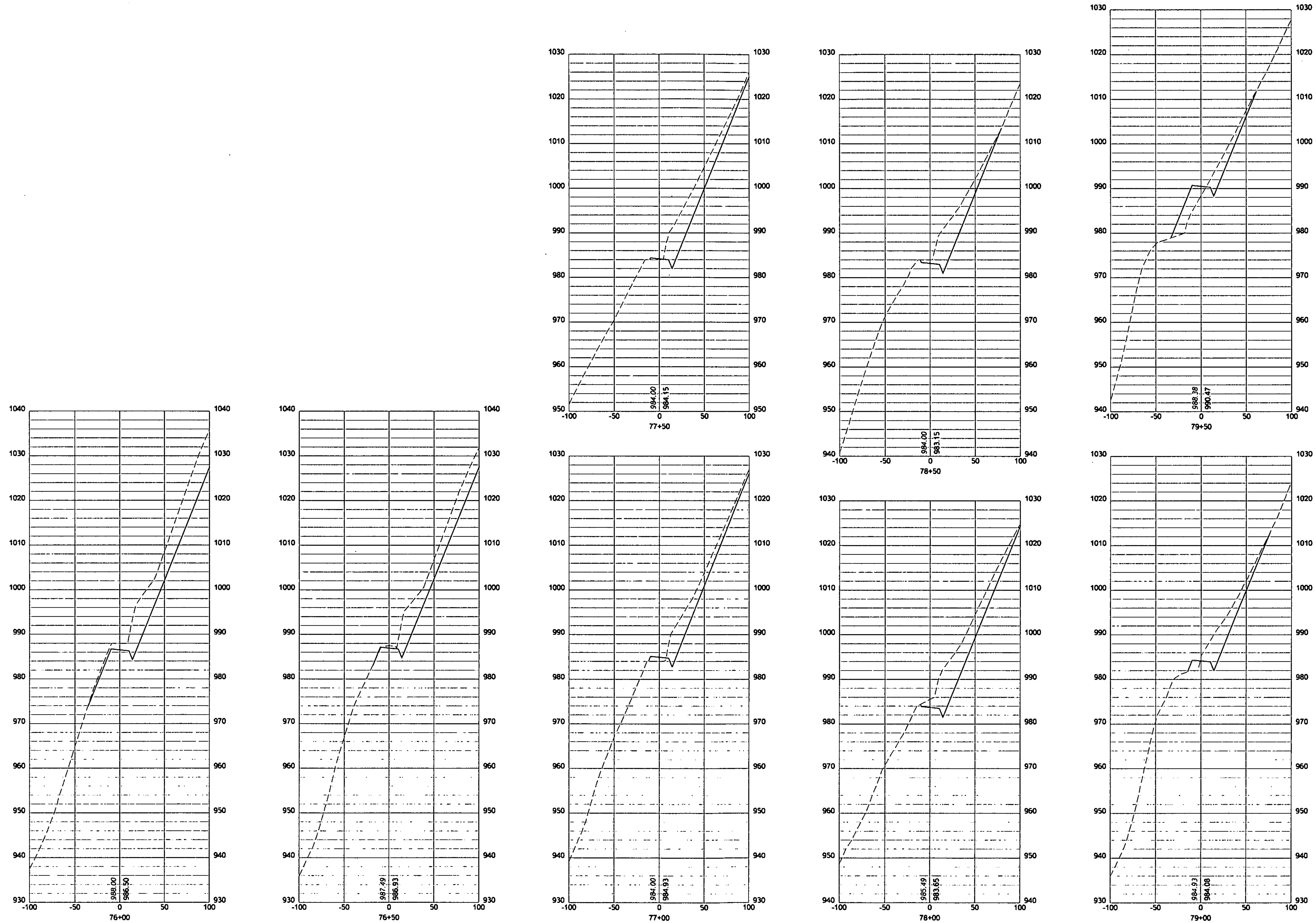
Stantec
111 ELDER STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401



LEGEND

- ——— PROPOSED GRADE
- – – – EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. ENGINEERS ENVIRONMENTAL
SLS
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

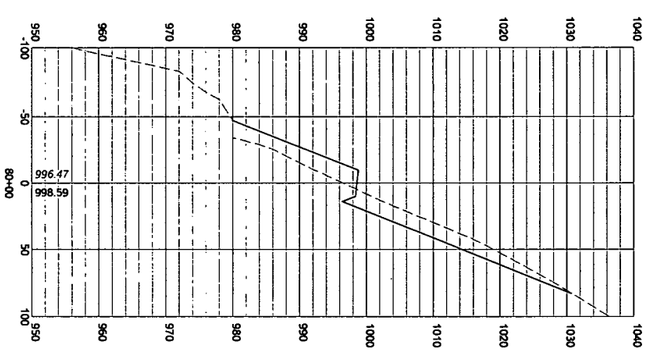
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-6051
SHEET 34 OF 57
REV:

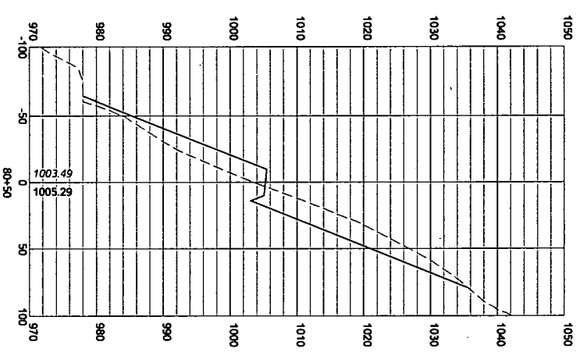
9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
DOT_2006 Color_0_black.TBL OILGAS_FullSize_PDF.plt

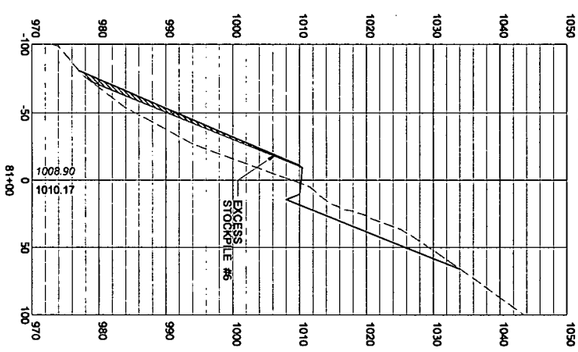
LEGEND

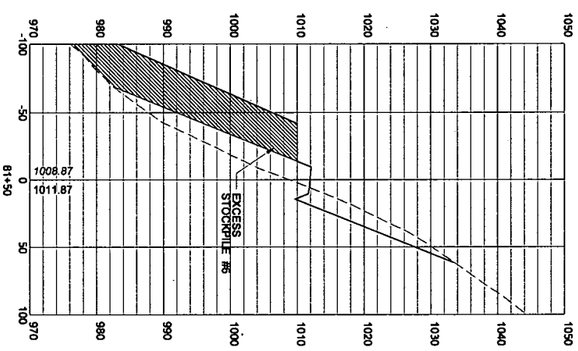
PROPOSED GRADE

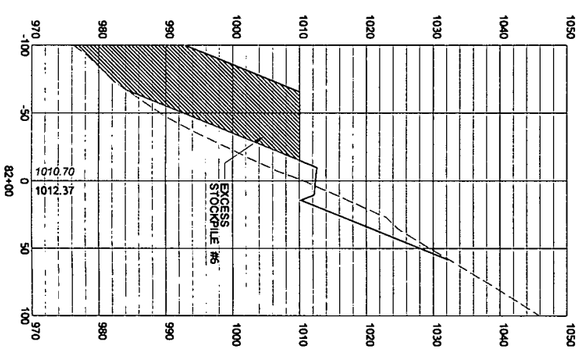
EXISTING GRADE

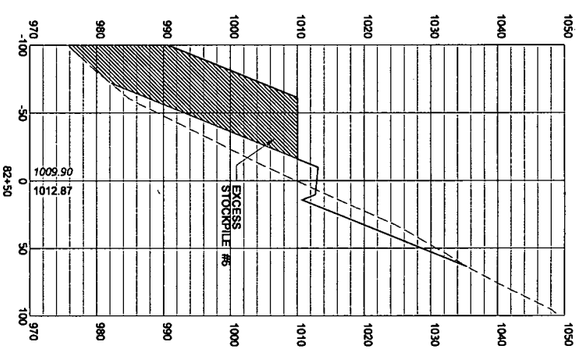


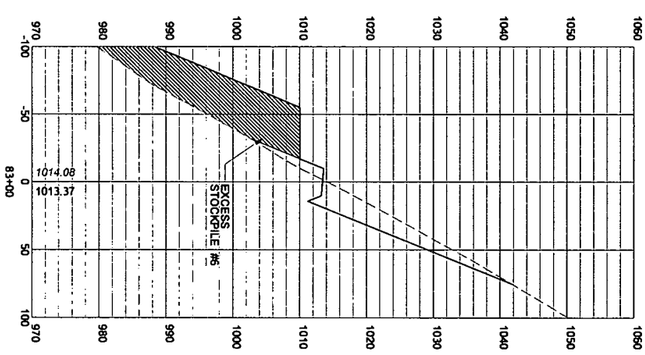


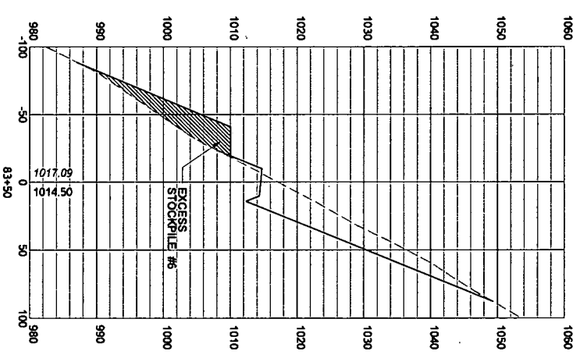


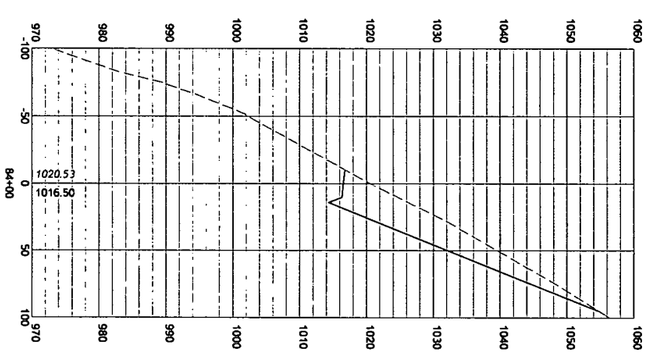


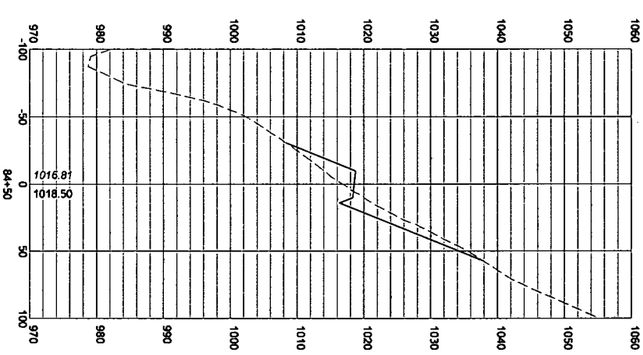












HORIZONTAL SCALE 0 50' 100' 150'

VERTICAL SCALE 0 10' 20' 30'

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

THIS DOCUMENT WAS PREPARED BY: SLS, INC. FOR EQT PRODUCTION COMPANY

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/MR
FILE NO: SLS-5051
SHEET 35 OF 57
REV:

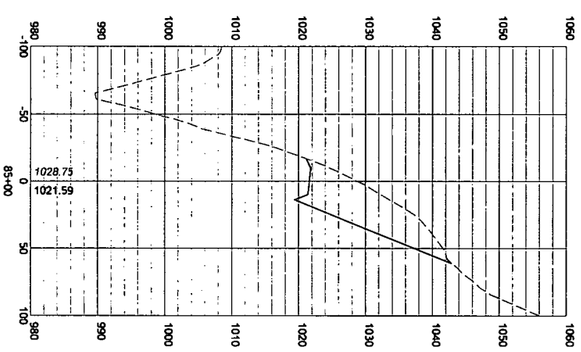
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS · ENGINEERS
PROJECT MGMT. · ENVIRONMENTAL
SLS
229 West Main St.
P.O. Box 150
Glenville, WV 26351
(304) 462-5634
59003 Ohio Bottom Road
Shadyside, OH 43947
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

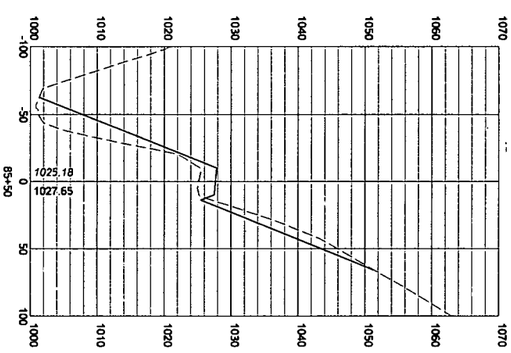
Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-0401

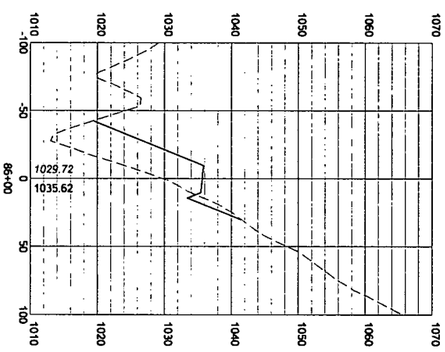
LEGEND

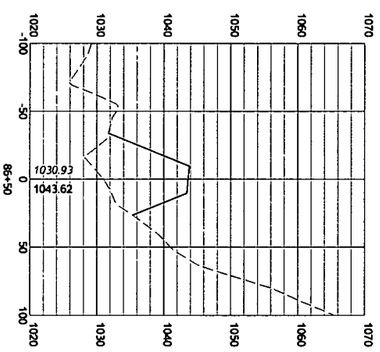
PROPOSED GRADE

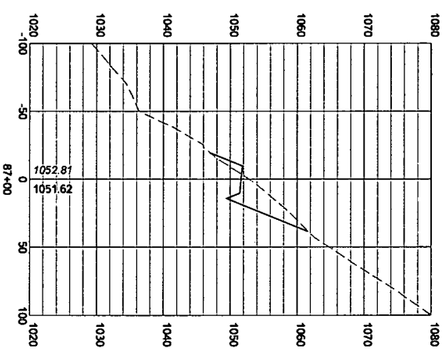
EXISTING GRADE

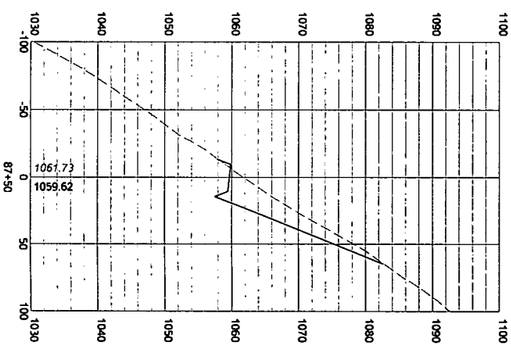


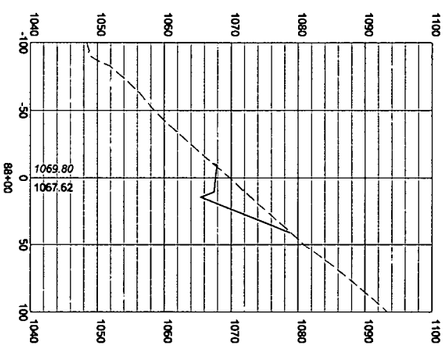


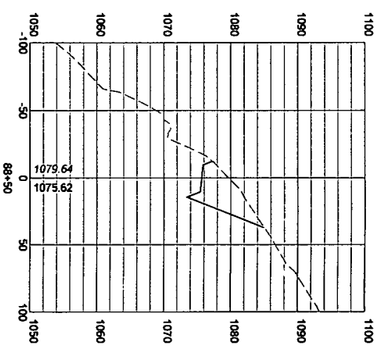


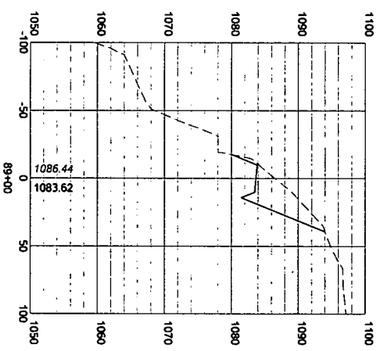


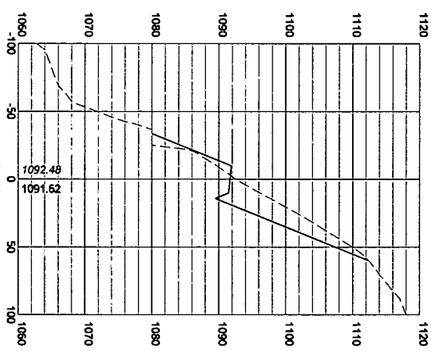


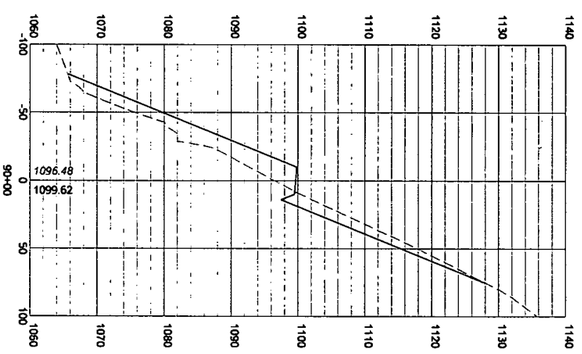


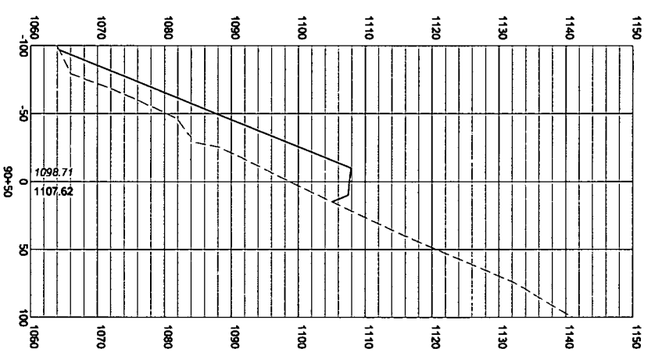












HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

DATE: 9/16/2013	MAIN ACCESS ROAD CROSS SECTIONS
SCALE: AS SHOWN	EQT WEU 51
DESIGNED BY: PJH/JMR	WEST UNION DISTRICT
FILE NO: SLS-5051	DODDRIDGE COUNTY, WV
SHEET 36 OF 57	
REV:	

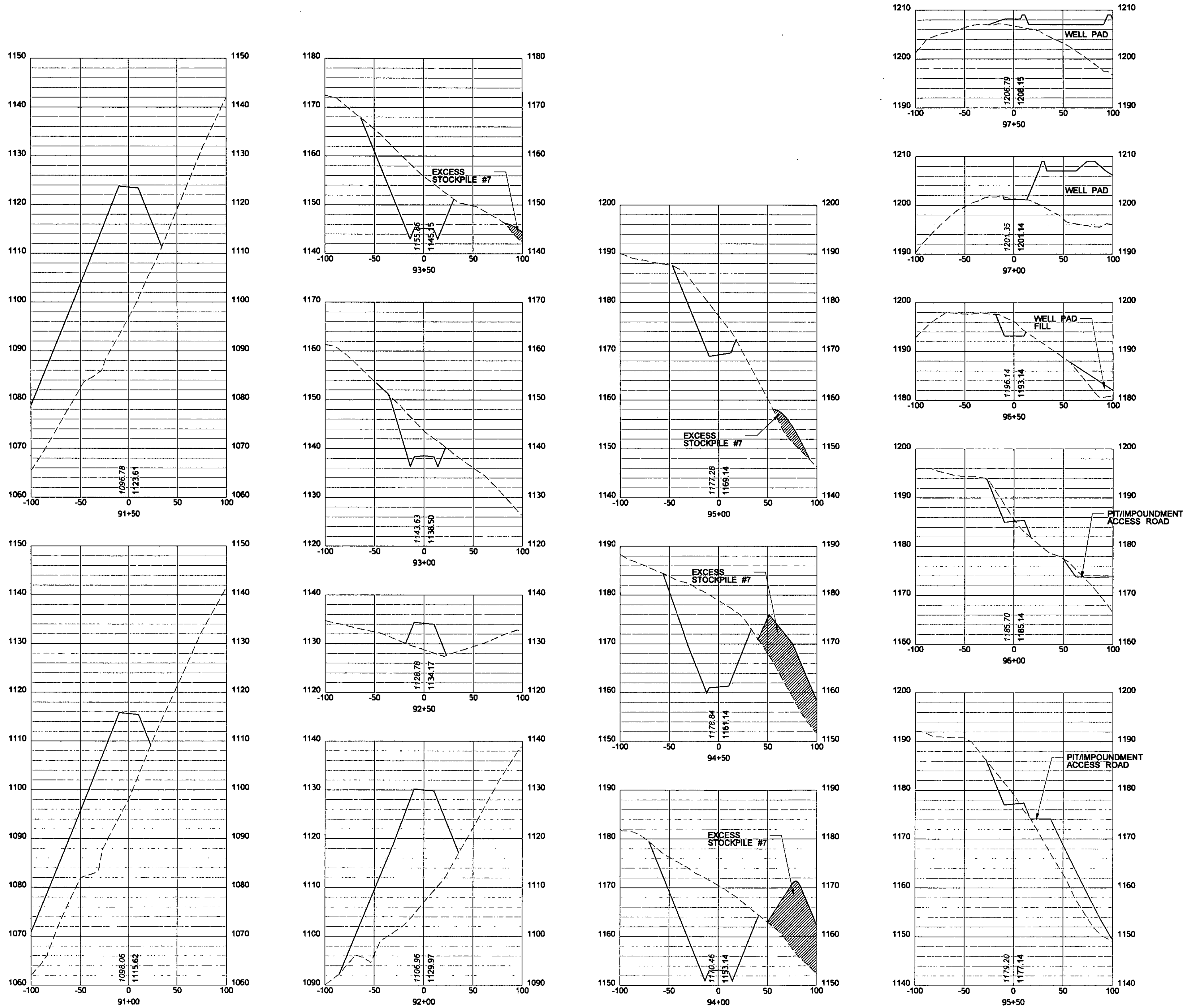
THIS DOCUMENT WAS PREPARED BY: SURVEYING FOR EQT PRODUCTION COMPANY

PROFESSIONAL ENGINEER — STATE OF WEST VIRGINIA — 17320 — REGISTERED — 12/31/14

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
228 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-8634
35063 Olive Bottom Road Shadyside, OH 43947 (740) 671-0911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-357-9401

DOT_2006
Color_0_black.TBL
OILGAS_FullSize_PDF.plt



LEGEND

- PROPOSED GRADE
- *EXISTING GRADE*

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS · ENGINEERS · PROJECT MGMT. · ENVIRONMENTAL
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HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
REGISTERED
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

MAIN ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 37 OF 57
REV:

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
U:\202705137\EQT WEU 51\3.0 CADD\3.1 Highway\PRES\1372esX501.dgn

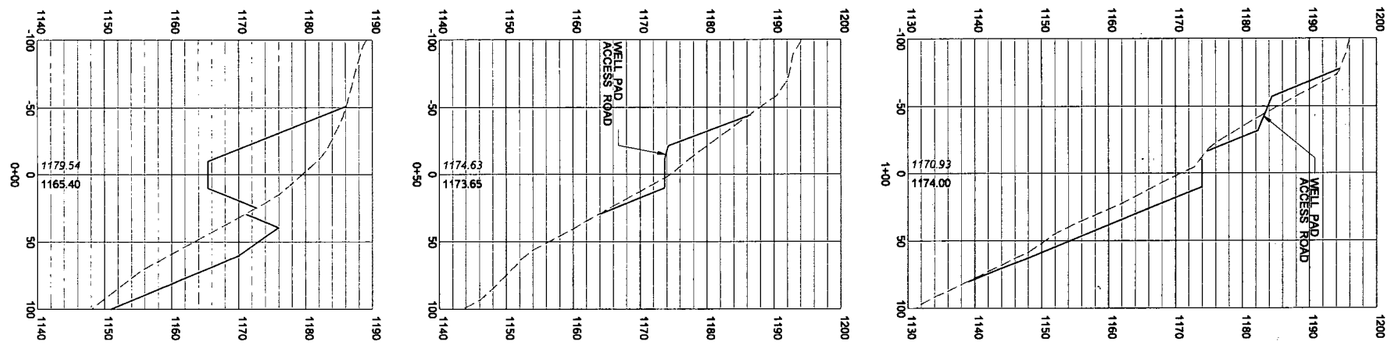
9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
U:\2027051372\EQT WEU 51\13.0 CADD\13.1 Highway\prES\1372esX501.dgn

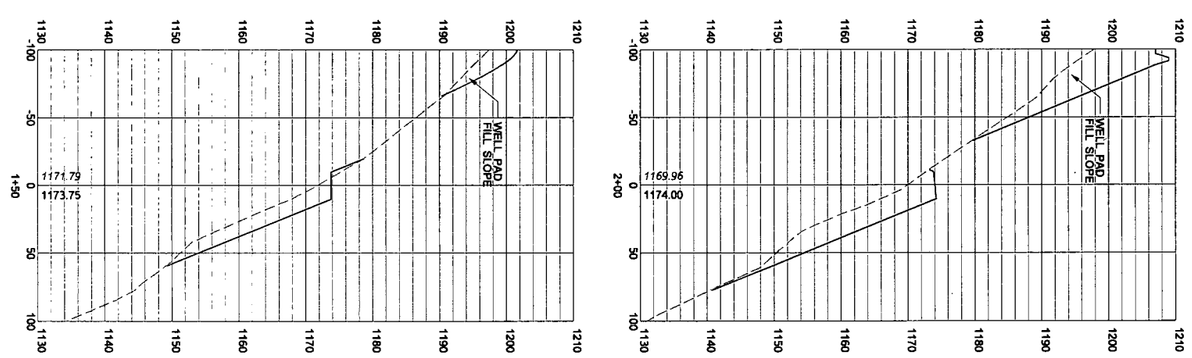
DOT_2006
Color_0.block.TBL
OILGAS_FullSize.PDF.plt

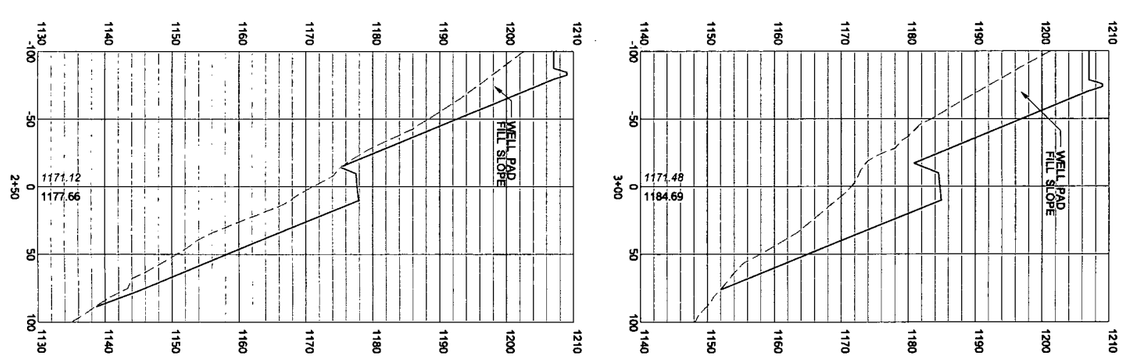
LEGEND

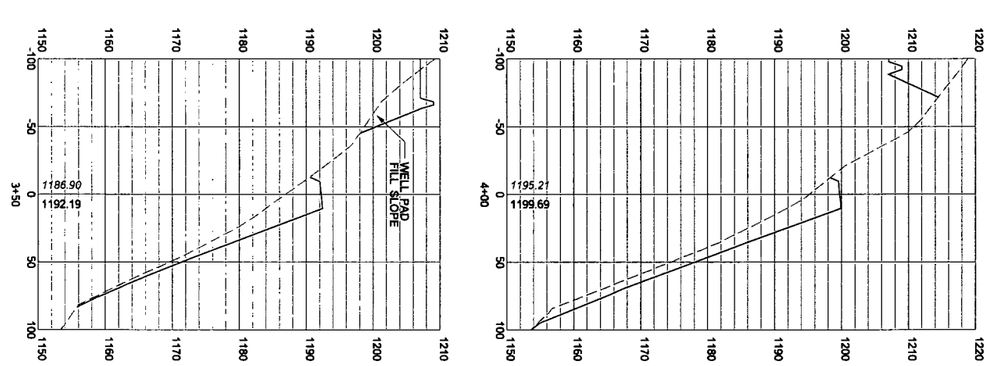
PROPOSED GRADE

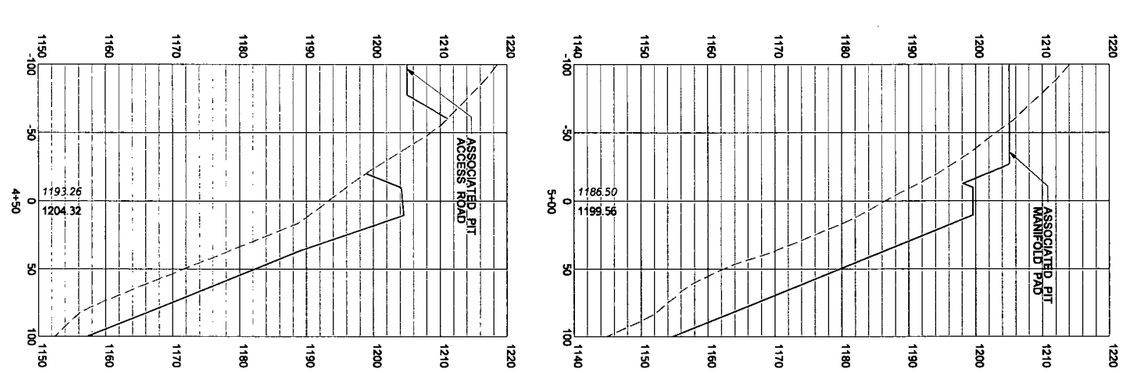
EXISTING GRADE











HORIZONTAL SCALE 0' 50' 100' 150'

VERTICAL SCALE 0' 10' 20' 30'

PIT / IMPOUND ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

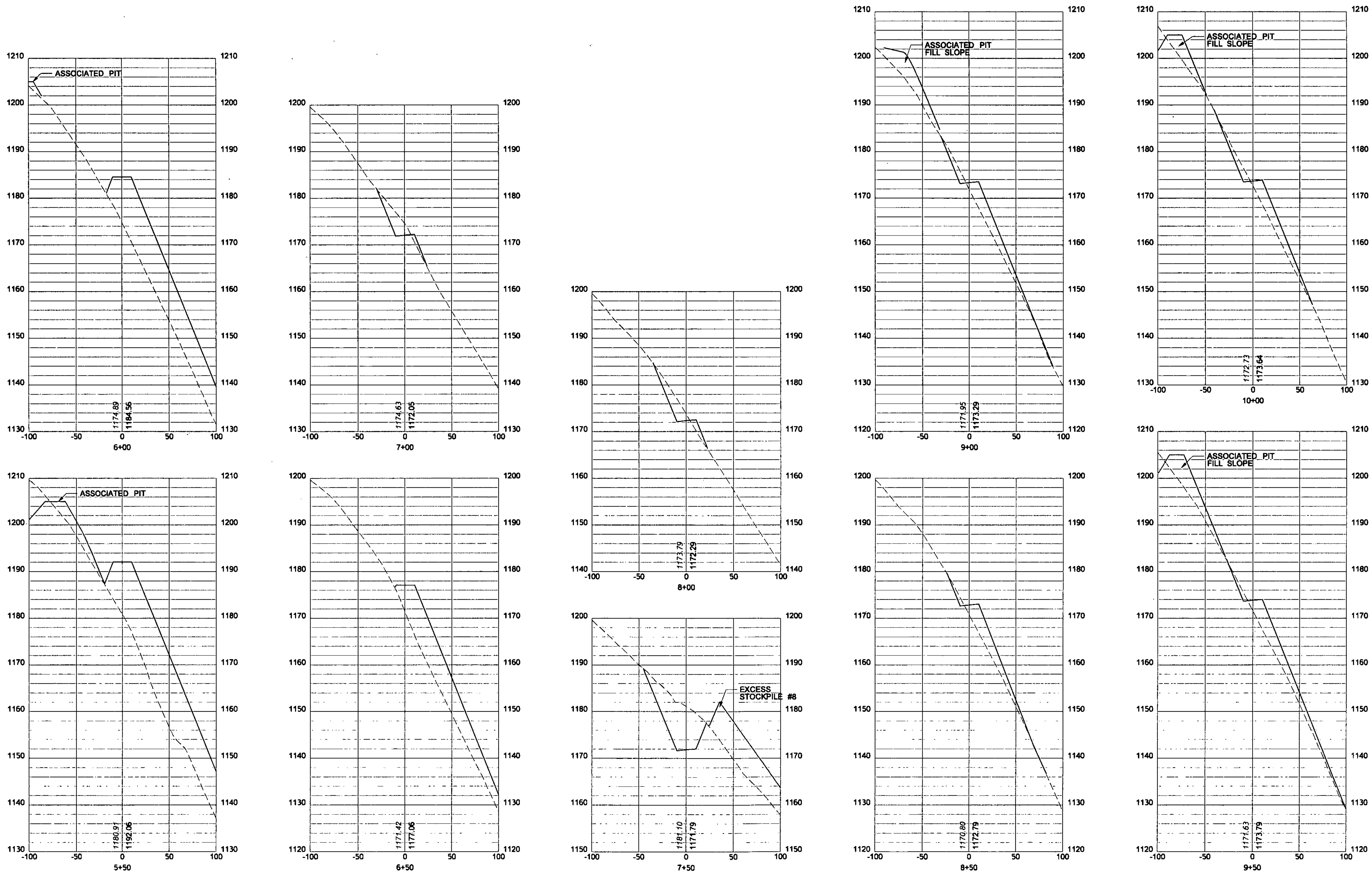
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/AMR
FILE NO: SLS-5051
SHEET 36 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY: SLS FOR EQT PRODUCTION COMPANY

RICHARD J. HAMRICK, 17220, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER, REGISTERED

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
328 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
39055 Dilles Bottom Road Shadyside, OH 43947 (740) 671-0511
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401



LEGEND

—— PROPOSED GRADE

- - - EXISTING GRADE

0' 50' 100' 150' HORIZONTAL SCALE

0' 10' 20' 30' VERTICAL SCALE

Stantec

111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
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SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
226 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
56065 Dilles Bottom Road Shadyside, OH 43947 (740) 671-9911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

PIT / IMPOUND ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 39 OF 57
REV:

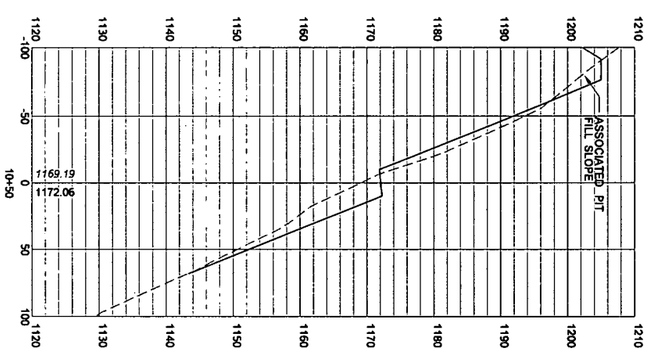
9/16/2013
WORKSPACE: DOT 2006 (SURVEY FEET)
U:\2072051372\EQT WEU 51\13.0 CADD\13.1 Highway\prESS1372esx501.dgn

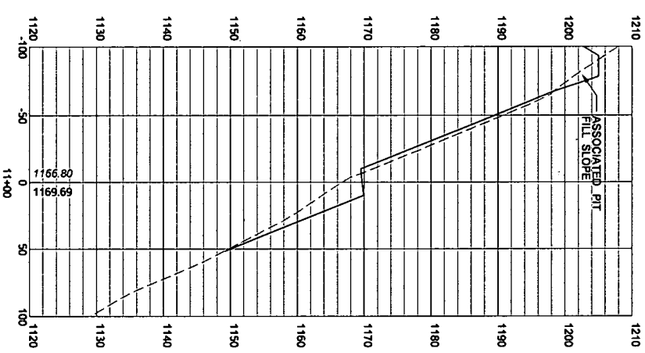
DOT_2006
Color_0_block_TBL
OILGAS_FullSize_PDF.plt

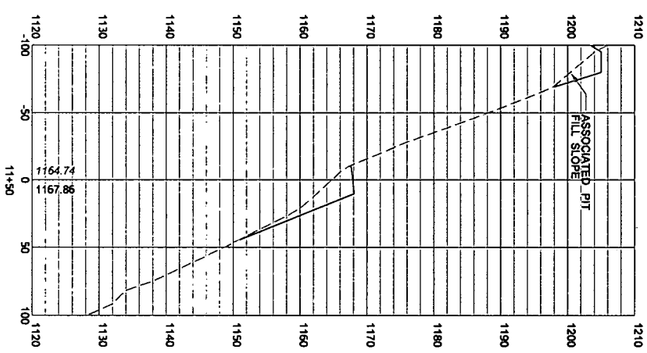
LEGEND

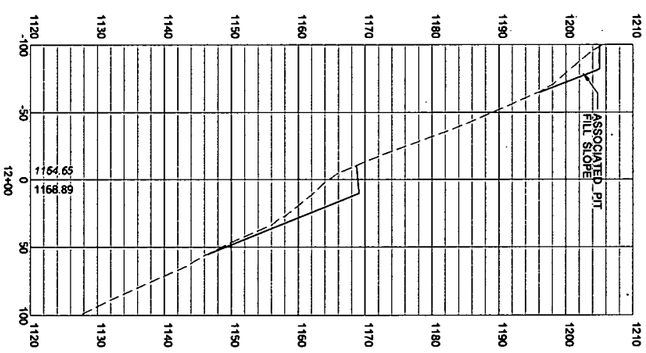
PROPOSED GRADE

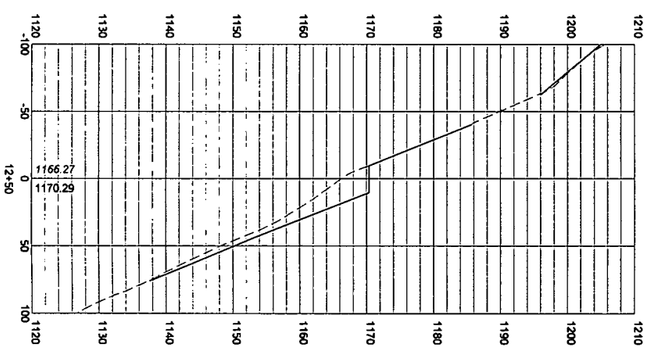
EXISTING GRADE

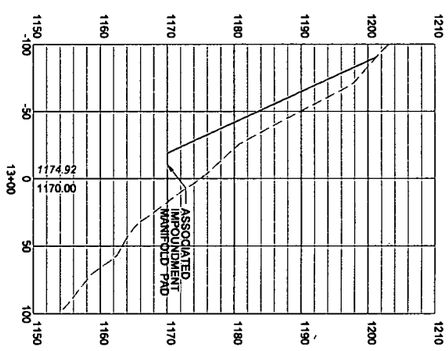












PIT / IMPOUND ACCESS ROAD CROSS SECTIONS
EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: EJH/JMR
FILE NO: SLS-6051
SHEET 40 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY SLS FOR EQT PRODUCTION COMPANY

RICHARD E. HICKS 17320 STATE OF WEST VIRGINIA PROFESSIONAL LAND SURVEYOR

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
228 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
59063 Dillon Bottom Road Shadyside, OH 43947 (740) 671-0911
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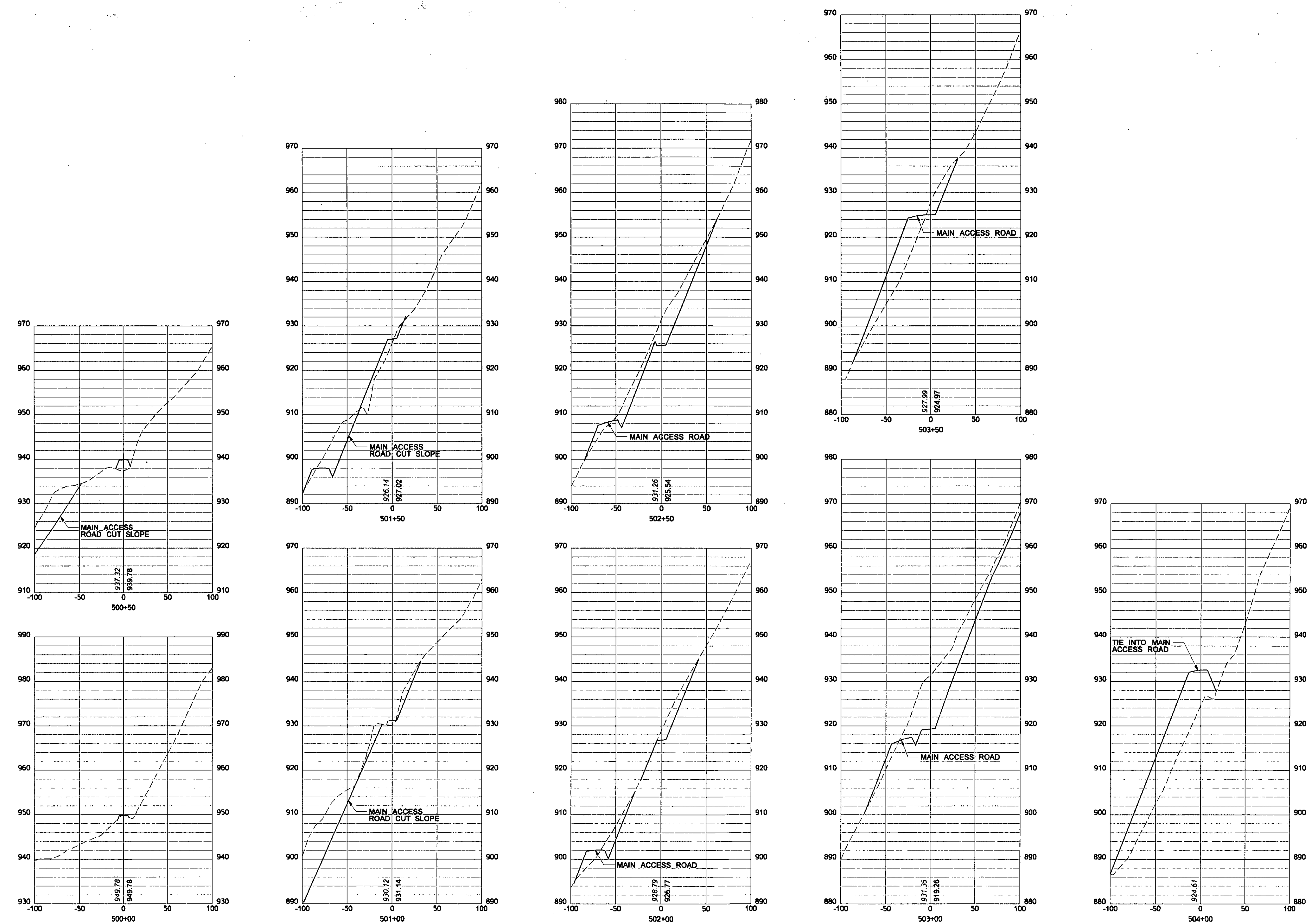
Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401



LEGEND

—— PROPOSED GRADE

- - - EXISTING GRADE

0' 50' 100' 150'
HORIZONTAL SCALE

0' 10' 20' 30'
VERTICAL SCALE

Stantec
11 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

Professional Energy Consultants
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226 West Main St. P.O. Box 150 Glenville, WV 26351 (304) 462-5634
56065 Dilles Bottom Road Shadyside, OH 43947 (740) 671-6911
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

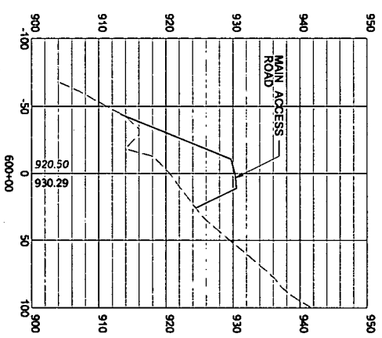
EXISTING WELL ACCESS ROAD CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

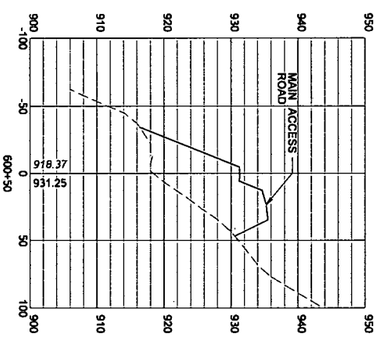
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 41 OF 57
REV:

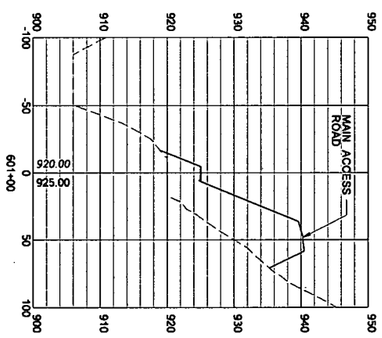
LEGEND

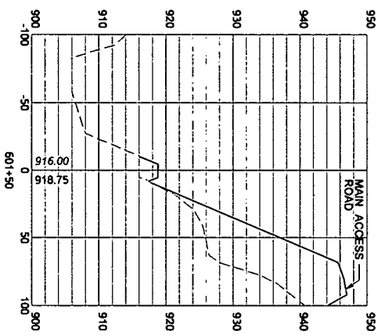
PROPOSED GRADE

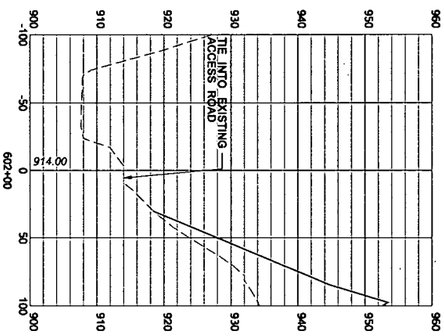
EXISTING GRADE











HORIZONTAL SCALE

0' 50' 100' 150'

VERTICAL SCALE

0' 10' 20' 30'

STOCKPILE ACCESS ROAD
CROSS SECTIONS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/MR
FILE NO: SJ3-8051
SHEET 42 OF 57
REV:

THIS DOCUMENT WAS PREPARED BY STANTEC FOR EQT PRODUCTION COMPANY

RICHARD J. HARRIS
PROFESSIONAL ENGINEER
17220
STATE OF WEST VIRGINIA

Professional Energy Consultants
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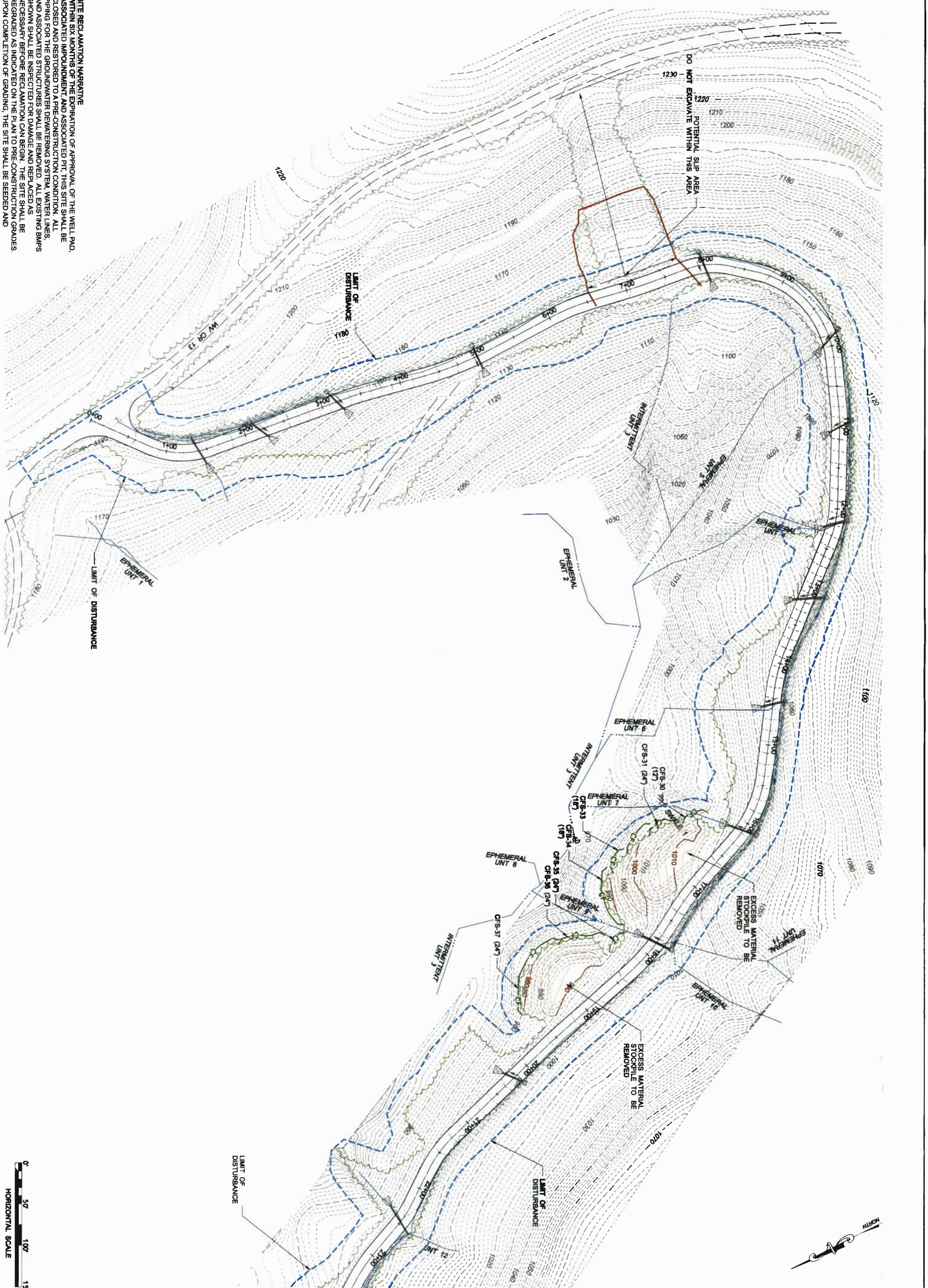
15053 Dillon Bottom Road
Shadyside, OH 43947
(740) 671-0911
HONESTY, INTEGRITY, QUALITY

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

SITE RECLAMATION NARRATIVE

WITHIN SIX MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMPS SHOWN SHALL BE REMOVED, UNLESS OTHERWISE NOTED. ALL BMPS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLAN TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 56.



SEE SHEET 44

ACCESS ROAD RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: 35-8-8051
SHEET 43 OF 57
REV

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RICHARD J. HOSKINS — STATE OF WEST VIRGINIA — 17220 — REGISTERED PROFESSIONAL ENGINEER

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111 ELKINS STREET
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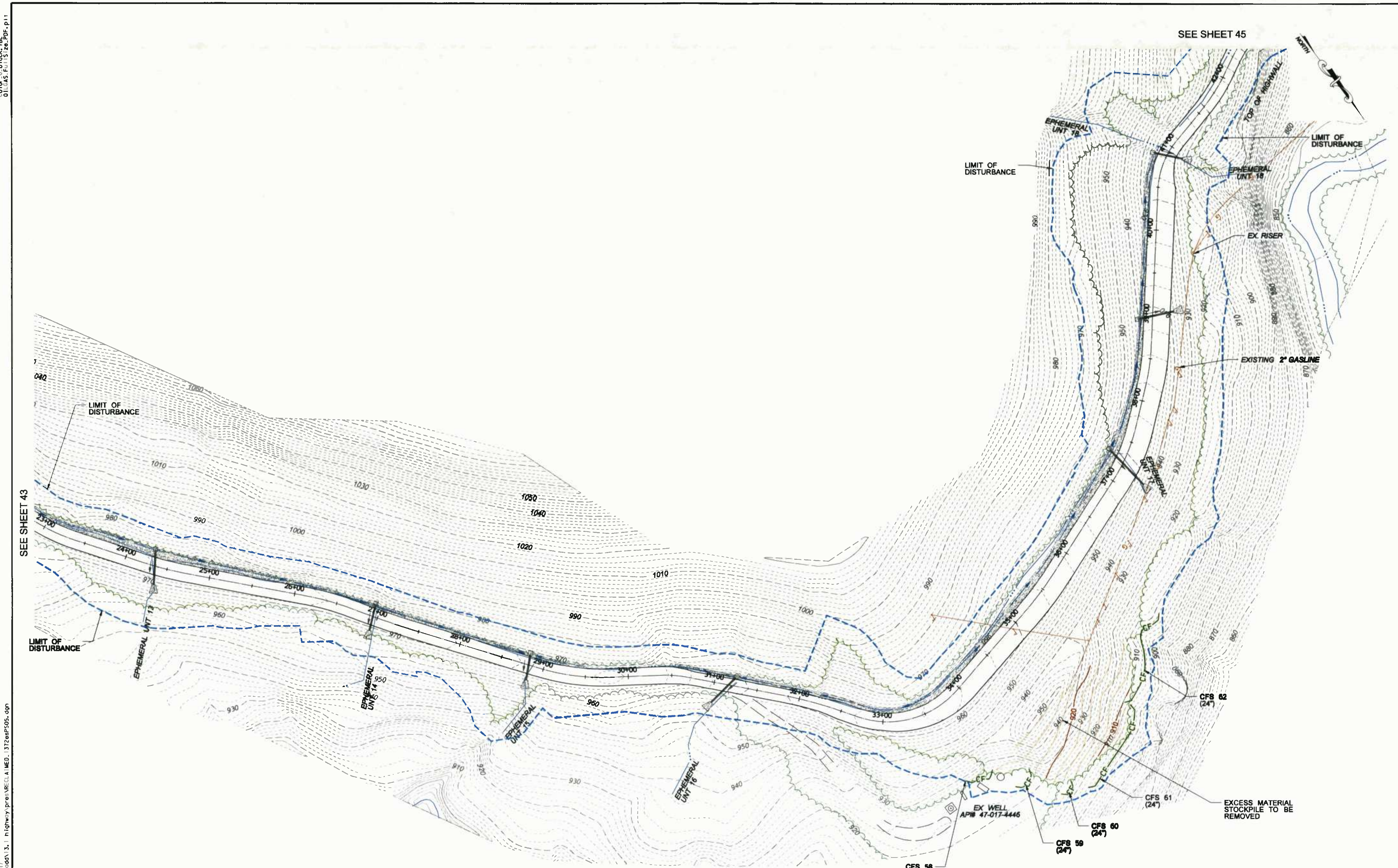
PHONE: 304-367-8401



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0' 50' 100' 150'
HORIZONTAL SCALE

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HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

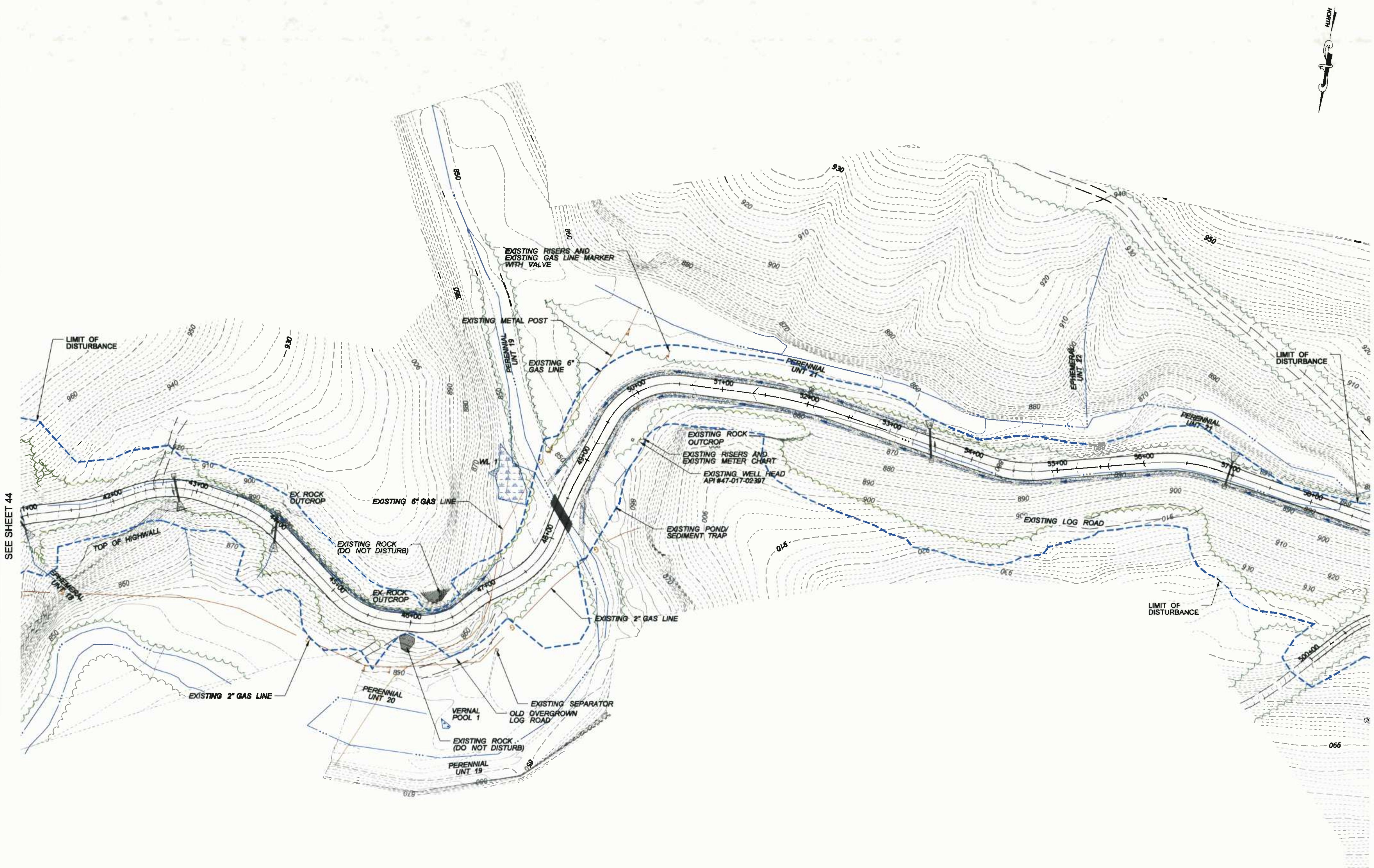
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: SLS-8051
SHEET 44 OF 57
REV:



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STATE OF WEST VIRGINIA
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ACCESS ROAD RECLAMATION PLAN
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 45 OF 57
REV:

SITE RECLAMATION NARRATIVE

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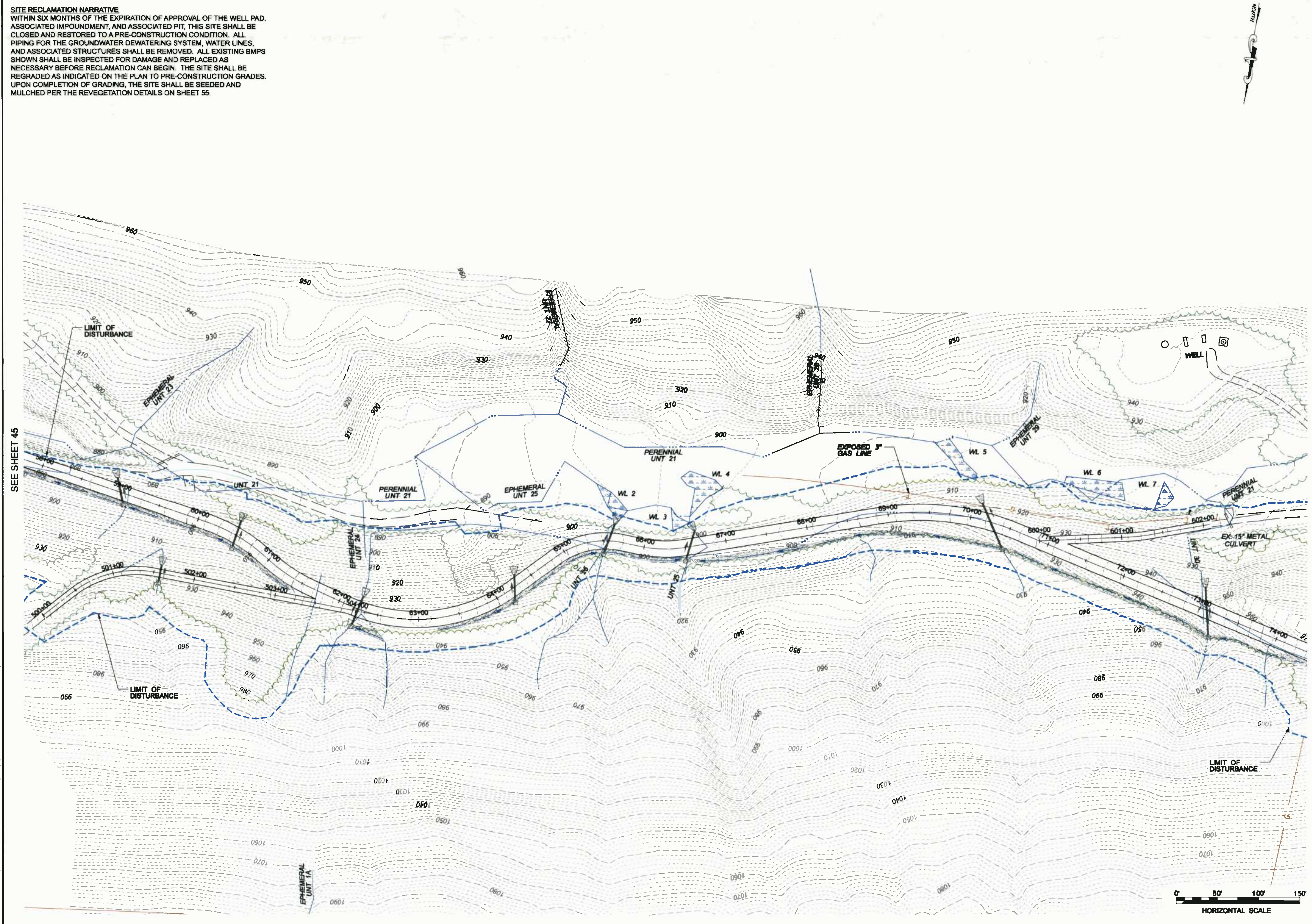

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ACCESS ROAD RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT

DODDRIDGE COUNTY, WV

DATE: 9/16/2013

SCALE: AS SHOWN

DESIGNED BY: RJH/JMR

FILE NO.: SLS-8051

SHEET 46 OF 57

REV:

SITE RECLAMATION NARRATIVE

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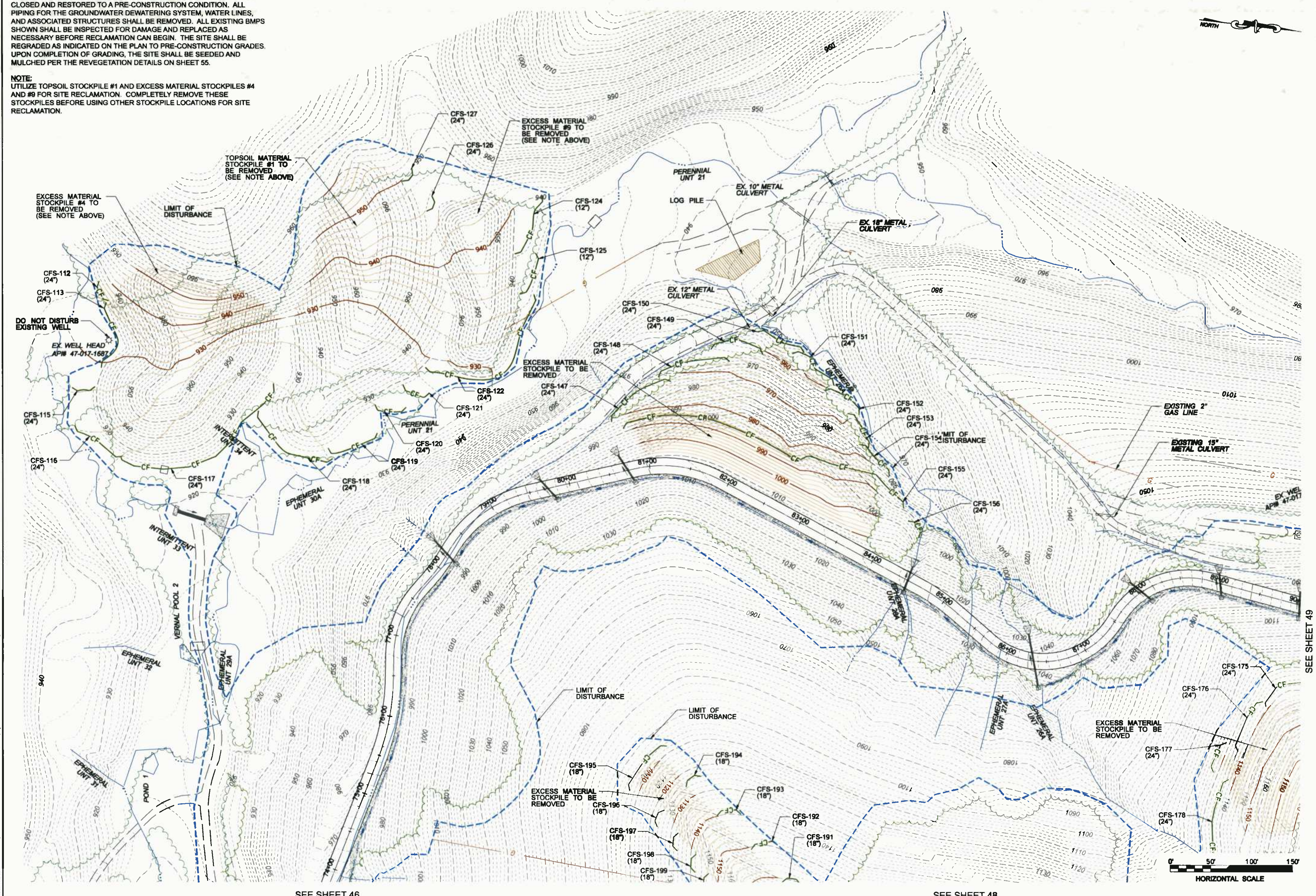
NOTE:

UTILIZE TOPSOIL STOCKPILE #1 AND EXCESS MATERIAL STOCKPILES #4 AND #9 FOR SITE RECLAMATION. COMPLETELY REMOVE THESE STOCKPILES BEFORE USING OTHER STOCKPILE LOCATIONS FOR SITE RECLAMATION.



NORTH
EXCESS MATERIAL STOCKPILE #9 TO BE REMOVED (SEE NOTE ABOVE)
TOPSOIL MATERIAL STOCKPILE #1 TO BE REMOVED (SEE NOTE ABOVE)
EXCESS MATERIAL STOCKPILE #4 TO BE REMOVED (SEE NOTE ABOVE)
LIMIT OF DISTURBANCE
DO NOT DISTURB EXISTING WELL
EX. WELL HEAD API# 47-017-1687
CFS-112 (24")
CFS-113 (24")
CFS-115 (24")
CFS-116 (24")
CFS-117 (24")
CFS-118 (24")
CFS-119 (24")
CFS-120 (24")
CFS-121 (24")
CFS-122 (24")
CFS-124 (12")
CFS-125 (12")
CFS-126 (24")
CFS-127 (24")
PERENNIAL UNT 21
EX. 10" METAL CULVERT
LOG PILE
EX. 18" METAL CULVERT
EX. 12" METAL CULVERT
CFS-147 (24")
CFS-148 (24")
CFS-149 (24")
CFS-150 (24")
CFS-151 (24")
CFS-152 (24")
CFS-153 (24")
CFS-154 (24")
CFS-155 (24")
CFS-156 (24")
EXCESS MATERIAL STOCKPILE TO BE REMOVED
LIMIT OF DISTURBANCE
EXISTING 2" GAS LINE
EXISTING 15" METAL CULVERT
INTERMITTENT UNT 34
INTERMITTENT UNT 33
EPHEMERAL UNT 30A
EPHEMERAL UNT 32
EPHEMERAL UNT 29A
EPHEMERAL UNT 31
EPHEMERAL UNT 28A
EPHEMERAL UNT 27A
EPHEMERAL UNT 26A
VERNAL POOL 2
POND 1
CFS-175 (24")
CFS-176 (24")
CFS-177 (24")
CFS-178 (24")
CFS-191 (18")
CFS-192 (18")
CFS-193 (18")
CFS-194 (18")
CFS-195 (18")
CFS-196 (18")
CFS-197 (18")
CFS-198 (18")
CFS-199 (18")
0' 50' 100' 150'
HORIZONTAL SCALE

SEE SHEET 46

SEE SHEET 48

SEE SHEET 49

Stantec
111 ELKINS STREET
FAIRMONT, WV 26554
PHONE: 304-367-9401

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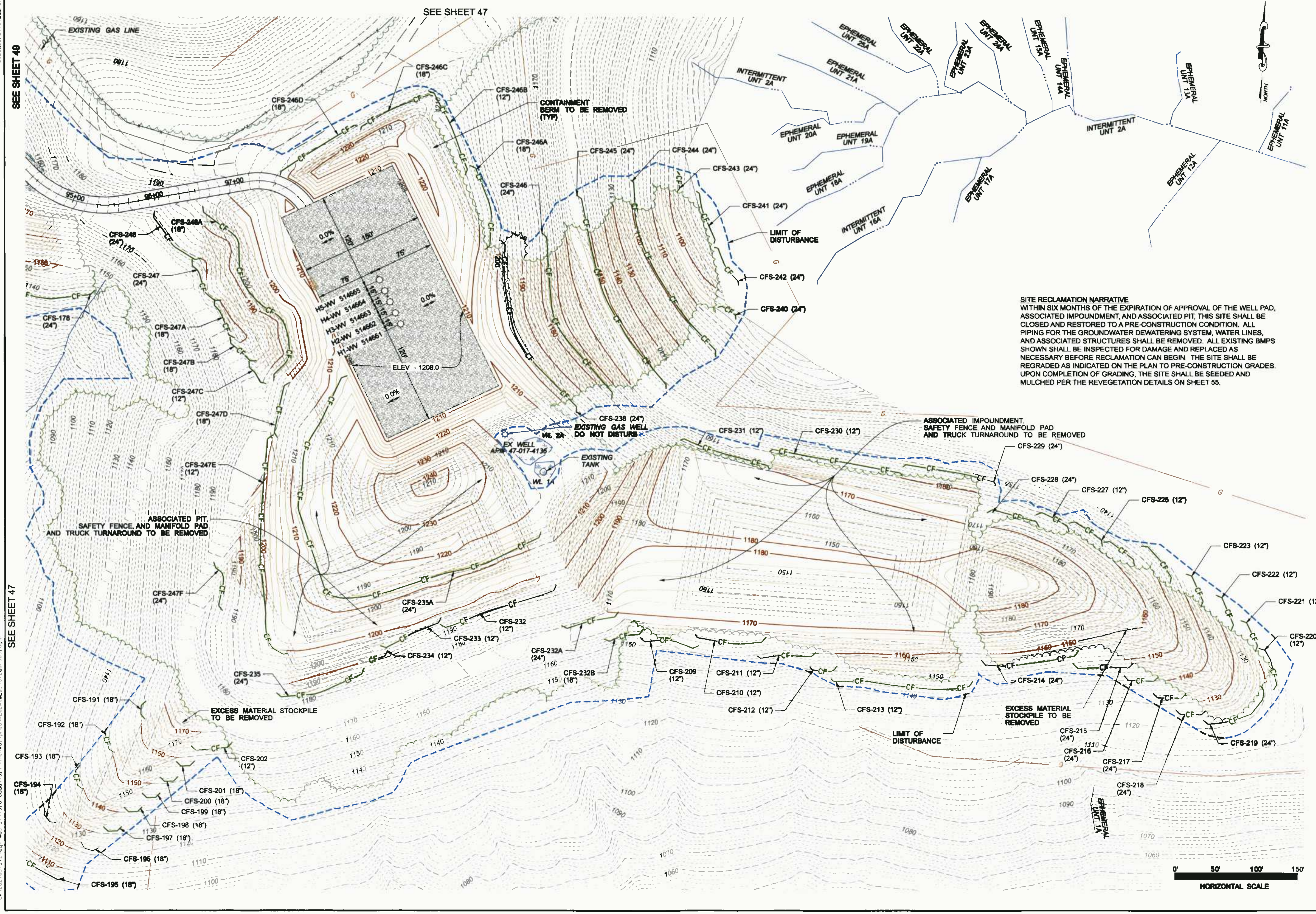
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES · REGISTERED · 17220 · STATE OF WEST VIRGINIA · PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD RECLAMATION PLAN
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 47 OF 57
REV:



SEE SHEET 47
SEE SHEET 49
SEE SHEET 47
EXISTING GAS LINE
CONTAINMENT BERM TO BE REMOVED (TYP)
CFS-246C (18")
CFS-246B (12")
CFS-246D (18")
CFS-246A (18")
CFS-246 (24")
CFS-245 (24")
CFS-244 (24")
CFS-243 (24")
CFS-241 (24")
CFS-242 (24")
CFS-240 (24")
LIMIT OF DISTURBANCE
CFS-248A (18")
CFS-248 (24")
CFS-247 (24")
CFS-178 (24")
CFS-247A (18")
CFS-247B (18")
CFS-247C (12")
CFS-247D (18")
CFS-247E (12")
CFS-247F (24")
H5-WV 514665
H4-WV 514664
H3-WV 514663
H2-WV 514662
H1-WV 514661
ELEV - 1208.0
0.0%
CFS-238 (24")
EXISTING GAS WELL DO NOT DISTURB
EX. WELL API# 47-017-4135
WL 2A
WL 1A
EXISTING TANK
ASSOCIATED PIT, SAFETY FENCE, AND MANIFOLD PAD AND TRUCK TURNAROUND TO BE REMOVED
ASSOCIATED IMPOUNDMENT, SAFETY FENCE AND MANIFOLD PAD AND TRUCK TURNAROUND TO BE REMOVED
CFS-231 (12")
CFS-230 (12")
CFS-229 (24")
CFS-228 (24")
CFS-227 (12")
CFS-226 (12")
CFS-223 (12")
CFS-222 (12")
CFS-221 (12")
CFS-220 (12")
CFS-219 (24")
CFS-235A (24")
CFS-232 (12")
CFS-233 (12")
CFS-234 (12")
CFS-235 (24")
CFS-232A (24")
CFS-232B (18")
CFS-209 (12")
CFS-211 (12")
CFS-210 (12")
CFS-212 (12")
CFS-213 (12")
CFS-214 (24")
EXCESS MATERIAL STOCKPILE TO BE REMOVED
CFS-215 (24")
CFS-216 (24")
CFS-217 (24")
CFS-218 (24")
LIMIT OF DISTURBANCE
EXCESS MATERIAL STOCKPILE TO BE REMOVED
CFS-191 (18")
CFS-192 (18")
CFS-193 (18")
CFS-194 (18")
CFS-195 (18")
CFS-196 (18")
CFS-197 (18")
CFS-198 (18")
CFS-199 (18")
CFS-200 (18")
CFS-201 (18")
CFS-202 (12")
INTERMITTENT UNT 2A
EPHEMERAL UNT 25A
EPHEMERAL UNT 22A
EPHEMERAL UNT 24A
EPHEMERAL UNT 23A
EPHEMERAL UNT 13A
EPHEMERAL UNT 14A
EPHEMERAL UNT 21A
EPHEMERAL UNT 20A
EPHEMERAL UNT 19A
EPHEMERAL UNT 18A
INTERMITTENT UNT 16A
EPHEMERAL UNT 17A
INTERMITTENT UNT 2A
EPHEMERAL UNT 13A
EPHEMERAL UNT 12A
EPHEMERAL UNT 11A
EPHEMERAL UNT 1A
NORTH
0' 50' 100' 150'
HORIZONTAL SCALE

SITE RECLAMATION NARRATIVE

WITHIN SIX MONTHS OF THE EXPIRATION OF APPROVAL OF THE WELL PAD, ASSOCIATED IMPOUNDMENT, AND ASSOCIATED PIT, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EXISTING BMPS SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON THE PLAN TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 55.

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HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES
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17220
STATE OF
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PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

ACCESS ROAD AND WELL SITE RECLAMATION PLAN

EQT WEU 51

WEST UNION DISTRICT

DODDRIDGE COUNTY, WV

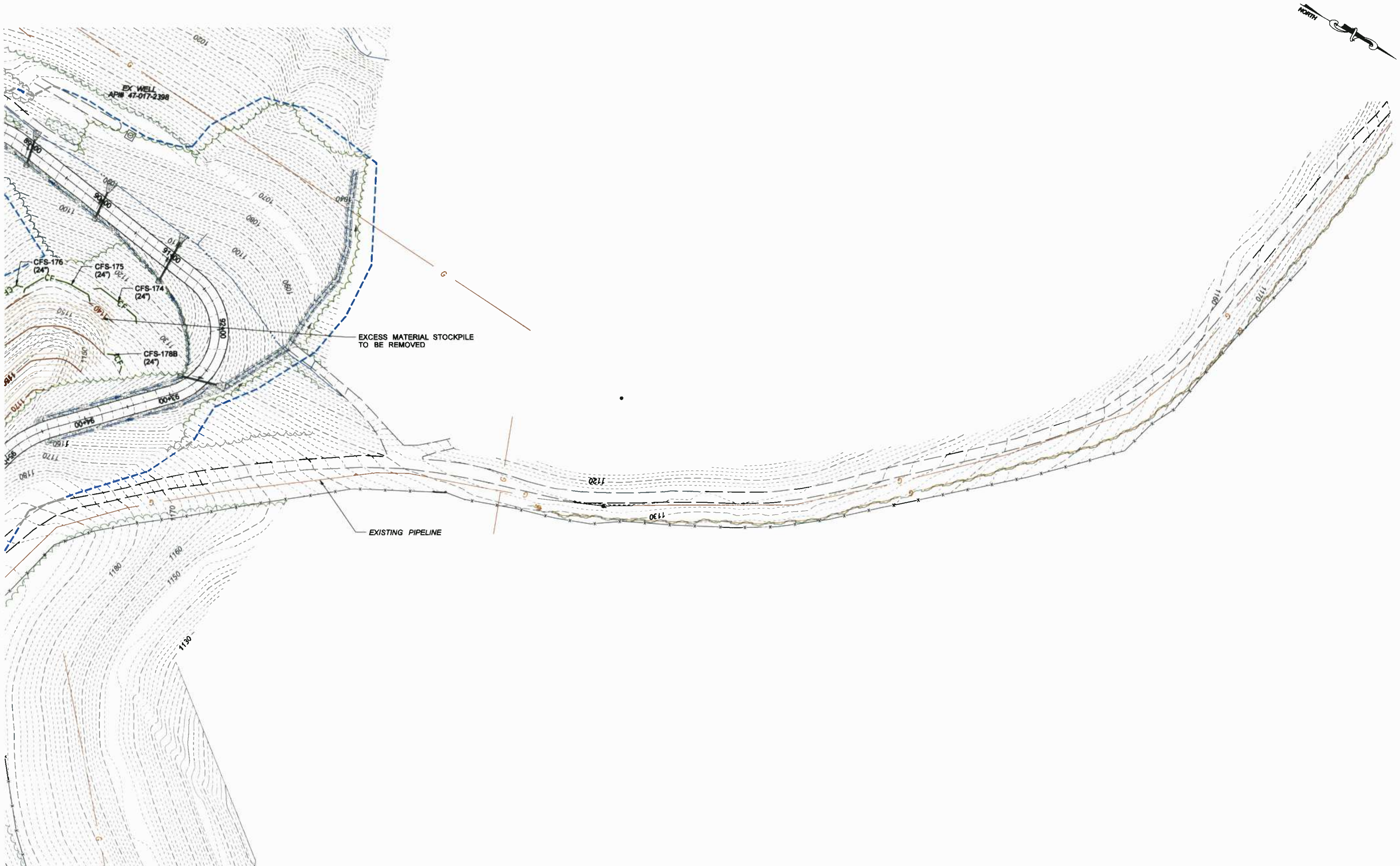
DATE: 9/16/2013

SCALE: AS SHOWN

DESIGNED BY:RJH/JMR

FILE NO.:SLS-8051

REV:



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0' 50' 100' 150'

HORIZONTAL SCALE

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A DIVISION OF SMITH LAND SURVEYING

RICHARD L. GAINES
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17220
STATE OF
WEST VIRGINIA
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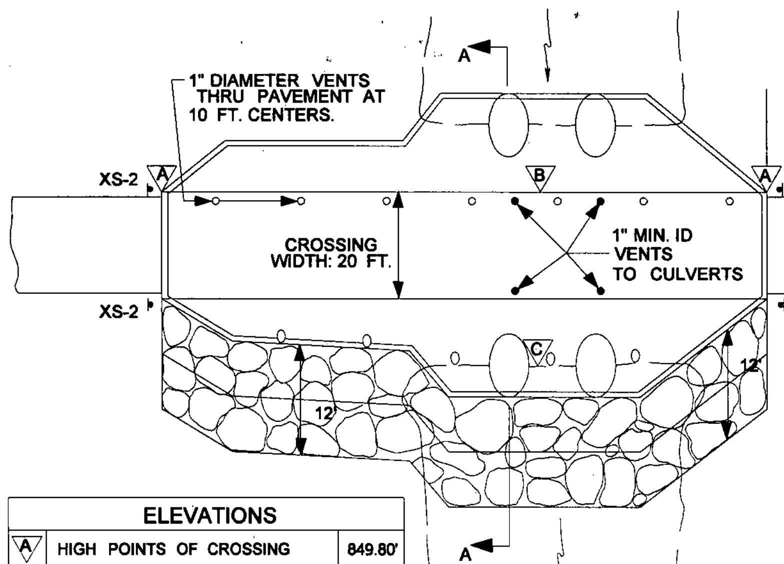
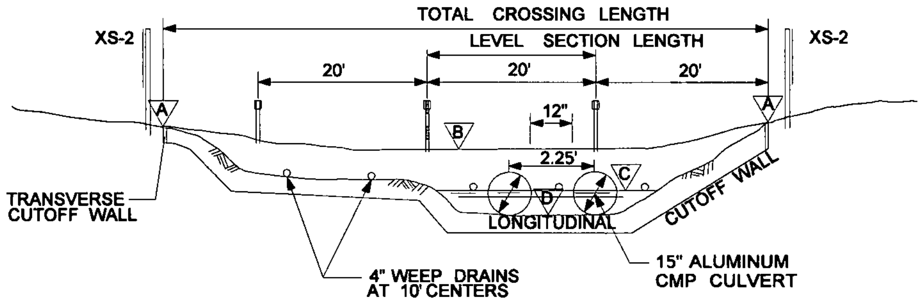
ACCESS ROAD AND WELL SITE
RECLAMATION PLAN
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO: SL8-8051
SHEET 49 OF 57
REV:



ELEVATIONS		
A	HIGH POINTS OF CROSSING	849.80'
B	LEVEL SECTION	849.30'
C	NORMAL DAILY STREAM FLOW	846.50'
D	STREAMBED (DOWNSTREAM)	846.00'

PLAN VIEW



ELEVATION VIEW

WEEP DRAINS

WEEP DRAINS ARE TO BE PLACED ON DOWNSTREAM SIDE ONLY. ANY TYPE OF PIPE WHICH WILL PROVIDE ADEQUATE FORMING OF WEEP HOLES THRU THE WALL MAY BE USED. COST OF PIPE IS TO BE INCLUDED IN VARIOUS BID ITEMS.

CULVERT PIPES

ALTHOUGH THESE DETAILS INDICATE USE OF 2 CULVERTS AS TYPICAL SITUATION, THE CROSSING FOR THIS LOCATION REQUIRES 4 PIPE CULVERTS; AND SUFFICIENT QUANTITIES ARE INCLUDED IN THE CONTRACT DOCUMENTS.

INCIDENTAL ITEMS

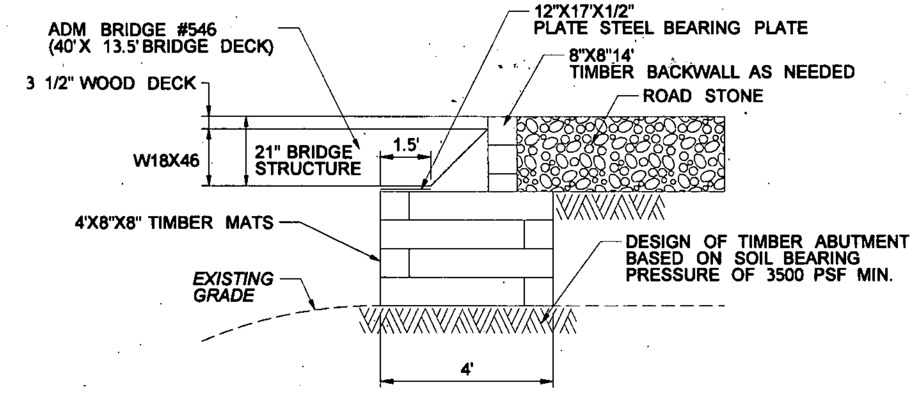
NO SEPARATE PAYMENT FOR JOINT SEALER, #5 BARS, OR VENT PIPES.

HAZARD MARKERS & DELINEATORS

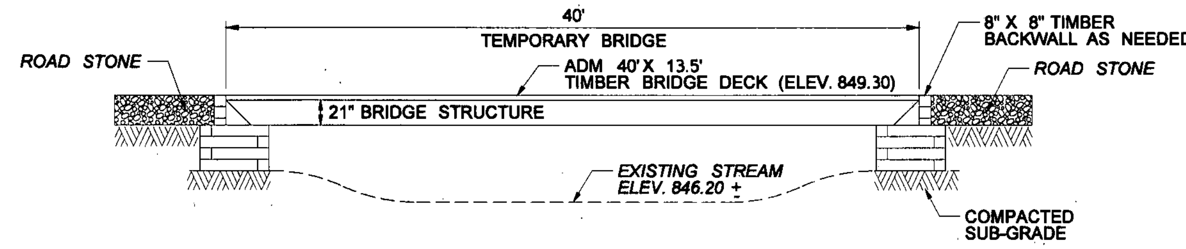
XS-2 HAZARD MARKERS AS PER STANDARD SHEET TP5-2 ARE TO BE INSTALLED AT EACH CORNER OF STRUCTURE. U-CHANNEL (2.00 #/FT.) AS PER STANDARD SHEET TEI-7A SHALL BE USED FOR HAZARD MARKER SUPPORTS AND FOR MOUNTING BIDIRECTIONAL 3 1/4" DELINEATORS AT MAXIMUM 20' SPACING EACH SIDE OF STRUCTURE. COST OF ALL MATERIALS AND LABOR FOR INSTALLATION OF HAZARD MARKERS AND DELINEATORS IS TO BE INCLUDED IN THE VARIOUS BID ITEMS AND NO SEPARATE PAYMENT WILL BE MADE. AT LEAST ONE POST TO BE STRIPED WITH BLACK PAINT AS SHOWN IN DETAIL.

VENT PIPES

VENTS MAY BE COMMERCIALLY-AVAILABLE ABS, PVC, OR PE.

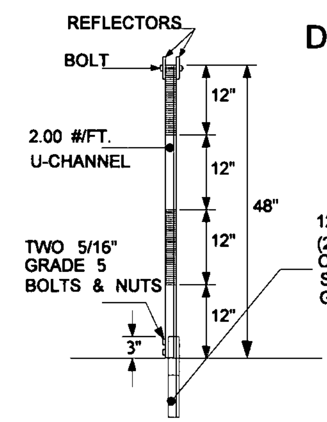


ABUTMENT DETAILS



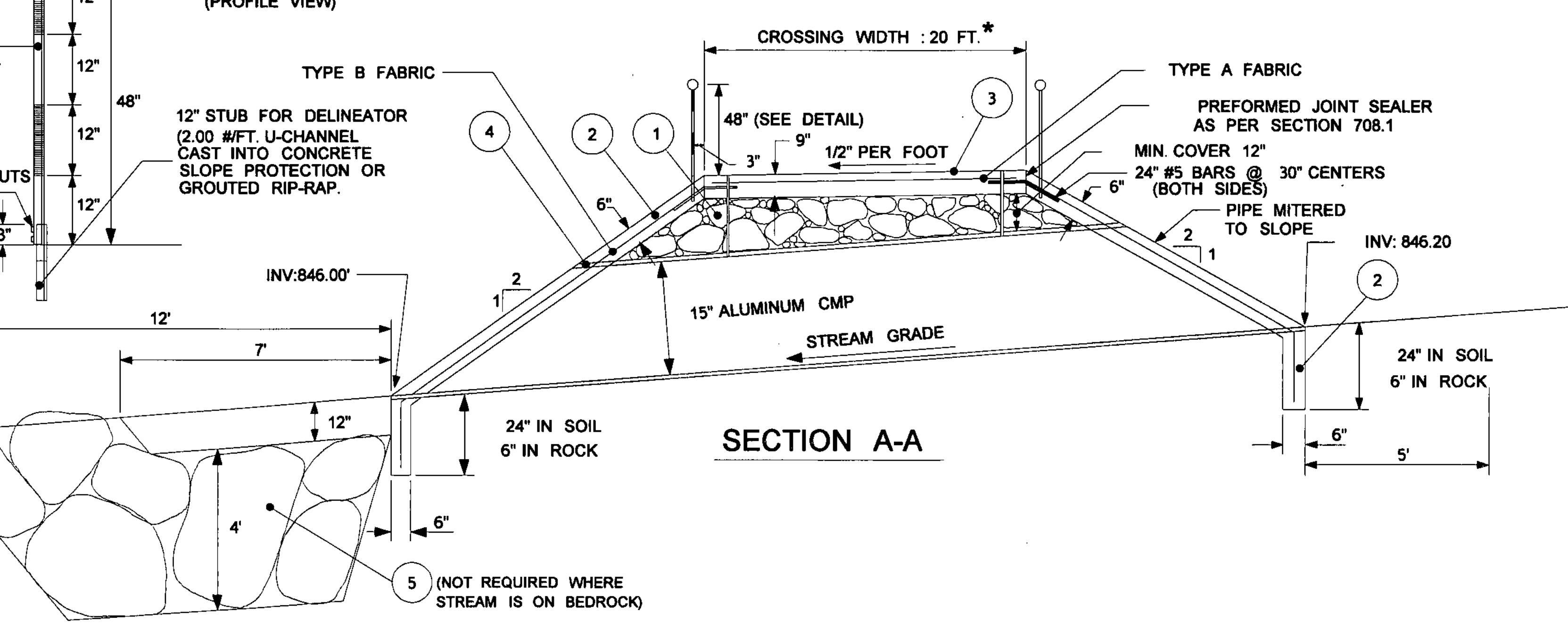
TEMPORARY BRIDGE DETAIL

NTS



DELINEATOR DETAIL

(PROFILE VIEW)



SECTION A-A

1. ROCK BORROW EXCAVATION (ROCK SIZE MAXIMUM: 6" WITHIN 12" OF PIPE)
2. CONCRETE SLOPE PROTECTION (ITEM 218002-000, GROUTED RIP RAP MAY BE SUBSTITUTED AS PER ALTERNATE SLOPE DETAIL)
3. 9 INCH REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT
4. FOUR 15" ALUMINUM CULVERTS
5. ROCK BORROW EXCAVATION (ROCK SIZE MINIMUM 18", MAXIMUM 48")

BLUESTONE CREEK LOW WATER CROSSING DETAIL

Stantec

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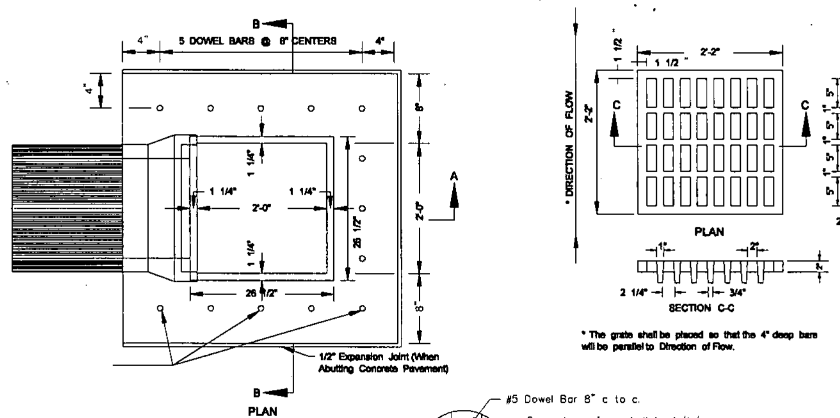
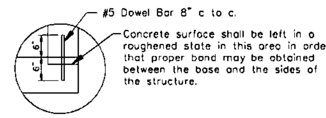
SLS

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

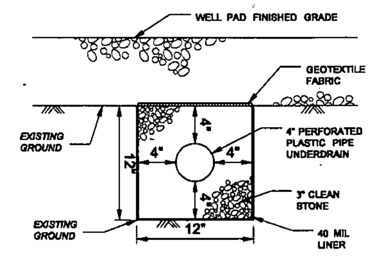
CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-6051
SHEET 50 OF 57
REV:





ALTERNATE CONSTRUCTION JOINT DETAIL



PAD UNDERDRAIN DETAIL

NTS

NOTES

All concrete shall be Class B Concrete.

The type and size of pipe to be used with the inlet shall be the type and size as called for on the Plans.

Details show pipe entering one side of the inlet, however, pipes may enter any or all sides as called for on the Plans.

Footer up to construction joint shall be Class B Concrete.

Sidewalls shall be concrete above footer.

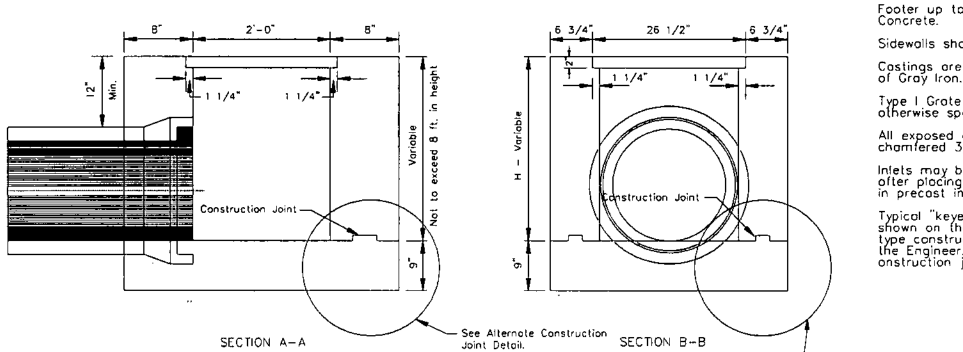
Castings are to be of the design shown and are to be of Gray Iron.

Type I Grate shall be used at all locations, unless otherwise specified on the Plans.

All exposed edges of construction joints shall be chamfered 3/4".

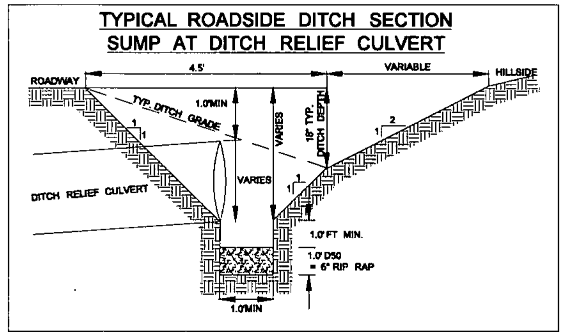
Inlets may be precast, with lifting hooks out of sight after placing Sufficient reinforcement shall be included in precast inlets to resist handling stresses.

Typical "keyed" and "doweled" construction joints are shown on the details herein. Other "keyed" or "doweled" type construction joints may be used if acceptable to the Engineer. When precast construction is used, this c onstruction joint will be omitted.



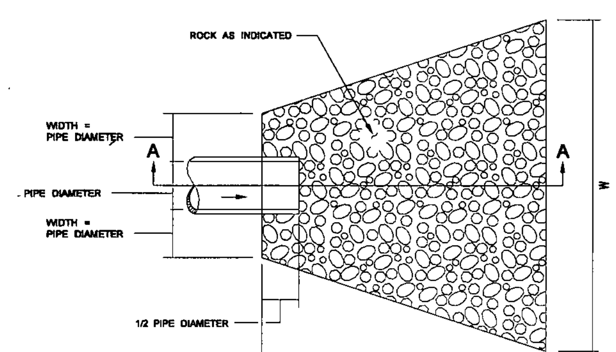
SUMP INLET

NTS

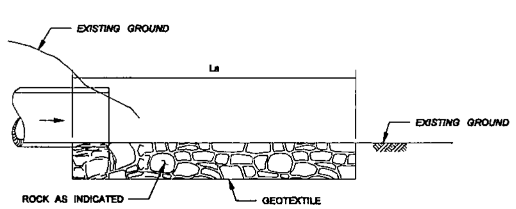


CORRUGATED METAL PIPE DESIGN TABLE

PIPE LOCATION (STA)	PIPE DIAMETER (IN)	PIPE LENGTH (FT)	OUTLET PROTECTION MIN D50 (IN)	OUTLET PROTECTION ROCK DEPTH (IN)	OUTLET PROTECTION LENGTH (FT)	OUTLET PROTECTION WIDTH (FT)
1+40	15	37	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
2+20	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
3+20	15	29	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
5+00	15	29	6	14	8	11.8
8+00	15	37	6	14	8	11.8
9+92	15	30	6	14	8	11.8
11+00	15	29	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
12+18	15	28	6	14	8	11.8
13+15	15	39	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
14+50	15	28	6	14	8	11.8
16+10	15	34	6	14	8	11.8
17+82	18	34	6	14	10	14.5
20+21	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
22+47	15	41	6	14	8	11.8
24+35	15	39	6	14	8	11.8
26+95	18	30	6	14	9	13.5
28+82	15	30	6	14	8	11.8
31+16	15	40	6	14	8	11.8
37+24	15	55	6	14	8	11.8
39+00	15	40	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
40+88	15	32	6	14	8	11.8
42+75	15	29	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
44+02	15	33	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
53+50	15	35	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
57+00	21	29	6	14	12	17.3
501+58	18	20	6	14	9	13.5
59+00	21	29	6	14	12	17.3
60+50	15	33	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
62+25	15	37	6	14	8	11.8
64+25	15	32	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
65+55	15	37	6	14	8	11.8
66+55	27	37	6	14	13	19.8
70+25	15	59	6	14	8	11.8
73+08	18	59	6	14	8	11.8
78+20	15	37	6	14	8	11.8
79+73	15	32	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
80+73	15	37	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
84+50	18	31	6	14	9	13.5
86+34	24	65	6	14	12	14
88+00	15	34	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
89+00	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
90+00	15	31	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
91+00	15	48	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
92+64	15	39	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
1+50 (IMPOUND. RD)	15	28	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
11+60 (IMPOUND. RD)	15	30	SEE DITCH RELIEF CULVERT OUTLET DETAIL			
STOCKPILES	DUAL 24	35	12	27	26	38



PLAN

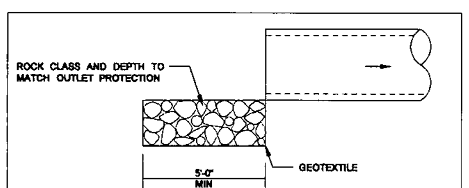


SECTION A-A

NOTES:
1. PROVIDE GEOTEXTILE MATERIAL ALONG ALL INTERFACE AREAS WITH GROUND CONTACT.
2. SLOPE SHOULD BE LEVEL OR AS CLOSE TO LEVEL AS POSSIBLE BASED ON EXISTING SITE CONDITIONS.

OUTLET PROTECTION

NOT TO SCALE



PIPE INLET PROTECTION

NOT TO SCALE

DITCH RELIEF CULVERT

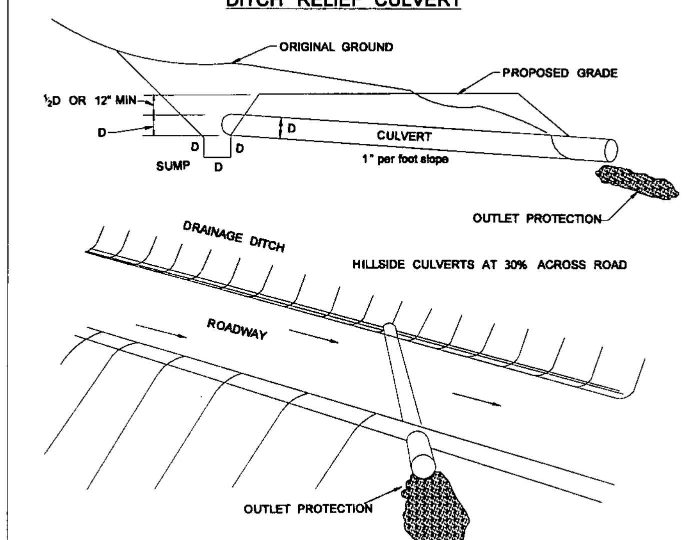


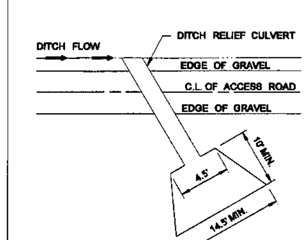
Table II-5 Pipe Sizes for Culverts Across Roads

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

Table II-6 Spacing of Culverts

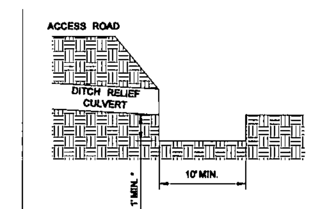
Road Grade (%)	Distance (Ft)
2-5	500-300
6-10	300-200
11-15	200-100
16-20	100

TYPICAL DITCH RELIEF CULVERT OUTLET TREATMENT



PLAN VIEW

NTS



* RECOMMENDED MEDIAN STONE SIZE=6"

SECTION VIEW

NTS

NOTE: ALL DITCH LINE PROTECTION SHALL BE INSTALLED AS RECOMMENDED IN THE WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL, DITCH LINE PROJECTION SHALL BE ROCK LINED.

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

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RICHARD L. GAINES
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17220
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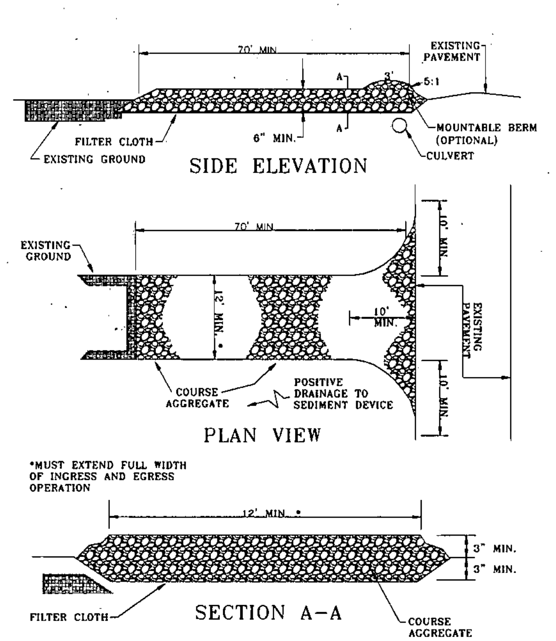
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

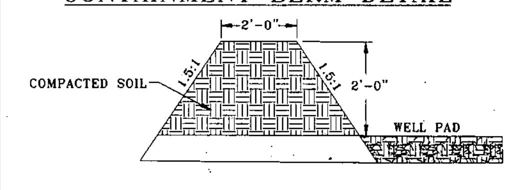
CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 51 OF 57
REV:

STONE CONSTRUCTION ENTRANCE

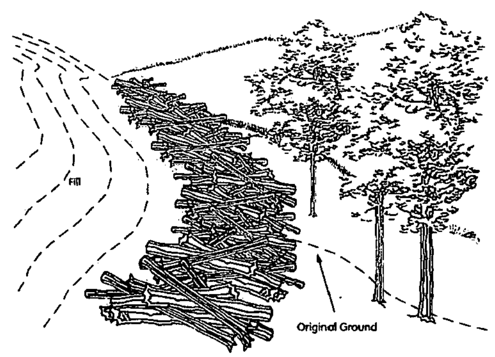


WELL PAD CONTAINMENT BERM DETAIL

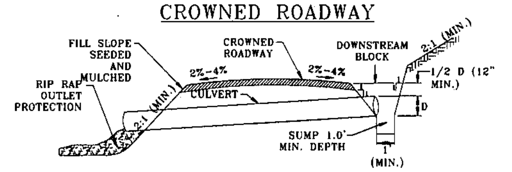


SECTION VIEW

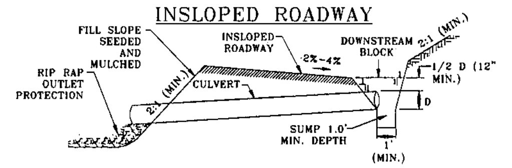
BRUSH PILE SEDIMENT BARRIER



CROWNED ROADWAY



INSLOPED ROADWAY



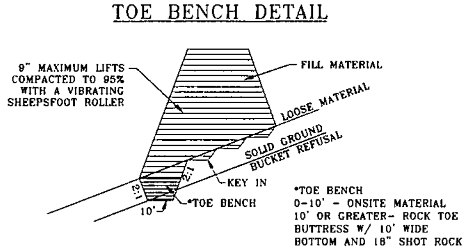
CUT AND FILL SLOPES SHALL BE STABILIZED IMMEDIATELY UPON COMPLETION OF ROADWAY GRADING. THESE AREA SHALL BE BLANKETED WHEREVER THEY ARE LOCATED WITHIN 50 FEET OF A SURFACE WATER OR WITHIN 100 FEET OF SURFACE WATER WHERE A SUITABLE VEGETATIVE FILTER STRIP DOES NOT EXIST.

A DURABLE TOP DRESSING SHALL BE PROVIDED FOR SOILS HAVING LOW STRENGTH.

ROADSIDE DITCHES SHALL BE PROVIDED WITH ADEQUATE PROTECTIVE LINING.

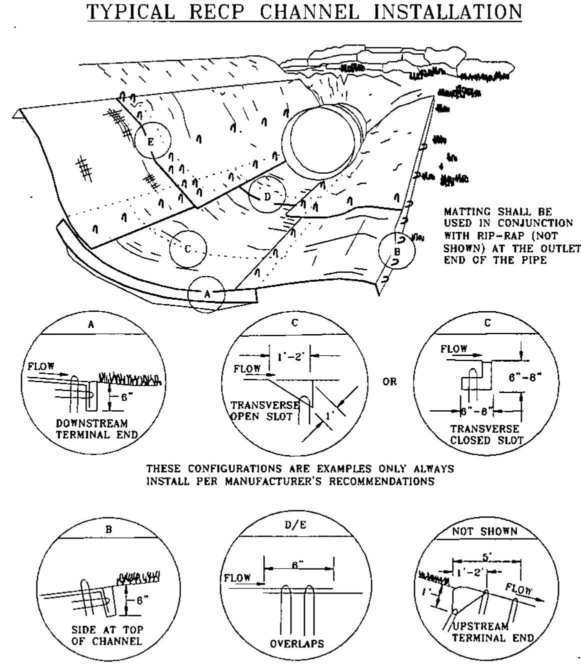
ROADWAY SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED ROADWAYS, DITCHES OR CROSS DRAINS SHALL BE REPAIRED IMMEDIATELY.

TOE BENCH DETAIL



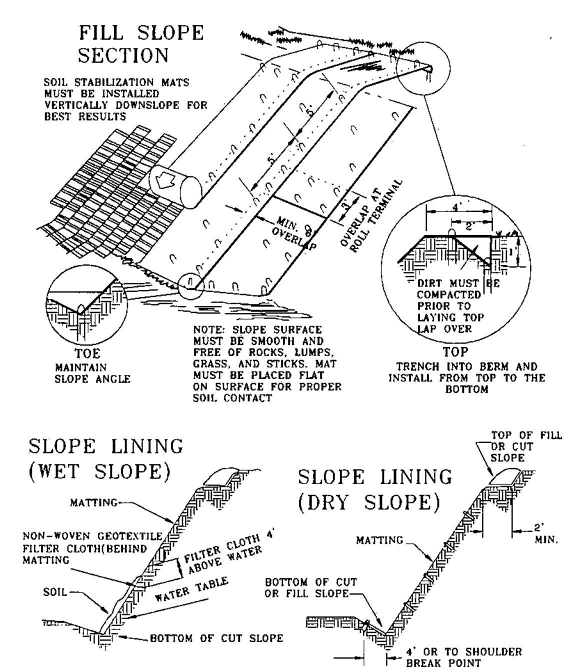
*TOE BENCH
0-10' - ONSITE MATERIAL
10' OR GREATER- ROCK TOE BUTTRESS W/ 10' WIDE BOTTOM AND 18" SHOT ROCK

TYPICAL RECP CHANNEL INSTALLATION

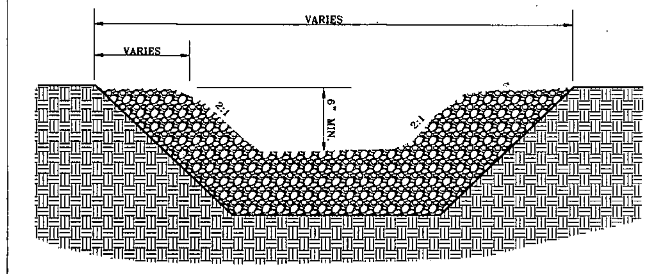


THESE CONFIGURATIONS ARE EXAMPLES ONLY ALWAYS INSTALL PER MANUFACTURER'S RECOMMENDATIONS

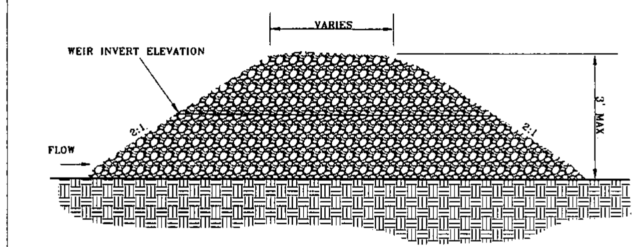
ROLLED EROSION CONTROL PRODUCTS



ROCK CHECK DAM

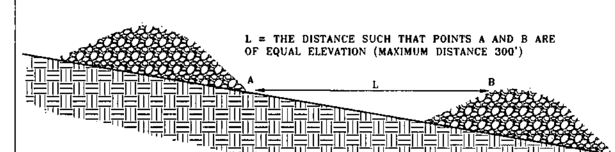


ELEVATION

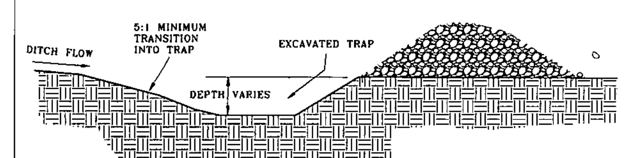


CROSS SECTION

ROCK CHECK DAM



CHECK DAM SPACING



CHECK DAM WITH SUMP

Stantec
111 ELKINS STREET
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RICHARD L. CAINES
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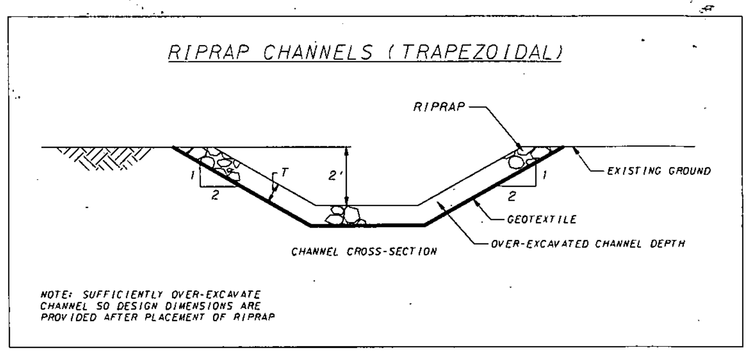
17220
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

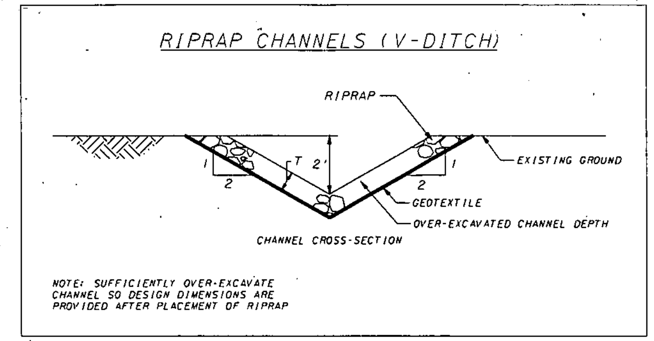
THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

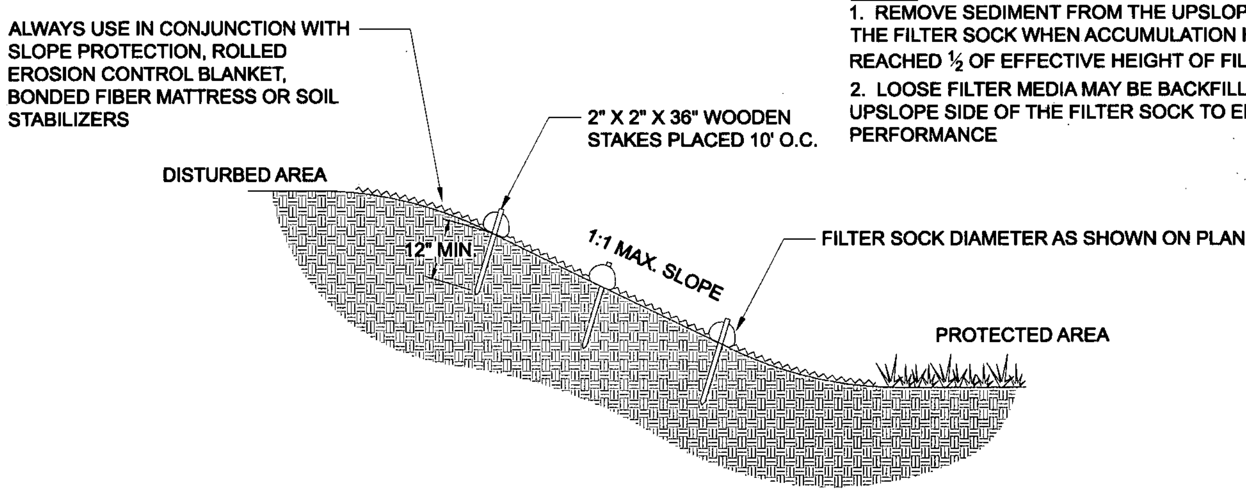
DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051
SHEET 52 OF 57
REV:

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
DOT_2006
Color_0_black.tbl
OILGAS_FullSize_PDF.plt

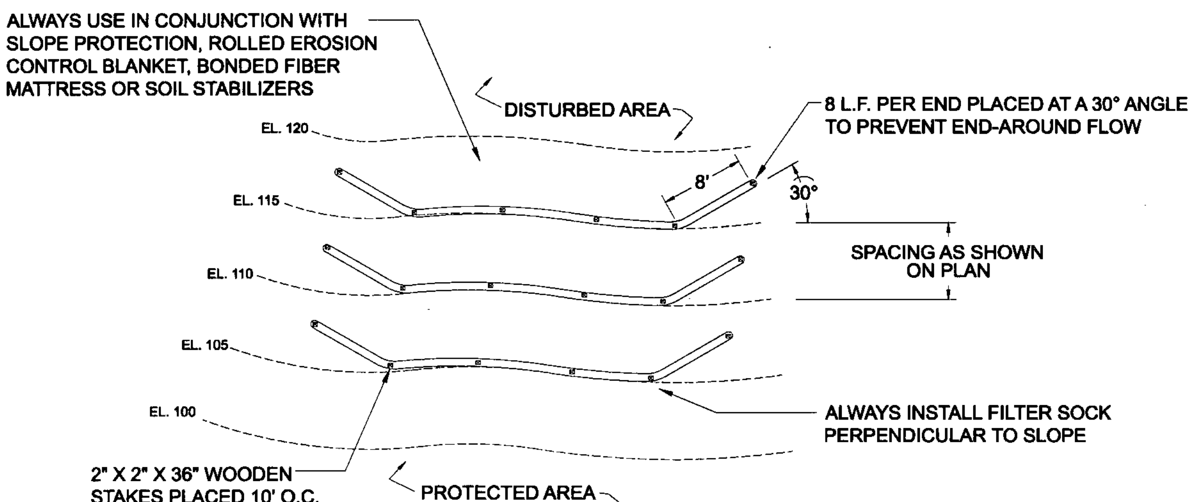




NOTES:
1. REMOVE SEDIMENT FROM THE UPSLOPE SIDE OF THE FILTER SOCK WHEN ACCUMULATION HAS REACHED ½ OF EFFECTIVE HEIGHT OF FILTER SOCK
2. LOOSE FILTER MEDIA MAY BE BACKFILLED ON THE UPSLOPE SIDE OF THE FILTER SOCK TO ENHANCE PERFORMANCE



SECTION



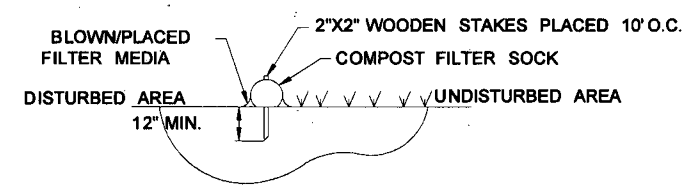
ADAPTED FROM FILTREXX

PLAN

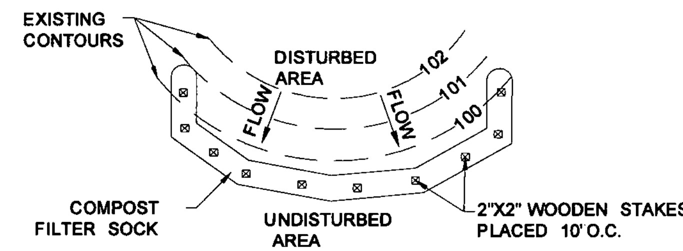
COMPOST FILTER SOCK SLOPE INTERRUPTION

NTS
(ADAPTED FROM FILTREXX)

STANDARD CONSTRUCTION DETAIL #4-1
COMPOST FILTER SOCK



SECTION VIEW
NTS



PLAN VIEW
NTS
ADAPTED FROM FILTREXX

SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1. COMPOST SHALL MEET THE FOLLOWING STANDARDS:

ORGANIC MATTER CONTENT	80% -100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5-8.0
MOISTURE CONTENT	35%-55%
PARTICLE SIZE	98% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 DS MAXIMUM

COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP THE SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT (SEE FIGURE 4.1). MAXIMUM SLOPE ABOVE ANY SOCK SHALL NOT EXCEED THAT SHOWN ON FIGURE 4.2.
TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
BIODEGRADABLE FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.
IN THE EVENT THE GROUND IS FROZEN, #5 REBAR WITH SAFETY CAPS SHALL BE USED INSTEAD OF WOODEN STAKES TO ANCHOR THE FILTER SOCK. ONCE THE GROUND THAWS THE REBAR ANCHORS SHALL BE REMOVED AND REPLACED WITH 2" X 2" WOODEN STAKES AND INSTALLED AS SHOWN IN THE DETAIL ABOVE.

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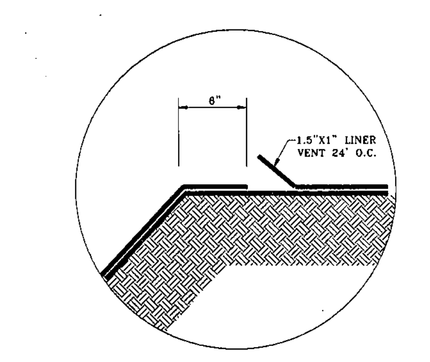
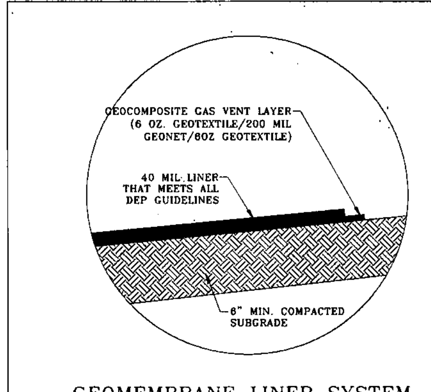
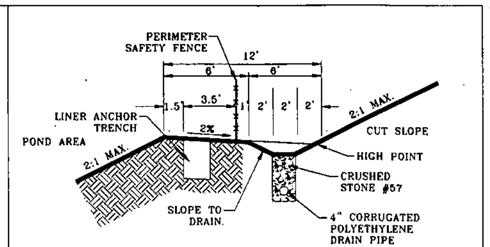
FILE NO.: SLS-8051
SHEET 53 OF 57
REV:



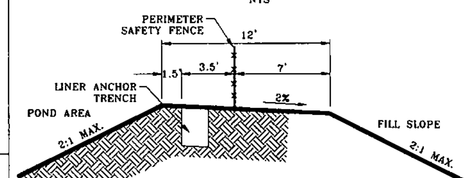
TYPICAL LINER VENT DETAIL
NTS



GEOMEMBRANE LINER SYSTEM
NTS

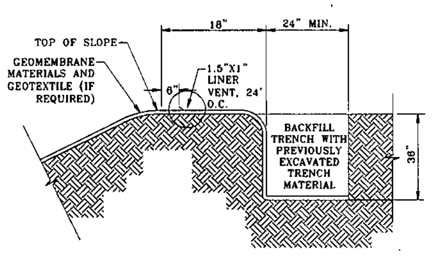


CUT SECTION DETAIL
NTS



FILL SECTION DETAIL
NTS

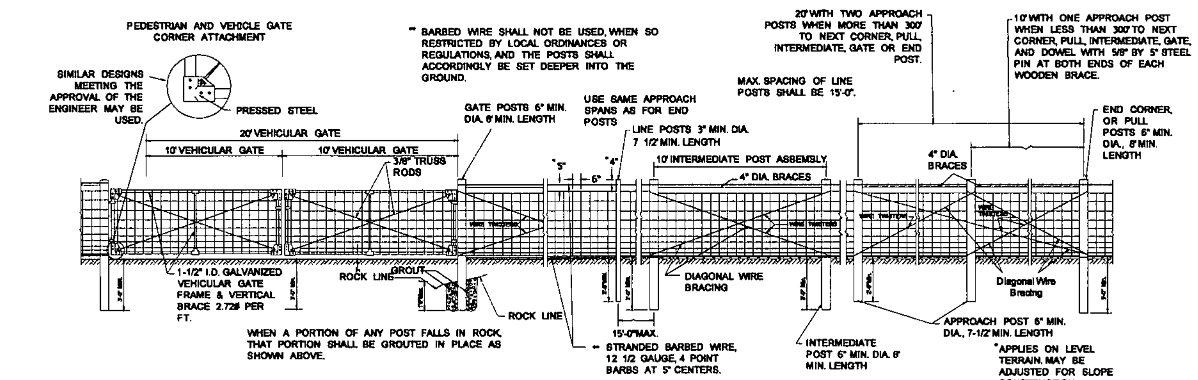
IMPOUNDMENT BENCH DETAIL
NTS



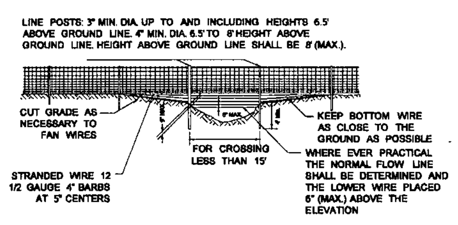
NOTE: USE SAND BAGS AS GEOMEMBRANE WEIGHTS IN TRENCH DURING GEOMEMBRANE INSTALLATION

TOP OF BERM ANCHOR TRENCH DETAIL
NTS

PERIMETER SAFETY FENCE



LINE POSTS: 3" MIN. DIA. UP TO AND INCLUDING HEIGHTS 6.5' ABOVE GROUND LINE. 4" MIN. DIA. 6.5' TO 8' HEIGHT ABOVE GROUND LINE. HEIGHT ABOVE GROUND LINE SHALL BE 8' (MAX.).



DETAIL SHOWING TYPICAL SECTION AT MINOR DEPRESSIONS AND WET WEATHER CROSSINGS

NOTES:

POSTS AND BRACES MAY BE EITHER ROUND OR SQUARE SHAPED. DIMENSIONS SHOWN ON THE PLANS ARE FOR ROUND POSTS AND BRACES ONLY. WHEN SQUARE POSTS ARE USED, LINE POSTS SHALL BE 3" SQUARE (MIN.); BRACES 4" SQUARE (MIN.); CORNER, END, PULL, GATE APPROACH, AND INTERMEDIATE POSTS 6" SQUARE (MIN.).
THE POSITIONING OF THE FENCE FABRIC AND BARBED WIRE ON THE POSTS, AS SHOWN ON THE "TYPICAL FENCE SECTION"DETAIL, APPLIES FOR LEVEL AND GENTLE SLOPING TERRAIN. FOR FENCE ERECTED ON SLOPES, THE POSITIONING MAY BE ADJUSTED TO MEET THE SLOPE CONDITIONS AS LONG AS THE ADJUSTMENT IS CONTINUED FROM POST TO POST IN A UNIFORM MANNER. TRENCHING ON SLOPES MAY BE WARRANTED. ON SLOPES, POSTS WILL CONTINUE TO ERECTED VERTICALLY, UNLESS OTHERWISE DIRECTED, AND THE ENDS OF THE FENCING FABRIC SHALL BE CUT ON A SKEW AS MAY BE NECESSARY FOR PROPER CONNECTION TO THE POSTS.

DUMPED ROCK CHANNEL PROTECTION WILL BE USED AT CHANNEL CROSSINGS WHEN CALLED FOR ON THE PLANS.

INSTALL DRAINAGE STRUCTURE TERMINAL INSTALLATIONS CALLED FOR ON THE PLANS AND/OR AS SHOWN ON TYPICAL FENCE DETAILS.

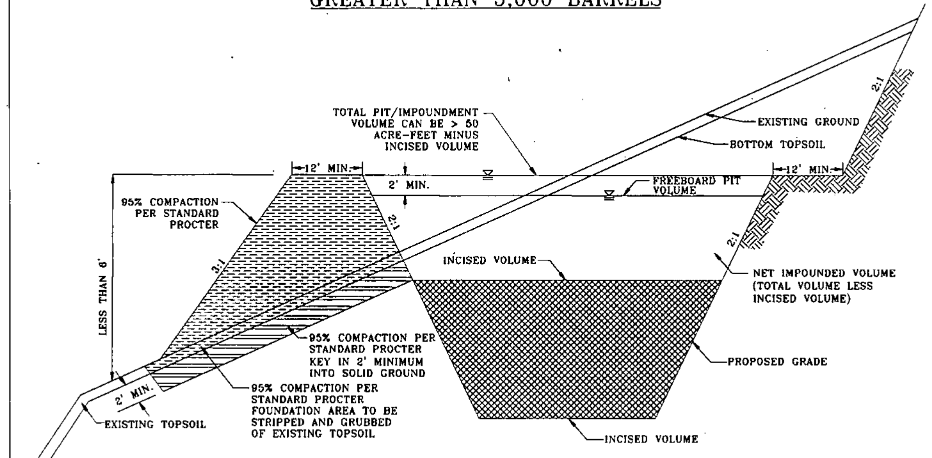
UNLESS OTHERWISE SPECIFIED, OR DIRECTED BY THE ENGINEER, THE FARM FIELD FENCE MAY BE INSTALLED WITH THE FENCE FABRIC AND BARBED WIRE POSITIONED ON EITHER SIDE OF THE FENCE POSTS.

HARDWARE AND MISCELLANEOUS FITTINGS, NOT SPECIFICALLY DESIGNATED HEREIN AS TO TYPE OR DIMENSIONS, SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF SECTION 606 OF THE SPECIFICATIONS AND SHALL BE OF GOOD QUALITY COMMERCIAL DESIGN ACCEPTABLE TO THE ENGINEER.

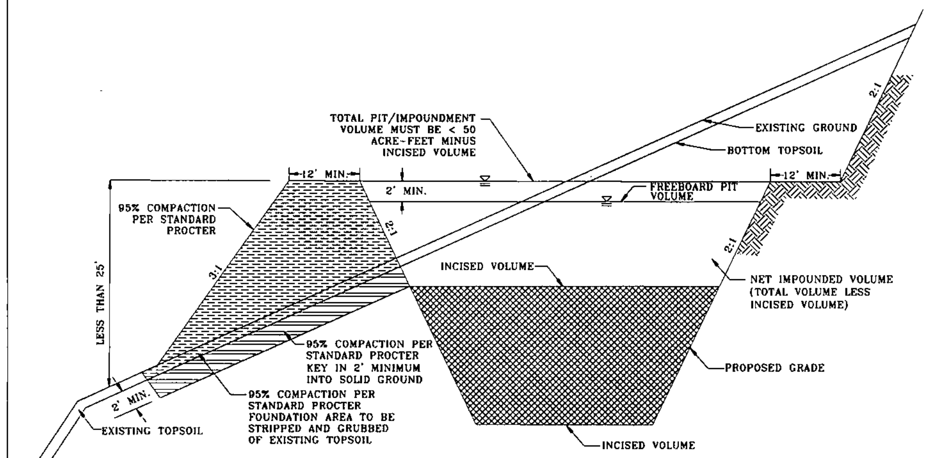
IN LIEU OF THE BARBED WIRE DETAILED HEREIN, THE FOLLOWING ADDITIONAL TYPES ARE ACCEPTABLE, PROVIDED THEY RETAIN THE "4-POINT BARB AT 5" CENTERS" REQUIREMENT AND PROVIDED THEY MEET OR EXCEED THE STRENGTH AND COATING REQUIREMENTS FOR THE STANDARD, 12 1/2 GAUGE, BARBED WIRE AS CALLED FOR IN 712.10 OF THE SPECIFICATIONS.
(A) STRANDED, 15 1/2 GAUGE, HIGH CARBON STEEL BARBED WIRE
(B) ORE STRAND, 12 GAUGE, STEEL BARBED WIRE

VEHICULAR GATE FRAMES (AND VERTICAL BRACES) MAY BE EITHER GALVANIZED STEEL PIPE MEMBERS AS SHOWN HEREIN OR MAY BE TRIPLE-COATED STEEL PIPE MEMBERS MEETING THE REQUIREMENTS SPECIFIED ON STANDARD SHEET F2. ALL OTHER METAL COMPONENTS OF THE GATE SHALL BE GALVANIZED, WITH THE EXCEPTION OF THE DIE-CAST ALUMINUM CORNER FITTINGS, OR PRESSED STEEL CORNER FITTINGS.

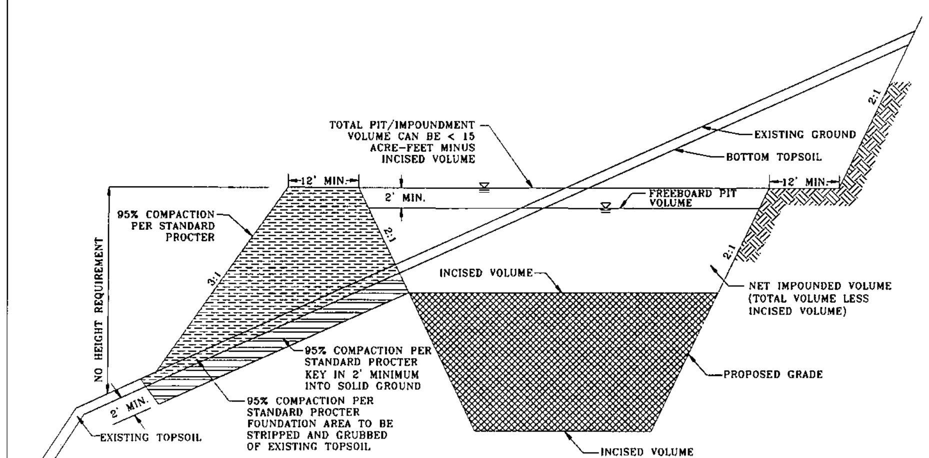
WEST VIRGINIA CODE 35 CSR 4 DESIGN AND CONSTRUCTION REQUIREMENTS FOR ASSOCIATED PITS, ASSOCIATED IMPOUNDMENTS, & CENTRALIZED IMPOUNDMENTS GREATER THAN 5,000 BARRELS



SECTION VIEW



SECTION VIEW



SECTION VIEW

NOTES:
1. ALL FILL SHOULD BE KEYED IN TO ORIGINAL GROUND EVERY 2-5 VERTICAL FEET DEPENDING ON EXISTING GROUND SLOPE
2. MINIMUM OUTSIDE AND INSIDE EMBANKMENT (FILL) SLOPES SHALL BE 2H:1V. THE INSIDE AND OUTSIDE SLOPES MUST ADD UP TO 5H:1V

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Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS · PROJECT MGMT. · ENGINEERS · ENVIRONMENTAL
SLS
HONESTY, INTEGRITY, QUALITY

RICHARD L. GAINES · REGISTERED · 17220 · STATE OF WEST VIRGINIA · PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013	
SCALE: AS SHOWN	
DESIGNED BY: RJH/JMR	
FILE NO.: SLS-8051	
SHEET 54 OF 57	
REV:	

9/16/2013
DOT.2006

Table 2
Acceptable Fertilization Recommendation

Species	N (lbs/ac)	P205 (lbs/ac)	Example Rec. (per acre)
Cool Season Grass	40	80	400 lbs. 10-20-20
CS Grass & Legume	30	60	300 lbs. 10-20-20
Temporary Cover	40	40	200 lbs. 19-19-19

Table 3
Temporary Cover

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

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

Table IV-5
Lime and Fertilizer 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

Table IV-6
Mulch Materials Is Rates and Used

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

Tables IV 1-4 taken from Natural Resources Conservation Service Manual 'Critical Area Planting'

Table IV-1
Recommended Seeding Dates

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

Table 4a
Permanent Seeding Mixture

Species/Mixtures	Seeding Rate (lbs/acre)	Drainage	pH Range
Crownvetch/ Tall Fescue	10 - 15 30	Well - Mod. Well	5.0 - 7.5
Crownvetch/ Perennial Ryegrass	10 - 15 20	Well - Mod. Well	5.0 - 7.5
Ladino Clover/ Serecia Lespedeza/ Tall Fescue	30 25 2	Well - Mod. Well	4.5 - 7.5
Tall Fescue/ Ladino Clover/ Redtop	40 3 3	Well - Mod. Well	5.0 - 7.5
Crownvetch/ Tall Fescue/ Redtop	10 20 3	Well - Mod. Well	5.0 - 7.5
Tall Fescue/ Birdsfoot Trefoil/ Redtop	40 10 3	Well - Mod. Well	5.0 - 7.5
Serecia Lespedeza/ Tall Fescue/ Redtop	25 30 3	Well - Mod. Well	4.5 - 7.5
Redtop/ Tall Fescue/ Creeping Red	30 3 50	Well - Mod. Well	5.0 - 7.5
Tall Fescue	50	Well - Poorly	4.5 - 7.5

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

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

Table 4b
Wildlife and Farm Friendly Seed Mixtures

Species/Mixtures	Seeding Rate (lbs/acre)	Drainage	pH Range
KY Bluegrass/ Redtop/ Ladino or Birdsfoot Trefoil	20 3 2/10	Well - Mod. Well	5.5 - 7.5
Timothy/ Alfalfa	5 12	Well - Mod. Well	6.5 - 8.0
Timothy/ Birdsfoot Trefroil	5 8	Well - Poorly	5.5 - 7.5
Orchardgrass/ Ladino Clover/ Redtop	10 2 3	Well - Mod. Well	5.5 - 7.5
Orchardgrass/ Ladino Clover	10 2	Well - Mod. Well	5.5 - 7.5
Orchardgrass/ Perennial Ryegrass	20 10	Well - Mod. Well	5.5 - 7.5
Creeping Red Fescue/ Perennial Ryegrass	30 10	Well - Mod. Well	5.5 - 7.5
Orchardgrass or KY Bluegrass	20	Well - Mod. Well	6.0 - 7.5
Birdsfoot Trefoil/ Redtop/ Orchardgrass	10 5 20	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea*/ Perennial Ryegrass	30 20	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea*/ Orchardgrass	30 20	Well - Mod. Well	5.5 - 7.5

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

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

REVEGETATION

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

Temporary Seeding

A. General Conditions Where Practice Applies

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

B. Seed Mixtures and Planting Dates

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

C. Seed Application

Apply seed by broadcasting, drilling, or by hydroseed according to the rates indicates in Table IV-3. Perform a11 planting operations at right angles to the slope. Necessary site preparation and roughening of the soil surface should be done just prior to seeding. Seedbed preparation may not be required on newly disturbed areas.

Permanent Seeding

A. General

Permanent vegetative cover will be established where no further soil disturbance is anticipated or needed. Soil fertility and pH level should be tested and adjusted according to seed species planted. Planting of permanent vegetative covers must be performed on a11 disturbed areas after completion of the drilling process. Any site that contains significant amounts of topsoil shall have the topsoil removed and stockpiled when feasible. Topsoil should not be added to slopes steeper than 2:1 unless a good bonding to the sub-layer can be achieved. After proper grading and seedbed preparation, the vegetation will reestablish ground cover for the control of surface water runoff erosion.
All required seedbed preparation and loosening of soil by disking or dozer tracking should be performed just prior to seeding. If seedbed preparation is not feasible, 50% more seed shall be added to the recommended rates shown in Tables IV-3 and IV-4.
When hydroseeding, seedbed preparation may not be necessary if adequate site preparation was performed. Incorporate the appropriate amount of lime and/or fertilizer in the slurry mix when hydroseeding.
When hydroseeding, first mix the lime, fertilizer, and hydro-mulch in the recommended amount of water. Mix the seed and inoculants together within one hour prior to planting, and add to the slurry just before seeding. Apply the slurry uniformly over the prepared site. Assure that agitation is continuous throughout the seeding operation and the mix is applied within one hour of initial mixing.

B. Lime and Fertilizer

1. Lime shall be applied to a11 permanent seedings. The pH of the soil is to be determined and lime applied accordingly. Once the pH is known, select the amount of lime to be applied from Table IV-5.
2.Fertilizer shall be applied in all permanent seedings. Apply the equivalent for 500 lbs. minimum 10-20-20 fertilizer per acre or use the amount of fertilizer and lime recommended by a certified soil test.
3.Application: For best results and maximum benefits, the lime and fertilizer are to be applied at the time of seedbed preparation.

C. Permanent Seed Mixtures

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

Notes:

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

D. Seeding for Wildlife Habitat

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

Mulching

A. General Organic Mulches

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

B. Chemical Mulches, Soil Binders and Tackifiers

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

C. Specifications

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

D. Anchoring

Depending on the field situation, mulch may not stay in place because of wind action or rapid water runoff. In such cases, mulch is to be anchored mechanically or with mulch netting.

1. Mechanical Anchoring

Apply mulch and pull mulch anchoring tool over the mulch. When a disk is used set the disk straight and pull across slope. Mulch material should be tucked into the soil about three inches.

2. Mulch netting

Follow manufacturer's recommendation when positioning and stapling the mulch netting in the soil.

Stantec

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REGISTERED
17220
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY:RJH/JMR
FILE NO.:SLS-8051
SHEET 55 OF 57
REV:

EQT WEU 51 MATERIAL QUANTITIES — WELL PAD				
ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM TOTAL
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	3.06	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK (INCLUDES ASSOC. PIT AND IMPOUNDMENT)				
2.a. 12" COMPOST FILTER SOCK	1,981	LF	$	$
2.b. 18" COMPOST FILTER SOCK	33	LF	$	$
2.c. 24" COMPOST FILTER SOCK	3,194	LF	$	$
3.0 AGGREGATE SURFACING				
3.a. 6" of 3"-6" BASE	2,500	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	1,029	TONS	$	$
3.c. GEOTEXTILE	10,000	SY	$	$
4.0 COCONUT SLOPE MATTING	8,166	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	2.6	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	0.9	AC	$	$
6.0 DITCH LINING				
6.a. HIGH VELOCITY EROSION CONTROL BLANKET (MIN SHEAR 2.25 PSF)	318	SY	$	$
7.0 EXCAVATION				
7.a. WELL PAD (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	49,320	CY	$	$
7.b.TOPSOIL (ESTIMATED 6")	3,020	CY	$	$
8.0 DITCH LENGTH	715	LF	$	$
9.0 KEYWAY EXCAVATION	872	CY	$	$
10.0 UNDERDRAIN SUMP				
10.a. 4" CORRUGATED UNDERDRAIN	554	LF	$	$

EQT WEU 51 MATERIAL QUANTITIES — ACCESS ROAD				
ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM TOTAL
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	14.56	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK				
2.a. 12" COMPOST FILTER SOCK	5,511	LF	$	$
2.b. 18" COMPOST FILTER SOCK	841	LF	$	$
2.c. 24" COMPOST FILTER SOCK	15,996	LF	$	$
			$	$
3.0 AGGREGATE SURFACING				
3.a. 6" of 3"-6" BASE	6,466	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	2,661	TONS	$	$
3.c. GEOTEXTILE	25,859	SY	$	$
4.0 COCONUT SLOPE MATTING	70,112	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING)	29.3	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING)	14.8	AC	$	$
6.0 DITCH LINING				
6.a. d50 = 6" MIN	4,701	TON	$	$
6.b. d50 = 12" MIN	456	TON	$	$
7.0 CMP CULVERT				
7.a. 15" CMP	1,292	LF	$	$
7.b. 18" CMP	174	LF	$	$
7.c. 21" CMP	58	LF	$	$
7.d. 24" CMP	135	LF	$	$
7.e. 27" CMP	37	LF	$	$
8.0 EXCAVATION				
8.a. ACCESS ROAD (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	47,206	CY	$	$
8.b. TOPSOIL (ESTIMATED 6")	15,149	CY	$	$
9.0 DITCH LENGTH	8,797	LF	$	$
10.0 RIP RAP APRONS				
10.a. d50 = 6" MIN	379	TON	$	$
10.b. d50 = 12" MIN	121	TON	$	$
11.0 KEYWAY EXCAVATION	22,339	CY	$	$
12.0 BLUESTONE CREEK LOW WATER CROSSING				
12.a. 9" REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT	14	CY	$	$
12.b. 6" CONCRETE SLOPE PROTECTION	5	CY	$	$
12.c. TYPE A FABRIC	56	SY	$	$
12.d. TYPE B FABRIC	32	SY	$	$
12.e. ROCK BORROW EXCAVATION (6" MAX)	92	TON	$	$
12.f. 15" ALUMINUM CMP (4 BARRELS)	140	LF	$	$
12.g. OUTLET PROTECTION (18" MIN, 48" MAX)	43	TON	$	$
12.h. REFLECTIVE DELINEATORS	4	EACH	$	$

NOTE:

GEOTEXTILE FABRIC, ROLLED EROSION CONTROL PRODUCT AND LINER SYSTEM QUANTITIES DO NOT ACCOUNT FOR OVERLAP.

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RICHARD L. GAINES
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STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION QUANTITIES
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-6051
SHEET 56 OF 57
REV:

DOT_2006
Color_black.tbl
OILGAS_FullSize_PDF.plt

9/16/2013
WORKSPACE: DOT_2006 (SURVEY FEET)
U:\202705137\EQT WEU 51\3.0 CADD\3.1 Highway\prES\1372es1001.dgn

EQT WEU 51 MATERIAL QUANTITIES ASSOCIATED IMPOUNDMENT				
ITEM DESCRIPTION	**QUANTITY**	**UNIT**	**UNIT COST**	**ITEM TOTAL**
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	3.73	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK (SEE WELL PAD QUANTITIES)				
2.a. 12" COMPOST FILTER SOCK		LF	$	$
2.b. 18" COMPOST FILTER SOCK		LF	$	$
2.c. 24" COMPOST FILTER SOCK		LF	$	$
3.0 AGGREGATE SURFACING (MANIFOLD PAD)				
3.a. 6" of 3"-6" BASE	209	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	86	TONS	$	$
3.c. GEOTEXTILE	834	SY	$	$
4.0 COCONUT SLOPE MATTING	3,897	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	3.3	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	2.5	AC	$	$
6.0 KEYWAY EXCAVATION	1,339	CY	$	$
7.0 LINER SYSTEM				
7.a. PRIMARY LINER (60 MIL)	4,834	SY	$	$
7.b. NON-WOVEN GEOTEXTILE FABRIC CUSHION (16 OZ FELT)	4,834	SY	$	$
8.0 EXCAVATION				
8.a. ASSOC. PIT (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	80,982	CY	$	$
8.b. TOPSOIL (ESTIMATED 6")	2,025	CY	$	$
9.0 MISCELLANEOUS				
9.a. ACCESS GATE W/ EMERGENCY LIFE LINE	1	EACH	$	$
9.b. PERIMETER SAFETY FENCE	1,021	LF	$	$

EQT WEU 51 MATERIAL QUANTITIES ASSOCIATED PIT				
ITEM DESCRIPTION	**QUANTITY**	**UNIT**	**UNIT COST**	**ITEM TOTAL**
1.0 CLEARING AND GRUBBING				
1.a. TREE CLEARING	5.54	AC	$	$
1.b. MOWING	0	AC	$	$
2.0 COMPOST FILTER SOCK (SEE WELL PAD QUANTITIES)				
2.a. 12" COMPOST FILTER SOCK		LF	$	$
2.b. 18" COMPOST FILTER SOCK		LF	$	$
2.c. 24" COMPOST FILTER SOCK		LF	$	$
3.0 AGGREGATE SURFACING (MANIFOLD PAD)				
3.a. 6" of 3"-6" BASE	209	TONS	$	$
3.b. 2" of 3/4" CRUSHER RUN	86	TONS	$	$
3.c. GEOTEXTILE	834	SY	$	$
4.0 COCONUT SLOPE MATTING	2,143	SY	$	$
5.0 SEED & MULCH				
5.a. SEEDING (INCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	5.4	AC	$	$
5.b. MULCH (EXCLUDES AREA OF SLOPE MATTING AND DITCH LINING)	4.9	AC	$	$
6.0 KEYWAY EXCAVATION	1,027	CY	$	$
7.0 LINER SYSTEM				
7.a. PRIMARY LINER (60 MIL)	2,685	SY	$	$
7.b. NON-WOVEN GEOTEXTILE FABRIC CUSHION (16 OZ FELT)	2,685	SY	$	$
8.0 EXCAVATION				
8.a. ASSOC. PIT (CUT W/ NO SWELL) - INCLUDES EXC. FOR AGGREGATE	28,483	CY	$	$
8.b. TOPSOIL (ESTIMATED 6")	1,263	CY	$	$
9.0 MISCELLANEOUS				
9.a. ACCESS GATE W/ EMERGENCY LIFE LINE	1	EACH	$	$
9.b. PERIMETER SAFETY FENCE	810	LF	$	$

NOTE:

GEOTEXTILE FABRIC, ROLLED EROSION CONTROL PRODUCT AND LINER SYSTEM QUANTITIES DO NOT ACCOUNT FOR OVERLAP.

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A DIVISION OF SMITH LAND SURVEYING
SLS

RICHARD L. GAINES REGISTERED 17220 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

THIS DOCUMENT WAS PREPARED BY: STANTEC FOR: EQT PRODUCTION COMPANY

CONSTRUCTION QUANTITIES
EQT WEU 51
WEST UNION DISTRICT
DODDRIDGE COUNTY, WV

DATE: 9/16/2013
SCALE: AS SHOWN
DESIGNED BY: RJH/JMR
FILE NO.: SLS-8051

REV: