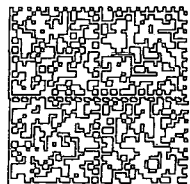


CERTIFIED MAIL™

Beth A. Rogers
Doddridge County Clerk
Room 102
118 East Court St.
West Union, WV 26456



7012 1010 0001 4282 8164



HASLER	015H14112420
	\$6.11
	08/01/13
	Mailed From 26456

US POSTAGE

*Called in to
Verify 8/21/13*

13-029

8/21/2013

DWAYNE E. KELLEY
HC 67 BOX 71
WEST UNION, WV 26456

1ST NOTICE
2ND NOTICE

NIXIE 238 SE 11000 0000/118/13

RETURN TO SENDER
UNCLAIMED
UNABLE TO FORWARD

BC: 26456126227 *1171-00571-01-42
2645601262



PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT
OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

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:
 Dwayne E. Kelley
 HC 67 Box 71
 West Union, WV 26456

2. Article Number
 (Transfer from service label)

7012 1010 0001 4282 8164

COMPLETE THIS SECTION ON DELIVERY

A. Signature Agent
 X Addressee

B. Received by (Printed Name) C. Date of Delivery

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

Legal Advertisement:
Doddridge County
Floodplain Permit Application

Please take notice that on the 31st day of July, 2013

EQT PRODUCTION COMPANY, filed an application for a Floodplain Permit to develop land located at or about: **SHIRLEY GESSLER SURFACE OWNER, 387 ACRES, BIG FLINT, GRANT DISTRICT, DB 282 PAGE 406, TAX MAP 2 PARCEL 11.**

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 **August 20, 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

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



Sent To
 Michael Benedum
 Street, Apt. No.;
 or PO Box No. Rt. 5, Box 426
 City, State, ZIP+4 Salem, WV 26426

PS Form 3800, August 2006 See Reverse for Instructions

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

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

Postmark
 Here

26456

Sent To
 Stephen W. Trent
 Street, Apt. No.;
 or PO Box No. 14 Millbrook Rd
 City, State, ZIP+4 Bridgeport, WV 26330

PS Form 3800, August 2006 See Reverse for Instructions

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

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

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



Sent To
 Jordan Family Partnership
 Street, Apt. No.;
 or PO Box No. 41 S. Front St.
 City, State, ZIP+4 York Haven, PA 17370

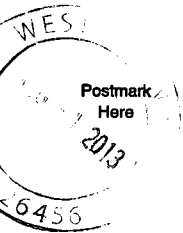
PS Form 3800, August 2006 See Reverse for Instructions

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



Sent To
 Paula A. Ash
 Street, Apt. No.;
 or PO Box No. Rt. 2, Box 290-1
 City, State, ZIP+4 Salem, WV 26426

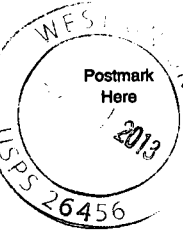
PS Form 3800, August 2006 See Reverse for Instructions

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	\$ 6.11



Sent To
 Dwayne E. Kelley
 Street, Apt. No.;
 or PO Box No. HC 67 Box 71
 City, State, ZIP+4 West Union, WV 26456

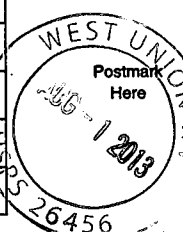
PS Form 3800, August 2006 See Reverse for Instructions

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



Sent To
 Marty L. Baker
 Street, Apt. No.;
 or PO Box No. 164 Valley St.
 City, State, ZIP+4 Salem, WV 26426

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:

13-029

Jordan Family Partnership
 41 S. Front St.
 York Haven, PA 17370

2. Article Number

(Transfer from service label)

7012 1010 0001 4282 8157

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

Green Jordan

 Agent Addressee

B. Received by (Printed Name)

C. Date of Delivery

8/13/13

D. Is delivery address different from item 1? Yes

If YES, enter delivery address below:

 No

3. Service Type

 Certified Mail Express Mail Registered Return Receipt for Merchandise Insured Mail C.O.D.

4. Restricted Delivery? (Extra Fee)

 Yes

UNITED STATES POSTAL SERVICE



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

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

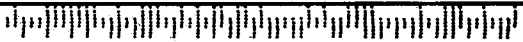
BETH A. ROGERS
DODDRIDGE COUNTY CLERK
118 E. COURT ST., RM 102
WEST UNION, WV 26456

DODDRIDGE COUNTY, WV
CLERK
ROGERS

2003 AUG - 7 AM 11: 26

FILED

00129790



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:

Stephen W. Trent
14 Millbrook Rd
Bridgeport, WV 26330

13029

2. Article Number

(Transfer from service label)

7012 1010 0001 4282 8171

PS Form 3811, February 2004

Domestic Return Receipt

102595-02-M-1540

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

[Signature] Agent Addressee

B. Received by (Printed Name)

C. Date of Delivery

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**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:

Michael Benedum
Rt. 5, Box 426
Salem, WV 26426

13-029

2. Article Number

(Transfer from service label)

7012 1010 0001 4282 8140

PS Form 3811, February 2004

Domestic Return Receipt

102595-02-M-1540

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

[Signature] Agent Addressee

B. Received by (Printed Name)

C. Date of Delivery

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**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:

Marty L. Baker
164 Valley St.
Salem, WV 26426

13-029

2. Article Number

(Transfer from service label)

7012 1010 0001 4282 8188

PS Form 3811, February 2004

Domestic Return Receipt

102595-02-M-1540

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

[Signature] Agent Addressee

B. Received by (Printed Name)

C. Date of Delivery

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

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

W. C. Underwood Jr.
Sheriff of Doddridge County

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

Doddridge County, West Virginia

No. 47

Date: July 10, 2013
Customer copy

Received: #13-029 Smith land surveying for eqt-guessler centralized im \$1,250.00

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

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

W. C .Underwood Jr.
Sheriff of Doddridge County

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

Doddridge County, West Virginia

No. 189

Date: July 31, 2013
Customer copy

Received: #13-029 SMITH LAND SURVEYING

\$2,552.50

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

**CENTRALIZED IMPOUNDMENT AND ACCESS ROAD PREPERATION
CONTRACTOR BID SCHEDULE
Gessler Centralized Impoundment**

Item Description	Estimated Cost
Erosion & Sediment Control	\$44,000.00
Unclassified Earthwork	\$163,000.00
Impoundment - Liner/Fence/Piping	\$201,000.00
Access Road & Manifold Pad	\$45,000.00
Stream Crossing	\$7,500.00

Total Estimated Cost \$460,500.00

Deposit for expenses \$1,000.00 (PAID)
 Flat fee for first
 \$100,000.00 of construction costs \$1,000.00
 \$5.00 per \$1,000.00 of costs
 in excess of first \$100,000.00
 \$5.00 x 360.5 = \$1,802.50
 TOTAL \$3,802.50
 Deposit Paid - 1,000.00
 \$2,802.50
 DUE
 - 1,250.00 Previous application
 1,552.50

Legal Advertisement:
Doddridge County
Floodplain Permit Application

Please take notice that on the 31st day of July, 2013

EQT PRODUCTION COMPANY, filed an
application for a Floodplain Permit to develop land located at or
about: **SHIRLEY GESSLER SURFACE OWNER, 387 ACRES, BIG FLINT,
GRANT DISTRICT, DB 282 PAGE 406, TAX MAP 2 PARCEL 11.**

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 **August 20, 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

* P. 01 *
* TRANSACTION REPORT *
* *****

JUL-31-2013 WED 05:21 PM

FOR: DODDRIDGE CO. CLERK 304 873 1840

SEND

DATE	START	RECEIVER	TX TIME	PAGES	TYPE	NOTE	M#	DP
JUL-31	05:20 PM	93048731600	25"	1	FAX TX	OK	544	
TOTAL :						25S PAGES:	1	

Legal Advertisement:

Doddridge County
Floodplain Permit Application

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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

PERMIT NO. 13-029

DODDRIDGE COUNTY
FLOODPLAIN DEVELOPMENT
PERMIT

PURPOSE FOR PERMIT: FRESHWATER IMPOUNDMENT

ISSUED TO EQT PRODUCTION CO.

ADDRESS: 115 PROFESSIONAL PLACE
P.O. BOX 280
BRIDGEPORT, WV 26330

PROJECT ADDRESS: _____

BIG FLINT RUN - GESSLER
IMPOUNDMENT

ISSUED BY: Dan Volz

DATE: 08/22/2013

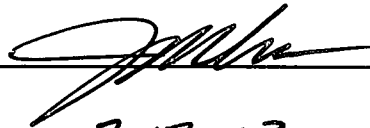
THIS PERMIT MUST BE POSTED ON THE PREMISES IN A CONSPICUOUS PLACE SO AS TO BE CLEARLY
VISIBLE FROM THE STREET.

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 _____

7-17-13

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
TELEPHONE NUMBER: 888-662-4185

PROJECT LOCATION:

NAME OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) Shirley Gessler

ADDRESS OF SURFACE OWNER/OWNERS (IF NOT THE APPLICANT) HC 67 Box, 81
West Union, WV 26456

DISTRICT: Grant

DATE/FROM WHOM PROPERTY
PURCHASED: Eric Gessler-11/09/09, (Will Book 42/132)

LAND BOOK DESCRIPTION: 387 acres on the waters of Big Flint

DEED BOOK REFERENCE: DB 282 Page 406

TAX MAP REFERENCE: Tax Map 2 Parcel 11

EXISTING BUILDINGS/USES OF PROPERTY: 2 residential structures, 1 storage bldg

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

ADDRESS OF AT LEAST ONE ADULT RESIDING IN EACH RESIDENCE LOCATED UPON THE SUBJECT PROPERTY HC 67, Box 81, West Union 26456

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

DESCRIPTION OF WORK (CHECK ALL APPLICABLE BOXES)

A. STRUCTURAL DEVELOPMENT

ACTIVITY

STRUCTURAL TYPE

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

B. OTHER DEVELOPMENT ACTIVITIES:

- Fill Mining Drilling Pipelining
- Grading
- Excavation (except for STRUCTURAL DEVELOPMENT checked above)
- Watercourse Altercation (including dredging and channel modification)
- Drainage Improvements (including culvert work)
- Road, Street, or Bridge Construction
- Subdivision (including new expansion)
- Individual Water or Sewer System
- Other (please specify)
- Develop a centralized Impoundment for freshwater to aid in oil and gas production.

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. (SEE ATTACHED SITE PLAN)
- 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 \$ (see Attachment

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: Michael Benedum
ADDRESS: Rt 5 Box 426
Salem WV 26426

NAME: See Attachment 1
ADDRESS: for additional adjacent
owners

NAME: Jordan Family Partnership
ADDRESS: 41 S Front st.
York Haven PA 17370

NAME: Stephen W. Trent
ADDRESS: 14 Millbrook Rd
Bridgeport WV 26330

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: Dwayne E. Kelley
ADDRESS: HC 67 Box 71
West Union WV 26456

NAME: N/A
ADDRESS: _____

NAME: N/A
ADDRESS: _____

NAME: N/A
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.

Attachment 1

1. Marty L. Baker
164 Valley St.
Salem WV 26426
2. Paula A. Ash
Rt. 2 Box 290-1
Salem WV 26426
3. Dwayne E. Kelley
HC 67 Box 71
West Union 26456

- (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): JOHN W. DANETO

SIGNATURE:  DATE: 7.17.13

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: Map 54017C0130C

Dated: 8/22/13

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

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

Unavailable

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

See section 4 for additional instructions.

SIGNED _____

DATE _____

**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: _____ BY: _____
DEFICIENCIES ? Y/N

COMMENTS _____

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

Certificate of Compliance issued: DATE: _____ BY: _____

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

PERMIT NUMBER: _____

PERMIT DATE: _____

PURPOSE –

CONSTRUCTION LOCATION: _____

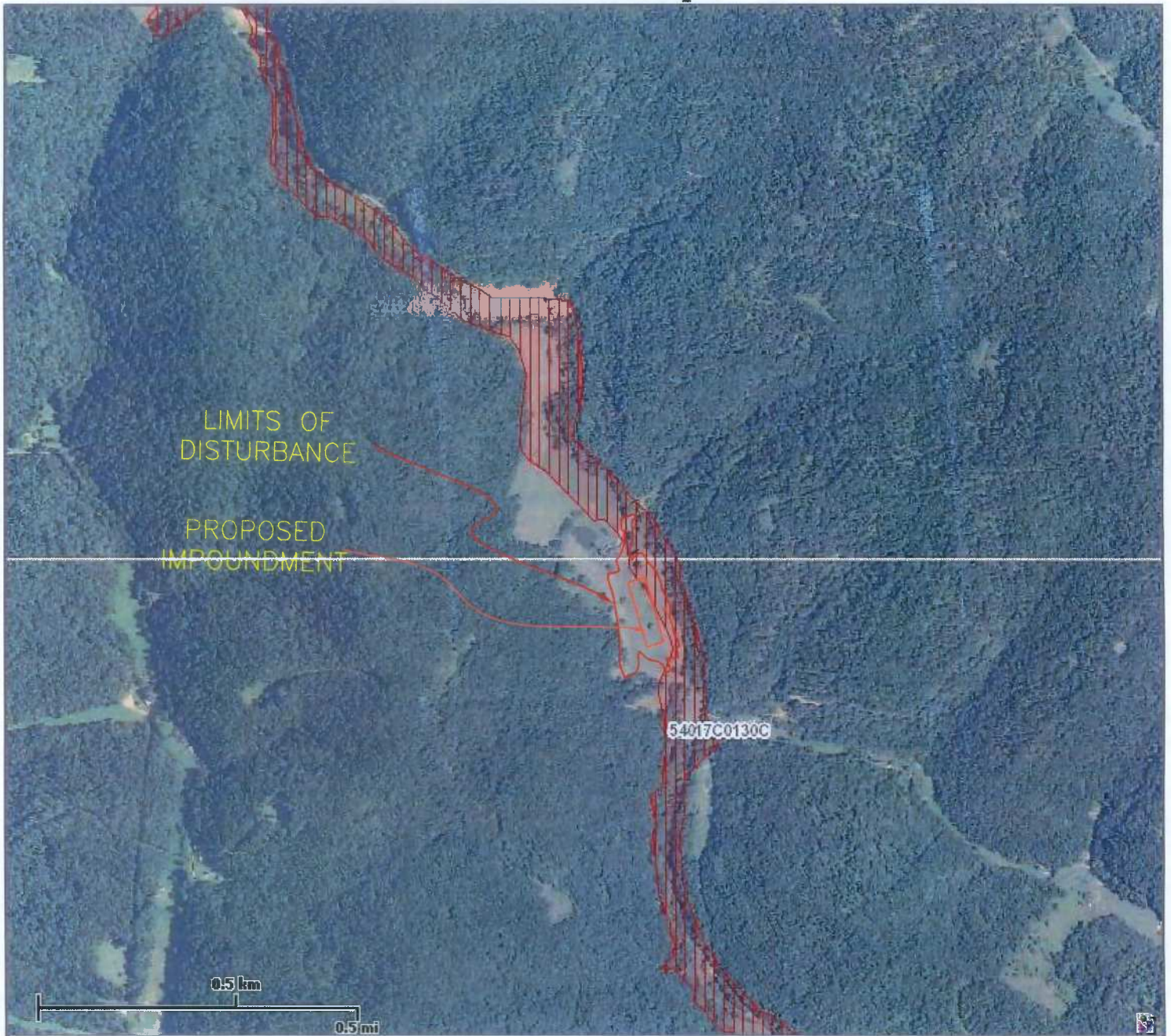
OWNER'S ADDRESS: _____

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

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

SIGNED _____ **DATE** _____

WV Flood Map



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

Map Created on 7/15/2013

	Location of the mouse click
	Approximate Study (Zone A)
	Detailed Study (Zone AE, AH, AO)
	Floodway
	Flood Water Depth (HEC-RAS)
	Cross Section Line
	Base Flood Elevation Line
	DFIRM Panel (Map) Index

User Notes:
EQT-GESSLER IMPOUNDMENT

Disclaimer:
The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. To obtain more detailed information in areas where Base Flood Elevations have been determined, users are encouraged to consult the latest Flood Profile data contained in the official flood insurance study. These studies are available online at www.msc.fema.gov.

WV Flood Tool is supported by FEMA, WV NFIP Office, and WV GIS Technical Center
(<http://www.MapWV.gov/Flood>)

Flood Hazard Area:

Advisory Flood Height:

Water Depth:

Elevation:

Location (long, lat):

Location (UTM 17N):

FEMA Issued Flood Map:

Contacts:

CRS Information:

Flood Profile: No Profile

HEC-RAS Model: No Model

Parcel Number:



P.O. BOX 150, GLENVILLE, WV 26351
 (304) 462-5634 • FAX (304) 462-5656

LETTER OF TRANSMITTAL

DATE 7/2/13	JOB NO. 7838
ATTENTION Dan Wellings	
RE: Gessler Centralized Impoundment	

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

2013 JUL -3 PM 12:15
 RECEIVED
 DODDRIDGE COUNTY
 FLOODPLAIN COORDINATOR

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			Application for Doddridge County Floodplain Permit with attachments
1			Gessler Centralized Impoundment Site Plans
1			Floodplain Analysis of Flint Run - Gessler Centralized Impoundment
1			SLS Check No. 17758 for \$1,250.00 Permit Fee

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.



P.O. BOX 150, GLENVILLE, WV 26351
 (304) 462-5634 • FAX (304) 462-5656

LETTER OF TRANSMITTAL

DATE 7/17/13	JOB NO. 7838
ATTENTION Dan Wellings	
RE: Gessler Impoundment - EQT Production Company	

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			Revised Doddridge County Floodplain Permit with requested information
1			SLS Check #17763 for \$1,000.00 Expense Deposit

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



P.O. BOX 150, GLENVILLE, WV 26351
 (304) 462-5634 • FAX (304) 462-5656

LETTER OF TRANSMITTAL

DATE 7/26/13	JOB NO. 7838
ATTENTION Dan Wellings	
RE: Gessler Impoundment - EQT Production Company	

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			SLS Ck #17770 for remaining Floodplain Permit Fee of \$1552.50
			I HAVE ENCLOSED A SELF-ADDRESSED STAMPED ENVELOPE IF YOU WOULD BE SO KIND AS TO RETURN THE CHECK THAT YOU HAVE THAT IS INCORRECT.
			Thank you!

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

SIGNED: Deanna McVicker

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



Engineers and Environmental Consultants

7012 MacCorkie Avenue, SE, Charleston, WV 25304 - (304) 342-1400 • FAX (304) 343-9031; www.potesta.com

December 11, 2014

Mr. Bo Wriston
Doddrige County Floodplain Coordinator
Doddrige County Commission
118 East Court Street
West Union, West Virginia 26456

RE: Request for Termination of Existing Floodplain Permit Application
EQT Production Company
EQT Gessler Centralized Impoundment
Doddrige County, West Virginia
POTESTA Project No. 0101-14-0524

Dear Mr. Wriston:

Potesta & Associates, Inc. (POTESTA) is pleased to submit this letter requesting termination of existing floodplain permit number 13-029 for the Gessler Centralized Impoundment project. The proposed project has been completed including those portions located within the floodplain. Areas of disturbance have been stabilized and revegetated. No aboveground structures were constructed as part of this project.

If you have any questions, please feel free to contact me at (304) 342-1400 or jmsmith@potesta.com, or Megan Landfried Neylon (EQT) at (304) 848-0061.

Sincerely,

POTESTA & ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read "Jarrett M. Smith".

Jarrett M. Smith, P.E.
Senior Engineer

JMS/clr

Enclosures

c: Ms. Megan Landfried Neylon – EQT (via email)

POTESTA & ASSOCIATES, INC.

Charleston, West Virginia • Morgantown, West Virginia • Winchester, Virginia • Cambridge, Ohio



June 28, 2013

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

Re: Proposed EQT Production Company- Gessler Centralized Impoundment

Mr. Wellings;

On behalf of our client, EQT Production Company, we are submitting an application for a Doddridge County Floodplain Permit for the above referenced site. A floodplain application for this site was submitted previously. The West Virginia DEP required an additional note to be placed on the site plans. We are re-submitting the application under the current Doddridge County ordinance dated May 21st, 2013.

The project is to construct an access road and centralized impoundment. Please find attached a copy of the site plans and floodplain analysis and other necessary permits acquired for the project. As shown in the floodplain analysis the project will raise the base flood elevation no more than 0.21 feet and no upstream or downstream properties will be affected. Also please find attached the permit application fee of \$1,250.00.

If you have any questions, please call.

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

2013 JUL -3 PM 12:14
PROFESSIONAL ENERGY CONSULTANTS
SMITH LAND SURVEYING, INC.
DODDRIDGE COUNTY, WV



July 17, 2013

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

Re: Proposed EQT Production Company- Gessler Centralized Impoundment

Mr. Wellings;

In response to you conversations and emails with Thomas Meeks of our office, please find attached the revised Doddridge County floodplain application. Please also find the signed and sealed cover letter and signed and sealed floodplain analysis of Flint Run. The itemized cost breakdown for the construction cost is also attached. As stated in the engineer's cover letter, the pre-construction BFE for the site is 760.03 feet (NGVD29 Datum) and the post construction BFE is proposed at 760.19 feet (NGVD29 Datum, yielding a maximum increase of 0.16 feet to the BFE at the center of the proposed impoundment. This will cause no impact to upstream or downstream properties.

Included in the attachments are the following: signed and sealed cover letter and signed and sealed floodplain analysis of Flint Run, FEMA map with impoundment shown and WV Flood Hazard Tool map with impoundment location.

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



GLESSLER

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division of Highways
Office of the District Engineer/Manager
District Four

Earl Ray Tomblin
Governor

P. O. Box 4220 · Clarksburg, West Virginia 26302 · (304) 842-1500

Paul A. Mattox, Jr., P. E.
Secretary of Transportation/
Commissioner of Highways

November 9, 2012

EQT Production Company
PO Box 280, 115 Professional Place
Bridgeport, WV 26330
Attn: Victor Moyers

Dear Applicant:

Your approved copy of Permit Number 04-12-0998 for a Drilling Permit is enclosed. A description of the work is on the permit.

Please contact District Four office (telephone 304-842-1575), at least 48 hours in advance of the date you plan to begin work so arrangements can be made to inspect the work authorized by the permit. Failure to comply will result in cancellation of your permit.

A copy of this permit is to be available on the job at all times while the work is in progress for inspection by the West Virginia Division of Highways personnel.

Sincerely,

Greg Phillips
District Manager

Denise Roncone
Permit Supervisor .

GP:DR:sg
Attachments
cc: County
Charleston
Permits

PERMIT TO ENTER UPON, UNDER, OVER OR ACROSS THE STATE ROADS OF THE STATE OF WEST VIRGINIA, AS PROVIDED FOR IN SECTION 6, ARTICLE 16, CHAPTER 17; SECTION 9, ARTICLE 16, CHAPTER 17; SECTION 8, ARTICLE 4, CHAPTER 17, WEST VIRGINIA CODE, 1931, AS AMENDED.

THIS PERMIT, Made this 16th day of October 20 12, between the WEST VIRGINIA DEPARTMENT OF TRANSPORTATION, DIVISION OF HIGHWAYS, a statutory corporation hereinafter called DIVISION and EQT Production Company

Address: P.O. Box 280, 115 Professional Place, Bridgeport, WV 26330 Phone No: 304-848-0076
hereinafter called APPLICANT.

WITNESSETH

In consideration of the hereinafter set out covenants and in accordance with Section 6, Article 16, Chapter 17; or Section 9, Article 16, Chapter 17; or Section 8, Article 4, Chapter 17, of the Official Code of West Virginia, 1931, as amended, and the rules and regulations promulgated thereunder, APPLICANT does hereby apply to enter

Route Type & No. County Rt. 3 DOH Project No. _____ (if applicable);
at 0.32³³ +/- miles ^{WEST} North of Junction Co. Rt. 3/1 Mile Post 1.828

in Doddridge County, for the purposes hereinafter set forth and in accordance with the plans and specifications which are attached hereto and made a part hereof: to utilize and maintain an entrance for ingress and egress on CR 3 for the Gessler Centralized Impoundment Site. Please see attached SLS detail sketch Plan & Profile View.

APPLICANT further agrees to accept the conditions hereinafter set forth:

1. APPLICANT shall deposit with DIVISION the sum of \$ \$1 Million in the form of an official, certified or cashier's check, or executed bond with surety satisfactory to DIVISION to cover any damage and inspection costs DIVISION may sustain by reason of the granting of this permit, including any expense incurred in restoring said highway to its original condition or the proper repair of any and all damages that may result within one (1) year from the date of the completion of said work.
2. APPLICANT agrees to reimburse DIVISION for inspection costs as follows:
 - A. For any inspection costs incurred under this permit.
 - B. At \$ _____ per linear foot for _____ feet of water line installed under this permit
 - C. At \$ _____ per linear foot for _____ feet of sewer line installed under this permit
3. APPLICANT shall notify DIVISION at least 48 hours in advance of the date the work will begin. Failure to comply will be cause for cancellation of this permit.
4. APPLICANT agrees to protect its employees, equipment and users of the highway at all times in accordance with the current Division of Highways manual "Traffic Control For Street and Highway Construction and Maintenance Operations"
5. APPLICANT agrees to comply with all applicable state and federal laws in the performance of work under this permit.
6. Supplementary conditions cited on the reverse side of this permit are understood and agreed to be a part hereof.
7. The work authorized under this permit shall be completed on or before (Date): October 16, 2013

Applicant's signature on this permit affirms that all text herein is a verbatim reproduction of The West Virginia Division of Highways Encroachment Permit Form MM-109, revision date May 19, 2005. All attachments are inclusive to this permit.

RECOMMENDED:

[Signature]
Title H&E

C. Victor Moyes, Agri
Signature and Title of Applicant

BOND REQUIREMENT:

BOND NO. 019033559 DATE 08/15/11

Attached On File
INSPECTION: Owner/Consultant
Full Time Part Time
Periodic Reimbursable No Cost

APPROVED

Original Signed By
Greg Phillips
Title District Manager
West Virginia Division of Highways

AUTHORIZATION NO: _____

PERMIT NO: 04-12-0998

CHAPTER 17 WEST VIRGINIA CODE, 1931

§17-4-8. Use of roadbed by railroad, telephone company, etc.

No railroad or electric or other railway shall be constructed upon the roadbed of any state road, except to cross the same, nor shall any person, firm or corporation enter upon or construct any works in or upon such road, or lay or maintain thereon or thereunder any drainage, sewer or water pipes, gas pipes, electric conduits or other pipes, nor shall any telephone, telegraph or electric line or power pole, or any other structure whatsoever, be erected upon, in or over any portion of a state road, except under such restrictions, conditions and regulations as may be prescribed by the state road commissioner. Whenever any railroad or electric or other railway, heretofore or hereafter constructed, shall cross any state road, it shall be required to keep its own roadbed, and the bed of the road or highway at such crossing, in proper repair, or else to construct and maintain an overhead or undergrade crossing, subject to the approval of the state road commissioner; and the tracks of such railroad or railway at grade crossings shall be so constructed as to give a safe and easy approach to and across the same, and when the construction of such approaches is made necessary by a change in the railroad grade at the grade crossing, the cost shall be upon the railway company.

§17-16-6. Permit by commission or county court for openings in or structures on public roads; franchises and easements of oil, etc., transportation companies.

No opening shall be made in any state or county-district road or highway, nor shall any structure be placed therein or thereover, nor shall any structure, which has been so placed, be changed or removed, except in accordance with a permit from the state road commission or county court, as the case may be. No road or highway shall be dug up for laying or placing pipes, sewers, poles or wires, or for other purposes, and no trees shall be planted or removed or obstructions placed thereon, without the written permit of the commission or county court, or its duly authorized agent, and then only in accordance with the regulations of the commission or court. The work shall be done under the supervision and to the satisfaction of the commission or court; and the entire expense of replacing the highway in as good condition as before shall be paid by the persons to whom the permit was given, or by whom the work was done: **Provided, however,** That nothing herein contained shall be so construed as to prevent any oil or gas company or person having a proper permit or franchise from transporting oil or gasoline along any of the public highways of this State, nor to give such company a franchise without paying to the landowners through whose lands such road passes the usual and customary compensation paid or to be paid to the landowners for such right of way. Any grant or franchise when made shall be construed to give to such company or person only the right to use the easement in such public road.

A violation of any provision of this section shall be a misdemeanor, and the person or corporation violating the same shall, upon conviction thereof, be fined not less than twenty-five nor more than one hundred dollars for each offense.

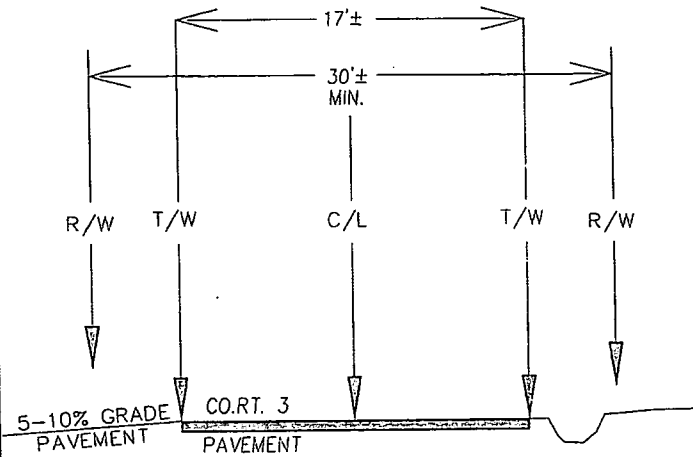
§17-16-9. Private driveways or approaches to roads; obstruction of ditches.

The owner or tenant of land fronting on any state road shall construct and keep in repair all approaches or driveways to and from the same, under the direction of the state road commission, and, likewise, the owner or tenant of land fronting on any county-district road shall construct and keep in repair approaches or driveways to and from the same, under the direction of the county road engineer, and it shall be unlawful for such owner or tenant to fill up any ditch, or place any material of any kind or character in any ditch, so as in any manner to obstruct or interfere with the purposes for which it was made.

SUPPLEMENTARY CONDITIONS

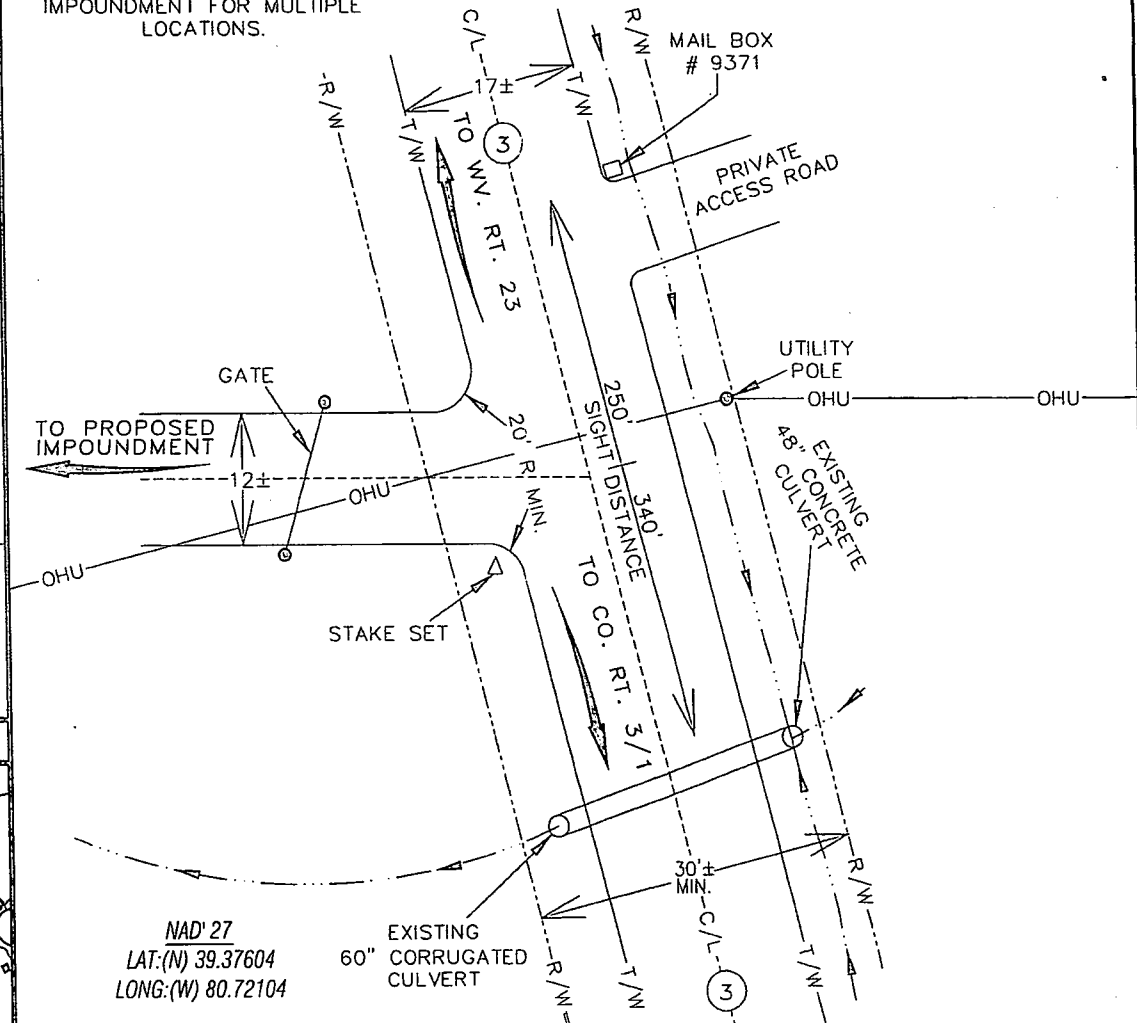
1. The person, firm or corporation to whom a permit is issued agrees to hold the State of West Virginia and DIVISION harmless on account of any damages to persons or property which may arise during the process of the work authorized by this permit or by reason thereof.
2. Applications for permission to perform work within highway rights of way shall be made on DIVISION'S standard permit form and shall be signed by the authorized representative of the person, firm or corporation applying.
3. The APPLICANT shall give detailed information concerning the work to be performed and the application must include a sketch sufficient to show the nature of the work performed.
4. APPLICANT, his agents, successor, heirs or assigns, contractors or any other person, firm or corporation working under APPLICANT'S real or apparent authority, shall perform the work in a manner satisfactory to DIVISION. Damage to the road resulting at any time from work authorized under this permit shall be repaired by APPLICANT. Unsatisfactory repairs may be corrected by DIVISION or its authorized agent and the cost thereof paid by APPLICANT.
5. DIVISION assumes no liability for damage to the proposed work by reason of construction or maintenance work on the road.
6. This permit is granted subject to removal of the authorized installation by APPLICANT at no cost to DIVISION when required for improvement of the road, and subject to all regulations now or hereafter adopted by DIVISION.
7. Utility installation shall be in accordance with the current manual, "Accommodation of Utilities on Highway Right of Way"
8. Driveways shall be in accordance with the current manual, "Rules and Regulations for Constructing Driveways on State Highway Rights-of-Way."
9. DIVISION reserves the right to cancel this permit at any time, should APPLICANT fail to comply with the terms and conditions under which it is granted.
10. This permit is granted only insofar as the DIVISION has a right to do so.

APPROACH PROFILE (VIEW NORTH)



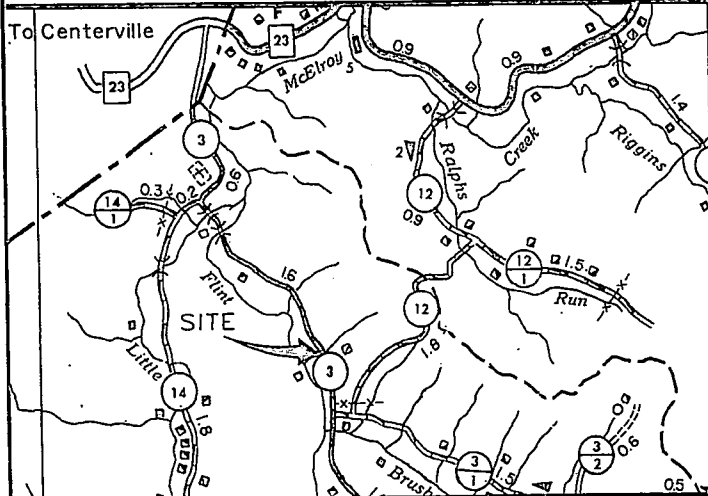
NOTE: THIS IS A CENTRALIZED IMPOUNDMENT FOR MULTIPLE LOCATIONS.

PLAN VIEW



NAD'27
LAT:(N) 39.37604
LONG:(W) 80.72104

VICINITY MAP SCALE: 1-INCH = 1-MILE



NOTES

ALL SPECIFICATIONS AS SET FORTH IN THE MANUAL ON RULES AND REGULATIONS FOR CONSTRUCTING DRIVEWAYS ON STATE HIGHWAY RIGHTS OF WAY WILL BE OBSERVED.
DRAWINGS NOT TO SCALE.

ACCESS ROAD WAS FLAGGED IN PINK & WHITE MARKING RIBBON WITH WELL AND COMPANY NAME IDENTIFIED.
APPLY 100 FEET OF 8-INCH COMPACTED STONE ON AREA.

LEGEND

CENTERLINE OF ROAD C/L
RIGHT-OF-WAY R/W
TRAVELED WAY TW
DRAIN/STREAM

PREPARED FOR:

EQT PRODUCTION COMPANY
115 PROFESSIONAL PLACE
P.O. BOX 280
BRIDGEPORT, WV 26330

CADD FILE

783BRDAP

K.D.W. 10/05/12

FIELD REVIEW

J.A.S

WELL NUMBERS

GESSLER IMPOUNDMENT

DATE

10/03/12

PLAT OF PROPOSED ROAD APPROACH.

LOCATED ON CO. RT. 3 AT 0.32± MILES NORTH OF JUNCTION CO. RT. 3/1 IN GRANT DISTRICT DODDRIDGE COUNTY, WEST VIRGINIA.

PREPARED BY

SMITH LAND SURVEYING, INC.
P.O. BOX 150 GLENVILLE, WV. 26351
PH: (304) 462-5634 FAX: (304) 462-5656 E-MAIL: sls@slssurveys.com



04-12-0998
SLS 3 MP 1.828
Gessler Cent. Impoundment
EQT Production
-80.72104, 39.37604



3

12

BIG HORN RD

ROBINSON HOLLOW RD

ASSURANCE OF COMPLIANCE WITH THE DEPARTMENT OF COMMERCE
REGULATIONS UNDER TITLE VI OF THE
CIVIL RIGHTS ACT OF 1964

As a condition to the approval of a permit to enter upon West Virginia Division of Highways' right of way, the permittee agrees to the following:

- (1) The permittee, for himself, his heirs, personal representatives successors in interest, and assigns, as a part of the consideration hereof, does hereby agree that in the event facilities are constructed, maintained, or otherwise operated, for the accommodation of the traveling public or business users on any federal-aid highway, such as eating, sleeping, rest, recreation, and vehicles services, he will not discriminate on the ground of race, color, or national origin against such traveling public or highway users in their access to and use of the facilities and services so constructed, maintained, or otherwise operated, and that the permittee shall maintain and operate such facilities and services in compliance with all other requirements imposed pursuant to Title 15, Code of Federal Regulations, Commerce and Foreign Trade Subtitle A, Office of the Secretary of Commerce, Part 8 (15 C.F.R., Part 8) and as said regulations may be amended.
- (2) That in the event of breach of any of the above non-discrimination covenants in Paragraph 1, the Department of Highways shall have the right to terminate the permit as if said permit had never been paid or issued.
- (3) The permittee, for himself, his personal representatives, successors in interest and assigns, as part of the consideration hereof, does hereby agree that, (1) No person, on the ground of race, color, or national origin shall be excluded from participation in, and be denied the benefits of, or otherwise subjected to discrimination and the use of said facilities. (2) That in connection with the construction of any improvements of said land and the furnishing of services thereon, no discrimination shall be practiced in the selection of employees and contractors, by contractors in the selection and retention of first tier subcontractors, and by first tier subcontractors. (3) That such discrimination shall not be practiced against the public in their access to and use of the facilities and services provided for public accommodations such as eating, sleeping, rest, recreation, and the vehicle servicing constructed and operated on, over, or under the space of the right of way. (4) That the permittee shall use the premises in compliance with all other requirements imposed pursuant to Title 15, Code of Federal Regulations. Commerce and Foreign Trade, Subtitle A, Office of the Secretary of Commerce, Part 8 (15) C.F.R., (Part 3), and as said regulations may be amended.
- (4) That in the event of any of the above non-discrimination covenants the West Virginia Division of Highways of West Virginia shall have the right to terminate the permit as if the same had never been made or issued.

Minimum Requirements for Approaches

Drainage—All driveway and buffer areas must be constructed so as not to impair drainage within the highway right of way nor alter the stability of the roadway subgrade and at the same time not impair or materially alter drainage of the adjacent areas. All culverts, catch basins, drainage channels, pipes and other drainage structures required within the buffered area and under the driveways as a result of the property to be developed shall be installed in accordance with standards to the West Virginia Department of Highways.

West Virginia Department of Highways may require a drop-inlet for the full width of the driveway depending on the grade and amount of water (shut flow) which would flow onto the highway. Water shall not be discharged across sidewalks or allowed to drain from steep approaches onto the highway pavement.

Alignment & Profile—The constructed driveway slope shall conform with the slope of the existing adjacent shoulder slopes and shall be carried for the full width of the shoulder. As a rule, the following driveway slopes are standard:

- (a) For shoulders of compacted aggregate material— $3/4$ " per foot.
- (b) For paved shoulders— $1/2$ " per foot.

Where curbs are used along the roadway and sidewalks are provided or contemplated, the gradient of the driveway usually should fit in the plane of the sidewalk. If the difference in elevation of the gutter and the sidewalk is such that this is not practical, then the sidewalk should be lowered to provide a suitable gradient for the driveway, in such cases the surface of the sidewalk should be sloped gently from either side of the driveway. Vertical curves on driveways should be flat enough to prevent dragging on central or overhand portions of passenger vehicles.

Surfacing—Driveways should be appropriately surfaced or stabilized between the travelway and the service area.

Commercial—When the travel is paved all driveways classed as commercial must be paved. Pavement for driveway approaches shall be equal to or better than either of the following:

- (a) 6 inches of bituminous concrete on 12 inches of compacted gravel or stone.
- (b) 8 inches of concrete on 6 inches of compacted stone.

Prior to placing of surface the County Supervisor must inspect the base of grade, drainage, and stability. Residential and far—driveways to residences or farms need not be surfaced although 6 inches of compacted stone or gravel and/or pavement is highly desirable and recommended.

Heavy Equipment—Where trucks will be hauling logs, coal, heavy equipment, mining, or drilling equipment, etc. the approaches shall be surfaced with at least eight inches of compacted gravel or stone for a distance to prevent the dragging of mud and debris onto the roadway.

Placing of Stone—The stone shall be placed and shaped on the prepared surface in layers to achieve the desired compacted thickness. When more than one layer is required each lay shall be shaped and compacted to the required density (not less than 95 percent of the maximum density obtainable) before the succeeding layer is placed. West Virginia Department of Highways may conduct a compaction test on any approach being constructed.

Setback—Rural and urban pump islands or other installations with parking parallel to the right of way line must be 12 feet outside the right of way line.

Parking—Each roadside business establishment must provide sufficient parking or storage spaces off the right of way to prevent the storage of vehicles on the driveway or the backing up of traffic on the travelway.

Signing—All advertising signs in conjunction with the roadside establishment must be placed outside the highway right of way, and shall comply, where required, with West Virginia laws regulating outdoor advertising.

Lighting—The lighting of the roadside establishment at night shall be concentrated on the service area itself and light beams shall not be directed toward the eyes of approaching drivers on the highway. All lighting equipment for the roadside establishment should be located off the highway right of way and shall not extend over the right of way.



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

REPLY TO
ATTENTION OF

MAY 09 2013

Regulatory Division
Energy Resource Branch
LRH-2013-00130-OHR-UnTrib Flint Run

Ms. Megan Landfried
EQT Production Company
115 Professional Place
Post Office Box 280
Bridgeport, West Virginia 26330

Dear Ms. Landfried:

I refer to the information submitted on your behalf by Potesta & Associates, Incorporated regarding the proposed Gessler Centralized Freshwater Impoundment. The proposed project would include the construction of a centralized freshwater impoundment and access road. The proposed impoundment would be utilized for hydraulic fracturing at multiple proposed gas wells in the vicinity of the project. The proposed impoundment would be located west of Big Flint Road (County Road 3), approximately 1.96 miles southeast of Little Pittsburgh, in Doddridge County, West Virginia (39.3735N, 80.7211W). You have indicated the proposed impoundment would be temporary and would be in use for approximately three years. After that time, the impoundment would be removed and the area would be restored to its original contours. Implementation of the proposal would include the discharge of fill material into 0.02 acres of one wetland, Wetland No.1.

The proposed project would also include upgrades to an existing roadway. Roadway upgrades would include the replacement of an existing culvert. The proposed culvert replacement would result in the discharge of fill material onto 90 linear feet of one ephemeral stream, UNT 3.

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

You have requested we provide a preliminary jurisdictional determination (PJD) for the aquatic resources that would be affected by the proposed project. Based on a review of the information provided and other information available to us, this office has determined Wetland No. 1 and UNT 3 may be jurisdictional waters of the United States. This determination has been made in accordance with the Regulatory Guidance Letter for Jurisdictional Determinations

issued by the U.S. Army Corps of Engineers on June 26, 2008 (RGL No. 08-02). As indicated in the guidance, this PJD is non-binding and cannot be appealed (33 C.F.R. 331.2) and only provides a written indication that waters of the U.S., including wetlands, may be present on-site.

You have declined to exercise the option to obtain an approved JD in this instance and at this time. For the purposes of the determination of impacts, compensatory mitigation, and other resource protection measures for activities that require authorization from this office, the stream and wetland described in the attached PJD will be evaluated as if they are waters of the United States.

Attached please find two copies of the PJD. If you agree with the findings of this PJD and understand your options regarding the same, please sign and date one copy of the form and return it to this office within 30 days of receipt of this letter. You should submit the signed copy to the following address:

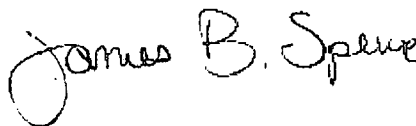
Ms. Susan Fields (LRH-2013-00130-OHR-UnTrib Flint Run)
U.S. Army Corps of Engineers, Huntington District
502 8th Street
Huntington, West Virginia 25701

I also refer to the pre-construction notification you have submitted for the proposed project. You have requested authorization from the Department of the Army to discharge fill material into 0.02 acres of Wetland No. 1 and 90 linear feet of UNT 3. Based on the submitted information, it has been determined the proposed discharge of fill material meets the criteria for authorization under Nationwide Permit Number (NWP) #39 (attached) under the February 21, 2012 Federal Register, Notice of Reissuance of Nationwide Permits (77 FR 10184) provided you comply with all terms and conditions of the enclosed material. A copy of this NWP can be found on our website at <http://www.lrh.usace.army.mil/Missions/Regulatory.aspx>.

Please be aware this nationwide permit authorization does not obviate the requirement to obtain other Federal, state or local authorizations required by law. A copy of this NWP and verification letter must be supplied to your project engineer responsible for construction activities. A copy of the verification letter must be kept at the site during construction. Upon completion of the work, the attached certification must be signed and returned to this office.

If you have any questions concerning the above, please contact Mrs. Susan A. Porter at (304) 399-5610 or by email at Susan.A.Porter@usace.army.mil.

Sincerely,



James B. Spence
Regulatory Project Manager
Energy Resource Branch

Enclosures

SPILL PREPAREDNESS, PREVENTION, AND COUNTERMEASURES PLAN FOR CONSTRUCTION ACTIVITIES

1.1 SPILL PREVENTION METHODS

Construction activities related to natural gas pipelines, well pads, impoundments, and aboveground facilities sometimes require storage of hazardous and non-hazardous products and wastes. All efforts will be made to prevent spills of any amount of these products. The scope of this plan is intended to cover activities related to construction of aboveground facilities, associated pipelines and appurtenances. The following items will be followed to help avoid spills and minimize the impact of spills that accidentally occur:

- All employees handling fuels and other hazardous materials will be properly trained. All equipment is in good operating order and inspected on a regular basis.
- Fuel trucks transporting fuel to on-site equipment travel only on approved access roads; Concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use.
- Bulk quantities of both diesel fuel and gasoline may be stored at the work area in aboveground tanks, which will be diked or be of double-wall secondary containment design, or smaller containers. No underground tanks will be used. A Material Safety Data Sheet for each hazardous material will be on site.
- Fuel will be stored at the equipment staging area within secondary containment and as much as practical all equipment will be refueled there. Any equipment that must be refueled in the field will be fueled from tanks carried to the work area and returned to secondary containment when refueling is complete.
- Lesser quantities of fuel and solvents and lubricants (i.e., motor oils, hydraulic fluid) may be stored at the work area as necessary to service equipment provided that this storage does not conflict with other parts of this plan. Secondary containment will be provided for these storage areas.
- All fuel storage areas will be located at least 200 feet from active private water wells, and at least 400 feet from municipal water wells. Equipment servicing, lubricating, and refueling will also be in accordance with these requirements whenever possible.
- Use of hazardous materials for vehicle maintenance will follow the same requirements mentioned above for equipment refueling. Impervious or sorbent materials will be placed under the work area before the work begins. Additional sorbent materials will also be readily available. Waste materials created during maintenance (i.e., used oil) will be collected for proper disposal. The work site and the vehicle will be inspected after the maintenance work is complete to ensure that all hazardous materials are properly contained. All waste material, including partially used or empty containers, discarded parts, dirty rags, and used sorbent material, as well as discarded hazardous materials containers (i.e., oil cans, grease tubes) will be collected and placed in open-top drums for proper disposal.

- All motor fuel, lube oil, chemicals, and other polluting substances will be tightly sealed and clearly labeled during transportation and storage.
- Fuel trucks, pumps, mechanics' vehicles, and contractor personnel vehicles will be equipped with spill kits containing absorbent materials approved for petroleum products.
- Runoff resulting from construction equipment washing operations will not be permitted to directly enter any waterbody or wetland area.
- Construction equipment, vehicles, materials, hazardous materials, chemicals, fuels, lubricating oils, and petroleum products will be parked, stored, or serviced 100 feet from all waterbodies and wetlands when not in use and when possible.

1.2 MITIGATION AND CLEANUP METHODS

In the event of a spill, the following will occur:

- the source will be immediately stopped;
- the spill will be contained by placing sorbent booms or constructing dikes;
- the spill will be collected with sorbent materials, skimmed off water surfaces with booms, and/or the contaminated soil will be excavated; and the waste materials will be properly disposed in accordance with EQT's policy and agency-approved facilities, as required;
- after completing cleanup as coordinated with the necessary contacts, the affected areas will be restored as close as possible to their previous conditions.

1.3 NOTIFICATION

Any spill must be reported immediately to one of the following EQT employees, who will then report the spill to the spill hotline:

Name	Office (7 am-5 pm; M-F)	Evenings and Weekends
Eileen Leach	(304) 848-0023	(412) 260-1645
David Guidas	(412) 553-5960	(412) 215-1445
Megan Landfried	(304) 848-0023	(304) 841-2086

For spills in West Virginia:

- In the event of an emergency, a spill or an accidental discharge, an EQT employee listed above should call immediately : **800.642.3074**

For all spills:

The following information will be provided to the applicable spill reporting hotline:

- Latitude and longitude of spill - degrees/minutes/seconds format is preferred
- Description of where the spill occurred – district and county, nearest roadway intersection
- Time the spill was first identified

- The amount of the spill
- The name of the affected water resource if known (if applicable)
- Description of containment measures and cleanup measures

1.4 STATE AND FEDERAL AGENCY CONTACT INFORMATION

West Virginia

- WVDEP Central Office (Charleston): 304.926.0470 or 0495
- WVDEP Report a Spill or Accidental Discharge 800.642.3074 (Available 24 hours a day, seven days per week)
- WVDEP Fairmont Office: 304.368.3960

Doddridge County

- Emergency Management Coordinator: 304.844.7390

Federal

- National Response Center: 800.424.8802

IMPROVEMENT LOCATION PERMIT APPLICATION
DODDRIDGE COUNTY, WEST VIRGINIA

DODDRIDGE COUNTY COMMISSION
WEST UNION, WEST VIRGINIA 26456

PHONE: (304) 873-2631

2013 JUL -3 PM 12:14
FILED
DODDRIDGE COUNTY, WV

A. COVERED ACTIVITIES

This application must be completed and submitted to the Doddridge County Commission if you intend to do one or more of the following activities in Doddridge County, outside of a municipality.

1. Erect or relocate a structure valued at more than \$1,000.00.
2. Alter a building or structure in a way which enlarges the exterior dimensions of the building or structure.
3. Engage in land-altering activities in a flood-prone area.

B. IDENTIFICATION OF PROPERTY OWNER AND BUILDER

1. Property Owner (s)

Name: Shirley L. Gessler Phone: 304-873-2631
Address: HC 67 BOX, WEST UNION, WV 26456

2. Builder or Contractor

Name: EQT PRODUCTION COMPANY Phone: 304-848-0076

C. IDENTIFICATION OF PROPERTY

1. District: GRANT
2. Date/From Whom Property Purchased: 11-7-2009 Eric S. Gessler WB 42 Page 132
3. Land Book Description: PART OF 387 RACT, GRANT
4. Deed Book Reference: DB 282 PAGE 406
5. Tax Map Reference: TAX MAP 2 PARCEL 11
6. Existing Buildings/Uses of Property: THE PORTION BEING APPLIED FOR IS VANCANT LAND

D. IDENTIFICATION OF INTENDED CONSTRUCTION OR LAND USE

1. Briefly describe the intended construction or land use.
2. Sketch on a separate 8 ½ x 11 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 sketch.
4. Estimated cost of building or structure: \$450,000
5. Estimated completion date: AS SOON AS POSSIBLE AFTER RECIEPT OF PERMIT

E. NOTES

1. The information on this application is true and accurate to the knowledge of the applicant.
2. The intended construction or land use identified on this application must be started no later than six (6) months from the date the application is approved.
3. In signing this application, it is understood that the Land Development Coordinator or his representative may inspect the property and/or activities identified on this application.
4. If the intended construction or land use identified on this application required Health Department's approval, evidence of such approval from the County and/or State must be submitted to the Doddridge County Commission in order to complete this application.

PUBLIC SEWAGE YES NO IF NO, SEPTIC TANK PERMIT # N/A

5. Duplicates of this application will be transmitted to:

Doddridge County Assessor's Office

6. The County Commission suggests all applicants call and advise local utility companies of your construction plans in order to avoid damage to underground utility lines.

7. Does your construction or renovation come within the floodplain area?

YES NO

If your answer is yes, you will be required to have an elevation certificate with your application.

F. I (we), the owner(s) of the property on which the intended improvement is to be constructed, hereby insure that this construction and intended use complies with all restrictive covenants applying to the subject real estate. And, I (we) agree, understand and acknowledge that I (we) assume full responsibility for compliance with any such private land use covenants and that a violation thereof may result in legal sanctions by court injunction and damages irrespective of the issuance of this permit by the Doddridge County Commission.

SIGNED: Shirley L. Gessler _____
Property Owner Property Owner

DO NOT WRITE BELOW THIS LINE – FOR OFFICIAL USE ONLY

Completed Application Received: _____

Subdivision Ordinance:

Complies Does Not Comply Not Applicable

Floodplain Management Ordinance:

Complies Does Not Comply Not Applicable

Flood – Prone:

Yes No FIRM Panel No. _____

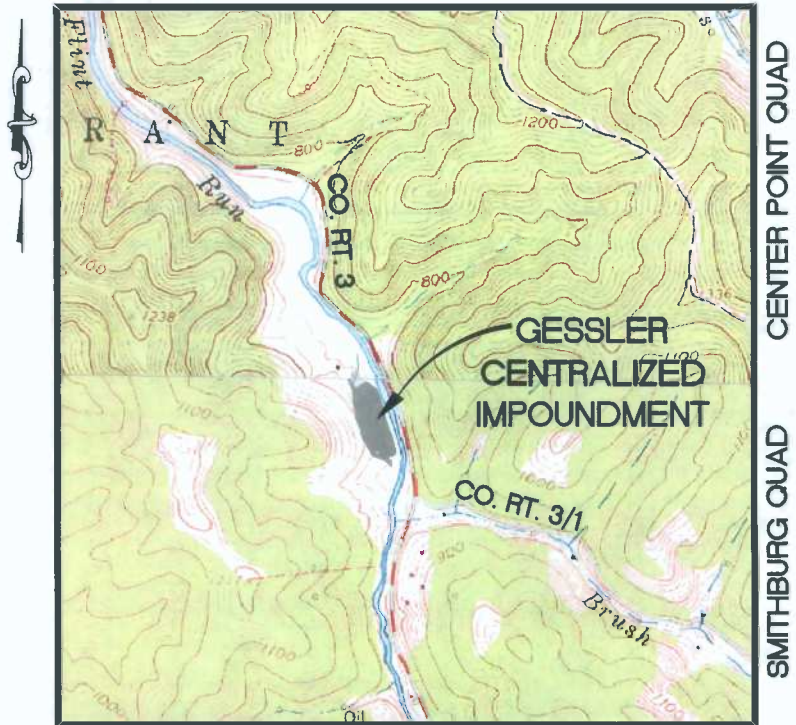
Aerial No. _____

Application Approved. Permit Issued: _____

Permit No. _____ Permit Expires: _____

Signature of Floodplain Manager: _____

**FLOODPLAIN ANALYSIS OF
FLINT RUN
GESSLER CENTRALIZED IMPOUNDMENT**



VICINITY MAP
1" = 2,000'



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

Engineering Survey Environmental GIS

Prepared For:
EQT Production Company
115 Professional Place
P.O. Box 280
Bridgeport, WV 26330

Contact:
Victoria J. Roark
Permitting Supervisor
(304) 848-0076

Designed By:
Navitus Engineering Inc.

Project Manager:
Cyrus Kump, PE
ckump@navituseng.com



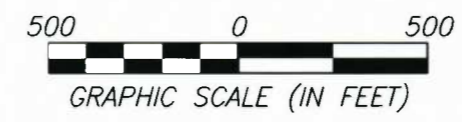
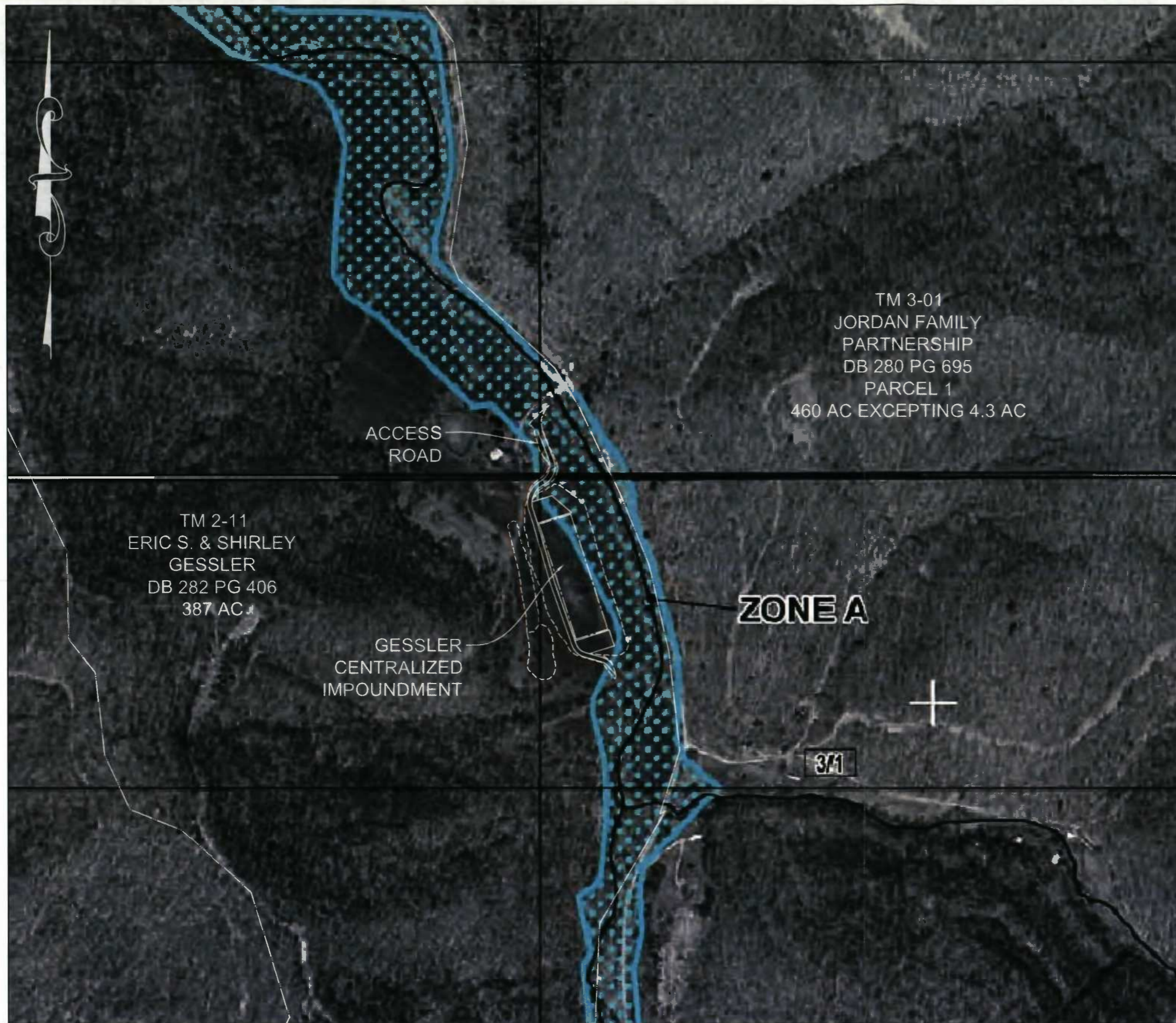
Surface Owner (s)
Eric S. & Shirley Gessler
HC 67 Box 81
West Union, WV 26456

Tax Parcel:
Map 2 Parcel 11
Deed Book 282 Page 406

Location:
Grant District, Doddridge County
West Virginia

Revised: July 12, 2013
Date: November 20, 2012

FN# 7838



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0040C


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

PANEL 40 OF 325
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0040	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
54017C0040C
MAP REVISED
OCTOBER 4, 2011
Federal Emergency Management Agency

PANEL 0130C


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

PANEL 130 OF 325
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0130	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
54017C0130C
MAP REVISED
OCTOBER 4, 2011
Federal Emergency Management Agency

Engineering
Survey
Environmental
GIS

NAVITUS ENGINEERING INC.

151 Wicksy Hill Lane
Winchester VA 22602
Telephone: (888) 662-4185
www.navituseng.com

SLS SMITH LAND SURVEYING, INC.
PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
P.O. Box 100 Street
Greenville, WV 26331
PH: (304) 492-6624
FAX: (304) 492-6666
E-MAIL: sls@slsurveying.com

CYRUS S. KUMP
REGISTERED
19578
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
07/12/2013

THIS DOCUMENT WAS
PREPARED BY:
NAVITUS ENGINEERING INC
FOR: EQT PRODUCTION
COMPANY

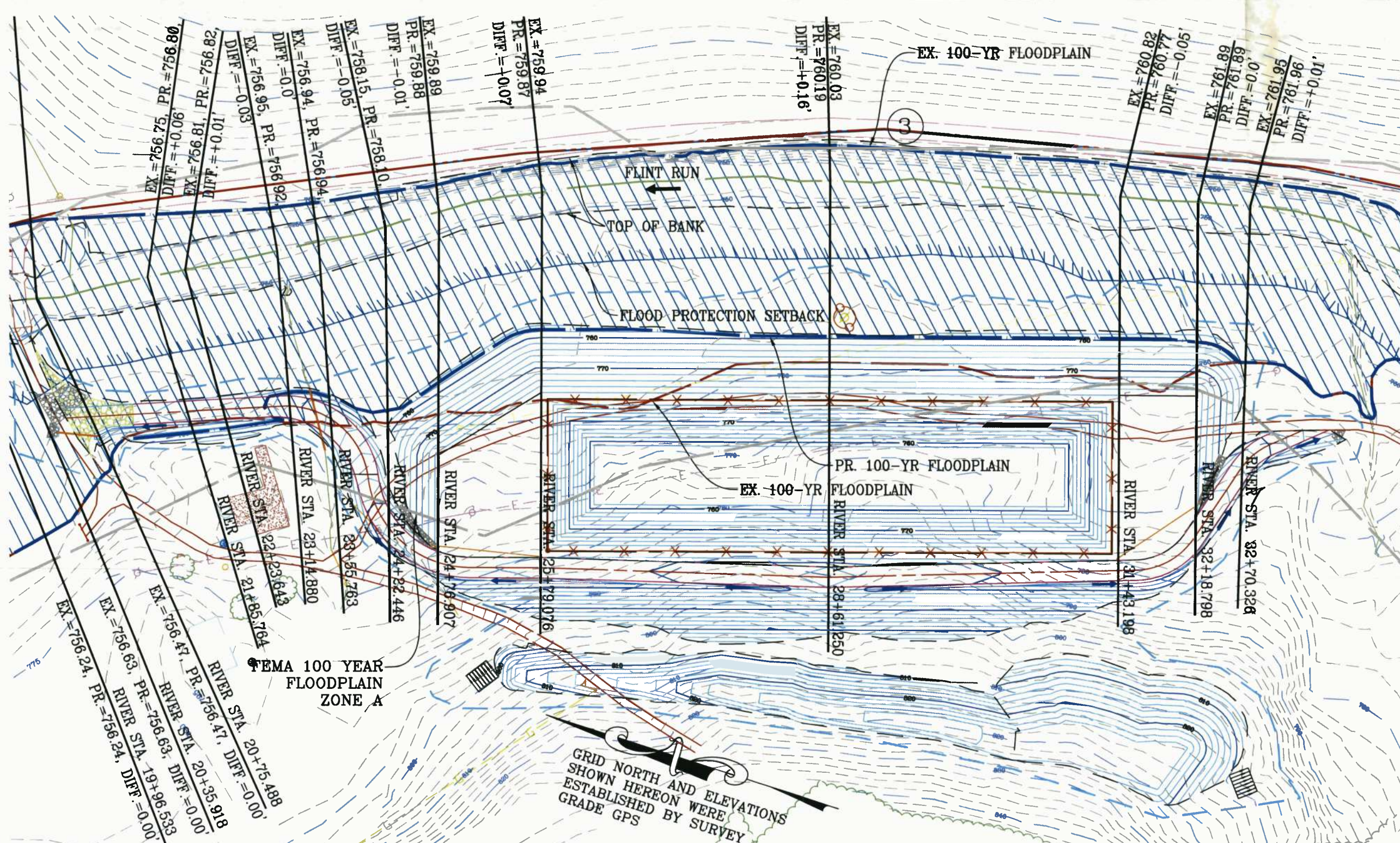
FIRM MAP EXHIBIT

GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

SHEET 1 OF 1

GESSLER
JOB NO. 7838

DATE: 07/12/13
SCALE: 1" = 500'



LEGEND	
	STREAM CENTERLINE
	EXISTING 100-YR FLOODPLAIN
	PROPOSED 100-YR FLOODPLAIN
	FLOOD PROTECTION SETBACK
	100-YR FEMA FLOODPLAIN ZONE A



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

Engineering
Survey
Environmental
GIS

NAVITUS ENGINEERING INC.
151 Windy Hill Lane
Winchester VA, 22602
Telephone: (888) 662-4185
www.navituseng.com

SLS SMITH LAND SURVEYING, INC.
PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
P.O. Box 150
226 W. Main Street
Gerrityville, WV 26031
PH: (304) 482-5634
FAX: (304) 482-5656
E-MAIL: sls@slsurvey.com

CYRUS S. KUMP
REGISTERED
1978
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
07/12/2013

THIS DOCUMENT WAS PREPARED BY:
NAVITUS ENGINEERING INC
FOR: EQT PRODUCTION COMPANY

PROPOSED CONDITIONS PLAN

GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

SHEET 3 OF 3

GESSLER
JOB NO. 7838

DATE: 07/12/2013

SCALE: 1" = 100'



151 Windy Hill Lane
Winchester, Virginia 22602
Telephone: (888) 662-4185

July 12, 2013

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

Attn: Dan Wellings, Doddridge County Floodplain Administrator

Re: Gessler Centralized Impoundment Floodplain Analysis

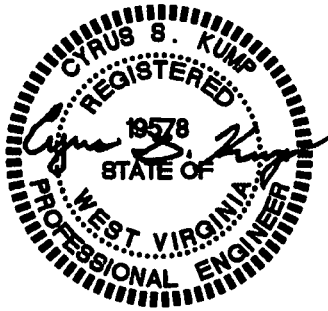
Dear Mr. Wellings:

Navitus Engineering has completed a floodplain analysis of the proposed Gessler Centralized Impoundment site adjacent to Flint Run and located south of Little Pittsburgh, along County Route 3 in Doddridge County, West Virginia. This site is located within a FEMA Flood Zone A, as shown on the Flood Insurance Rate Maps (FIRM) from the National Flood Insurance Program (NFIP), Map Numbers 54017C0040C and 54017C0130C, dated October 4, 2011. Being that the site is located in a Flood Zone A, base flood elevations for this area have not been established and no detailed study information was found in the Flood Insurance Study for Doddridge County, dated October 4, 2011.

In order to establish base flood elevations for this site, a hydrologic and hydraulic analysis was performed as outlined in the current Doddridge County Floodplain Ordinance, enacted May 21st, 2013. Using field shot data, 10-foot interval topography converted from 3 meter West Virginia GIS Technical Center DEM data, and information taken from USGS 7.5 Minute Series Topographic Maps, a drainage analysis was performed for the Flint Run drainage shed. Upon establishing the peak flow drainage calculations for the 100-year storm event, a HEC-RAS river analysis was conducted for a section of Flint Run adjacent to the proposed Gessler Centralized Impoundment development area and Base Flood Elevations (BFE) were established. The resulting BFEs were used to establish adjusted floodplain boundaries for the segment of Flint Run being studied. These boundaries are shown on the attached Floodplain Exhibit of this development site. In addition to establishing BFEs, a proposed conditions analysis was performed to determine the impacts of the proposed impoundment grading. The proposed impoundment grading was added into the cross sections and the manning's "n" values were adjusted. The model was run with these changes to determine the impacts of the proposed impoundment. The results of this analysis indicate that the proposed impoundment will cause a maximum increase in the BFEs at the cross section at river station 2861.250. The existing BFE at this elevation is 760.03 and the proposed BFE is 760.19, for a maximum increase of 0.16'. The increases to the BFE begin at river station 3710.271 and end at river station 2185.764, with no change in BFE before or after these cross sections. All the affected cross sections that show a change in BFE are contained within the developed parcel, therefore no upstream or downstream properties will be impacted.

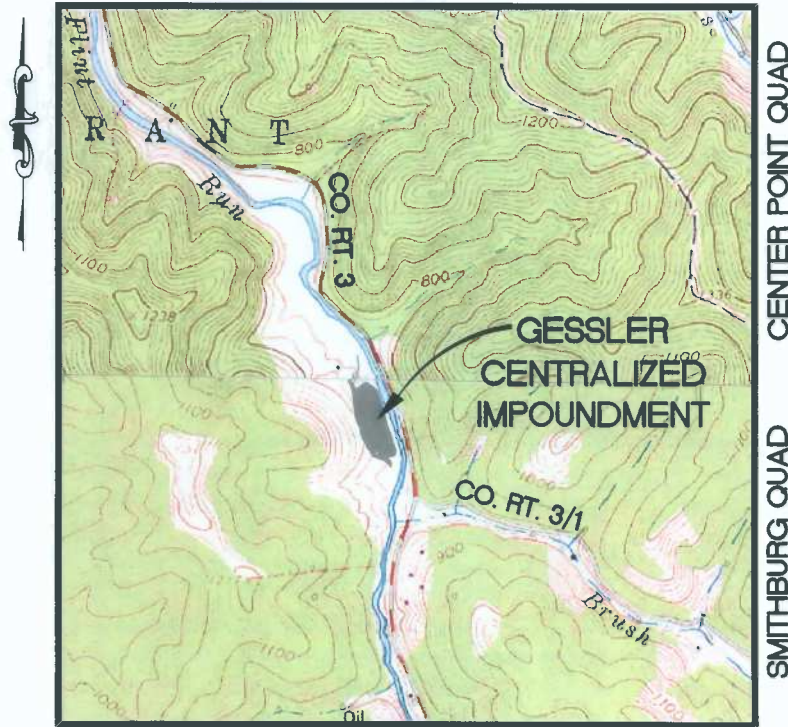
Attached is a report documenting the methods used for the Floodplain Analysis. The report contains drainage computations, cross sections, and a narrative to describe the analysis. Also attached are exhibits that identify the existing and proposed 100-year floodplain. The Gessler Centralized Impoundment site plan, prepared by Navitus Engineering, Inc., includes additional site design and construction specifications. Please let me know if you should need additional information. You can reach me by phone (888) 662-4185 or email: ckump@navituseng.com.

Sincerely,
Navitus Engineering, Inc.



Cyrus S. Kump, PE

**FLOODPLAIN ANALYSIS OF
FLINT RUN
GESSLER CENTRALIZED IMPOUNDMENT**



VICINITY MAP
1" = 2,000'



Engineering Survey Environmental GIS

Prepared For:
EQT Production Company
115 Professional Place
P.O. Box 280
Bridgeport, WV 26330

Contact:
Victoria J. Roark
Permitting Supervisor
(304) 848-0076

Designed By:
Navitus Engineering Inc.

Project Manager:
Cyrus Kump, PE
ckump@navituseng.com



Surface Owner (s)
Eric S. & Shirley Gessler
HC 67 Box 81
West Union, WV 26456

Tax Parcel:
Map 2 Parcel 11
Deed Book 282 Page 406

Location:
Grant District, Doddridge County
West Virginia

Revised: July 12, 2013
Date: November 20, 2012

FN# 7838

1. Objective

The objective of this floodplain analysis was to establish boundaries for the existing and proposed conditions of the 100 year base flood elevations within the proposed centralized impoundment. A 100 year floodplain boundary will be established from these base flood elevations for both conditions.

2. Existing Conditions

2.1. *Property Description*

This site is located in Doddridge County, West Virginia along Flint Run and County Route 3 just south of Little Pittsburgh. The proposed access road entrance is located along County Route 3.

2.2. *Floodplain Delineation*

The approximate limit of the 100-year floodplain (a flood event that has a 1% chance of being equaled or exceeded in any given year) is shown on FEMA Flood Insurance Rate Map (FIRM) for Doddridge County on panels 54017C0040C and 54017C0130C effective October 4, 2011. This floodplain is located in zone designation "A" and no base flood elevations have been established.

2.3. *Floodplain Ordinance*

This site is administered under the Doddridge County Floodplain Ordinance. Per Section 4.4 of the ordinance, when a site is located in Floodplain Zone designation "A" without floodway area no new construction or development shall be allowed unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the elevation of the 100-year flood more than one (1) foot at any point.

Per Section 5.1 of this ordinance, permits are required for the construction of the centralized freshwater impoundment. The format of the permit will coincide with the requirements set forth in Section 5.2 of the ordinance.

Per Section 6.1.E of this ordinance, any fill associated with the project shall be only used in manner which does not affect upstream and downstream properties. The centralized freshwater impoundment has been designed with this in mind. Impacts to the 100 year are minimal with the maximum increase being 0.16' as demonstrated later in this report. The increases to the base flood elevation are isolated to the subject property and do not affect adjacent properties.

Per Section 6.1.I of this ordinance, no material or equipment storage shall be allowed within the base flood elevation. The storage of all material and equipment shall be onsite and outside of the floodplain above the proposed base flood elevation.

Per Section 6.1.K of this ordinance, an existing low water crossing is being used to access the site and all proposed development includes roadside ditches and cross to allow adequate drainage to the existing stream.

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

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

2.4. Flint Run Characteristics

Flint Run is located in the Grant District of Doddridge County and flows in a northern direction. The drainage area flowing to Flint Run is approximately 12,284 acres of forested and agricultural land with an average basin slope of 24.7%.

3. Analysis Information

3.1. HEC-RAS

A HEC-RAS hydraulic analysis was performed for the portion of the Flint Run that has an impact on the BFE's across the property. A portion of Brush Run was also modeled to properly determine the BFEs on site, due to the proximity of the site and the confluence of Flint Run and Brush Run. HEC-RAS is designed to perform one-dimensional hydraulic calculations for a full network of natural and constructed channels. The steady flow system is designed for applications in floodplain management and flood insurance studies.

3.2. Analysis Limits

The analysis information is based upon a combination of two foot interval field shot and five foot interval GIS topography. The upstream analysis limit for Flint Run is located approximately 2,886 feet upstream from the proposed impoundment site and represents the 53+48.412 section. The downstream analysis limit for Flint Run is located approximately 1,460 feet downstream of the proposed impoundment site and represents the 10+00.000 section. The upstream analysis limit for Brush Run is located approximately 1,011 feet upstream from the confluence of Brush Run and Flint Run and represents the 20+11.333 section. The downstream analysis limit for Brush Run is located at the confluence of Brush Run and Flint Run and represents the 40+52.349 section. These limits were selected so that the HEC-RAS model would accurately determine the base flood elevations on site and off site.

3.3. Flow Data

The TR-55 SCS method was used to formulate 100-year peak flow data for Flint Run and Brush Run. The drainage areas were determined using 10-foot interval topography converted from 3 meter West Virginia GIS Technical Center DEM data for the drainage shed. Soils types of the drainage area were found using USDA soil maps. The majority of the drainage areas were determined to have soils mostly in hydrologic soils group C. The time of concentration for the drainage areas were calculated using the SCS lag method. See the table below for a summary of the flow conditions, and see Supplement 1 for the complete Drainage Computations.

Stream	Drainage Area	Flow	Note
Flint Run	11,287.5 Ac.	7,165.3	Upper Reach
Brush Run	996.5 Ac.	1,553.5	
Flint Run	12,284.0 Ac.	7,411.7	Lower Reach

3.4. Cross Section Data

The cross sections were employed at significant changes in site features. This includes major bends in the stream channel, areas of major contraction and expansion of the floodplain area, upstream and downstream of existing culverts, and at building obstructions. Field run 2-foot interval topography was used within the project area to help refine the cross sectional information through the site.

3.5. Manning's n-value

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

Manning's n value	Description	Portion Used
.1	Heavy stand of timber, few down trees, little undergrowth, flow below branches	Floodplains
.035	Clean, straight, full, no rifts or deep pools with more stones and weeds	Main Channel
.035	High grass	Floodplains
.02	Gravel	Gravel Road
.05	Scattered brush, heavy weeds	Floodplains
.04	Mature Field Crops	Floodplains
.03	Short Grass	Impoundment Site Grading

4. Results

4.1. Existing Conditions

Since the site is in Zone "A" floodplain area as shown on the FIRM, the existing condition model was based on existing topography and drainage computations. This information was processed in HEC-RAS to determine the existing conditions of the Base Flood Elevations.

4.2. Proposed Conditions

The proposed conditions model was based on the proposed topography for the centralized impoundment. This information was added into the existing conditions cross sections, and then was processed in HEC-RAS to determine the proposed conditions of the Base Flood Elevations. Below is a table showing the existing and proposed BFEs at the various cross sections. As shown in the table, the proposed development will decrease the existing BFEs at multiple cross sections through the project area.

SUMMARY OF COMPUTED ELEVATIONS				
CROSS SECTION STATION	RIVER NAME	100 YEAR BASE FLOOD ELEVATION		
		EXISTING CONDITIONS MODEL	PROPOSED CONDITIONS MODEL	DIFFERENCE
5348.412	FLINT RUN	767.24	767.24	0.00
4587.709	FLINT RUN	766.04	766.04	0.00
4327.913	FLINT RUN	764.07	764.07	0.00
4052.349	FLINT RUN	764.76	764.76	0.00
3910.912	FLINT RUN	764.81	764.81	0.00
3710.271	FLINT RUN	762.00	762.01	+ 0.01
3270.325	FLINT RUN	761.95	761.96	+ 0.01
3218.798	FLINT RUN	761.89	761.89	0.00
3143.198	FLINT RUN	760.82	760.77	- 0.05
2861.250	FLINT RUN	760.03	760.19	+ 0.16
2579.076	FLINT RUN	759.94	759.87	- 0.07
2476.907	FLINT RUN	759.89	759.88	- 0.01
2422.446	FLINT RUN	758.15	758.10	- 0.05
2355.763	FLINT RUN	756.94	756.94	0.00
2314.880	FLINT RUN	756.95	756.92	- 0.03
2223.643	FLINT RUN	756.81	756.82	+ 0.01
2185.764	FLINT RUN	756.75	756.81	+ 0.06
2075.488	FLINT RUN	756.47	756.47	0.00
2035.918	FLINT RUN	756.63	756.63	0.00
1996.533	FLINT RUN	756.24	756.24	0.00
1720.640	FLINT RUN	754.92	754.92	0.00
1407.321	FLINT RUN	753.75	753.75	0.00
1000.000	FLINT RUN	752.41	752.41	0.00

2011.333	BRUSH RUN	777.24	777.24	0.00
1507.212	BRUSH RUN	768.38	768.38	0.00

5. Conclusion

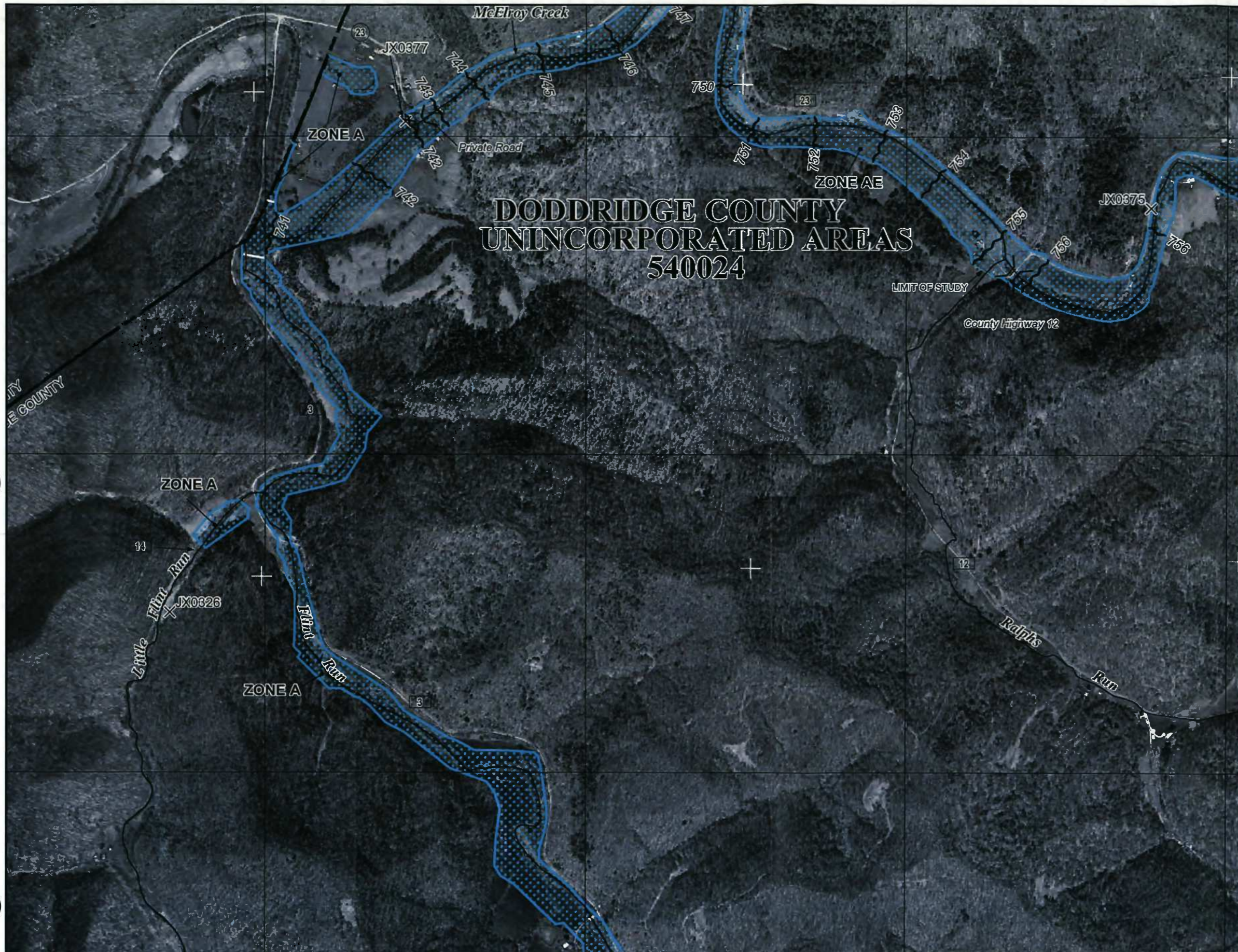
The results of this floodplain analysis indicate that there will be minimal changes in the 100 year base flood elevation and no impacts to upstream and downstream properties along Flint Run. The largest increase in base flood elevation is 0.16' and is located on site.

APPENDIX

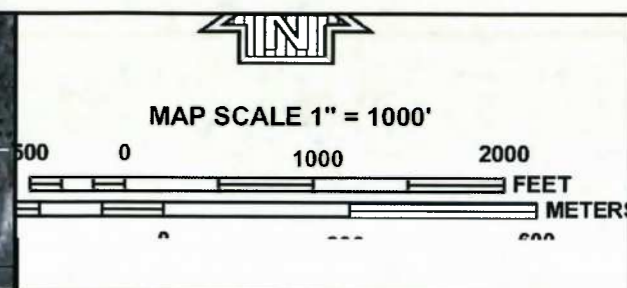
Exhibit A	FIRM Panel 54017C0040C
Exhibit B	FIRM Panel 54017C0130C
Exhibit C	FIRM Map Exhibit
Exhibit D	WV Flood Tool Exhibit
Exhibit E	Overall Plan
Exhibit F	Existing Conditions Plan
Exhibit G	Proposed Conditions Plan
Supplement 1	Drainage Computations
Supplement 2	HEC-RAS Analysis –Existing Conditions Summary w/ Cross Sections
Supplement 3	HEC-RAS Analysis –Proposed Conditions Summary w/ Cross Sections

Exhibit A

FIRM Panel 54017C0040C



**DODDRIDGE COUNTY
UNINCORPORATED AREAS
540024**



NATIONAL FLOOD INSURANCE PROGRAM

NFIP
PANEL 0040C


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

PANEL 40 OF 325
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0040	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.

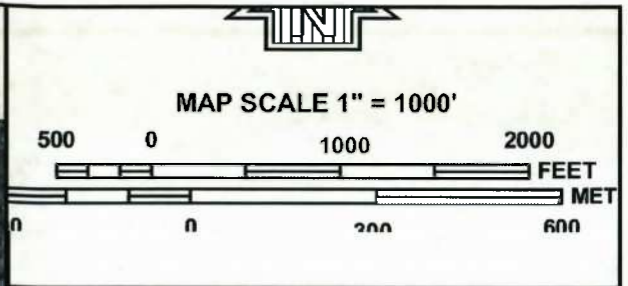
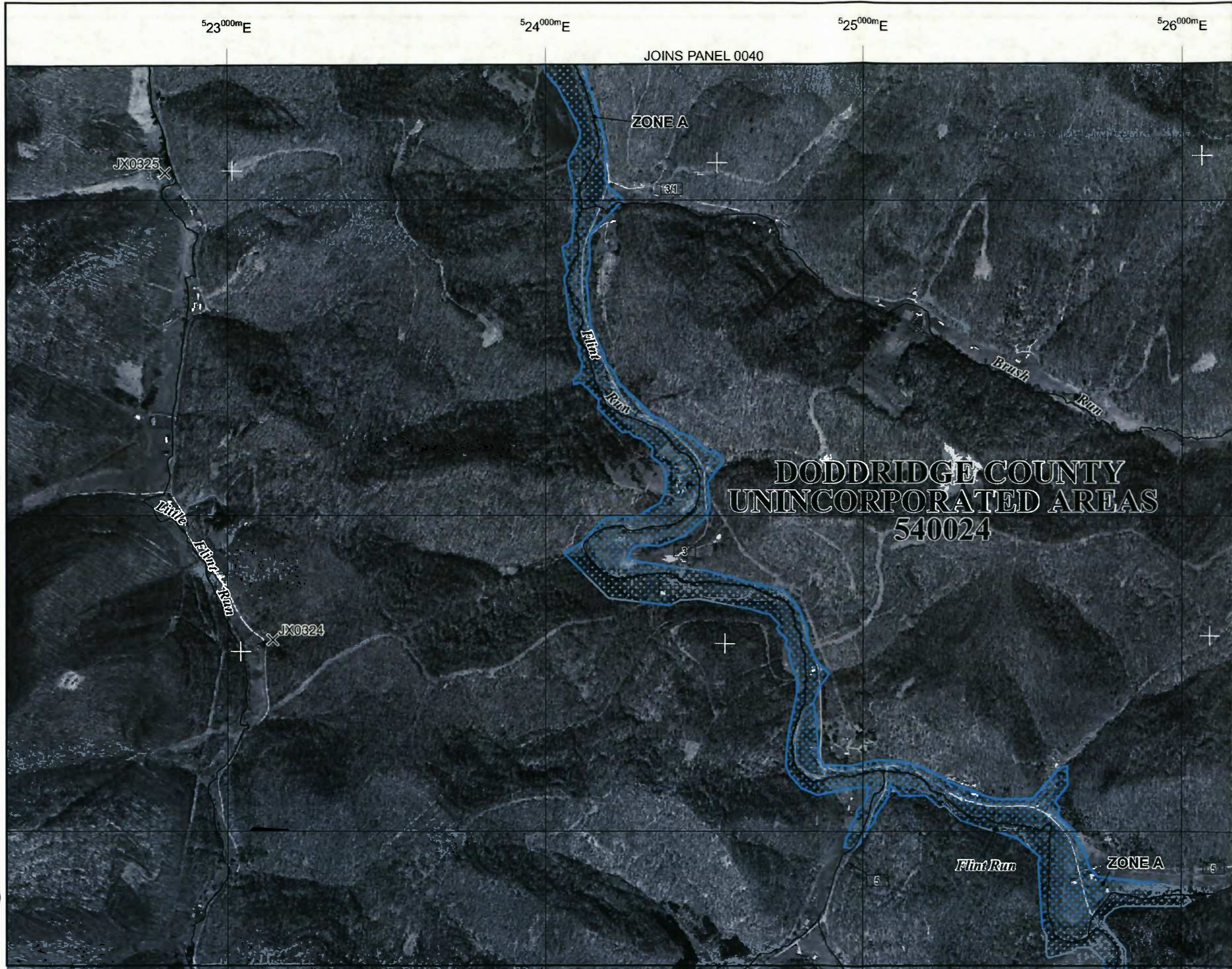

MAP NUMBER
54017C0040C
MAP REVISED
OCTOBER 4, 2011
 Federal Emergency Management Agency

JOINS PANEL 0130

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

Exhibit B

FIRM Panel 54017C0130C



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0130C

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

PANEL 130 OF 325
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0130	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.

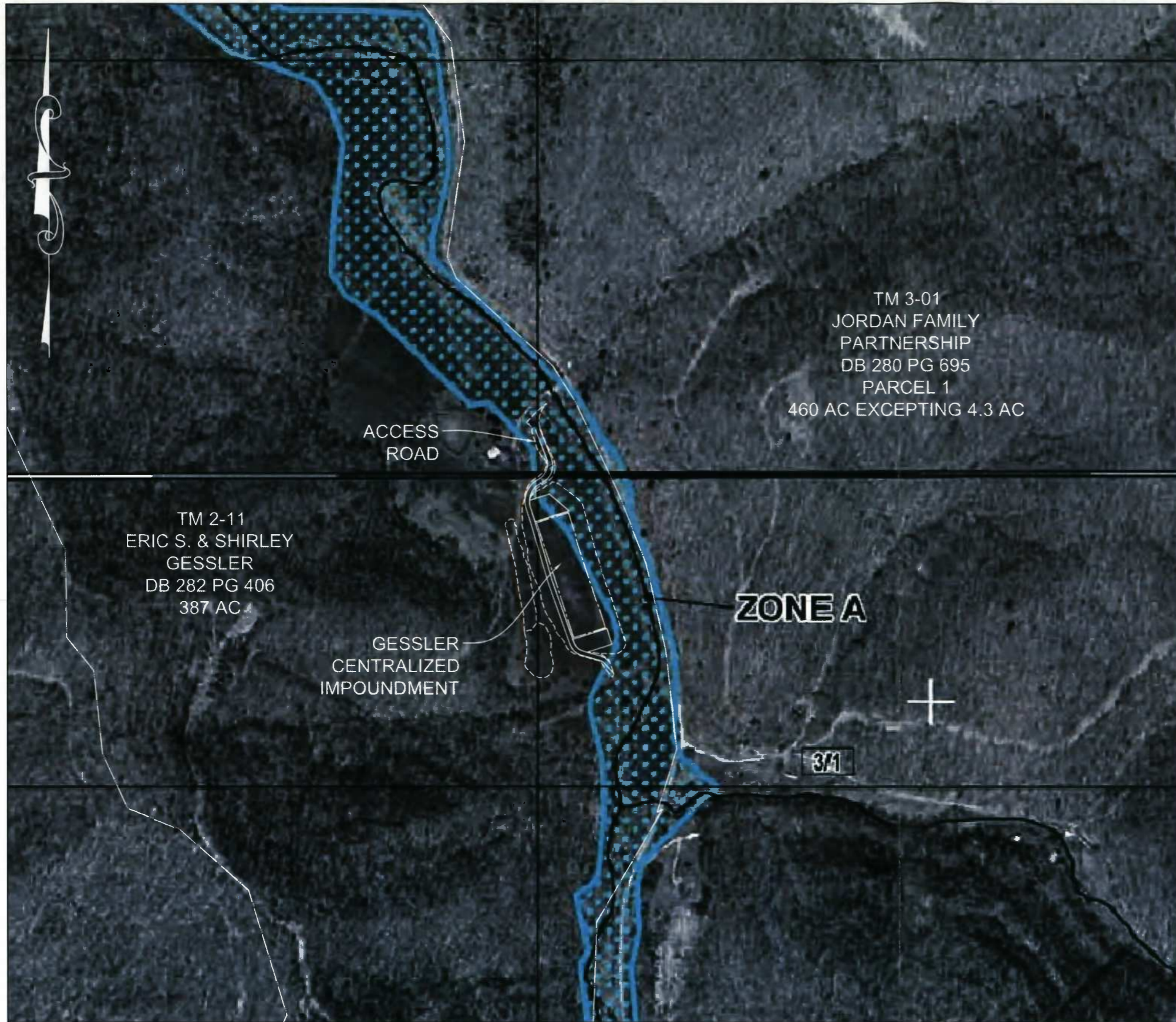


MAP NUMBER
 54017C0130C
 MAP REVISED
 OCTOBER 4, 2011

Federal Emergency Management Agency

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

Exhibit C
FIRM Map Exhibit



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0040C

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

PANEL 40 OF 325
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0040	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.

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAP NUMBER
54017C0040C
MAP REVISED
OCTOBER 4, 2011

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0130C

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

PANEL 130 OF 325
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DODDRIDGE COUNTY	540024	0130	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.

FEDERAL EMERGENCY MANAGEMENT AGENCY

MAP NUMBER
54017C0130C
MAP REVISED
OCTOBER 4, 2011

Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.

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

SLS SMITH LAND SURVEYING, INC.
PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
P.O. Box 150
228 W. Main Street
Martinsburg, WV 26151
PH: (304) 482-8834
FAX: (304) 482-8858
E-MAIL: sls@slsusa.com

CYRUS S. KUMP
REGISTERED
19578
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
07/12/2013

THIS DOCUMENT WAS PREPARED BY:
NAVITUS ENGINEERING INC
FOR: EQT PRODUCTION COMPANY

FIRM MAP EXHIBIT

GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

SHEET 1 OF 1
GESSLER
JOB NO. 7838
DATE: 07/12/13
SCALE: 1" = 500'


Exhibit D
WV Flood Tool Exhibit

Gessler Centralized Impoundment



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

Map Created on 7/11/2013

 Location of the mouse click

 **Flood Hazard Zone**
(1% annual chance floodplain)

User Notes:

Disclaimer:

The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. To obtain more detailed information in areas where Base Flood Elevations have been determined, users are encouraged to consult the latest Flood Profile data contained in the official flood insurance study. These studies are available online at www.msc.fema.gov.

WV Flood Tool is supported by FEMA, WV NFIP Office, and WV GIS Technical Center
(<http://www.MapWV.gov/flood>)

Flood Hazard Area:

Elevation:

Location (long, lat):

Location (UTM 17N):

FEMA Issued Flood Map:

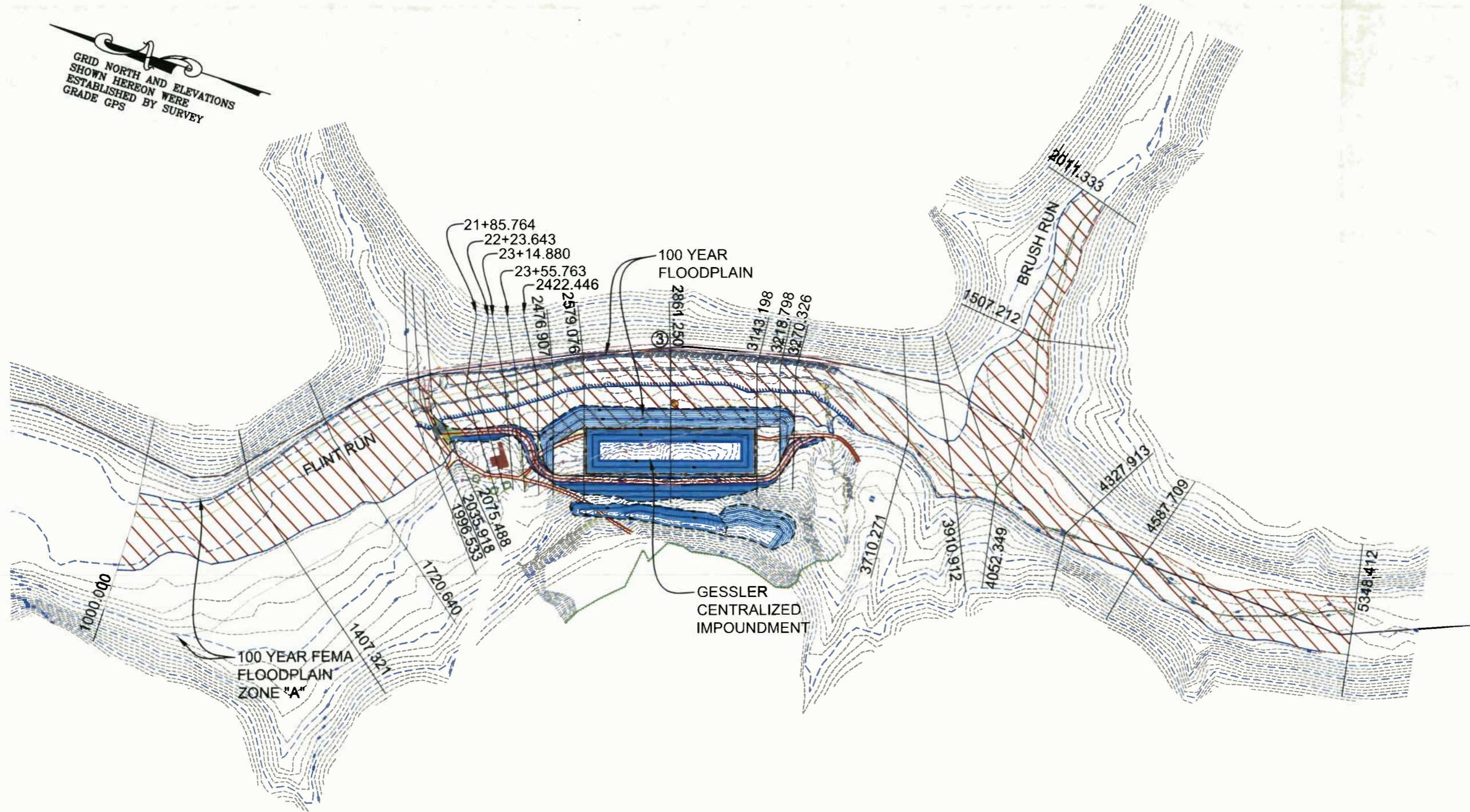
Contacts:

CRS Information:

Parcel Number:

Exhibit E
Overall Plan

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



NAVITUS
ENGINEERING INC.
151 Waddy Hill Lane
Winchester VA, 22602
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Engineering
Survey
Environmental
GIS

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FAX: (304) 482-5858
E-MAIL: sls@slsurveying.com



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FOR: EQT PRODUCTION
COMPANY

OVERALL PLAN
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

SHEET 1 OF 3
GESSLER
JOB NO. 7838
DATE: 07/12/2013
SCALE: 1" = 350'

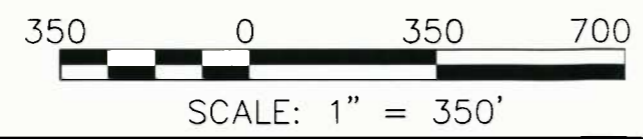
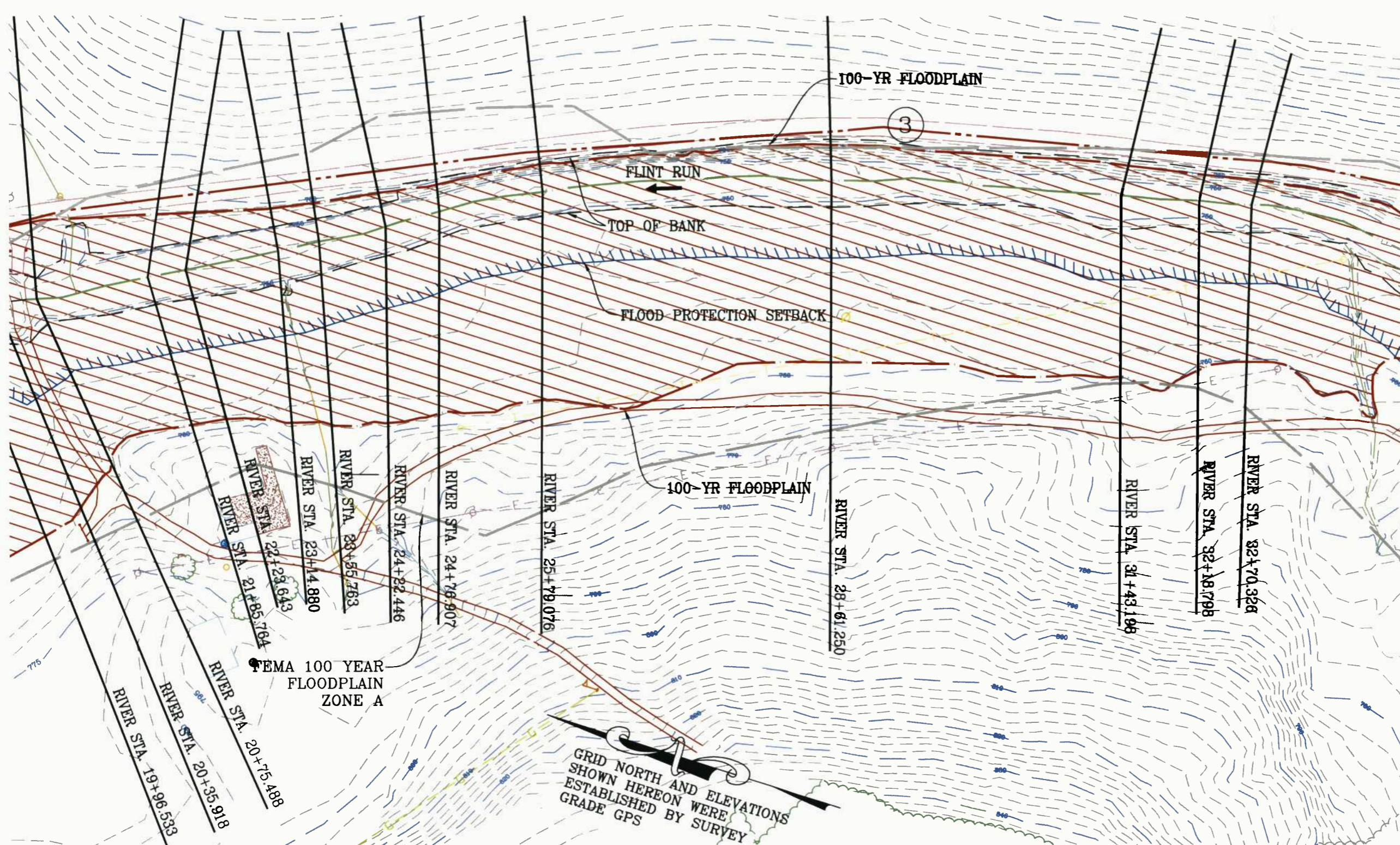
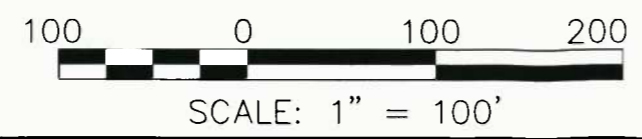


Exhibit F
Existing Conditions Plan



LEGEND	
	STREAM CENTERLINE
	100-YR FLOODPLAIN
	FLOOD PROTECTION SETBACK
	100-YR FEMA FLOODPLAIN ZONE A



GRID NORTH AND ELEVATIONS SHOWN HEREON WERE ESTABLISHED BY SURVEY

Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.
 151 Windy Hill Lane
 Winchester VA, 22602
 Telephone: (888) 662-4185
 www.navituseng.com

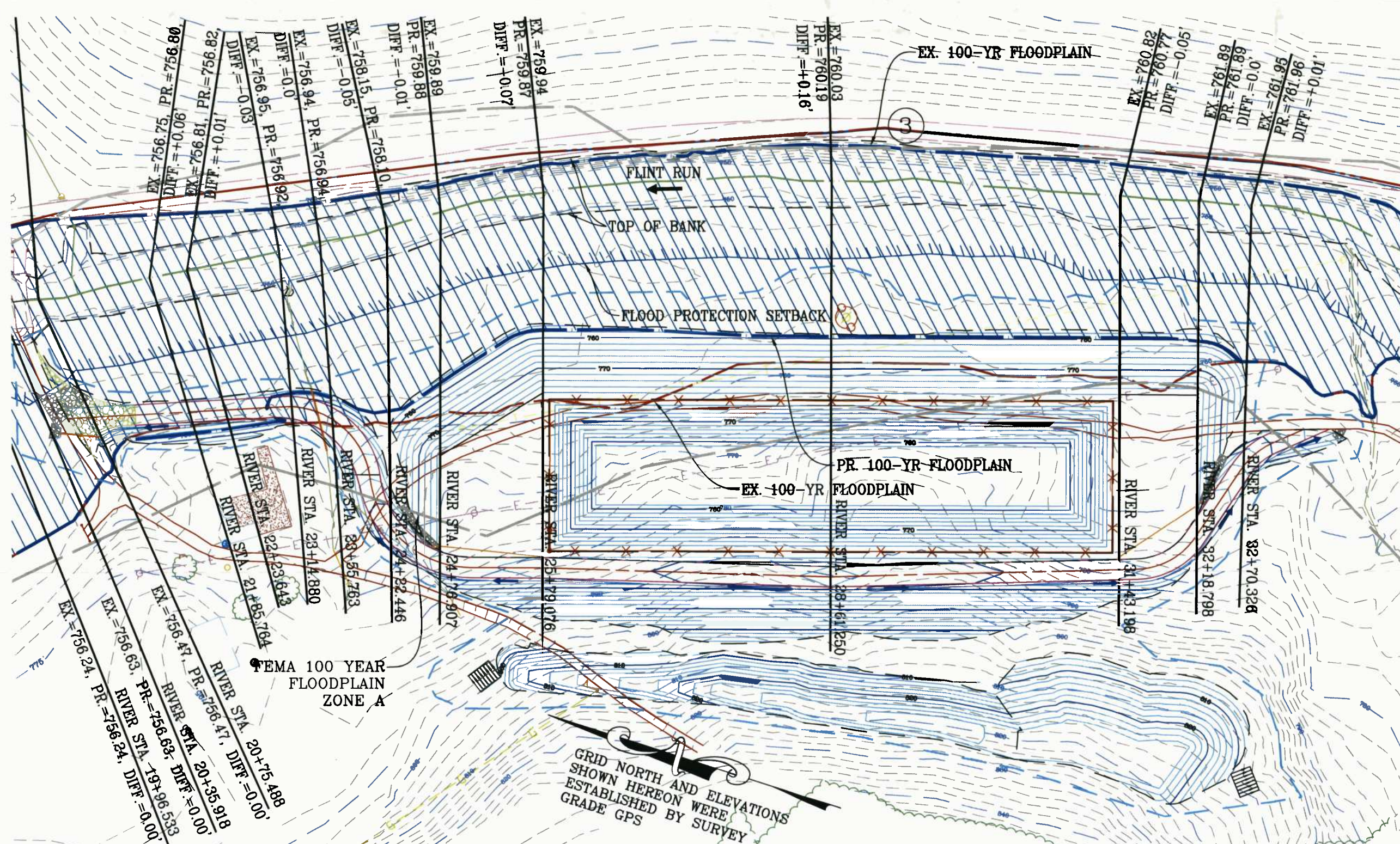
SMITH LAND SURVEYING, INC.
 PROFESSIONAL SURVEYING AND ENVIRONMENTAL SERVICES
 P.O. Box 150 Street
 Genetta, WV 25351
 PH: (304) 482-5834
 FAX: (304) 482-5835
 E-MAIL: sals@slsurvey.com

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 FOR: EQT PRODUCTION COMPANY

EXISTING CONDITIONS PLAN
GESSLER
 CENTRALIZED IMPOUNDMENT
 GRANT DISTRICT
 DODDRIDGE COUNTY, WV

SHEET 2 OF 3
 GESSLER
 JOB NO. 7838
 DATE: 07/12/2013
 SCALE: 1" = 100'

Exhibit G
Proposed Conditions Plan



EX. = 756.75, PR. = 756.80
DIFF. = +0.06'
EX. = 756.81, PR. = 756.82
DIFF. = +0.01'
EX. = 756.94, PR. = 756.92
DIFF. = 0.0'
EX. = 756.95, PR. = 756.92
DIFF. = -0.03'

EX. = 758.15, PR. = 758.10
DIFF. = -0.05'
EX. = 759.89, PR. = 759.88
DIFF. = +0.01'
EX. = 759.94, PR. = 759.87
DIFF. = +0.07'

EX. = 760.03, PR. = 760.19
DIFF. = +0.16'

EX. = 760.82, PR. = 760.77
DIFF. = -0.05'

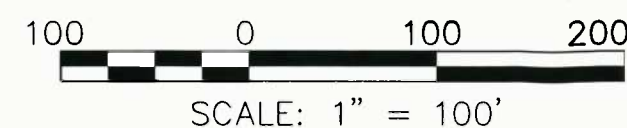
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DIFF. = 0.0'
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DIFF. = +0.01'

EX. = 756.24, PR. = 756.24, DIFF. = 0.00'
EX. = 756.63, PR. = 756.63, DIFF. = 0.00'
EX. = 756.47, PR. = 756.47, DIFF. = 0.00'
RIVER STA. 19+96.533
RIVER STA. 20+35.918
RIVER STA. 20+75.488
RIVER STA. 21+85.784
RIVER STA. 22+23.643
RIVER STA. 23+14.880
RIVER STA. 23+55.763
RIVER STA. 24+22.446
RIVER STA. 24+76.907
RIVER STA. 25+79.076
RIVER STA. 28+61.850
RIVER STA. 31+43.198
RIVER STA. 32+18.798
RIVER STA. 32+70.328

FEMA 100 YEAR FLOODPLAIN ZONE A

GRID NORTH AND ELEVATIONS SHOWN HEREON WERE ESTABLISHED BY SURVEY

LEGEND	
	STREAM CENTERLINE
	EXISTING 100-YR FLOODPLAIN
	PROPOSED 100-YR FLOODPLAIN
	FLOOD PROTECTION SETBACK
	100-YR FEMA FLOODPLAIN ZONE A



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Gerritsville, WV 26031
E-MAIL: sals@slsusa.com

CYRUS S. KUMP
REGISTERED
1958
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
07/12/2013

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NAVITUS ENGINEERING INC
FOR: EQT PRODUCTION COMPANY

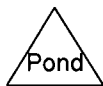
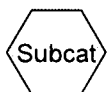
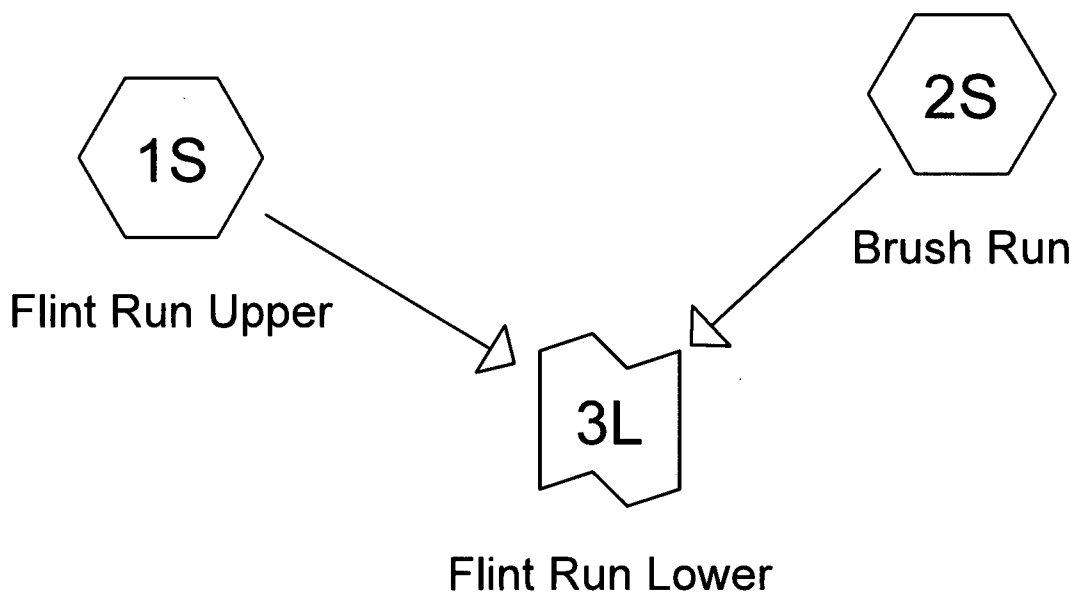
PROPOSED CONDITIONS PLAN

GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

SHEET 3 OF 3

GESSLER
JOB NO. 7838
DATE: 07/12/2013
SCALE: 1" = 100'

Supplement 1
Drainage Computations



Routing Diagram for Gessler
Prepared by Windows User, Printed 10/8/2012
HydroCAD® 10.00 s/n M28119 © 2012 HydroCAD Software Solutions LLC

Gessler

Prepared by Windows User

Printed 10/8/2012

HydroCAD® 10.00 s/n M28119 © 2012 HydroCAD Software Solutions LLC

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12,284.020	73	(1S, 2S)
12,284.020	73	TOTAL AREA

Gessler

Prepared by Windows User

HydroCAD® 10.00 s/n M28119 © 2012 HydroCAD Software Solutions LLC

Flint Run Drainage Computations
Type II 24-hr 100-YR Rainfall=5.39"

Printed 10/8/2012

Page 3

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Flint Run Upper Runoff Area=11,287.500 ac 0.00% Impervious Runoff Depth=2.59"
Flow Length=56,749' Slope=0.3640 '/' Tc=163.8 min CN=73 Runoff=7,165.30 cfs 2,436.375 af

Subcatchment2S: Brush Run Runoff Area=996.520 ac 0.00% Impervious Runoff Depth=2.59"
Flow Length=12,758' Slope=0.3620 '/' Tc=49.8 min CN=73 Runoff=1,553.54 cfs 215.096 af

Link 3L: Flint Run Lower

Inflow=7,411.70 cfs 2,651.471 af
Primary=7,411.70 cfs 2,651.471 af

Total Runoff Area = 12,284.020 ac Runoff Volume = 2,651.471 af Average Runoff Depth = 2.59"
100.00% Pervious = 12,284.020 ac 0.00% Impervious = 0.000 ac

Gessler

Prepared by Windows User

HydroCAD® 10.00 s/n M28119 © 2012 HydroCAD Software Solutions LLC

Flint Run Drainage Computations
Type II 24-hr 100-YR Rainfall=5.39"

Printed 10/8/2012

Page 4

Summary for Subcatchment 1S: Flint Run Upper

Runoff = 7,165.30 cfs @ 14.01 hrs, Volume= 2,436.375 af, Depth= 2.59"

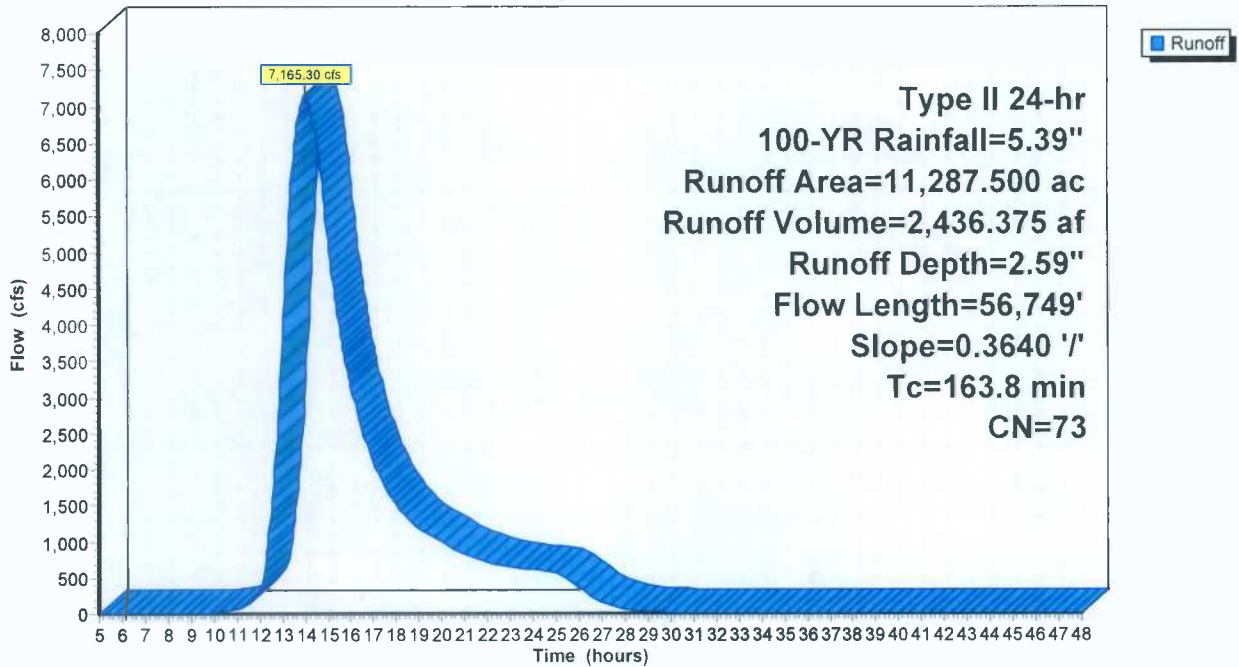
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YR Rainfall=5.39"

Area (ac)	CN	Description
* 11,287.500	73	
11,287.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
163.8	56,749	0.3640	5.78		Lag/CN Method, DA1

Subcatchment 1S: Flint Run Upper

Hydrograph



Gessler

Prepared by Windows User

HydroCAD® 10.00 s/n M28119 © 2012 HydroCAD Software Solutions LLC

Printed 10/8/2012

Page 5

Summary for Subcatchment 2S: Brush Run

Runoff = 1,553.54 cfs @ 12.50 hrs, Volume= 215.096 af, Depth= 2.59"

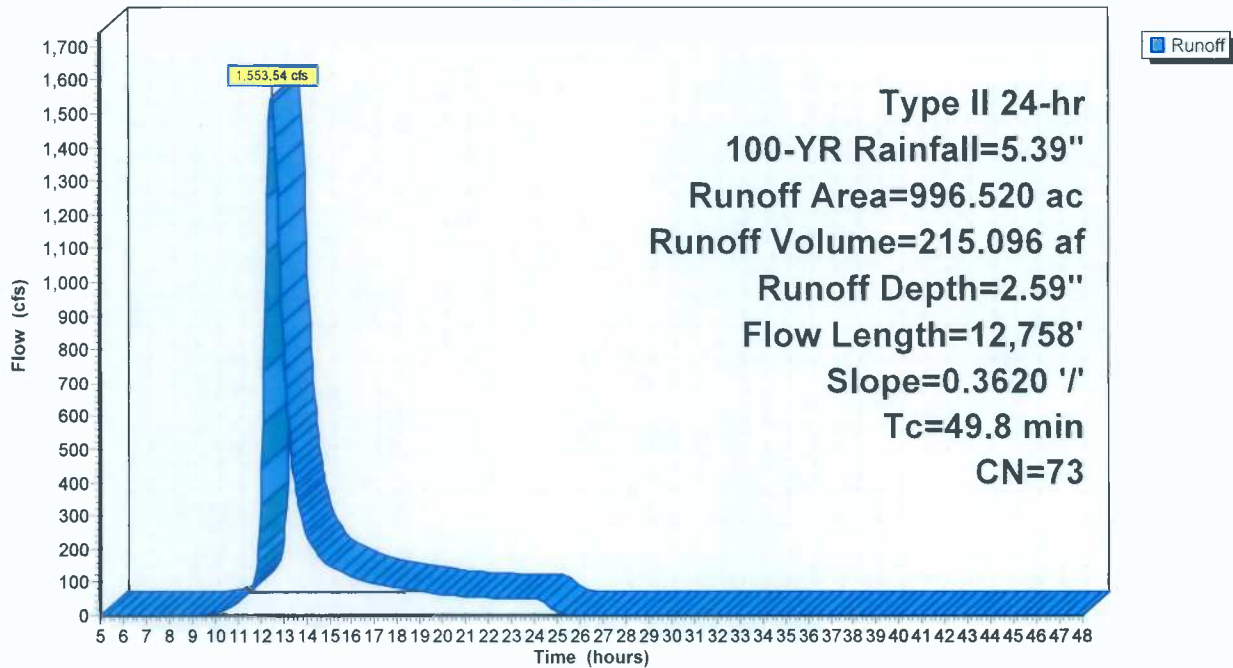
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YR Rainfall=5.39"

Area (ac)	CN	Description
* 996.520	73	
996.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.8	12,758	0.3620	4.27		Lag/CN Method, DA 2

Subcatchment 2S: Brush Run

Hydrograph



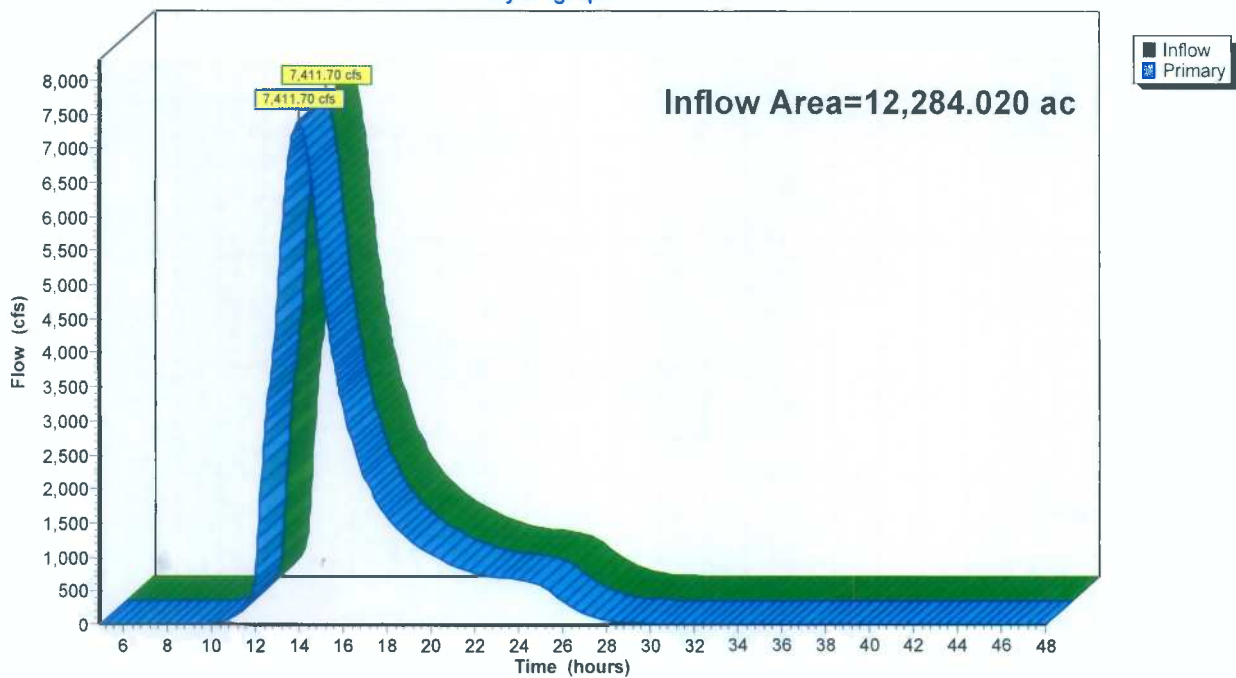
Summary for Link 3L: Flint Run Lower

Inflow Area = 12,284.020 ac, 0.00% Impervious, Inflow Depth = 2.59" for 100-YR event
Inflow = 7,411.70 cfs @ 14.00 hrs, Volume= 2,651.471 af
Primary = 7,411.70 cfs @ 14.00 hrs, Volume= 2,651.471 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Link 3L: Flint Run Lower

Hydrograph



Supplement 2

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

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

```

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

PROJECT DATA

Project Title: Gessler Final
 Project File : GesslerFinal.prj
 Run Date and Time: 2/1/2013 7:47:44 AM

Project in English units

Project Description:

Flint Run Existing Drainage - 100yr

PLAN DATA

Plan Title: Existing

Plan File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain - Final\GesslerFinal.p05

Geometry Title: Flint Run Existing

Geometry File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain - Final\GesslerFinal.g01

Flow Title : Flint Run

Flow File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain - Final\GesslerFinal.f01

Plan Summary Information:

Number of: Cross Sections	=	25	Multiple Openings	=	0
Culverts	=	1	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: Flint Run
 Flow File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain -
 Final\GesslerFinal.f01

Flow Data (cfs)

River	Reach	RS	100-yr
Brush Run	Reach 1	2011.333	1554
Flint Run	Lower	4052.349	7412
Flint Run	Upper	5348.411	7165

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Brush Run	Reach 1	100-yr	Normal S = 0.02	
Flint Run	Upper	100-yr	Normal S = 0.0028	
Flint Run	Lower	100-yr		Normal S = 0.0028

GEOMETRY DATA

Geometry Title: Flint Run Existing
 Geometry File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain -
 Final\GesslerFinal.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Brush Run	Reach 1		Flint/Brush
Flint Run	Upper		Flint/Brush

Flint Run

Lower

Flint/Brush

JUNCTION INFORMATION

Name: Flint/Brush

Description:

Energy computation Method

Length across Junction		Tributary		Reach	Length	Angle
River	Reach	River	Reach			
Flint Run	Upper	to Flint Run	Lower		271.11	0
Brush Run	Reach 1	to Flint Run	Lower		0	0

CROSS SECTION

RIVER: Brush Run

REACH: Reach 1

RS: 2011.333

INPUT

Description:

Station Elevation Data num= 27									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	13.15	820	25.84	815	38.21	810	50.42	805
62.38	800	73.77	795	85.55	790	98.37	785	112.22	780
152.85	775	164.2	774.43	192.7	774.25	196.77	772.8	200.7	774.25
214.97	775	231.99	780	232.62	780.27	243.56	785	254.04	790
264.52	795	274.85	800	286.88	805	300.37	810	314.46	815
328.19	820	342.09	825						

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	192.7	.035	200.7	.1

Bank Sta:	Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
	192.7	200.7	530.52	498.55	409.24	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	778.42				
Vel Head (ft)	1.18	Wt. n-Val.	0.035	0.035	0.100
W.S. Elev (ft)	777.24	Reach Len. (ft)	530.52	498.55	409.24
Crit W.S. (ft)	777.24	Flow Area (sq ft)	131.86	29.74	45.92
E.G. Slope (ft/ft)	0.012925	Area (sq ft)	131.86	29.74	45.92
Q Total (cfs)	1554.00	Flow (cfs)	1097.60	330.65	125.76
Top width (ft)	87.98	Top width (ft)	58.08	8.00	21.90
Vel Total (ft/s)	7.49	Avg. vel. (ft/s)	8.32	11.12	2.74
Max Chl Dpth (ft)	4.44	Hydr. Depth (ft)	2.27	3.72	2.10
Conv. Total (cfs)	13668.7	Conv. (cfs)	9654.3	2908.3	1106.1
Length wtd. (ft)	507.85	wetted Per. (ft)	58.23	8.51	22.25
Min Ch El (ft)	772.80	Shear (lb/sq ft)	1.83	2.82	1.67

Alpha	1.35	Stream Power (lb/ft s)	342.09	0.00	0.00
Frctn Loss (ft)	6.25	Cum Volume (acre-ft)	1.45	0.42	0.57
C & E Loss (ft)	0.01	Cum SA (acres)	0.66	0.10	0.23

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 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: Brush Run
 REACH: Reach 1 RS: 1507.212

INPUT

Description:

Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	13.46	820	26.15	815	38.91	810	52.5	805
66.14	800	79.79	795	93.18	790	106.62	785	121.37	780
147.73	775	200	770	220.39	768.22	257.2	765	268.2	764.5
273.24	763.58	278.2	764.5	292.38	765	312.6	770	325.34	774.15
327.95	775	342.48	780	357.11	785	375.04	790	394.75	795
416.88	800	439.08	805	460.07	810	481.91	815	502.95	820
524.75	825								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	268.2	.035	278.2	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
268.2	278.2	101.38	496.45	893.29	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	769.63				
Vel Head (ft)	1.25	wt. n-val.	0.035	0.035	0.100
W.S. Elev (ft)	768.38	Reach Len. (ft)	0.00	0.00	0.00
Crit w.s. (ft)	768.38	Flow Area (sq ft)	105.48	43.45	74.71
E.G. Slope (ft/ft)	0.011714	Area (sq ft)	105.48	43.45	74.71
Q Total (cfs)	1554.00	Flow (cfs)	798.70	525.74	229.57
Top width (ft)	87.57	Top width (ft)	49.70	10.00	27.87
Vel Total (ft/s)	6.95	Avg. vel. (ft/s)	7.57	12.10	3.07

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Max Chl Dpth (ft)	4.80	Hydr. Depth (ft)	2.12	4.34	2.68
Conv. Total (cfs)	14358.1	Conv. (cfs)	7379.5	4857.5	2121.1
Length Wtd. (ft)	0.00	Wetted Per. (ft)	49.86	10.17	28.29
Min Ch El (ft)	763.58	Shear (lb/sq ft)	1.55	3.13	1.93
Alpha	1.67	Stream Power (lb/ft s)	524.75	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)			
C & E Loss (ft)	0.24	Cum SA (acres)			

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 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: Flint Run
REACH: Upper

RS: 5348.411

INPUT

Description:

Station Elevation Data				num= 67						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	840	1.72	839.54	20.54	835	24.75	833.8	36.88	830	
51.38	825.46	55.35	824.2	67.57	820	73.13	817.69	79.16	815	
84.47	812.57	90.58	810	97.49	806.98	101.8	805	106.69	802.5	
110.69	800	115.05	796.83	117.97	795	122.72	791.65	125.34	790	
130.32	786.47	132.65	785	135.2	783.3	146.28	775.4	147.14	775	
158.66	770.79	160.42	770	174.03	765.42	174.99	765	180.62	763.23	
181.36	763	192.5	760	222.27	755.17	223.26	755	230.93	753.25	
235.85	755	269.45	758.27	280.96	759.23	290.29	760	326.78	762.1	
365.08	765	372.98	766.67	386.11	770	396.48	774.04	398.32	775	
406.94	779.55	407.8	780	416.8	784.76	417.27	785	426.65	789.96	
426.73	790	428.71	791.05	436.09	795	444.41	799.48	445.39	800	
446.08	800.36	454.72	805	455.78	805.56	464.06	810	465.51	810.76	
473.44	815	475.26	815.96	482.89	820	485.06	821.16	492.3	825	
494.85	826.36	501.72	830							

Manning's n Values				num= 3		
Sta	n Val	Sta	n Val	Sta	n Val	
0	.1	192.5	.035	290.29	.1	

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 192.5 290.29 580.67 714.22 806.06 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	767.86	Element	0.100	0.035	0.100
Vel Head (ft)	0.62	Wt. n-Val.	580.67	714.22	806.06
W.S. Elev (ft)	767.24	Reach Len. (ft)	91.45	989.74	378.91
Crit W.S. (ft)		Flow Area (sq ft)	91.45	989.74	378.91
E.G. Slope (ft/ft)	0.001126	Area (sq ft)	108.35	6546.35	510.30
Q Total (cfs)	7165.00	Flow (cfs)	23.88	97.79	84.94
Top width (ft)	206.60	Top width (ft)	1.18	6.61	1.35
Vel Total (ft/s)	4.91	Avg. Vel. (ft/s)	3.83	10.12	4.46
Max Chl Dpth (ft)	13.99	Hydr. Depth (ft)	3229.1	195102.5	15208.6
Conv. Total (cfs)	213540.1	Conv. (cfs)	24.97	98.92	85.35
Length Wtd. (ft)	718.22	Wetted Per. (ft)	0.26	0.70	0.31
Min Ch El (ft)	753.25	Shear (lb/sq ft)	501.72	0.00	0.00
Alpha	1.67	Stream Power (lb/ft s)	4.85	23.53	7.54
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	0.45	1.90	1.55
C & E Loss (ft)	0.03	Cum SA (acres)			

CROSS SECTION

RIVER: Flint Run
 REACH: Upper RS: 4587.709

INPUT
 Description:

Station Elevation Data num= 70

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	840	16.28	837.87	44.55	835	50.03	834.1	70.49	830		
71.13	829.87	74.8	828.94	89.92	825	92.85	824.16	107.23	820		
117.17	816.98	122.54	815	133.88	811.31	137.46	810	141.29	808.34		
149.13	805	155.07	802.08	159.98	800	166.69	796.65	170.66	795		
180.52	790	183.16	788.77	190.93	785	201.31	780.39	202.06	780		
212.06	775.62	213.49	775	213.71	774.92	226.49	770	234.57	767.82		
245	765	252.1	763.08	253.44	762.72	257.73	761.49	262.92	760		
300	751.5	307.31	751.12	310	751.6	339.98	758.49	350.45	759.54		
355.56	760	359.38	760.46	365.09	761.16	399.99	765	402.3	765.98		
415.29	770	427.45	774.34	428.94	775	430.68	775.78	438.45	780		
442.51	782.05	447.95	785	452.55	787.32	457.52	790	462.66	792.58		
467.15	795	472.85	797.85	476.81	800	483.08	803.12	486.55	805		
493.4	808.4	496.37	810	503.81	813.67	506.28	815	514.29	818.95		
516.32	820	524.84	824.23	526.34	825	535.44	829.51	536.39	830		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	262.92	.035	339.98	.1

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

262.92 339.98 165.19 259.78 200.58 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	766.94	Wt. n-val.	0.100	0.035	0.100
Vel Head (ft)	0.89	Reach Len. (ft)	165.19	259.78	200.58
W.S. Elev (ft)	766.04	Flow Area (sq ft)	64.85	858.62	262.45
Crit w.s. (ft)		Area (sq ft)	64.85	858.62	262.45
E.G. Slope (ft/ft)	0.001406	Flow (cfs)	72.94	6713.88	378.19
Q Total (cfs)	7165.00	Top Width (ft)	21.78	77.06	62.53
Top width (ft)	161.36	Avg. vel. (ft/s)	1.12	7.82	1.44
Vel Total (ft/s)	6.04	Hydr. Depth (ft)	2.98	11.14	4.20
Max Chl Dpth (ft)	14.92	Conv. (cfs)	1945.5	179077.3	10087.3
Conv. Total (cfs)	191110.0	Wetted Per. (ft)	22.60	78.86	63.09
Length wtd. (ft)	255.72	Shear (lb/sq ft)	0.25	0.96	0.37
Min Ch El (ft)	751.12	Stream Power (lb/ft s)	536.39	0.00	0.00
Alpha	1.57	Cum Volume (acre-ft)	3.80	8.38	1.61
Frctn Loss (ft)	0.64	Cum SA (acres)	0.14	0.47	0.19
C & E Loss (ft)	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

RIVER: Flint Run
 REACH: Upper

RS: 4327.913

INPUT

Description:

Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	833.82	19.57	830.26	21.04	830	21.99	829.86	47.76	825
48.22	824.91	50.72	824.4	68.17	820.98	73.18	820	78.14	818.92
96.27	815	114.35	810.94	116.96	810	126.97	806.39	127.89	805.99
130.7	805	140.29	801.4	144.1	800	147.74	798.78	158.49	795
160.48	794.34	171.07	790	179.16	786.84	183.7	785	188.85	782.97
196.53	780	209.11	775.55	210.65	775	218.43	773.03	231.45	770
262.46	765.7	268.7	765	290.32	762.84	326.29	760	330.65	759.71
335.69	759.38	359.73	757.01	380.75	755	394.73	755	410.28	758.76
414.93	760	418.46	760.97	432.73	765	446.67	772.66	468.61	784.7
469.11	785	469.23	785.07	477.23	790	477.75	790.22	485.38	795
485.72	795.15	501.33	804.99	501.35	805	501.39	805.02	502.19	805.53
509.35	810	527.85	814.53	529.88	815	551.4	819.56	552.97	820
553.92	820.47	564.75	825	565.92	825.57	576.46	830	577.84	830.68
580.09	831.63								

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Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 330.65 .035 410.28 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 330.65 410.28 783.59 271.11 224.1 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	766.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.10	Wt. n-Val.	0.100	0.035	0.100
W.S. Elev (ft)	764.07	Reach Len. (ft)	271.11	271.11	271.11
Crit W.S. (ft)	763.25	Flow Area (sq ft)	121.06	571.85	51.40
E.G. slope (ft/ft)	0.005757	Area (sq ft)	121.06	571.85	51.40
Q Total (cfs)	7165.00	Flow (cfs)	237.36	6818.41	109.23
Top Width (ft)	151.37	Top Width (ft)	52.60	79.63	19.14
Vel Total (ft/s)	9.63	Avg. vel. (ft/s)	1.96	11.92	2.12
Max Chl Dpth (ft)	9.07	Hydr. Depth (ft)	2.30	7.18	2.69
Conv. Total (cfs)	94431.1	Conv. (cfs)	3128.3	89863.2	1439.5
Length Wtd. (ft)	271.11	Wetted Per. (ft)	52.78	80.30	19.86
Min Ch El (ft)	755.00	Shear (lb/sq ft)	0.82	2.56	0.93
Alpha	1.46	Stream Power (lb/ft s)	580.09	0.00	0.00
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	3.45	4.11	0.89
C & E Loss (ft)	0.50	Cum SA (acres)			

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

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 4052.349

INPUT
 Description:

Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	12.51	820	27.22	815	41.83	810	53.13	805
64.15	800	76.03	795	88.87	790	100.79	785	113.96	780
127.03	775	147.55	770	263.25	765	408.02	760	445.55	757.94
499.06	755	535.56	749.62	559.34	755	588.18	760	598.81	765
609.68	770	620.27	774.99	620.29	775	633.72	780	648.98	785
662.08	790	694.14	795	731.89	800	766.48	805	796.9	810
828.16	815	854.05	820	873.62	825				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .05 499.06 .035 559.34 .1

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

499.06 559.34

46.88 141.39 54.28

.1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	765.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.	0.050	0.035	0.100
W.S. Elev (ft)	764.76	Reach Len. (ft)	46.88	141.39	54.28
Crit W.S. (ft)		Flow Area (sq ft)	988.05	750.26	233.32
E.G. Slope (ft/ft)	0.000824	Area (sq ft)	988.05	750.26	233.32
Q Total (cfs)	7412.00	Flow (cfs)	2234.26	4857.60	320.13
Top width (ft)	327.98	Top width (ft)	228.75	60.28	38.95
Vel Total (ft/s)	3.76	Avg. vel. (ft/s)	2.26	6.47	1.37
Max Chl Dpth (ft)	15.14	Hydr. Depth (ft)	4.32	12.45	5.99
Conv. Total (cfs)	258187.4	Conv. (cfs)	77827.7	169208.3	11151.4
Length Wtd. (ft)	102.66	Wetted Per. (ft)	228.97	61.28	40.44
Min Ch El (ft)	749.62	Shear (lb/sq ft)	0.22	0.63	0.30
Alpha	2.06	Stream Power (lb/ft s)	873.62	0.00	0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	15.51	81.07	57.98
C & E Loss (ft)	0.05	Cum SA (acres)	3.95	9.02	15.48

CROSS SECTION

RIVER: Flint Run
REACH: Lower

RS: 3910.912

INPUT

Description:

Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	13.06	820	25.72	815	38.09	810	49.94	805
60.85	800	72.27	795	84.38	790	96.36	785	110.18	780
125.5	775	144.56	770	183.92	765	270.21	760	395.63	756.36
442.34	755	475.81	749.22	497.6	755	521.35	760	547	765
563.98	767.12	587.08	770	605.74	775	624.3	780	639.31	785
655.35	790	672.44	795	692.16	800	714.94	805	748.48	810
778.02	815	814.83	820	841.76	825				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	442.34	.035	497.6	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
442.34	497.6	545.19	736.56	773.43	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	765.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.	0.050	0.035	0.100
W.S. Elev (ft)	764.81	Reach Len. (ft)	545.19	736.56	773.43
Crit W.S. (ft)		Flow Area (sq ft)	1456.72	701.60	232.78

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E.G. Slope (ft/ft)	0.000580	Area (sq ft)	1456.72	701.60	232.78
Q Total (cfs)	7412.00	Flow (cfs)	3330.24	3847.53	234.24
Top Width (ft)	358.75	Top Width (ft)	255.08	55.26	48.41
Vel Total (ft/s)	3.10	Avg. vel. (ft/s)	2.29	5.48	1.01
Max chl Dpth (ft)	15.59	Hydr. Depth (ft)	5.71	12.70	4.81
Conv. Total (cfs)	307672.8	Conv. (cfs)	138238.5	159711.1	9723.2
Length Wtd. (ft)	692.00	Wetted Per. (ft)	255.29	56.51	49.39
Min Ch El (ft)	749.22	Shear (lb/sq ft)	0.21	0.45	0.17
Alpha	1.87	Stream Power (lb/ft s)	841.76	0.00	0.00
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	14.19	78.72	57.69
C & E Loss (ft)	0.17	Cum SA (acres)	3.69	8.83	15.42

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.

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: Flint Run
REACH: Lower

RS: 3710.271

INPUT

Description:

Station Elevation Data		num= 67		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	830.59	1.19	830	5.17	828.26	11.78	825	18.55	822.06		
22.62	820	25.86	818.34	32.69	815	39.5	811.75	42.95	810		
50.85	806.25	53.33	805	62.32	800.74	63.72	800	72.83	795.28		
73.35	795	79.16	792	82.94	790	83.33	789.82	92.54	785		
93.94	784.35	102.34	780	105.35	778.85	116.54	775	124.62	773		
134.24	770	154.69	766.67	163.72	765	173.17	764.14	192.66	762.77		
216.3	761.04	228.82	760.42	238.05	760	259.77	758.83	268.66	758.35		
295.6	756.85	310.89	755.83	327.74	755	361.63	755	363.07	755.53		
373.76	760	381.2	763.3	385.82	765	392.04	767.49	397.71	770		
404.57	772.41	414.53	775	422.13	776.81	427.28	778.04	434.83	780		
453.33	782.48	457.94	782.86	479.51	784.62	482.04	784.84	484.65	785		
529.85	787.44	553.59	790	583.03	792.13	626.64	795	635.74	795		
646.71	796.76	672.12	800	684.01	800	736.87	804.08	745.03	805		
804.17	805	811.79	807.38								

Manning's n Values

num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	259.77	.035	373.76	.04

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

259.77 373.76

310.33 428.51 382.56

.1

.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	763.94	Element	0.100	0.035	0.040
Vel Head (ft)	1.94	Wt. n-Val.	310.33	428.51	382.56
W.S. Elev (ft)	762.00	Reach Len. (ft)	94.82	638.47	4.51
Crit W.S. (ft)	761.55	Flow Area (sq ft)	94.82	638.47	4.51
E.G. Slope (ft/ft)	0.007244	Area (sq ft)	169.02	7229.57	13.41
Q Total (cfs)	7412.00	Flow (cfs)	56.58	113.99	4.51
Top width (ft)	175.08	Top width (ft)	1.78	11.32	2.98
Vel Total (ft/s)	10.05	Avg. vel. (ft/s)	1.68	5.60	1.00
Max chl Dpth (ft)	7.00	Hydr. Depth (ft)	1985.9	84943.8	157.6
Conv. Total (cfs)	87087.3	Conv. (cfs)	56.67	115.09	4.93
Length Wtd. (ft)	417.13	Wetted Per. (ft)	0.76	2.51	0.41
Min Ch El (ft)	755.00	Shear (lb/sq ft)	811.79	0.00	0.00
Alpha	1.24	Stream Power (lb/ft s)	4.48	67.39	55.58
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	1.74	7.40	14.95
C & E Loss (ft)	0.40	Cum SA (acres)			

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

RIVER: Flint Run

REACH: Lower

RS: 3270.326

INPUT

Description:

Station Elevation Data		num= 107									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	830.35	.62	830	3.7	828.37	9.03	825	12.01	823.42		
22.94	816.51	25.77	815	31.37	811.45	34.09	810	39.88	806.4		
42.62	805	48.76	801.34	51.43	800	57.66	796.28	60.21	795		
66.52	791.22	68.96	790	73.81	787.17	77.42	785	82.26	782.7		
88.32	780	93.41	774.58	98.85	769.7	102.41	766.52	104.59	766.29		
107.58	766	118.66	764.89	120.09	764.73	120.28	764.75	122.12	764.46		
122.76	764.37	123.27	764	124.63	762.92	125.88	762	127.98	760.08		
128.11	760	128.42	759.77	130.52	758.09	130.64	758	130.71	757.94		
132.7	756.36	133.11	756	133.45	755.76	135.68	754	137.04	753.03		
138.23	752	140.01	750.41	140.52	750	140.78	749.92	140.81	749.9		
147.08	748.66	153.81	747.64	168.81	749.47	175.26	750	176.2	750		
176.55	750.02	176.81	750.22	178.14	750.98	179.61	752	179.72	752.07		

GesslerFinal.rep

181.25	753.12	183.58	753.34	191.25	754	197.69	754.21	208.69	754.48
269.6	756	276.77	756	283.82	757.14	289.37	758	304.52	759.95
304.89	760	305.51	760.06	305.73	760.08	331.42	762	347.28	763.38
355.61	764	358.49	764.68	360.23	765.08	364.95	766	373.96	766.93
374.88	766.98	376.44	767.11	378.24	767.6	381.59	768.57	384.29	768.76
395.07	770	407.01	771.12	416.76	772	430.89	773.27	434.87	773.61
439.3	774	457.68	775.47	464.31	776	466.4	776.16	467.01	776.21
474.6	776.76	487.8	777.73	488.28	777.75	491.33	778	502.32	779.12
510.97	780	513.33	780.24	514.22	780.33	527.07	782	537.73	783.53
541.14	784	549.19	785.15						

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	135.68	.035	181.25	.04

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

135.68	181.25	56.8	51.5	42.19	.1	.3
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CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	762.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	761.95	Reach Len. (ft)	56.80	51.50	42.19
Crit W.S. (ft)		Flow Area (sq ft)	39.60	567.50	801.81
E.G. slope (ft/ft)	0.001168	Area (sq ft)	39.60	567.50	801.81
Q Total (cfs)	7412.00	Flow (cfs)	43.19	4255.24	3113.58
Top width (ft)	204.76	Top width (ft)	9.74	45.57	149.45
Vel Total (ft/s)	5.26	Avg. vel. (ft/s)	1.09	7.50	3.88
Max chl dpth (ft)	14.31	Hydr. Depth (ft)	4.07	12.45	5.37
Conv. Total (cfs)	216895.1	Conv. (cfs)	1263.8	124519.7	91111.6
Length Wtd. (ft)	47.85	Wetted Per. (ft)	12.58	48.30	149.87
Min Ch El (ft)	747.64	Shear (lb/sq ft)	0.23	0.86	0.39
Alpha	1.40	Stream Power (lb/ft s)	549.19	0.00	0.00
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	4.00	61.46	52.04
C & E Loss (ft)	0.00	Cum SA (acres)	1.50	6.61	14.28

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 3218.798

INPUT

Description:

Station Elevation Data num= 106

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	828.88	.23	828.76	7.55	825	10.07	823.65	17.17	820
19.89	818.54	26.77	815	32.42	812	36.36	810	40.08	808.16
46.43	805	50.01	803.2	56.47	800	60.28	798.08	66.51	795
73.67	791.4	76.37	790	78.73	788.7	85.9	785	90.73	782.74
95.72	780	102.21	773.16	107.4	767.69	108.76	766.03	109.03	766

GesslerFinal.rep

124.19	764.57	126.34	764.36	127.28	764.21	128.59	764	129.66	763.84
130.15	763.76	132.48	762.13	132.67	762	135.22	760.24	135.52	760
137.74	758.3	138.14	758	138.39	757.79	140.64	756	142.61	754.47
143.22	754	143.71	753.59	145.71	752	146.32	751.52	148.24	749.99
148.33	749.92	160.99	747.7	161.66	747.59	162.51	747.69	176.31	749.61
176.94	749.78	177.66	750	182.2	751.26	185	752	188.38	752.92
197.84	754	199.96	754.09	202.2	754	205.09	754	215.77	754.44
239.26	755.41	271.98	756	284.51	756	286.21	756.18	303.45	758
313.9	759.23	321.91	759.89	323.33	760	360.52	761.55	367.94	762
374.22	763.26	377.74	764	379.82	764.43	382.44	764.63	390.01	765.44
392.55	765.65	394.18	766	403.15	766	404.96	766.66	409.02	768
412.18	768.21	428.2	770	432.93	770.41	437.4	770.74	444.67	771.26
449.13	771.39	453.48	771.56	455.91	771.61	469.9	772	475.86	772.35
488.67	773.25	491.72	773.51	495.64	774	503.56	775.09	510.04	776
516.62	776.93	524.07	778	535.75	779.66	538.08	780	538.71	780.09
547.74	782	548.26	782.11	556.72	784	560.99	784.91	565.9	786
567.81	786.42								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 142.61 .035 197.84 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 142.61 197.84 785.25 753.13 556.83 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	762.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.59	Wt. n-Val.	0.100	0.035	0.040
w.s. Elev (ft)	761.89	Reach Len. (ft)	785.25	753.13	556.83
Crit w.s. (ft)		Flow Area (sq ft)	35.47	633.43	770.06
E.G. Slope (ft/ft)	0.001214	Area (sq ft)	35.47	633.43	770.06
Q Total (cfs)	7412.00	Flow (cfs)	37.23	4630.93	2743.84
Top width (ft)	233.37	Top width (ft)	9.79	55.23	168.35
Vel Total (ft/s)	5.15	Avg. vel. (ft/s)	1.05	7.31	3.56
Max Chl Dpth (ft)	14.30	Hydr. Depth (ft)	3.62	11.47	4.57
Conv. Total (cfs)	212686.6	Conv. (cfs)	1068.4	132884.0	78734.2
Length wtd. (ft)	686.94	wetted Per. (ft)	12.29	57.67	168.64
Min Ch El (ft)	747.59	Shear (lb/sq ft)	0.22	0.83	0.35
Alpha	1.44	Stream Power (lb/ft s)	567.81	0.00	0.00
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	3.95	60.75	51.28
C & E Loss (ft)	0.01	Cum SA (acres)	1.49	6.55	14.12

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 3143.198

INPUT
 Description:

GesslerFinal.rep

Station Elevation Data		num= 119		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	828.29	5.49	825.77	17.29	820	21.67	817.85	27.1	815		
31.65	812.49	36.19	810	40.9	807.4	45.28	805	50.15	802.31		
54.36	800	61.91	795.84	63.43	795	65.19	794.1	73.74	790		
79.87	787.01	84.09	785	90.43	781.91	94.44	780	101.15	774.46		
112.15	765.76	112.42	765.73	119.43	765.02	129.18	764.27	129.79	764.13		
130.32	764	132.1	763.58	133.01	763.41	135.21	762.41	136.06	762		
138.41	760.54	139.21	760	141.56	758.35	142.12	758	145.16	756.12		
145.35	756	148.1	754.16	148.34	754	150.93	752.42	151.55	752		
153.96	750.49	154.71	750	155.08	749.77	167.46	747.7	168.72	747.5		
187.93	749	189.3	749.12	189.53	749.18	191.27	749.48	193.74	750		
195.64	750.7	199.13	752	200.09	752.36	201.56	752.92	205.05	753.72		
206.24	753.96	206.63	754	216.1	754	230.76	754.74	249.31	755.67		
250.8	755.73	251.03	755.74	258.12	756	263.65	756	291.86	756.82		
294.98	756.91	303.54	757.23	324.68	758	344.71	759.6	348.66	760		
358.45	760.94	370.21	762	370.48	762.04	375.06	762.58	391.13	764		
391.29	764.02	392.26	764.14	393.38	764.18	393.95	764.24	395.83	764.29		
406.48	764.83	411.3	765.18	411.46	765.19	411.59	765.22	411.94	765.24		
413.32	765.29	424.45	766	433.25	766.6	434.73	766.75	436.11	766.8		
439.14	767.17	454.05	767.61	458.45	768	469.74	769.12	478.67	770		
486.18	771.01	493.92	772	503.23	773.37	507.19	774	508.93	774.31		
518.98	776	523.62	776.92	529.14	778	535.92	779.37	539.06	780		
546.31	781.43	547.5	781.64	549.84	782	560.6	783.76	561.79	784		
569.1	785.8	569.95	786	573.86	786.99	576.84	788	578.8	788.64		
582.89	790	586.6	791.28	588.7	792	591.68	793				

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	148.1	.035	206.63	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	148.1	206.63		328.74	281.33	282.2	.1
							.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	761.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.73	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	760.82	Reach Len. (ft)	328.74	281.33	282.20
Crit W.S. (ft)		Flow Area (sq ft)	33.96	645.97	618.31
E.G. Slope (ft/ft)	0.001484	Area (sq ft)	33.96	645.97	618.31
Q Total (cfs)	7412.00	Flow (cfs)	38.61	5106.53	2266.86
Top width (ft)	219.23	Top width (ft)	10.14	58.53	150.56
Vel Total (ft/s)	5.71	Avg. vel. (ft/s)	1.14	7.91	3.67
Max Chl Dpth (ft)	13.32	Hydr. Depth (ft)	3.35	11.04	4.11
Conv. Total (cfs)	192423.2	Conv. (cfs)	1002.2	132570.9	58850.1
Length Wtd. (ft)	281.91	Wetted Per. (ft)	12.13	60.78	150.77
Min Ch El (ft)	747.50	Shear (lb/sq ft)	0.26	0.98	0.38
Alpha	1.45	Stream Power (lb/ft s)	591.68	0.00	0.00
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	3.33	49.69	42.41
C & E Loss (ft)	0.03	Cum SA (acres)	1.31	5.57	12.08

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2861.250

INPUT

Description:

Station Elevation Data		num= 128	
Sta	Elev	Sta	Elev
0	826.9	4.8	825
32.71	815	41.14	811.83
61.05	804.15	70.89	800
95.97	789.57	107.51	785
138.06	767.36	139.79	765.92
158.64	764	159.11	763.92
165.46	760.51	166.16	760
172.06	755.91	175.03	754
181.49	750	183.57	748.54
206.45	747.15	217.53	747.66
222.22	750	225.36	751.49
234.32	753.23	244.21	754
315.7	757.29	318.46	757.39
377.78	759.4	389.73	759.83
403.31	761.12	409.98	762
424.12	763.65	425.18	764
436.16	768	440.53	769.55
454.01	774	454.69	774.2
471.6	778.77	479.33	780
497.33	782.12	505.38	782.44
540.41	783.11	544.19	783.21
556.42	784	559.92	784.61
577.75	788.02	589	790
602.13	792.31	609.17	794
626.33	798	631.12	799.1
651.56	803.29	656.3	804

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.1	177.68	.035
		227.52	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	177.68	227.52		296.63	281.27	281.46	.1
							.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	761.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.02	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	760.03	Reach Len. (ft)	296.63	281.27	281.46
Crit w.s. (ft)		Flow Area (sq ft)	45.46	584.88	544.28
E.G. slope (ft/ft)	0.001902	Area (sq ft)	45.46	584.88	544.28

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Q Total (cfs)	7412.00	Flow (cfs)	64.90	5409.29	1937.80
Top Width (ft)	228.30	Top width (ft)	11.56	49.84	166.89
Vel Total (ft/s)	6.31	Avg. vel. (ft/s)	1.43	9.25	3.56
Max Chl Dpth (ft)	13.15	Hydr. Depth (ft)	3.93	11.74	3.26
Conv. Total (cfs)	169947.9	Conv. (cfs)	1488.2	124028.3	44431.4
Length Wtd. (ft)	281.41	wetted Per. (ft)	13.90	52.39	167.08
Min Ch El (ft)	746.88	Shear (lb/sq ft)	0.39	1.33	0.39
Alpha	1.65	Stream Power (lb/ft s)	663.87	0.00	0.00
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	3.03	45.71	38.64
C & E Loss (ft)	0.14	Cum SA (acres)	1.23	5.22	11.06

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2579.076

INPUT

Description:

Station Elevation Data

num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	15.21	820	27.97	815.49	29.43	815	37.74	812.05
42.99	810	47.62	808.16	56	805	64.64	801.42	68.65	800
69.31	799.77	82.89	795	85.84	793.93	97.04	790	102.08	788.12
110.79	785	118.7	782.03	123.55	780	132.63	774.42	140.89	769.34
145.19	766.68	152.14	766.05	152.65	766	154.5	765.81	162.84	765.05
163.2	764.88	164.87	764	165.21	763.85	166.44	763.24	167.48	762
168.46	760.7	168.99	760	170.28	758.29	170.48	758	171.42	756.82
172.31	756	174.02	754.3	174.35	754	174.61	753.75	176.64	752
178.01	750.57	178.62	750	180.09	748.58	180.72	748	181.02	747.68
182.28	746.5	191.79	746.04	192.63	746	193.42	746	197.24	745.85
201.26	745.98	201.68	746	202.75	746.05	204.91	746.19	217	746.9
217.34	747.42	217.74	748	218.23	748.97	218.99	750	219.7	751.04
220.27	752	220.52	752.38	221.26	752.97	248.71	753.86	254.02	753.92
258.94	753.98	261.16	754	267.96	754	274.07	754.26	288.53	754.54
293.17	754.64	301.91	754.88	361.59	756	372.94	756	392	757.2
403.75	758	410.88	758.87	412.88	759.04	417.87	759.45	427.04	759.8
427.31	759.82	427.38	759.84	427.86	760	428.39	760.16	437.5	762
438.49	762.17	441.16	762.4	443.31	762.52	453.12	764	461.52	765.42
465.12	766	471.29	767.03	477.09	768	482.32	768.78	491.75	770
503.41	771.52	507.03	772	511.6	772.59	522.55	774	526.04	774.45
533.69	775.51	537.17	776	541.47	776.69	542.97	776.92	545.09	777.3
548.46	778	551.98	778.73	557.92	780	560.77	780.57	563.7	781.28
566.65	782	572.62	783.7	573.81	784	575.37	784.47	580.71	786
582.49	786.52	587.67	788	593.13	789.61	594.5	790	599.64	791.47
601.54	792	602.39	792.22	609.77	794	615.62	795.16	619.95	796
626.28	797.25	630.42	798	631.55	798				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	174.02	.035	221.26	.04

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Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 174.02 221.26 100.63 101.9 100.41 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	760.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.100	0.035	0.040
w.s. Elev (ft)	759.94	Reach Len. (ft)	100.63	101.90	100.41
Crit w.s. (ft)		Flow Area (sq ft)	15.12	595.36	904.43
E.G. Slope (ft/ft)	0.001177	Area (sq ft)	15.12	595.36	904.43
Q Total (cfs)	7412.00	Flow (cfs)	12.24	4316.10	3083.67
Top Width (ft)	258.66	Top width (ft)	4.99	47.24	206.43
Vel Total (ft/s)	4.89	Avg. vel. (ft/s)	0.81	7.25	3.41
Max Chl Dpth (ft)	14.09	Hydr. Depth (ft)	3.03	12.60	4.38
Conv. Total (cfs)	216083.3	Conv. (cfs)	356.7	125827.9	89898.6
Length wtd. (ft)	101.23	Wetted Per. (ft)	7.55	53.60	206.64
Min Ch El (ft)	745.85	Shear (lb/sq ft)	0.15	0.82	0.32
Alpha	1.48	Stream Power (lb/ft s)	631.55	0.00	0.00
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	2.82	41.90	33.96
C & E Loss (ft)	0.02	Cum SA (acres)	1.17	4.91	9.85

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2476.907

INPUT

Description:

Station Elevation Data num= 129

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	831.38	3.33	830	5.72	829.01	15.43	825	22.82	822.34
28.58	820	40.8	815.67	42.71	815	44.21	814.47	55.18	810
59.63	808.2	67.59	805	67.84	804.9	79.93	800	89.78	795.99
92.37	795	97.27	793.01	104.66	790	109.47	788.03	116.91	785
123.41	782.33	129.15	780	142.55	770.74	146.96	767.78	150.66	765.3
160.01	764.7	168.22	764	172.06	763.29	173.79	762.87	174.04	762.64
174.91	762	176.73	760.21	176.95	760	177.56	759.41	179.34	758
179.44	757.9	182.16	756	183.28	755.08	184.78	754	185.95	753.02
187.32	752	190.07	750.11	190.22	750	192.21	748.44	192.82	748
193.24	747.76	193.53	747.54	206.22	745.61	206.72	745.53	208.65	745.76
223.7	747.61	223.76	747.64	224.43	748	225.55	748.48	228.72	750
231.91	751.57	232.75	752	233	752.13	235.44	752.14	259.47	753.16
261.54	753.16	269.43	753.21	277.15	753.26	326.57	754	327.55	754
334.78	754.24	340.44	754.41	342.94	754.49	387.79	756	396.64	757.07
407.05	758	409.16	758.33	417.04	760	420.6	761.4	422.33	762
424.54	762.58	428.22	764	436.28	765.55	438.62	766	442.96	766.83
444.87	767.11	457.41	767.36	458.84	767.82	459.4	768	461.3	768.59
462.91	768.58	474.99	769.14	480.26	769.43	482.57	769.58	488.41	769.73
490.03	769.75	501.14	770	504.2	770.05	504.3	770.05	505.61	770.12

GesslerFinal.rep

510.36	770.3	513.51	770.47	518.62	771.06	522.03	771.47	526.56	772
542.42	773.8	544.05	774	553.06	775.33	557.39	776	558.6	776.2
561.37	776.65	565.64	777.31	566.92	777.08	570.1	776.53	570.42	776.52
572.46	776	573.26	776	574.02	775.88	574.13	776	574.32	776.12
574.39	776.16	576.51	778	578.08	779.19	580.23	779.54	581.06	779.78
585.6	779.93	586.2	779.93	589.77	779.97	589.93	780	598.78	781.61
598.82	781.61	603.87	782	607.81	782.36	612.35	783.14		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	187.32	.035	233	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.	
	187.32	233		1155.6	1093.26	853.34	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	760.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	759.89	Reach Len. (ft)	1155.60	1093.26	853.34
Crit W.S. (ft)		Flow Area (sq ft)	40.88	558.45	984.72
E.G. Slope (ft/ft)	0.001001	Area (sq ft)	40.88	558.45	984.72
Q Total (cfs)	7412.00	Flow (cfs)	41.35	3827.94	3542.71
Top width (ft)	239.45	Top width (ft)	10.25	45.68	183.51
Vel Total (ft/s)	4.68	Avg. vel. (ft/s)	1.01	6.85	3.60
Max Chl Dpth (ft)	14.36	Hydr. Depth (ft)	3.99	12.23	5.37
Conv. Total (cfs)	234268.2	Conv. (cfs)	1307.0	120988.1	111973.2
Length wtd. (ft)	996.77	wetted Per. (ft)	12.95	48.44	183.87
Min Ch El (ft)	745.53	Shear (lb/sq ft)	0.20	0.72	0.33
Alpha	1.39	Stream Power (lb/ft s)	612.35	0.00	0.00
Frctn Loss (ft)	1.34	Cum Volume (acre-ft)	2.76	40.55	31.78
C & E Loss (ft)	0.04	Cum SA (acres)	1.15	4.80	9.40

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: Flint Run
REACH: Lower

RS: 2422.446

INPUT
Description:

Station Elevation Data num= 119

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	827.33	2.04	826.52	8.7	823.9	18.49	820	26.59	816.78
31.02	815	43.42	810.03	43.71	809.91	54.78	805	60.08	802.88
66.69	800	74.34	796.99	78.98	795	89.14	791.07	91.95	790
103.33	785.18	103.8	785	106.19	783.96	113.68	780.68	115.31	780

GesslerFinal.rep

118.54	777.88	140.62	764.19	142.29	764.11	144.58	764	144.84	764
152.26	763.62	158.03	763.3	160.92	762.67	164.22	762	164.71	761.59
166.7	760	168.44	758.49	168.99	758	170.24	757.01	171.81	756
172.19	755.78	175.1	754	175.49	753.72	175.98	753.38	178.43	752.83
181.13	752.77	181.48	752.3	181.65	752	182.61	750.49	182.87	750
183.38	749.35	184.29	748	184.5	747.68	184.78	747.3	193.16	746.66
203.98	745.48	217.18	746.81	225.14	747.51	225.66	747.78	226.09	748
228.92	749.5	229.87	750	230.61	750.38	232.45	752	232.85	752.31
232.95	752.4	260.86	752.89	294.85	753.48	318.12	754	357.87	755.53
367.67	755.91	370.06	756	371.96	756.14	377.39	756.48	400.27	758
405.99	759.54	407.35	760	409.43	760.56	415.23	761.51	418.4	762
422.13	762.26	427.49	762.69	438.54	763.45	445.89	764	445.98	764.01
450.72	764.31	457.31	764.66	468.97	765.18	473.41	764.92	476.44	764.98
481.45	765.78	482.02	765.87	482.98	766	486.54	766.53	496.79	768
498.55	768.27	500.18	768	501.55	767.77	506.62	766.99	506.95	767.01
510.16	767.11	511.72	767.16	512.3	767.17	513.92	768	516.15	769.06
516.78	769.47	517.17	769.52	521.86	770	522.39	770	522.56	770.07
538.9	771.76	541.52	772	546.77	772.53	547.5	772.61	547.85	772.66
548.46	772.68	556.6	774.61	557.51	774.57	557.96	774.56	585.55	778.67
590.53	779.65	591.47	780	592.65	780	592.87	780.06		

Manning's n Values	num=	3
Sta n Val	Sta	n Val
0 .1	178.43	.035 232.45 .04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
178.43	232.45	335.76	346.43	218.7	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	758.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.83	Wt. n-Val.	0.100	0.035	0.040
w.s. Elev (ft)	758.15	Reach Len. (ft)	335.76	346.43	218.70
Crit w.s. (ft)		Flow Area (sq ft)	30.04	577.66	626.54
E.G. Slope (ft/ft)	0.001909	Area (sq ft)	30.04	577.66	626.54
Q Total (cfs)	7412.00	Flow (cfs)	37.82	4934.71	2439.47
Top width (ft)	232.01	Top width (ft)	9.61	54.02	168.38
Vel Total (ft/s)	6.01	Avg. vel. (ft/s)	1.26	8.54	3.89
Max Chl Dpth (ft)	12.67	Hydr. Depth (ft)	3.13	10.69	3.72
Conv. Total (cfs)	169621.4	Conv. (cfs)	865.6	112929.3	55826.5
Length wtd. (ft)	309.49	wetted Per. (ft)	11.13	58.46	168.66
Min Ch El (ft)	745.48	Shear (lb/sq ft)	0.32	1.18	0.44
Alpha	1.49	Stream Power (lb/ft s)	592.87	0.00	0.00
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)	1.82	26.29	16.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.89	3.55	5.95

CROSS SECTION

RIVER: Flint Run
REACH: Lower

RS: 2355.763

INPUT

Description:

Station Elevation Data		num= 125	
Sta	Elev	Sta	Elev
0	825	10.21	821.05
32.1	812.7	38.29	810
61.49	800	64.14	798.95
95.42	786.48	99.06	785
137.58	762.78	146.88	762.44
158.29	761.64	163.32	760.9
167.42	758.19	167.69	758
173.13	754	173.64	753.64
184.82	752.06	184.85	752
188.17	748	188.32	747.77
206.99	745.42	210.92	746
234.51	747.47	234.99	748
239.26	752.07	263.63	752.63
303.52	753.43	315.09	753.69
330.82	754.05	363.37	756
397.67	758.5	421.92	760
432.1	760	437.22	760.93
445.37	762.17	446.19	762
454.42	762	456.96	762.09
481.15	763.4	490.57	764
507.57	765.77	508.22	765.78
519.73	767.47	519.97	767.54
529.76	768.49	537.93	768
543.98	767.22	547.94	767.31
561.68	766.28	563.3	766.28

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.1	184.22	.035
		239.26	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	184.22	239.26		48.16	40.88	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

	E.G. Elev (ft)		Element	Left OB	Channel	Right OB
Vel Head (ft)	758.20		Wt. n-Val.	0.100	0.035	0.040
W.s. Elev (ft)	756.94		Reach Len. (ft)	48.16	40.88	38.52
Crit w.s. (ft)			Flow Area (sq ft)	48.20	540.75	422.80
E.G. Slope (ft/ft)	0.003034		Area (sq ft)	48.20	540.75	422.80
Q Total (cfs)	7412.00		Flow (cfs)	81.09	5493.68	1837.23
Top width (ft)	206.69		Top width (ft)	15.14	55.04	136.51
Vel Total (ft/s)	7.33		Avg. vel. (ft/s)	1.68	10.16	4.35
Max Chl Dpth (ft)	11.52		Hydr. Depth (ft)	3.18	9.82	3.10
Conv. Total (cfs)	134557.6		Conv. (cfs)	1472.2	99732.3	33353.1
Length Wtd. (ft)	40.44		Wetted Per. (ft)	16.36	59.72	136.62
Min Ch El (ft)	745.42		Shear (lb/sq ft)	0.56	1.72	0.59

GesslerFinal.rep

Alpha	1.51	Stream Power (lb/ft s)	573.12	0.00	0.00
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	1.52	21.85	13.37
C & E Loss (ft)	0.05	Cum SA (acres)	0.79	3.11	5.19

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 2314.880

INPUT
 Description:

Station Elevation Data		num= 118							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	19.5	818	28.11	815	36.25	812.18	42.53	810
56.39	805.1	56.63	805	66.61	801.16	69.63	800	72.03	799.07
82.59	795	90.29	792.01	94.69	790	97.61	788.63	105.64	785
113.46	781.64	117.02	780	121.01	778.24	138.82	766.27	145.02	761.77
160.34	761.2	162.74	761.1	164.48	760.89	167.6	760.5	170	760.19
170.29	760.17	171	760.07	171.21	760.03	171.48	759.87	173.71	758.37
174.27	758	175.29	757.38	177.31	756	178.41	755.28	180.25	754
180.93	753.59	181.27	753.36	193.53	752.27	194.51	752.23	194.54	752.18
194.63	752	194.7	751.84	195.49	750	195.56	749.77	196.1	748.95
196.6	748	196.68	747.23	196.69	747.22	205.08	746.58	212.71	746
218.94	745.38	227.24	746	232.48	746.29	244.35	746.97	245.59	747.78
245.92	748	247.75	749.2	248.1	749.47	248.85	750	249.62	750.56
249.88	750.64	250.85	751.24	261.15	752.56	261.33	752.58	262.14	752.68
277.92	752.69	279.68	752.69	292.5	752.92	298.82	752.9	322.81	753.54
327.56	753.77	332.01	753.89	334.12	754	336.21	754	340.62	754.22
352.2	754.51	371.05	755.96	371.69	756	373.41	756	385.15	757.36
387.78	757.64	391.43	758	394.31	758.21	406.45	760	413.23	761.12
418.5	762	423.18	762.75	424.39	762.88	443.25	763.96	443.67	763.98
443.74	763.99	445.42	764	457.65	764.13	457.77	764.13	467.5	764.06
469.11	764.11	476.62	764.36	487.38	764.57	488.62	764.5	489.9	764.2
502.7	765.85	503.7	766	505.57	766.24	505.97	766.3	507.46	766.45
516.98	767.35	520.13	767.72	521.12	767.9	523.92	767.95	529.43	767.98
531.43	767.98	531.7	768	540.12	768.65	542.23	768.78	547.7	769.16
562.92	769.85	563.68	769.88	567.18	770				

Manning's n Values	num= 3				
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	193.53	.035	261.15	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
193.53	261.15	14.36	91.23	28.15	.1	.3	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	758.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.09	Wt. n-Val.	0.100	0.035	0.040
w.S. Elev (ft)	756.95	Reach Len. (ft)	14.36	91.23	28.15

GesslerFinal.rep

Crit w.s. (ft)		Flow Area (sq ft)	60.37	631.20	370.21
E.G. Slope (ft/ft)	0.002633	Area (sq ft)	60.37	631.20	370.21
Q Total (cfs)	7412.00	Flow (cfs)	100.36	5821.18	1490.46
Top width (ft)	205.69	Top width (ft)	17.61	67.62	120.46
Vel Total (ft/s)	6.98	Avg. Vel. (ft/s)	1.66	9.22	4.03
Max Chl Dpth (ft)	11.57	Hydr. Depth (ft)	3.43	9.33	3.07
Conv. Total (cfs)	144449.8	Conv. (cfs)	1955.9	113446.9	29047.0
Length Wtd. (ft)	74.72	Wetted Per. (ft)	18.75	72.46	120.61
Min Ch El (ft)	745.38	Shear (lb/sq ft)	0.53	1.43	0.50
Alpha	1.44	Stream Power (lb/ft s)	567.18	0.00	0.00
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	1.46	21.30	13.02
C & E Loss (ft)	0.02	Cum SA (acres)	0.78	3.06	5.07

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2223.643

INPUT
 Description:

Station Elevation Data		num= 117									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	27.73	815	34.41	812.57	41.67	810	51.05	806.58		
55.42	805	58.57	803.87	69.2	800	73.81	798.35	81.51	795		
87.77	791.97	92.08	790	96.21	788.14	102.73	785	107.36	782.93		
113.45	780	119.05	777.7	125.77	775	133.03	772.43	139.3	770		
149.59	763.59	152.1	760.27	157.45	760.05	158.38	760	166.7	759.51		
172.23	759.11	177.72	758.38	178.27	758	179.88	757.02	181.33	756.14		
181.54	756	181.73	755.88	184.62	754	185.04	753.73	185.31	753.56		
207.65	752.72	208.62	752.7	209.08	752.08	209.12	752	209.17	751.94		
210.3	750	211.6	748.18	211.72	748	212.03	747.69	212.53	746.94		
233.11	746.13	235.95	746	236.34	745.96	236.97	745.3	237.41	745.96		
237.66	746	239.35	746.12	257.68	746.72	259.4	747.73	259.84	748		
262.98	749.98	263.04	750.02	265.2	752	265.46	752.34	266.25	753.09		
295.92	752.68	305.73	752.54	343.2	752.45	346.57	752.53	347.78	752.57		
351.69	752.72	352.4	752.71	356.77	752.96	374.51	754	379.83	754.73		
385.32	756	388.92	757.13	391.58	758	396.79	759.74	397.6	760		
398.41	760.3	403.72	762	404.88	762.33	405.21	762.4	408.43	762.97		
410.23	763.19	422.43	764	426.15	764.29	430.67	764.85	434.41	764.95		
437.51	766	437.82	766.1	439.15	766.55	442.1	766.65	450.77	766.33		
452.23	766.31	464.94	766.36	465.78	766.36	467.12	766.4	469.77	766		
477.19	766	505.78	766.37	509.94	766.55	510.53	766.34	510.66	766.34		
518.58	767.43	519.03	767.5	519.68	767.58	520.34	767.64	524.71	767.85		
526.06	767.89	532.55	768	532.81	768.01	535.5	768.02	553.12	769.97		
553.44	770	554.15	770.07	574.46	771.76	575.95	771.96	576.48	772		
578.16	772	580.24	778.23								

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	207.65	.035	266.25	.04

GesslerFinal.rep

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 207.65 266.25 39.89 37.88 44.06 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 494.07 507.39 800

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	757.82				
Vel Head (ft)	1.01	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	756.81	Reach Len. (ft)	39.89	37.88	44.06
Crit W.S. (ft)		Flow Area (sq ft)	90.20	563.55	456.80
E.G. Slope (ft/ft)	0.002603	Area (sq ft)	90.20	563.55	456.80
Q Total (cfs)	7412.00	Flow (cfs)	147.77	5177.03	2087.19
Top Width (ft)	207.68	Top width (ft)	27.43	58.60	121.65
Vel Total (ft/s)	6.67	Avg. vel. (ft/s)	1.64	9.19	4.57
Max Chl Dpth (ft)	11.51	Hydr. Depth (ft)	3.29	9.62	3.75
Conv. Total (cfs)	145289.9	Conv. (cfs)	2896.6	101480.1	40913.1
Length Wtd. (ft)	39.66	Wetted Per. (ft)	28.39	64.51	122.02
Min Ch El (ft)	745.30	Shear (lb/sq ft)	0.52	1.42	0.61
Alpha	1.46	Stream Power (lb/ft s)	580.24	0.00	0.00
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	1.43	20.05	12.75
C & E Loss (ft)	0.02	Cum SA (acres)	0.77	2.92	5.00

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 2185.764

INPUT

Description:

Station Elevation Data num= 119

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	14.44	820	15.39	819.67	28.89	815	30.77	814.35
43.61	810	46.43	809.02	58.5	805	62.27	803.68	73.29	800
77.15	798.36	86.5	795	90.52	793.08	98.84	790	103.37	787.81
111.03	785	116.77	782.18	121.84	780	128.58	777.28	134.01	775
141.49	772	146.27	770	157.97	765.3	159.15	765	159.53	764.6
167.95	759.3	178.98	758.72	188.57	758	189.07	757.92	190.8	757.66
191.91	757.49	193.04	756.84	194.34	756	196.29	754.86	198.33	754
198.65	753.77	198.84	753.68	206	753.46	226.2	752.66	226.5	752.28
226.65	752	227.4	751.05	228.28	750	229.58	748.42	229.85	748
230.79	746.94	230.85	746.86	232.6	746.79	232.91	746.78	255.43	745.34
255.45	745.27	255.48	745.34	258.85	745.41	277.09	746.39	278.3	747.61
278.68	748	279.12	748.39	280.84	750	281.49	750.58	282.74	752
283.6	752.82	283.82	753.02	304.14	752.7	318	752.51	354.53	752
362.74	752	375.72	752.96	394.2	754	397.51	754.93	401.3	756
406.93	757.6	408.32	758	410.59	758.65	414.78	760	417.64	760.89
422.97	762	424.18	762.23	435.45	764	439.18	764.59	440.45	764.79

GesslerFinal.rep

443.8	765.18	446.37	765.34	456.87	766	457.13	766.03	458.2	766.08
462.99	766.32	464.54	766.38	469.6	766.32	477.45	766.2	483.79	766
489.89	765.82	497.17	765.85	501.81	765.93	504.34	766	506.22	766
525.5	766.08	530.79	766.58	531.62	766.6	539.2	766.99	545.12	767.08
549.74	767.47	550.66	767.48	556.32	767.65	562.96	768	569.41	768
573.65	768.37	576.32	768.74	584.99	770	586.31	770.14	600.11	771.39
605.92	772	609.78	772	614.47	772.31	616.42	772.49	627.88	774
630.43	774	631.19	780.48	631.25	780.39	635.99	780.55		

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	226.2	.035	283.6	.04

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

226.2	283.6	190.76	109.94	157.38	.1	.3
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
515.49	528.8	800

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	757.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	756.75	Reach Len. (ft)	190.76	109.94	157.38
Crit w.s. (ft)		Flow Area (sq ft)	106.58	577.58	469.96
E.G. Slope (ft/ft)	0.002318	Area (sq ft)	106.58	577.58	469.96
Q Total (cfs)	7412.00	Flow (cfs)	163.81	5170.10	2078.09
Top width (ft)	210.77	Top width (ft)	33.02	57.40	120.34
Vel Total (ft/s)	6.42	Avg. vel. (ft/s)	1.54	8.95	4.42
Max Chl Dpth (ft)	11.48	Hydr. Depth (ft)	3.23	10.06	3.91
Conv. Total (cfs)	153964.5	Conv. (cfs)	3402.8	107395.0	43166.7
Length Wtd. (ft)	126.63	Wetted Per. (ft)	33.84	63.02	120.87
Min Ch El (ft)	745.27	Shear (lb/sq ft)	0.46	1.33	0.56
Alpha	1.49	Stream Power (lb/ft s)	635.99	0.00	0.00
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	1.34	19.55	12.28
C & E Loss (ft)	0.02	Cum SA (acres)	0.74	2.87	4.87

CROSS SECTION

RIVER: Flint Run
REACH: Lower

RS: 2075.488

INPUT
Description:

Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	802.23	3.51	801.49	11.2	800	23.28	797.48	37.66	795
45.98	793.51	66.38	790	66.75	789.93	77.42	788.18	92.16	785.7
95.67	785	110.22	782.46	121.42	780	132.63	777.62	144.52	775
153.17	773.15	167.17	770	172.97	769.53	182.57	766.54	189.19	765

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226.92	765	255.29	758.47	258.94	758.29	262.94	757.39	265.94	756.71
269.59	756.41	275.43	756	278.33	755.79	287.28	755.2	289.64	755.02
292.29	754.77	292.59	754.74	296.35	754.35	298.4	754.14	298.98	754
299.33	753.9	304.32	752.88	313.3	752.57	319.57	752	320.16	752
331.52	750.76	336.84	750.08	337.14	750.03	337.6	750	338.5	749.96
340.85	749.47	346.27	748	347.01	747.8	351.42	747.26	357.61	745.69
358.12	745.17	375.72	748	378.17	749.67	378.68	750	380.07	750.9
382.5	751.57	384.12	752	384.28	752.05	385.43	752.36	390.12	752.43
411.87	752.53	434.09	752.12	444.28	752.05	451.3	752	499.75	752
508.05	753.84	508.95	754	511.38	754.44	512.07	754.53	517.05	755.31
517.68	755.36	522.76	755.38	530.91	755.38	538.94	755.37	542.82	755.68
547.05	756	550	756	561.76	757.77	563.24	757.99	563.34	758
564.55	758	566.62	758.29	569.75	758.52	572.04	758.67	576.08	758.9
581.86	759.45	583.67	759.61	584.97	759.72	585.93	759.78	592.84	760
592.86	760	594.56	760.05	602.27	761.74	603.46	762	603.73	762.06
611.35	763.55	612.46	763.7	612.68	763.73	613.11	763.81	614.13	764
616.28	764.4	617.45	764.62	626.9	765.99	626.97	766	642	768
646.62	768.63	648.2	768.84	655.6	770	668.42	772.24	669.35	773.12
700.03	781.17	722.83	783.03	742.99	787.88	757.66	786.67	763.96	787.49
764.04	787.51	795.36	791.59	802.24	795	808.51	795	830.36	792.84
856.2	792.6	904.14	792.39	906.69	792.68				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	313.3	.035	384.12	.04

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

313.3	384.12	41.03	39.47	55.96	.1	.3
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Blocked Obstructions num= 1

Sta L	Sta R	Elev
714	766	810

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	757.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.87	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	756.47	Reach Len. (ft)	41.03	39.47	55.96
Crit w.s. (ft)	754.92	Flow Area (sq ft)	82.89	525.37	574.67
E.G. Slope (ft/ft)	0.003094	Area (sq ft)	82.89	525.37	574.67
Q Total (cfs)	7412.00	Flow (cfs)	103.48	4627.76	2680.76
Top width (ft)	284.25	Top width (ft)	44.43	70.82	169.00
Vel Total (ft/s)	6.27	Avg. vel. (ft/s)	1.25	8.81	4.66
Max Chl Dpth (ft)	11.30	Hydr. Depth (ft)	1.87	7.42	3.40
Conv. Total (cfs)	133242.3	Conv. (cfs)	1860.2	83191.3	48190.8
Length wtd. (ft)	39.47	Wetted Per. (ft)	44.66	72.93	169.43
Min Ch El (ft)	745.17	Shear (lb/sq ft)	0.36	1.39	0.66
Alpha	1.43	Stream Power (lb/ft s)	906.69	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.93	18.16	10.39
C & E Loss (ft)		Cum SA (acres)	0.57	2.71	4.35

RIVER: Flint Run
 REACH: Lower RS: 2057.86

INPUT

Description:

Distance from Upstream XS = 10
 Deck/Roadway width = 15
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 2
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
 338.5 749.96 0 378.68 750 0

Upstream Bridge Cross Section Data

Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	802.23	3.51	801.49	11.2	800	23.28	797.48	37.66	795
45.98	793.51	66.38	790	66.75	789.93	77.42	788.18	92.16	785.7
95.67	785	110.22	782.46	121.42	780	132.63	777.62	144.52	775
153.17	773.15	167.17	770	172.97	769.53	182.57	766.54	189.19	765
226.92	765	255.29	758.47	258.94	758.29	262.94	757.39	265.94	756.71
269.59	756.41	275.43	756	278.33	755.79	287.28	755.2	289.64	755.02
292.29	754.77	292.59	754.74	296.35	754.35	298.4	754.14	298.98	754
299.33	753.9	304.32	752.88	313.3	752.57	319.57	752	320.16	752
331.52	750.76	336.84	750.08	337.14	750.03	337.6	750	338.5	749.96
340.85	749.47	346.27	748	347.01	747.8	351.42	747.26	357.61	745.69
358.12	745.17	375.72	748	378.17	749.67	378.68	750	380.07	750.9
382.5	751.57	384.12	752	384.28	752.05	385.43	752.36	390.12	752.43
411.87	752.53	434.09	752.12	444.28	752.05	451.3	752	499.75	752
508.05	753.84	508.95	754	511.38	754.44	512.07	754.53	517.05	755.31
517.68	755.36	522.76	755.38	530.91	755.38	538.94	755.37	542.82	755.68
547.05	756	550	756	561.76	757.77	563.24	757.99	563.34	758
564.55	758	566.62	758.29	569.75	758.52	572.04	758.67	576.08	758.9
581.86	759.45	583.67	759.61	584.97	759.72	585.93	759.78	592.84	760
592.86	760	594.56	760.05	602.27	761.74	603.46	762	603.73	762.06
611.35	763.55	612.46	763.7	612.68	763.73	613.11	763.81	614.13	764
616.28	764.4	617.45	764.62	626.9	765.99	626.97	766	642	768
646.62	768.63	648.2	768.84	655.6	770	668.42	772.24	669.35	773.12
700.03	781.17	722.83	783.03	742.99	787.88	757.66	786.67	763.96	787.49
764.04	787.51	795.36	791.59	802.24	795	808.51	795	830.36	792.84
856.2	792.6	904.14	792.39	906.69	792.68				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	313.3	.035	384.12	.04

Bank Sta: Left Right Coeff Contr. Expan.
 313.3 384.12 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev

714 766 810

Downstream Deck/Roadway Coordinates

num= 2					
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
343.84	750	0	417.5	750	0

Downstream Bridge Cross Section Data

Station Elevation Data		num= 128									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	797.48	4.66	796.43	11.04	795	27.23	791.35	33.9	790		
43.01	788.21	59.06	785	65.87	783.66	81.55	780.84	83.94	780.44		
85.52	780.18	86.62	780	114.79	775.53	117.33	775	132.81	772.38		
143.55	770	153.89	768.47	158.37	768.52	192.54	765.91	196.06	765.62		
199.75	765.31	200.76	765	208.51	765	237.42	767.51	244.73	768.19		
268.64	765	282.05	760.05	288.17	757.8	289.35	756.46	289.4	756.45		
295.03	756	304.43	755.26	307.38	755.01	315.56	754.1	316.61	754		
321.62	753.55	337.61	752.06	338.07	752	342.74	751.44	343.57	750.49		
343.84	750	343.89	749.93	344.12	749.66	345.11	748	345.55	747.3		
346.34	746	346.96	745.04	347.45	744.85	348.87	744.46	349.02	744.36		
357.9	745.65	379.86	745.14	405.91	744.25	406.39	744.49	409.49	746		
410.95	746.72	414.72	748.61	417.5	750	418.28	750.39	421.68	752		
422.03	752.18	422.48	752.42	428.58	752.3	435.53	752.14	457.89	752.24		
470.09	752.07	472.1	752.05	475.35	752	476.3	751.99	491.47	752.63		
495.94	752.53	505.27	752.53	519.73	752	521.1	752	523.71	752.13		
535.47	752.53	553.07	753.59	558.81	753.85	559.28	753.88	562.41	754		
571.09	754.29	574.06	754.48	580.8	754.97	589.35	755.44	597.42	756		
605.47	756.63	609.52	756.9	611.59	757.21	616.07	757.25	620.82	757.42		
622.16	757.57	625.72	757.76	626.44	757.93	634.36	759.95	634.54	760		
634.58	760.11	639.58	763.14	641.45	762	644.86	762.97	648.36	764		
651.47	764.9	655.48	766	659.92	767.24	660.69	768.76	662.5	768		
667.51	769.19	670.21	770	671.27	770.26	673.42	771.6	679.03	775		
688.59	777.32	706.8	780	718.51	782.01	740.86	785	740.95	785.01		
741.09	785.03	770.29	786.92	791.45	787.88	793.6	787.99	810.56	788.39		
823.46	788.52	829.23	788.2	834.73	787.97	853.01	786.99	891.13	785.73		
898.11	785.56	899.14	785.7	940.17	789.01						

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	337.61	.035	422.03	.04

Bank Sta:	Left	Right	Coeff Contr.	Expan.
	337.61	422.03	.1	.3

- Upstream Embankment side slope = 0 horiz. to 1.0 vertical
- Downstream Embankment side slope = 0 horiz. to 1.0 vertical
- Maximum allowable submergence for weir flow = .98
- Elevation at which weir flow begins =
- Energy head used in spillway design =
- Spillway height used in design =
- Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
 Culvert #1 Circular 1.5
 FHWA Chart # 2 - Corrugated Metal Pipe Culvert
 FHWA Scale # 2 - Mitered to conform to slope
 Solution Criteria = Highest U.S. EG
 Culvert Upstrm Dist Length Top n Bottom n Depth Blocked Entrance Loss Coef Exit Loss Coef
 6 20 .024 .024 0 .7 1

Number of Barrels = 11
 Upstream Elevation = 747.14
 Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
350.5	352	353.5	355	356.5	358	359.5	361	362.5	364
365.5									

Downstream Elevation = 746
 Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
372.5	374	375.5	377	378.5	380	381.5	383	384.5	386
387.5									

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (cfs)	54.79	Culv Full Len (ft)	20.00
# Barrels	11	Culv Vel US (ft/s)	2.82
Q Barrel (cfs)	4.98	Culv Vel DS (ft/s)	2.82
E.G. US. (ft)	757.35	Culv Inv El Up (ft)	747.14
W.S. US. (ft)	756.47	Culv Inv El Dn (ft)	746.00
E.G. DS (ft)	757.11	Culv Frctn Ls (ft)	0.15
W.S. DS (ft)	756.63	Culv Exit Loss (ft)	0.00
Delta EG (ft)	0.24	Culv Entr Loss (ft)	0.09
Delta WS (ft)	0.16	Q Weir (cfs)	7357.21
E.G. IC (ft)	757.31	Weir Sta Lft (ft)	263.17
E.G. OC (ft)	757.35	Weir Sta Rgt (ft)	558.88
Culvert Control	Outlet	Weir Submerg	0.87
Culv WS Inlet (ft)	748.64	Weir Max Depth (ft)	7.38
Culv WS Outlet (ft)	747.50	Weir Avg Depth (ft)	4.49
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	1328.83
Culv Crt Depth (ft)	0.86	Min El weir Flow (ft)	750.01

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 2035.918

INPUT

Description:

Station	Elevation	Data	num=	128	Sta	Elev	Sta	Elev	Sta	Elev
0	797.48	4.66	796.43	11.04	795	27.23	791.35	33.9	790	

GesslerFinal.rep

43.01	788.21	59.06	785	65.87	783.66	81.55	780.84	83.94	780.44
85.52	780.18	86.62	780	114.79	775.53	117.33	775	132.81	772.38
143.55	770	153.89	768.47	158.37	768.52	192.54	765.91	196.06	765.62
199.75	765.31	200.76	765	208.51	765	237.42	767.51	244.73	768.19
268.64	765	282.05	760.05	288.17	757.8	289.35	756.46	289.4	756.45
295.03	756	304.43	755.26	307.38	755.01	315.56	754.1	316.61	754
321.62	753.55	337.61	752.06	338.07	752	342.74	751.44	343.57	750.49
343.84	750	343.89	749.93	344.12	749.66	345.11	748	345.55	747.3
346.34	746	346.96	745.04	347.45	744.85	348.87	744.46	349.02	744.36
357.9	745.65	379.86	745.14	405.91	744.25	406.39	744.49	409.49	746
410.95	746.72	414.72	748.61	417.5	750	418.28	750.39	421.68	752
422.03	752.18	422.48	752.42	428.58	752.3	435.53	752.14	457.89	752.24
470.09	752.07	472.1	752.05	475.35	752	476.3	751.99	491.47	752.63
495.94	752.53	505.27	752.53	519.73	752	521.1	752	523.71	752.13
535.47	752.53	553.07	753.59	558.81	753.85	559.28	753.88	562.41	754
571.09	754.29	574.06	754.48	580.8	754.97	589.35	755.44	597.42	756
605.47	756.63	609.52	756.9	611.59	757.21	616.07	757.25	620.82	757.42
622.16	757.57	625.72	757.76	626.44	757.93	634.36	759.95	634.54	760
634.58	760.11	639.58	763.14	641.45	762	644.86	762.97	648.36	764
651.47	764.9	655.48	766	659.92	767.24	660.69	768.76	662.5	768
667.51	769.19	670.21	770	671.27	770.26	673.42	771.6	679.03	775
688.59	777.32	706.8	780	718.51	782.01	740.86	785	740.95	785.01
741.09	785.03	770.29	786.92	791.45	787.88	793.6	787.99	810.56	788.39
823.46	788.52	829.23	788.2	834.73	787.97	853.01	786.99	891.13	785.73
898.11	785.56	899.14	785.7	940.17	789.01				

Manning's n Values num= 3
 Sta n Val Sta n Val
 0 .1 337.61 .035 422.03 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 337.61 422.03 50.28 39.38 62.3 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	757.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	756.63	Reach Len. (ft)	16.00	16.00	16.00
Crit W.S. (ft)	753.24	Flow Area (sq ft)	111.05	880.30	646.51
E.G. Slope (ft/ft)	0.001044	Area (sq ft)	111.05	880.30	646.51
Q Total (cfs)	7412.00	Flow (cfs)	92.40	5523.40	1796.20
Top Width (ft)	316.21	Top width (ft)	48.41	84.42	183.38
Vel Total (ft/s)	4.53	Avg. Vel. (ft/s)	0.83	6.27	2.78
Max Chl Dpth (ft)	12.38	Hydr. Depth (ft)	2.29	10.43	3.53
Conv. Total (cfs)	229372.3	Conv. (cfs)	2859.4	170927.5	55585.4
Length wtd. (ft)	16.00	wetted Per. (ft)	48.68	90.00	183.61
Min Ch El (ft)	744.25	Shear (lb/sq ft)	0.15	0.64	0.23
Alpha	1.52	Stream Power (lb/ft s)	940.17	0.00	0.00
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.93	17.20	10.39
C & E Loss (ft)	0.03	Cum SA (acres)	0.53	2.64	4.12

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.

BRIDGE

RIVER: Flint Run
REACH: Lower

RS: 2017.29

INPUT

Description:

Distance from Upstream XS = 16
Deck/Roadway Width = 8
Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
321.62	754.05	753.55	457.89	752.74	752.24

Upstream Bridge Cross Section Data

Station Elevation Data

num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	797.48	4.66	796.43	11.04	795	27.23	791.35	33.9	790
43.01	788.21	59.06	785	65.87	783.66	81.55	780.84	83.94	780.44
85.52	780.18	86.62	780	114.79	775.53	117.33	775	132.81	772.38
143.55	770	153.89	768.47	158.37	768.52	192.54	765.91	196.06	765.62
199.75	765.31	200.76	765	208.51	765	237.42	767.51	244.73	768.19
268.64	765	282.05	760.05	288.17	757.8	289.35	756.46	289.4	756.45
295.03	756	304.43	755.26	307.38	755.01	315.56	754.1	316.61	754
321.62	753.55	337.61	752.06	338.07	752	342.74	751.44	343.57	750.49
343.84	750	343.89	749.93	344.12	749.66	345.11	748	345.55	747.3
346.34	746	346.96	745.04	347.45	744.85	348.87	744.46	349.02	744.36
357.9	745.65	379.86	745.14	405.91	744.25	406.39	744.49	409.49	746
410.95	746.72	414.72	748.61	417.5	750	418.28	750.39	421.68	752
422.03	752.18	422.48	752.42	428.58	752.3	435.53	752.14	457.89	752.24
470.09	752.07	472.1	752.05	475.35	752	476.3	751.99	491.47	752.63
495.94	752.53	505.27	752.53	519.73	752	521.1	752	523.71	752.13
535.47	752.53	553.07	753.59	558.81	753.85	559.28	753.88	562.41	754
571.09	754.29	574.06	754.48	580.8	754.97	589.35	755.44	597.42	756
605.47	756.63	609.52	756.9	611.59	757.21	616.07	757.25	620.82	757.42
622.16	757.57	625.72	757.76	626.44	757.93	634.36	759.95	634.54	760
634.58	760.11	639.58	763.14	641.45	762	644.86	762.97	648.36	764
651.47	764.9	655.48	766	659.92	767.24	660.69	768.76	662.5	768
667.51	769.19	670.21	770	671.27	770.26	673.42	771.6	679.03	775
688.59	777.32	706.8	780	718.51	782.01	740.86	785	740.95	785.01
741.09	785.03	770.29	786.92	791.45	787.88	793.6	787.99	810.56	788.39
823.46	788.52	829.23	788.2	834.73	787.97	853.01	786.99	891.13	785.73
898.11	785.56	899.14	785.7	940.17	789.01				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0 .1 337.61 .035 422.03 .04

Bank Sta: Left Right Coeff Contr. Expan.
 337.61 422.03 .1 .3

Downstream Deck/Roadway Coordinates

num= 2
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
 386.49 754.62 754.12 496.28 752.33 751.83

Downstream Bridge Cross Section Data

Station Elevation Data		num= 100									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	800.66	2.87	800	20.54	796.34	26.59	795	36.01	792.98		
49.32	790	59.3	787.88	73.33	785	83.96	782.91	98.17	780		
110.22	777.43	123.36	775	146.01	770.34	147.65	770	148.86	770		
161.56	768.45	187.96	765.59	190.53	765	212.74	765	253.18	767.96		
264.25	770	321.36	770	321.59	770	321.74	769.95	334.48	765		
338.22	757.6	339.53	756.12	340.34	756.05	340.99	756	343.03	755.84		
344.1	755.84	358.64	754.61	365.02	754.27	367.69	754.14	371.47	754.14		
372.1	754.12	378.35	754.22	381.77	754.24	386.49	754.12	386.64	754		
390.39	754	390.53	752.89	390.68	752	390.77	751.51	391.24	750.56		
391.36	750.46	392.18	749.9	399.43	745.4	412.84	745.49	429.87	745.1		
430.68	746.25	431.49	745.59	456.87	746.69	457.47	747.11	458.75	748		
460.62	749.36	461.5	750	464.07	751.86	464.2	751.97	468.76	752.05		
479.07	752.08	496.28	751.83	496.46	751.84	527.54	754.42	528.69	754.44		
552.71	754.82	561.91	754.99	562	754.99	562.21	755	562.32	755		
595.37	753.58	612.25	754.6	623.27	754.45	645.53	758.04	658.09	758.71		
693.09	760	709.49	763.47	710.27	763.68	715.07	765	717.82	765.77		
733.15	770	749.73	774.64	751.01	775	761.67	776.19	762.32	776.22		
794.97	778.22	813.46	779.54	813.52	779.55	826.69	780	850.66	781.41		
865.24	781.54	890.26	781.22	898.37	780	947.8	780	968.82	782.8		
977.23	785	1019.29	789.33	1027.08	790	1035.86	791.47	1036.64	791.59		

Manning's n Values		num= 5									
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	264.25	.2	321.36	.04	378.35	.035	528.69	.04		

Bank Sta: Left Right Coeff Contr. Expan.
 378.35 528.69 .1 .3

- Upstream Embankment side slope = 0 horiz. to 1.0 vertical
- Downstream Embankment side slope = 0 horiz. to 1.0 vertical
- Maximum allowable submergence for weir flow = .98
- Elevation at which weir flow begins =
- Energy head used in spillway design =
- Spillway height used in design =
- Weir crest shape = Broad Crested

Number of 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 #100-yr

E.G. US. (ft)	757.11	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	756.63	E.G. Elev (ft)	757.05	756.99
Q Total (cfs)	7412.00	W.S. Elev (ft)	756.67	756.38
Q Bridge (cfs)	2992.01	Crit w.s. (ft)	753.40	753.52
Q Weir (cfs)		Max Chl Dpth (ft)	12.42	11.28
Weir Sta Lft (ft)		Vel Total (ft/s)	4.68	6.12
Weir Sta Rgt (ft)		Flow Area (sq ft)	1582.53	1211.05
Weir Submerg		Froude # Chl	0.25	0.33
Weir Max Depth (ft)		Specif Force (cu ft)	7230.79	5800.81
Min El Weir Flow (ft)	752.00	Hydr Depth (ft)	4.99	4.09
Min El Prs (ft)	753.55	W.P. Total (ft)	596.50	523.93
Delta EG (ft)	0.18	Conv. Total (cfs)	127513.6	89063.7
Delta WS (ft)	0.39	Top width (ft)	316.84	295.95
BR Open Area (sq ft)	513.33	Frctn Loss (ft)	0.04	0.06
BR Open Vel (ft/s)	5.83	C & E Loss (ft)	0.02	0.01
Coef of Q		Shear Total (lb/sq ft)	0.56	1.00
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

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.

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: Flint Run
REACH: Lower RS: 1996.533

INPUT

Description:
Station Elevation Data num= 100

GesslerFinal.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	800.66	2.87	800	20.54	796.34	26.59	795	36.01	792.98
49.32	790	59.3	787.88	73.33	785	83.96	782.91	98.17	780
110.22	777.43	123.36	775	146.01	770.34	147.65	770	148.86	770
161.56	768.45	187.96	765.59	190.53	765	212.74	765	253.18	767.96
264.25	770	321.36	770	321.59	770	321.74	769.95	334.48	765
338.22	757.6	339.53	756.12	340.34	756.05	340.99	756	343.03	755.84
344.1	755.84	358.64	754.61	365.02	754.27	367.69	754.14	371.47	754.14
372.1	754.12	378.35	754.22	381.77	754.24	386.49	754.12	386.64	754
390.39	754	390.53	752.89	390.68	752	390.77	751.51	391.24	750.56
391.36	750.46	392.18	749.9	399.43	745.4	412.84	745.49	429.87	745.1
430.68	746.25	431.49	745.59	456.87	746.69	457.47	747.11	458.75	748
460.62	749.36	461.5	750	464.07	751.86	464.2	751.97	468.76	752.05
479.07	752.08	496.28	751.83	496.46	751.84	527.54	754.42	528.69	754.44
552.71	754.82	561.91	754.99	562	754.99	562.21	755	562.32	755
595.37	753.58	612.25	754.6	623.27	754.45	645.53	758.04	658.09	758.71
693.09	760	709.49	763.47	710.27	763.68	715.07	765	717.82	765.77
733.15	770	749.73	774.64	751.01	775	761.67	776.19	762.32	776.22
794.97	778.22	813.46	779.54	813.52	779.55	826.69	780	850.66	781.41
865.24	781.54	890.26	781.22	898.37	780	947.8	780	968.82	782.8
977.23	785	1019.29	789.33	1027.08	790	1035.86	791.47	1036.64	791.59

Manning's n	Values	num=	5
Sta	n Val	Sta	n Val
0	.1	264.25	.2
		321.36	.04
		378.35	.035
		528.69	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	378.35	528.69		477.61	274.2		.1	.3
					175.6			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	756.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.69	Wt. n-val.	0.040	0.035	0.040
W.S. Elev (ft)	756.24	Reach Len. (ft)	477.61	274.20	175.60
Crit W.S. (ft)		Flow Area (sq ft)	55.08	987.34	180.62
E.G. Slope (ft/ft)	0.002293	Area (sq ft)	55.08	987.34	180.62
Q Total (cfs)	7412.00	Flow (cfs)	123.22	6830.05	458.73
Top width (ft)	294.92	Top width (ft)	38.92	150.34	105.65
Vel Total (ft/s)	6.06	Avg. vel. (ft/s)	2.24	6.92	2.54
Max chl Dpth (ft)	11.14	Hydr. Depth (ft)	1.42	6.57	1.71
Conv. Total (cfs)	154798.8	Conv. (cfs)	2573.4	142644.9	9580.5
Length Wtd. (ft)	261.19	Wetted Per. (ft)	39.05	157.28	105.87
Min Ch El (ft)	745.10	Shear (lb/sq ft)	0.20	0.90	0.24
Alpha	1.21	Stream Power (lb/ft s)	1036.64	0.00	0.00
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)	0.85	16.38	10.02
C & E Loss (ft)	0.05	Cum SA (acres)	0.49	2.54	3.99

CROSS SECTION

RIVER: Flint Run

REACH: Lower

RS: 1720.640

INPUT

Description:

Station Elevation Data		num= 66		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	837.16	1.23	836.49	13.1	830	17.08	827.77	21.76	825		
25.63	822.75	42.44	812.26	46.07	810	50.32	807.36	54.09	805		
59.39	801.78	62.27	800	64.45	798.71	70.4	795	74.16	792.68		
78.56	790	85.62	785.73	86.73	785	98.37	777.91	102.25	775.54		
103.14	775	108.56	772.08	112.09	770	130.34	760.38	131.04	760		
131.6	759.8	144.88	755	149.32	753.92	165.23	750	170.74	749.21		
195.91	744.85	230.75	749.58	234.55	750	240.54	750	288.17	751.29		
311.57	751.92	430.38	755	453.79	755	457.16	755.23	515.06	760		
519.16	760	552.44	764.22	557.98	765	559.45	765	574.29	767.43		
593.86	770	608.06	771.67	629.58	774.61	631.13	775	633.42	775.21		
648.79	776.49	690.41	780	712.88	782.89	739.28	785	753.82	785		
786.54	788.08	809.67	790	829.53	792.2	850.76	793.74	863.78	795		
886.65	799.16	891.24	800	910.57	803.96	914.92	805	925.56	807.51		
929.58	808.43										

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	165.23	.035	240.54	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	165.23	240.54		277.27	313.32	323.91	.1
							.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	756.11				
Vel Head (ft)	1.19	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	754.92	Reach Len. (ft)	277.27	313.32	323.91
Crit W.S. (ft)		Flow Area (sq ft)	49.14	545.23	454.65
E.G. slope (ft/ft)	0.003952	Area (sq ft)	49.14	545.23	454.65
Q Total (cfs)	7412.00	Flow (cfs)	81.90	5408.93	1921.17
Top width (ft)	282.06	Top width (ft)	20.02	75.31	186.73
Vel Total (ft/s)	7.07	Avg. Vel. (ft/s)	1.67	9.92	4.23
Max Chl Dpth (ft)	10.07	Hydr. Depth (ft)	2.45	7.24	2.43
Conv. Total (cfs)	117903.1	Conv. (cfs)	1302.8	86040.1	30560.2
Length wtd. (ft)	314.90	wetted Per. (ft)	20.61	76.08	186.79
Min Ch El (ft)	744.85	Shear (lb/sq ft)	0.59	1.77	0.60
Alpha	1.53	Stream Power (lb/ft s)	929.58	0.00	0.00
Frctn Loss (ft)	1.23	Cum Volume (acre-ft)	0.28	11.55	8.74
C & E Loss (ft)	0.02	Cum SA (acres)	0.17	1.83	3.40

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: Flint Run
 REACH: Lower

RS: 1407.321

INPUT
 Description:

Station Elevation Data			num= 40		
Sta	Elev	Sta	Elev	Sta	Elev
0	835	15.3	830	29.71	825
60.66	810	68.42	805	76.06	800
95.11	785	99.61	781.84	102.24	780
139.85	765	149.46	760	158.8	755
291.54	750	298.84	750.31	407.75	755
640.93	770	692.34	775	744.25	780
863.99	795	879.83	800	894.48	805
937.27	820	952.18	825	967.2	830

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	139.85	.035	291.54	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	139.85	291.54		277.15	391.34	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

	E.G. Elev (ft)	754.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.11		Wt. n-Val.		0.035	0.040
w.s. Elev (ft)	753.75		Reach Len. (ft)	277.15	391.34	964.75
Crit w.s. (ft)	752.37		Flow Area (sq ft)		783.74	163.29
E.G. Slope (ft/ft)	0.003864		Area (sq ft)		783.74	163.29
Q Total (cfs)	7412.00		Flow (cfs)		6839.00	573.00
Top width (ft)	216.17		Top width (ft)		129.08	87.09
Vel Total (ft/s)	7.83		Avg. vel. (ft/s)		8.73	3.51
Max Chl Dpth (ft)	9.18		Hydr. Depth (ft)		6.07	1.87
Conv. Total (cfs)	119236.8		Conv. (cfs)		110018.9	9217.8
Length Wtd. (ft)	483.09		Wetted Per. (ft)		130.35	87.17
Min Ch El (ft)	744.57		Shear (lb/sq ft)		1.45	0.45
Alpha	1.16		Stream Power (lb/ft s)	996.14	0.00	0.00
Frctn Loss (ft)	1.58		Cum Volume (acre-ft)	0.12	6.77	6.44
C & E Loss (ft)	0.10		Cum SA (acres)	0.10	1.09	2.39

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: Flint Run

REACH: Lower

RS: 1000.000

INPUT

Description:

Station Elevation Data			num= 38								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835	11.33	830	22.75	825	34.21	820	45.56	815		
56.88	810	68.24	805	79.67	800	91.34	795	103.05	790		
114.79	785	127.21	780	140.15	775	152.91	770	170.26	765		
190.86	760	221.82	755	250.19	752.85	287.95	750	327.56	744.2		
401.82	746.77	495.35	750	567.57	755	605.23	760	621.13	765		
637.13	770	652.43	775	667.45	780	682.71	785	691.45	790		
700.18	795	708.92	800	717.65	805	726.09	810	734.13	815		
742.18	820	750.22	825	758.16	830						

Manning's n Values

num= 3		
Sta	n Val	Sta
0	.1	287.95
		.035
		401.82
		.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	287.95	401.82		1	1		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	753.17				
Vel Head (ft)	0.76	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	752.41	Reach Len. (ft)			
Crit W.S. (ft)	750.74	Flow Area (sq ft)	38.41	724.33	418.13
E.G. Slope (ft/ft)	0.002801	Area (sq ft)	38.41	724.33	418.13
Q Total (cfs)	7412.00	Flow (cfs)	34.12	5572.26	1805.63
Top width (ft)	274.08	Top width (ft)	31.90	113.87	128.31
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)	0.89	7.69	4.32
Max Chl Dpth (ft)	8.21	Hydr. Depth (ft)	1.20	6.36	3.26
Conv. Total (cfs)	140045.8	Conv. (cfs)	644.6	105284.8	34116.3
Length Wtd. (ft)		Wetted Per. (ft)	31.99	114.34	128.45
Min Ch El (ft)	744.20	Shear (lb/sq ft)	0.21	1.11	0.57
Alpha	1.24	Stream Power (lb/ft s)	758.16	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: Brush Run

Reach	River Sta.	n1	n2	n3
Reach 1	2011.333	.035	.035	.1
Reach 1	1507.212	.035	.035	.1

River: Flint Run

Reach	River Sta.	n1	n2	n3	n4	n5
Upper	5348.411	.1	.035	.1		
Upper	4587.709	.1	.035	.1		
Upper	4327.913	.1	.035	.1		
Lower	4052.349	.05	.035	.1		
Lower	3910.912	.05	.035	.1		
Lower	3710.271	.1	.035	.04		
Lower	3270.326	.1	.035	.04		
Lower	3218.798	.1	.035	.04		
Lower	3143.198	.1	.035	.04		
Lower	2861.250	.1	.035	.04		
Lower	2579.076	.1	.035	.04		
Lower	2476.907	.1	.035	.04		
Lower	2422.446	.1	.035	.04		
Lower	2355.763	.1	.035	.04		
Lower	2314.880	.1	.035	.04		
Lower	2223.643	.1	.035	.04		
Lower	2185.764	.1	.035	.04		
Lower	2075.488	.1	.035	.04		
Lower	2057.86	Culvert				
Lower	2035.918	.1	.035	.04		
Lower	2017.29	Bridge				
Lower	1996.533	.1	.2	.04	.035	.04
Lower	1720.640	.1	.035	.04		
Lower	1407.321	.1	.035	.04		
Lower	1000.000	.1	.035	.04		

SUMMARY OF REACH LENGTHS

River: Brush Run

Reach	River Sta.	Left	Channel	Right
Reach 1	2011.333	530.52	498.55	409.24
Reach 1	1507.212	101.38	496.45	893.29

River: Flint Run

Reach	River Sta.	Left	Channel	Right
Upper	5348.411	580.67	714.22	806.06
Upper	4587.709	165.19	259.78	200.58
Upper	4327.913	783.59	271.11	224.1
Lower	4052.349	46.88	141.39	54.28

Lower	3910.912	545.19	736.56	773.43
Lower	3710.271	310.33	428.51	382.56
Lower	3270.326	56.8	51.5	42.19
Lower	3218.798	785.25	753.13	556.83
Lower	3143.198	328.74	281.33	282.2
Lower	2861.250	296.63	281.27	281.46
Lower	2579.076	100.63	101.9	100.41
Lower	2476.907	1155.6	1093.26	853.34
Lower	2422.446	335.76	346.43	218.7
Lower	2355.763	48.16	40.88	38.52
Lower	2314.880	14.36	91.23	28.15
Lower	2223.643	39.89	37.88	44.06
Lower	2185.764	190.76	109.94	157.38
Lower	2075.488	41.03	39.47	55.96
Lower	2057.86	Culvert		
Lower	2035.918	50.28	39.38	62.3
Lower	2017.29	Bridge		
Lower	1996.533	477.61	274.2	175.6
Lower	1720.640	277.27	313.32	323.91
Lower	1407.321	277.15	391.34	964.75
Lower	1000.000	1	1	1

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Brush Run

Reach	River Sta.	Contr.	Expan.
Reach 1	2011.333	.1	.3
Reach 1	1507.212	.1	.3

River: Flint Run

Reach	River Sta.	Contr.	Expan.
Upper	5348.411	.1	.3
Upper	4587.709	.1	.3
Upper	4327.913	.1	.3
Lower	4052.349	.1	.3
Lower	3910.912	.1	.3
Lower	3710.271	.1	.3
Lower	3270.326	.1	.3
Lower	3218.798	.1	.3
Lower	3143.198	.1	.3
Lower	2861.250	.1	.3
Lower	2579.076	.1	.3
Lower	2476.907	.1	.3
Lower	2422.446	.1	.3

Lower	2355.763	.1	.3
Lower	2314.880	.1	.3
Lower	2223.643	.1	.3
Lower	2185.764	.1	.3
Lower	2075.488	.1	.3
Lower	2057.86	Culvert	
Lower	2035.918	.1	.3
Lower	2017.29	Bridge	
Lower	1996.533	.1	.3
Lower	1720.640	.1	.3
Lower	1407.321	.1	.3
Lower	1000.000	.1	.3

Profile Output Table - Standard Table 1

River Chnl	Reach Flow Area	Top Width	River Sta Froude #	Q Total Chl	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)
Flint Run	Upper		5348.411	7165.00	753.25	767.24		767.86	0.001126	
6.61	1460.11	206.60		0.37						
Flint Run	Upper		4587.709	7165.00	751.12	766.04		766.94	0.001406	
7.82	1185.92	161.36		0.41						
Flint Run	Upper		4327.913	7165.00	755.00	764.07	763.25	766.17	0.005757	
11.92	744.31	151.37		0.78						
Flint Run	Lower		4052.349	7412.00	749.62	764.76		765.21	0.000824	
6.47	1971.62	327.98		0.32						
Flint Run	Lower		3910.912	7412.00	749.22	764.81		765.09	0.000580	
5.48	2391.11	358.75		0.27						
Flint Run	Lower		3710.271	7412.00	755.00	762.00	761.55	763.94	0.007244	
11.32	737.80	175.08		0.84						
Flint Run	Lower		3270.326	7412.00	747.64	761.95		762.55	0.001168	
7.50	1408.91	204.76		0.37						
Flint Run	Lower		3218.798	7412.00	747.59	761.89		762.49	0.001214	
7.31	1438.96	233.37		0.38						
Flint Run	Lower		3143.198	7412.00	747.50	760.82		761.55	0.001484	
7.91	1298.25	219.23		0.42						
Flint Run	Lower		2861.250	7412.00	746.88	760.03		761.05	0.001902	
9.25	1174.61	228.30		0.48						
Flint Run	Lower		2579.076	7412.00	745.85	759.94		760.49	0.001177	
7.25	1514.91	258.66		0.36						
Flint Run	Lower		2476.907	7412.00	745.53	759.89		760.36	0.001001	
6.85	1584.04	239.45		0.35						
Flint Run	Lower		2422.446	7412.00	745.48	758.15		758.98	0.001909	
8.54	1234.24	232.01		0.46						
Flint Run	Lower		2355.763	7412.00	745.42	756.94		758.20	0.003034	
10.16	1011.74	206.69		0.57						
Flint Run	Lower		2314.880	7412.00	745.38	756.95		758.04	0.002633	

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9.22	1061.79	205.69	0.53							
Flint Run	Lower	2223.643	7412.00	745.30	756.81	757.82	0.002603			
9.19	1110.56	207.68	0.52							
Flint Run	Lower	2185.764	7412.00	745.27	756.75	757.71	0.002318			
8.95	1154.12	210.77	0.50							
Flint Run	Lower	2075.488	7412.00	745.17	756.47	754.92	757.34	0.003094		
8.81	1182.93	284.25	0.57							
Flint Run	Lower	2057.86	Culvert							
	Flint Run	Lower	2035.918	7412.00	744.25	756.63	753.24	757.11	0.001044	
6.27	1637.86	316.21	0.34							
Flint Run	Lower	2017.29	Bridge							
	Flint Run	Lower	1996.533	7412.00	745.10	756.24	756.93	0.002293		
6.92	1223.04	294.92	0.48							
Flint Run	Lower	1720.640	7412.00	744.85	754.92	756.11	0.003952			
9.92	1049.02	282.06	0.65							
Flint Run	Lower	1407.321	7412.00	744.57	753.75	752.37	754.85	0.003864		
8.73	947.03	216.17	0.62							
Flint Run	Lower	1000.000	7412.00	744.20	752.41	750.74	753.17	0.002801		
7.69	1180.87	274.08	0.54							
Brush Run	Reach 1	2011.333	1554.00	772.80	777.24	777.24	778.42	0.012925		
11.12	207.53	87.98	1.02							
Brush Run	Reach 1	1507.212	1554.00	763.58	768.38	768.38	769.63	0.011714		
12.10	223.64	87.57	1.02							

ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : Ex

River: Brush Run Reach: Reach 1 RS: 2011.333 Profile: 100-yr

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 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.

River: Brush Run Reach: Reach 1 RS: 1507.212 Profile: 100-yr

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 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.

River: Flint Run Reach: Upper RS: 4587.709 Profile: 100-yr

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.

River: Flint Run Reach: Upper RS: 4327.913 Profile: 100-yr

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

River: Flint Run Reach: Lower RS: 3910.912 Profile: 100-yr
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.

River: Flint Run Reach: Lower RS: 3710.271 Profile: 100-yr

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.

River: Flint Run Reach: Lower RS: 2476.907 Profile: 100-yr

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.

River: Flint Run Reach: Lower RS: 2035.918 Profile: 100-yr

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

This may indicate the need for additional cross sections.

River: Flint Run Reach: Lower RS: 2017.29 Profile: 100-yr Upstream

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.

River: Flint Run Reach: Lower RS: 2017.29 Profile: 100-yr Downstream

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

GesslerFinal.rep

This may indicate the need for additional cross sections.
River: Flint Run Reach: Lower RS: 1720.640 Profile: 100-yr

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

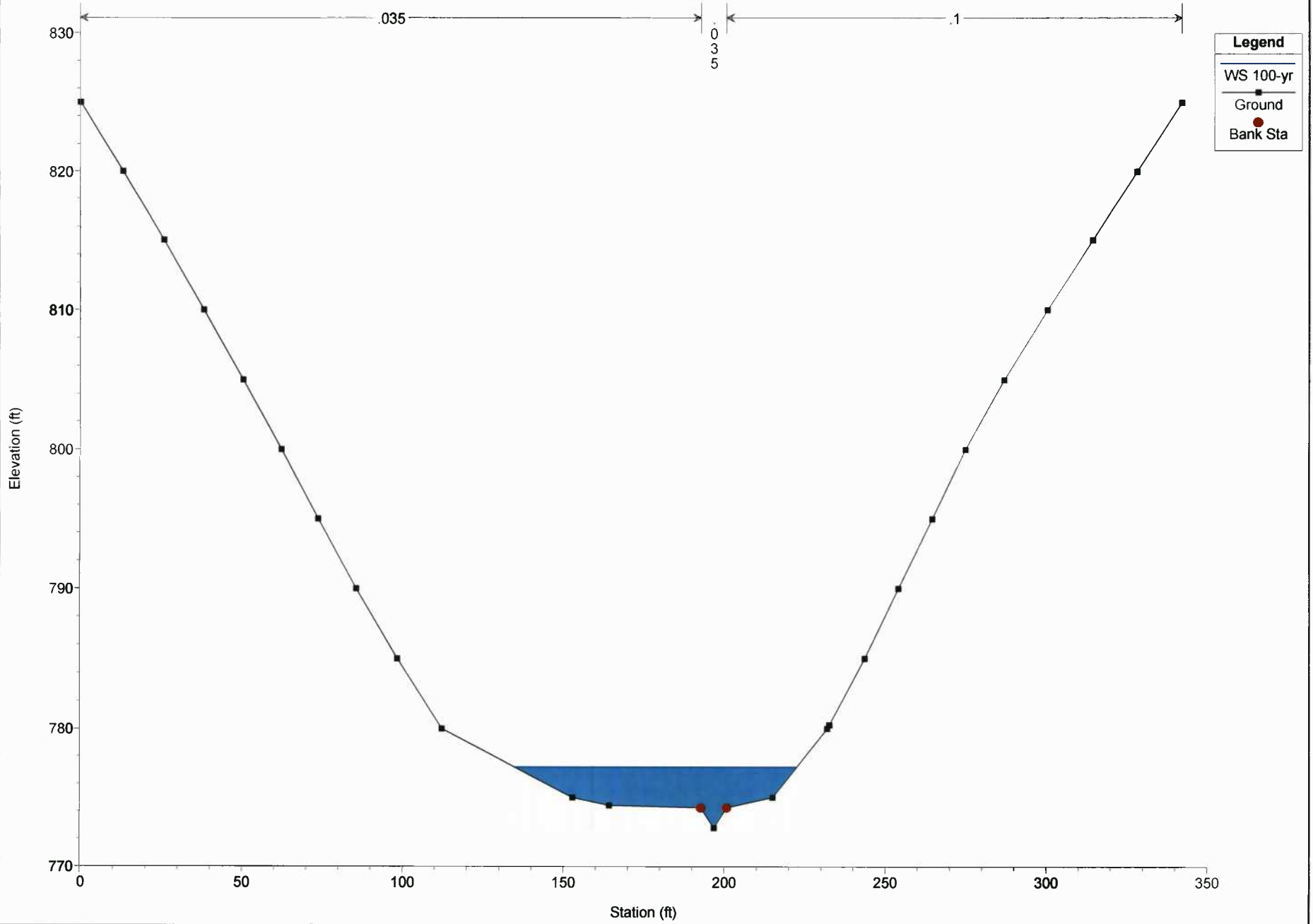
the need for additional cross sections.

River: Flint Run Reach: Lower RS: 1407.321 Profile: 100-yr

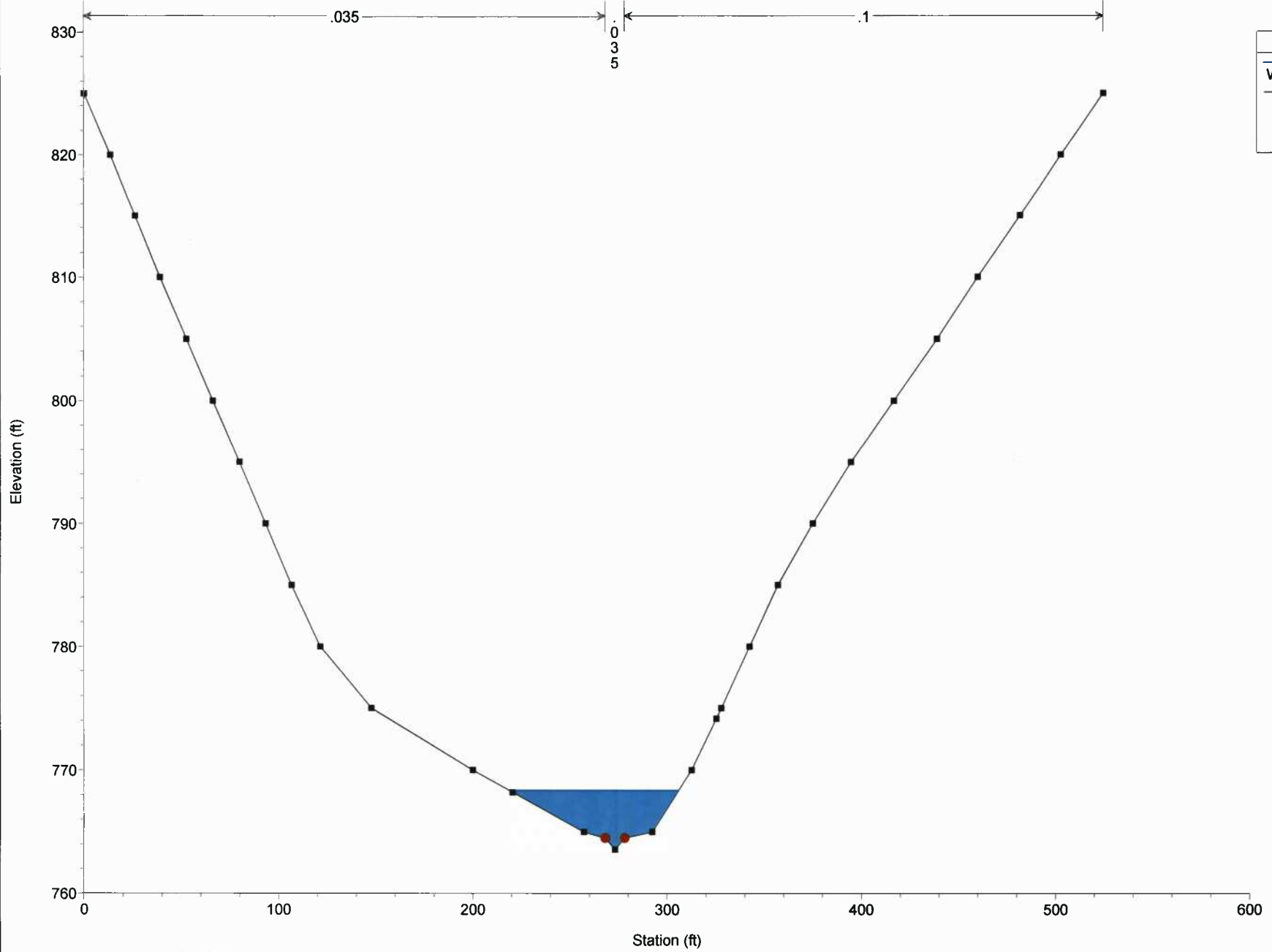
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Brush Run Reach = Reach 1 RS = 2011.333

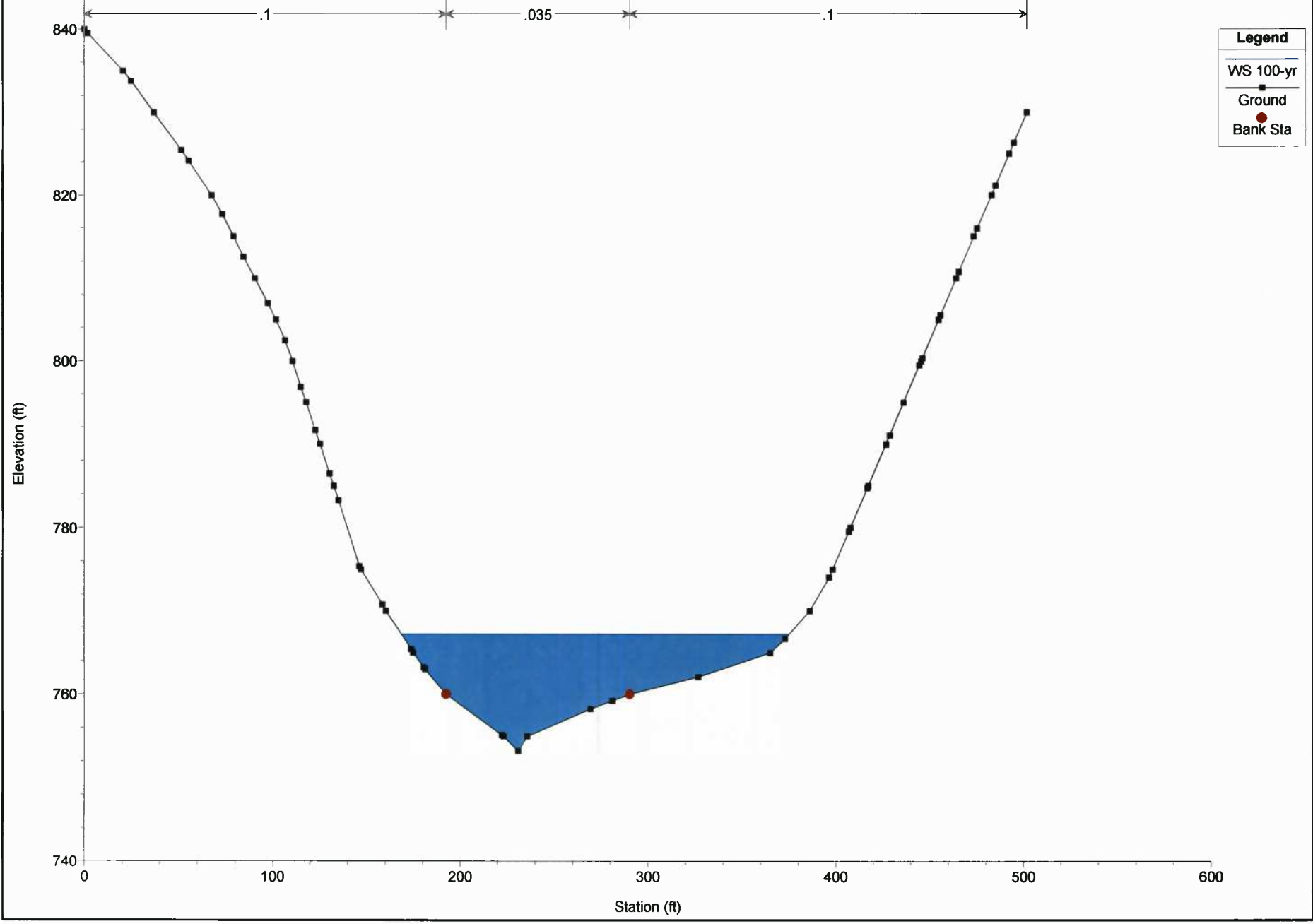


Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Brush Run Reach = Reach 1 RS = 1507.212



Legend	
WS 100-yr	■
Ground	—
Bank Sta	●

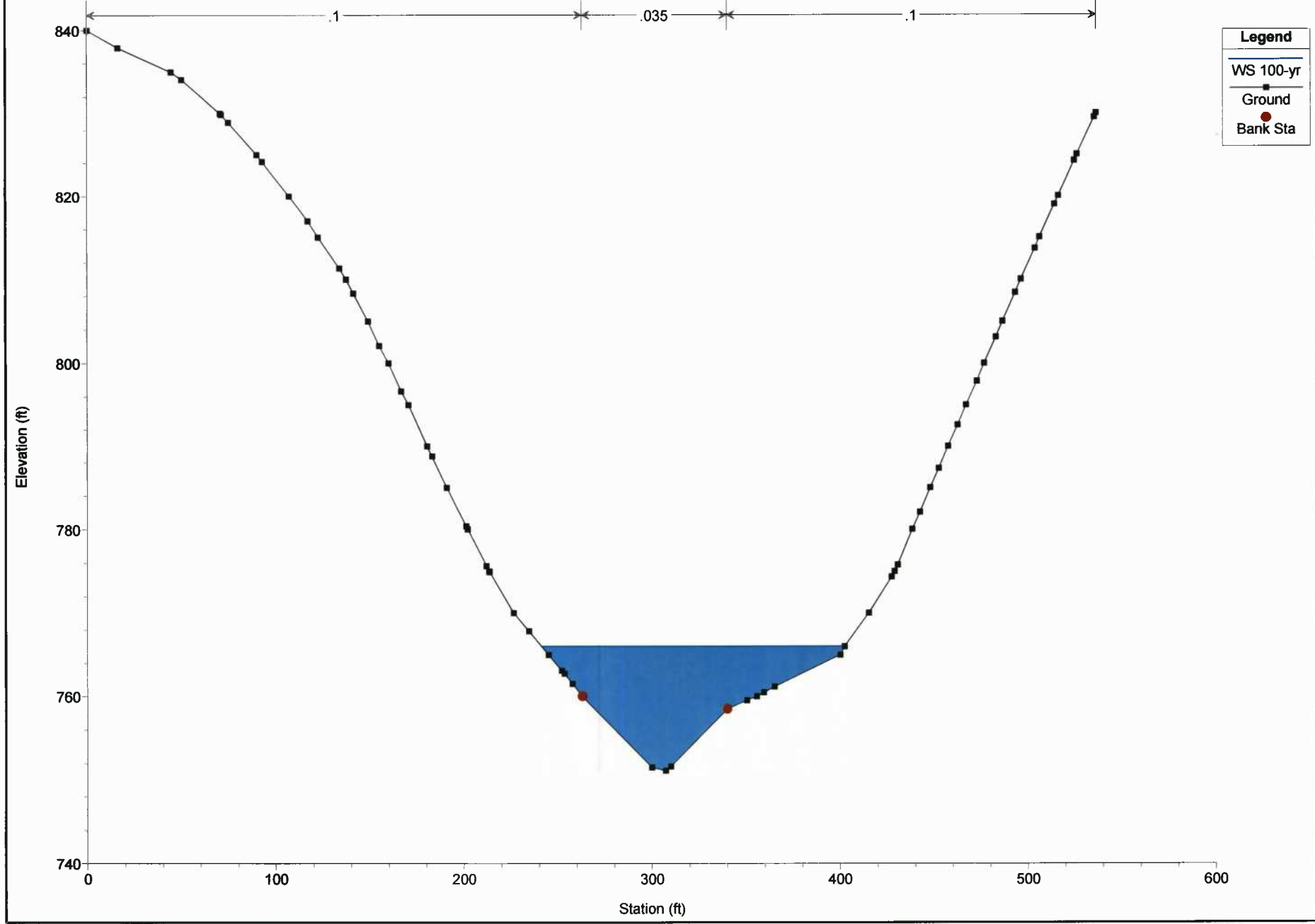
Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Upper RS = 5348.411



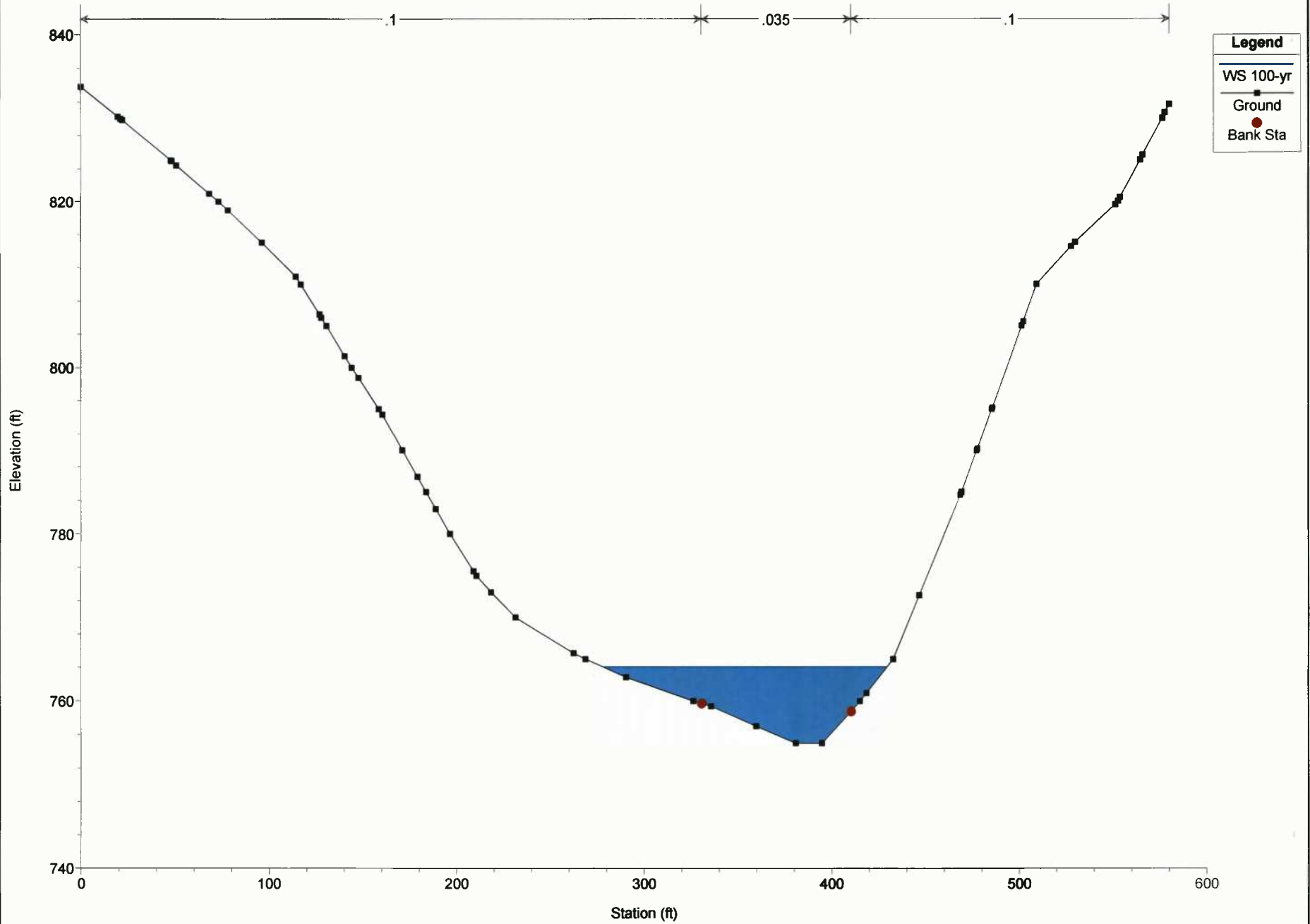
Legend	
WS 100-yr	■
Ground	■
Bank Sta	●

Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Upper RS = 4587.709

Legend	
WS 100-yr	■
Ground	■
Bank Sta	●

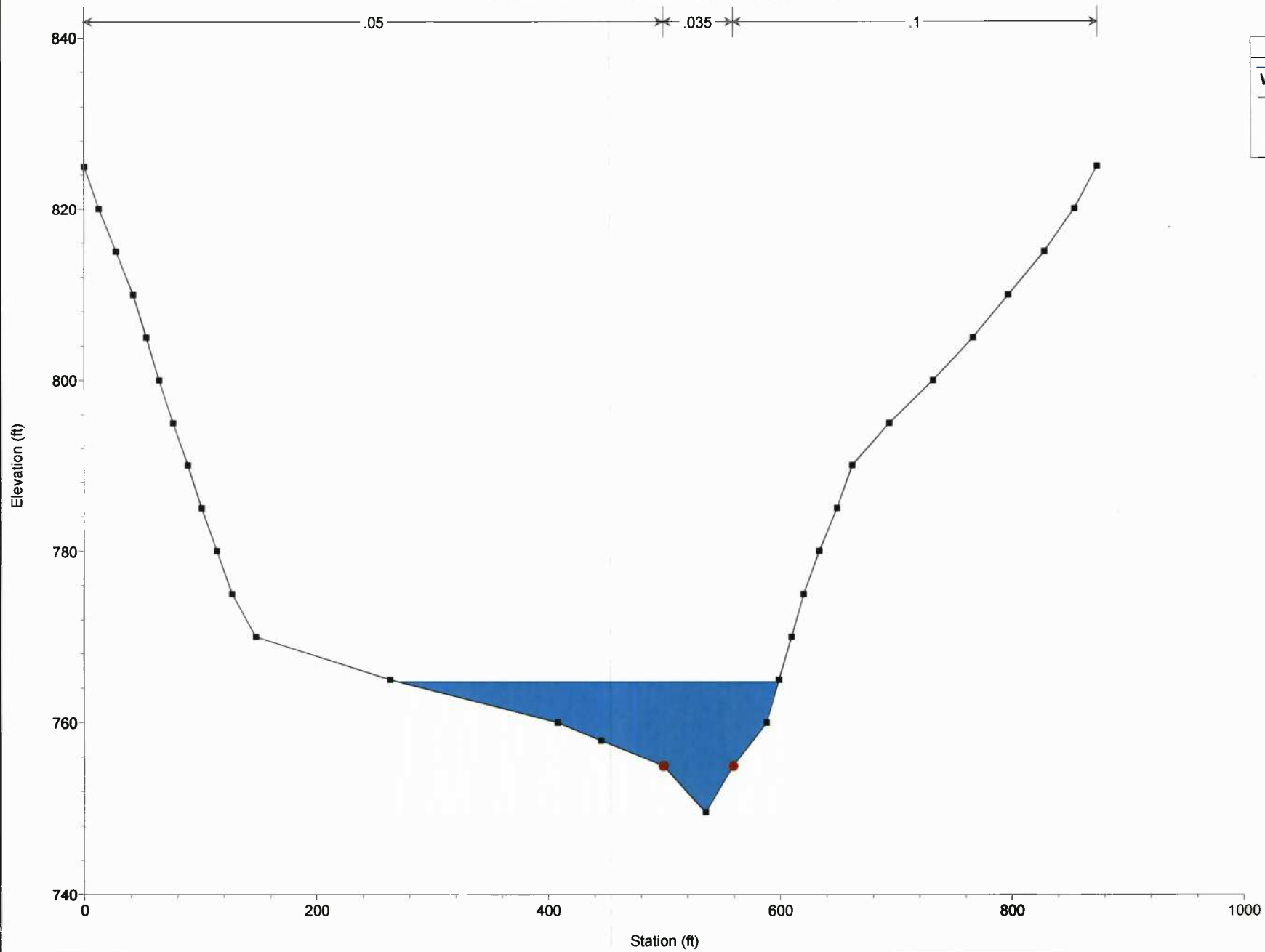


Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Upper RS = 4327.913

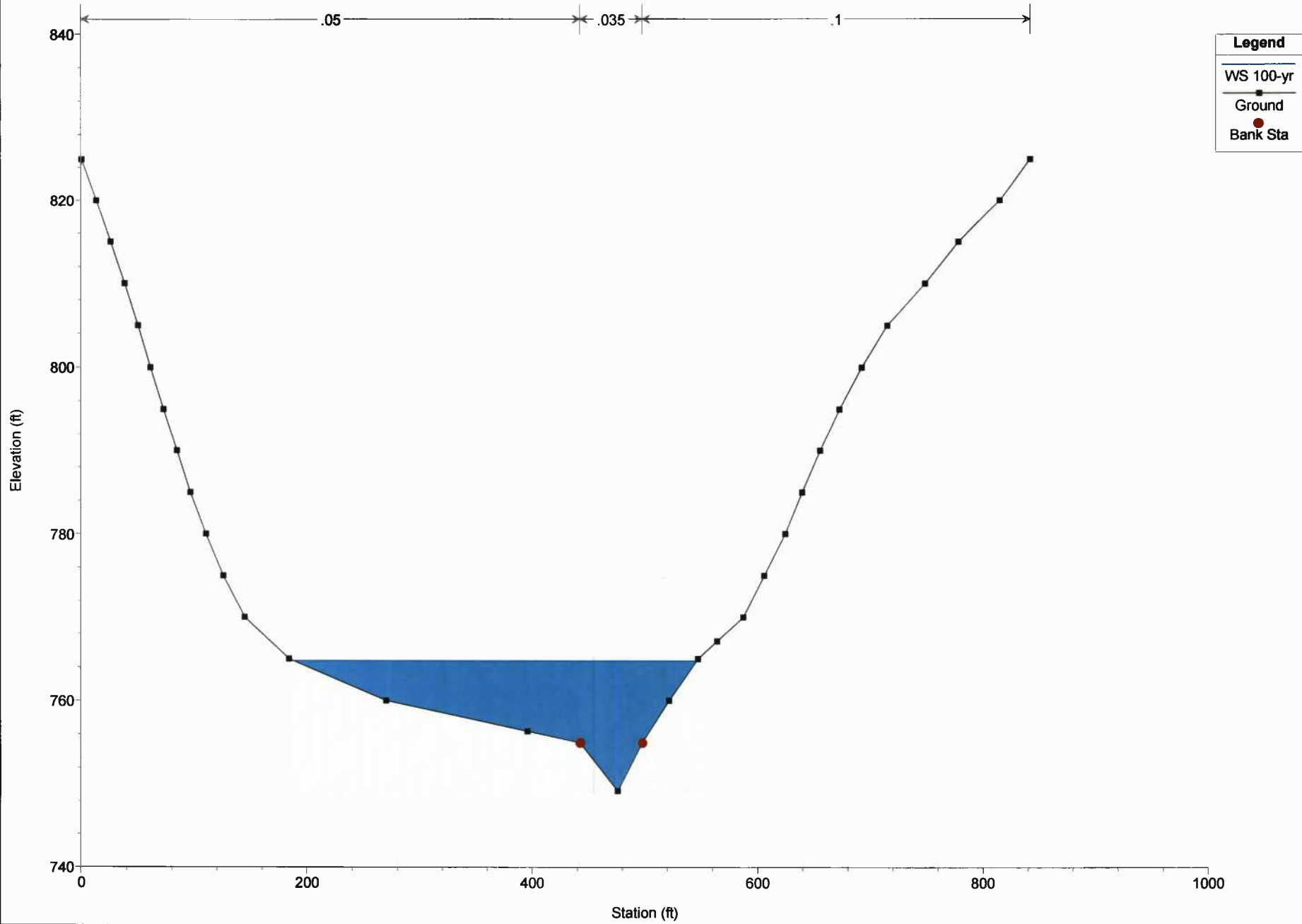


Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 4052.349

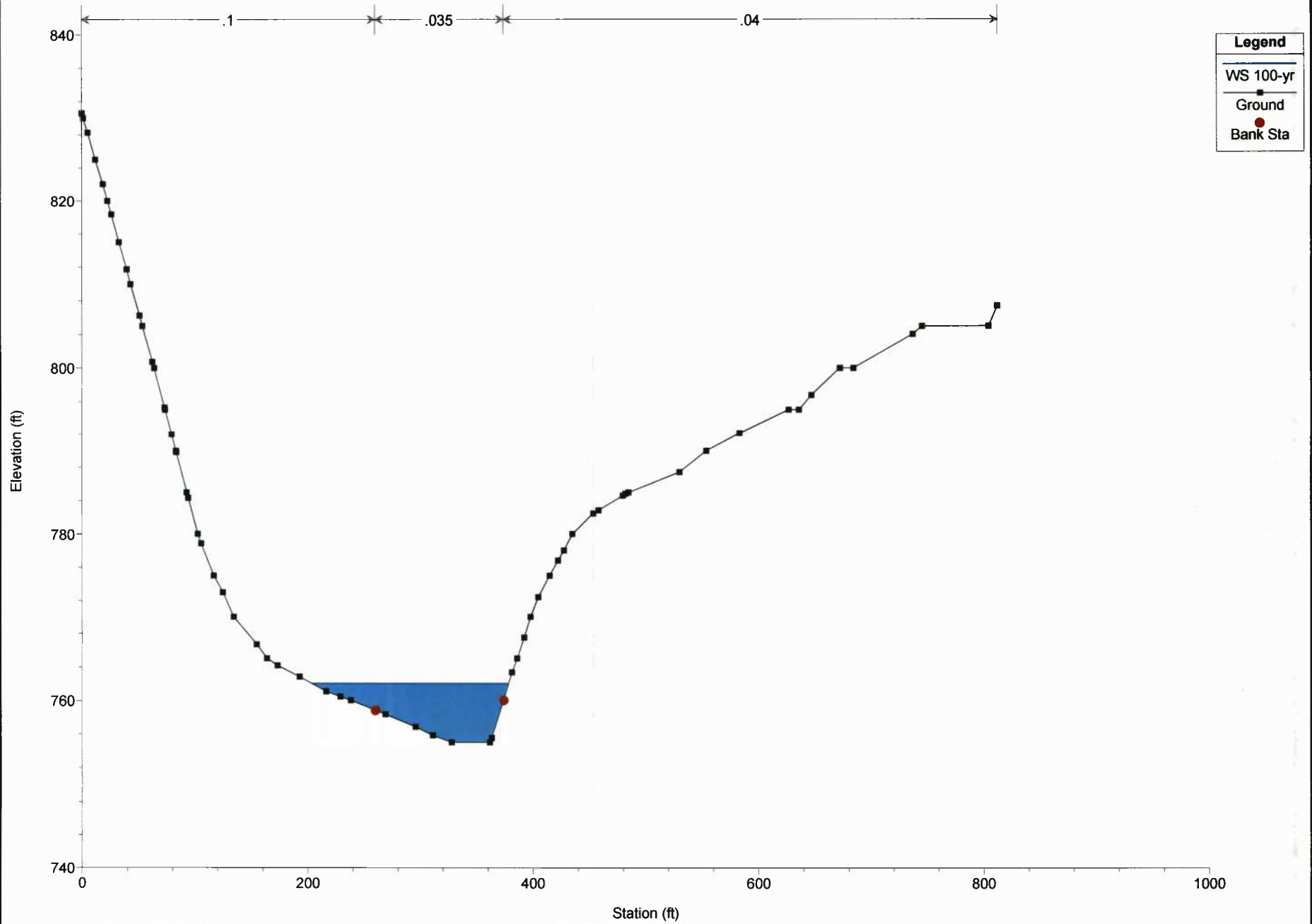
Legend	
WS 100-yr	■
Ground	●
Bank Sta	●



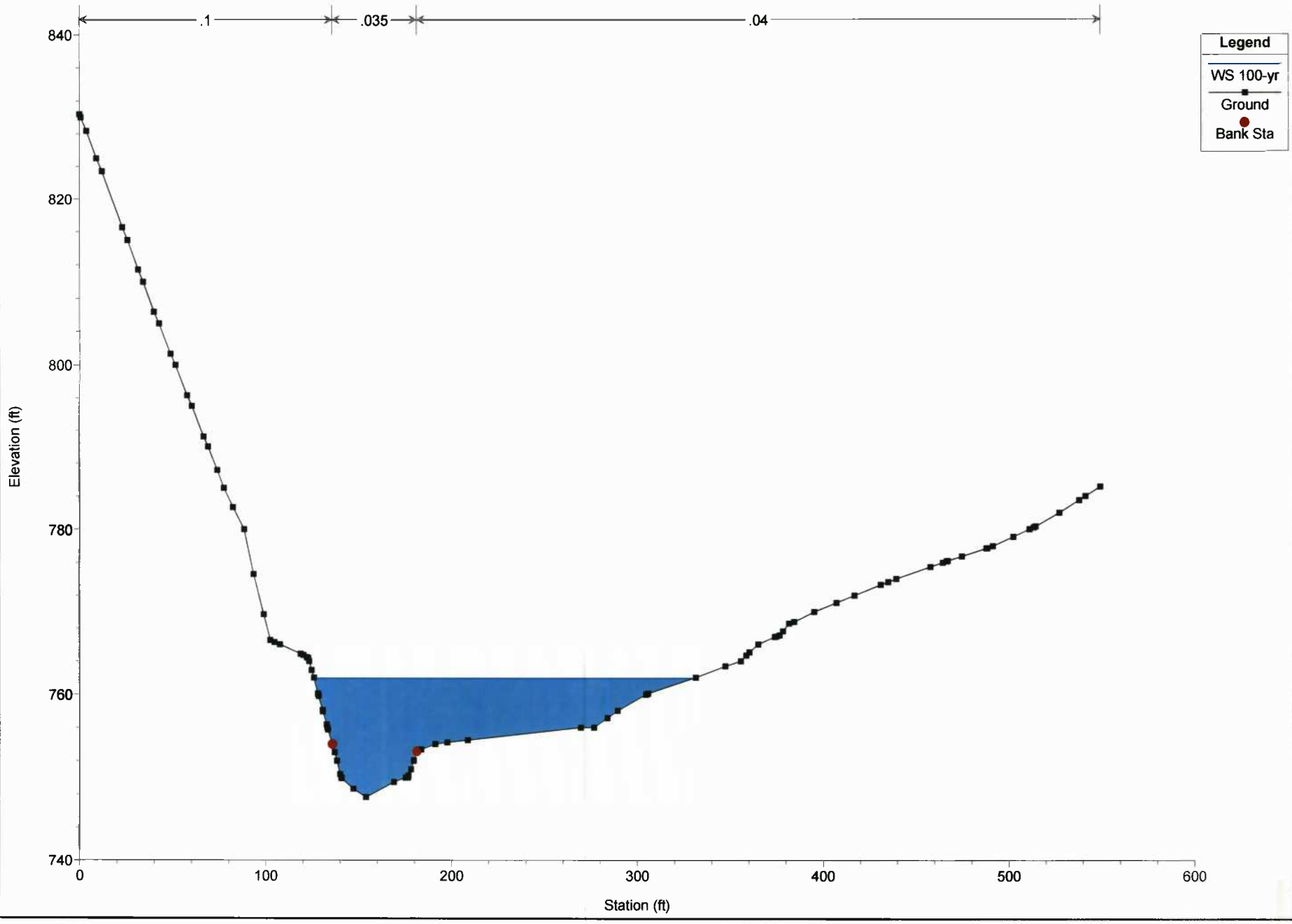
Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 3910.912



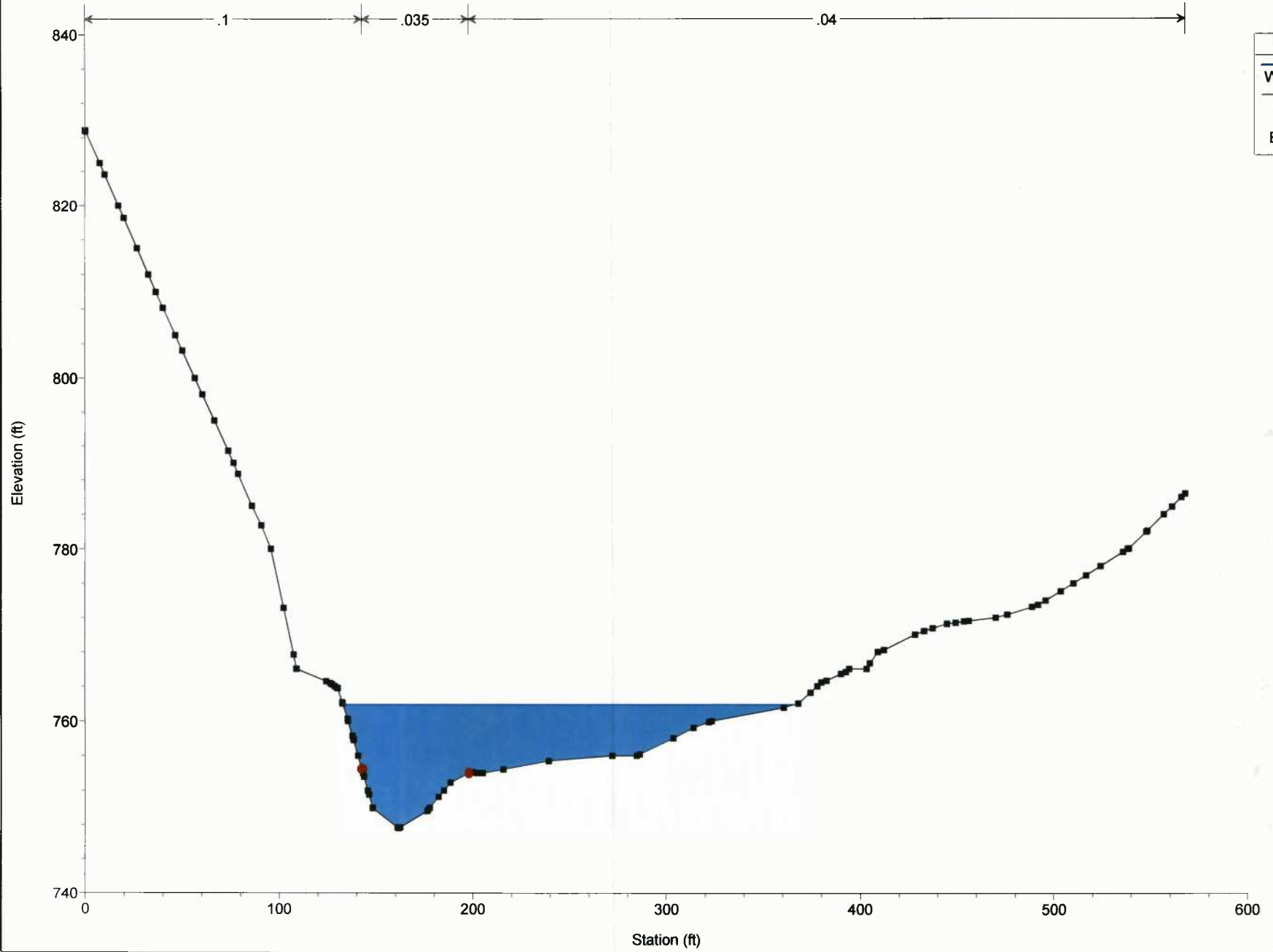
Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 3710.271



Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 3270.326

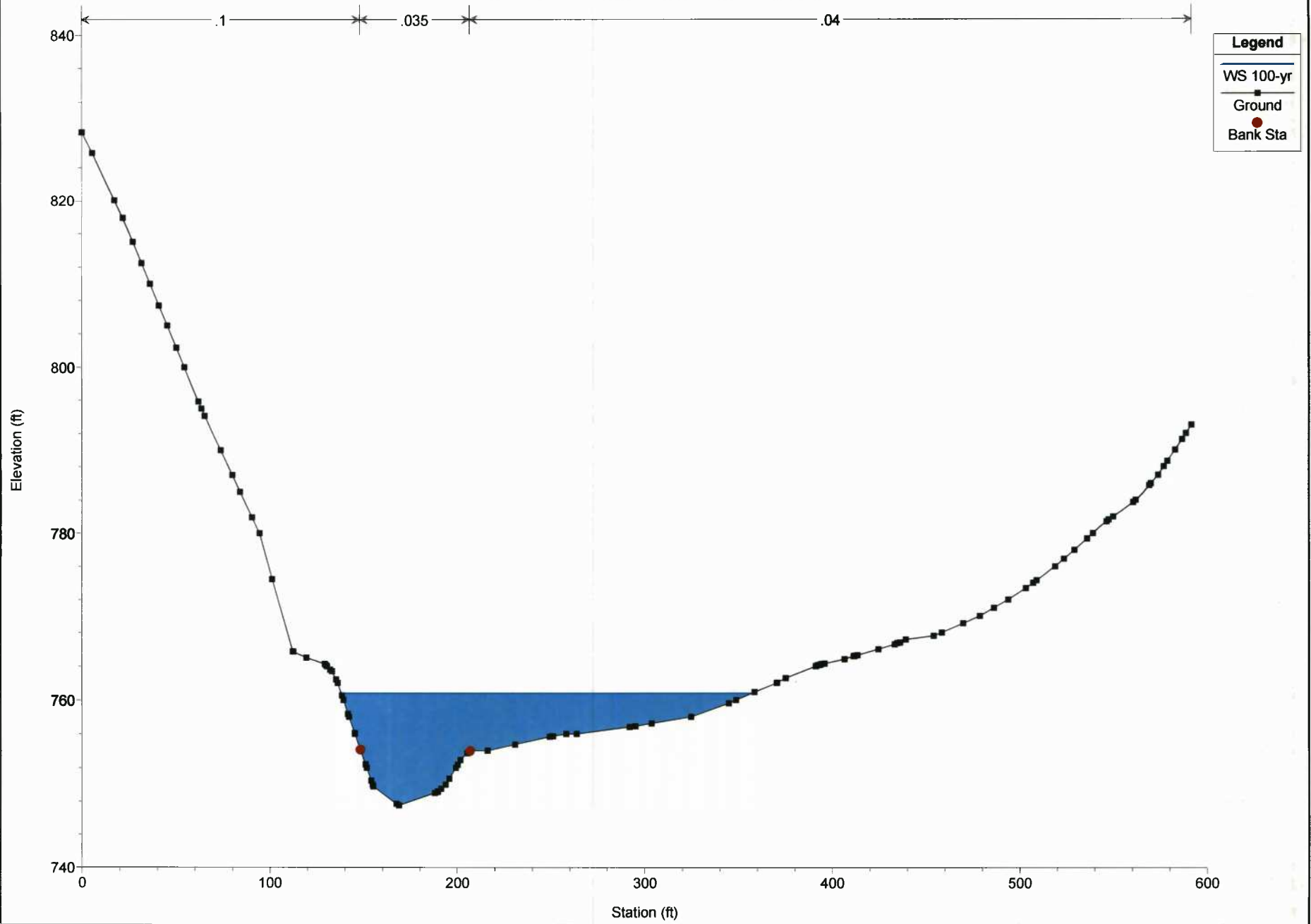


Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 3218.798

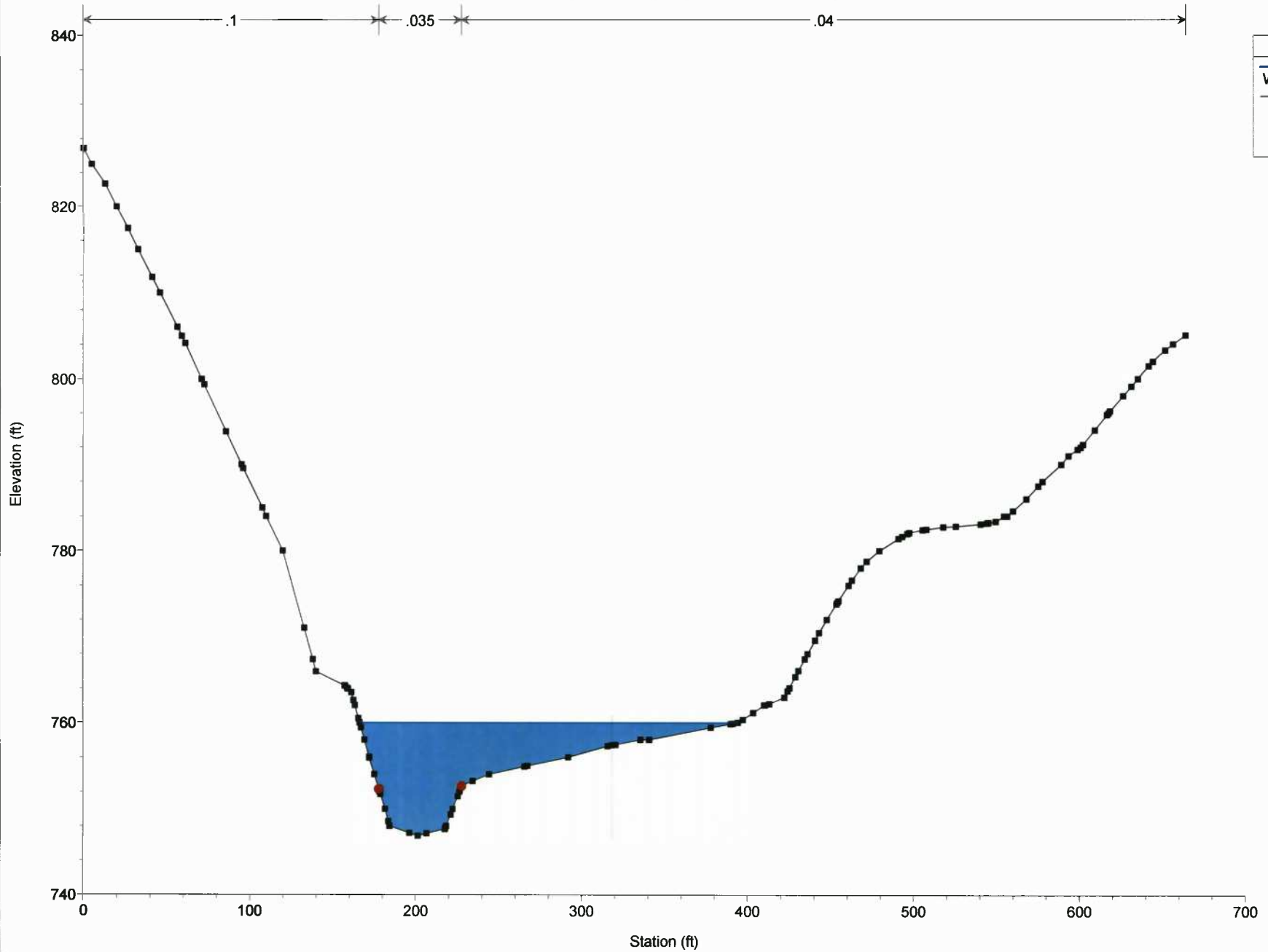


Legend
WS 100-yr
Ground
Bank Sta

Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 3143.198

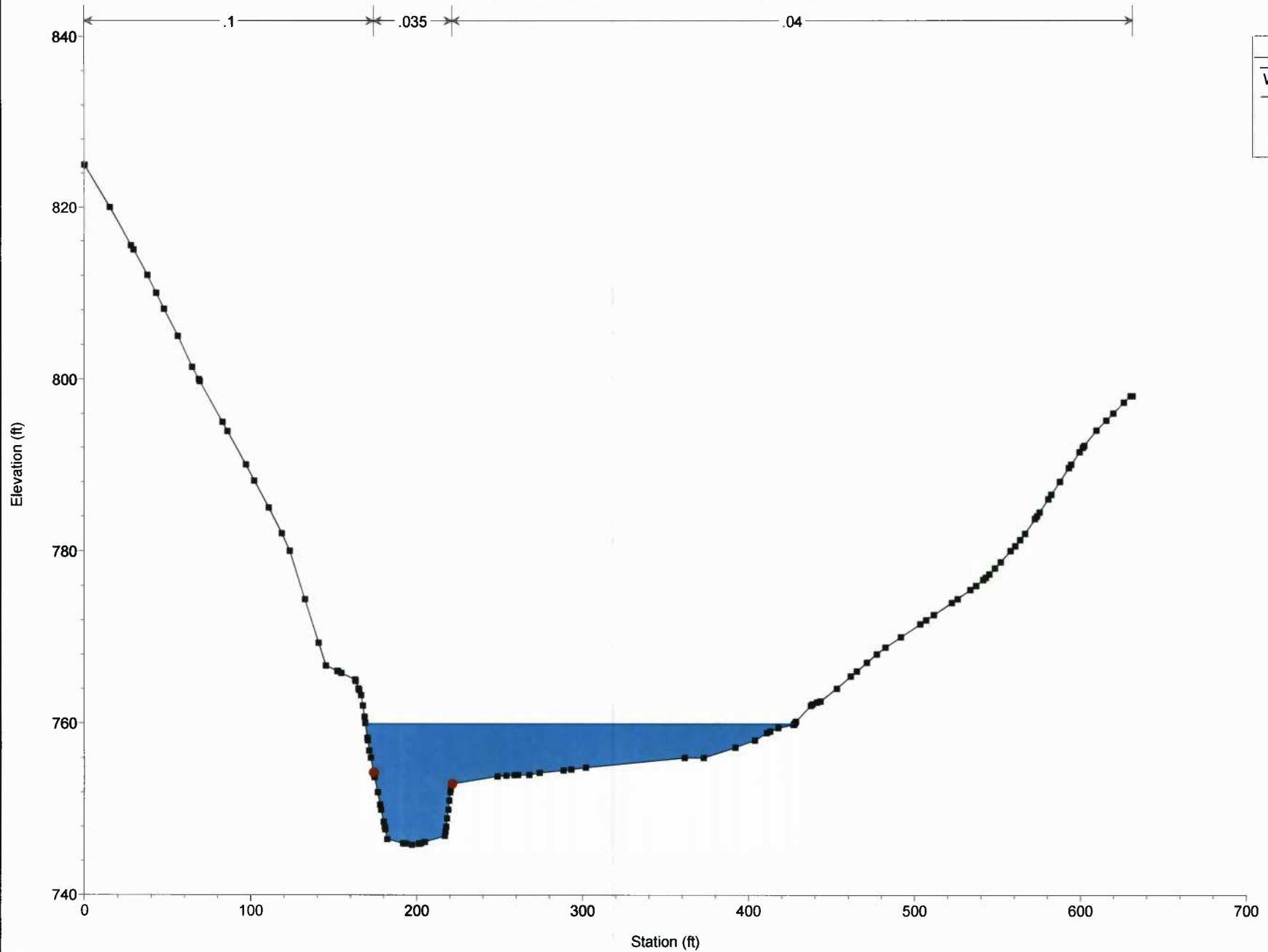


Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 2861.250

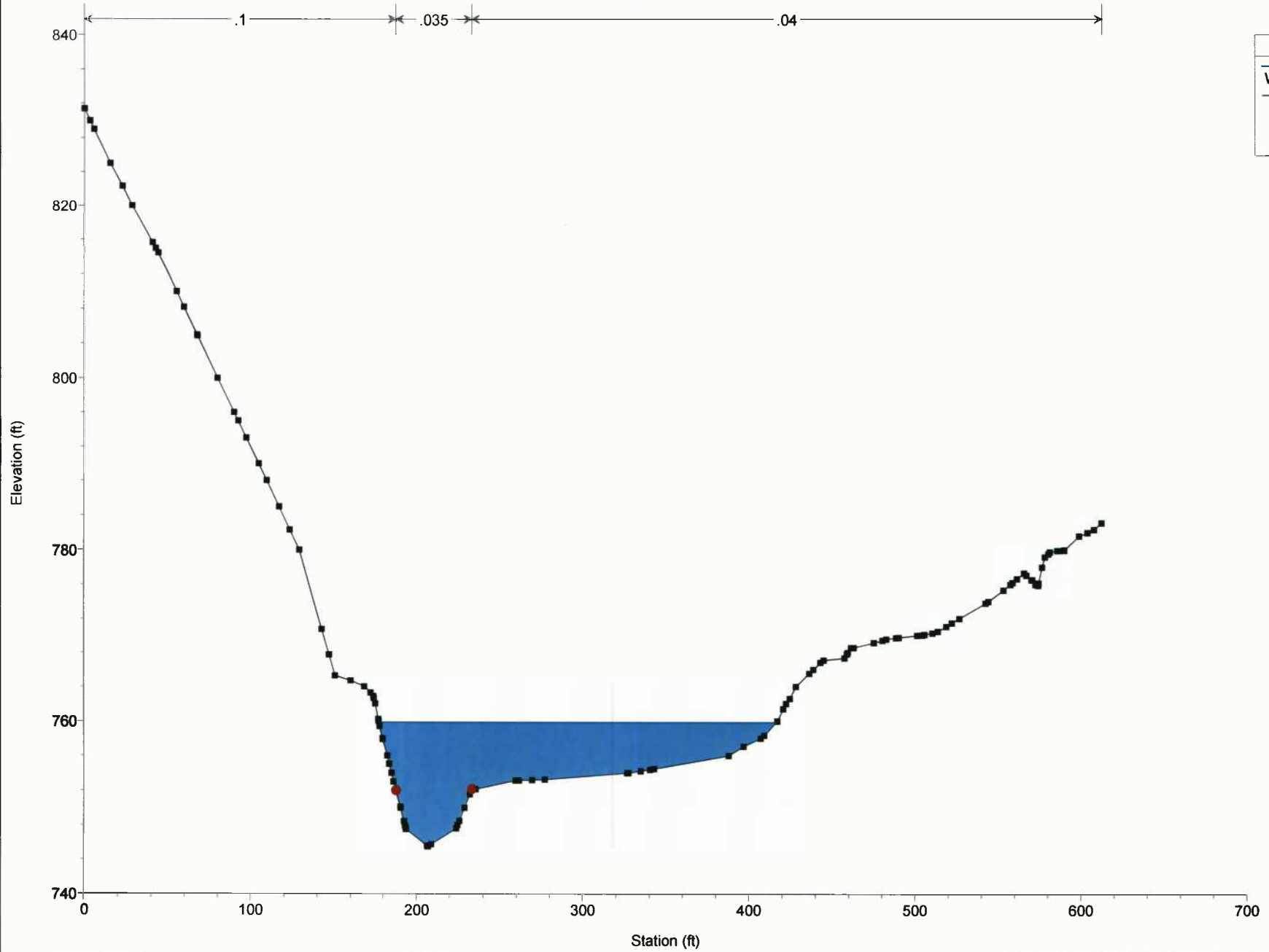


Legend	
—	WS 100-yr
■	Ground
●	Bank Sta

Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 2579.076

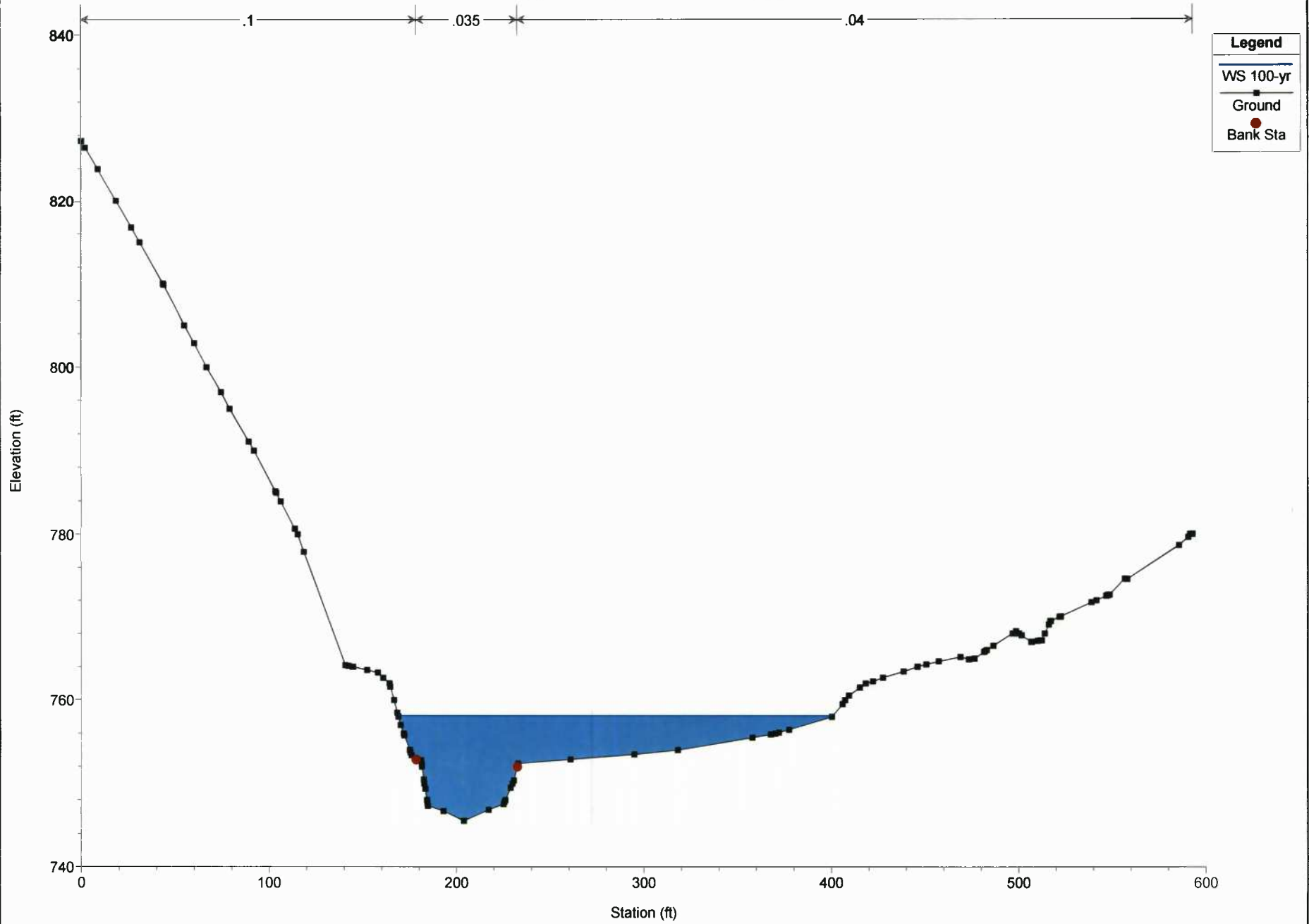


Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 2476.907



Legend	
WS 100-yr	—■—
Ground	—■—
Bank Sta	●

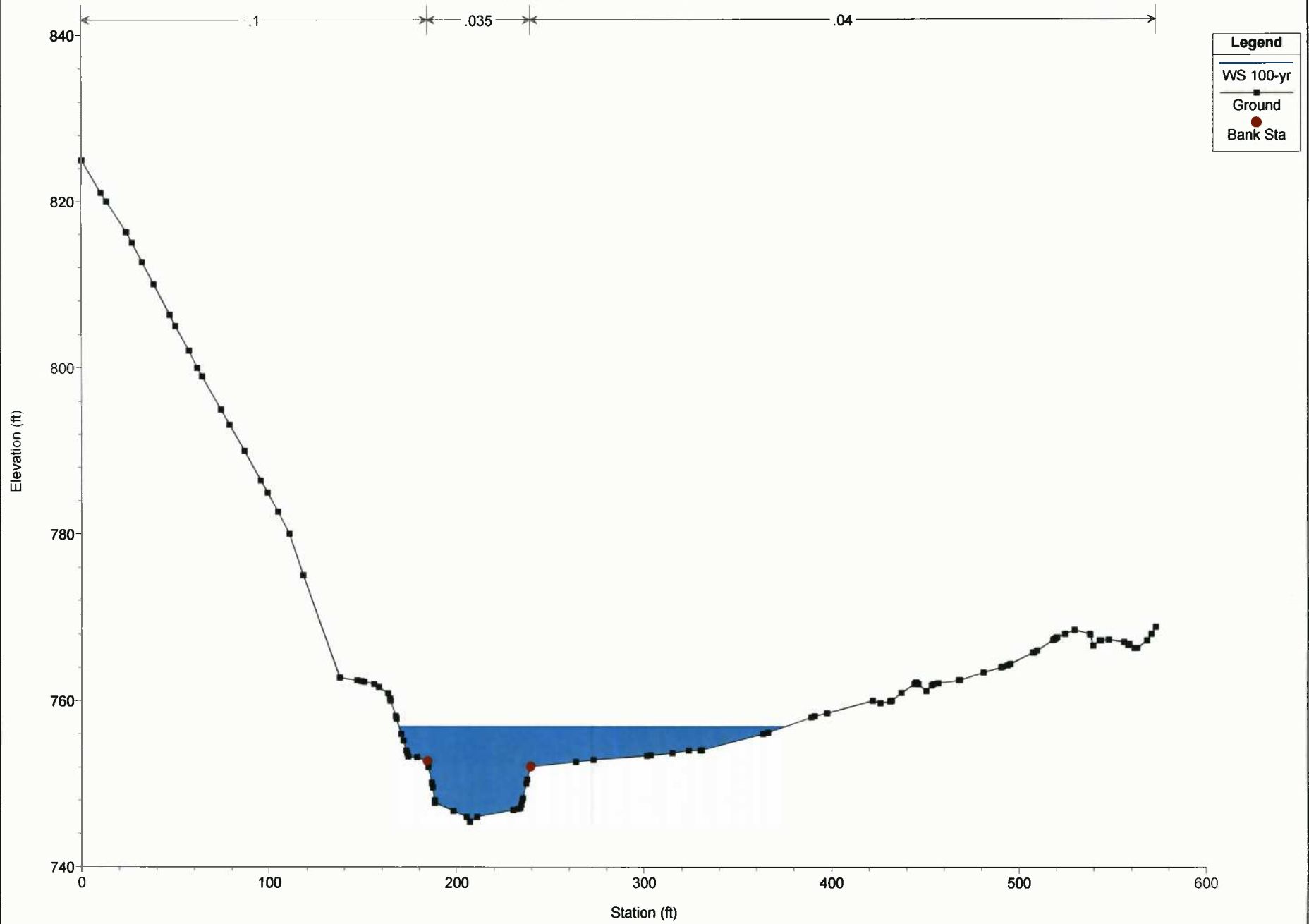
Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 2422.446



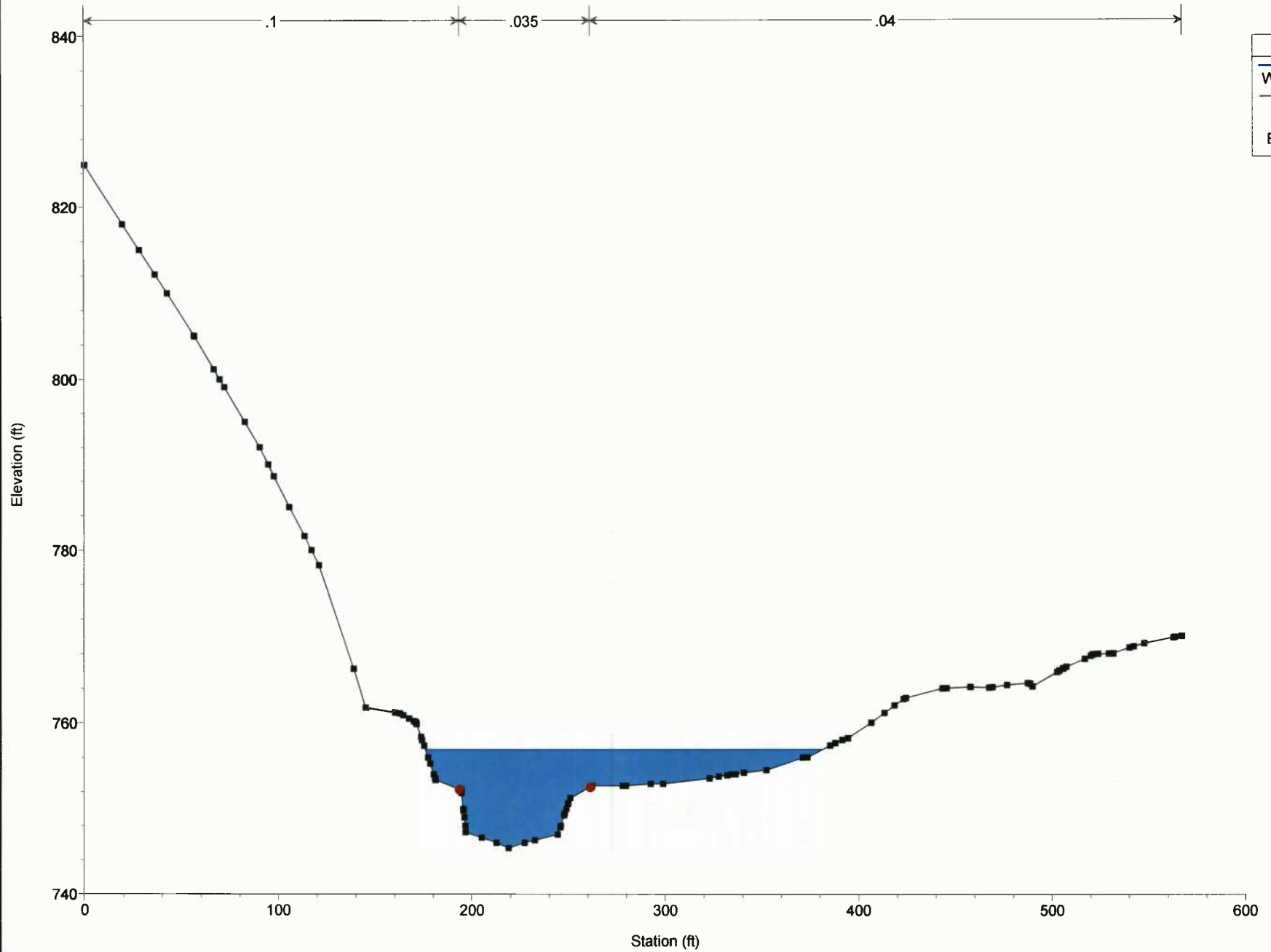
Gessler Final Plan: Existing

Geom: Flint Run Existing Flow: Flint Run

River = Flint Run Reach = Lower RS = 2355.763



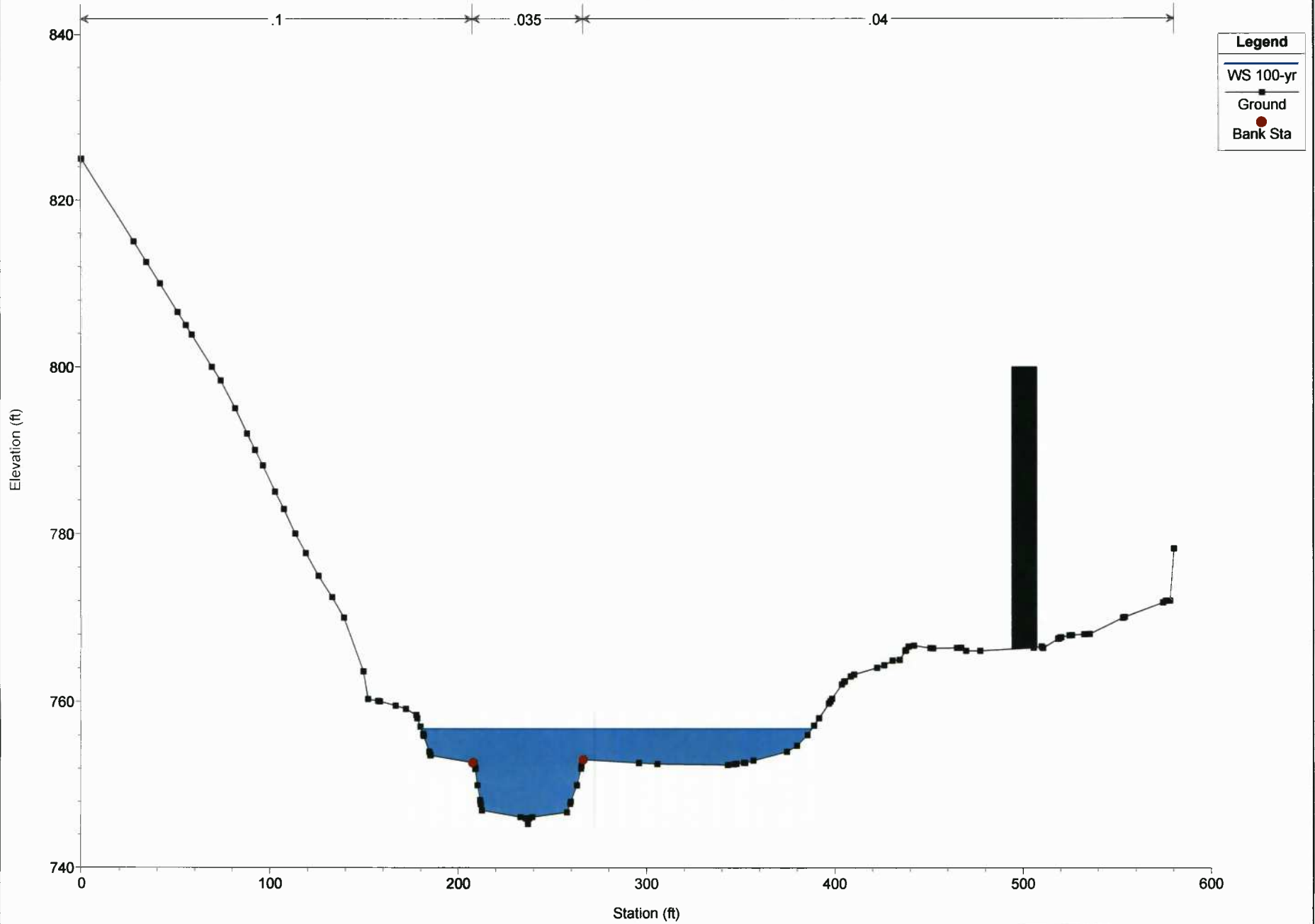
Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 2314.880



Gessler Final Plan: Existing

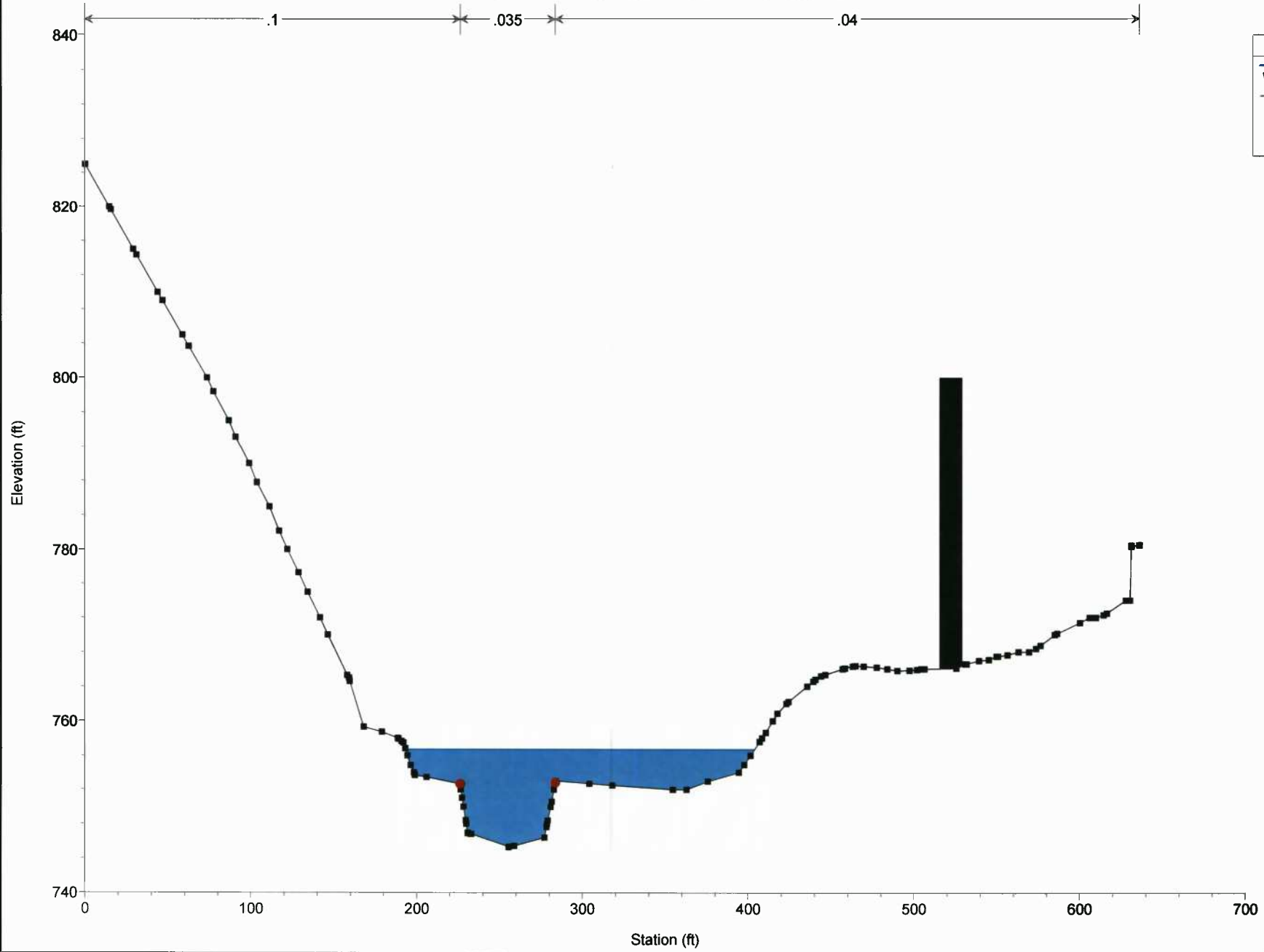
Geom: Flint Run Existing Flow: Flint Run

River = Flint Run Reach = Lower RS = 2223.643



Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 2185.764

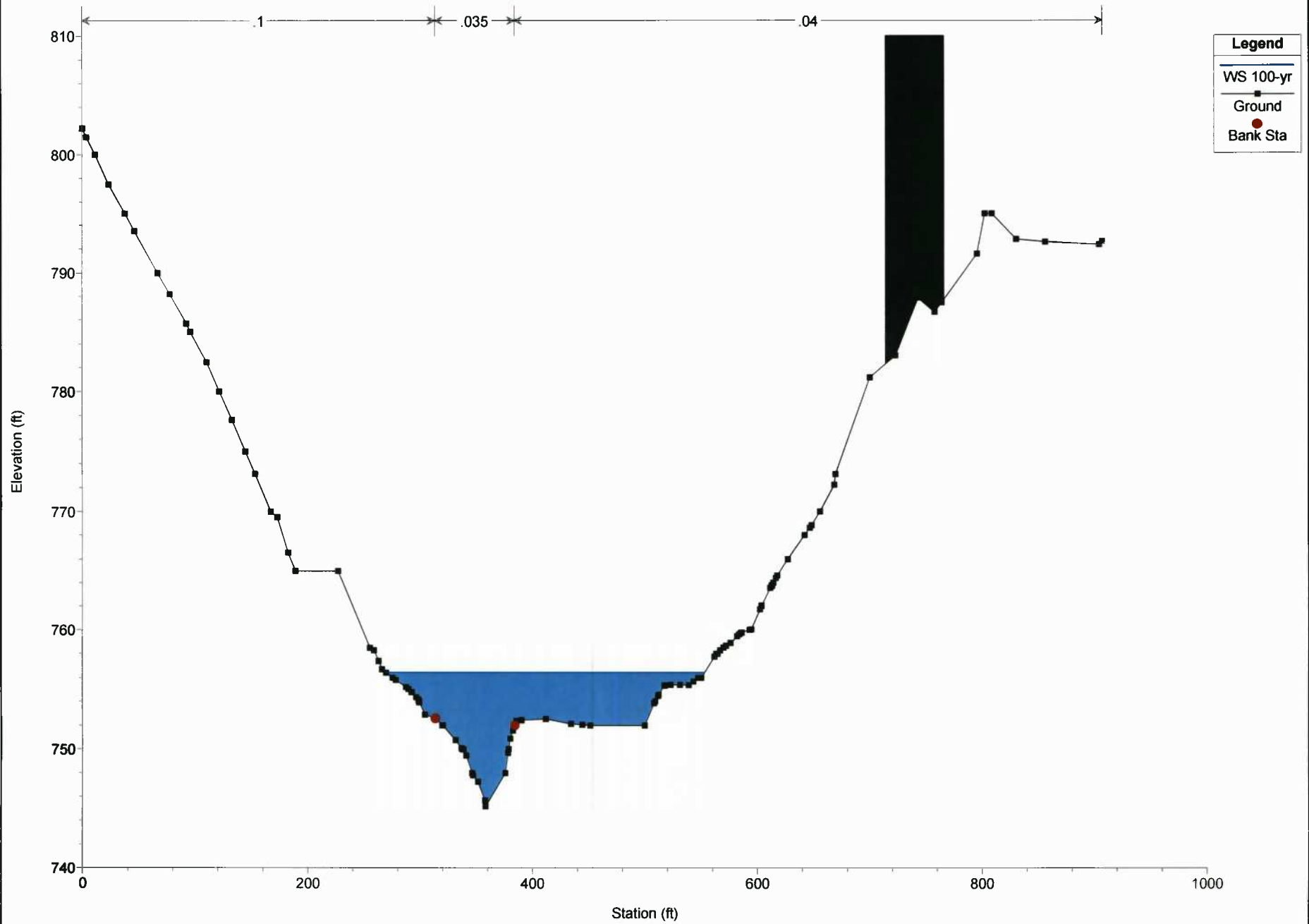
Legend	
—	WS 100-yr
■	Ground
●	Bank Sta



Gessler Final Plan: Existing

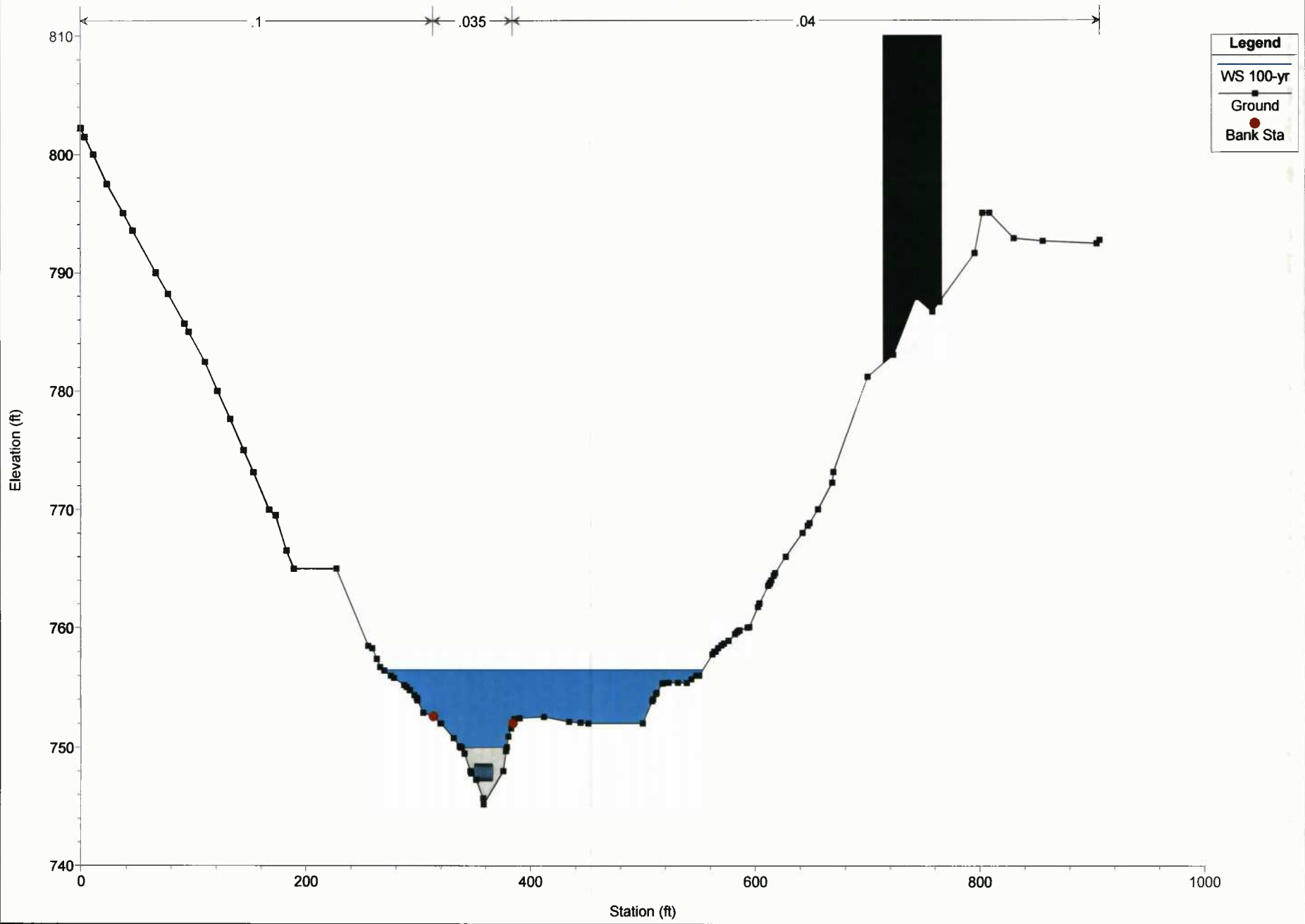
Geom: Flint Run Existing Flow: Flint Run

River = Flint Run Reach = Lower RS = 2075.488



Gessler Final Plan: Existing

Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 2057.86 Culv

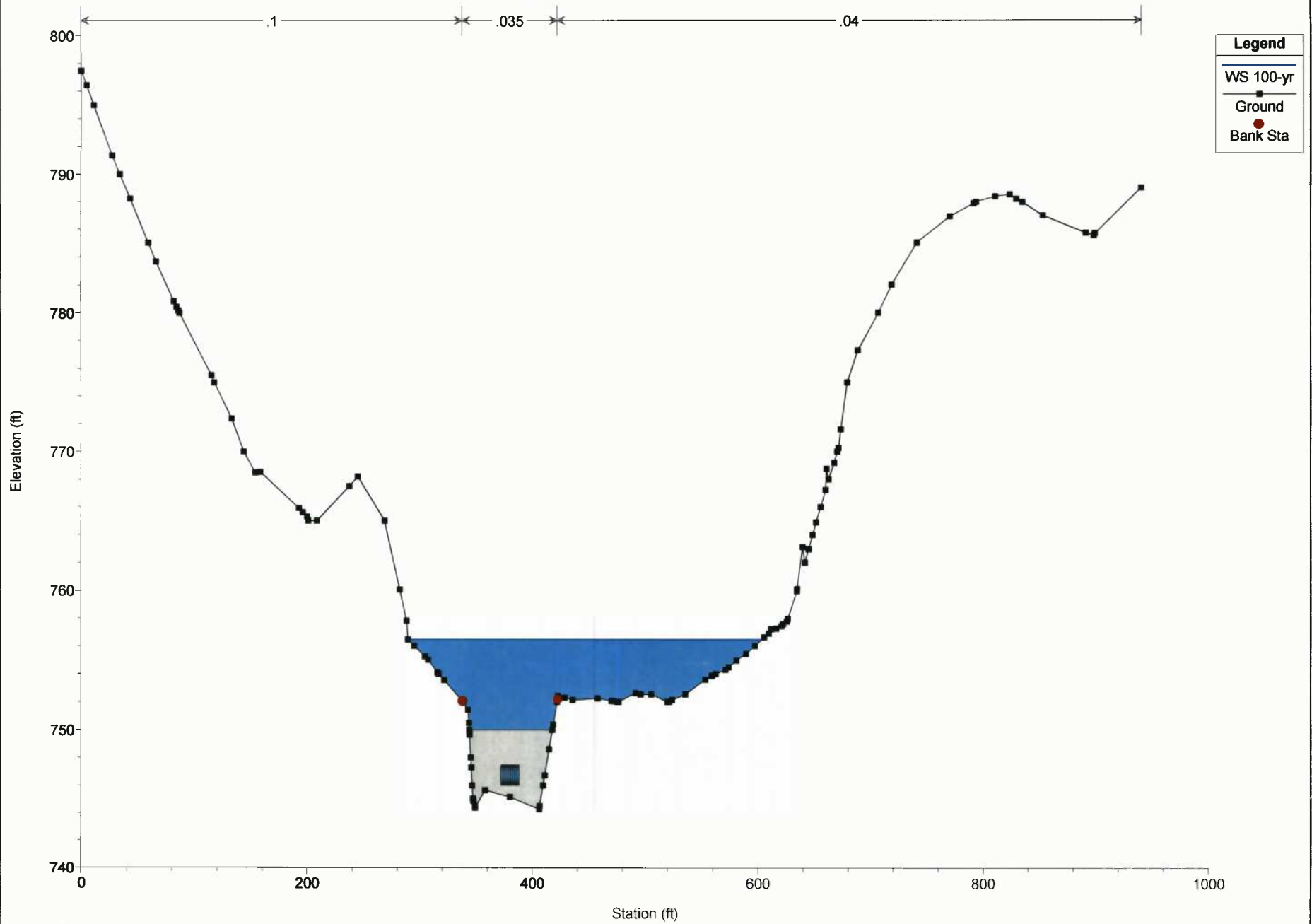


Legend	
WS 100-yr	—
Ground	■
Bank Sta	●

Gessler Final Plan: Existing

Geom: Flint Run Existing Flow: Flint Run

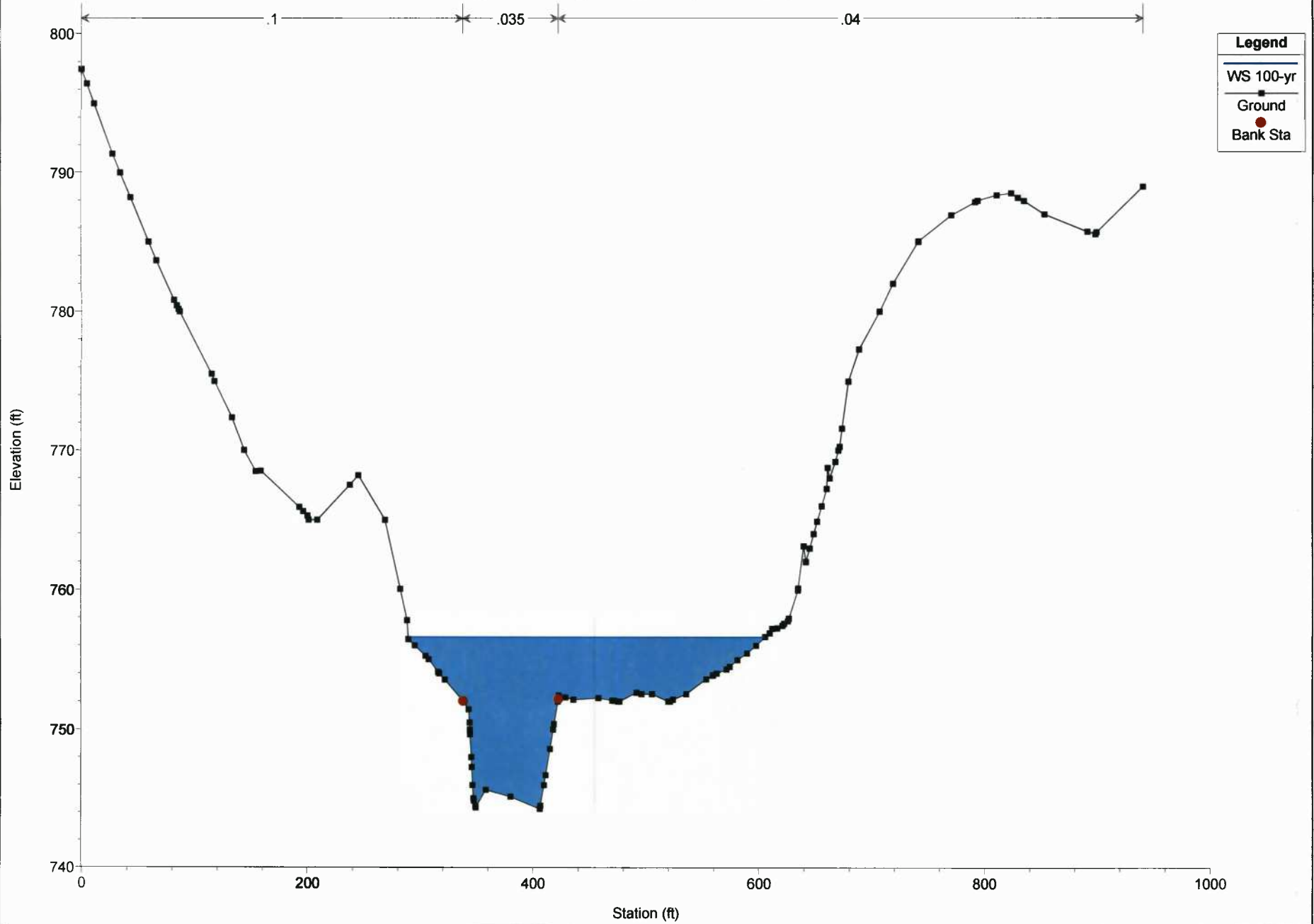
River = Flint Run Reach = Lower RS = 2057.86 Culv



Gessler Final Plan: Existing

Geom: Flint Run Existing Flow: Flint Run

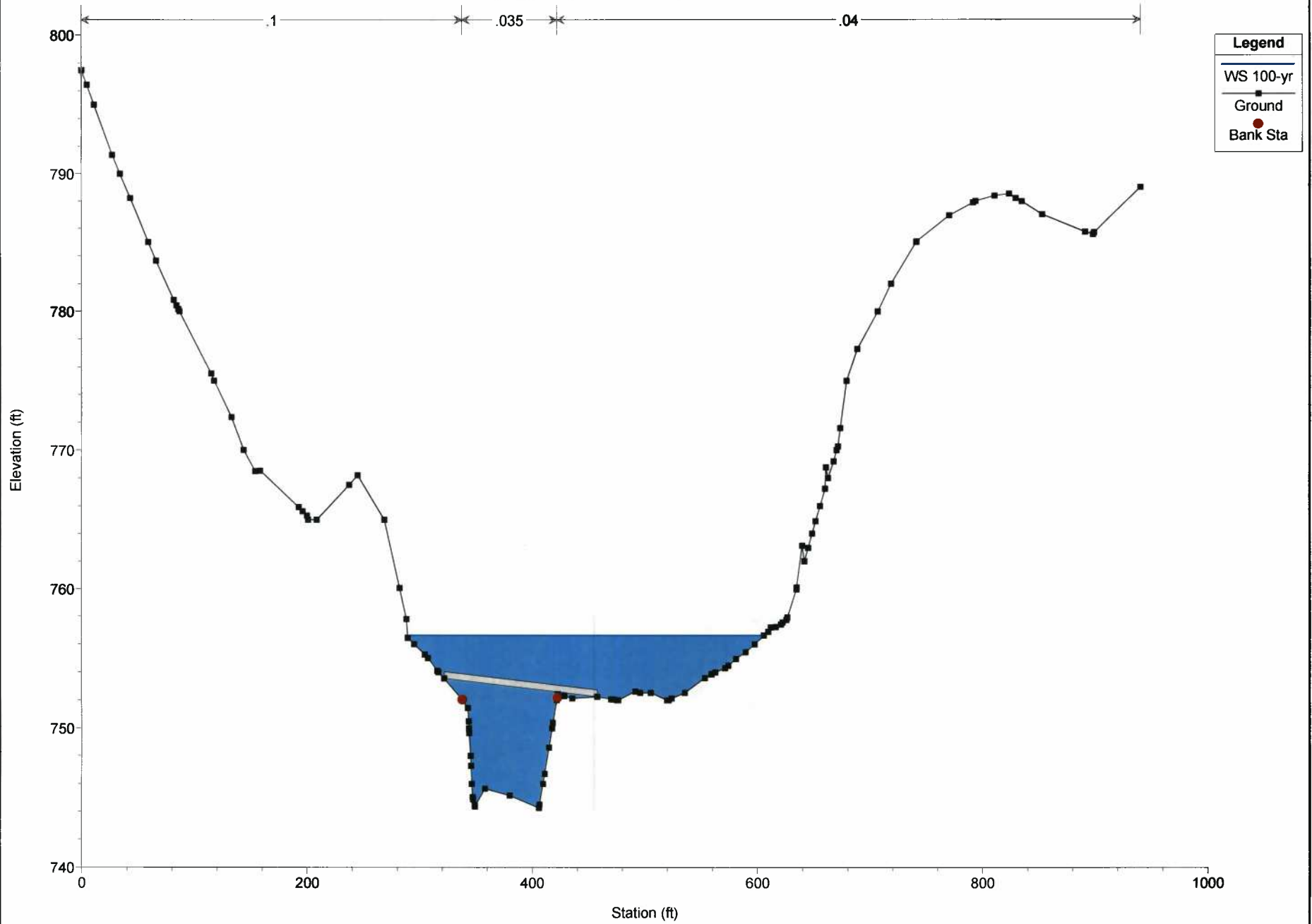
River = Flint Run Reach = Lower RS = 2035.918



Gessler Final Plan: Existing

Geom: Flint Run Existing Flow: Flint Run

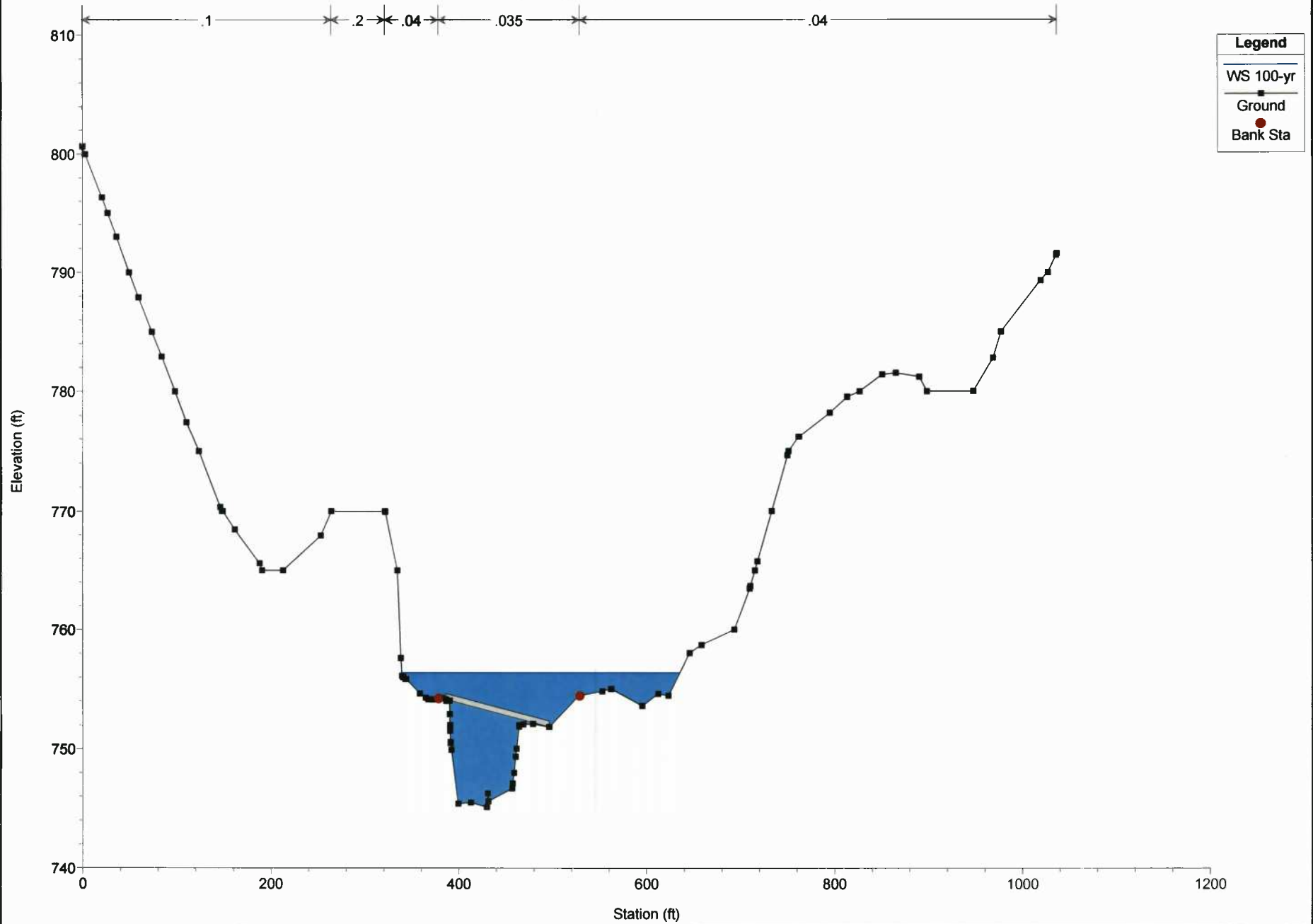
River = Flint Run Reach = Lower RS = 2017.29 BR



Gessler Final Plan: Existing

Geom: Flint Run Existing Flow: Flint Run

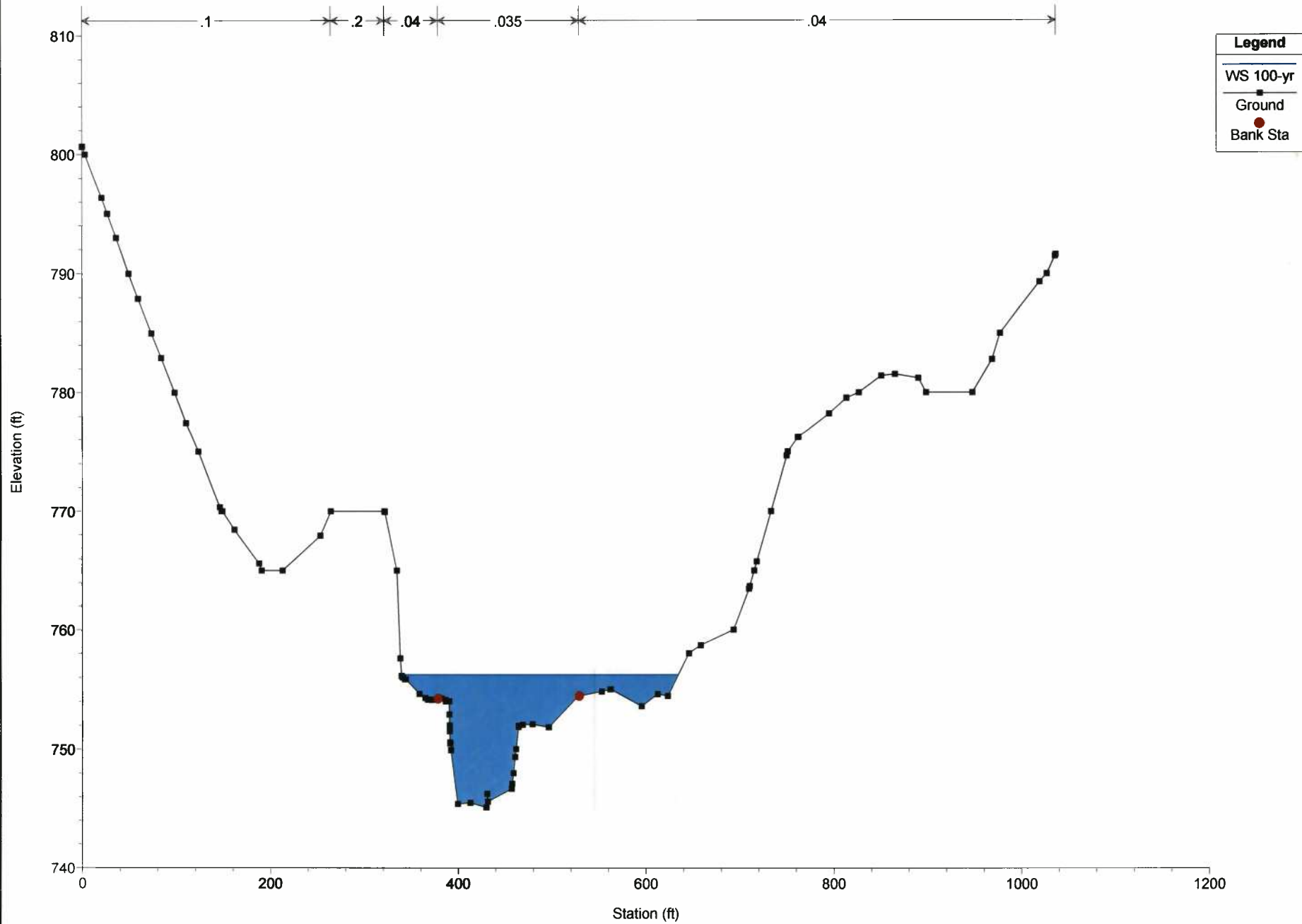
River = Flint Run Reach = Lower RS = 2017.29 BR



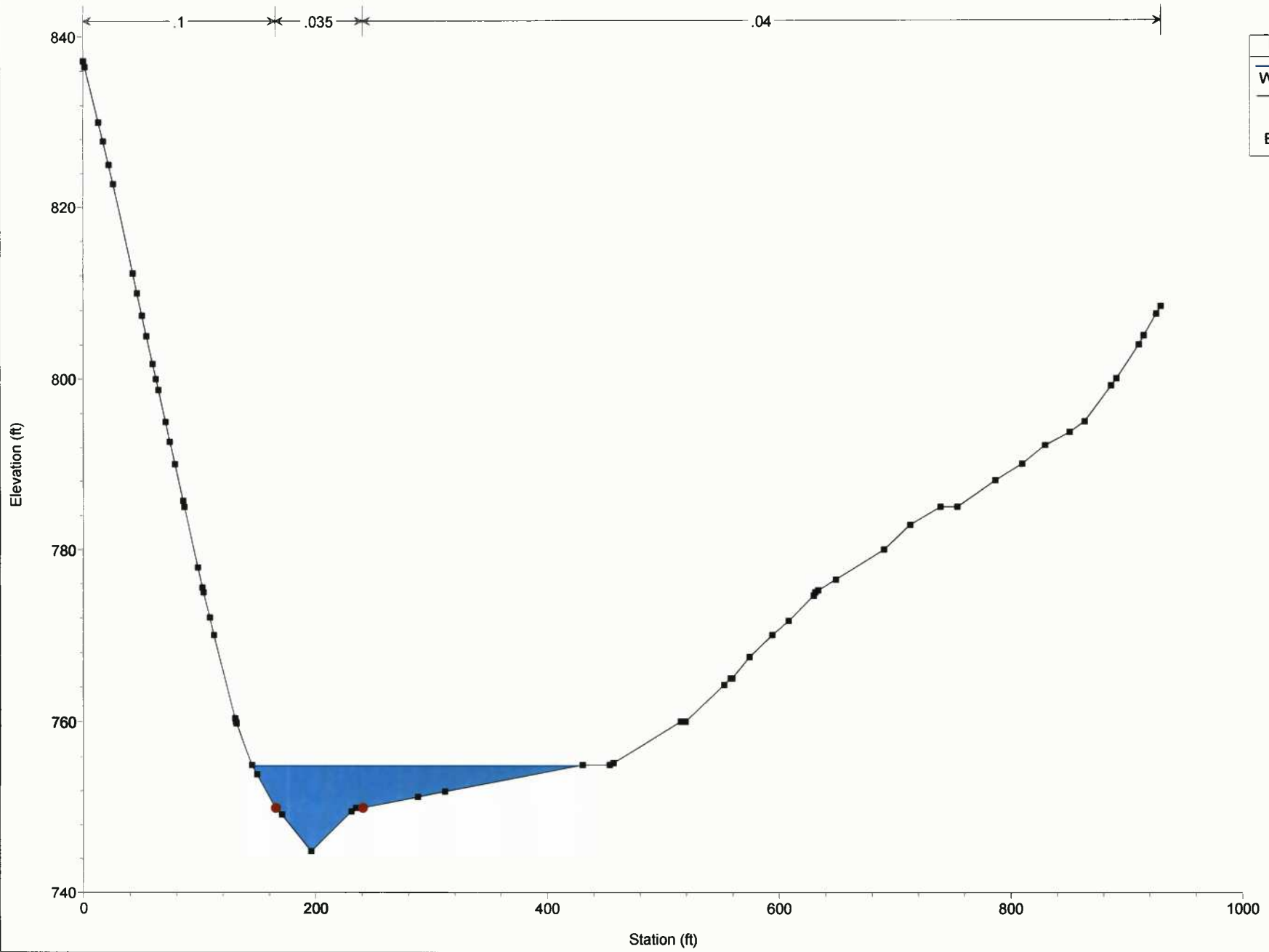
Gessler Final Plan: Existing

Geom: Flint Run Existing Flow: Flint Run

River = Flint Run Reach = Lower RS = 1996.533

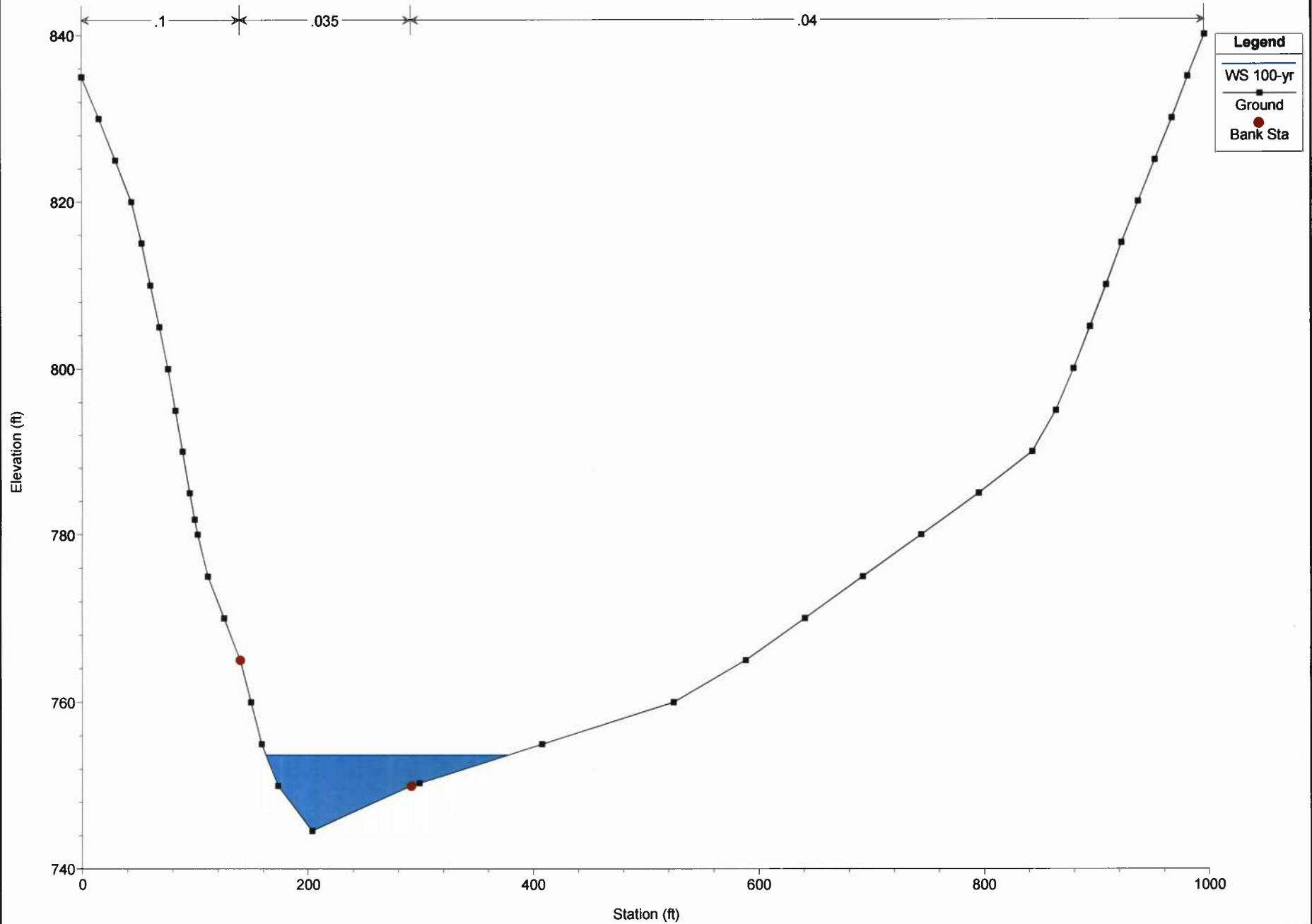


Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 1720.640



Legend	
WS 100-yr	■
Ground	—
Bank Sta	●

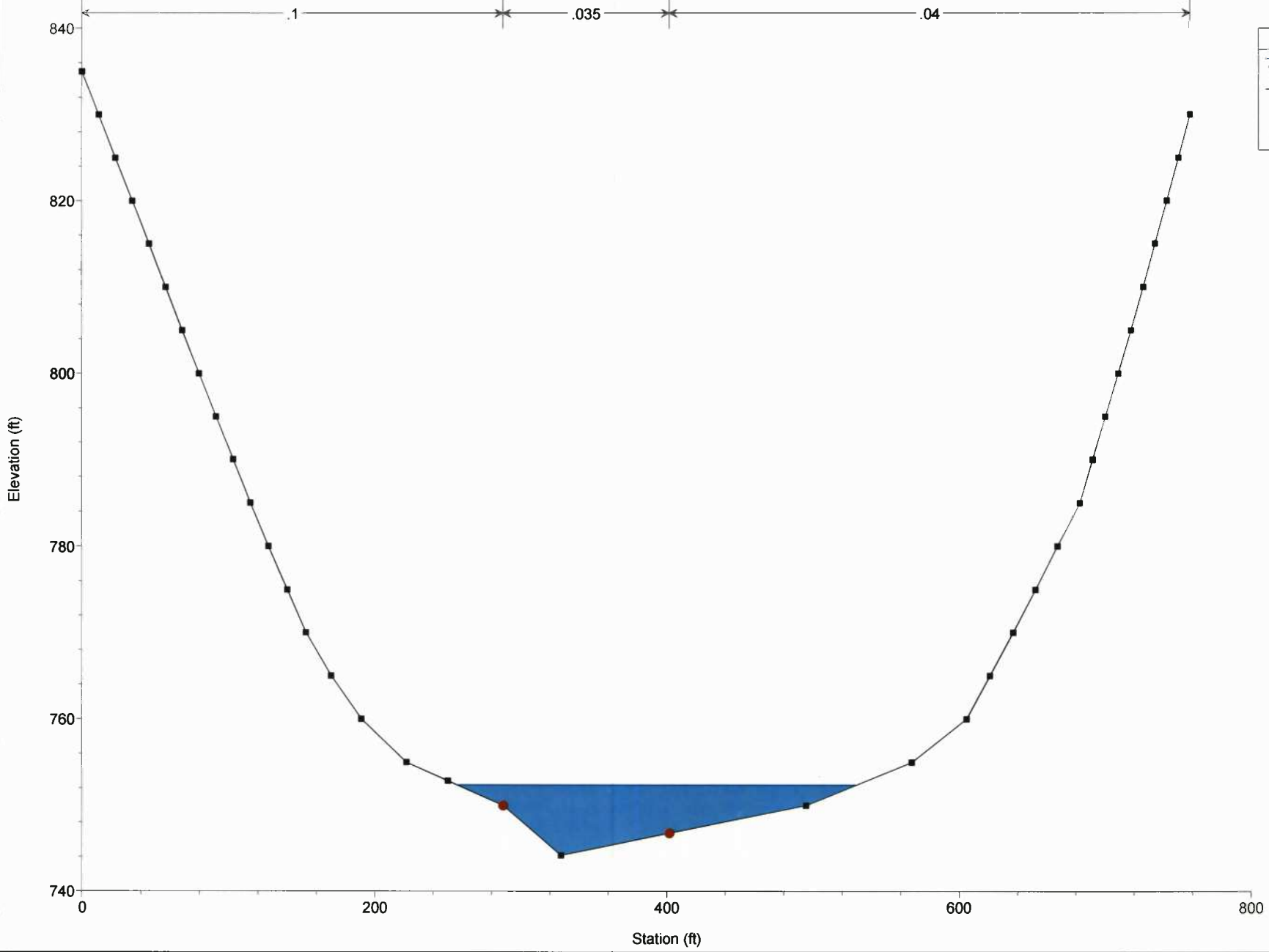
Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 1407.321



Legend
WS 100-yr
Ground
Bank Sta

Gessler Final Plan: Existing
Geom: Flint Run Existing Flow: Flint Run
River = Flint Run Reach = Lower RS = 1000.000

Legend	
WS 100-yr	■
Ground	—
Bank Sta	●



Supplement 3

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

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

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

PROJECT DATA

Project Title: Gessler Final
Project File : GesslerFinal.prj
Run Date and Time: 2/1/2013 7:51:46 AM

Project in English units

Project Description:
Flint Run Existing Drainage - 100yr

PLAN DATA

Plan Title: Proposed
Plan File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain - Final\GesslerFinal.p03

Geometry Title: Flint Run Proposed
Geometry File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain - Final\GesslerFinal.g02

Flow Title : Flint Run
Flow File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain - Final\GesslerFinal.f01

Plan Summary Information:

Number of:	Cross Sections	=	25	Multiple Openings	=	0
	Culverts	=	1	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: Flint Run
 Flow File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain -
 Final\GesslerFinal.f01

Flow Data (cfs)

River	Reach	RS	100-yr
Brush Run	Reach 1	2011.333	1554
Flint Run	Lower	4052.349	7412
Flint Run	Upper	5348.411	7165

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Brush Run	Reach 1	100-yr	Normal S = 0.02	
Flint Run	Upper	100-yr	Normal S = 0.0028	
Flint Run	Lower	100-yr		Normal S = 0.0028

GEOMETRY DATA

Geometry Title: Flint Run Proposed
 Geometry File : X:\Navitus Jobfiles\SLS\7838-Gessler Centralized Impoundment\Engineering\Drainage Comp\Floodplain -
 Final\GesslerFinal.g02

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Brush Run	Reach 1		Flint/Brush
Flint Run	Upper		Flint/Brush

Flint Run Lower Flint/Brush

JUNCTION INFORMATION

Name: Flint/Brush
 Description:
 Energy computation Method

Length across Junction		Tributary		Reach	Length	Angle
Flint Run	Brush Run	to Flint Run	to Flint Run			
Upper	Reach 1	Lower	Lower		271.11	0
					0	0

CROSS SECTION

RIVER: Brush Run
 REACH: Reach 1 RS: 2011.333

INPUT

Description:

Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	13.15	820	25.84	815	38.21	810	50.42	805
62.38	800	73.77	795	85.55	790	98.37	785	112.22	780
152.85	775	164.2	774.43	192.7	774.25	196.77	772.8	200.7	774.25
214.97	775	231.99	780	232.62	780.27	243.56	785	254.04	790
264.52	795	274.85	800	286.88	805	300.37	810	314.46	815
328.19	820	342.09	825						

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	192.7	.035	200.7	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	192.7	200.7		530.52	498.55		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	778.42				
Vel Head (ft)	1.18	Wt. n-Val.	0.035	0.035	0.100
w.s. Elev (ft)	777.24	Reach Len. (ft)	530.52	498.55	409.24
Crit w.s. (ft)	777.24	Flow Area (sq ft)	131.86	29.74	45.92
E.G. Slope (ft/ft)	0.012925	Area (sq ft)	131.86	29.74	45.92
Q Total (cfs)	1554.00	Flow (cfs)	1097.60	330.65	125.76
Top width (ft)	87.98	Top width (ft)	58.08	8.00	21.90
Vel Total (ft/s)	7.49	Avg. vel. (ft/s)	8.32	11.12	2.74
Max Chl Dpth (ft)	4.44	Hydr. Depth (ft)	2.27	3.72	2.10
Conv. Total (cfs)	13668.7	Conv. (cfs)	9654.3	2908.3	1106.1
Length Wtd. (ft)	507.85	Wetted Per. (ft)	58.23	8.51	22.25
Min Ch El (ft)	772.80	Shear (lb/sq ft)	1.83	2.82	1.67

Alpha	1.35	Stream Power (lb/ft s)	342.09	0.00	0.00
Frctn Loss (ft)	6.25	Cum Volume (acre-ft)	1.45	0.42	0.57
C & E Loss (ft)	0.01	Cum SA (acres)	0.66	0.10	0.23

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 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: Brush Run
 REACH: Reach 1 RS: 1507.212

INPUT

Description:

Station Elevation Data	num=	31
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 825 13.46 820 26.15 815 38.91 810 52.5 805		
66.14 800 79.79 795 93.18 790 106.62 785 121.37 780		
147.73 775 200 770 220.39 768.22 257.2 765 268.2 764.5		
273.24 763.58 278.2 764.5 292.38 765 312.6 770 325.34 774.15		
327.95 775 342.48 780 357.11 785 375.04 790 394.75 795		
416.88 800 439.08 805 460.07 810 481.91 815 502.95 820		
524.75 825		

Manning's n Values

num=	3
Sta n Val Sta n Val Sta n Val	
0 .035 268.2 .035 278.2 .1	

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
268.2	278.2	101.38	496.45	893.29	.1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	769.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.25	wt. n-val.	0.035	0.035	0.100
w.s. Elev (ft)	768.38	Reach Len. (ft)	0.00	0.00	0.00
Crit w.s. (ft)	768.38	Flow Area (sq ft)	105.48	43.45	74.71
E.G. Slope (ft/ft)	0.011714	Area (sq ft)	105.48	43.45	74.71
Q Total (cfs)	1554.00	Flow (cfs)	798.70	525.74	229.57
Top width (ft)	87.57	Top Width (ft)	49.70	10.00	27.87
Vel Total (ft/s)	6.95	Avg. vel. (ft/s)	7.57	12.10	3.07

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Max Chl Dpth (ft)	4.80	Hydr. Depth (ft)	2.12	4.34	2.68
Conv. Total (cfs)	14358.1	Conv. (cfs)	7379.5	4857.5	2121.1
Length wtd. (ft)	0.00	Wetted Per. (ft)	49.86	10.17	28.29
Min Ch El (ft)	763.58	Shear (lb/sq ft)	1.55	3.13	1.93
Alpha	1.67	Stream Power (lb/ft s)	524.75	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)			
C & E Loss (ft)	0.24	Cum SA (acres)			

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 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: Flint Run

REACH: Upper

RS: 5348.411

INPUT

Description:

Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	840	1.72	839.54	20.54	835	24.75	833.8	36.88	830
51.38	825.46	55.35	824.2	67.57	820	73.13	817.69	79.16	815
84.47	812.57	90.58	810	97.49	806.98	101.8	805	106.69	802.5
110.69	800	115.05	796.83	117.97	795	122.72	791.65	125.34	790
130.32	786.47	132.65	785	135.2	783.3	146.28	775.4	147.14	775
158.66	770.79	160.42	770	174.03	765.42	174.99	765	180.62	763.23
181.36	763	192.5	760	222.27	755.17	223.26	755	230.93	753.25
235.85	755	269.45	758.27	280.96	759.23	290.29	760	326.78	762.1
365.08	765	372.98	766.67	386.11	770	396.48	774.04	398.32	775
406.94	779.55	407.8	780	416.8	784.76	417.27	785	426.65	789.96
426.73	790	428.71	791.05	436.09	795	444.41	799.48	445.39	800
446.08	800.36	454.72	805	455.78	805.56	464.06	810	465.51	810.76
473.44	815	475.26	815.96	482.89	820	485.06	821.16	492.3	825
494.85	826.36	501.72	830						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	192.5	.035	290.29	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 192.5 290.29 580.67 714.22 806.06 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	767.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.62	Wt. n-Val.	0.100	0.035	0.100
W.S. Elev (ft)	767.24	Reach Len. (ft)	580.67	714.22	806.06
Crit W.S. (ft)		Flow Area (sq ft)	91.45	989.75	378.92
E.G. Slope (ft/ft)	0.001126	Area (sq ft)	91.45	989.75	378.92
Q Total (cfs)	7165.00	Flow (cfs)	108.35	6546.35	510.30
Top width (ft)	206.60	Top width (ft)	23.88	97.79	84.94
Vel Total (ft/s)	4.91	Avg. Vel. (ft/s)	1.18	6.61	1.35
Max Chl Dpth (ft)	13.99	Hydr. Depth (ft)	3.83	10.12	4.46
Conv. Total (cfs)	213542.4	Conv. (cfs)	3229.2	195104.4	15208.9
Length Wtd. (ft)	718.22	Wetted Per. (ft)	24.97	98.92	85.35
Min Ch El (ft)	753.25	Shear (lb/sq ft)	0.26	0.70	0.31
Alpha	1.67	Stream Power (lb/ft s)	501.72	0.00	0.00
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	4.85	23.53	7.54
C & E Loss (ft)	0.03	Cum SA (acres)	0.45	1.90	1.55

CROSS SECTION

RIVER: Flint Run
 REACH: Upper RS: 4587.709

INPUT

Description:

Station Elevation Data num= 70

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	840	16.28	837.87	44.55	835	50.03	834.1	70.49	830		
71.13	829.87	74.8	828.94	89.92	825	92.85	824.16	107.23	820		
117.17	816.98	122.54	815	133.88	811.31	137.46	810	141.29	808.34		
149.13	805	155.07	802.08	159.98	800	166.69	796.65	170.66	795		
180.52	790	183.16	788.77	190.93	785	201.31	780.39	202.06	780		
212.06	775.62	213.49	775	213.71	774.92	226.49	770	234.57	767.82		
245	765	252.1	763.08	253.44	762.72	257.73	761.49	262.92	760		
300	751.5	307.31	751.12	310	751.6	339.98	758.49	350.45	759.54		
355.56	760	359.38	760.46	365.09	761.16	399.99	765	402.3	765.98		
415.29	770	427.45	774.34	428.94	775	430.68	775.78	438.45	780		
442.51	782.05	447.95	785	452.55	787.32	457.52	790	462.66	792.58		
467.15	795	472.85	797.85	476.81	800	483.08	803.12	486.55	805		
493.4	808.4	496.37	810	503.81	813.67	506.28	815	514.29	818.95		
516.32	820	524.84	824.23	526.34	825	535.44	829.51	536.39	830		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	262.92	.035	339.98	.1

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

262.92 339.98 165.19 259.78 200.58 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	766.94		0.100	0.035	0.100
Vel Head (ft)	0.89	Wt. n-Val.	0.100	0.035	0.100
W.S. Elev (ft)	766.04	Reach Len. (ft)	165.19	259.78	200.58
Crit W.S. (ft)		Flow Area (sq ft)	64.85	858.63	262.46
E.G. Slope (ft/ft)	0.001406	Area (sq ft)	64.85	858.63	262.46
Q Total (cfs)	7165.00	Flow (cfs)	72.94	6713.86	378.20
Top Width (ft)	161.37	Top Width (ft)	21.78	77.06	62.53
Vel Total (ft/s)	6.04	Avg. vel. (ft/s)	1.12	7.82	1.44
Max Chl Dpth (ft)	14.92	Hydr. Depth (ft)	2.98	11.14	4.20
Conv. Total (cfs)	191113.9	Conv. (cfs)	1945.6	179080.6	10087.7
Length wtd. (ft)	255.72	Wetted Per. (ft)	22.60	78.86	63.09
Min Ch El (ft)	751.12	Shear (lb/sq ft)	0.25	0.96	0.37
Alpha	1.57	Stream Power (lb/ft s)	536.39	0.00	0.00
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)	3.80	8.38	1.61
C & E Loss (ft)	0.12	Cum SA (acres)	0.14	0.47	0.19

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: Flint Run
REACH: Upper

RS: 4327.913

INPUT

Description:

Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	833.82	19.57	830.26	21.04	830	21.99	829.86	47.76	825
48.22	824.91	50.72	824.4	68.17	820.98	73.18	820	78.14	818.92
96.27	815	114.35	810.94	116.96	810	126.97	806.39	127.89	805.99
130.7	805	140.29	801.4	144.1	800	147.74	798.78	158.49	795
160.48	794.34	171.07	790	179.16	786.84	183.7	785	188.85	782.97
196.53	780	209.11	775.55	210.65	775	218.43	773.03	231.45	770
262.46	765.7	268.7	765	290.32	762.84	326.29	760	330.65	759.71
335.69	759.38	359.73	757.01	380.75	755	394.73	755	410.28	758.76
414.93	760	418.46	760.97	432.73	765	446.67	772.66	468.61	784.7
469.11	785	469.23	785.07	477.23	790	477.75	790.22	485.38	795
485.72	795.15	501.33	804.99	501.35	805	501.39	805.02	502.19	805.53
509.35	810	527.85	814.53	529.88	815	551.4	819.56	552.97	820
553.92	820.47	564.75	825	565.92	825.57	576.46	830	577.84	830.68
580.09	831.63								

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Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 330.65 .035 410.28 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 330.65 410.28 783.59 271.11 224.1 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	766.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.10	Wt. n-Val.	0.100	0.035	0.100
W.S. Elev (ft)	764.07	Reach Len. (ft)	271.11	271.11	271.11
Crit W.S. (ft)	763.25	Flow Area (sq ft)	121.07	571.87	51.41
E.G. Slope (ft/ft)	0.005756	Area (sq ft)	121.07	571.87	51.41
Q Total (cfs)	7165.00	Flow (cfs)	237.39	6818.38	109.23
Top Width (ft)	151.38	Top width (ft)	52.60	79.63	19.14
Vel Total (ft/s)	9.63	Avg. Vel. (ft/s)	1.96	11.92	2.12
Max Chl Dpth (ft)	9.07	Hydr. Depth (ft)	2.30	7.18	2.69
Conv. Total (cfs)	94438.2	Conv. (cfs)	3128.9	89869.6	1439.8
Length Wtd. (ft)	271.11	Wetted Per. (ft)	52.79	80.30	19.87
Min Ch El (ft)	755.00	Shear (lb/sq ft)	0.82	2.56	0.93
Alpha	1.46	Stream Power (lb/ft s)	580.09	0.00	0.00
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	3.45	4.11	0.89
C & E Loss (ft)	0.50	Cum SA (acres)			

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

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 4052.349

INPUT

Description:

Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	12.51	820	27.22	815	41.83	810	53.13	805
64.15	800	76.03	795	88.87	790	100.79	785	113.96	780
127.03	775	147.55	770	263.25	765	408.02	760	445.55	757.94
499.06	755	535.56	749.62	559.34	755	588.18	760	598.81	765
609.68	770	620.27	774.99	620.29	775	633.72	780	648.98	785
662.08	790	694.14	795	731.89	800	766.48	805	796.9	810
828.16	815	854.05	820	873.62	825				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .05 499.06 .035 559.34 .1

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

499.06 559.34 46.88 141.39 54.28 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	765.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.	0.050	0.035	0.100
W.S. Elev (ft)	764.76	Reach Len. (ft)	46.88	141.39	54.28
Crit w.s. (ft)		Flow Area (sq ft)	988.09	750.27	233.32
E.G. Slope (ft/ft)	0.000824	Area (sq ft)	988.09	750.27	233.32
Q Total (cfs)	7412.00	Flow (cfs)	2234.31	4857.56	320.14
Top width (ft)	327.99	Top Width (ft)	228.76	60.28	38.95
Vel Total (ft/s)	3.76	Avg. vel. (ft/s)	2.26	6.47	1.37
Max Chl Dpth (ft)	15.14	Hydr. Depth (ft)	4.32	12.45	5.99
Conv. Total (cfs)	258196.3	Conv. (cfs)	77832.0	169212.5	11151.9
Length wtd. (ft)	102.66	wetted Per. (ft)	228.98	61.28	40.45
Min Ch El (ft)	749.62	Shear (lb/sq ft)	0.22	0.63	0.30
Alpha	2.06	Stream Power (lb/ft s)	873.62	0.00	0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	15.52	81.06	53.98
C & E Loss (ft)	0.05	Cum SA (acres)	3.95	9.02	14.05

CROSS SECTION

RIVER: Flint Run
REACH: Lower

RS: 3910.912

INPUT

Description:

Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	13.06	820	25.72	815	38.09	810	49.94	805
60.85	800	72.27	795	84.38	790	96.36	785	110.18	780
125.5	775	144.56	770	183.92	765	270.21	760	395.63	756.36
442.34	755	475.81	749.22	497.6	755	521.35	760	547	765
563.98	767.12	587.08	770	605.74	775	624.3	780	639.31	785
655.35	790	672.44	795	692.16	800	714.94	805	748.48	810
778.02	815	814.83	820	841.76	825				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	442.34	.035	497.6	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
442.34 497.6 545.19 736.56 773.43 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	765.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.	0.050	0.035	0.100
W.S. Elev (ft)	764.81	Reach Len. (ft)	545.19	736.56	773.43
Crit w.s. (ft)		Flow Area (sq ft)	1456.77	701.61	232.79

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E.G. Slope (ft/ft)	0.000580	Area (sq ft)	1456.77	701.61	232.79
Q Total (cfs)	7412.00	Flow (cfs)	3330.27	3847.49	234.24
Top Width (ft)	358.75	Top Width (ft)	255.08	55.26	48.41
Vel Total (ft/s)	3.10	Avg. vel. (ft/s)	2.29	5.48	1.01
Max Chl Dpth (ft)	15.59	Hydr. Depth (ft)	5.71	12.70	4.81
Conv. Total (cfs)	307683.4	Conv. (cfs)	138244.7	159715.0	9723.7
Length wtd. (ft)	691.98	Wetted Per. (ft)	255.29	56.51	49.39
Min Ch El (ft)	749.22	Shear (lb/sq ft)	0.21	0.45	0.17
Alpha	1.87	Stream Power (lb/ft s)	841.76	0.00	0.00
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	14.20	78.70	53.69
C & E Loss (ft)	0.17	Cum SA (acres)	3.69	8.83	13.99

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

RIVER: Flint Run
REACH: Lower

RS: 3710.271

INPUT

Description:

Station Elevation Data		num= 67									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	830.59	1.19	830	5.17	828.26	11.78	825	18.55	822.06		
22.62	820	25.86	818.34	32.69	815	39.5	811.75	42.95	810		
50.85	806.25	53.33	805	62.32	800.74	63.72	800	72.83	795.28		
73.35	795	79.16	792	82.94	790	83.33	789.82	92.54	785		
93.94	784.35	102.34	780	105.35	778.85	116.54	775	124.62	773		
134.24	770	154.69	766.67	163.72	765	173.17	764.14	192.66	762.77		
216.3	761.04	228.82	760.42	238.05	760	259.77	758.83	268.66	758.35		
295.6	756.85	310.89	755.83	327.74	755	361.63	755	363.07	755.53		
373.76	760	381.2	763.3	385.82	765	392.04	767.49	397.71	770		
404.57	772.41	414.53	775	422.13	776.81	427.28	778.04	434.83	780		
453.33	782.48	457.94	782.86	479.51	784.62	482.04	784.84	484.65	785		
529.85	787.44	553.59	790	583.03	792.13	626.64	795	635.74	795		
646.71	796.76	672.12	800	684.01	800	736.87	804.08	745.03	805		
804.17	805	811.79	807.38								

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	259.77	.035	373.76	.04

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

259.77 373.76

310.33 428.51 382.56

.1

.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	763.95				
Vel Head (ft)	1.93	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	762.01	Reach Len. (ft)	310.33	428.51	382.56
Crit w.s. (ft)	761.55	Flow Area (sq ft)	95.70	640.23	4.58
E.G. Slope (ft/ft)	0.007174	Area (sq ft)	95.70	640.23	4.58
Q Total (cfs)	7412.00	Flow (cfs)	170.39	7227.98	13.63
Top width (ft)	175.32	Top width (ft)	56.79	113.99	4.54
Vel Total (ft/s)	10.01	Avg. vel. (ft/s)	1.78	11.29	2.98
Max Chl Dpth (ft)	7.01	Hydr. Depth (ft)	1.69	5.62	1.01
Conv. Total (cfs)	87508.6	Conv. (cfs)	2011.6	85336.0	160.9
Length Wtd. (ft)	417.10	Wetted Per. (ft)	56.88	115.09	4.97
Min Ch El (ft)	755.00	Shear (lb/sq ft)	0.75	2.49	0.41
Alpha	1.24	Stream Power (lb/ft s)	811.79	0.00	0.00
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	4.49	67.35	51.58
C & E Loss (ft)	0.40	Cum SA (acres)	1.74	7.40	13.52

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

RIVER: Flint Run

REACH: Lower

RS: 3270.326

INPUT

Description:

Station Elevation Data		num=		107					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	830.35	.62	830	3.7	828.37	9.03	825	12.01	823.42
22.94	816.51	25.77	815	31.37	811.45	34.09	810	39.88	806.4
42.62	805	48.76	801.34	51.43	800	57.66	796.28	60.21	795
66.52	791.22	68.96	790	73.81	787.17	77.42	785	82.26	782.7
88.32	780	93.41	774.58	98.85	769.7	102.41	766.52	104.59	766.29
107.58	766	118.66	764.89	120.09	764.73	120.28	764.75	122.12	764.46
122.76	764.37	123.27	764	124.63	762.92	125.88	762	127.98	760.08
128.11	760	128.42	759.77	130.52	758.09	130.64	758	130.71	757.94
132.7	756.36	133.11	756	133.45	755.76	135.68	754	137.04	753.03
138.23	752	140.01	750.41	140.52	750	140.78	749.92	140.81	749.9
147.08	748.66	153.81	747.64	168.81	749.47	175.26	750	176.2	750
176.55	750.02	176.81	750.22	178.14	750.98	179.61	752	179.72	752.07

GesslerFinal.rep

181.25	753.12	183.58	753.34	191.25	754	197.69	754.21	208.69	754.48
269.6	756	276.77	756	283.82	757.14	289.37	758	304.52	759.95
304.89	760	305.51	760.06	305.73	760.08	331.42	762	347.28	763.38
355.61	764	358.49	764.68	360.23	765.08	364.95	766	373.96	766.93
374.88	766.98	376.44	767.11	378.24	767.6	381.59	768.57	384.29	768.76
395.07	770	407.01	771.12	416.76	772	430.89	773.27	434.87	773.61
439.3	774	457.68	775.47	464.31	776	466.4	776.16	467.01	776.21
474.6	776.76	487.8	777.73	488.28	777.75	491.33	778	502.32	779.12
510.97	780	513.33	780.24	514.22	780.33	527.07	782	537.73	783.53
541.14	784	549.19	785.15						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	135.68	.035	181.25	.04

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

135.68	181.25	56.8	51.5	42.19	.1	.3
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CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	762.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	761.96	Reach Len. (ft)	56.80	51.50	42.19
Crit w.s. (ft)		Flow Area (sq ft)	39.76	568.24	804.23
E.G. Slope (ft/ft)	0.001161	Area (sq ft)	39.76	568.24	804.23
Q Total (cfs)	7412.00	Flow (cfs)	43.29	4251.77	3116.94
Top width (ft)	204.99	Top width (ft)	9.76	45.57	149.66
Vel Total (ft/s)	5.25	Avg. vel. (ft/s)	1.09	7.48	3.88
Max chl dpth (ft)	14.32	Hydr. Depth (ft)	4.07	12.47	5.37
Conv. Total (cfs)	217541.8	Conv. (cfs)	1270.6	124789.3	91481.9
Length wtd. (ft)	47.80	Wetted Per. (ft)	12.60	48.30	150.09
Min Ch El (ft)	747.64	Shear (lb/sq ft)	0.23	0.85	0.39
Alpha	1.40	Stream Power (lb/ft s)	549.19	0.00	0.00
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	4.00	61.41	48.03
C & E Loss (ft)	0.00	Cum SA (acres)	1.50	6.61	12.85

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 3218.798

INPUT

Description:

Station Elevation Data num= 98

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	828.88	.23	828.76	7.55	825	10.07	823.65	17.17	820
19.89	818.54	26.77	815	32.42	812	36.36	810	40.08	808.16
46.43	805	50.01	803.2	56.47	800	60.28	798.08	66.51	795
73.67	791.4	76.37	790	78.73	788.7	85.9	785	90.73	782.74
95.72	780	102.21	773.16	107.4	767.69	108.76	766.03	109.03	766

GesslerFinal.rep

124.19	764.57	126.34	764.36	127.28	764.21	128.59	764	129.66	763.84
130.15	763.76	132.48	762.13	132.67	762	135.22	760.24	135.52	760
137.74	758.3	138.14	758	138.39	757.79	140.64	756	142.61	754.47
143.22	754	143.71	753.59	145.71	752	146.32	751.52	148.24	749.99
148.33	749.92	160.99	747.7	161.66	747.59	162.51	747.69	176.31	749.61
176.94	749.78	177.66	750	182.2	751.26	185	752	188.38	752.92
197.84	754	199.96	754.09	202.2	754	205.09	754	215.77	754.44
239.26	755.41	271.98	756	284.51	756	286.21	756.18	292.49	758
292.58	758.03	298.84	760	302.28	761.15	304.82	762	308.46	763.22
310.79	764	314.66	765.3	316.89	766	322.48	767.88	322.82	768
328.76	770	334.42	771.98	334.6	772.04	340.63	774	345.3	775.6
346.57	776	346.84	776	351.61	776.15	464.32	776.05	468.6	776.05
469.67	776.08	482.13	776	509.7	776	512.02	775.5	512.54	775.35
514.94	775.91	515.28	776	519.76	777.12	521.48	777.65	532.74	779.69
536.06	780.56	544.14	782.62	567.81	788.23				

Manning's n Values

num=	7								
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	142.61	.035	197.84	.04	292.49	.03	351.61	.02
509.7	.03	544.14	.04						

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

142.61	197.84	785.25	753.13	556.83	.1	.3
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CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	762.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	761.89	Reach Len. (ft)	785.25	753.13	556.83
Crit w.s. (ft)		Flow Area (sq ft)	35.46	633.41	642.78
E.G. Slope (ft/ft)	0.001178	Area (sq ft)	35.46	633.41	642.78
Q Total (cfs)	7412.00	Flow (cfs)	36.66	4559.89	2815.45
Top width (ft)	171.68	Top width (ft)	9.79	55.23	106.66
Vel Total (ft/s)	5.65	Avg. vel. (ft/s)	1.03	7.20	4.38
Max Chl Dpth (ft)	14.30	Hydr. Depth (ft)	3.62	11.47	6.03
Conv. Total (cfs)	215986.4	Conv. (cfs)	1068.3	132875.7	82042.4
Length wtd. (ft)	686.95	Wetted Per. (ft)	12.29	57.67	107.58
Min Ch El (ft)	747.59	Shear (lb/sq ft)	0.21	0.81	0.44
Alpha	1.23	Stream Power (lb/ft s)	567.81	0.00	0.00
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	3.95	60.70	47.33
C & E Loss (ft)	0.02	Cum SA (acres)	1.49	6.55	12.72

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 3143.198

INPUT
 Description:
 Station Elevation Data num= 78

GesslerFinal.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	828.29	5.49	825.77	17.29	820	21.67	817.85	27.1	815
31.65	812.49	36.19	810	40.9	807.4	45.28	805	50.15	802.31
54.36	800	61.91	795.84	63.43	795	65.19	794.1	73.74	790
79.87	787.01	84.09	785	90.43	781.91	94.44	780	101.15	774.46
112.15	765.76	112.42	765.73	119.43	765.02	129.18	764.27	129.79	764.13
130.32	764	132.1	763.58	133.01	763.41	135.21	762.41	136.06	762
138.41	760.54	139.21	760	141.56	758.35	142.12	758	145.16	756.12
145.35	756	148.1	754.16	148.34	754	150.93	752.42	151.55	752
153.96	750.49	154.71	750	155.08	749.77	167.46	747.7	168.72	747.5
187.93	749	189.3	749.12	189.53	749.18	191.27	749.48	193.74	750
195.64	750.7	199.13	752	200.09	752.36	201.56	752.92	205.05	753.72
206.24	753.96	206.63	754	216.1	754	230.76	754.74	249.31	755.67
250.8	755.73	251.03	755.74	258.12	756	263.65	756	291.86	756.82
294.98	756.91	303.54	757.23	304.26	758	346.26	772	352.48	774
358.26	776	364.26	778	546.27	778	549.27	776.51	556.14	780
560.06	781.91	567.2	785.48	591.68	792.89				

Manning's n	Values	num=	7
Sta	n Val	Sta	n Val
0	.1	148.1	.035
546.27	.03	567.2	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	148.1	206.63		328.74	281.33		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	761.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	760.77	Reach Len. (ft)	328.74	281.33	282.20
Crit W.S. (ft)		Flow Area (sq ft)	33.50	643.30	511.99
E.G. Slope (ft/ft)	0.001547	Area (sq ft)	33.50	643.30	511.99
Q Total (cfs)	7412.00	Flow (cfs)	38.72	5178.35	2194.94
Top Width (ft)	174.55	Top width (ft)	10.07	58.53	105.95
Vel Total (ft/s)	6.23	Avg. vel. (ft/s)	1.16	8.05	4.29
Max chl Dpth (ft)	13.27	Hydr. Depth (ft)	3.33	10.99	4.83
Conv. Total (cfs)	188446.6	Conv. (cfs)	984.3	131657.0	55805.3
Length wtd. (ft)	281.92	Wetted Per. (ft)	12.05	60.78	106.80
Min ch El (ft)	747.50	Shear (lb/sq ft)	0.27	1.02	0.46
Alpha	1.30	Stream Power (lb/ft s)	591.68	0.00	0.00
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	3.33	49.66	39.95
C & E Loss (ft)	0.01	Cum SA (acres)	1.31	5.57	11.36

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2861.250

INPUT

GesslerFinal.rep

Description:

Station Elevation Data		num= 96		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	826.9	4.8	825	12.94	822.7	19.82	820	26.57	817.43		
32.71	815	41.14	811.83	45.78	810	56.33	806.06	58.94	805		
61.05	804.15	70.89	800	72.52	799.34	85.51	793.83	94.91	790		
95.97	789.57	107.51	785	109.72	784	119.83	780	132.77	771.02		
138.06	767.36	139.79	765.92	157.05	764.29	157.48	764.26	157.54	764.24		
158.64	764	159.11	763.92	161.15	763.5	162.46	762.59	163.32	762		
165.46	760.51	166.16	760	167.02	759.42	169.07	758	171.9	756.02		
172.06	755.91	175.03	754	177.68	752.32	178.16	752	178.63	751.72		
181.49	750	183.57	748.54	184.21	748	196.25	747.21	201.32	746.88		
206.45	747.15	217.53	747.66	217.74	747.77	218.35	748	221	749.34		
222.22	750	225.36	751.49	226.27	752	226.62	752.19	227.52	752.66		
234.32	753.23	244.21	754	265.55	754.91	267.37	754.99	291.93	756		
315.7	757.29	318.46	757.39	320.44	757.45	335.42	758	340.68	758		
348.67	757.41	395.78	773.11	398.54	774	401.11	774.89	410.43	778		
422.43	778	462.43	758	520.43	758	560.43	778	572.43	778		
576.44	780	580.43	782	600.32	782	601.74	781.34	603.43	780.5		
606.46	782	608.51	783.02	612.52	785.03	614.42	786	616.47	787.02		
618.38	788	620.48	789.05	622.5	790	624.34	790.96	628.56	793.07		
630.36	794	632.73	795.18	634.41	796	647.48	802.53	655.28	803.77		
663.87	805.36										

Manning's n Values		num= 7		Sta n Val		Sta n Val		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	177.68	.035	227.52	.04	348.67	.03	580.43	.02		
600.32	.03	647.48	.04								

Bank Sta:	Left	Right	Lengths: Left Channel		Right	Coeff	Contr.	Expan.
	177.68	227.52	296.63	281.27	281.46		.1	.3
Ineffective Flow	num= 1							
Sta L	Sta R	Elev	Permanent					
422.43	663.87	785	T					

CROSS SECTION OUTPUT Profile #100-yr

	E.G. Elev (ft)	761.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.90		Wt. n-val.	0.100	0.035	0.040
w.s. Elev (ft)	760.19		Reach Len. (ft)	296.63	281.27	281.46
Crit w.s. (ft)			Flow Area (sq ft)	47.36	593.03	539.46
E.G. Slope (ft/ft)	0.001669		Area (sq ft)	47.36	593.03	676.29
Q Total (cfs)	7412.00		Flow (cfs)	64.25	5184.68	2163.07
Top width (ft)	257.90		Top width (ft)	11.79	49.84	196.27
Vel Total (ft/s)	6.28		Avg. vel. (ft/s)	1.36	8.74	4.01
Max Chl Dpth (ft)	13.31		Hydr. Depth (ft)	4.02	11.90	4.17
Conv. Total (cfs)	181445.6		Conv. (cfs)	1572.9	126920.8	52951.9
Length Wtd. (ft)	281.41		Wetted Per. (ft)	14.18	52.39	130.12
Min Ch El (ft)	746.88		Shear (lb/sq ft)	0.35	1.18	0.43
Alpha	1.47		Stream Power (lb/ft s)	663.87	0.00	0.00
Frctn Loss (ft)	0.44		Cum Volume (acre-ft)	3.03	45.67	36.10
C & E Loss (ft)	0.05		Cum SA (acres)	1.23	5.22	10.38

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 2579.076

INPUT

Description:

Station Elevation Data		num= 98		Sta Elev		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	15.21	820	27.97	815.49	29.43	815	37.74	812.05		
42.99	810	47.62	808.16	56	805	64.64	801.42	68.65	800		
69.31	799.77	82.89	795	85.84	793.93	97.04	790	102.08	788.12		
110.79	785	118.7	782.03	123.55	780	132.63	774.42	140.89	769.34		
145.19	766.68	152.14	766.05	152.65	766	154.5	765.81	162.84	765.05		
163.2	764.88	164.87	764	165.21	763.85	166.44	763.24	167.48	762		
168.46	760.7	168.99	760	170.28	758.29	170.48	758	171.42	756.82		
172.31	756	174.02	754.3	174.35	754	174.61	753.75	176.64	752		
178.01	750.57	178.62	750	180.09	748.58	180.72	748	181.02	747.68		
182.28	746.5	191.79	746.04	192.63	746	193.42	746	197.24	745.85		
201.26	745.98	201.68	746	202.75	746.05	204.91	746.19	217	746.9		
217.34	747.42	217.74	748	218.23	748.97	218.99	750	219.7	751.04		
220.27	752	220.52	752.38	221.26	752.97	248.71	753.86	254.02	753.92		
258.94	753.98	261.16	754	267.96	754	274.07	754.26	288.53	754.54		
293.17	754.64	301.91	754.88	328.08	756	376.08	772	382.31	774		
387.99	775.97	394.08	778	576.08	778	579.08	776.51	581.94	777.92		
582.91	778.4	585.93	779.85	586.24	780	590.1	781.98	594.19	784.02		
596.09	784.99	598.14	786	598.52	786.19	601.73	787.87	601.99	788		
606.23	790	608.23	791.04	610.17	792	611.89	792.87	613.7	793.88		
613.94	794	614.13	794.09	631.55	796.79						

Manning's n Values		num= 7		Sta n Val		Sta n Val		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	174.02	.035	221.26	.04	328.08	.03	394.08	.02		
576.08	.03	613.94	.04								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 174.02 221.26 100.63 101.9 100.41 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	760.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	wt. n-val.	0.100	0.035	0.040
w.s. Elev (ft)	759.87	Reach Len. (ft)	100.63	101.90	100.41
Crit w.s. (ft)		Flow Area (sq ft)	14.76	591.96	613.04
E.G. Slope (ft/ft)	0.001442	Area (sq ft)	14.76	591.96	613.04
Q Total (cfs)	7412.00	Flow (cfs)	13.12	4732.07	2666.81
Top width (ft)	170.61	Top width (ft)	4.93	47.24	118.44

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Vel Total (ft/s)	6.08	Avg. vel. (ft/s)	0.89	7.99	4.35
Max Chl Dpth (ft)	14.02	Hydr. Depth (ft)	2.99	12.53	5.18
Conv. Total (cfs)	195217.8	Conv. (cfs)	345.6	124633.7	70238.6
Length Wtd. (ft)	101.29	Wetted Per. (ft)	7.46	53.60	119.12
Min Ch El (ft)	745.85	Shear (lb/sq ft)	0.18	0.99	0.46
Alpha	1.29	Stream Power (lb/ft s)	631.55	0.00	0.00
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	2.82	41.84	31.93
C & E Loss (ft)	0.06	Cum SA (acres)	1.17	4.91	9.37

CROSS SECTION

RIVER: Flint Run
REACH: Lower

RS: 2476.907

INPUT

Description:

Station Elevation Data num= 105

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	831.38	3.33	830	5.72	829.01	15.43	825	22.82	822.34
28.58	820	40.8	815.67	42.71	815	44.21	814.47	55.18	810
59.63	808.2	67.59	805	67.84	804.9	79.93	800	89.78	795.99
92.37	795	97.27	793.01	104.66	790	109.47	788.03	116.91	785
123.41	782.33	129.15	780	142.55	770.74	146.96	767.78	150.66	765.3
160.01	764.7	168.22	764	172.06	763.29	173.79	762.87	174.04	762.64
174.91	762	176.73	760.21	176.95	760	177.56	759.41	179.34	758
179.44	757.9	182.16	756	183.28	755.08	184.78	754	185.95	753.02
187.32	752	190.07	750.11	190.22	750	192.21	748.44	192.82	748
193.24	747.76	193.53	747.54	206.22	745.61	206.72	745.53	208.65	745.76
223.7	747.61	223.76	747.64	224.43	748	225.55	748.48	228.72	750
231.91	751.57	232.75	752	233	752.13	235.44	752.14	259.47	753.16
261.54	753.16	269.43	753.21	277.15	753.26	326.57	754	327.55	754
331.28	755.23	331.3	755.23	331.4	755.24	333.08	755.32	337.42	755.42
341.93	755.32	344.62	755.62	370.65	756	372.86	756.61	377.93	758
380.12	758.61	385.24	760	390.46	761.49	392.29	762	397.91	763.57
405.4	765.64	406.71	766	407.95	766.35	413.69	768	420.85	770
428.05	772	428.61	772.15	435.3	774	436.02	774.21	442.64	776
444.41	776	447.37	776.06	542.96	776.06	544.8	776.09	545.6	776
567.96	776	568.38	775.79	569.97	774.64	573.06	775.28	574.08	776
574.48	776.2	578.63	778	586.5	780.84	609.97	784.69	612.35	785.19

Manning's n Values

num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	187.32	.035	233	.04	370.65	.03
567.96	.03	578.63	.04			447.37	.02

Bank Sta: Left 187.32 Right 233 Lengths: Left Channel 1155.6 Right 1093.26 853.34 Coeff Contr. .1 Expan. .3

CROSS SECTION OUTPUT Profile #100-yr

GesslerFinal.rep

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	760.43	Wt. n-Val.	0.100	0.035	0.040
Vel Head (ft)	0.55	Reach Len. (ft)	1155.60	1093.26	853.34
w.s. Elev (ft)	759.88	Flow Area (sq ft)	40.74	557.86	837.67
Crit w.s. (ft)		Area (sq ft)	40.74	557.86	837.67
E.G. Slope (ft/ft)	0.001113	Flow (cfs)	43.41	4029.59	3339.00
Q Total (cfs)	7412.00	Top width (ft)	10.24	45.68	151.78
Top width (ft)	207.70	Avg. Vel. (ft/s)	1.07	7.22	3.99
Vel Total (ft/s)	5.16	Hydr. Depth (ft)	3.98	12.21	5.52
Max Chl Dpth (ft)	14.35	Conv. (cfs)	1301.2	120775.7	100077.1
Conv. Total (cfs)	222154.0	Wetted Per. (ft)	12.93	48.44	152.55
Length Wtd. (ft)	1000.47	Shear (lb/sq ft)	0.22	0.80	0.38
Min Ch El (ft)	745.53	Stream Power (lb/ft s)	612.35	0.00	0.00
Alpha	1.33	Cum Volume (acre-ft)	2.75	40.50	30.26
Frctn Loss (ft)	1.45	Cum SA (acres)	1.15	4.80	9.06
C & E Loss (ft)	0.03				

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: Flint Run
 REACH: Lower

RS: 2422.446

INPUT

Description:

Station Elevation Data		num= 101									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	827.33	2.04	826.52	8.7	823.9	18.49	820	26.59	816.78		
31.02	815	43.42	810.03	43.71	809.91	54.78	805	60.08	802.88		
66.69	800	74.34	796.99	78.98	795	89.14	791.07	91.95	790		
103.33	785.18	103.8	785	106.19	783.96	113.68	780.68	115.31	780		
118.54	777.88	140.62	764.19	142.29	764.11	144.58	764	144.84	764		
152.26	763.62	158.03	763.3	160.92	762.67	164.22	762	164.71	761.59		
166.7	760	168.44	758.49	168.99	758	170.24	757.01	171.81	756		
172.19	755.78	175.1	754	175.49	753.72	175.98	753.38	178.43	752.83		
181.13	752.77	181.48	752.3	181.65	752	182.61	750.49	182.87	750		
183.38	749.35	184.29	748	184.5	747.68	184.78	747.3	193.16	746.66		
203.98	745.48	217.18	746.81	225.14	747.51	225.66	747.78	226.09	748		
228.92	749.5	229.87	750	230.61	750.38	232.45	752	232.85	752.31		
232.95	752.4	260.86	752.89	294.85	753.48	318.12	754	357.87	755.53		
367.67	755.91	370.06	756	371.96	756.14	377.39	756.48	400.27	758		
405.99	759.54	407.35	760	409.43	760.56	415.23	761.51	418.4	762		
422.13	762.26	427.49	762.69	438.54	763.45	445.89	764	445.98	764.01		
450.72	764.31	457.31	764.66	458.95	764.67	480.98	770.6	499.66	772.3		
515.1	772.8	523.56	770.1	538.9	771.76	541.52	772	546.77	772.53		
547.5	772.61	547.85	772.66	548.46	772.68	556.6	774.61	557.51	774.57		
557.96	774.56	585.55	778.67	590.53	779.65	591.47	780	592.65	780		
592.87	780.06										

GesslerFinal.rep

Manning's n Values num= 7
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
 0 .1 178.43 .035 232.45 .04 457.31 .03 480.98 .02
 515.1 .03 523.56 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 178.43 232.45 335.76 346.43 218.7 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	758.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.85	Wt. n-Val.	0.100	0.035	0.040
w.s. Elev (ft)	758.10	Reach Len. (ft)	335.76	346.43	218.70
Crit W.S. (ft)		Flow Area (sq ft)	29.53	574.79	617.61
E.G. Slope (ft/ft)	0.001961	Area (sq ft)	29.53	574.79	617.61
Q Total (cfs)	7412.00	Flow (cfs)	37.43	4959.10	2415.47
Top Width (ft)	231.75	Top width (ft)	9.55	54.02	168.18
Vel Total (ft/s)	6.07	Avg. Vel. (ft/s)	1.27	8.63	3.91
Max Chl Dpth (ft)	12.62	Hydr. Depth (ft)	3.09	10.64	3.67
Conv. Total (cfs)	167394.0	Conv. (cfs)	845.3	111997.3	54551.3
Length Wtd. (ft)	309.14	Wetted Per. (ft)	11.05	58.46	168.46
Min Ch El (ft)	745.48	Shear (lb/sq ft)	0.33	1.20	0.45
Alpha	1.49	Stream Power (lb/ft s)	592.87	0.00	0.00
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)	1.82	26.29	16.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.89	3.55	5.92

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2355.763

INPUT
 Description:

Station	Elevation	Data	num=	125					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	10.21	821.05	13.07	820	23.71	816.28	26.8	815
32.1	812.7	38.29	810	46.89	806.31	49.93	805	57.14	802.05
61.49	800	64.14	798.95	74.21	795	78.78	793.14	86.71	790
95.42	786.48	99.06	785	104.68	782.71	110.72	780	118.05	775.07
137.58	762.78	146.88	762.44	149.01	762.36	150.64	762.29	155.97	762
158.29	761.64	163.32	760.9	163.35	760.9	164.36	760.26	164.71	760
167.42	758.19	167.69	758	167.89	757.86	170.3	756	171.54	755.19
173.13	754	173.64	753.64	174.15	753.27	178.85	753.19	184.22	752.73
184.82	752.06	184.85	752	186.64	750.14	186.74	750	187.23	749.51
188.17	748	188.32	747.77	188.37	747.71	198.18	746.71	205.27	746
206.99	745.42	210.92	746	230.13	746.85	232.78	746.97	234.03	747.03
234.51	747.47	234.99	748	235.3	748.24	237.05	750	237.56	750.51
239.26	752.07	263.63	752.63	263.67	752.63	272.98	752.86	301.5	753.37
303.52	753.43	315.09	753.69	323.85	754	330	754	330.07	754

GesslerFinal.rep

330.82	754.05	356.8	755.6	369.54	761.5	381.48	762.4	401.6	763
416.2	759.7	421.92	760	426.05	759.69	431.14	759.92	431.67	760
432.1	760	437.22	760.93	444.16	762	444.81	762.16	445.26	762.2
445.37	762.17	446.19	762	446.29	761.97	450.55	761.16	453.37	761.84
454.42	762	456.96	762.09	467.93	762.44	468.26	762.46	468.6	762.49
481.15	763.4	490.57	764	491.33	764.07	494	764.25	495.49	764.41
507.57	765.77	508.22	765.78	509.7	766	518.27	767.27	519.09	767.4
519.73	767.47	519.97	767.54	520.51	767.59	524.68	768	524.9	768
529.76	768.49	537.93	768	538.2	767.92	539.72	766.59	543.27	767.24
543.98	767.22	547.94	767.31	556.22	767.03	558.31	766.68	558.95	766.74
561.68	766.28	563.3	766.28	568.4	767.22	570.83	768	573.12	768.85

Manning's n Values	num=	7							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	184.22	.035	239.26	.04	356.8	.03	369.54	.02
401.6	.03	416.2	.04						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
184.22	239.26	48.16	40.88	38.52	.1	.3	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	758.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.23	Wt. n-Val.	0.100	0.035	0.040
w.s. Elev (ft)	756.94	Reach Len. (ft)	48.16	40.88	38.52
Crit w.s. (ft)		Flow Area (sq ft)	48.11	540.43	410.64
E.G. Slope (ft/ft)	0.002970	Area (sq ft)	48.11	540.43	410.64
Q Total (cfs)	7412.00	Flow (cfs)	80.02	5429.91	1902.07
Top width (ft)	190.60	Top width (ft)	15.14	55.04	120.43
Vel Total (ft/s)	7.42	Avg. vel. (ft/s)	1.66	10.05	4.63
Max Chl Dpth (ft)	11.52	Hydr. depth (ft)	3.18	9.82	3.41
Conv. Total (cfs)	136005.3	Conv. (cfs)	1468.3	99635.3	34901.7
Length wtd. (ft)	40.42	wetted Per. (ft)	16.35	59.72	120.79
Min Ch El (ft)	745.42	Shear (lb/sq ft)	0.55	1.68	0.63
Alpha	1.44	Stream Power (lb/ft s)	573.12	0.00	0.00
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	1.52	21.85	13.42
C & E Loss (ft)	0.04	Cum SA (acres)	0.79	3.11	5.20

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 2314.880

INPUT
 Description:

Station Elevation Data	num=	119							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	19.5	818	28.11	815	36.25	812.18	42.53	810
56.39	805.1	56.63	805	66.61	801.16	69.63	800	72.03	799.07
82.59	795	90.29	792.01	94.69	790	97.61	788.63	105.64	785

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113.46	781.64	117.02	780	121.01	778.24	138.82	766.27	145.02	761.77
160.34	761.2	162.74	761.1	164.48	760.89	167.6	760.5	170	760.19
170.29	760.17	171	760.07	171.21	760.03	171.48	759.87	173.71	758.37
174.27	758	175.29	757.38	177.31	756	178.41	755.28	180.25	754
180.93	753.59	181.27	753.36	193.53	752.27	194.51	752.23	194.54	752.18
194.63	752	194.7	751.84	195.49	750	195.56	749.77	196.1	748.95
196.6	748	196.68	747.23	196.69	747.22	205.08	746.58	212.71	746
218.94	745.38	227.24	746	232.48	746.29	244.35	746.97	245.59	747.78
245.92	748	247.75	749.2	248.1	749.47	248.85	750	249.62	750.56
249.88	750.64	250.85	751.24	261.15	752.56	261.33	752.58	262.14	752.68
277.92	752.69	279.68	752.69	292.5	752.92	298.82	752.9	322.81	753.54
327.56	753.77	332.01	753.89	334.12	754	336.21	754	340.62	754.22
352.2	754.51	353.78	754.6	361.68	758.6	371.75	759	383.72	758.7
386.37	757.5	387.78	757.64	391.43	758	394.31	758.21	406.45	760
413.23	761.12	418.5	762	423.18	762.75	424.39	762.88	443.25	763.96
443.67	763.98	443.74	763.99	445.42	764	457.65	764.13	457.77	764.13
467.5	764.06	469.11	764.11	476.62	764.36	487.38	764.57	488.62	764.5
489.9	764.2	502.7	765.85	503.7	766	505.57	766.24	505.97	766.3
507.46	766.45	516.98	767.35	520.13	767.72	521.12	767.9	523.92	767.95
529.43	767.98	531.43	767.98	531.7	768	540.12	768.65	542.23	768.78
547.7	769.16	562.92	769.85	563.68	769.88	567.18	770		

Manning's n Values		num= 7							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	193.53	.035	261.15	.04	352.2	.03	353.78	.02
383.72	.03	386.37	.04						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
193.53	261.15	14.36	91.23	28.15	.1	.3	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	758.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.09	Wt. n-Val.	0.100	0.035	0.040
w.s. Elev (ft)	756.92	Reach Len. (ft)	14.36	91.23	28.15
Crit w.s. (ft)		Flow Area (sq ft)	59.89	629.36	338.33
E.G. Slope (ft/ft)	0.002636	Area (sq ft)	59.89	629.36	338.33
Q Total (cfs)	7412.00	Flow (cfs)	99.26	5796.02	1516.72
Top width (ft)	182.41	Top width (ft)	17.57	67.62	97.22
Vel Total (ft/s)	7.21	Avg. Vel. (ft/s)	1.66	9.21	4.48
Max Chl Dpth (ft)	11.54	Hydr. Depth (ft)	3.41	9.31	3.48
Conv. Total (cfs)	144372.5	Conv. (cfs)	1933.5	112896.1	29543.0
Length wtd. (ft)	74.19	wetted Per. (ft)	18.70	72.46	97.81
Min Ch El (ft)	745.38	Shear (lb/sq ft)	0.53	1.43	0.57
Alpha	1.35	Stream Power (lb/ft s)	567.18	0.00	0.00
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	1.46	21.30	13.09
C & E Loss (ft)	0.04	Cum SA (acres)	0.78	3.06	5.10

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2223.643

INPUT

Description:

Station Elevation Data		num= 110	
Sta	Elev	Sta	Elev
0	825	27.73	815
55.42	805	58.57	803.87
87.77	791.97	92.08	790
113.45	780	119.05	777.7
149.59	763.59	152.1	760.27
172.23	759.11	177.72	758.38
181.54	756	181.73	755.88
207.65	752.72	208.62	752.7
210.3	750	211.6	748.18
233.11	746.13	235.95	746
237.66	746	239.35	746.12
262.98	749.98	263.04	750.02
295.92	752.68	305.73	752.54
351.69	752.72	352.4	752.71
378.83	755.5	389.05	755.2
426.15	764.29	430.67	764.85
439.15	766.55	442.1	766.65
465.78	766.36	467.12	766.4
509.94	766.55	510.53	766.34
519.68	767.58	520.34	767.64
532.81	768.01	535.5	768.02
574.46	771.76	575.95	771.96

Manning's n Values		num= 7	
Sta	n Val	Sta	n Val
0	.1	207.65	.035
389.05	.03	411.25	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	207.65	266.25		39.89	37.88		.1	.3

Blocked Obstructions		num= 1
Sta L	Sta R	Elev
494.07	507.39	800

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	757.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.96	wt. n-Val.	0.100	0.035	0.038
w.s. Elev (ft)	756.82	Reach Len. (ft)	39.89	37.88	44.06
Crit w.s. (ft)		Flow Area (sq ft)	90.55	564.29	464.31
E.G. Slope (ft/ft)	0.002493	Area (sq ft)	90.55	564.29	464.31
Q Total (cfs)	7412.00	Flow (cfs)	145.47	5077.82	2188.71
Top width (ft)	218.19	Top width (ft)	27.45	58.60	132.14
Vel Total (ft/s)	6.62	Avg. Vel. (ft/s)	1.61	9.00	4.71
Max Chl Dpth (ft)	11.52	Hydr. Depth (ft)	3.30	9.63	3.51

GesslerFinal.rep

Conv. Total (cfs)	148453.0	Conv. (cfs)	2913.6	101702.4	43837.0
Length wtd. (ft)	39.80	Wetted Per. (ft)	28.42	64.51	133.62
Min Ch El (ft)	745.30	Shear (lb/sq ft)	0.50	1.36	0.54
Alpha	1.42	Stream Power (lb/ft s)	580.24	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	1.44	20.05	12.83
C & E Loss (ft)	0.03	Cum SA (acres)	0.77	2.92	5.03

CROSS SECTION

RIVER: Flint Run
REACH: Lower

RS: 2185.764

INPUT

Description:

Station Elevation Data num= 115

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	825	14.44	820	15.39	819.67	28.89	815	30.77	814.35
43.61	810	46.43	809.02	58.5	805	62.27	803.68	73.29	800
77.15	798.36	86.5	795	90.52	793.08	98.84	790	103.37	787.81
111.03	785	116.77	782.18	121.84	780	128.58	777.28	134.01	775
141.49	772	146.27	770	157.97	765.3	159.15	765	159.53	764.6
167.95	759.3	178.98	758.72	188.57	758	189.07	757.92	190.8	757.66
191.91	757.49	193.04	756.84	194.34	756	196.29	754.86	198.33	754
198.65	753.77	198.84	753.68	206	753.46	226.2	752.66	226.5	752.28
226.65	752	227.4	751.05	228.28	750	229.58	748.42	229.85	748
230.79	746.94	230.85	746.86	232.6	746.79	232.91	746.78	255.43	745.34
255.45	745.27	255.48	745.34	258.85	745.41	277.09	746.39	278.3	747.61
278.68	748	279.12	748.39	280.84	750	281.49	750.58	282.74	752
283.6	752.82	283.82	753.02	304.14	752.7	318	752.51	354.53	752
362.74	752	375.72	752.96	380.78	753.25	382.63	754.15	392.91	754.6
403.18	754.25	406.27	752.76	426.18	762.15	435.45	764	439.18	764.59
440.45	764.79	443.8	765.18	446.37	765.34	456.87	766	457.13	766.03
458.2	766.08	462.99	766.32	464.54	766.38	469.6	766.32	477.45	766.2
483.79	766	489.89	765.82	497.17	765.85	501.81	765.93	504.34	766
506.22	766	525.5	766.08	530.79	766.58	531.62	766.6	539.2	766.99
545.12	767.08	549.74	767.47	550.66	767.48	556.32	767.65	562.96	768
569.41	768	573.65	768.37	576.32	768.74	584.99	770	586.31	770.14
600.11	771.39	605.92	772	609.78	772	614.47	772.31	616.42	772.49
627.88	774	630.43	774	631.19	780.48	631.25	780.39	635.99	780.55

Manning's n Values

num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	226.2	.035	283.6	.04	380.78	.03	382.63	.02
403.18	.03	426.18	.04						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
226.2 283.6 190.76 109.94 157.38 .1 .3

Blocked Obstructions

num= 1

Sta L	Sta R	Elev
515.5	528.8	800

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	757.66				
Vel Head (ft)	0.85	Wt. n-Val.	0.100	0.035	0.037
W.S. Elev (ft)	756.81	Reach Len. (ft)	190.76	109.94	157.38
Crit W.S. (ft)		Flow Area (sq ft)	108.65	581.17	503.61
E.G. Slope (ft/ft)	0.002069	Area (sq ft)	108.65	581.17	503.61
Q Total (cfs)	7412.00	Flow (cfs)	159.47	4935.97	2316.57
Top Width (ft)	221.78	Top Width (ft)	33.12	57.40	131.27
Vel Total (ft/s)	6.21	Avg. Vel. (ft/s)	1.47	8.49	4.60
Max Chl Dpth (ft)	11.54	Hydr. Depth (ft)	3.28	10.12	3.84
Conv. Total (cfs)	162942.2	Conv. (cfs)	3505.6	108510.1	50926.4
Length wtd. (ft)	127.37	wetted Per. (ft)	33.96	63.02	132.87
Min Ch El (ft)	745.27	Shear (lb/sq ft)	0.41	1.19	0.49
Alpha	1.42	Stream Power (lb/ft s)	635.99	0.00	0.00
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	1.34	19.55	12.34
C & E Loss (ft)	0.00	Cum SA (acres)	0.74	2.87	4.89

CROSS SECTION

RIVER: Flint Run
REACH: Lower

RS: 2075.488

INPUT

Description:

Station Elevation Data		num= 123									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	802.23	3.51	801.49	11.2	800	23.28	797.48	37.66	795		
45.98	793.51	66.38	790	66.75	789.93	77.42	788.18	92.16	785.7		
95.67	785	110.22	782.46	121.42	780	132.63	777.62	144.52	775		
153.17	773.15	167.17	770	172.97	769.53	182.57	766.54	189.19	765		
226.92	765	255.29	758.47	258.94	758.29	262.94	757.39	265.94	756.71		
269.59	756.41	275.43	756	278.33	755.79	287.28	755.2	289.64	755.02		
292.29	754.77	292.59	754.74	296.35	754.35	298.4	754.14	298.98	754		
299.33	753.9	304.32	752.88	313.3	752.57	319.57	752	320.16	752		
331.52	750.76	336.84	750.08	337.14	750.03	337.6	750	338.5	749.96		
340.85	749.47	346.27	748	347.01	747.8	351.42	747.26	357.61	745.69		
358.12	745.17	375.72	748	378.17	749.67	378.68	750	380.07	750.9		
382.5	751.57	384.12	752	384.28	752.05	385.43	752.36	390.12	752.43		
411.87	752.53	434.09	752.12	444.28	752.05	451.3	752	499.75	752		
508.05	753.84	508.95	754	511.38	754.44	512.07	754.53	517.05	755.31		
517.68	755.36	522.76	755.38	530.91	755.38	538.94	755.37	542.82	755.68		
547.05	756	550	756	561.76	757.77	563.24	757.99	563.34	758		
564.55	758	566.62	758.29	569.75	758.52	572.04	758.67	576.08	758.9		
581.86	759.45	583.67	759.61	584.97	759.72	585.93	759.78	592.84	760		
592.86	760	594.56	760.05	602.27	761.74	603.46	762	603.73	762.06		
611.35	763.55	612.46	763.7	612.68	763.73	613.11	763.81	614.13	764		
616.28	764.4	617.45	764.62	626.9	765.99	626.97	766	642	768		
646.62	768.63	648.2	768.84	655.6	770	668.42	772.24	669.35	773.12		

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700.03	781.17	722.83	783.03	742.99	787.88	757.66	786.67	763.96	787.49
764.04	787.51	795.36	791.59	802.24	795	808.51	795	830.36	792.84
856.2	792.6	904.14	792.39	906.69	792.68				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 313.3 .035 384.12 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 313.3 384.12 41.03 39.47 55.96 .1 .3
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 714 766 810

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	757.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.87	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	756.47	Reach Len. (ft)	41.03	39.47	55.96
Crit W.S. (ft)	754.92	Flow Area (sq ft)	82.89	525.37	574.67
E.G. Slope (ft/ft)	0.003094	Area (sq ft)	82.89	525.37	574.67
Q Total (cfs)	7412.00	Flow (cfs)	103.48	4627.76	2680.76
Top Width (ft)	284.25	Top Width (ft)	44.43	70.82	169.00
Vel Total (ft/s)	6.27	Avg. Vel. (ft/s)	1.25	8.81	4.66
Max Chl Dpth (ft)	11.30	Hydr. Depth (ft)	1.87	7.42	3.40
Conv. Total (cfs)	133242.3	Conv. (cfs)	1860.2	83191.3	48190.8
Length Wtd. (ft)	39.47	Wetted Per. (ft)	44.66	72.93	169.43
Min Ch El (ft)	745.17	Shear (lb/sq ft)	0.36	1.39	0.66
Alpha	1.43	Stream Power (lb/ft s)	906.69	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.93	18.16	10.39
C & E Loss (ft)		Cum SA (acres)	0.57	2.71	4.35

CULVERT

RIVER: Flint Run
 REACH: Lower RS: 2057.86

INPUT

Description:
 Distance from Upstream XS = 10
 Deck/Roadway Width = 15
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates
 num= 2
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
 338.5 749.96 0 378.68 750 0

Upstream Bridge Cross Section Data

Station Elevation Data num= 123
 Sta Elev Sta Elev Sta Elev Sta Elev

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0	802.23	3.51	801.49	11.2	800	23.28	797.48	37.66	795
45.98	793.51	66.38	790	66.75	789.93	77.42	788.18	92.16	785.7
95.67	785	110.22	782.46	121.42	780	132.63	777.62	144.52	775
153.17	773.15	167.17	770	172.97	769.53	182.57	766.54	189.19	765
226.92	765	255.29	758.47	258.94	758.29	262.94	757.39	265.94	756.71
269.59	756.41	275.43	756	278.33	755.79	287.28	755.2	289.64	755.02
292.29	754.77	292.59	754.74	296.35	754.35	298.4	754.14	298.98	754
299.33	753.9	304.32	752.88	313.3	752.57	319.57	752	320.16	752
331.52	750.76	336.84	750.08	337.14	750.03	337.6	750	338.5	749.96
340.85	749.47	346.27	748	347.01	747.8	351.42	747.26	357.61	745.69
358.12	745.17	375.72	748	378.17	749.67	378.68	750	380.07	750.9
382.5	751.57	384.12	752	384.28	752.05	385.43	752.36	390.12	752.43
411.87	752.53	434.09	752.12	444.28	752.05	451.3	752	499.75	752
508.05	753.84	508.95	754	511.38	754.44	512.07	754.53	517.05	755.31
517.68	755.36	522.76	755.38	530.91	755.38	538.94	755.37	542.82	755.68
547.05	756	550	756	561.76	757.77	563.24	757.99	563.34	758
564.55	758	566.62	758.29	569.75	758.52	572.04	758.67	576.08	758.9
581.86	759.45	583.67	759.61	584.97	759.72	585.93	759.78	592.84	760
592.86	760	594.56	760.05	602.27	761.74	603.46	762	603.73	762.06
611.35	763.55	612.46	763.7	612.68	763.73	613.11	763.81	614.13	764
616.28	764.4	617.45	764.62	626.9	765.99	626.97	766	642	768
646.62	768.63	648.2	768.84	655.6	770	668.42	772.24	669.35	773.12
700.03	781.17	722.83	783.03	742.99	787.88	757.66	786.67	763.96	787.49
764.04	787.51	795.36	791.59	802.24	795	808.51	795	830.36	792.84
856.2	792.6	904.14	792.39	906.69	792.68				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 313.3 .035 384.12 .04

Bank Sta: Left Right Coeff Contr. Expan.
 313.3 384.12 .1 .3

Blocked Obstructions num= 1
 Sta L Sta R Elev
 714 766 810

Downstream Deck/Roadway Coordinates
 num= 2
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
 343.84 750 0 417.5 750 0

Downstream Bridge Cross Section Data
 Station Elevation Data num= 128
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 0 797.48 4.66 796.43 11.04 795 27.23 791.35 33.9 790
 43.01 788.21 59.06 785 65.87 783.66 81.55 780.84 83.94 780.44
 85.52 780.18 86.62 780 114.79 775.53 117.33 775 132.81 772.38
 143.55 770 153.89 768.47 158.37 768.52 192.54 765.91 196.06 765.62
 199.75 765.31 200.76 765 208.51 765 237.42 767.51 244.73 768.19
 268.64 765 282.05 760.05 288.17 757.8 289.35 756.46 289.4 756.45
 295.03 756 304.43 755.26 307.38 755.01 315.56 754.1 316.61 754
 321.62 753.55 337.61 752.06 338.07 752 342.74 751.44 343.57 750.49

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343.84	750	343.89	749.93	344.12	749.66	345.11	748	345.55	747.3
346.34	746	346.96	745.04	347.45	744.85	348.87	744.46	349.02	744.36
357.9	745.65	379.86	745.14	405.91	744.25	406.39	744.49	409.49	746
410.95	746.72	414.72	748.61	417.5	750	418.28	750.39	421.68	752
422.03	752.18	422.48	752.42	428.58	752.3	435.53	752.14	457.89	752.24
470.09	752.07	472.1	752.05	475.35	752	476.3	751.99	491.47	752.63
495.94	752.53	505.27	752.53	519.73	752	521.1	752	523.71	752.13
535.47	752.53	553.07	753.59	558.81	753.85	559.28	753.88	562.41	754
571.09	754.29	574.06	754.48	580.8	754.97	589.35	755.44	597.42	756
605.47	756.63	609.52	756.9	611.59	757.21	616.07	757.25	620.82	757.42
622.16	757.57	625.72	757.76	626.44	757.93	634.36	759.95	634.54	760
634.58	760.11	639.58	763.14	641.45	762	644.86	762.97	648.36	764
651.47	764.9	655.48	766	659.92	767.24	660.69	768.76	662.5	768
667.51	769.19	670.21	770	671.27	770.26	673.42	771.6	679.03	775
688.59	777.32	706.8	780	718.51	782.01	740.86	785	740.95	785.01
741.09	785.03	770.29	786.92	791.45	787.88	793.6	787.99	810.56	788.39
823.46	788.52	829.23	788.2	834.73	787.97	853.01	786.99	891.13	785.73
898.11	785.56	899.14	785.7	940.17	789.01				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 337.61 .035 422.03 .04

Bank Sta: Left Right Coeff Contr. Expan.
 337.61 422.03 .1 .3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
 Culvert #1 Circular 1.5
 FHWA Chart # 2 - Corrugated Metal Pipe Culvert
 FHWA Scale # 2 - Mitered to conform to slope
 Solution Criteria = Highest U.S. EG
 Culvert Upstrm Dist Length Top n Bottom n Depth Blocked Entrance Loss Coef Exit Loss Coef
 6 20 .024 .024 0 .7 1

Number of Barrels = 11
 Upstream Elevation = 747.14

Centerline Stations
 Sta. Sta. Sta. Sta. Sta. Sta. Sta. Sta. Sta. Sta.
 350.5 352 353.5 355 356.5 358 359.5 361 362.5 364
 365.5

Downstream Elevation = 746
 Centerline Stations
 Sta. Sta. Sta. Sta. Sta. Sta. Sta. Sta. Sta. Sta.

372.5 374 375.5 377 378.5 380 381.5 383 384.5 386
 387.5

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (cfs)	54.79	Culv Full Len (ft)	20.00
# Barrels	11	Culv Vel US (ft/s)	2.82
Q Barrel (cfs)	4.98	Culv Vel DS (ft/s)	2.82
E.G. US. (ft)	757.35	Culv Inv El Up (ft)	747.14
W.S. US. (ft)	756.47	Culv Inv El Dn (ft)	746.00
E.G. DS (ft)	757.11	Culv Frctn Ls (ft)	0.15
W.S. DS (ft)	756.63	Culv Exit Loss (ft)	0.00
Delta EG (ft)	0.24	Culv Entr Loss (ft)	0.09
Delta WS (ft)	0.16	Q Weir (cfs)	7357.21
E.G. IC (ft)	757.31	Weir Sta Lft (ft)	263.17
E.G. OC (ft)	757.35	Weir Sta Rgt (ft)	558.88
Culvert Control	Outlet	Weir Submerg	0.87
Culv WS Inlet (ft)	748.64	Weir Max Depth (ft)	7.38
Culv WS Outlet (ft)	747.50	Weir Avg Depth (ft)	4.49
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	1328.83
Culv Crt Depth (ft)	0.86	Min El weir Flow (ft)	750.01

CROSS SECTION

RIVER: Flint Run
 REACH: Lower

RS: 2035.918

INPUT

Description:

Station Elevation Data	num=	128							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
0 797.48	4.66 796.43	11.04 795	27.23 791.35	33.9 790					
43.01 788.21	59.06 785	65.87 783.66	81.55 780.84	83.94 780.44					
85.52 780.18	86.62 780	114.79 775.53	117.33 775	132.81 772.38					
143.55 770	153.89 768.47	158.37 768.52	192.54 765.91	196.06 765.62					
199.75 765.31	200.76 765	208.51 765	237.42 767.51	244.73 768.19					
268.64 765	282.05 760.05	288.17 757.8	289.35 756.46	289.4 756.45					
295.03 756	304.43 755.26	307.38 755.01	315.56 754.1	316.61 754					
321.62 753.55	337.61 752.06	338.07 752	342.74 751.44	343.57 750.49					
343.84 750	343.89 749.93	344.12 749.66	345.11 748	345.55 747.3					
346.34 746	346.96 745.04	347.45 744.85	348.87 744.46	349.02 744.36					
357.9 745.65	379.86 745.14	405.91 744.25	406.39 744.49	409.49 746					
410.95 746.72	414.72 748.61	417.5 750	418.28 750.39	421.68 752					
422.03 752.18	422.48 752.42	428.58 752.3	435.53 752.14	457.89 752.24					
470.09 752.07	472.1 752.05	475.35 752	476.3 751.99	491.47 752.63					
495.94 752.53	505.27 752.53	519.73 752	521.1 752	523.71 752.13					
535.47 752.53	553.07 753.59	558.81 753.85	559.28 753.88	562.41 754					
571.09 754.29	574.06 754.48	580.8 754.97	589.35 755.44	597.42 756					
605.47 756.63	609.52 756.9	611.59 757.21	616.07 757.25	620.82 757.42					
622.16 757.57	625.72 757.76	626.44 757.93	634.36 759.95	634.54 760					

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634.58	760.11	639.58	763.14	641.45	762	644.86	762.97	648.36	764
651.47	764.9	655.48	766	659.92	767.24	660.69	768.76	662.5	768
667.51	769.19	670.21	770	671.27	770.26	673.42	771.6	679.03	775
688.59	777.32	706.8	780	718.51	782.01	740.86	785	740.95	785.01
741.09	785.03	770.29	786.92	791.45	787.88	793.6	787.99	810.56	788.39
823.46	788.52	829.23	788.2	834.73	787.97	853.01	786.99	891.13	785.73
898.11	785.56	899.14	785.7	940.17	789.01				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 337.61 .035 422.03 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 337.61 422.03 50.28 39.38 62.3 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	757.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	756.63	Reach Len. (ft)	16.00	16.00	16.00
Crit W.S. (ft)	753.24	Flow Area (sq ft)	111.05	880.30	646.51
E.G. Slope (ft/ft)	0.001044	Area (sq ft)	111.05	880.30	646.51
Q Total (cfs)	7412.00	Flow (cfs)	92.40	5523.40	1796.20
Top width (ft)	316.21	Top width (ft)	48.41	84.42	183.38
Vel Total (ft/s)	4.53	Avg. vel. (ft/s)	0.83	6.27	2.78
Max Chl Dpth (ft)	12.38	Hydr. Depth (ft)	2.29	10.43	3.53
Conv. Total (cfs)	229372.3	Conv. (cfs)	2859.4	170927.5	55585.4
Length wtd. (ft)	16.00	Wetted Per. (ft)	48.68	90.00	183.61
Min Ch El (ft)	744.25	Shear (lb/sq ft)	0.15	0.64	0.23
Alpha	1.52	Stream Power (lb/ft s)	940.17	0.00	0.00
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.93	17.20	10.39
C & E Loss (ft)	0.03	Cum SA (acres)	0.53	2.64	4.12

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.

BRIDGE

RIVER: Flint Run
 REACH: Lower RS: 2017.29

INPUT

Description:

Distance from Upstream XS = 16
 Deck/Roadway width = 8
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 2
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

321.62 754.05 753.55 457.89 752.74 752.24

Upstream Bridge Cross Section Data

Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	797.48	4.66	796.43	11.04	795	27.23	791.35	33.9	790
43.01	788.21	59.06	785	65.87	783.66	81.55	780.84	83.94	780.44
85.52	780.18	86.62	780	114.79	775.53	117.33	775	132.81	772.38
143.55	770	153.89	768.47	158.37	768.52	192.54	765.91	196.06	765.62
199.75	765.31	200.76	765	208.51	765	237.42	767.51	244.73	768.19
268.64	765	282.05	760.05	288.17	757.8	289.35	756.46	289.4	756.45
295.03	756	304.43	755.26	307.38	755.01	315.56	754.1	316.61	754
321.62	753.55	337.61	752.06	338.07	752	342.74	751.44	343.57	750.49
343.84	750	343.89	749.93	344.12	749.66	345.11	748	345.55	747.3
346.34	746	346.96	745.04	347.45	744.85	348.87	744.46	349.02	744.36
357.9	745.65	379.86	745.14	405.91	744.25	406.39	744.49	409.49	746
410.95	746.72	414.72	748.61	417.5	750	418.28	750.39	421.68	752
422.03	752.18	422.48	752.42	428.58	752.3	435.53	752.14	457.89	752.24
470.09	752.07	472.1	752.05	475.35	752	476.3	751.99	491.47	752.63
495.94	752.53	505.27	752.53	519.73	752	521.1	752	523.71	752.13
535.47	752.53	553.07	753.59	558.81	753.85	559.28	753.88	562.41	754
571.09	754.29	574.06	754.48	580.8	754.97	589.35	755.44	597.42	756
605.47	756.63	609.52	756.9	611.59	757.21	616.07	757.25	620.82	757.42
622.16	757.57	625.72	757.76	626.44	757.93	634.36	759.95	634.54	760
634.58	760.11	639.58	763.14	641.45	762	644.86	762.97	648.36	764
651.47	764.9	655.48	766	659.92	767.24	660.69	768.76	662.5	768
667.51	769.19	670.21	770	671.27	770.26	673.42	771.6	679.03	775
688.59	777.32	706.8	780	718.51	782.01	740.86	785	740.95	785.01
741.09	785.03	770.29	786.92	791.45	787.88	793.6	787.99	810.56	788.39
823.46	788.52	829.23	788.2	834.73	787.97	853.01	786.99	891.13	785.73
898.11	785.56	899.14	785.7	940.17	789.01				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	337.61	.035	422.03	.04

Bank Sta: Left Right Coeff Contr. Expan.

337.61	422.03	.1	.3
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Downstream Deck/Roadway Coordinates

num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
386.49	754.62	754.12	496.28	752.33	751.83

Downstream Bridge Cross Section Data

Station Elevation Data num= 100

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	800.66	2.87	800	20.54	796.34	26.59	795	36.01	792.98
49.32	790	59.3	787.88	73.33	785	83.96	782.91	98.17	780
110.22	777.43	123.36	775	146.01	770.34	147.65	770	148.86	770
161.56	768.45	187.96	765.59	190.53	765	212.74	765	253.18	767.96
264.25	770	321.36	770	321.59	770	321.74	769.95	334.48	765

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338.22	757.6	339.53	756.12	340.34	756.05	340.99	756	343.03	755.84
344.1	755.84	358.64	754.61	365.02	754.27	367.69	754.14	371.47	754.14
372.1	754.12	378.35	754.22	381.77	754.24	386.49	754.12	386.64	754
390.39	754	390.53	752.89	390.68	752	390.77	751.51	391.24	750.56
391.36	750.46	392.18	749.9	399.43	745.4	412.84	745.49	429.87	745.1
430.68	746.25	431.49	745.59	456.87	746.69	457.47	747.11	458.75	748
460.62	749.36	461.5	750	464.07	751.86	464.2	751.97	468.76	752.05
479.07	752.08	496.28	751.83	496.46	751.84	527.54	754.42	528.69	754.44
552.71	754.82	561.91	754.99	562	754.99	562.21	755	562.32	755
595.37	753.58	612.25	754.6	623.27	754.45	645.53	758.04	658.09	758.71
693.09	760	709.49	763.47	710.27	763.68	715.07	765	717.82	765.77
733.15	770	749.73	774.64	751.01	775	761.67	776.19	762.32	776.22
794.97	778.22	813.46	779.54	813.52	779.55	826.69	780	850.66	781.41
865.24	781.54	890.26	781.22	898.37	780	947.8	780	968.82	782.8
977.23	785	1019.29	789.33	1027.08	790	1035.86	791.47	1036.64	791.59

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	264.25	.2	321.36	.04	378.35	.035	528.69	.04

Bank Sta: Left Right Coeff Contr. Expan.

378.35	528.69	.1	.3
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Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .98
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of 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 #100-yr

E.G. US. (ft)	757.11	Element	Inside BR US	Inside BR DS
w.s. US. (ft)	756.63	E.G. Elev (ft)	757.05	756.99
Q Total (cfs)	7412.00	w.s. Elev (ft)	756.67	756.38

Q Bridge (cfs)	2992.01	Crit w.s. (ft)	753.40	753.52
Q Weir (cfs)		Max Chl Dpth (ft)	12.42	11.28
Weir Sta Lft (ft)		Vel Total (ft/s)	4.68	6.12
Weir Sta Rgt (ft)		Flow Area (sq ft)	1582.53	1211.05
Weir Submerg		Froude # Chl	0.25	0.33
Weir Max Depth (ft)		Specif Force (cu ft)	7230.79	5800.81
Min El Weir Flow (ft)	752.00	Hydr Depth (ft)	4.99	4.09
Min El Prs (ft)	753.55	W.P. Total (ft)	596.50	523.93
Delta EG (ft)	0.18	Conv. Total (cfs)	127513.6	89063.7
Delta WS (ft)	0.39	Top width (ft)	316.84	295.95
BR Open Area (sq ft)	513.33	Frctn Loss (ft)	0.04	0.06
BR Open Vel (ft/s)	5.83	C & E Loss (ft)	0.02	0.01
Coef of Q		Shear Total (lb/sq ft)	0.56	1.00
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

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.

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: Flint Run
REACH: Lower

RS: 1996.533

INPUT
Description:

Station Elevation Data		num=	100								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	800.66	2.87	800	20.54	796.34	26.59	795	36.01	792.98		
49.32	790	59.3	787.88	73.33	785	83.96	782.91	98.17	780		
110.22	777.43	123.36	775	146.01	770.34	147.65	770	148.86	770		
161.56	768.45	187.96	765.59	190.53	765	212.74	765	253.18	767.96		
264.25	770	321.36	770	321.59	770	321.74	769.95	334.48	765		
338.22	757.6	339.53	756.12	340.34	756.05	340.99	756	343.03	755.84		
344.1	755.84	358.64	754.61	365.02	754.27	367.69	754.14	371.47	754.14		
372.1	754.12	378.35	754.22	381.77	754.24	386.49	754.12	386.64	754		
390.39	754	390.53	752.89	390.68	752	390.77	751.51	391.24	750.56		
391.36	750.46	392.18	749.9	399.43	745.4	412.84	745.49	429.87	745.1		
430.68	746.25	431.49	745.59	456.87	746.69	457.47	747.11	458.75	748		
460.62	749.36	461.5	750	464.07	751.86	464.2	751.97	468.76	752.05		
479.07	752.08	496.28	751.83	496.46	751.84	527.54	754.42	528.69	754.44		
552.71	754.82	561.91	754.99	562	754.99	562.21	755	562.32	755		
595.37	753.58	612.25	754.6	623.27	754.45	645.53	758.04	658.09	758.71		
693.09	760	709.49	763.47	710.27	763.68	715.07	765	717.82	765.77		
733.15	770	749.73	774.64	751.01	775	761.67	776.19	762.32	776.22		

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794.97 778.22 813.46 779.54 813.52 779.55 826.69 780 850.66 781.41
 865.24 781.54 890.26 781.22 898.37 780 947.8 780 968.82 782.8
 977.23 785 1019.29 789.33 1027.08 790 1035.86 791.47 1036.64 791.59

Manning's n Values num= 5
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
 0 .1 264.25 .2 321.36 .04 378.35 .035 528.69 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 378.35 528.69 477.61 274.2 175.6 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	756.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.69	wt. n-val.	0.040	0.035	0.040
W.S. Elev (ft)	756.24	Reach Len. (ft)	477.61	274.20	175.60
Crit w.s. (ft)		Flow Area (sq ft)	55.08	987.34	180.62
E.G. Slope (ft/ft)	0.002293	Area (sq ft)	55.08	987.34	180.62
Q Total (cfs)	7412.00	Flow (cfs)	123.22	6830.05	458.73
Top width (ft)	294.92	Top width (ft)	38.92	150.34	105.65
Vel Total (ft/s)	6.06	Avg. Vel. (ft/s)	2.24	6.92	2.54
Max Chl Dpth (ft)	11.14	Hydr. Depth (ft)	1.42	6.57	1.71
Conv. Total (cfs)	154798.8	Conv. (cfs)	2573.4	142644.9	9580.5
Length wtd. (ft)	261.19	wetted Per. (ft)	39.05	157.28	105.87
Min Ch El (ft)	745.10	Shear (lb/sq ft)	0.20	0.90	0.24
Alpha	1.21	Stream Power (lb/ft s)	1036.64	0.00	0.00
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)	0.85	16.38	10.02
C & E Loss (ft)	0.05	Cum SA (acres)	0.49	2.54	3.99

CROSS SECTION

RIVER: Flint Run
 REACH: Lower RS: 1720.640

INPUT

Description:

Station Elevation Data		num=	66							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	837.16	1.23	836.49	13.1	830	17.08	827.77	21.76	825	
25.63	822.75	42.44	812.26	46.07	810	50.32	807.36	54.09	805	
59.39	801.78	62.27	800	64.45	798.71	70.4	795	74.16	792.68	
78.56	790	85.62	785.73	86.73	785	98.37	777.91	102.25	775.54	
103.14	775	108.56	772.08	112.09	770	130.34	760.38	131.04	760	
131.6	759.8	144.88	755	149.32	753.92	165.23	750	170.74	749.21	
195.91	744.85	230.75	749.58	234.55	750	240.54	750	288.17	751.29	
311.57	751.92	430.38	755	453.79	755	457.16	755.23	515.06	760	
519.16	760	552.44	764.22	557.98	765	559.45	765	574.29	767.43	
593.86	770	608.06	771.67	629.58	774.61	631.13	775	633.42	775.21	
648.79	776.49	690.41	780	712.88	782.89	739.28	785	753.82	785	
786.54	788.08	809.67	790	829.53	792.2	850.76	793.74	863.78	795	

886.65 799.16 891.24 800 910.57 803.96 914.92 805 925.56 807.51
 929.58 808.43

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 165.23 .035 240.54 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 165.23 240.54 277.27 313.32 323.91 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	756.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.19	Wt. n-val.	0.100	0.035	0.040
W.S. Elev (ft)	754.92	Reach Len. (ft)	277.27	313.32	323.91
Crit W.S. (ft)		Flow Area (sq ft)	49.14	545.23	454.65
E.G. Slope (ft/ft)	0.003952	Area (sq ft)	49.14	545.23	454.65
Q Total (cfs)	7412.00	Flow (cfs)	81.90	5408.93	1921.17
Top Width (ft)	282.06	Top Width (ft)	20.02	75.31	186.73
Vel Total (ft/s)	7.07	Avg. vel. (ft/s)	1.67	9.92	4.23
Max Chl Dpth (ft)	10.07	Hydr. Depth (ft)	2.45	7.24	2.43
Conv. Total (cfs)	117903.1	Conv. (cfs)	1302.8	86040.1	30560.2
Length Wtd. (ft)	314.90	Wetted Per. (ft)	20.61	76.08	186.79
Min Ch El (ft)	744.85	Shear (lb/sq ft)	0.59	1.77	0.60
Alpha	1.53	Stream Power (lb/ft s)	929.58	0.00	0.00
Frctn Loss (ft)	1.23	Cum Volume (acre-ft)	0.28	11.55	8.74
C & E Loss (ft)	0.02	Cum SA (acres)	0.17	1.83	3.40

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: Flint Run
 REACH: Lower RS: 1407.321

INPUT
 Description:

Station	Elevation	Data	num=	40					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835	15.3	830	29.71	825	43.91	820	52.91	815
60.66	810	68.42	805	76.06	800	82.66	795	88.88	790
95.11	785	99.61	781.84	102.24	780	111.32	775	125.54	770
139.85	765	149.46	760	158.8	755	173.41	750	203.62	744.57
291.54	750	298.84	750.31	407.75	755	524.57	760	588.52	765
640.93	770	692.34	775	744.25	780	795.32	785	843.16	790
863.99	795	879.83	800	894.48	805	908.83	810	922.47	815
937.27	820	952.18	825	967.2	830	981.3	835	996.14	840

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 139.85 .035 291.54 .04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 139.85 291.54 277.15 391.34 964.75 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	754.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.11	Wt. n-Val.		0.035	0.040
W.S. Elev (ft)	753.75	Reach Len. (ft)	277.15	391.34	964.75
Crit W.S. (ft)	752.37	Flow Area (sq ft)		783.74	163.29
E.G. Slope (ft/ft)	0.003864	Area (sq ft)		783.74	163.29
Q Total (cfs)	7412.00	Flow (cfs)		6839.00	573.00
Top Width (ft)	216.17	Top width (ft)		129.08	87.09
Vel Total (ft/s)	7.83	Avg. vel. (ft/s)		8.73	3.51
Max Chl Dpth (ft)	9.18	Hydr. Depth (ft)		6.07	1.87
Conv. Total (cfs)	119236.8	Conv. (cfs)		110018.9	9217.8
Length Wtd. (ft)	483.09	Wetted Per. (ft)		130.35	87.17
Min Ch El (ft)	744.57	Shear (lb/sq ft)		1.45	0.45
Alpha	1.16	Stream Power (lb/ft s)	996.14	0.00	0.00
Frctn Loss (ft)	1.58	Cum Volume (acre-ft)	0.12	6.77	6.44
C & E Loss (ft)	0.10	Cum SA (acres)	0.10	1.09	2.39

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: Flint Run
 REACH: Lower RS: 1000.000

INPUT
 Description:

Station Elevation Data		num=	38						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835	11.33	830	22.75	825	34.21	820	45.56	815
56.88	810	68.24	805	79.67	800	91.34	795	103.05	790
114.79	785	127.21	780	140.15	775	152.91	770	170.26	765
190.86	760	221.82	755	250.19	752.85	287.95	750	327.56	744.2
401.82	746.77	495.35	750	567.57	755	605.23	760	621.13	765
637.13	770	652.43	775	667.45	780	682.71	785	691.45	790
700.18	795	708.92	800	717.65	805	726.09	810	734.13	815
742.18	820	750.22	825	758.16	830				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .1 287.95 .035 401.82 .04

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Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 287.95 401.82 1 1 1 .1 .3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	753.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.76	Wt. n-Val.	0.100	0.035	0.040
W.S. Elev (ft)	752.41	Reach Len. (ft)			
Crit W.S. (ft)	750.74	Flow Area (sq ft)	38.41	724.33	418.13
E.G. Slope (ft/ft)	0.002801	Area (sq ft)	38.41	724.33	418.13
Q Total (cfs)	7412.00	Flow (cfs)	34.12	5572.26	1805.63
Top Width (ft)	274.08	Top width (ft)	31.90	113.87	128.31
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)	0.89	7.69	4.32
Max Chl Dpth (ft)	8.21	Hydr. Depth (ft)	1.20	6.36	3.26
Conv. Total (cfs)	140045.8	Conv. (cfs)	644.6	105284.8	34116.3
Length Wtd. (ft)		Wetted Per. (ft)	31.99	114.34	128.45
Min Ch El (ft)	744.20	Shear (lb/sq ft)	0.21	1.11	0.57
Alpha	1.24	Stream Power (lb/ft s)	758.16	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:Brush Run

Reach	River Sta.	n1	n2	n3
Reach 1	2011.333	.035	.035	.1
Reach 1	1507.212	.035	.035	.1

River:Flint Run

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7
Upper	5348.411	.1	.035	.1				
Upper	4587.709	.1	.035	.1				
Upper	4327.913	.1	.035	.1				
Lower	4052.349	.05	.035	.1				
Lower	3910.912	.05	.035	.1				
Lower	3710.271	.1	.035	.04				
Lower	3270.326	.1	.035	.04				
Lower	3218.798	.1	.035	.04	.03	.02	.03	.04
Lower	3143.198	.1	.035	.04	.03	.02	.03	.04
Lower	2861.250	.1	.035	.04	.03	.02	.03	.04
Lower	2579.076	.1	.035	.04	.03	.02	.03	.04
Lower	2476.907	.1	.035	.04	.03	.02	.03	.04
Lower	2422.446	.1	.035	.04	.03	.02	.03	.04

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Lower	2355.763	.1	.035	.04	.03	.02	.03	.04
Lower	2314.880	.1	.035	.04	.03	.02	.03	.04
Lower	2223.643	.1	.035	.04	.03	.02	.03	.04
Lower	2185.764	.1	.035	.04	.03	.02	.03	.04
Lower	2075.488	.1	.035	.04				
Lower	2057.86							
Lower	2035.918	Culvert	.1	.035	.04			
Lower	2017.29	Bridge						
Lower	1996.533	.1	.2	.04	.035	.04		
Lower	1720.640	.1	.035	.04				
Lower	1407.321	.1	.035	.04				
Lower	1000.000	.1	.035	.04				

SUMMARY OF REACH LENGTHS

River: Brush Run

Reach	River Sta.	Left	Channel	Right
Reach 1	2011.333	530.52	498.55	409.24
Reach 1	1507.212	101.38	496.45	893.29

River: Flint Run

Reach	River Sta.	Left	Channel	Right	
Upper	5348.411	580.67	714.22	806.06	
Upper	4587.709	165.19	259.78	200.58	
Upper	4327.913	783.59	271.11	224.1	
Lower	4052.349	46.88	141.39	54.28	
Lower	3910.912	545.19	736.56	773.43	
Lower	3710.271	310.33	428.51	382.56	
Lower	3270.326	56.8	51.5	42.19	
Lower	3218.798	785.25	753.13	556.83	
Lower	3143.198	328.74	281.33	282.2	
Lower	2861.250	296.63	281.27	281.46	
Lower	2579.076	100.63	101.9	100.41	
Lower	2476.907	1155.6	1093.26	853.34	
Lower	2422.446	335.76	346.43	218.7	
Lower	2355.763	48.16	40.88	38.52	
Lower	2314.880	14.36	91.23	28.15	
Lower	2223.643	39.89	37.88	44.06	
Lower	2185.764	190.76	109.94	157.38	
Lower	2075.488	41.03	39.47	55.96	
Lower	2057.86				
Lower	2035.918	Culvert	50.28	39.38	62.3
Lower	2017.29	Bridge			
Lower	1996.533	477.61	274.2	175.6	

Lower	1720.640	277.27	313.32	323.91
Lower	1407.321	277.15	391.34	964.75
Lower	1000.000	1	1	1

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Brush Run

Reach	River Sta.	Contr.	Expan.
Reach 1	2011.333	.1	.3
Reach 1	1507.212	.1	.3

River: Flint Run

Reach	River Sta.	Contr.	Expan.
Upper	5348.411	.1	.3
Upper	4587.709	.1	.3
Upper	4327.913	.1	.3
Lower	4052.349	.1	.3
Lower	3910.912	.1	.3
Lower	3710.271	.1	.3
Lower	3270.326	.1	.3
Lower	3218.798	.1	.3
Lower	3143.198	.1	.3
Lower	2861.250	.1	.3
Lower	2579.076	.1	.3
Lower	2476.907	.1	.3
Lower	2422.446	.1	.3
Lower	2355.763	.1	.3
Lower	2314.880	.1	.3
Lower	2223.643	.1	.3
Lower	2185.764	.1	.3
Lower	2075.488	.1	.3
Lower	2057.86	culvert	
Lower	2035.918	.1	.3
Lower	2017.29	Bridge	
Lower	1996.533	.1	.3
Lower	1720.640	.1	.3
Lower	1407.321	.1	.3
Lower	1000.000	.1	.3

Profile Output Table - Standard Table 1

River Reach River Sta 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)								
6.61	Flint Run	Upper	5348.411	7165.00	0.37	753.25	767.24		767.86	0.001126
	1460.12	206.60								
7.82	Flint Run	Upper	4587.709	7165.00	0.41	751.12	766.04		766.94	0.001406
	1185.94	161.37								
11.92	Flint Run	Upper	4327.913	7165.00	0.78	755.00	764.07	763.25	766.17	0.005756
	744.35	151.38								
6.47	Flint Run	Lower	4052.349	7412.00	0.32	749.62	764.76		765.21	0.000824
	1971.68	327.99								
5.48	Flint Run	Lower	3910.912	7412.00	0.27	749.22	764.81		765.09	0.000580
	2391.17	358.75								
11.29	Flint Run	Lower	3710.271	7412.00	0.84	755.00	762.01	761.55	763.95	0.007174
	740.51	175.32								
7.48	Flint Run	Lower	3270.326	7412.00	0.37	747.64	761.96		762.56	0.001161
	1412.22	204.99								
7.20	Flint Run	Lower	3218.798	7412.00	0.37	747.59	761.89		762.50	0.001178
	1311.65	171.68								
8.05	Flint Run	Lower	3143.198	7412.00	0.43	747.50	760.77		761.56	0.001547
	1188.79	174.55								
8.74	Flint Run	Lower	2861.250	7412.00	0.45	746.88	760.19		761.10	0.001669
	1179.85	257.90								
7.99	Flint Run	Lower	2579.076	7412.00	0.40	745.85	759.87		760.61	0.001442
	1219.76	170.61								
7.22	Flint Run	Lower	2476.907	7412.00	0.36	745.53	759.88		760.43	0.001113
	1436.27	207.70								
8.63	Flint Run	Lower	2422.446	7412.00	0.47	745.48	758.10		758.95	0.001961
	1221.94	231.75								
10.05	Flint Run	Lower	2355.763	7412.00	0.57	745.42	756.94		758.17	0.002970
	999.18	190.60								
9.21	Flint Run	Lower	2314.880	7412.00	0.53	745.38	756.92		758.02	0.002636
	1027.59	182.41								
9.00	Flint Run	Lower	2223.643	7412.00	0.51	745.30	756.82		757.79	0.002493
	1119.16	218.19								
8.49	Flint Run	Lower	2185.764	7412.00	0.47	745.27	756.81		757.66	0.002069
	1193.44	221.78								
8.81	Flint Run	Lower	2075.488	7412.00	0.57	745.17	756.47	754.92	757.34	0.003094
	1182.93	284.25								
	Flint Run	Lower	2057.86	Culvert						
6.27	Flint Run	Lower	2035.918	7412.00	0.34	744.25	756.63	753.24	757.11	0.001044
	1637.86	316.21								
	Flint Run	Lower	2017.29	Bridge						
6.92	Flint Run	Lower	1996.533	7412.00	0.48	745.10	756.24		756.93	0.002293
	1223.04	294.92								
9.92	Flint Run	Lower	1720.640	7412.00	0.65	744.85	754.92		756.11	0.003952
	1049.02	282.06								
	Flint Run	Lower	1407.321	7412.00		744.57	753.75	752.37	754.85	0.003864

8.73	947.03	216.17	0.62						
Flint Run	Lower	1000.000	7412.00	744.20	752.41	750.74	753.17	0.002801	
7.69	1180.87	274.08	0.54						
Brush Run	Reach 1	2011.333	1554.00	772.80	777.24	777.24	778.42	0.012925	
11.12	207.53	87.98	1.02						
Brush Run	Reach 1	1507.212	1554.00	763.58	768.38	768.38	769.63	0.011714	
12.10	223.64	87.57	1.02						

ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : Prop

River: Brush Run Reach: Reach 1 RS: 2011.333 Profile: 100-yr

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 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.

River: Brush Run Reach: Reach 1 RS: 1507.212 Profile: 100-yr

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 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.

River: Flint Run Reach: Upper RS: 4587.709 Profile: 100-yr

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.

River: Flint Run Reach: Upper RS: 4327.913 Profile: 100-yr

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

River: Flint Run Reach: Lower RS: 3910.912 Profile: 100-yr

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.

River: Flint Run Reach: Lower RS: 3710.271 Profile: 100-yr

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.

River: Flint Run Reach: Lower RS: 2861.250 Profile: 100-yr

Warning:Divided flow computed for this cross-section.

River: Flint Run Reach: Lower RS: 2476.907 Profile: 100-yr

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.

River: Flint Run Reach: Lower RS: 2035.918 Profile: 100-yr

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

This may indicate the need for additional cross sections.

River: Flint Run Reach: Lower RS: 2017.29 Profile: 100-yr Upstream

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.

River: Flint Run Reach: Lower RS: 2017.29 Profile: 100-yr Downstream

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

This may indicate the need for additional cross sections.

River: Flint Run Reach: Lower RS: 1720.640 Profile: 100-yr

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

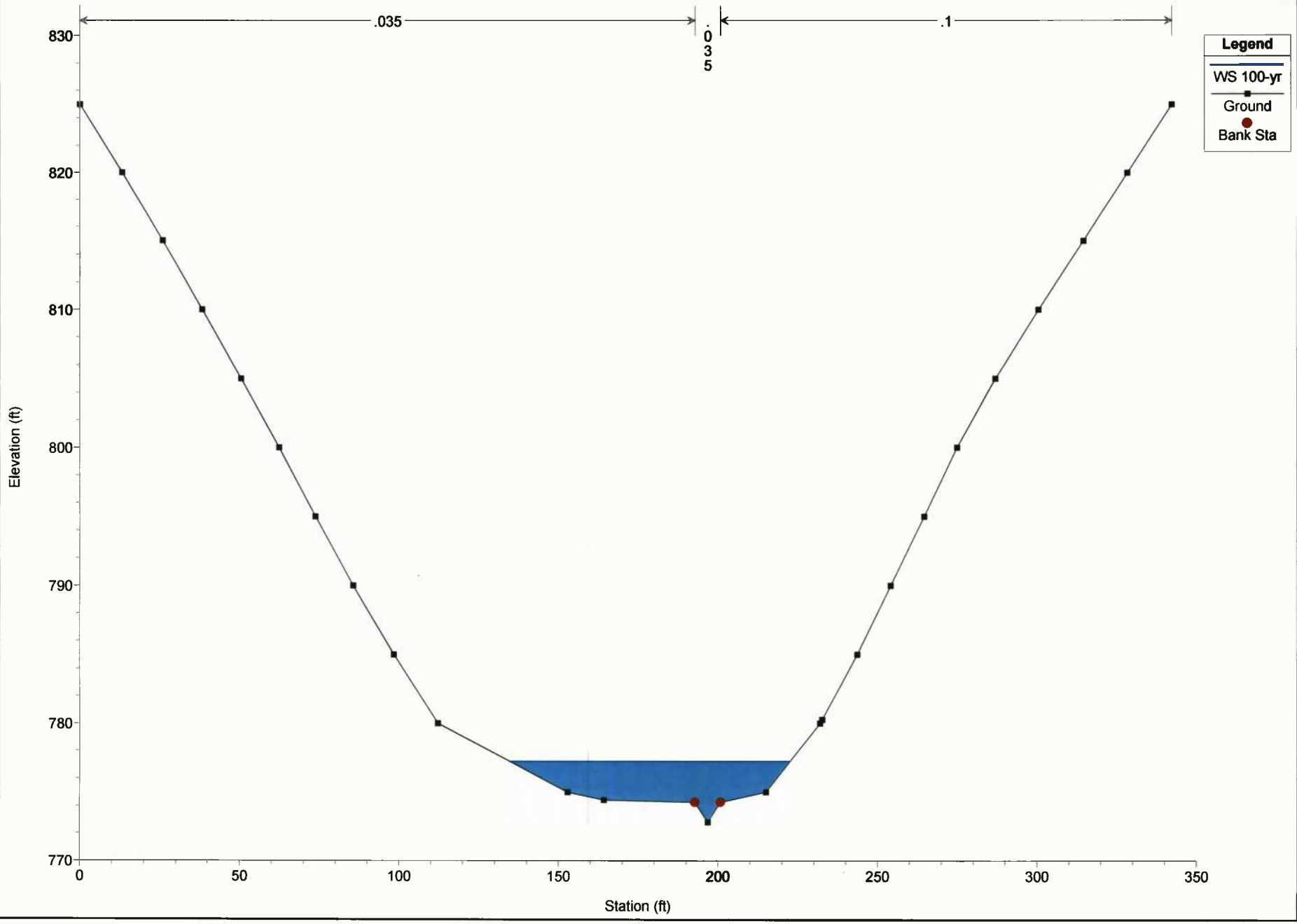
the need for additional cross sections.

River: Flint Run Reach: Lower RS: 1407.321 Profile: 100-yr

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

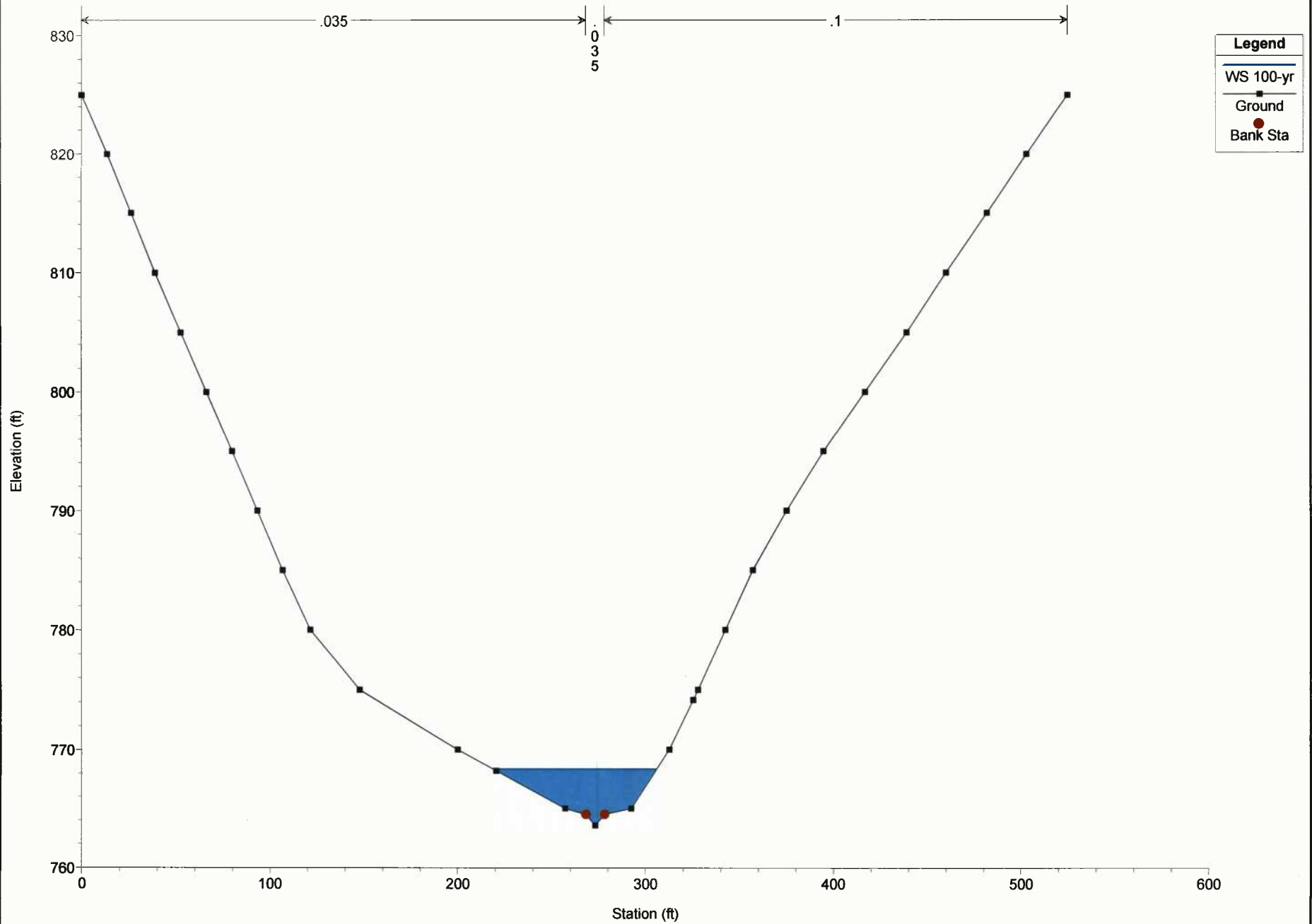
the need for additional cross sections.

Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Brush Run Reach = Reach 1 RS = 2011.333

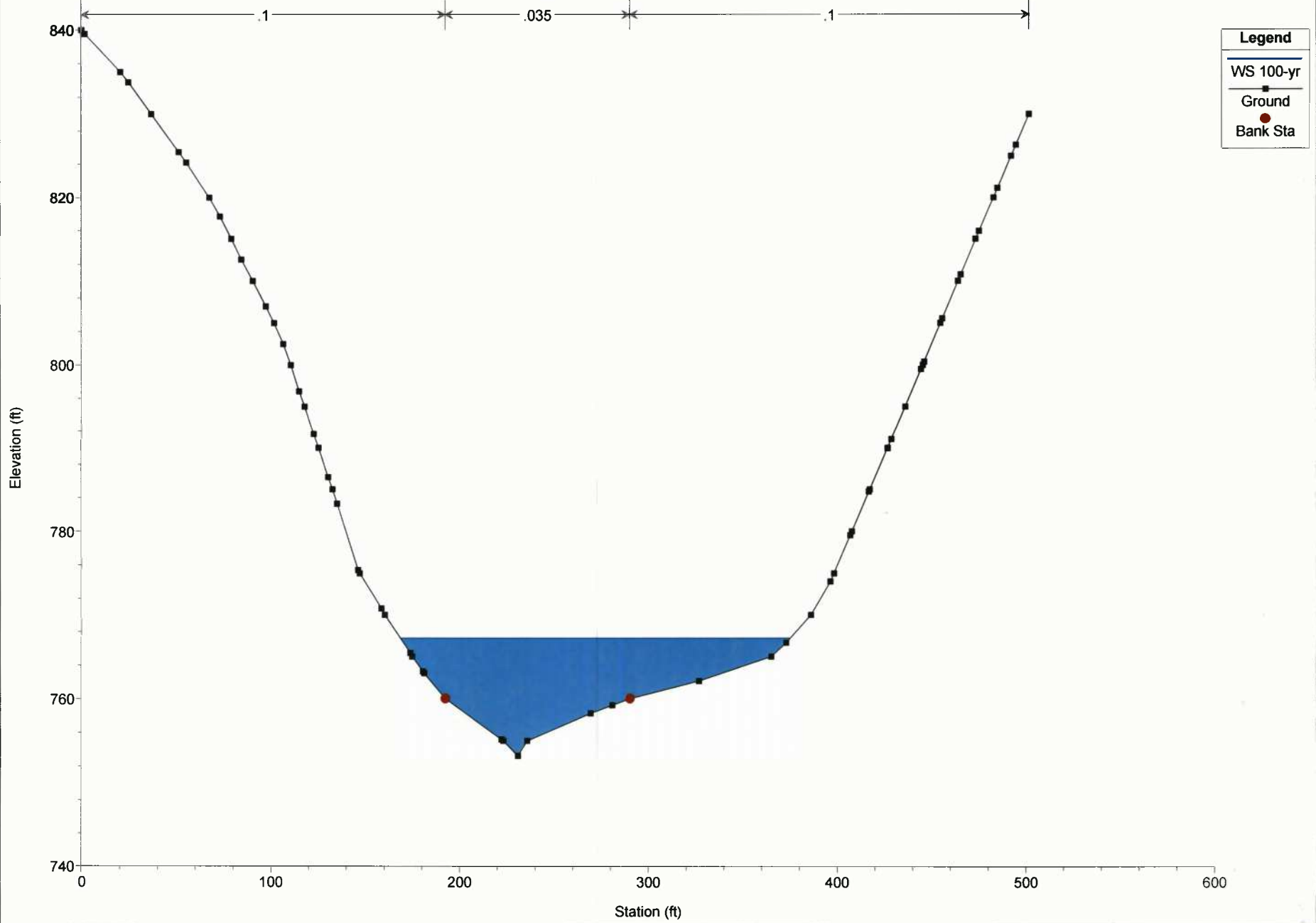


Legend	
WS 100-yr	■
Ground	■
Bank Sta	●

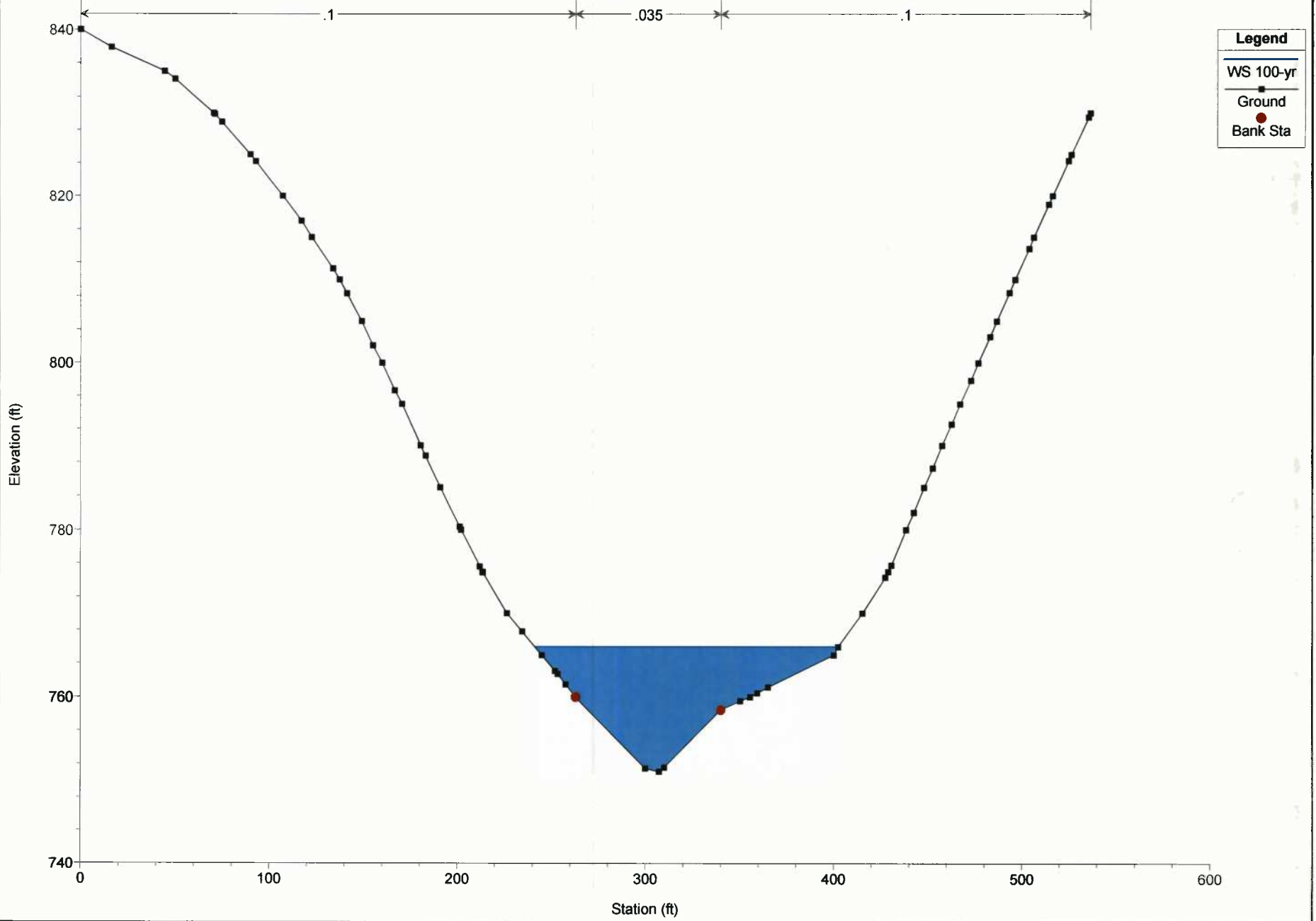
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Brush Run Reach = Reach 1 RS = 1507.212



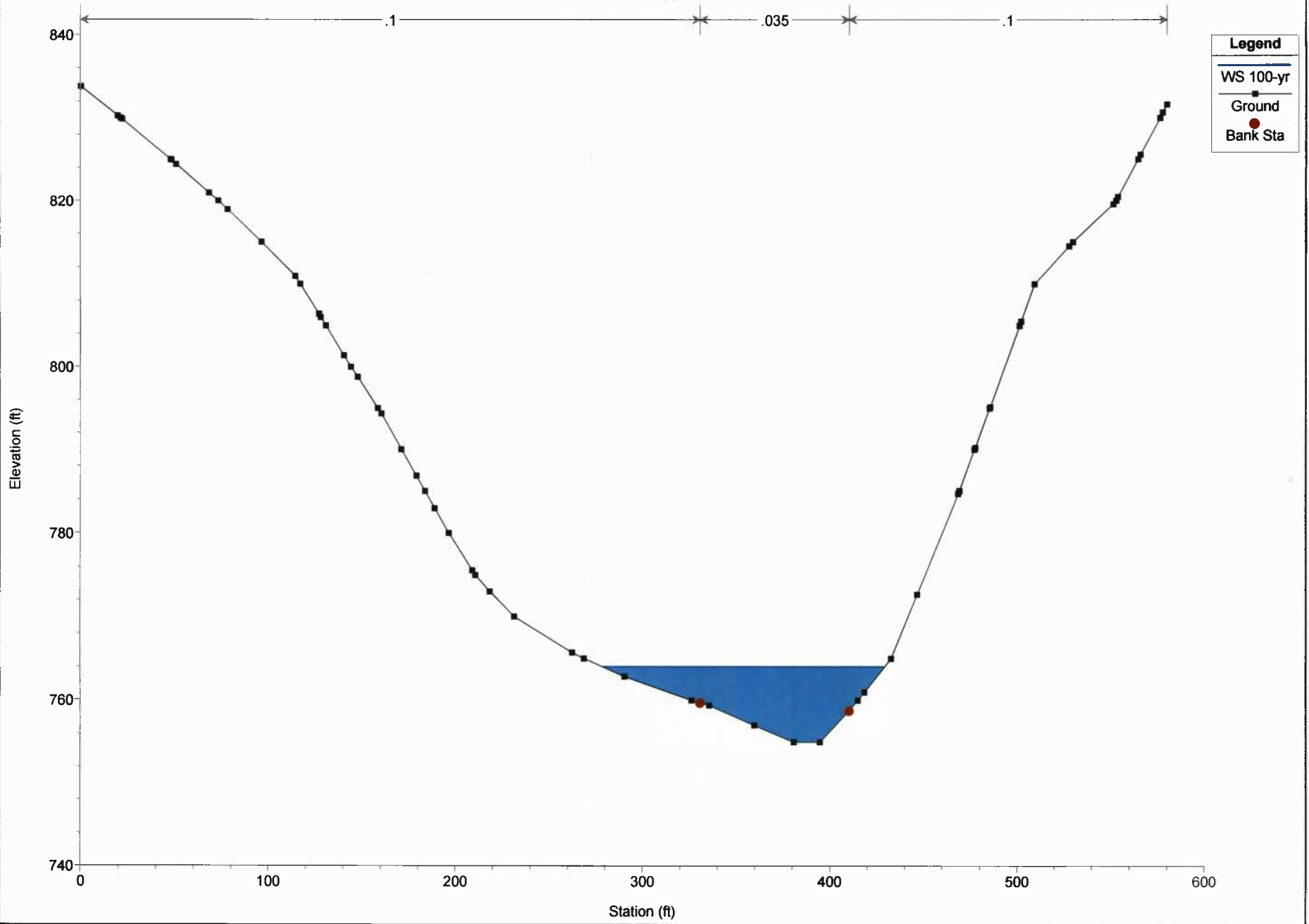
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Upper RS = 5348.411



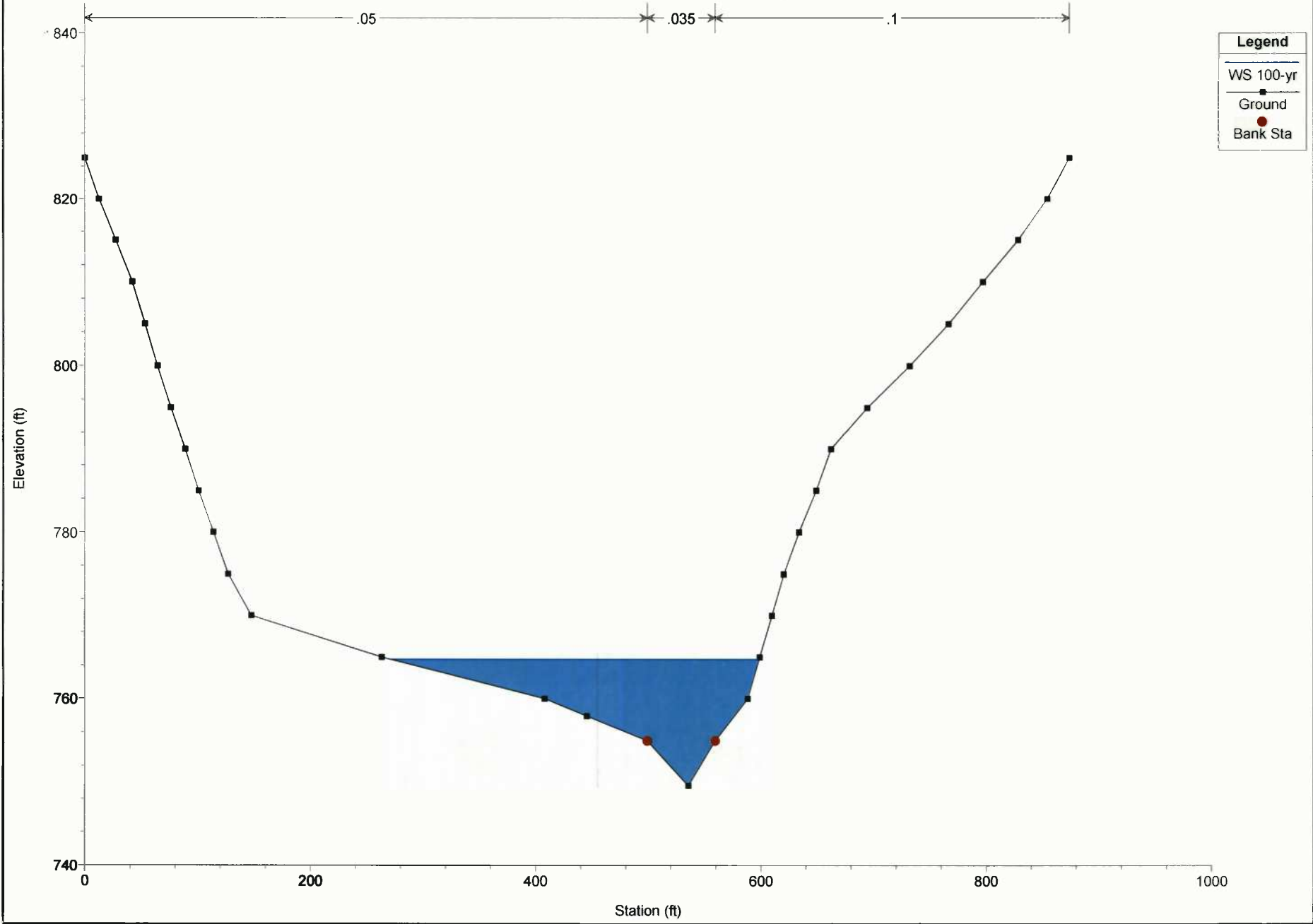
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Upper RS = 4587.709



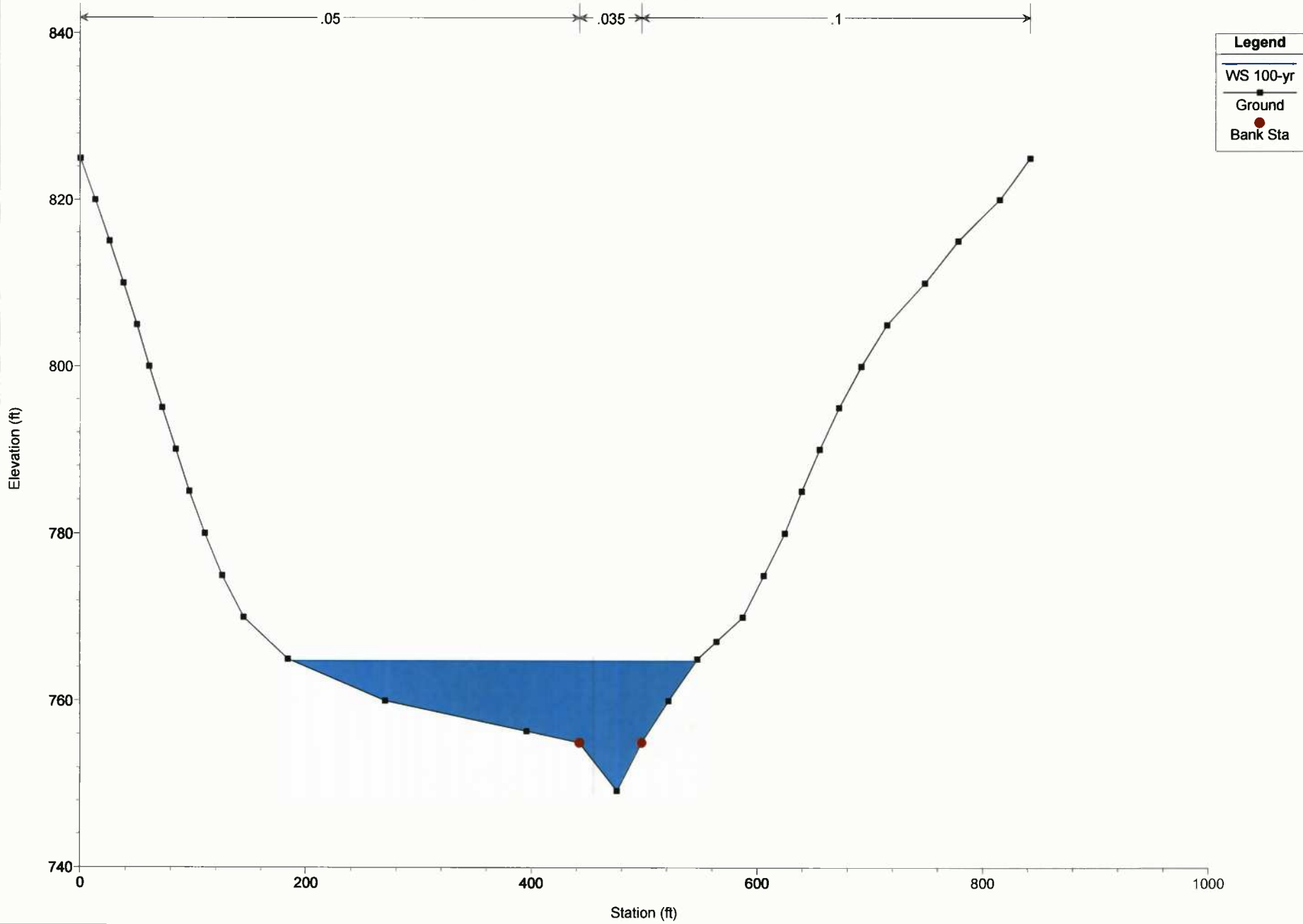
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Upper RS = 4327.913



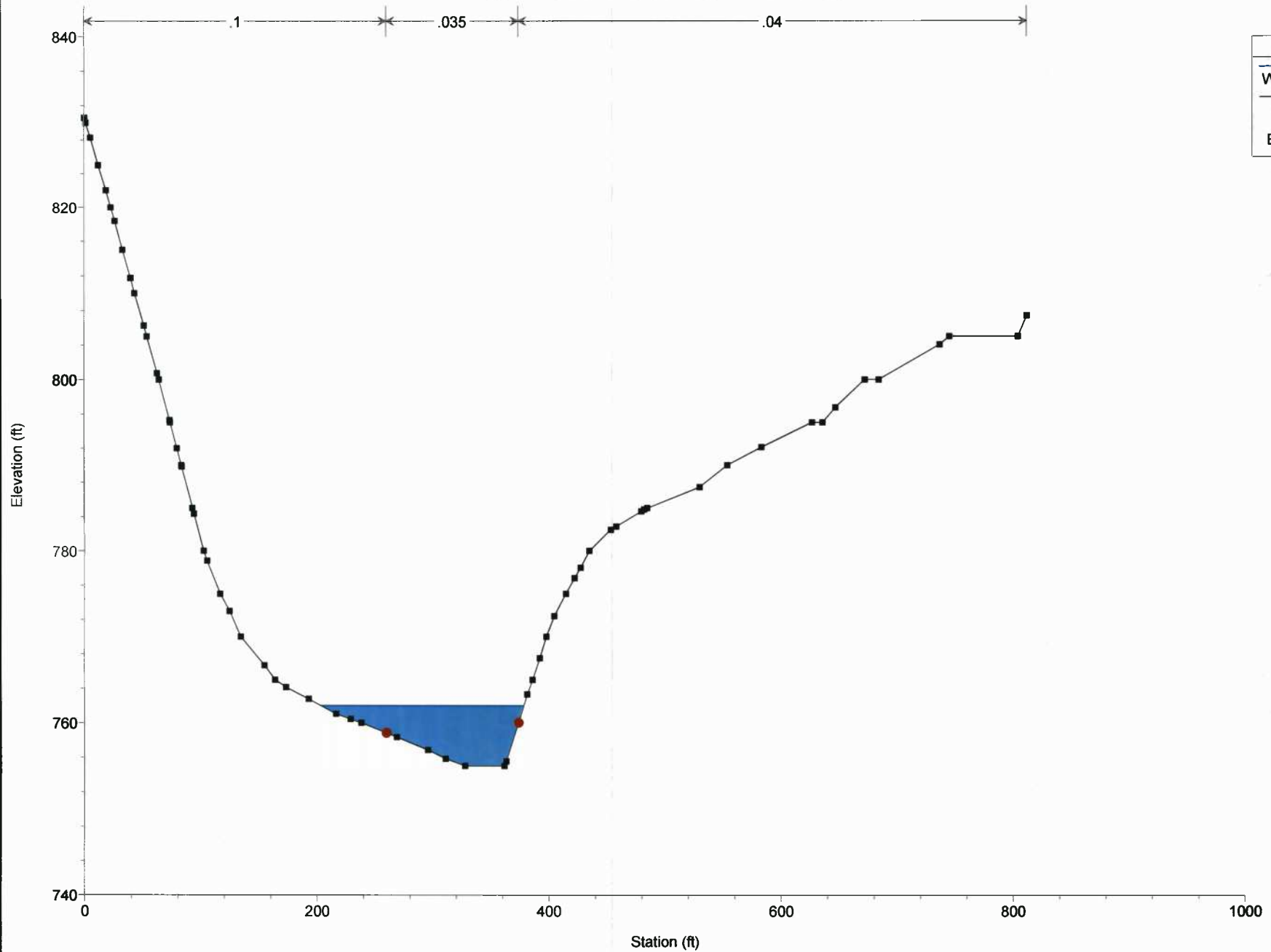
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 4052.349



Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 3910.912

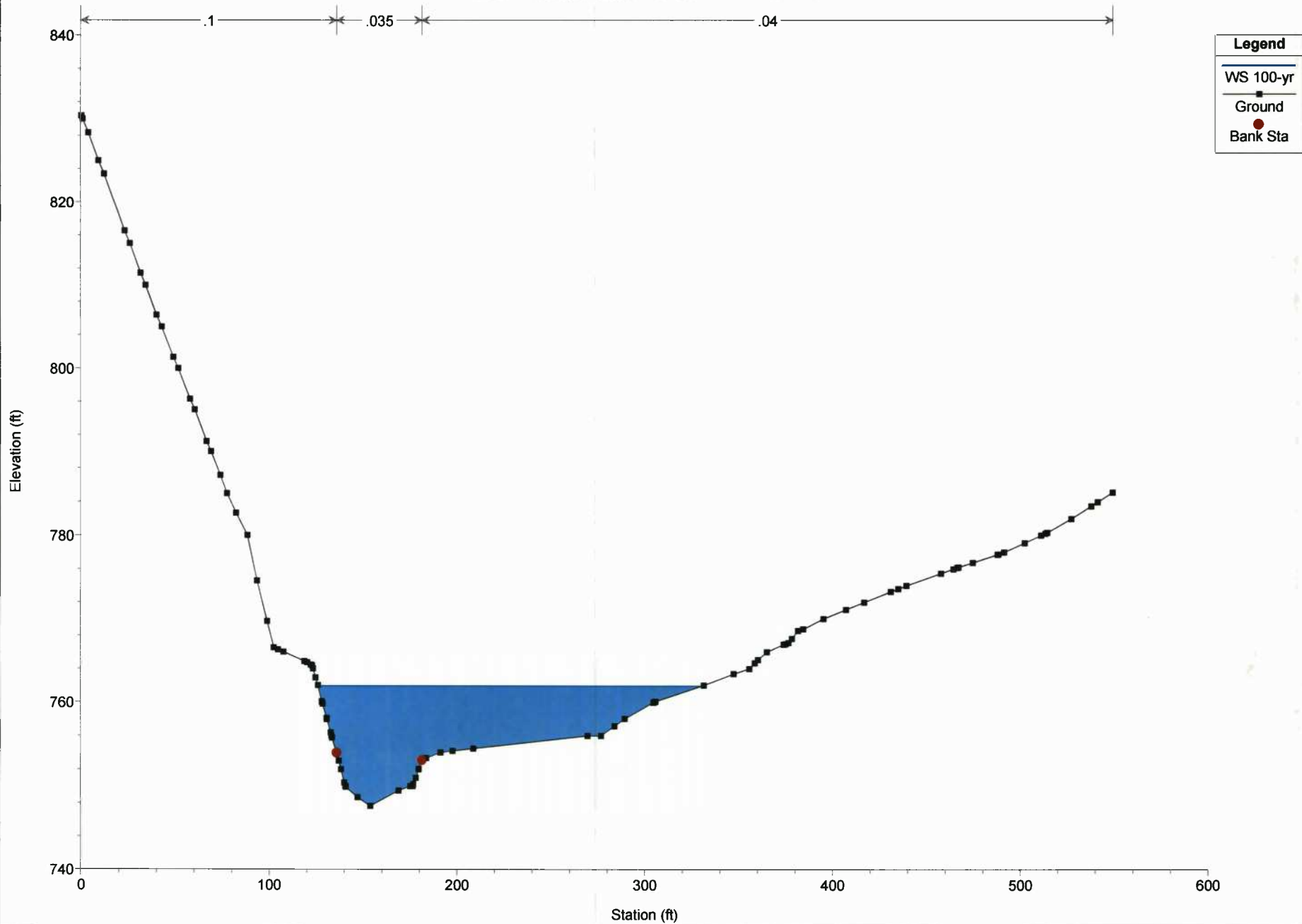


Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 3710.271

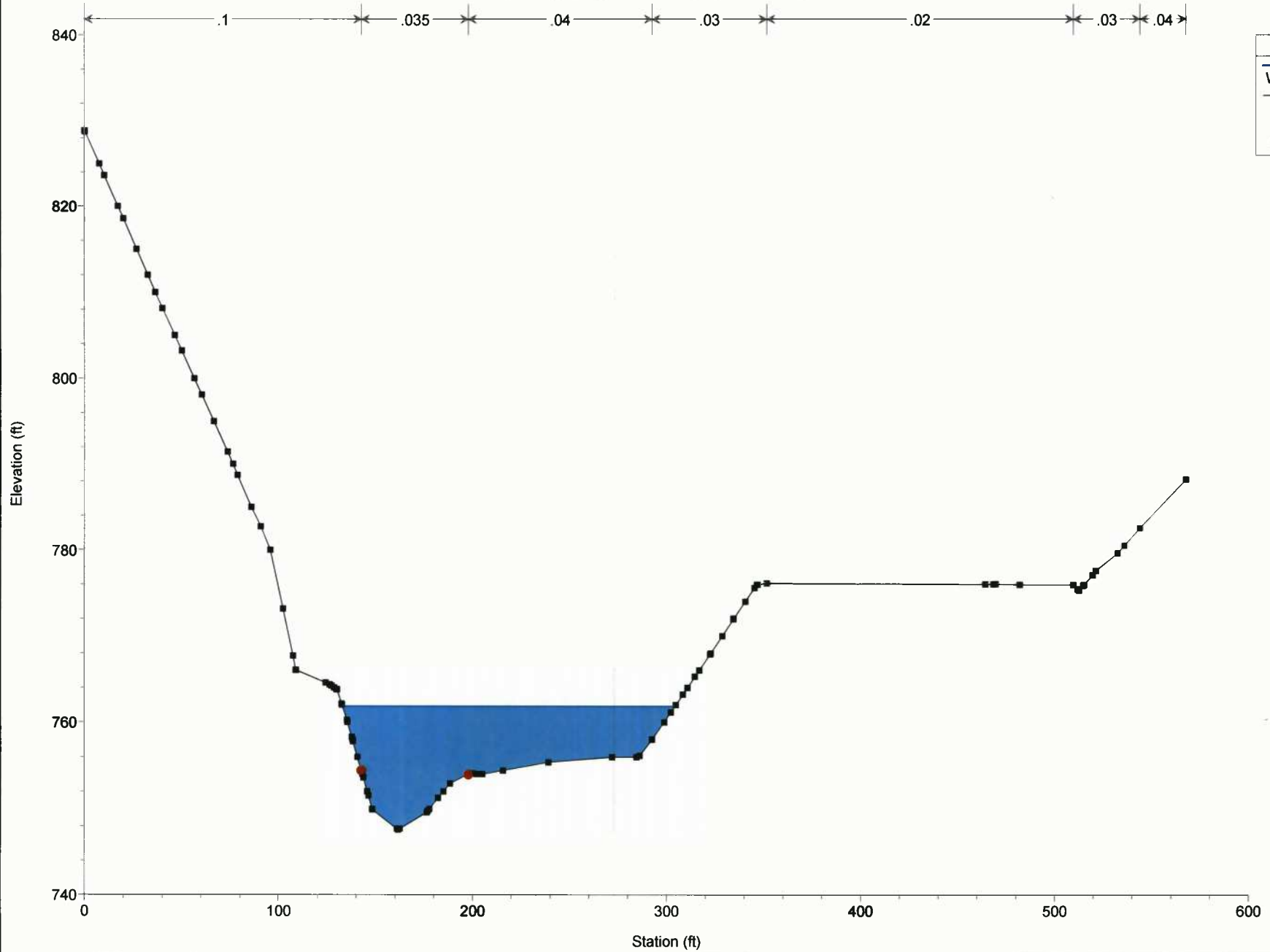


Legend	
WS 100-yr	—
Ground	■
Bank Sta	●

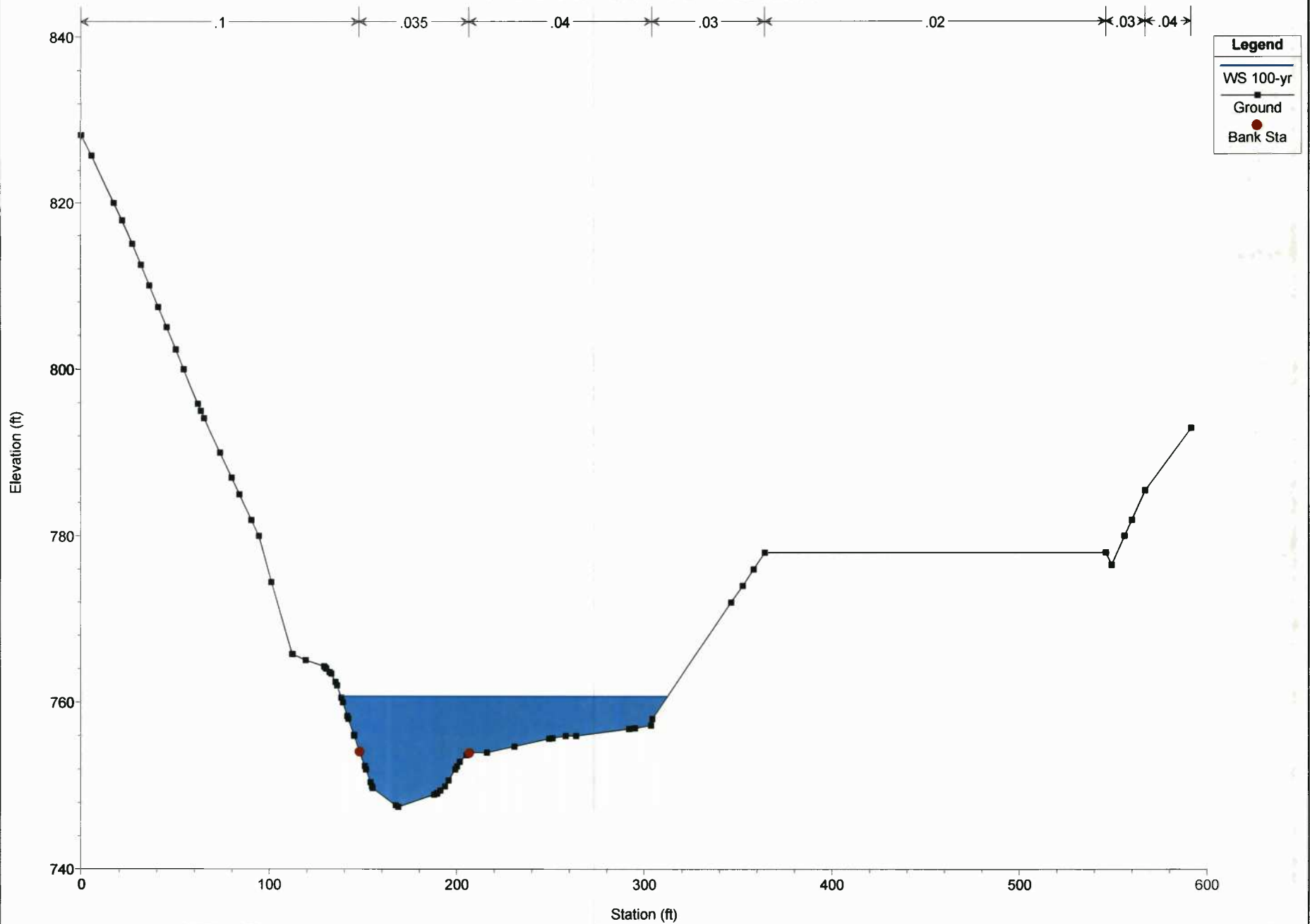
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 3270.326



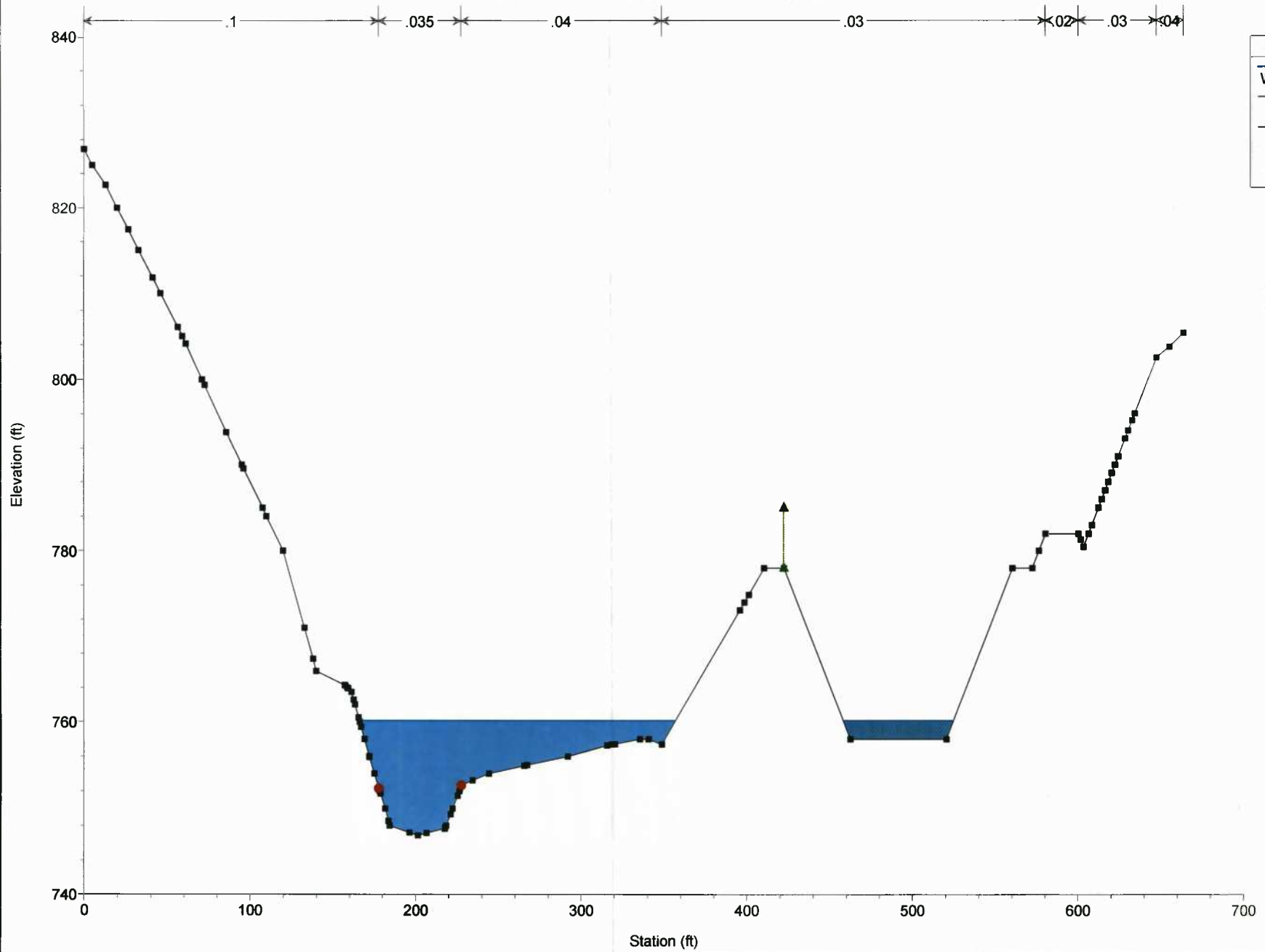
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 3218.798



Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 3143.198



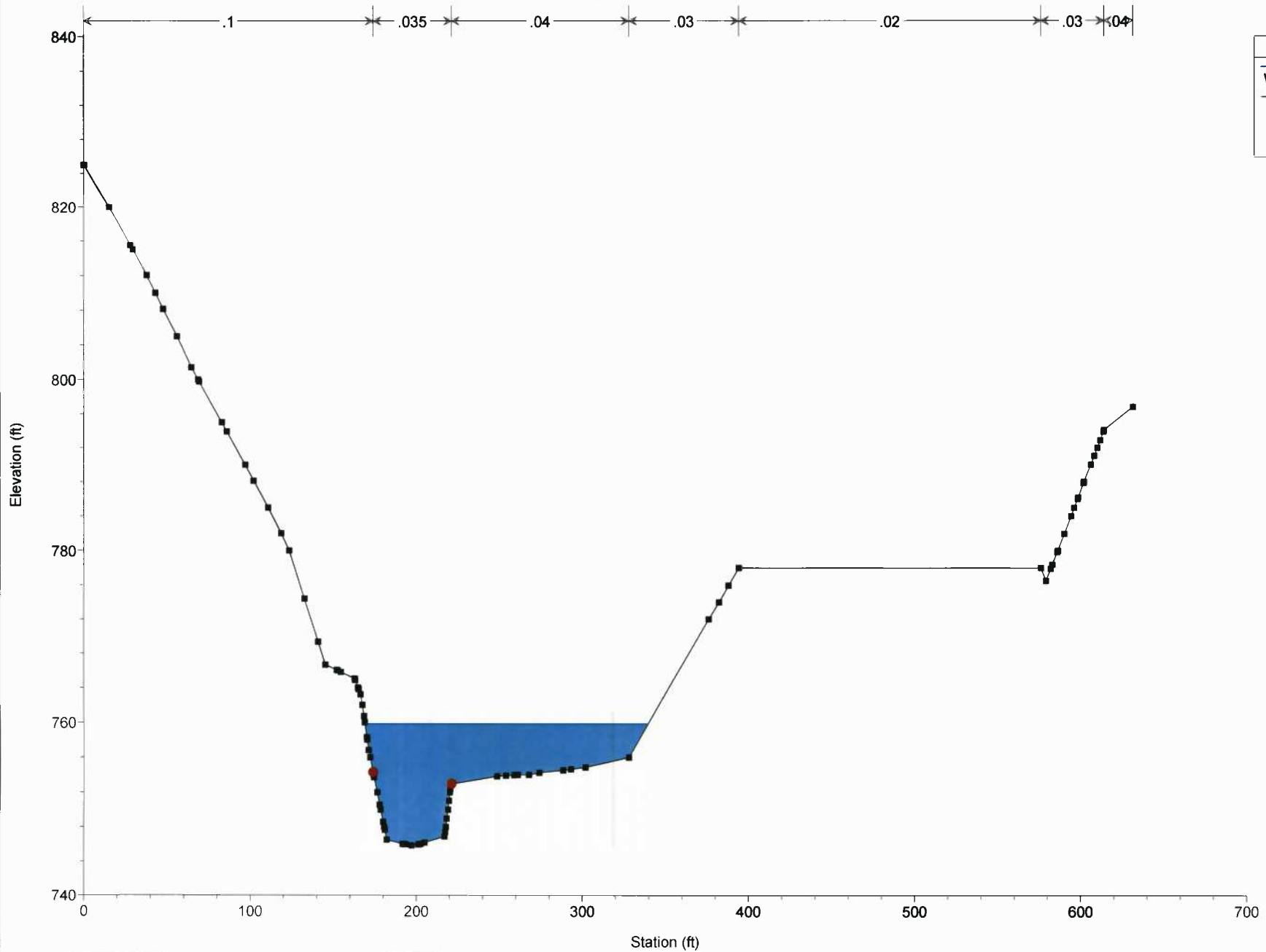
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2861.250



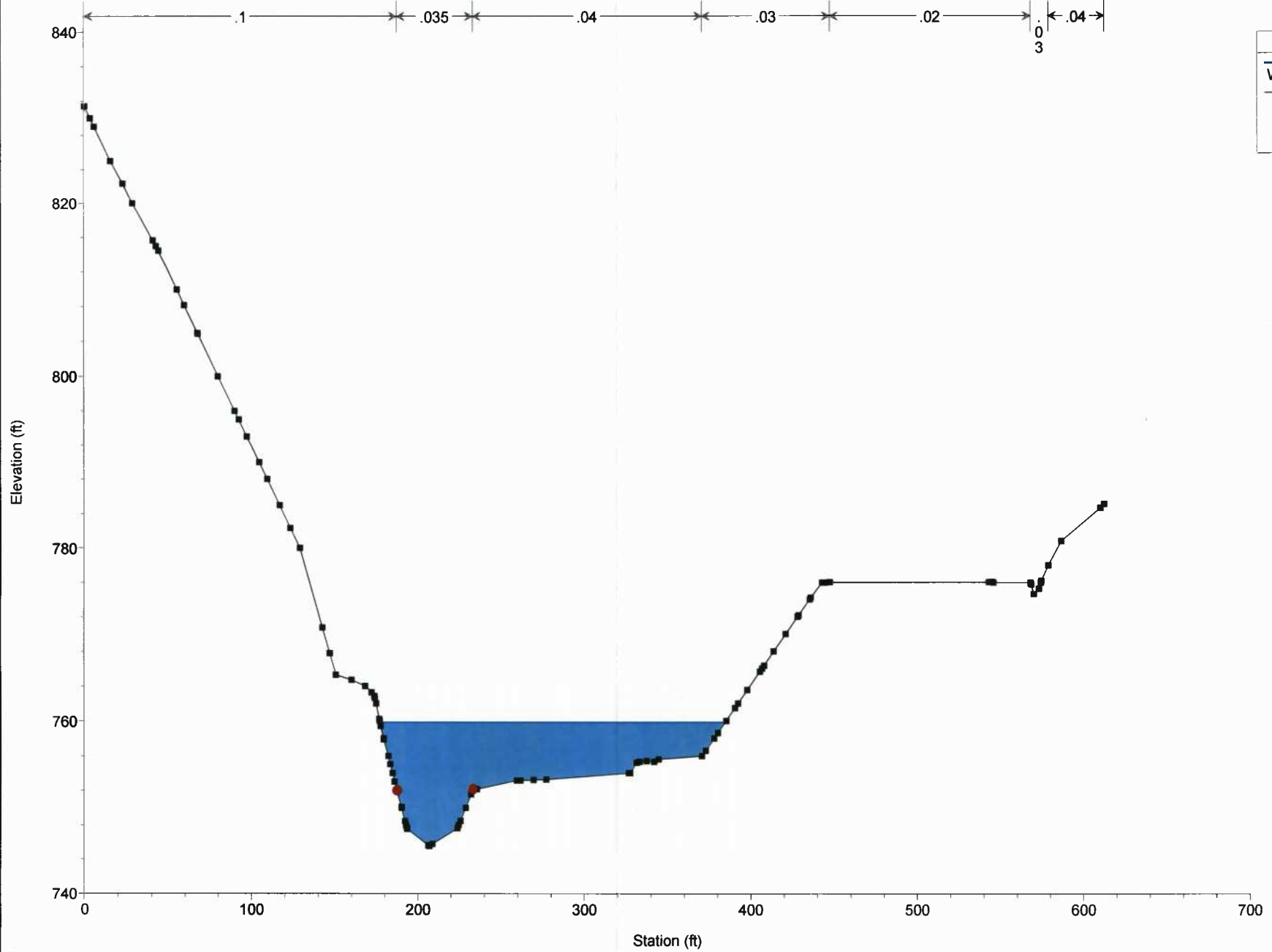
Legend

- WS 100-yr
- Ground
- Ineff
- Bank Sta

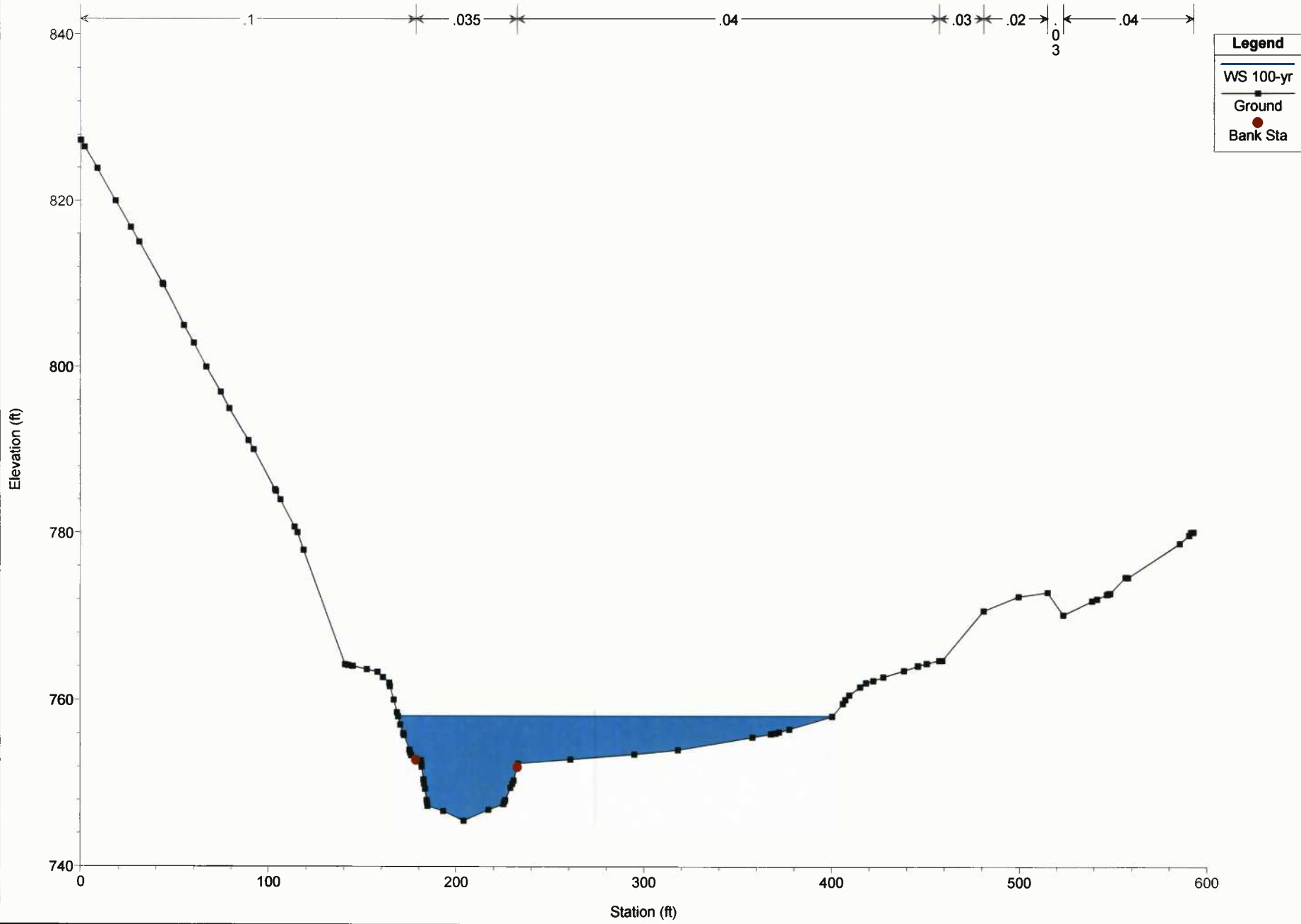
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2579.076



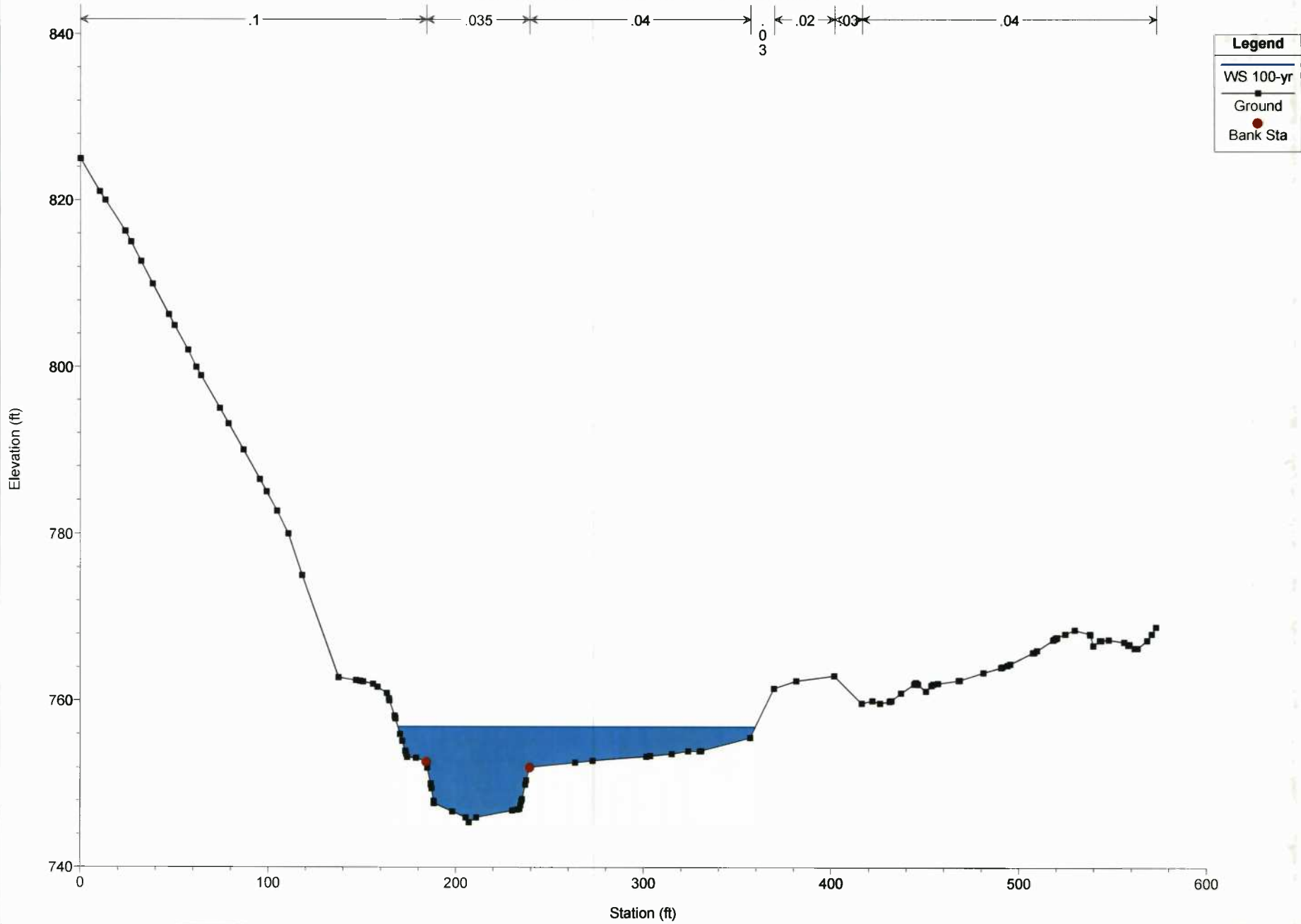
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2476.907



Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2422.446



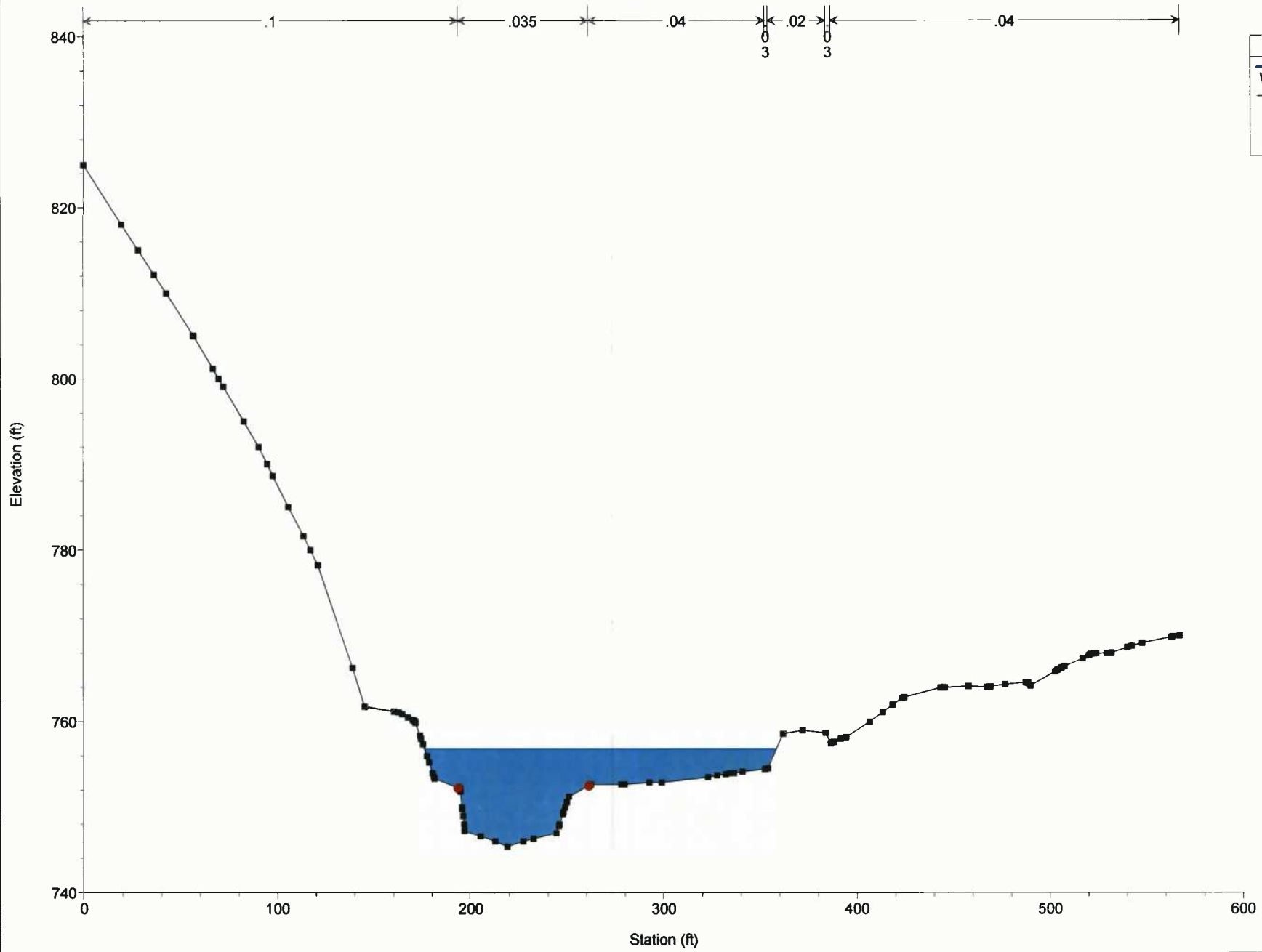
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2355.763



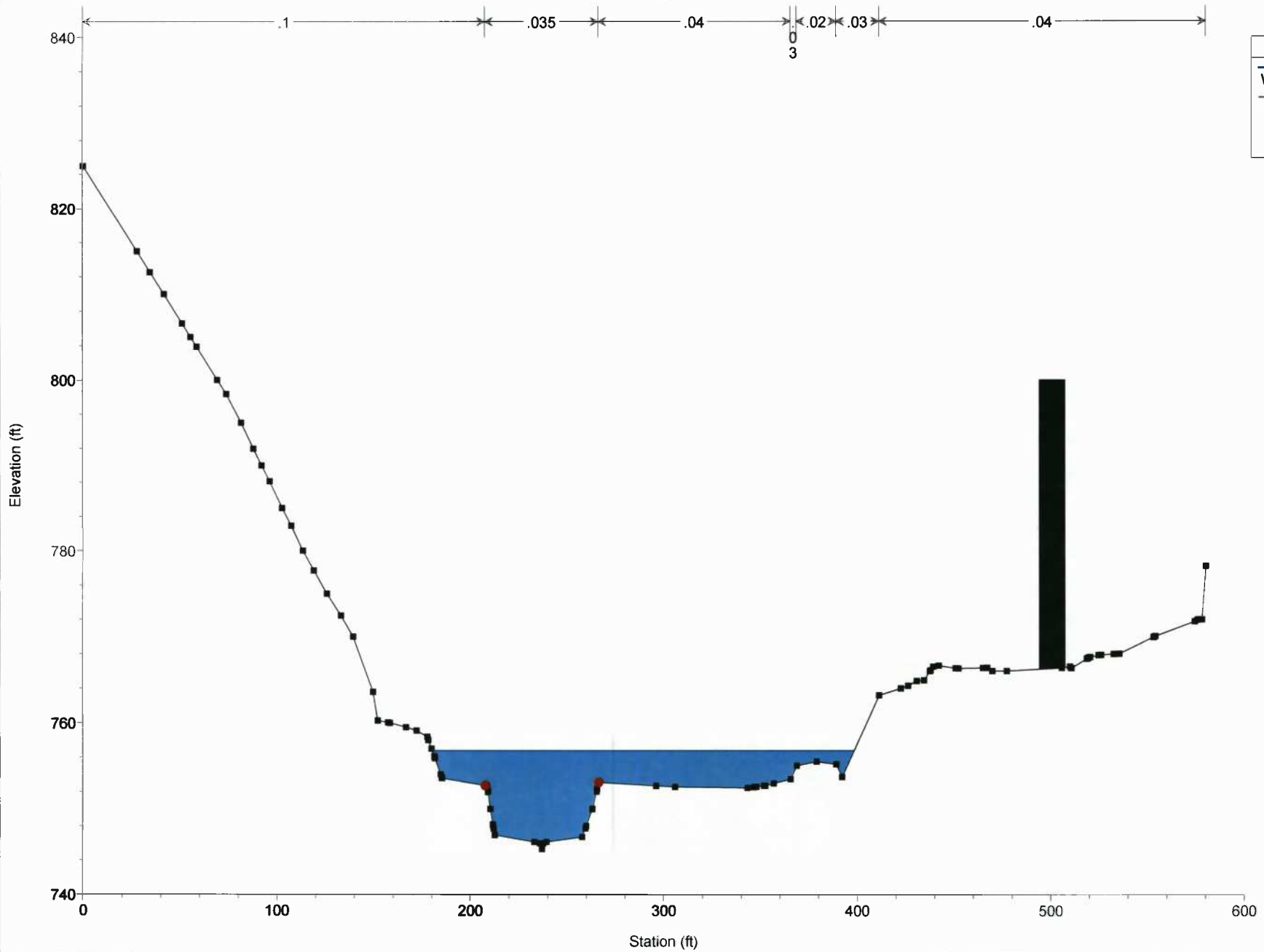
Legend	
—	WS 100-yr
■	Ground
●	Bank Sta

Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2314.880

Legend	
—	WS 100-yr
■	Ground
●	Bank Sta

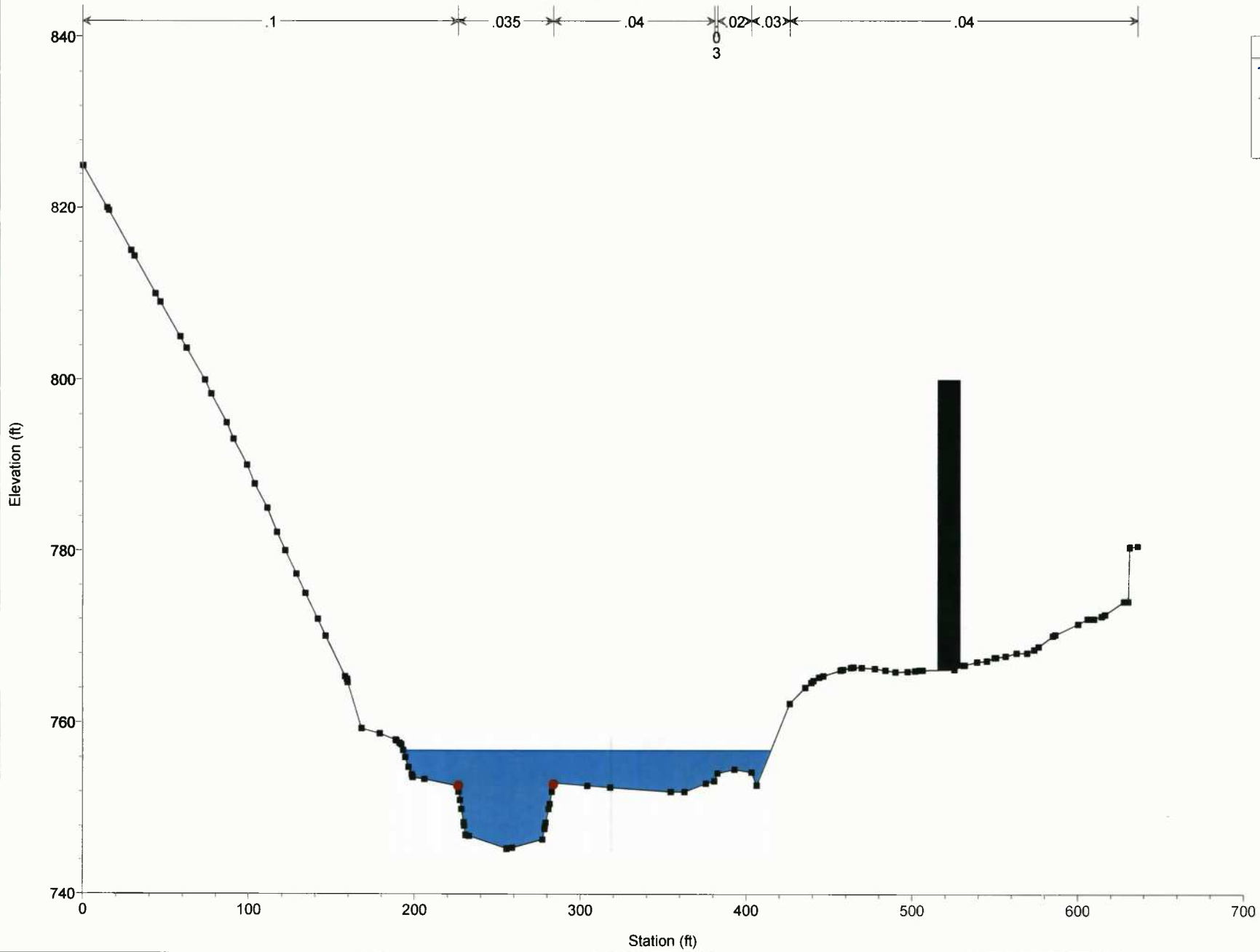


Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2223.643

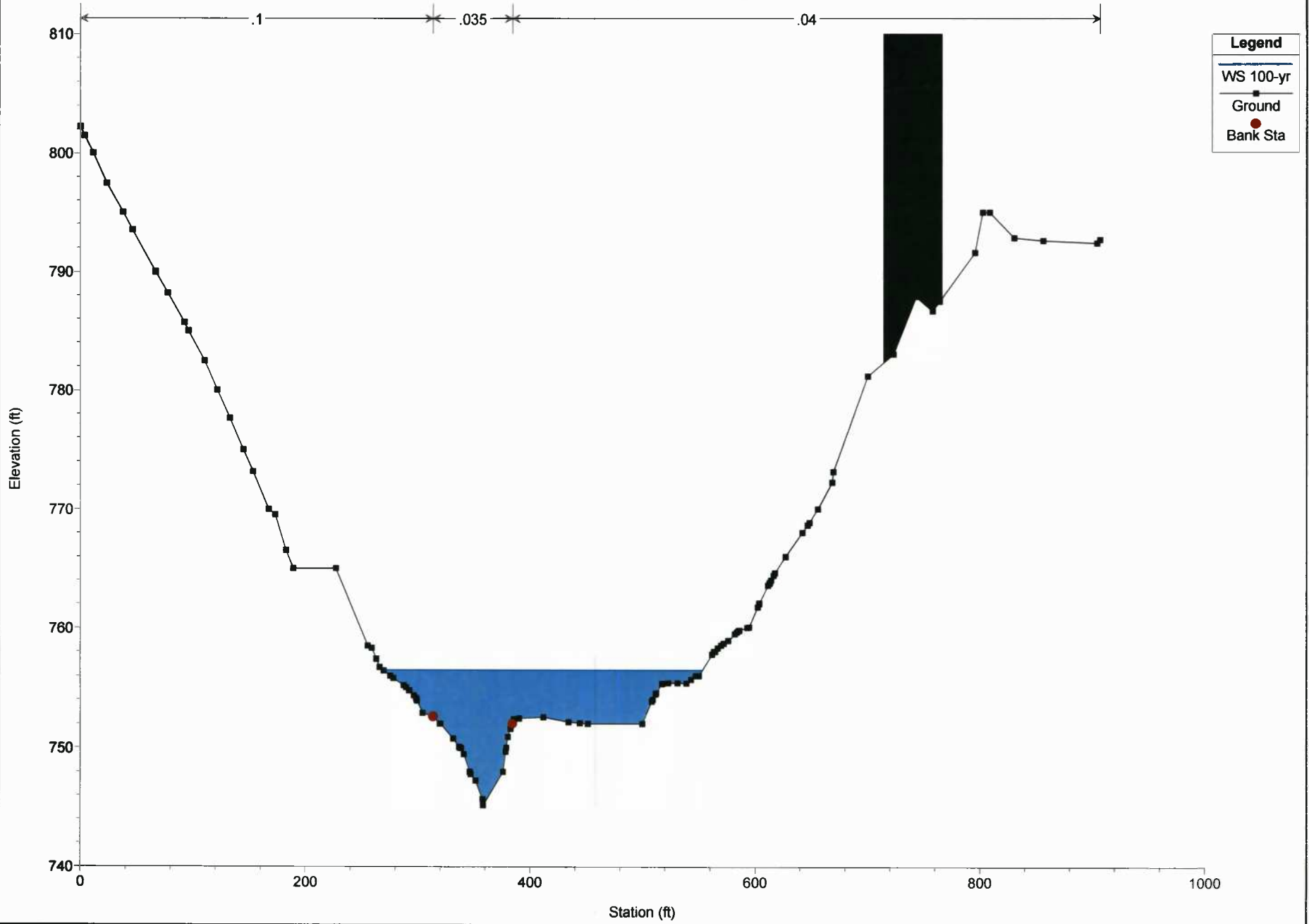


Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2185.764

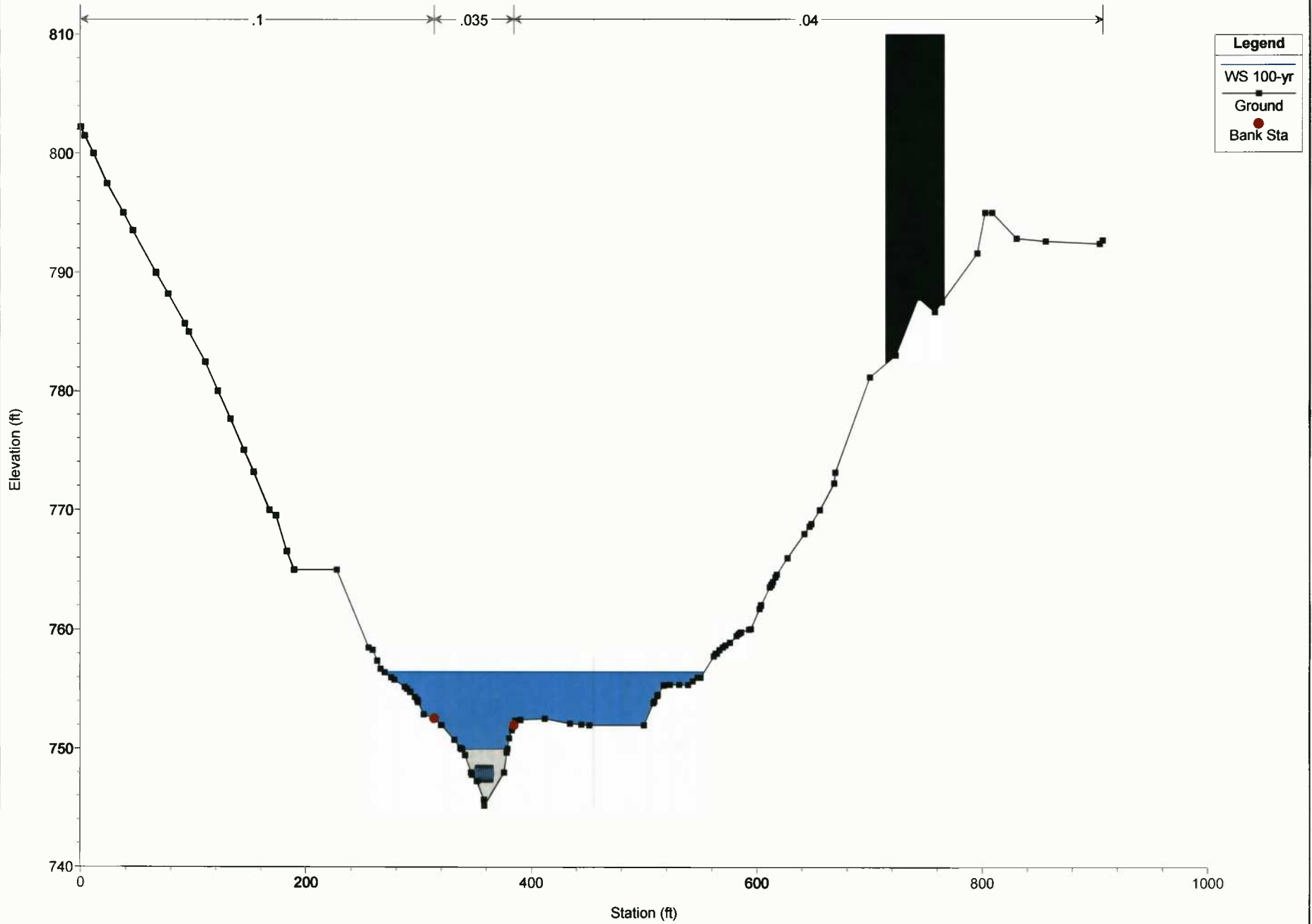
Legend	
—	WS 100-yr
■	Ground
●	Bank Sta



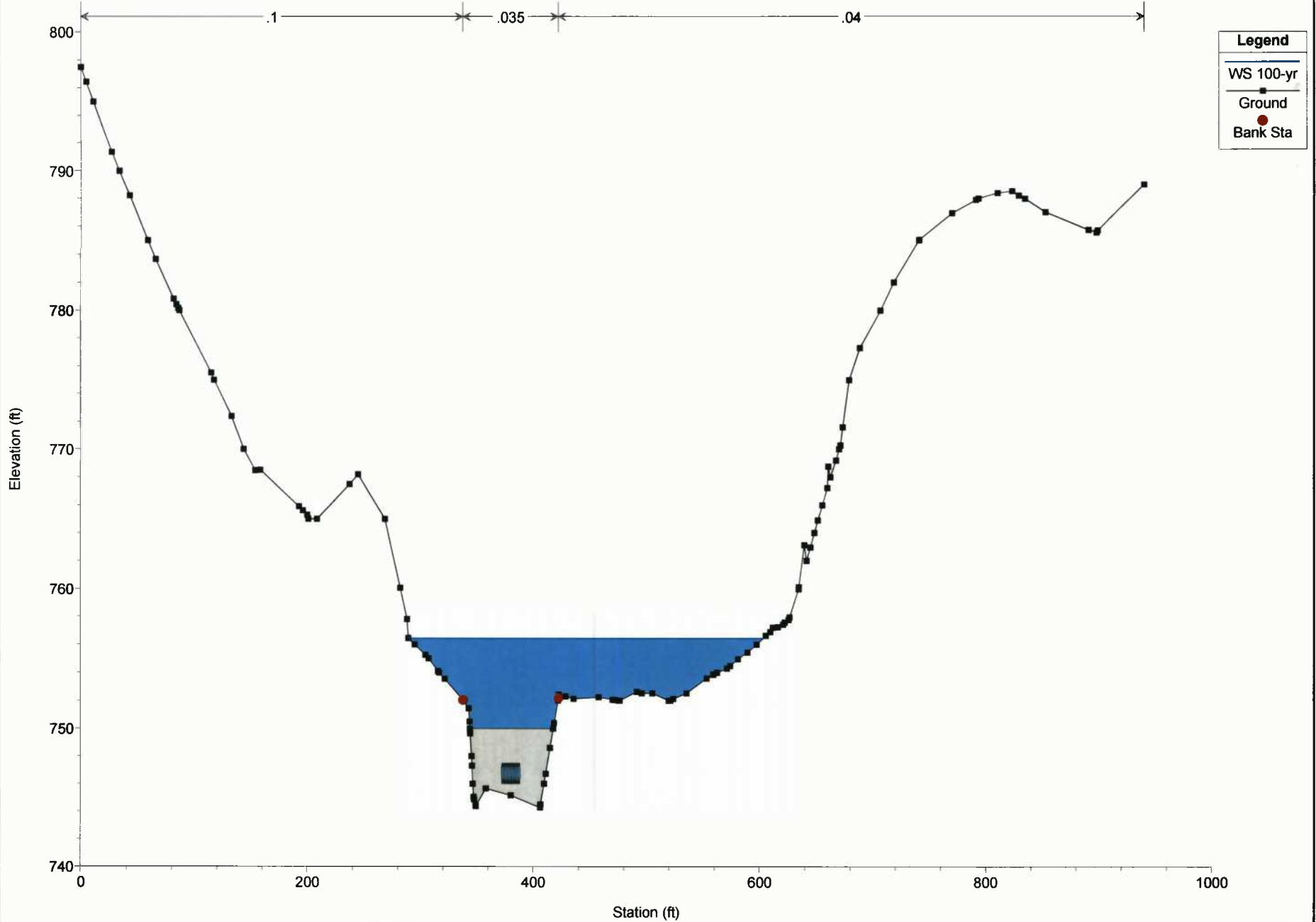
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2075.488



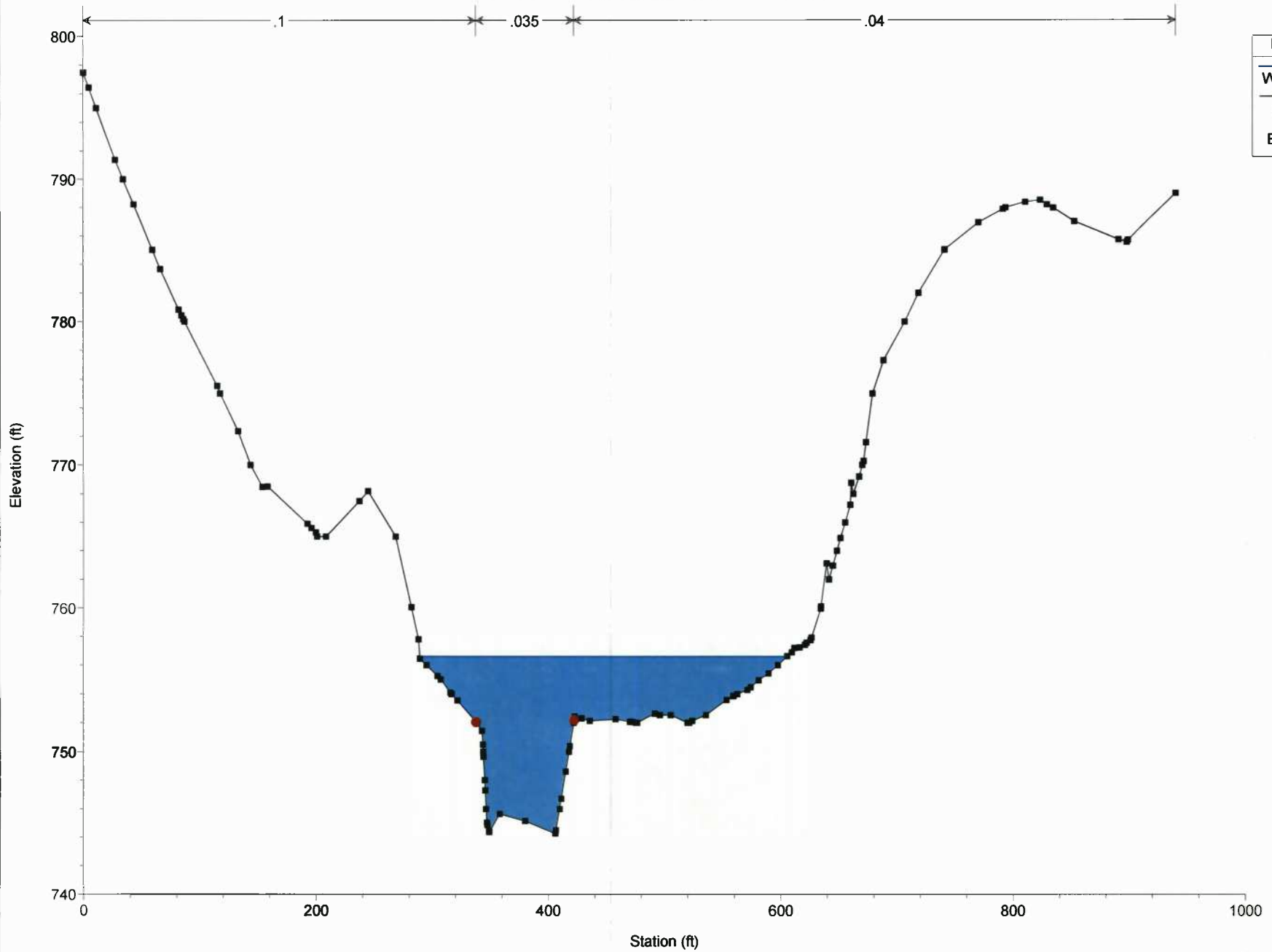
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2057.86 Culv



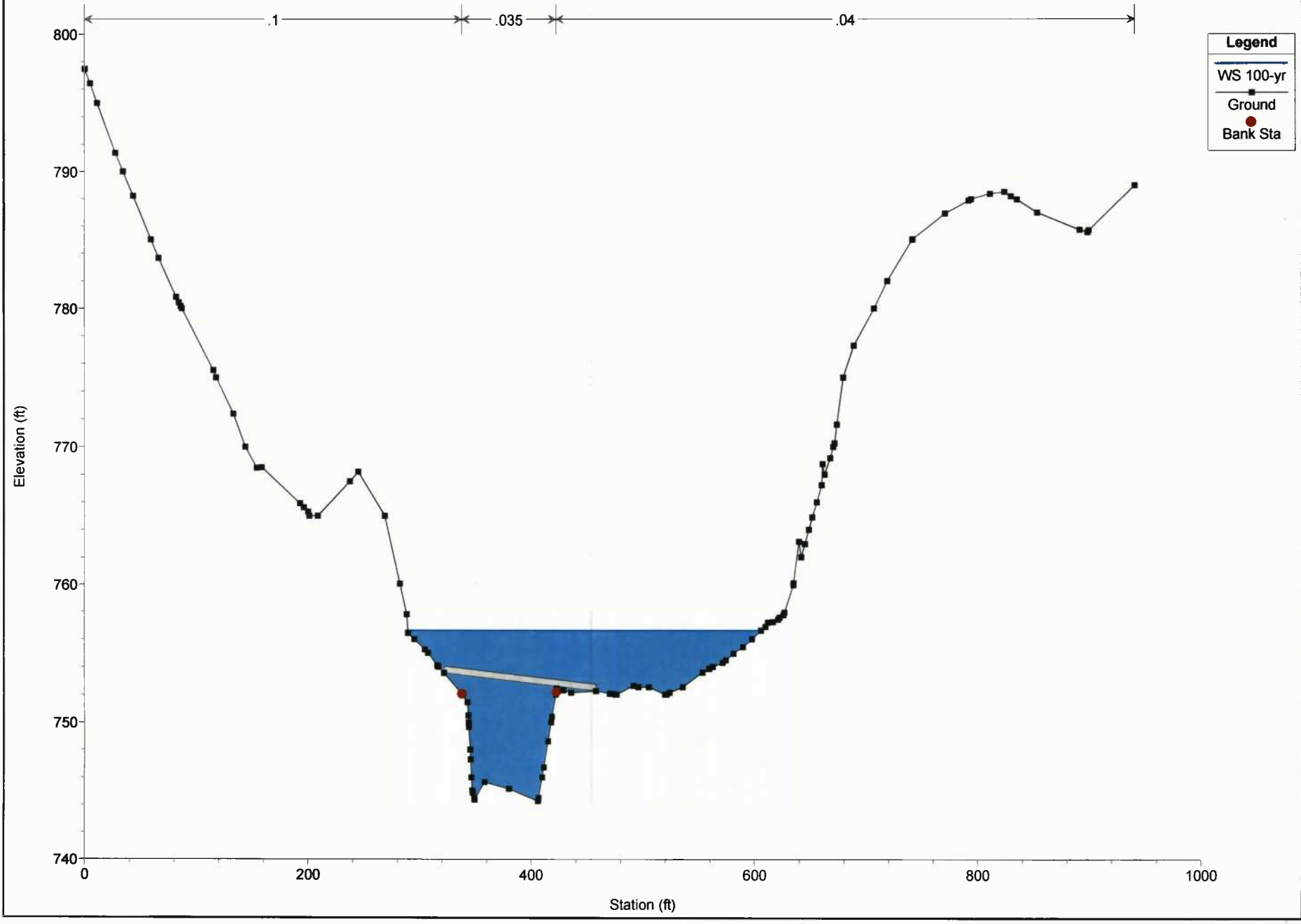
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2057.86 Culv



Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2035.918



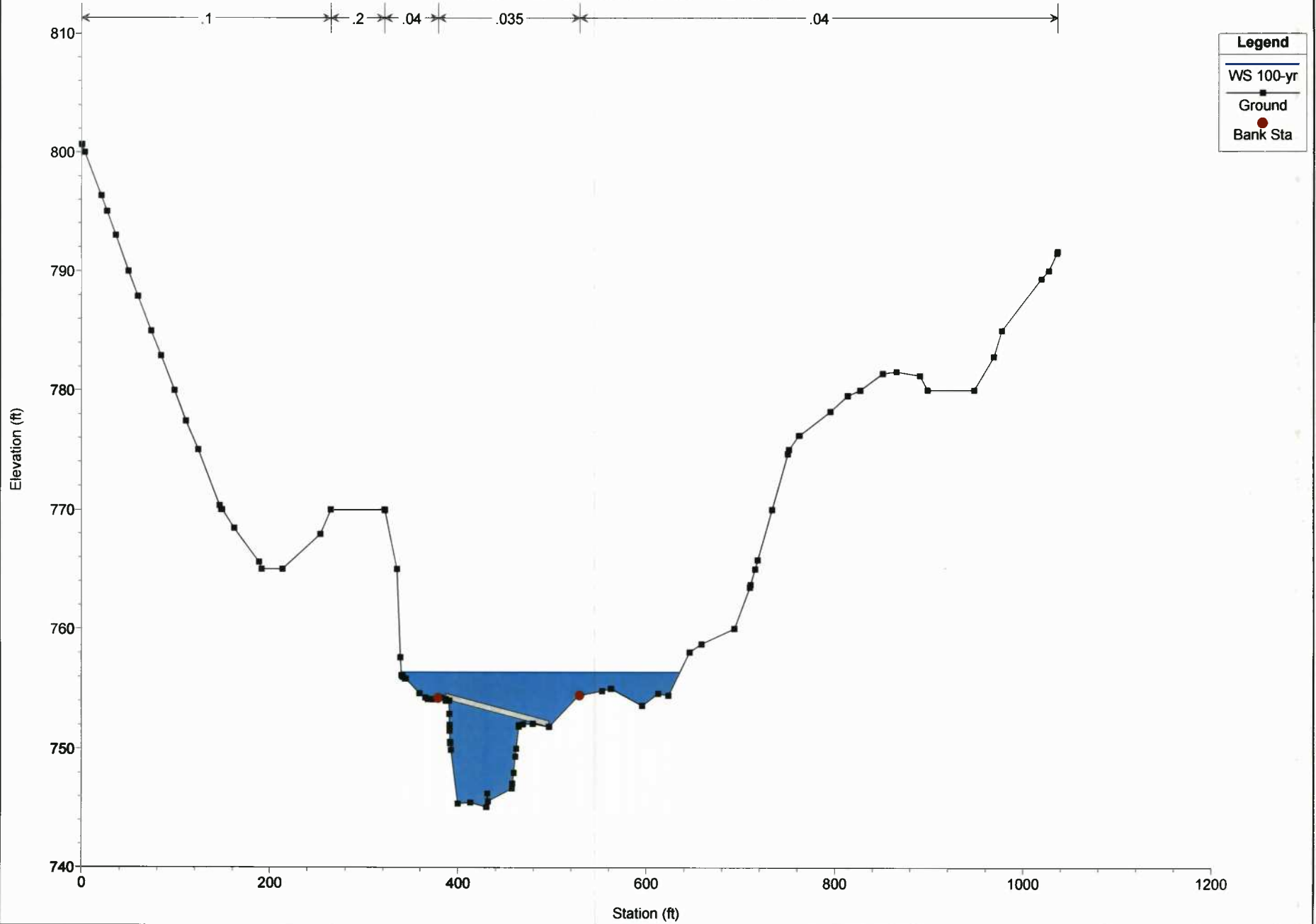
Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 2017.29 BR



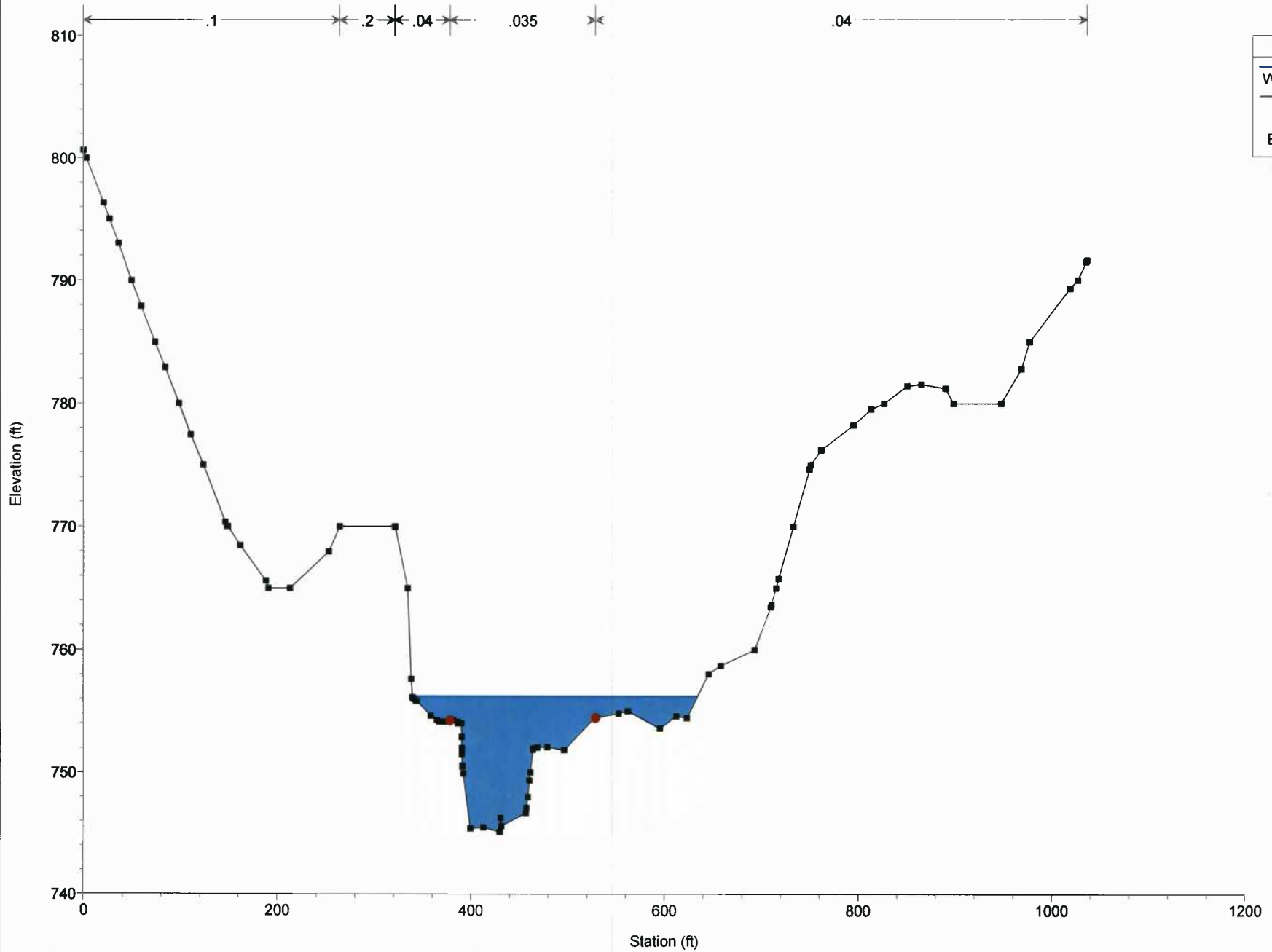
Gessler Final Plan: Proposed

Geom: Flint Run Proposed Flow: Flint Run

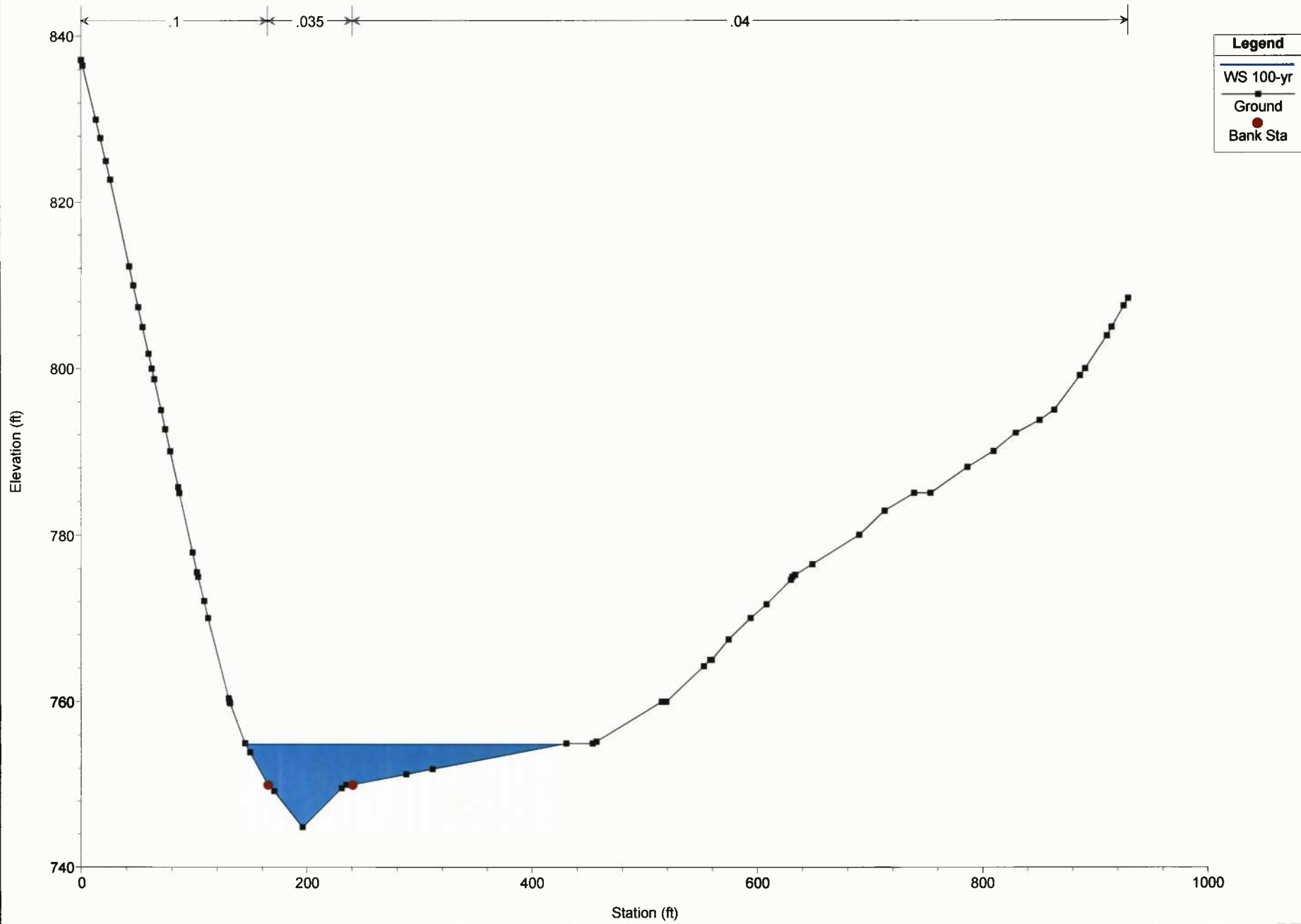
River = Flint Run Reach = Lower RS = 2017.29 BR



Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 1996.533

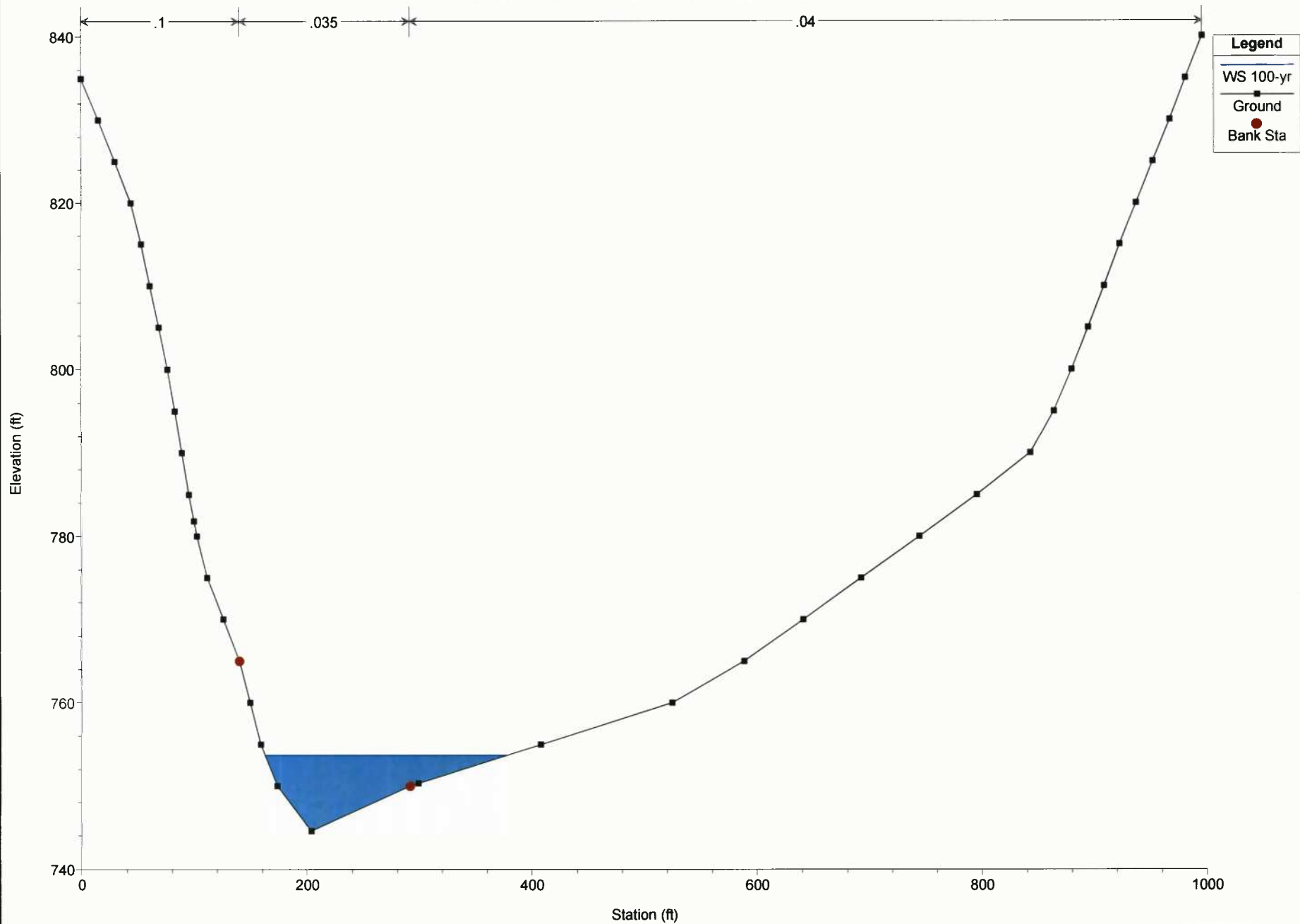


Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 1720.640

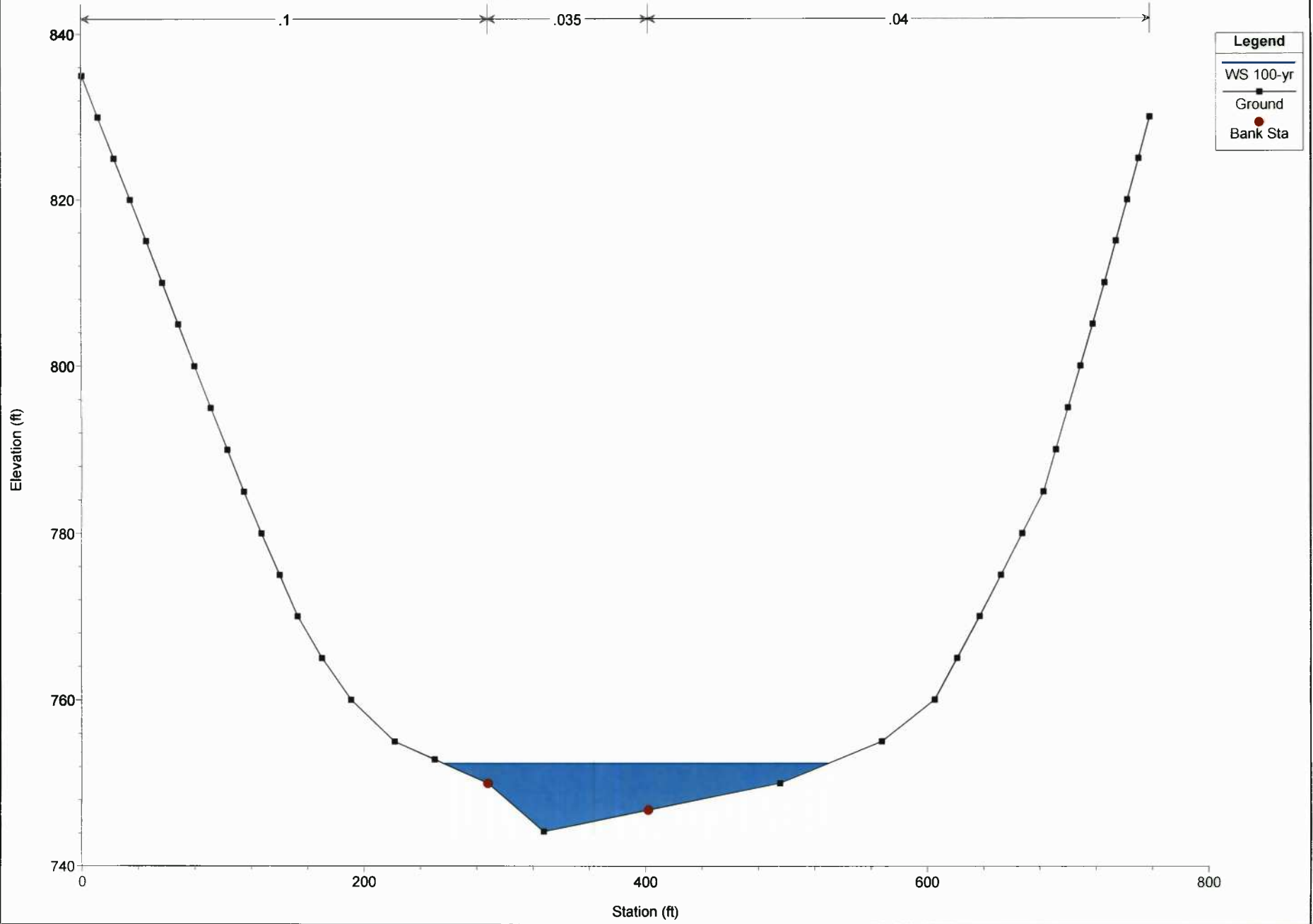


Legend	
—	WS 100-yr
■	Ground
●	Bank Sta

Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 1407.321



Gessler Final Plan: Proposed
Geom: Flint Run Proposed Flow: Flint Run
River = Flint Run Reach = Lower RS = 1000.000



Legend

- WS 100-yr
- Ground
- Bank Sta



Dan Wellings <wellingsd8@gmail.com>

Gessler impoundment

Dan Wellings <wellingsd8@gmail.com>

Wed, Jul 10, 2013 at 5:00 PM

Draft To: tmeeks@slssurveys.com

Tom,

Per our conversation this afternoon, I am submitting the following items I must have to process the Gessler impoundment floodplain application.

1. The application must be on the current application form (sending as attachment).
2. Cover page and summary must be signed and sealed by engineer (Gump).
3. An itemized cost breakdown must be submitted with application including total construction cost of impoundment.
4. What is the BFE both pre-construction and post-construction, not just the difference.
5. Show the location of the impoundment on the appropriate FIRM panel or panels and the WV Flood Tool www.mapwv.gov/flood
6. There is a \$1,000 deposit required in addition to application fee to help cover additional expenses, (certified letters, additional study, ect.) the remainder of which will be reimbursed.
7. Do you have a copy in the latest floodplain ordinance adopted May 24, 2013?

IF any further questions, please contact me.

Sincerely,

Dan Wellings, PS

Doddridge County Floodplain Manager

2 attachments**Floodplain Application Form.docx**

28K

**Doddridge County Floodplain Permit Application Fees.docx**

15K

SMITH LAND SURVEYING, INC.

P.O. Box 150
226 West Main Street
Glennville, WV 26351

TO: DODDRIDGE COUNTY FLOODPLAIN COORD.
ATTENTION: DAN WELLINGS
118 EAST COURT STREET
WEST UNION, WV 26456



UPS Ground



1Z 26X 790 03 1006 236 5

TRACKING NUMBER

1/05 MW

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

was published in said paper for 2

successive weeks beginning with the issue
of August 6 2013 and
ending with the issue of

..... August 13 2013 and
that said notice contains 168

WORD SPACE at e. 115 cents a word
amounts to the sum of \$ 19.32

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

\$ 14.49
and each publication thereafter

\$ 33.81 TOTAL

EDITOR

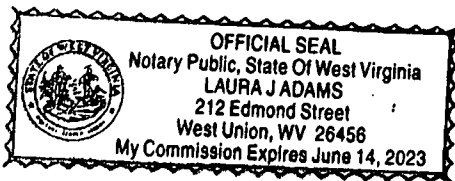
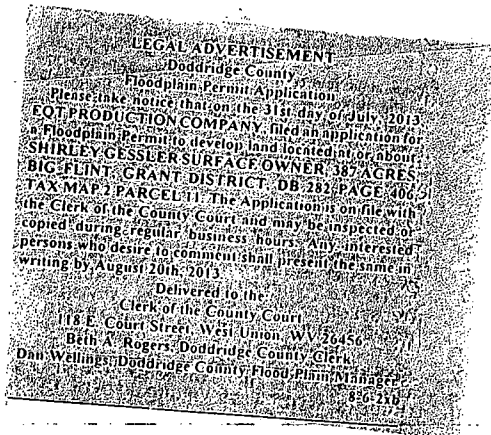
..... Danny Nicholson

SWORN TO AND SUBSCRIBED

BEFORE ME THIS THE 15 DAY
OF August 2013

NOTARY PUBLIC

..... Laura J Adams



GESSLER CENTRALIZED IMPOUNDMENT SITE PLAN

EQT PRODUCTION COMPANY

PROJECT INFORMATION

PROJECT NAME: GESSLER CENTRALIZED IMPOUNDMENT

TAX PARCEL:
GRANT DISTRICT
MAP 2-11

SURFACE OWNER:
ERIC S. AND SHIRLEY GESSLER
GRANT DISTRICT
DODDRIDGE COUNTY, WV
TOTAL PROPERTY AREA: 387 ± ACRES

SITE LOCATION:
THE GESSLER CENTRALIZED IMPOUNDMENT SITE IS LOCATED ON A HILLSIDE WEST OF CO. RT. 3, APPROXIMATELY 900 FT NORTHWEST OF THE CO. RT. 3 AND CO. RT. 3/1 INTERSECTION.

LOCATION COORDINATES

GESSLER CENTRALIZED IMPOUNDMENT ENTRANCE
LATITUDE: 39.37612 LONGITUDE: -80.72088 (NAD 83)

GESSLER CENTRALIZED IMPOUNDMENT
LATITUDE: 39.37385 LONGITUDE: -80.72082 (NAD 83)

SITE DISTURBANCE COMPUTATIONS

CENTRALIZED IMPOUNDMENT AREA = 6.75 ± ACRES*
ACCESS ROAD = 2.21 ± ACRES
TOTAL SITE DISTURBANCE = 8.96 ± ACRES
*INCLUDES AREA OF THE CENTRALIZED IMPOUNDMENT & STOCKPILES

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 NOTIFIED FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN; TICKET #1232591569. IN ADDITION, MISS UTILITY WILL BE CONTACTED PRIOR TO START OF THE PROJECT.

FLOODPLAIN NOTE

THE PROPOSED LIMITS OF DISTURBANCE FOR THIS PROJECT IS LOCATED IN FEMA FLOOD ZONE A, PER THE FLOOD INSURANCE RATE MAP (FIRM) NUMBER 54017C0040C & 54017C0130C DATED OCT. 04, 2011.

ENVIRONMENTAL NOTES

A WETLAND DELINEATION WAS PERFORMED ON OCTOBER 14 AND 22, 2012 BY POTESTA ENGINEERS AND ENVIRONMENTAL CONSULTANTS 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 NOVEMBER 14, 2012 REPORT PROJECT # 0101-11-0147-001 WAS PREPARED BY POTESTA ENGINEERS AND ENVIRONMENTAL CONSULTANTS 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.

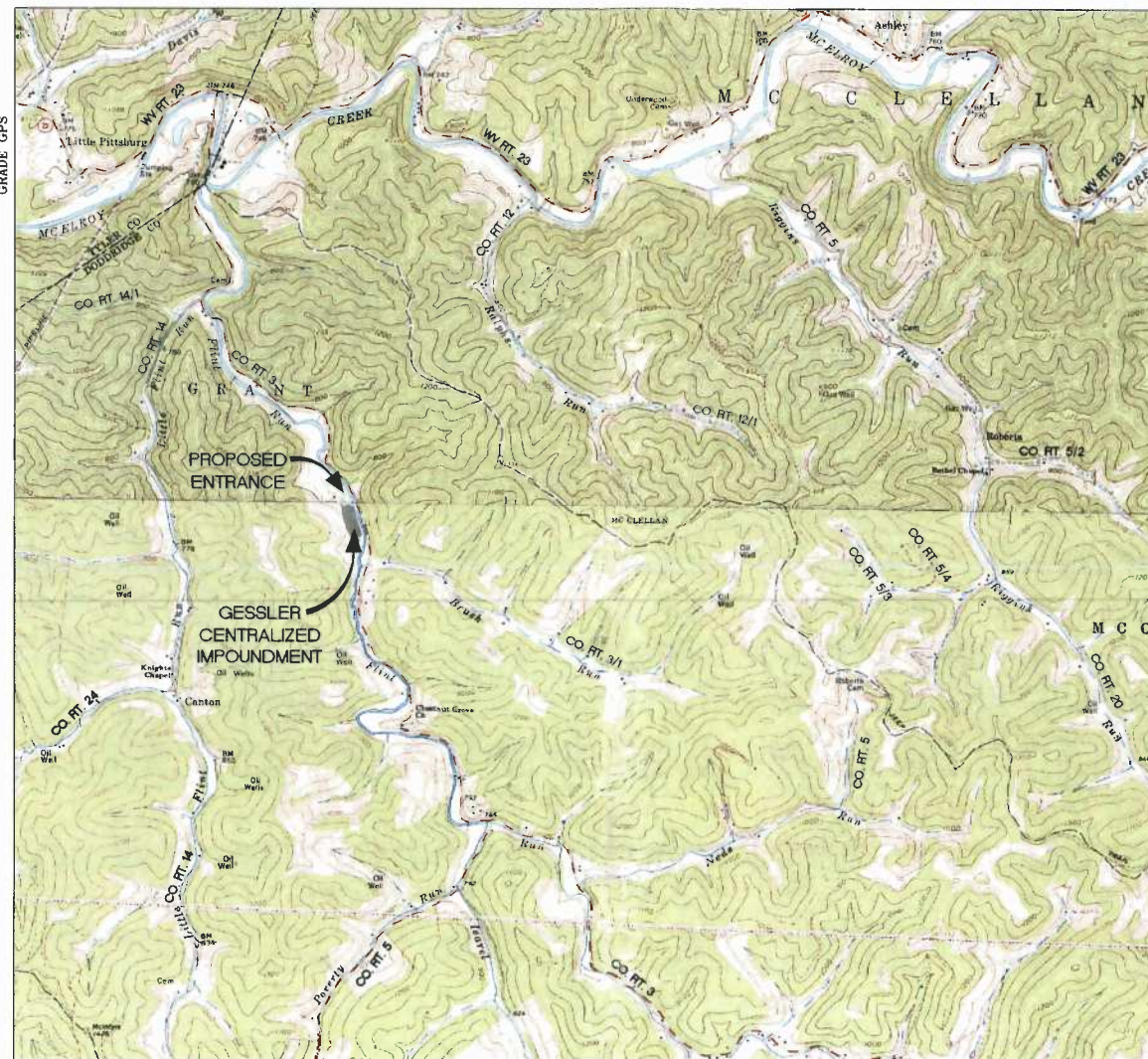
GENERAL DESCRIPTION

THE CENTRALIZED IMPOUNDMENT IS BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

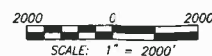
MISS Utility of West Virginia
1-800-245-4848
West Virginia State Law
(Section XIV: Chapter 24-C)
Requires that you call two
business days before you dig in
the state of West Virginia.
IT'S THE LAW!!

SITUATE ON THE WATERS OF FLINT RUN IN GRANT DISTRICT, DODDRIDGE COUNTY, WEST VIRGINIA.

CENTER POINT QUAD



SMITHBURG QUAD



OPERATOR

EQT PRODUCTION COMPANY
OPERATOR ID: 306888
115 PROFESSIONAL PLACE
P.O. BOX 280
BRIDGEPORT, WV 28330
PHONE: (304) 348-3870

ENGINEER

NAVITUS ENGINEERING, INC.
151 WINDY HILL LANE
WINCHESTER, VA 22602
PHONE: (888) 662-4185

SURVEYOR

SMITH LAND SURVEYING, INC.
228 WEST MAIN STREET
P.O. BOX 150
GLENVILLE, WV 28351
PHONE: (304) 462-5634

LIST OF DRAWINGS

- 1 - COVER SHEET
- 2 - NOTES
- 3 - CENTRALIZED IMPOUNDMENT DETAILS
- 4 - CENTRALIZED IMPOUNDMENT SECTIONS
- 5 - CENTRALIZED IMPOUNDMENT SECTIONS
- 6 - ACCESS ROAD PROFILE AND SECTIONS
- 7 - ACCESS ROAD SECTIONS
- 8 - STREAM CROSSING "A" DETAILS
- 9 - CENTRALIZED IMPOUNDMENT RECLAMATION PLAN
- 10 - CONSTRUCTION DETAILS
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- 13 - CONSTRUCTION DETAILS

LEGEND

EX. INDEX CONTOUR	--- 700 ---	PROP. INDEX CONTOUR	--- 700 ---
EX. INTERMEDIATE CONTOUR	--- 700 ---	PROP. INTERMEDIATE CONTOUR	--- 700 ---
EX. BOUNDARY LINE	---	PROP. LIMITS OF DISTURBANCE	---
EX. RIGHT-OF-WAY LINE	--- RW --- RW ---	PROP. WELL PAD	---
EX. ROAD EDGE OF GRAVEL/DIRT	---	PROP. WELL HEAD	---
EX. ROAD EDGE OF PAVEMENT	---	PROP. 4" PVC DRAIN PIPE	---
EX. ROAD CENTERLINE	---	PROP. SUMP DRAIN	---
EX. DITCHLINE	---	PROP. CONTAINMENT BERM	---
EX. CULVERT	---	PROP. PIT/IMPOUNDMENT CL	---
EX. GUARDRAIL	---	PROP. PERIMETER SAFETY FENCE	---
EX. FENCELINE	---	PROP. ACCESS GATE WITH EMERGENCY LIFELINE	---
EX. GATE	---		
EX. OVERHEAD UTILITY	---		
EX. OVERHEAD UTILITY R/W	---		
EX. POWER POLE	---		
EX. GUY WIRE	---		
EX. TELEPHONE LINE	---		
EX. GASLINE	---	PROP. ROCK CONSTRUCTION ENTRANCE	---
EX. GASLINE R/W	---		
EX. WATERLINE	---		
EX. WATER WELL	---		
EX. GAS WELL	---		
EX. TREETRUNK	---		
EX. REFERENCE TREE	---		
EX. DELINEATED STREAM	---		
EX. DELINEATED WETLAND	---		
		PROP. ROAD EDGE OF GRAVEL	---
		PROP. ROAD CENTERLINE	---
		PROP. V-DITCH W/ CHECK DAMS	---
		PROP. DITCH RELIEF CULVERT (DRC)	---
		PROP. RIP-RAP OUTLET PROTECTION	---
EX. BUILDING	---	PROP. GUARDRAIL	---
		PROP. ROCK LEVEL SPREADER	---
EX. BRIDGE	---	PROP. EARTHEN DIVERSION BERM	---
EX. TOP OF BANK	---	PROP. ORANGE SAFETY FENCE	---
EX. 100 YEAR FEMA FLOODPLAIN	---	PROP. SUPER SILT FENCE	---
EX. 100 YEAR FLOODPLAIN	---	PROP. REINFORCED SILT FENCE	---
100' WETLAND/STREAM BUFFER	---	PROP. COMPOST SOCK DIVERSION	---
FLOOD PROTECTION SETBACK	---	PROP. GROUNDWATER DEWATERING TRENCH	---
PROP. 100 YEAR FLOODPLAIN	---	PROP. GROUNDWATER DEWATERING PIPE	---
PROP. 100 YEAR FLOODWAY	---		
		SECTION LINE	---
		MATCHLINE	---
		X-SECTION GRID INDEX	---
		X-SECTION GRID INTERMEDIATE	---
		X-SECTION PROPOSED GRADE	---
		X-SECTION EXISTING GRADE	---
		X-SECTION WATER SURFACE	---
		SPOT ELEVATION	---
		CENTER OF PAD	---



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THIS DOCUMENT WAS PREPARED BY NAVITUS ENGINEERING, INC. FOR: EQT PRODUCTION COMPANY

LOCATION MAP
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012
SCALE: 1" = 2000'
DESIGNED BY: TVF/DEM
FILE NO. 7838
SHEET 1 OF 13
REV. 03/27/2013

CONSTRUCTION NOTES:

1. THE CONTRACTOR IS TO VERIFY FIELD CONDITIONS PRIOR TO AND DURING CONSTRUCTION AND WILL NOTIFY NAVITUS ENGINEERING AT (888) 662-4185 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 INSURE 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 EXCAVATION OR DEMOLITION.
12. CONTRACTOR TO CONTACT OPERATOR AND ENGINEER IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION.
13. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE EROSION AND SEDIMENT CONTROL INSPECTOR, 2 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 TEST 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.

CONSTRUCTION SEQUENCE

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

- 1) A PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTOR AND THE APPROPRIATE EROSION AND SEDIMENT CONTROL INSPECTOR 48 HOURS PRIOR TO BEGINNING WORK TO REVIEW THE CONSTRUCTION DRAWINGS AND PROVIDE ANY REQUESTED GUIDANCE.
- 2) STAKE THE LIMITS OF CONSTRUCTION.
- 3) INSTALL THE ROCK CONSTRUCTION ENTRANCE AS SHOWN ON THE PLANS.
- 4) INSTALL ALL BMP'S (SILT FENCE, SUPER SILT FENCE, ETC) AS SHOWN ON THE PLANS AND DETAILS.
- 5) CLEAR AND GRUB THE ACCESS ROAD AND IMPOUNDMENT AREA. ALL WOODY MATERIAL, BRUSH, TREES, STUMPS, LARGE ROOTS, BOULDERS, AND DEBRIS SHALL BE CLEARED FROM THE SITE AREA AND KEPT TO THE MINIMUM NECESSARY FOR PROPER CONSTRUCTION, INCLUDING THE INSTALLATION OF NECESSARY SEDIMENT CONTROLS. TREES SIX INCHES IN DIAMETER AND LARGER SHALL BE CUT AND LOGS STACKED. SMALLER TREES, BRUSH, & STUMPS SHALL BE CUT AND OR GRUBBED AND WINDOWED IN APPROPRIATE AREAS FOR USE AS SEDIMENT BARRIERS AT WATER DRAINAGE OUTLETS, WINDOWED BELOW THE WELL SITE, USED FOR WILDLIFE HABITAT, BURNED (AS PER WV FOREST FIRE LAWS), REMOVED FROM SITE, OR DISPOSED OF BY OTHER METHODS APPROVED BY DEP.
- 6) CONSTRUCT THE ACCESS ROAD. DITCH RELIEF CULVERTS SHALL BE INSTALLED AT A GRADE OF 1-8% TO MINIMIZE OUTLET VELOCITIES TO THE EXTENT POSSIBLE. INSTALL OUTLET PROTECTION AS SHOWN ON PLANS. STABILIZE THE ROAD WITH STONE AND SIDE SLOPES WITH EROSION CONTROL BLANKETING WHEN SLOPES ARE GREATER THAN 3:1.
- 7) STRIP THE TOPSOIL FROM THE IMPOUNDMENT AREA. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURE SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, AS SHOWN.
- 8) GRADE THE IMPOUNDMENT AREA AS SHOWN ON THE PLANS. IMMEDIATELY STABILIZE THE OUTER AREAS OF THE IMPOUNDMENT. THE TURNAROUND AREA SHALL BE STABILIZED WITH STONE AND THE SIDE SLOPES WITH EROSION CONTROL BLANKETS ON ALL SLOPES GREATER THAN 3:1. APPLY SEED AND MULCH TO ALL DISTURBED AREAS. THIS SHALL INCLUDE ALL AREAS THAT WILL NOT BE SUBJECT TO REGULAR TRAFFIC ACTIVITY (TO BE STABILIZED WITH STONE), OR ANY DISTURBED AREA THAT WILL NOT BE RE-DISTURBED BEFORE SITE RECLAMATION BEGINS.
- 9) PRIOR TO THE INSTALLATION OF THE LINER SYSTEM, THE CONTRACTOR SHALL CONTACT THE ENGINEER/SURVEYOR TO COMPLETE AND AS-BUILT SURVEY OF THE CONSTRUCTED IMPOUNDMENT 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.
- 10) INSTALL THE IMPOUNDMENT LINER SYSTEM AND PERIMETER SAFETY FENCE W/GATE AND EMERGENCY LIFE LINE AS SHOWN ON THE PLANS.
- 11) 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 BMP'S AS DEEMED NECESSARY. THESE INSPECTIONS SHALL CONTINUE DURING THE DURATION OF THE PROJECT AND SUBSEQUENT SITE RECLAMATION.
- 12) ONCE THE IMPOUNDMENT HAS BEEN COMPLETED, SUBMIT THE AS-BUILT CERTIFICATION FOR EACH STRUCTURE FACILITY TO THE WVDEP OFFICE OF OIL AND GAS, PRIOR TO PLACING FLUIDS IN EITHER STRUCTURE.
- 13) ONCE DISTURBED AREAS HAVE BEEN RE-VEGETATED AND STABILIZED FOLLOWING RECLAMATION, THE TEMPORARY BMP'S 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 DEFICIENT SHALL BE RE-SEEDING AND MULCHED.

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 SEEDING AND MULCHED, AS NECESSARY. ALTERNATIVELY, THE REMOVED SEDIMENT CAN BE TRANSPORTED TO A SITE WITH AN APPROVED PERMIT.
5. ALL POLLUTION AND EMERGENCY SPILLS SHALL BE IMMEDIATELY REPORTED TO THE WVDEP OFFICE OF OIL AND GAS. (EMERGENCY #1-800-642-3074)

MAINTENANCE PROGRAM

1. BMP'S WILL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH MEASURABLE 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 EACH STRUCTURE.
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. FILTER STRIPS AND/OR SILT FENCE WILL BE MAINTAINED.
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.

CENTRALIZED IMPOUNDMENT CONSTRUCTION STANDARDS

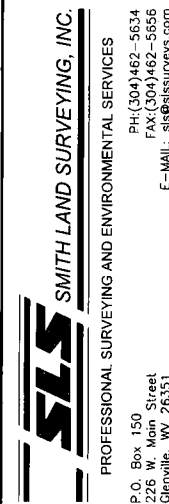
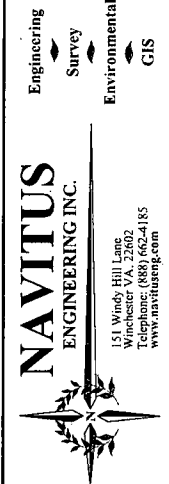
THE DESIGN, CONSTRUCTION, AND REMOVAL OF EMBANKMENTS ASSOCIATED WITH CENTRALIZED IMPOUNDMENTS FOR OIL AND GAS WELLS MUST BE ACCOMPLISHED IN SUCH A MANNER AS TO PROTECT THE HEALTH AND SAFETY OF THE PEOPLE, THE NATURAL RESOURCES, AND ENVIRONMENT OF THE STATE. THE PIT EMBANKMENTS SHALL BE DESIGNED, CONSTRUCTED, AND MAINTAINED TO BE STRUCTURALLY SOUND AND REASONABLY PROTECTED FROM UNAUTHORIZED ACTS OF THIRD PARTIES.

1. THE FOUNDATION FOR A CENTRALIZED 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 THE 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' 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 (ASTM-D-2487 - UNIFIED SOILS CLASSIFICATION). SOILS MUST CONTAIN A MINIMUM OF 20% OF PLUS NO. 200 SIEVE AND BE "WELL GRADED" MATERIAL WITH NO COBBLES OR BOULDER SIZE MATERIAL MIXED WITH THE 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 12" AND MAXIMUM PARTICLE SIZE LESS THAN 6". ALL FILL SHALL BE COMPACTED TO 95% PER THE STANDARD PROCTOR TEST (ASTM-D-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 12' IN WIDTH.
7. THE MINIMUM INSIDE 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 IMPOUNDMENT CONSTRUCTION. EMBANKMENTS SHALL BE MAINTAINED WITH A GRASSY VEGETATIVE COVER AND FREE OF BRUSH AND/OR TREES.
9. A MINIMUM OF 2' OF FREEBOARD SHALL BE MAINTAINED AT ALL TIMES DURING THE OPERATION OF THE PIT.
10. ALL EMBANKMENT CONSTRUCTION AND COMPACTION TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CENTRALIZED IMPOUNDMENT LINER SYSTEM NOTES

THE DESIGNED 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 WITHOUT CAUSING OR ALLOWING A FAILURE OF THE LINER SYSTEM.
2. THE SUB-BASE SHALL BE COMPACTED TO ACCOMMODATE 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 IMPOUNDMENT AREA SHALL BE DRAINED AND COMPLETELY DRY PRIOR TO THE PLACEMENT OF THE PRIMARY LINER. THE PRIMARY LINER SHALL MEET ALL WV DEP 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 IMPOUNDMENT.
8. AN ANCHOR TRENCH SHALL BE EXCAVATED COMPLETELY AROUND THE PERIMETER OF THE 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 (6" INCREMENTS) ON THE LINER SYSTEM TO IDENTIFY THE WATER SURFACE ELEVATION.



THIS DOCUMENT WAS PREPARED BY NAVITUS ENGINEERING INC. FOR THE PRODUCTION COMPANY

NOTES
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012

SCALE: N/A

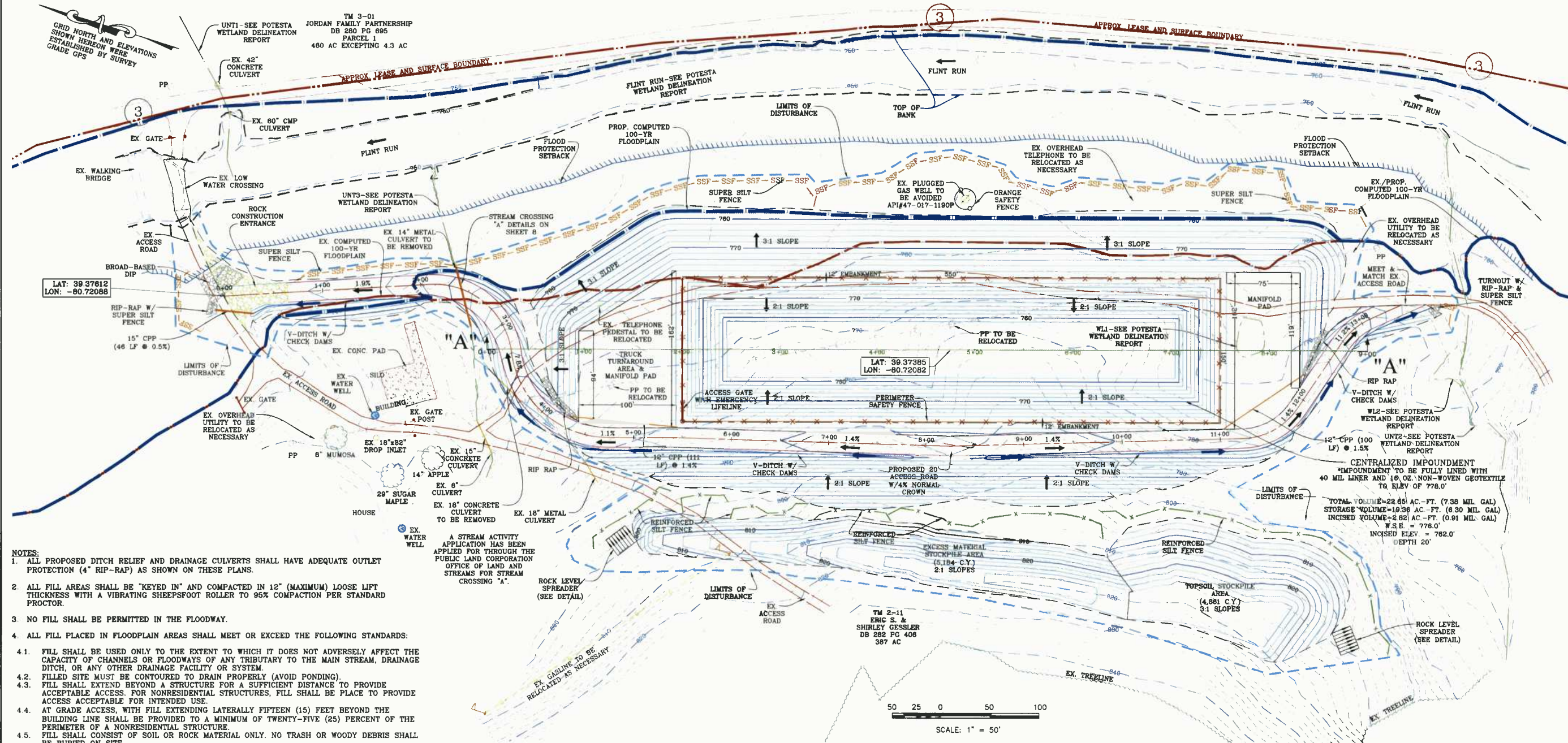
DESIGNED BY: TVF/DEM

FILE NO. 7838

SHEET 2 OF 13

REV. 03/27/2013

CENTRALIZED IMPOUNDMENT DETAILS



- NOTES:**
1. ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 2. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.
 3. NO FILL SHALL BE PERMITTED IN THE FLOODWAY.
 4. ALL FILL PLACED IN FLOODPLAIN AREAS SHALL MEET OR EXCEED THE FOLLOWING STANDARDS:
 - 4.1. FILL SHALL BE USED ONLY TO THE EXTENT TO WHICH IT DOES NOT ADVERSELY AFFECT THE CAPACITY OF CHANNELS OR FLOODWAYS OF ANY TRIBUTARY TO THE MAIN STREAM, DRAINAGE DITCH, OR ANY OTHER DRAINAGE FACILITY OR SYSTEM.
 - 4.2. FILLED SITE MUST BE CONTOURED TO DRAIN PROPERLY (AVOID PONDING).
 - 4.3. FILL SHALL EXTEND BEYOND A STRUCTURE FOR A SUFFICIENT DISTANCE TO PROVIDE ACCEPTABLE ACCESS. FOR NONRESIDENTIAL STRUCTURES, FILL SHALL BE PLACED TO PROVIDE ACCESS ACCEPTABLE FOR INTENDED USE.
 - 4.4. AT GRADE ACCESS, WITH FILL EXTENDING LATERALLY FIFTEEN (15) FEET BEYOND THE BUILDING LINE SHALL BE PROVIDED TO A MINIMUM OF TWENTY-FIVE (25) PERCENT OF THE PERIMETER OF A NONRESIDENTIAL STRUCTURE. FILL SHALL CONSIST OF SOIL OR ROCK MATERIAL ONLY. NO TRASH OR WOODY DEBRIS SHALL BE BURIED ON SITE.
 - 4.5. FILL MATERIAL SHALL BE COMPACTED TO PROVIDE THE NECESSARY STABILITY AND RESISTANCE TO EROSION, SCOURING, OR SETTLING. FILL COMPACTION STANDARDS MUST BE APPROPRIATE TO PROPOSED POST FILL USE. PARTICULAR ATTENTION IS NECESSARY WHEN FILL IS BEING USED TO ELEVATE A STRUCTURE.
 - 4.6. FILL SLOPES SHALL BE NO STEEPER THAN (1) VERTICAL ON TWO (2) HORIZONTAL UNLESS SUBSTANTIATING DATA JUSTIFYING STEEPER SLOPES ARE SUBMITTED TO AND APPROVED BY THE FLOODPLAIN ADMINISTRATOR.
 - 4.7. FILL SITE AND FILL MUST BE PROTECTED FROM EROSION. EROSION CONTROL BLANKETS OR OTHER ARMORING MATERIALS SHALL BE USED ALONG ALL EMBANKMENTS LOCATED BELOW THE 100-YR FLOODPLAIN.
 5. ALL STORAGE TANKS LOCATED AT OR BELOW THE BASE FLOOD ELEVATION SHALL BE FIRMLY ANCHORED TO RESIST FLOTATION.
 6. NO MATERIALS THAT ARE BUOYANT, FLAMMABLE, EXPLOSIVE, OR IN TIMES OF FLOODING COULD BE INJURIOUS TO HUMAN, ANIMAL, OR PLANT LIFE, SHALL BE STORED BELOW BASE FLOOD ELEVATION.
 7. ALL EXISTING CULVERTS WITHIN LIMITS OF DISTURBANCE SHALL BE REMOVED UNLESS OTHERWISE NOTED.
- FLOODPLAIN ADMINISTRATION NOTES:**
1. ALL APPLICANTS PLACING FILL IN A MAPPED FLOOD HAZARD AREA MUST OBTAIN A CONDITIONAL LETTER OF MAP REVISION (LOMR) FROM FEMA WHEN DIRECTED TO DO SO BY THE FLOODPLAIN ADMINISTRATOR BEFORE A PERMIT CAN BE ISSUED. AFTER FILL IS FINISHED THE APPLICANT MUST CONVERT THE LOMR TO A LETTER OF MAP REVISION BASED ON FILL (LOMR-F) BEFORE A CERTIFICATION OR COMPLIANCE CAN BE ISSUED.
 2. THE APPLICANT MUST SUBMIT ANY MAPS, COMPUTATIONS, OR OTHER MATERIAL REQUIRED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) TO REVISE THE FLOOD INSURANCE STUDY AND/OR FLOOD INSURANCE RATE MAPS, WHEN NOTIFIED BY THE FLOODPLAIN ADMINISTRATOR, AND MUST PAY ANY FEES OR OTHER COSTS ASSESSED BY FEMA FOR THIS PURPOSE.

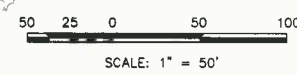
Elevation	Barrels	Gallons	Acra-Ft
758	0	0.0	0.00000
759	4865	205175.6	0.82966
760	10174	427305.2	1.31135
761	15842	665356.0	2.04190
762 (Incised)	21894	919562.4	2.82203
763	28337	1190169.0	3.65249
764	35176	1477410.3	4.53400
765	42417	1781527.4	5.46730
766	50066	2102758.2	6.45312
767	58127	2441347.2	7.49221
768	66608	2797528.8	8.58529
769	75513	3171544.3	9.73310
770	84848	3563631.6	10.93637
771	94620	3974034.9	12.19585
772	104833	4402988.9	13.51226
773	115494	4850734.8	14.88634
774	126807	5317510.5	16.31882
775	138177	5803428.6	17.81004
776 (Storage)	150217	6309112.1	19.36193
777	162724	6834413.9	20.97402
778 (Top)	175734	7380811.4	22.65085

Proposed Impoundment and Turnaround Area(s)

Topsoil Removal: 87,871.5 C.F., 3,254.5 C.Y.
 Total cut: 906,379.2 C.F., 33,569.6 C.Y. (Cut/Swell=1)
 Total fill: 1,006,830.0 C.F., 37,290.0 C.Y. (Fill/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 33.33%, slope ratio: 2:1
 Interior slope percent grade: 50.00%, slope ratio: 2:1
 Top of dam elevation: 778.0'
 Bottom of impoundment elevation: 758.0'
 Top of dam width: 12.0'
 Turnaround area gravel (6" depth): 12,204.0 C.F., 452.0 C.Y.

Proposed Access Road

Topsoil Removal: 34,403.4 C.F., 1,274.2 C.Y.
 Total cut: 296,306.1 C.F., 10,974.3 C.Y. (Cut/Swell=1)
 Total fill: 46,161.9 C.F., 1,709.7 C.Y. (Fill/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 50.00%, slope ratio: 2:1
 Gravel (6" depth): 14,274.9 C.F., 528.7 C.Y.



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REGISTERED PROFESSIONAL ENGINEER
 STATE OF WEST VIRGINIA
 01/27/2013

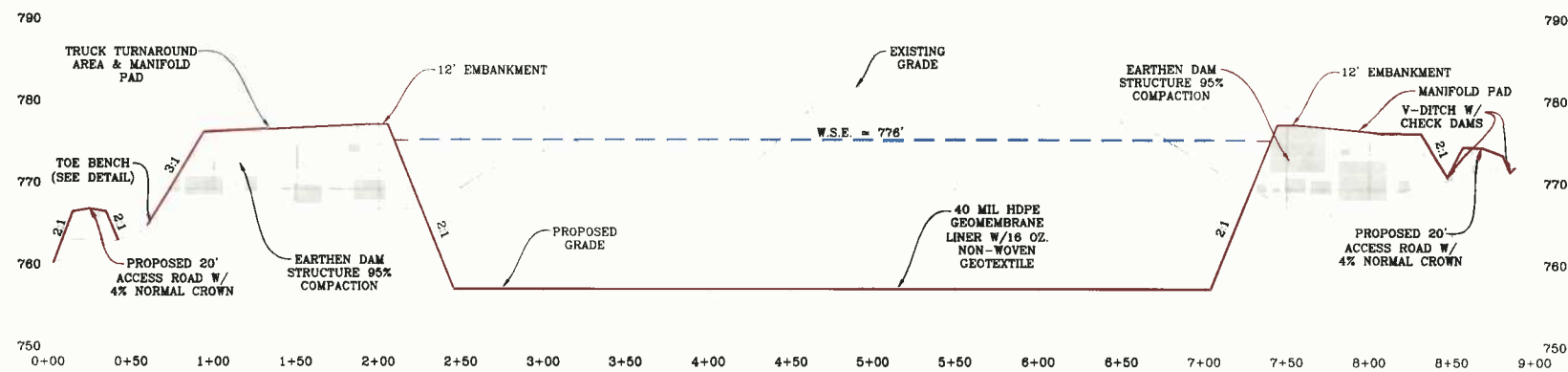
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CENTRALIZED IMPOUNDMENT DETAILS
GESSELER
 CENTRALIZED IMPOUNDMENT
 GRANT DISTRICT
 DODDRIDGE COUNTY, WV

DATE: 11/20/2012
 SCALE: 1" = 50'
 DESIGNED BY: TVF/DEM
 FILE NO. 7838
 SHEET 3 OF 13
 REV. 03/27/2013

CENTRALIZED IMPOUNDMENT SECTIONS

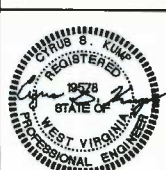
NOTE:
 1. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.



CENTRALIZED IMPOUNDMENT CROSS-SECTION "A-A"
 SCALE: HORIZ 1" = 50' VERT. 1" = 10'



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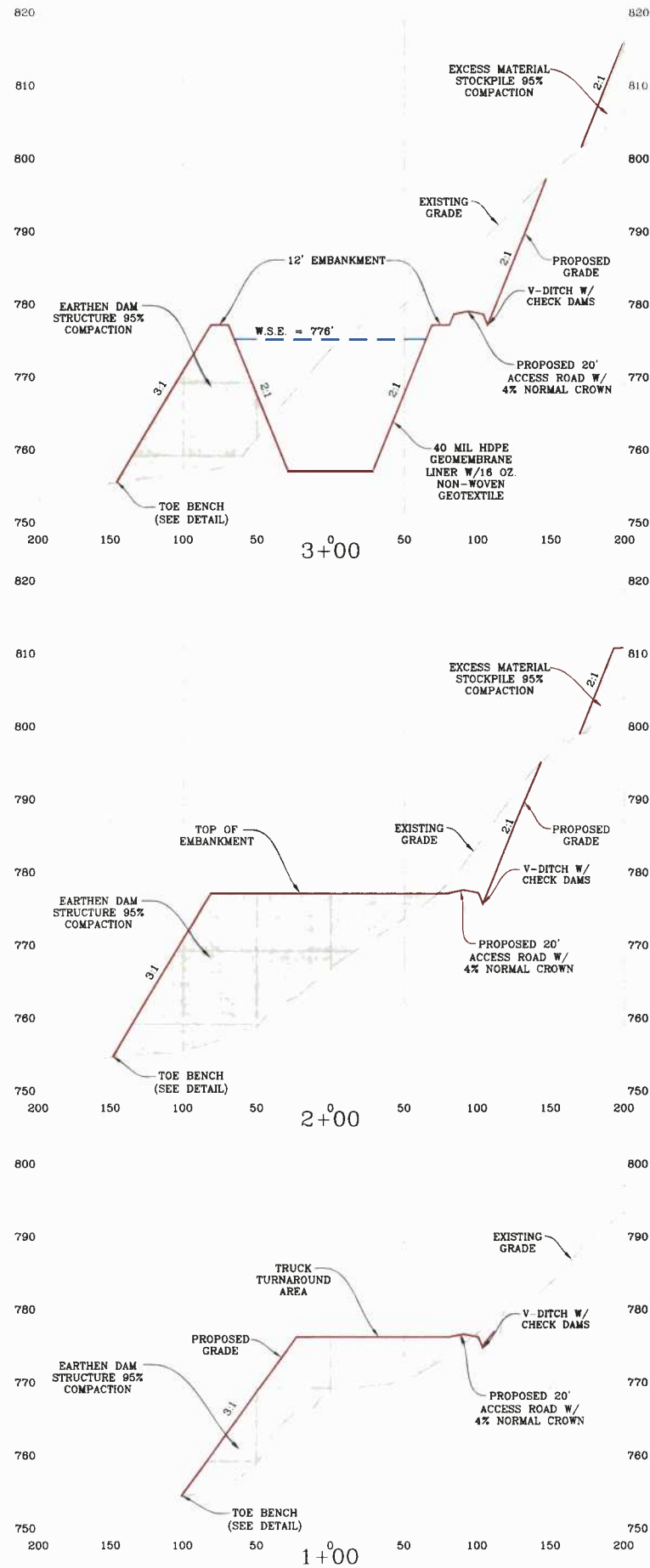
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CENTRALIZED IMPOUNDMENT SECTIONS
GESSLER
 CENTRALIZED IMPOUNDMENT
 GRANT DISTRICT
 DODDRIDGE COUNTY, WV

DATE:	11/20/2012
SCALE:	AS SHOWN
DESIGNED BY:	TVF/DEM
FILE NO.	7838
SHEET	4 OF 13
REV.	03/27/2013

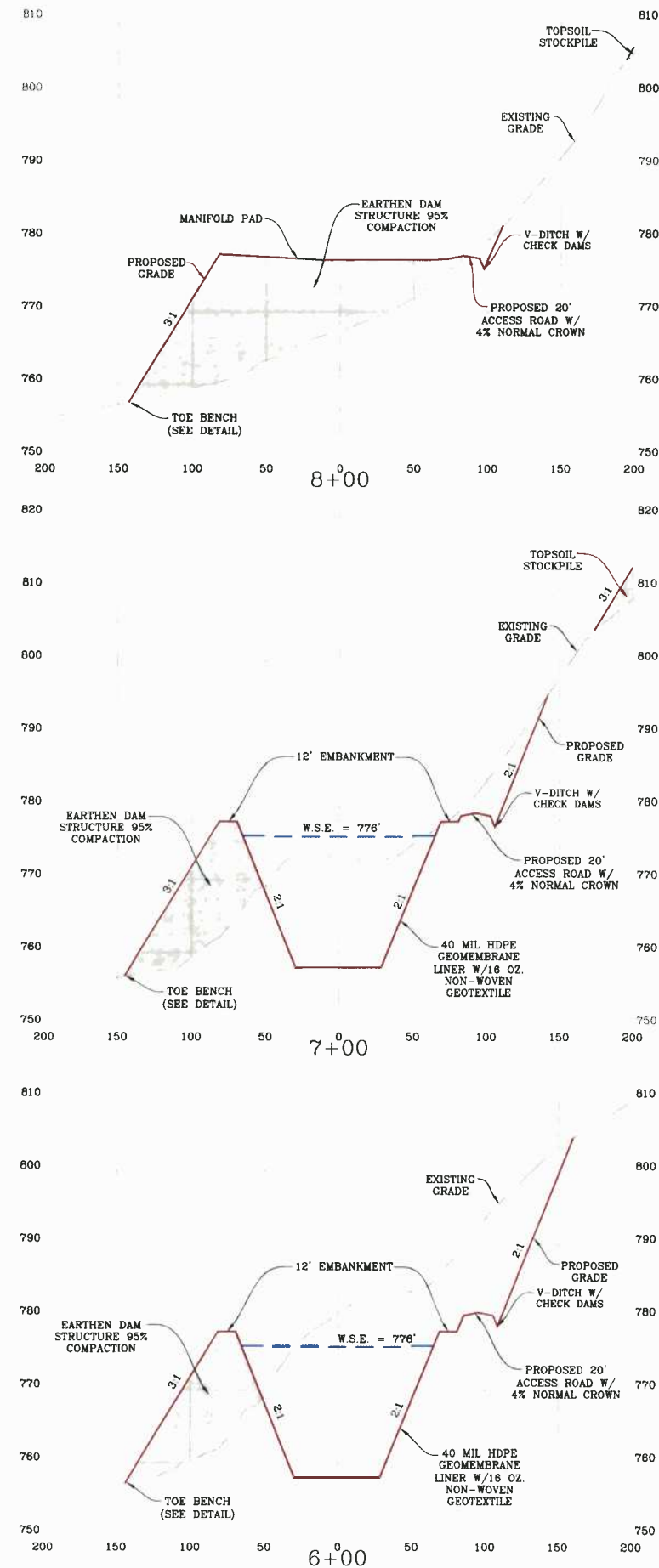
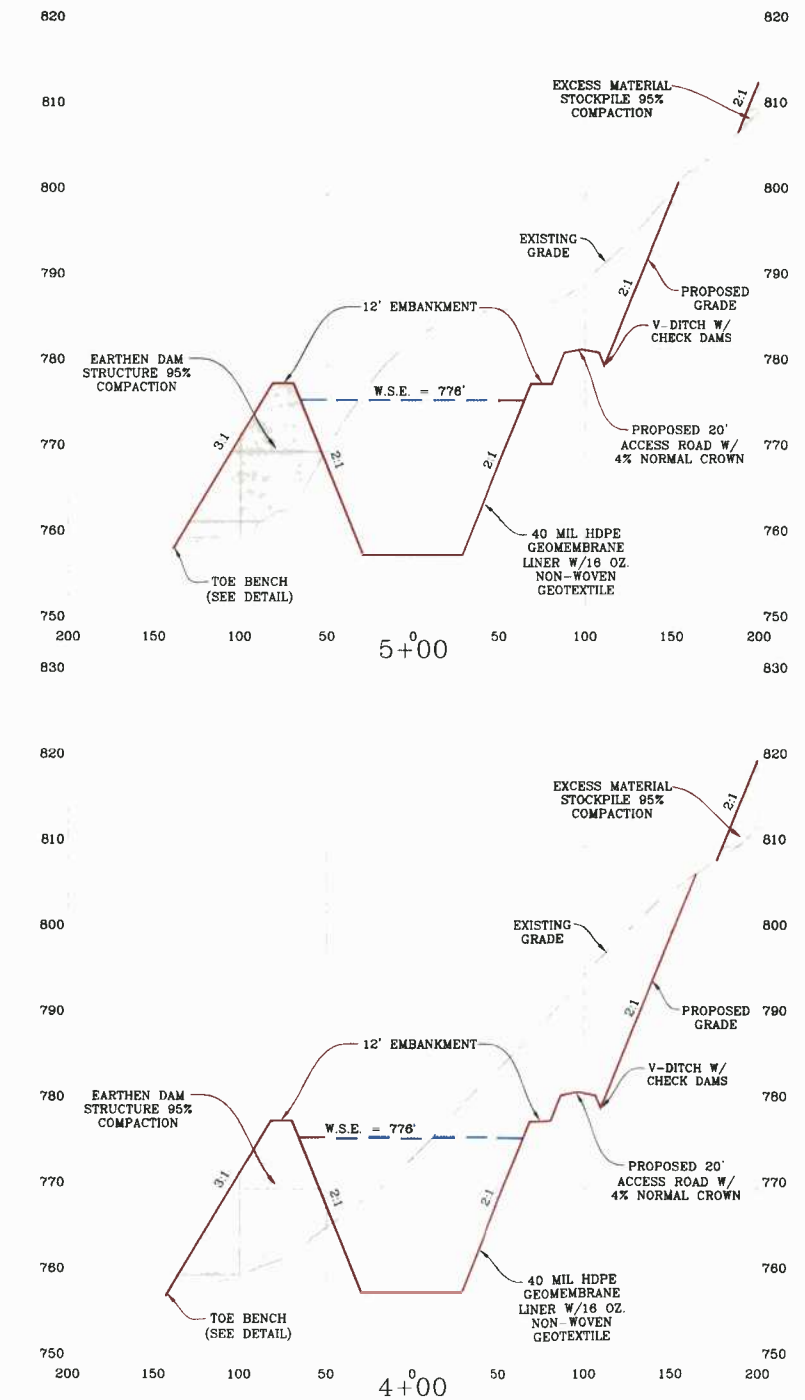
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CENTRALIZED IMPOUNDMENT SECTIONS



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.

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



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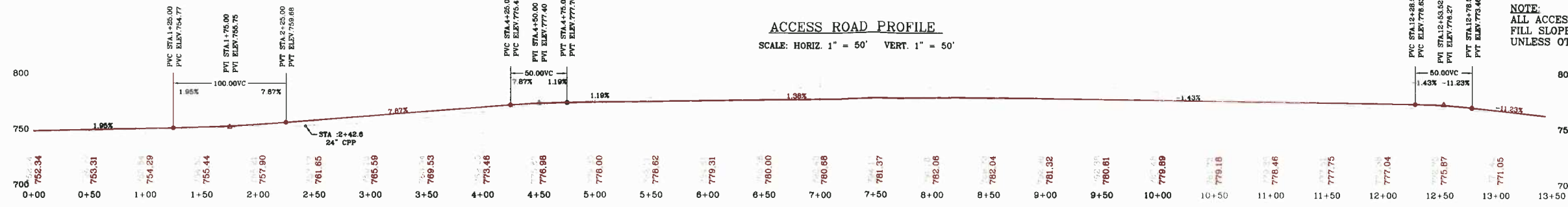
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 STATE OF WEST VIRGINIA
 03/27/2013

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CENTRALIZED IMPOUNDMENT SECTIONS
GESSLER
 CENTRALIZED IMPOUNDMENT
 GRANT DISTRICT
 DODDRIDGE COUNTY, WV

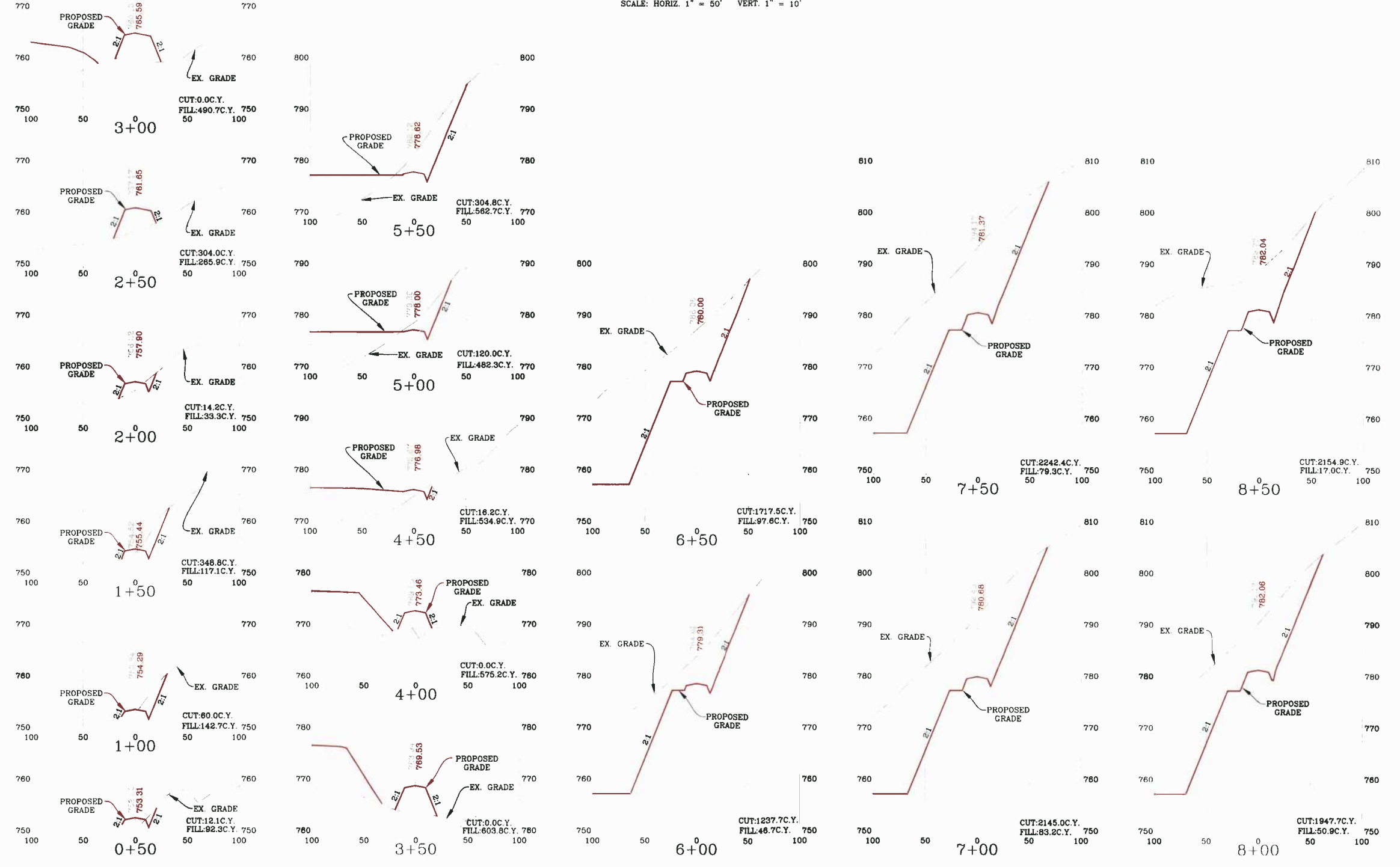
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 FILE NO. 7838
 SHEET 5 OF 13
 REV. 03/27/2013

ACCESS ROAD PROFILE AND SECTIONS



NOTE:
ALL ACCESS ROAD CUT AND
FILL SLOPES SHALL BE 2:1
UNLESS OTHERWISE NOTED

ACCESS ROAD CROSS-SECTIONS



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ACCESS ROAD PROFILE AND SECTIONS

GESSLER
CENTRALIZED IMPROVEMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

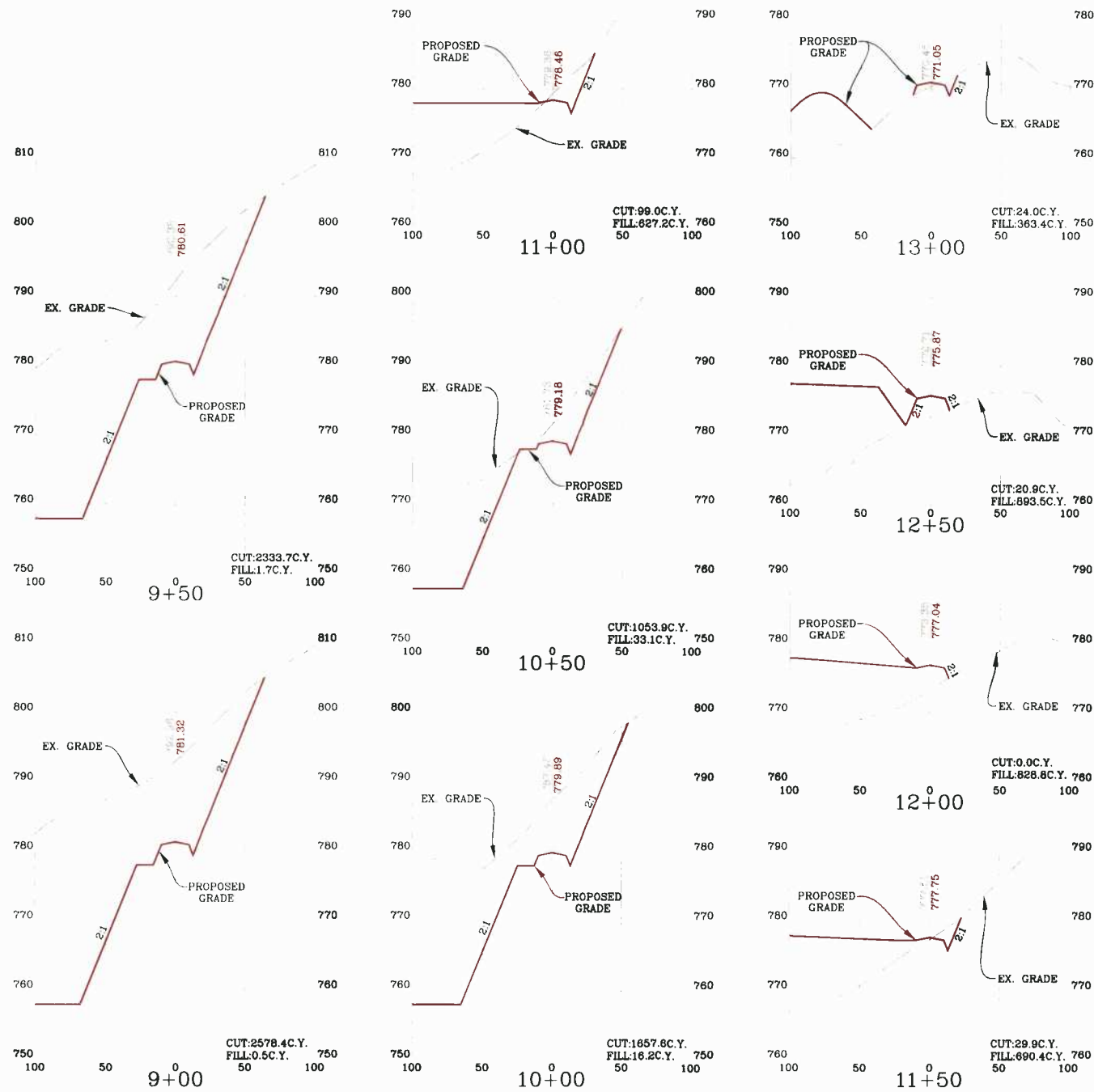
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FILE NO. 7838
SHEET 6 OF 13
REV. 03/27/2013

ACCESS ROAD SECTIONS

ACCESS ROAD CROSS-SECTIONS

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

NOTE:
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UNLESS OTHERWISE NOTED



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ACCESS ROAD SECTIONS
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012
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DESIGNED BY: TVF/DEM
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SHEET 7 OF 13
REV. 03/27/2013

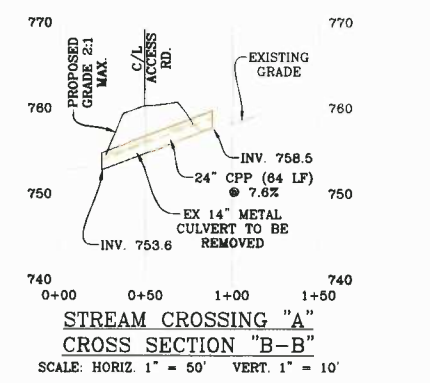
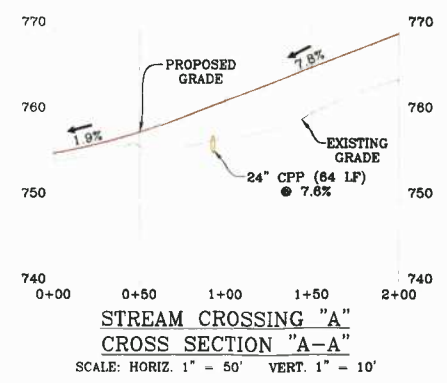
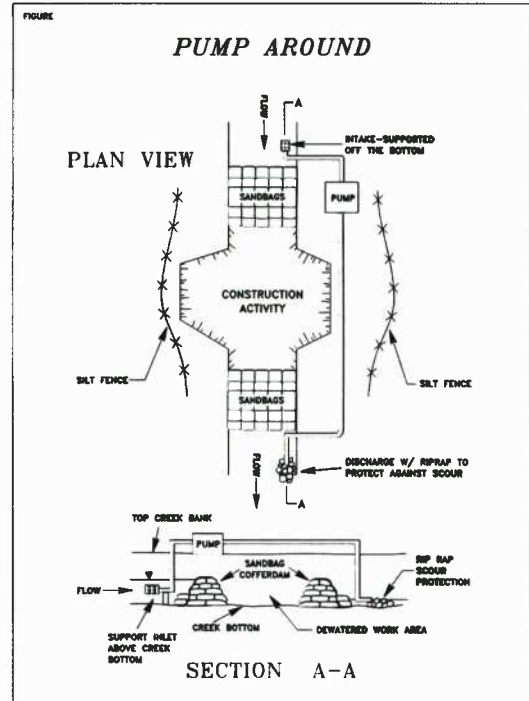
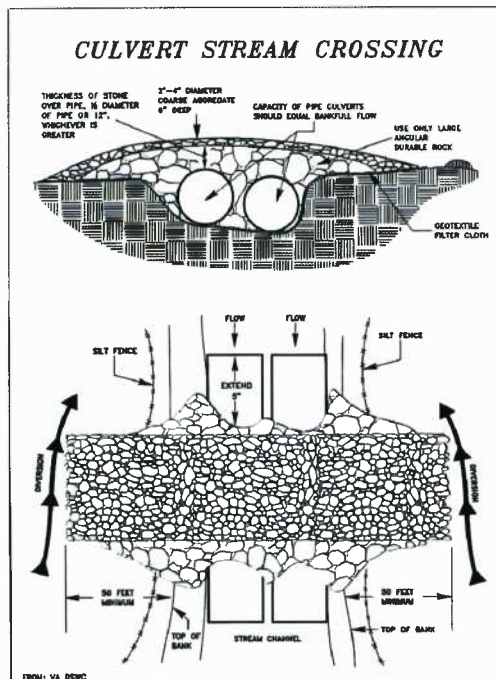
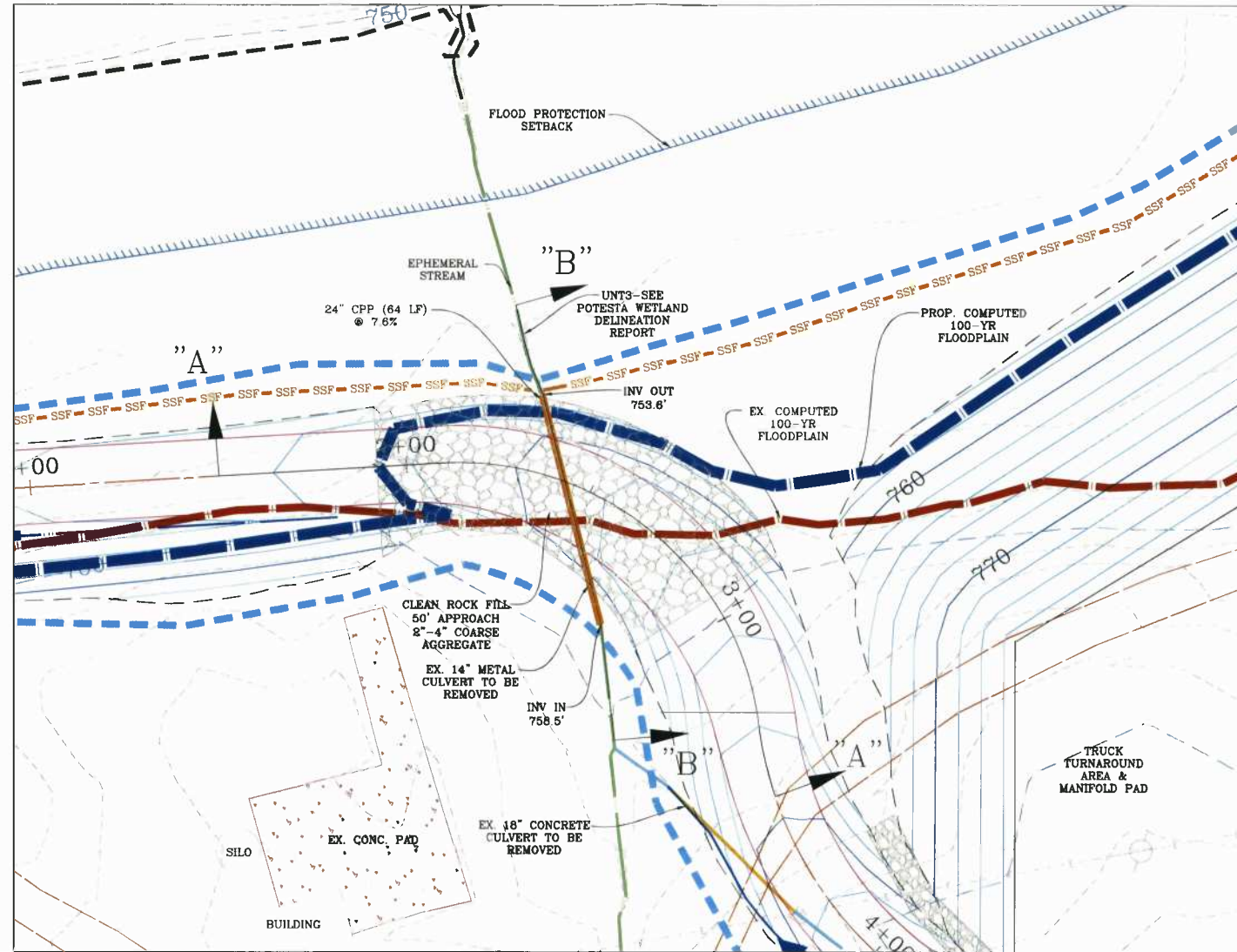
STREAM CROSSING "A" DETAILS

GENERAL NOTES:

- 1) 2" TO 4" COARSE AGGREGATE OR LARGER SHALL BE USED TO FORM THE CROSSING. DO NOT USE ERODIBLE MATERIAL MATERIAL FOR CONSTRUCTION OF THE CROSSING.
- 2) DEPTH OF STONE COVER OVER THE CULVERTS SHALL BE EQUAL TO ONE-HALF THE CULVERT DIAMETER OR 12 INCHES, WHICHEVER IS GREATER.
- 3) IF MULTIPLE CULVERTS ARE USED, THEY SHALL BE SEPARATED BY AT LEAST 12 INCHES OF COMPACTED AGGREGATE FILL.
- 4) SIDES SHALL BE PROTECTED WITH CONCRETE GROUTED RIPRAP TO PREVENT EROSION AND PROTECTION FROM OVERFLOW CONDITIONS.
- 5) CULVERTS SHALL EXTEND A MINIMUM OF 5' BEYOND THE UPSTREAM AND DOWNSTREAM TOE OF AGGREGATE PLACED AROUND PIPE.
- 6) CLEARING AND EXCAVATION OF THE STREAMBED AND BANKS SHALL BE KEPT TO A MINIMUM.
- 7) FILTER CLOTH SHALL BE PLACED ON THE STREAMBED AND STREAMBANKS PRIOR TO PLACEMENT OF THE PIPE CULVERTS AND AGGREGATE. THE FILTER CLOTH SHALL COVER THE STREAMBED AND EXTEND A MINIMUM OF SIX INCHES AND A MAXIMUM OF ONE FOOT BEYOND THE END OF THE CULVERTS AND BEDDING MATERIAL.
- 8) A WATER DIVERTING SWALE SHALL BE CONSTRUCTED ACROSS THE ROADWAY ON EITHER SIDE OF THE STREAM CROSSING.
- 9) APPROPRIATE PERIMETER CONTROLS SUCH AS SILT FENCE, SUPER SILT FENCE AND/OR SEDIMENT TRAPS SHALL BE EMPLOYED ALONG THE BANKS AND PARALLEL TO THE STREAMBED.
- 10) CROSS CRIBBING OF THE DOWNSTREAM SIDE OF THE CULVERT INSTALLATIONS MAY BE NEEDED TO AID IN REDUCING STRUCTURAL DAMAGE DURING HIGH VELOCITY WATER OVERFLOW PERIODS.
- 11) STREAMBED MATERIAL IS NOT TO BE USED AS FILL.
- 12) GREEN CONCRETE SHALL NOT BE PLACED IN CONTACT WITH FLOWING WATER.
- 13) WHEN THE CROSSING HAS SERVED ITS PURPOSE, ALL STRUCTURES INCLUDING CULVERTS, BEDDING, AND FILTER CLOTH SHALL BE REMOVED. REMOVAL OF THE STRUCTURE AND CLEAN UP OF THE AREA SHOULD BE ACCOMPLISHED WITHOUT CONSTRUCTION EQUIPMENT WORKING IN THE WATERWAY CHANNEL. UPON REMOVAL OF THE STRUCTURE, THE STREAM BANK SHALL IMMEDIATELY BE STABILIZED.
- 14) DURING ROUTINE MAINTENANCE DO NOT GRADE MUD AND DEBRIS OVER THE SIDES OF THE CROSSING INTO THE STREAM.
- 15) THE CROSSING MUST BE INSPECTED AFTER EVERY RAIN EVENT OF 0.5 INCHES OR MORE AND ONCE A WEEK TO ENSURE THAT THE CULVERTS, STREAMBED, AND STREAM BANKS ARE MAINTAINED AND NOT DAMAGED. NEVER ALLOW THE CULVERTS TO BECOME CLOGGED WITH DEBRIS AND REMOVE ANY OBSTRUCTIONS IMMEDIATELY.

NOTE:

- 1) SEE STREAM CROSSING REPORT BY NAVITUS ENGINEERING FOR CULVERT AND DRAINAGE COMPUTATIONS.



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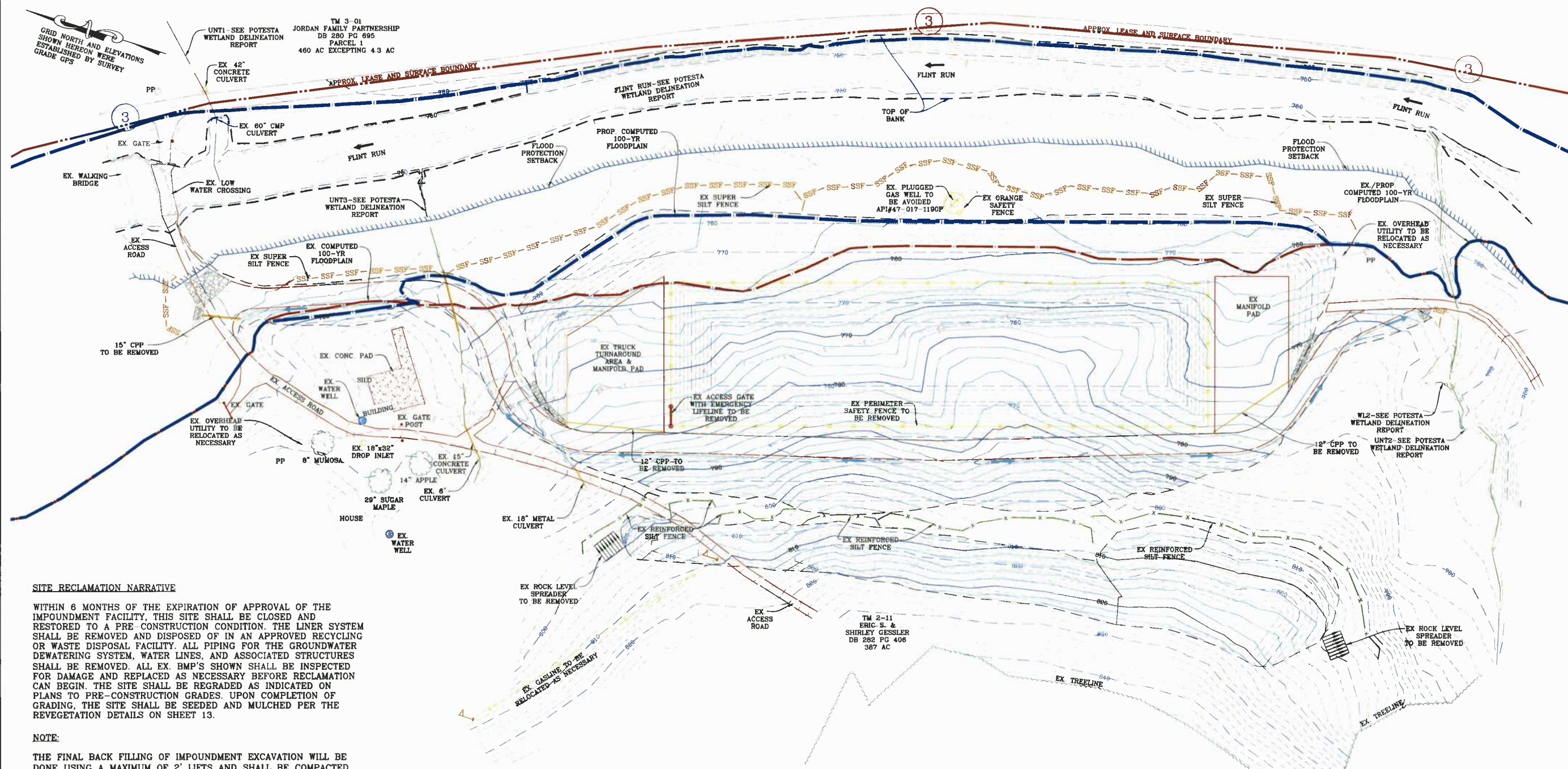


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STREAM CROSSING "A" DETAILS
GESSLER
CENTRALIZED INFONMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WY

DATE: 11/20/2012
SCALE: AS SHOWN
DESIGNED BY: TVF/DEM
FILE NO. 7838
SHEET 8 OF 13
REV. 03/27/2013

CENTRALIZED IMPOUNDMENT RECLAMATION PLAN



SITE RECLAMATION NARRATIVE

WITHIN 6 MONTHS OF THE EXPIRATION OF APPROVAL OF THE IMPOUNDMENT FACILITY, THIS SITE SHALL BE CLOSED AND RESTORED TO A PRE-CONSTRUCTION CONDITION. THE LINER SYSTEM SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED RECYCLING OR WASTE DISPOSAL FACILITY. ALL PIPING FOR THE GROUNDWATER DEWATERING SYSTEM, WATER LINES, AND ASSOCIATED STRUCTURES SHALL BE REMOVED. ALL EX. BMP'S SHOWN SHALL BE INSPECTED FOR DAMAGE AND REPLACED AS NECESSARY BEFORE RECLAMATION CAN BEGIN. THE SITE SHALL BE REGRADED AS INDICATED ON PLANS TO PRE-CONSTRUCTION GRADES. UPON COMPLETION OF GRADING, THE SITE SHALL BE SEEDED AND MULCHED PER THE REVEGETATION DETAILS ON SHEET 13.

NOTE:

THE FINAL BACK FILLING OF IMPOUNDMENT EXCAVATION WILL BE DONE USING A MAXIMUM OF 2' LIFTS AND SHALL BE COMPACTED TO AT LEAST 90% OF THE STANDARD PROCTOR, USING ASTM D-698 STANDARD.

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Glenville, WV 26531

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E-MAIL: sls@slsurveyors.com

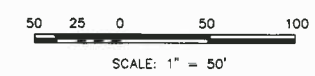


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CENTRALIZED IMPOUNDMENT RECLAMATION PLAN

GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIIDGE COUNTY, WV

DATE: 11/20/2012
SCALE: 1" = 50'
DESIGNED BY: TVF/DEM
FILE NO. 7838
SHEET 9 OF 13
REV. 03/27/2013



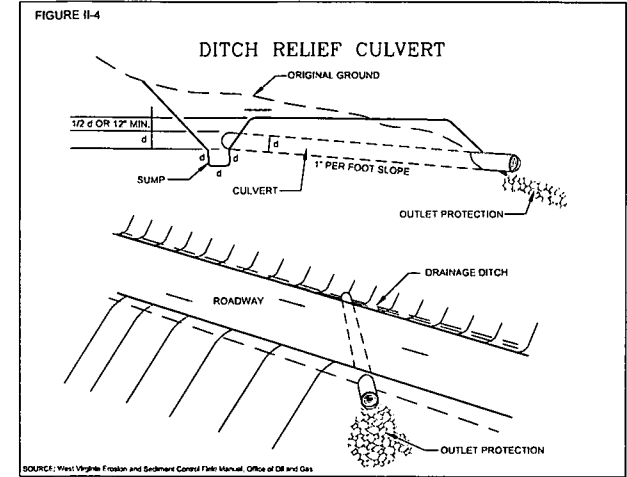
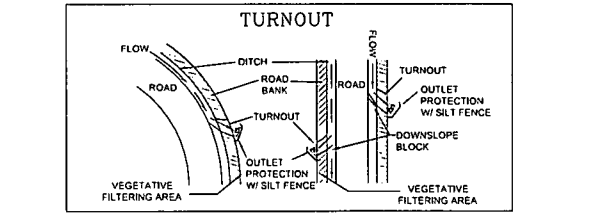
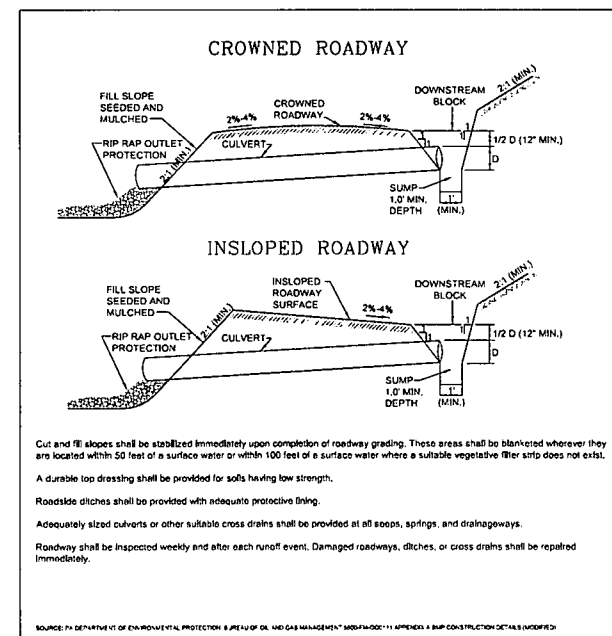
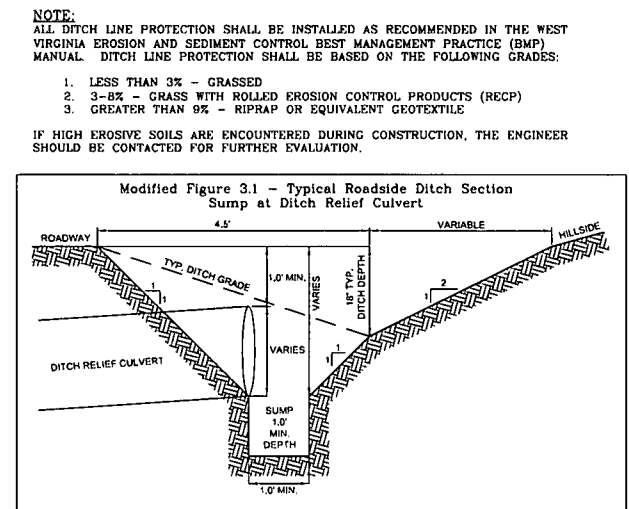
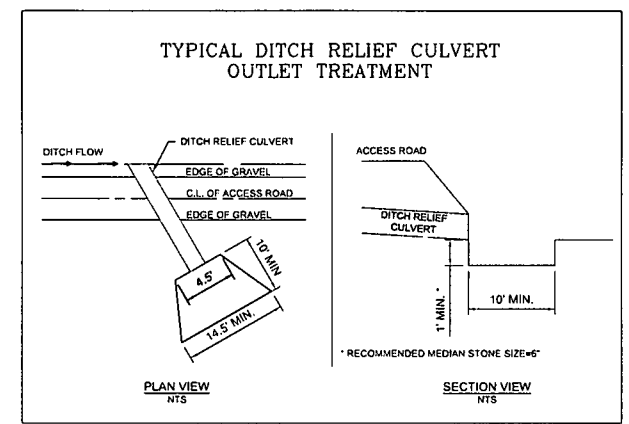
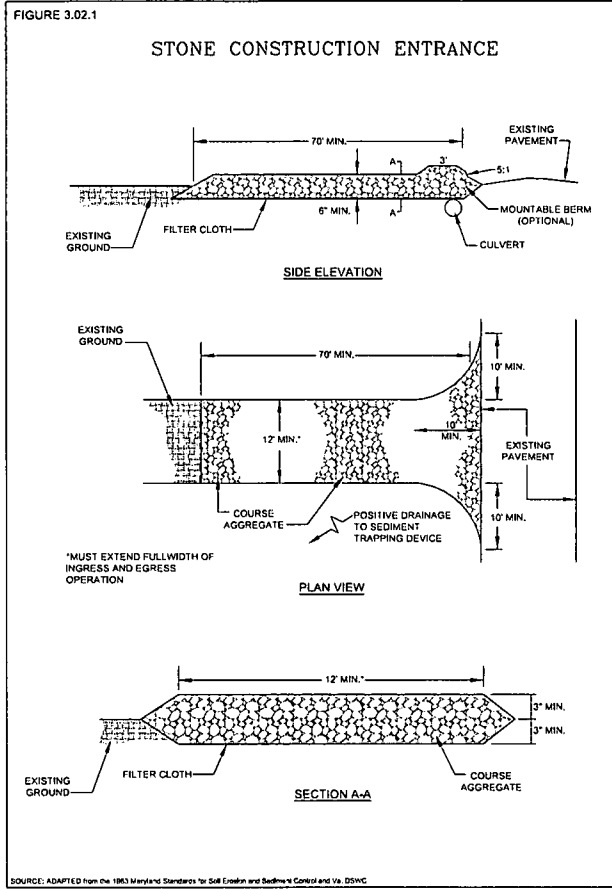


Table II-5

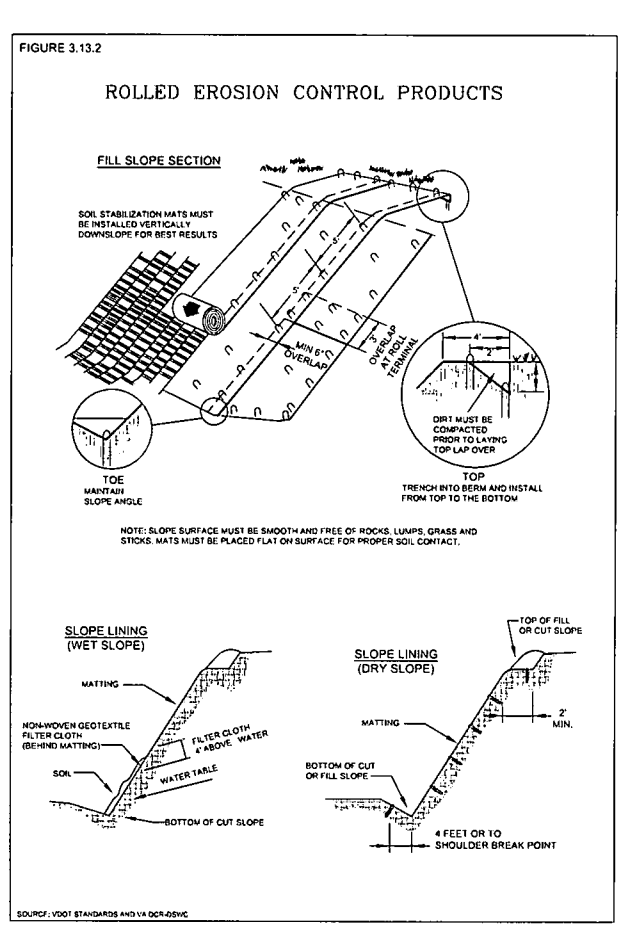
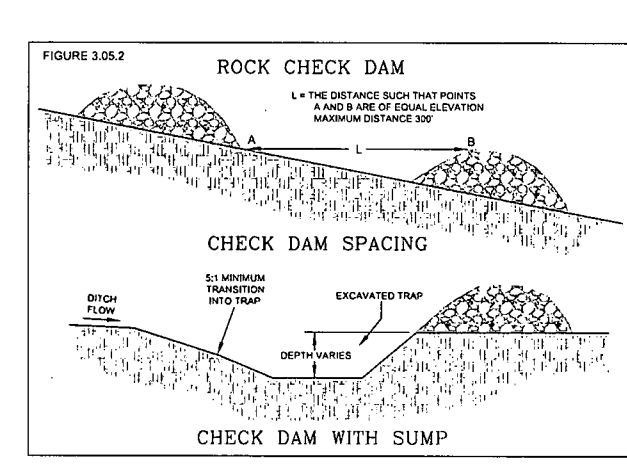
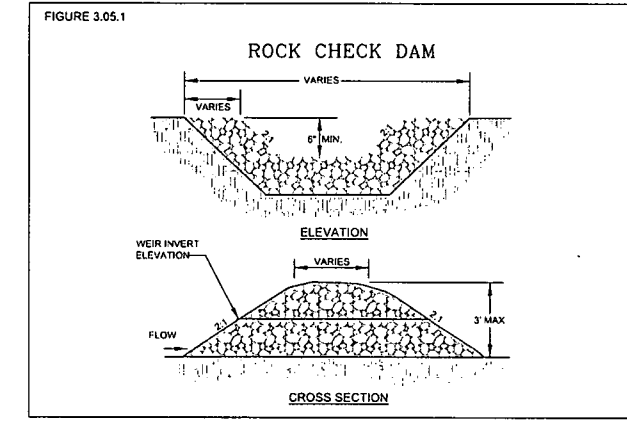
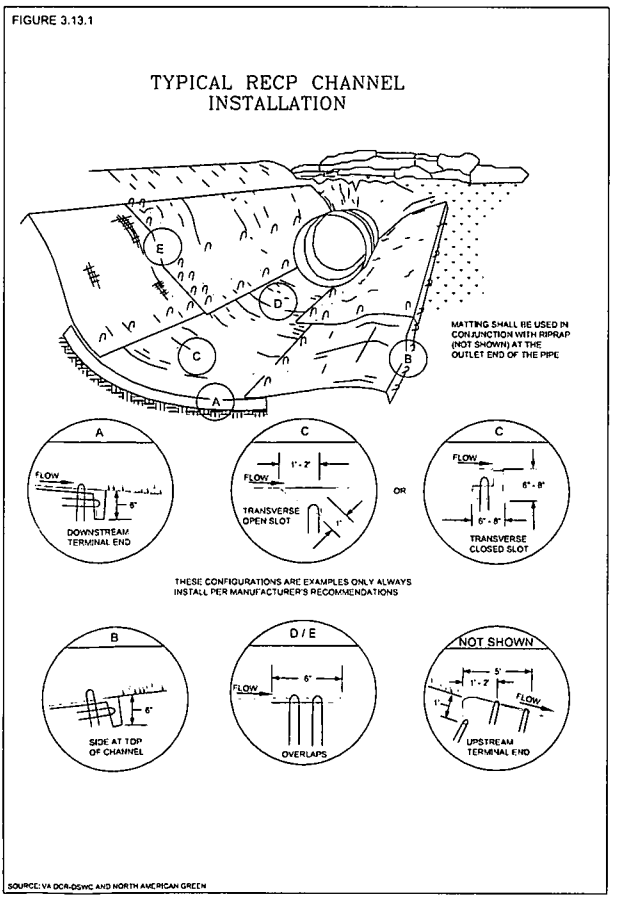
Pipe Sizes for Culverts Across Roads

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



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CONSTRUCTION DETAILS

GESSLER

CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012

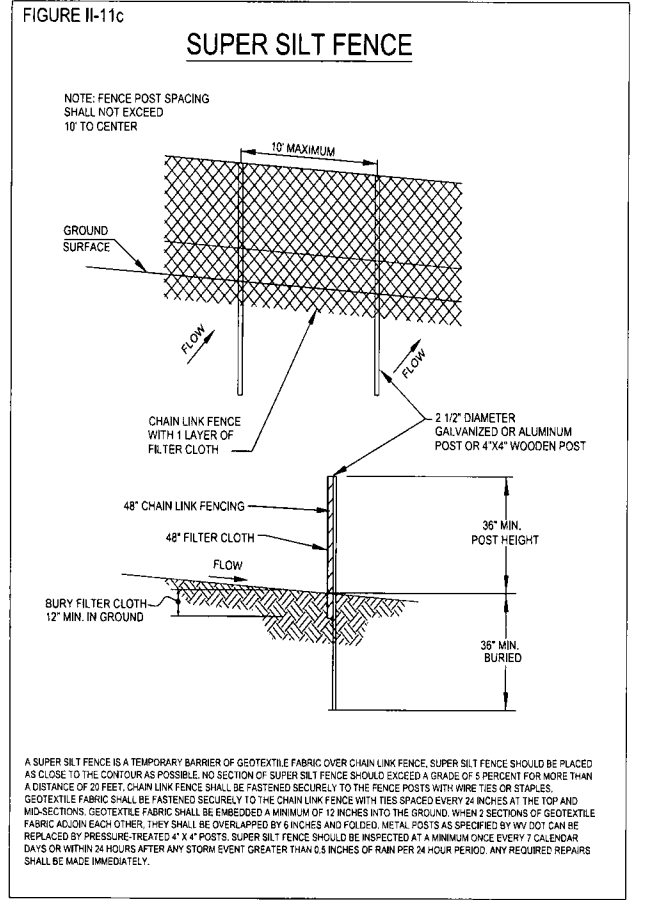
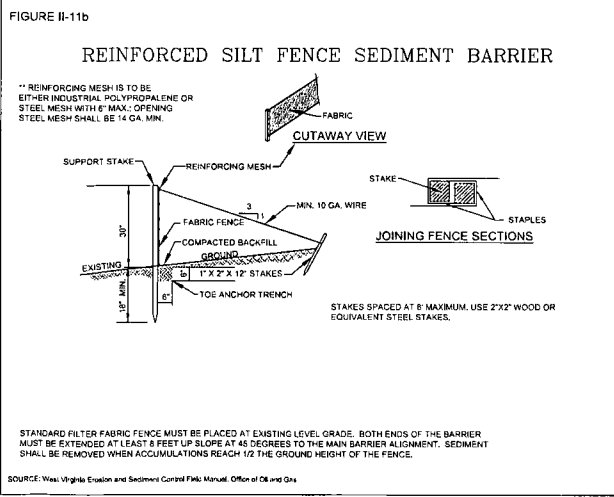
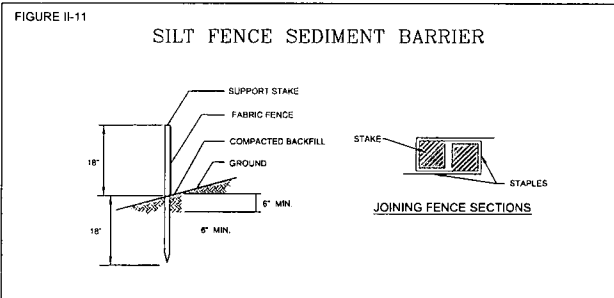
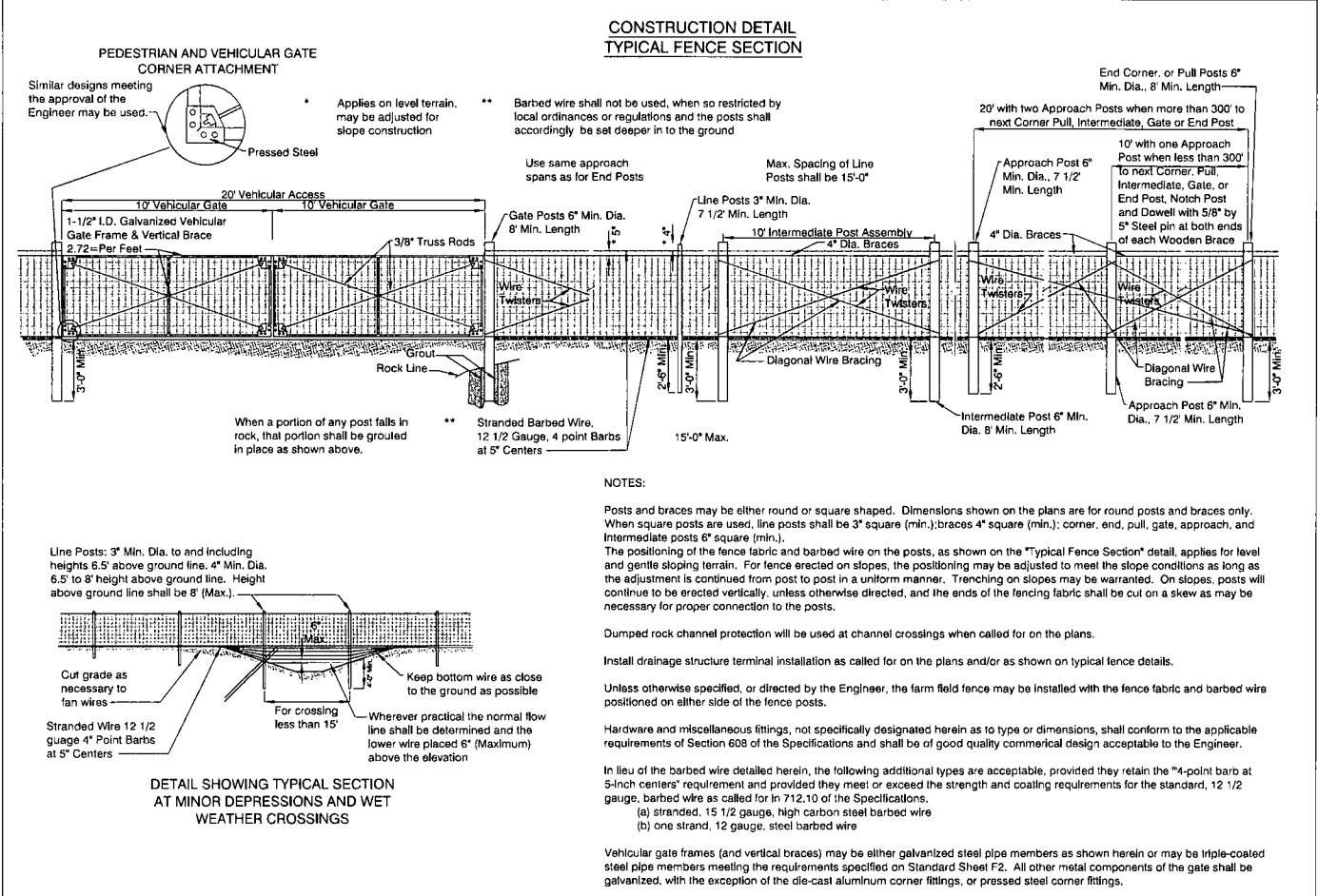
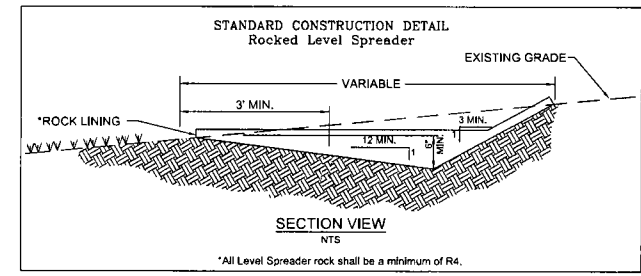
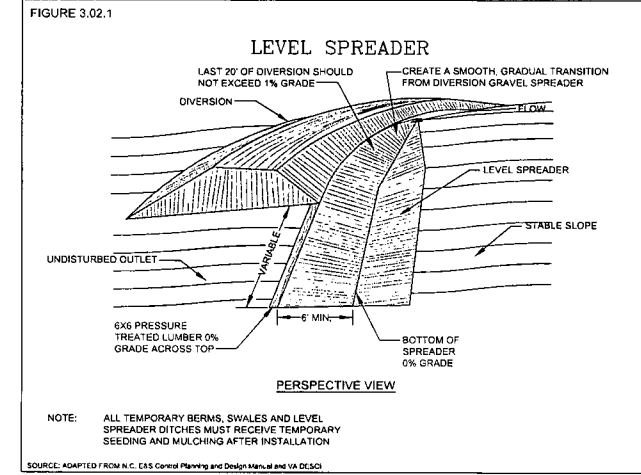
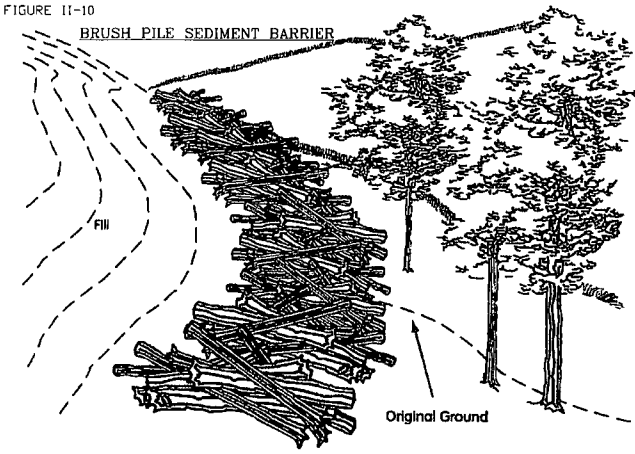
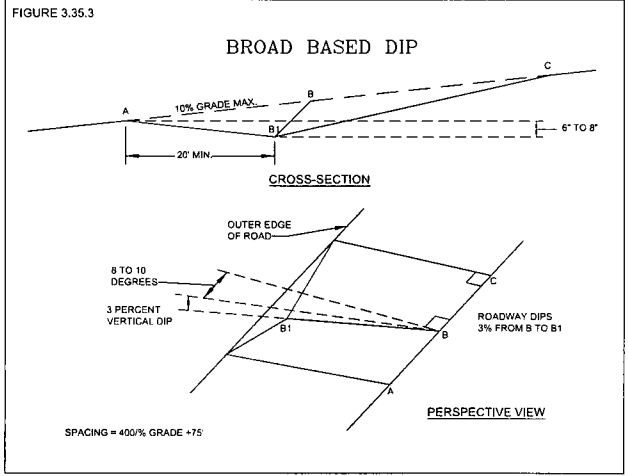
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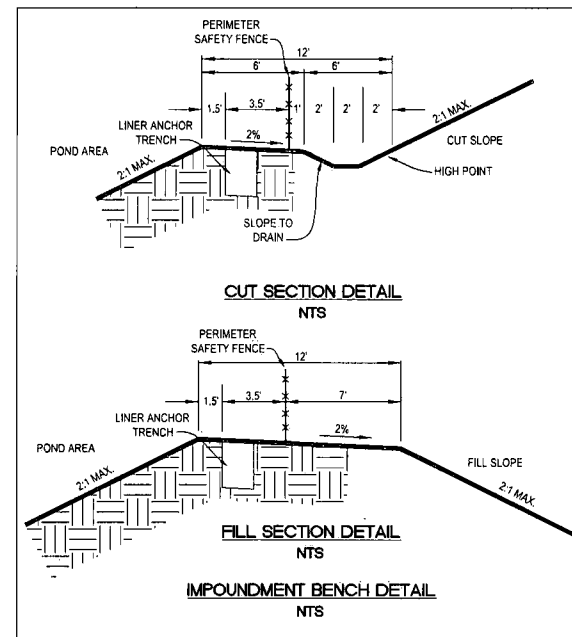
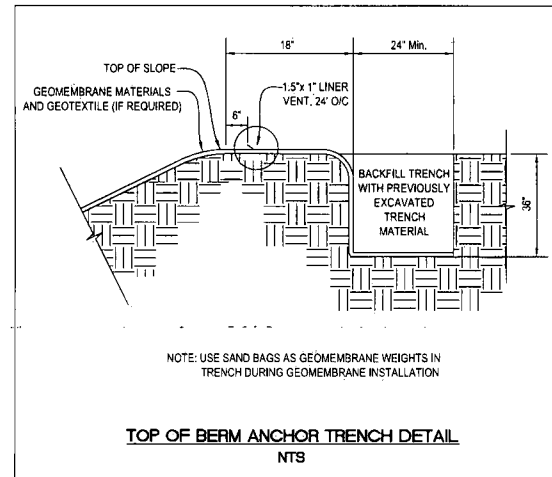
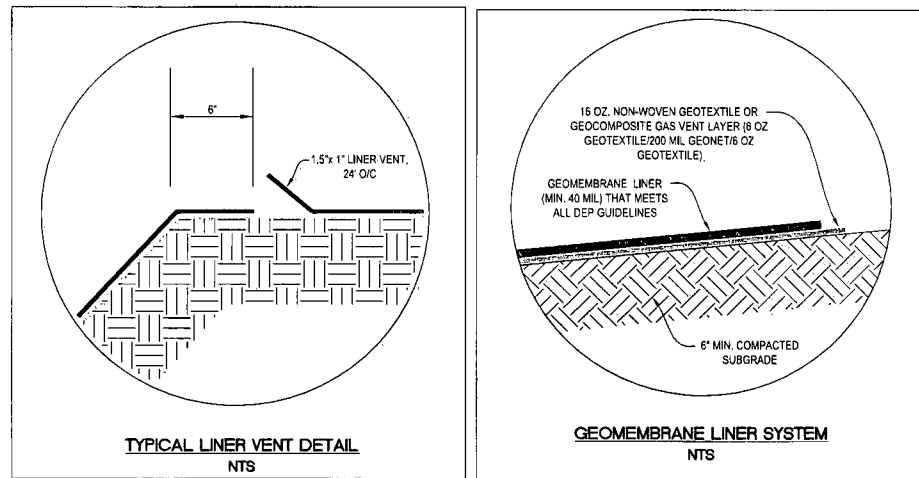
DESIGNED BY: TVP/DEM

FILE NO. 7838

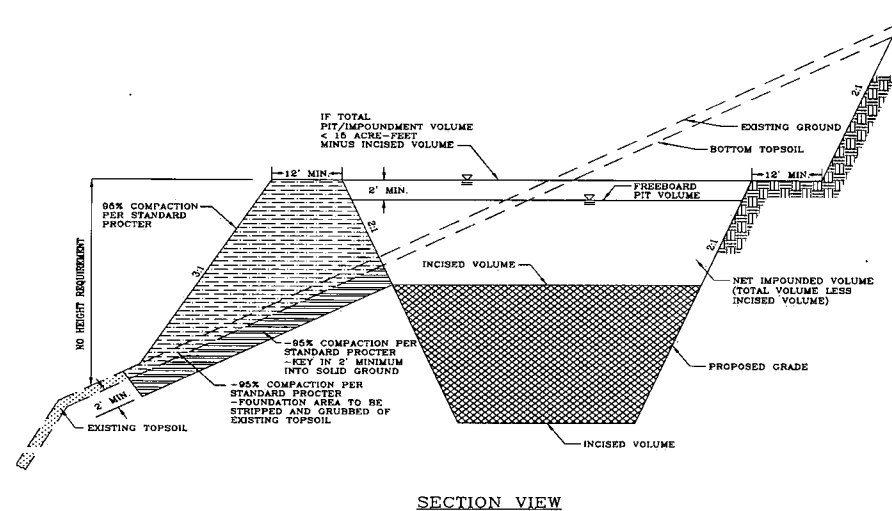
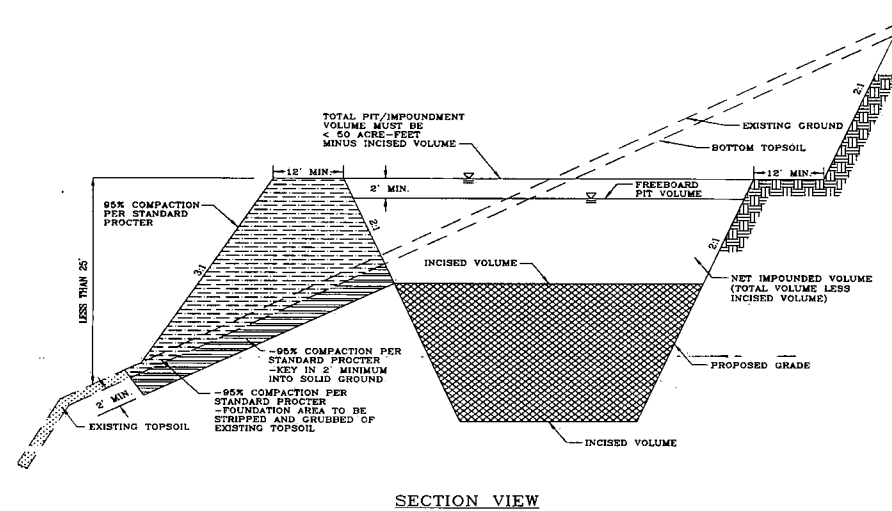
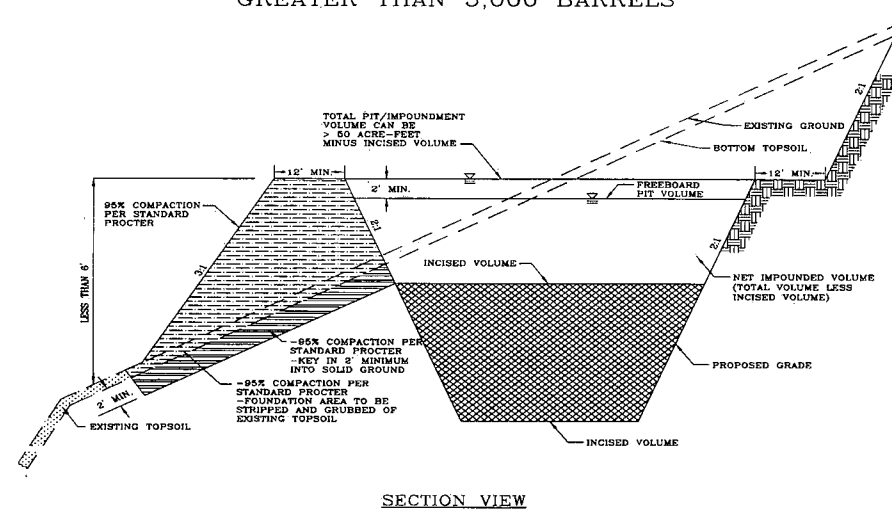
SHEET 10 OF 13

REV. 03/27/2013



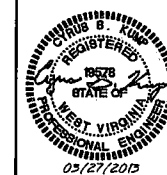


WEST VIRGINIA CODE 35 CSR 4
DESIGN AND CONSTRUCTION REQUIREMENTS
FOR ASSOCIATED PITS, ASSOCIATED IMPOUNDMENTS, &
CENTRALIZED IMPOUNDMENTS
GREATER THAN 5,000 BARRELS



- NOTES:
- ALL FILL SHOULD BE KEYED IN TO ORIGINAL GROUND EVERY 2-5 VERTICAL FEET DEPENDING ON EXISTING GROUND SLOPE
 - MINIMUM OUTSIDE AND INSIDE EMBANKMENT (FILL) SLOPES SHALL BE 2H:1V. THE INSIDE AND OUTSIDE SLOPES MUST ADD UP TO 5H:1V.

NTS



THIS DOCUMENT WAS
PREPARED BY:
NAVITUS ENGINEERING
INC.
FOR EAT PRODUCTION
COMPANY

CONSTRUCTION DETAILS
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012

SCALE: N/A

DESIGNED BY: TVF/DEM

FILE NO. 7838

SHEET 12 OF 13

REV. 03/27/2013

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 indicated in Table IV-3. Perform all planting operations at right angles to the slope. Necessary site preparation and roughening of the soil surface should be done just prior to seeding. Seedbed preparation may not be required on newly disturbed areas.

Permanent Seeding

a. General
Permanent vegetative cover will be established where no further soil disturbance is anticipated or needed. Soil fertility and pH level should be tested and adjusted according to seed species planted. Planting of permanent vegetative covers must be performed on all disturbed areas after completion of the drilling process. Any site that contains significant amounts of topsoil shall have the topsoil removed and stockpiled when feasible. Topsoil should not be added to slopes steeper than 2:1 unless a good bonding to the sub-layer can be achieved. After proper grading and seedbed preparation, the vegetation will reestablish ground cover for the control of surface water runoff erosion.

All required seedbed preparation and loosening of soil by disking or dozer tracking should be performed just prior to seeding. If seedbed preparation is not feasible, 50% more seed shall be added to the recommended rates shown in Tables IV-3 and IV-4. When hydroseeding, seedbed preparation may not be necessary if adequate site preparation was performed. Incorporate the appropriate amount of lime and/or fertilizer in the slurry mix when hydroseeding.

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

Lime and Fertilizer

- Lime shall be applied to all permanent seedings. The pH of the soil is to be determined and lime applied accordingly. Once the pH is known, select the amount of lime to be applied from Table IV-5.
- 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.
- Application: For best results and maximum benefits, the lime and fertilizer are to be applied at the time of seedbed preparation.

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:
- All legumes must be planted with the proper inoculants prior to seeding.
 - Lathco Flatpea is potentially poisonous to some livestock.
 - Only endophyte free varieties of Tall Fescue should be used. Tall Fescue and Crownvetch are also very invasive species, non-native to WV.
 - 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.

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.

- 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.
- Mulch netting
Follow manufacturer's recommendation when positioning and stapling the mulch netting in the soil.

**Table IV-1
Recommended Seeding Dates**

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

**Table 2
Acceptable Fertilization Recommendation**

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

**Table 3
Temporary Cover**

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

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

**Table 4a
Permanent Seeding Mixture**

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

* Lathco Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.
Mixtures listed in bold are suitable for use in shaded woodland settings; those in italics are suitable for use in filter strips.

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

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

* Lathco Flatpea is potentially poisonous to some livestock. All legumes should be planted with proper inoculants prior to seeding. For unprepared seedbeds or seeding outside the optimum timeframe, add 50% more seed to the specified rate.
Mixtures listed in bold are suitable for use in shaded woodland settings; those in italics are suitable for use in filter strips.

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

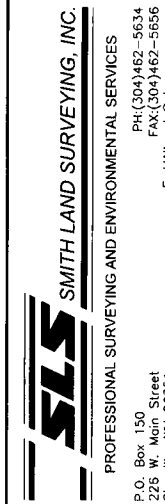
pH of Soil	Lime in Tons per Acre	Fertilizer, Lbs., per Acre (10-20-20 or Equivalent)
Above 6.0	2	500
5.0 to 6.0	3	500
Below 5.0	4	500

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

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

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

Tables IV 1-4 taken from Natural Resources Conservation Service Manual 'Critical Area Planting'



THIS DOCUMENT WAS PREPARED BY:
NAVITUS ENGINEERING INC.
FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
GESSLER
CENTRALIZED IMPROVEMENT
GRANT DISTRICT
DODD RIDGE COUNTY, WV

DATE: 11/20/2012
SCALE: N/A
DESIGNED BY: TVF/DEM
FILE NO. 7838
SHEET 13 OF 13
REV. 03/27/2013

GESSLER CENTRALIZED IMPOUNDMENT SITE PLAN

EQT PRODUCTION COMPANY

PROJECT INFORMATION

PROJECT NAME: GESSLER CENTRALIZED IMPOUNDMENT

TAX PARCEL:
GRANT DISTRICT
MAP 2-11

SURFACE OWNER:
ERIC S. AND SHIRLEY GESSLER
GRANT DISTRICT
DODDRIDGE COUNTY, WV
TOTAL PROPERTY AREA: 387 ± ACRES

SITE LOCATION:
THE GESSLER CENTRALIZED IMPOUNDMENT SITE IS LOCATED ON A HILLSIDE WEST OF CO. RT. 3, APPROXIMATELY 900 FT NORTHWEST OF THE CO. RT. 3 AND CO. RT. 3/1 INTERSECTION.

SITUATE ON THE WATERS OF FLINT RUN IN GRANT DISTRICT, DODDRIDGE COUNTY, WEST VIRGINIA.

CENTER POINT QUAD

LOCATION COORDINATES

GESSLER CENTRALIZED IMPOUNDMENT ENTRANCE
LATITUDE: 39.37612 LONGITUDE: -80.72088 (NAD 83)

GESSLER CENTRALIZED IMPOUNDMENT
LATITUDE: 39.37385 LONGITUDE: -80.72082 (NAD 83)

SITE DISTURBANCE COMPUTATIONS

CENTRALIZED IMPOUNDMENT AREA = 6.75 ± ACRES*
ACCESS ROAD = 2.21 ± ACRES
TOTAL SITE DISTURBANCE = 8.96 ± ACRES
*INCLUDES AREA OF THE CENTRALIZED IMPOUNDMENT & STOCKPILES

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 NOTIFIED FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN. TICKET #1232591569. IN ADDITION, MISS UTILITY WILL BE CONTACTED PRIOR TO START OF THE PROJECT.

FLOODPLAIN NOTE

THE PROPOSED LIMITS OF DISTURBANCE FOR THIS PROJECT IS LOCATED IN FEMA FLOOD ZONE A, PER THE FLOOD INSURANCE RATE MAP (FIRM) NUMBER 54017C0040C & 54017C0130C DATED OCT. 04, 2011.

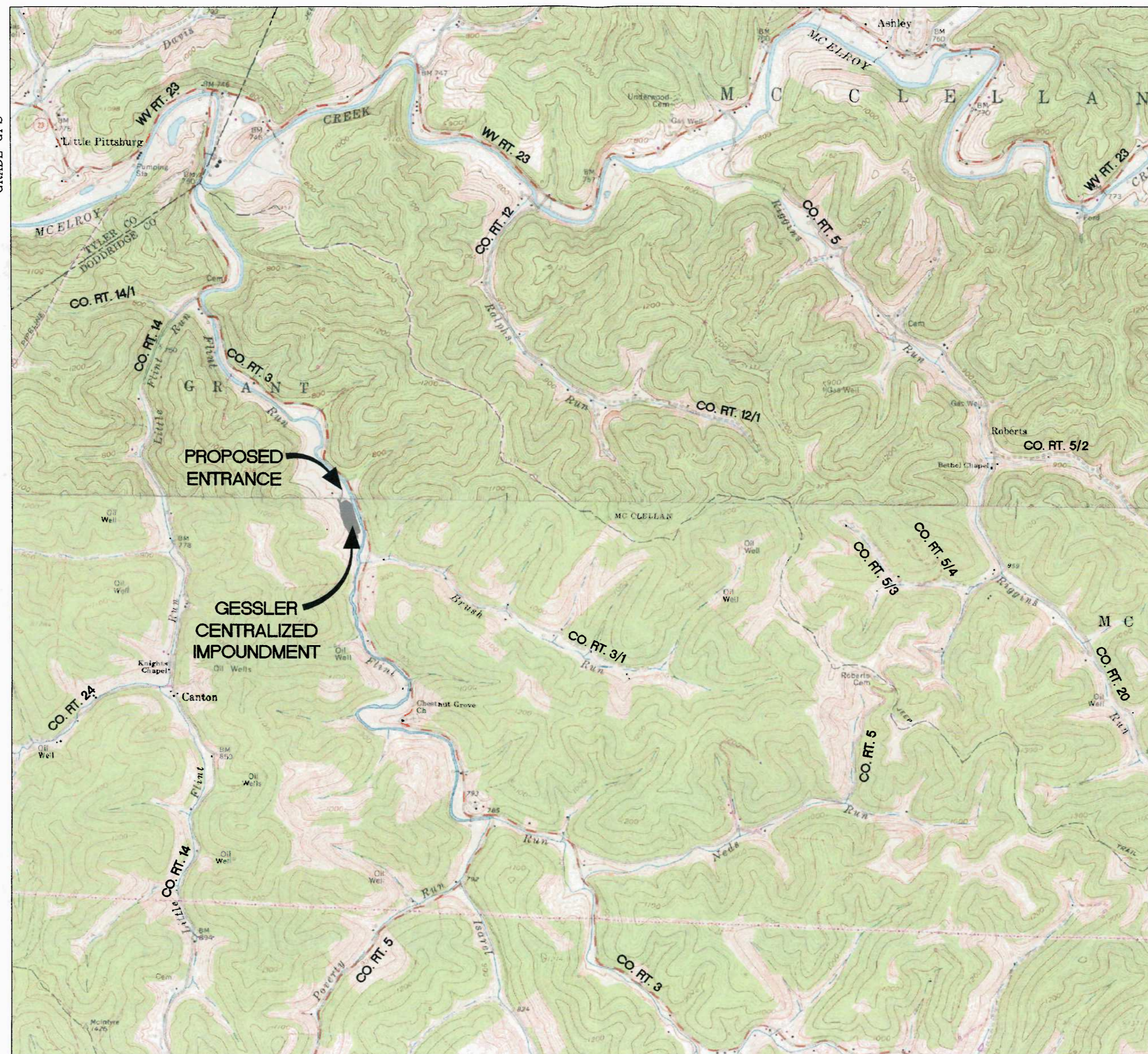
ENVIRONMENTAL NOTES

A WETLAND DELINEATION WAS PERFORMED ON OCTOBER 14 AND 22, 2012 BY POTESA ENGINEERS AND ENVIRONMENTAL CONSULTANTS 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 NOVEMBER 14, 2012 REPORT PROJECT # 0101-11-0147-001 WAS PREPARED BY POTESA ENGINEERS AND ENVIRONMENTAL CONSULTANTS SUMMARIZING 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.

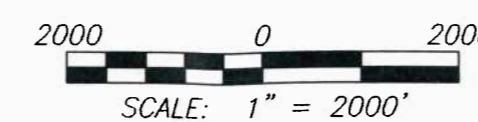
GENERAL DESCRIPTION

THE CENTRALIZED IMPOUNDMENT IS BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

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



SMITHBURG QUAD



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!!

OPERATOR

EQT PRODUCTION COMPANY
OPERATOR ID: 306686
115 PROFESSIONAL PLACE
P.O. BOX 280
BRIDGEPORT, WV 26330
PHONE: (304) 348-3870

ENGINEER

NAVITUS ENGINEERING, INC.
151 WINDY HILL LANE
WINCHESTER, VA 22602
PHONE: (888) 662-4185

SURVEYOR

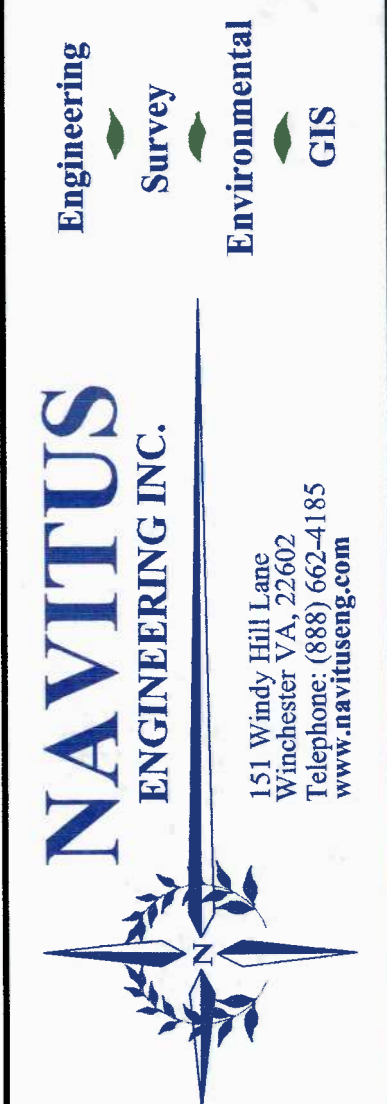
SMITH LAND SURVEYING, INC.
226 WEST MAIN STREET
P.O. BOX 150
GLENVILLE, WV 26351
PHONE: (304) 462-5634

LIST OF DRAWINGS

- 1 - COVER SHEET
- 2 - NOTES
- 3 - CENTRALIZED IMPOUNDMENT DETAILS
- 4 - CENTRALIZED IMPOUNDMENT SECTIONS
- 5 - CENTRALIZED IMPOUNDMENT SECTIONS
- 6 - ACCESS ROAD PROFILE AND SECTIONS
- 7 - ACCESS ROAD SECTIONS
- 8 - STREAM CROSSING "A" DETAILS
- 9 - CENTRALIZED IMPOUNDMENT RECLAMATION PLAN
- 10 - CONSTRUCTION DETAILS
- 11 - CONSTRUCTION DETAILS
- 12 - CONSTRUCTION DETAILS
- 13 - CONSTRUCTION DETAILS

LEGEND

EX. INDEX CONTOUR	- 700 -	PROP. INDEX CONTOUR	- 700 -
EX. INTERMEDIATE CONTOUR	- - - - -	PROP. INTERMEDIATE CONTOUR	- - - - -
EX. BOUNDARY LINE	- - - - -	PROP. GRADING LIMITS	- - - - -
EX. RIGHT-OF-WAY LINE	- RW - RW -	PROP. LIMITS OF DISTURBANCE	- - - - -
EX. ROAD EDGE OF GRAVEL/DIRT	- - - - -	PROP. WELL PAD	- - - - -
EX. ROAD EDGE OF PAVEMENT	- - - - -	PROP. WELL HEAD	- - - - -
EX. ROAD CENTERLINE	- - - - -	PROP. 4" PVC DRAIN PIPE	- - - - -
EX. DITCHLINE	- - - - -	PROP. SUMP DRAIN	- - - - -
EX. CULVERT	- - - - -	PROP. CONTAINMENT BERM	- - - - -
EX. GUARDRAIL	- - - - -	PROP. PIT/IMPOUNDMENT CL	- - - - -
EX. FENCELINE	- - - - -	PROP. PERIMETER SAFETY FENCE	- - - - -
EX. GATE	- - - - -	PROP. ACCESS GATE WITH EMERGENCY LIFELINE	- - - - -
EX. OVERHEAD UTILITY	- - - - -		
EX. OVERHEAD UTILITY R/W	- - - - -		
EX. POWER POLE	- - - - -		
EX. GUY WIRE	- - - - -		
EX. TELEPHONE LINE	- - - - -		
EX. GASLINE	- - - - -	PROP. ROCK CONSTRUCTION ENTRANCE	- - - - -
EX. GASLINE R/W	- - - - -		
EX. WATERLINE	- - - - -		
EX. WATER WELL	- - - - -		
EX. GAS WELL	- - - - -		
EX. TREELINE	- - - - -	PROP. ROAD EDGE OF GRAVEL	- - - - -
EX. REFERENCE TREE	- - - - -	PROP. ROAD CENTERLINE	- - - - -
EX. DELINEATED STREAM	- - - - -	PROP. V-DITCH W/ CHECK DAMS	- - - - -
EX. DELINEATED WETLAND	- - - - -	PROP. DITCH RELIEF CULVERT (DRC)	- - - - -
		PROP. RIP-RAP OUTLET PROTECTION	- - - - -
EX. BUILDING	- - - - -	PROP. GUARDRAIL	- - - - -
EX. BRIDGE	- - - - -	PROP. ROCK LEVEL SPREADER	- - - - -
EX. TOP OF BANK	- - - - -	PROP. EARTHEN DIVERSION BERM	- - - - -
EX. 100 YEAR FEMA FLOODPLAIN	- - - - -	PROP. ORANGE SAFETY FENCE	- - - - -
EX. 100 YEAR FLOODPLAIN	- - - - -	PROP. SUPER SILT FENCE	- - - - -
100' WETLAND/STREAM BUFFER	- - - - -	PROP. REINFORCED SILT FENCE	- - - - -
FLOOD PROTECTION SETBACK	- - - - -	PROP. COMPOST SOCK DIVERSION	- - - - -
PROP. 100 YEAR FLOODPLAIN	- - - - -	PROP. GROUNDWATER DEWATERING TRENCH	- - - - -
PROP. 100 YEAR FLOODWAY	- - - - -	PROP. GROUNDWATER DEWATERING PIPE	- - - - -
		SECTION LINE	- - - - -
		MATCHLINE	- - - - -
		X-SECTION GRID INDEX	- - - - -
		X-SECTION GRID INTERMEDIATE	- - - - -
		X-SECTION PROPOSED GRADE	- - - - -
		X-SECTION EXISTING GRADE	- - - - -
		X-SECTION WATER SURFACE	- - - - -
		SPOT ELEVATION	- - - - -
		CENTER OF PAD	- - - - -



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THIS DOCUMENT WAS PREPARED BY NAVITUS ENGINEERING, INC. FOR: EQT PRODUCTION COMPANY

LOCATION MAP
GESSLER CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012
SCALE: 1" = 2000'
DESIGNED BY: TVF/DEM
FILE NO. 7638
SHEET 1 OF 13
REV. 03/27/2013

CONSTRUCTION NOTES:

1. THE CONTRACTOR IS TO VERIFY FIELD CONDITIONS PRIOR TO AND DURING CONSTRUCTION AND WILL NOTIFY NAVITUS ENGINEERING AT (888) 662-4186 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 INSURE 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 EXCAVATION OR DEMOLITION.
12. CONTRACTOR TO CONTACT OPERATOR AND ENGINEER IF GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION.
13. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE EROSION AND SEDIMENT CONTROL INSPECTOR, 2 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 TEST 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.

CONSTRUCTION SEQUENCE

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

- 1) A PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTOR AND THE APPROPRIATE EROSION AND SEDIMENT CONTROL INSPECTOR 48 HOURS PRIOR TO BEGINNING WORK TO REVIEW THE CONSTRUCTION DRAWINGS AND PROVIDE ANY REQUESTED GUIDANCE
- 2) STAKE THE LIMITS OF CONSTRUCTION.
- 3) INSTALL THE ROCK CONSTRUCTION ENTRANCE AS SHOWN ON THE PLANS.
- 4) INSTALL ALL BMP'S (SILT FENCE, SUPER SILT FENCE, ETC) AS SHOWN ON THE PLANS AND DETAILS.
- 5) CLEAR AND GRUB THE ACCESS ROAD AND IMPOUNDMENT AREA. ALL WOODY MATERIAL, BRUSH, TREES, STUMPS, LARGE ROOTS, BOULDERS, AND DEBRIS SHALL BE CLEARED FROM THE SITE AREA AND KEPT TO THE MINIMUM NECESSARY FOR PROPER CONSTRUCTION, INCLUDING THE INSTALLATION OF NECESSARY SEDIMENT CONTROLS. TREES SIX INCHES IN DIAMETER AND LARGER SHALL BE CUT AND LOGS STACKED. SMALLER TREES, BRUSH, & STUMPS SHALL BE CUT AND OR GRUBBED AND WINDROWED IN APPROPRIATE AREAS FOR USE AS SEDIMENT BARRIERS AT WATER DRAINAGE OUTLETS, WINDROWED BELOW THE WELL SITE, USED FOR WILDLIFE HABITAT, BURNED (AS PER WV FOREST FIRE LAWS), REMOVED FROM SITE, OR DISPOSED OF BY OTHER METHODS APPROVED BY DEP.
- 6) CONSTRUCT THE ACCESS ROAD. DITCH RELIEF CULVERTS SHALL BE INSTALLED AT A GRADE OF 1-8% TO MINIMIZE OUTLET VELOCITIES TO THE EXTENT POSSIBLE. INSTALL OUTLET PROTECTION AS SHOWN ON PLANS. STABILIZE THE ROAD WITH STONE AND SIDE SLOPES WITH EROSION CONTROL BLANKETING WHEN SLOPES ARE GREATER THAN 3:1.
- 7) STRIP THE TOPSOIL FROM THE IMPOUNDMENT AREA. ALL STRIPPED TOPSOIL SHALL BE STOCKPILED IN AREAS SHOWN IN THE PLANS AND IMMEDIATELY STABILIZED. ADDITIONAL BMP MEASURE SHALL BE CONSTRUCTED AROUND TOPSOIL STOCKPILES, AS SHOWN.
- 8) GRADE THE IMPOUNDMENT AREA AS SHOWN ON THE PLANS. IMMEDIATELY STABILIZE THE OUTER AREAS OF THE IMPOUNDMENT. THE TURNAROUND AREA SHALL BE STABILIZED WITH STONE AND THE SIDE SLOPES WITH EROSION CONTROL BLANKETS ON ALL SLOPES GREATER THAN 3:1. APPLY SEED AND MULCH TO ALL DISTURBED AREAS. THIS SHALL INCLUDE ALL AREAS THAT WILL NOT BE SUBJECT TO REGULAR TRAFFIC ACTIVITY (TO BE STABILIZED WITH STONE), OR ANY DISTURBED AREA THAT WILL NOT BE RE-DISTURBED BEFORE SITE RECLAMATION BEGINS.
- 9) PRIOR TO THE INSTALLATION OF THE LINER SYSTEM, THE CONTRACTOR SHALL CONTACT THE ENGINEER/SURVEYOR TO COMPLETE AND AS-BUILT SURVEY OF THE CONSTRUCTED IMPOUNDMENT 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.
- 10) INSTALL THE IMPOUNDMENT LINER SYSTEM AND PERIMETER SAFETY FENCE W/GATE AND EMERGENCY LIFE LINE AS SHOWN ON THE PLANS.
- 11) 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 BMP'S AS DEEMED NECESSARY. THESE INSPECTIONS SHALL CONTINUE DURING THE DURATION OF THE PROJECT AND SUBSEQUENT SITE RECLAMATION.
- 12) ONCE THE IMPOUNDMENT HAS BEEN COMPLETED, SUBMIT THE AS-BUILT CERTIFICATION FOR EACH IMPOUNDMENT FACILITY TO THE WVDEP OFFICE OF OIL AND GAS, PRIOR TO PLACING FLUIDS IN EITHER STRUCTURE.
- 13) ONCE DISTURBED AREAS HAVE BEEN RE-VEGETATED AND STABILIZED FOLLOWING RECLAMATION, THE TEMPORARY BMP'S 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 DEFICIENT SHALL BE RE-SEEDING AND MULCHED.

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 SEEDING AND MULCHED, AS NECESSARY. ALTERNATIVELY, THE REMOVED SEDIMENT CAN BE TRANSPORTED TO A SITE WITH AN APPROVED PERMIT.
5. ALL POLLUTION AND EMERGENCY SPILLS SHALL BE IMMEDIATELY REPORTED TO THE WVDEP OFFICE OF OIL AND GAS. (EMERGENCY #1-800-642-3074)

MAINTENANCE PROGRAM

1. BMP'S WILL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH MEASURABLE 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 EACH STRUCTURE.
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. FILTER STRIPS AND/OR SILT FENCE WILL BE MAINTAINED.
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.

CENTRALIZED IMPOUNDMENT CONSTRUCTION STANDARDS

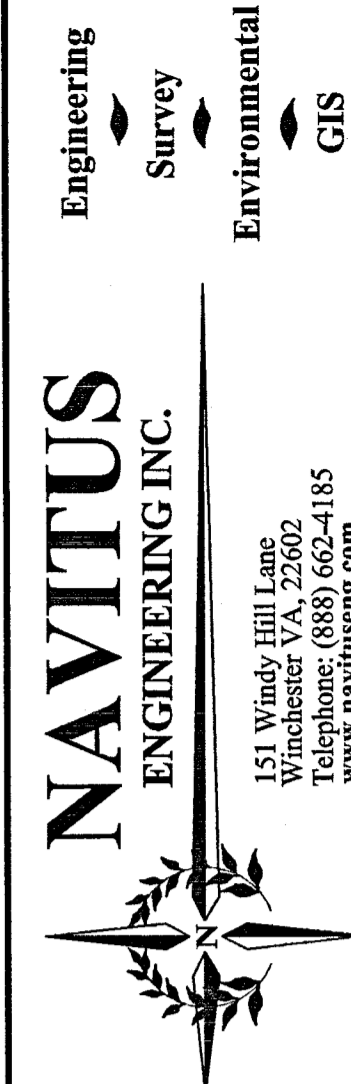
THE DESIGN, CONSTRUCTION, AND REMOVAL OF EMBANKMENTS ASSOCIATED WITH CENTRALIZED IMPOUNDMENTS FOR OIL AND GAS WELLS MUST BE ACCOMPLISHED IN SUCH A MANNER AS TO PROTECT THE HEALTH AND SAFETY OF THE PEOPLE, THE NATURAL RESOURCES, AND ENVIRONMENT OF THE STATE. THE PIT EMBANKMENTS SHALL BE DESIGNED, CONSTRUCTED, AND MAINTAINED TO BE STRUCTURALLY SOUND AND REASONABLY PROTECTED FROM UNAUTHORIZED ACTS OF THIRD PARTIES.

1. THE FOUNDATION FOR A CENTRALIZED 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 THE 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' OF DRAIN AT THE DOWNSTREAM END SHALL BE CONSTRUCTED WITH AASHTO #9 MATERIAL.
3. SOILS FOR EARTHEN EMBANKMENT CONSTRUCTION SHALL BE LIMITED TO TYPES GC, GM, SC, SM, CL, OR ML (ASTM-2487 - UNIFIED SOILS CLASSIFICATION). SOILS MUST CONTAIN A MINIMUM OF 20% OF PLUS NO. 200 SIEVE AND BE "WELL GRADED" MATERIAL WITH NO COBBLES OR BOULDER SIZE MATERIAL MIXED WITH THE 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 12" AND MAXIMUM PARTICLE SIZE LESS THAN 6". ALL FILL SHALL BE COMPACTED TO 95% PER THE STANDARD PROCTOR TEST (ASTM-699).
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 12' IN WIDTH.
7. THE MINIMUM INSIDE 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, SEEDING 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 IMPOUNDMENT CONSTRUCTION. EMBANKMENTS SHALL BE MAINTAINED WITH A GRASSY VEGETATIVE COVER AND FREE OF BRUSH AND/OR TREES.
9. A MINIMUM OF 2' OF FREEBOARD SHALL BE MAINTAINED AT ALL TIMES DURING THE OPERATION OF THE PIT.
10. ALL EMBANKMENT CONSTRUCTION AND COMPACTION TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CENTRALIZED IMPOUNDMENT LINER SYSTEM NOTES

THE DESIGNED IMPOUNDMENT FACILITY SHALL BE FULLY LINED WITH A GEOSYNTHETIC LINER SYSTEM. LINERS SHALL BE INSTALLED IN ACCORDANCE TO MANUFACTURER'S SPECIFICATIONS.

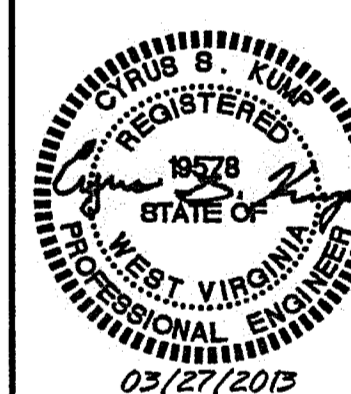
1. THE SUB-BASE SHALL BEAR THE WEIGHT OF THE LINER SYSTEM, WATER, AND EQUIPMENT OPERATING ON THE PIT WITHOUT CAUSING OR ALLOWING A FAILURE OF THE LINER SYSTEM.
2. THE SUB-BASE SHALL BE COMPACTED TO ACCOMMODATE POTENTIAL SETTLEMENT WITHOUT DAMAGE TO THE LINER SYSTEM.
3. THE UPPER 6" OF THE SUB-BASE SHALL 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 IMPOUNDMENT AREA SHALL BE DRAINED AND COMPLETELY DRY PRIOR TO THE PLACEMENT OF THE PRIMARY LINER. THE PRIMARY LINER SHALL MEET ALL WV DEP 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 IMPOUNDMENT.
8. AN ANCHOR TRENCH SHALL BE EXCAVATED COMPLETELY AROUND THE PERIMETER OF THE 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 (6" INCREMENTS) ON THE LINER SYSTEM TO IDENTIFY THE WATER SURFACE ELEVATION.



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THIS DOCUMENT WAS PREPARED BY:
NAVITUS ENGINEERING INC.
FOR: EQT PRODUCTION COMPANY

NOTES
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012

SCALE: N/A

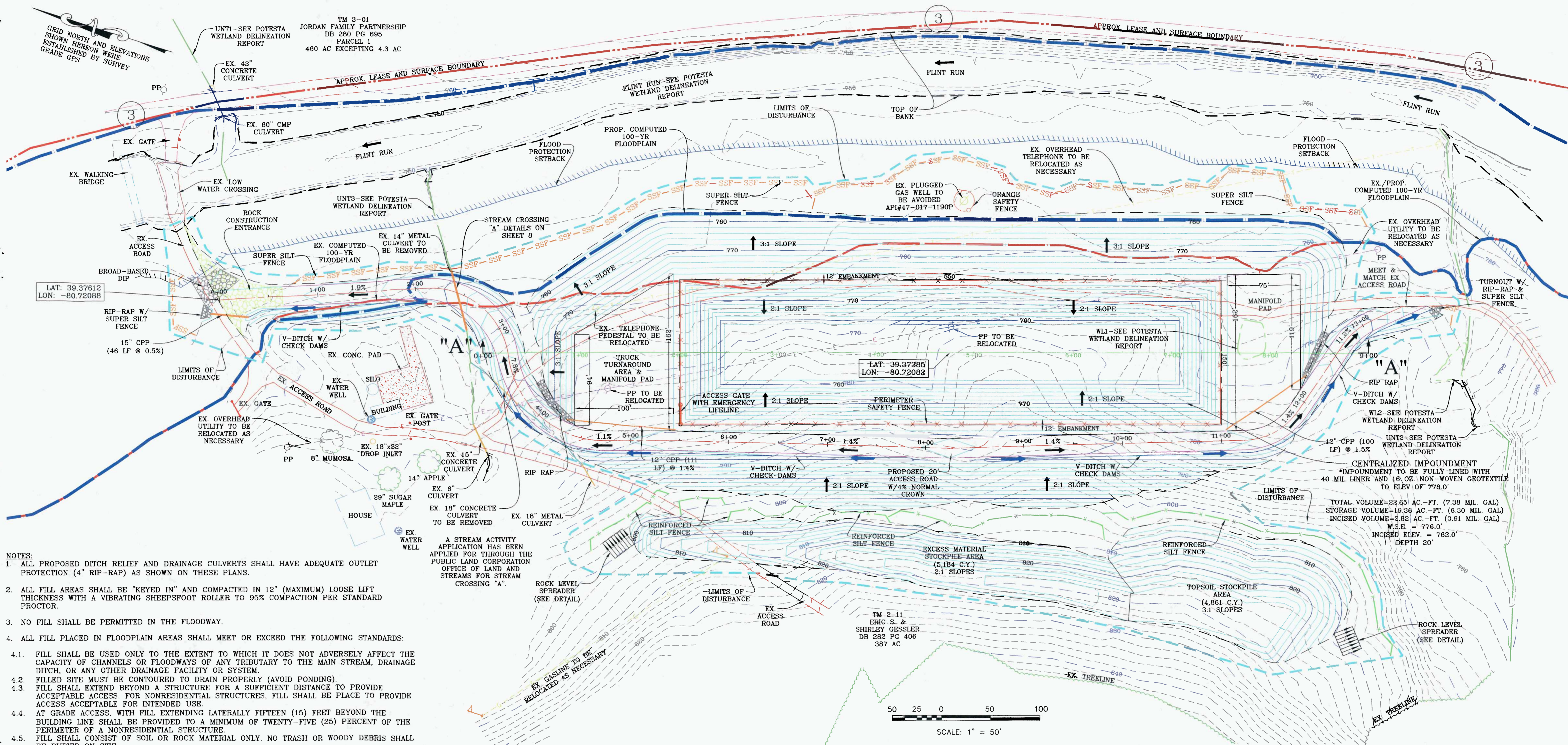
DESIGNED BY: TVF/DEM

FILE NO. 7838

SHEET 2 OF 13

REV. 03/27/2013

CENTRALIZED IMPOUNDMENT DETAILS



- NOTES:**
1. ALL PROPOSED DITCH RELIEF AND DRAINAGE CULVERTS SHALL HAVE ADEQUATE OUTLET PROTECTION (4" RIP-RAP) AS SHOWN ON THESE PLANS.
 2. ALL FILL AREAS SHALL BE "KEYED IN" AND COMPACTED IN 12" (MAXIMUM) LOOSE LIFT THICKNESS WITH A VIBRATING SHEEPSFOOT ROLLER TO 95% COMPACTION PER STANDARD PROCTOR.
 3. NO FILL SHALL BE PERMITTED IN THE FLOODWAY.
 4. ALL FILL PLACED IN FLOODPLAIN AREAS SHALL MEET OR EXCEED THE FOLLOWING STANDARDS:
 - 4.1. FILL SHALL BE USED ONLY TO THE EXTENT TO WHICH IT DOES NOT ADVERSELY AFFECT THE CAPACITY OF CHANNELS OR FLOODWAYS OF ANY TRIBUTARY TO THE MAIN STREAM, DRAINAGE DITCH, OR ANY OTHER DRAINAGE FACILITY OR SYSTEM.
 - 4.2. FILLED SITE MUST BE CONTOURED TO DRAIN PROPERLY (AVOID PONDING).
 - 4.3. FILL SHALL EXTEND BEYOND A STRUCTURE FOR A SUFFICIENT DISTANCE TO PROVIDE ACCEPTABLE ACCESS. FOR NONRESIDENTIAL STRUCTURES, FILL SHALL BE PLACED TO PROVIDE ACCESS ACCEPTABLE FOR INTENDED USE.
 - 4.4. AT GRADE ACCESS, WITH FILL EXTENDING LATERALLY FIFTEEN (15) FEET BEYOND THE BUILDING LINE SHALL BE PROVIDED TO A MINIMUM OF TWENTY-FIVE (25) PERCENT OF THE PERIMETER OF A NONRESIDENTIAL STRUCTURE.
 - 4.5. FILL SHALL CONSIST OF SOIL OR ROCK MATERIAL ONLY. NO TRASH OR WOODY DEBRIS SHALL BE BURIED ON SITE.
 - 4.6. FILL MATERIAL SHALL BE COMPACTED TO PROVIDE THE NECESSARY STABILITY AND RESISTANCE TO EROSION, SCOURING, OR SETTLING. FILL COMPACTION STANDARDS MUST BE APPROPRIATE TO PROPOSED POST FILL USE, PARTICULAR ATTENTION IS NECESSARY WHEN FILL IS BEING USED TO ELEVATE A STRUCTURE.
 - 4.7. FILL SLOPES SHALL BE NO STEEPER THAN (1) VERTICAL ON TWO (2) HORIZONTAL, UNLESS SUBSTANTIATING DATA JUSTIFYING STEEPER SLOPES ARE SUBMITTED TO AND APPROVED BY THE FLOODPLAIN ADMINISTRATOR.
 - 4.8. FILL SITE AND FILL MUST BE PROTECTED FROM EROSION. EROSION CONTROL BLANKETS OR OTHER ARMORING MATERIALS SHALL BE USED ALONG ALL EMBANKMENTS LOCATED BELOW THE 100-YR FLOODPLAIN.
 5. ALL STORAGE TANKS LOCATED AT OR BELOW THE BASE FLOOD ELEVATION SHALL BE FIRMLY ANCHORED TO RESIST FLOTATION.
 6. NO MATERIALS THAT ARE BUOYANT, FLAMMABLE, EXPLOSIVE, OR IN TIMES OF FLOODING COULD BE INJURIOUS TO HUMAN, ANIMAL, OR PLANT LIFE, SHALL BE STORED BELOW BASE FLOOD ELEVATION.
 7. ALL EXISTING CULVERTS WITHIN LIMITS OF DISTURBANCE SHALL BE REMOVED UNLESS OTHERWISE NOTED.
- FLOODPLAIN ADMINISTRATION NOTES:**
1. ALL APPLICANTS PLACING FILL IN A MAPPED FLOOD HAZARD AREA MUST OBTAIN A CONDITIONAL LETTER OF MAP REVISION (LOMR) FROM FEMA WHEN DIRECTED TO DO SO BY THE FLOODPLAIN ADMINISTRATOR BEFORE A PERMIT CAN BE ISSUED. AFTER FILL IS FINISHED THE APPLICANT MUST CONVERT THE LOMR TO A LETTER OF MAP REVISION BASED ON FILL (LOMR-F) BEFORE A CERTIFICATION OR COMPLIANCE CAN BE ISSUED.
 2. THE APPLICANT MUST SUBMIT ANY MAPS, COMPUTATIONS, OR OTHER MATERIAL REQUIRED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) TO REVISE THE FLOOD INSURANCE STUDY AND/OR FLOOD INSURANCE RATE MAPS, WHEN NOTIFIED BY THE FLOODPLAIN ADMINISTRATOR, AND MUST PAY ANY FEES OR OTHER COSTS ASSESSED BY FEMA FOR THIS PURPOSE.

Elevation	Barrels	Gallons	Acre-Ft
758	0	0.0	0.00000
759	4885	205175.6	0.62966
760	10174	427305.2	1.31135
761	15842	665356.0	2.04190
762 (Incised)	21894	919562.4	2.82203
763	28337	1190169.0	3.65249
764	35176	1477410.3	4.53400
765	42417	1781527.4	5.46730
766	50066	2102758.2	6.45312
767	58127	2441347.2	7.49221
768	66608	2797528.8	8.58529
769	75513	3171544.3	9.73310
770	84848	3563631.6	10.93637
771	94620	3974034.9	12.19585
772	104833	4402988.9	13.51226
773	115494	4850734.8	14.88634
774	126607	5317510.5	16.31882
775	138177	5803426.6	17.81004
776 (Storage)	150217	6309112.1	19.36193
777	162724	6834413.9	20.97402
778 (Top)	175734	7380811.4	22.65085

Proposed Impoundment and Turnaround Area(s)

Topsail Removal: 87,871.5 C.F., 3,254.5 C.Y.
 Total cut: 906,379.2 C.F., 33,569.6 C.Y. (Cut/Swell=1)
 Total fill: 1,006,830.0 C.F., 37,290.0 C.Y. (Fill/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 33.33%, slope ratio: 3:1
 Interior slope percent grade: 50.00%, slope ratio: 2:1
 Top of dam elevation: 778.0'
 Bottom of impoundment elevation: 758.0'
 Top of dam width: 12.0'
 Turnaround area gravel (6" depth): 12,204.0 C.F., 452.0 C.Y.

Proposed Access Road

Topsail Removal: 34,403.4 C.F., 1,274.2 C.Y.
 Total cut: 296,306.1 C.F., 10,974.3 C.Y. (Cut/Swell=1)
 Total fill: 46,161.9 C.F., 1,709.7 C.Y. (Fill/Shrink=1)
 Cut slope percent grade: 50.00%, slope ratio: 2:1
 Fill slope percent grade: 50.00%, slope ratio: 2:1
 Gravel (6" depth): 14,274.9 C.F., 528.7 C.Y.

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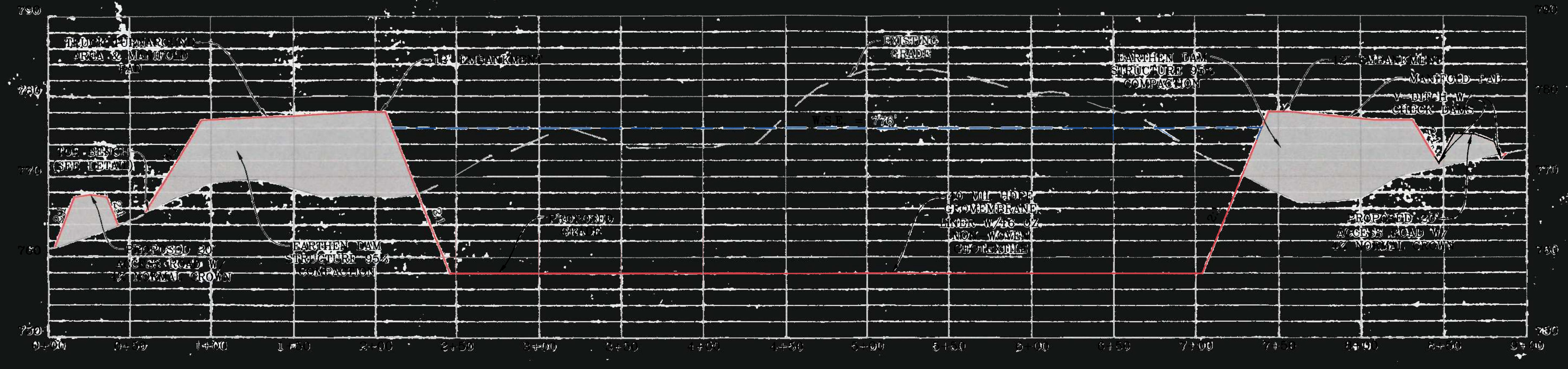
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CENTRALIZED IMPOUNDMENT DETAILS
GESSLER
 CENTRALIZED IMPOUNDMENT
 GRANT DISTRICT
 DODDRIDGE COUNTY, WV

DATE: 11/20/2012
 SCALE: 1" = 50'
 DESIGNED BY: TVF/DEM
 FILE NO. 7838
 SHEET 3 OF 13
 REV. 03/27/2013

CENTRALIZED IMPOUNDMENT SECTIONS

NOTE:
 1. ALL FILL AREAS SHALL BE CONFINED
 2. ALL CONSTRUCTION SHALL BE ACCORDING TO
 3. ALL CONSTRUCTION SHALL BE ACCORDING TO
 4. ALL CONSTRUCTION SHALL BE ACCORDING TO
 5. ALL CONSTRUCTION SHALL BE ACCORDING TO



CENTRALIZED IMPOUNDMENT CROSS-SECTION (A-A)
 DATE: 08/12/2010

Engineering
 Survey
 Planning
 GIS

NAVITUS
 ENGINEERING

111 West 20th Ave.
 Columbus, GA 31907
 Telephone: (706) 321-1111
 Fax: (706) 321-1112

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 Telephone: (706) 321-1111
 Fax: (706) 321-1112

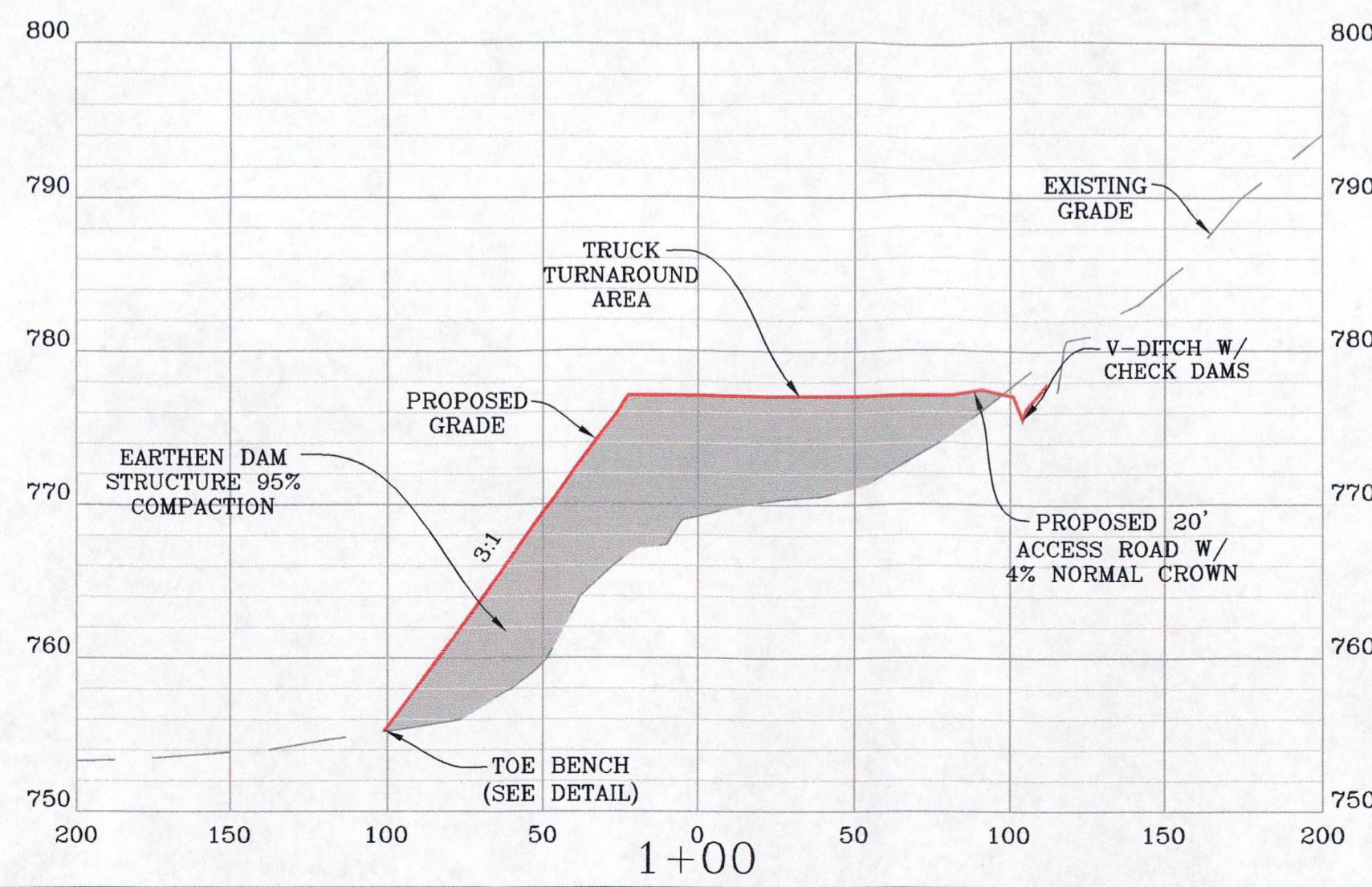
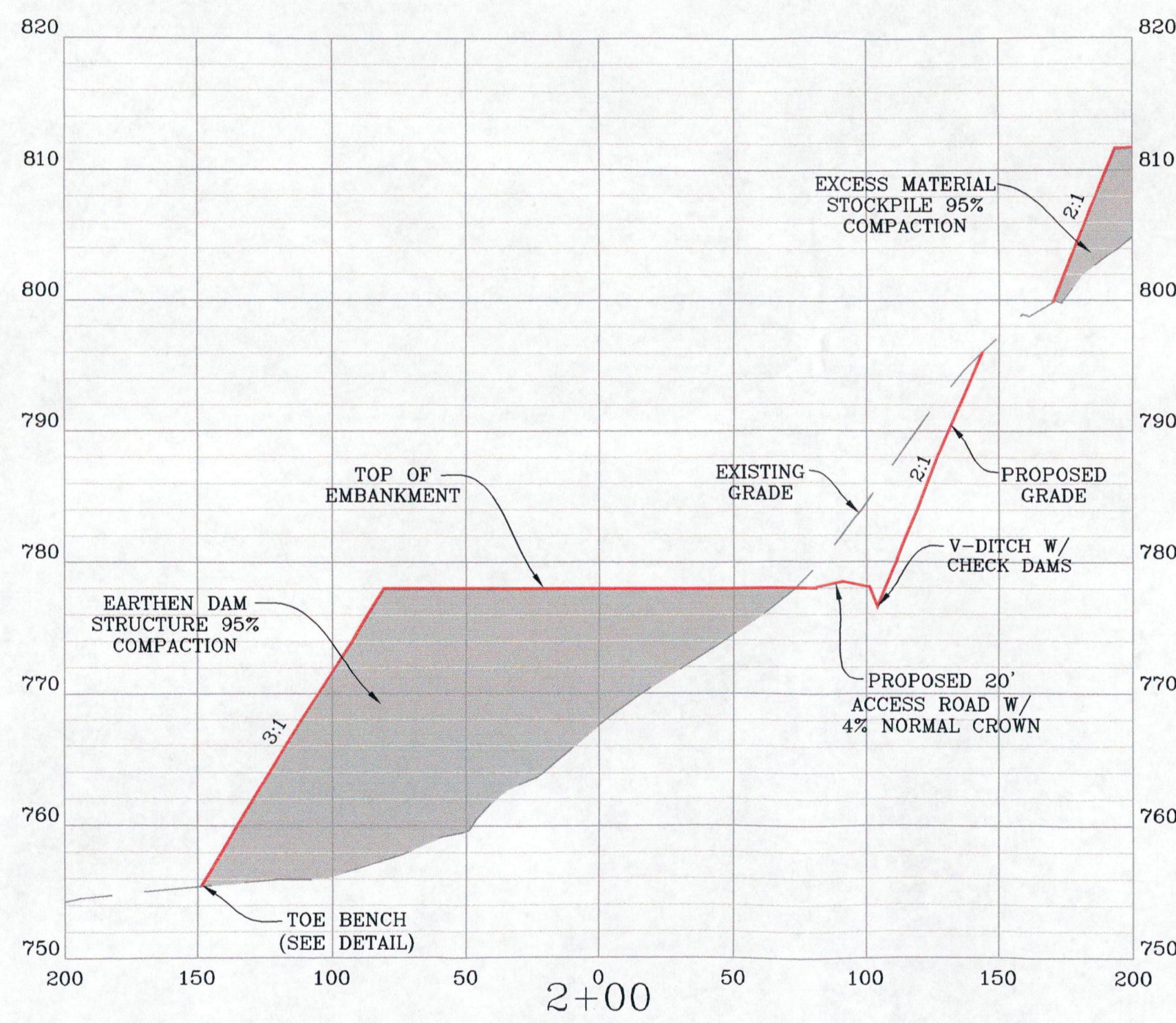
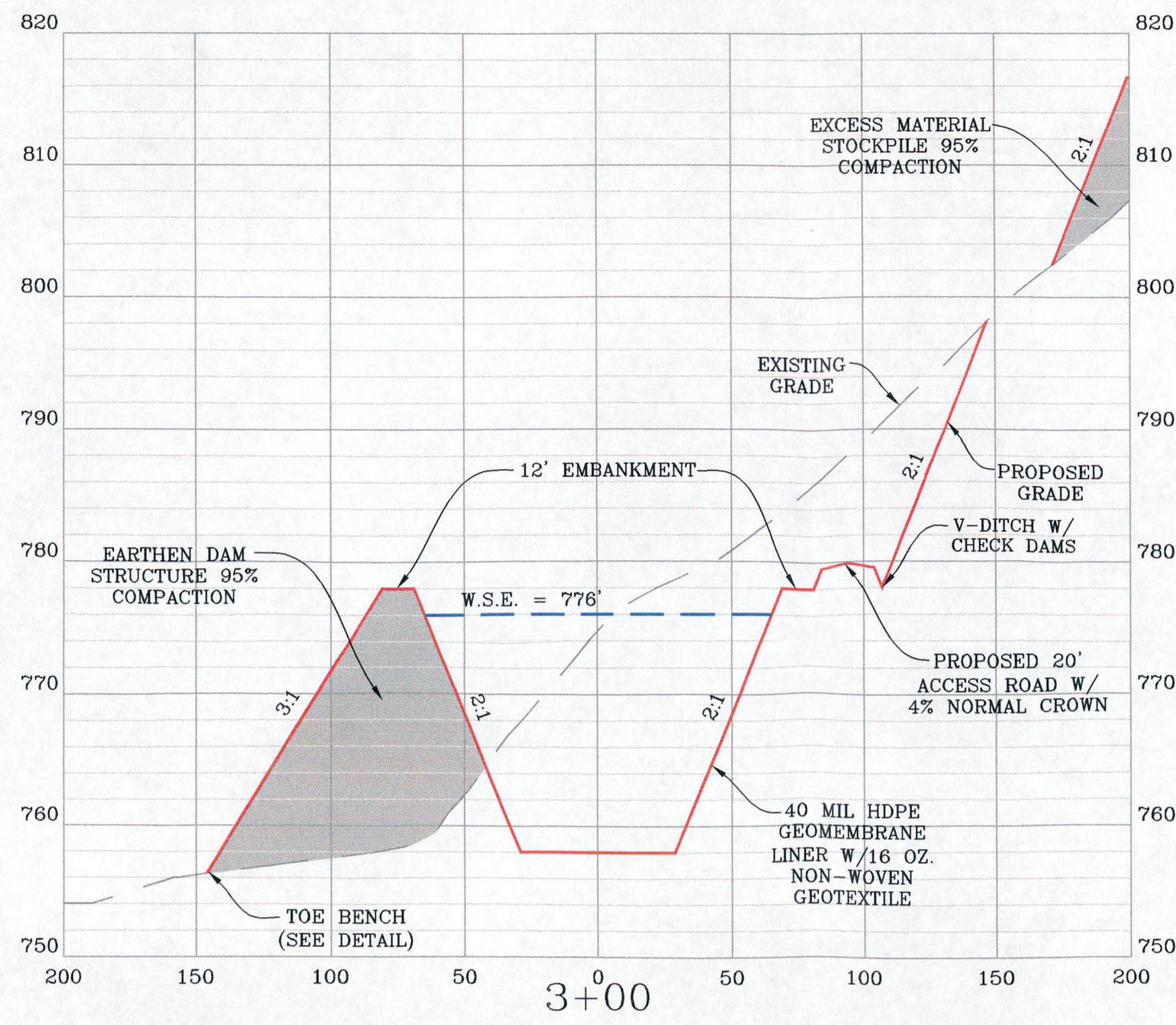


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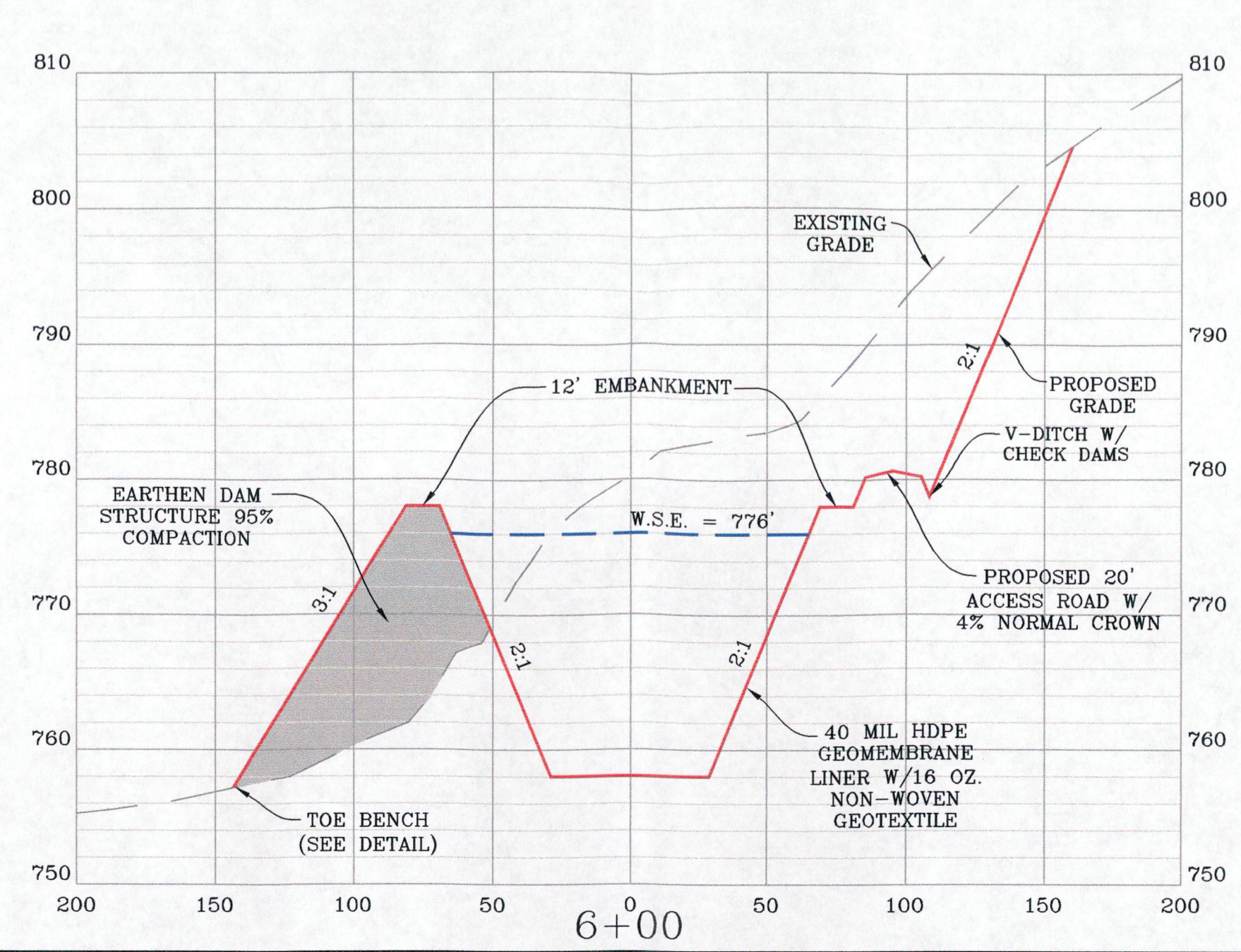
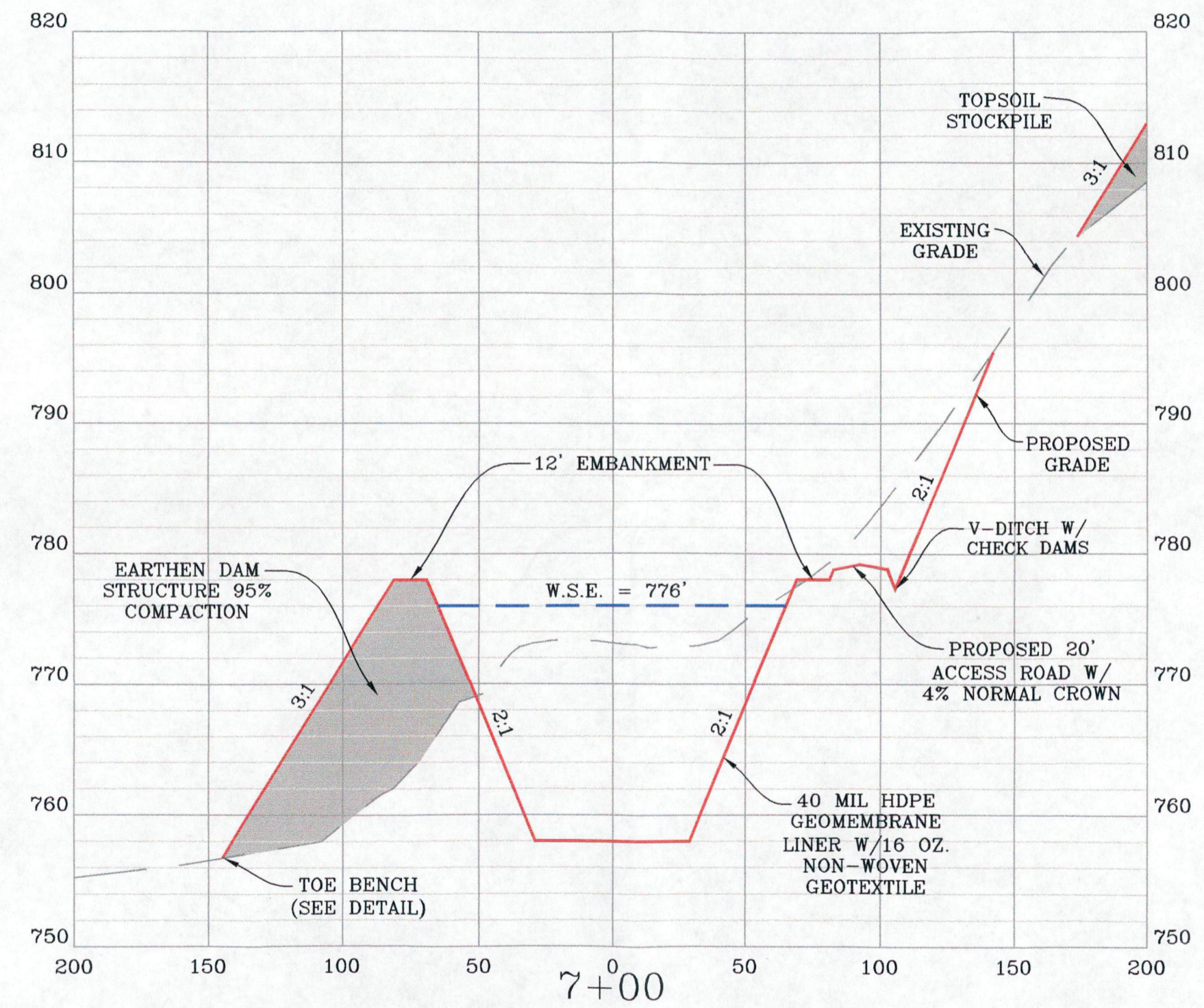
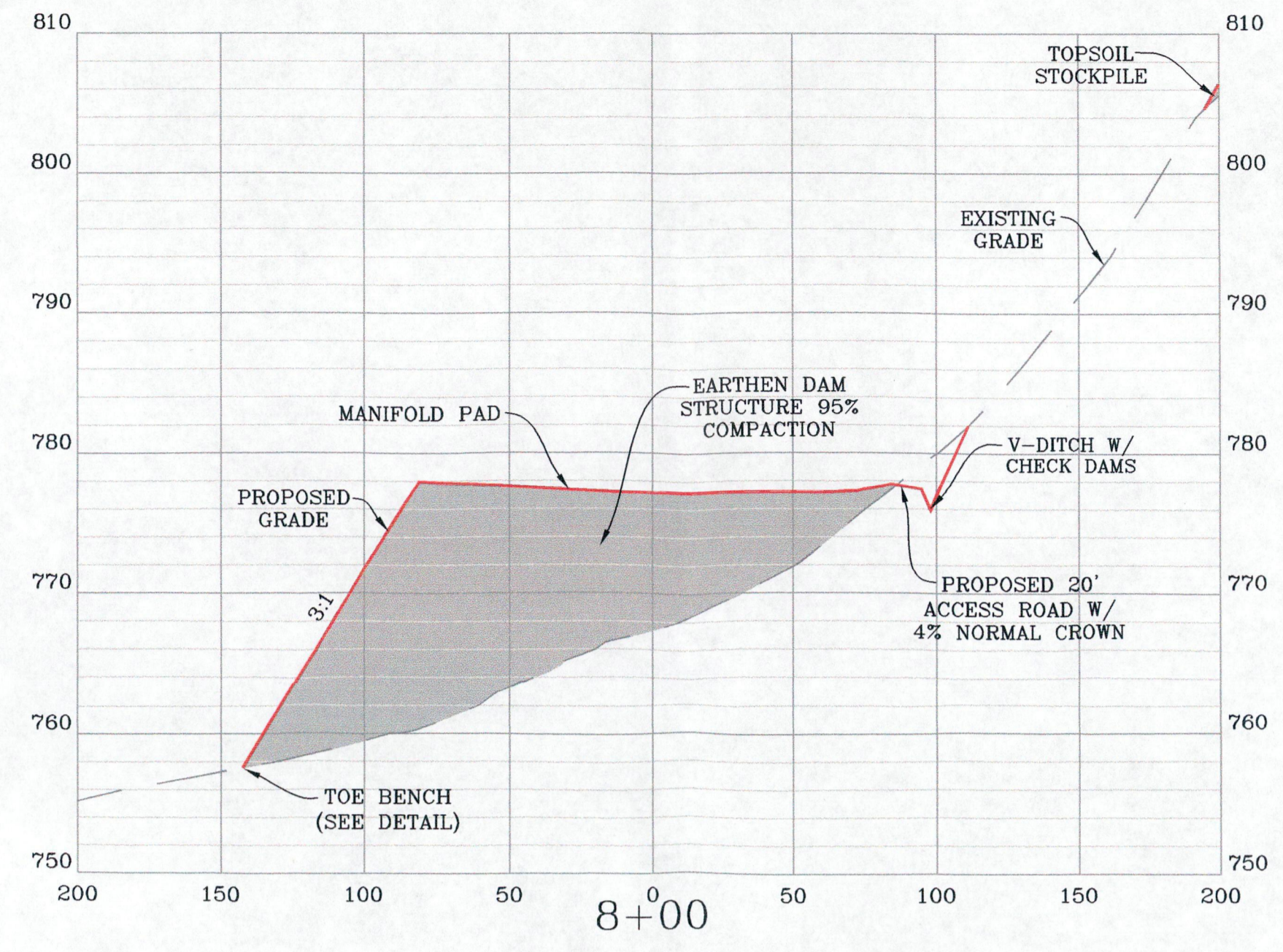
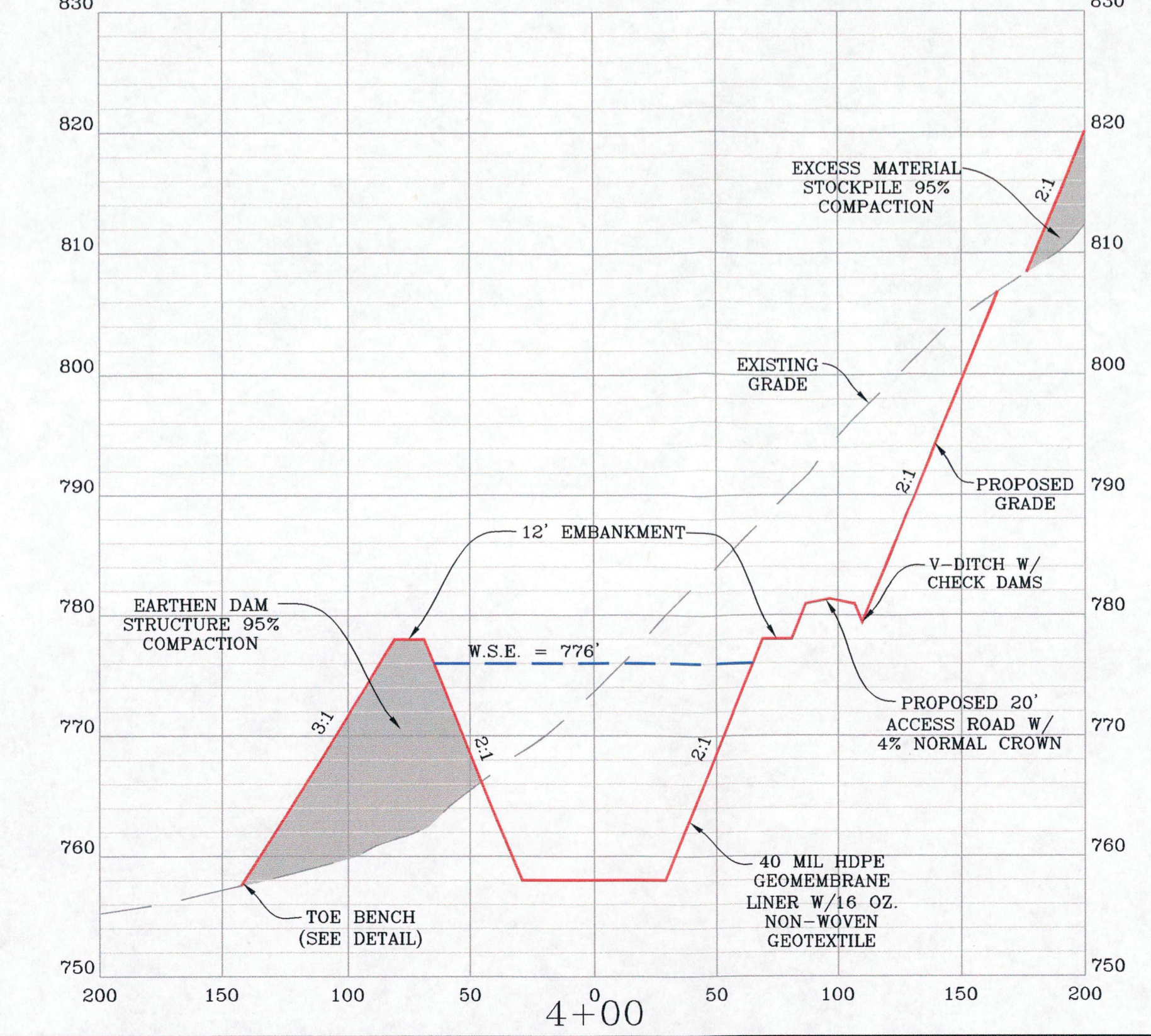
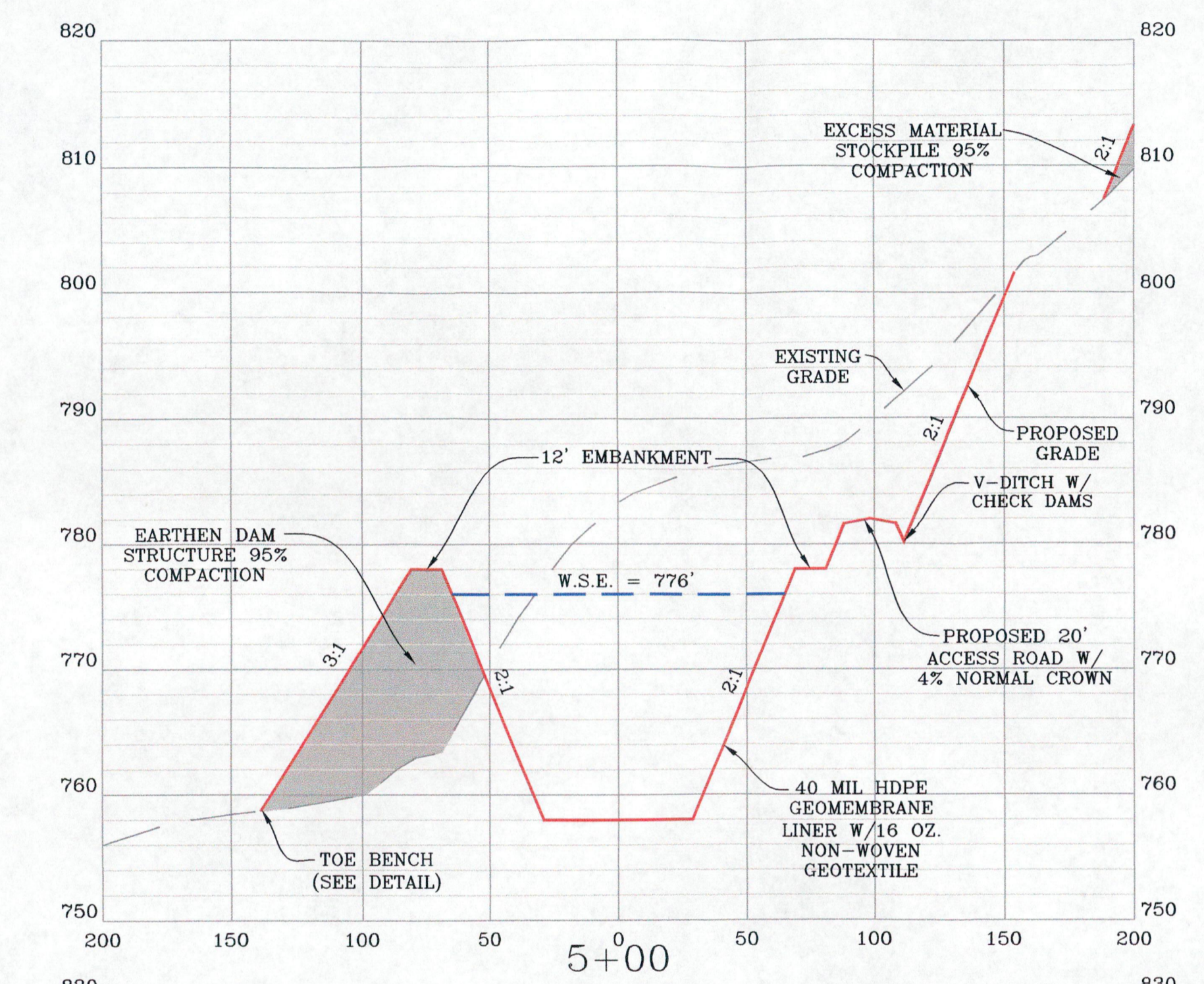
DATE: 08/12/2010
 SCALE: AS SHOWN
 DRAWN BY: JAY / JAY
 CHECKED BY: JAY / JAY
 DATE: 08/12/2010

CENTRALIZED IMPOUNDMENT SECTIONS



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.

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



Engineering Survey Environmental GIS

NAVITUS ENGINEERING INC.

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SLS SMITH LAND SURVEYING, INC.

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 Glenville, WV 26031

PH: (304) 462-5834
 FAX: (304) 462-5856
 E-MAIL: sls@slssurveys.com



THIS DOCUMENT WAS PREPARED BY NAVITUS ENGINEERING INC. FOR: EQT PRODUCTION COMPANY

CENTRALIZED IMPOUNDMENT SECTIONS

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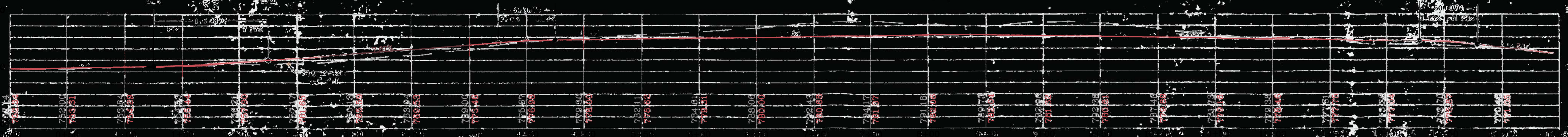
CENTRALIZED IMPOUNDMENT
 GRANT DISTRICT
 DODDRIDGE COUNTY, WV

DATE:	11/20/2012
SCALE:	AS SHOWN
DESIGNED BY:	TVF/DEM
FILE NO.	7838
SHEET	5 OF 13
REV.	03/27/2013

ACCESS ROAD PROFILE AND SECTIONS

ACCESS ROAD PROFILE

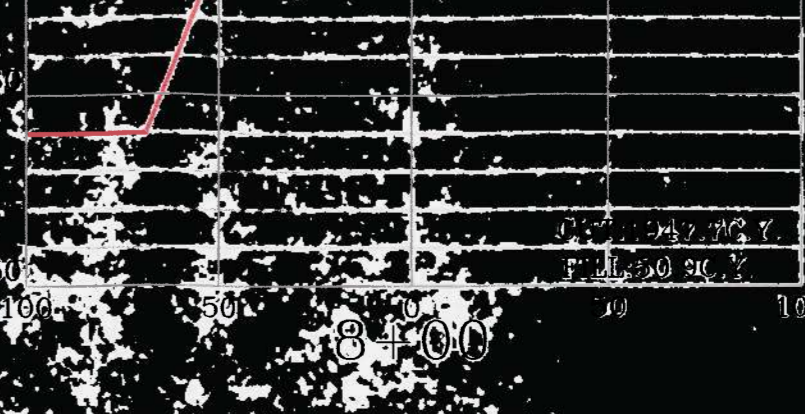
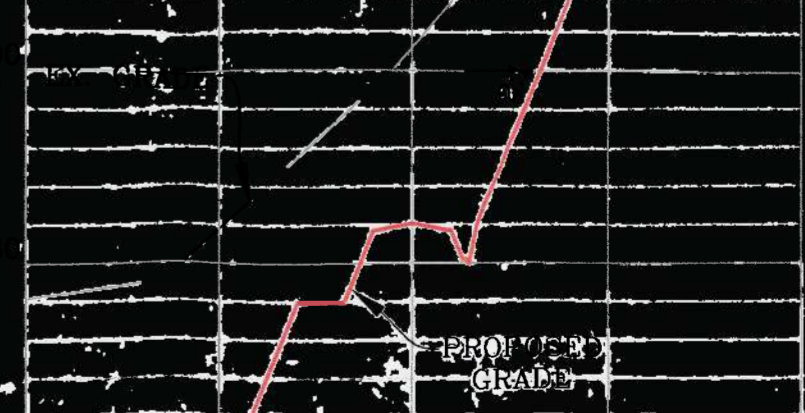
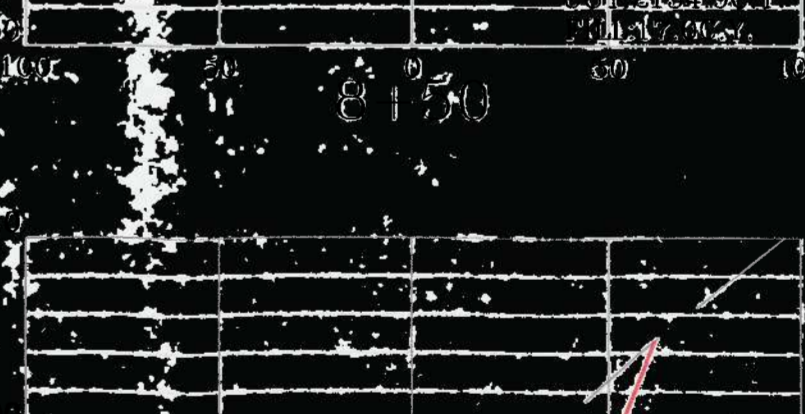
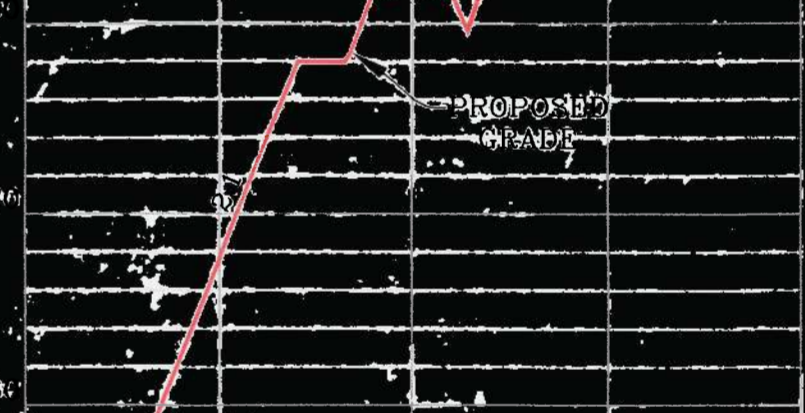
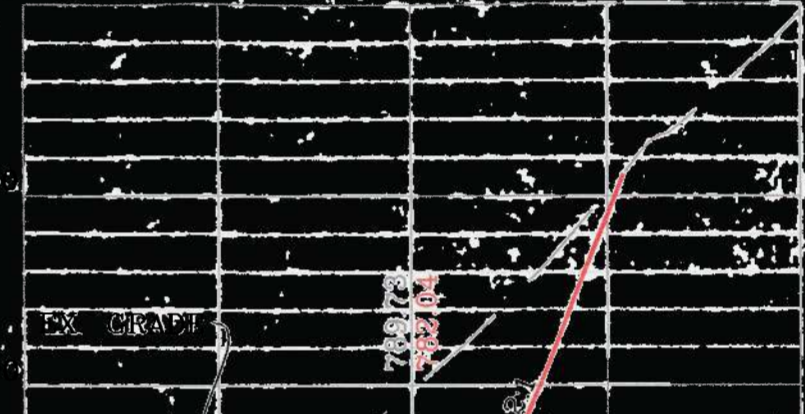
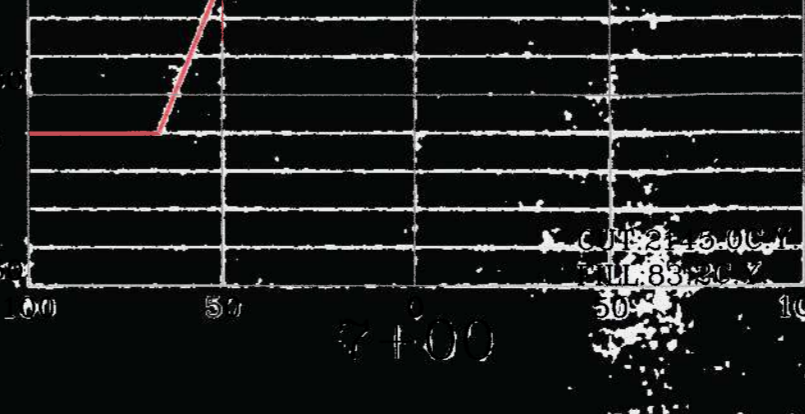
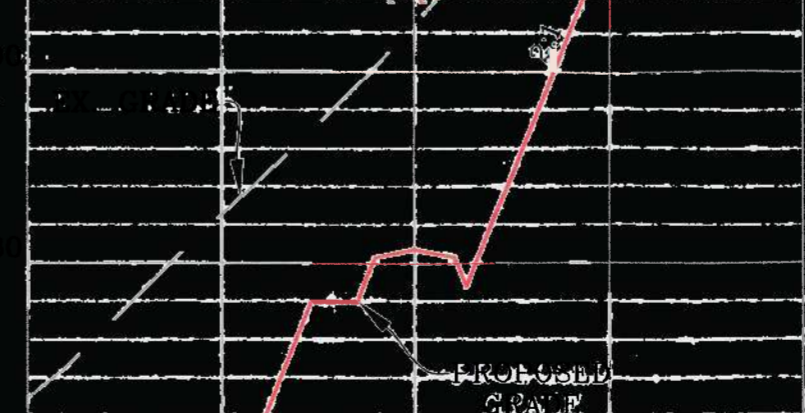
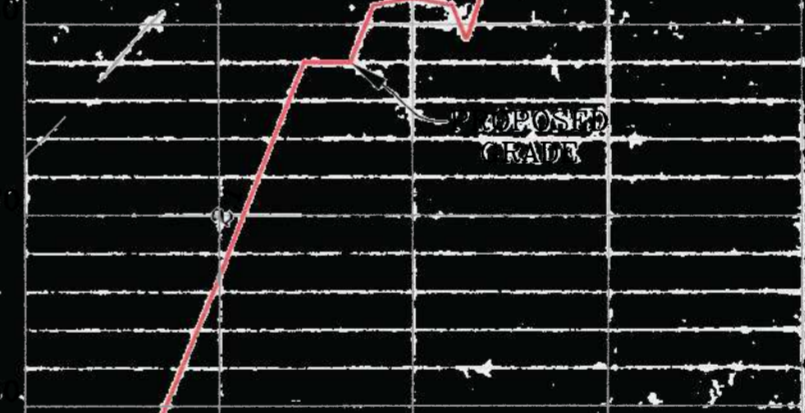
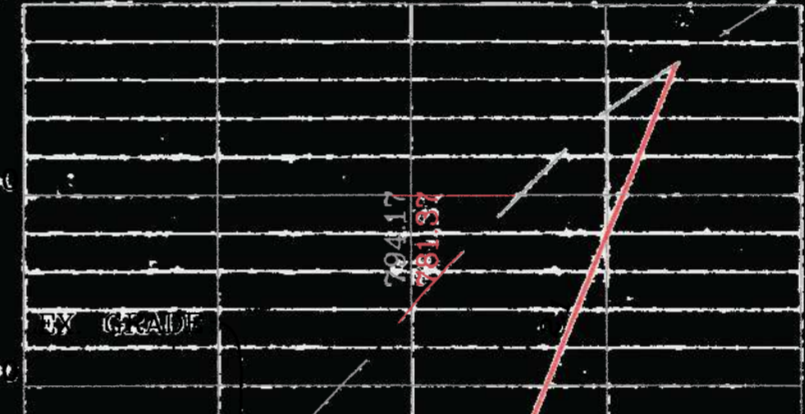
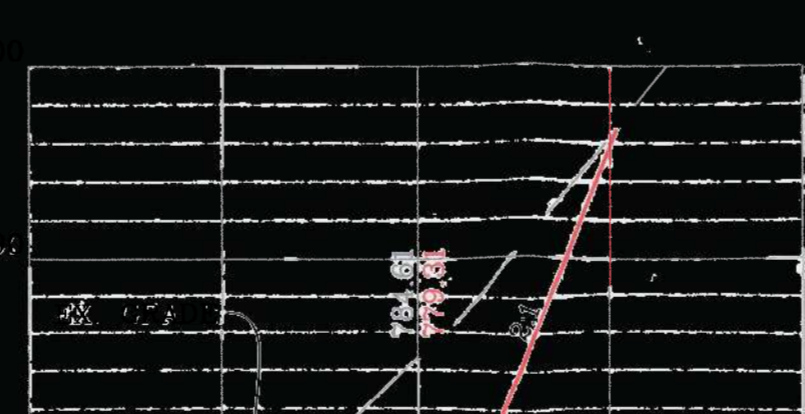
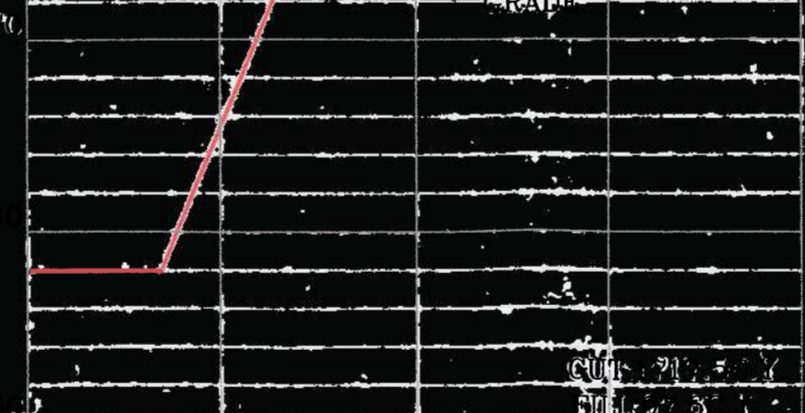
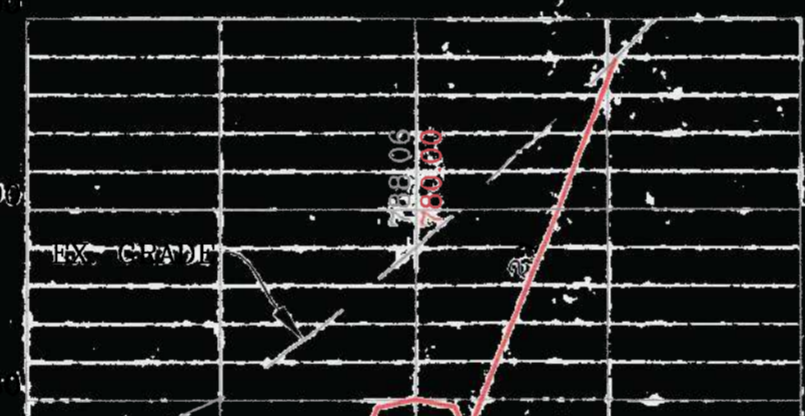
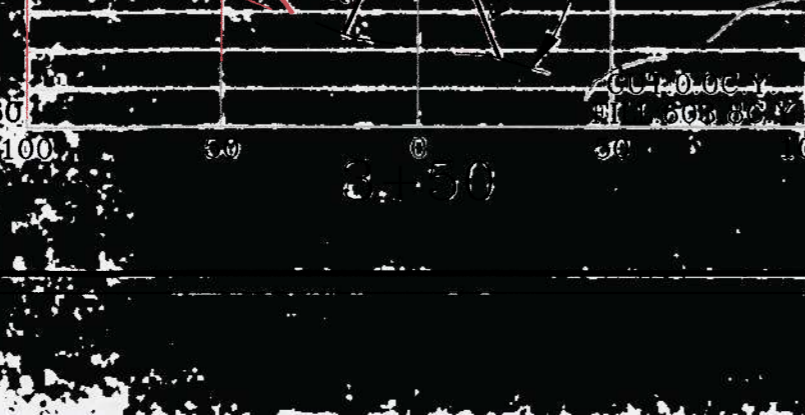
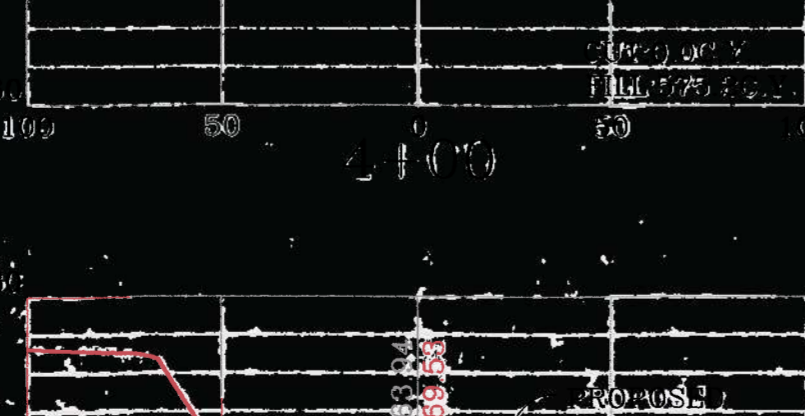
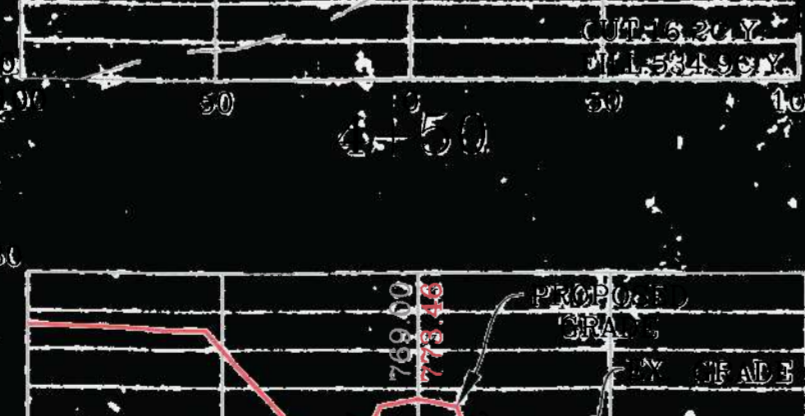
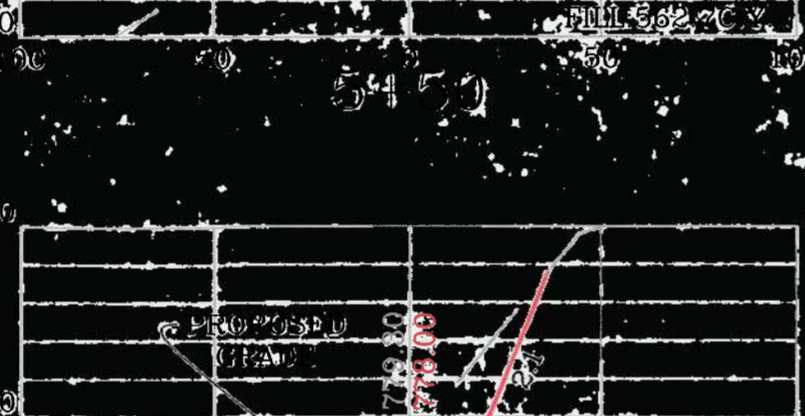
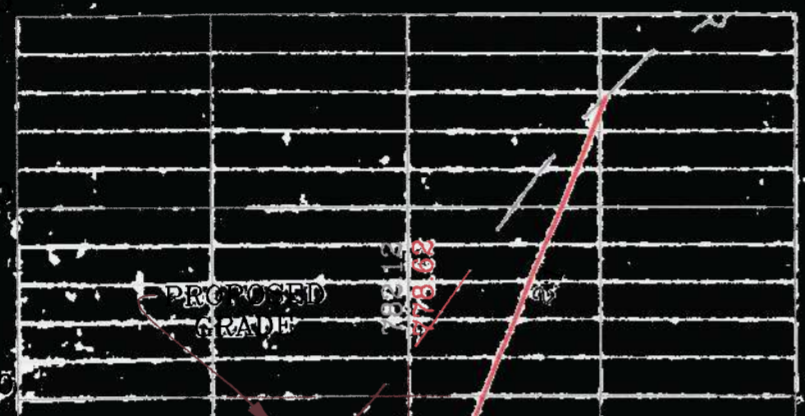
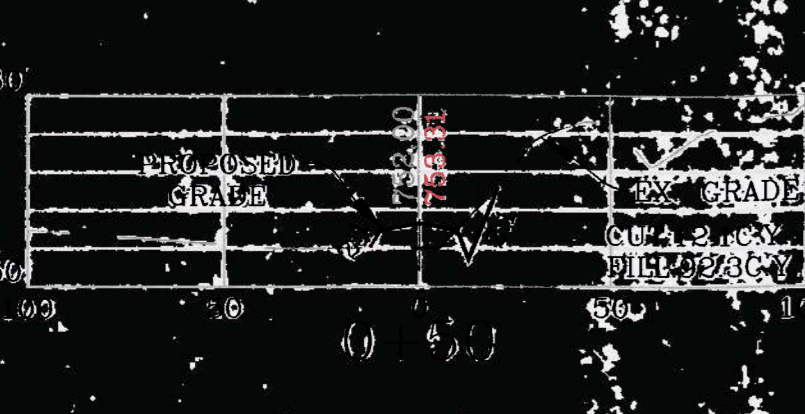
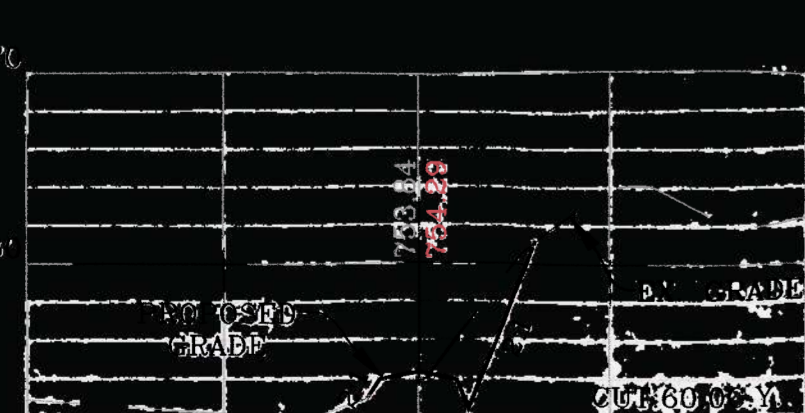
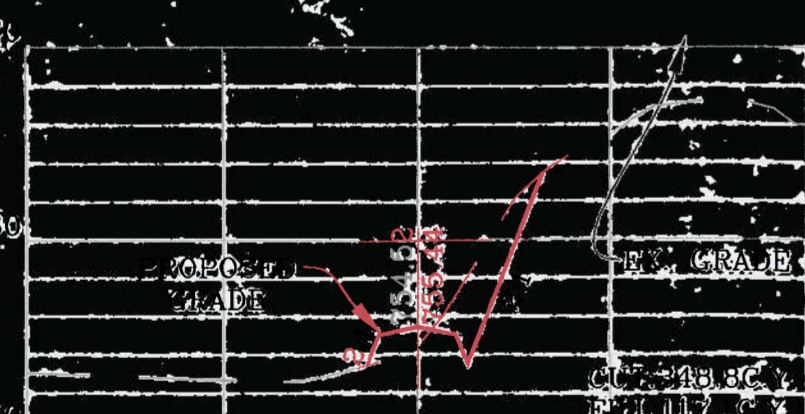
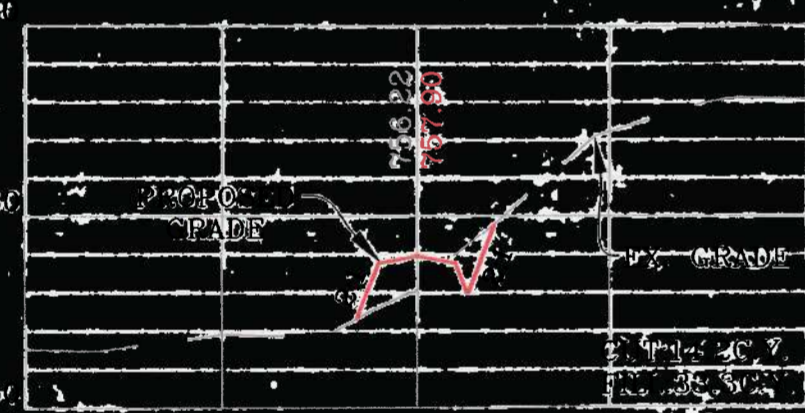
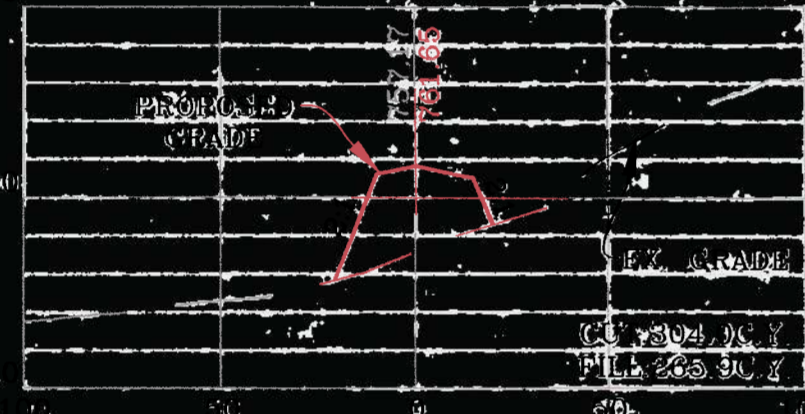
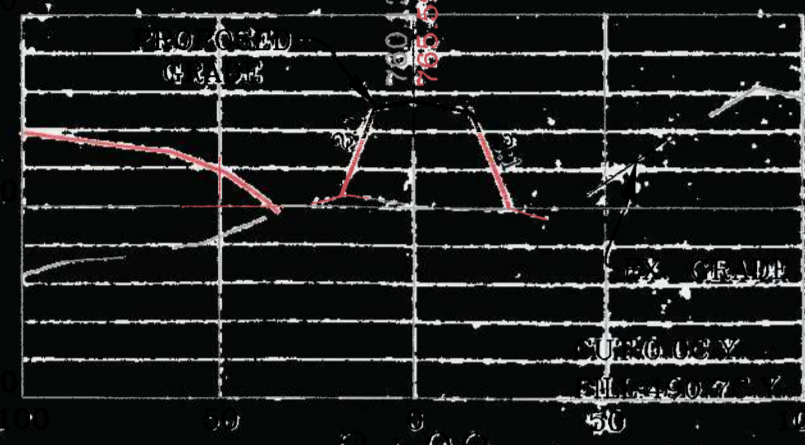
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'



10' 11" 12' 13' 14' 15' 16' 17' 18' 19' 20' 21' 22' 23' 24' 25' 26' 27' 28' 29' 30' 31' 32' 33' 34' 35' 36' 37' 38' 39' 40' 41' 42' 43' 44' 45' 46' 47' 48' 49' 50' 51' 52' 53' 54' 55' 56' 57' 58' 59' 60' 61' 62' 63' 64' 65' 66' 67' 68' 69' 70' 71' 72' 73' 74' 75' 76' 77' 78' 79' 80' 81' 82' 83' 84' 85' 86' 87' 88' 89' 90' 91' 92' 93' 94' 95' 96' 97' 98' 99' 100'

ACCESS ROAD CROSS SECTIONS

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



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AND SURVEYORS OF THE STATE OF COLORADO

REGISTERED PROFESSIONAL ENGINEER
No. 10000

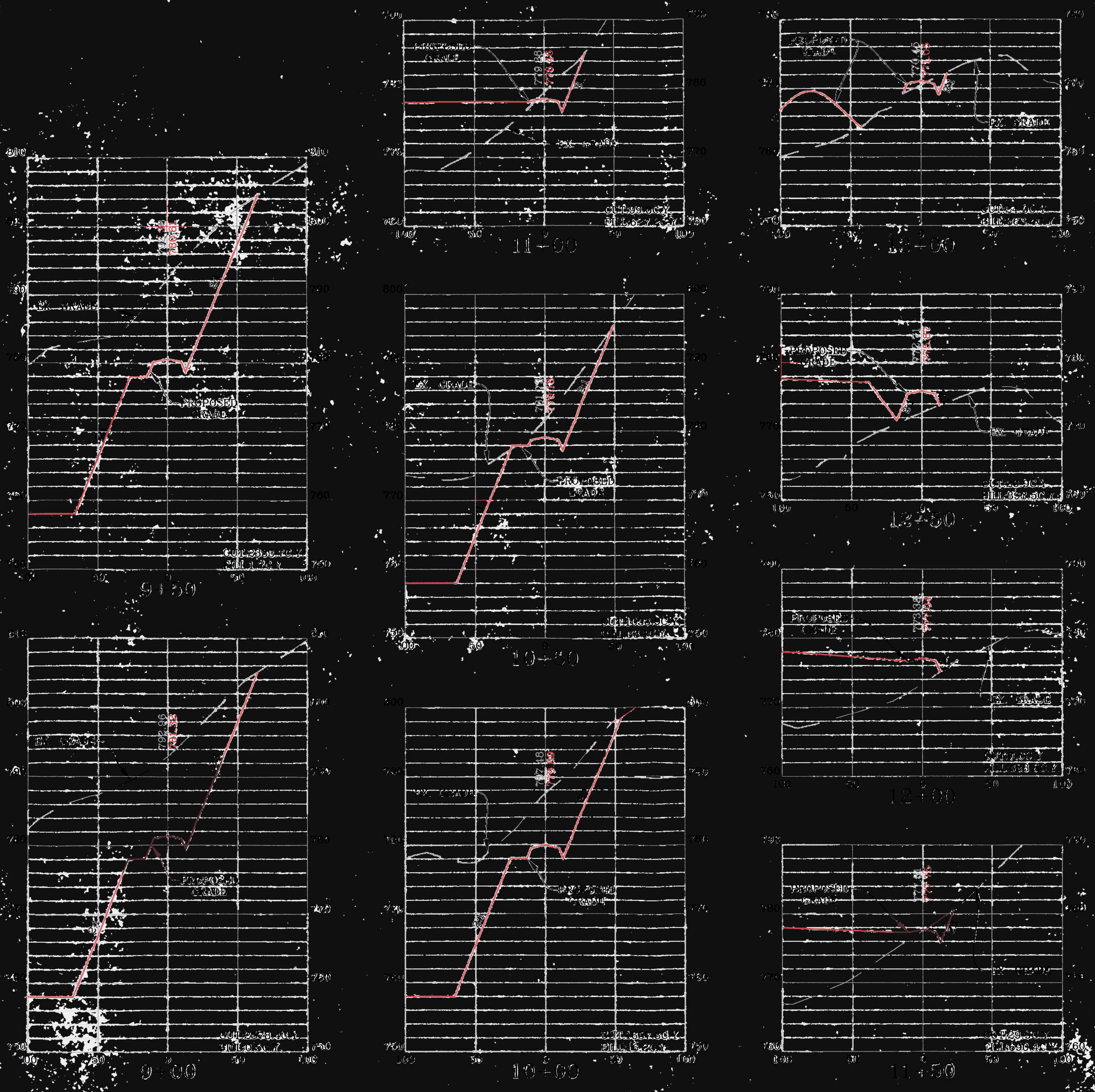
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Denver, CO 80202
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Fax: (303) 751-1112
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ACCESS ROAD SECTIONS

ACCESS ROAD CROSS SECTIONS
 DATE: 11/27/2015

NOTE:
 ALL ELEVATIONS ARE IN FEET
 UNLESS OTHERWISE SPECIFIED



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 1100 W. 10th Ave
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 (405) 521-1100
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 (405) 521-1100
 www.fisurveying.com



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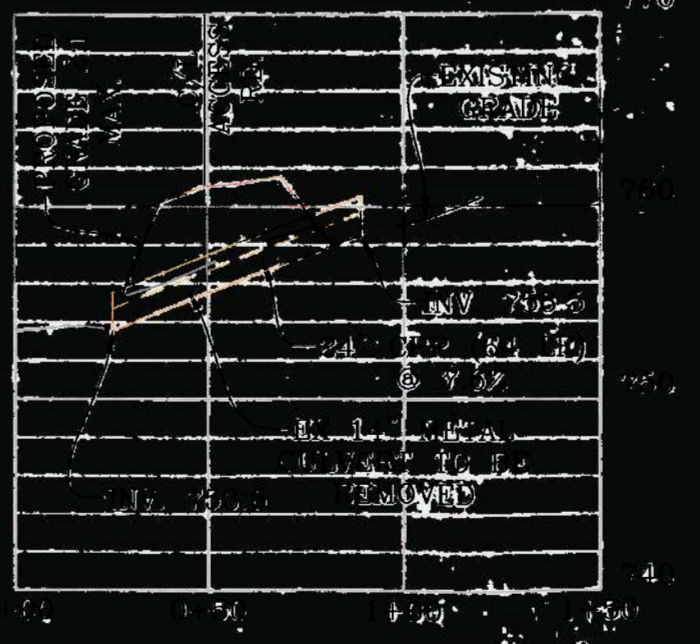
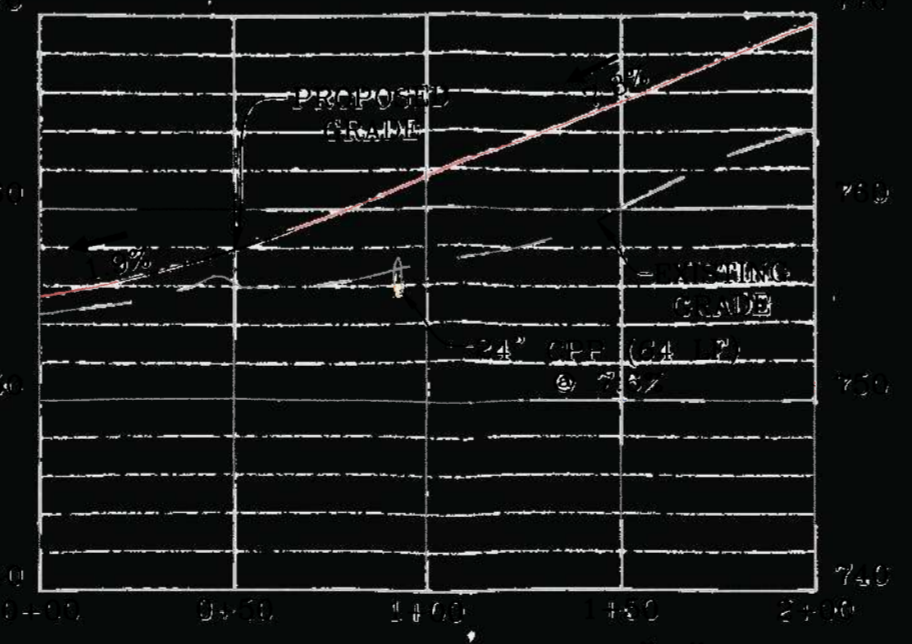
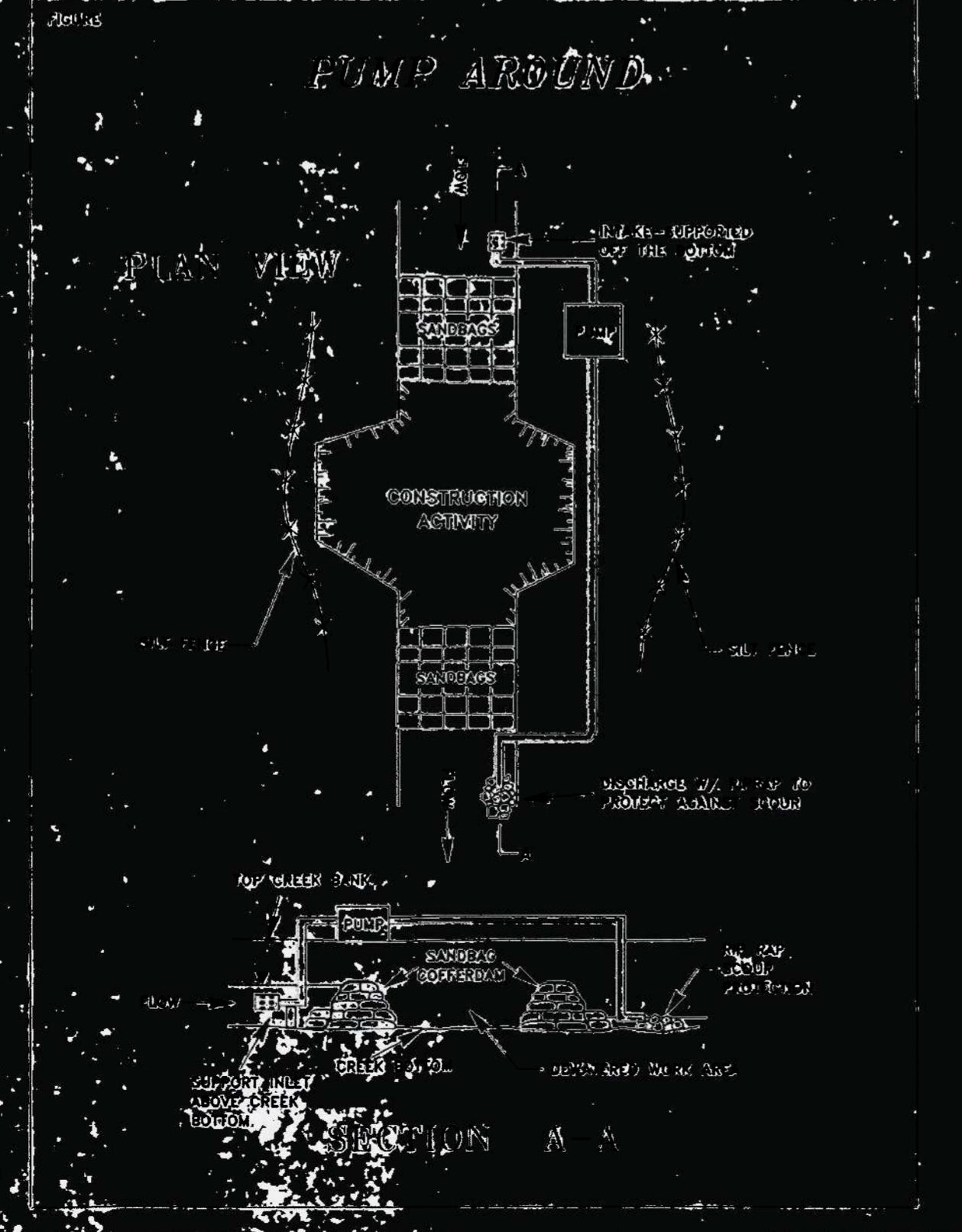
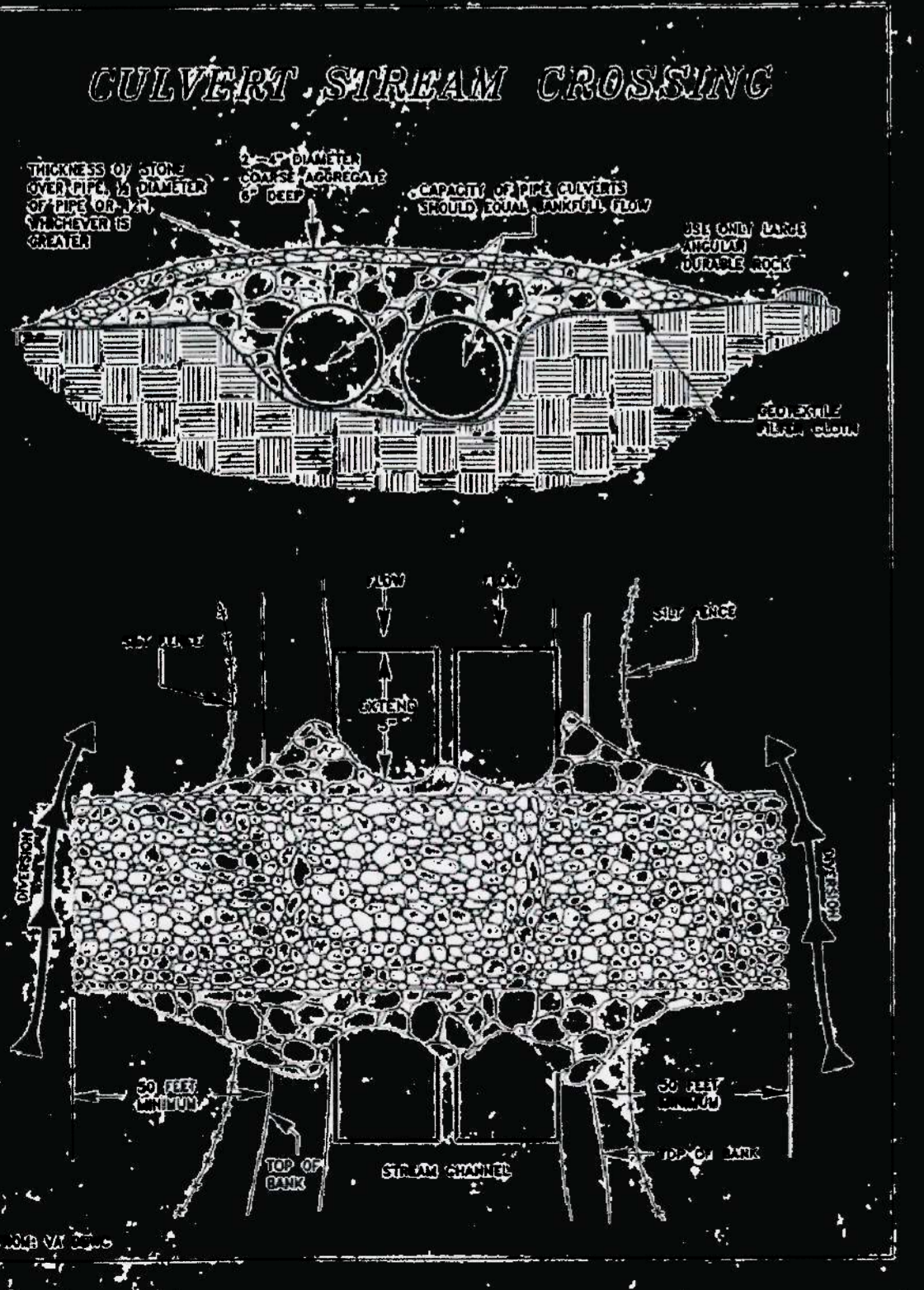
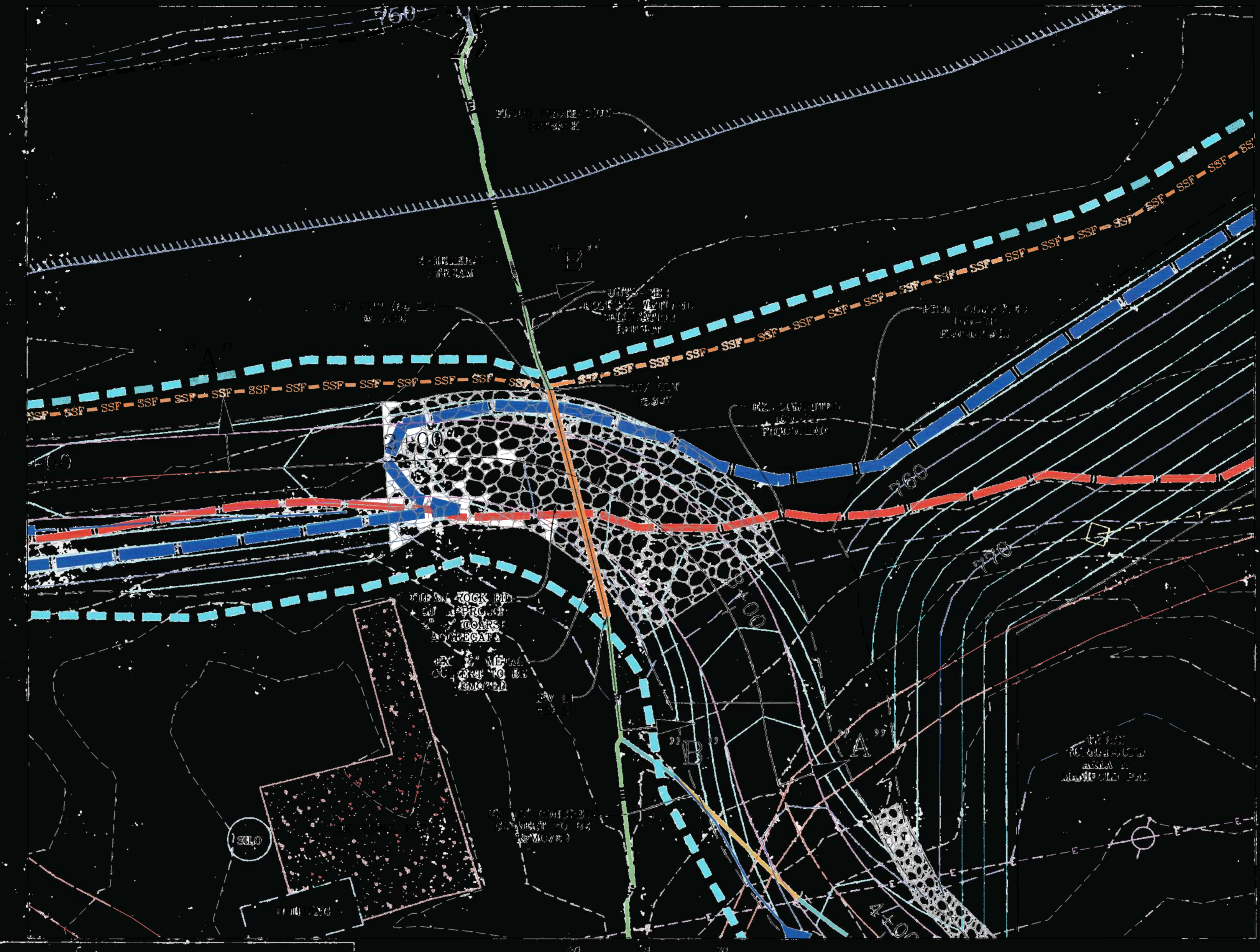
ACCESS ROAD SECTIONS
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 CENTRALES HOLDINGS
 1100 W. 10th Ave, Suite 100
 Oklahoma City, OK 73106
 (405) 521-1100
 www.gessler.com

DATE: 11/27/2015
 SCALE: AS SHOWN
 DISTRICT: 0000000000
 SHEET NO.: 2015-000000
 SHEET TOTAL: 0000000000

STREAM CROSSING "A" DETAILS

GENERAL NOTES:

- 1) ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN FEET AND INCHES.
- 2) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 3) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 4) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
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- 13) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 14) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 15) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 16) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 17) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 18) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 19) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.
- 20) THE PROPOSED STREAM CROSSING IS TO BE CONSTRUCTED AS SHOWN ON THESE PLANS.



NAVITUS ENGINEERING

REGISTERED PROFESSIONAL ENGINEER

STATE OF NEW YORK

NO. 12345

DATE: 10/15/2024

PROJECT: STREAM CROSSING "A" DETAILS

SCALE: AS SHOWN

REV: 00/00/2024

NAVITUS ENGINEERING, INC.

100 WEST 100th STREET, SUITE 1000

NEW YORK, NY 10025

PHONE: (212) 123-4567

FAX: (212) 123-4568

WWW.NAVITUS-ENGINEERING.COM

REGISTERED PROFESSIONAL ENGINEER

STATE OF NEW YORK

NO. 12345

DATE: 10/15/2024

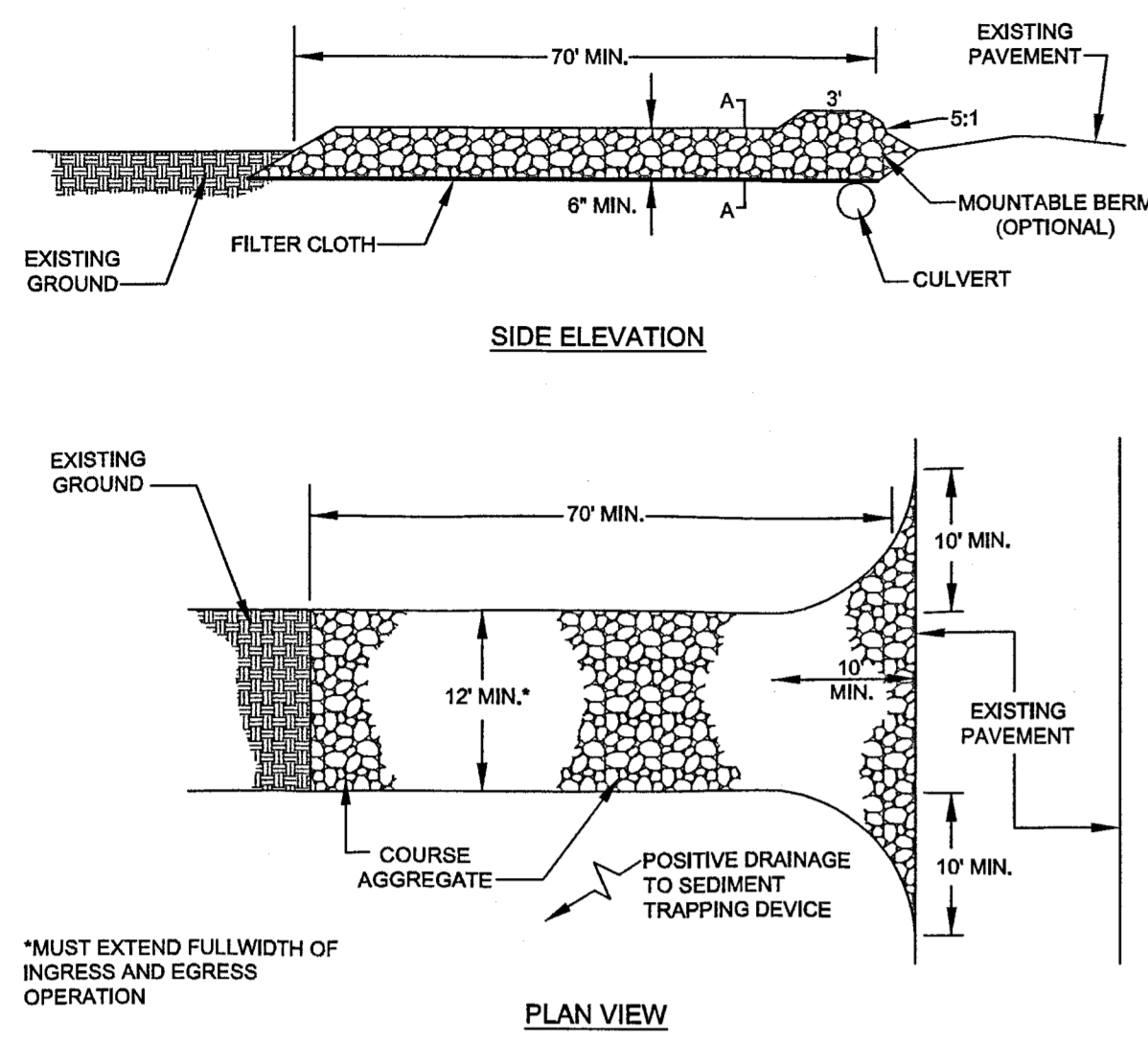
PROJECT: STREAM CROSSING "A" DETAILS

SCALE: AS SHOWN

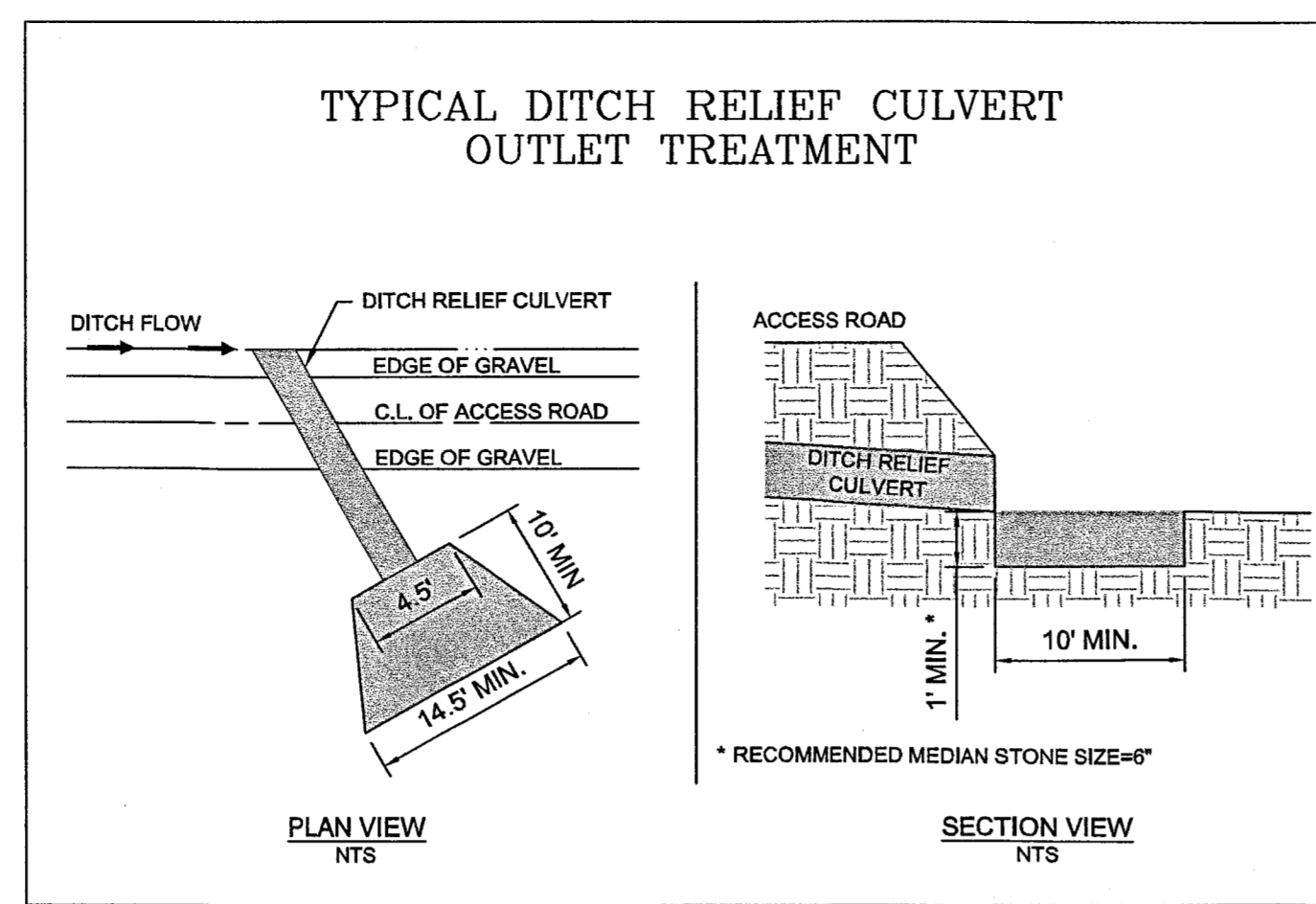
REV: 00/00/2024

FIGURE 3.02.1

STONE CONSTRUCTION ENTRANCE



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



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

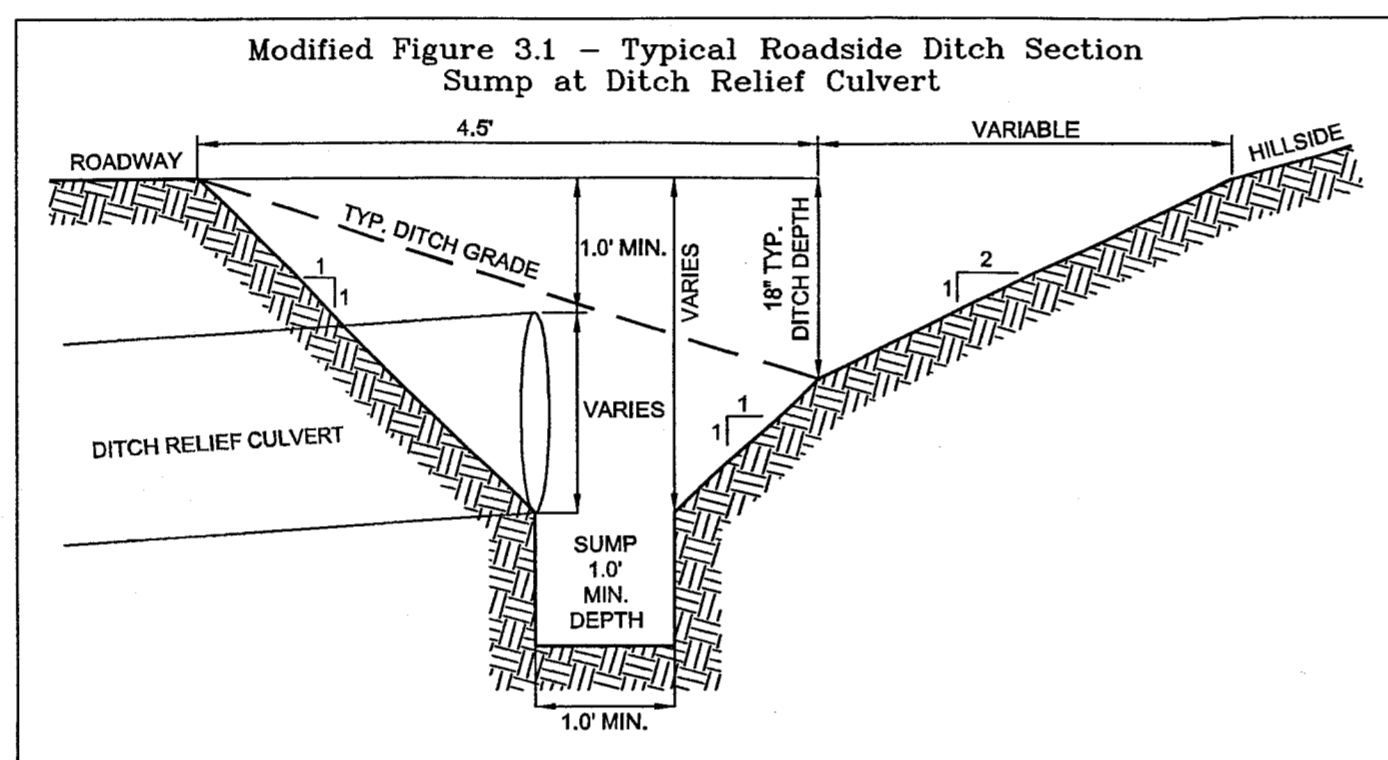
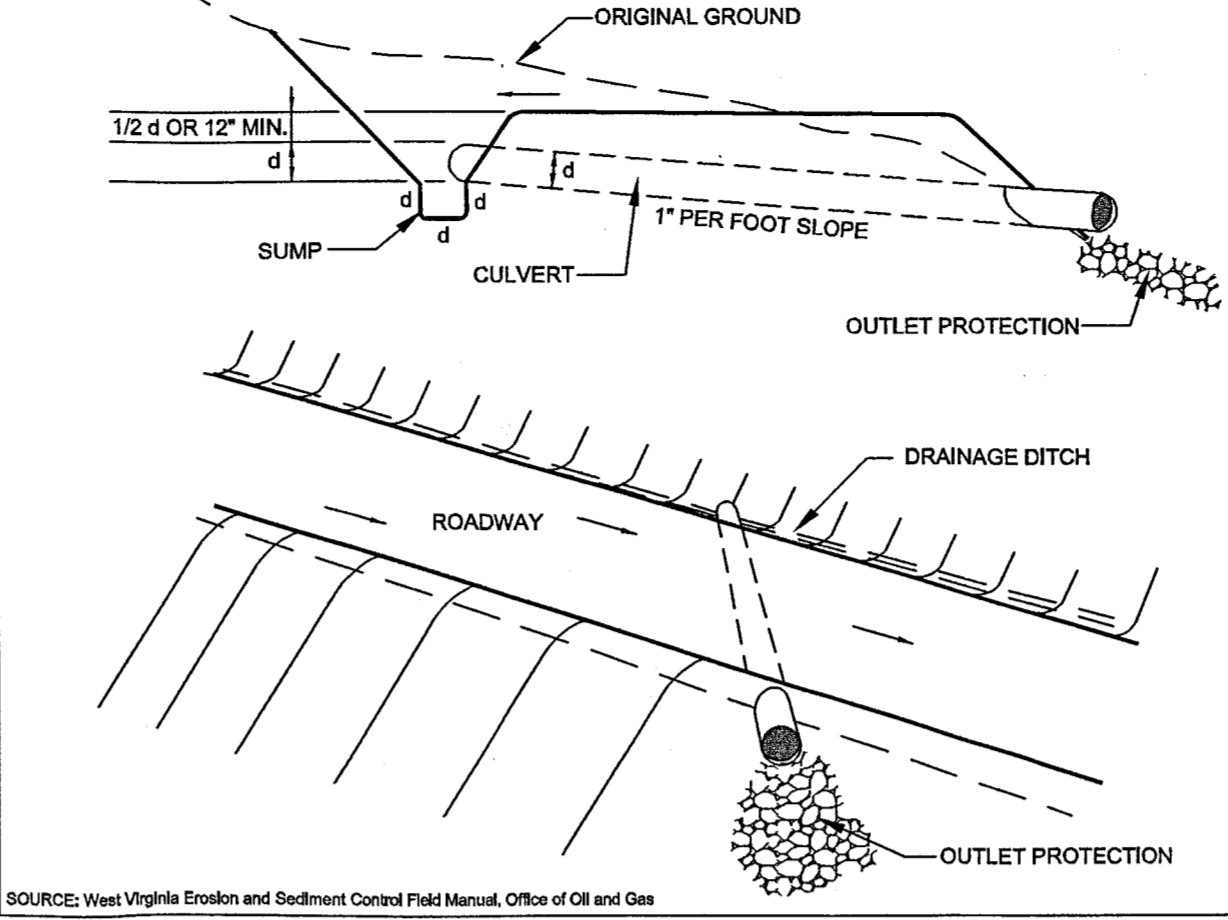


FIGURE II-4

DITCH RELIEF CULVERT



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

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

FIGURE 3.05.1

ROCK CHECK DAM

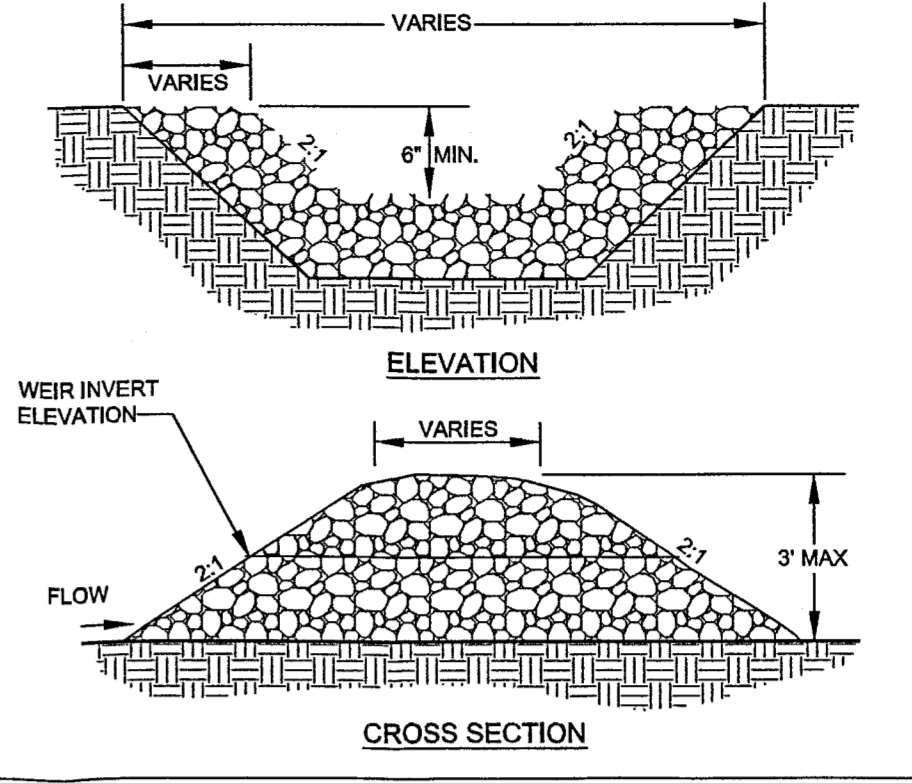
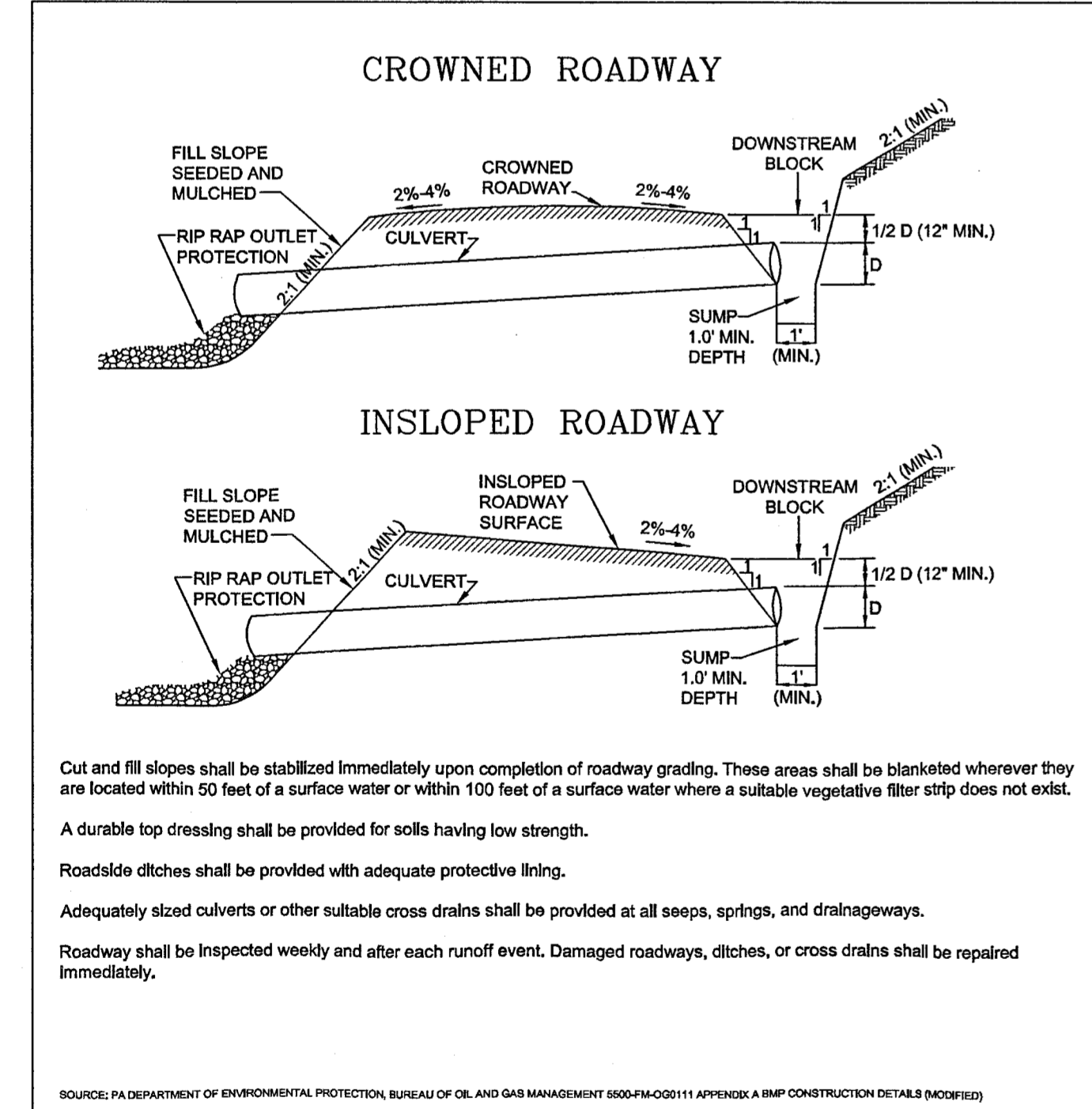
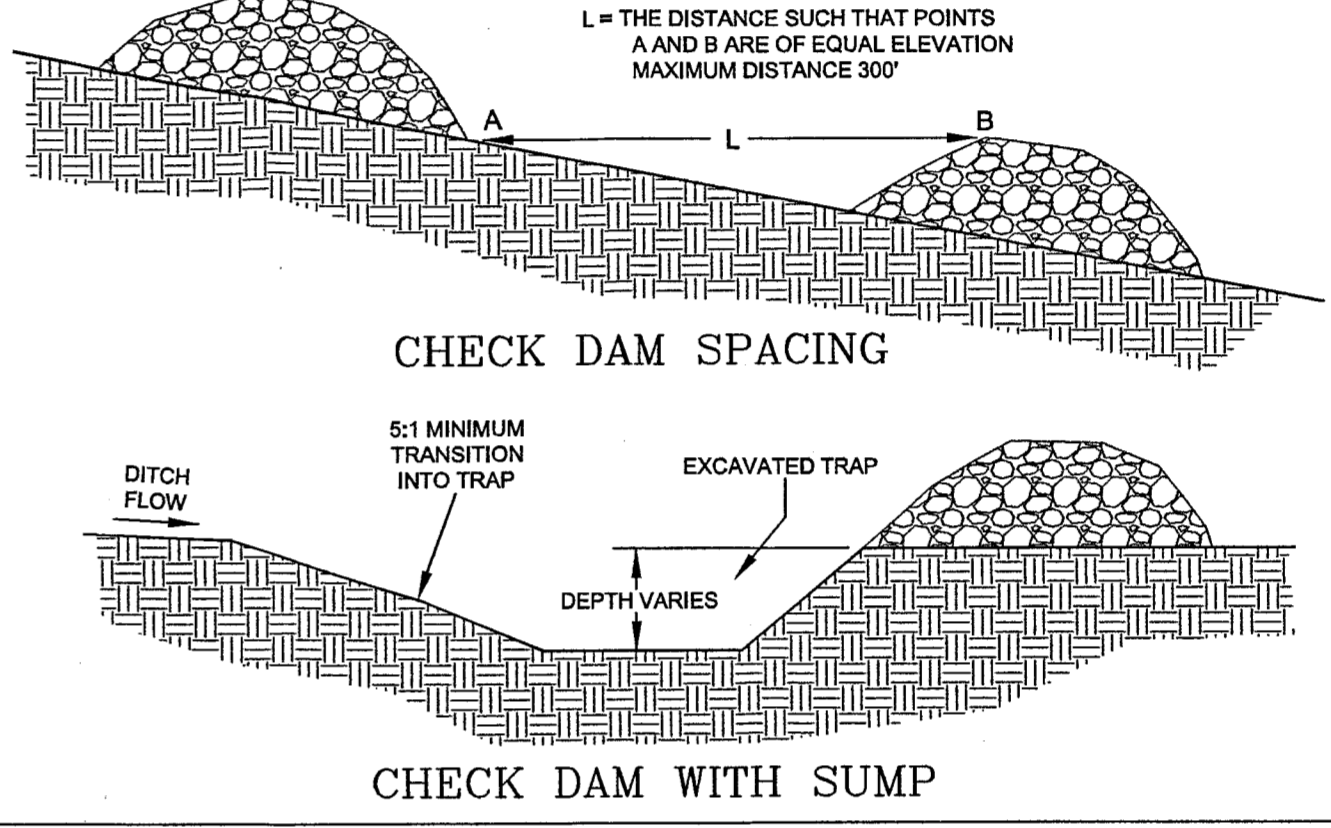


FIGURE 3.05.2

ROCK CHECK DAM



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

SOURCE: PA DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF OIL AND GAS MANAGEMENT (800)FHA-000111 APPENDIX A BMP CONSTRUCTION DETAILS (NOV2012)

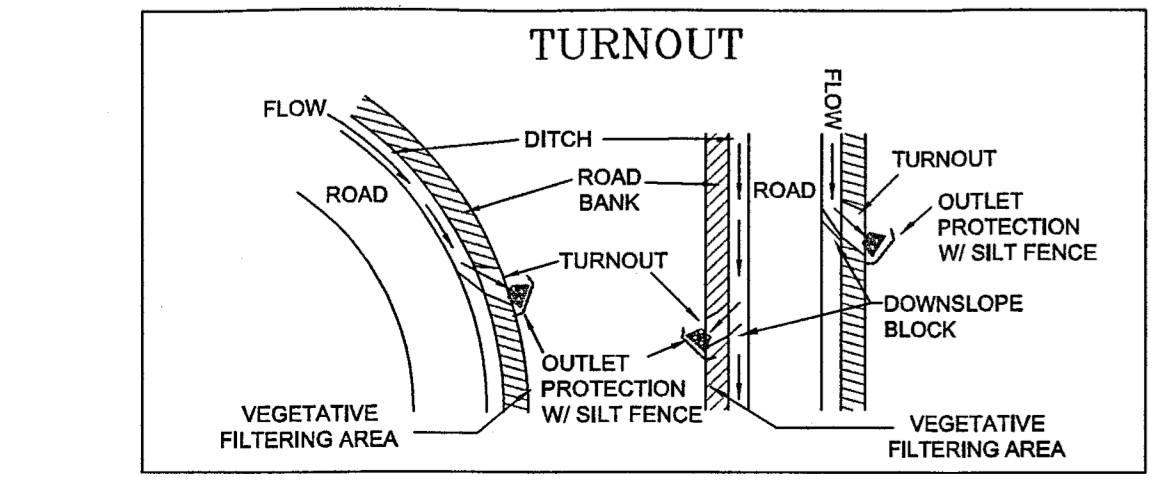
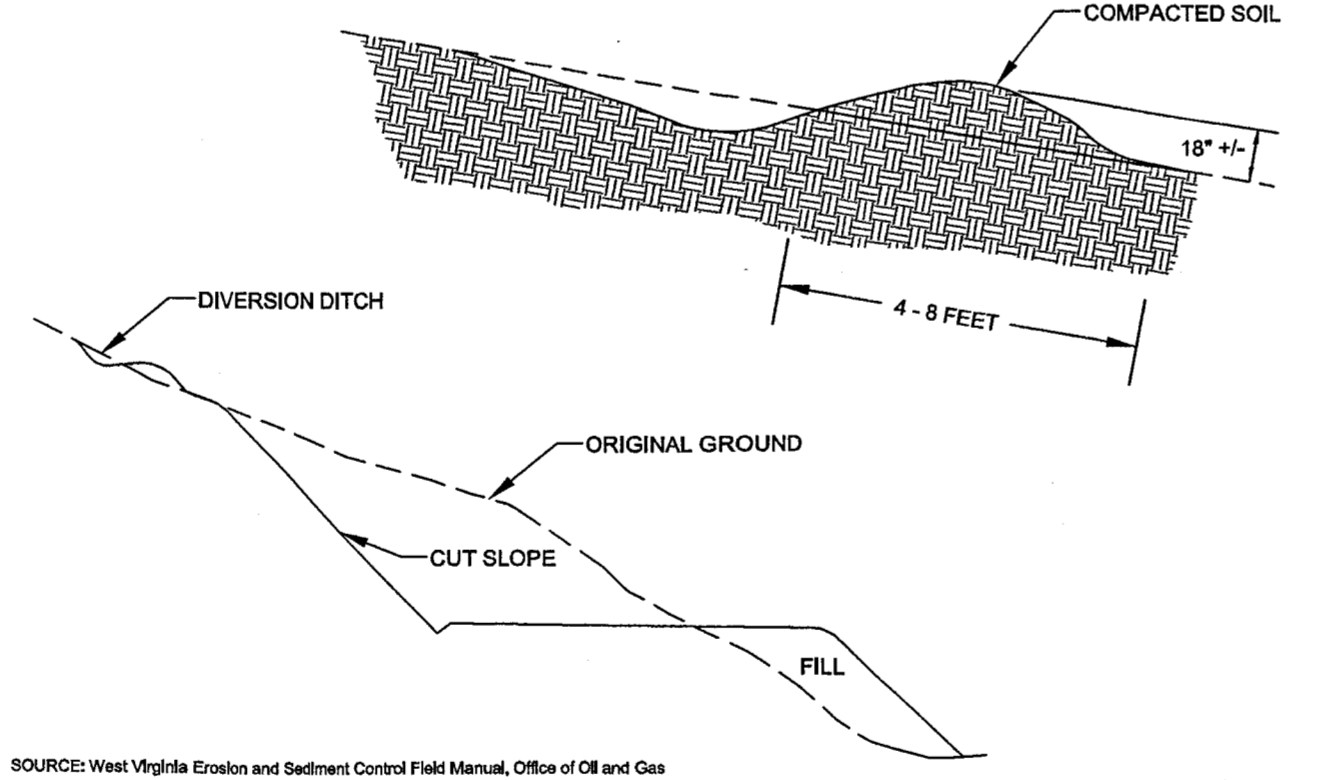


FIGURE II-3

DIVERSION DITCH - TEMPORARY



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

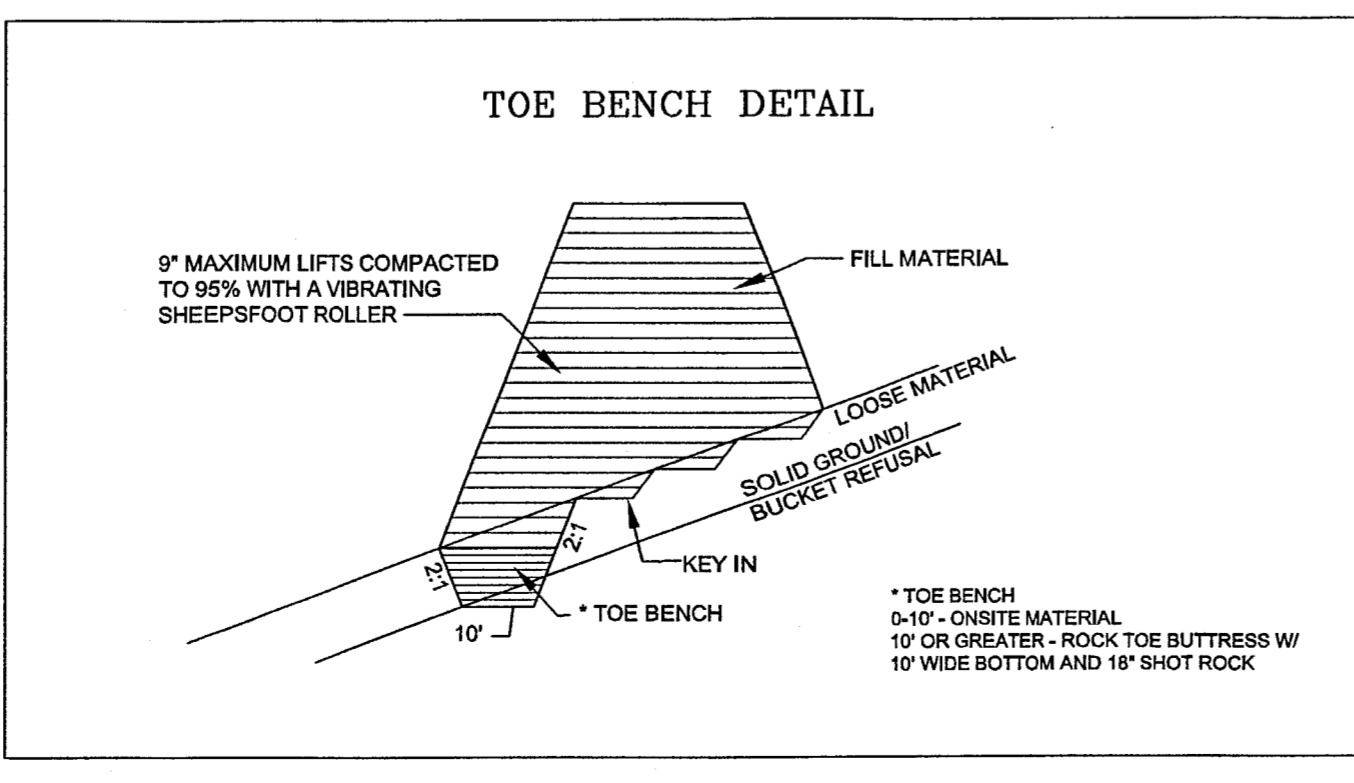
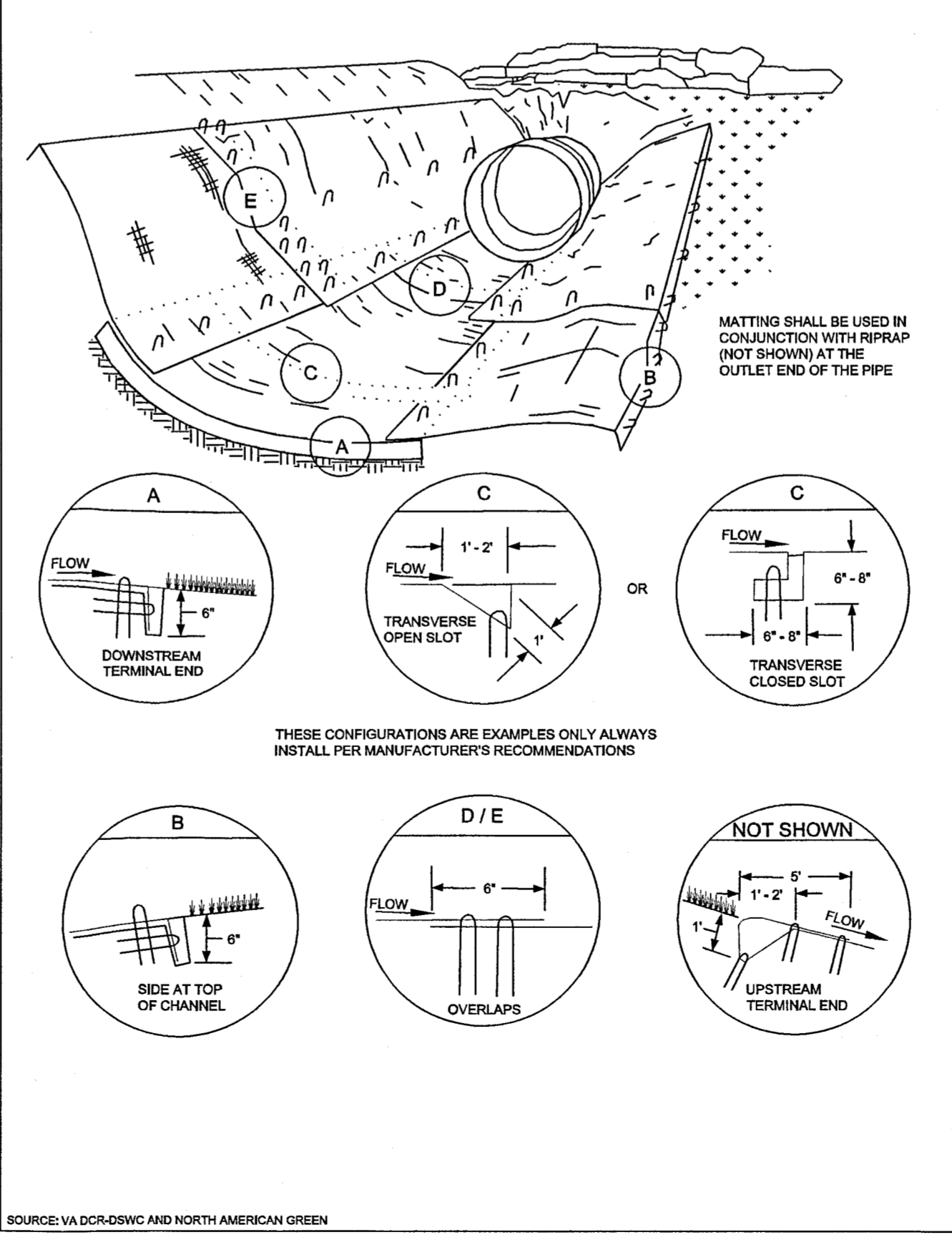


FIGURE 3.13.1

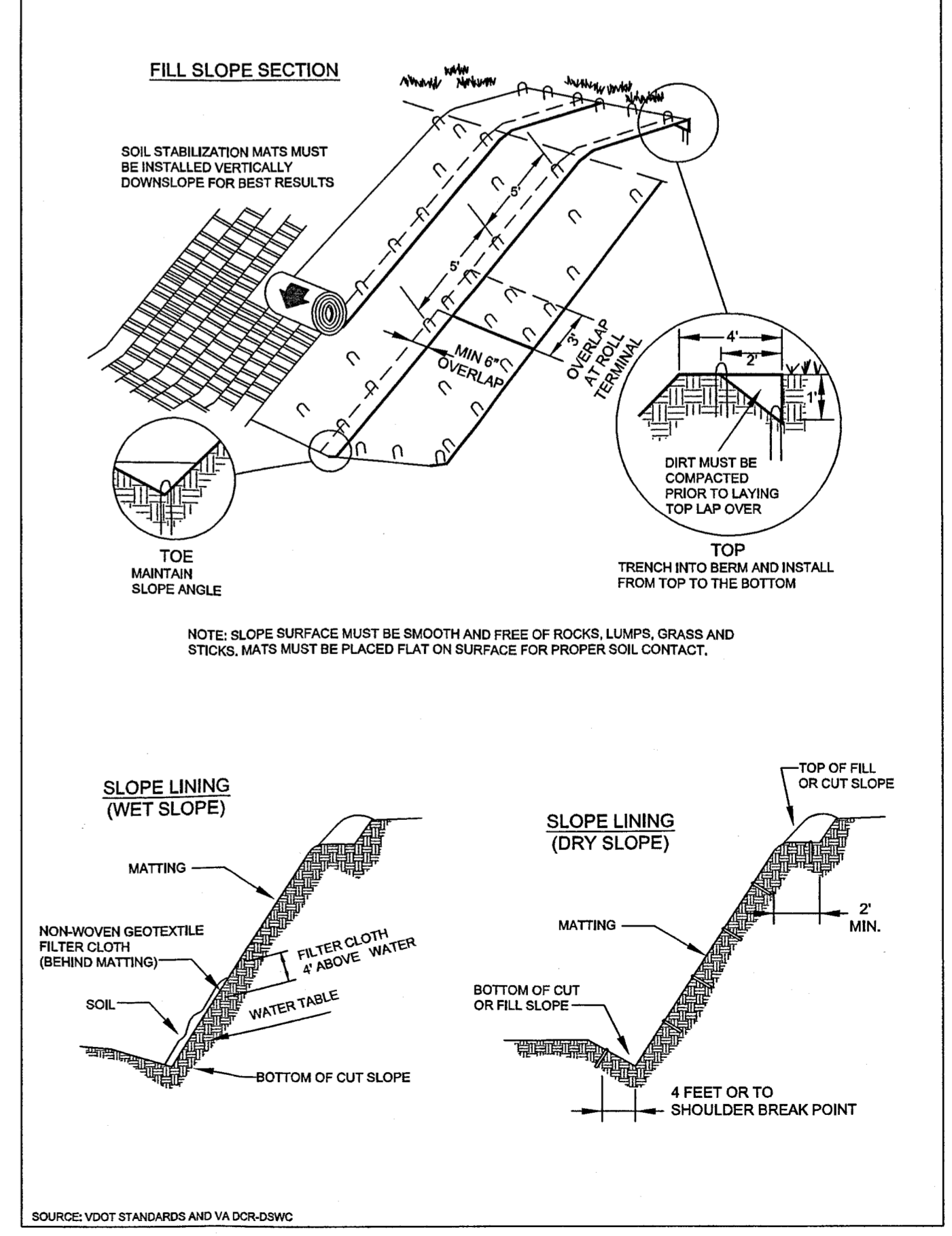
TYPICAL RECP CHANNEL INSTALLATION



SOURCE: VA DCR-DSWC AND NORTH AMERICAN GREEN

FIGURE 3.13.2

ROLLED EROSION CONTROL PRODUCTS



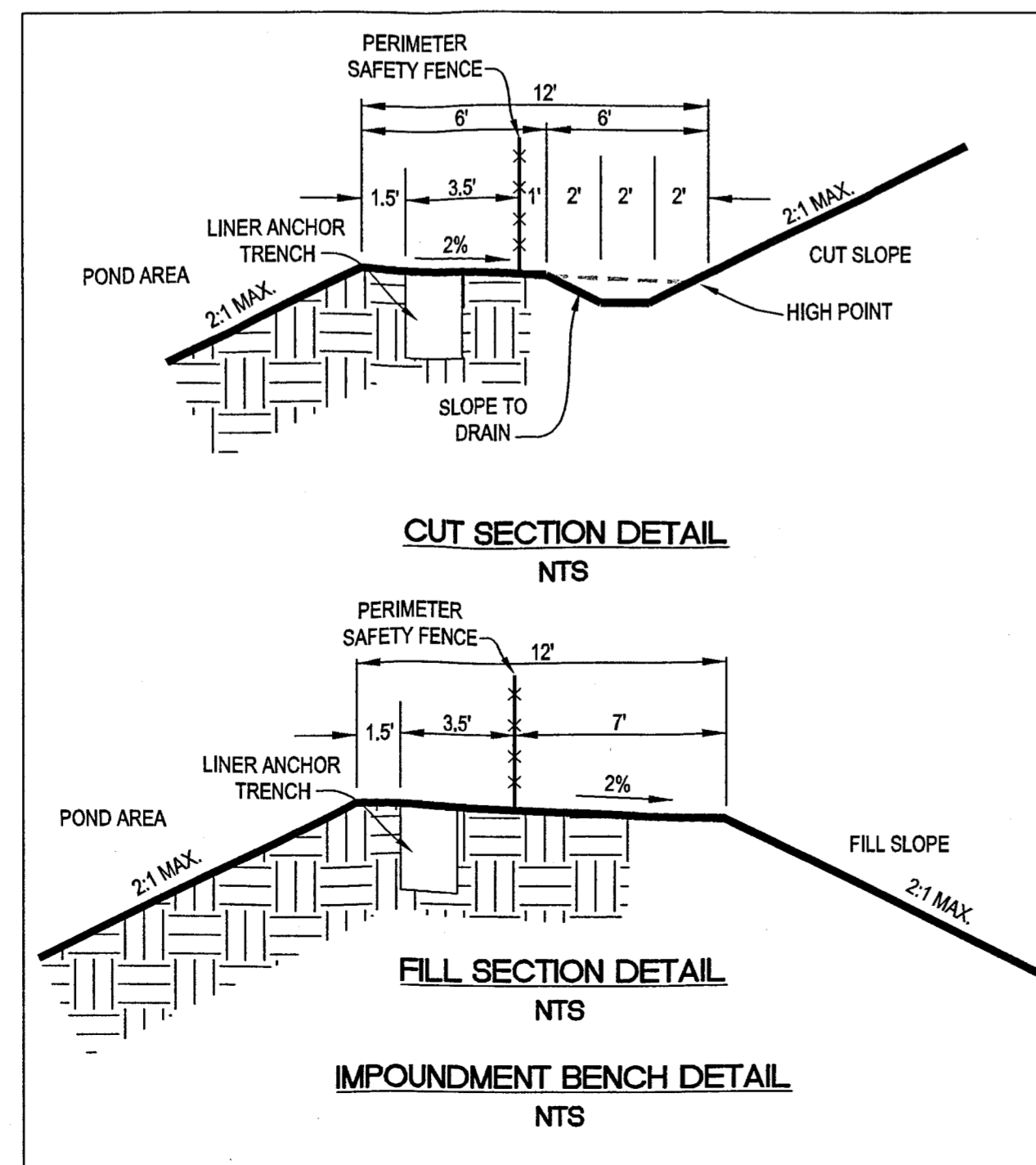
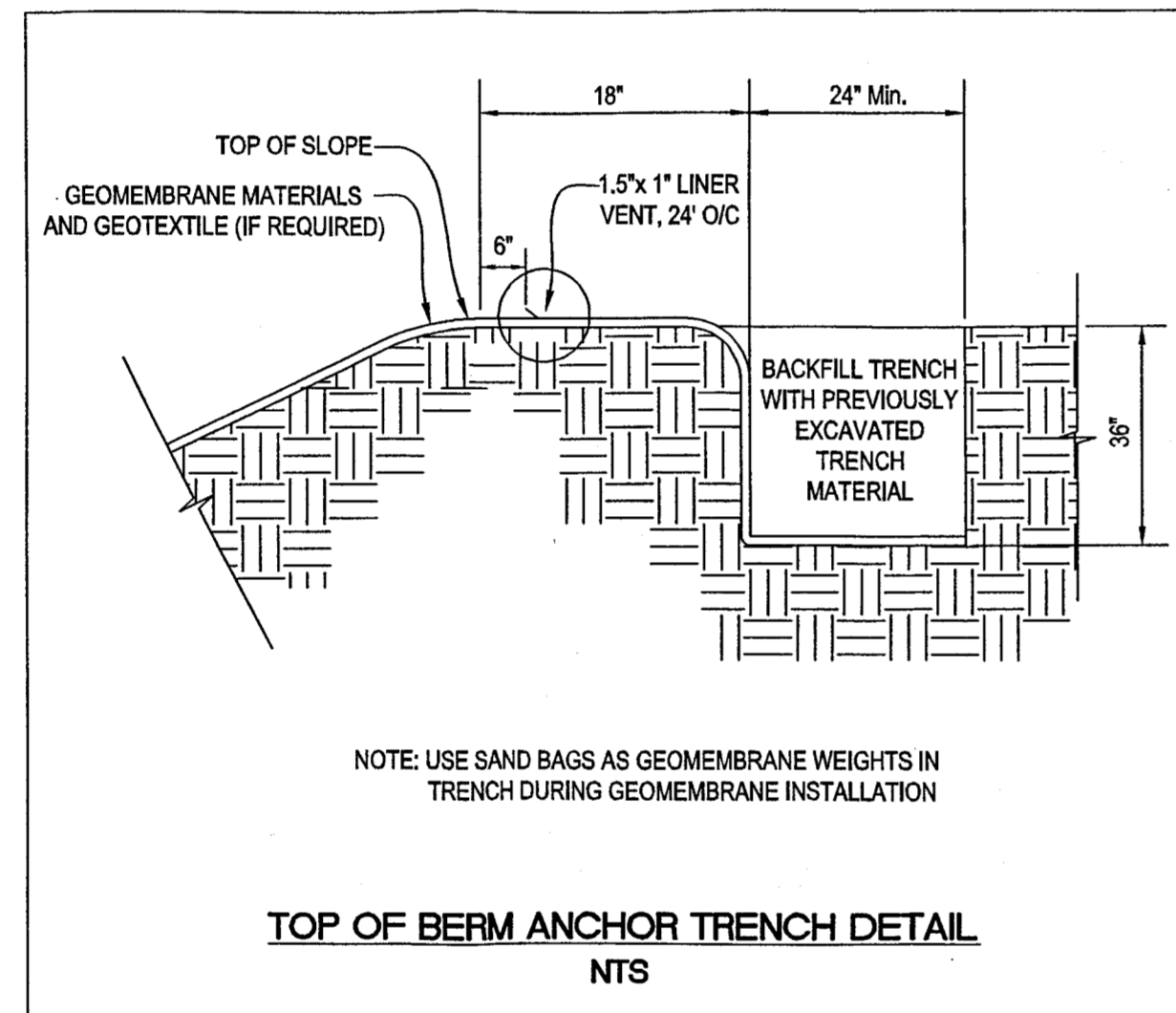
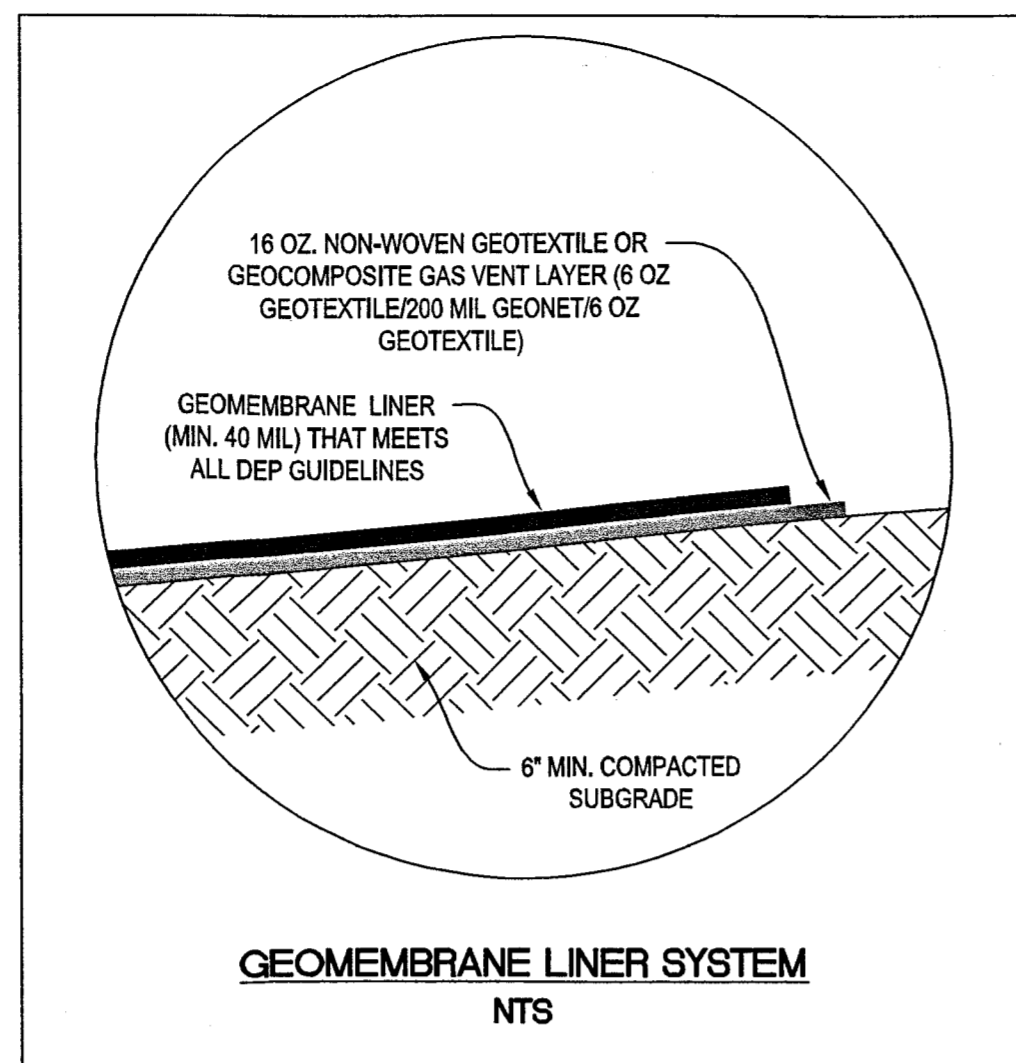
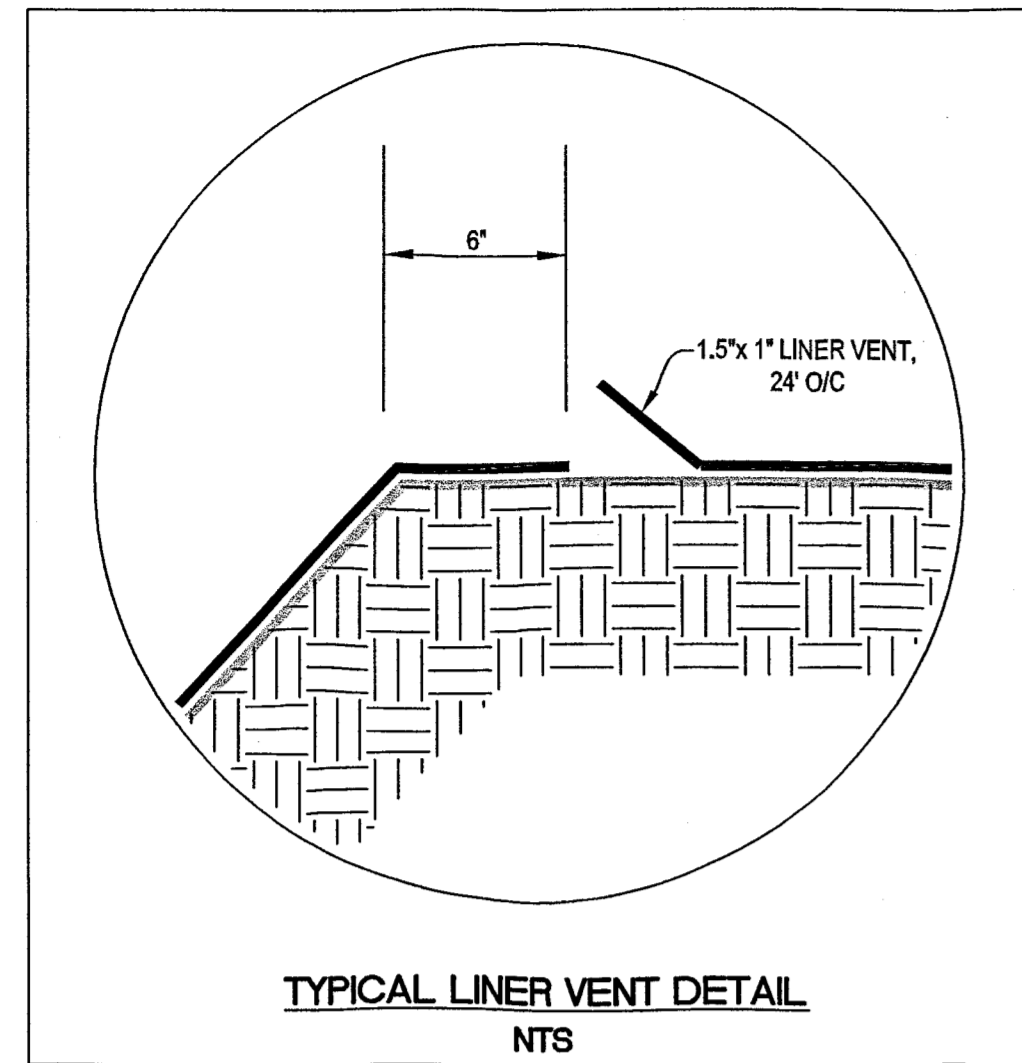
SOURCE: VDOT STANDARDS AND VA DCR-DSWC



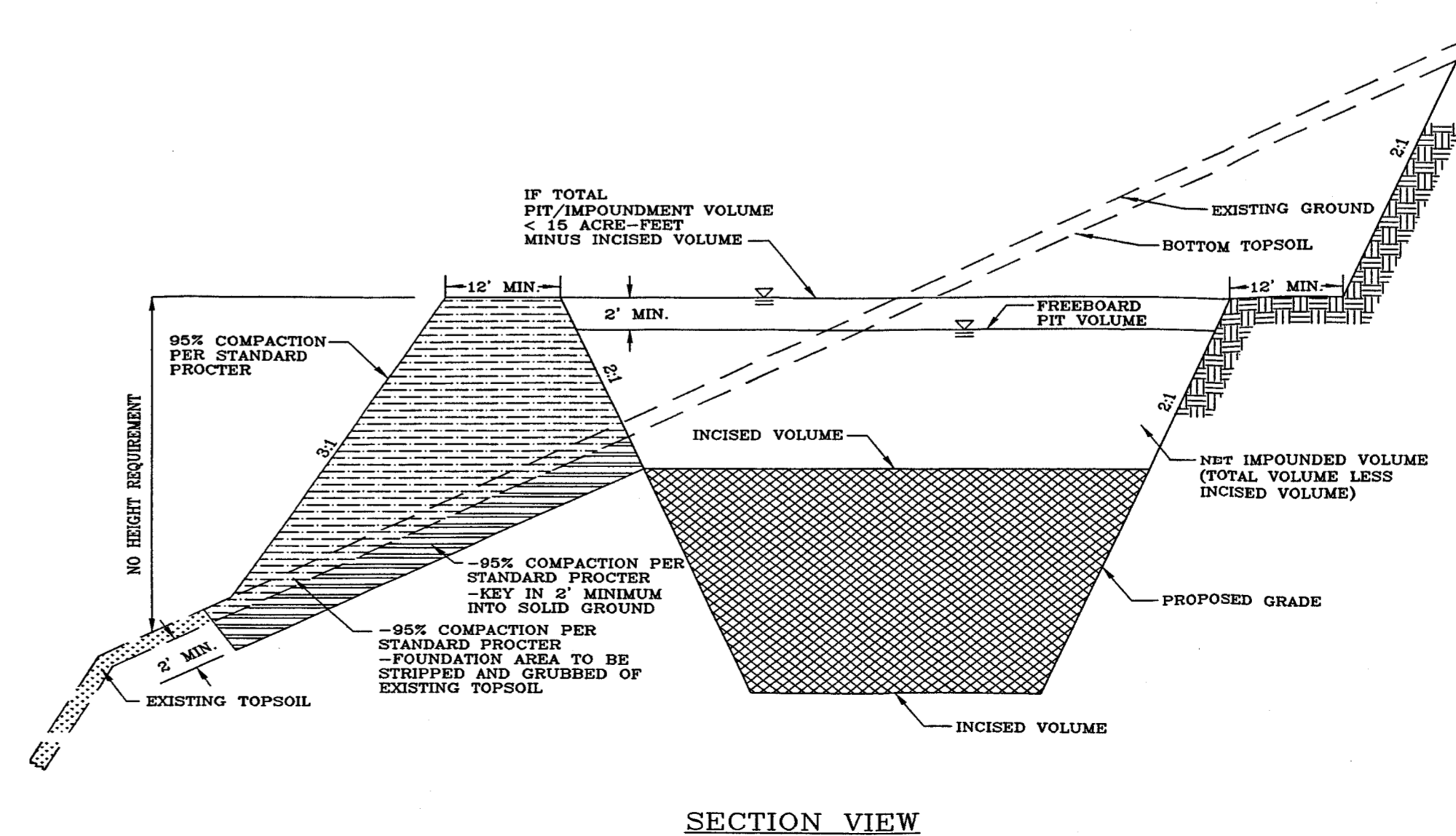
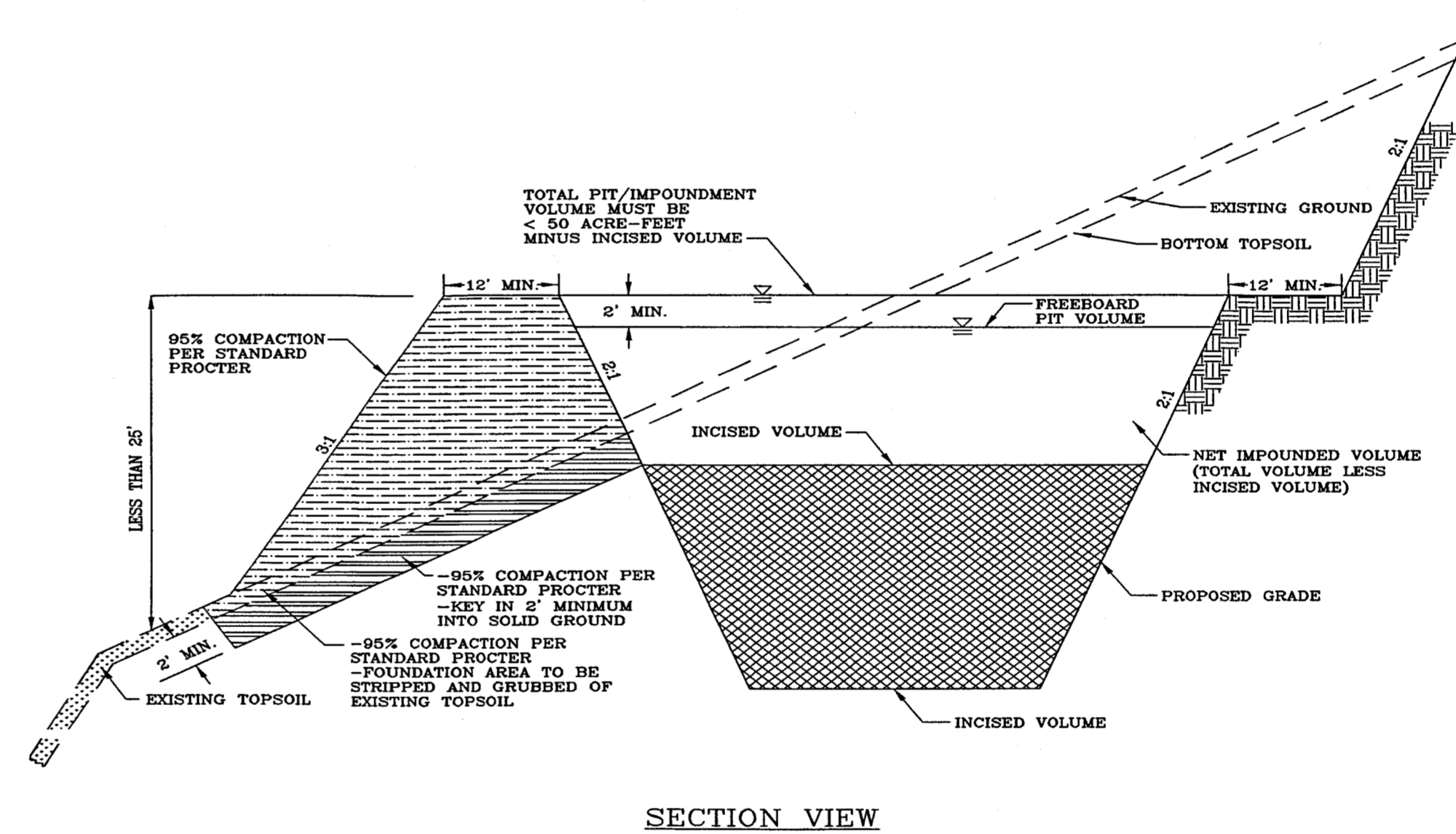
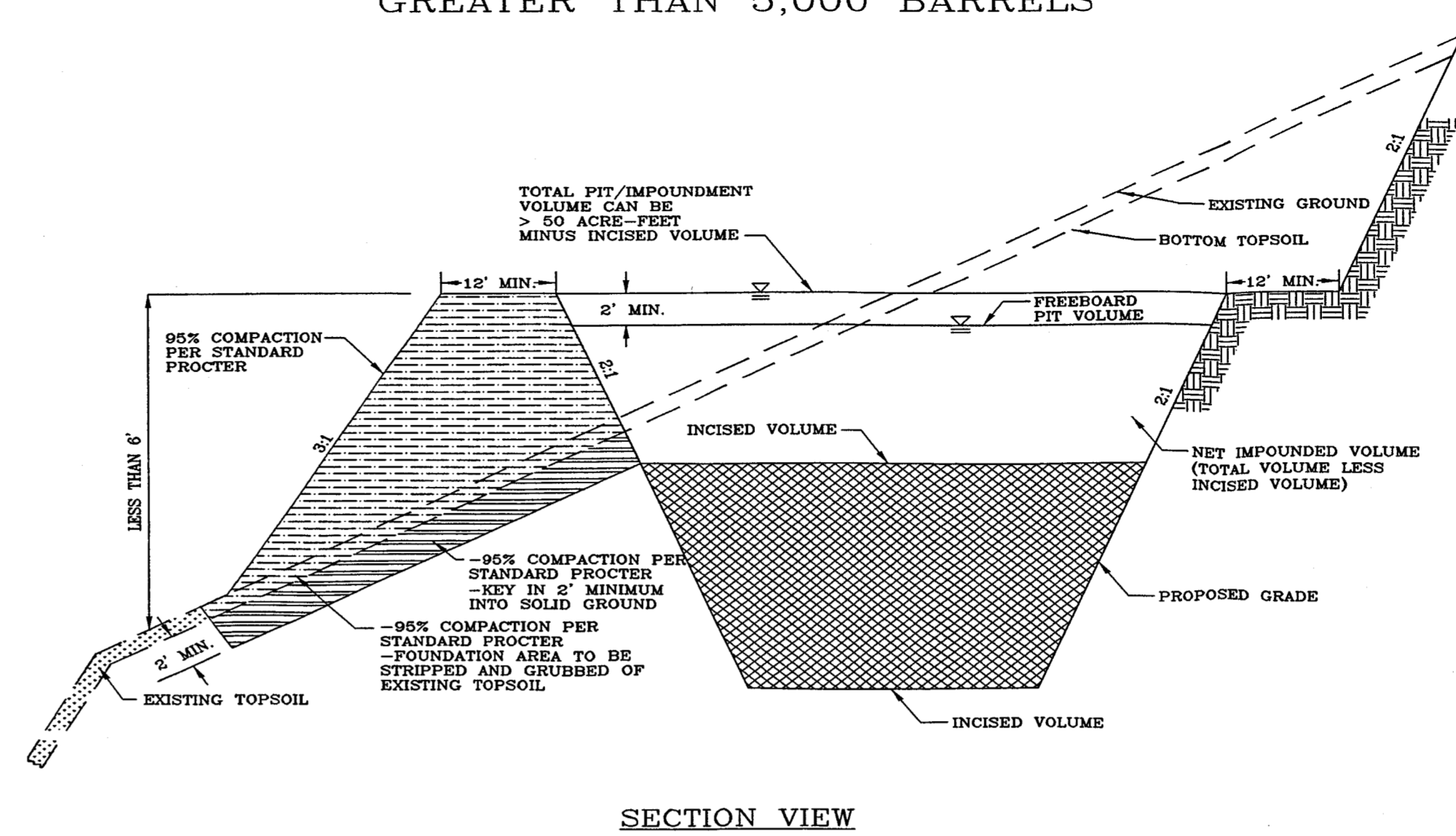
THIS DOCUMENT WAS PREPARED BY:
NAVITUS ENGINEERING INC.
FOR: EQT PRODUCTION COMPANY

CONSTRUCTION DETAILS
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012
SCALE: N/A
DESIGNED BY: TVF/DEM
FILE NO. 7836
SHEET 10 OF 13
REV. 03/27/2013



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



- 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.
- NTS

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

Temporary Seeding

a.General Conditions Where Practice Applies

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

b.Seed Mixtures and Planting Dates

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

c.Seed Application

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

Permanent Seeding

a.General

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

When hydroseeding, seedbed preparation may not be necessary if adequate site preparation was performed. Incorporate the appropriate amount of lime and/or fertilizer in the slurry mix when hydroseeding.

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

b.Lime and Fertilizer

- Lime shall be applied to all permanent seedings. The pH of the soil is to be determined and lime applied accordingly. Once the pH is known, select the amount of lime to be applied from Table IV-5.
- 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.
- 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:

- All legumes must be planted with the proper inoculants prior to seeding.
- Lathco Flatpea is potentially poisonous to some livestock.
- Only endophyte free varieties of Tall Fescue should be used. Tall Fescue and Crownvetch are also very invasive species, non-native to WV.
- 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.

**Table IV-1
Recommended Seeding Dates**

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

**Table 2
Acceptable Fertilization Recommendation**

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

**Table 3
Temporary Cover**

Species	Seeding Rate (lbs/acre)	Optimum Seeding Dates	Drainage	pH Range
Annual Ryegrass	40	3/1 - 6/15 or 8/15 - 9/15	Well - Poorly	5.5 - 7.5
Field Bromegrass	40	3/1 - 6/15 or 8/15 - 9/15	Well - Mod. Well	6.0 - 7.0
Spring Oats	96	3/1 - 6/15	Well - Poorly	5.5 - 7.0
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 by 50% if planted April 15 - August 1 and October 1 - March 1.

**Table 4a
Permanent Seeding Mixture**

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

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

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

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

Species/Mixture	Seeding Rate (lbs/acre)	Soil Drainage preference	pH Range
KY Bluegrass / Redtop / Ladino Clover or Birdsfoot Trefoil	20	Well - Mod. Well	5.5 - 7.5
Timothy / Alfalfa	3	Well - Mod. Well	6.5 - 8.0
Timothy / Birdsfoot Trefoil	5	Well - Poorly	5.5 - 7.5
Orchardgrass / Ladino Clover / Redtop	8	Well - Mod. Well	5.5 - 7.5
Orchardgrass / Ladino Clover	10	Well - Mod. Well	5.5 - 7.5
Orchardgrass / Perennial Ryegrass	2	Well - Mod. Well	5.5 - 7.5
Creeping Red Fescue / Perennial Ryegrass	20	Well - Mod. Well	5.5 - 7.5
Orchardgrass or KY Bluegrass	30	Well - Mod. Well	5.5 - 7.5
Birdsfoot Trefoil / Redtop / Orchardgrass	10	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea * / Perennial Ryegrass	5	Well - Mod. Well	5.5 - 7.5
Lathco Flatpea * / Orchardgrass	20	Well - Mod. Well	5.5 - 7.5

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

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

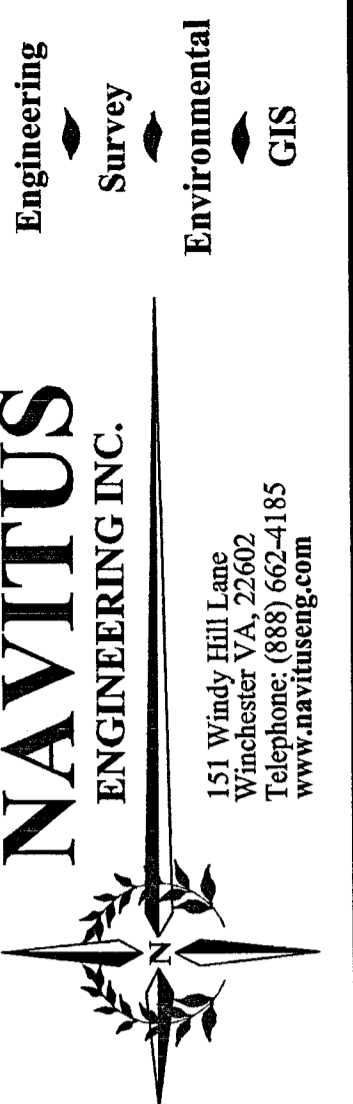
**Table IV-5
Lime and Fertilizer Application Table**

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

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

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

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



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CONSTRUCTION DETAILS
GESSLER
CENTRALIZED IMPOUNDMENT
GRANT DISTRICT
DODDRIDGE COUNTY, WV

DATE: 11/20/2012
SCALE: N/A
DESIGNED BY: TVF/DEM
FILE NO. 7838
SHEET 13 OF 13
REV. 03/27/2013