CONDITIONAL LETTER OF MAP REVISION
TODD CREEK TRIBUTARY 2

Fuller Subdivision
City of Thornton, Adams County, Colorado

Prepared for:

Equinox Group, LLC
9055 E. Mineral Circle, Suite 200
Centennial, Colorado 80112

Prepared by:

Manhard Consulting, Ltd.

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June 2005

Project # EGTNC (C-329)

MANHARD CONSULTING, LTD.

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Manhard Consulting, Ltd.

FULLER SUBDIVISION

CONDITIONAL LETTER OF MAP REVISION

TODD CREEK - TRIBUTARY 2

PREPARED FOR:
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Conditional Letter of Map Revision
Todd Creek Tributary 2
City of Thornton, Adams County, Colorado
Fuller Subdivision

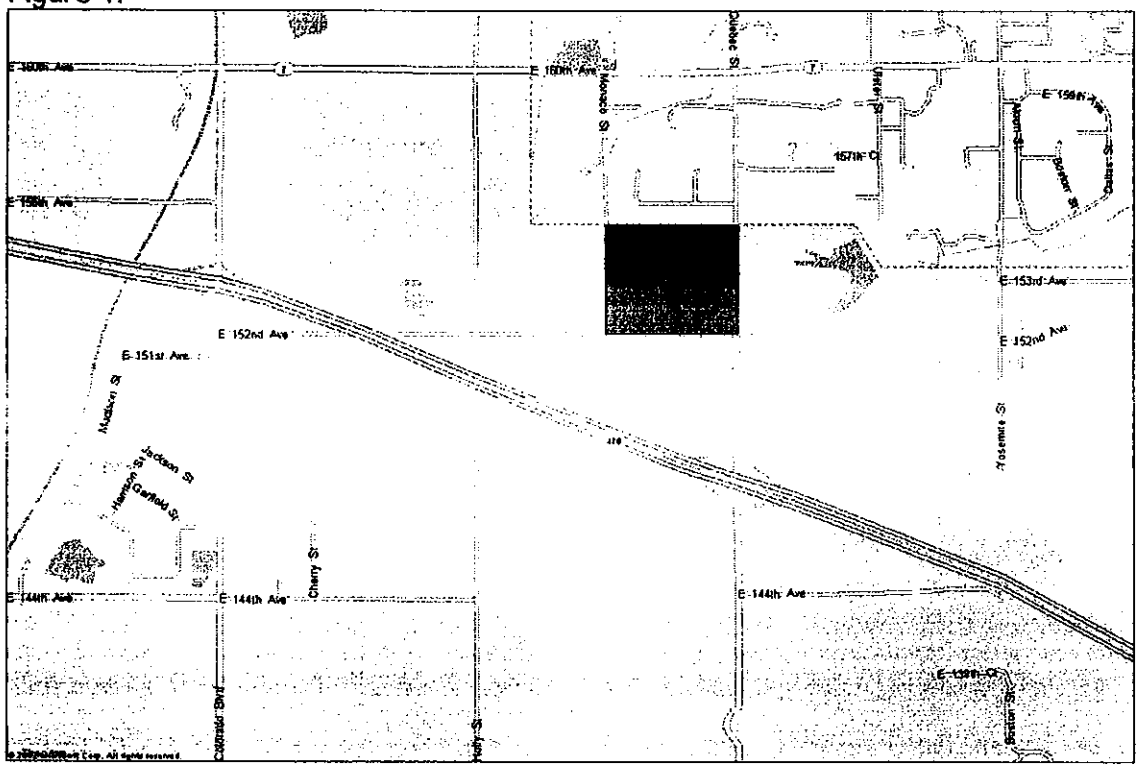
Purpose

Contained herein is documentation and analysis of the existing and proposed conditions base flood elevations (BFEs) of the above referenced project to substantiate a request for a Conditional Letter of Map Revision (CLOMR) as based on the proposed floodplain modifications. FEMA MT-2 Forms 1, 2 and 3 are included in Tab 2.

Project Summary

The proposed Fuller Subdivision is located in the City of Thornton, Colorado. The project is located within Township 1 South, Range 67 West, Section 8, Southwest 1/4 of the 6th principal meridian of Adams County, Colorado. The project is bordered by Monaco Street on the west and Quebec Street on the east. East 152nd Avenue runs along the south property line of the project. The land to the north is undeveloped agricultural land. The Heritage Todd Creek Subdivision is located on the east side of Quebec adjacent to the southeast corner of this project. The land north of Heritage Todd Creek is undeveloped. This project occupies approximately 155 acres to be developed into single-family detached homes. A portion of the property has been planned as a public school site. Also associated with the project are three roadway improvements: Monaco Street, Quebec Street and East 152nd Avenue. Monaco Street and 152nd Avenue are located in Adams County Jurisdiction. Monaco Street is proposed as a minor collector and East 152nd Avenue is proposed as a major collector. The improvements for the roadway will include the inside half of the road plus six feet for both Monaco Street and East 152nd Avenue. The west side of Quebec Street, a major arterial, will also be completed with this project. See Figure 1 for a vicinity map of the project site.

Figure 1.



Effective Floodplain Data

Tributary 2, which bi-sects the development, is part of Todd Creek drainage basin. The floodplain is delineated as a Zone A by FEMA on FIRM No. 08001C0035 G, effective date August 16, 1995. The effective floodplain delineation is the result of the Flood Hazard Area Delineation (FHAD) prepared by Muller Engineering Company, December 1985 for the Urban Drainage and Flood Control District. The FHAD study included a HEC-2 model of the project area and the model is included in Tab 4 for reference. Although the FHAD was a detailed study with base flood elevations, FEMA's floodplain designation is Zone A as shown on the FIRM in Tab 7. Floodway data tables and channel plan and profile sheets from the FHAD study for Tributary 2 are included in Tab 4 for comparison purposes. The effective flow rates through the project site and the

starting water surface elevations at FHAD cross-section 2.12 were used in the existing and proposed conditions hydraulic analyses.

Existing Conditions

One-foot contour interval topography for the project site was used to develop an existing condition hydraulic model. Cross sections were cut to match the locations of the effective (FHAD) cross sections and additional cross sections were inserted to accurately define the existing site and channel. The starting water surface elevation (SWSEL) was taken from the effective model at FHAD cross section 2.12. A vertical datum adjustment was necessary to convert the SWSEL to NAVD 88 to match the topography in NGVD 29. The conversion factor and site benchmark information are included in Tab 7. Manning's 'n' values for the existing conditions channel were taken from the effective model.

Proposed Conditions

The proposed conditions model used the same cross section locations as used in the existing conditions analysis. The proposed conditions channel geometry was created based on proposed grading activity within the channel and at roadway crossings. Three road crossings with corresponding hydraulic structures are proposed within the development. Two of the crossings, Quebec Street and Monaco Street, will be improved from the existing conditions and a new proposed crossing will be built to facilitate traffic through the development. The existing agricultural pond berm downstream of Monaco Street will be eliminated in the proposed condition.

Conclusion

The existing and proposed condition hydraulic models and outputs are included in Tabs 5 and 6 respectively and a summary table of existing and proposed base flood elevations is included in Tab 3. The summary table shows that the proposed grading activity and channel roadway crossings do not negatively impact the development or the adjacent property owners. The only resulting increase in water surface elevation occurs at Cross Section 4268, directly upstream of the proposed roadway crossing. The flood elevation increase is entirely contained within the proposed site. The resulting floodplain mapping is included in Tab 7 and an annotated FIRM is also included in Tab 7 showing the tie-in locations to the effective FIRM. All hydraulic models are included electronically on disk in Tab 8. CHECK-RAS was used to review the proposed conditions HEC-RAS model and the reports are included in Tab 6.

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☒ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
080007	City of Thornton	CO	08001C	0035G	8/16/95

2. Flooding Source: Todd Creek Tributary 2

3. Project Name/Identifier: Fuller Subdivision

4. FEMA zone designations affected: A (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☒ Physical Change ☒ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding:	☒ Riverine	☐ Coastal	☐ Shallow Flooding (e.g., Zones AO and AH)
	☐ Alluvial fan	☐ Lakes	☐ Other (Attach Description)
Structures:	☒ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☒ Fill	☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $4000.00

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Morris Barbera	Company: Todd Creek Village LLC	
Mailing Address: 9055 East Mineral Circle Suite 200 Centennial, CO 80112	Daytime Telephone No.: (303) 799-6000	Fax No.: (303) 771-7985
	E-Mail Address: morris@equinoxland.com	
Signature of Requester (required):		Date: 6/22/05

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Frank Casteleneto, P.E., Floodplain Administrator		Telephone No.: (303) 538-7295
Community Name: City of Thornton	Community Official's Signature (required):	Date: 6/22/05

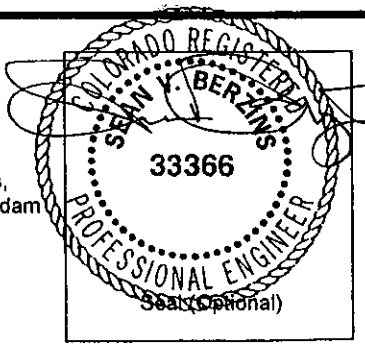
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Sean Berzins	License No.: 33366	Expiration Date: January 1, 2007
Company Name: Manhard Consulting, Ltd.	Telephone No.: 303-708-0500	Fax No.: 303-708-0400
Signature:		Date: 06/22/05

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans



Seal (Optional)

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Todd Creek Tributary 2
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☒ Not revised (skip to section 2) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Quebec Street	2664	n/a	5123.18
Upstream Limit	Monaco Street	5141	n/a	5155.76

2. Hydraulic Method Used

Hydraulic Analysis HEC-RAS [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:		Floodway File Name:
Corrected Effective Model*	Natural File Name:		Floodway File Name:
Existing or Pre-Project Conditions Model	Natural File Name:	Existing Conidtions	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name:	Proposed Conditions	Floodway File Name:
Other - (attach description)	Natural File Name:		Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A certified topographic map must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☒ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☒ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Todd Creek Tributary 2
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Quebec Street Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Quebec Street

   Downstream Limit/Cross Section: 2505

   Upstream Limit/Cross Section: 2592

2. **Name of Structure: Proposed Road Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Proposed Road approx. 1000 feet downstream of Monaco Street

   Downstream Limit/Cross Section: 4117

   Upstream Limit/Cross Section: 4249

3. **Name of Structure: Monaco Street Culvert**

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Monaco Street

   Downstream Limit/Cross Section: 5156

   Upstream Limit/Cross Section: 5303

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Todd Creek Tributary 2

Name of Structure: Quebec Street Culvert

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

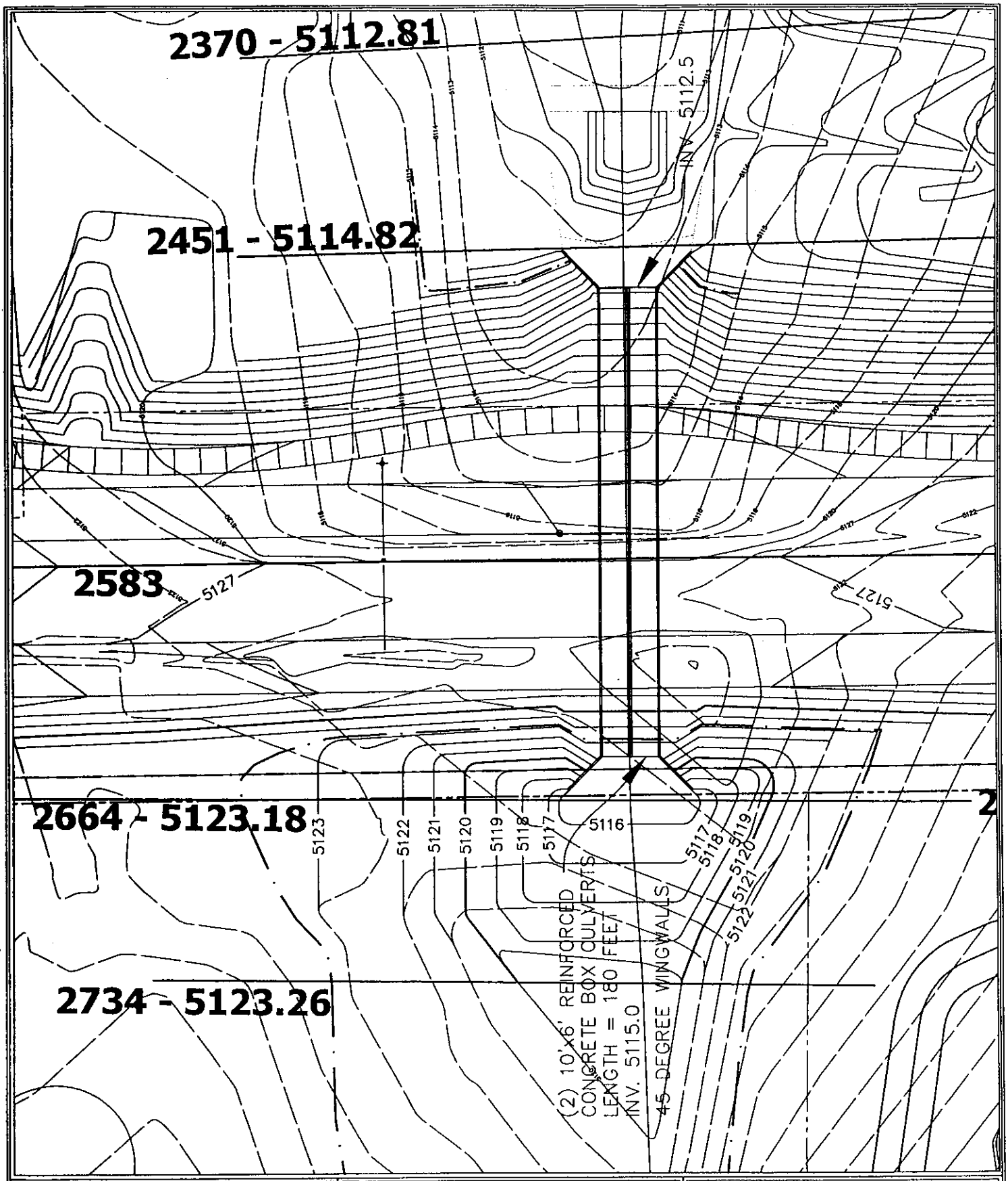
2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☒ Beveling or Rounding
- ☒ Wing Wall Angle
- ☐ Skew Angle
- ☒ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☒ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.



FULLER SUBDIVISION	THORNTON, COLORADO	QUEBEC STREET CULVERT

PROJ. MGR.: SVB
DRAWN BY: JC
DATE: 6-16-05
SCALE: 1"=50'

Manhard Consulting, Ltd.

Civil Engineers • Surveyors • Water Resources Engineers • Water & Wastewater Engineers
Environmental Scientists • Landscape Architects • Planners • Construction Managers
14505 North Hayden Road, Suite 340 • Scottsdale, AZ 85260 • 480.946.5550 • 480.946.5599 FX • www.manhard.com

SHEET
EXHIBIT 1
EGTNC C-329

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Todd Creek Tributary 2

Name of Structure: Proposed Road Culvert

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☒ Wing Wall Angle
- ☐ Skew Angle
- ☒ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☒ Cross-Section Locations

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Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
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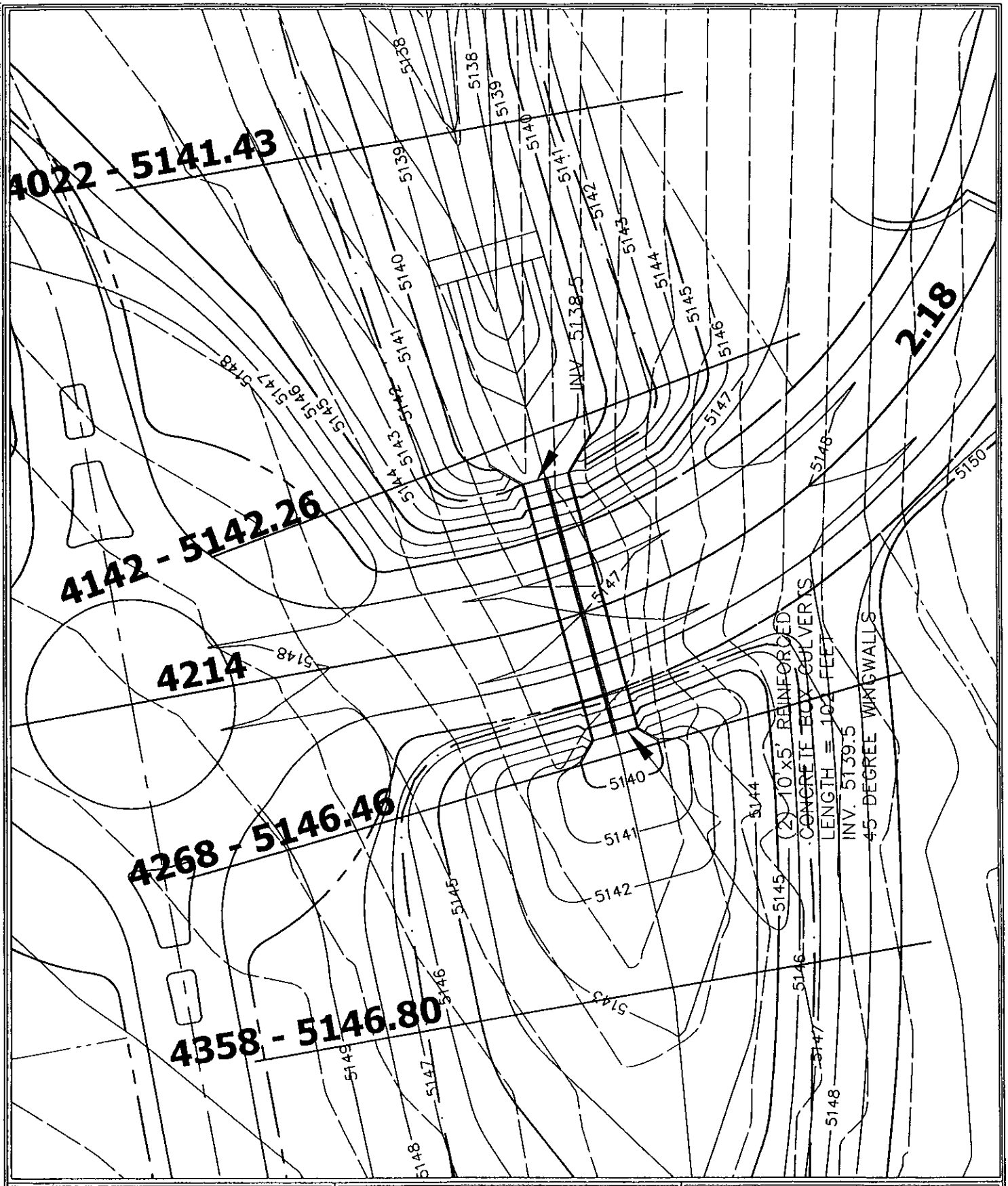


FULLER SUBDIVISION	THORNTON, COLORADO	PROPOSED ROAD CULVERT

PROJ. MGR.: SVB
DRAWN BY: JC
DATE: 6-16-05
SCALE: 1"=40'

Manhard Consulting, Ltd.
Civil Engineers • Surveyors • Water Resources Engineers • Water & Wastewater Engineers
Environmental Scientists • Landscape Architects • Planners • Construction Managers
14505 North Hayden Road, Suite 340 • Scottsdale, AZ 85260 • 480.946.5550 • 480.946.5599 FX • www.manhard.com

SHEET
EXHIBIT 2
EGTNC C-329

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Todd Creek Tributary 2

Name of Structure: Monaco Street Culvert

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

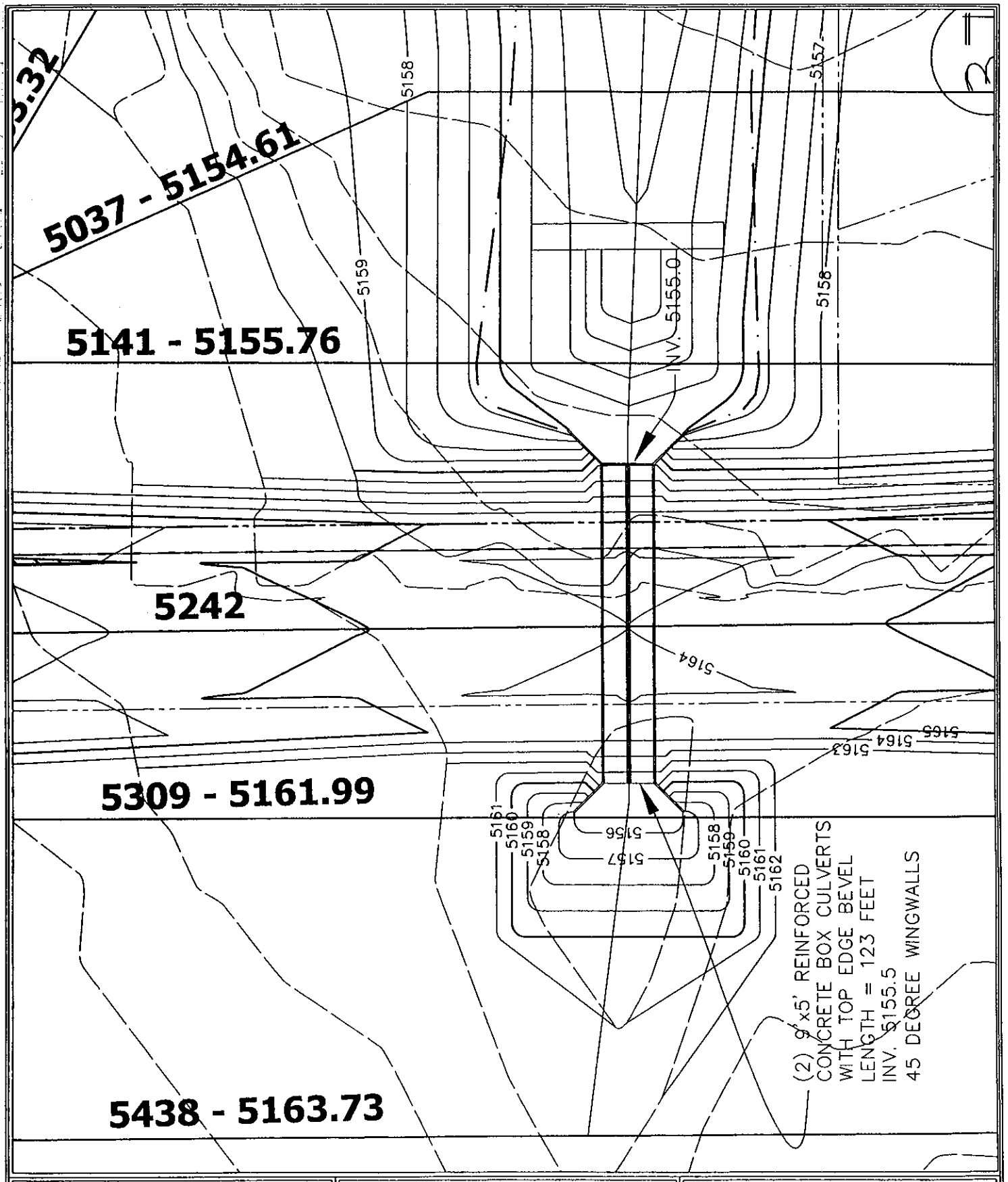
2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☒ Beveling or Rounding
- ☒ Wing Wall Angle
- ☐ Skew Angle
- ☒ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☒ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.



FULLER SUBDIVISION	THORNTON, COLORADO	MONACO STREET CULVERT

PROJ. MGR.: SVB
DRAWN BY: JC
DATE: 6-16-05
SCALE: 1"=50'

Manhard Consulting, Ltd.

Civil Engineers • Surveyors • Water Resources Engineers • Water & Wastewater Engineers
Environmental Scientists • Landscape Architects • Planners • Construction Managers
14505 North Hayden Road, Suite 340 • Scottsdale, AZ 85260 • 480.946.5550 • 480.946.5599 FX • www.manhard.com

SHEET
EXHIBIT 3
EGTNC C-329

Fuller Subdivision
Conditional Letter of Map Revision
Todd Creek Tributary #2

Manhard Consulting, Ltd.

BFE Comparison

FHAD Cross Section	MCL Cross Section[1]	Location	Flow Rate (cfs)	100-Year Water Surface Elevation			
				Effective (FHAD) HEC-2	Effective (FHAD) HEC-2	Existing Conditions	Proposed Conditions
				(NGVD-29)	(NAVD-88)	(NAVD-88)	(NAVD-88)
2.12	2050		1300	5104.26	5107.21	5107.21	5107.21
	2169		1300	--	--	5109.20	5109.20
	2370		1300	--	--	5113.13	5112.81
2.13	2451		1160	5114.5	5117.45	5114.52	5114.82
	2583	Quebec Street	1160	--	--	5121.91	--
2.15	2664		1160	5119.8	5122.75	5123.24	5123.18
	2734		1160	--	--	5123.65	5123.26
	2910		1160	--	--	5126.06	5126.06
2.16	3101		1080	5122.6	5125.55	5129.16	5129.16
	3356		1080	--	--	5133.15	5133.15
2.17	3600		1010	5133.0	5135.95	5137.58	5137.58
	3844		1010	--	--	5140.28	5140.04
	4022		1010	--	--	5142.23	5141.43
	4142		920	--	--	5144.07	5142.26
2.18	4214	Proposed Road	920	5141.9	5144.85	5145.34	--
	4268		920	--	--	5145.81	5146.46
	4358		920	--	--	5146.84	5146.80
	4544		920	--	--	5149.28	5148.69
2.19	4711		830	5149.8	5152.75	5153.92	5151.31
2.20	4790	Agricultural Pond	830	5158.5	5161.45	5161.90	5152.36
2.21	4878		830	5158.8	5161.75	5162.27	5153.32
	5037		830	--	--	5162.27	5154.61
2.22	5141		830	5158.8	5161.75	5162.27	5155.76
	5242	Monaco Street	830	--	--	5162.45	
2.24	5309		830	5158.9	5161.85	5162.83	5161.99
	5438		830	--	--	5163.76	5163.73

[1] Feet above confluence with Todd Creek

```
T1TODD CREEK TRIBUTARY 2 FHAD                                                   T1          039
T2MULLER ENGINEERING CO. AUG 1985                                               T2          040
T3       10 YEAR FLOOD                                                          T3          041
J1   -10       2        0        0        0        0        0        0 5103.11  J1          018
J2     1       0       -1        0        0        0       -1        0        0 0J2          019
J6     1                                                                       J6          023
NC 0.050   0.050    0.050      .1       .3                                     NC          029
QT     3     530     1030     1300                                            QT          034
X1  2120      21   1199.6   1248.7        0        0        0                  X1          053
GR5112.0 1000.0  5110.9  1030.9  5110.6  1048.8  5110.3  1065.1  5109.7  1094.0GR  015
GR5110.6 1110.0  5111.4  1113.6  5108.8  1120.2  5108.5  1139.9  5107.0  1159.9GR  015
GR5105.5 1176.9  5104.3  1189.9  5101.8  1199.6  5101.6  1220.1  5101.3  1233.2GR  015
GR5101.9 1248.7  5104.5  1265.8  5105.8  1274.9  5108.1  1306.2  5110.8  1341.4GR  015
GR5112.0 1374.0                                                         GR          015
QT     3     490      920     1160                                            QT          034
X1  2130      27   1331.0   1453.4      490      480      485                  X1          053
X3  10.0                                                 5113.8  5113.8     X3          055
GR5124.0 1000.0  5121.1  1050.6  5119.2  1109.6  5118.6  1138.4  5118.6  1159.4GR  015
GR5118.6 1168.3  5118.4  1174.2  5118.4  1200.9  5118.4  1224.4  5117.7  1246.4GR  015
GR5116.8 1263.0  5116.3  1284.9  5115.9  1294.2  5115.3  1308.9  5114.2  1331.0GR  015
GR5112.9 1348.9  5112.4  1370.3  5112.4  1393.9  5112.4  1418.8  5112.4  1435.7GR  015
GR5114.2 1453.4  5115.6  1478.5  5118.1  1534.5  5120.5  1585.2  5121.7  1634.6GR  015
GR5123.1 1673.9  5124.0  1695.0                                           GR          015
SB  0.90    1.56     2.80     0.00     1.57     0.10     3.34     0.00  5112.0 5111.8SB  036
X1  2150      34   1433.3   1504.3       90       80       80                  X1          053
X2     0       0        1   5114.0   5117.2                                  X2          054
X3  10.0                                                                    X3          055
BT    13  1070.0  6124.0      0.0  1107.9  6122.0      0.0  1165.9  6121.0    0.0BT  005
BT1222.3 6119.3      0.0  1276.1  6118.6      0.0  1419.0  6117.5      0.0  1420.0BT  005
BT5117.3    0.0  1460.9  5117.4      0.0  1523.7  5118.3      0.0  1569.9  5119.3BT  005
BT   0.0  1623.1  5121.1      0.0  1657.3  5122.5      0.0  1710.0  5124.0    0.0BT  005
GR 6125. 1000.0  6124.9  1005.0  6124.6  1010.9  6124.0  1019.0  6124.7  1027.6GR  015
GR6123.7 1055.9  6122.5  1106.1  6121.3  1163.7  6121.4  1197.8  6121.4  1207.8GR  015
GR6120.7 1213.8  6121.1  1216.9  6119.9  1227.6  6119.5  1255.5  6119.9  1279.1GR  015
GR6119.5 1309.4  6118.9  1332.0  6118.6  1374.8  6118.6  1406.0  6118.4  1420.0GR  015
GR5117.8 1433.3  5114.8  1441.0  5114.1  1452.8  5113.8  1467.9  5113.8  1486.8GR  015
GR5113.8 1493.7  5116.5  1504.3  5117.7  1518.1  5117.4  1519.9  5119.8  1556.2GR  015
GR5121.6 1596.6  5122.9  1633.7  5124.7  1686.5  5126.1  1715.0                  GR  015
QT     3     460      860     1080                                            QT          034
X1  2160      18   1136.1   1188.9      475      470      480                  X1          053
GR5129.9 1000.0  5128.7  1033.2  5127.2  1053.7  5125.8  1079.4  5124.8  1098.0GR  015
GR5124.5 1112.6  5124.5  1129.5  5121.9  1136.1  5120.1  1142.2  5120.0  1159.4GR  015
GR5120.0 1178.6  5121.2  1188.9  5123.6  1202.3  5124.6  1211.8  5127.0  1219.0GR  015
GR5127.2 1236.2  5129.3  1265.3  5130.2  1281.2                          GR  015
QT     3     440      810     1010                                            QT          034
X1  2170      25   1176.2   1234.1      490      490      500                  X1          053
GR5139.9 1000.0  5138.6  1025.8  5137.4  1048.5  5136.3  1069.2  5135.4  1089.9GR  015
GR5134.7 1105.4  5134.4  1133.0  5133.3  1138.5  5132.6  1141.9  5131.7  1157.4GR  015
GR5131.2 1176.2  5130.6  1186.9  5130.5  1197.6  5130.3  1203.1  5130.3  1208.2GR  015
GR5130.6 1214.9  5130.6  1221.4  5132.1  1234.1  5133.5  1248.4  5134.5  1259.8GR  015
GR5136.6 1266.0  5137.2  1280.6  5138.4  1298.4  5139.5  1316.2  5139.9  1329.0GR  015
QT     3     420      740      920                                            QT          034
X1  2180      24   1247.0   1316.5      600      600      600                  X1          053
GR5146.2 1000.1  5145.6  1056.8  5145.0  1095.8  5144.1  1139.7  5143.5  1161.8GR  015
GR5143.7 1168.5  5143.1  1174.8  5142.5  1186.6  5142.0  1196.6  5142.0  1208.1GR  015
GR5141.4 1217.6  5141.6  1225.8  5141.3  1233.9  5141.0  1247.0  5139.9  1256.0GR  015
GR5139.2 1267.5  5139.0  1282.1  5139.3  1291.2  5140.2  1307.7  5141.3  1316.5GR  015
GR5142.9 1320.7  5144.1  1345.8  5145.6  1370.2  5146.2  1389.2                  GR  015
QT     3     390      680      830                                            QT          034
X1  2190      19   1194.3   1279.2      565      575      580                  X1          053
GR5152.2 1000.1  5152.3  1031.9  5152.9  1045.0  5153.1  1060.5  5151.7  1071.7GR  015
GR5151.3 1089.0  5150.8  1102.0  5150.1  1130.8  5149.5  1158.8  5148.6  1194.3GR  015
GR5147.8 1225.6  5147.7  1249.4  5148.7  1279.2  5150.1  1317.2  5151.7  1353.0GR  015
GR5153.4 1380.8  5152.8  1384.0  5154.3  1398.8  5154.3  1432.4                  GR  015
X1  2200      15   1090.0   1390.0       45       45       45                  X1          053
GR5160.0 1000.0  5158.0  1090.0  5157.2  1160.0  5158.0  1230.0  5158.6  1330.0GR  015
GR5158.0 1370.0  5157.5  1385.0  5158.0  1390.0  5158.7  1495.0  5159.8  1635.0GR  015
GR5159.8 1820.0  5158.0  1895.0  5157.8  1910.0  5158.0  1920.0  5160.0  1940.0GR  015
EJ                                                                              EJ          012
T1TODD CREEK TRIBUTARY 2 FHAD                                                   T1          039
T2MULLER ENGINEERING CO. AUG 1985                                               T2          040
```

```
T3       50 YEAR FLOOD
J1      0        3        0        0        0        0        0        0 5103.89
J2      2        0       -1        0        0        0       -1        0        0
T1TODD CREEK TRIBUTARY 2 FHAD
T2MULLER ENGINEERING CO. AUG 1985
T3       100 YEAR FLOOD
J1      0        4        0        0        0        0        0        0 5104.26
J2     14        0       -1        0        0        0       -1        0        0



ER
```

```
T3              041
J1              018
0J2             019
T1              039
T2              040
T3              041
J1              018
15J2            019
BLANK_LINE      004
BLANK_LINE      004
BLANK_LINE      004
ER              013
```

HEC2 S/N: 1353000414 HMVersion: 6.60 Data File: EFFECT.hc2

```
*******************************************
*  HEC-2 WATER SURFACE PROFILES           *
*                                         *
*  Version   4.6.2;  May 1991             *
*                                         *
*  RUN DATE     2JUN**    TIME    8:31:48 *
*******************************************
```

```
*************************************
*  U.S. ARMY CORPS OF ENGINEERS     *
*  HYDROLOGIC ENGINEERING CENTER    *
*  609 SECOND STREET, SUITE D       *
*  DAVIS, CALIFORNIA 95616-4687     *
*        (916) 756-1104             *
*************************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X           X     X
X     X  X        X                 X     X
XXXXXXX  XXXX     X           XXXXX   XXXXX
X     X  X        X                 X
X     X  X        X     X           X
X     X  XXXXXXX   XXXXX            XXXXXXX
```

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:::::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::::
:::                                       :::
:::   FULL MICRO-COMPUTER IMPLEMENTATION   :::
:::                                       :::
:::::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::::
```

HAESTAD METHODS

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

Run Date: 2JUN** Run Time: 8:31:48 HMVersion: 6.60 Data File: EFFECT.hc2 Page 1

THIS RUN EXECUTED 2JUN** 8:31:48

```
************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************
```

```
T1TODD CREEK TRIBUTARY 2 FHAD
T2MULLER ENGINEERING CO. AUG 1985
T3      10 YEAR FLOOD

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      -10       2         0         0         0         0         0         0   5103.11

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

       1        0        -1         0         0         0        -1         0         0         0

J6  IHLEQ     ICOPY     SUBDIV    STRTDS    RMILE

       1
```

Run Date: 2JUN** Run Time: 8:31:48 HMVersion: 6.60 Data File: EFFECT.hc2 Page 2

```
    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS
```

```
CCHV=      .100 CEHV=      .300
*SECNO 2120.000
  2120.000       1.81    5103.11    5103.11    5103.11    5103.79       .68       .00       .00    5101.80
     530.0       12.6      499.8       17.5        3.3       74.1        4.8         .         .    5101.90
       .00       3.79       6.75       3.64       .050       .050       .050       .000    5101.30    1194.52
   .029833         0.         0.         0.          0          4          0        .00      62.14    1256.66


*SECNO 2130.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      5113.80 ELREA=      5113.80

  2130.000       1.31    5113.71    5113.44        .00    5113.96        .25      10.13        .04    5114.20
     490.0         .0      490.0         .0         .0      122.1         .0        1.1        1.0    5114.20
       .03        .00       4.01        .00       .000       .050       .000       .000    5112.40    1337.65
   .016065        490.       485.       480.          4         11          0        .00     111.00    1448.65


SPECIAL BRIDGE

SB  XK         XKOR       COFQ       RDLEN      BWC        BWP        BAREA      SS         ELCHU      ELCHD
      .90       1.56       2.80         .00       1.57        .10        3.34        .00    5112.00    5111.80

*SECNO 2150.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  7.02

PRESSURE AND WEIR FLOW,  Weir Submergence Based on TRAPEZOIDAL Shape

 EGPRS      EGLWC      H3         QWEIR      QPR        BAREA      TRAPEZOID      ELLC       ELTRD      WEIRLN
                                                                     AREA
   5635.07    5116.66        .05        441.       49.         3.         3.      5114.00    5117.20       133.
```



```
   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


  2150.000       5.10    5118.90        .00        .00    5118.93        .03       4.97        .00    5117.80
     490.0         .0      461.2       28.8         .0      318.7       44.4        1.6        1.2    5116.50
       .05         .01       1.45        .65       .000       .050       .050       .000    5113.80    1433.29
   .000326        90.        80.        80.          2          0         11        .00     109.33    1542.62


*SECNO 2160.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2160.000       1.56    5121.56    5121.56        .00    5122.24        .68      16.16     -14.38    5121.90
     460.0         .0      459.4         .6         .0      69.4         .4        4.0        2.1    5121.20
       .07        .00       6.62       1.72       .000       .050       .050       .000    5120.00    1137.25
   .033695        475.       480.       470.          0         17          0        .00      53.65    1190.91


*SECNO 2170.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.45

  2170.000       1.91    5132.21    5131.95        .00    5132.52        .31      10.25        .04    5131.20
     440.0         46.3      393.7         .0        16.6       84.7         .1        4.9        2.9    5132.10
       .10         2.80       4.65        .04        .050       .050       .050       .000    5130.30    1148.59
   .014747        490.       500.       490.          6          8          0        .00      86.64    1235.24


*SECNO 2180.000
  2180.000       2.07    5141.07    5140.69        .00    5141.38        .31       8.86        .00    5141.00
     420.0         .0      420.0         .0         .1       93.7         .0        6.3        3.9    5141.30
       .14        .04       4.48        .00       .050       .050       .000       .000    5139.00    1244.21
   .014776        600.       600.       600.          5         11          0        .00      70.41    1314.61


*SECNO 2190.000
  2190.000       1.54    5149.24    5148.95        .00    5149.45        .21       8.06        .01    5148.60
     390.0         12.7      371.8         5.5        8.0       98.7         3.9        7.6        5.2    5148.70
       .18         1.59       3.77       1.42        .050       .050       .050       .000    5147.70    1169.18
   .013132        565.       580.       575.          4         14          0        .00     124.58    1293.77
```

```
    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

*SECNO 2200.000

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2200.000      1.00    5158.20    5158.20       .00    5158.40       .20       1.88       -.64    5158.00
     390.0       1.2       362.6       26.2        .9       98.2       11.7        7.8        5.4    5158.00
       .19      1.32        3.69       2.24       .050       .050       .050       .000    5157.20    1080.88
   .041806       45.        45.        45.          0         14          0        .00     282.25    1922.03


   Run Date:   2JUN**    Run Time:  8:31:48    HMVersion: 6.60    Data File:   EFFECT.hc2                          Page    5

T1TODD CREEK TRIBUTARY 2 FHAD
T2MULLER ENGINEERING CO. AUG 1985
T3       50 YEAR FLOOD

J1  ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

        0          3          0          0          0          0          0          0    5103.89

J2  NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

        2          0         -1          0          0          0         -1          0          0          0


   Run Date:   2JUN**    Run Time:  8:31:48    HMVersion: 6.60    Data File:   EFFECT.hc2                          Page    6

    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

*PROF 2

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=      .100 CEHV=      .300
*SECNO 2120.000
3720 CRITICAL DEPTH ASSUMED
  2120.000      2.59    5103.89    5103.89    5103.89    5104.88       .99        .00        .00    5101.80
    1030.0      40.7       927.9       61.4        8.5       112.5       13.1         .0         .0    5101.90
       .00      4.79        8.25       4.70       .050       .050       .050       .000    5101.30    1191.48
   .025482        0.          0.         0.          0          4          0        .00      70.34    1261.81


*SECNO 2130.000

3301 HV CHANGED MORE THAN HVINS

  2130.000      1.85    5114.25    5113.92       .00    5114.63       .39       9.70        .06    5114.20
     920.0         .0       920.0         .0         .0       184.0         .0        1.8        1.1    5114.20
       .03        .04        5.00        .04       .050       .050       .050       .000    5112.40    1330.09
   .016448       490.       485.       480.          4         11          0        .00     124.13    1454.21


SPECIAL BRIDGE

SB  XK         XKOR       COPQ       RDLEN      BWC        BWP        BAREA      SS         ELCHU      ELCHD
       .90       1.56       2.80        .00       1.57        .10       3.34        .00    5112.00    5111.80

*SECNO 2150.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  4.80

PRESSURE AND WEIR FLOW,  Weir Submergence Based on TRAPEZOIDAL Shape


   Run Date:   2JUN**    Run Time:  8:31:48    HMVersion: 6.60    Data File:   EFFECT.hc2                          Page    7

    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST
```

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
6952.14	5145.85	.08	871.	50.	3.	3.	5114.00	5117.20	158.
2150.000	5.70	5119.50	.00	.00	5119.58	.08	4.95	.00	5117.80
920.0	.0	841.3	78.7	.0	361.2	70.0	2.3	1.3	5116.50
.04	.01	2.33	1.12	.050	.050	.050	.000	5113.80	1433.28
.000714	90.	80.	80.	2	0	10	.00	118.40	1551.67

*SECNO 2160.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2160.000	2.27	5122.27	5122.27	.00	5123.24	.97	13.48	-11.06	5121.90
860.0	.3	849.2	10.5	.2	106.9	3.2	5.3	2.3	5121.20
.05	1.55	7.94	3.26	.050	.050	.050	.000	5120.00	1135.15
.028109	475.	480.	470.	0	18	0	.00	59.74	1194.90

*SECNO 2170.000

2170.000	2.45	5132.75	5132.49	.00	5133.23	.48	9.93	.05	5131.20
810.0	130.7	675.6	3.7	33.6	115.6	2.1	6.8	3.2	5132.10
.08	3.89	5.84	1.73	.050	.050	.050	.000	5130.30	1141.20
.015407	490.	500.	490.	5	8	0	.00	99.49	1240.69

*SECNO 2180.000

2180.000	2.64	5141.64	5141.26	.00	5142.09	.45	8.86	.00	5141.00
740.0	16.7	723.1	.1	9.3	132.9	.1	8.8	4.6	5141.30
.11	1.80	5.44	1.02	.050	.050	.050	.000	5139.00	1213.94
.014172	600.	600.	600.	5	11	0	.00	103.43	1317.37

*SECNO 2190.000

2190.000	1.94	5149.64	5149.34	.00	5149.94	.30	7.84	.02	5148.60
680.0	49.9	605.6	24.4	21.4	132.9	12.0	10.9	6.3	5148.70
.15	2.34	4.56	2.04	.050	.050	.050	.000	5147.70	1152.31
.012944	565.	580.	575.	4	14	0	.00	152.38	1304.69

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2200.000

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2200.000	1.20	5158.40	5158.40	.00	5158.65	.24	1.84	-.62	5158.00
680.0	7.4	591.9	80.7	3.6	143.9	28.7	11.1	6.5	5158.00
.15	2.06	4.11	2.81	.050	.050	.050	.000	5157.20	1071.96
.040790	45.	45.	45.	0	14	0	.00	377.39	1924.01

T1TODD CREEK TRIBUTARY 2 FHAD
T2MULLER ENGINEERING CO. AUG 1985
T3 100 YEAR FLOOD

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	4	0	0	0	0	0	0	5104.26	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	14	0	-1	0	0	0	-1	0	0	15

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

```
*PROF 3

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=     .100 CEHV=     .300
*SECNO 2120.000
  2120.000      2.96   5104.26   5104.25   5104.26   5105.36      1.10       .00       .00   5101.80
    1300.0      60.4    1146.7      92.9      11.7     130.5      18.3        .0        .0   5101.90
       .00      5.15      8.79      5.07      .050      .050      .050      .000   5101.30   1190.06
   .023742        0.        0.        0.         0         4         0       .00     74.16   1264.22


FLOW DISTRIBUTION FOR SECNO=   2120.00          CWSEL=   5104.26

STA=    1190.    1200.    1249.    1264.
  PER Q=      4.6     88.2      7.1
   AREA=     11.7    130.5     18.3
    VEL=      5.1      8.8      5.1
  DEPTH=      1.2      2.7      1.2

*SECNO 2130.000

3301 HV CHANGED MORE THAN HVINS

  2130.000      2.06   5114.46   5114.13       .00   5114.93       .47      9.50       .06   5114.20
    1160.0        .7    1158.7        .6        .7     210.5        .6       2.1       1.1   5114.20
       .02        .99      5.51       .99      .050      .050      .050      .000   5112.40   1325.75
   .016685      490.      485.      480.         5        14         0       .00     132.33   1458.08


FLOW DISTRIBUTION FOR SECNO=   2130.00          CWSEL=   5114.46

STA=    1326.    1331.    1453.    1458.
  PER Q=      .1     99.9       .1
   AREA=      .7    210.5        .6
    VEL=     1.0      5.5      1.0
  DEPTH=      .1      1.7       .1
```



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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
      .90      1.56      2.80       .00      1.57       .10      3.34       .00   5112.00   5111.80

*SECNO 2150.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  4.21

PRESSURE AND WEIR FLOW,  Weir Submergence Based on TRAPEZOIDAL Shape

 EGPRS      EGLWC       H3        QWEIR     QPR       BAREA     TRAPEZOID      BLLC      ELTRD     WEIRLN
                                                               AREA
  8036.34   5134.41       .11      1111.      50.       3.        3.      5114.00   5117.20      167.


  2150.000      5.96   5119.76       .00       .00   5119.87       .11      4.93       .00   5117.80
    1160.0        .0    1047.4     112.6        .0     379.4      82.6       2.7       1.4   5116.50
       .03        .01      2.76      1.36      .050      .050      .050      .000   5113.80   1433.27
   .000939      90.       80.       80.         2         0        10       .00     122.28   1555.55


FLOW DISTRIBUTION FOR SECNO=   2150.00          CWSEL=   5119.76

STA=    1433.    1504.    1518.    1520.    1556.
  PER Q=     90.3      5.5       .5      3.7
   AREA=    379.4     36.7      4.0     42.0
    VEL=      2.8      1.7      1.5      1.0
  DEPTH=      5.3      2.7      2.2      1.2

*SECNO 2160.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2160.000      2.61   5122.61   5122.61       .00   5123.71      1.10     12.51     -9.84   5121.90
    1080.0        1.5    1057.6      20.9        .6     124.7       5.6       5.9       2.4   5121.20
```

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      .05      2.30      8.48      3.76      .050      .050      .050      .000   5120.00   1134.30
  .026100      475.      480.      470.         0        14         0       .00     62.48   1196.78


 Run Date:  2JUN**    Run Time:  8:31:48    HMVersion: 6.60    Data File:  EFFECT.hc2                          Page  12

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

FLOW DISTRIBUTION FOR SECNO=  2160.00          CWSEL=  5122.61

STA=    1134.     1136.     1189.     1197.
  PER Q=      .1      97.9       1.9
   AREA=      .6     124.7       5.6
    VEL=     2.3       8.5       3.8
  DEPTH=      .4       2.4        .7

*SECNO 2170.000

3301 HV CHANGED MORE THAN HVINS

  2170.000      2.68   5132.98   5132.72       .00   5133.54       .56      9.78       .05   5131.20
    1010.0     183.7     817.9       8.4      41.8     129.0       3.9       7.7       3.3   5132.10
       .07      4.39      6.34      2.14      .050      .050      .050      .000   5130.30   1140.08
  .015690      490.      500.      490.         4        11         0       .00    102.97   1243.04


FLOW DISTRIBUTION FOR SECNO=  2170.00          CWSEL=  5132.98

STA=    1140.     1142.     1157.     1176.     1234.     1243.
  PER Q=      .0       4.1      14.0      81.0        .8
   AREA=      .3      12.8      28.7     129.0       3.9
    VEL=     1.2       3.3       4.9       6.3       2.1
  DEPTH=      .2        .8       1.5       2.2        .4

*SECNO 2180.000
  2180.000      2.88   5141.88   5141.55       .00   5142.39       .51      8.84       .01   5141.00
     920.0      42.2     877.2        .6      17.9     150.1        .4      10.1       4.8   5141.30
       .10      2.35      5.84      1.47      .050      .050      .050      .000   5139.00   1210.02
  .013897      600.      600.      600.         5         8         0       .00    108.00   1318.02


FLOW DISTRIBUTION FOR SECNO=  2180.00          CWSEL=  5141.88

STA=    1210.     1218.     1226.     1234.     1247.     1317.     1318.
  PER Q=      .3        .6        .8       2.9      95.3        .1
   AREA=     1.8       3.1       3.5       9.5     150.1        .4
    VEL=     1.3       1.8       2.0       2.8       5.8       1.5
  DEPTH=      .2        .4        .4        .7       2.2        .3

 Run Date:  2JUN**    Run Time:  8:31:48    HMVersion: 6.60    Data File:  EFFECT.hc2                          Page  13

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*SECNO 2190.000
  2190.000      2.11   5149.81   5149.53       .00   5150.14       .33      7.73       .02   5148.60
     830.0      77.3     715.0      37.7      29.1     147.1      16.6      12.5       6.6   5148.70
       .14      2.66      4.86      2.27      .050      .050      .050      .000   5147.70   1144.49
  .012857      565.      580.      575.         4        14         0       .00    164.74   1309.23


FLOW DISTRIBUTION FOR SECNO=  2190.00          CWSEL=  5149.81

STA=    1144.     1159.     1194.     1279.     1309.
  PER Q=      .3       9.1      86.1       4.5
   AREA=     2.2      26.9     147.1      16.6
    VEL=     1.0       2.8       4.9       2.3
  DEPTH=      .2        .8       1.7        .6

*SECNO 2200.000

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2200.000      1.28   5158.48   5158.48       .00   5158.74       .26      1.79      -.60   5158.00
     830.0      12.1     703.4     114.5       5.3     165.6      38.1      12.7       6.9   5158.00
       .14      2.30      4.25      3.00      .050      .050      .050      .000   5157.20   1068.25
  .039756       45.       45.       45.         0        14         0       .00    416.99   1924.83


FLOW DISTRIBUTION FOR SECNO=  2200.00          CWSEL=  5158.48

STA=    1068.     1090.     1390.     1462.     1895.     1910.     1920.     1925.
```

PER Q=	1.5	84.7	4.9	1.3	4.4	2.9	.3
AREA=	5.3	165.6	17.5	4.9	8.8	5.8	1.2
VEL=	2.3	4.2	2.3	2.3	4.1	4.1	2.3
DEPTH=	.2	.6	.2	.0	.6	.6	.2

THIS RUN EXECUTED 2JUN** 8:31:48

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

10 YEAR FLOOD

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	2120.000	.00	.00	.00	5101.30	530.00	5103.11	5103.11	5103.79	298.33	6.75	82.20	30.68
*	2120.000	.00	.00	.00	5101.30	1030.00	5103.89	5103.89	5104.88	254.82	8.25	134.11	64.52
	2120.000	.00	.00	.00	5101.30	1300.00	5104.26	5104.25	5105.36	237.42	8.79	160.57	84.37
	2130.000	485.00	.00	.00	5112.40	490.00	5113.71	5113.44	5113.96	160.65	4.01	122.13	38.66
	2130.000	485.00	.00	.00	5112.40	920.00	5114.25	5113.92	5114.63	164.48	5.00	184.08	71.73
	2130.000	485.00	.00	.00	5112.40	1160.00	5114.46	5114.13	5114.93	166.85	5.51	211.76	89.80
*	2150.000	80.00	5117.20	5114.00	5113.80	490.00	5118.90	.00	5118.93	3.26	1.45	363.11	271.57
*	2150.000	80.00	5117.20	5114.00	5113.80	920.00	5119.50	.00	5119.58	7.14	2.33	431.27	344.34
*	2150.000	80.00	5117.20	5114.00	5113.80	1160.00	5119.76	.00	5119.87	9.39	2.76	462.12	378.52
*	2160.000	480.00	.00	.00	5120.00	460.00	5121.56	5121.56	5122.24	336.95	6.62	69.76	25.06
*	2160.000	480.00	.00	.00	5120.00	860.00	5122.27	5122.27	5123.24	281.09	7.94	110.32	51.30
*	2160.000	480.00	.00	.00	5120.00	1080.00	5122.61	5122.61	5123.71	261.00	8.48	130.91	66.85
*	2170.000	500.00	.00	.00	5130.30	440.00	5132.21	5131.95	5132.52	147.47	4.65	101.36	36.23
	2170.000	500.00	.00	.00	5130.30	810.00	5132.75	5132.49	5133.23	154.07	5.84	151.38	65.26
	2170.000	500.00	.00	.00	5130.30	1010.00	5132.98	5132.72	5133.54	156.90	6.34	174.71	80.63
	2180.000	600.00	.00	.00	5139.00	420.00	5141.07	5140.69	5141.38	147.76	4.48	93.78	34.55
	2180.000	600.00	.00	.00	5139.00	740.00	5141.64	5141.26	5142.09	141.72	5.44	142.32	62.16
	2180.000	600.00	.00	.00	5139.00	920.00	5141.88	5141.55	5142.39	138.97	5.84	168.50	78.04
	2190.000	580.00	.00	.00	5147.70	390.00	5149.24	5148.95	5149.45	131.32	3.77	110.64	34.03
	2190.000	580.00	.00	.00	5147.70	680.00	5149.64	5149.34	5149.94	129.44	4.56	166.22	59.77
	2190.000	580.00	.00	.00	5147.70	830.00	5149.81	5149.53	5150.14	128.57	4.86	192.78	73.20
*	2200.000	45.00	.00	.00	5157.20	390.00	5158.20	5158.20	5158.40	418.06	3.69	110.83	19.07
*	2200.000	45.00	.00	.00	5157.20	680.00	5158.40	5158.40	5158.65	407.90	4.11	176.21	33.67
*	2200.000	45.00	.00	.00	5157.20	830.00	5158.48	5158.48	5158.74	397.56	4.25	208.99	41.63

10 YEAR FLOOD

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	2120.000	530.00	5103.11	.00	.00	.00	62.14	.00
*	2120.000	1030.00	5103.89	.78	.00	.00	70.34	.00
	2120.000	1300.00	5104.26	.37	.00	.00	74.16	.00
	2130.000	490.00	5113.71	.00	10.60	.00	111.00	485.00
	2130.000	920.00	5114.25	.54	10.35	.00	124.13	485.00
	2130.000	1160.00	5114.46	.22	10.20	.00	132.33	485.00
*	2150.000	490.00	5118.90	.00	5.19	.00	109.33	80.00
*	2150.000	920.00	5119.50	.60	5.25	.00	118.40	80.00
*	2150.000	1160.00	5119.76	.26	5.29	.00	122.28	80.00
*	2160.000	460.00	5121.56	.00	2.66	.00	53.65	480.00
*	2160.000	860.00	5122.27	.71	2.77	.00	59.74	480.00
*	2160.000	1080.00	5122.61	.34	2.85	.00	62.48	480.00
*	2170.000	440.00	5132.21	.00	10.65	.00	86.64	500.00
	2170.000	810.00	5132.75	.54	10.47	.00	99.49	500.00
	2170.000	1010.00	5132.98	.23	10.37	.00	102.97	500.00
	2180.000	420.00	5141.07	.00	8.86	.00	70.41	600.00
	2180.000	740.00	5141.64	.57	8.89	.00	103.43	600.00
	2180.000	920.00	5141.88	.24	8.90	.00	108.00	600.00

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      2190.000    390.00   5149.24      .00      8.17      .00    124.58    580.00
      2190.000    680.00   5149.64      .40      8.01      .00    152.38    580.00
      2190.000    830.00   5149.81      .17      7.93      .00    164.74    580.00

*     2200.000    390.00   5158.20      .00      8.96      .00    282.25     45.00
*     2200.000    680.00   5158.40      .20      8.76      .00    377.39     45.00
*     2200.000    830.00   5158.48      .08      8.67      .00    416.99     45.00

0
   Run Date:   2JUN**    Run Time:  8:31:48    HMVersion: 6.60    Data File:   EFFECT.hc2
```



```
 SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO=   2120.000  PROFILE=  2  CRITICAL DEPTH ASSUMED

WARNING SECNO=   2150.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=   2150.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=   2150.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=   2160.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2160.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2160.000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2160.000  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2160.000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2160.000  PROFILE=  3  MINIMUM SPECIFIC ENERGY

WARNING SECNO=   2170.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=   2200.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2200.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2200.000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2200.000  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2200.000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2200.000  PROFILE=  3  MINIMUM SPECIFIC ENERGY

Normal program termination
```

FLOODING SOURCE				100-YEAR FLOODPLAIN DATA				FLOODWAY DATA				
								FLOODWAY WIDTH[3]				
IDENTIFICATION	CROSS SECTION	STATION[1]	100 yr. DISCHARGE (CFS)	THALWEG ELEV. (MSL)	FLOOD ELEV. (MSL)	FLOODPLAIN WIDTH (Ft.)	VEL.[2] (FPS)	LEFT (Ft.)	RIGHT (Ft.)	TOTAL (Ft.)	VEL.[4] (FPS)	FLOODWAY ELEV. (MSL)
	1.25	40+85	430	5105.5	5106.4	170	3.7	100	10	110	3.7	5106.7
Upstream Study Limit	1.24	39+00	430	5101.6	5103.0	95	6.4	9	39	48	6.5	5103.2
East 160th Avenue	1.23	36+05	430	5093.9	5095.6	55	5.3	16	26	42	5.4	5096.0
	1.22	34+60	560	5092.1	5094.2	115	2.5	30	30	60	4.6	5094.5
Road Crossing	1.20	34+25	560	5088.8	5091.2	65	6.2	11	25	36	6.1	5091.6
	1.19	30+00	560	5080.0	5082.2	50	7.5	22	13	35	8.1	5082.4
	1.18	27+00	680	5076.7	5080.1	100	2.4			*		
	1.17	22+45	680	(5070.0)	5079.8	350	0.4			*		
	1.16	21+80	680	5073.1	5078.1	30@@	9.2			*		
Reservoir Embankment	1.15	21+20	800	5064.3	5066.8	90+	6.3	13	32	45+	6.7	5067.1
	1.14	17+90	800	5059.2	5060.8	110	5.8	60	16	76	6.4	5061.1
	1.13	13+50	800	5050.2	5053.7	85	5.0	15	37	52	5.0	5054.1
	1.12	9+65	940	5045.9	5048.9	70	8.4	20	17	37	9.4	5048.9
	1.11	6+00	940	5040.3	5044.2	130	3.2	16	34	50	5.0	5044.5
	1.10	3+55	940	5037.3	5044.0	295	1.2			*		
	2.24	53+20	830	5155.4	5158.9	505	0.9	43	117	160	1.5	5159.4
Upstream Study Limit	2.22	52+50	830	5154.0	5158.8	595	0.5	150	250	400	0.5	5158.8
Monaco Street	2.21	48+80	830	5152.0	5158.8	820	0.5			*		
	2.20	48+25	830	5157.2	5158.5	830**	4.3			*		
Reservoir Embankment	2.19	47+75	830	5147.7	5149.8	200+	4.9	58	14	72	5.9	5150.0
	2.18	42+00	920	5139.0	5141.9	150	5.8	40	25	65	5.5	5142.3
	2.17	36+00	1010	5130.3	5133.0	90	6.3	38	22	60	8.1	5133.0

1 Distance in feet above confluence
2 Mean velocity in channel
3 From channel station line looking downstream
4 Mean velocity in floodway

() Estimated reservoir bottom
@@ Floodplain confined to spillway
\+ Width does not include spillway floodplain
* Floodway width = floodplain width
** Width includes island areas and/or other high ground between outer floodplain boundaries

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
7000 WEST FOURTEENTH AVENUE
LAKEWOOD, COLORADO 80215
(303) 232-9340

URBAN DRAINAGE & FLOOD CONTROL DISTRICT

FLOOD HAZARD AREA DELINEATION
ADAMS COUNTY, COLORADO

FLOODPLAIN AND FLOODWAY REFERENCE DATA

TODD CREEK TRIBUTARIES 1 & 2

TABLE V

FLOODING SOURCE				100-YEAR FLOODPLAIN DATA				FLOODWAY DATA				
IDENTIFICATION	CROSS SECTION	STATION[1]	100 yr. DISCHARGE (CFS)	THALWEG ELEV. (MSL)	FLOOD ELEV. (MSL)	FLOODPLAIN WIDTH (Ft.)	VEL.[2] (FPS)	FLOODWAY WIDTH[3] LEFT (Ft.)	RIGHT (Ft.)	TOTAL (Ft.)	VEL.[4] (FPS)	FLOODWAY ELEV. (MSL)
	2.16	31+00	1080	5120.0	5122.6	65	8.5	27	35	62	6.7	5123.1
Quebec Street	2.15	26+20	1160	5113.8	5119.8	185	2.7	30	70	100	2.4	5120.1
	2.13	25+35	1160	5112.4	5114.5	120	5.5	54	26	80	6.3	5114.8
	2.12	20+50	1300	5101.3	5104.3	80	8.8	38	15	53	9.2	5104.3
	2.11	16+00	1300	(5097.0)	5102.5	185	1.9			*		
	2.10	10+00	1470	(5095.0)	5102.4	550	0.5			*		
Upstream Study Limit	3.15	26+25	420	5206.4	5209.0	50	5.9	10	15	25	6.4	5209.3
	3.14	22+85	460	5201.2	5203.6	55	5.4	8	28	36	5.9	5203.9
	3.13	17+80	520	5191.3	5193.5	50	6.7	16	14	30	7.8	5193.7
	3.12	13+35	570	5182.3	5184.0	100	5.4	20	34	54	5.9	5184.3
	3.11	6+80	640	5170.3	5173.2	75	5.4	10	30	40	6.1	5173.5
	3.10	1+75	700	5160.8	5163.5	90	6.0	26	24	50	7.7	5163.7
Upstream Study Limit	4.55	145+00	500	5202.0	5204.1	70	7.7	25	15	40	7.3	5204.1
	4.54	144+00	530	5198.4	5201.1	65	7.5	11	23	34	7.0	5201.3
	4.53	139+50	620	5192.1	5194.6	70	8.3	23	20	43	7.6	5194.7
	4.52	134+50	750	5188.5	5191.6	260	2.4	25	55	80	3.5	5191.9
Quebec Street	4.51	134+15	750	5185.4	5191.5	210	2.8	32	48	80	2.8	5191.9
	4.49	133+30	750	5184.9	5185.3	150	2.4	68	30	98	6.2	5185.7
	4.48	132+90	750	5182.1	5184.2	120	4.2	76	9	85	5.6	5184.6
	4.47	127+75	890	5175.9	5178.5	110	6.6	17	54	71	5.9	5178.8
	4.46	125+80	890	5173.7	5175.6	120	5.5	22	61	83	7.0	5175.9

1 Distance in feet above confluence
2 Mean velocity in channel
3 From channel station line looking downstream
4 Mean velocity in floodway

* Floodway width = floodplain width
() Estimated reservoir bottom

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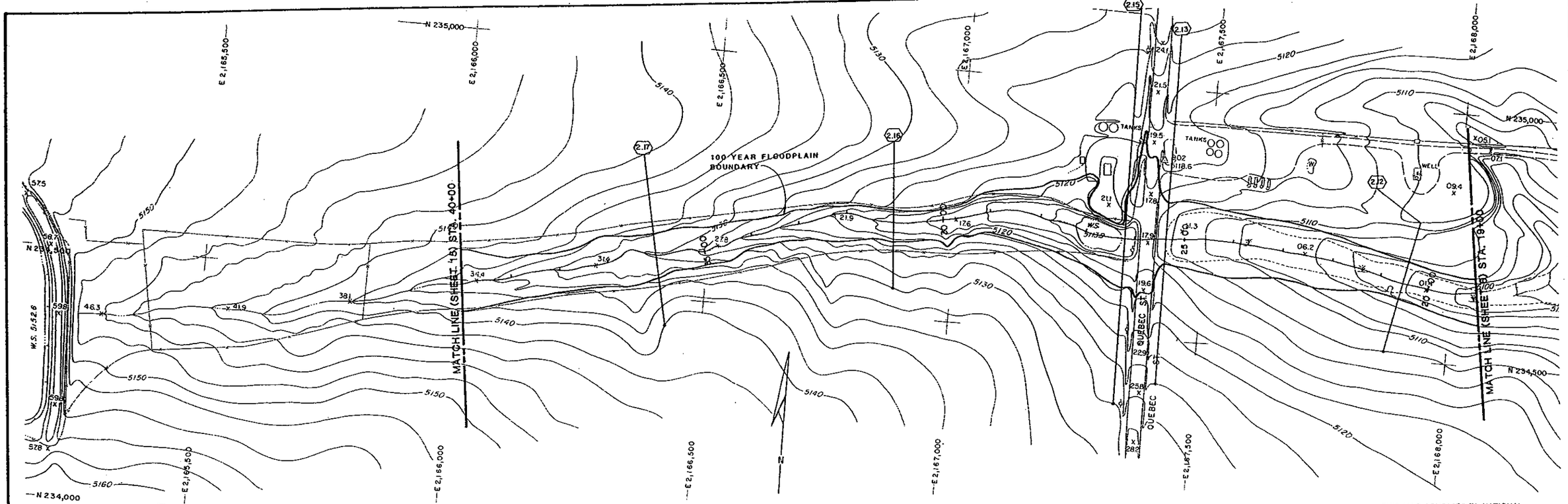
URBAN DRAINAGE & FLOOD CONTROL DISTRICT

FLOOD HAZARD AREA DELINEATION
ADAMS COUNTY, COLORADO

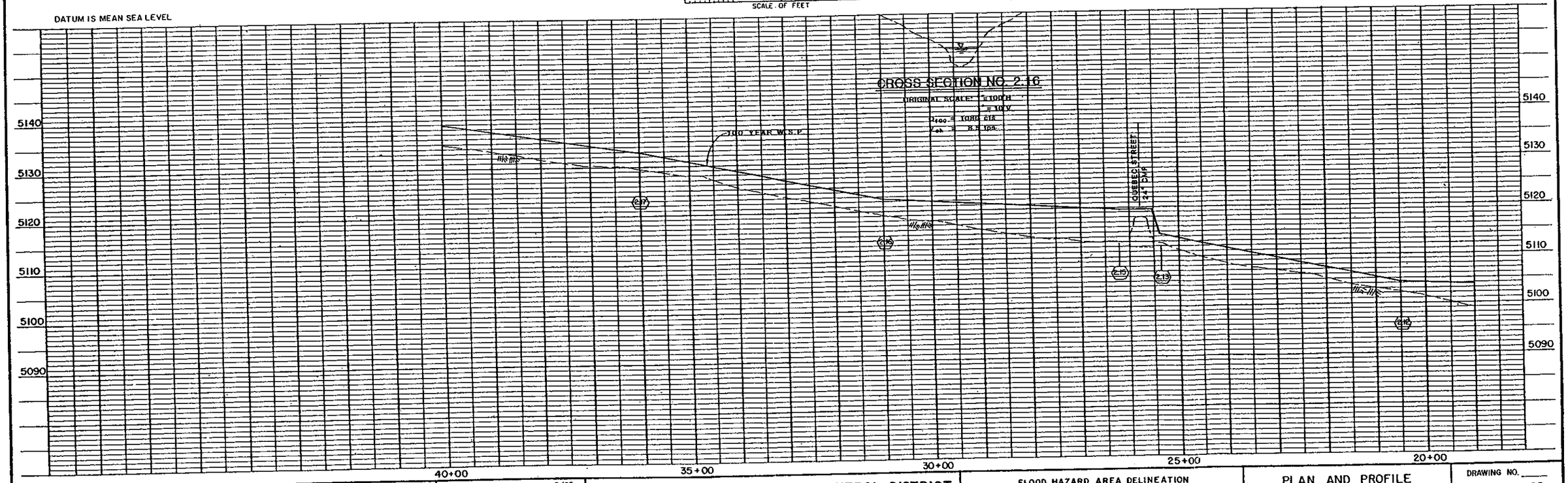
FLOODPLAIN AND FLOODWAY REFERENCE DATA

TODD CREEK TRIBUTARIES 2,3, & 4

TABLE V



DATUM IS MEAN SEA LEVEL



GROUND CONTROL SURVEY;
AERIAL PHOTOGRAPHY: JAN. 6, 1985
TOPOGRAPHIC MAPPING BY; Delta Aerial Surveys, Inc.
2345 SO. FEDERAL BLVD, SUITE 195
DENVER, COLORADO, 80219
CONTOUR INTERVAL = 2 FT.

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
7000 WEST FOURTEENTH AVENUE
LAKEWOOD, COLORADO 80215
(303) 232-9340

DESIGNED CEL, ADS DATE 9/85
DRAWN JHK, BMG DATE 9/85
CHECKED LAM DATE 12/85
REVISED ____ DATE ____

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

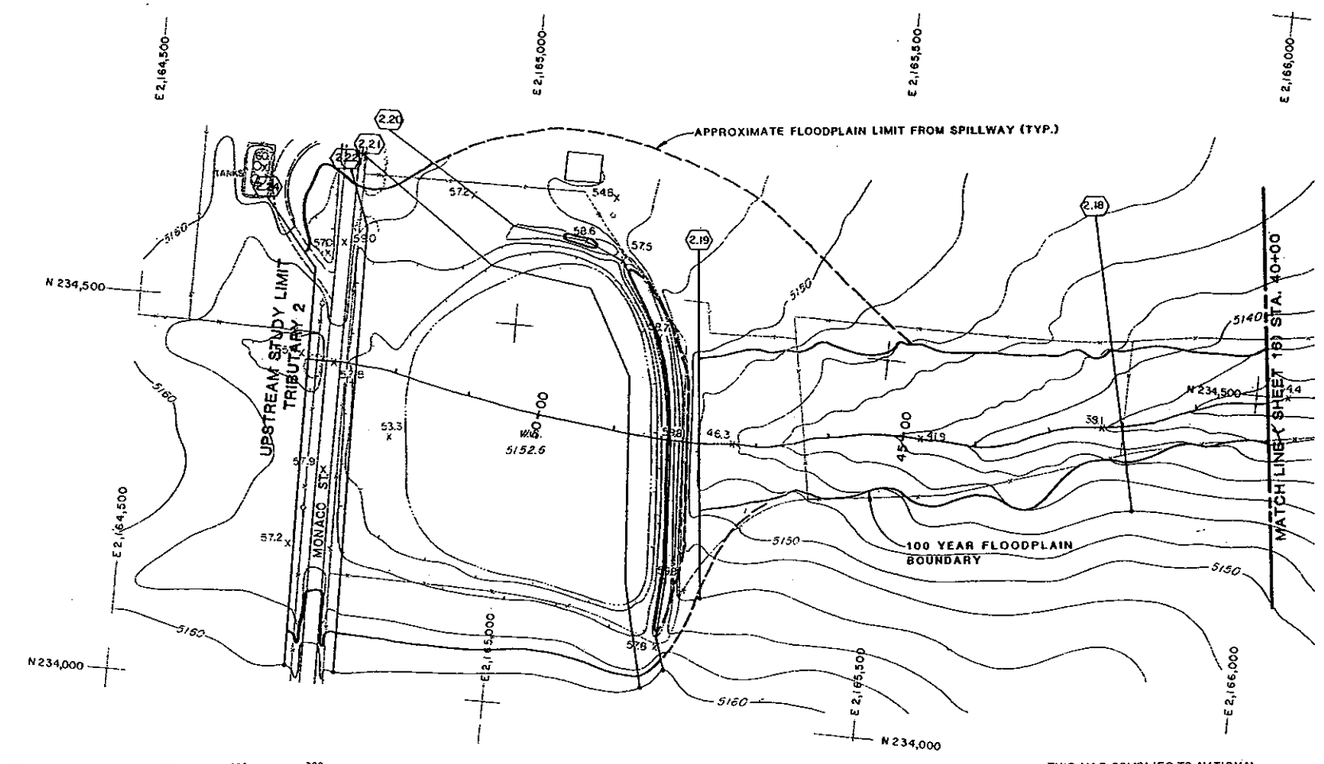
ADAMS COUNTY, COLORADO

FLOOD HAZARD AREA DELINEATION

TODD CREEK

PLAN AND PROFILE
TRIBUTARY 2
Sta 40+00 to Sta 19+00

DRAWING NO. ____
SHEET 16 OF 25
MEC JOB NO. 8515



GROUND CONTROL SURVEY:
AERIAL PHOTOGRAPHY: JAN. 6, 1985
TOPOGRAPHIC MAPPING BY:
CONTOUR INTERVAL = 2 FT.

Delta Aerial Surveys, Inc.
2345 SO. FEDERAL BLVD, SUITE 195
DENVER, COLORADO, 80219

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
7000 WEST FOURTEENTH AVENUE
LAKEWOOD, COLORADO 80215
(303) 232-9340

DESIGNED	CEL, ADS	DATE	9/85
DRAWN	JHK, BMG	DATE	9/85
CHECKED	I.AM	DATE	12/85
REVISED		DATE	

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

ADAMS COUNTY, COLORADO

FLOOD HAZARD AREA DELINEATION

TODD CREEK

PLAN AND PROFILE
TRIBUTARY 2
Sta 53+20 to Sta 40+00

DRAWING NO. ____
SHEET 15 OF 25
MEC JOB NO. 8515

HEC-RAS Version 3.1.2 April 2004
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Fuller Property CLOMR-Tributary 2
Project File : trib2.prj
Run Date and Time: 6/15/2005 8:36:46 AM

Project in English units

Project Description:
Fuller Subdivision - Conditional Letter of Map Revision
Todd Creek - Tributary
2
Thornton, Colorado

Prepared by:
Manhard Consulting, Ltd.
345 Inverness
Drive South, Suite B200
Englewood, CO 80112
303-708-0500

June
2005

Starting water surface elevation taken from FHAD model (Effective
FEMA model) at FHAD cross-section 2.12. 2.95 feet were added to the starting
WSEL to convert to NAVD88 (from NGVD29) datum to match topography.

****

PLAN DATA

Plan Title: existing
Plan File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.p01

Geometry Title: existing
Geometry File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.g01

Flow Title : existing
Flow File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.f01

Plan Summary Information:
Number of: Cross Sections = 26 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 40
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: Between every coordinate point (HEC2 Style)
Friction Slope Method: Program Selects Appropriate method
Computational Flow Regime: Subcritical Flow

****

FLOW DATA

Flow Title: existing
Flow File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.f01

Flow Data (cfs)

River	Reach	RS	10-year	50-year	100-year
Trib 2	Reach-1	5438	390	680	830
Trib 2	Reach-1	4711	420	740	920
Trib 2	Reach-1	4022	440	810	1010
Trib 2	Reach-1	3356	460	860	1080
Trib 2	Reach-1	2910	490	920	1160

```
* Trib 2          Reach-1         2370    *             530            1030            1300 *
*****************************************************************************************

Boundary Conditions
*****************************************************************************************************************
* River           Reach           Profile         *            Upstream                  Downstream    *
*****************************************************************************************************************
* Trib 2          Reach-1         10-year         *                                   Known WS = 5106.06 *
* Trib 2          Reach-1         50-year         *                                   Known WS = 5106.84 *
* Trib 2          Reach-1         100-year        *                                   Known WS = 5107.21 *
*****************************************************************************************************************

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

GEOMETRY DATA

Geometry Title: existing
Geometry File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.g01

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 5438

INPUT
Description:
Station Elevation Data    num=      89
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*************************************************************************************
        0     5166     4.28     5166     5.16     5166    16.8 5165.82    45.76 5165.58
    78.45   5165.3   109.34     5165    110.2 5164.99   110.22 5164.99   143.97 5164.72
   157.44   5164.6   182.38 5164.31   193.04   5164.2   212.22     5164    230.7 5163.79
   269.85   5163.4   294.71     5163   307.69 5162.69   323.08 5162.33   338.29     5162
   356.24 5161.73   375.57     5162   386.13 5162.32   390.25 5162.52   399.76     5163
   408.16 5163.14   444.86 5163.58   445.05 5163.59   451.05   5163.6   451.52 5163.55
   472.19 5163.65   474.17 5163.67   474.55   5163.7   476.25 5163.68   480.61 5163.74
   483.68 5163.78   485.65   5163.8   486.76   5163.8   487.91 5163.82   488.76 5163.82
   493.16 5163.83   498.49 5163.89   499.48   5163.9   533.54 5163.86   539.37 5163.85
   541.19 5163.83   544.22 5163.82    544.7   5163.8   560.12 5163.62   585.96 5163.37
    601.7     5163   611.25 5162.83    626.4   5162.6    632.9 5162.51   640.34 5162.44
   643.36 5162.41   649.78 5162.35   651.09   5162.3   652.48 5162.34      653 5162.33
   653.59 5162.33   653.93 5162.33   654.31   5162.3    674.7 5162.35   674.88 5162.35
    675.1 5162.35   675.22 5162.35   675.35   5162.3   675.41 5162.35   675.48 5162.35
   675.52 5162.35   675.58 5162.35   675.68   5162.4   675.81 5162.35   676.02 5162.36
   676.25 5162.36   689.41 5162.66   704.24     5163   720.68 5163.44   728.62 5163.73
   736.21     5164   744.46 5164.31   752.15   5164.6    762.4     5165   776.14 5165.42
   787.69   5165.7   800.17     5166   803.72   5166.1   805.78 5166.12

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*************************************************
       0     .05   212.22     .05   736.21     .05

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.   Expan.
        212.22   736.21               129     129     129              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 5309

INPUT
Description: FHAD x-section 2.24
Station Elevation Data    num=      50
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*************************************************************************************
        0   5164.5    26.88 5164.33    27.37 5164.33    28.43 5164.32    47.44 5164.22
    47.92   5164.2    48.49 5164.21    72.62     5164    79.15     5164    82.14     5164
   130.95   5163.2   133.96 5163.12   139.56     5163   143.18     5163   149.96 5162.91
   154.88   5162.9   155.44 5162.89   167.49 5162.79   179.27 5162.69   222.74 5162.34
   224.24   5162.3   250.68     5162    263.9 5161.64   300.79     5161   319.24 5160.79
   344.46     5161    358.5 5161.76   360.32 5161.83   361.33 5161.86   362.47 5161.89
   370.71     5162   424.23 5162.26   429.46 5162.29   429.91 5162.29    439.3 5162.33
   441.44 5162.33   461.42   5162.4   480.85 5162.32   483.27 5162.31   495.67   5162.3
   538.99     5162   596.39 5162.18    620.6     5162   621.31 5162.02   669.54     5163
   687.42 5163.63   699.73     5164    707.1   5164.3    728.5     5165   734.17 5165.26

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*************************************************
       0     .05   179.27     .05   669.54     .05

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.   Expan.
        179.27   669.54                67      67      67              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 5242

INPUT
Description: Monaco Street
```

Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5164.3	51.04	5164	128.37	5163	255.23	5162	261.08	5161.9
262.66	5161.84	265.63	5161.75	271.68	5161.74	292.3	5161.28	326.33	5161.11
400.17	5161.15	412.51	5161.19	421.52	5161.23	442.47	5161.2	443.96	5161.21
449.18	5161.26	452.44	5161.29	468.74	5161.3	482.86	5161.29	490.9	5161.3
493.83	5161.35	509.24	5161.4	518.77	5161.3	527.36	5161.33	537.81	5161.29
549.19	5161.4	558.6	5161.44	562.81	5161.47	580.23	5161.72	581.15	5161.7
594.89	5162	673.81	5162.7	677.38	5162.74	680.94	5162.8	689.74	5163
703.81	5163.27	728.11	5163.75	734.12	5163.8	739.61	5163.98	740.77	5164
769.69	5164.7	772.73	5164.73	781.04	5165	798.68	5165.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	255.23	.05	594.89	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
255.23	594.89	101	101	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 5141

INPUT
Description: PHAD x-section 2.22

Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5162.4	10.18	5162.38	33.48	5162.19	44.22	5162	47.92	5162
83.07	5161.1	86.04	5161.08	90.08	5161	114.96	5160.24	123.68	5160
138.51	5159.4	149.04	5159	160.38	5158.67	163.33	5158.6	196.76	5158
210.83	5157.8	211.44	5157.83	217.01	5157.8	222.42	5157.78	240.35	5157.73
241.05	5157.7	247.57	5157.67	258.11	5157.67	258.63	5157.67	260.53	5157.66
261.18	5157.7	263.03	5157.65	263.28	5157.65	274.97	5157.68	305.15	5157.47
305.83	5157.5	305.95	5157.47	325.25	5157.45	345.79	5157.45	369.12	5157.47
370.63	5157.5	398.84	5157.42	416.42	5157.64	417.16	5157.65	417.69	5157.65
418.61	5157.7	420.78	5157.66	421.75	5157.67	437.64	5157.75	445.47	5157.79
455.46	5158	481.69	5158.71	490.6	5159	508.51	5159.62	517.02	5160
522.47	5160.3	543.31	5161	558.34	5161.48	573.71	5162	598.47	5162.73
607.04	5163	613.63	5163.17						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	196.76	.05	455.46	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
196.76	455.46	104	104	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 5037

INPUT
Description:

Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5162.1	14.63	5162	24.32	5161.89	29.18	5161.82	63.03	5161.26
71.87	5161.1	77.34	5161.03	79.3	5161	79.41	5161	85.36	5160.74
86.14	5160.7	87.5	5160.64	88.51	5160.59	89.83	5160.53	102.16	5160
102.8	5160	102.94	5160	103.36	5159.97	104.69	5159.86	119.19	5159
119.76	5159	134.8	5158	138.99	5157.8	158.9	5157.24	159.52	5157.22
160.15	5157.2	160.58	5157.18	161.93	5157.12	162.27	5157.11	168.29	5157
184.16	5156.9	199.43	5156.84	199.55	5156.84	211.45	5156.82	213.35	5156.8
217.96	5156.8	219.54	5156.76	220.9	5156.75	222.47	5156.73	239.74	5156.61
265.86	5156.4	268.43	5156.35	277.3	5156.33	291.01	5156.28	291.78	5156.27
309.84	5156.2	314.31	5156.14	320.01	5156.16	326	5156.13	327.24	5156.13
328.36	5156.1	333.2	5156.15	338.75	5156.15	340.64	5156.16	373.82	5156.34
374.49	5156.3	375.34	5156.34	376.51	5156.34	379.88	5156.37	394.04	5156.33
479.15	5157	498.25	5157.98	498.64	5158	498.66	5158	502.03	5158.1
509.93	5158.38	512.42	5158.46	513.2	5158.49	521.38	5159	529.52	5159.6
536.01	5160	543.62	5160.24	565.2	5161	591.84	5161.8	598.28	5162
602.14	5162.11	631.19	5163	637.77	5163.19				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	168.29	.05	479.15	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
168.29	479.15	152	159	170	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 4878

INPUT
Description: FHAD x-section 2.21
Station Elevation Data num= 58

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5163.1	4.8	5163	29.77	5162.69	85.65	5162	154.19	5161.05
159.73	5161	212.81	5162	215.26	5161.75	219.78	5161	222.73	5160.71
230.12	5160.2	232.15	5160	234.83	5159.74	238.19	5159.43	241.42	5159.07
242.13	5159	249.14	5158.2	251.52	5158	266.85	5157.37	274.43	5157
293.76	5156.5	317.57	5156.47	317.9	5156.5	318.26	5156.47	329.7	5156
368.69	5155.38	475.59	5155	507.26	5154.76	536.47	5155	553.1	5155.14
574.15	5155	581	5154.93	586.13	5155	614.5	5155.19	643.69	5155.03
644.33	5155	648.6	5155.1	649.79	5155.08	653.36	5155.12	659.06	5155.19
665.1	5155.3	673.84	5155.4	676.74	5155.5	694.65	5156	700.89	5156.31
713.9	5157	724.07	5157.6	732.12	5158	742.85	5158.55	750.84	5159
762.14	5159.6	772.35	5160	786.87	5160.55	798.95	5161	803.05	5161.18
820.9	5162	822.59	5162.1	838.26	5162.97				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	274.43	.05	713.9	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
274.43	713.9	85	88	89	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 4790

INPUT
Description: Agricultural Pond Berm - FHAD x-section 2.20
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5163.2	9.43	5163	92.87	5162	174.37	5161	230.06	5160
251.43	5159.8	272.73	5160	299	5161	310.54	5162	311.81	5162
314.17	5161.96	357.12	5161.92	364.74	5162	394.89	5162.3	425.6	5162.45
435.76	5162.53	459.46	5162.52	501.38	5162.56	541.89	5162.55	577.48	5162.45
668.57	5162.19	696.73	5162.14	730.4	5162.38	769.59	5162	793.52	5161
805.53	5160.48	807.84	5161	811.33	5162	826.13	5162.6	845.91	5162
848.66	5161.6	860.46	5162	893.3	5163	912.22	5163.65		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.87	.05	826.13	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
92.87	826.13	79	79	79	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
174	299	5161	T

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 4711

INPUT
Description: FHAD x-section 2.19
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5157.3	13.46	5157	47.08	5156.29	61.97	5156	88.1	5155.64
157.3	5155	184.92	5154.5	218.02	5154	258.59	5153.15	264.81	5153
268.72	5152.91	274.36	5153	278.39	5153.09	291.19	5153	309.81	5152.3
335.18	5152.17	335.93	5152.18	342.01	5152.26	355.44	5152.5	363.5	5152.74
371.6	5152.92	373.08	5153	392.97	5153.69	408.81	5153.56	434.57	5153.73
441.57	5153.8	446.62	5153.86	448.04	5153.87	451.59	5154	454.17	5154.13
472.4	5155	485.36	5155.51	493.6	5155.99	493.95	5156	494.16	5156
513.92	5156.53	523.97	5157	547.53	5157.93	550.27	5158	581.01	5159
581.84	5159.04								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	291.19	.05	392.97	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
291.19	392.97	167	167	167	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 4544

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
**********************************************************************************
       0  5152.1   16.61    5152   18.11  5151.9   35.01    5151   52.84 5150.45
   62.6    5150   73.33 5149.65   95.27    5149      98 5148.91  128.15    5148
  137.1 5147.59  155.28    5147  172.84  5146.8   180.1    5147  193.15  5147.6
  199.38    5148  209.58  5148.6  216.05    5149  226.51 5149.49  236.36    5150
  255.09 5150.82  258.71    5151  261.45 5151.13  283.81    5152  289.61 5152.24

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
       0     .05  128.15     .05  199.38     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        128.15  199.38               182     186     189             .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4358

INPUT
Description:
Station Elevation Data    num=      27
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************
       0  5149.6   24.32    5149   43.45 5148.17   46.97    5148   49.93  5147.9
   81.96    5147    94.8 5146.45  104.79    5146  115.36 5145.52  127.63    5145
   144.9 5144.29  154.78  5144.3  162.61  5144.5  177.96    5145  186.78 5145.45
  198.91    5146  212.11  5146.9  212.77    5147  212.89    5147  212.91    5147
  215.32 5147.07  215.56  5147.1  233.13    5148  242.27 5148.49  251.43    5149
  263.88 5149.61   264.3  5149.6

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
       0     .05  127.63     .05  177.96     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        127.63  177.96               86      90      97             .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4268

INPUT
Description:
Station Elevation Data    num=      53
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************
       0  5148.8   39.42    5148   53.83  5147.5   64.35 5147.11   67.24    5147
   87.06 5146.22    92.3    5146  102.45 5145.53  115.04    5145  128.57 5144.15
  130.92    5144  142.34  5143.3  148.47    5143  149.97    5143  168.75  5143.2
  190.56    5144  193.06  5144.3  198.31 5144.85  199.61 5144.94  200.51    5145
   201.4 5145.07  201.53 5145.08  207.25 5145.48  208.39 5145.57  211.67  5145.8
  212.05  5145.8  212.27 5145.82  213.78  5145.9  213.87  5145.9  213.94  5145.9
  215.38 5145.96  216.08    5146  218.09    5146  220.17 5146.02   220.2    5146
  221.18 5146.04  221.89 5146.07  222.94 5146.13  223.74 5146.17  224.27  5146.2
  224.74 5146.23  225.41 5146.28  228.26 5146.49  229.54 5146.58   230.2  5146.6
  230.83 5146.68  234.69    5147  240.77 5147.26  252.67    5148  260.32  5148.5
  269.04    5149  279.48 5149.62   285.8 5149.97

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
       0     .05  115.04     .05  200.51     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        115.04  200.51               56      54      52             .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4214

INPUT
Description: FHAD x-section 2.18
Station Elevation Data    num=      30
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************
       0  5147.8   31.18    5147   31.26    5147   38.52 5146.63   49.59    5146
   52.03  5145.9   63.85 5145.49   72.59  5145.2   74.16 5145.14   77.63    5145
   81.39  5144.8   99.85    5144  115.98 5143.12  117.96    5143  139.91 5142.19
   167.9    5143  172.32 5143.64  175.44    5144  179.31 5144.44  184.07    5145
  187.39 5145.38  187.44 5145.39  194.27    5146  203.64 5146.57  210.85    5147
  224.01 5147.62  225.66 5147.71  230.04    5148  231.66  5148.1  241.48 5148.73

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
       0     .05   77.63     .05  184.07     .05
```

```
Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
          77.63  184.07                67      72      75              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4142

INPUT
Description:
Station Elevation Data    num=      36
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
       0  5146.5    21.25     5146     32.2 5145.23    35.93     5145    51.65 5144.56
   70.95     5144    73.14 5143.91       88     5143       99 5142.36   104.65     5142
  120.84 5141.05   121.55     5141   125.46 5140.91   129.37     5141   135.31   5141.5
  141.09     5142   149.17 5142.65   153.54     5143   162.99 5143.78   166.37     5144
  175.96 5144.61   181.12     5145   186.55   5145.3   200.48     5146   201.26     5146
  201.92 5146.07   211.98   5146.5   213.48 5146.56   214.94 5146.63   215.54   5146.7
  216.07 5146.69   220.83     5147   232.47 5147.72   237.09     5148    241.1   5148.2
  241.86 5148.28

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05       88     .05   153.54     .05

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
             88  153.54                128     120     115              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4022

INPUT
Description:
Station Elevation Data    num=      40
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
       0  5144.6    25.06 5144.07    26.37 5144.05    27.38 5144.02    28.28 5144.02
    29.8     5144     30.2     5144     30.5     5144    31.57 5143.97    32.72 5143.93
   46.34   5143.6    47.49 5143.57    48.46 5143.53    49.19  5143.5     50.6 5143.43
   57.84     5143     61.9 5142.77     73.2     5142    82.59 5141.38    90.67     5141
   96.85   5140.7   110.28     5140   127.27 5139.12   129.87     5139   131.82 5138.93
  134.06     5139    134.9 5139.07   146.29     5140   153.29 5140.65   157.62     5141
  168.28   5141.9   169.25     5142   175.69 5142.54   181.24     5143   182.53 5143.08
  197.14     5144   198.65 5144.09   214.13     5145   217.64 5145.22   220.82 5145.41

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05     90.67     .05   157.62     .05

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
          90.67  157.62                178     178     178              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 3844

INPUT
Description:
Station Elevation Data    num=      25
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
       0  5143.2     4.78     5143    24.59 5142.32    32.91     5142    82.24     5141
   84.66 5140.78    93.32     5140    96.42 5139.77   106.43     5139   116.34   5138.5
  131.04     5138   167.31   5137.3   180.51     5138   184.94   5138.4   190.69     5139
  195.09 5139.46   200.52     5140   206.69 5140.67   211.71     5141   226.21 5141.72
  231.78     5142   250.88 5142.94   252.05     5143   252.96     5143      258  5143.3

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05   106.43     .05   190.69     .05

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
         106.43  190.69                244     239     246              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 3600

INPUT
Description: FHAD x-section 2.17
Station Elevation Data    num=      28
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
```

```
      0  5140.2    4.01    5140   18.87  5139.3   25.21    5139   75.02 5138.07
  80.81    5138   80.99    5138   85.61 5137.85   87.1 5137.79  105.03    5137
 123.01  5136.2  127.85    5136  148.07 5135.15  151.42    5135  169.85  5134.4
 180.53    5135  182.51 5135.23  189.09    5136  193.09 5136.48  197.51    5137
 202.22  5137.6  206.42    5138   212.3 5138.77  214.12 5138.95  214.86    5139
 215.22    5139  238.39    5140  249.38 5140.65

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05  105.03     .05  197.51     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
        105.03  197.51               249     244     243              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 3356

INPUT
Description:
Station Elevation Data     num=      28
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*****************************************************************************************
       0  5135.9     3.23 5135.72   20.53    5135   28.13 5134.63    47.2    5134
   62.11  5133.5    76.63    5133   97.62  5132.3  104.37    5132  117.63 5131.42
  130.02    5131   159.13 5130.35  163.54    5131   168.9  5131.7  170.68    5132
  176.65 5132.84  177.83    5133  184.71 5133.96  184.97    5134  186.49 5134.21
  192.82    5135  193.45 5135.08  200.84    5136  204.98  5136.5  208.64    5137
  217.14 5137.49  219.94 5137.59  220.78 5137.61

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05  104.37     .05  170.68     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
        104.37  170.68               262     255     253              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 3101

INPUT
Description: FHAD x-section 2.16
Station Elevation Data     num=      32
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*****************************************************************************************
       0  5132.2     6.78    5132   25.21 5131.24   30.73    5131   31.87 5130.95
   52.93    5130    70.09 5129.22    75.2    5129   86.69 5128.49   95.51    5128
  104.53  5127.5   105.66 5127.47  111.71 5127.32   122.5 5127.12  124.38 5127.05
  136.24    5127   193.46  5126.9  202.79    5127  203.44 5127.11  206.74    5128
  212.78 5128.76  214.49    5129  217.29 5129.42  217.78 5129.46  219.24  5129.5
  227.27    5130  235.94 5130.45  246.56    5131  253.83 5131.37  263.18    5132
  269.69 5132.37  278.41 5132.92

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05     75.2     .05  214.49     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
         75.2  214.49               188     191     191              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 2910

INPUT
Description:
Station Elevation Data     num=      30
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*****************************************************************************************
       0  5129.6      8.1 5129.63   19.03 5129.44   27.21  5129.3   34.55    5129
   52.02 5128.25    56.69    5128   67.92 5127.42   76.62    5127   83.13 5126.64
  107.23    5126   146.01    5125  148.57  5124.9  177.86    5124  205.79 5123.16
  216.11    5124   219.25 5124.48  222.87    5125  226.71 5125.61  229.53    5126
  234.21  5126.7   236.08    5127  241.44 5127.85  242.48    5128  248.44 5128.93
  248.93    5129   254.33 5129.86  255.35    5130  259.08 5130.23  259.34 5130.24

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05  146.01     .05  222.87     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
        146.01  222.87               183     176     174              .1      .3

CROSS SECTION
```

RIVER: Trib 2
REACH: Reach-1 RS: 2734

INPUT
Description:
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5125.6	10.43	5125.54	12.91	5125.49	13.71	5125.47	14.04	5125.46
34.34	5125	34.93	5124.99	34.99	5124.99	35.01	5124.98	35.04	5124.98
35.09	5125	36.62	5124.92	37.61	5124.86	52.03	5124	55.05	5123.9
56.92	5123.8	58.01	5123.8	75.63	5123	80.29	5122.81	107.39	5122
112.91	5121.6	122.44	5121	133.8	5120.28	140.27	5120	188.77	5119.7
203.1	5120	210.64	5120.91	211.26	5121	211.74	5121.07	218.25	5122
224.59	5122.92	225.1	5123	226.98	5123.2	227.72	5123.29	229.21	5123.38
242.43	5124	248.79	5124.32	263.08	5125	272.39	5125.47	277.88	5125.73

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	122.44	.05	211.26	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
122.44	211.26	70	70	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 2664

INPUT
Description: FHAD x-section 2.15
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5125.3	7.88	5125	85.81	5124	96.23	5123.9	106.58	5124
114.54	5124.1	122.67	5124	156.8	5123.38	214.91	5123	264.57	5122
300.31	5121.6	337.26	5121	354.21	5120.27	356.28	5120.34	365.78	5121
367.2	5121.1	369.88	5121.24	382.52	5122	393	5122.59	399.84	5123
411.17	5123.6	418.85	5124	431.36	5124.65	437.68	5125	448.23	5125.51

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	264.57	.05	382.52	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
264.57	382.52	81	81	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 2583

INPUT
Description: Quebec Street
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5126.4	14.99	5126	17.88	5125.9	57.39	5125	101.83	5124
155.52	5123	226.11	5122	234.13	5121.8	299.83	5121	315.37	5120.8
393.02	5120.1	414.15	5120.8	414.84	5120.85	425.35	5121	481.01	5122
524.35	5123	555.44	5124	581.66	5124.8	587.73	5125	617.41	5126
647.39	5127	662.07	5127.44						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	299.83	.05	425.35	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
299.83	425.35	132	132	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 2451

INPUT
Description: FHAD x-section 2.13
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5118.8	13.91	5118.2	17.46	5118	17.48	5118	21.55	5117.68
22.25	5117.6	30.5	5117	38.6	5116.66	42.25	5116.53	55.45	5116
58.36	5115.9	59.42	5115.85	68.52	5115	76.21	5114.29	79.68	5114
85.46	5113.3	87.81	5113	119.35	5112.27	123.71	5112.18	128.29	5112.12
129.89	5112.1	131.54	5112.07	132.37	5112.07	134.04	5112.06	135.89	5112.07
137.93	5112.1	138.71	5112.08	141.92	5112.08	145.5	5112.1	148.87	5112.13
152.63	5112.2	168.2	5113	177.45	5113.7	178.14	5113.75	183.38	5114

193.19	5114.7	199.84	5115	218.7	5115.85	222.19	5116	222.93	5116.04
242.91	5117	261.77	5117.69	270.8	5118	274.56	5118.22	280.57	5118.57

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	79.68	.05	183.38	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
79.68	183.38	79	81	82	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 2370

INPUT
Description:
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5118.2	12.56	5118	23.2	5117.3	28.45	5117	29.49	5116.94
32.08	5116.76	33.3	5116.64	35.61	5116	39.41	5115.4	41.65	5115.22
43.27	5115.1	43.69	5115.06	44.87	5115	47.49	5114.88	66.77	5114
73.71	5113.58	76.7	5113.35	77.57	5113.3	79.49	5113	82.07	5112.85
92.55	5112	107.21	5111.07	108.95	5111	109.53	5111	114.79	5110.86
115.55	5110.85	134.71	5110.57	137.18	5110.5	139.03	5110.53	143.66	5110.49
148.97	5110.49	152.36	5110.53	153.11	5110.5	157.98	5110.63	160.39	5110.69
161.13	5110.69	163	5110.71	165.46	5110.8	165.91	5110.76	169.02	5111
185.17	5111.93	185.22	5111.94	186.3	5112	186.48	5112.01	196.2	5113
203.41	5113.56	211.25	5114	237.58	5114.8	242.44	5115	248.96	5115.41
258.43	5116	271.54	5116.58	282.44	5116.9	285.6	5117	290.09	5117.18
313.53	5118	327.06	5118.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.55	.05	186.3	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
92.55	186.3	209	201	195	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 2169

INPUT
Description:
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5114	2.7	5114	8.67	5113.11	9.08	5113	9.38	5112.95
13.38	5112.5	18.41	5112	20.92	5111.86	36.13	5111	44.53	5110.56
57.79	5110	65.19	5109.17	66.32	5109.03	66.63	5109	67.33	5108.92
76.22	5108	78.59	5107.65	86.25	5107	93.36	5106.35	96.19	5106.2
98.93	5106.1	102.11	5106.02	102.85	5106	106.22	5106	109.21	5105.9
115.09	5105.98	115.11	5106	115.82	5106	116.11	5106	120.05	5106.09
120.51	5106.11	121.05	5106.1	121.87	5106.2	129.18	5107	132.09	5107.39
138.08	5108	142.47	5108.7	145.26	5109	149.56	5109.22	161.31	5110
169.74	5110.73	172.1	5111	183.17	5111.69	188.19	5112	191.54	5112.17
211.15	5113	219.21	5113.5	229.78	5114	238.48	5114.39		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	76.22	.05	138.08	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
76.22	138.08	117	119	120	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 2050

INPUT
Description: FHAD x-section 2.12
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5112	11.1	5112	19.14	5112	19.77	5112.14	23.39	5113
27.7	5113	30.2	5113	32.61	5112.32	34.51	5112	40.11	5111.09
41.06	5111	48.43	5110.61	60.01	5110	62.57	5109.9	79.06	5109
89.66	5108.3	93.94	5108	100.57	5107.25	101.86	5107.1	103.09	5107
108.24	5106.5	113.16	5106	113.88	5105.91	123.33	5105	134.68	5104.12
135.29	5104.1	137.57	5104	149.65	5104	151.55	5104	151.92	5104.01
162.68	5104.3	175.47	5105	181.51	5105.91	182.11	5106	182.62	5106.06
187.2	5107	188.14	5107.12	190.73	5108	192.59	5108.23	197.69	5109
213.98	5110	214.13	5110	218.37	5110.37				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	113.16	.05	182.11	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
113.16	182.11	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Trib 2

Reach	River Sta.	n1	n2	n3
Reach-1	5438	.05	.05	.05
Reach-1	5309	.05	.05	.05
Reach-1	5242	.05	.05	.05
Reach-1	5141	.05	.05	.05
Reach-1	5037	.05	.05	.05
Reach-1	4878	.05	.05	.05
Reach-1	4790	.05	.05	.05
Reach-1	4711	.05	.05	.05
Reach-1	4544	.05	.05	.05
Reach-1	4358	.05	.05	.05
Reach-1	4268	.05	.05	.05
Reach-1	4214	.05	.05	.05
Reach-1	4142	.05	.05	.05
Reach-1	4022	.05	.05	.05
Reach-1	3844	.05	.05	.05
Reach-1	3600	.05	.05	.05
Reach-1	3356	.05	.05	.05
Reach-1	3101	.05	.05	.05
Reach-1	2910	.05	.05	.05
Reach-1	2734	.05	.05	.05
Reach-1	2664	.05	.05	.05
Reach-1	2583	.05	.05	.05
Reach-1	2451	.05	.05	.05
Reach-1	2370	.05	.05	.05
Reach-1	2169	.05	.05	.05
Reach-1	2050	.05	.05	.05

SUMMARY OF REACH LENGTHS

River: Trib 2

Reach	River Sta.	Left	Channel	Right
Reach-1	5438	129	129	129
Reach-1	5309	67	67	67
Reach-1	5242	101	101	101
Reach-1	5141	104	104	104
Reach-1	5037	152	159	170
Reach-1	4878	85	88	89
Reach-1	4790	79	79	79
Reach-1	4711	167	167	167
Reach-1	4544	182	186	189
Reach-1	4358	86	90	97
Reach-1	4268	56	54	52
Reach-1	4214	67	72	75
Reach-1	4142	128	120	115
Reach-1	4022	178	178	178
Reach-1	3844	244	239	246
Reach-1	3600	249	244	243
Reach-1	3356	262	255	253
Reach-1	3101	188	191	191
Reach-1	2910	183	176	174
Reach-1	2734	70	70	70
Reach-1	2664	81	81	81
Reach-1	2583	132	132	132
Reach-1	2451	79	81	82
Reach-1	2370	209	201	195
Reach-1	2169	117	119	120
Reach-1	2050	0	0	0

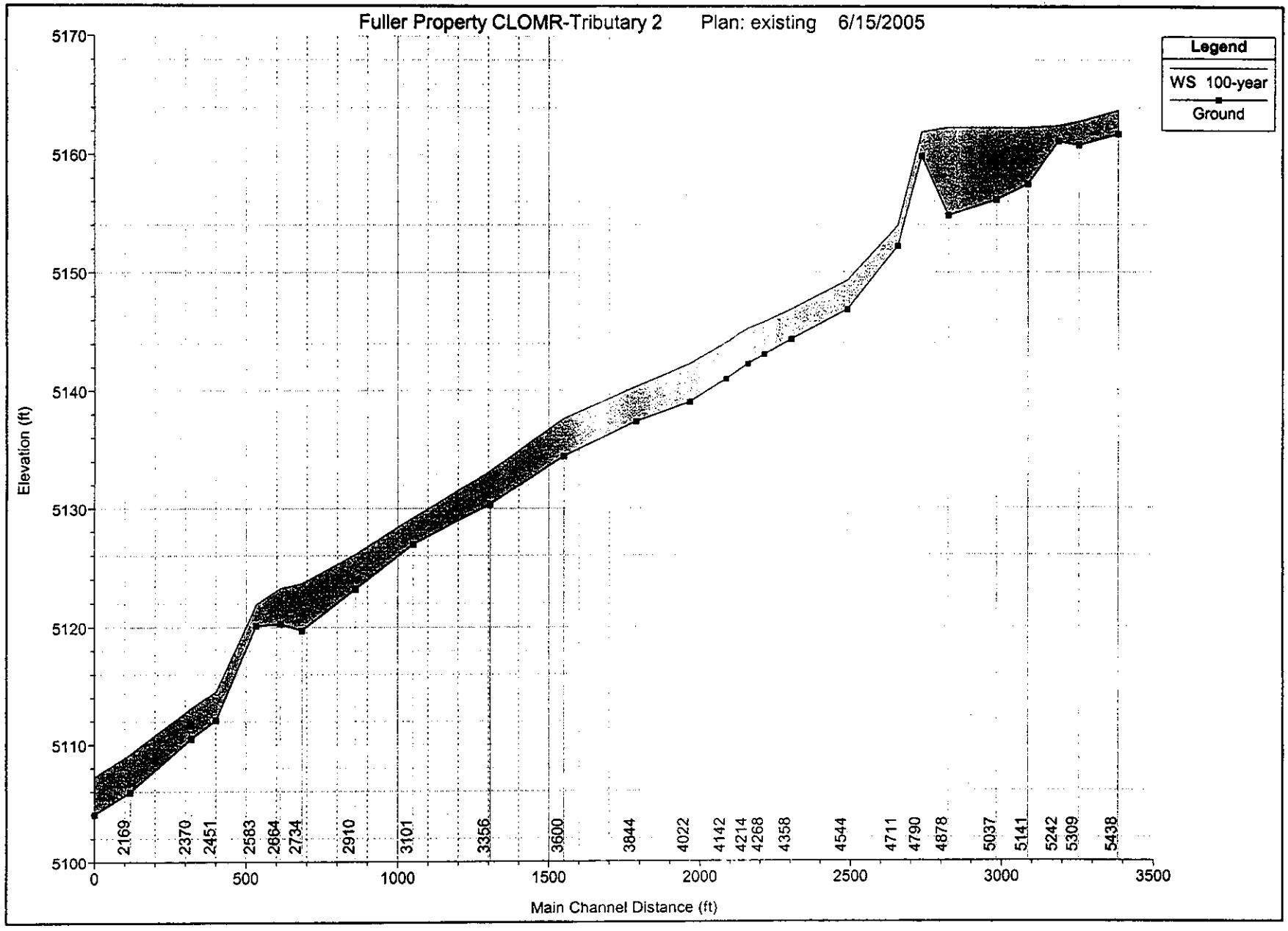
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Trib 2

Reach	River Sta.	Contr.	Expan.
Reach-1	5438	.1	.3
Reach-1	5309	.1	.3
Reach-1	5242	.1	.3
Reach-1	5141	.1	.3
Reach-1	5037	.1	.3
Reach-1	4878	.1	.3
Reach-1	4790	.1	.3
Reach-1	4711	.1	.3

```
*Reach-1          *    4544    *        .1*       .3*
*Reach-1          *    4358    *        .1*       .3*
*Reach-1          *    4268    *        .1*       .3*
*Reach-1          *    4214    *        .1*       .3*
*Reach-1          *    4142    *        .1*       .3*
*Reach-1          *    4022    *        .1*       .3*
*Reach-1          *    3844    *        .1*       .3*
*Reach-1          *    3600    *        .1*       .3*
*Reach-1          *    3356    *        .1*       .3*
*Reach-1          *    3101    *        .1*       .3*
*Reach-1          *    2910    *        .1*       .3*
*Reach-1          *    2734    *        .1*       .3*
*Reach-1          *    2664    *        .1*       .3*
*Reach-1          *    2583    *        .1*       .3*
*Reach-1          *    2451    *        .1*       .3*
*Reach-1          *    2370    *        .1*       .3*
*Reach-1          *    2169    *        .1*       .3*
*Reach-1          *    2050    *        .1*       .3*
**************************************************
```

HEC-RAS Plan: existing River: Trib 2 Reach: Reach-1 Profile: 100-year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2050	100-year	1300.00	5104.00	5107.21	5106.88	5107.96	0.015726	7.05	190.90	87.49	0.77
Reach-1	2160	100-year	1300.00	5105.90	5109.20	5109.11	5110.15	0.020044	7.90	171.70	84.35	0.87
Reach-1	2370	100-year	1300.00	5110.49	5113.13	5112.80	5113.71	0.015596	6.21	217.35	119.20	0.74
Reach-1	2491	100-year	1160.00	5112.06	5114.52	5114.27	5115.08	0.018051	6.01	195.36	116.90	0.78
Reach-1	2663	100-year	1160.00	5120.10	5121.91	5121.91	5122.38	0.025176	5.80	228.34	246.49	0.88
Reach-1	2864	100-year	1160.00	5120.27	5123.24	5122.81	5123.54	0.009818	4.55	281.84	226.38	0.58
Reach-1	2754	100-year	1160.00	5119.70	5123.65	5121.82	5123.78	0.001924	3.07	421.03	173.57	0.28
Reach-1	2910	100-year	1160.00	5123.16	5126.06	5126.06	5126.78	0.021473	6.96	181.20	125.11	0.86
Reach-1	3101	100-year	1080.00	5126.90	5129.16	5128.56	5129.45	0.010147	4.38	247.06	143.96	0.58
Reach-1	3356	100-year	1080.00	5130.35	5133.15	5133.15	5133.93	0.022612	7.27	160.28	106.61	0.89
Reach-1	3600	100-year	1010.00	5134.40	5137.58	5137.14	5138.04	0.013275	5.42	189.96	110.30	0.68
Reach-1	3844	100-year	1010.00	5137.30	5140.28	5139.67	5140.66	0.009282	4.98	212.36	112.95	0.58
Reach-1	4022	100-year	1010.00	5138.93	5142.23	5141.92	5142.78	0.013947	6.11	177.02	102.27	0.71
Reach-1	4142	100-year	920.00	5140.91	5144.02	5143.78	5144.61	0.016292	6.29	155.11	96.45	0.76
Reach-1	4214	100-year	920.00	5142.19	5145.23	5144.64	5145.56	0.010594	4.83	199.46	114.39	0.60
Reach-1	4268	100-year	920.00	5143.00	5145.78	5145.30	5146.18	0.011484	5.13	186.38	114.31	0.63
Reach-1	4368	100-year	920.00	5144.29	5146.84	5146.56	5147.26	0.012385	5.71	186.19	125.62	0.67
Reach-1	4544	100-year	920.00	5146.80	5149.27	5149.05	5149.71	0.013984	5.59	183.77	135.90	0.69
Reach-1	4731	100-year	920.00	5152.17	5153.92	5153.92	5154.35	0.025117	5.57	187.97	227.67	0.87
Reach-1	4790	100-year	830.00	5159.80	5161.90	5161.90	5162.24	0.038542	4.67	178.80	258.03	0.97
Reach-1	4878	100-year	830.00	5154.76	5162.27	5155.72	5162.27	0.000005	0.25	3594.53	761.87	0.02
Reach-1	5037	100-year	830.00	5156.10	5162.27	5157.14	5162.27	0.000015	0.37	2447.72	607.40	0.03
Reach-1	5141	100-year	830.00	5157.42	5162.27	5158.31	5162.28	0.000036	0.50	1833.43	559.59	0.04
Reach-1	5242	100-year	830.00	5161.11	5162.45	5161.89	5162.52	0.004399	2.13	405.76	447.63	0.35
Reach-1	5309	100-year	830.00	5160.79	5162.83	5162.43	5162.89	0.006540	2.10	395.46	497.60	0.41
Reach-1	5438	100-year	830.00	5161.73	5163.76	5163.23	5163.85	0.008130	2.35	353.13	429.71	0.46


Fuller Property CLOMR-Tributary 2 Plan: existing 6/15/2005
Legend
WS 100-year
Ground
Elevation (ft)
5170
5160
5150
5140
5130
5120
5110
5100
0
500
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)
2169
2370
2451
2583
2864
2734
2910
3101
3356
3600
3844
4022
4142
4214
4268
4358
4544
4711
4790
4878
5037
5141
5242
5309
5438

HEC-RAS Version 3.1.2 April 2004
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: Fuller Property CLOMR-Tributary 2
Project File : trib2.prj
Run Date and Time: 6/15/2005 10:50:00 AM

Project in English units

Project Description:
Fuller Subdivision - Conditional Letter of Map Revision
Todd Creek - Tributary
2
Thornton, Colorado

Prepared by:
Manhard Consulting, Ltd.
345 Inverness
Drive South, Suite B200
Englewood, CO 80112
303-708-0500

June
2005

Starting water surface elevation taken from FHAD model (Effective
FEMA model) at FHAD cross-section 2.12. 2.95 feet were added to the starting
WSEL to convert to NAVD88 (from NGVD29) datum to match topography.

****

PLAN DATA

Plan Title: proposed
Plan File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.p02

Geometry Title: proposed
Geometry File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.g02

Flow Title : existing
Flow File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.f01

Plan Summary Information:
Number of: Cross Sections = 23 Multiple Openings = 0
Culverts = 3 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 40
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: Between every coordinate point (HEC2 Style)
Friction Slope Method: Program Selects Appropriate method
Computational Flow Regime: Subcritical Flow

****

FLOW DATA

Flow Title: existing
Flow File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.f01

Flow Data (cfs)

River	Reach	RS	10-year	50-year	100-year
Trib 2	Reach-1	5438	390	680	830
Trib 2	Reach-1	4711	420	740	920
Trib 2	Reach-1	4022	440	810	1010
Trib 2	Reach-1	3356	460	860	1080
Trib 2	Reach-1	2910	490	920	1160

```
* Trib 2          Reach-1         2370    *             530            1030            1300 *
*****************************************************************************************

Boundary Conditions
*****************************************************************************************************************
* River           Reach           Profile         *           Upstream                  Downstream     *
*****************************************************************************************************************
* Trib 2          Reach-1         10-year         *                                 Known WS = 5106.06 *
* Trib 2          Reach-1         50-year         *                                 Known WS = 5106.84 *
* Trib 2          Reach-1         100-year        *                                 Known WS = 5107.21 *
*****************************************************************************************************************

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

GEOMETRY DATA

Geometry Title: proposed
Geometry File : C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.g02

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 5438

INPUT
Description:
Station Elevation Data    num=      89
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*************************************************************************************
       0     5166     4.28     5166     5.16     5166    16.8  5165.82    45.76  5165.58
   78.45   5165.3   109.34     5165    110.2  5164.99   110.22  5164.99   143.97  5164.72
  157.44   5164.6   182.38  5164.31   193.04   5164.2   212.22     5164    230.7  5163.79
  269.85   5163.4   294.71     5163   307.69  5162.69   323.08  5162.33   338.29     5162
  356.24  5161.73   375.57     5162   386.13  5162.32   390.25  5162.52   399.76     5163
  403.16  5163.14   444.86  5163.58   445.05  5163.59   451.05   5163.6   451.52  5163.55
  472.19  5163.65   474.17  5163.67   474.55   5163.7   476.25  5163.68   480.61  5163.74
  483.68  5163.78   485.65   5163.8   486.76   5163.8   487.91  5163.82   488.76  5163.82
  493.16  5163.83   498.49  5163.89   499.48   5163.9   533.54  5163.86   539.37  5163.85
  541.19  5163.83   544.22  5163.82    544.7   5163.8   560.12  5163.62   585.96  5163.37
   601.7     5163   611.25  5162.83    626.4   5162.6    632.9  5162.51   640.34  5162.44
  643.36  5162.41   649.78  5162.35   651.09   5162.3   652.48  5162.34      653  5162.33
  653.59  5162.33   653.93  5162.33   654.31   5162.3    674.7  5162.35   674.88  5162.35
   675.1  5162.35   675.22  5162.35   675.35   5162.3   675.41  5162.35   675.48  5162.35
  675.52  5162.35   675.58  5162.35   675.68   5162.4   675.81  5162.35   676.02  5162.36
  676.25  5162.36   689.41  5162.66   704.24     5163   720.68  5163.44   728.62  5163.73
  736.21     5164   744.46  5164.31   752.15   5164.6    762.4     5165   776.14  5165.42
  787.69   5165.7   800.17     5166   803.72   5166.1   805.78  5166.12

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*************************************************
       0     .05   212.22     .05   736.21     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
        212.22  736.21                 129     129     129              .3      .5
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
     516  805.78    5164          F

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 5309

INPUT
Description: PHAD x-section 2.24
Station Elevation Data    num=      53
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*************************************************************************************
       0   5164.5    26.88  5164.33    27.37  5164.33    28.43  5164.32    47.44  5164.22
   47.92   5164.2    48.49  5164.21    72.62     5164    79.15     5164    82.14     5164
  130.95   5163.2   133.96  5163.12   139.56     5163   143.18     5163   149.96  5162.91
  154.88   5162.9   155.44  5162.89   167.49  5162.79   179.27  5162.69   222.74  5162.34
  224.24   5162.3   246.77     5162   271.31     5161   283.32     5159   289.31     5158
  296.24     5157   301.31     5156   312.79   5155.8   332.13   5155.8   343.23     5156
  348.52     5157   355.23     5158   367.23     5160   379.23     5162   424.23  5162.26
  429.46  5162.29   429.91  5162.29    439.3  5162.33   441.44  5162.33   461.42   5162.4
  480.85  5162.32   483.27  5162.31   495.67   5162.3   538.99     5162   596.39  5162.18
   620.6     5162   621.31  5162.02   669.54     5163   687.42  5163.63   699.73     5164
   707.1   5164.3    728.5     5165   734.17  5165.26

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*************************************************
       0     .05   179.27     .05   669.54     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
        179.27  669.54                 168     168     168              .3      .5
Ineffective Flow      num=       2
   Sta L   Sta R    Elev  Permanent
       0     299    5164          F
     345  734.17    5164          F
```

CULVERT

RIVER: Trib 2
REACH: Reach-1 RS: 5242

INPUT
Description: Monaco Street
Distance from Upstream XS = 27
Deck/Roadway Width = 80
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	5164	700	5164

Upstream Bridge Cross Section Data
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5164.5	26.88	5164.33	27.37	5164.33	28.43	5164.32	47.44	5164.22
47.92	5164.2	48.49	5164.21	72.62	5164	79.15	5164	82.14	5164
130.95	5163.2	133.96	5163.12	139.56	5163	143.18	5163	149.96	5162.91
154.88	5162.9	155.44	5162.89	167.49	5162.79	179.27	5162.69	222.74	5162.34
224.24	5162.3	246.77	5162	271.31	5161	283.32	5159	289.31	5158
296.24	5157	301.31	5156	312.79	5155.8	332.13	5155.8	343.23	5156
348.52	5157	355.23	5158	367.23	5160	379.23	5162	424.23	5162.26
429.46	5162.29	429.91	5162.29	439.3	5162.33	441.44	5162.33	461.42	5162.4
480.85	5162.32	483.27	5162.31	495.67	5162.3	538.99	5162	596.39	5162.18
620.6	5162	621.31	5162.02	669.54	5163	687.42	5163.63	699.73	5164
707.1	5164.3	728.5	5165	734.17	5165.26				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	179.27	.05	669.54	.05

Bank Sta: Left Right Coeff Contr. Expan.
179.27 669.54 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	299	5164	F
345	734.17	5164	F

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	5164	700	5164

Downstream Bridge Cross Section Data
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5162.4	10.18	5162.38	33.48	5162.19	44.22	5162	47.92	5162
83.07	5161.1	86.04	5161.08	90.08	5161	114.96	5160.24	123.68	5160
144.54	5159	159.12	5158	207.08	5154	228.12	5153	245.02	5152.5
262.75	5153	279.11	5154	319.11	5158	490.6	5159	508.51	5159.62
517.02	5160	522.47	5160.3	543.31	5161	558.34	5161.48	573.71	5162
598.47	5162.73	607.04	5163	613.63	5163.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	207.08	.05	279.11	.05

Bank Sta: Left Right Coeff Contr. Expan.
207.08 279.11 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	225	5164	F
263	613.63	5164	F

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 = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	5	9

FHWA Chart # 9 - flared wingwalls and Inlet top edge bevel
FHWA Scale # 1 - Wingwall flared 45 deg.; inlet top edge bevel=0.043D
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	6	125	.011	.011	0	.2	1

Number of Barrels = 2
Upstream Elevation = 5155.5
Centerline Stations

Sta.	Sta.

```
     317     329
Downstream Elevation =  5155
Centerline Stations
    Sta.    Sta.
     239     251

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 5141

INPUT
Description: FHAD x-section 2.22
Station Elevation Data    num=      28
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  5162.4   10.18 5162.38   33.48 5162.19   44.22    5162   47.92    5162
   83.07  5161.1   86.04 5161.08   90.08    5161  114.96 5160.24  123.68    5160
  144.54    5159  159.12    5158  207.08    5154  228.12    5153  245.02  5152.5
  262.75    5153  279.11    5154  319.11    5158   490.6    5159  508.51 5159.62
  517.02    5160  522.47  5160.3  543.31    5161  558.34 5161.48  573.71    5162
  598.47 5162.73  607.04    5163  613.63 5163.17

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .05  207.08     .05  279.11     .05

Bank Sta: Left   Right   Lengths: Left Channel   Right     Coeff Contr.   Expan.
        207.08  279.11              104     104     104              .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     225    5164         F
     263  613.63    5164         F

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 5037

INPUT
Description:
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  5162.1   14.63    5162   24.32 5161.89   29.18 5161.82   63.03 5161.26
   71.87  5161.1   77.34 5161.03    79.3    5161   79.41    5161   85.36 5160.74
   86.14  5160.7    87.5 5160.64   88.51 5160.59   89.83 5160.53  102.94    5160
     151    5159  175.45    5158  188.21    5157   224.2    5154  236.98    5153
  254.52    5152  266.38  5151.6  276.97    5152  292.68    5153  303.43    5154
  343.58    5158  521.38    5159  529.52  5159.6  536.01    5160  543.62 5160.24
   565.2    5161  591.84  5161.8  598.28    5162  602.14 5162.11  631.19    5163
  637.77 5163.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .05   224.2     .05  303.43     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         224.2  303.43              152     159     170              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4878

INPUT
Description: FHAD x-section 2.21
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  5163.1     4.8    5163   29.77 5162.69   85.65    5162  157.06    5161
  211.78    5160  280.67    5159  324.09    5158  358.47    5157  384.67    5156
  397.06    5155  433.07    5152  457.04    5150   468.9  5149.7  480.24    5150
  500.95    5152  542.38    5156  577.98    5157   619.9    5158  838.26 5162.97

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .05  433.07     .05  500.95     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        433.07  500.95               85      88      89              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4790

INPUT
```

Description: FHAD x-section 2.20
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5163.2	9.43	5163	92.87	5162	174.37	5161	230.06	5160
310.75	5159	349.73	5158	378.92	5157	416.98	5156	458.69	5155
494.96	5152	507.01	5151	533.53	5150	541.97	5149.84	551.45	5150
566.95	5151	587.83	5152	629.54	5156	712.18	5157	751.98	5158
912.22	5158								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	494.96	.05	587.83	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
494.96	587.83	79	79	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 4711

INPUT
Description: FHAD x-section 2.19
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5157.3	13.46	5157	47.08	5156.29	61.97	5156	88.1	5155.64
157.3	5155	184.92	5154.5	218.02	5154	246.53	5153	282.52	5150
296.58	5149	315.52	5148	338.15	5149	352.44	5150	383.62	5153
451.59	5154	454.17	5154.13	472.4	5155	485.36	5155.51	493.6	5155.99
493.95	5156	494.16	5156	513.92	5156.53	523.97	5157	547.53	5157.93
550.27	5158	581.01	5159	581.84	5159.04				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	282.52	.05	352.44	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
282.52	352.44	167	167	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 4544

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5152.1	16.61	5152	18.11	5151.9	35.01	5151	52.84	5150.45
62.6	5150	73.33	5149.65	95.27	5149	131.03	5148	144.26	5147
165.32	5146	168.19	5145.95	171.28	5146	186.3	5147	201.95	5148
216.39	5149	228.77	5150	258.71	5151	261.45	5151.13	283.81	5152
289.61	5152.24								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	131.03	.05	201.95	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
131.03	201.95	182	186	.1	.3

CROSS SECTION

RIVER: Trib 2
REACH: Reach-1 RS: 4358

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5149.6	34.83	5149	52.09	5148	64.1	5147	76.13	5146
88.19	5145	101.82	5144	135.75	5143	162.83	5142.7	174.02	5143
195.76	5144	203.91	5145	220.25	5147	229.41	5148	252.87	5150
264.3	5150								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	88.19	.05	203.91	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
88.19	203.91	86	90	.3	.5

CROSS SECTION

```
RIVER: Trib 2
REACH: Reach-1            RS: 4268

INPUT
Description:
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0    5149   40.52    5149   77.68    5148   88.32    5146  100.17    5145
  111.05    5144  123.08    5143  137.29    5142  153.04    5141  157.48    5140
   164.5 5139.75  181.84 5139.75  188.23    5140  194.88    5141  204.43    5142
  215.52    5143  224.18    5144  232.32    5145  256.74    5148  281.53    5150
   285.8 5150.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .05  123.08     .05  215.52     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        123.08  215.52              123     126     127              .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     155    5147        F
     190   285.8    5147        F

CULVERT


RIVER: Trib 2
REACH: Reach-1            RS: 4214

INPUT
Description: Proposed Road
Distance from Upstream XS =       33
Deck/Roadway Width        =       42
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
**********************************************************************************
      73    5148               173    5147               273    5148

Upstream Bridge Cross Section Data
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0    5149   40.52    5149   77.68    5148   88.32    5146  100.17    5145
  111.05    5144  123.08    5143  137.29    5142  153.04    5141  157.48    5140
   164.5 5139.75  181.84 5139.75  188.23    5140  194.88    5141  204.43    5142
  215.52    5143  224.18    5144  232.32    5145  256.74    5148  281.53    5150
   285.8 5150.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .05  123.08     .05  215.52     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        123.08  215.52              .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     155    5147        F
     190   285.8    5147        F

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
**********************************************************************************
      33    5148               133    5147               233    5148

Downstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0    5148   52.69    5148   71.33    5145   77.55    5144   89.96    5142
  104.57    5140  112.71    5139  124.13  5138.2  141.55  5138.2  154.48    5139
  162.27    5140   171.8    5141  180.21    5142  188.38    5143  212.47    5146
  220.83    5147  229.91    5148  239.51    5149  241.86 5148.28

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .05   89.96     .05  180.21     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
         89.96  180.21              .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     117    5147        F
     149  241.86    5147        F

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 =     .95
Elevation at which weir flow begins          =
Energy head used in spillway design          =
Spillway height used in design               =
Weir crest shape                             = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1            Box       5      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  8      97     .011      .011          0                   .4                 1
Number of Barrels =  2
Upstream   Elevation =  5139.5
Centerline Stations
    Sta.    Sta.
     167     179
Downstream Elevation =  5138.5
Centerline Stations
    Sta.    Sta.
     127     139

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4142

INPUT
Description:
Station Elevation Data    num=      19
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************
       0     5148    52.69     5148    71.33     5145    77.55     5144    89.96     5142
  104.57     5140   112.71     5139   124.13   5138.2   141.55   5138.2   154.48     5139
  162.27     5140    171.8     5141   180.21     5142   188.38     5143   212.47     5146
  220.83     5147   229.91     5148   239.51     5149   241.86 5148.28

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05    89.96     .05   180.21     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
         89.96  180.21                128      120      115              .3      .5
Ineffective Flow      num=       2
   Sta L   Sta R    Elev  Permanent
       0     117    5147          F
     149  241.86    5147          F

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 4022

INPUT
Description:
Station Elevation Data    num=      18
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************
       0   5145.5     6.71     5145    33.65     5144    57.28     5143    70.93     5142
   82.98     5141    96.07     5140   109.13     5139   121.03     5138   131.83     5137
  143.61     5138   152.04     5139   168.12     5141   184.22     5143   197.11     5144
  214.13     5145   217.64  5145.22   220.82  5145.41

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05    82.98     .05   168.12     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.   Expan.
         82.98  168.12                178      178      178              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 3844

INPUT
Description:
Station Elevation Data    num=      27
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************
       0   5143.2     4.78     5143    24.59  5142.32    32.91     5142    82.24     5141
   84.66  5140.78    93.32     5140    96.42  5139.77   106.43     5139   116.34   5138.5
  131.04     5138   146.52     5137   165.49     5136   173.44     5137   180.51     5138
  184.94   5138.4   190.69     5139   195.09  5139.46   200.52     5140   206.69  5140.67
  211.71     5141   226.21  5141.72   231.78     5142   250.88  5142.94   252.05     5143
  252.96     5143      258   5143.3
```

```
Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05  106.43     .05  190.69     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         106.43  190.69               244      239      246              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1              RS: 3600

INPUT
Description: FHAD x-section 2.17
Station Elevation Data      num=       28
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
       0  5140.2     4.01     5140    18.87  5139.3    25.21     5139    75.02 5138.07
   80.81     5138    80.99     5138    85.61 5137.85    87.1 5137.79  105.03     5137
  123.01  5136.2   127.85     5136   148.07 5135.15   151.42     5135   169.85  5134.4
  180.53     5135   182.51 5135.23   189.09     5136   193.09 5136.48   197.51     5137
  202.22  5137.6   206.42     5138    212.3 5138.77   214.12 5138.95   214.86     5139
  215.22     5139   238.39     5140   249.38 5140.65

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05  105.03     .05  197.51     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         105.03  197.51               249      244      243              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1              RS: 3356

INPUT
Description:
Station Elevation Data      num=       28
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
       0  5135.9     3.23 5135.72    20.53     5135    28.13 5134.63     47.2     5134
   62.11  5133.5    76.63     5133    97.62  5132.3   104.37     5132   117.63 5131.42
  130.02     5131   159.13 5130.35   163.54     5131   168.9  5131.7   170.68     5132
  176.65 5132.84   177.83     5133   184.71 5133.96   184.97     5134   186.49 5134.21
  192.82     5135   193.45 5135.08   200.84     5136   204.98  5136.5   208.64     5137
  217.14 5137.49   219.94 5137.59   220.78 5137.61

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05  104.37     .05  170.68     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         104.37  170.68               262      255      253              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1              RS: 3101

INPUT
Description: FHAD x-section 2.16
Station Elevation Data      num=       32
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
       0  5132.2     6.78     5132    25.21 5131.24    30.73     5131    31.87 5130.95
   52.93     5130    70.09 5129.22     75.2     5129    86.69 5128.49    95.51     5128
  104.53   5127.5   105.66 5127.47   111.71 5127.32    122.5 5127.12   124.38 5127.05
  136.24     5127   193.46  5126.9   202.79     5127   203.44 5127.11   206.74     5128
  212.78 5128.76   214.49     5129   217.29 5129.42   217.78 5129.46   219.24   5129.5
  227.27     5130   235.94 5130.45   246.56     5131   253.83 5131.37   263.18     5132
  269.69 5132.37   278.41 5132.92

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
       0     .05     75.2     .05  214.49     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
          75.2  214.49               188      191      191              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1              RS: 2910

INPUT
Description:
```

```
Station Elevation Data    num=       30
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************************
       0  5129.6      8.1 5129.63    19.03 5129.44    27.21  5129.3    34.55     5129
   52.02 5128.25    56.69     5128    67.92 5127.42    76.62    5127    83.13 5126.64
  107.23    5126   146.01     5125   148.57  5124.9   177.86    5124   205.79 5123.16
  216.11    5124   219.25 5124.48    222.87    5125   226.71 5125.61   229.53     5126
  234.21  5126.7   236.08     5127   241.44 5127.85   242.48    5128   248.44 5128.93
  248.93    5129   254.33 5129.86    255.35    5130   259.08 5130.23   259.34 5130.24

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05   146.01     .05   222.87     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
        146.01  222.87                 183     176     174              .1       .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 2734

INPUT
Description:
Station Elevation Data    num=       40
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************************
       0  5125.6    10.43 5125.54    12.91 5125.49    13.71 5125.47    14.04 5125.46
   34.34    5125    34.93 5124.99    34.99 5124.99    35.01 5124.98    35.04 5124.98
   35.09    5125    36.62 5124.92    37.61 5124.86    52.03    5124    55.05  5123.9
   56.92  5123.8    58.01  5123.8    75.63    5123    80.29 5122.81   107.39    5122
  112.91  5121.6   122.44     5121   133.8 5120.28   140.27    5120   188.77  5119.7
   203.1    5120   210.64 5120.91   211.26    5121   211.74 5121.07   218.25    5122
  224.59 5122.92   225.1     5123   226.98  5123.2   227.72 5123.29   229.21 5123.38
  242.43    5124   248.79 5124.32   263.08    5125   272.39 5125.47   277.88 5125.73

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05   122.44     .05   211.26     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
        122.44  211.26                  70      70      70              .3       .5

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 2664

INPUT
Description: FHAD x-section 2.15
Station Elevation Data    num=       28
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************************
       0  5125.3     7.88     5125    85.81     5124    96.23  5123.9   106.58     5124
  114.54  5124.1   122.67     5124   195.45     5123      228    5122      240     5121
     252    5120      274     5118   284.06     5117   288.01    5116   302.16  5115.7
  328.91  5115.7   342.89     5116   349.07     5117   356.37    5118   376.01     5121
  382.52    5122      393 5122.59   399.84     5123   411.17  5123.6   418.85     5124
  431.36 5124.65   437.68     5125   448.23 5125.51

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
       0     .05      240     .05   376.01     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
          240  376.01                 213     213     213              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     286  5126.8          F
     346  448.23  5126.8          F

CULVERT


RIVER: Trib 2
REACH: Reach-1            RS: 2583

INPUT
Description: Quebec Street
Distance from Upstream XS =       63
Deck/Roadway Width        =       60
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=       8
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
**********************************************************************
       0  5129.3                33     5129              97     5128
     177     5127              316  5126.9              375     5127
     487     5128              599     5129
```

```
Upstream Bridge Cross Section Data
Station Elevation Data    num=      28
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  5125.3    7.88    5125   85.81    5124   96.23  5123.9  106.58    5124
  114.54  5124.1  122.67    5124  195.45    5123     228    5122     240    5121
     252    5120     274    5118  284.06    5117  288.01    5116  302.16  5115.7
  328.91  5115.7  342.89    5116  349.07    5117  356.37    5118  376.01    5121
  382.52    5122     393 5122.59  399.84    5123  411.17  5123.6  418.85    5124
  431.36 5124.65  437.68    5125  448.23 5125.51

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .05     240     .05  376.01     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
          240  376.01            .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     286  5126.8          F
     346  448.23  5126.8          F

Downstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
**********************************************************************
       0  5127.1               9    5127             148  5126.9
     207    5127             319    5128          398.47  5128.6

Downstream Bridge Cross Section Data
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  5118.8   13.91  5118.2   17.46    5118   17.48    5118   21.55 5117.68
   22.25  5117.6    30.5    5117    38.6 5116.66   42.25 5116.53   55.45    5116
   58.36  5115.9   59.42 5115.85   68.52    5115   79.55    5114   87.75    5113
  122.84  5112.9  136.55 5112.25  163.3 5112.25  176.72  5112.9  182.86    5113
  196.83    5114  217.08    5115  243.49    5116  351.89    5117   356.8    5118
  398.47    5122

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .05   68.52     .05  217.08     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
         68.52  217.08            .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     130  5126.8          F
     187  398.47  5126.8          F

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   =     .95
Elevation at which weir flow begins           =
Energy head used in spillway design           =
Spillway height used in design                =
Weir crest shape                              = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1            Box       6      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 17     180     .011      .011          0                   .4                  1
Number of Barrels =  2
Upstream   Elevation =  5115
Centerline Stations
    Sta.    Sta.
     309     321
Downstream Elevation =  5112.5
Centerline Stations
    Sta.    Sta.
     141     153

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 2451

INPUT
Description: FHAD x-section 2.13
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0  5118.8   13.91  5118.2   17.46    5118   17.48    5118   21.55 5117.68
   22.25  5117.6    30.5    5117    38.6 5116.66   42.25 5116.53   55.45    5116
   58.36  5115.9   59.42 5115.85   68.52    5115   79.55    5114   87.75    5113
  122.84  5112.9  136.55 5112.25  163.3 5112.25  176.72  5112.9  182.86    5113
```

```
  196.83    5114  217.08    5115  243.49    5116  351.89    5117   356.8    5118
  398.47    5122

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
       0     .05   68.52     .05  217.08     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         68.52  217.08                  79       81       82              .3      .5
Ineffective Flow      num=       2
   Sta L   Sta R    Elev  Permanent
       0     130  5126.8          F
     187  398.47  5126.8          F

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 2370

INPUT
Description:
Station Elevation Data    num=      41
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**************************************************************************************
       0   5118.2    12.56     5118     23.2   5117.3    28.45     5117    29.49  5116.94
   32.08  5116.76     33.3  5116.64    35.61     5116    39.41   5115.4    41.65  5115.22
   43.27   5115.1    43.69  5115.06    44.87     5115    47.49  5114.88    66.77     5114
   73.71  5113.58     76.7  5113.35    77.57   5113.3    79.49     5113    82.07  5112.85
   92.55     5112   107.21  5111.07   108.65     5111   131.69     5110   147.01   5109.7
  162.32     5110   182.47     5111   188.05     5112   196.2      5113   203.41  5113.56
  211.25     5114   237.58   5114.8   242.44     5115  248.96  5115.41   258.43     5116
  271.54  5116.58   282.44   5116.9    285.6     5117  290.09  5117.18   313.53     5118
  327.06  5118.56

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
       0     .05    92.55     .05  188.05     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         92.55  188.05                 209      201      195              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 2169

INPUT
Description:
Station Elevation Data    num=      49
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**************************************************************************************
       0     5114      2.7     5114     8.67  5113.11     9.08     5113    9.38  5112.95
   13.38   5112.5    18.41     5112    20.92  5111.86    36.13     5111   44.53  5110.56
   57.79     5110    65.19  5109.17    66.32  5109.03    66.63     5109   67.33  5108.92
   76.22     5108    78.59  5107.65    86.25     5107    93.36  5106.35   96.19   5106.2
   98.93   5106.1   102.11  5106.02   102.85     5106   106.22     5106  109.21   5105.9
  115.09  5105.98   115.11     5106   115.82     5106   116.11     5106  120.05  5106.09
  120.51  5106.11   121.05   5106.1   121.87   5106.2   129.18     5107  132.09  5107.39
  138.08     5108   142.47   5108.7   145.26     5109   149.56  5109.22  161.31     5110
  169.74  5110.73   172.1      5111   183.17  5111.69   188.19     5112  191.54  5112.17
  211.15     5113   219.21   5113.5   229.78     5114   238.48  5114.39

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
       0     .05    76.22     .05  138.08     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         76.22  138.08                 117      119      120              .1      .3

CROSS SECTION


RIVER: Trib 2
REACH: Reach-1            RS: 2050

INPUT
Description: FHAD x-section 2.12
Station Elevation Data    num=      43
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**************************************************************************************
       0     5112     11.1     5112    19.14     5112   19.77  5112.14    23.39     5113
    27.7     5113     30.2     5113    32.61  5112.32    34.51     5112    40.11  5111.09
   41.06     5111    48.43  5110.61    60.01     5110   62.57   5109.9    79.06     5109
   89.66   5108.3    93.94     5108   100.57  5107.25   101.86   5107.1   103.09     5107
  108.24   5106.5   113.16     5106   113.88  5105.91   123.33     5105   134.68  5104.12
  135.29   5104.1   137.57     5104   149.65     5104   151.55     5104   151.92  5104.01
  162.68   5104.3   175.47     5105   181.51  5105.91   182.11     5106   182.62  5106.06
   187.2     5107   188.14  5107.12   190.73     5108   192.59  5108.23   197.69     5109
  213.98     5110   214.13     5110   218.37  5110.37
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	113.16	.05	182.11	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
113.16	182.11	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Trib 2

Reach	River Sta.	n1	n2	n3
Reach-1	5438	.05	.05	.05
Reach-1	5309	.05	.05	.05
Reach-1	5242	Culvert		
Reach-1	5141	.05	.05	.05
Reach-1	5037	.05	.05	.05
Reach-1	4878	.05	.05	.05
Reach-1	4790	.05	.05	.05
Reach-1	4711	.05	.05	.05
Reach-1	4544	.05	.05	.05
Reach-1	4358	.05	.05	.05
Reach-1	4268	.05	.05	.05
Reach-1	4214	Culvert		
Reach-1	4142	.05	.05	.05
Reach-1	4022	.05	.05	.05
Reach-1	3844	.05	.05	.05
Reach-1	3600	.05	.05	.05
Reach-1	3356	.05	.05	.05
Reach-1	3101	.05	.05	.05
Reach-1	2910	.05	.05	.05
Reach-1	2734	.05	.05	.05
Reach-1	2664	.05	.05	.05
Reach-1	2583	Culvert		
Reach-1	2451	.05	.05	.05
Reach-1	2370	.05	.05	.05
Reach-1	2169	.05	.05	.05
Reach-1	2050	.05	.05	.05

SUMMARY OF REACH LENGTHS

River: Trib 2

Reach	River Sta.	Left	Channel	Right
Reach-1	5438	129	129	129
Reach-1	5309	168	168	168
Reach-1	5242	Culvert		
Reach-1	5141	104	104	104
Reach-1	5037	152	159	170
Reach-1	4878	85	88	89
Reach-1	4790	79	79	79
Reach-1	4711	167	167	167
Reach-1	4544	182	186	189
Reach-1	4358	86	90	97
Reach-1	4268	123	126	127
Reach-1	4214	Culvert		
Reach-1	4142	128	120	115
Reach-1	4022	178	178	178
Reach-1	3844	244	239	246
Reach-1	3600	249	244	243
Reach-1	3356	262	255	253
Reach-1	3101	188	191	191
Reach-1	2910	183	176	174
Reach-1	2734	70	70	70
Reach-1	2664	213	213	213
Reach-1	2583	Culvert		
Reach-1	2451	79	81	82
Reach-1	2370	209	201	195
Reach-1	2169	117	119	120
Reach-1	2050	0	0	0

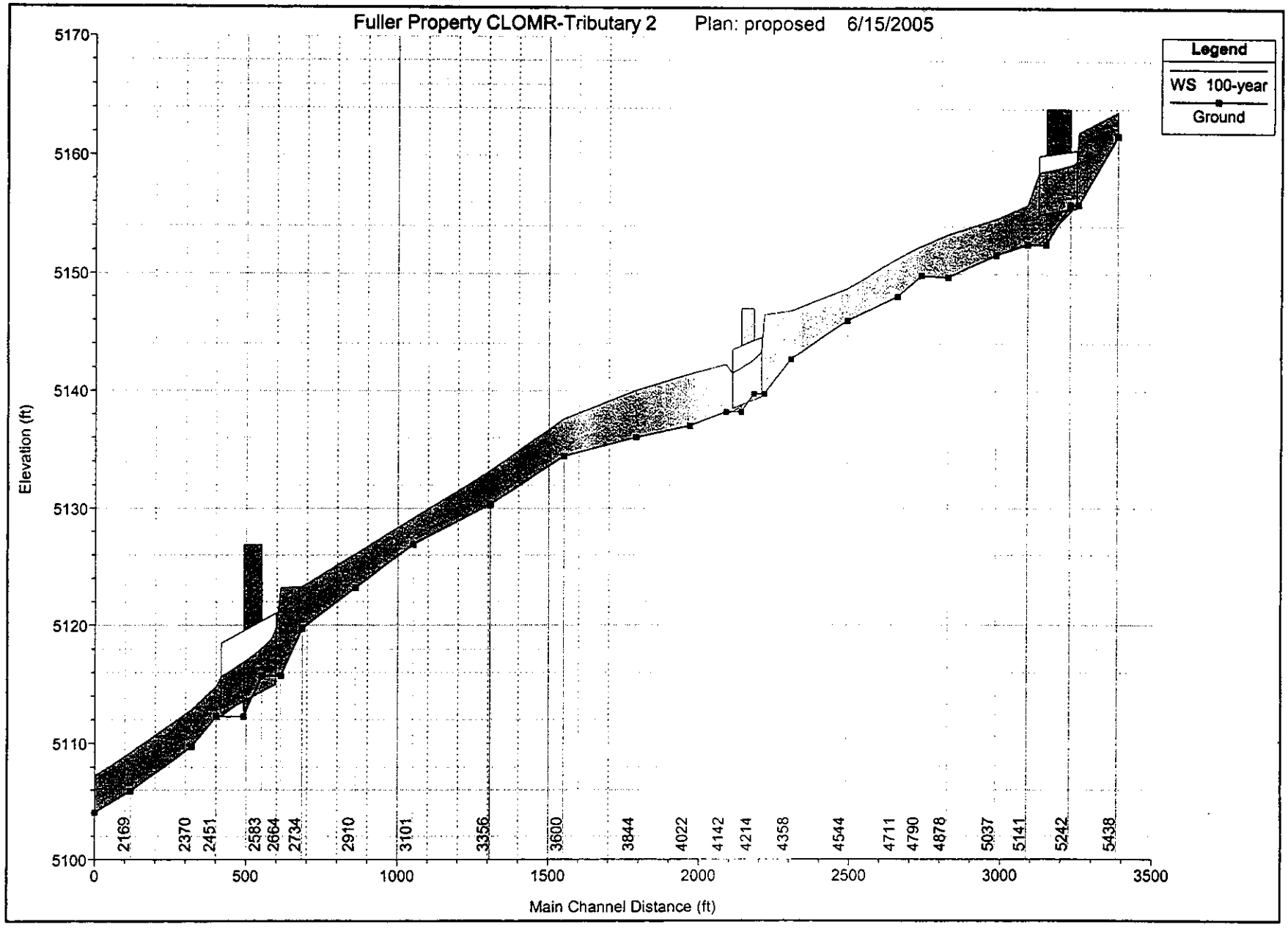
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Trib 2

Reach	River Sta.	Contr.	Expan.
Reach-1	5438	.3	.5
Reach-1	5309	.3	.5
Reach-1	5242	Culvert	
Reach-1	5141	.3	.5
Reach-1	5037	.1	.3
Reach-1	4878	.1	.3
Reach-1	4790	.1	.3

```
*Reach-1          *    4711    *        .1*        .3*
*Reach-1          *    4544    *        .1*        .3*
*Reach-1          *    4358    *        .3*        .5*
*Reach-1          *    4268    *        .3*        .5*
*Reach-1          *    4214    *Culvert  *          *
*Reach-1          *    4142    *        .3*        .5*
*Reach-1          *    4022    *        .1*        .3*
*Reach-1          *    3844    *        .1*        .3*
*Reach-1          *    3600    *        .1*        .3*
*Reach-1          *    3356    *        .1*        .3*
*Reach-1          *    3101    *        .1*        .3*
*Reach-1          *    2910    *        .1*        .3*
*Reach-1          *    2734    *        .3*        .5*
*Reach-1          *    2664    *        .3*        .5*
*Reach-1          *    2583    *Culvert  *          *
*Reach-1          *    2451    *        .3*        .5*
*Reach-1          *    2370    *        .1*        .3*
*Reach-1          *    2169    *        .1*        .3*
*Reach-1          *    2050    *        .1*        .3*
*****************************************************
```

HEC-RAS Plan: proposed River: Trib 2 Reach: Reach-1 Profile: 100-year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2050	100-year	1300.00	5104.00	5107.21	5106.88	5107.96	0.015726	7.05	190.90	87.49	0.77
Reach-1	2186	100-year	1300.00	5105.90	5109.20	5109.11	5110.15	0.020030	7.89	171.74	84.36	0.87
Reach-1	2370	100-year	1300.00	5109.70	5112.81	5112.32	5113.34	0.012909	5.87	226.10	112.16	0.68
Reach-1	2451	100-year	1160.00	5112.25	5114.82	5114.82	5116.00	0.027891	8.73	132.95	142.85	1.01
Reach-1	2503		Culvert									
Reach-1	2564	100-year	1160.00	5115.70	5123.18	5118.06	5123.28	0.000548	2.63	441.46	220.46	0.17
Reach-1	2734	100-year	1160.00	5119.70	5123.26	5121.82	5123.44	0.003012	3.56	357.42	157.67	0.35
Reach-1	2910	100-year	1160.00	5123.16	5126.06	5126.06	5126.78	0.021473	6.96	181.20	125.11	0.86
Reach-1	3101	100-year	1080.00	5126.90	5129.16	5128.56	5129.45	0.010147	4.38	247.06	143.96	0.58
Reach-1	3356	100-year	1080.00	5130.35	5133.15	5133.15	5133.93	0.022612	7.27	160.28	106.61	0.89
Reach-1	3600	100-year	1010.00	5134.40	5137.58	5137.14	5138.04	0.013275	5.42	189.96	110.30	0.68
Reach-1	3844	100-year	1010.00	5138.00	5140.04	5139.23	5140.38	0.007754	4.76	219.57	107.96	0.53
Reach-1	4022	100-year	1010.00	5137.00	5141.43	5140.52	5141.79	0.008077	4.84	210.28	93.73	0.54
Reach-1	4152	100-year	920.00	5138.20	5142.26	5141.28	5143.08	0.009617	7.28	126.41	93.98	0.65
Reach-1	4214		Culvert									
Reach-1	4288	100-year	920.00	5139.75	5146.46	5142.65	5146.71	0.001452	3.98	231.20	158.34	0.27
Reach-1	4356	100-year	920.00	5142.70	5146.80	5144.71	5146.88	0.001216	2.31	416.96	152.01	0.22
Reach-1	4544	100-year	920.00	5145.95	5148.69	5148.69	5149.41	0.024021	6.88	141.77	105.68	0.90
Reach-1	4731	100-year	920.00	5148.00	5151.31	5150.71	5151.72	0.009555	5.21	187.68	99.33	0.59
Reach-1	4790	100-year	830.00	5149.84	5152.36	5152.09	5152.83	0.018000	5.50	152.09	101.07	0.76
Reach-1	4878	100-year	830.00	5149.70	5153.32	5152.31	5153.60	0.005600	4.32	204.00	97.48	0.46
Reach-1	5037	100-year	830.00	5151.60	5154.61	5154.10	5155.02	0.011888	5.16	163.76	92.74	0.64
Reach-1	5141	100-year	830.00	5152.50	5155.76	5155.22	5156.59	0.014225	7.33	113.17	110.65	0.75
Reach-1	5242		Culvert									
Reach-1	5309	100-year	830.00	5155.80	5161.99	5158.05	5162.13	0.000888	2.95	280.91	132.19	0.21
Reach-1	5438	100-year	830.00	5161.73	5163.73	5163.59	5164.01	0.027066	4.24	195.88	420.37	0.83


Fuller Property CLOMR-Tributary 2 Plan: proposed 6/15/2005
Legend
WS 100-year
Ground
Elevation (ft)
5170
5160
5150
5140
5130
5120
5110
5100
0
500
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)
2169
2370
2451
2583
2664
2734
2910
3101
3356
3600
3844
4022
4142
4214
4358
4544
4711
4790
4878
5037
5141
5242
5438

CHECK-RAS Program, XS Check
Cross Section Location and Alignment Review

Project File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.prj
Plan File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.p02
Geometry File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.g02
Flow File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.f01
Report File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.xs
Selected profiles: 100-year
Date: 6/15/2005
Time: 10:51:17 AM

SECNO	Len Lob	Len Chl	Len Rob	TopWdthAct	Q Total	Flow Code
Trib 2,Reach-1						
5438	129	129	129	242.72	830	D
5309	168	168	168	46	830	
5242	Culvert #1-Up					
5242	Culvert #1-Dn					
5141	104	104	104	38	830	
5037	152	159	170	92.74	830	
4878	85	88	89	97.48	830	
4790	79	79	79	101.07	830	
4711	167	167	167	99.33	920	
4544	182	186	189	105.68	920	C
4358	86	90	97	152.01	920	
4268	123	126	127	35	920	
4214	Culvert #1-Up					
4214	Culvert #1-Dn					
4142	128	120	115	32	920	
4022	178	178	178	93.73	1010	
3844	244	239	246	107.96	1010	
3600	249	244	243	110.3	1010	
3356	262	255	253	106.61	1080	C
3101	188	191	191	143.96	1080	
2910	183	176	174	125.11	1160	C
2734	70	70	70	157.67	1160	
2664	213	213	213	60	1160	
2583	Culvert #1-Up					
2583	Culvert #1-Dn					
2451	79	81	82	57	1160	C
2370	209	201	195	112.16	1300	
2169	117	119	120	84.36	1300	
2050	0	0	0	87.49	1300	

B=blocked obstruction XS SC 05
C=critial depth XS SC 03
D=divided flow XS SC 01
E=cross section extended XS SC 02
K=known water-surface XS SC 04

DISTANCE CHECK

SPACING CHECK

INEFFECTIVE FLOW CHECK

DISCHARGE CHECK

LOCATION CHECK

BOUNDARY CONDITION CHECK

XS BC 02 The name of the stream is Trib 2,Reach-1
Known WS = 5107.21 is specified as the downstream boundary
for profile 100-year

XS BC 03 Maximum number of iterations is 0
It should not be less than 20.

LATERAL WEIRS CHECK

---END---

CHECK-RAS Program: NT Check
Manning's n Value and Transition Loss Coefficient Review

Project File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.prj
Plan File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.p02
Geometry File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.g02
Flow File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.f01
Report File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.nt
Selected profiles: 100-year
Date: 6/15/2005
Time: 10:50:51 AM

SECNO	STRUCTURE	NLOB	NCHL	NROB	CNTR	EXP
Trib 2,Reach-1						
5438		0.05	0.05	0.05	0.3	0.5
5309		0.05	0.05	0.05	0.3	0.5
5242	Culvert-Up	0.05	0.05	0.05	0.3	0.5
5242	Culvert-Dn	0.05	0.05	0.05	0.3	0.5
5141		0.05	0.05	0.05	0.3	0.5
5037		0.05	0.05	0.05	0.1	0.3
4878		0.05	0.05	0.05	0.1	0.3
4790		0.05	0.05	0.05	0.1	0.3
4711		0.05	0.05	0.05	0.1	0.3
4544		0.05	0.05	0.05	0.1	0.3
4358		0.05	0.05	0.05	0.3	0.5
4268		0.05	0.05	0.05	0.3	0.5
4214	Culvert-Up	0.05	0.05	0.05	0.3	0.5
4214	Culvert-Dn	0.05	0.05	0.05	0.3	0.5
4142		0.05	0.05	0.05	0.3	0.5
4022		0.05	0.05	0.05	0.1	0.3
3844		0.05	0.05	0.05	0.1	0.3
3600		0.05	0.05	0.05	0.1	0.3
3356		0.05	0.05	0.05	0.1	0.3
3101		0.05	0.05	0.05	0.1	0.3
2910		0.05	0.05	0.05	0.1	0.3
2734		0.05	0.05	0.05	0.3	0.5
2664		0.05	0.05	0.05	0.3	0.5
2583	Culvert-Up	0.05	0.05	0.05	0.3	0.5
2583	Culvert-Dn	0.05	0.05	0.05	0.3	0.5
2451		0.05	0.05	0.05	0.3	0.5
2370		0.05	0.05	0.05	0.1	0.3
2169		0.05	0.05	0.05	0.1	0.3
2050		0.05	0.05	0.05	0.1	0.3

---Summary of Statistics---

	Minimum	Maximum
Left Overbank n Value:	0.05	0.05
Right Overbank n Value:	0.05	0.05
Channel n Value:	0.05	0.05
Contraction Coefficient:	0.1	0.3
Expansion Coefficient:	0.3	0.5

ROUGHNESS COEFFICIENT CHECK

RS: 5438
NT RC 05 The left overbank n value of 0.05 and the right overbank n value of 0.05 are less than or equal to the channel n value of 0.05 The overbank n values should be reevaluated.

RS: 5309
NT RC 05 The left overbank n value of 0.05 and the right overbank n value of 0.05 are less than or equal to the channel n value of 0.05 The overbank n values should be reevaluated.

RS: 5242

NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 5242
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 5141
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 5037
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4878
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4790
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4711
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4544
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4358
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4268
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4214
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4214
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4142
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 4022
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
of 0.05 are less than or equal to the channel n value of 0.05
The overbank n values should be reevaluated.

RS: 3844
NT RC 05 The left overbank n value of 0.05 and the right overbank n value

```
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       3600
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       3356
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       3101
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2910
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2734
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2664
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2583
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2583
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2451
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2370
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

RS:       2169
NT RC 05 The left overbank n value of 0.05 and the right overbank n value
          of 0.05 are less than or equal to the channel n value of 0.05
          The overbank n values should be reevaluated.

TRANSITION LOSS COEFFICIENT CHECK
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ROUGHNESS COEFFICIENT AT STRUCTURES
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---END---
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CHECK-RAS Program: Structure Check

Project File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.prj
Plan File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.p02
Geometry File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.g02
Flow File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.f01
Report File: C:\Documents and Settings\JColeman\Desktop\egtnc\hd\trib2.br
Selected profiles: 100-year
Date: 6/15/2005
Time: 10:51:44 AM

RS	MaxLoChord	MnTpRd	EGEL	WSEL	MinChEl	Structure
Trib 2,Reach-1						
5438			5164.01	5163.73	5161.73	
5309			5162.13	5161.99	5155.8	
5242	5160.5	5164	0	5159.54	5155.5	Culvert #1-Up
5242	5160	5164	0	5158.6	5155	Culvert #1-Dn
5141			5156.59	5155.76	5152.5	
5037			5155.02	5154.61	5151.6	
4878			5153.6	5153.32	5149.7	
4790			5152.83	5152.36	5149.84	
4711			5151.72	5151.31	5148	
4544			5149.41	5148.69	5145.95	
4358			5146.88	5146.8	5142.7	
4268			5146.71	5146.46	5139.75	
4214	5144.5	5147	0	5143.54	5139.5	Culvert #1-Up
4214	5143.5	5147	0	5141.52	5138.5	Culvert #1-Dn
4142			5143.08	5142.26	5138.2	
4022			5141.79	5141.43	5137	
3844			5140.38	5140.04	5136	
3600			5138.04	5137.58	5134.4	
3356			5133.93	5133.15	5130.35	
3101			5129.45	5129.16	5126.9	
2910			5126.78	5126.06	5123.16	
2734			5123.44	5123.26	5119.7	
2664			5123.28	5123.18	5115.7	
2583	5121	5126.9	0	5119.71	5115	Culvert #1-Up
2583	5118.5	5126.9	0	5115.62	5112.5	Culvert #1-Dn
2451			5116	5114.82	5112.25	
2370			5113.34	5112.81	5109.7	
2169			5110.15	5109.2	5105.9	
2050			5107.96	5107.21	5104	

RIVER/REACH: Trib 2, Reach-1
RIVER STATION: 5242
TYPE OF STRUCTURE: Culvert

Description:	Monaco Street
Distance from Upstream XS:	27
Deck/Roadway Width:	80
Weir Coefficient:	2.6
Maximum allowable submergence for weir flow:	0.95
Elevation at which weir flow begins:	0
Weir crest shape:	Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	5438	129.00	5163.73		5164.01	242.72	
3	5309	168.00	5161.99		5162.13	46	
	5242	125.00	5159.54		0	0	Culvert #1-Up
	5242	37.00	5158.6		0	0	Culvert #1-Dn
2	5141	104.00	5155.76		5156.59	38	
1	5037	159.00	5154.61		5155.02	92.74	

	Ineffective Flow, Section 3			Ineffective Flow, Section 2		
	Sta L	Sta R	Elev	Sta L	Sta R	Elev
1	0	299	5164	0	225	5164
2	345	734.17	5164	263	613.63	5164

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Culvert Group					299	345	U
					225	263	D

CULVERT:
Culvert Name: Culvert #1
Shape: Box Rise: 5 Span: 9 Barrels: 2
FHWA Chart #: # 9 - flared wingwalls and In
FHWA Scale #: # 1 - Wingwall flared 45 deg.; inlet top edge bev
Solution Crit:Highest U.S. EG

UpstrmDist:	6	Length:	125	n-Value:	0.011		
EntLossCoef:	0.2	ExtLossCoef:	1	CulvInvElU	5155.5	CulvInvElD	5155
LCntStaU:	317	RCntStaU:	329	LCntStaD	239	RCntStaD	251
Culvert Depth Blocked:	0						

Culv Area:	90	CulvQ:	830	MinTopRd:	5164.01

	LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd	
Culvert #1	312.5	333.5	5164	5164	5164	5160.5	U
	234.5	255.5	5164	5164	5164	5160	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Culvert #1		830	0	Highest U.S. EG	Pressure Flow

GEOMETRIC CHECK

TYPE OF FLOW CHECK

RS: 5242 This is Culvert #1
CV PF 01 Type of flow is pressure flow because,
1. EGEL 3 of 5162.13 is less than or equal to MinTopRd of 5164.01.
2. CulvWSIn of 5159.54 is less than MxLoCdU of 5160.50.
3. CulvWSOut of 5158.60 is less than MxLoCdD of 5160.00.
4. Q/AD^0.5 of 4.12 is greater than or equal to 4.0.

DISTANCE CHECK

CULVERT COEFFICIENT CHECK

CULVERT CRITERIA CHECK

INEFFECTIVE FLOW CHECK

RS: 5438 This is Section 4

ST IF 07 Ineffective flow option was considered at this section.
However, it should be a fully expanded cross section.
Ineffective flow stations and elevations should be cleared from
this section, unless the areas beyond the ineffective flow stations
are not within the flow path of the stream.
This message should be ignored if this section is Section 2 of
the upstream structure.

RIVER/REACH: Trib 2, Reach-1
RIVER STATION: 4214
TYPE OF STRUCTURE: Culvert

Description:	Proposed Road
Distance from Upstream XS:	33
Deck/Roadway Width:	42
Weir Coefficient:	2.6
Maximum allowable submergence for weir flow:	0.95
Elevation at which weir flow begins:	0
Weir crest shape:	Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	4358	90.00	5146.8		5146.88	152.01	
3	4268	126.00	5146.46		5146.71	35	
	4214	97.00	5143.54		0	0	Culvert #1-Up
	4214	21.00	5141.52		0	0	Culvert #1-Dn
2	4142	120.00	5142.26		5143.08	32	
1	4022	178.00	5141.43		5141.79	93.73	

	Ineffective Flow, Section 3 Sta L	Sta R	Elev	Ineffective Flow, Section 2 Sta L	Sta R	Elev
1	0	155	5147	0	117	5147
2	190	285.8	5147	149	241.86	5147

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Culvert Group					155	190	U
					117	149	D

CULVERT:
Culvert Name: Culvert #1
Shape: Box Rise: 5 Span: 10 Barrels: 2
FHWA Chart #: # 8 - flared wingwalls
FHWA Scale #: # 1 - Wingwall flared 30 to 75 deg.
Solution Crit:Highest U.S. EG

UpstrmDist: 8 Length: 97 n-Value: 0.011
EntLossCoef: 0.4 ExtLossCoef: 1 CulvInvElU 5139.5 CulvInvElD 5138.5
LCntStaU: 167 RCntStaU: 179 LCntStaD 127 RCntStaD 139
Culvert Depth Blocked: 0

Culv Area: 100 CulvQ: 920 MinTopRd: 5147.01

	LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd	
Culvert #1	162	184	5147	5147	5147	5144.5	U
	122	144	5147	5147	5147	5143.5	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Culvert #1		920	0	Highest U.S. EG	Pressure Flow

GEOMETRIC CHECK

TYPE OF FLOW CHECK

RS: 4214 This is Culvert #1
CV PF 01 Type of flow is pressure flow because,
1. EGEL 3 of 5146.71 is less than or equal to MinTopRd of 5147.01.
2. CulvWSIn of 5143.54 is less than MxLoCdU of 5144.50.
3. CulvWSOut of 5141.52 is less than MxLoCdD of 5143.50.
4. Q/AD^0.5 of 4.11 is greater than or equal to 4.0.

DISTANCE CHECK

CULVERT COEFFICIENT CHECK

CULVERT CRITERIA CHECK

INEFFECTIVE FLOW CHECK

RIVER/REACH: Trib 2, Reach-1
RIVER STATION: 2583
TYPE OF STRUCTURE: Culvert

Description:	Quebec Street
Distance from Upstream XS:	63
Deck/Roadway Width:	60
Weir Coefficient:	2.6
Maximum allowable submergence for weir flow:	0.95
Elevation at which weir flow begins:	0
Weir crest shape:	Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	2734	70.00	5123.26		5123.44	157.67	
3	2664	213.00	5123.18		5123.28	60	
	2583	180.00	5119.71		0	0	Culvert #1-Up
	2583	16.00	5115.62		0	0	Culvert #1-Dn
2	2451	81.00	5114.82		5116	57	
1	2370	201.00	5112.81		5113.34	112.16	

	Ineffective Flow, Section 3			Ineffective Flow, Section 2		
	Sta L	Sta R	Elev	Sta L	Sta R	Elev
1	0	286	5126.8	0	130	5126.8
2	346	448.23	5126.8	187	398.47	5126.8

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Culvert Group					286	346	U

130 187 D

CULVERT:
Culvert Name: Culvert #1
Shape: Box Rise: 6 Span: 10 Barrels: 2
FHWA Chart #: # 8 - flared wingwalls
FHWA Scale #: # 1 - Wingwall flared 30 to 75 deg.
Solution Crit:Highest U.S. EG

UpstrmDist:	17	Length:	180	n-Value:	0.011		
EntLossCoef:	0.4	ExtLossCoef:	1	CulvInvElU	5115	CulvInvElD	5112.5
LCntStaU:	309	RCntStaU:	321	LCntStaD	141	RCntStaD	153
Culvert Depth Blocked:	0						

Culv Area:	120	CulvQ:	1160	MinTopRd:	5126.91

	LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd	
Culvert #1	304	326	5126.9	5126.9	5126.9	5121	U
	136	158	5126.9	5126.9	5126.9	5118.5	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Culvert #1		1160	0	Highest U.S. EG	Low Flow

GEOMETRIC CHECK

TYPE OF FLOW CHECK

RS: 2583 This is Culvert #1
CV LF 01 Type of flow is low flow because,
1. EGEL 3 of 5123.28 is less than or equal to MinTopRd of 5126.91.
2. CulvWSIn of 5119.71 is less than MxLoCdU of 5121.00.
3. CulvWSout of 5115.62 is less than MxLoCdD of 5118.50.
4. Q/AD^0.5 of 3.95 is less than 4.0.

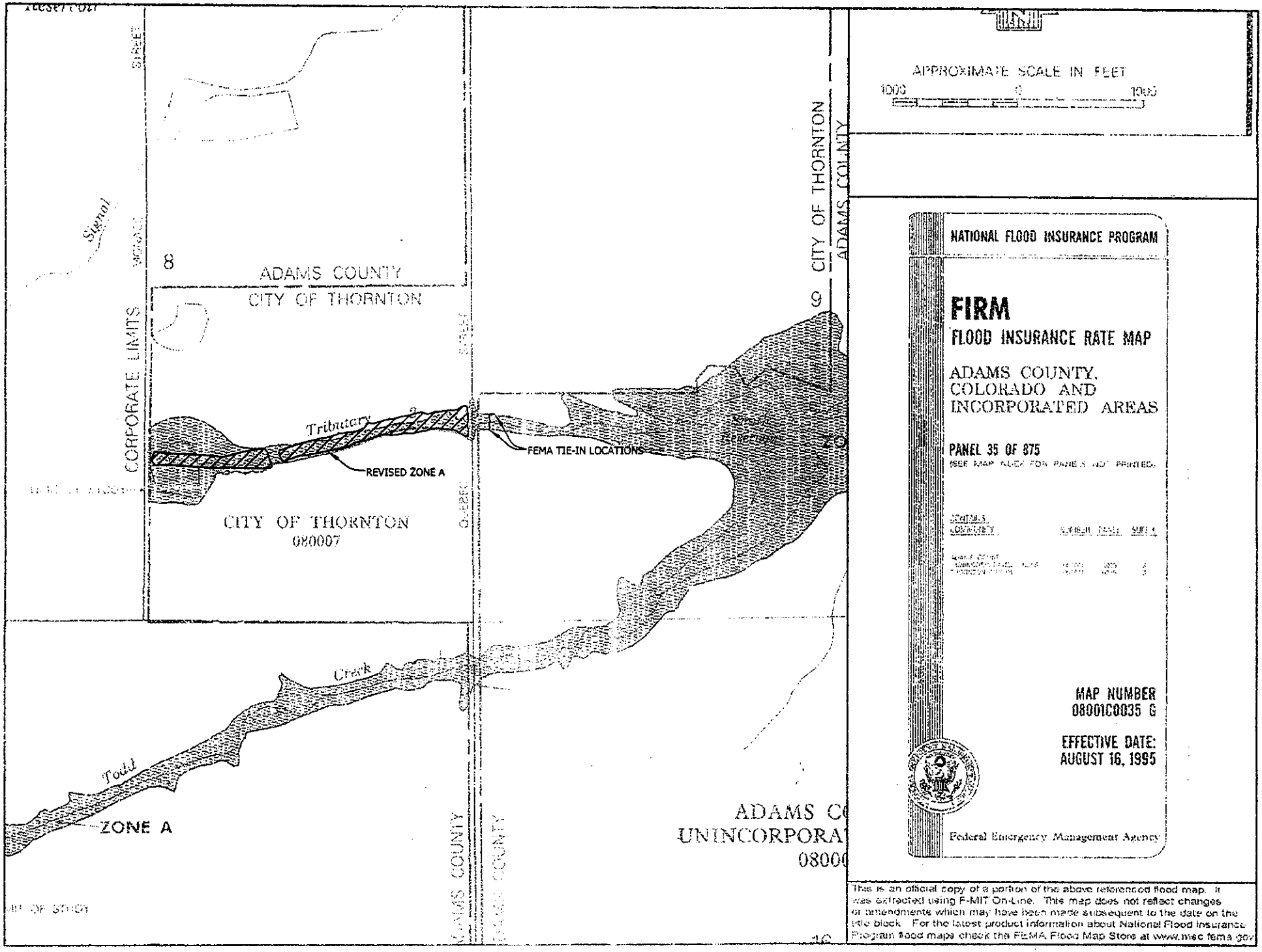
DISTANCE CHECK

CULVERT COEFFICIENT CHECK

CULVERT CRITERIA CHECK

INEFFECTIVE FLOW CHECK

---END


APPROXIMATE SCALE IN FEET
1000
0
1000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
ADAMS COUNTY, COLORADO AND INCORPORATED AREAS
PANEL 35 OF 875
(SEE MAP INDEX FOR PANELS NOT PRINTED)
MAP NUMBER
08001C0035 G
EFFECTIVE DATE:
AUGUST 16, 1995
Federal Emergency Management Agency
ADAMS COUNTY
CITY OF THORNTON
080007
CORPORATE LIMITS
REVISED ZONE A
FEMA TIE-IN LOCATIONS
ZONE A
Tributary
Creek
Todd
Signal
ADAMS COUNTY
UNINCORPORATED
080001
CITY OF THORNTON
ADAMS COUNTY
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

ADAMS COUNTY
STATION LOCATION RECORD

ADAMS COUNTY

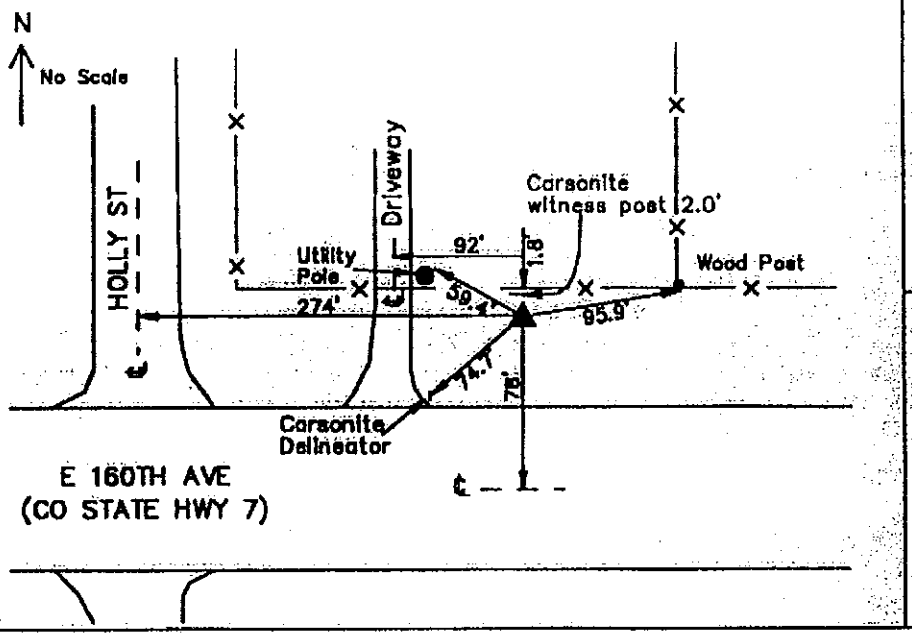
JOHN E. CHANCE & ASSOC.

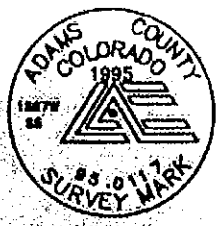
STATION NAME: 95.0117	PROJECT: WEST ADAMS COUNTY DENSIFICATION
STATION NUMBER: 0117	DATE: SEPTEMBER 1995 – JANUARY 1996

MONUMENT DESCRIPTION: SET STANDARD ADAMS COUNTY 3-1/4" ALUMINUM SURVEY MARK DISK STAMPED " 95.0117 1995 1S67W S5 " SECURED TO THE TOP OF A 5/8" FINNED ALUMINUM ROD ENCASED IN A 6" PVC PIPE WITH A LOGO CAP. SET IN A CONCRETE POST 0.2' BELOW GROUND LEVEL.

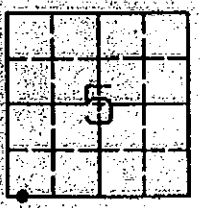
LOCATION: STATION IS LOCATED NORTHEAST OF THE INTERSECTION OF HOLLY STREET AND COLORADO HIGHWAY 7 (EAST 160TH AVENUE), 78' NORTH OF THE CENTER LINE OF COLORADO HIGHWAY 7, AND 274' EAST OF THE CENTER LINE OF HOLLY STREET.

LATITUDE (NAD83-92):	39° 59' 11.10249" N	SCALE FACTOR:	1.00005534
LONGITUDE (NAD83-92):	104° 55' 15.84004" W	ELEVATION FACTOR:	0.99975236
ELEVATION (NAVD 1988 USFT):	5178.50	COMBINED PROJECT FACTOR (5000'):	0.99979199
HORZ/VERT ORDER:	2ND I / 3RD	CONVERGENCE:	0° 21' 54.5"
HORZ/VERT METHOD:	GPS / LEVEL	MODIFIED PROJECT NORTHING (5000'):	785079.574
NORTHING (CO SPC ZONE 502 USFT):	1784708.260	MODIFIED PROJECT EASTING (5000'):	162893.630
EASTING (CO SPC ZONE 502 USFT):	3162235.716	Modified Coordinates = State Plane Values / Combined Factor then Subtract 1,000,000 from Northing and 3,000,000 from Easting	





STAMPING ON CAP



T 1 S, R 67 W, 6TH PM
ADAMS COUNTY, COLORADO
QUAD MAP: EASTLAKE

REFERENCE LANDMARK / STATION	DISTANCE (Miles)	AZIMUTH (Grid)	AZIMUTH (Geodetic)
NORTHGLENN MUN TANK	8.6	212° 58' 47.0"	213° 21' 43.2"

TOP CENTER OF CAP AT APEX OF THE SOUTHERLY OF TWO 75 FOOT HIGH, ELEVATED, GOLF BALL TYPE, WATER TANKS, PAINTED WHITE ON TOP AND GREEN ON BOTTOM. NORTHERLY TANK IS SLIGHTLY LARGER AND HAS SHORT ANTENNAS PROTRUDING FROM THE TOP. LOCATED ON HIGH GROUND IN A RESIDENTIAL AREA IN THORNTON NEAR THE INTERSECTION OF W. 103RD AVENUE AND URA LANE IN THE NW1/4 OF SECTION 16, T2S, R68W OF THE 6TH PM.

ERIE MAST	6.2	314° 38' 55.3"	315° 00' 51.7"

TOP CENTER OF A 1000 FOOT TALL ANTENNA MAST WITH WHITE STROBE LIGHTS AT EACH SECTION. MAST IS LOCATED ABOUT 2.5 MILES EAST OF ERIE IN THE SE1/4 OF SECTION 16, T1N, R68W OF THE 6TH PM.

FREDERICK MAST	7.7	7° 21' 10.2"	7° 43' 04.2"

TOP CENTER OF A 1000 FOOT TALL ANTENNA MAST WITH WHITE STROBE LIGHTS AT EACH SECTION AND SMALL DISHES FIXED TO THE TOP SECTION. MAST IS LOCATED ABOUT 1.5 MILES EAST OF FREDERICK IN THE NW1/4 OF SECTION 33, T2N, R67W OF THE 6TH PM.

Questions concerning the VERTCON process may be mailed to NGS

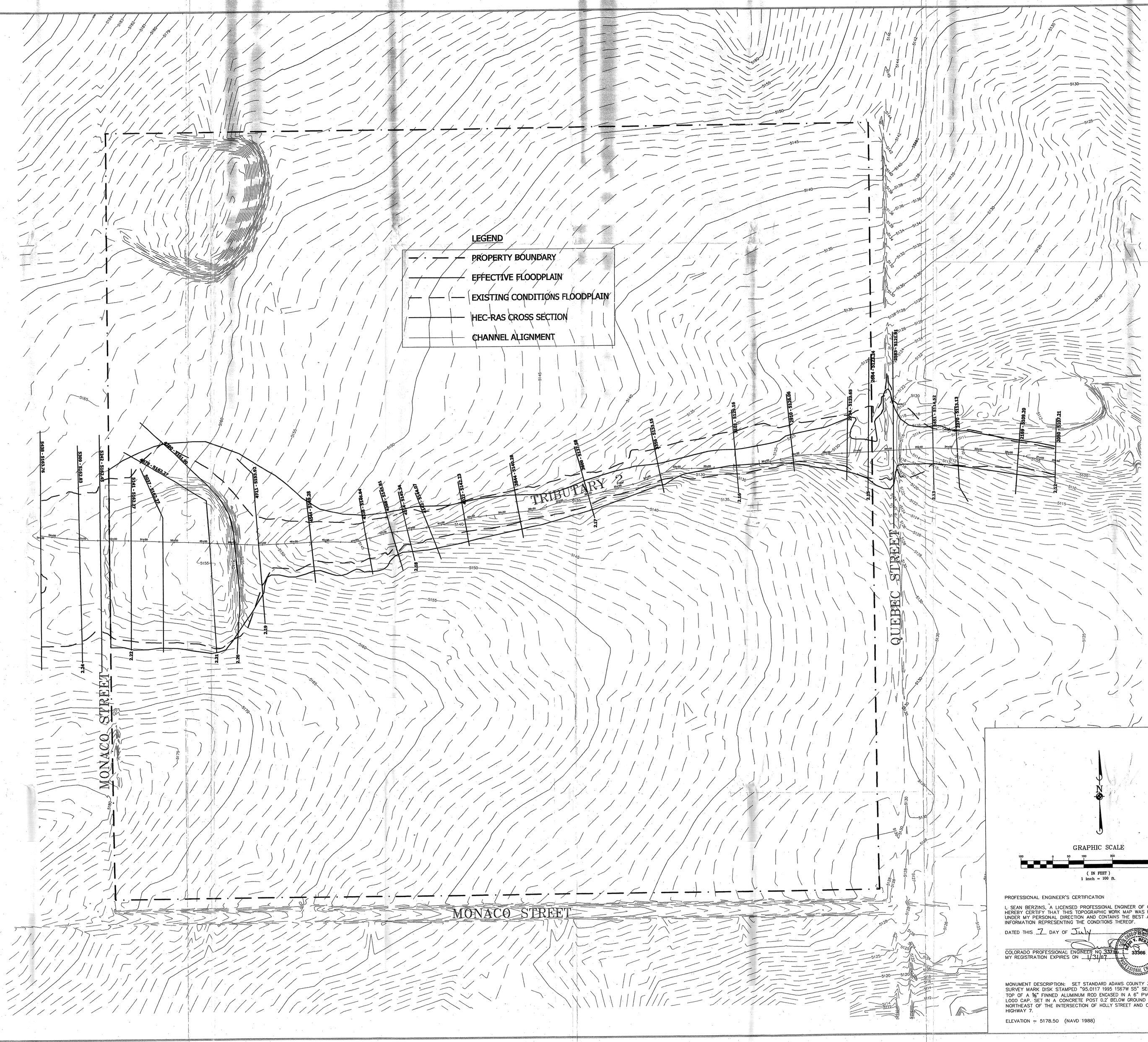
Latitude: 39 58 30

Longitude: 104 54 15

AT QUEBEC STREET AND CROSSING OF TRIBUTARY 2

NGVD 29 height:

Datum shift (NAVD 88 minus NGVD 29): 0.898 meter = 2.95 FEET



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

PROFESSIONAL ENGINEER'S CERTIFICATION

I, SEAN BERZINS, A LICENSED PROFESSIONAL ENGINEER OF COLORADO, HEREBY CERTIFY THAT THIS TOPOGRAPHIC WORK MAP WAS PREPARED UNDER MY PERSONAL DIRECTION AND CONTAINS THE BEST AVAILABLE INFORMATION REPRESENTING THE CONDITIONS THEREOF.

DATED THIS 7 DAY OF July

COLORADO PROFESSIONAL ENGINEER NO. 33366
MY REGISTRATION EXPIRES ON 11/31/07

STATE OF COLORADO — SEAN P. BERZINS — 33366 — REGISTERED PROFESSIONAL ENGINEER

MONUMENT DESCRIPTION: SET STANDARD ADAMS COUNTY 3-¼" ALUMINUM SURVEY MARK DISK STAMPED "95.0117 1995 1567W SS" SECURED TO THE TOP OF A ⅝" FINNED ALUMINUM ROD ENCASED IN A 6" PVC PIPE WITH A LOGO CAP. SET IN A CONCRETE POST 0.2' BELOW GROUND LEVEL LOCATED NORTHEAST OF THE INTERSECTION OF HOLLY STREET AND COLORADO HIGHWAY 7.

ELEVATION = 5178.50 (NAVD 1988)

Manhard Consulting, Ltd.
Civil Engineers • Surveyors • Water Resources Engineers • Water & Wastewater Engineers
Environmental Scientists • Landscape Architects • Planners • Construction Managers
245 Inverness Drive South, Suite 2000 • Englewood, CO 80112 • 303.708.0500 • 303.708.0400 FX • www.manhard.com

FULLER SUBDIVISION
THORNTON, COLORADO
EXISTING CONDITIONS HYDRAULIC WORKMAP

PROJ. MGR.:	SVB
PROJ. ASSOC.:	JC
DRAWN BY:	JC
CHECKED BY:	JAB
DATE:	6-15-05
SCALE:	1"=100'

SHEET 1 OF 2

EGTNC C-329

FULLER SUBDIVISION

THORNTON, COLORADO

PROPOSED CONDITIONS HYDRAULIC WORKMAP

PROJ. MGR.	SVB
PROJ. ASSOC.	JC
DESIGNED BY	JAB
DRAWN BY	JC
DATE:	6-15-05
SCALE:	1"=100'
SHEET	2 OF 2
ECTNC	C-329

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NO.	REVISIONS	DATE	BY

DRAWN BY / CHECK BY

MOUNUMENT DESCRIPTION:
SET STANDARD ADAMS COUNTY 3-¼" ALUMINUM SURVEY MARK DISK STAMPED "36,017 1995 15&7W S5" SECURED TO THE TOP OF A 24" FINNED CONCRETE POST 0.2' BELOW GROUND LEVEL LOCATED NORTHEAST OF THE INTERSECTION OF HOLLY STREET AND COLORADO HIGHWAY 7.
ELEVATION = 5178.50 (NAVD 1988)

PROFESSIONAL ENGINEER'S CERTIFICATION

I, SEAN BERZINS, A LICENSED PROFESSIONAL ENGINEER OF COLORADO, HEREBY CERTIFY THAT THIS TOPOGRAPHIC WORK MAP WAS PREPARED UNDER MY PERSONAL DIRECTION AND CONTAINS THE BEST AVAILABLE INFORMATION REPRESENTING THE CONDITIONS THEREOF.

DATED THIS 7 DAY OF July, 2006

COLORADO PROFESSIONAL ENGINEER NO. 33366
MY REGISTRATION EXPIRES ON 1/31/07

GRAPHIC SCALE
(IN FEET)
1 inch = 100 ft.

LEGEND

- PROPERTY BOUNDARY
- EFFECTIVE FLOODPLAIN
- EXISTING CONDITIONS FLOODPLAIN
- PROPOSED CONDITIONS FLOODPLAIN
- HEC-RAS CROSS SECTION
- CHANNEL ALIGNMENT

EXISTING AND PROPOSED FLOODPLAIN ELEVATIONS ARE EQUAL BETWEEN CROSS SECTIONS 2910 AND 3600

MONACO STREET

QUEBEC STREET

TRIBUTARY 2

152ND AVENUE

ZONE A FROM FIRM

ZONE A FROM FIRM

ZONE A FROM FIRM