INVENTORY & EVALUATION (I&E)
(JOB APPROVAL DOCUMENTATION)

Customer:	Grand Traverse Band of Ottawa and Chippewa Indians		
Location:	Leelanau County County Road 675 Crossing #1 of Crystal	Date:	3/30/2021

CPS Name and Number			
Practice	Controlling Factor	Amounts/Units	Job Class
AOP - 396	bridge span	60	V
	Channel Depth (Bottom of channel to lowest top of bank)	4+/-	IV
	Bankfull capacity (at channel depth)	70	III

NOTE:
I&E engineering approval indicates that the selected practices and preliminary design work meets the applicable conservation practice standards. The preliminary design work is extensive enough to identify the location, size, extent, and complexity of the conservation practice(s). This I&E was used to develop preliminary quantities and cost estimates. See NRCS Conservation Plan for the resource concerns as identified by the Certified Conservation Planner.

I&E Preparer	DJ Shook Digitally signed by DJ Shook Date: 2021.03.31 09:09:46 -04'00'	DATE	3/30/2021
I&E Checker	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 10:58:13 -05'00'	DATE	
I&E Approver	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 10:58:55 -05'00'	DATE	

INVENTORY & EVALUATION (I&E)
(JOB APPROVAL DOCUMENTATION)

Customer:	Grand Traverse Band of Ottawa and Chippewa Indians		
Location:	Leelanau County County Road 675 Crossing #2 of Crystal	Date:	3/30/2021

CPS Name and Number			
Practice	Controlling Factor	Amounts/Units	Job Class
AOP - 396	bridge span	80 ft.	V
	Channel Depth (Bottom of channel to lowest top of bank)	4+/-	V
	Bankfull capacity (at channel depth)	70	III

NOTE:
I&E engineering approval indicates that the selected practices and preliminary design work meets the applicable conservation practice standards. The preliminary design work is extensive enough to identify the location, size, extent, and complexity of the conservation practice(s). This I&E was used to develop preliminary quantities and cost estimates. See NRCS Conservation Plan for the resource concerns as identified by the Certified Conservation Planner.

I&E Preparer	DJ Shook Digitally signed by DJ Shook Date: 2021.03.31 09:10:23 -04'00'	DATE	3/30/2021
I&E Checker	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 11:05:55 -05'00'	DATE	
I&E Approver	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 11:06:39 -05'00'	DATE	

INVENTORY & EVALUATION (I&E)
(JOB APPROVAL DOCUMENTATION)

Customer:	Grand Traverse Band of Ottawa and Chippewa Indians		
Location:	Leelanau County County Road 675 Crossing #3 of Crystal	Date:	3/30/2021

CPS Name and Number			
Practice	Controlling Factor	Amounts/Units	Job Class
AOP - 396	bridge span	80	V
	Channel Depth (Bottom of channel to lowest top of bank)	2.2+/-	IV
	Bankfull capacity (at channel depth)	70	III

NOTE:
I&E engineering approval indicates that the selected practices and preliminary design work meets the applicable conservation practice standards. The preliminary design work is extensive enough to identify the location, size, extent, and complexity of the conservation practice(s). This I&E was used to develop preliminary quantities and cost estimates. See NRCS Conservation Plan for the resource concerns as identified by the Certified Conservation Planner.

I&E Preparer	DJ Shook Digitally signed by DJ Shook Date: 2021.03.31 09:11:39 -04'00'	DATE	3/30/2021
I&E Checker	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 11:32:18 -05'00'	DATE	
I&E Approver	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 11:32:55 -05'00'	DATE	

INVENTORY & EVALUATION (I&E)
(JOB APPROVAL DOCUMENTATION)

Customer:	Grand Traverse Band of Ottawa and Chippewa Indians		
Location:	Leelanau County County Road 675 Crossing #4 of Crystal	Date:	3/30/2021

CPS Name and Number			
Practice	Controlling Factor	Amounts/Units	Job Class
AOP - 396 - Culvert(See struc for water	drainage area	1600	V
	Pipe Nonpressure Flow - Inside Diameter	16'-6" x 6'-8"	V
	Effective Height	7.4 ft.	III
	Channel Depth (bottom of channel to lowest top of bank)	3.5 ft.	IV
	Bankfull Capacity (at channel depth)	4cfs	III

NOTE:
I&E engineering approval indicates that the selected practices and preliminary design work meets the applicable conservation practice standards. The preliminary design work is extensive enough to identify the location, size, extent, and complexity of the conservation practice(s). This I&E was used to develop preliminary quantities and cost estimates. See NRCS Conservation Plan for the resource concerns as identified by the Certified Conservation Planner.

I&E Preparer	DJ Shook Digitally signed by DJ Shook Date: 2021.03.31 09:12:03 -04'00'	DATE	3/30/2021
I&E Checker	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 13:18:45 -05'00'	DATE	
I&E Approver	ANDREA PALADINO Digitally signed by ANDREA PALADINO Date: 2022.01.28 13:19:51 -05'00'	DATE	

Three Crystal River Crossings and Tucker Lake Outlet Crossing of Leelanau County Road 675 – I&E

June and July 2019 Site Visits (three total):
Attendance:
DJ Shook-GTB (now CRA), Melissa Witkowski-GTB, Andrea Paladino-NRCS, Andy-NRCS Intern

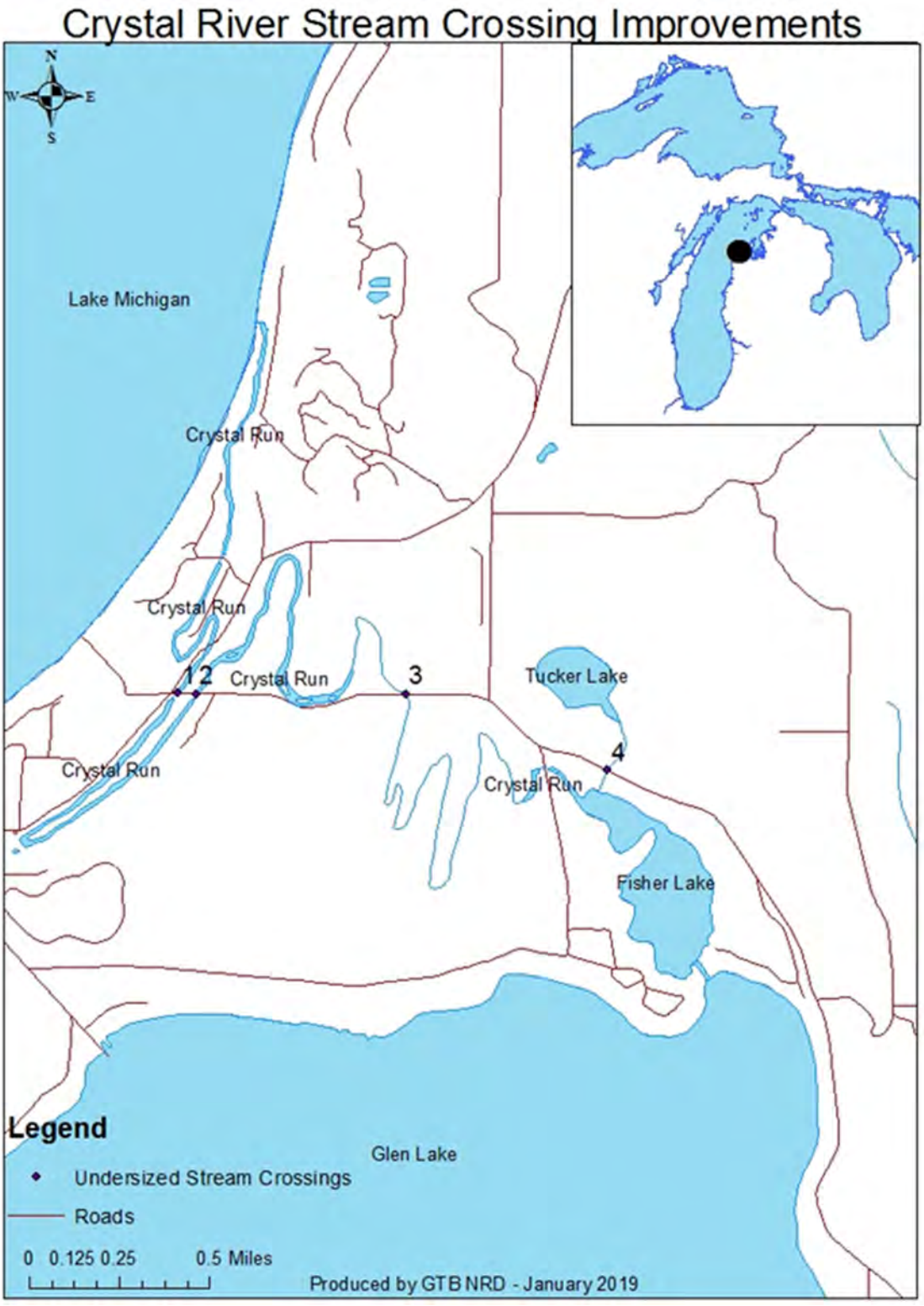
May 2020 Site Visits (tree total):
Attendance:
DJ Shook-GTB (now CRA), contracted professional surveyor-Gosling Czubak, Andrea Paladino-NRCS (first visit only), Brett Fessell-GTB (first visit only)

June and October 2020 Glen Lake Association Technical Committee Meeting:
Attendance: DJ Shook-GTB, Brett Fessell-GTB, Bob Verschaeve-Gosling Czubak (first meeting only), Glen Lake Association Technical Committee Meeting comprised of staff from Sleeping Bear National Lakeshore, Leelanau County Road Commission, Leelanau County Drain Commission, as well as landowners from the Glen Lake-Crystal River watershed.

October 2020 Meeting with Leelanau County Road Commission:
Attendance: DJ Shook-GTB, Brett Fessell-GTB, Bob Verschaeve-Gosling Czubak, Martin Graf-Gosling Czubak, Keith Moore-Leelanau County Road Commission, Brendan Mullane-Leelanau County Road Commission

Prepared by: DJ Shook

This Inventory and evaluation document pertains to the four road-stream crossings shown in the map below:

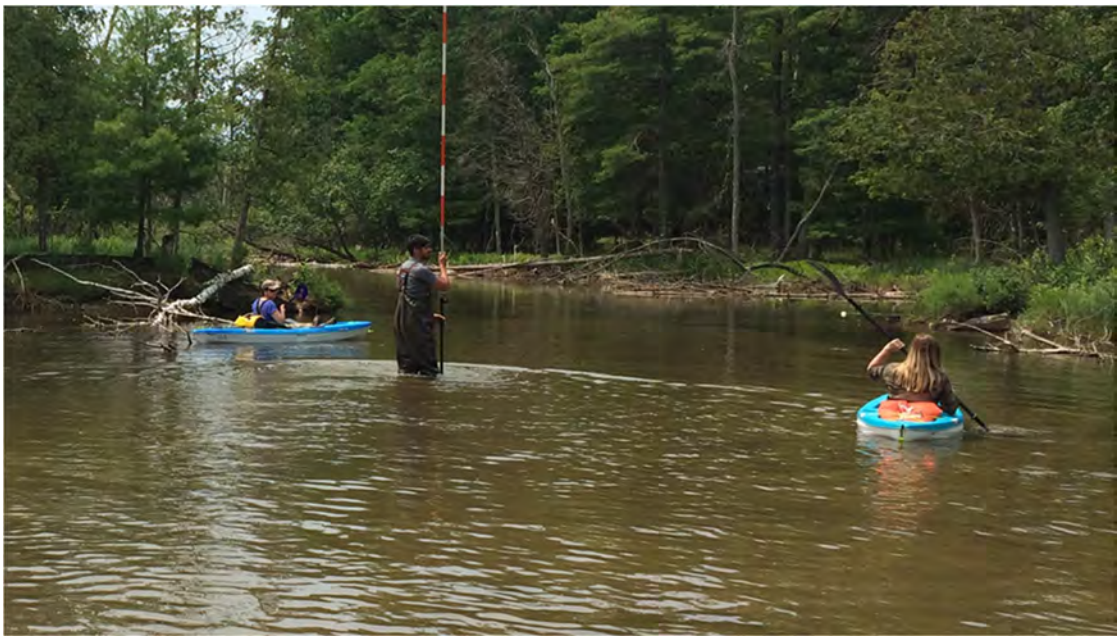


During the NRCS and GTB site visits in 2019 the following was completed:

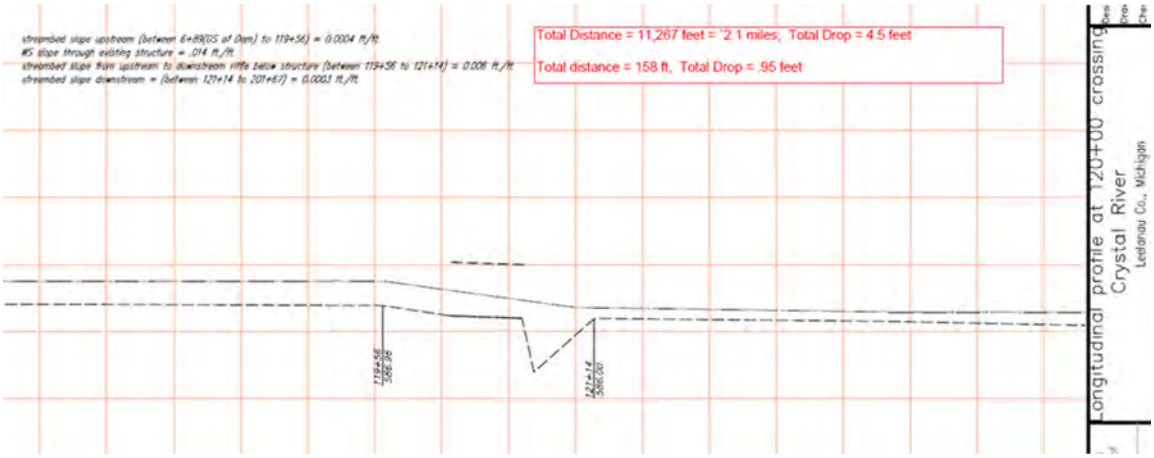
- Participated in site visits to the three road-stream crossing sites on the Crystal River as it crosses Duns Farm Road (County Road 675) as well as the Tucker

Lake outlet crossing of Duns Farm Road (County Road 675). Collected pertinent stream longitudinal profile information pertaining to the plan to replace the undersized crossings.

- Participated in three sites visits (one day in June and two days in July) to the Crystal River to collect longitudinal profile information in between the proposed road stream crossing improvements. A photo from these site visits is included below for reference:



A snapshot of a graph of some of the longitudinal profile information that was collected is copied below for reference. This data was used to communicate with the project stakeholders about the changes at the site that are expected. During these days of longitudinal profile survey, GTB staff was approached by a member of the Glen Lake Association Water Level Committee and invited to present at their fall 2019 meeting.

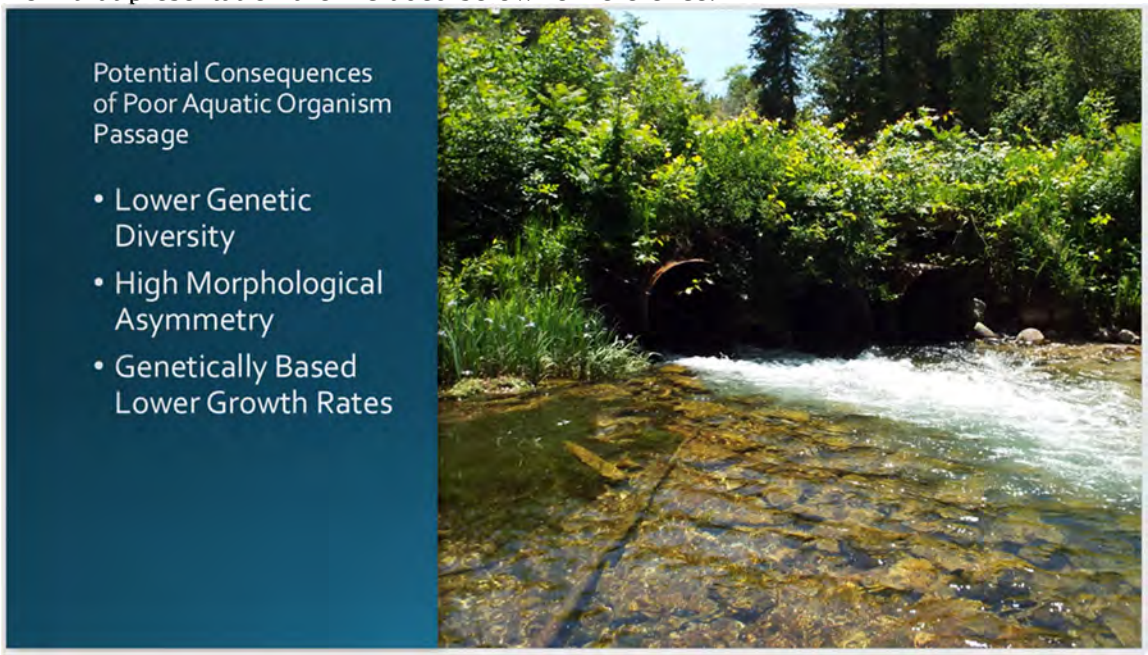


All of plots of this data is provided as an attachment to this report for reference.

Leelanau Co., Glen Arbor Twp, T29N, R14W Section 23

Three Crystal River Crossings and Tucker Lake Outlet Crossing of Leelanau County Road 675 – I&E

At a Glen Lake Association Technical Association Meeting, DJ Shook, then working for the Grand Traverse Band delivered a presentation about the proposal to replace the undersized road-stream crossings with appropriately sized structures. A couple of slides from that presentation are included below for reference:



Using grant funds from the Bureau of Indian Affairs, the Grand Traverse Band of Ottawa and Chippewa Indians partnered with the Leelanau County Road Commission to prepare final designs for the improvement of the four road-stream crossings on County Road 675 according to NRCS conservation standards and specifications. Gosling Czubak is the consultant design firm hired by the road commission to complete the work.

Leelanau Co., Glen Arbor Twp, T29N, R14W Section 23

Road commission staff, Gosling Czubak, NRCS staff, GTB staff, and DJ Shook (now with the Conservation Resource Alliance) cooperated and communicated through the survey and development of preliminary designs for this project. DJ Shook, Brett Fessell, and Andrea Paladino worked alongside the Gosling Czubak surveyor as the stream longitudinal profile survey was completed. A preliminary engineering report and designs are provided as attachments to this report. Key communications pertaining to sizing of the road-stream crossing structures, structure selection, bridge clearance, construction timing, and channel bed design under the bridges is included as an attachment as well.

Resource concerns:

1. Crossing #1 consists of two 60-inch diameter corrugated metal pipe culverts. Assessing the aquatic organism passage resource concern at this site using the Great Lakes Road Stream Crossing Inventory Instructions, crossing #1 is rated as a possibility score of .5, some species and/or life stages cannot pass at most stream flows, because the culverts are longer that 30 ft and do not have natural substrate through them. There are no other barriers below this crossing, so native Great Lakes fish species are prevented from migrating upstream from Lake Michigan through this road-stream crossing during elevated stream flows.
2. An over-widened scour pool is located downstream of the culverts indicating past channel bed and streambank erosion caused by the elevated water velocities created as high-water events are forced to flow through the undersized culverts.

Photo 1: Crossing #1 outlet

3. Crossing #2 consists of consists of three culverts including 36-inch diameter, 48-inch diameter, and a 60-inch diameter corrugated metal pipe culverts. Assessing the aquatic organism passage resource concern at this site using the Great Lakes Road Stream Crossing Inventory Instructions, crossing #2

is rated as a possibility score of .5, some species and/or life stages cannot pass at most stream flows, because the culverts are longer that 30 ft and do not have natural substrate through them.

4. An over widened scour pool is located downstream of the culverts indicating past channel bed and streambank erosion caused by the elevated water velocities created as high-water events are forced to flow through the undersized culverts.

Photo 2: Crossing #2 inlet:

5. Crossing #3 consist of three 48-inch diameter corrugated metal pipe culverts. Assessing the aquatic organism passage resource concern at this site using the Great Lakes Road Stream Crossing Inventory Instructions, crossing #3 is rated as a possibility score of .0, most species and life stages cannot pass at most stream flows, because the water velocity within the culvert is greater than 3 feet per second at base flow.
6. An over widened scour pool is located downstream of the culverts indicating past channel bed and streambank erosion caused by the elevated water velocities created as high-water events are forced to flow through the undersized culverts.

Photo 3: Crossing #3 outlet:

7. Crossing #4 consist of a single 42-inch diameter corrugated metal pipe culvert. At the time of assessment this culvert was not passing water completely blocking all fish species from passing. A two-foot water surface elevation differential from upstream to downstream was measured at this site.
8. During previous rain and runoff events water has overtopped the road due to the failure of the culvert to pass water. This has causes erosion from the road shoulders into the waterway.

Photo 4: Crossing #4 inlet:

Resource Information and Analysis:

1. Gosling Czubak produced preliminary design plans for the four road-stream crossing improvements. The Owner Review design plans are included for reference.

2. A soil borings were conducted and are included as part of the design plans.
3. Cost estimates were prepared by and are included in the preliminary engineering report.

Potential options for addressing the resource concerns:

1. The **Aquatic Organism Passage/Stream Crossing** practices are needed at the four road-stream crossing sites with the following dimensions pertaining to each proposed structure:
    a. Crossing #1: Beam Bridge:
        i. Bankfull width of the stream: 65.5ft – Average from page 4 of the Report.
        ii. Clear Deck Width of the Bridge: 34ft from page 14 of the preliminary engineering report.
        iii. Average Abutment Height: 8.5ft from preliminary design sheets C1-6&7.
    b. Crossing #2: Timber Bridge:
        i. Bankfull width of the stream: 84.5ft – Average from page 4 of the preliminary engineering report.
        ii. Clear Deck Width of the Bridge: 34ft from page 14 of the preliminary engineering report.
        iii. Average Abutment Height: 10ft scaled from preliminary design sheet C2.2.
    c. Crossing #3: Timber Bridge:
        i. Bankfull width of the stream: 70ft – Average from page 4 of the Report.
        ii. Clear Deck Width of the Bridge: 34ft from page 14 of the preliminary engineering report.
        iii. Average Abutment Height: 9.15ft scaled from preliminary design sheet C3.3.
    d. Crossing #4: multi-plate full invert aluminum box culvert:
        i. Published cross sectional area of proposed culvert, 16’6” X 6’8” Aluminum Box Culvert: 98.3 square feet
        ii. Length of culvert under the road: 31 ft. from page 14 of the preliminary engineering report (11ft lanes and 4.5ft shoulders).

Job Class:
The Job class is determined for each crossing on the I&E sheet

Attachments:
1. Preliminary Longitudinal Profile Survey Plots
2. Planning Communications

Leelanau Co., Glen Arbor Twp, T29N, R14W Section 23

3. CR 675 Crossings_OWNER REVIEW_02052021
4. CR 675 Xings PRELIM DESIGN REPORT – REV 12222020

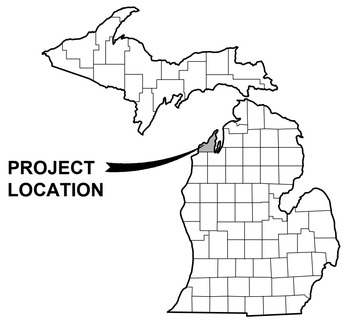
LEELANAU COUNTY ROAD COMMISSION

IN COOPERATION WITH THE

GRAND TRAVERSE BAND OF OTTAWA AND CHIPPEWA INDIANS

PROPOSED PLANS FOR

COUNTY ROAD 675 STREAM CROSSINGS PROJECTS



VICINITY MAP
SCALE

PLAN INDEX	
Sheet Number	Sheet Title
TS	COVER SHEET
C0.1	TYPICAL ROAD CROSS SECTIONS
C1.1	GENERAL PLAN OF SITE – M-22 CROSSINGS 1 & 2
C1.2	SOIL BORINGS – CROSSING 1
C1.3	GENERAL PLAN OF STRUCTURE – CROSSING 1
C1.4	GENERAL PLAN OF STRUCTURE – CROSSING 1
C1.5	PILE DETAILS – CROSSING 1
C1.6	ABUTMENT A DETAILS – CROSSING 1
C1.7	ABUTMENT B DETAILS – CROSSING 1
C1.8	STEEL REINFORCEMENT DETAILS – CROSSING 1
C2.1	SOIL BORINGS – CROSSING 2
C2.2	GENERAL PLAN OF STRUCTURE – CROSSING 2
C2.3	GENERAL PLAN OF STRUCTURE – CROSSING 2
C2.4	PILE DETAILS – CROSSING 2
C2.5	ABUTMENT & PIER DETAILS – CROSSING 2
C3.1	GENERAL PLAN OF SITE – CROSSING 3
C3.2	SOIL BORINGS – CROSSING 3
C3.3	GENERAL PLAN OF STRUCTURE – CROSSING 3
C3.4	GENERAL PLAN OF STRUCTURE – CROSSING 3
C3.5	PILE DETAILS – CROSSING 3
C3.6	ABUTMENT & PIER DETAILS – CROSSING 3
C4.1	GENERAL PLAN OF SITE – CROSSING 4
C4.2	SOIL BORINGS – CROSSING 4
C4.3	GENERAL PLAN OF STRUCTURE – CROSSING 4
C4.4	GENERAL PLAN OF STRUCTURE – CROSSING 4

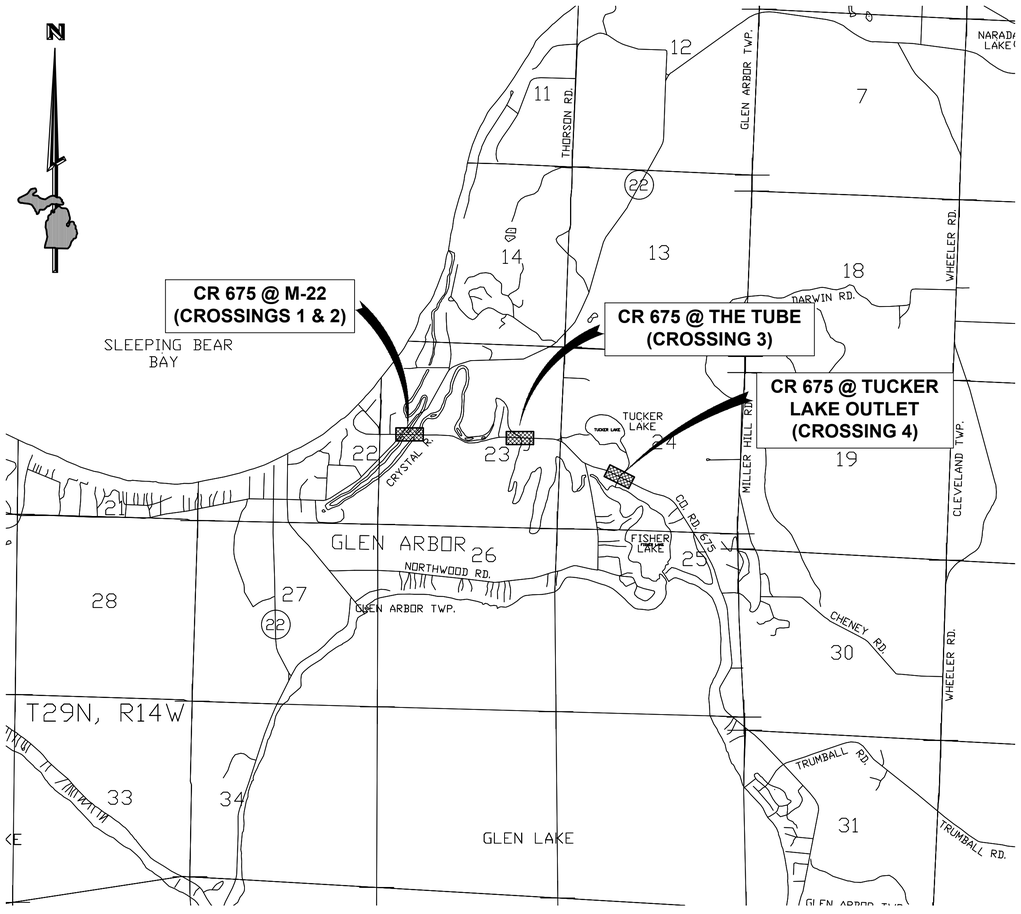
PUBLIC UTILITIES

NAME OF OWNER	TYPE OF UTILITY
CONSUMER'S ENERGY 821 HASTINGS STREET TRAVERSE CITY, MI 49686 231.929.6265 CONTACT: CURTIS HANSEN	ELECTRIC
CHARTER COMMUNICATIONS 1392 TRADE CENTRE DR TRAVERSE CITY, MI 49696 231.941.3819 CONTACT: DAN BIELACZYC	CABLE TV
CENTURY TELEPHONE 116 CENTURY ROAD MAPLE CITY, MI 49664 989.879.8709 CONTACT: BILL MARCHAND	TELEPHONE
DTE 1250 MICH CON LANE, S.W. P.O. BOX 259 KALKASKA, MI 49646 231.258.3785 CONTACT: MATTHEW LOGAN	GAS

NOTES APPLYING TO STANDARD PLANS

WHERE THE FOLLOWING ITEMS ARE CALLED FOR ON THE PLANS,THEY ARE TO BE CONSTRUCTED ACCORDING TO THE MDOT STANDARD PLAN GIVEN BELOW OPPOSITE EACH ITEM UNLESS OTHERWISE INDICATED

SOIL EROSION AND SEDIMENTATION CONTROLS	:	R-96-E
GUARDRAIL TYPES A, B, BD, T, TD, MGS-8, & MGS-8D	:	R-60-J
GUARDRAIL APPROACH TERMINAL TYPE 2M	:	R-62-H
GUARDRAIL DEPARTING TERMINALS TYPES B, T, & MGS	:	R-66-E
GUARDRAIL ANCHORAGE , BRIDGE, DETAILS	:	R-68-G
GUARDRAIL LONG SPAN INSTALLATIONS	:	R-72-D
SEEDING AND TREE PLANTING	:	R-100-H
GROUND DRIVEN SIGN SUPPORTS FOR TEMP SIGNS	:	WZD-100-A
TEMPORARY TRAFFIC CONTROL DEVICES	:	WZD-125-E



LOCATION MAP
NOT TO SCALE

Know what's below.
Call before you dig.

NOTES :

1. THE DESIGN OF THIS STRUCTURE IS BASED ON 1.2 TIMES THE CURRENT ASSHTO LRFD BRIDGE DESIGN SPECIFICATION HL-93 LOADING WITH THE EXCEPTION THAT THE DESIGN TANDEM PORTION OF THE HL-93 LOAD DEFINITION SHALL BE REPLACED BY A SINGLE 60 KIP AXLE LOAD BEFORE APPLICATION OF THIS 1.2 FACTOR. THE RESULTING LOAD IS DESIGNATED HL-93 MOD. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/800 OF THE SPAN LENGTH.
2. EXCEPT WHERE OTHERWISE INDICATED ON THESE PLANS, OR IN THE PROPOSAL AND SUPPLEMENTAL SPECIFICATIONS CONTAINED HEREIN, ALL MATERIALS AND WORKMANSHIP SHALL BE ACCORDING TO THE MICHIGAN DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION 2012 EDITION.
3. PLANS HAVE BEEN PREPARED IN ACCORDANCE WITH AASHTO'S A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, 2011 EDITION.
4. THE STATIONING AS SHOWN ON THESE PLANS IS BASED ON AN ASSUMED LOCAL SYSTEM.
5. ALL EXPOSED CONCRETE CORNERS SHOWN SQUARE ON THE PLANS SHALL BE BEVELED WITH 1/2 " TRIANGULAR MOLDINGS EXCEPT AS OTHERWISE NOTED.
6. THE DESIGN OF THE FOUNDATION PILING IS BASED ON MATERIAL OF THE FOLLOWING GRADES AND STRESSES (AND LOSSES):
   CONCRETE: GRADE S1 — f_c = 3,500 PSI
   STEEL REINFORCEMENT — f_y = 60,000 PSI
   FOUNDATION PILING (STEEL H-PILING):
   AASHTO M270
   GRADE 50W — F_Y = 50,000 PSI
   FOUNDATION PILING (TIMBER) — Fco= 900 PSI
7. UNLESS OTHERWISE SHOWN ON THE PLANS PROVIDE MINIMUM CONCRETE CLEAR COVER FOR REINFORCEMENT ACCORDING TO THE FOLLOWING:
   CONCRETE CAST AGAINST EARTH: 3 IN.
   PRESTRESSED BEAMS: 1 IN.
   ALL OTHER UNLESS SHOWN ON PLANS: 2 IN.
8. PLACEMENT OF TEMPORARY TRAFFIC CONTROL DEVICES SHALL BE DONE IN ACCORDANCE WITH THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, 2011 EDITION.

CONTRACT FOR: REMOVAL OF EXISTING CULVERTS, CONSTRUCTION OF PRE-ENGINEERED STEEL STRUCTURE, TIMBER STRUCTURES, AND AN ALUMINUM BOX CULVERT, APPROACHES, AND RELATED WORK AT FOUR STREAM CROSSING LOCATIONS.

LEELANAU COUNTY ROAD COMMISSION APPROVAL

MANAGING DIRECTOR _____ DATE _____

NATURAL RESOURCES CONSERVATION SERVICE STATEMENTS

TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, JUDGEMENT AND BELIEF, THE DESIGN, CONSTRUCTION DRAWINGS, AND SPECIFICATIONS MEET APPLICABLE NRCS STANDARDS AND SPECIFICATIONS.

MARTIN A. GRAF, P.E. _____ DATE _____

NRCS PRACTICE STANDARDS:
AQUATIC ORGANISM PASSAGE - 396

NRCS IS ACCEPTING THESE CONSTRUCTION DRAWINGS AND SPECIFICATIONS ON THE BASIS THAT THEY HAVE BEEN SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER. BASED ON THE INFORMATION PROVIDED BY THE PROFESSIONAL ENGINEER, THE CONSTRUCTION DRAWINGS AND SPECIFICATIONS APPEAR TO MEET APPLICABLE NRCS STANDARDS AND SPECIFICATIONS. ANY DEFICIENCIES IN THE DESIGN, CONSTRUCTION DRAWINGS OR SPECIFICATIONS ARE THE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE SEAL APPEARS ON THE CONSTRUCTION DRAWINGS.

NRCS REPRESENTATIVE _____ DATE _____

PREPARED UNDER SUPERVISION OF

MARTIN A. GRAF (REGISTERED PROFESSIONAL ENGINEER) — 43931 (REGISTRATION NO.)

GOSLING CZUBAK ENGINEERING SCIENCES, INC.
ORGANIZATION

1280 BUSINESS PARK DRIVE, TRAVERSE CITY, MICHIGAN 49686
ADDRESS

CIVIL ENGINEERING
SURVEYING
ENVIRONMENTAL SERVICES
GEOTECHNICAL
CONSTRUCTION SERVICES
DRILLING
LANDSCAPE ARCHITECTURE

Gosling Czubak
engineering sciences, inc.
1280 Business Park Drive, Traverse City, Michigan
231.946.9191 800.968.1062
www.goslingczubak.com info@goslingczubak.com

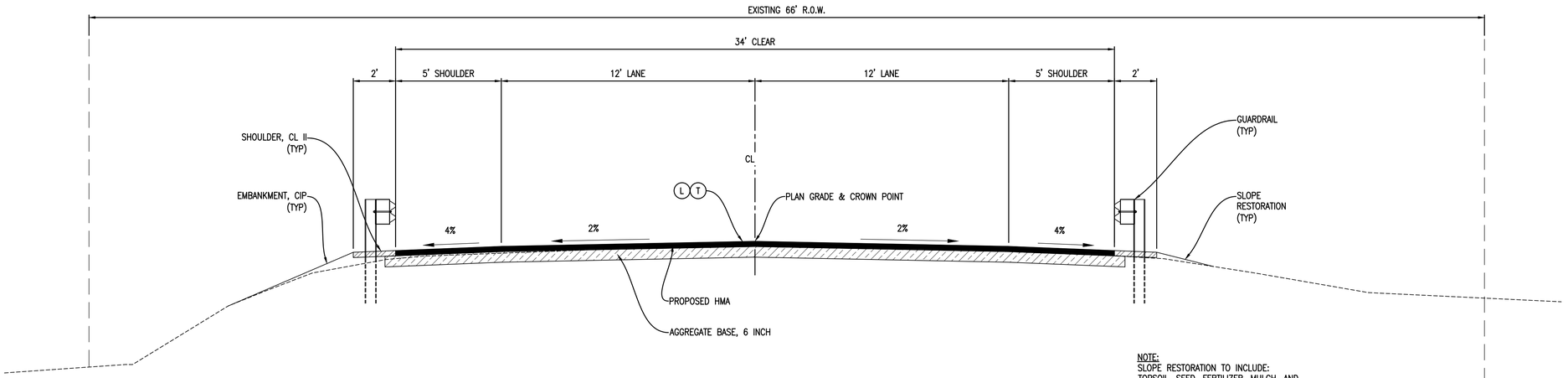
CR 675 STREAM CROSSINGS PROJECTS

Issue Date
01-27-2022

Project No.
2020430002

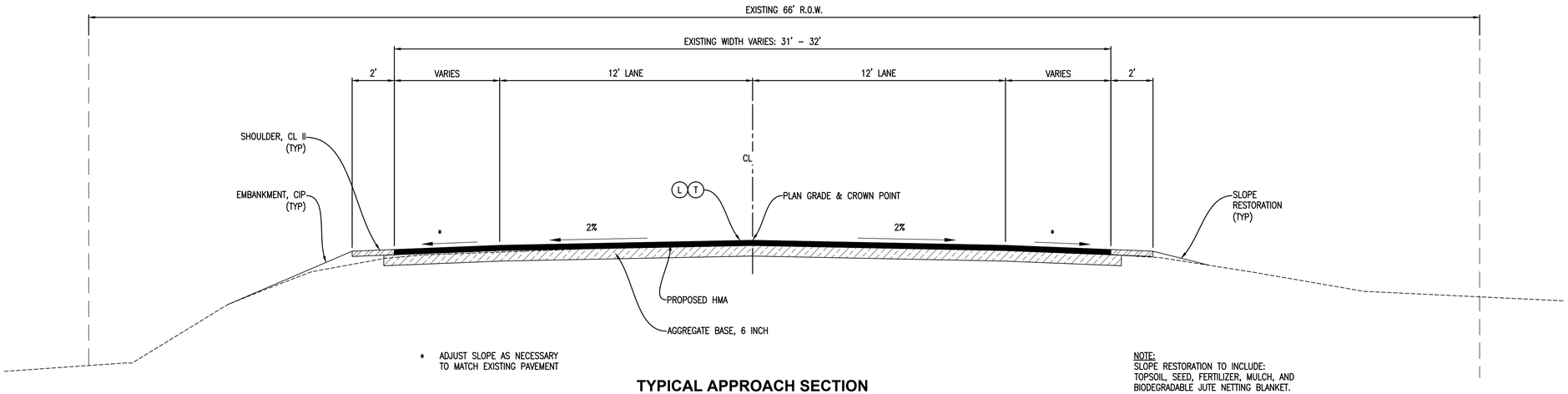
Sheet
TS

ORIGINAL SHEET SIZE IS 22x34 - HALF SCALE SHEET IS 11x17



NOTE:
SLOPE RESTORATION TO INCLUDE:
TOPSOIL, SEED, FERTILIZER, MULCH, AND BIODEGRADABLE JUTE NETTING BLANKET.

TYPICAL APPROACH SECTION
(ALL CROSSINGS)



* ADJUST SLOPE AS NECESSARY TO MATCH EXISTING PAVEMENT

NOTE:
SLOPE RESTORATION TO INCLUDE:
TOPSOIL, SEED, FERTILIZER, MULCH, AND BIODEGRADABLE JUTE NETTING BLANKET.

TYPICAL APPROACH SECTION
(ALL CROSSINGS)

HMA APPLICATION ESTIMATE

IDENT. NO.	ITEM	RATE PER SYD	PG–GRADE	REMARKS	AWI (MIN.)
L	HMA 4E1	165 LB	64–22	LEVELING COURSE	N/A
T	HMA 4E1	165 LB	64–22	TOP COURSE	220
	BOND COAT	0.05–0.15 GAL		FOR INFORMATION ONLY	

SCALE 1" = 30'
0' 30' 60'

GoslingCzubak
engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
www.goslingczubak.com

CIVIL ENGINEERING
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GEOTECHNICAL
CONSTRUCTION SERVICES
DRILLING
LANDSCAPE ARCHITECTURE

No.	Date	Revision	By
4	01-27-2022	ISSUED FOR PERMITS	RMV
3	12-10-2021	ROAD COMMISSION REVIEW	RMV
2	02-05-2021	PARTNER REVIEW PLAN SET	RMV
1	12-22-2020	CROSSINGS 1, 2, & 3 REVISIONS	RMV

TYPICAL ROAD CROSS SECTIONS
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued: 01-27-2022
Date Surveyed: 04-30-2020
Designed By: RMV
Drawn By: RMV
Checked By: MAG
Scale: AS NOTED

Original sheet size is 22x34

Location:
SECTIONS 23 & 24
T29N, R14W
GLEN ARBOR TOWNSHIP
LEELANAU COUNTY
MICHIGAN

Project Number:
2020430002

Sheet:
C0.1

P:\2020\2020430002\05CAD\Data\C3D\2020430002_PS_Final Plans.dwg, Tab: C0.1, Saved by rmerschman 12/7/2022 10:51 AM, Plotted by Bob Verschaere, P.E. 12/7/2022 10:53 AM

GUARDRAIL TABLE - CROSSING 1				
MARK	LOCATION	GUARDRAIL ITEMS		
		Description	Unit	Qty
GR-1	NE QUAD	GUARDRAIL ANCH, BRIDGE, DET M1	EA	1
GR-2	SW QUAD	*GUARDRAIL ANCH, BRIDGE, DET M1, MODIFIED	EA	1
GR-3	NE QUAD	GUARDRAIL APPROACH TERMINAL, TYPE 2M	EA	1
GR-4	SW QUAD	GUARDRAIL DEPARTING TERMINAL, TYPE T	EA	1
GR-5	NW&SE QUADS	**GUARDRAIL DEPARTING TERMINAL, TYPE T, MODIFIED	EA	2

* MODIFIED WITH CURVE (125' RADIUS)

** MODIFIED WITH CURVE (10' RADIUS) AND DIRECT CONNECTION TO TIMBER RAILING

EXISTING STRUCTURE CROSSING 1

TWO 60" DIA. CMP CULVERTS

PROPOSED STRUCTURE CROSSING 1

SINGLE SPAN 65' x 34' WIDE (CLR) PRE-ENGINEERED STEEL SUPERSTRUCTURE

BENCHMARKS

BENCHMARK #3
SPIKE IN POWER POLE
STATION 0+04.67, 46.4' RT
ELEVATION = 587.03 (NAVD 88)

BENCHMARK #4
SPIKE IN 28" WHITE PINE
STATION 5+07.86, 23.43' LT
ELEVATION = 590.18 (NAVD 88)

EXISTING STRUCTURE CROSSING 2

ONE 36" DIA. CMP CULVERT,
ONE 48" DIA. CMP CULVERT,
ONE 60" DIA. CMP CULVERT

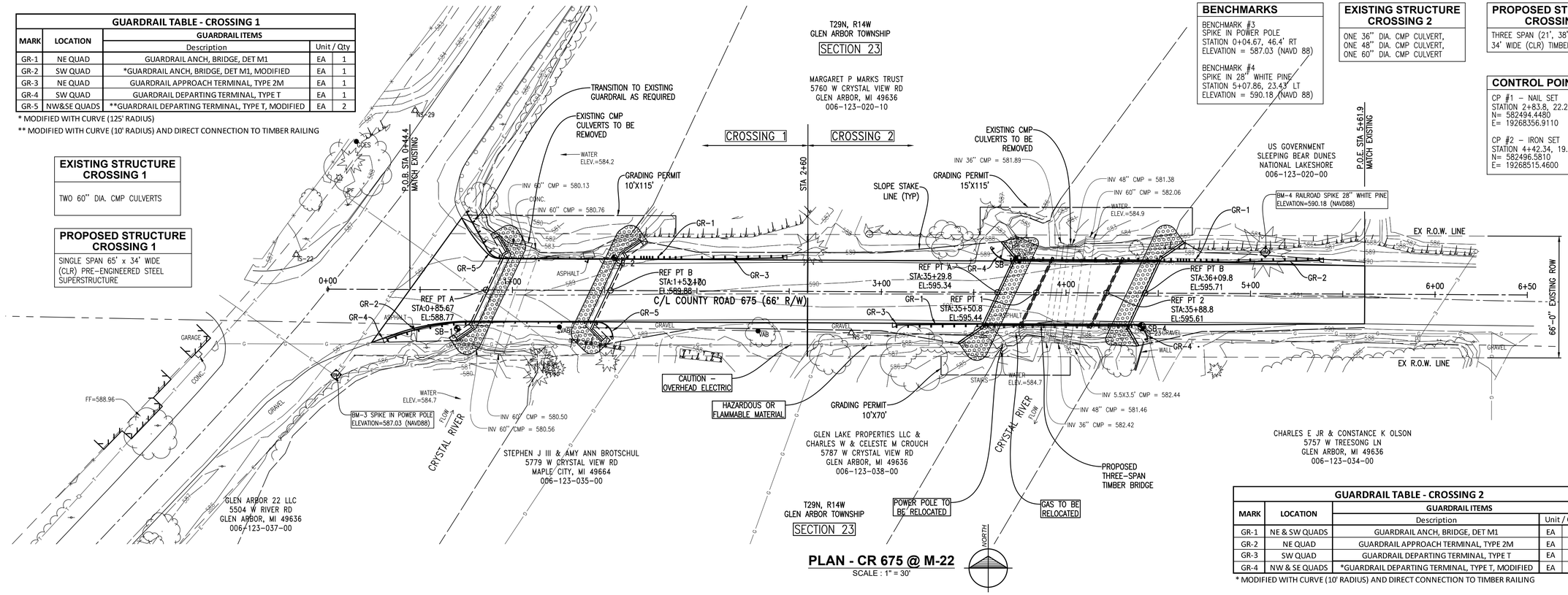
PROPOSED STRUCTURE CROSSING 2

THREE SPAN (21', 38', 21') x 34' WIDE (CLR) TIMBER BRIDGE

CONTROL POINTS

CP #1 – NAIL SET
STATION 2+83.8, 22.25' RT
N= 582494.4480
E= 19268356.9110

CP #2 – IRON SET
STATION 4+42.34, 19.46' RT
N= 582496.5810
E= 19268515.4600



PLAN - CR 675 @ M-22

SCALE : 1" = 30'

GUARDRAIL TABLE - CROSSING 2				
MARK	LOCATION	GUARDRAIL ITEMS		
		Description	Unit	Qty
GR-1	NE & SW QUADS	GUARDRAIL ANCH, BRIDGE, DET M1	EA	2
GR-2	NE QUAD	GUARDRAIL APPROACH TERMINAL, TYPE 2M	EA	1
GR-3	SW QUAD	GUARDRAIL DEPARTING TERMINAL, TYPE T	EA	1
GR-4	NW & SE QUADS	*GUARDRAIL DEPARTING TERMINAL, TYPE T, MODIFIED	EA	2

* MODIFIED WITH CURVE (10' RADIUS) AND DIRECT CONNECTION TO TIMBER RAILING

THE WORK COVERED BY THESE PLANS INCLUDES REMOVAL OF THE EXISTING CULVERTS AND GUARDRAIL, CONSTRUCTION OF THE PROPOSED BRIDGE AND APPROACHES, RETAINING WALL, SLOPE RESTORATION, RIPRAP SCOUR PROTECTION, HMA PAVING, AND GUARDRAIL.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UNDERGROUND UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

COUNTY ROAD 675 TRAFFIC IS TO BE DETOURED OVER OTHER EXISTING ROADS.

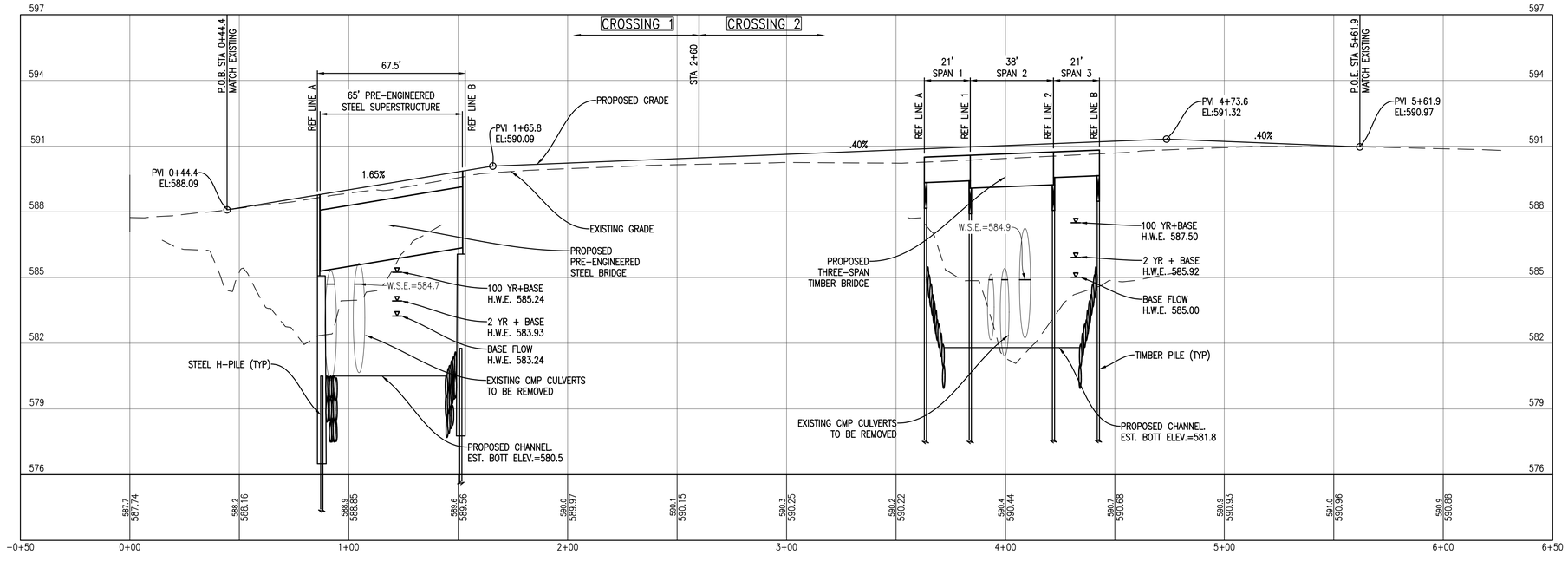
PLAN ELEVATIONS AND COORDINATES ARE BASED ON NAVD (88) AND NAD (83) DATUMS RESPECTIVELY.

WATER LEVEL IS SUBJECT TO CHANGE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING A DETERMINATION OF WATER LEVELS THAT MAY EXIST DURING CONSTRUCTION.

MEASURES SHALL BE TAKEN TO PREVENT DEBRIS FROM FALLING FROM THE STRUCTURE. IF DEBRIS FALLS INTO THE WATERWAY, IT SHALL BE REMOVED WITHIN 24 HOURS. SINCE DISTURBANCE OF THE WATERWAY BOTTOM MAY BE AS HARMFUL AS THE DEBRIS ITSELF, THE PREVENTATIVE MEASURES MUST BE EFFECTIVE.

IMMEDIATELY AFTER CONSTRUCTION OF AN ABUTMENT IS COMPLETED, SLOPE PROTECTION AND SEEDING OR SODDING SHALL BE PLACED ON THE ADJACENT SLOPES.

FOR PROTECTION OF UNDERGROUND UTILITIES AND IN CONFORMANCE WITH PUBLIC ACT 53, 1974, THE CONTRACTOR SHALL DIAL 1-800-482-7171 A MINIMUM OF THREE FULL WORKING DAYS, EXCLUDING SATURDAYS, SUNDAYS, AND HOLIDAYS PRIOR TO BEGINNING EACH EXCAVATION IN AREAS WHERE PUBLIC UTILITIES HAVE NOT BEEN PREVIOUSLY LOCATED. MEMBERS WILL THUS BE ROUTINELY NOTIFIED. THIS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF NOTIFYING UTILITY OWNERS WHO MAY NOT BE A PART OF THE "MISS DIG" ALERT SYSTEM.



PROFILE - CR 675 @ M-22

SCALE HORIZ. 1" = 30'
VERT. 1" = 3'

SCALE 1" = 30'
0' 30' 60'

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GENERAL PLAN OF SITE - M-22 CROSSINGS 1 & 2
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued:	01-27-2022
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T29N, R14W
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LEELANAU COUNTY
MICHIGAN

Project Number:
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Sheet:
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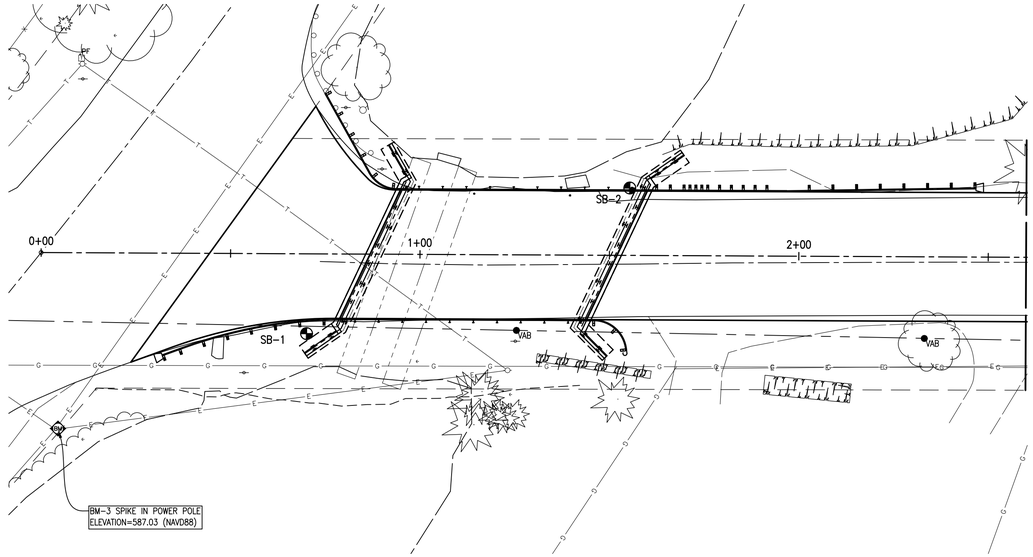
PROJECT: County Road 675 Culvert Replacement
PROJECT NO.: 2020430002.02
PROJECT LOCATION: Glen Arbor, Michigan
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

LOG OF BORING: SB-1

GROUND ELEVATION: **DATE:** 6/10/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 30
STATIC WATER LEVEL: ▽ 2.5 **CAVING DEPTH:** ▽ 2.5

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200	TEST RESULTS: Plastic Limit ⊢ Liquid Limit; Water Content - × %; SPT RESULT - ▲ N Value (10 20 30 40 50)
ELEV.=587.4		Gravelly SAND (SP) - few cobbles - very loose - dark brown - wet below 3-ft bgs	0	SS1	6		4 2 2	Drove Rock			4
			5	SS2	2		1 1 1				3
STREAM BED ELEV.=580.5		Fine to coarse SAND (SP) - little fine gravel - loose - brown	6	SS3	2		5 3 3				8
			9.5	SS4	10		8 4 3				7
ABUT A EST SCOUR ELEV.=575.3		Fine GRAVEL (GP) - little sand - loose - brown	10.5								
		Fine to coarse SAND (SP) - occasonal gravel seams - medium dense - brown	10								
			15	SS5	18		13 10 17				27
MIN. PILE TIP ELEV.=565.3			20	SS6	18		22 27 28				55
EST. PILE TIP ELEV.=565.3			24								
		Fine to medium SAND (SP) - little silt - trace coarse sand - medium dense - brown	25	SS7	18		13 10 17				27
			30	SS8	18		30 24 24				48
		Boring terminated at 30 ft.									



BORING LOCATION PLAN
CR 675 @ M-22 CROSSING 1
SCALE : 1" = 20'

PROJECT: County Road 675 Culvert Replacement
PROJECT NO.: 2020430002.02
PROJECT LOCATION: Glen Arbor, Michigan
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

LOG OF BORING: SB-2

GROUND ELEVATION: **DATE:** 6/10/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 30
STATIC WATER LEVEL: ▽ 3 **CAVING DEPTH:** ▽ 3

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200	TEST RESULTS: Plastic Limit ⊢ Liquid Limit; Water Content - × %; SPT RESULT - ▲ N Value (10 20 30 40 50)
ELEV.=587.7		TOPSOIL - sandy - black	0								
		Fine to medium SAND (SP) - little silt - trace organics - very loose - dark brown	1	SS1	10		2 1 1				2
			3.5								
		Fine to coarse SAND (SP) - occasional gravelly sand seams - loose to very dense - brown - wet	5	SS2	14		1 1 1				2
STREAM BED ELEV.=580.5				SS3	18		2 2 7				3
ABUT B EST SCOUR ELEV.=578.4			10	SS4	18		6 5 6				11
			15	SS5	18		13 16 28				44
MIN. PILE TIP ELEV.=568.4			20	SS6	4		12 22 28				50
EST. PILE TIP ELEV.=568.4			24								
		Fine to medium SAND (SP) - little silt - trace coarse sand - medium dense - brown	25	SS7	18		8 8 14				22
			30	SS8	0		9 7 11				18
		Boring terminated at 30 ft.									

NOTES:

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. (1 3/8" I.D.) SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140# HAMMER FALLING 30".

12 1st 6"
13 2nd 6"
14 3rd 6"

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

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engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
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SOIL BORINGS - CROSSING 1
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

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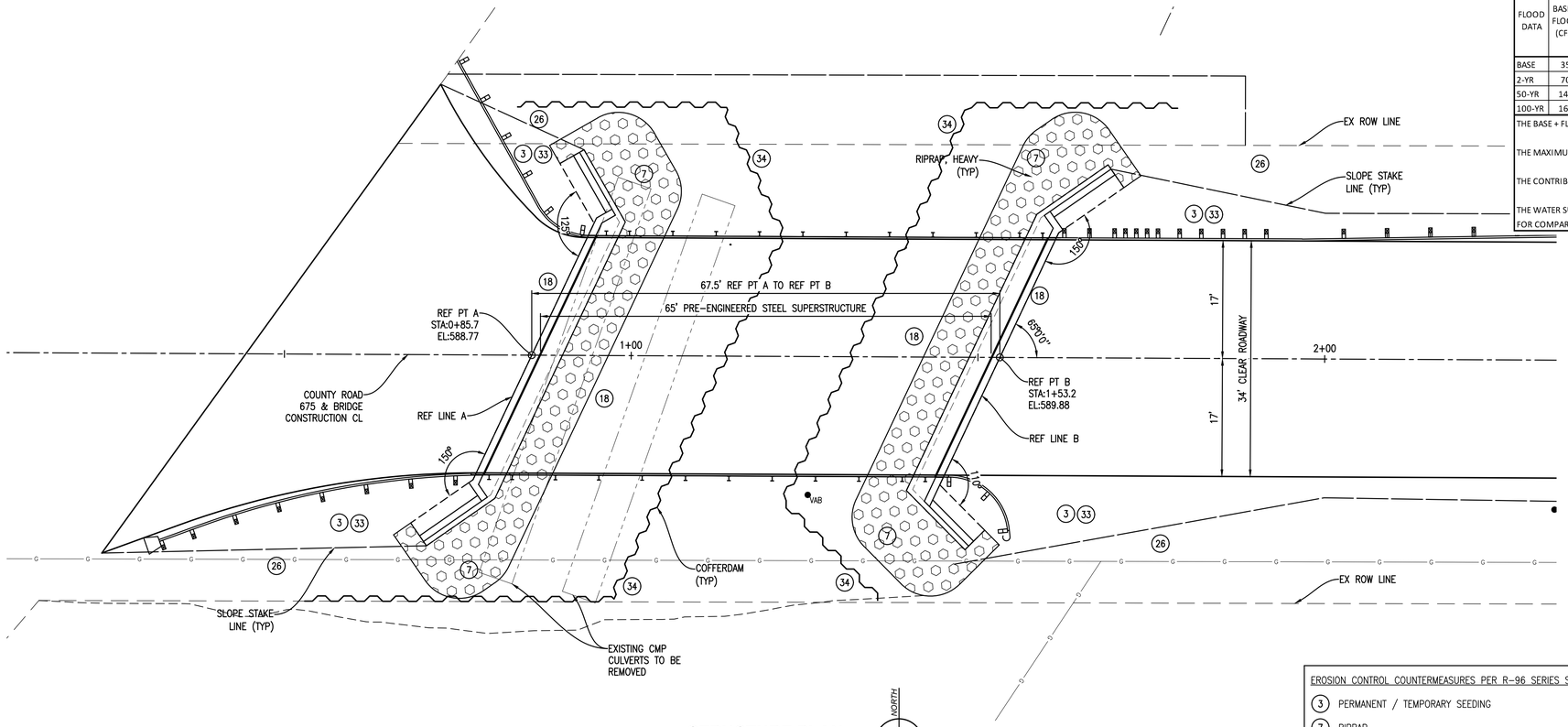
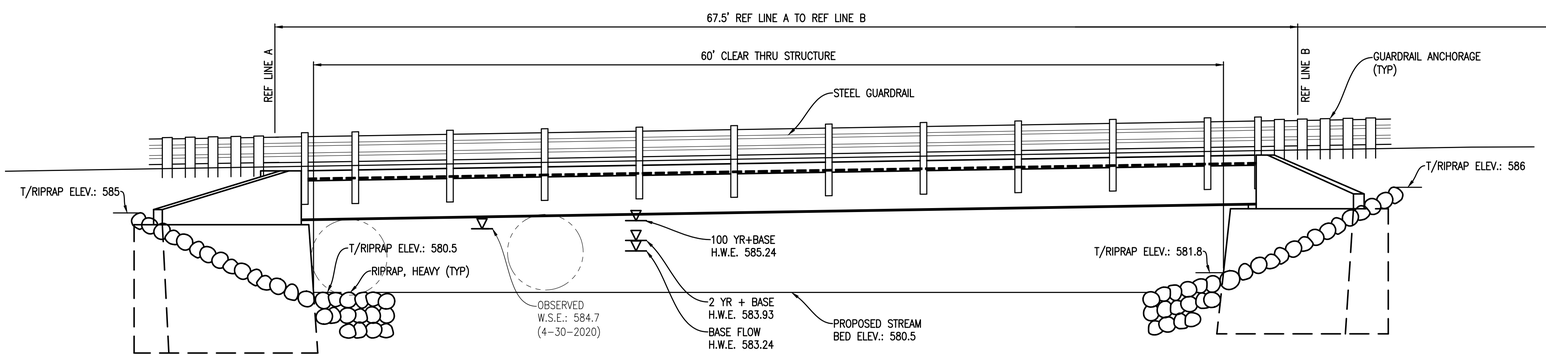


STRUCTURE PLAN
SCALE : 1" = 10'



STRUCTURE ELEVATION
NO SCALE

SUMMARY OF HYDRAULIC ANALYSIS

FLOOD DATA	BASE + FLOOD (CFS)	EXISTING WATER SURF. ELEV. (FT) U/S FACE OF CULVERTS	EXISTING WATER SURF. ELEV. (FT) D/S FACE OF CULVERTS	EXISTING VELOCITY (FPS) U/S CHANNEL (200 FT)	EXISTING VELOCITY (FPS) D/S CHANNEL (@ STR)	PROPOSED WATER SURF. ELEV. (FT) U/S FACE OF BRIDGE	PROPOSED WATER SURF. ELEV. (FT) D/S FACE OF BRIDGE	PROPOSED VELOCITY (FPS) U/S CHANNEL (200 FT)	PROPOSED VELOCITY (FPS) D/S CHANNEL (@ STR)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	35	583.36	583.23	0.3	0.6	583.24	583.23	0.3	0.2	146.7	-0.12
2-YR	70	584.20	583.93	0.4	0.9	583.93	583.93	0.4	0.4	215.2	-0.27
50-YR	145	585.71	584.99	0.6	1.6	585.00	584.99	0.7	0.6	242.9	-0.71
100-YR	165	586.18	585.22	0.6	1.7	585.24	585.23	0.7	0.7	256	-0.94

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 335.8.2 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

MISCELLANEOUS QUANTITIES

1	LS	MOBILIZATION
1	LS	TRAFFIC CONTROL
2	EA	CULV, REM, OVER 48 INCH
25	FT	GUARDRAIL, REM
50	CYD	EMBANKMENT, CIP
900	CYD	EXCAVATION, CHANNEL
400	CYD	EXCAVATION, EARTH
500	CYD	BACKFILL, STRUCTURE, CIP
500	CYD	EXCAVATION, FDN
2	EA	EROSION CONTROL, FILTER BAG
100	FT	EROSION CONTROL, SILT FENCE
700	SYD	AGGREGATE BASE, 6 INCH
70	SYD	SHOULDER, CL II, 3 INCH
850	SYD	HMA SURFACE, REM
230	TON	HMA, 4E1
1	LS	COFFERDAMS
1	LS	PREFABRICATED BRIDGE SUPERSTRUCTURE, FURN
1	LS	PREFABRICATED BRIDGE SUPERSTRUCTURE, ERECT
1	EA	GUARDRAIL ANCH, BRIDGE, DET M1
1	EA	GUARDRAIL ANCH, BRIDGE, DET M1, MODIFIED
1	EA	GUARDRAIL APPROACH TERMINAL, TYPE 2M
1	EA	GUARDRAIL DEPARTING TERMINAL, TYPE T
2	EA	GUARDRAIL DEPARTING TERMINAL, TYPE T, MODIFIED
6	EA	GUARDRAIL REFLECTOR
150	SYD	RIPRAP, HEAVY
235	SYD	SLOPE RESTORATION
1	LS	UTILITY POLE RELOCATION

EROSION CONTROL COUNTERMEASURES PER R-96 SERIES STANDARD PLAN

- (3) PERMANENT / TEMPORARY SEEDING
- (7) RIPRAP
- (18) DEWATERING WITH FILTER BAG
- (26) SILT FENCE
- (33) MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS
- (34) COFFERDAMS

THE DESIGN OF THIS STRUCTURE IS BASED ON 1.2 TIMES THE CURRENT ASSHTO LRFD BRIDGE DESIGN SPECIFICATION HL-93 LOADING WITH THE EXCEPTION THAT THE DESIGN TANDEM PORTION OF THE HL-93 LOAD DEFINITION SHALL BE REPLACED BY A SINGLE 60 KIP AXLE LOAD BEFORE APPLICATION OF THIS 1.2 FACTOR. THE RESULTING LOAD IS DESIGNATED HL-93 MOD. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/800 OF THE SPAN LENGTH.

WITHOUT THE PREVENTIVE MEASURES SHOWN ON THESE PLANS, THERE IS A POSSIBILITY THAT STREAM BED SCOUR MAY OCCUR. THE ESTIMATED TOTAL SCOUR DEPTH IS CALCULATED TO BE 5.2 FEET AT ABUTMENT A AND 2.1 FEET AT ABUTMENT B. THESE DEPTHS ARE BASED ON A 500 YEAR RUNOFF EVENT.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYTMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN PAYMENT FOR RIPRAP.

THE RIPRAP QUANTITY IS BASED ON THE LATERAL DIMENSIONS OF THE AREA TO BE PROTECTED, REGARDLESS OF THE NUMBER OF LAYERS REQUIRED.

THE INTENT OF THE FLOW DIVERSION AND STAGING SEQUENCE DESCRIBED IS TO FACILITATE RIPRAP PLACEMENT, CONTAIN SEDIMENTATION, AND MAINTAIN STREAM FLOW. ALTERNATE METHODS OF STREAM DIVERSION SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

RIPRAP SHALL BE NATURAL FIELD STONE.

SCALE 1" = 10'
0' 10' 20'

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GENERAL PLAN OF STRUCTURE - CROSSING 1
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

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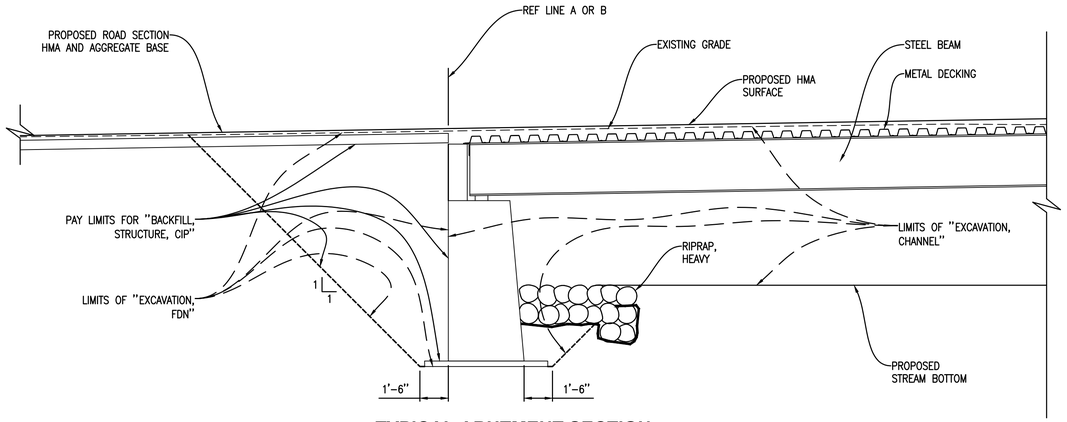
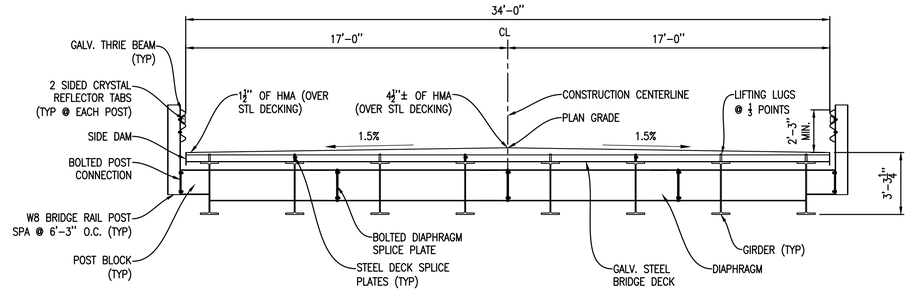


TYPICAL ABUTMENT SECTION



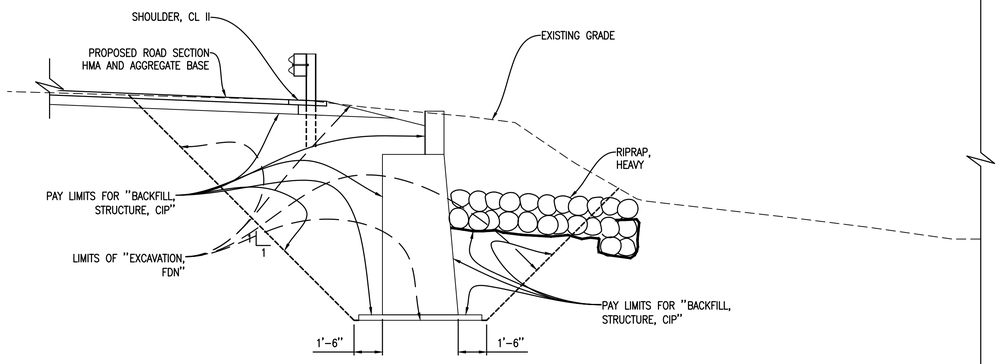
NOTES:
SEE TYPICAL APPROACH SECTION FOR HMA TYPE

CONSTRUCT CROWN ACROSS BRIDGE DECK BY FILLING STEEL DECKING AND WEDGING BASE LAYER.

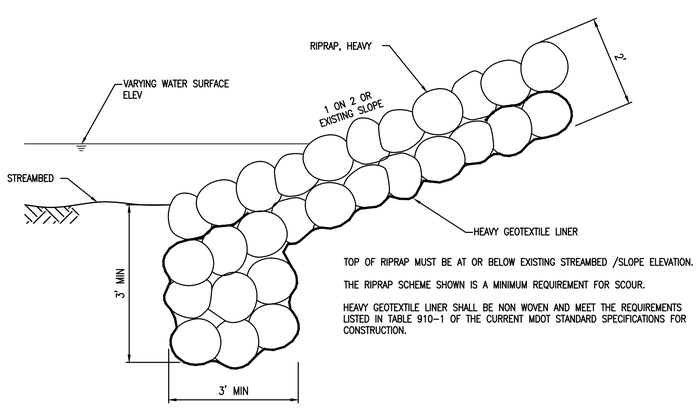
TRANSITION FROM 2% APPROACH CROSS-SLOPE TO 1.5% DECK CROSS-SLOPE IN 25' LENGTH OF APPROACH AT EACH END OF BRIDGE.

TYPICAL DECK SECTION

PRE-ENGINEERED STEEL SUPERSTRUCTURE



TYPICAL WINGWALL SECTION



TOP OF RIPRAP MUST BE AT OR BELOW EXISTING STREAMBED /SLOPE ELEVATION.

THE RIPRAP SCHEME SHOWN IS A MINIMUM REQUIREMENT FOR SCOUR.

HEAVY GEOTEXTILE LINER SHALL BE NON WOVEN AND MEET THE REQUIREMENTS LISTED IN TABLE 910-1 OF THE CURRENT MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

TYPICAL RIPRAP HEADER DETAIL

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engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
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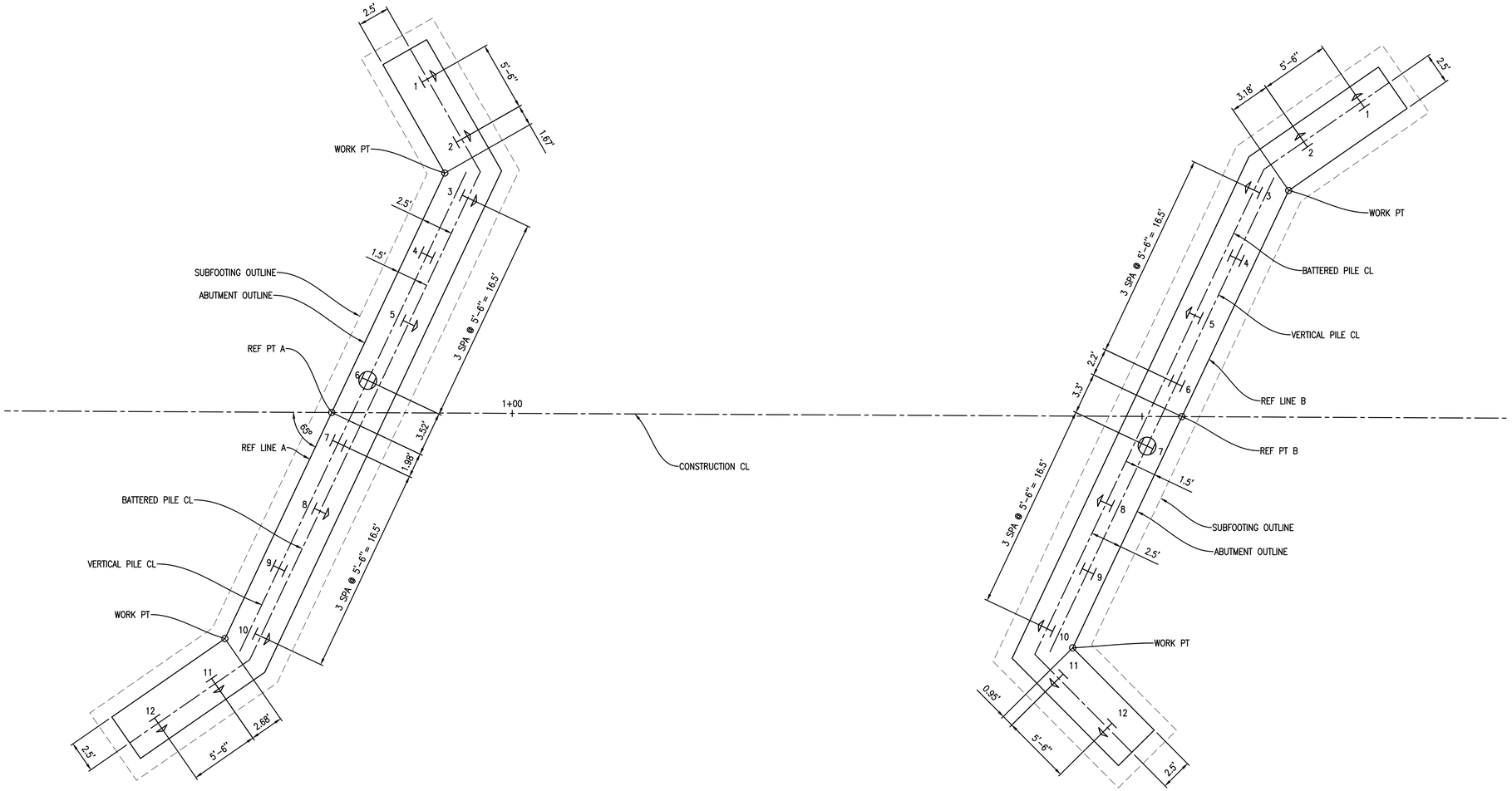

PILE LAYOUT

NORTH

MISCELLANEOUS QUANTITIES

1	LS	PILE DRIVING EQUIPMENT, FURN
500	FT	PILE, STEEL, FURN AND DRIVEN, 12 INCH
2	EA	TEST PILE, STEEL, 12 INCH
24	EA	PILE POINT, STEEL

H PILES

LOCATION	PILE TYPE	NUMBER OF PILES	ESTIMATED LENGH FURNISHED	
			EACH (FT)	TOTAL (FT)
ABUT A	TEST	1	30	30
	VERTICAL	3	20	60
	BATTERED	8	20	160
ABUT B	TEST	1	30	30
	VERTICAL	3	20	60
	WINGWALL	8	20	160
TOTAL		24		500

DENOTES VERTICAL PILES.

DENOTES BATTERED PILES.

DENOTES TEST PILES.

DRIVE ALL PILES TO A NOMINAL PILE DRIVING RESISTANCE NOT LESS THAN 210 KIPS. DETERMINE NOMINAL PILE DRIVING RESISTANCE (Rndr) USING THE FHWA MODIFIED GATES DYNAMIC FORMULA.

PILES SHALL BE HP12X53

THE ESTIMATED PILE LENGTH IS BASED ON THE STATIC ANALYSIS.

THE ESTIMATED LOSS OF NOMINAL PILE RESISTANCE DUE TO SCOUR AFTER DRIVING IS 6 KIPS.

THE ESTIMATED FACTORED DOWNDRAG AFTER PILE DRIVING IS 0 KIPS.

THE FACTORED PILE RESISTANCE AVAILABLE TO RESIST ALL FACTORED LOADS IS EQUAL TO 50 PERCENT OF NOMINAL PILE DRIVING RESISTANCE THAT IS REDUCED BY THE LOSS DUE TO SCOUR.

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CIVIL ENGINEERING
SURVEYING
ENVIRONMENTAL SERVICES
GEOTECHNICAL
CONSTRUCTION SERVICES
DRILLING
LANDSCAPE ARCHITECTURE

No.	Date	Revision	By
4	01-27-2022	ISSUED FOR PERMITS	RMV
3	12-10-2021	ROAD COMMISSION REVIEW	RMV
2	02-05-2021	PARTNER REVIEW PLAN SET	RMV
1	12-22-2020	CROSSINGS 1, 2, & 3 REVISIONS	RMV

PILE DETAILS - CROSSING 1
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued:	01-27-2022
Date Surveyed:	04-30-2020
Designed By:	RMV
Drawn By:	RMV
Checked By:	MAG
Scale:	AS NOTED

Original sheet size is 22x34

Location:
SECTIONS 23 & 24
T29N, R14W
GLEN ARBOR TOWNSHIP
LEELANAU COUNTY
MICHIGAN

Project Number:
2020430002

Sheet:
C1.5

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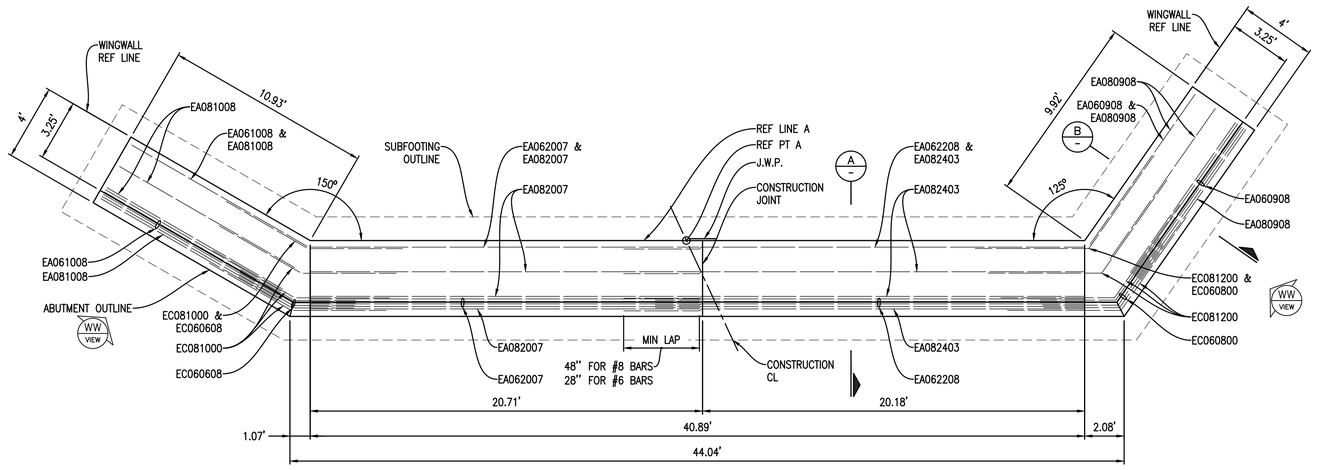
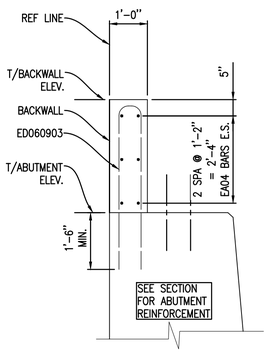
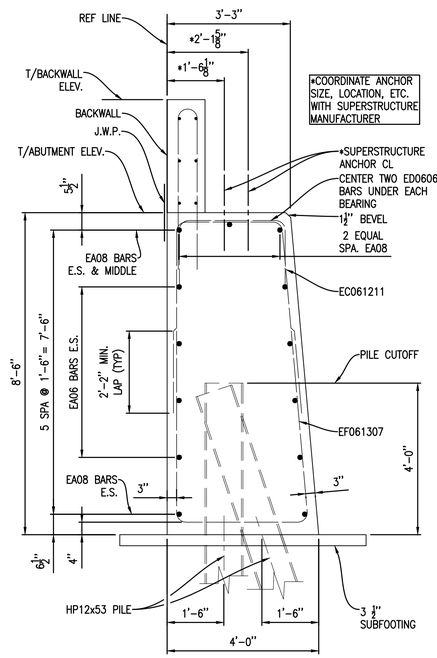


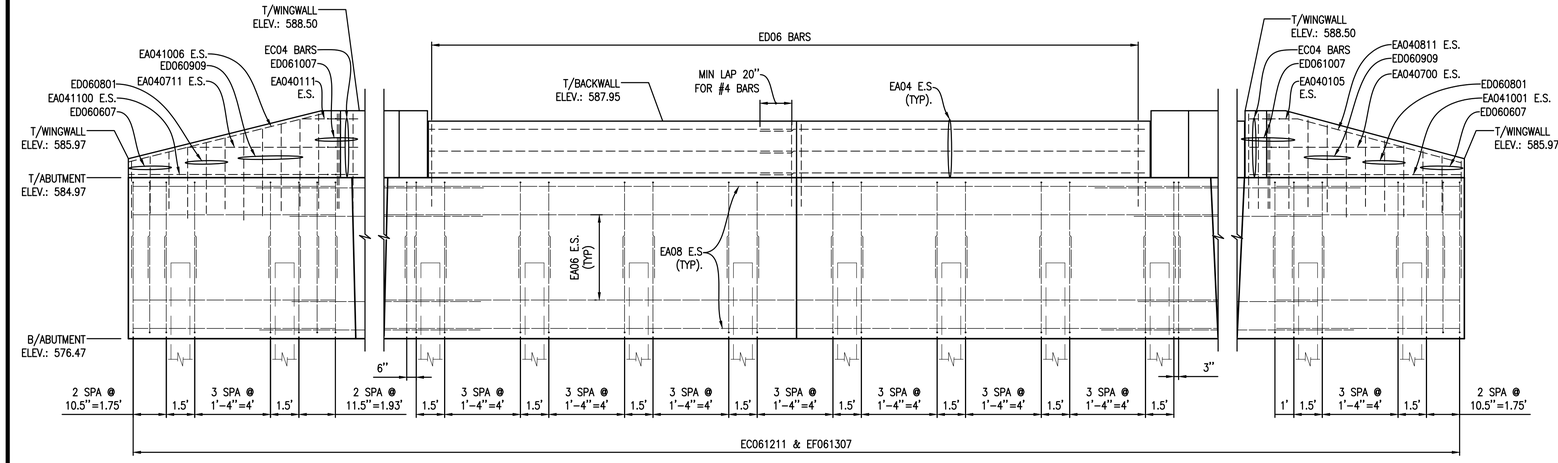
PLAN - ABUTMENT A



BACKWALL DETAIL SECTION A



SECTION A

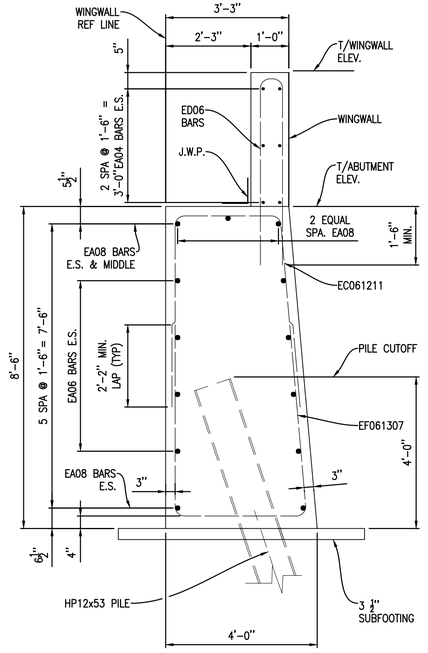


S. WINGWALL ELEVATION VIEW

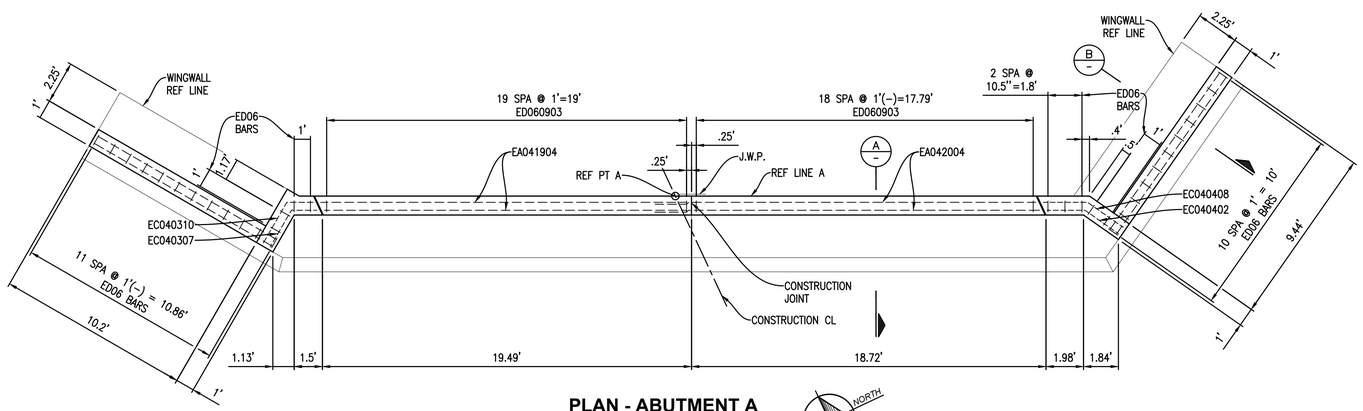
ABUTMENT A ELEVATION VIEW

(LOOKING WEST)

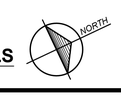
N. WINGWALL ELEVATION VIEW

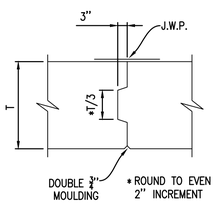


SECTION B



PLAN - ABUTMENT A BACKWALL & WINGWALLS





CONSTRUCTION JOINT DETAIL

MISCELLANEOUS QUANTITIES

5	CYD	CONC, GRADE S2, SUBFOOTING
80	CYD	SUBSTRUCTURE CONC
10	CYD	SUPERSTRUCTURE CONC
.5	LS	SUPERSTRUCTURE CONC, FORM, FINISH, AND CURE
115	SFT	JOINT WATERPROOFING

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ABUTMENT A DETAILS - CROSSING 1
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued:	01-27-2022
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MICHIGAN

Project Number:
2020430002

Sheet:
C1.6

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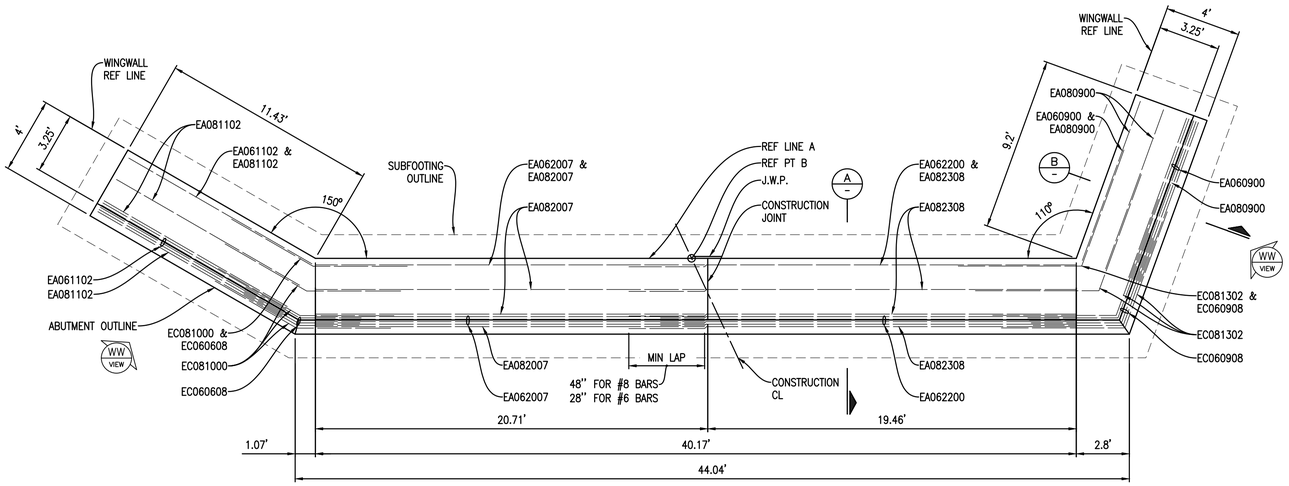
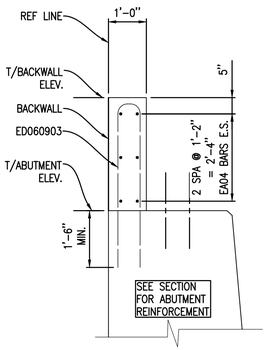
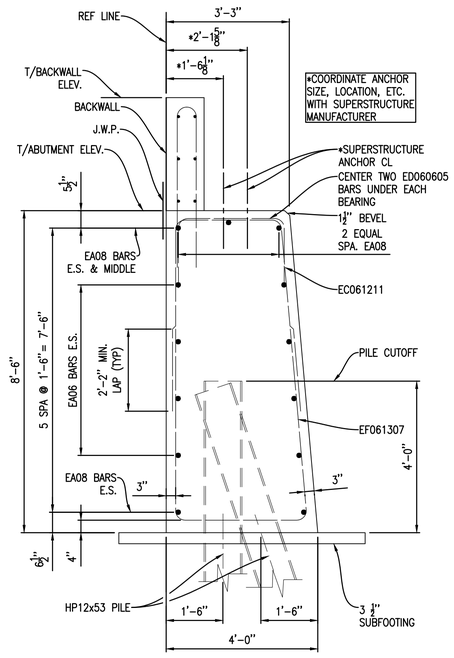


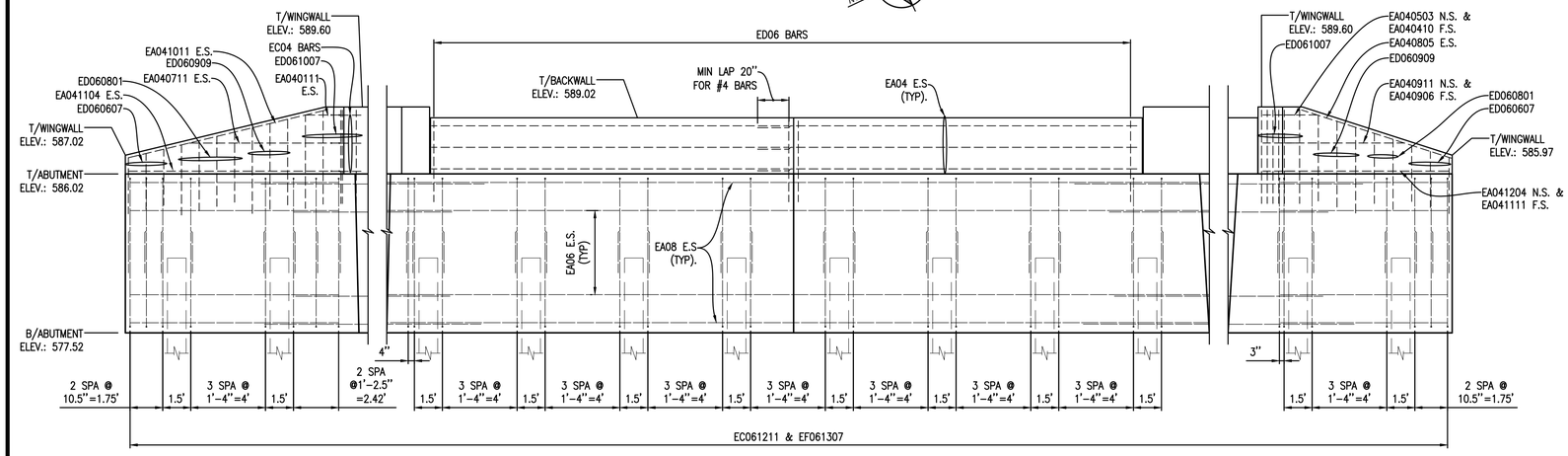
PLAN - ABUTMENT B



BACKWALL DETAIL SECTION A



SECTION A

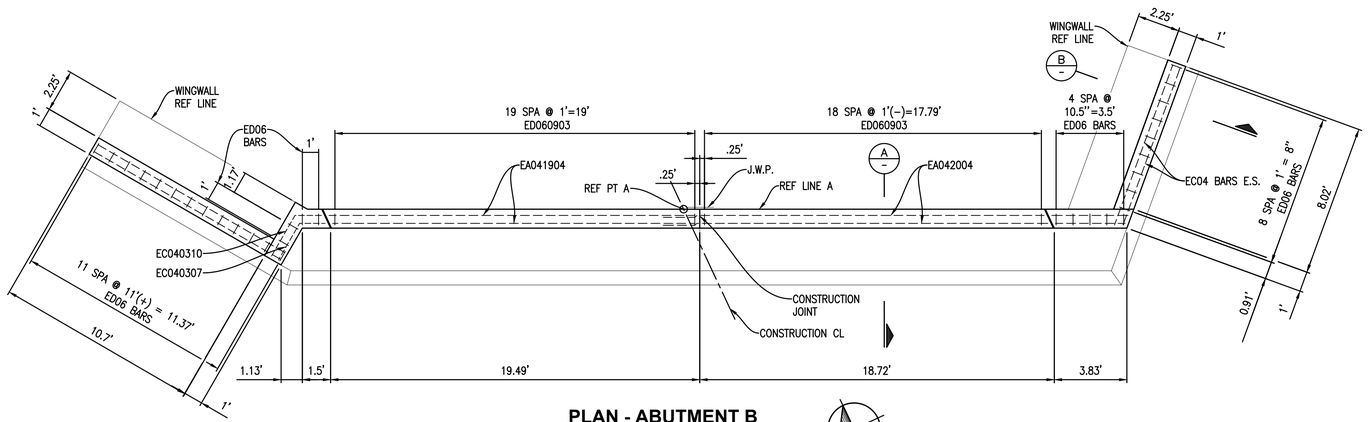


N. WINGWALL ELEVATION VIEW

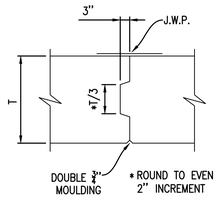
ABUTMENT B ELEVATION VIEW

(LOOKING EAST)

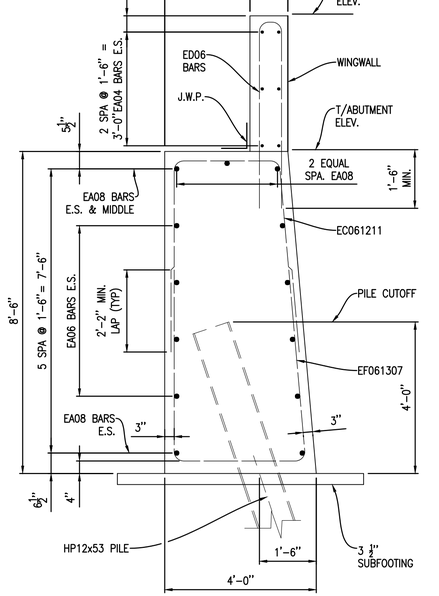
S. WINGWALL ELEVATION VIEW



PLAN - ABUTMENT B BACKWALL & WINGWALLS



CONSTRUCTION JOINT DETAIL



SECTION B

MISCELLANEOUS QUANTITIES

5	CYD	CONC, GRADE S2, SUBFOOTING
80	CYD	SUBSTRUCTURE CONC
10	CYD	SUPERSTRUCTURE CONC
.5	LS	SUPERSTRUCTURE CONC, FORM, FINISH, AND CURE
115	SFT	JOINT WATERPROOFING

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ABUTMENT B DETAILS - CROSSING 1
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued: 01-27-2022
Date Surveyed: 04-30-2020
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Drawn By: RMV
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Scale: AS NOTED

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GLEN ARBOR TOWNSHIP
LEELANAU COUNTY
MICHIGAN

Project Number:
2020430002

Sheet:
C1.7

ABUTMENT A

BAR	DIMENSIONS												NO. REQ'D	TOTAL WT.
	a	b	c	d	e	f	g	h	j	k	m	p		
EC061211		2'-9 1/2"	0'-5 1/2"	5'-0 1/2"	5'-1"		5'-0 1/2"						51	989.4
EF061307	3'-5 1/2"			5'-0 1/2"			5'-1"	0'-5 1/2"	5'-0 1/2"				51	1040.5
EA081008	10'-8"												5	142.4
EA082007	20'-7"												5	274.8
EA082403	24'-3"												5	323.7
EA080908	9'-8"												5	129.0
EC081000	4'-4"	5'-0"				2'-6"	5'-0"						5	133.5
EC081200		6'-0"	3'-5 1/2"	4'-11"	6'-0"								5	160.2
EA061008	10'-8"												8	128.2
EA062007	20'-7"												8	247.3
EA062208	22'-8"												8	272.4
EA060908	9'-8"												8	116.1
EC060608	2'-10 1/2"	3'-4"				1'-8"	3'-4"						8	80.1
EC060800		4'-0"	2'-3 1/2"	3'-3 1/2"	4'-0"								8	96.1
ED060605	1'-10"	2'-9"	1'-10"										20	192.8
													SUBTOTAL	4326.6

BACKWALL A

BAR	DIMENSIONS												NO. REQ'D	TOTAL WT.
	a	b	c	d	e	f	g	h	j	k	m	p		
EA041904	19'-4"												6	77.5
EA042004	20'-4"												6	81.5
ED060903	4'-4"	0'-7"	4'-4"										39	541.8
													SUBTOTAL	700.8

WINGWALL CAPS A

BAR	DIMENSIONS												NO. REQ'D	TOTAL WT.
	a	b	c	d	e	f	g	h	j	k	m	p		
EA040111	1'-11"												2	2.6
EA040711	7'-11"												2	10.6
EA041100	11'-0"												2	14.7
EA041006	10'-6"												2	14.0
EC040310	0'-8 1/2"	2'-5 1/2"				1'-2 1/2"	1'-4 1/2"						3	7.7
EC040307	0'-8"	2'-3"				1'-2"	1'-4"						3	7.2
EC040402	1'-7 1/2"	2'-2"				1'-2"	2'-0"						3	8.3
EC040408	1'-11"	2'-4"				1'-4"	2'-4"						3	9.4
EA040105	1'-5"												2	1.9
EA040700	7'-0"												2	9.4
EA041001	10'-1"												2	13.5
EA040811	8'-11"												2	11.9
ED061007	5'-0"	0'-7"	5'-0"										13	206.6
ED060909	4'-7"	0'-7"	4'-7"										7	102.5
ED060801	3'-9"	0'-7"	3'-9"										6	72.8
ED060607	3'-0"	0'-7"	3'-0"										6	59.3
													SUBTOTAL	552.4

ABUTMENT B

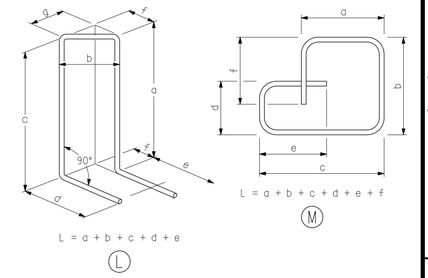
BAR	DIMENSIONS												NO. REQ'D	TOTAL WT.
	a	b	c	d	e	f	g	h	j	k	m	p		
EC061211		2'-9 1/2"	0'-5 1/2"	5'-0 1/2"	5'-1"		5'-0 1/2"						51	989.4
EF061307	3'-5 1/2"			5'-0 1/2"			5'-1"	0'-5 1/2"	5'-0 1/2"				51	1040.5
EA081102	11'-2"												5	149.1
EA082007	20'-7"												5	274.8
EA082308	23'-8"												5	316.0
EA080900	9'-0"												5	120.2
EC081000	4'-4"	5'-0"				2'-6"	5'-0"						5	133.5
EC081302		6'-7"	2'-3"	6'-2"	6'-7"								5	175.8
EA061102	11'-2"												8	134.2
EA062007	20'-7"												8	247.3
EA062200	22'-0"												8	264.4
EA060900	9'-0"												8	108.1
EC060608	2'-10 1/2"	3'-4"				1'-8"	3'-4"						8	80.1
EC060908		4'-10"	1'-8"	4'-6 1/2"	4'-10"								8	116.1
ED060605	1'-10"	2'-9"	1'-10"										20	192.8
													SUBTOTAL	4342.2

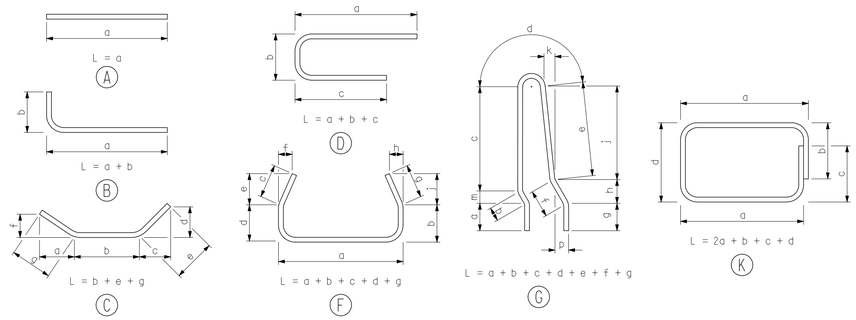
BACKWALL B

BAR	DIMENSIONS												NO. REQ'D	TOTAL WT.
	a	b	c	d	e	f	g	h	j	k	m	p		
EA041904	19'-4"												6	77.5
EA042004	20'-4"												6	81.5
ED060903	4'-4"	0'-7"	4'-4"										39	541.8
													SUBTOTAL	700.8

WINGWALL CAPS B

BAR	DIMENSIONS												NO. REQ'D	TOTAL WT.
	a	b	c	d	e	f	g	h	j	k	m	p		
EA040111	1'-11"												2	2.6
EA040801	8'-1"												2	10.8
EA041104	11'-4"												2	15.1
EA041011	10'-11"												2	14.6
EC040310	0'-8 1/2"	2'-5 1/2"				1'-2 1/2"	1'-4 1/2"						3	7.7
EC040307	0'-8"	2'-3"				1'-2"	1'-4"						3	7.2
EA040805	8'-5"												2	11.2
EC041111	1'-2 1/2"	8'-5"				3'-3 1/2"	3'-6"						1	8.0
EC040906	1'-2 1/2"	6'-0"				3'-3 1/2"	3'-6"						1	6.3
EC040410	1'-2 1/2"	1'-4"				3'-3 1/2"	3'-6"						1	3.2
EC041204	1'-3"	8'-9"				3'-4 1/2"	3'-7"						1	8.2
EC040911	1'-3"	6'-4"				3'-4 1/2"	3'-7"						1	6.6
EC040503	1'-3"	1'-8"				3'-4 1/2"	3'-7"						1	3.5
ED061007	5'-0"	0'-7"	5'-0"										13	206.6
ED060909	4'-7"	0'-7"	4'-7"										6	87.9
ED060801	3'-9"	0'-7"	3'-9"										6	72.8
ED060607	3'-0"	0'-7"	3'-0"										6	59.3
													SUBTOTAL	531.8





MISCELLANEOUS QUANTITIES

11,155	Lb	Reinforcement, Steel, Epoxy Coated

EPOXY COATED
BAR SIZE
BAR LENGTH (FT)
BAR LENGTH (IN)
EA064700
BAR SHAPE

BAR LEGEND

NOTES:

REINFORCEMENT SHALL BE BUNDLED AND TAGGED AS TO THE LOCATION AS SHOWN ON THIS SHEET.

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STEEL REINFORCEMENT DETAILS - CROSSING 1
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

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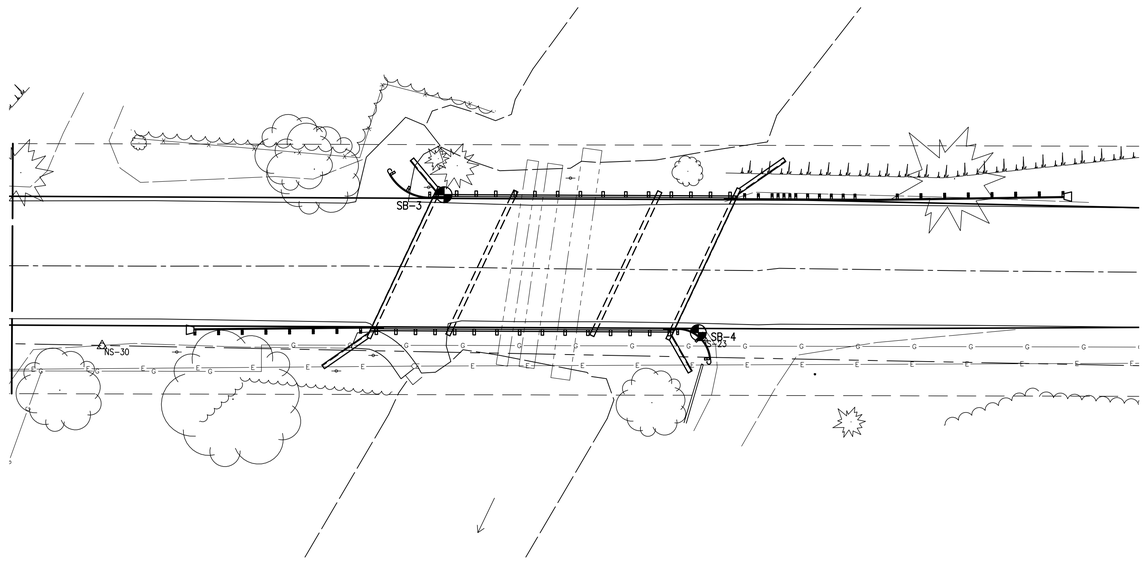
PROJECT: County Road 675 Culvert Replacement
PROJECT NO.: 2020430002.02
PROJECT LOCATION: Glen Arbor, Michigan
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

LOG OF BORING: SB-3

GROUND ELEVATION: **DATE:** 6/10/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 30
STATIC WATER LEVEL: ▽ 3 **CAVING DEPTH:** ▽ 3.5

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200	TEST RESULTS: Plastic Limit ⊢ Liquid Limit; Water Content - × %; SPT RESULT - ▲ N Value (10 20 30 40 50)
ELEV.=589.8		ASPHALT PAVEMENT	0								
		0.25									
		ASPHALT SUB-BASE - Sand and Gravel - dark brown		SS	1	6	3 2 2				4
		1.5									
		Fine to coarse SAND (SP) - occasional fine gravel - very loose - brown		SS	2	8	2 2 2				4
		4	5								
		PEAT - very loose - black - wet		SS	3	12	2 0 2				2
		5.5									
STREAM BED ELEV.=581.8		Fine to coarse SAND (SP) - occasional fine gravel = occasional gravel seams - very lose to medium dense - brown		SS	4	18	3 1 0				1
ABUT A / PIER 1 EST SCOUR ELEV.=579.8			10								
				SS	5	18	8 5 10				15
MIN. PILE PEN. ELEV.=569.8			15								
				SS	6	12	11 13 22				35
			20								
				SS	7	18	10 8 8				14
		25	25								
		Fine to medium SAND (SP) - little silt - trace coarse sand - medium dense - brown		SS	8	18	10 13 11				24
		Boring terminated at 30 ft.	30								



BORING LOCATION PLAN
CR 675 @ M-22 CROSSING 2
SCALE : 1" = 20'

NORTH

PROJECT: County Road 675 Culvert Replacement
PROJECT NO.: 2020430002.02
PROJECT LOCATION: Glen Arbor, Michigan
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

LOG OF BORING: SB-4

GROUND ELEVATION: **DATE:** 6/11/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 30
STATIC WATER LEVEL: ▽ 2.5 **CAVING DEPTH:** ▽ 3

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200	TEST RESULTS: Plastic Limit ⊢ Liquid Limit; Water Content - × %; SPT RESULT - ▲ N Value (10 20 30 40 50)
ELEV.=590.0		Gravelly SAND (SP) - loose - dark brown - [FILL]	0								
				SS	1	2	4 2 1				3
		3.5									
		Fine to coarse SAND (SP) - occasonal gravelly seams - very loose to dense - brown - wet		SS	2	10	1 2 1				3
			5								
				SS	3	8	1 1 1				2
STREAM BED ELEV.=581.8											
				SS	4	18	2 1 2				3
ABUT B / PIER 2 EST SCOUR ELEV.=579.8			10								
				SS	5	18	15 15 18				33
			15								
MIN. PILE PEN. ELEV.=569.8				SS	6	2	12 15 24	Drove Rock			39
			20								
		24									
		Fine to medium SAND (SP) - little silt - medium dense - light brown		SS	7	16	8 7 9				16
			25								
				SS	8	8	7 8 10				18
		Boring terminated at 30 ft.	30								

NOTES:

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. (1 3/8" I.D.) SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140# HAMMER FALLING 30".

(12 / 13 / 14) 1st 6" / 2nd 6" / 3rd 6"

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

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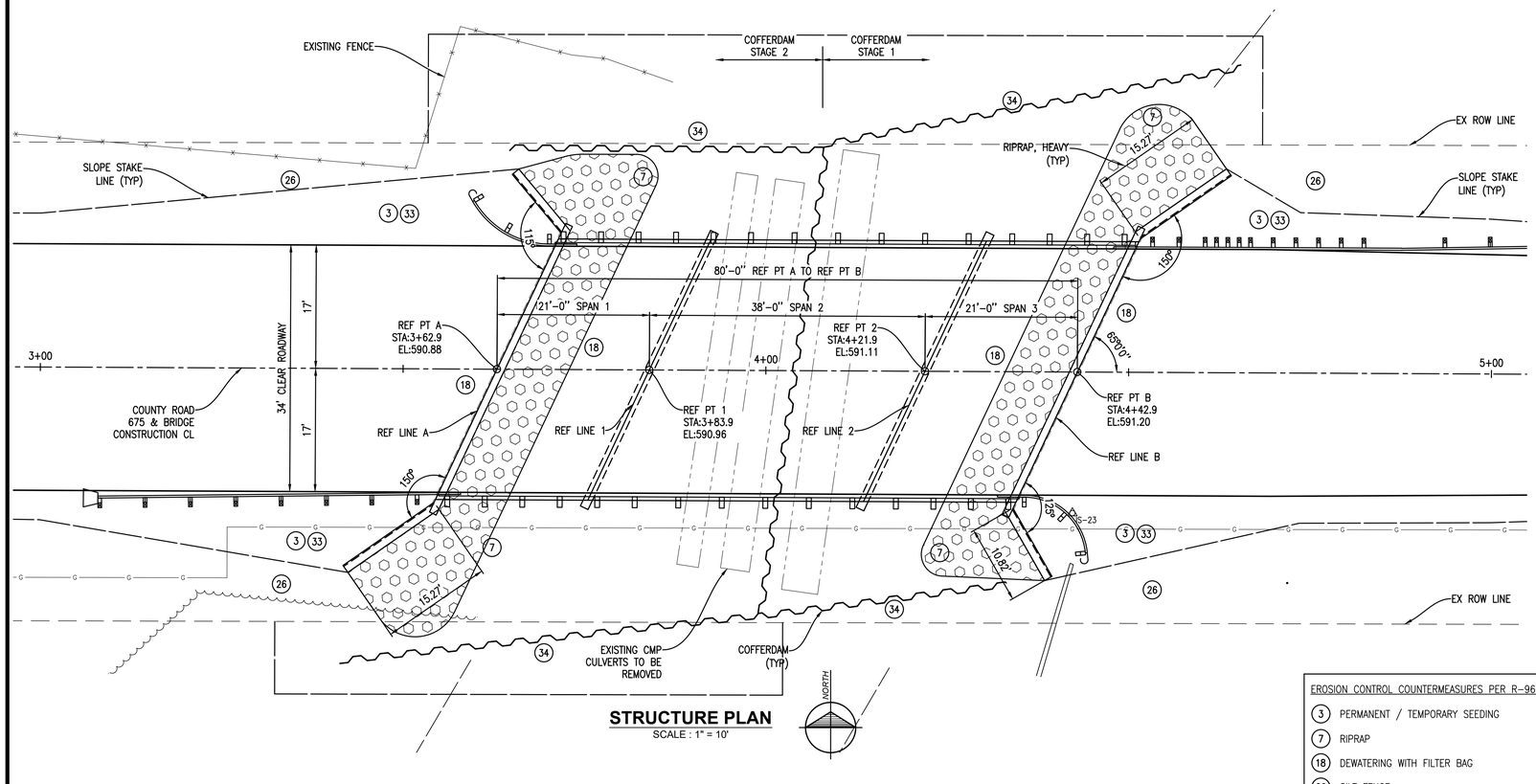


STRUCTURE PLAN

SCALE : 1" = 10'

SUMMARY OF HYDRAULIC ANALYSIS											
		EXISTING				PROPOSED					
		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		WATER SURF. ELEV. (FT)		VELOCITY (FPS)			
FLOOD DATA	BASE + FLOOD (CFS)	U/S FACE OF CULVERTS	D/S FACE OF CULVERTS	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	U/S FACE OF BRIDGE	D/S FACE OF BRIDGE	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	35	585.00	584.93	0.3	0.5	585.00	584.93	0.3	0.3	204.2	0.00
2-YR	70	586.03	585.78	0.4	0.8	585.92	585.75	0.4	0.4	241	-0.11
50-YR	145	588.17	587.15	0.6	1.3	587.23	586.99	0.6	0.6	629.9	-0.94
100-YR	165	588.92	587.49	0.7	1.4	587.50	587.26	0.7	0.7	344.4	-1.42

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 513.2 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

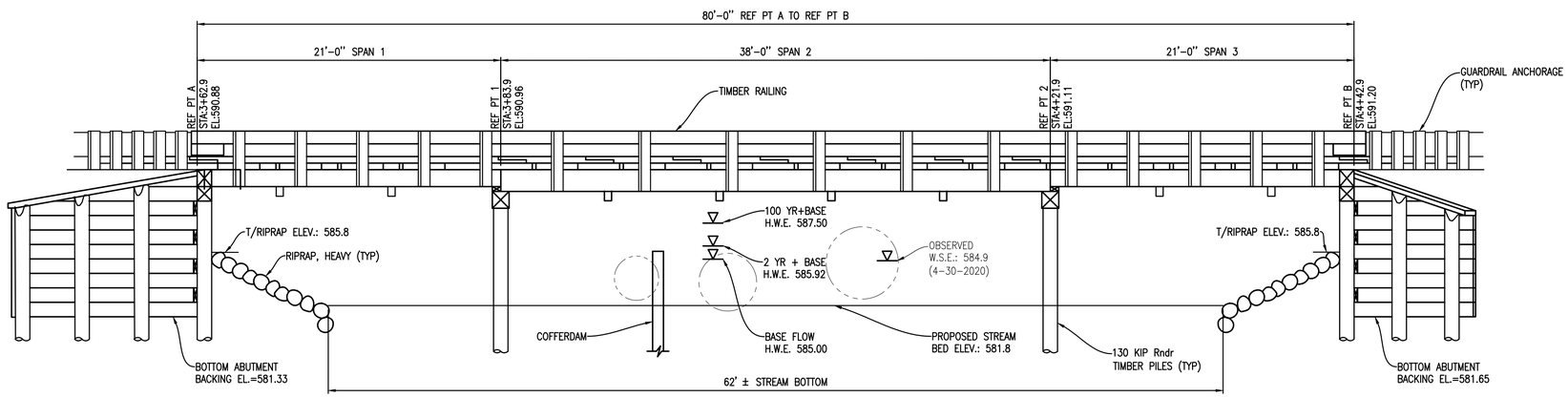
THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

MISCELLANEOUS QUANTITIES

1	LS	MOBILIZATION
1	LS	TRAFFIC CONTROL
2	EA	CULV, REM, 24 INCH TO 48 INCH
1	EA	CULV, REM, OVER 48 INCH
150	FT	GUARDRAIL, REM
50	CYD	EMBANKMENT, CIP
650	CYD	EXCAVATION, CHANNEL
800	CYD	EXCAVATION, EARTH
200	CYD	BACKFILL, STRUCTURE, CIP
200	CYD	EXCAVATION, FDN
2	EA	EROSION CONTROL, FILTER BAG
100	FT	EROSION CONTROL, SILT FENCE
900	SYD	AGGREGATE BASE, 6 INCH
55	SYD	SHOULDER, CL II, 3 INCH
1090	SYD	HMA SURFACE, REM
200	TON	HMA, 4E1
1	LS	TEMPORARY STREAM CONTROL
1	LS	STRUCTURE, TIMBER,34' X 80', FURN
1	LS	STRUCTURE, TIMBER, 34' X 80', INSTALL
2	EA	GUARDRAIL ANCH, BRIDGE, DET M1
1	EA	GUARDRAIL APPROACH TERMINAL, TYPE 2M
1	EA	GUARDRAIL DEPARTING TERMINAL, TYPE T
2	EA	GUARDRAIL DEPARTING TERMINAL, TYPE T, MODIFIED
6	EA	GUARDRAIL REFLECTOR
150	SYD	RIPRAP, HEAVY
290	SYD	SLOPE RESTORATION
1	LS	UTILITY POLE RELOCATION

EROSION CONTROL COUNTERMEASURES PER R-96 SERIES STANDARD PLAN

- (3) PERMANENT / TEMPORARY SEEDING
- (7) RIPRAP
- (18) DEWATERING WITH FILTER BAG
- (26) SILT FENCE
- (33) MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS
- (34) COFFERDAMS



STRUCTURE ELEVATION

NO SCALE

THE DESIGN OF THIS STRUCTURE IS BASED ON 1.2 TIMES THE CURRENT ASSHTO LRFD BRIDGE DESIGN SPECIFICATION HL-93 LOADING WITH THE EXCEPTION THAT THE DESIGN TANDEM PORTION OF THE HL-93 LOAD DEFINITION SHALL BE REPLACED BY A SINGLE 60 KIP AXLE LOAD BEFORE APPLICATION OF THIS 1.2 FACTOR. THE RESULTING LOAD IS DESIGNATED HL-93 MOD. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/800 OF THE SPAN LENGTH.

WITHOUT THE PREVENTIVE MEASURES SHOWN ON THESE PLANS, THERE IS A POSSIBILITY THAT STREAM BED SCOUR MAY OCCUR. THE ESTIMATED TOTAL SCOUR DEPTH IS CALCULATED TO BE 1 FEET AT ABUTMENT A, 1.6 FEET AT PIER 1, 1.6 FEET AT PIER 2, AND 1.1 FEET AT ABUTMENT B. THESE DEPTHS ARE BASED ON A 500 YEAR RUNOFF EVENT.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN PAYMENT FOR RIPRAP.

THE RIPRAP QUANTITY IS BASED ON THE LATERAL DIMENSIONS OF THE AREA TO BE PROTECTED, REGARDLESS OF THE NUMBER OF LAYERS REQUIRED.

THE INTENT OF THE FLOW DIVERSION AND STAGING SEQUENCE DESCRIBED IS TO FACILITATE RIPRAP PLACEMENT, CONTAIN SEDIMENTATION, AND MAINTAIN STREAM FLOW. ALTERNATE METHODS OF STREAM DIVERSION SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

RIPRAP SHALL BE NATURAL FIELD STONE.

PROPOSED CONSTRUCTION STAGING SEQUENCE:

STAGE 1:
1. REMOVE ROAD EMBANKMENT OVER EXISTING CULVERTS TO TOP OF CULVERTS.
2. PLACE STAGE 1 COFFERDAM BETWEEN EXISTING CULVERTS ISOLATING EAST CULVERT FROM THE STREAM. MAINTAIN STREAM FLOW THROUGH WEST CULVERTS.
3. REMOVE THE EAST CULVERT AND EXCAVATE WEST PART OF STREAM CHANNEL.
4. CONSTRUCT ABUTMENT B AND PIER 2, AND PLACE RIPRAP AT ABUTMENT B.

STAGE 2:
1. REMOVE FLOW DIVERSION ISOLATING THE EAST SIDE AND PLACE IN THE WEST PART OF THE STREAM ISOLATING THE WEST CULVERT FROM THE STREAM. MAINTAIN STREAM FLOW THOUGH THE EAST SIDE OF THE NEWLY EXCAVATED CHANNEL.
2. REMOVE THE WEST CULVERT AND EXCAVATE WEST PART OF STREAM CHANNEL.
3. CONSTRUCT ABUTMENT A AND PIER 1, AND PLACE RIPRAP AT ABUTMENT A.
4. REMOVE FLOW DIVERSION.
5. CONSTRUCT THE SUPERSTRUCTURE AND APPROACHES.

SCALE 1" = 10'

0' 10' 20'

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Traverse City, Michigan
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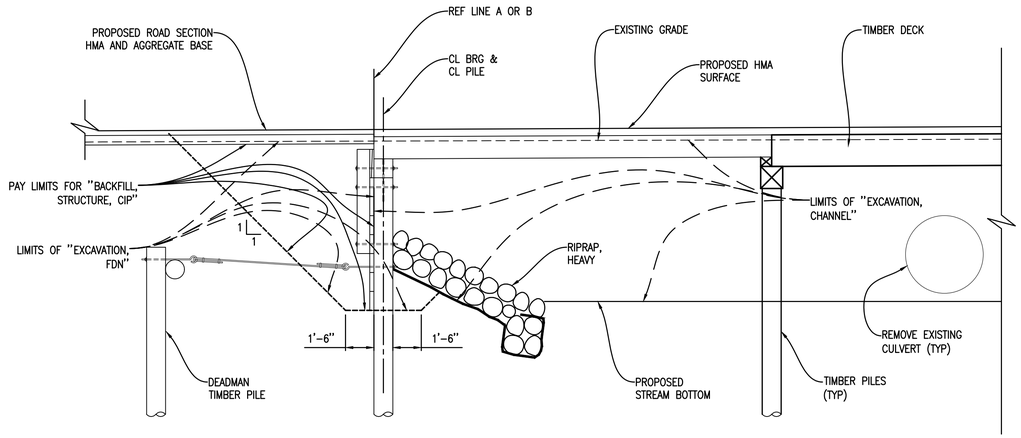
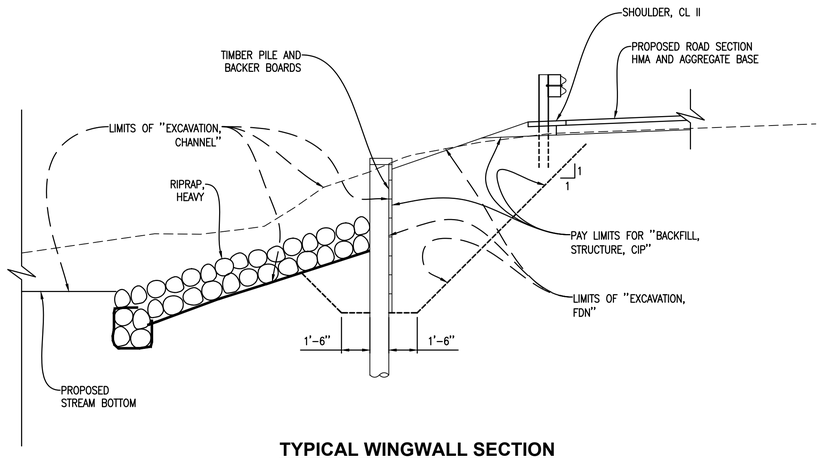
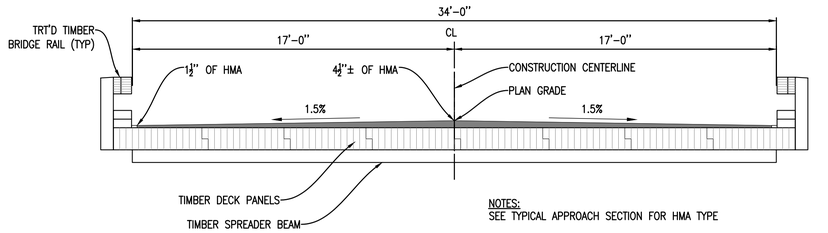


TYPICAL ABUTMENT SECTION



TYPICAL WINGWALL SECTION

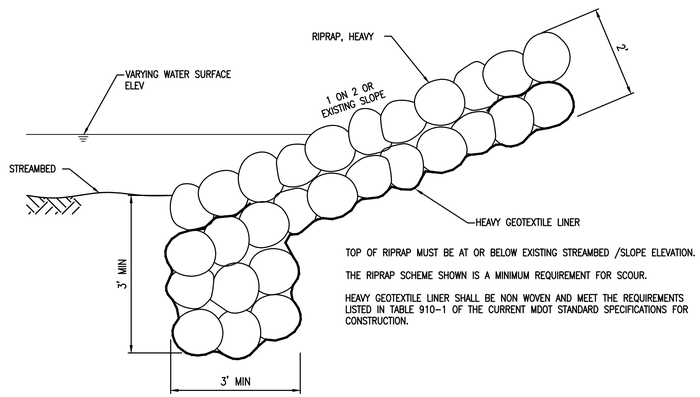


NOTES:
SEE TYPICAL APPROACH SECTION FOR HMA TYPE

CONSTRUCT CROWN ACROSS BRIDGE DECK BY WEDGING BASE LAYER.

TRANSITION FROM 2% APPROACH CROSS-SLOPE TO 1.5% DECK CROSS-SLOPE IN 25' LENGTH OF APPROACH AT EACH END OF BRIDGE.

TYPICAL DECK SECTION



TOP OF RIPRAP MUST BE AT OR BELOW EXISTING STREAMBED /SLOPE ELEVATION.

THE RIPRAP SCHEME SHOWN IS A MINIMUM REQUIREMENT FOR SCOUR.

HEAVY GEOTEXTILE LINER SHALL BE NON WOVEN AND MEET THE REQUIREMENTS LISTED IN TABLE 910-1 OF THE CURRENT MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

TYPICAL RIPRAP HEADER DETAIL

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Traverse City, Michigan
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info@goslingczubak.com
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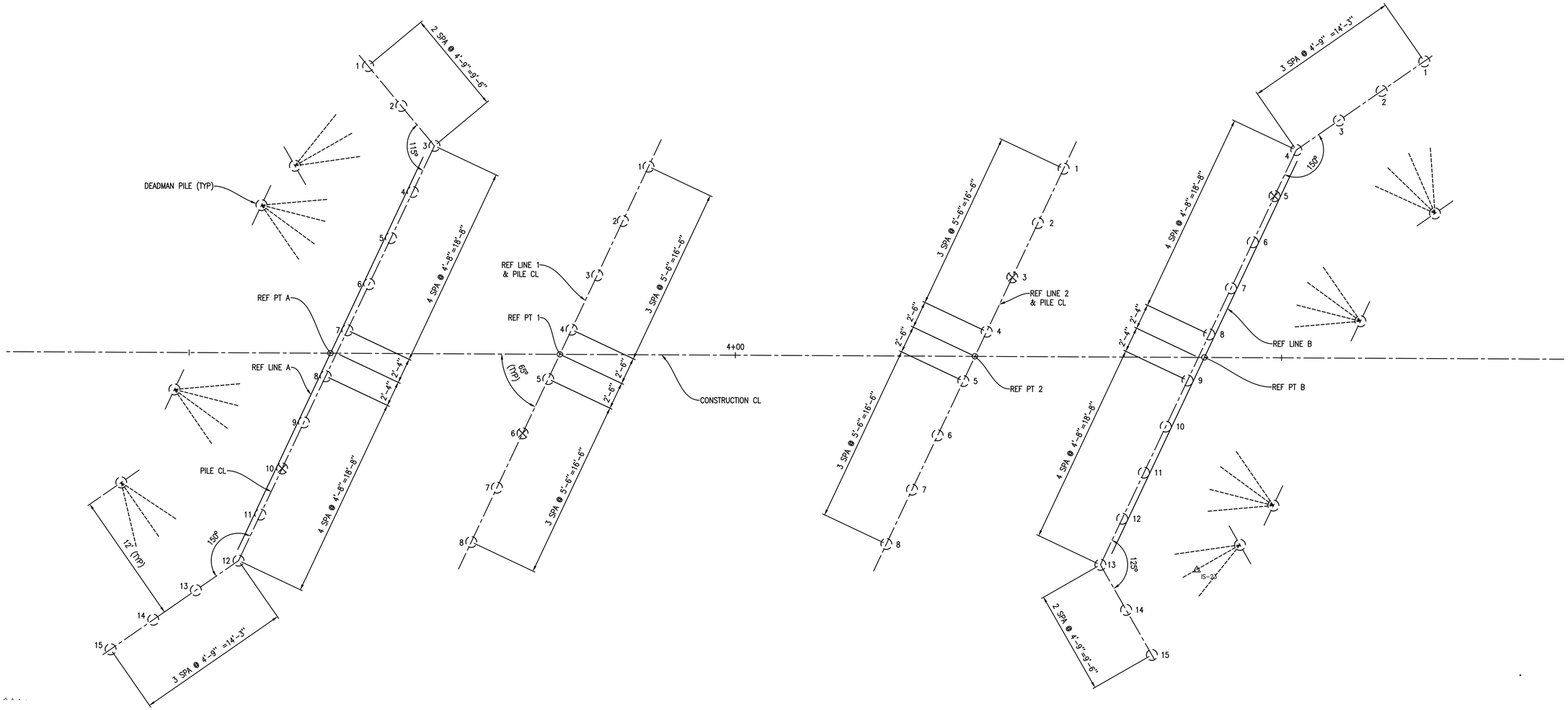

PILE LAYOUT

NORTH

MISCELLANEOUS QUANTITIES

1	LS	PILE DRIVING EQUIPMENT, FURN
1380	FT	PILE, TREATED TIMBER, FURN
1380	FT	PILE, TREATED TIMBER, DRIVEN
4	EA	TEST PILE, TREATED TIMBER

TREATED TIMBER PILES

LOCATION	PILE TYPE	NUMBER OF PILES	ESTIMATED LENGH FURNISHED	
			EACH (FT)	TOTAL (FT)
ABUT A	TEST	1	35	35
	VERTICAL	9	25	225
	WINGWALL	5	20	100
	DEADMAN	4	20	80
PIER 1	TEST	1	40	40
	VERTICAL	7	30	210
PIER 2	TEST	1	40	40
	VERTICAL	7	30	210
ABUT B	TEST	1	35	35
	VERTICAL	9	25	225
	WINGWALL	5	20	100
	DEADMAN	4	20	80
TOTAL		54		1380

⊖ DENOTES VERTICAL PILES.

⊗ DENOTES VERTICAL TEST PILES.

DRIVE ALL PILES TO A NOMINAL PILE DRIVING RESISTANCE NOT LESS THAN 130 KIPS. DETERMINE NOMINAL PILE DRIVING RESISTANCE (Rndr) USING THE FHWA MODIFIED GATES DYNAMIC FORMULA.

PILES SHALL HAVE A NOMINAL BUTT DIAMETER OF 12 INCHES.

THE ESTIMATED PILE LENGTH IS BASED ON THE STATIC ANALYSIS.

THE ESTIMATED LOSS OF NOMINAL PILE RESISTANCE DUE TO SCOUR AFTER DRIVING IS 2 KIPS.

THE ESTIMATED FACTORED DOWNDRAG AFTER PILE DRIVING IS 0 KIPS.

THE FACTORED PILE RESISTANCE AVAILABLE TO RESIST ALL FACTORED LOADS IS EQUAL TO 50 PERCENT OF NOMINAL PILE DRIVING RESISTANCE THAT IS REDUCED BY THE LOSS DUE TO SCOUR.

PILE SUBSTRUCTURE DESIGN SHOWN IN THESE PLANS, INCLUDING DEADMEN, IS ESTIMATED AND SHALL BE CONFIRMED WITH COMPLETE ENGINEERED TIMBER STRUCTURE CALCULATIONS AND SHOP DRAWINGS PREPARED BY THE BRIDGE SUPPLIER.

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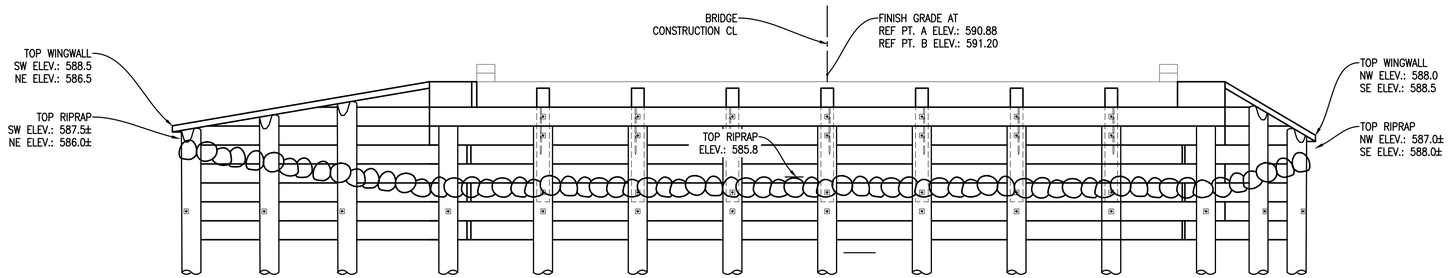
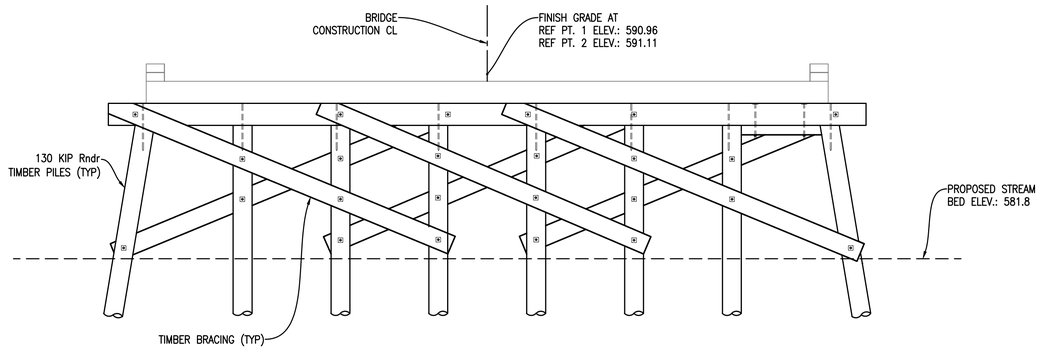
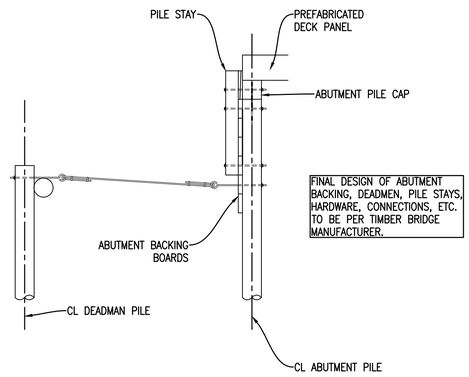


ABUTMENTS A & B

(ABUTMENT A - LOOKING WEST)
(ABUTMENT B - LOOKING EAST)



PIERS 1 & 2



TYPICAL DEADMAN SECTION

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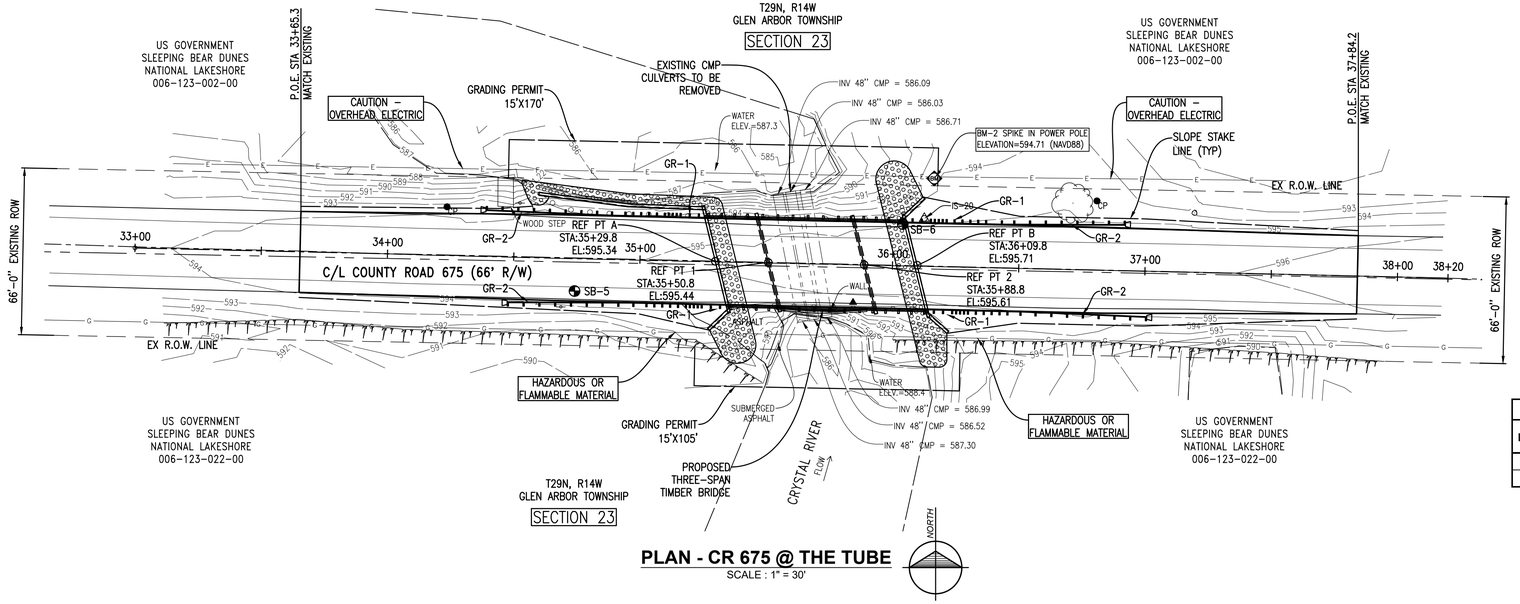
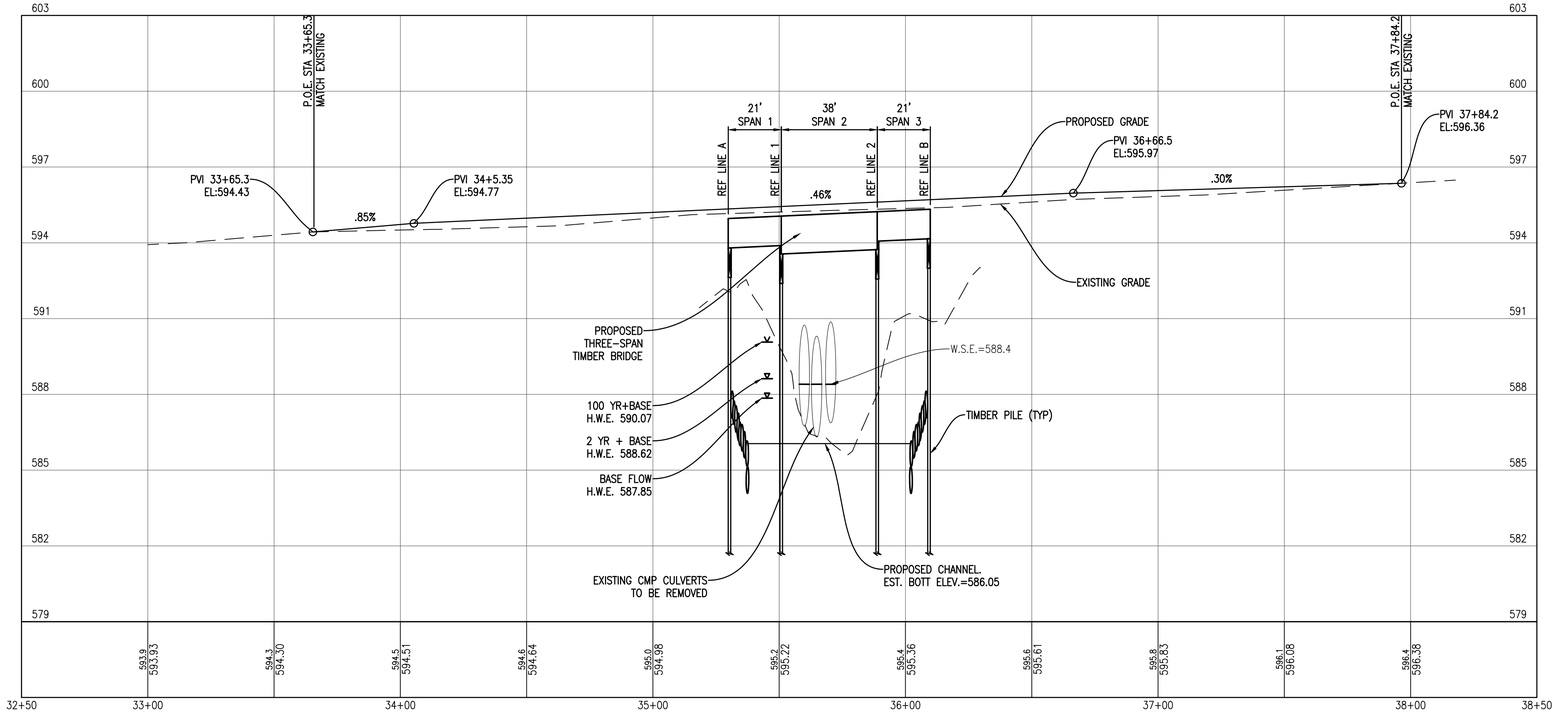


PLAN - CR 675 @ THE TUBE

SCALE : 1" = 30'



PROFILE - CR 675 @ The Tube

SCALE HORIZ. 1" = 30'
VERT. 1" = 3'

EXISTING STRUCTURE
THREE 48" DIAMETER CMP CULVERTS

PROPOSED STRUCTURE
THREE SPAN (21', 38', 21') x 34' WIDE (CLR) TIMBER BRIDGE

BENCHMARKS
BENCHMARK #2 SPIKE IN POWER POLE STATION 36+15.75, 34.79' LT ELEVATION = 594.71 (NAVD 88)

CONTROL POINTS
CP #1 – STATION 34+23.14, 19.12' LT N= 582455.2940 E= 19271437.3240 CP #2 – STATION 36+80.37, 27.37' LT N= 582457.6250 E= 19271694.6790

GUARDRAIL TABLE

MARK	LOCATION	GUARDRAIL ITEMS		
		Description	Unit	Qty
GR-1	EACH QUAD	GUARDRAIL ANCH, BRIDGE, DET M1	EA	4
GR-2	EACH QUAD	GUARDRAIL APPROACH TERMINAL, TYPE 2M	EA	4

THE WORK COVERED BY THESE PLANS INCLUDES REMOVAL OF THE EXISTING CULVERTS AND GUARDRAIL, CONSTRUCTION OF THE PROPOSED BRIDGE AND APPROACHES, RETAINING WALL, SLOPE RESTORATION, RIPRAP SCOUR PROTECTION, HMA PAVING, AND GUARDRAIL.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UNDERGROUND UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

COUNTY ROAD 675 TRAFFIC IS TO BE DETOURED OVER OTHER EXISTING ROADS.

PLAN ELEVATIONS AND COORDINATES ARE BASED ON NAVD (88) AND NAD (83) DATUMS RESPECTIVELY.

WATER LEVEL IS SUBJECT TO CHANGE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING A DETERMINATION OF WATER LEVELS THAT MAY EXIST DURING CONSTRUCTION.

MEASURES SHALL BE TAKEN TO PREVENT DEBRIS FROM FALLING FROM THE STRUCTURE. IF DEBRIS FALLS INTO THE WATERWAY, IT SHALL BE REMOVED WITHIN 24 HOURS. SINCE DISTURBANCE OF THE WATERWAY BOTTOM MAY BE AS HARMFUL AS THE DEBRIS ITSELF, THE PREVENTATIVE MEASURES MUST BE EFFECTIVE.

IMMEDIATELY AFTER CONSTRUCTION OF AN ABUTMENT IS COMPLETED, SLOPE PROTECTION AND SEEDING OR SODDING SHALL BE PLACED ON THE ADJACENT SLOPES.

FOR PROTECTION OF UNDERGROUND UTILITIES AND IN CONFORMANCE WITH PUBLIC ACT 53, 1974, THE CONTRACTOR SHALL DIAL 1-800-482-7171 A MINIMUM OF THREE FULL WORKING DAYS, EXCLUDING SATURDAYS, SUNDAYS, AND HOLIDAYS PRIOR TO BEGINNING EACH EXCAVATION IN AREAS WHERE PUBLIC UTILITIES HAVE NOT BEEN PREVIOUSLY LOCATED. MEMBERS WILL THUS BE ROUTINELY NOTIFIED. THIS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF NOTIFYING UTILITY OWNERS WHO MAY NOT BE A PART OF THE "MISS DIG" ALERT SYSTEM.

SCALE 1" = 30'
0' 30' 60'

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1	12-22-2020	CROSSINGS 1, 2, & 3 REVISIONS	RMV

GENERAL PLAN OF SITE - CROSSING 3
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued:	01-27-2022
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Project Number:
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PROJECT: County Road 675 Culvert Replacement
PROJECT NO.: 2020430002.02
PROJECT LOCATION: Glen Arbor, Michigan
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

LOG OF BORING: SB-5

GROUND ELEVATION: **DATE:** 6/11/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 30
STATIC WATER LEVEL: ▽ 4 **CAVING DEPTH:** ▽ 4

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200	TEST RESULTS: Plastic Limit ⊢ Liquid Limit; Water Content - × %; SPT RESULT - ▲ N Value (10 20 30 40 50)
ELEV.=594.4		Gravelly SAND (SP) - medium dense - dark brown - [FILL]	0	SS1	10		3 4 5				9
		Fine to medium SAND (SP) - little gravel - litle silt - medium dense - dark brown - wet below 5-ft bgs	2.5	SS2	10		5 6 5				11
			▽ 5	SS3	10		5 5 7				12
STREAM BED ELEV.=586.05		Gravelly fine to medium SAND (SP) - trace silt - medium dense - brown	7	SS4	12		9 7 10				17
ABUT A/ PIER 1		Fine to medium SAND (SP) - little gravel - trace silt - very dense - brown	13	SS5	10		21 23 30				53
EST. SCOUR ELEV.=579.55		Silty fine to medium SAND (SM) - occasional gravel - medium dense - light brown	16	SS6	18		4 13 14				27
MIN. PILE PEN. ELEV.=569.05				SS7	10		12 10 17				27
		Boring terminated at 30 ft.	30	SS8	18		14 11 4				15

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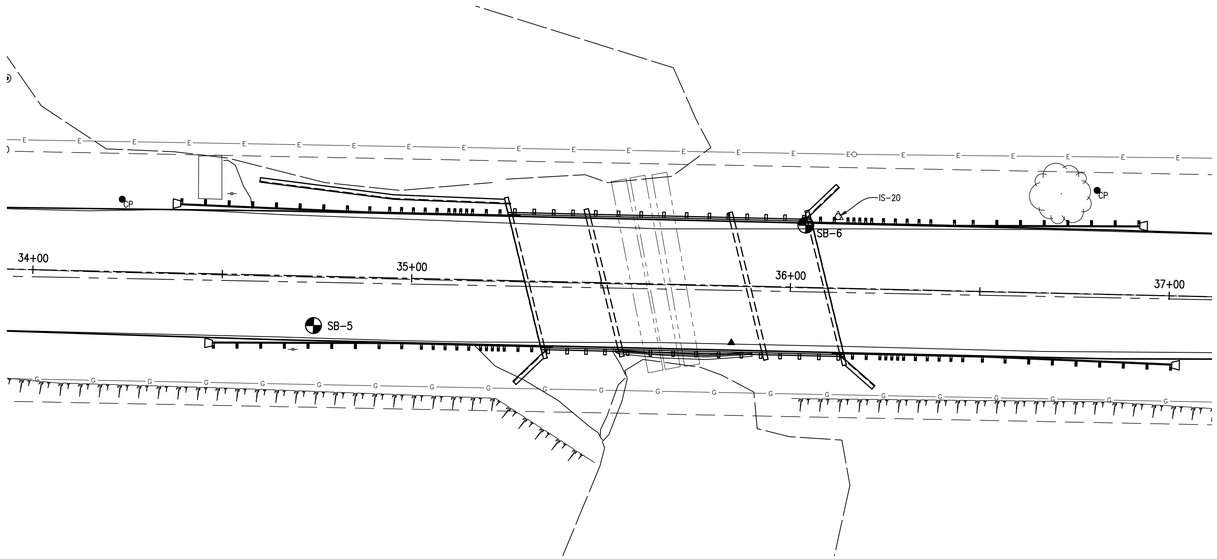
PROJECT NO.: 2020430002.02
PROJECT LOCATION: Glen Arbor, Michigan
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

LOG OF BORING: SB-6

GROUND ELEVATION: **DATE:** 6/11/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 30
STATIC WATER LEVEL: ▽ 4.5 **CAVING DEPTH:** ▽ 4.5

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200	TEST RESULTS: Plastic Limit ⊢ Liquid Limit; Water Content - × %; SPT RESULT - ▲ N Value (10 20 30 40 50)
ELEV.=594.9		Gravelly SAND (SP) - loose - dark brown	0	SS1	0		7 11 4	Drove Rock			15
		Fine to medium SAND (SP) - trace coarse sand - very loose - brown - wet below 4. 75-ft bgs	4	SS2	10		2 2 2				4
		Fine to coarse SAND (SP) - little fine gravel - loose - brown	5.5	SS3	18		2 1 0				1
STREAM BED ELEV.=586.05		Gravelly SAND (SP) - medium dense - brown	9	SS4	18		1 1 6				7
ABUT B/ PIER 2		Silty fine SAND (SM) - medium dense - light brown	14	SS5	18		10 10 14				24
EST. SCOUR ELEV.=584.05		Coarse SAND (SP) - little fine gravel - loose - brown	18	SS6	4		8 5 4				9
MIN. PILE PEN. ELEV.=574.05		GRAVEL (GP) - little sand - medium dense - brown	22.5	SS7	18		24 12 14				26
		Gravelly fine to coarse SAND (SP) - medium dense - grayish brown	23.5								
		Silty fine SAND (SM) - medium dense - light brown	29	SS8	18		20 20 6				28
		Boring terminated at 30 ft.	30								



BORING LOCATION PLAN
CR 675 @ THE TUBE
SCALE : 1" = 20'

NOTES:

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. (1 ½" I.D.) SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140# HAMMER FALLING 30".

(12 / 13 / 14) 1st 6" / 2nd 6" / 3rd 6"

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

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engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
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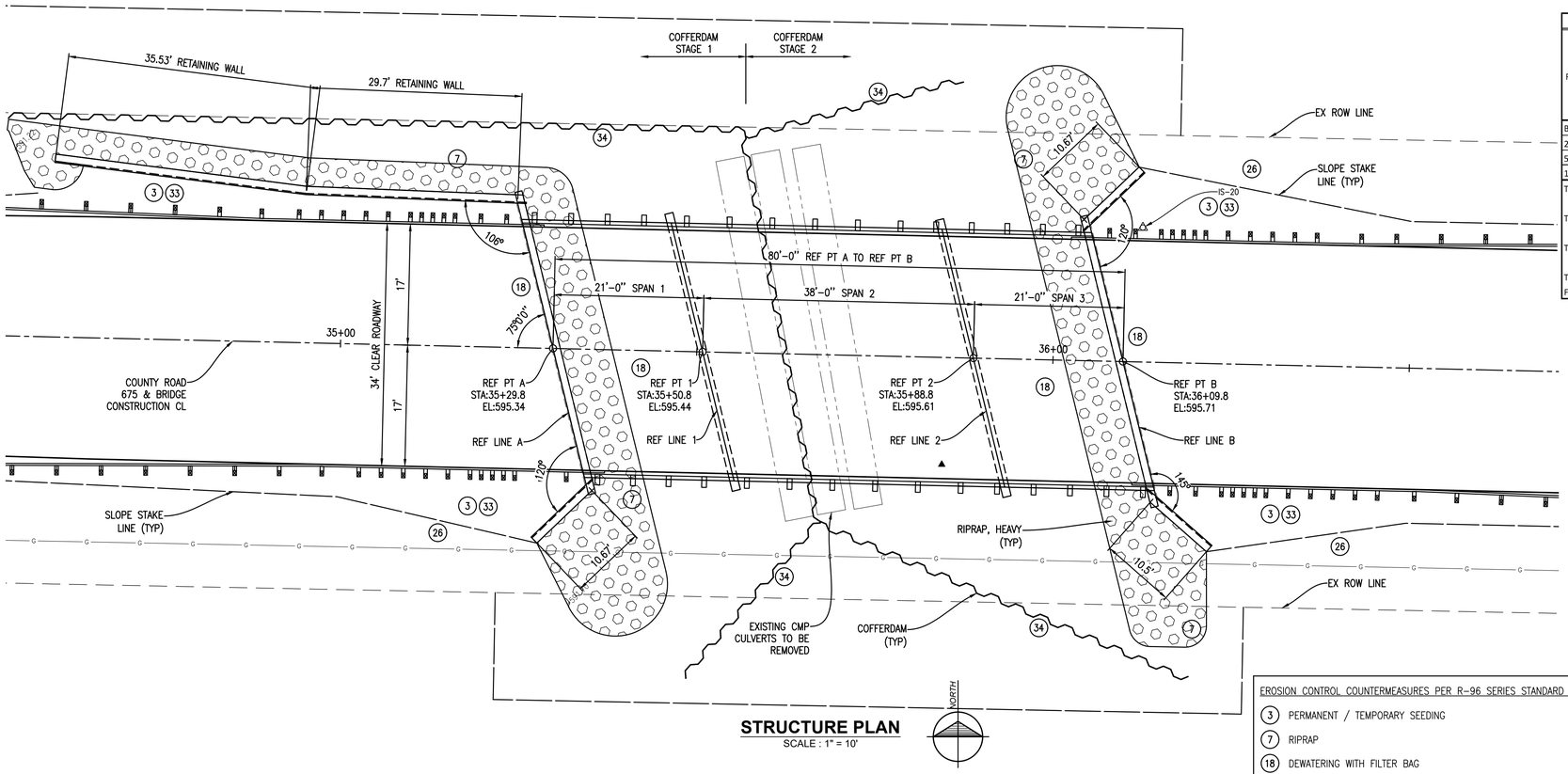


STRUCTURE PLAN
SCALE : 1" = 10'

SUMMARY OF HYDRAULIC ANALYSIS										
		EXISTING				PROPOSED				
		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		
FLOOD DATA	BASE + FLOOD (CFS)	U/S FACE OF CULVERTS	D/S FACE OF CULVERTS	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	U/S FACE OF BRIDGE	D/S FACE OF BRIDGE	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	35	588.46	587.10	0.5	1.5	587.85	587.11	0.7	0.7	69.9	-0.61
2-YR	70	589.13	587.74	0.7	2.1	588.62	587.75	0.8	1.0	113.4	-0.51
50-YR	145	590.20	588.85	0.9	2.9	589.81	588.88	1.0	1.3	195.1	-0.39
100-YR	165	590.47	589.10	0.9	3.1	590.07	589.14	1.0	1.4	214.1	-0.40

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 556.0 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

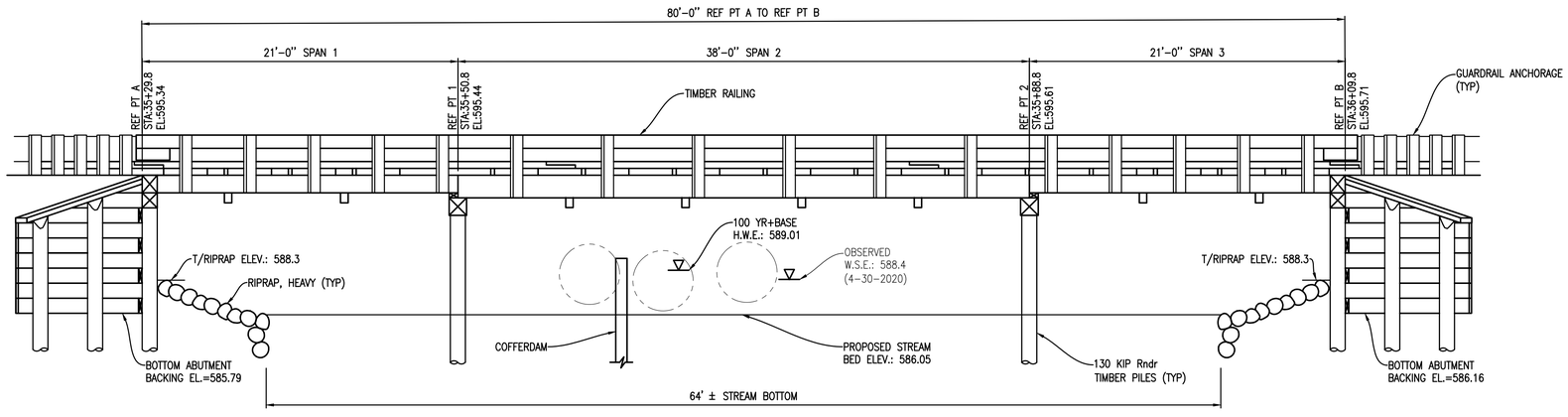
THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

MISCELLANEOUS QUANTITIES

1	LS	MOBILIZATION
1	LS	TRAFFIC CONTROL
3	EA	CULV, REM, 24 INCH TO 48 INCH
245	FT	GUARDRAIL, REM
50	CYD	EMBANKMENT, CIP
735	CYD	EXCAVATION, CHANNEL
700	CYD	EXCAVATION, EARTH
275	CYD	BACKFILL, STRUCTURE, CIP
275	CYD	EXCAVATION, FDN
2	EA	EROSION CONTROL, FILTER BAG
100	FT	EROSION CONTROL, SILT FENCE
1335	SYD	AGGREGATE BASE, 6 INCH
160	SYD	SHOULDER, CL II, 3 INCH
1530	SYD	HMA SURFACE, REM
280	TON	HMA, 4E1
1	LS	TEMPORARY STREAM CONTROL
1	LS	STRUCTURE, TIMBER, 34'X 80', FURN
1	LS	STRUCTURE, TIMBER, 34'X 80', INSTALL
1	LS	TIMBER RETAINING WALL LAGGING
1	LS	TIMBER RETAINING WALL LAGGING INSTALL
4	EA	GUARDRAIL ANCH, BRIDGE, DET M1
4	EA	GUARDRAIL APPROACH TERMINAL, TYPE 2M
10	EA	GUARDRAIL REFLECTOR
170	SYD	RIPRAP, HEAVY
780	SYD	SLOPE RESTORATION

EROSION CONTROL COUNTERMEASURES PER R-96 SERIES STANDARD PLAN

- (3) PERMANENT / TEMPORARY SEEDING
- (7) RIPRAP
- (18) DEWATERING WITH FILTER BAG
- (26) SILT FENCE
- (33) MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS
- (34) COFFERDAMS



STRUCTURE ELEVATION
NO SCALE

THE DESIGN OF THIS STRUCTURE IS BASED ON 1.2 TIMES THE CURRENT ASSHTO LRFD BRIDGE DESIGN SPECIFICATION HL-93 LOADING WITH THE EXCEPTION THAT THE DESIGN TANDEM PORTION OF THE HL-93 LOAD DEFINITION SHALL BE REPLACED BY A SINGLE 60 KIP AXLE LOAD BEFORE APPLICATION OF THIS 1.2 FACTOR. THE RESULTING LOAD IS DESIGNATED HL-93 MOD. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/800 OF THE SPAN LENGTH.

WITHOUT THE PREVENTIVE MEASURES SHOWN ON THESE PLANS, THERE IS A POSSIBILITY THAT STREAM BED SCOUR MAY OCCUR. THE ESTIMATED TOTAL SCOUR DEPTH IS CALCULATED TO BE 6.5 FEET AT ABUTMENT A, 2.1 FEET AT PIER 1, 2.1 FEET AT PIER 2, AND 1.8 FEET AT ABUTMENT B. THESE DEPTHS ARE BASED ON A 500 YEAR RUNOFF EVENT.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYTMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN PAYMENT FOR RIPRAP.

THE RIPRAP QUANTITY IS BASED ON THE LATERAL DIMENSIONS OF THE AREA TO BE PROTECTED, REGARDLESS OF THE NUMBER OF LAYERS REQUIRED.

THE INTENT OF THE FLOW DIVERSION AND STAGING SEQUENCE DESCRIBED IS TO FACILITATE RIPRAP PLACEMENT, CONTAIN SEDIMENTATION, AND MAINTAIN STREAM FLOW. ALTERNATE METHODS OF STREAM DIVERSION SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

RIPRAP SHALL BE NATURAL FIELD STONE.

PROPOSED CONSTRUCTION STAGING SEQUENCE:

STAGE 1:
1. REMOVE ROAD EMBANKMENT OVER EXISTING CULVERTS TO TOP OF CULVERTS.
2. PLACE STAGE 1 COFFERDAM BETWEEN EXISTING CULVERTS ISOLATING WEST CULVERT FROM THE STREAM. MAINTAIN STREAM FLOW THROUGH EAST CULVERTS.
3. REMOVE THE WEST CULVERT AND EXCAVATE WEST PART OF STREAM CHANNEL.
4. CONSTRUCT ABUTMENT A AND PIER 1, AND PLACE RIPRAP AT ABUTMENT A.

STAGE 2:
1. REMOVE FLOW DIVERSION ISOLATING THE WEST SIDE AND PLACE IN THE EAST PART OF THE STREAM ISOLATING THE EAST CULVERTS FROM THE STREAM. MAINTAIN STREAM FLOW THOUGH THE WEST SIDE OF THE NEWLY EXCAVATED CHANNEL.
2. REMOVE THE EAST CULVERTS AND EXCAVATE EAST PART OF STREAM CHANNEL.
3. CONSTRUCT ABUTMENT B AND PIER 2, AND PLACE RIPRAP AT ABUTMENT B.
4. REMOVE FLOW DIVERSION.
5. CONSTRUCT THE SUPERSTRUCTURE AND APPROACHES.

SCALE 1" = 10'
0' 10' 20'

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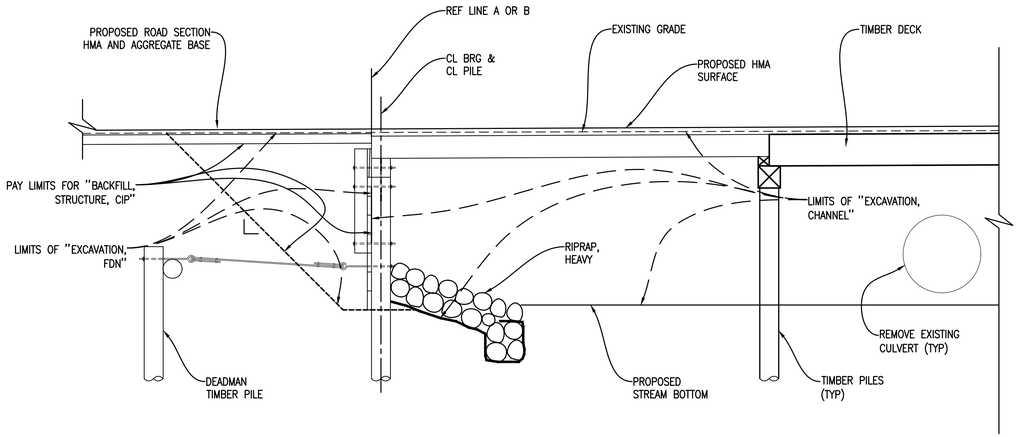
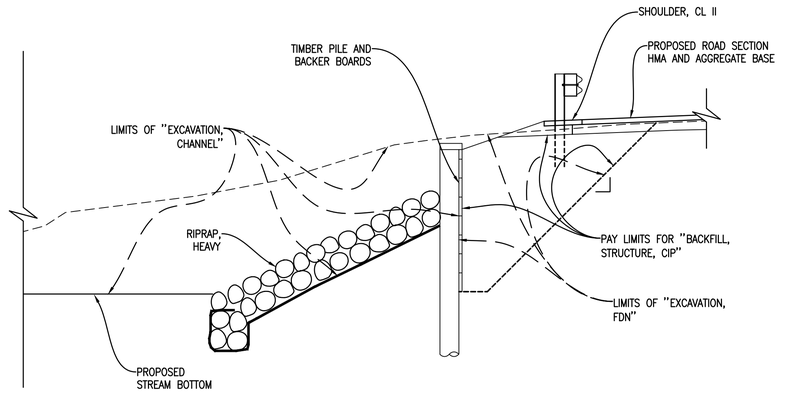
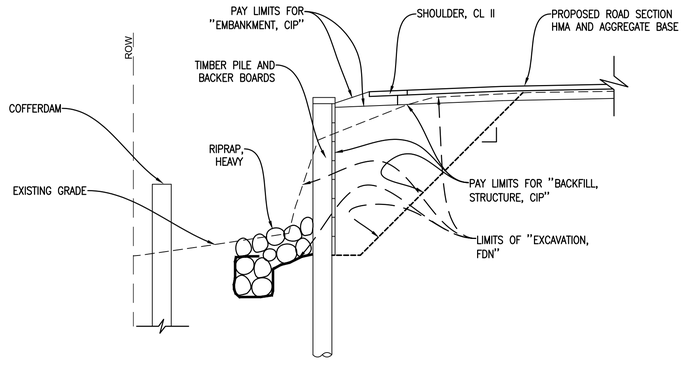


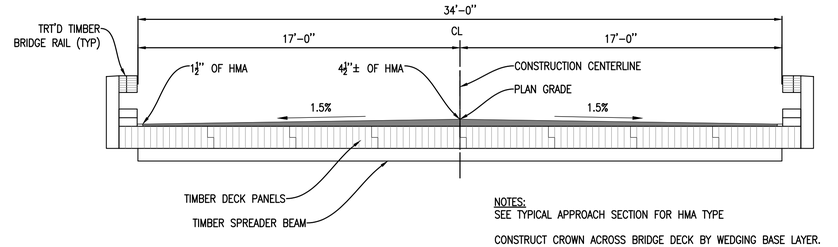
TYPICAL ABUTMENT SECTION



TYPICAL WINGWALL SECTION



TYPICAL RETAINING WALL SECTION

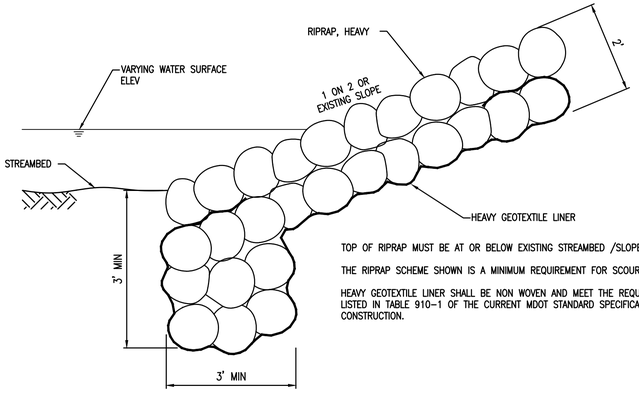


NOTES:
SEE TYPICAL APPROACH SECTION FOR HMA TYPE

CONSTRUCT CROWN ACROSS BRIDGE DECK BY WEDGING BASE LAYER.

TRANSITION FROM 2% APPROACH CROSS-SLOPE TO 1.5% DECK CROSS-SLOPE IN 25' LENGTH OF APPROACH AT EACH END OF BRIDGE.

TYPICAL DECK SECTION



TOP OF RIPRAP MUST BE AT OR BELOW EXISTING STREAMBED /SLOPE ELEVATION.

THE RIPRAP SCHEME SHOWN IS A MINIMUM REQUIREMENT FOR SCOUR.

HEAVY GEOTEXTILE LINER SHALL BE NON WOVEN AND MEET THE REQUIREMENTS LISTED IN TABLE 910-1 OF THE CURRENT MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

TYPICAL RIPRAP HEADER DETAIL

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engineering sciences, inc.
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Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
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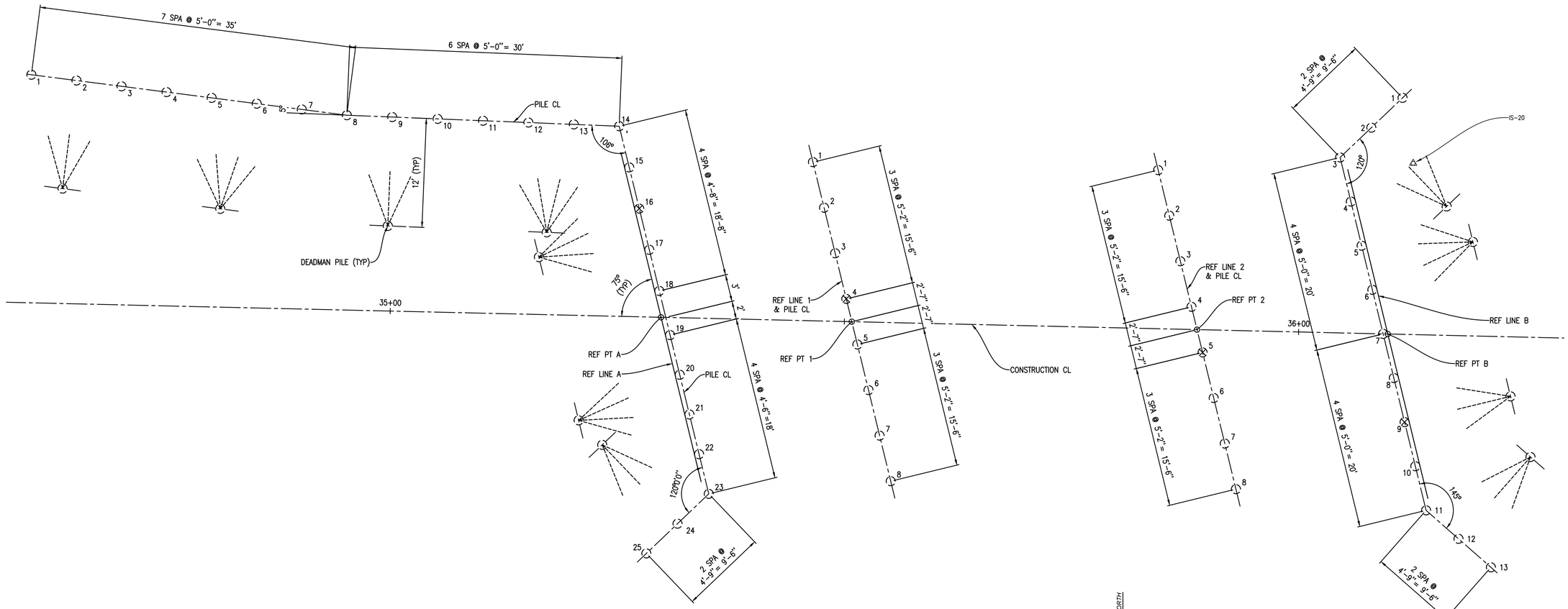

PILE LAYOUT

NORTH

MISCELLANEOUS QUANTITIES		
1	LS	PILE DRIVING EQUIPMENT, FURN
1595	FT	PILE, TREATED TIMBER, FURN
1595	FT	PILE, TREATED TIMBER, DRIVEN
4	EA	TEST PILE, TREATED TIMBER

TREATED TIMBER PILES

LOCATION	PILE TYPE	NUMBER OF PILES	ESTIMATED LENGH FURNISHED	
			EACH (FT)	TOTAL (FT)
ABUT A	TEST	1	35	35
	VERTICAL	9	25	225
	WINGWALL	15	20	300
	DEADMAN	7	20	140
PIER 1	TEST	1	40	40
	VERTICAL	7	30	210
PIER 2	TEST	1	40	40
	VERTICAL	7	30	210
ABUT B	TEST	1	35	35
	VERTICAL	8	25	200
	WINGWALL	4	20	80
	DEADMAN	4	20	80
TOTAL		65		1595

( ) DENOTES VERTICAL PILES.

⊗ DENOTES VERTICAL TEST PILES.

DRIVE ALL PILES TO A NOMINAL PILE DRIVING RESISTANCE NOT LESS THAN 130 KIPS. DETERMINE NOMINAL PILE DRIVING RESISTANCE (Rndr) USING THE FHWA MODIFIED GATES DYNAMIC FORMULA.

PILES SHALL HAVE A NOMINAL BUTT DIAMETER OF 12 INCHES.

THE ESTIMATED PILE LENGTH IS BASED ON THE STATIC ANALYSIS.

THE ESTIMATED LOSS OF NOMINAL PILE RESISTANCE DUE TO SCOUR AFTER DRIVING IS 2 KIPS.

THE ESTIMATED FACTORED DOWNDRAG AFTER PILE DRIVING IS 0 KIPS.

THE FACTORED PILE RESISTANCE AVAILABLE TO RESIST ALL FACTORED LOADS IS EQUAL TO 50 PERCENT OF NOMINAL PILE DRIVING RESISTANCE THAT IS REDUCED BY THE LOSS DUE TO SCOUR.

PILE SUBSTRUCTURE DESIGN SHOWN IN THESE PLANS, INCLUDING DEADMEN, IS ESTIMATED AND SHALL BE CONFIRMED WITH COMPLETE ENGINEERED TIMBER STRUCTURE CALCULATIONS AND SHOP DRAWINGS PREPARED BY THE BRIDGE SUPPLIER.

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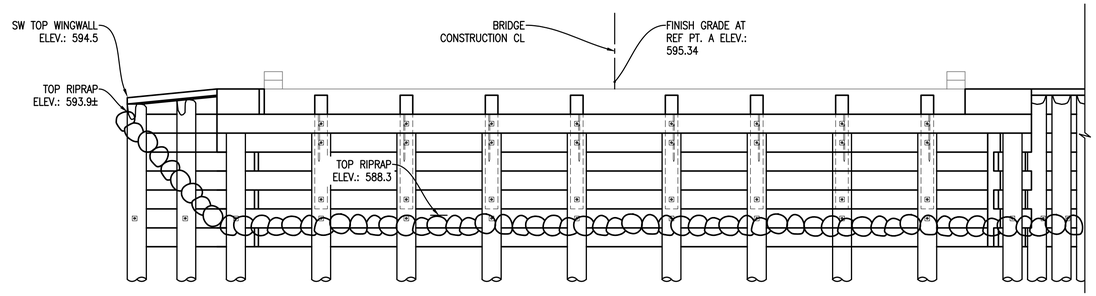
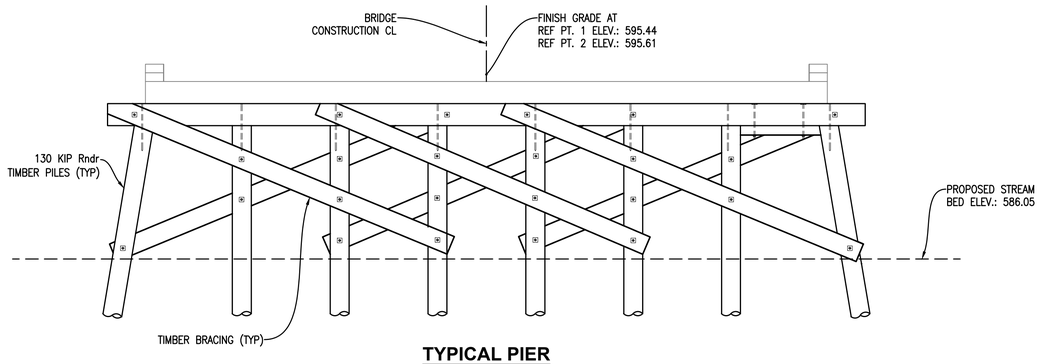
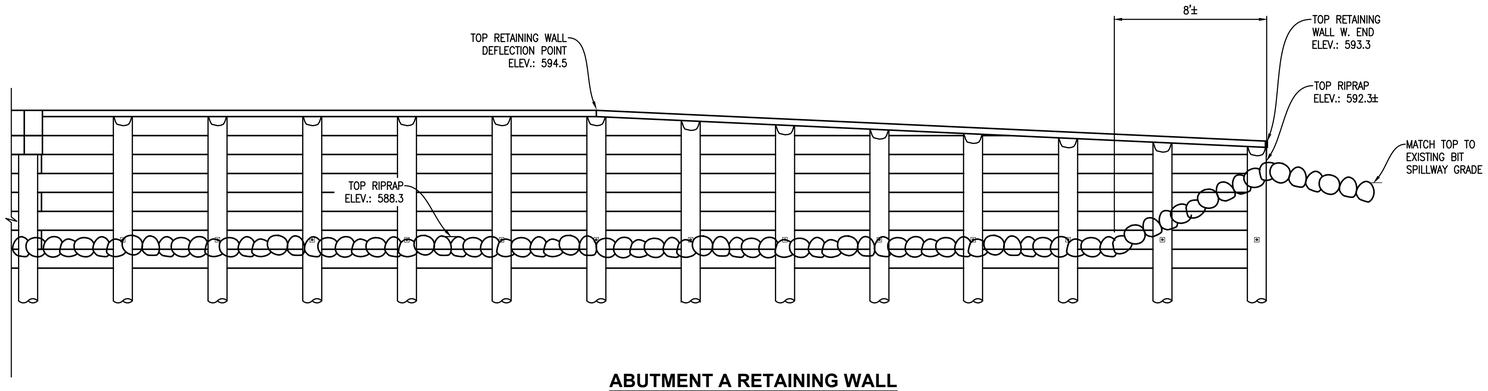


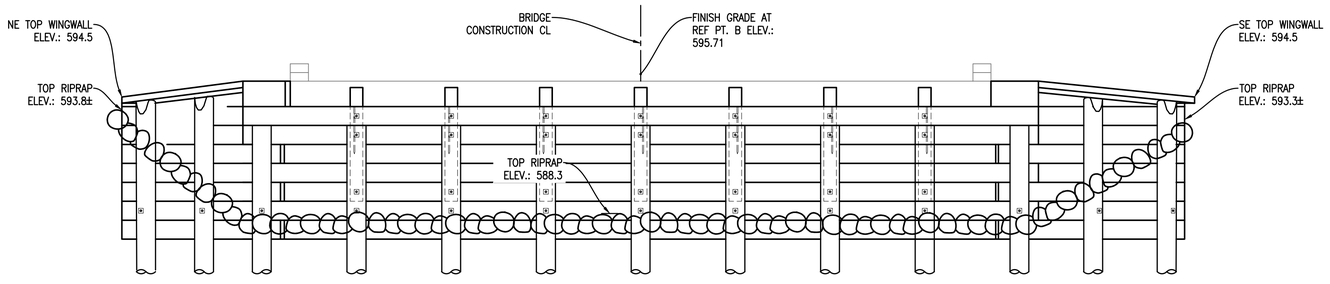
ABUTMENT A
(LOOKING WEST)



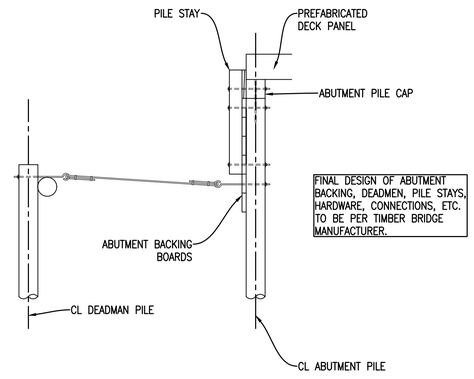
TYPICAL PIER



ABUTMENT A RETAINING WALL
(LOOKING SOUTH)



ABUTMENT B
(LOOKING EAST)



TYPICAL DEADMAN SECTION

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engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
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2	02-05-2021	PARTNER REVIEW PLAN SET	RMV
1	12-22-2020	CROSSINGS 1, 2, & 3 REVISIONS	RMV

ABUTMENT & PIER DETAILS - CROSSING 3
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued: 01-27-2022
Date Surveyed: 04-30-2020
Designed By: RMV
Drawn By: RMV
Checked By: MAG
Scale: AS NOTED

Original sheet size is 22x34

Location:
SECTIONS 23 & 24
T29N, R14W
GLEN ARBOR TOWNSHIP
LEELANAU COUNTY
MICHIGAN

Project Number:
2020430002

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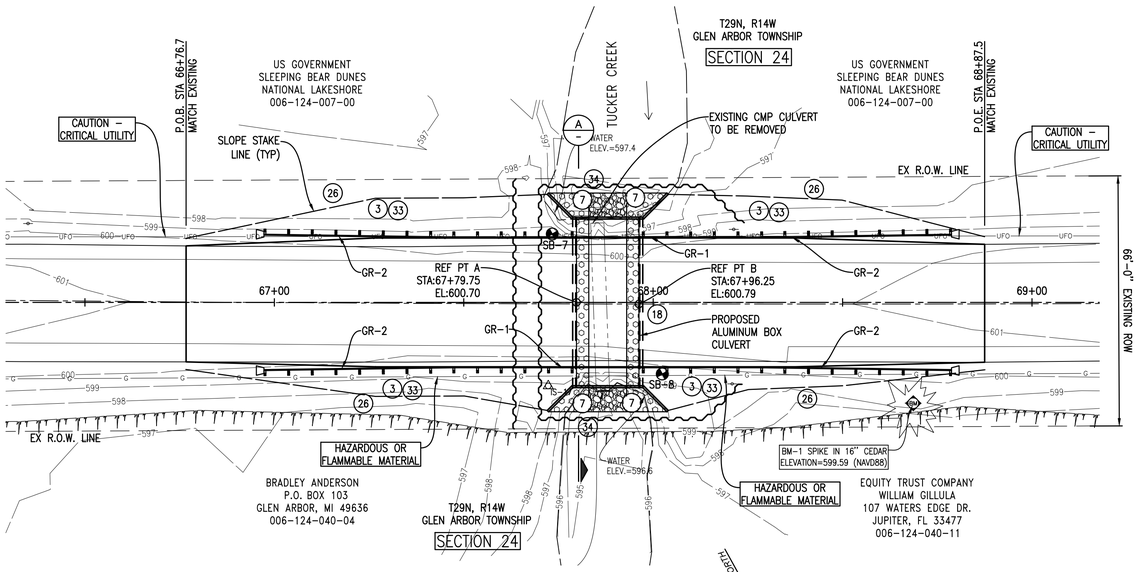
C3.6



PLAN - CR 675 @ TUCKER LAKE OUTLET

SCALE : 1" = 20'

EXISTING STRUCTURE
42" DIAMETER CMP CULVERT

PROPOSED STRUCTURE
16'-4" X 6'-8" ALUMINUM BOX CULVERT W/ BURIED INVERT

BENCHMARKS
BENCHMARK #1 SPIKE IN 16" CEDAR STATION 68+68.65, 26.6' RT ELEVATION = 599.59 (NAVD 88)

CONTROL POINTS
CP #1 – STATION 65+35.44, 23.8' LT N= 581414.0190 E= 19274235.1120 CP #2 – STATION 69+78.33, 25.3' RT N= 581156.6780 E= 19274599.2570

GUARDRAIL TABLE

MARK	LOCATION	GUARDRAIL ITEMS		
		Description	Unit / Qty	
GR-1	NORTH SIDE	GUARDRAIL LONG SPAN, DET MGS-2	EA	1
GR-1	SOUTH SIDE	GUARDRAIL LONG SPAN, DET MGS-2	EA	1
GR-2	NE QUAD	GUARDRAIL, TYPE MGS-8	FT	37.5
GR-2	NW QUAD	GUARDRAIL, TYPE MGS-8	FT	37.5
GR-2	SE QUAD	GUARDRAIL, TYPE MGS-8	FT	37.5
GR-2	SW QUAD	GUARDRAIL, TYPE MGS-8	FT	37.5
GR-3	EACH QUAD	GUARDRAIL DEPARTING TERMINAL, TYPE MGS	EA	4

EROSION CONTROL COUNTERMEASURES PER R-96 SERIES STANDARD PLAN

- (3) PERMANENT / TEMPORARY SEEDING
- (7) RIPRAP
- (18) DEWATERING WITH FILTER BAG
- (26) SILT FENCE
- (33) MULCH BLANKETS
- (34) COFFERDAMS

GENERAL NOTES:

THE WORK COVERED BY THESE PLANS GENERALLY INCLUDES REMOVAL OF THE EXISTING CULVERT AND CONSTRUCTION OF THE PROPOSED CULVERT INCLUDING ROAD RECONSTRUCTION, CREEK DIVERSION, REMOVING UNSUITABLE MATERIAL, PLACING AND COMPACTING SAND, SLOPE RESTORATION, RIPRAP, HMA PAVING, AND GUARDRAIL.

WATER LEVEL IS SUBJECT TO CHANGE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING A DETERMINATION OF WATER LEVELS THAT MAY EXIST DURING CONSTRUCTION.

IMMEDIATELY AFTER CONSTRUCTION IS COMPLETED, SLOPE PROTECTION AND SEEDING OR SODDING SHALL BE PLACED ON THE ADJACENT SLOPES.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UNDERGROUND UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

FOR PROTECTION OF UNDERGROUND UTILITIES AND IN CONFORMANCE WITH PUBLIC ACT 53, 1974, THE CONTRACTOR SHALL DIAL 1-800-482-7171 A MINIMUM OF THREE FULL WORKING DAYS, EXCLUDING SATURDAYS, SUNDAYS, AND HOLIDAYS PRIOR TO BEGINNING EACH EXCAVATION IN AREAS WHERE PUBLIC UTILITIES HAVE NOT BEEN PREVIOUSLY LOCATED. MEMBERS WILL THUS BE ROUTINELY NOTIFIED. THIS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF NOTIFYING UTILITY OWNERS WHO MAY NOT BE A PART OF THE "MISS DIG" ALERT SYSTEM.

APPROPRIATE SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO EARTH-DISTURBING ACTIVITIES. PLACE TURF ESTABLISHMENT ITEMS AS SOON AS POSSIBLE ON POTENTIAL ERODIBLE SLOPES AS DIRECTED BY THE ENGINEER. CRITICAL DITCH GRADES SHALL BE PROTECTED WITH EITHER SOD OR SEED/MULCH OR MULCH BLANKET AS DIRECTED BY THE ENGINEER.

PERMANENT ROAD VEGETATIVE RESTORATION MEASURES SHALL INCLUDE TOPSOIL, CHEMICAL FERTILIZER NUTRIENT CLASS A (228 LB/ACRE), GENERAL ROADSIDE SEED MIX TDS (220 LB/ACRE), MULCH, AND BIODEGRADABLE JUTE NETTING BLANKET. MEASURES SHALL BE SELECTED FROM MDOT QUALIFIED PRODUCTS AND INSTALLED PER MDOT SPECIFICATIONS.

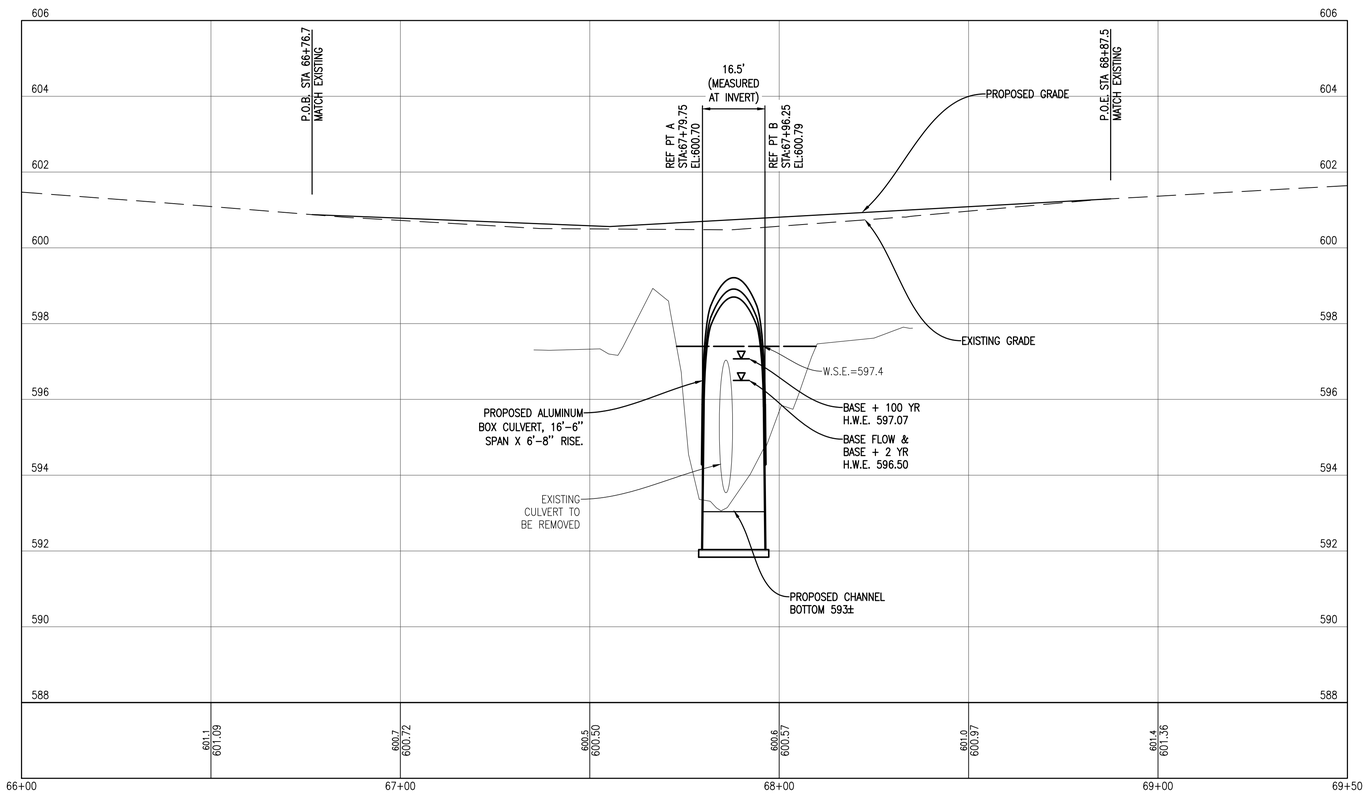
PLAN ELEVATIONS AND COORDINATES ARE BASED ON NAVD (88) AND NAD (83) DATUMS RESPECTIVELY.

CREEK DIVERSION:

IT IS INTENDED FOR CONSTRUCTION OF THE PROPOSED CULVERT TO BE COMPLETED IN DRY CONDITIONS. CREEK FLOW SHALL BE DIVERTED AND DEWATERING PERFORMED AS NECESSARY TO PROVIDE DRY WORKING CONDITIONS AND FACILITATE REMOVING AND REPLACING UNSUITABLE MATERIAL.

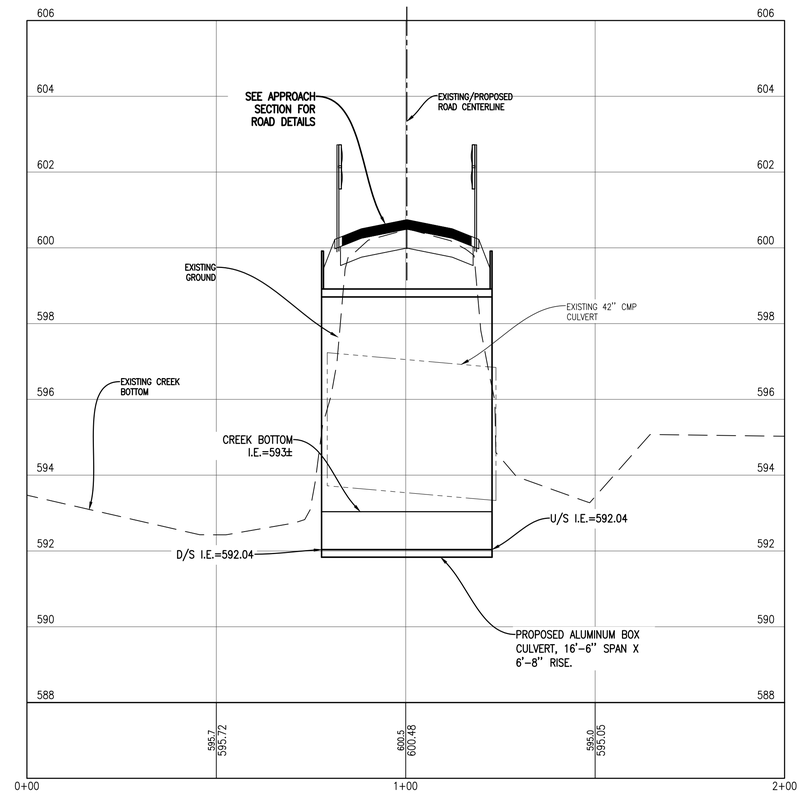
CONCEPTUAL DIVERSION METHOD IS SHOWN ON THESE PLANS. THE CONTRACTOR SHALL PROVIDE A DIVERSION AND DEWATERING PLAN FOR APPROVAL A MINIMUM OF 10 BUSINESS DAYS PRIOR TO CONSTRUCTION COMMENCING.

CREEK DIVERSION PAY ITEM INCLUDES ANY TEMPORARY SHEETING, DEWATERING, DIVERSIONS DITCHING, AND / OR TEMPORARY DRAINAGE PIPE NECESSARY TO MAINTAIN STREAM FLOW DURING CONSTRUCTION.



PROFILE - CR 675 @ Tucker Lake Outlet

SCALE HORIZ. 1" = 20'
VERT. 1" = 2'



SECTION A-A

SCALE HORIZ. 1" = 20'
VERT. 1" = 2'

SCALE 1" = 20'
0' 20' 40'

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GENERAL PLAN OF SITE - CROSSING 4
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

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Project Number:
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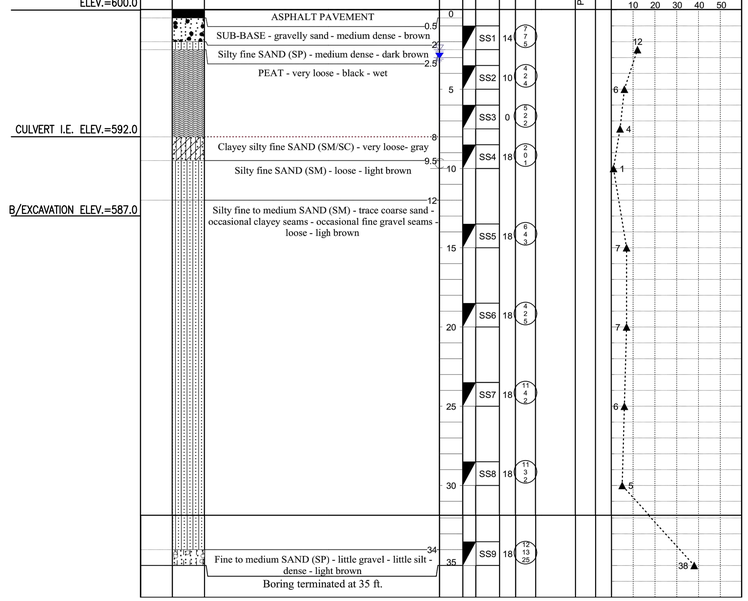
PROJECT: County Road 675 Culvert Replacement
PROJECT NO.: 2020430002.02
PROJECT LOCATION: Glen Arbor, Michigan
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

LOG OF BORING: SB-7

GROUND ELEVATION: **DATE:** 6/11/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 35
STATIC WATER LEVEL: ▽ 3 **CAVING DEPTH:** ▽ 10

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200
ELEV.=600.0		ASPHALT PAVEMENT	0							
		SUB-BASE - gravelly sand - medium dense - brown	0.5							
		Silty fine SAND (SP) - medium dense - dark brown	2	SS1	14		7 7 6			
		PEAT - very loose - black - wet	2.5	SS2	10		4 2 4			
			5	SS3	0		3 2 2			
CULVERT I.E. ELEV.=592.0			8							
		Clayey silty fine SAND (SM/SC) - very loose- gray	9.5	SS4	18		2 0 1			
		Silty fine SAND (SM) - loose - light brown	10							
B/EXCAVATION ELEV.=587.0			12							
		Silty fine to medium SAND (SM) - trace coarse sand - occasional clayey seams - occasional fine gravel seams - loose - ligh brown	15	SS5	18		3 4 3			
			20	SS6	18		4 2 5			
			25	SS7	18		11 4 2			
			30	SS8	18		11 3 2			
		Fine to medium SAND (SP) - little gravel - little silt - dense - light brown	34	SS9	18		12 13 25			
		Boring terminated at 35 ft.	35							

TEST RESULTS: Plastic Limit ⊢ Liquid Limit; Water Content - × %; SPT RESULT - ▲ N Value; 10 20 30 40 50



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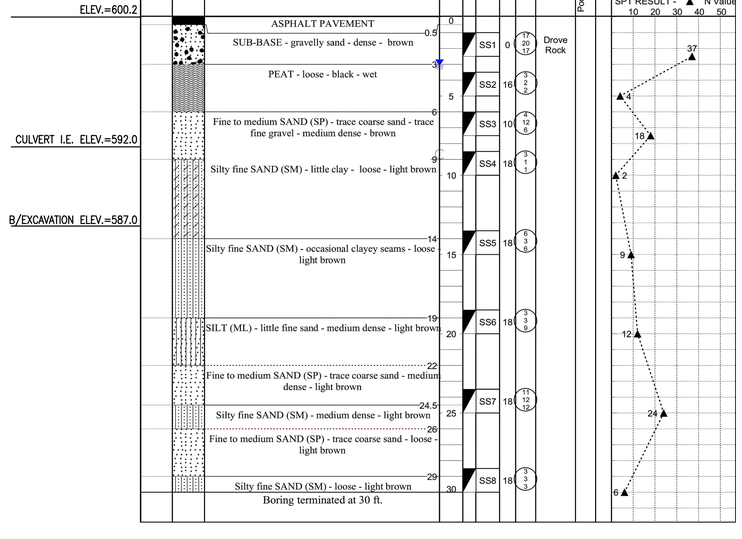
CLIENT: Leelanau County Road Commission
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** M. Korndorfer

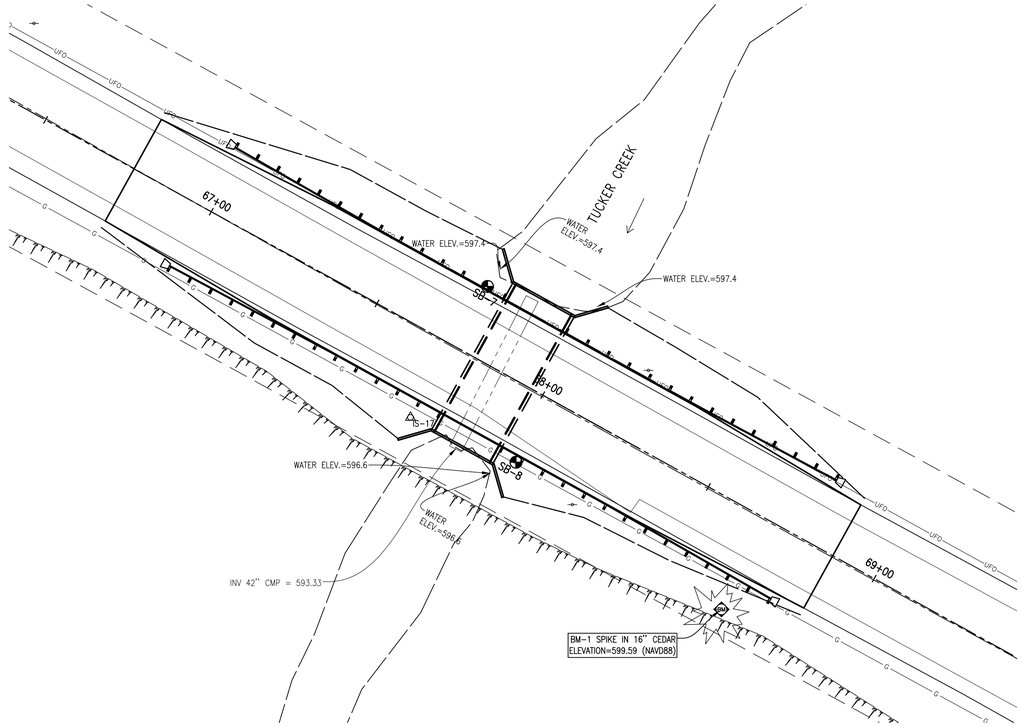
LOG OF BORING: SB-8

GROUND ELEVATION: **DATE:** 6/11/2020
DRILLING LOCATION: Glen Arbor, Michigan
DRILLING METHOD: 4.25" (ID) Hollow-Stem Auger
BOREHOLE DIAMETER (IN): +/- 10" **TOTAL DEPTH (FT):** 30
STATIC WATER LEVEL: ▽ 3 **CAVING DEPTH:** ▽ 9

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200
ELEV.=600.2		ASPHALT PAVEMENT	0							
		SUB-BASE - gravelly sand - dense - brown	0.5	SS1	0		17 20 17	Drove Rock		
		PEAT - loose - black - wet	3	SS2	16		3 2 2			
		Fine to medium SAND (SP) - trace coarse sand - trace fine gravel - medium dense - brown	6	SS3	10		4 12 6			
CULVERT I.E. ELEV.=592.0			9	SS4	18		3 11 4			
		Silty fine SAND (SM) - little clay - loose - light brown	10							
B/EXCAVATION ELEV.=587.0			14	SS5	18		6 5 6			
		Silty fine SAND (SM) - occasional clayey seams - loose light brown	15							
		SILT (ML) - little fine sand - medium dense - light brown	19	SS6	18		3 3 9			
		Fine to medium SAND (SP) - trace coarse sand - medium dense - light brown	20							
			22	SS7	18		17 12 12			
		Silty fine SAND (SM) - medium dense - light brown	24.5							
		Fine to medium SAND (SP) - trace coarse sand - loose - light brown	25							
		Silty fine SAND (SM) - loose - light brown	29	SS8	18		3 3 3			
		Boring terminated at 30 ft.	30							

TEST RESULTS: Plastic Limit ⊢ Liquid Lim; Water Content - × %; SPT RESULT - ▲ N Value; 10 20 30 40 50





BORING LOCATION PLAN
CROSSING 4
SCALE : 1" = 20'

NORTH

NOTES:

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. (1 3/8" I.D.) SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140# HAMMER FALLING 30".

(12 / 13 / 14) 1st 6" / 2nd 6" / 3rd 6"

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

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1280 Business Park Dr.
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SOIL BORINGS - CROSSING 4
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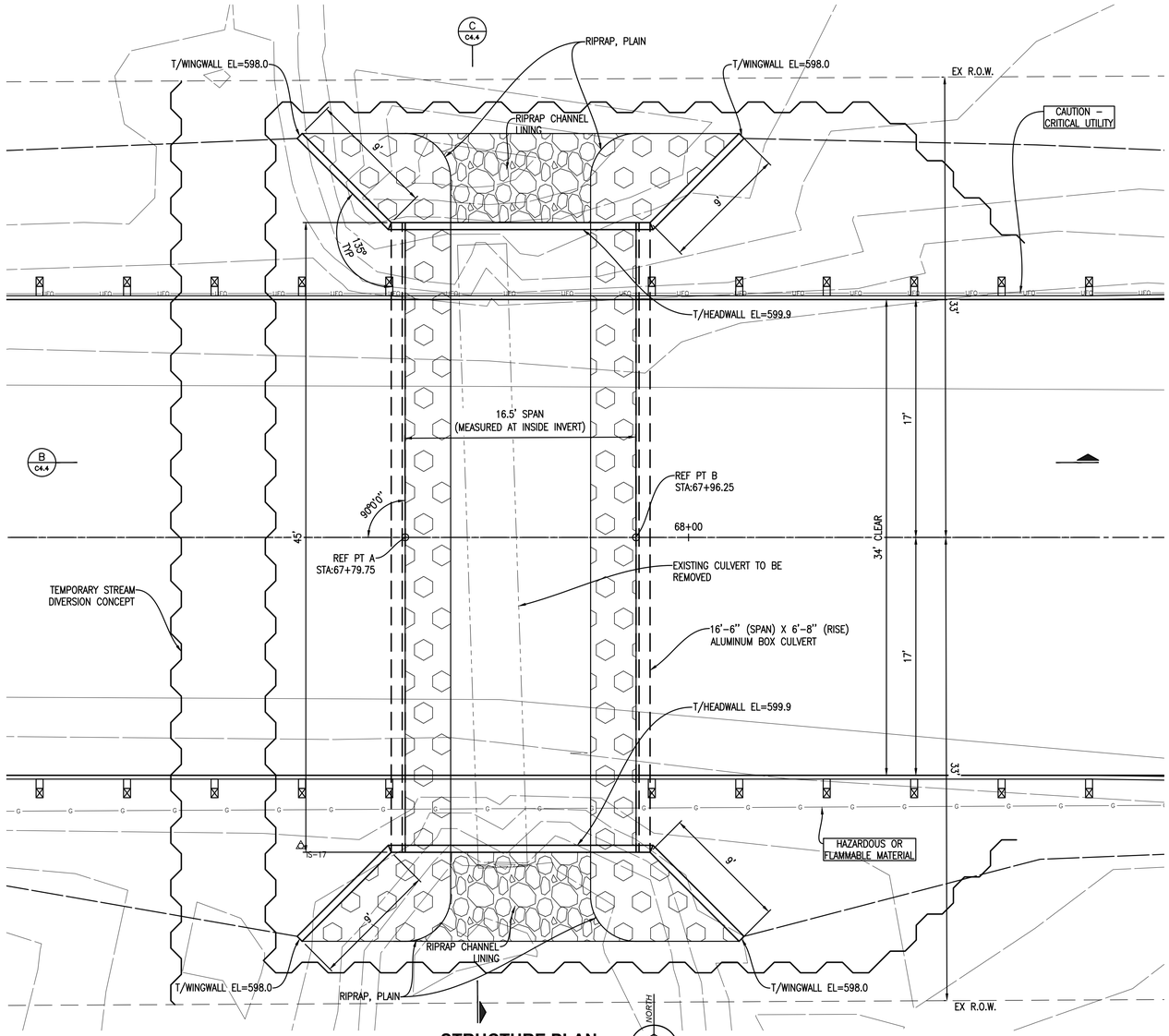
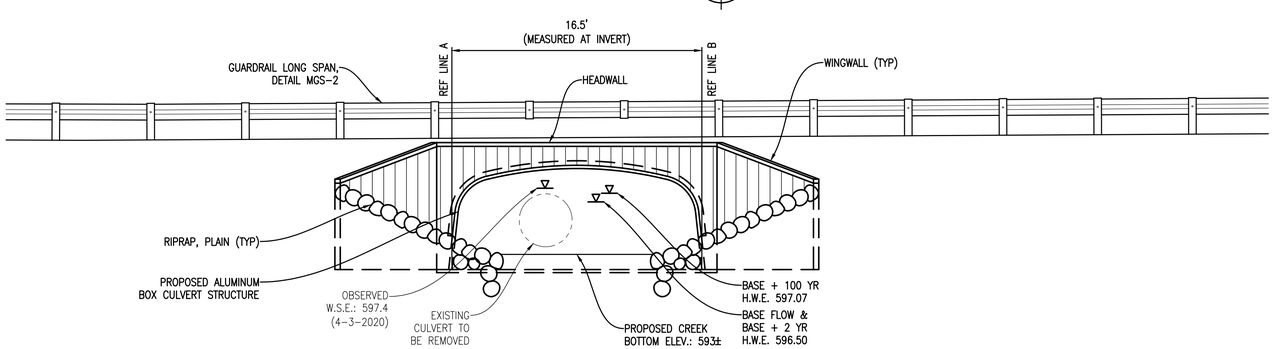


STRUCTURE PLAN

SCALE : 1" = 5'



STRUCTURE ELEVATION

NO SCALE

SUMMARY OF HYDRAULIC ANALYSIS

	EXISTING			PROPOSED			
FLOOD DATA	DISCHARGE (CFS)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE (FT)	VELOCITY IN D/S CHANNEL (FPS)	WATER SURFACE ELEV AT U/S FACE OF STRUCTURE (FT)	VELOCITY IN D/S CHANNEL (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	3	596.52	0.2	596.50	0.1	55.0	-0.02
2-YEAR	4	596.53	0.3	596.50	0.1	55.0	-0.03
50-YEAR	38	599.33	1.4	596.75	0.7	58.8	-2.58
100-YEAR	63	600.94	1.9	597.07	1.0	63.6	-3.87

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 2.5 SQUARE MILES.

THE MAXIMUM AREA BELOW LOW CHORD IS 78.3 SQUARE FEET.

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE ARE TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOODPLAIN.

NOTES

THE DESIGN OF THIS STRUCTURE IS BASED ON 1.2 TIMES THE CURRENT AASHTO LRFD BRIDGE DESIGN SPECIFICATION HL-93 LOADING WITH THE EXCEPTION THAT THE DESIGN TANDEM PORTION OF THE HL-93 LOAD DEFINITION SHALL BE REPLACED BY A SINGLE 60 KIP AXLE LOAD BEFORE APPLICATION OF THIS 1.2 FACTOR. THE RESULTING LOAD IS DESIGNATED HL-93 MOD. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/425 OF SPAN LENGTH.

CULVERT STRUCTURE SHALL BE ASSEMBLED AND INSTALLED PER THE MANUFACTURERS SPECIFICATIONS AND APPROVED SHOP DRAWINGS.

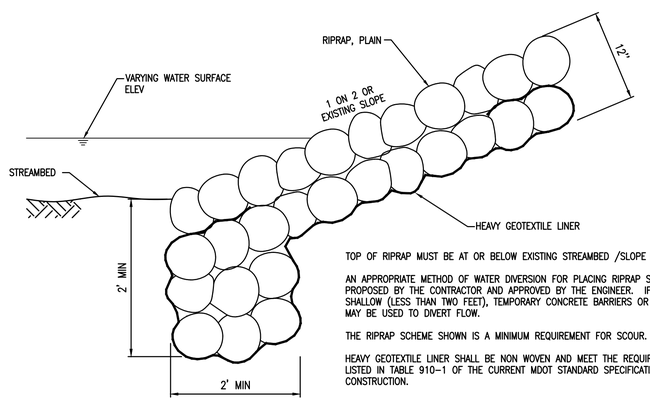
THE PROPOSED CULVERT INVERT IS BURIED BELOW THE EXISTING CREEK BED AND FILLED WITH NATIVE STREAM BED MATERIAL TO PROVIDE A NATURAL BOTTOM FOR FISH PASSAGE.

RIPRAP CHANNEL LINING AT THE INLET AND OUTLET SHALL BE INSTALLED TO PREVENT SCOUR AT THE INVERTS AND UNDERMINING OF THE CULVERT.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN PAYMENT FOR RIPRAP.

MISCELLANEOUS QUANTITIES

1	LS	MOBILIZATION
1	LS	TRAFFIC CONTROL
1	EA	CULV, REM, 24 INCH TO 48 INCH
50	CYD	EMBANKMENT, CIP
540	CYD	EXCAVATION, EARTH
480	CYD	EXCAVATION, PEAT
760	CYD	BACKFILL, STRUCTURE, CIP
1	EA	EROSION CONTROL, FILTER BAG
150	FT	EROSION CONTROL, SILT FENCE
780	SYD	AGGREGATE BASE, 6 INCH
95	SYD	SHOULDER, CL II, 3 INCH
725	SYD	HMA SURFACE, REM
130	TON	HMA, 4E1
1	LS	CREEK DIVERSION
1	LS	DEWATERING
1	LS	ALUMINUM BOX CULVERT, 16'-6"x6'-8"
1	LS	CULVERT ASSEMBLY AND INSTALLATION
150	FT	GUARDRAIL, TYPE MGS-8
2	EA	GUARDRAIL LONG SPAN, DET MGS-2
4	EA	GUARDRAIL DEPARTING TERMINAL, TYPE MGS
8	EA	GUARDRAIL REFLECTOR
60	SYD	RIPRAP, PLAIN
18	SYD	RIPRAP, CHANNEL LINING
265	SYD	SLOPE RESTORATION



TOP OF RIPRAP MUST BE AT OR BELOW EXISTING STREAMBED /SLOPE ELEVATION.

AN APPROPRIATE METHOD OF WATER DIVERSION FOR PLACING RIPRAP SHALL BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. IF WATER IS SHALLOW (LESS THAN TWO FEET), TEMPORARY CONCRETE BARRIERS OR SANDBAGS MAY BE USED TO DIVERT FLOW.

THE RIPRAP SCHEME SHOWN IS A MINIMUM REQUIREMENT FOR SCOUR.

HEAVY GEOTEXTILE LINER SHALL BE NON WOVEN AND MEET THE REQUIREMENTS LISTED IN TABLE 910-1 OF THE CURRENT MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

RIPRAP HEADER DETAIL

SCALE 1" = 5'

0' 5' 10'

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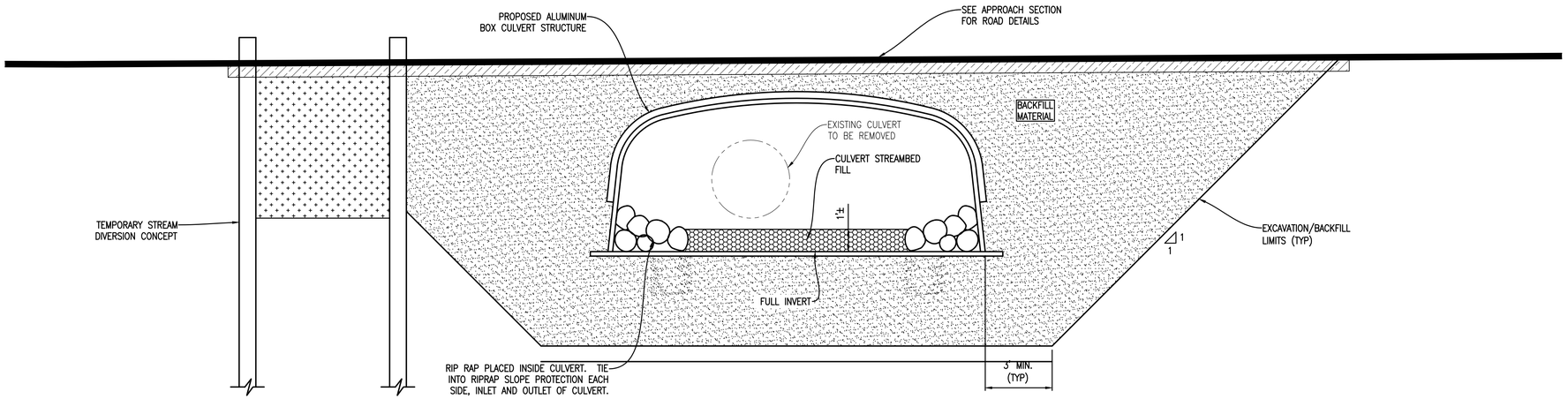


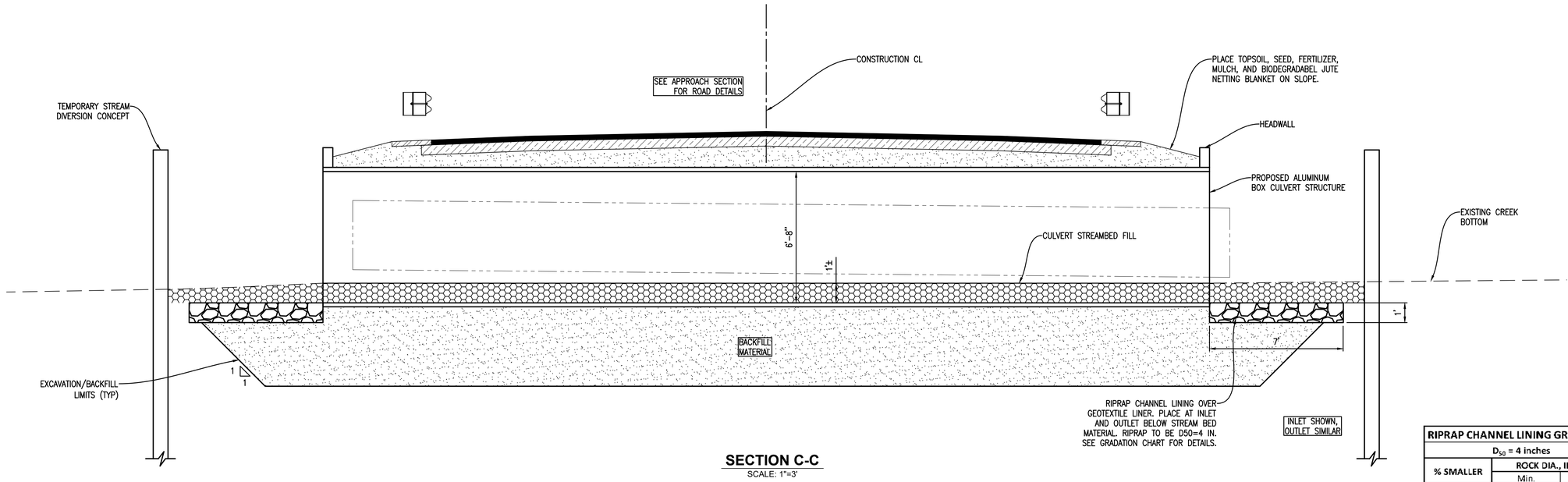
SECTION B-B

SCALE: 1"=3'

NOTES:

CULVERT STREAMBED FILL MATERIAL SHALL BE MIXTURE OF SILTY FINE SAND AND MEDIUM SAND MATERIALS EXCAVATED MATERIAL SALVAGED DURING CONSTRUCTION. IF A SUFFICIENT QUANTITY OF MATERIAL IS NOT SALVAGEABLE, USE CLASS II SAND.

BACKFILL MATERIAL SHALL BE CLASS II SAND COMPACTED TO MINIMUM 95% OF MAXIMUM DRY UNIT WEIGHT.



SECTION C-C

SCALE: 1"=3'

RIPRAP CHANNEL LINING GRADATION

D_{50} = 4 inches		
% SMALLER	ROCK DIA., INCHES	
	Min.	Max.
100	6.0	8.0
85	5.2	7.2
50	4.0	6.0
10	3.2	5.2

GoslingCzubak
engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
www.goslingczubak.com

CIVIL ENGINEERING
SURVEYING
ENVIRONMENTAL SERVICES
GEOTECHNICAL
CONSTRUCTION SERVICES
DRILLING
LANDSCAPE ARCHITECTURE

No.	Date	Revision	By
4	01-27-2022	ISSUED FOR PERMITS	RMV
3	12-10-2021	ROAD COMMISSION REVIEW	RMV
2	02-05-2021	PARTNER REVIEW PLAN SET	RMV
1	12-22-2020	CROSSINGS 1, 2, & 3 REVISIONS	RMV

GENERAL PLAN OF STRUCTURE - CROSSING 4
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued: 01-27-2022
Date Surveyed: 04-30-2020
Designed By: RMV
Drawn By: RMV
Checked By: MAG
Scale: AS NOTED

Original sheet size is 22x34

Location:
SECTIONS 23 & 24
T29N, R14W
GLEN ARBOR TOWNSHIP
LEELANAU COUNTY
MICHIGAN

Project Number:
2020430002

Sheet:
C4.4

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CR 675 Crossings Preliminary Engineering Report

Removed for size limitation, but available at:
https://leelanaucountyroads.org/public-info-meetings-notices

TECHNICAL MEMORANDUM

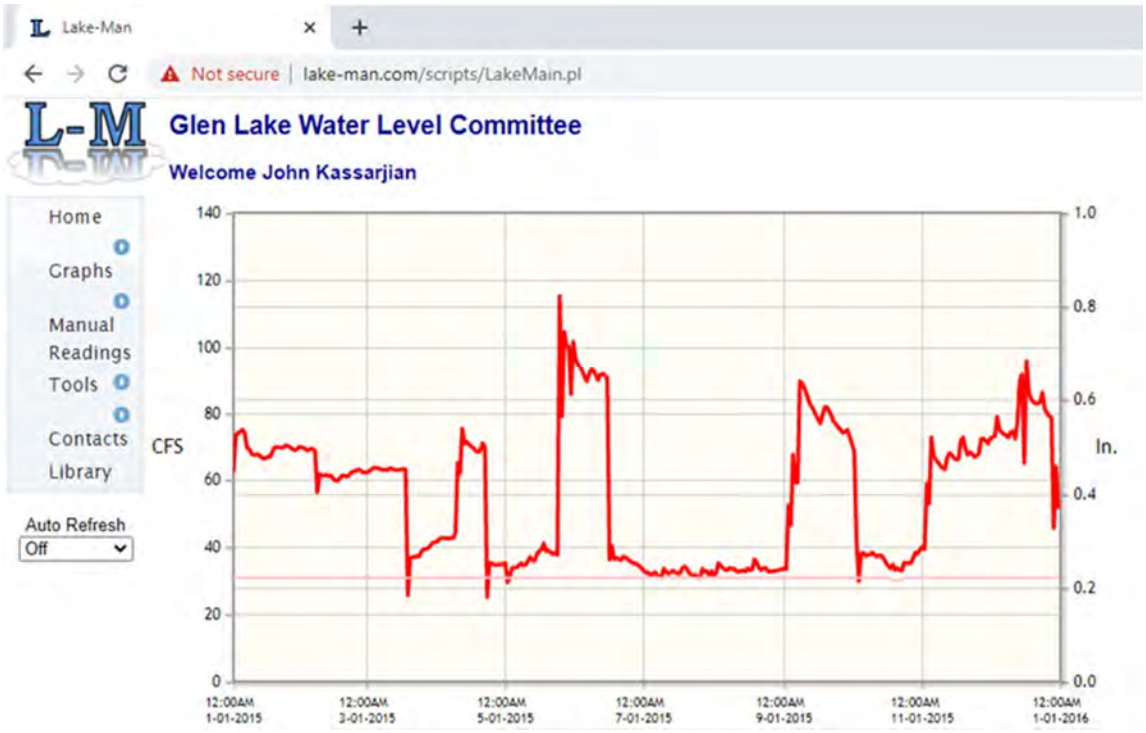
CR 675 Crossings Supplemental Information

To:	Leelanau County Road Commission GT Band of Ottawa & Chippewa Indians USDA-NRCS	Date:	January 27, 2022
From:	Robert Verschaeve	Re:	CR 675 Crossings Supplemental Information
cc:	Martin Graf		

This memo is provided to supplement the CR 675 Crossings Preliminary Engineering Report dated December 22, 2020. During review by the project partners, several questions arose requiring further attention or explanation. This memo provides documented responses to those questions.

The first item presented for further clarification is the base flow within the Crystal River used for the HEC-RAS analysis. As described in the report, it is understood that EGLE uses the rainfall-runoff methodology to calculate flood flows. Base flow is typically not included in those flood flows provided. As described in the report, a base flow of 1 cfs per square mile of drainage area was added to the flood flows analyzed in the HEC-RAS model. The drainage areas provided by EGLE for each crossing were 34.5 square miles for crossings 1 and 2; 33 square miles for crossing 3; and 2.5 square miles for crossing 4. The Base flows used in the analysis based on 1 cfs per square mile were 35 cfs for Crossings 1, 2, and 3 and 3 cfs for Crossing 4.

The original report notes the existence of extensive flow data collected over the years at the Fisher Lake Dam. The report also noted these flows generally in the 60-80 cfs range with peaks of 110 cfs and lows of 25 cfs. The data supporting this information was provided to us in graph form. The graphs from 2015-2017 are shown below.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Glen Lake Water Level Committee
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Manual Readings
Tools
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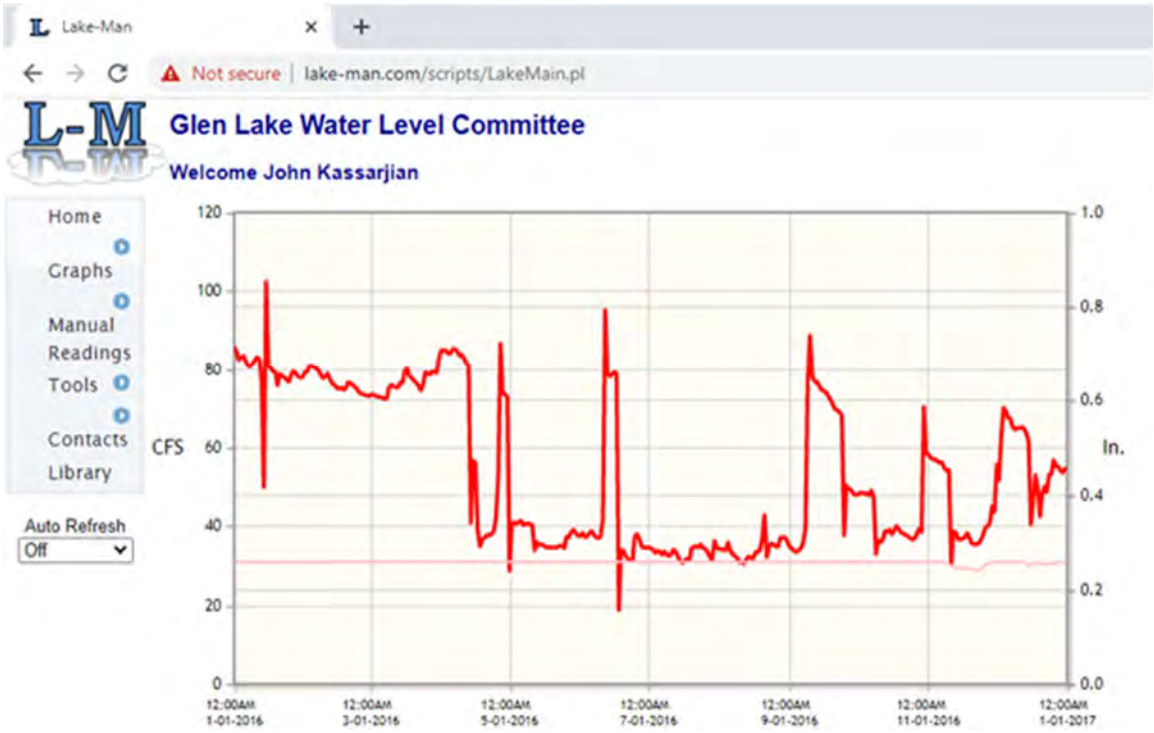
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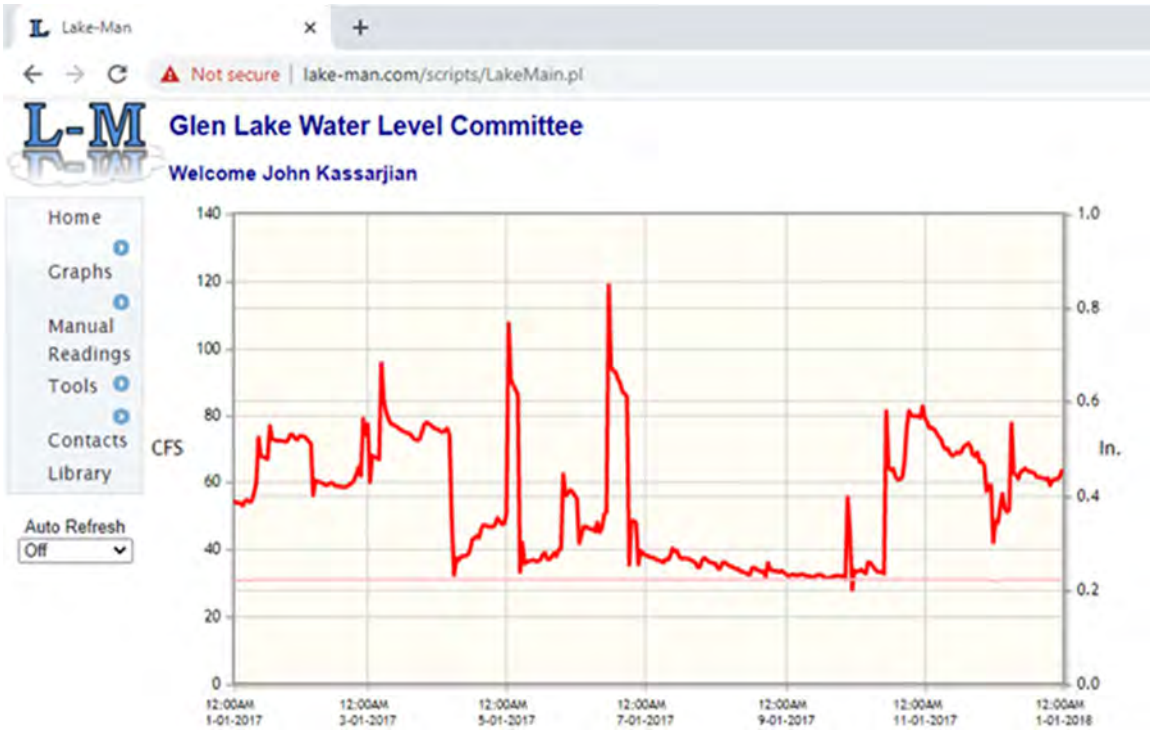


An older report dated November 2009 prepared for the Leelanau County Circuit Court – Technical Committee titled "Glen Lake – Crystal River Hydrological Assessment" was also recently provided by USDA-NRCS. An item of interest in this report is the system water balance calculations for surface water discharging over the dam to the Crystal River. Calculations of the following monthly flows over the dam for the 2006 (Average) System Water Balance were presented in this report as: April = 35.5 cfs, May = 69.5 cfs, June = 48.2 cfs, July = 33.1 cfs, August = 32.9 cfs, September = 30.9 cfs, and October = 45.9 cfs.

It is also understood that a court ordered minimum flow of 31 cfs has been established for the Crystal River system. The court order also established the normal lake level of Glen Lake at 596.75. The dam is used to maintain Glen Lake's lake level within a few inches of that elevation with the water level being slightly higher in the summer and slightly lower in the winter. These varying lake levels correspond to the higher and lower flows identified from the previous two sources as water is released in the winter for lower lake levels and retained in the summer for higher lake levels. The data from these available sources coupled with the court ordered minimum flow of 31 cfs corroborate the 35 cfs baseflow used in the HEC-RAS analysis as a valid estimate to be used with flood flows provided by EGLE for comparing changes between existing and proposed structures.

The second item presented for further clarification is the water surface elevations related to the bankfull ground elevations. Comments noted that bankfull ground elevations and water surface elevations from the 2-year event should closely match in a typical well-functioning river system. Results from the HEC-RAS models showed a consistent difference of the 2-year + base flow being about 1 foot below the bankfull ground elevation in the representative cross sections. The fact that the flow through the Crystal River is managed by the dam is likely the primary factor. The HEC-RAS modeling used a base flow of 35 cfs just above the court ordered minimum flow of 31 cfs in the river. The higher flows in the 60 – 80 cfs range released during other seasons may better align with observed bankfull elevations.

The other factor is the overall vastness of the river modeling compared to the survey data collected. There are three or four fully surveyed cross sections up and downstream of each crossing. The HEC-RAS models are generally built with cross sections approximately every 100 to 200 feet. These additional cross sections are set to the surveyed river profile with cross section floodplain data interpolated between the surveyed sections and digital model.

Following discussions with project partners and review of the original HEC-RAS modeling assumptions, it was decided that adjustments to the original model were warranted. Incremental adjustments to the Manning's roughness coefficients for the channel and overbank/floodplain areas were made in an effort to better align the 2-year flood plus base flow profile to the surveyed bankfull markers at the surveyed cross sections. The roughness coefficients adjustments were kept within the acceptable range for channel conditions that were previously observed. The HEC-RAS model for all the crossings were also updated with a separate flow regime of 35 cfs representing only the base flow without a storm event to show the low water elevations.

The updated 2 year + base flow elevation and bankfull survey elevation at the representative cross sections are as follows:

Crossing 1 (Sta 20+27)	2+Base: 583.83	Survey: 584.4
Crossing 2 (Sta 12+08)	2+Base: 586.06	Survey: 586.06
Crossing 3 (Sta 16+87)	2+Base: 587.53	Survey: 587.7

The updated hydraulic analysis table for each site are below:

Crossing 1

SUMMARY OF HYDRAULIC ANALYSIS											
		EXISTING				PROPOSED					
		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		WATER SURF. ELEV. (FT)		VELOCITY (FPS)			
FLOOD DATA	BASE + FLOOD (CFS)	U/S FACE OF CULVERTS	D/S FACE OF CULVERTS	U/S CHANNEL (200 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	U/S FACE OF BRIDGE	D/S FACE OF BRIDGE	U/S CHANNEL (200 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	35	583.36	583.23	0.3	0.6	583.24	583.23	0.3	0.2	146.7	-0.12
2-YR	70	584.20	583.93	0.4	0.9	583.93	583.93	0.4	0.4	215.2	-0.27
50-YR	145	585.71	584.99	0.6	1.6	585.00	584.99	0.7	0.6	242.9	-0.71
100-YR	165	586.18	585.22	0.6	1.7	585.24	585.23	0.7	0.7	256	-0.94

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 335.8.2 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

Crossing 2

SUMMARY OF HYDRAULIC ANALYSIS											
		EXISTING				PROPOSED					
		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		WATER SURF. ELEV. (FT)		VELOCITY (FPS)			
FLOOD DATA	BASE + FLOOD (CFS)	U/S FACE OF CULVERTS	D/S FACE OF CULVERTS	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	U/S FACE OF BRIDGE	D/S FACE OF BRIDGE	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	35	585.00	584.93	0.3	0.5	585.00	584.93	0.3	0.3	204.2	0.00
2-YR	70	586.03	585.78	0.4	0.8	585.92	585.75	0.4	0.4	241	-0.11
50-YR	145	588.17	587.15	0.6	1.3	587.23	586.99	0.6	0.6	629.9	-0.94
100-YR	165	588.92	587.49	0.7	1.4	587.50	587.26	0.7	0.7	344.4	-1.42

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 513.2 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

Crossing 3

SUMMARY OF HYDRAULIC ANALYSIS											
		EXISTING				PROPOSED					
		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		WATER SURF. ELEV. (FT)		VELOCITY (FPS)			
FLOOD DATA	BASE + FLOOD (CFS)	U/S FACE OF CULVERTS	D/S FACE OF CULVERTS	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	U/S FACE OF BRIDGE	D/S FACE OF BRIDGE	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	35	588.46	587.10	0.5	1.5	587.85	587.11	0.7	0.7	69.9	-0.61
2-YR	70	589.13	587.74	0.7	2.1	588.62	587.75	0.8	1.0	113.4	-0.51
50-YR	145	590.20	588.85	0.9	2.9	589.81	588.88	1.0	1.3	195.1	-0.39
100-YR	165	590.47	589.10	0.9	3.1	590.07	589.14	1.0	1.4	214.1	-0.40

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 556.0 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

Crossing 4

SUMMARY OF HYDRAULIC ANALYSIS							
EXISTING				PROPOSED			
FLOOD DATA	DISCHARGE (CFS)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE (FT)	VELOCITY IN D/S CHANNEL (FPS)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE (FT)	VELOCITY IN D/S CHANNEL (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
BASE	3	596.52	0.2	596.50	0.1	55.0	-0.02
2-YEAR	4	596.53	0.3	596.50	0.1	55.0	-0.03
50-YEAR	38	599.33	1.4	596.75	0.7	58.8	-2.58
100-YEAR	63	600.94	1.9	597.07	1.0	63.6	-3.87

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 2.5 SQUARE MILES.

THE MAXIMUM AREA BELOW LOW CHORD IS 78.3 SQUARE FEET.

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE ARE TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOODPLAIN.

The structure size for the Tucker Lake Outlet crossing was selected based on a review of standard aluminum box sizes that best fit the site constraints. In order to maintain adequate cover over the culvert structure and provide a buried invert, the 16'6" x 6'-8" structure was determined to fit best vertically while maximizing the span. The HEC-RAS analysis shows the flood flows all pass through the structure adequately. Discussion with Luke Golden from EGLE during a site visit confirmed that this was the main criteria he would want to see for this crossing in a permit application.

The streambed elevations at the structures were determined from the existing culvert and channel elevations in the immediate vicinity of each crossing. The differences between higher and lower culvert inverts at the crossings were split to set a stream bed elevation for the construction plans.

Gosling Czubak
engineering sciences, inc.

Project: County Road 675 Stream Crossings

Date: January 27, 2022
Project No.: 2020430002
By: RMV

Clients: Leelanau County Road Commission
Grand Traverse Band of Ottawa & Chippewa Indians

County Road 675 over the Crystal River - Crossing 1
Opinion of Probable Cost - Clear Span Steel w/ Asphalt Deck

Item No.	MDOT Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	*1000001*	Mobilization	1	LS	$36,000.00	$36,000.00
2		Traffic Control	1	LS	$14,000.00	$14,000.00
3	*2030003*	Culv, Rem, Over 48 inch	2	Ea	$2,000.00	$4,000.00
4	*2040035*	Guardrail, Rem	25	Ft	$4.00	$100.00
5	*2050010*	Embankment, CIP	50	Cyd	$15.00	$750.00
6	*2050015*	Excavation, Channel	900	Cyd	$30.00	$27,000.00
7	*2050016*	Excavation, Earth	400	Cyd	$15.00	$6,000.00
8	*2060002*	Backfill, Structure, CIP	500	Cyd	$35.00	$17,500.00
9	*2060010*	Excavation, Fdn	500	Cyd	$25.00	$12,500.00
10	*2080014*	Erosion Control, Filter Bag	2	Ea	$250.00	$500.00
11	*2080036*	Erosion Control, Silt Fence	100	Ft	$2.50	$250.00
12	*3020001*	Aggregate Base, 6 inch	700	Syd	$12.00	$8,400.00
13	*3070125*	Shoulder, Cl II, 3 inch	70	Syd	$10.00	$700.00
14	*5010005*	HMA Surface, Rem	850	Syd	$5.00	$4,250.00
15	*5010033*	HMA, 4E1	230	Ton	$100.00	$23,000.00
16	*7040007*	Cofferdams	1	LS	$25,000.00	$25,000.00
17	*7050002*	Pile Driving Equipment, Furn	1	LS	$15,000.00	$15,000.00
18	*7050030*	Pile, Steel, Furn and Driven, 12 inch	440	Ft	$75.00	$33,000.00
19	*7050031*	Test Pile, Steel, 12 inch	2	Ea	$1,500.00	$3,000.00
20	*7050039*	Pile Point, Steel	22	Ea	$200.00	$4,400.00
21	*7060012*	Conc, Grade S2, Subfooting	10	Cyd	$350.00	$3,500.00
22	*7060092*	Reinforcement, Steel, Epoxy Coated	11650	Lb	$2.50	$29,125.00
23	*7060100*	Substructure Conc	165	Cyd	$800.00	$132,000.00
24	*7060110*	Superstructure Conc	20	Cyd	$400.00	$8,000.00
25	*7060111*	Superstructure Conc, Form, Finish, and Cure	1	LS	$8,000.00	$8,000.00
26	*7077051*	Prefabricated Bridge Superstructure, Furn	2210	Sft	$135.50	$299,455.00
27	*7077051*	Prefabricated Bridge Superstructure, Erect	1	LS	$18,000.00	$18,000.00
28	*7100001*	Joint Waterproofing	260	Sft	$5.00	$1,300.00
29	*8070044*	Guardrail Approach Terminal, Type 2M	1	Ea	$3,000.00	$3,000.00
30	*8070051*	Guardrail Departing Terminal, Type T	1	Ea	$1,500.00	$1,500.00
31	*8077051*	Guardrail Departing Terminal, Type T, Modified	2	Ea	$2,000.00	$4,000.00
32	*8070080*	Guardrail Reflector	6	Ea	$5.00	$30.00
33	*8070130*	Guardrail Anch, Bridge, Det M1	1	Ea	$3,000.00	$3,000.00
34	*8077130*	Guardrail Anch, Bridge, Det M1, Modified	1	Ea	$3,500.00	$3,500.00
35	*8130005*	Riprap, Heavy	150	Syd	$110.00	$16,500.00
36	*8160050*	Slope Restoration	235	Syd	$5.00	$1,175.00
37		Utility Pole relocation	1	LS	$5,000.00	$5,000.00
					Subtotal	$772,435.00
					Construction Engineering & Contingency (25%)	$193,108.75
					Project Total	**$965,544**

Gosling Czubak
engineering sciences, inc.

Project: County Road 675 Stream Crossings

Date: January 27, 2022
Project No.: 2020430002.00
By: RMV

Clients: Leelanau County Road Commission
Grand Traverse Band of Ottawa & Chippewa Indians

County Road 675 over the Crystal River - Crossing 2
Opinion of Probable Cost - Timber Structure - 80 ft total span

Item No.	MDOT Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	*1000001*	Mobilization	1	LS	$35,000.00	$35,000.00
2		Traffic Control	1	LS	$14,000.00	$14,000.00
3	*2030002*	Culv, Rem, 24 inch to 48 inch	2	Ea	$1,000.00	$2,000.00
4	*2030003*	Culv, Rem, Over 48 inch	1	Ea	$2,000.00	$2,000.00
5	*2040035*	Guardrail, Rem	150	Ft	$4.00	$600.00
6	*2050010*	Embankment, CIP	50	Cyd	$15.00	$750.00
7	*2050015*	Excavation, Channel	650	Cyd	$30.00	$19,500.00
8	*2050016*	Excavation, Earth	800	Cyd	$15.00	$12,000.00
9	*2060002*	Backfill, Structure, CIP	200	Cyd	$35.00	$7,000.00
10	*2060010*	Excavation, Fdn	200	Cyd	$25.00	$5,000.00
11	*2080014*	Erosion Control, Filter Bag	2	Ea	$250.00	$500.00
12	*2080036*	Erosion Control, Silt Fence	100	Ft	$2.50	$250.00
13	*3020001*	Aggregate Base, 6 inch	900	Syd	$12.00	$10,800.00
14	*3070125*	Shoulder, Cl II, 3 inch	55	Syd	$10.00	$550.00
15	*5010005*	HMA Surface, Rem	1090	Syd	$5.00	$5,450.00
16	*5010033*	HMA, 4E1	200	Ton	$100.00	$20,000.00
17		Temporary Stream Control	1	LS	$15,000.00	$15,000.00
18	*7050002*	Pile Driving Equipment, Furn	1	LS	$15,000.00	$15,000.00
19	*7050010*	Pile, Treated Timber, Furn	1340	Ft	$22.00	$29,480.00
20	*7050011*	Pile, Treated Timber, Driven	1340	Ft	$25.00	$33,500.00
21	*7050015*	Test Pile, Treated Timber	4	Ea	$1,500.00	$6,000.00
22	*7090001*	Structure, Timber,34' x 80', Furn	1	LS	$450,000.00	$450,000.00
23	*7097051*	Structure, Timber, 34' x 80', Install	1	LS	$23,000.00	$23,000.00
24	*8070044*	Guardrail Approach Terminal, Type 2M	1	Ea	$3,000.00	$3,000.00
25	*8070051*	Guardrail Departing Terminal, Type T	1	Ea	$1,500.00	$1,500.00
26	*8077051*	Guardrail Departing Terminal, Type T, Modified	2	Ea	$2,000.00	$4,000.00
27	*8070080*	Guardrail Reflector	6	Ea	$5.00	$30.00
28	*8070130*	Guardrail Anch, Bridge, Det M1	1	Ea	$3,000.00	$3,000.00
29	*8077130*	Guardrail Anch, Bridge, Det M1, Modified	1	Ea	$3,500.00	$3,500.00
30	*8130005*	Riprap, Heavy	150	Syd	$110.00	$16,500.00
31	*8160050*	Slope Restoration	290	Syd	$5.00	$1,450.00
32		Utility Pole relocation	1	LS	$5,000.00	$5,000.00
					Subtotal	$745,360.00
					Construction Engineering & Contingency (25%)	$186,340.00
					Project Total	**$931,700**

Gosling Czubak
engineering sciences, inc.

Project: County Road 675 Stream Crossings

Date: January 27, 2022
Project No.: 2020430002.00
By: RMV

Clients: Leelanau County Road Commission
Grand Traverse Band of Ottawa & Chippewa Indians

County Road 675 over the Crystal River - Crossing 3
Opinion of Probable Cost - Timber Structure- 80 ft Total Span

Item No.	MDOT Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	*1000001*	Mobilization	1	LS	$38,000.00	$38,000.00
2		Traffic Control	1	LS	$15,000.00	$15,000.00
3	*2030002*	Culv, Rem, 24 inch to 48 inch	3	Ea	$1,000.00	$3,000.00
4	*2040035*	Guardrail, Rem	245	Ft	$4.00	$980.00
5	*2050010*	Embankment, CIP	50	Cyd	$15.00	$750.00
6	*2050015*	Excavation, Channel	735	Cyd	$30.00	$22,050.00
7	*2050016*	Excavation, Earth	700	Cyd	$15.00	$10,500.00
8	*2060002*	Backfill, Structure, CIP	275	Cyd	$35.00	$9,625.00
9	*2060010*	Excavation, Fdn	275	Cyd	$25.00	$6,875.00
10	*2080014*	Erosion Control, Filter Bag	2	Ea	$250.00	$500.00
11	*2080036*	Erosion Control, Silt Fence	100	Ft	$2.50	$250.00
12	*3020001*	Aggregate Base, 6 inch	1335	Syd	$12.00	$16,020.00
13	*3070125*	Shoulder, Cl II, 3 inch	160	Syd	$10.00	$1,600.00
14	*5010005*	HMA Surface, Rem	1530	Syd	$5.00	$7,650.00
15	*5010033*	HMA, 4E1	280	Ton	$100.00	$28,000.00
16		Temporary Stream Control	1	LS	$16,000.00	$16,000.00
17	*7050002*	Pile Driving Equipment, Furn	1	LS	$15,000.00	$15,000.00
18	*7050010*	Pile, Treated Timber, Furn	1555	Ft	$22.00	$34,210.00
19	*7050011*	Pile, Treated Timber, Driven	1555	Ft	$25.00	$38,875.00
20	*7050015*	Test Pile, Treated Timber	4	Ea	$1,500.00	$6,000.00
21	*7090001*	Structure, Timber, 34'x 80', Furn	1	LS	$450,000.00	$450,000.00
22	*7097051*	Structure, Timber, 34'x 80', Install	1	LS	$23,000.00	$23,000.00
23		Timber Retaining Wall Lagging	1	LS	$8,500.00	$8,500.00
24		Timber Retaining Wall Lagging Install	1	LS	$8,500.00	$8,500.00
25	*8070130*	Guardrail Anch, Bridge, Det M1	4	Ea	$3,000.00	$12,000.00
26	*8070044*	Guardrail Approach Terminal, Type 2M	4	Ea	$3,000.00	$12,000.00
27	*8070080*	Guardrail Reflector	10	Ea	$5.00	$50.00
28	*8130005*	Riprap, Heavy	170	Syd	$110.00	$18,700.00
29	*8160050*	Slope Restoration	780	Syd	$5.00	$3,900.00

Subtotal	$807,535.00
Construction Engineering & Contingency (25%)	$201,883.75
Project Total	**$1,009,419**

Gosling Czubak
engineering sciences, inc.

Project: County Road 675 Stream Crossings

Date: January 27, 2022
Project No.: 2020430002.00
By: RMV

Clients: Leelanau County Road Commission
Grand Traverse Band of Ottawa & Chippewa Indians

County Road 675 over Tucker Lake Outlet - Crossing 4
Opinion of Probable Cost - Aluminum Box Culvert

Item No.	MDOT Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	*1000001*	Mobilization	1	LS	$11,000.00	$11,000.00
2		Traffic Control	1	LS	$4,000.00	$4,000.00
3	*2030002*	Culv, Rem, 24 inch to 48 inch	1	Ea	$2,000.00	$2,000.00
4	*2050010*	Embankment, CIP	50	Cyd	$15.00	$750.00
5	*2050016*	Excavation, Earth	540	Cyd	$15.00	$8,100.00
6	*2050017*	Excavation, Peat	480	Cyd	$20.00	$9,600.00
7	*2060002*	Backfill, Structure, CIP	760	Cyd	$35.00	$26,600.00
8	*2080014*	Erosion Control, Filter Bag	1	Ea	$250.00	$250.00
9	*2080036*	Erosion Control, Silt Fence	150	Ft	$2.50	$375.00
10	*3020001*	Aggregate Base, 6 inch	780	Syd	$12.00	$9,360.00
11	*3070125*	Shoulder, Cl II, 3 inch	95	Syd	$10.00	$950.00
12	*5010005*	HMA Surface, Rem	725	Syd	$5.00	$3,625.00
13	*5010033*	HMA, 4E1	130	Ton	$100.00	$13,000.00
14	*7047007*	Creek Diversion	1	LS	$15,000.00	$15,000.00
15		Dewatering	1	LS	$15,000.00	$15,000.00
16		Aluminum Box Culvert, 16'-6"x6'-8"	1	LS	$80,000.00	$80,000.00
17		Culvert Assembly and Installation	1	LS	$12,000.00	$12,000.00
18	*8070004*	Guardrail, Type MGS-8	150	Ft	$25.00	$3,750.00
19	*8070052*	Guardrail Departing Terminal, Type MGS	4	Ea	$1,000.00	$4,000.00
20	*8077050*	Guardrail Long Span, Det MGS-2	2	Ea	$1,500.00	$3,000.00
21	*8070080*	Guardrail Reflector	8	Ea	$5.00	$40.00
22	*8130005*	Riprap, Plain	60	Syd	$75.00	$4,500.00
23		Riprap Channel Lining	18	Syd	$75.00	$1,350.00
24	*8160050*	Slope Restoration	265	Syd	$5.00	$1,325.00

Subtotal	$229,575.00
Construction Engineering & Contingency (25%)	$57,393.75
Project Total	**$286,969**

Computation Sheet

NRCS-ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State	Project		
MI	Crystal River Site #1 Most DS Bridge		
By: A. Paladino	Date: 12-16-21	Checked by:	Date:
Job No.			
Subject: Scenario Calculation FY 2021 Scenario 62	Sheet ____ of ____		

Crystal #1 Steel Superstructure

Pre-Engineered Steel Superstructure

65' Span

Scenario 62: "Bridge, Manufactured, foundation Modification"

Measurement is the linear feet of bridge deck

FY 21 Scenario

$2416.58 65'(2416.58) = $157,077.7

Based on FY 2021 Scenario description for Scenario 62 - Bridge, Manufactured, foundation Modification

I believe this Scenario best matches the design for this bridge. This assessment is based on the Source 4 Designer's Design, which calls out a 65' Pre-engineered Steel superstructure. The design report p. 17 indicates the structure would require conventional driven steel pile and concrete abutment foundations and wing walls to support the superstructure. Asphalt surfacing over a metal decking system over the steel beams.

*NOTE: Confirm Scenario measurement has not changed or make needed updates once FY 22 guidance is available.

Computation Sheet

NRCS-ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State	Project		
MI	Crystal River Site #2 2nd from DS Bridge		
By: A. Paladino	Date: 1-28-22	Checked by	Date
Job No.			
Subject: Scenario Calc. FY 2021 Scenario 11		Sheet ____ of ____	

Crystal #2 Timber Bridge

Scenario 11: Bridge; Timber Decking, Timber Supports, Timber Pilings

measurement is by cubic feet

BF width X Clear deck Bridge width x total abutment ht

73' X 34' X 8' = 19856

FY 22 Scenario HU = $48.06 unit cost

Bankfull width = 73 ft

Clear deck width = 34 ft

Total Abutment ht = Provided by Bob V. (Gasling (Zubak) 8 ft. (1-27-22)

$ 48.06 (19856) = $ 954,279

*NOTE: Confirm scenario measurement has not changed or make needed updates once FY 22 final guidance document is available.

Computation Sheet

NRCS–ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State	Project		
MI	Crystal River Site # 3 3rd from DS Bridge		
By: A. Paladino	Date: 1-28-22	Checked by	Date
Subject: Scenario Calculation FY2021 Scenario 11		Job No.	Sheet ____ of ____

Crystal # 3 Timber Bridge

Scenario 11: Bridge: Timber Decking, Timber Supports, Timber Pilings

measurement is by cubic feet

BF width X clear deck Bridge width X total abutment ht.

Bankfull width = 77 ft

Clear deck width = 34 ft

Total Abutment ht. = Provided by Bob V. (Gosling Czubak) 8 ft. (1-27-22)

77' X 34' X 8.0' = 20944

FY21 Scenario HU = $48.06 unit cost

$ 48.06 (20944 ft³) = $ 1,006,568.64

* NOTE: Confirm scenario measurement has not changed or make needed updates once FY 22 final guidance document is available.

Computation Sheet

NRCS-ENG-523A Rev. 6-2002

U.S. Department of Agriculture
Natural Resources Conservation Service

State	Project			
MI	Tucker Lake outlet (Site # 4)			
By: A. Paladino	Date: 12-8-21	Checked by:	Date:	Job No.:
Subject: Scenario Calc. FY 2021 Scenario 29				Sheet ____ of ____

Aluminum Box Culvert

16'-6" Span x 6'-8" Rise

Area = 98.3 SF (Published x-Section)

Scenario 29 Multiplate Full invert Culvert
Area 124 sf or less

Measurement is by cubic ft
(Published x-sectional area) (Length of culvert under the Rd + total width of shoulders)

Length of culvert under the Rd = 24'

Total width of Shoulders = 10 ft

98.3 SF (24' + 10') = 3342.2 ft3

FY21 Scenario 29 HV = $43.51 unit cost

3342.2 ft3 ($43.51) = $ 145,419.12

* NOTE: Confirm scenario measurement has not changed or make needed updates once FY 22 guidance is available.

Bob Verschaeve, P.E.

From:	DJ Shook <DJ@rivercare.org>
Sent:	Sunday, November 22, 2020 6:32 PM
To:	Keith Moore; Martin Graf, P.E.; Bob Verschaeve, P.E.
Cc:	'Brendan Mullane'; 'Fessell, Brett'
Subject:	RE: CR 675 Crystal River Crossings
Attachments:	396_MI_SOW_Aquatic_Organism_Passage_2015.pdf; 396 _MI_CPS_Aquatic_Organism_Passage_2015.pdf; Engineer_Tech_Assist_Source_4_R__R_ 09-10-15_.pdf

Hello All,

Thanks for pushing forward on this project. Pertaining to my comments on increasing size of some of the structures, copied below is an excerpt from the USDA-NRCS Aquatic Organism Passage conservation practice standard (also attached):

Design Requirements

Design passage to accommodate present and reasonably anticipated changes in watershed conditions.

Design passage structures according to known swimming and leaping capabilities of target species or a similar species with comparable swimming abilities. Utilize hydraulic computations to document how designs satisfy the physiological requirements of target organisms.

Design passage structures to mimic channel geometry and morphology referenced from an adjacent reach or analog stream when the swimming and leaping abilities of target species are unknown, or when a project will benefit multiple aquatic organisms.

The objective of these road-stream crossing projects are intended to benefit multiple aquatic organisms, therefore we need to mimic the channel geometry (cross-section and slope) underneath the new bridges from the adjacent reaches that we are using as analogs.

For crossing #1, it appears that the cross section at station 20+27 would fit within the abutments of a 60ft span bridge provided the scour protection rip rap can be set at an elevation below the streambed elevation at the margins of the river. Mid-channel occlusions are not included in the analog reaches for this crossing, therefore the steel super structure alternative should be selected because that alternative does not include piles in the center of the stream.

For crossing #2, it appears that the cross sections at station 12+08 or station 19+18 would be a good fit for mimicking under the bridge. To mimic these cross sections, the total span of the structure needs to span the bankfull width and the scour protection rip rap would need to be designed to not encroach into the channel or set at an elevation below the streambed elevation at the margins of the river.

For crossing #3, it appears that the cross section at station 16+87 would be a good fir for mimicking under the bridge. To mimic this cross section, the total span of the structure needs to span the bankfull width and the scour protection rip rap would need to be designed to not encroach into the channel or set at an elevation below the streambed elevation at the margins of the river. Since a head-cut is anticipated at this road-stream crossing, the mimicked channel cross-section should be shown at an elevation after the head-cut has worked its way as far upstream as it is going to go.

The design report, should indicate the station of the cross sections that are being mimicked underneath the bridges and plot those cross sections with base-flow water-surface and bankfull water-surface indicated on those cross sections.

For the Tucker Lake Outlet Crossing, the aluminum box culvert meets the objectives of the project and is the cheaper option, so that is the best way to go.

In order to document that the designs meet the Aquatic Organism Passage conservation practice standard, all of the items in the attached scope of work and roles and responsibility document needs to be functionally reviewed and approved by NRCS engineering.

Thanks again.

DJ Shook
Biologist/Project Manager
Conservation Resource Alliance
Bayview Professional Centre
10850 Traverse Highway, Suite 1180
Traverse City MI 49684
Phone 231-946-6817 – office
Phone 231-492-7587 – mobile
Fax 231-947-5441
Email dj@rivercare.org

Conservation Resource Alliance

Read the latest from CRA in our Fall Catalyst!

From: Keith Moore <kmoore@leelanauroads.org>
Sent: Wednesday, November 18, 2020 12:39 PM
To: Martin Graf <magraf@goslingczubak.com>; Bob Verschaeve <rmverschaeve@goslingczubak.com>
Cc: 'Brendan Mullane' <bmullane@leelanauroads.org>; DJ Shook <DJ@rivercare.org>; 'Fessell, Brett' <Brett.Fessell@gtbindians.com>
Subject: CR 675 Crystal River Crossings

Martin and Bob,
Just a follow up email per our phone conversation yesterday.
As discussed we need to push forward toward final design of the structures while updating to include the design notations by DJ Shook. He indicated larger spans to eliminate piles in the stream bed, along with riprap placement for scour. The timeframe for final design, as indicated by DJ earlier this summer, was by late December. There are still some meetings to set up for public comments with the Crystal River Groups, which may add to design changes.
LCRC is looking for a deadline date to be able to start scheduling any additional meetings that may be required to get the structure design approved. The month of December is typically a very busy time for all and scheduling may be more difficult than anticipated.

Thank you,

Keith Moore

Engineering Technician
Leelanau County Road Commission
231-271-3993 ext 224
kmoore@leelanauroads.org

Paladino, Andrea - NRCS, Traverse City, MI

From: Bob Verschaeve, P.E. <rmverschaeve@goslingczubak.com>
Sent: Thursday, January 6, 2022 11:04 AM
To: Paladino, Andrea - NRCS, Traverse City, MI; Brett.Fessell@gtbindians.com; Melissa.Witkowski@gtbindians.com; DJ Shook
Cc: Martin Graf, P.E.; Engineer Craig Brown; Manager Brendan Mullane
Subject: [External Email]DOCUMENTATION - Crystal River sites and Tucker lake outlet
Attachments: Supplemental Memo_01062022.pdf; EGLE FLood Flows.pdf; HECRAS Input for Crossing 3.pdf; HECRAS Input for Crossing 4.pdf; HECRAS Input for Crossings 1 and 2.pdf; HECRAS Output for Crossing 3.pdf; HECRAS Output for Crossing 4.pdf; HECRAS Outuput for Crossings 1 and 2.pdf; Scour Calculations 2021-01-12.pdf; Crossing 1 abutments.pdf; Crossing 2 & 3 foundation loads.pdf; Crossing 4 I-O Riprap lining.pdf; Crossing 4-Aquatic Organism passage OM Plan.pdf; Crossing 4-Aquatic Organism Passage (396) Inspection Checklist.pdf; Crossing 4-AOP (396) Inspection Plan.pdf; Crossing 3-Aquatic Organism passage OM Plan.pdf; Crossing 3-Aquatic Organism Passage (396) Inspection Checklist.pdf; Crossing 3-AOP (396) Inspection Plan.pdf; Crossing 2-Aquatic Organism passage OM Plan.pdf; Crossing 2-Aquatic Organism Passage (396) Inspection Checklist.pdf; Crossing 2-AOP (396) Inspection Plan .pdf; Crossing 1-Aquatic Organism passage OM Plan.pdf; Crossing 1-Aquatic Organism Passage (396) Inspection Checklist.pdf; Crossing 1-AOP (396) Inspection Plan.pdf

Hi Andrea,
Attached to this email is documentation for the Crystal River sites that addresses questions from previous communications including the message below. The Items attached are:

- Supplemental memo. This item documents the responses to those questions.
- EGLE flood flow documentation
- HEC-RAS input and output documentation
- Scour calculations
- Crossing 1 abutments loading
- Crossings 2 and 3 foundation loads
- Crossing 4 riprap lining
- Inspection plans, Inspection checklist, and O&M plans for each crossing.

EGLE permits are required for each crossing. It is anticipated application(s) will be submitted through Mi-Waters in the near future.

Please let me know if you have any questions or comments.

Thanks,
Bob V.

--
Robert Verschaeve, P.E. | Project Manager
Gosling Czubak Engineering Sciences, Inc.

From: Paladino, Andrea - NRCS, Traverse City, MI <andrea.paladino@usda.gov>
Sent: Thursday, December 16, 2021 2:47 PM

To: Bob Verschaeve, P.E. <rmverschaeve@goslingczubak.com>; Brett.Fessell@gtbindians.com; Melissa.Witkowski@gtbindians.com; DJ Shook <dj@rivercare.org>
Cc: Martin Graf, P.E. <magraf@goslingczubak.com>
Subject: Crystal River sites and Tucker lake outlet

Hi Bob,
As you look to finalize these site designs and as a follow up to my email earlier today, I wanted to send along a couple documents with highlighted items on what I will need to complete the functional review for NRCS. I provided paper copies of these at our last meeting at the LCRC office but wanted to reference them here again and provide a little clarification to the documents. Please let me know if you have any questions on what I need.

For our current I&E phase could you please provide me with a copy of the EGLE flood flows for Crystal and Tucker Lake outlet as well as a copy of the HECRAS report and summary. In looking at the tucker lake outlet flows in table 1of the report, I see there is no base flows listed, could you please provide clarification is there always some flow in the channel? Also, in looking at the summary of hydraulic analysis on page 12 of the report it looks like it might be for the bridge that was originally considered. Could you please provide the analysis for the selected Aluminum box culvert and a little discussion on how the structure size was selected to meet project objectives.

Thank you!
Andrea

Andrea Paladino
Civil Engineer, P.E.
USDA-NRCS
Cell: 989-698-6036
Phone: 231-486-2523
andrea.paladino@usda.gov

From: Bob Verschaeve, P.E. <rmverschaeve@goslingczubak.com>
Sent: Tuesday, December 14, 2021 2:27 PM
To: Brett.Fessell@gtbindians.com; Melissa.Witkowski@gtbindians.com; DJ Shook <dj@rivercare.org>; Paladino, Andrea - NRCS, Traverse City, MI <andrea.paladino@usda.gov>
Cc: Martin Graf, P.E. <magraf@goslingczubak.com>
Subject: RE: Crystal River Designs -BF widths - abutments heights.

Team,
I apologize for the delay in getting back to you on these questions. I was able to spend some time looking back at the data and updated some of the drawings to help everyone understand.

First, regarding the bankfull calls and widths, I have updated sheets H1 and H4 (attached) with some clarifying points. The locations from which the information in Table 3 of the report comes from are shown in purple on these sheets. During the survey last year, many bankfull points were identified along the reaches for our surveyors to pick up along with the pool and riffle points. These are the data points that the Table 3 information comes from. Some of these locations had points across from each other on either bank clearly establishing a bankfull width. Other locations had two points along the same bank with a point on the opposite bank somewhere between. An “interpolation” was made in that instance. Other locations had a bankfull call out on one bank and an edge of water shot on the other bank that was used.

The representative cross sections presented in Table 4 on page 6 came directly from DJ's 11-22-2020 recommendations. A copy of the email he sent to team members is attached. We agreed with his review and proceeded with those representative cross sections. In retrospect, it might have been less confusing to not have table 3 after the representative cross sections were selected and added to the report. I can update and revise the report if desired, just let me know.

To answer Brett and Andrea's bankfull and water surface question, the bankfull survey elevations noted on these cross sections are ground elevations, not water surface elevations. The 2 year WSE elevations being consistently below these bankfull elevations makes sense to me with respect to the hydraulic modeling. If the bankfull elevations represent the point where the river overflows its channel and into the floodplain, that would be expected to occur during a larger flood event.

At this point, I think the representative cross sections are the way to go for the bankfull widths. The structure spans and riprap elevations are based off these too.

Regarding the abutment heights, the other sheets attached show these dimensions. All the crossings show the dimension from the top of the abutment cap to the stream bed elevation. The intent for the timber bridges is to have the backer boards extend to at least this elevation. The concrete abutment for crossing 1 does need to extend below the stream bed elevation to provide required embedment depth for the piles. Each of those abutments is 8.5 feet tall and that dimension is also shown.

Please let me know if you have any other questions or comments.

--
Robert Verschaeve, P.E. | Project Manager
Gosling Czubak Engineering Sciences, Inc.

From: Paladino, Andrea - NRCS, Traverse City, MI <andrea.paladino@usda.gov>
Sent: Wednesday, December 8, 2021 3:02 PM
To: Fessell, Brett <Brett.Fessell@gtbindians.com>; Witkowski, Melissa <Melissa.Witkowski@gtbindians.com>; DJ Shook <dj@rivercare.org>
Cc: Martin Graf, P.E. <magraf@goslingczubak.com>; Bob Verschaeve, P.E. <rmverschaeve@goslingczubak.com>
Subject: RE: Crystal River Designs -BF widths - abutments heights.

Hi Brett,
Thanks for the message getting us all in communication. I did see that In looking at the last page of Appendix 1 in the report, that the three cross sections called out as representative in table 4 are plotted with the (base+2yr HECRAS WSE). In each of these cross sections the 2 year event appear to be consistently 1ft. below the bankfull elevation as identified?? I agree with Brett that we like to see the flow model support the bankfull calls and having the converging evidence of flows and bankfull width are good to support each other or identify if something needs another look.

Bob and Martin, I had a question as to the reason the representative design cross sections were selected? Were these the cross sections that were thought to be the best representations of a functioning cross section outside the influence of the current crossings with observable BKF indicators? Or were there other reasons?

For the abutment heights, we are looking for the heights that include the abutment cap.

Thanks!
Andrea

Andrea Paladino

Civil Engineer, P.E.
USDA-NRCS
Cell: 989-698-6036
Phone: 231-486-2523
andrea.paladino@usda.gov

From: Fessell, Brett <Brett.Fessell@gtbindians.com>
Sent: Wednesday, December 8, 2021 2:12 PM
To: Paladino, Andrea - NRCS, Traverse City, MI <andrea.paladino@usda.gov>; Witkowski, Melissa <Melissa.Witkowski@gtbindians.com>; DJ Shook <DJ@rivercare.org>
Cc: Martin Graf <magraf@goslingczubak.com>; Bob Verschaeve <rmverschaeve@goslingczubak.com>
Subject: RE: Crystal River Designs -BF widths - abutments heights.

Good Afternoon Andrea-

I have not received any clarification from Bob or Martin on either the abutment heights or bankfull calls in the report. I've copied them on this so that they may respond as well. As a matter for consideration on bankfull calls, all the crossings with the exception of #3 are within a few feet of each other and even though the difference between upstream and downstream at crossing #3 is 20ft, which is basically a consequence of the undersized culverts, I am of the opinion (of course I am not an engineer) that we could safely use the average BKF width at each site Where:

Site	U/S	D/S	Ave
#1	62	69	66
#2	83	86	85
#3	80	60	70
Tucker	35	32	34

Alternatively, we could err on the conservative side and run with the greater of each width at each crossing…?

The only remaining question I have for the calls is whether elevations were taken at each BKF width measurement cited and how they compare to what was used in hydraulic model. I'm assuming they should be at least close to the 2-year event elevation? Thus your question regarding abutment height clarification?

Thanks and others please chime in.

Brett P. Fessell
Restoration Section Leader
River Ecologist
Natural Resources Department
Grand Traverse Band of Ottawa and Chippewa Indians
Field Contact Cell: 231-866-6063 or 231-342-1491

From: Paladino, Andrea - NRCS, Traverse City, MI <andrea.paladino@usda.gov>
Sent: Wednesday, December 8, 2021 9:38 AM
To: Witkowski, Melissa <Melissa.Witkowski@gtbindians.com>; DJ Shook <DJ@rivercare.org>; Fessell, Brett <Brett.Fessell@gtbindians.com>
Subject: Crystal River Designs -BF widths - abutments heights.

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Good Morning to you all,
DJ and Brett, at our last meeting with Bob and Martin from Gosling Czubak they were going to clarify the bankfull calls and the abutment heights for the timber bridges so that we would be able to clarify the scenario quantities for contract calculations. Table 3 (p.4 of report) and Table 4 (p.6 of report) had different Bankfull measurements listed. Have you received any clarification for the bankfull calls and abutment heights or final designs from them yet? I just need that information to be able to calculate the scenario quantities which I wanted to get to Melissa in the near future.

Thankyou!
Andrea

Andrea Paladino
Civil Engineer, P.E.
USDA-NRCS
Cell: 989-698-6036
Phone: 231-486-2523
andrea.paladino@usda.gov

CROSSING 1 – CRYSTAL RIVER
HYDRAULIC SURVEY ALIGNMENT

CROSSING 2 – CRYSTAL RIVER
HYDRAULIC SURVEY ALIGNMENT

X-SECTION
STA 20+27

X-SECTION
STA 12+08

BANKFULL
SURVEY POINT

69'

BANKFULL
SURVEY POINT

BANKFULL
SURVEY POINT

BANKFULL
SURVEY POINT

83'

BANKFULL
SURVEY POINT

BANKFULL
SURVEY POINT

62'

EDGE OF WATER
SURVEY POINT

EDGE OF WATER
SURVEY POINT

86'

BANKFULL
SURVEY POINT

BANKFULL
SURVEY POINT

FF=588.96

SAN MH
RIM=587.78

ISO MON

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 28+50 28+77

HYDRAULIC SURVEY PLAN

SCALE : 1" = 100'

NORTH

SCALE 1" = 100'

0' 100' 200'

Gosling Czubak
engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
www.goslingczubak.com

CIVIL ENGINEERING
SURVEYING
ENVIRONMENTAL SERVICES
GEOTECHNICAL
CONSTRUCTION SERVICES
DRILLING
LANDSCAPE ARCHITECTURE

No.	Date	Revision	By

HYDRAULIC SURVEY PLAN - CROSSINGS 1 & 2
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued:	----
Date Surveyed:	----
Designed By:	----
Drawn By:	----
Checked By:	----
Scale:	----

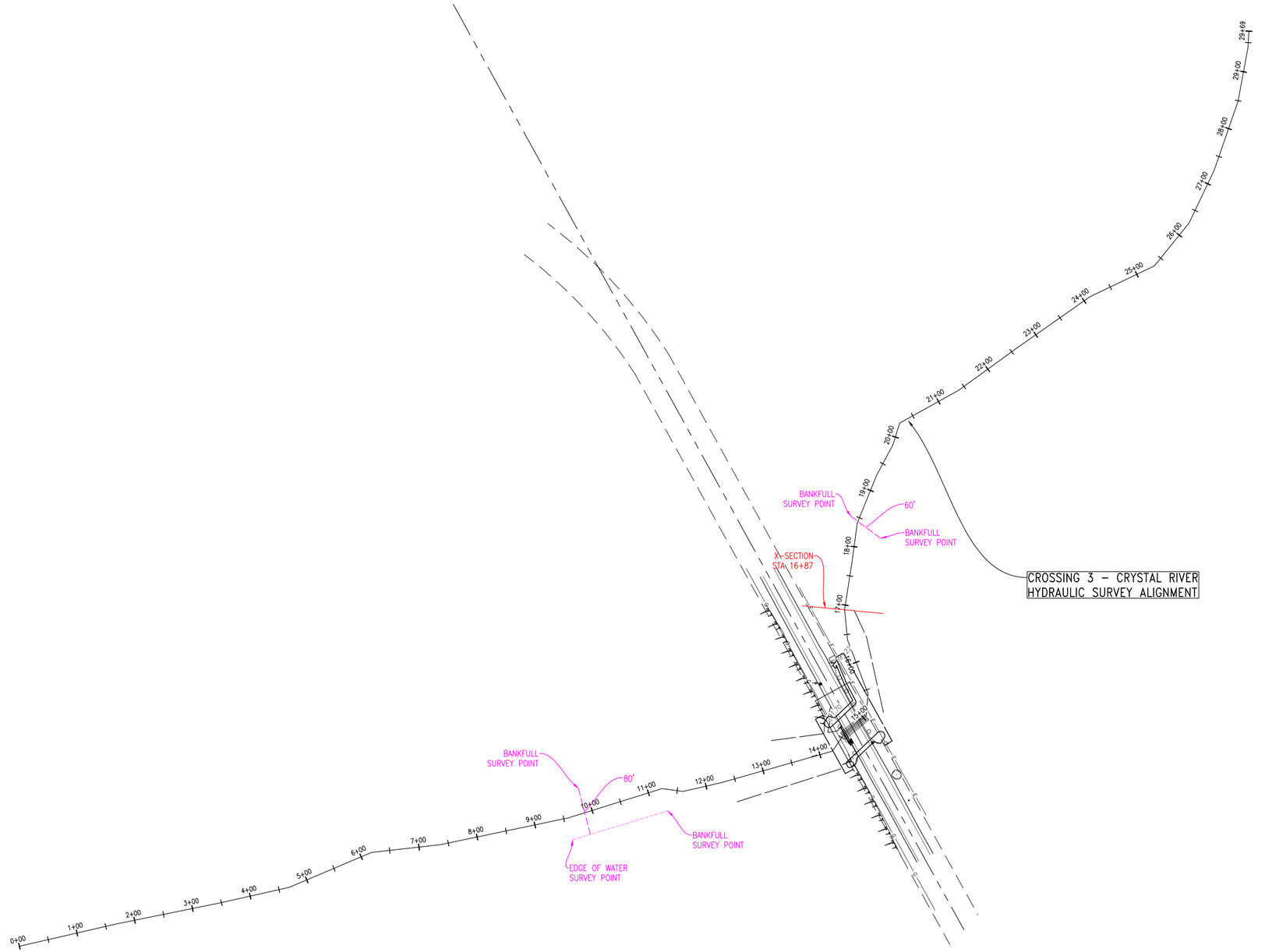
Original sheet size is 22x34

Location:

Project Number:
2020430002

Sheet:
H1

P:\2020\2020002\20CAD\Sheets\20200430002_P3_HYDRO SURVEY REPORT.dwg, Tab: H1, Saved by: jmeschewa 12/14/2021 10:31 AM, Plotted by: Bob Verschaeve, P.E. 12/14/2021 10:59 AM



HYDRAULIC SURVEY PLAN

SCALE : 1" = 100'

SCALE 1" = 100'

0' 100' 200'

Gosling Czubak
engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
www.goslingczubak.com

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DRILLING
LANDSCAPE ARCHITECTURE

No.	Date	Revision	By

HYDRAULIC SURVEY PLAN - CROSSING 3
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued:	----
Date Surveyed:	----
Designed By:	----
Drawn By:	----
Checked By:	----
Scale:	----

Original sheet size is 22x34

Location:

Project Number:
2020430002

Sheet:
H4

P:\2020\2020430002\CAD\Drawings\2020430002_PS_HYDRO SURVEY REPORT.dwg Tab: H4 Saved by: mmeshlanie 12/14/2021 10:31 AM Plotted by: Bob Vinciguerra 12/14/2021 10:50 AM

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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: CR675 Crystal River
Project File : CR675CrystalRiver.prj
Run Date and Time: 1/3/2022 4:37:09 PM

Project in English units

Project Description:
HEC-RAS model analyzes Crystal River from just downstream of M22 (does not include M22 structures in existing or proposed plans) and extends 9,162' upstream through the first two structures under County Road 675.

Energy
slope uased for the starting water surface elevations is
slope=(586.35-583.88)/(10162.2-1185.3) = 0.00028 ft/ft

Base Flow is 35 cfs.
EGLE flow data was increased by the base flow, 35 cfs, for each storm event.

PLAN DATA

Plan Title: Prop Bridges 12-2020 w base flow nearM22
Plan File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near M22\CR675CrystalRiver.p07

Geometry Title: Proposed Conditions 12/2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near M22\CR675CrystalRiver.g05

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          Flow Title    : Crystal River @ M22 w/ 35 cfs base flow
          Flow File     : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR
675 near M22\CR675CrystalRiver.f02

Plan Summary Information:
Number of:  Cross Sections =   66    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    2    Lateral Structures =    0

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

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



FLOW DATA

Flow Title: Crystal River @ M22 w/ 35 cfs base flow
Flow File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near
M22\CR675CrystalRiver.f02

Flow Data (cfs)


  River           Reach           RS                  2 Year         50 Year
100 Year        500 Year       Base Flow
  Crystal River   Glen Arbor      10162.2               70             145
   165             220              35



Boundary Conditions


  River           Reach           Profile                       Upstream
    Downstream


  Crystal River   Glen Arbor      2 Year
```

Normal S = 0.00026
  Crystal River   Glen Arbor   50 Year
Normal S = 0.00026
  Crystal River   Glen Arbor   100 Year
Normal S = 0.00026

GEOMETRY DATA

Geometry Title: Proposed Conditions 12/2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near M22\CR675CrystalRiver.g05

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor   RS: 10162.2

INPUT
Description: XSEC 15 (STA. 101+62.2)
Station Elevation Data   num=   16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-112.89	590.16	-65.46	589.51	-53.51	589.14	-48.53	586.34	-33.78	584.4
-19.04	583.68	0	584.21	11.21	583.66	24.06	583.65	34.21	585.36
38.97	586.36	43.58	586.77	91.43	586.97	109.55	585.06	144.24	585.42
184.38	591.16								

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
-112.89	.15	-48.53	.05	38.97	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-48.53	38.97	138.65	138.65	138.65	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor   RS: 10023.5*

INPUT
Description: Interpolated Section 51
Station Elevation Data   num=   23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-123.1	590.2	-103.8	590	-57.3	589	-39.2	585.96	-28.8	584.32
-20.62	583.94	-15.46	583.65	-6.3	583.78	1.78	583.97	11.93	583.5

```
   23.56  583.47   29.38  584.31   33.96  585.05   38.83     586    40.9  586.49
   43.17  586.68   85.67     587   88.19  587.01  105.23  585.42  137.87  585.72
   189.3     586   206.1     589   231.1   589.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -123.1     .15   -39.2     .05   38.83     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -39.2   38.83           138.65  138.65  138.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9884.90*

INPUT
Description: Interpolated Section 50
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    -198   590.5  -149.3 586.122 -148.08  585.58 -136.12  584.24  -128.8  583.92
 -124.17  583.62 -115.97   583.6 -108.74  583.74  -99.65  583.33  -89.24  583.28
  -83.28  584.02   -78.6  584.74  -73.61  585.63  -71.67   586.2  -69.55   586.2
  -29.72   586.2   -10.6   584.5    -2.6   584.4     7.4   584.5    24.5   586.2
   158.2   586.2   175.6     589

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -198     .15  -149.3     .05  -73.61     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -149.3  -73.61           138.65  138.65  138.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9746.25*

INPUT
Description: Interpolated Section 49
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -192.3   590.5  -147.6     586  -145.6   585.2 -135.04  584.16 -128.57  583.89
 -124.49  583.58 -117.25  583.42 -110.86   583.5 -102.83  583.17  -93.64  583.09
  -87.54  583.73  -82.75  584.43  -77.65  585.27     -14  585.27      -5   584.3
       6   584.1      17   584.3      26  585.27    88.5     587   194.6     593
   209.1     593
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-192.3	.15	-147.6	.05	-77.65	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-147.6	-77.65	138.65	138.65	138.65	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 9607.60*

INPUT
Description: Interpolated Section 48
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-94.5	590.1	-38.44	586.46	-38.43	586.46	-28.42	586.35	-27.55	586.24
-23.02	584.81	-13.86	584.08	-8.25	583.87	-4.71	583.55	1.58	583.24
7.12	583.26	14.08	583	22.07	582.91	48.29	583.44	53.19	584.12
58.41	584.91	60.09	586.29	82.9	586.2	125.6	586.2	158.7	595
178.7	595.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-94.5	.15	-23.02	.05	58.41	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-23.02	58.41	138.65	138.65	138.65	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 9468.95*

INPUT
Description: Interpolated Section 47
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-146.9	589.55	-31.68	585.7	-31.67	585.7	-21.91	585.64	-21.07	585.52
-16.65	584.43	-8.88	583.99	-4.12	583.85	-1.12	583.52	4.2	583.06
8.9	583.03	14.8	582.84	21.57	582.72	27.93	583.14	32.94	583.8
38.27	584.54	39.82	586.22	41.52	586.3	73.33	587.17	75.21	587.17
102.5	589.95								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-146.9	.15	-16.65	.05	38.27	.15

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.65   38.27           138.65  138.65  138.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9330.3

INPUT
Description: XSEC 14 (STA. 93+30.3)
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -65.92  589.05  -36.06  586.12  -24.92  584.94   -15.4  584.94  -10.27  584.05
       0  583.83    6.83  582.88   21.07  582.54   27.57  582.85   38.13  584.18
   39.55  586.15   70.24  587.21  131.92  587.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -65.92     .15  -10.27     .05   38.13     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -10.27   38.13           105.8   105.8   105.8             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9224.50*

INPUT
Description: Interpolated Section 46
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -71.22  588.46  -44.24  586.68  -34.17  585.97  -33.44  585.96  -25.56  585.75
  -20.92  585.18  -11.86  583.61  -10.91  583.38   -5.84  582.94   -1.84  582.85
    6.72  582.69   10.53  583.22    15.5  583.26   22.82  582.69   27.21  583.14
   29.25  583.46   34.35  584.88   35.82  586.15   35.91  586.17    44.2  586.32
   67.59  587.11   77.05  587.27  131.46  587.64

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -71.22     .15  -20.92     .05   34.35     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -20.92   34.35           105.8   105.8   105.8             .1       .3

CROSS SECTION
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RIVER: Crystal River
REACH: Glen Arbor RS: 9118.7

INPUT
Description: XSEC 13 (STA. 91+18.7)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-76.53	587.87	-42.76	586.99	-31.58	586.32	-22.9	583.08	-15.04	582.92
-7.62	582.85	0	583.9	9.94	583.98	24.57	582.85	27.91	583.7
30.56	585.57	32.18	586.18	40.75	586.21	74.73	587.32	130.99	588.02

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-76.53	.15	-31.58	.05	30.56	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-31.58	30.56	126.9	126.9	126.9	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8986.6

INPUT
Description: XSEC 12 (STA. 89+86.6)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-49.97	590.12	-44.87	589.84	-35.87	589.18	-31.04	588	-27.27	587
-20.87	584.83	-7.46	581.87	5.31	580.55	12.79	581.1	18.08	583.23
20.22	584.83	22.62	585.88	38.48	586.54	62.31	587.58	81.6	588
118.5	589	136.3	590	145.3	591				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-49.97	.15	-27.27	.05	22.62	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-27.27	22.62	12.6	12.6	12.6	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8974

INPUT
Description: US Face Culvert (Interpolated Section 45)
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
  -52.16  590.11  -46.49  589.84  -43.86  589.68  -42.54  589.58  -42.35  589.61
  -41.95  589.58  -41.57  589.27  -36.49  588.86  -31.25  587.76  -31.12  587.72
  -29.07  587.09  -26.93  586.46  -21.03  584.43  -19.99  584.19   -8.94  581.83
   -8.67  581.77     3.1  580.62    5.99  580.84   11.09  581.16   11.35   581.2
   13.44  582.03   17.19  583.18   19.55  584.53   22.19  585.41   28.64  585.96
   34.14  586.49   37.06  586.62   59.39  587.63   60.28  587.66   73.84  588.03
   77.47  588.12    89.7  588.46  112.05  589.06  128.74  589.94  137.17   590.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -52.16     .15  -26.93     .05   22.19     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
        -26.93   22.19               55      55      55             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -52.16  -29.85     591       F
   41.03  137.17     591       F

BRIDGE


RIVER: Crystal River
REACH: Glen Arbor         RS: 8946.1

INPUT
Description: 2nd Bridge crossing CR 675 from M22
Distance from Upstream XS =     8.6
Deck/Roadway Width        =    38.6
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      13
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
 -153.96  590.97          -65.69  591.32           -29.7  591.19
  -29.65  591.19  589.65  -11.54  591.12  589.57  -11.53  591.12  589.24
   22.91     591  589.08   22.92     591  589.41   41.03  590.88  589.33
   41.04  590.88           57.94  590.83          107.94  590.63
  157.94  590.43

Upstream Bridge Cross Section Data
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -52.16  590.11  -46.49  589.84  -43.85  589.68  -42.54  589.58  -42.35  589.61
  -41.95  589.58  -41.57  589.27  -37.51  588.94  -29.85  585.11  -22.35   581.8
   33.73   581.8   41.03   585.5      45  586.62   59.39  587.63   60.28  587.66
   73.84  588.03   77.47  588.12    89.7  588.46  112.05  589.06  128.74  589.94
  137.17   590.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
  -52.16     .15  -29.85     .06   41.03     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -29.85   41.03            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -52.16  -29.85     591       F
   41.03  137.17     591       F

Downstream  Deck/Roadway Coordinates
    num=      13
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
 -153.96  590.97          -65.69  591.32           -29.7  591.19
  -29.65  591.19  589.65  -11.54  591.12  589.57  -11.53  591.12  589.24
   22.91     591  589.08   22.92     591  589.41   41.03  590.88  589.33
   41.04  590.88           57.94  590.83          107.94  590.63
  157.94  590.43

Downstream Bridge Cross Section Data
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -62.36  590.06  -54.05  589.84  -50.18  589.73  -48.25  589.58  -47.97   589.8
  -47.39  589.75  -39.37  587.37  -32.91  586.65  -29.85  585.12  -22.35   581.8
   33.73   581.8   41.03   585.5   45.77  587.88   46.39  587.91   55.71  588.59
    58.2  588.68   66.61  588.98   81.97  589.32   93.44  589.65   99.24  589.89

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -62.36     .15  -29.85     .06   41.03     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -29.85   41.03            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -62.36  -29.85     591       F
   41.03   99.24     591       F

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

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
```

```
  -29.65   585.8  -22.35   581.8
Downstream     num=       2
     Sta    Elev     Sta    Elev
  -29.65   585.8  -22.35   581.8

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   33.73   581.8   41.03   585.8
Downstream     num=       2
     Sta    Elev     Sta    Elev
   33.73   581.8   41.03   585.8

Number of Piers =  2

Pier Data
Pier Station     Upstream=  -11.53    Downstream=  -11.53
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590

Pier Data
Pier Station     Upstream=   22.91    Downstream=   22.91
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       Yarnell                KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

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

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8919.20*

INPUT
Description: DS Face Culvert (Interpolated Section 44)
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-62.36	590.06	-54.05	589.84	-50.18	589.73	-48.25	589.58	-47.97	589.8
-47.39	589.75	-46.83	588.1	-39.37	587.37	-31.69	586.51	-31.49	586.42
-28.49	585.15	-25.34	583.94	-21.78	582.59	-21.15	582.37	-14.47	581.34
-14.31	581.32	-7.2	580.96	-3.05	581.28	4.27	581.54	4.64	581.67
7.64	582.8	13.02	582.93	16.41	583.12	20.21	583.23	24.64	585.01
28.42	586.89	30.42	587	45.77	587.88	46.39	587.91	55.71	588.59
58.2	588.68	66.61	588.98	81.97	589.32	93.44	589.65	99.24	589.89

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-62.36	.15	-25.34	.05	20.21	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-25.34	20.21	11.9	11.9	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-62.36	-29.85	591	F
41.03	99.24	591	F

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8907.3

INPUT
Description: XSEC 11 (STA. 89+07.3)
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-64.55	590.05	-51.54	589.74	-49.47	589.58	-49.17	589.84	-48.55	589.79
-47.96	587.85	-31.78	586.24	-28.36	584.73	-25	583.402	-21.4	581.98
-15.66	581.23	-9.41	581.03	-4.99	581.37	2.81	581.62	6.4	582.96
19.78	582.76	23.78	584.81	27.19	586.97	43.41	587.97	51.82	588.71
61.66	589.09	91.11	589.69						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-64.55	.15	-25	.05	19.78	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-25 19.78 164.83 164.83 164.83 .1 .3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8742.47*

INPUT
Description: Interpolated Section 43
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-76.14	589.38	-63.13	589.39	-59.35	589.23	-56.68	589.04	-56.29	589.2
-55.49	589.14	-54.73	587.82	-48.78	587.33	-40.91	586.4	-34.4	585.73
-33.85	585.68	-29.44	584.42	-25.11	583.28	-20.76	582.34	-19.77	582.27
-13.82	581.68	-8.67	581.46	-6.27	581.3	-2.55	581.67	4.03	582.08
4.86	582.35	7.05	582.99	18.33	582.83	23.52	584.7	23.87	584.85
27.94	586.42	30.33	586.63	31.56	586.75	45.94	587.69	48.98	587.77
59.89	588.21	72.65	588.39	79.92	588.43	110.84	589.73		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-76.14	.15	-25.11	.05	18.33	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-25.11 18.33 164.83 164.83 164.83 .1 .3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8577.63*

INPUT
Description: Interpolated Section 42
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-87.72	588.7	-71.79	588.98	-67.16	588.72	-63.89	588.5	-63.41	588.56
-62.43	588.49	-61.5	587.8	-54.21	587.27	-44.57	586.02	-36.59	585.19
-35.93	585.11	-30.52	584.1	-25.21	583.17	-20.12	582.7	-18.96	582.66
-11.99	582.14	-5.94	581.82	-3.14	581.58	-.11	581.96	5.24	582.53
5.92	582.72	7.7	583.03	16.88	582.89	23.26	584.6	23.68	584.72
28.69	585.86	31.63	586.18	33.14	586.37	50.81	587.56	54.55	587.57
67.95	587.7	83.63	587.7	92.57	587.66	130.58	589.76		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-87.72	.15	-25.21	.05	16.88	.15

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.21   16.88           164.83  164.83  164.83             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 8412.8

INPUT
Description: XSEC 10 (STA. 84+12.8)
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -99.31  588.03  -80.45  588.56  -59.64  587.21  -48.23  585.64  -38.79  584.64
  -25.32  583.05  -18.15  583.06   -3.22  582.19       0  581.85    6.98  583.08
   15.43  582.96    23.5  584.59   32.93  585.73   34.72  585.98   55.68  587.42
  105.22  586.89  150.31   589.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -99.31     .15  -25.32     .05   15.43     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.32   15.43           170.23  170.23  170.23             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 8242.58*

INPUT
Description: Interpolated Section 41
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -106.79   588.3 -104.79  588.34  -85.66  588.73  -62.34  587.75  -51.44  586.76
  -49.56  586.51  -38.98   585.3  -34.01  584.69  -31.34  584.26  -23.89  583.15
  -17.61  583.05  -12.52   582.7   -4.52  582.28    -1.7  582.02    1.68   582.4
    6.06   582.9    8.83  583.14   19.46  583.06   21.57   583.1   29.71  584.43
   31.78  584.65   38.33  585.27   39.23  585.37   41.03  585.58   62.18  586.94
   67.88  586.97   68.87  586.95  108.73  586.88  112.16   586.9  157.65  589.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -106.79     .15  -23.89     .05   21.57     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -23.89   21.57           170.23  170.23  170.23             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Glen Arbor RS: 8072.35*

INPUT
Description: Interpolated Section 40
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-114.27	588.58	-112.05	588.59	-90.87	588.89	-65.05	588.29	-52.97	587.66
-50.89	587.38	-39.18	585.95	-33.67	585.26	-30.71	584.69	-22.47	583.26
-17.07	583.03	-12.7	582.67	-5.83	582.36	-3.4	582.18	1.12	582.56
6.97	583.04	10.67	583.2	24.89	583.13	27.72	583.24	35.93	584.27
38.01	584.45	44.62	584.93	45.53	585	47.35	585.18	68.68	586.46
74.43	586.58	75.43	586.55	115.64	586.83	119.11	586.91	165	589.68

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-114.27	.15	-22.47	.05	27.72	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-22.47	27.72	170.23	170.23	170.23	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7902.13*

INPUT
Description: Interpolated Section 39
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-121.75	588.85	-119.32	588.85	-96.08	589.06	-67.75	588.83	-54.51	588.55
-52.22	588.24	-39.37	586.61	-33.33	585.83	-30.09	585.12	-21.04	583.36
-16.53	583.02	-12.87	582.65	-7.13	582.45	-5.11	582.34	.56	582.72
7.89	583.18	12.52	583.26	30.32	583.21	33.86	583.38	42.14	584.12
44.25	584.26	50.91	584.58	51.83	584.64	53.66	584.78	75.18	585.98
80.98	586.19	81.99	586.16	122.56	586.78	126.05	586.92	172.35	589.62

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-121.75	.15	-21.04	.05	33.86	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-21.04	33.86	170.23	170.23	170.23	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7731.9

INPUT
Description: XSEC 9 (STA. 77+31.9)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-129.23	589.12	-126.58	589.1	-56.04	589.44	-32.99	586.4	-29.46	585.55
-19.61	583.47	-13.05	582.62	-6.81	582.51	0	582.88	8.8	583.32
35.75	583.29	40	583.515	50.48	584.07	57.2	584.23	87.53	585.8
88.55	585.76	129.47	586.73	179.69	589.56				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-129.23	.15	-19.61	.05	40	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-19.61	40	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7558.02*

INPUT
Description: Interpolated Section 38
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-80.7	588.8	-32.23	586.33	-28.7	585.49	-23.39	584.38	-18.86	583.42
-15.91	583.09	-11.48	582.61	-9.76	582.58	-6.92	582.53	-5.9	582.5
-4.46	582.46	2.12	582.82	10.62	583.25	36.66	583.24	40.77	583.45
50.99	584.01	57.55	584.17	67.97	584.72	74.66	585.12	87.15	585.81
88.15	585.78	108.73	586.34	128.08	586.81	161.3	590.1		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-80.7	.15	-18.86	.05	40.77	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-18.86	40.77	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7384.15*

INPUT
Description: Interpolated Section 37

```
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -88.2     590  -33.86  586.61  -32.55   586.4  -31.48  586.26  -27.95  585.43
  -22.63  584.34   -18.1  583.36  -14.83  583.05   -9.91  582.59   -7.99  582.58
   -4.84  582.52   -3.71  582.47   -2.11  582.41    4.24  582.76   12.44  583.18
   37.57  583.18   41.53  583.39   51.51  583.94    57.9  584.11   68.06  584.65
   74.59  585.11   86.77  585.82   87.74   585.8  107.82  586.42  126.69  586.88
  174.49  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -88.2     .15   -18.1     .05   41.53     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -18.1   41.53           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 7210.27*

INPUT
Description: Interpolated Section 36
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -126.93   589.1     -92   588.8  -33.11  586.56  -31.79  586.33  -30.72  586.19
  -27.19  585.37  -21.88  584.29  -17.35  583.31  -13.75  583.01   -8.33  582.58
   -6.23  582.57   -2.76   582.5   -1.52  582.44     .24  582.36    6.36   582.7
   14.27   583.1   38.48  583.13    42.3  583.33   52.02  583.88   58.25  584.05
   68.15  584.59   74.51   585.1   86.39  585.84   87.34  585.81  106.91  586.51
   125.3  586.96  171.89  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -126.93     .15  -17.35     .05    42.3     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -17.35    42.3           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 7036.39*

INPUT
Description: Interpolated Section 35
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

```
 -126.16   589.4     -92  588.88  -32.35  586.51  -31.04  586.26  -29.97  586.11
  -26.44  585.31  -21.12  584.24  -16.59  583.26  -12.66  582.97   -6.76  582.57
   -4.47  582.56    -.69  582.49     .67   582.4    2.59  582.31    8.48  582.64
   16.09  583.03   39.39  583.07   43.06  583.27   52.53  583.81    58.6  583.99
   68.25  584.53   74.44  585.08   86.01  585.85   86.93  585.83  105.99  586.59
   142.4   589.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -126.16     .15  -16.59     .05   43.06     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.59   43.06           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6862.52*

INPUT
Description: Interpolated Section 34
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -125.4   589.1    -100   586.2  -29.21  586.04  -25.68  585.26  -20.37   584.2
  -15.84  583.21  -11.58  582.92   -5.19  582.56    -2.7  582.55    1.39  582.47
    2.86  582.37    4.94  582.26    10.6  582.58   17.91  582.96    40.3  583.02
   43.83  583.21   53.04  583.75   58.95  583.93   68.34  584.46   74.37  585.07
   85.63  585.86   86.53  585.85  105.08  586.67   128.3     589

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -125.4     .15  -15.84     .05   43.83     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.84   43.83           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6688.64*

INPUT
Description: Interpolated Section 33
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -124.63   588.5    -100   586.5  -30.84   586.4  -29.53  586.12  -28.46  585.97
  -24.93   585.2  -19.61  584.15  -15.08  583.15   -10.5  582.88   -3.62  582.54
    -.94  582.54    3.47  582.46    5.05  582.34    7.29  582.21   12.72  582.52
```

```
   19.73  582.89   41.21  582.96   44.59  583.15   53.56  583.68   59.31  583.87
   68.44   584.4    74.3  585.06   85.25  585.87   86.12  585.87   113.4   589.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -124.63     .15  -15.08     .05   44.59     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.08   44.59           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6514.76*

INPUT
Description: Interpolated Section 32
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -61.5   587.5  -14.33   583.1   -9.42  582.84   -2.04  582.53     .82  582.53
    5.55  582.44    7.24  582.31    9.64  582.16   14.84  582.46   21.55  582.82
   42.12  582.91   45.36  583.09   54.07  583.62   59.66  583.81   68.53  584.33
   74.23  585.04   84.87  585.88   85.72  585.88     107   588.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -61.5     .15  -14.33     .05   45.36     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -14.33   45.36           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6340.88*

INPUT
Description: Interpolated Section 31
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    -139     590    -115   585.3  -67.02  585.08  -61.71  584.06  -57.18  583.05
  -51.94   582.8  -44.07  582.52  -41.02  582.52  -35.98  582.43  -34.17  582.27
  -31.61  582.11  -26.64   582.4  -20.23  582.75  -19.58  582.85  -16.48  583.03
   -8.02  583.55   -2.59  583.75    6.02  584.27   11.56  585.03   21.89   585.9
   22.71   585.9   39.74  586.92    65.4   588.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
    -139     .15  -57.18     .05  -16.48     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -57.18  -16.48           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6167.01*

INPUT
Description: Interpolated Section 30
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -159.6   591.5 -146.62   588.4 -125.97  586.25 -124.66   585.9 -123.59  585.76
 -120.06  585.02 -114.75  584.01    -105   583.2  -36.42     583  -30.86  582.76
   -22.5   582.5  -19.25  582.52   -13.9  582.41  -11.98  582.24   -9.26  582.06
   -4.52  582.34     1.6  582.67   20.33   582.8   23.29  582.97    31.5  583.49
   36.76  583.69   45.12  584.21   50.49  585.02   60.51  585.91   61.31  585.92
   77.83     587

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -159.6     .15  -36.42     .05   23.29     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -36.42   23.29           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 5993.13*

INPUT
Description: Interpolated Section 29
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -158.2   591.5 -122.06  588.28 -101.42  586.19  -100.1  585.83  -99.03  585.69
  -95.51  584.96   -90.2  583.97  -75.67  582.94  -69.78  582.72  -60.93  582.49
  -57.49  582.51  -51.82   582.4  -49.79  582.21  -46.91  582.01   -42.4  582.28
  -36.58   582.6  -18.76  582.75  -15.95  582.91   -7.99  583.42   -2.89  583.63
    5.21  584.14   10.41     585   20.13  585.92    20.9  585.94   36.92  587.08
   51.96   587.5   90.08  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -158.2     .15  -75.67     .05  -15.95     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -75.67  -15.95           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 5819.25*

INPUT
Description: Interpolated Section 28
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -120.6   592.5  -95.06  586.14  -93.75  585.76  -92.68  585.61  -89.15   584.9
  -83.84  583.92  -79.31  582.89   -58.1  582.68  -33.76  582.48  -30.13   582.5
  -24.14  582.38     -22  582.18  -18.96  581.96  -14.68  582.22   -9.16  582.53
    7.75  582.69   10.42  582.85   18.12  583.36   23.06  583.57    30.9  584.08
   35.94  584.99   45.35  585.93    46.1  585.95    61.6  587.16   76.17  587.57
   104.4   588.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -120.6     .15   -58.1     .05   10.42     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -58.1   10.42           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 5645.38*

INPUT
Description: Interpolated Section 27
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -149.3     594  -119.1  588.05  -109.1  586.09 -107.79  585.69 -106.72  585.54
  -103.2  584.84  -97.89  583.87  -93.36  582.84  -46.32  582.64  -36.48  582.46
  -32.66  582.49  -26.37  582.37  -24.11  582.14  -20.91  581.91  -16.86  582.16
  -11.64  582.46    4.36  582.64    6.88  582.79   14.33  583.29   19.11  583.51
    26.7  584.02   31.57  584.98   40.67  585.94    41.4  585.97    51.6  587.24
    56.6   588.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -149.3     .15  -46.32     .05    6.88     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -46.32    6.88             223  173.88      96             .1       .3
```

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 5471.50*

INPUT
Description: Interpolated Section 26
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-46.18	587.94	-25.55	586.04	-24.24	585.62	-23.17	585.47	-19.64	584.78
-14.33	583.83	-9.8	582.78	-2.93	582.6	7.39	582.45	11.4	582.48
18.01	582.35	20.38	582.11	23.75	581.86	27.56	582.1	32.48	582.39
47.57	582.58	49.95	582.73	57.15	583.23	61.76	583.45	69.09	583.95
73.8	584.96	82.59	585.95	83.29	585.99	97.78	587.33	111.39	587.73

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-46.18	.15	-9.8	.05	49.95	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-9.8	49.95	223	173.88	93	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 5297.62*

INPUT
Description: Interpolated Section 25
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-89.1	588.47	-86.45	588.33	-86.02	588.31	-64.49	587.85	-60.9	587.87
-55.39	585.99	-54.08	585.55	-53.01	585.4	-49.49	584.73	-44.18	583.78
-39.65	582.73	-32.45	582.55	-21.64	582.44	-17.44	582.47	-10.51	582.34
-8.03	582.08	-4.5	581.81	-.92	582.04	3.71	582.31	17.88	582.53
20.12	582.67	27.06	583.16	31.51	583.39	38.59	583.89	43.13	584.95
51.61	585.97	52.29	586.01	66.26	587.41	79.4	587.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-89.1	.15	-39.65	.05	20.12	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-39.65	20.12	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 5123.75*

INPUT
Description: Interpolated Section 24
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.3	588.43	-81.7	588.28	-81.3	588.26	-60.2	587.76	-54.84	585.93
-53.52	585.48	-52.45	585.33	-48.93	584.67	-43.62	583.74	-39.1	582.68
-31.57	582.51	-20.27	582.43	-15.87	582.46	-8.63	582.32	-6.04	582.05
-2.35	581.76	1	581.98	5.33	582.24	18.59	582.47	20.68	582.61
27.37	583.1	31.66	583.33	38.48	583.82	42.86	584.94	51.03	585.98
51.68	586.02	65.15	587.49	74.2	588.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-84.3	.15	-39.1	.05	20.68	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-39.1	20.68	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4949.87*

INPUT
Description: Interpolated Section 23
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-89.6	588.38	-86.9	588.23	-86.5	588.2	-60.6	587.66	-55.68	585.88
-54.37	585.41	-53.3	585.26	-49.77	584.61	-44.47	583.69	-39.94	582.63
-32.09	582.47	-20.29	582.41	-15.71	582.46	-8.16	582.31	-5.44	582.01
-1.6	581.71	1.52	581.92	5.55	582.17	17.9	582.42	19.85	582.55
26.29	583.03	30.41	583.27	36.97	583.76	41.18	584.92	49.05	585.99
49.68	586.04	62.64	587.57						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-89.6	.15	-39.94	.05	19.85	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-39.94	19.85	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River

REACH: Glen Arbor RS: 4775.99*

INPUT
Description: Interpolated Section 22
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100.6	588.34	-98	588.17	-97.6	588.15	-76	587.56	-67.1	587.53
-62.55	585.83	-61.24	585.34	-60.17	585.18	-56.65	584.55	-51.34	583.64
-46.82	582.57	-38.64	582.43	-26.35	582.4	-21.58	582.45	-13.71	582.29
-10.88	581.98	-6.88	581.66	-3.99	581.86	-.26	582.1	11.18	582.36
12.98	582.49	19.17	582.97	23.14	583.21	29.44	583.7	33.48	584.91
41.04	586	41.64	586.06	54.1	587.65				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-100.6	.15	-46.82	.05	12.98	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-46.82	12.98	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4602.12*

INPUT
Description: Interpolated Section 21
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-115.43	588.29	-112.79	588.12	-112.36	588.09	-90.83	587.46	-54.21	587.42
-52.39	587.36	-31.77	585.78	-30.46	585.27	-29.39	585.11	-25.86	584.49
-20.56	583.6	-16.03	582.52	-7.53	582.39	5.25	582.39	10.22	582.44
18.4	582.28	21.34	581.95	25.5	581.61	28.16	581.8	31.59	582.03
42.12	582.31	43.78	582.42	49.71	582.9	53.52	583.15	59.56	583.63
63.44	584.9	70.69	586.01	71.27	586.08	88.4	588.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-115.43	.15	-16.03	.05	43.78	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-16.03	43.78	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4428.24*

INPUT
Description: Interpolated Section 20
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-89.2	588.24	-86.5	588.06	-86.1	588.03	-64.6	587.37	-61.2	587.31
-55.9	585.2	-54.83	585.04	-51.31	584.43	-46	583.55	-41.48	582.47
-32.65	582.35	-19.38	582.37	-14.22	582.43	-5.72	582.26	-2.67	581.92
1.65	581.56	4.08	581.74	7.21	581.96	16.83	582.26	18.34	582.36
24.02	582.84	27.67	583.09	33.45	583.57	50	589.1		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-89.2	.15	-41.48	.05	18.34	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-41.48	18.34	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4254.36*

INPUT
Description: Interpolated Section 19
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-65.9	588.2	-63.3	588.01	-62.7	587.98	-51	587.13	-46.05	585.12
-44.98	584.97	-41.45	584.37	-36.15	583.51	-31.63	582.42	-22.47	582.31
-8.7	582.36	-3.36	582.42	5.45	582.25	8.62	581.88	13.1	581.51
15.3	581.68	18.14	581.88	26.84	582.2	28.21	582.3	33.64	582.77
37.12	583.03	42.65	583.5	56.2	588	61.2	589	63.4	589.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-65.9	.15	-31.63	.05	28.21	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-31.63	28.21	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4080.48*

INPUT
Description: Interpolated Section 18
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

-68.9	588.15	-66.3	587.95	-65.9	587.92	-44.3	587.01	-40.4	585.62
-39.09	585.05	-38.02	584.9	-34.5	584.31	-29.19	583.46	-24.67	582.36
-19.19	582.27	-4.93	582.35	.6	582.41	9.73	582.23	13.01	581.85
17.65	581.46	19.62	581.62	22.16	581.81	29.95	582.15	31.17	582.24
36.35	582.71	39.67	582.97	44.94	583.44	48.33	584.86	54.65	586.05
55.15	586.13	65.57	587.98	75.37	588.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-68.9	.15	-24.67	.05	31.17	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-24.67	31.17	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 3906.61*

INPUT
Description: Interpolated Section 17
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-109.2	588.1	-106.5	587.9	-106.1	587.86	-86	587.08	-85.47	586.98
-83.66	586.9	-63.04	585.57	-61.73	584.98	-60.66	584.83	-57.14	584.25
-51.84	583.41	-47.32	582.31	-37.5	582.22	-22.76	582.34	-17.03	582.4
-7.59	582.22	-4.2	581.82	.6	581.41	2.34	581.56	4.58	581.74
11.45	582.09	12.54	582.18	17.46	582.64	20.62	582.91	25.64	583.38
28.86	584.84	34.87	586.06	35.35	586.15	45.26	588.06	50.2	588.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-109.2	.15	-47.32	.05	12.54	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-47.32	12.54	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 3732.73*

INPUT
Description: Interpolated Section 16
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-111.6	588.06	-109	587.84	-108.5	587.81	-87	586.98	-74.42	586.86
-72.6	586.78	-51.99	585.52	-50.68	584.91	-49.61	584.76	-46.09	584.19

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  -40.78  583.37  -36.26  582.26  -26.12  582.18  -10.89  582.32   -4.97   582.4
    4.79   582.2    8.29  581.79   13.25  581.36   14.76   581.5    16.7  581.67
   22.66  582.04    23.6  582.12   28.28  582.58   31.27  582.85   36.03  583.31
   39.08  584.83   44.79  586.07   45.25  586.16   54.65  588.14      63   590.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -111.6     .15  -36.26     .05    23.6     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -36.26    23.6           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3558.85*

INPUT
Description: Interpolated Section 15
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -135.83  588.01 -133.19  587.79 -132.76  587.75 -111.25  586.88  -64.66  586.75
  -62.84  586.67  -42.23  585.46  -40.92  584.84  -39.85  584.68  -36.33  584.14
  -31.03  583.32  -26.51  582.21  -16.04  582.14    -.32  582.31    5.79  582.39
   15.86  582.19   19.48  581.75    24.6  581.31   25.88  581.44   27.52   581.6
   32.57  581.98   33.37  582.06   37.79  582.51   40.62  582.79   45.12  583.25
      53     589    64.2   589.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -135.83     .15  -26.51     .05   33.37     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -26.51   33.37           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3384.98*

INPUT
Description: Interpolated Section 14
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -110.07  587.97 -107.42  587.73    -107   587.7  -85.48  586.79   -38.9  586.64
  -37.08  586.55  -16.48  585.41  -15.17  584.77   -14.1  584.61  -10.58  584.08
   -5.27  583.28    -.75  582.15   10.04   582.1   26.26   582.3   32.56  582.38
   42.94  582.17   46.67  581.72   51.95  581.26   52.99  581.38   54.35  581.53
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   58.48  581.93   59.13     582    63.3  582.45   65.97  582.73   70.22  583.18
    81.4   589.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -110.07     .15    -.75     .05   59.13     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -.75   59.13           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3211.1

INPUT
Description: XSEC 8 (STA. 32+11.1)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -109.3  587.92 -106.23  587.64  -84.72  586.69  -38.14  586.53  -15.72  585.36
  -14.41   584.7   -4.52  583.23       0   582.1   11.12  582.06   34.32  582.37
   45.02  582.16   48.86  581.69    54.3  581.21    59.9  581.94   70.31  583.12
   72.87  584.79   85.91  588.39  112.07  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -109.3     .15       0     .05    59.9     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    59.9           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3050.95*

INPUT
Description: Interpolated Section 13
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -109.05  587.88 -106.24  587.65  -86.54  586.82  -43.87  586.43  -23.34  585.42
  -22.14  584.91  -18.58  584.46  -13.08  583.65  -10.77  583.12   -8.94  582.34
    1.23  582.11    6.05  582.07   22.45  582.16   32.24  581.95   35.75  581.58
   40.72   581.2   44.11  581.41   49.28  581.77   53.37  582.26   54.09  582.68
   58.15   583.4   62.85  584.09   65.18  585.48   69.38  586.66   77.06  588.49
   100.9  589.62

Manning's n Values        num=       3
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     Sta   n Val     Sta   n Val     Sta   n Val
 -109.05     .15   -8.94     .05   53.37     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -8.94   53.37           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2890.80*

INPUT
Description: Interpolated Section 12
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -108.8  587.84 -106.25  587.66  -88.35  586.94   -49.6  586.32  -30.95  585.48
  -29.86  585.13  -26.64   584.8  -21.64  584.07  -19.54  583.64  -17.88  582.57
   -8.65  582.16   -4.29  582.01   10.58  581.95   19.46  581.75   22.64  581.48
   27.15  581.18   32.43  581.42   40.47  581.84   46.83  582.57   47.49  583.33
   51.15  584.26   55.39  585.07    57.5  586.16   61.28  587.26   68.22  588.59
   89.72  589.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -108.8     .15  -17.88     .05   46.83     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -17.88   46.83           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2730.65*

INPUT
Description: Interpolated Section 11
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -108.55   587.8 -106.25  587.68  -90.17  587.07  -55.33  586.22  -38.57  585.53
  -37.59  585.34  -34.69  585.13  -30.19  584.49  -28.31  584.16  -26.81  582.81
  -18.54  582.21  -14.62  581.94   -1.29  581.75    6.67  581.54    9.53  581.37
   13.57  581.17   20.74  581.42   31.66  581.91    40.3  582.89   40.88  583.98
   44.15  585.12   47.93  586.04   49.81  586.85   53.19  587.86   59.37  588.69
   78.55  589.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -108.55     .15  -26.81     .05    40.3     .15
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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -26.81    40.3           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2570.5

INPUT
Description: XSEC 7 (STA. 25+70.5)
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -108.3  587.76  -42.74  585.47  -37.08  584.68  -35.75  583.05  -24.96  581.88
       0  581.16    9.05  581.43   22.85  581.98   33.77   583.2   34.28  584.63
   37.15  585.98   45.09  588.46   67.38   589.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -108.3     .15  -35.75     .05   33.77     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -35.75   33.77           143.1   143.1   143.1             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2427.35*

INPUT
Description: Interpolated Section 10
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -89.42  587.29  -82.47  587.08  -64.74  586.32  -58.91  585.93  -53.99   585.3
  -39.48  584.13  -34.65  583.66  -29.92  582.91  -28.81  582.02  -21.44  581.47
  -20.55  581.37  -11.35  580.81   -1.47  580.51     5.1  580.75    7.11   580.8
   10.76   580.9   19.97  581.97    20.2  581.98   30.56  582.65   30.98  583.45
    33.4  584.58   36.76  585.83   40.02  587.29    40.1  587.31   53.72  589.22
   58.88   589.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -89.42     .15  -28.81     .05   30.56     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -28.81   30.56           143.1   143.1   143.1             .1       .3

CROSS SECTION
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RIVER: Crystal River
REACH: Glen Arbor RS: 2284.2

INPUT
Description: XSEC 6 (STA. 22+84.2)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70.54	586.82	-64.96	586.69	-50.72	585.91	-46.04	585.38	-42.09	584.32
-30.43	582.58	-21.86	580.98	-16.76	580.94	-9.78	580.09	-2.94	579.86
3.27	580.14	8.62	580.22	17.33	581.97	27.34	582.1	32.39	584.44
35.04	586.15	46.19	589	50.39	590				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70.54	.15	-21.86	.05	27.34	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-21.86	27.34	32.5	32.5	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2261.22*

INPUT
Description: US Face Culvert (Interpolated Section 9)
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70.98	586.91	-65.52	586.77	-51.6	586.05	-51.43	586.03	-47.03	585.55
-43.17	584.62	-41.17	584.34	-36.87	583.44	-31.77	582.59	-23.39	580.94
-18.49	580.75	-18.06	580.75	-14.26	580.38	-10.78	580.04	-9.55	580
-3.63	579.76	-.06	579.95	2.31	580.07	3	580.13	5.97	580.34
8.71	580.4	12.93	581.1	18.01	581.9	21.27	581.95	28.69	582.03
31.35	582.99	34.86	584.53	38	586.28	38.1	586.33	49.65	588.57
51.72	588.97	56.86	589.89						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70.98	.15	-23.39	.05	28.69	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-23.39	28.69	63	63	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-70.98	-25.5	590	F
29.5	56.86	590	F

BRIDGE

RIVER: Crystal River
REACH: Glen Arbor RS: 2225.7

INPUT
Description: 1st Bridge crossing CR 675 from M22
Distance from Upstream XS = 8.9
Deck/Roadway Width = 43.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 9

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-85.6	587.82		-71.23	588.09		-25.48	588.79	
-25.43	588.79	586.2	29.38	589.79	587.2	29.39	589.79	
50.14	590.09		134.33	590.43		184.33	590.63	

Upstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70.98	586.91	-65.52	586.77	-51.6	586.05	-51.43	586.03	-47.03	585.55
-43.17	584.62	-41.17	584.34	-36.87	583.44	-31.77	582.59	-25.43	580.5
-23.08	580.5	-21.84	580.5	.59	580.5	24.36	580.5	29.38	581.8
31.35	582.99	34.86	584.53	38	586.28	38.1	586.33	49.65	588.57
51.72	588.97	56.86	589.89						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70.98	.15	-31.77	.06	29.38	.15

Bank Sta: Left	Right	Coeff Contr.	Expan.
-31.77	29.38	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-70.98	-25.5	590	F
29.5	56.86	590	F

Downstream Deck/Roadway Coordinates
num= 9

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-85.6	587.82		-71.23	588.09		-25.48	588.79	
-25.43	588.79	586.2	29.38	589.79	587.2	29.39	589.79	
50.14	590.09		134.33	590.43		184.33	590.63	

Downstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-72.19	587.16	-67.07	587	-54.02	586.44	-53.86	586.43	-49.73	586.01
-46.11	585.45	-44.24	585.23	-40.22	583.66	-35.43	582.63	-27.58	580.83

```
  -25.43   580.5     .59   580.5   24.36   580.5   29.38   581.8   32.41  581.82
   36.39  582.68   41.64  584.77   46.34  586.79   46.49  586.82   63.78  588.59
   66.88  588.89   74.56  589.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -72.19     .15  -27.58     .06   29.38     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -27.58   29.38             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -72.19   -25.5     590       F
    29.5   74.56     590       F

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

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   -25.5   580.5   -24.5   580.5
Downstream     num=       2
     Sta    Elev     Sta    Elev
   -25.5   580.5   -24.5   580.5

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   24.36   580.5   29.38   581.8
Downstream     num=       2
     Sta    Elev     Sta    Elev
   24.36   580.5   29.38   581.8

Number of Bridge Coefficient Sets =  1

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

High Flow Method
       Energy Only
```

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

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2198.27*

INPUT
Description: DS Face Culvert (Interpolated Section 8)
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-72.19	587.16	-67.07	587	-54.02	586.44	-53.86	586.43	-49.73	586.01
-46.11	585.45	-44.24	585.23	-40.22	583.66	-35.43	582.63	-27.58	580.83
-22.11	580.22	-21.63	580.21	-17.39	580.05	-13.5	579.89	-12.14	579.87
-5.53	579.49	-1.34	579.77	1.44	579.95	2.25	580.11	5.73	580.76
8.95	580.9	13.91	581.34	19.86	581.72	23.69	581.77	32.41	581.82
36.39	582.68	41.64	584.77	46.34	586.79	46.49	586.82	63.78	588.59
66.88	588.89	74.56	589.61						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-72.19	.15	-27.58	.05	32.41	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-27.58 32.41 32.5 32.5 32.5 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-72.19	-25.5	590	F
29.5	74.56	590	F

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2157.3

INPUT
Description: XSEC 5 (STA. 21+57.3)
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-72.97	587.32	-55.44	586.69	-46.24	585.81	-42.39	583.8	-30.3	580.76
-24.47	579.87	-19.43	579.84	-13.82	579.78	-6.77	579.32	-2.17	579.66
.88	579.88	5.58	581.04	14.54	581.5	25.27	581.66	34.82	581.69
39.66	582.47	51.76	587.12	72.97	588.6	86.09	589.42		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-72.97	.15	-30.3	.05	34.82	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.3	34.82	95.7	95.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2061.60*

INPUT
Description: Interpolated Section 7
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-60.08	587.55	-56.01	587.34	-49.09	586.3	-43.51	585.18	-43.32	585.15
-41.9	584.39	-40.9	583.87	-33.32	581.58	-28.76	580.79	-28.34	580.75
-24.81	580.65	-20.42	580.5	-14.9	580.12	-9.99	580.59	-6.73	580.9
-5.75	581.07	-1.71	581.55	6.75	581.79	7.86	581.8	18.15	581.75
19.32	581.8	29.52	582.13	30.85	582.96	36.37	584.68	37.86	584.75
58.7	587.08	79.6	587.5	95.24	588.02	117.83	588.72		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-60.08	.15	-33.32	.05	29.52	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-33.32	29.52	95.7	95.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1965.9

INPUT
Description: XSEC 4 (STA. 19+65.9)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-47.19	587.77	-45.54	587.6	-40.47	584.53	-39.82	584.14	-36.34	582.39
-32.74	581.64	-23.03	580.93	-13.3	582.03	0	582.13	12.13	581.86
24.22	582.57	26.11	584.1	33.94	587.02	95.3	587.04	149.58	588.02

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-47.19	.15	-36.34	.05	24.22	.15

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -36.34   24.22            123.5   123.5   123.5             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 1842.40*

INPUT
Description: Interpolated Section 6
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -53.76  588.59  -52.33  588.45  -50.72  588.13  -45.81  586.53  -41.35  585.92
  -40.15  585.75  -39.94  585.73  -34.95  583.55  -34.34  583.26  -33.72  582.38
  -27.71  581.57   -26.9   581.5  -18.53  581.23  -11.52  580.95    -2.7  581.75
   -2.44  581.77    9.07  581.91    9.97  581.91   21.28  581.78   21.95   581.8
   32.56  582.28   33.98  583.11   39.88  584.86      40  584.87   42.16  585.64
   43.88  585.73   62.47  586.95   86.09  587.02  126.96  587.64

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -53.76     .15  -33.72     .05   32.56     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -33.72   32.56            123.5   123.5   123.5             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 1718.9

INPUT
Description: XSEC 3 (STA. 17+18.9)
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -60.34   589.4  -58.25   589.2  -48.74  587.06  -40.18  587.38   -32.9  584.38
     -32  583.97   -31.1  582.37  -21.55  581.39   -9.82  581.22       0  580.97
    8.18  581.51    19.1  581.69   31.05   581.7    40.9  581.99    45.9  582.72
   47.35  584.26   48.51  584.44      61  586.87  104.34  587.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -60.34     .15   -31.1     .05    40.9     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -31.1    40.9            133.4   133.4   133.4             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Glen Arbor RS: 1585.50*

INPUT
Description: Interpolated Section 5
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-69.42	588.74	-66.65	588.57	-54.06	586.86	-42.72	587.01	-41.29	586.67
-38.73	585.78	-35.9	585.02	-35.1	584.74	-33.68	584.12	-33.07	583.95
-31.88	583.61	-30.69	582.37	-21.69	581.64	-21.26	581.6	-9.69	581.34
0	581.04	7.56	581.51	10.52	581.57	17.64	581.73	26.45	581.82
28.68	581.82	37.78	582.04	40.65	582.75	42.98	583.16	44.48	584.42
45.69	584.64	56.09	586.81	58.68	587.24	89.36	588.18	103.74	588.16

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-69.42	.15	-30.69	.05	37.78	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.69	37.78	133.4	133.4	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1452.10*

INPUT
Description: Interpolated Section 4
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-78.5	588.09	-75.06	587.94	-59.37	586.67	-45.25	586.65	-43.48	586.4
-40.28	585.41	-36.76	584.77	-35.77	584.47	-34.01	583.66	-33.24	583.53
-31.76	583.25	-30.28	582.38	-21.4	581.84	-20.98	581.81	-9.56	581.46
0	581.12	6.93	581.51	9.65	581.58	16.18	581.78	24.26	581.95
26.31	581.95	34.65	582.09	37.64	583.11	40.05	583.6	41.62	584.57
42.87	584.83	53.67	587.24	56.35	587.61	88.21	589.24	103.13	589.08

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-78.5	.15	-30.28	.05	34.65	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.28	34.65	133.4	133.4	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1318.70*

INPUT
Description: Interpolated Section 3
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-87.59	587.43	-83.46	587.31	-64.69	586.47	-47.79	586.28	-45.66	586.14
-41.84	585.05	-37.63	584.53	-36.44	584.19	-34.33	583.21	-33.42	583.1
-31.64	582.89	-29.86	582.38	-21.11	582.04	-20.69	582.01	-9.43	581.58
0	581.2	6.31	581.51	8.78	581.59	14.73	581.82	22.08	582.07
23.94	582.07	31.53	582.14	34.62	583.47	37.13	584.03	38.75	584.73
40.05	585.03	51.24	587.66	54.03	587.98	87.06	590.29	102.53	589.99

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-87.59	.15	-29.86	.05	31.53	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-29.86	31.53	133.4	133.4	133.4	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1185.3

INPUT
Description: XSEC 2 (STA. 11+85.3)
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-96.67	586.77	-47.85	585.87	-43.4	584.69	-38.49	584.29	-37.11	583.92
-34.65	582.75	-29.45	582.38	-20.82	582.24	0	581.27	7.91	581.6
19.89	582.2	28.41	582.19	31.61	583.83	48.82	588.09	85.91	591.35
101.93	590.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-96.67	.15	-29.45	.05	28.41	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-29.45	28.41	61.77	61.77	61.77	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1123.53*

INPUT

Description: Interpolated Section 2
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-92.49	586.85	-92.49	585.52	-57.22	584.86	-47.27	584.76	-43.14	583.98
-38.59	583.73	-37.32	583.49	-35.04	582.71	-30.22	582.48	-22.83	582.14
-22.47	582.13	-12.28	581.46	-3.77	580.76	2.64	581.36	4.86	581.25
5.92	581.2	17.93	582.04	22.09	582.2	27.22	582.27	31.07	583.49
41.77	585.31	49.94	587.29	51.76	587.68	65.52	589.44	96.35	590.99
110.63	590.79	115.6	590.78						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-92.49	.15	-30.22	.05	27.22	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.22	27.22	61.77	61.77	61.77	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1061.77*

INPUT
Description: Interpolated Section 1
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-88.31	586.92	-88.31	584.28	-55.85	583.64	-46.68	583.64	-42.89	583.27
-38.7	583.17	-37.52	583.05	-35.42	582.68	-30.99	582.59	-24.44	582.04
-24.12	582.02	-15.09	581.22	-7.54	580.26	-.59	581.21	1.81	580.9
2.96	580.76	15.97	581.88	20.47	582.2	26.04	582.34	30.53	583.15
43.03	584.59	52.57	586.86	54.7	587.27	70.77	589.79	106.78	590.63
123.46	590.56	129.28	590.67						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-88.31	.15	-30.99	.05	26.04	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.99	26.04	61.77	61.77	61.77	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1000.0

INPUT
Description: XSEC 1 (STA. 10+00)
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.13	587	-84.13	583.03	-54.47	582.43	-31.76	582.69	-26.05	581.94
-17.89	580.97	-11.31	579.75	-3.83	581.06	0	580.31	18.86	582.2
24.85	582.42	44.29	583.87	55.2	586.43	76.02	590.14	136.3	590.33
142.95	590.55								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-84.13	.15	-31.76	.05	24.85	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-31.76	24.85	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Crystal River

Reach	River Sta.	n1	n2	n3
Glen Arbor	10162.2	.15	.05	.15
Glen Arbor	10023.5*	.15	.05	.15
Glen Arbor	9884.90*	.15	.05	.15
Glen Arbor	9746.25*	.15	.05	.15
Glen Arbor	9607.60*	.15	.05	.15
Glen Arbor	9468.95*	.15	.05	.15
Glen Arbor	9330.3	.15	.05	.15
Glen Arbor	9224.50*	.15	.05	.15
Glen Arbor	9118.7	.15	.05	.15
Glen Arbor	8986.6	.15	.05	.15
Glen Arbor	8974	.15	.05	.15
Glen Arbor	8946.1	Bridge		
Glen Arbor	8919.20*	.15	.05	.15
Glen Arbor	8907.3	.15	.05	.15
Glen Arbor	8742.47*	.15	.05	.15
Glen Arbor	8577.63*	.15	.05	.15
Glen Arbor	8412.8	.15	.05	.15
Glen Arbor	8242.58*	.15	.05	.15
Glen Arbor	8072.35*	.15	.05	.15
Glen Arbor	7902.13*	.15	.05	.15
Glen Arbor	7731.9	.15	.05	.15
Glen Arbor	7558.02*	.15	.05	.15
Glen Arbor	7384.15*	.15	.05	.15
Glen Arbor	7210.27*	.15	.05	.15
Glen Arbor	7036.39*	.15	.05	.15
Glen Arbor	6862.52*	.15	.05	.15
Glen Arbor	6688.64*	.15	.05	.15
Glen Arbor	6514.76*	.15	.05	.15
Glen Arbor	6340.88*	.15	.05	.15

Glen Arbor	6167.01*	.15	.05	.15
Glen Arbor	5993.13*	.15	.05	.15
Glen Arbor	5819.25*	.15	.05	.15
Glen Arbor	5645.38*	.15	.05	.15
Glen Arbor	5471.50*	.15	.05	.15
Glen Arbor	5297.62*	.15	.05	.15
Glen Arbor	5123.75*	.15	.05	.15
Glen Arbor	4949.87*	.15	.05	.15
Glen Arbor	4775.99*	.15	.05	.15
Glen Arbor	4602.12*	.15	.05	.15
Glen Arbor	4428.24*	.15	.05	.15
Glen Arbor	4254.36*	.15	.05	.15
Glen Arbor	4080.48*	.15	.05	.15
Glen Arbor	3906.61*	.15	.05	.15
Glen Arbor	3732.73*	.15	.05	.15
Glen Arbor	3558.85*	.15	.05	.15
Glen Arbor	3384.98*	.15	.05	.15
Glen Arbor	3211.1	.15	.05	.15
Glen Arbor	3050.95*	.15	.05	.15
Glen Arbor	2890.80*	.15	.05	.15
Glen Arbor	2730.65*	.15	.05	.15
Glen Arbor	2570.5	.15	.05	.15
Glen Arbor	2427.35*	.15	.05	.15
Glen Arbor	2284.2	.15	.05	.15
Glen Arbor	2261.22*	.15	.05	.15
Glen Arbor	2225.7	Bridge		
Glen Arbor	2198.27*	.15	.05	.15
Glen Arbor	2157.3	.15	.05	.15
Glen Arbor	2061.60*	.15	.05	.15
Glen Arbor	1965.9	.15	.05	.15
Glen Arbor	1842.40*	.15	.05	.15
Glen Arbor	1718.9	.15	.05	.15
Glen Arbor	1585.50*	.15	.05	.15
Glen Arbor	1452.10*	.15	.05	.15
Glen Arbor	1318.70*	.15	.05	.15
Glen Arbor	1185.3	.15	.05	.15
Glen Arbor	1123.53*	.15	.05	.15
Glen Arbor	1061.77*	.15	.05	.15
Glen Arbor	1000.0	.15	.05	.15

SUMMARY OF REACH LENGTHS

River: Crystal River

Reach	River Sta.	Left	Channel	Right
Glen Arbor	10162.2	138.65	138.65	138.65

Glen Arbor	10023.5*	138.65	138.65	138.65
Glen Arbor	9884.90*	138.65	138.65	138.65
Glen Arbor	9746.25*	138.65	138.65	138.65
Glen Arbor	9607.60*	138.65	138.65	138.65
Glen Arbor	9468.95*	138.65	138.65	138.65
Glen Arbor	9330.3	105.8	105.8	105.8
Glen Arbor	9224.50*	105.8	105.8	105.8
Glen Arbor	9118.7	126.9	126.9	126.9
Glen Arbor	8986.6	12.6	12.6	12.6
Glen Arbor	8974	55	55	55
Glen Arbor	8946.1	Bridge		
Glen Arbor	8919.20*	11.9	11.9	11.9
Glen Arbor	8907.3	164.83	164.83	164.83
Glen Arbor	8742.47*	164.83	164.83	164.83
Glen Arbor	8577.63*	164.83	164.83	164.83
Glen Arbor	8412.8	170.23	170.23	170.23
Glen Arbor	8242.58*	170.23	170.23	170.23
Glen Arbor	8072.35*	170.23	170.23	170.23
Glen Arbor	7902.13*	170.23	170.23	170.23
Glen Arbor	7731.9	173.88	173.88	173.88
Glen Arbor	7558.02*	173.88	173.88	173.88
Glen Arbor	7384.15*	173.88	173.88	173.88
Glen Arbor	7210.27*	173.88	173.88	173.88
Glen Arbor	7036.39*	173.88	173.88	173.88
Glen Arbor	6862.52*	173.88	173.88	173.88
Glen Arbor	6688.64*	173.88	173.88	173.88
Glen Arbor	6514.76*	173.88	173.88	173.88
Glen Arbor	6340.88*	173.88	173.88	173.88
Glen Arbor	6167.01*	173.88	173.88	173.88
Glen Arbor	5993.13*	173.88	173.88	173.88
Glen Arbor	5819.25*	173.88	173.88	173.88
Glen Arbor	5645.38*	223	173.88	96
Glen Arbor	5471.50*	223	173.88	93
Glen Arbor	5297.62*	173.88	173.88	173.88
Glen Arbor	5123.75*	173.88	173.88	173.88
Glen Arbor	4949.87*	173.88	173.88	173.88
Glen Arbor	4775.99*	173.88	173.88	173.88
Glen Arbor	4602.12*	173.88	173.88	173.88
Glen Arbor	4428.24*	173.88	173.88	173.88
Glen Arbor	4254.36*	173.88	173.88	173.88
Glen Arbor	4080.48*	173.88	173.88	173.88
Glen Arbor	3906.61*	173.88	173.88	173.88
Glen Arbor	3732.73*	173.88	173.88	173.88
Glen Arbor	3558.85*	173.88	173.88	173.88
Glen Arbor	3384.98*	173.88	173.88	173.88
Glen Arbor	3211.1	160.15	160.15	160.15
Glen Arbor	3050.95*	160.15	160.15	160.15
Glen Arbor	2890.80*	160.15	160.15	160.15
Glen Arbor	2730.65*	160.15	160.15	160.15
Glen Arbor	2570.5	143.1	143.1	143.1

Glen Arbor	2427.35*	143.1	143.1	143.1
Glen Arbor	2284.2	32.5	32.5	32.5
Glen Arbor	2261.22*	63	63	63
Glen Arbor	2225.7	Bridge		
Glen Arbor	2198.27*	32.5	32.5	32.5
Glen Arbor	2157.3	95.7	95.7	95.7
Glen Arbor	2061.60*	95.7	95.7	95.7
Glen Arbor	1965.9	123.5	123.5	123.5
Glen Arbor	1842.40*	123.5	123.5	123.5
Glen Arbor	1718.9	133.4	133.4	133.4
Glen Arbor	1585.50*	133.4	133.4	133.4
Glen Arbor	1452.10*	133.4	133.4	133.4
Glen Arbor	1318.70*	133.4	133.4	133.4
Glen Arbor	1185.3	61.77	61.77	61.77
Glen Arbor	1123.53*	61.77	61.77	61.77
Glen Arbor	1061.77*	61.77	61.77	61.77
Glen Arbor	1000.0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Crystal River

Reach	River Sta.	Contr.	Expan.
Glen Arbor	10162.2	.1	.3
Glen Arbor	10023.5*	.1	.3
Glen Arbor	9884.90*	.1	.3
Glen Arbor	9746.25*	.1	.3
Glen Arbor	9607.60*	.1	.3
Glen Arbor	9468.95*	.1	.3
Glen Arbor	9330.3	.1	.3
Glen Arbor	9224.50*	.1	.3
Glen Arbor	9118.7	.1	.3
Glen Arbor	8986.6	.1	.3
Glen Arbor	8974	.1	.3
Glen Arbor	8946.1	Bridge	
Glen Arbor	8919.20*	.1	.3
Glen Arbor	8907.3	.1	.3
Glen Arbor	8742.47*	.1	.3
Glen Arbor	8577.63*	.1	.3
Glen Arbor	8412.8	.1	.3
Glen Arbor	8242.58*	.1	.3
Glen Arbor	8072.35*	.1	.3
Glen Arbor	7902.13*	.1	.3
Glen Arbor	7731.9	.1	.3
Glen Arbor	7558.02*	.1	.3
Glen Arbor	7384.15*	.1	.3

Glen Arbor	7210.27*		.1	.3
Glen Arbor	7036.39*		.1	.3
Glen Arbor	6862.52*		.1	.3
Glen Arbor	6688.64*		.1	.3
Glen Arbor	6514.76*		.1	.3
Glen Arbor	6340.88*		.1	.3
Glen Arbor	6167.01*		.1	.3
Glen Arbor	5993.13*		.1	.3
Glen Arbor	5819.25*		.1	.3
Glen Arbor	5645.38*		.1	.3
Glen Arbor	5471.50*		.1	.3
Glen Arbor	5297.62*		.1	.3
Glen Arbor	5123.75*		.1	.3
Glen Arbor	4949.87*		.1	.3
Glen Arbor	4775.99*		.1	.3
Glen Arbor	4602.12*		.1	.3
Glen Arbor	4428.24*		.1	.3
Glen Arbor	4254.36*		.1	.3
Glen Arbor	4080.48*		.1	.3
Glen Arbor	3906.61*		.1	.3
Glen Arbor	3732.73*		.1	.3
Glen Arbor	3558.85*		.1	.3
Glen Arbor	3384.98*		.1	.3
Glen Arbor	3211.1		.1	.3
Glen Arbor	3050.95*		.1	.3
Glen Arbor	2890.80*		.1	.3
Glen Arbor	2730.65*		.1	.3
Glen Arbor	2570.5		.1	.3
Glen Arbor	2427.35*		.1	.3
Glen Arbor	2284.2		.1	.3
Glen Arbor	2261.22*		.3	.5
Glen Arbor	2225.7	Bridge		
Glen Arbor	2198.27*		.3	.5
Glen Arbor	2157.3		.1	.3
Glen Arbor	2061.60*		.1	.3
Glen Arbor	1965.9		.1	.3
Glen Arbor	1842.40*		.1	.3
Glen Arbor	1718.9		.1	.3
Glen Arbor	1585.50*		.1	.3
Glen Arbor	1452.10*		.1	.3
Glen Arbor	1318.70*		.1	.3
Glen Arbor	1185.3		.1	.3
Glen Arbor	1123.53*		.1	.3
Glen Arbor	1061.77*		.1	.3
Glen Arbor	1000.0		.1	.3

HEC-RAS Plan: Exist w base Q River: Crystal River Reach: Glen Arbor

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)	
Glen Arbor	10162.2	2 Year	70.00	583.65	586.30		586.30	0.000255	0.37	218.99	139.42	0.05
Glen Arbor	10162.2	50 Year	145.00	583.65	588.30		588.30	0.000080	0.33	603.76	216.38	0.03
Glen Arbor	10162.2	100 Year	165.00	583.65	588.93		588.93	0.000058	0.31	741.39	221.89	0.03
Glen Arbor	10162.2	500 Year	220.00	583.65	590.78		590.78	0.000027	0.27	1227.11	294.60	0.02
Glen Arbor	10162.2	Base Flow	35.00	583.65	585.36		585.36	0.000429	0.36	100.78	106.55	0.06
Glen Arbor	10023.5*	2 Year	70.00	583.47	586.26		586.26	0.000259	0.40	214.48	175.46	0.05
Glen Arbor	10023.5*	50 Year	145.00	583.47	588.29		588.29	0.000072	0.33	677.76	255.18	0.03
Glen Arbor	10023.5*	100 Year	165.00	583.47	588.92		588.92	0.000052	0.30	841.05	262.47	0.02
Glen Arbor	10023.5*	500 Year	220.00	583.47	590.78		590.78	0.000024	0.25	1439.09	354.20	0.02
Glen Arbor	10023.5*	Base Flow	35.00	583.47	585.30		585.30	0.000422	0.37	94.38	70.22	0.06
Glen Arbor	9884.90*	2 Year	70.00	583.28	586.23		586.23	0.000247	0.39	236.10	308.81	0.05
Glen Arbor	9884.90*	50 Year	145.00	583.28	588.28		588.28	0.000049	0.27	907.21	344.44	0.02
Glen Arbor	9884.90*	100 Year	165.00	583.28	588.91		588.91	0.000034	0.25	1128.80	355.42	0.02
Glen Arbor	9884.90*	500 Year	220.00	583.28	590.77		590.77	0.000015	0.21	1809.35	373.60	0.01
Glen Arbor	9884.90*	Base Flow	35.00	583.28	585.24		585.24	0.000361	0.35	114.68	103.12	0.05
Glen Arbor	9746.25*	2 Year	70.00	583.09	586.20		586.20	0.000162	0.33	307.97	209.13	0.04
Glen Arbor	9746.25*	50 Year	145.00	583.09	588.27		588.27	0.000051	0.29	825.95	281.20	0.02
Glen Arbor	9746.25*	100 Year	165.00	583.09	588.91		588.91	0.000039	0.27	1010.12	298.74	0.02
Glen Arbor	9746.25*	500 Year	220.00	583.09	590.77		590.77	0.000019	0.24	1613.82	347.47	0.02
Glen Arbor	9746.25*	Base Flow	35.00	583.09	585.20		585.20	0.000322	0.33	123.64	106.08	0.05
Glen Arbor	9607.60*	2 Year	70.00	582.91	586.18		586.18	0.000127	0.32	220.85	87.31	0.03
Glen Arbor	9607.60*	50 Year	145.00	582.91	588.27		588.27	0.000060	0.33	591.37	199.61	0.03
Glen Arbor	9607.60*	100 Year	165.00	582.91	588.90		588.90	0.000047	0.31	722.40	211.81	0.02
Glen Arbor	9607.60*	500 Year	220.00	582.91	590.77		590.77	0.000025	0.28	1147.26	237.28	0.02
Glen Arbor	9607.60*	Base Flow	35.00	582.91	585.17		585.17	0.000158	0.26	134.65	82.87	0.04
Glen Arbor	9468.95*	2 Year	70.00	582.72	586.15		586.16	0.000255	0.46	163.96	84.99	0.05
Glen Arbor	9468.95*	50 Year	145.00	582.72	588.25		588.25	0.000118	0.46	467.89	193.89	0.04
Glen Arbor	9468.95*	100 Year	165.00	582.72	588.89		588.89	0.000089	0.43	600.07	219.32	0.03
Glen Arbor	9468.95*	500 Year	220.00	582.72	590.76		590.76	0.000041	0.36	1054.45	249.40	0.02
Glen Arbor	9468.95*	Base Flow	35.00	582.72	585.13		585.14	0.000313	0.37	94.54	58.33	0.05
Glen Arbor	9330.3	2 Year	70.00	582.54	586.12		586.12	0.000252	0.48	166.92	75.56	0.05
Glen Arbor	9330.3	50 Year	145.00	582.54	588.24		588.24	0.000125	0.48	459.54	189.54	0.04
Glen Arbor	9330.3	100 Year	165.00	582.54	588.88		588.88	0.000094	0.45	583.71	196.10	0.03
Glen Arbor	9330.3	500 Year	220.00	582.54	590.76		590.76	0.000046	0.38	954.82	197.84	0.02
Glen Arbor	9330.3	Base Flow	35.00	582.54	585.09		585.09	0.000297	0.39	94.78	65.14	0.05
Glen Arbor	9224.50*	2 Year	70.00	582.69	586.09		586.09	0.000248	0.46	158.10	71.64	0.05
Glen Arbor	9224.50*	50 Year	145.00	582.69	588.22		588.23	0.000121	0.47	447.58	199.07	0.04
Glen Arbor	9224.50*	100 Year	165.00	582.69	588.87		588.87	0.000089	0.44	578.36	202.68	0.03
Glen Arbor	9224.50*	500 Year	220.00	582.69	590.75		590.75	0.000043	0.37	959.70	202.68	0.02
Glen Arbor	9224.50*	Base Flow	35.00	582.69	585.06		585.06	0.000293	0.37	95.41	54.79	0.05
Glen Arbor	9118.7	2 Year	70.00	582.85	586.06		586.07	0.000289	0.46	153.32	62.76	0.05
Glen Arbor	9118.7	50 Year	145.00	582.85	588.21		588.21	0.000129	0.46	430.36	207.52	0.04
Glen Arbor	9118.7	100 Year	165.00	582.85	588.86		588.86	0.000092	0.43	565.47	207.52	0.03
Glen Arbor	9118.7	500 Year	220.00	582.85	590.75		590.75	0.000043	0.35	956.96	207.52	0.02
Glen Arbor	9118.7	Base Flow	35.00	582.85	585.03		585.03	0.000376	0.38	90.91	57.90	0.05
Glen Arbor	8986.6	2 Year	70.00	580.55	586.04	581.77	586.04	0.000154	0.43	163.97	50.79	0.04
Glen Arbor	8986.6	50 Year	145.00	580.55	588.19	582.22	588.19	0.000141	0.55	261.70	120.39	0.04
Glen Arbor	8986.6	100 Year	165.00	580.55	588.84	582.33	588.85	0.000128	0.57	291.37	147.19	0.04
Glen Arbor	8986.6	500 Year	220.00	580.55	590.73	582.57	590.74	0.000096	0.58	377.24	192.88	0.04
Glen Arbor	8986.6	Base Flow	35.00	580.55	585.00	581.44	585.00	0.000102	0.29	119.04	42.00	0.03
Glen Arbor	8974	2 Year	70.00	580.62	586.03	581.91	586.03	0.000303	0.73	96.15	55.00	0.06
Glen Arbor	8974	50 Year	145.00	580.62	588.17	582.42	588.19	0.000376	1.04	139.47	112.50	0.07
Glen Arbor	8974	100 Year	165.00	580.62	588.82	582.54	588.84	0.000360	1.08	152.65	139.55	0.07
Glen Arbor	8974	500 Year	220.00	580.62	590.71	582.81	590.73	0.000304	1.15	190.81	188.47	0.07
Glen Arbor	8974	Base Flow	35.00	580.62	585.00	581.56	585.00	0.000170	0.46	75.40	43.64	0.04
Glen Arbor	8946.1		Culvert									
Glen Arbor	8919.20*	2 Year	70.00	580.96	585.78	582.07	585.79	0.000408	0.79	88.12	56.18	0.07
Glen Arbor	8919.20*	50 Year	145.00	580.96	587.15	582.57	587.17	0.000707	1.25	115.64	70.34	0.09
Glen Arbor	8919.20*	100 Year	165.00	580.96	587.49	582.68	587.52	0.000753	1.35	122.64	79.63	0.10
Glen Arbor	8919.20*	500 Year	220.00	580.96	588.49	582.96	588.52	0.000808	1.54	142.69	101.23	0.10
Glen Arbor	8919.20*	Base Flow	35.00	580.96	584.93	581.76	584.94	0.000210	0.49	70.94	52.37	0.05
Glen Arbor	8907.3	2 Year	70.00	581.03	585.78	582.01	585.79	0.000216	0.55	128.35	56.06	0.05
Glen Arbor	8907.3	50 Year	145.00	581.03	587.15	582.45	587.16	0.000347	0.84	172.28	70.96	0.06
Glen Arbor	8907.3	100 Year	165.00	581.03	587.49	582.55	587.51	0.000364	0.90	183.46	80.08	0.07
Glen Arbor	8907.3	500 Year	220.00	581.03	588.49	582.80	588.51	0.000379	1.02	215.49	97.46	0.07
Glen Arbor	8907.3	Base Flow	35.00	581.03	584.93	581.75	584.93	0.000120	0.35	100.96	52.79	0.03

HEC-RAS Plan: Exist w base Q River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	8742.47*	2 Year	70.00	581.30	585.75		585.76	0.000161	0.44	176.98	60.84	0.04
Glen Arbor	8742.47*	50 Year	145.00	581.30	587.10		587.11	0.000224	0.64	272.34	83.85	0.05
Glen Arbor	8742.47*	100 Year	165.00	581.30	587.45		587.46	0.000226	0.67	302.83	92.52	0.05
Glen Arbor	8742.47*	500 Year	220.00	581.30	588.45		588.46	0.000209	0.73	411.44	135.44	0.05
Glen Arbor	8742.47*	Base Flow	35.00	581.30	584.91		584.92	0.000103	0.29	128.51	55.21	0.03
Glen Arbor	8577.63*	2 Year	70.00	581.58	585.72		585.73	0.000210	0.47	172.05	69.80	0.05
Glen Arbor	8577.63*	50 Year	145.00	581.58	587.06		587.07	0.000261	0.66	281.91	96.07	0.05
Glen Arbor	8577.63*	100 Year	165.00	581.58	587.41		587.42	0.000257	0.69	316.62	104.74	0.05
Glen Arbor	8577.63*	500 Year	220.00	581.58	588.41		588.42	0.000219	0.72	464.70	168.53	0.05
Glen Arbor	8577.63*	Base Flow	35.00	581.58	584.89		584.90	0.000146	0.33	118.90	59.22	0.04
Glen Arbor	8412.8	2 Year	70.00	581.85	585.68		585.69	0.000278	0.51	171.46	81.08	0.05
Glen Arbor	8412.8	50 Year	145.00	581.85	587.02		587.02	0.000299	0.68	297.58	122.07	0.06
Glen Arbor	8412.8	100 Year	165.00	581.85	587.37		587.37	0.000286	0.70	348.07	168.85	0.06
Glen Arbor	8412.8	500 Year	220.00	581.85	588.38		588.38	0.000220	0.70	542.50	218.28	0.05
Glen Arbor	8412.8	Base Flow	35.00	581.85	584.86		584.87	0.000222	0.37	110.98	66.68	0.04
Glen Arbor	8242.58*	2 Year	70.00	582.02	585.64		585.64	0.000273	0.49	172.91	83.82	0.05
Glen Arbor	8242.58*	50 Year	145.00	582.02	586.97		586.97	0.000285	0.65	308.71	166.74	0.06
Glen Arbor	8242.58*	100 Year	165.00	582.02	587.32		587.32	0.000273	0.67	368.83	176.46	0.06
Glen Arbor	8242.58*	500 Year	220.00	582.02	588.34		588.35	0.000197	0.65	565.93	213.84	0.05
Glen Arbor	8242.58*	Base Flow	35.00	582.02	584.83		584.83	0.000225	0.36	111.20	68.77	0.04
Glen Arbor	8072.35*	2 Year	70.00	582.18	585.59		585.59	0.000270	0.47	177.67	90.48	0.05
Glen Arbor	8072.35*	50 Year	145.00	582.18	586.92		586.93	0.000272	0.62	330.53	166.44	0.05
Glen Arbor	8072.35*	100 Year	165.00	582.18	587.28		587.28	0.000246	0.62	390.94	175.20	0.05
Glen Arbor	8072.35*	500 Year	220.00	582.18	588.31		588.32	0.000176	0.61	587.92	208.30	0.05
Glen Arbor	8072.35*	Base Flow	35.00	582.18	584.79		584.79	0.000235	0.35	112.27	73.88	0.04
Glen Arbor	7902.13*	2 Year	70.00	582.34	585.54		585.55	0.000271	0.46	185.04	99.39	0.05
Glen Arbor	7902.13*	50 Year	145.00	582.34	586.88		586.88	0.000249	0.58	354.10	166.48	0.05
Glen Arbor	7902.13*	100 Year	165.00	582.34	587.24		587.24	0.000223	0.58	415.43	175.77	0.05
Glen Arbor	7902.13*	500 Year	220.00	582.34	588.28		588.29	0.000157	0.56	613.34	201.98	0.04
Glen Arbor	7902.13*	Base Flow	35.00	582.34	584.75		584.75	0.000259	0.35	112.91	81.38	0.05
Glen Arbor	7731.9	2 Year	70.00	582.51	585.50		585.50	0.000275	0.44	194.76	110.90	0.05
Glen Arbor	7731.9	50 Year	145.00	582.51	586.84		586.84	0.000228	0.54	379.86	167.69	0.05
Glen Arbor	7731.9	100 Year	165.00	582.51	587.20		587.20	0.000203	0.54	442.28	176.87	0.05
Glen Arbor	7731.9	500 Year	220.00	582.51	588.26		588.26	0.000142	0.53	643.70	203.68	0.04
Glen Arbor	7731.9	Base Flow	35.00	582.51	584.70		584.70	0.000297	0.35	113.85	91.69	0.05
Glen Arbor	7558.02*	2 Year	70.00	582.46	585.45		585.45	0.000270	0.44	194.80	109.15	0.05
Glen Arbor	7558.02*	50 Year	145.00	582.46	586.80		586.80	0.000229	0.54	375.53	169.00	0.05
Glen Arbor	7558.02*	100 Year	165.00	582.46	587.16		587.17	0.000203	0.54	439.67	180.28	0.05
Glen Arbor	7558.02*	500 Year	220.00	582.46	588.23		588.24	0.000139	0.52	649.47	212.06	0.04
Glen Arbor	7558.02*	Base Flow	35.00	582.46	584.65		584.65	0.000290	0.35	114.42	91.28	0.05
Glen Arbor	7384.15*	2 Year	70.00	582.41	585.40		585.41	0.000265	0.44	195.02	107.46	0.05
Glen Arbor	7384.15*	50 Year	145.00	582.41	586.76		586.76	0.000226	0.54	369.41	157.95	0.05
Glen Arbor	7384.15*	100 Year	165.00	582.41	587.13		587.13	0.000203	0.55	431.22	173.33	0.05
Glen Arbor	7384.15*	500 Year	220.00	582.41	588.21		588.21	0.000141	0.53	638.23	209.92	0.04
Glen Arbor	7384.15*	Base Flow	35.00	582.41	584.60		584.60	0.000283	0.34	115.19	90.97	0.05
Glen Arbor	7210.27*	2 Year	70.00	582.36	585.36		585.36	0.000260	0.43	195.13	105.80	0.05
Glen Arbor	7210.27*	50 Year	145.00	582.36	586.72		586.72	0.000224	0.54	365.03	152.77	0.05
Glen Arbor	7210.27*	100 Year	165.00	582.36	587.09		587.10	0.000204	0.55	426.78	174.86	0.05
Glen Arbor	7210.27*	500 Year	220.00	582.36	588.19		588.19	0.000140	0.53	643.93	223.10	0.04
Glen Arbor	7210.27*	Base Flow	35.00	582.36	584.55		584.55	0.000276	0.34	115.87	90.57	0.05
Glen Arbor	7036.39*	2 Year	70.00	582.31	585.31		585.32	0.000255	0.43	195.35	104.41	0.05
Glen Arbor	7036.39*	50 Year	145.00	582.31	586.68		586.68	0.000221	0.54	361.40	143.90	0.05
Glen Arbor	7036.39*	100 Year	165.00	582.31	587.06		587.06	0.000200	0.55	418.65	158.71	0.05
Glen Arbor	7036.39*	500 Year	220.00	582.31	588.16		588.16	0.000141	0.54	617.23	201.80	0.04
Glen Arbor	7036.39*	Base Flow	35.00	582.31	584.50		584.50	0.000269	0.34	116.57	90.18	0.05
Glen Arbor	6862.52*	2 Year	70.00	582.26	585.27		585.27	0.000252	0.43	195.34	102.95	0.05
Glen Arbor	6862.52*	50 Year	145.00	582.26	586.64		586.65	0.000213	0.53	394.95	208.36	0.05
Glen Arbor	6862.52*	100 Year	165.00	582.26	587.03		587.03	0.000182	0.52	476.26	215.87	0.04
Glen Arbor	6862.52*	500 Year	220.00	582.26	588.14		588.14	0.000116	0.49	728.09	236.71	0.04
Glen Arbor	6862.52*	Base Flow	35.00	582.26	584.46		584.46	0.000264	0.34	117.10	89.93	0.05
Glen Arbor	6688.64*	2 Year	70.00	582.21	585.23		585.23	0.000248	0.43	195.51	101.61	0.05
Glen Arbor	6688.64*	50 Year	145.00	582.21	586.61		586.61	0.000218	0.54	362.73	192.80	0.05
Glen Arbor	6688.64*	100 Year	165.00	582.21	586.99		587.00	0.000190	0.54	439.04	200.42	0.05
Glen Arbor	6688.64*	500 Year	220.00	582.21	588.12		588.12	0.000124	0.51	676.77	222.49	0.04
Glen Arbor	6688.64*	Base Flow	35.00	582.21	584.41		584.41	0.000259	0.33	117.80	89.47	0.05

HEC-RAS Plan: Exist w base Q River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	6514.76*	2 Year	70.00	582.16	585.19		585.19	0.000233	0.42	208.72	112.76	0.05
Glen Arbor	6514.76*	50 Year	145.00	582.16	586.57		586.57	0.000194	0.51	386.63	142.29	0.05
Glen Arbor	6514.76*	100 Year	165.00	582.16	586.96		586.97	0.000174	0.51	443.81	149.35	0.04
Glen Arbor	6514.76*	500 Year	220.00	582.16	588.10		588.10	0.000124	0.51	622.82	163.37	0.04
Glen Arbor	6514.76*	Base Flow	35.00	582.16	584.37		584.37	0.000248	0.33	123.24	96.74	0.04
Glen Arbor	6340.88*	2 Year	70.00	582.11	585.13		585.13	0.000459	0.59	149.94	89.98	0.07
Glen Arbor	6340.88*	50 Year	145.00	582.11	586.53		586.53	0.000327	0.67	342.13	154.41	0.06
Glen Arbor	6340.88*	100 Year	165.00	582.11	586.92		586.93	0.000281	0.66	405.25	163.07	0.06
Glen Arbor	6340.88*	500 Year	220.00	582.11	588.07		588.07	0.000182	0.62	605.63	186.44	0.05
Glen Arbor	6340.88*	Base Flow	35.00	582.11	584.31		584.31	0.000468	0.46	88.71	69.29	0.06
Glen Arbor	6167.01*	2 Year	70.00	582.06	585.09		585.09	0.000123	0.30	338.48	171.71	0.03
Glen Arbor	6167.01*	50 Year	145.00	582.06	586.50		586.50	0.000101	0.37	597.15	198.53	0.03
Glen Arbor	6167.01*	100 Year	165.00	582.06	586.90		586.90	0.000092	0.38	678.69	208.50	0.03
Glen Arbor	6167.01*	500 Year	220.00	582.06	588.05		588.05	0.000067	0.38	927.35	221.12	0.03
Glen Arbor	6167.01*	Base Flow	35.00	582.06	584.27		584.27	0.000142	0.25	201.20	161.61	0.03
Glen Arbor	5993.13*	2 Year	70.00	582.01	585.06		585.07	0.000220	0.41	211.56	107.09	0.05
Glen Arbor	5993.13*	50 Year	145.00	582.01	586.47		586.48	0.000190	0.51	378.92	132.61	0.05
Glen Arbor	5993.13*	100 Year	165.00	582.01	586.88		586.88	0.000172	0.52	434.28	142.25	0.04
Glen Arbor	5993.13*	500 Year	220.00	582.01	588.04		588.04	0.000127	0.52	622.76	181.52	0.04
Glen Arbor	5993.13*	Base Flow	35.00	582.01	584.24		584.24	0.000235	0.32	127.07	97.42	0.04
Glen Arbor	5819.25*	2 Year	70.00	581.96	585.03		585.04	0.000143	0.33	266.72	126.19	0.04
Glen Arbor	5819.25*	50 Year	145.00	581.96	586.45		586.45	0.000127	0.42	460.64	148.77	0.04
Glen Arbor	5819.25*	100 Year	165.00	581.96	586.85		586.85	0.000116	0.43	522.31	155.59	0.04
Glen Arbor	5819.25*	500 Year	220.00	581.96	588.02		588.02	0.000089	0.44	723.75	196.10	0.03
Glen Arbor	5819.25*	Base Flow	35.00	581.96	584.21		584.21	0.000145	0.26	166.04	116.98	0.03
Glen Arbor	5645.38*	2 Year	70.00	581.91	585.01		585.01	0.000149	0.34	289.11	135.89	0.04
Glen Arbor	5645.38*	50 Year	145.00	581.91	586.43		586.43	0.000132	0.43	496.13	155.87	0.04
Glen Arbor	5645.38*	100 Year	165.00	581.91	586.83		586.83	0.000120	0.44	560.69	161.21	0.04
Glen Arbor	5645.38*	500 Year	220.00	581.91	588.00		588.00	0.000090	0.44	757.18	173.49	0.03
Glen Arbor	5645.38*	Base Flow	35.00	581.91	584.18		584.18	0.000153	0.27	180.13	127.09	0.04
Glen Arbor	5471.50*	2 Year	70.00	581.86	584.98		584.98	0.000224	0.42	197.46	94.58	0.05
Glen Arbor	5471.50*	50 Year	145.00	581.86	586.40		586.40	0.000201	0.53	346.27	117.08	0.05
Glen Arbor	5471.50*	100 Year	165.00	581.86	586.80		586.81	0.000183	0.54	396.07	125.96	0.05
Glen Arbor	5471.50*	500 Year	220.00	581.86	587.98		587.99	0.000136	0.54	563.17	157.57	0.04
Glen Arbor	5471.50*	Base Flow	35.00	581.86	584.15		584.15	0.000226	0.32	122.54	86.10	0.04
Glen Arbor	5297.62*	2 Year	70.00	581.81	584.94		584.94	0.000224	0.42	197.09	93.66	0.05
Glen Arbor	5297.62*	50 Year	145.00	581.81	586.36		586.37	0.000200	0.53	343.85	112.28	0.05
Glen Arbor	5297.62*	100 Year	165.00	581.81	586.77		586.78	0.000181	0.54	391.31	117.61	0.05
Glen Arbor	5297.62*	500 Year	220.00	581.81	587.96		587.96	0.000140	0.55	543.42	148.98	0.04
Glen Arbor	5297.62*	Base Flow	35.00	581.81	584.11		584.11	0.000224	0.32	122.73	85.54	0.04
Glen Arbor	5123.75*	2 Year	70.00	581.76	584.90		584.90	0.000224	0.42	196.38	92.85	0.05
Glen Arbor	5123.75*	50 Year	145.00	581.76	586.33		586.33	0.000200	0.53	341.74	110.49	0.05
Glen Arbor	5123.75*	100 Year	165.00	581.76	586.74		586.75	0.000181	0.54	388.78	115.53	0.05
Glen Arbor	5123.75*	500 Year	220.00	581.76	587.93		587.94	0.000137	0.55	535.63	136.72	0.04
Glen Arbor	5123.75*	Base Flow	35.00	581.76	584.07		584.07	0.000224	0.32	122.60	84.95	0.04
Glen Arbor	4949.87*	2 Year	70.00	581.71	584.86		584.86	0.000226	0.42	195.51	92.09	0.05
Glen Arbor	4949.87*	50 Year	145.00	581.71	586.29		586.30	0.000201	0.53	339.52	108.63	0.05
Glen Arbor	4949.87*	100 Year	165.00	581.71	586.71		586.72	0.000182	0.54	386.09	113.35	0.05
Glen Arbor	4949.87*	500 Year	220.00	581.71	587.91		587.92	0.000137	0.55	531.06	135.28	0.04
Glen Arbor	4949.87*	Base Flow	35.00	581.71	584.03		584.03	0.000225	0.32	122.30	84.38	0.04
Glen Arbor	4775.99*	2 Year	70.00	581.66	584.82		584.82	0.000227	0.42	194.56	91.34	0.05
Glen Arbor	4775.99*	50 Year	145.00	581.66	586.26		586.26	0.000201	0.53	337.28	106.88	0.05
Glen Arbor	4775.99*	100 Year	165.00	581.66	586.68		586.68	0.000182	0.54	383.41	111.32	0.05
Glen Arbor	4775.99*	500 Year	220.00	581.66	587.89		587.89	0.000138	0.55	530.05	142.07	0.04
Glen Arbor	4775.99*	Base Flow	35.00	581.66	583.99		583.99	0.000227	0.32	121.91	83.80	0.04
Glen Arbor	4602.12*	2 Year	70.00	581.61	584.78		584.78	0.000230	0.42	193.33	90.59	0.05
Glen Arbor	4602.12*	50 Year	145.00	581.61	586.22		586.23	0.000204	0.53	335.80	109.70	0.05
Glen Arbor	4602.12*	100 Year	165.00	581.61	586.65		586.65	0.000184	0.54	384.33	117.95	0.05
Glen Arbor	4602.12*	500 Year	220.00	581.61	587.86		587.87	0.000137	0.55	559.38	187.10	0.04
Glen Arbor	4602.12*	Base Flow	35.00	581.61	583.95		583.95	0.000231	0.32	121.25	83.19	0.04
Glen Arbor	4428.24*	2 Year	70.00	581.56	584.74		584.74	0.000233	0.42	192.12	90.06	0.05
Glen Arbor	4428.24*	50 Year	145.00	581.56	586.19		586.19	0.000203	0.53	330.07	99.66	0.05
Glen Arbor	4428.24*	100 Year	165.00	581.56	586.62		586.62	0.000183	0.54	373.42	102.03	0.05
Glen Arbor	4428.24*	500 Year	220.00	581.56	587.84		587.84	0.000140	0.56	507.18	126.10	0.04
Glen Arbor	4428.24*	Base Flow	35.00	581.56	583.91		583.91	0.000235	0.32	120.49	82.65	0.04
Glen Arbor	4254.36*	2 Year	70.00	581.51	584.70		584.70	0.000237	0.42	190.87	89.65	0.05

HEC-RAS Plan: Exist w base Q River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	4254.36*	50 Year	145.00	581.51	586.15		586.16	0.000204	0.53	328.74	99.22	0.05
Glen Arbor	4254.36*	100 Year	165.00	581.51	586.58		586.59	0.000183	0.54	372.26	101.60	0.05
Glen Arbor	4254.36*	500 Year	220.00	581.51	587.81		587.82	0.000138	0.55	504.02	116.07	0.04
Glen Arbor	4254.36*	Base Flow	35.00	581.51	583.87		583.87	0.000240	0.33	119.60	82.14	0.04
Glen Arbor	4080.48*	2 Year	70.00	581.46	584.66		584.66	0.000272	0.45	179.21	84.40	0.05
Glen Arbor	4080.48*	50 Year	145.00	581.46	586.11		586.12	0.000234	0.57	311.54	96.82	0.05
Glen Arbor	4080.48*	100 Year	165.00	581.46	586.55		586.55	0.000209	0.58	354.71	100.53	0.05
Glen Arbor	4080.48*	500 Year	220.00	581.46	587.79		587.79	0.000157	0.59	492.02	127.27	0.04
Glen Arbor	4080.48*	Base Flow	35.00	581.46	583.83		583.83	0.000277	0.35	112.07	77.34	0.05
Glen Arbor	3906.61*	2 Year	70.00	581.41	584.61		584.61	0.000250	0.43	186.49	87.68	0.05
Glen Arbor	3906.61*	50 Year	145.00	581.41	586.07		586.08	0.000214	0.54	325.32	105.80	0.05
Glen Arbor	3906.61*	100 Year	165.00	581.41	586.52		586.52	0.000191	0.55	374.07	114.95	0.05
Glen Arbor	3906.61*	500 Year	220.00	581.41	587.76		587.77	0.000137	0.55	535.73	147.34	0.04
Glen Arbor	3906.61*	Base Flow	35.00	581.41	583.78		583.78	0.000258	0.33	116.51	80.69	0.05
Glen Arbor	3732.73*	2 Year	70.00	581.36	584.57		584.57	0.000258	0.43	184.22	86.97	0.05
Glen Arbor	3732.73*	50 Year	145.00	581.36	586.04		586.04	0.000218	0.55	322.30	105.07	0.05
Glen Arbor	3732.73*	100 Year	165.00	581.36	586.48		586.49	0.000193	0.55	371.25	114.51	0.05
Glen Arbor	3732.73*	500 Year	220.00	581.36	587.74		587.74	0.000137	0.55	543.85	159.43	0.04
Glen Arbor	3732.73*	Base Flow	35.00	581.36	583.73		583.74	0.000271	0.34	114.65	80.01	0.05
Glen Arbor	3558.85*	2 Year	70.00	581.31	584.52		584.52	0.000267	0.44	181.32	85.68	0.05
Glen Arbor	3558.85*	50 Year	145.00	581.31	586.00		586.00	0.000222	0.55	315.73	100.28	0.05
Glen Arbor	3558.85*	100 Year	165.00	581.31	586.45		586.45	0.000196	0.56	362.75	108.57	0.05
Glen Arbor	3558.85*	500 Year	220.00	581.31	587.72		587.72	0.000137	0.55	558.27	183.16	0.04
Glen Arbor	3558.85*	Base Flow	35.00	581.31	583.69		583.69	0.000287	0.34	112.47	79.11	0.05
Glen Arbor	3384.98*	2 Year	70.00	581.26	584.47		584.48	0.000278	0.44	178.98	85.63	0.05
Glen Arbor	3384.98*	50 Year	145.00	581.26	585.96		585.96	0.000226	0.55	314.61	101.39	0.05
Glen Arbor	3384.98*	100 Year	165.00	581.26	586.41		586.42	0.000199	0.56	362.77	110.39	0.05
Glen Arbor	3384.98*	500 Year	220.00	581.26	587.69		587.70	0.000135	0.55	565.42	184.78	0.04
Glen Arbor	3384.98*	Base Flow	35.00	581.26	583.63		583.64	0.000307	0.35	110.03	78.62	0.05
Glen Arbor	3211.1	2 Year	70.00	581.21	584.42		584.43	0.000292	0.45	175.91	84.86	0.05
Glen Arbor	3211.1	50 Year	145.00	581.21	585.92		585.92	0.000233	0.56	312.54	103.40	0.05
Glen Arbor	3211.1	100 Year	165.00	581.21	586.38		586.38	0.000203	0.56	362.49	113.88	0.05
Glen Arbor	3211.1	500 Year	220.00	581.21	587.67		587.67	0.000135	0.54	576.08	189.85	0.04
Glen Arbor	3211.1	Base Flow	35.00	581.21	583.58		583.58	0.000333	0.36	107.10	77.88	0.05
Glen Arbor	3050.95*	2 Year	70.00	581.20	584.38		584.38	0.000280	0.45	168.26	81.36	0.05
Glen Arbor	3050.95*	50 Year	145.00	581.20	585.88		585.89	0.000225	0.55	300.83	99.36	0.05
Glen Arbor	3050.95*	100 Year	165.00	581.20	586.35		586.35	0.000196	0.56	349.55	110.45	0.05
Glen Arbor	3050.95*	500 Year	220.00	581.20	587.65		587.65	0.000132	0.54	550.39	179.71	0.04
Glen Arbor	3050.95*	Base Flow	35.00	581.20	583.53		583.53	0.000306	0.35	102.88	71.56	0.05
Glen Arbor	2890.80*	2 Year	70.00	581.18	584.33		584.34	0.000263	0.44	164.77	74.99	0.05
Glen Arbor	2890.80*	50 Year	145.00	581.18	585.85		585.85	0.000216	0.55	292.20	96.00	0.05
Glen Arbor	2890.80*	100 Year	165.00	581.18	586.32		586.32	0.000189	0.55	339.89	107.55	0.05
Glen Arbor	2890.80*	500 Year	220.00	581.18	587.63		587.63	0.000128	0.54	528.49	168.61	0.04
Glen Arbor	2890.80*	Base Flow	35.00	581.18	583.48		583.48	0.000278	0.34	104.32	67.37	0.05
Glen Arbor	2730.65*	2 Year	70.00	581.17	584.29		584.30	0.000250	0.43	165.96	70.85	0.05
Glen Arbor	2730.65*	50 Year	145.00	581.17	585.81		585.82	0.000209	0.54	286.36	92.44	0.05
Glen Arbor	2730.65*	100 Year	165.00	581.17	586.29		586.29	0.000183	0.54	333.28	106.55	0.05
Glen Arbor	2730.65*	500 Year	220.00	581.17	587.61		587.61	0.000125	0.53	509.83	156.65	0.04
Glen Arbor	2730.65*	Base Flow	35.00	581.17	583.44		583.44	0.000264	0.33	106.84	68.10	0.05
Glen Arbor	2570.5	2 Year	70.00	581.16	584.26		584.26	0.000175	0.42	168.90	70.89	0.05
Glen Arbor	2570.5	50 Year	145.00	581.16	585.79		585.79	0.000146	0.53	284.51	88.51	0.05
Glen Arbor	2570.5	100 Year	165.00	581.16	586.26		586.27	0.000128	0.53	330.24	103.47	0.04
Glen Arbor	2570.5	500 Year	220.00	581.16	587.59		587.59	0.000089	0.53	495.63	145.72	0.04
Glen Arbor	2570.5	Base Flow	35.00	581.16	583.40		583.40	0.000190	0.32	108.41	69.88	0.05
Glen Arbor	2427.35*	2 Year	70.00	580.51	584.24		584.24	0.000123	0.40	183.96	73.51	0.04
Glen Arbor	2427.35*	50 Year	145.00	580.51	585.77		585.77	0.000123	0.52	313.04	94.22	0.04
Glen Arbor	2427.35*	100 Year	165.00	580.51	586.25		586.25	0.000111	0.53	359.68	101.31	0.04
Glen Arbor	2427.35*	500 Year	220.00	580.51	587.58		587.58	0.000083	0.54	516.51	131.43	0.04
Glen Arbor	2427.35*	Base Flow	35.00	580.51	583.38		583.38	0.000098	0.28	125.52	63.84	0.03
Glen Arbor	2284.2	2 Year	70.00	579.86	584.22	580.77	584.23	0.000101	0.40	193.79	73.37	0.04
Glen Arbor	2284.2	50 Year	145.00	579.86	585.75	581.16	585.75	0.000122	0.56	290.61	83.71	0.04
Glen Arbor	2284.2	100 Year	165.00	579.86	586.23	581.24	586.23	0.000115	0.58	321.09	91.88	0.04
Glen Arbor	2284.2	500 Year	220.00	579.86	587.56	581.44	587.57	0.000086	0.58	504.40	111.11	0.04
Glen Arbor	2284.2	Base Flow	35.00	579.86	583.37	580.51	583.37	0.000067	0.27	140.01	65.81	0.03
Glen Arbor	2261.22*	2 Year	70.00	579.76	584.20	580.79	584.22	0.000435	0.95	73.70	74.64	0.08
Glen Arbor	2261.22*	50 Year	145.00	579.76	585.71	581.28	585.74	0.000676	1.45	99.99	85.43	0.11

HEC-RAS Plan: Exist w base Q River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	2261.22*	100 Year	165.00	579.76	586.18	581.39	586.22	0.000670	1.52	108.32	91.99	0.11
Glen Arbor	2261.22*	500 Year	220.00	579.76	587.56	581.69	587.57	0.000077	0.55	523.09	115.44	0.04
Glen Arbor	2261.22*	Base Flow	35.00	579.76	583.36	580.49	583.37	0.000229	0.59	58.97	68.60	0.06
Glen Arbor	2225.7		Culvert									
Glen Arbor	2198.27*	2 Year	70.00	579.49	583.93	580.55	583.94	0.000450	0.96	73.00	80.43	0.08
Glen Arbor	2198.27*	50 Year	145.00	579.49	584.99	581.05	585.03	0.000907	1.58	91.54	85.76	0.12
Glen Arbor	2198.27*	100 Year	165.00	579.49	585.22	581.17	585.27	0.001015	1.73	95.65	86.91	0.13
Glen Arbor	2198.27*	500 Year	220.00	579.49	585.81	581.46	585.87	0.001286	2.08	105.87	92.46	0.15
Glen Arbor	2198.27*	Base Flow	35.00	579.49	583.23	580.26	583.24	0.000206	0.58	60.85	76.01	0.05
Glen Arbor	2157.3	2 Year	70.00	579.32	583.93	580.30	583.93	0.000080	0.36	201.37	86.08	0.03
Glen Arbor	2157.3	50 Year	145.00	579.32	584.99	580.66	585.00	0.000141	0.57	263.44	90.89	0.05
Glen Arbor	2157.3	100 Year	165.00	579.32	585.23	580.75	585.23	0.000154	0.62	277.24	91.96	0.05
Glen Arbor	2157.3	500 Year	220.00	579.32	585.82	580.93	585.83	0.000186	0.74	311.67	94.71	0.06
Glen Arbor	2157.3	Base Flow	35.00	579.32	583.23	580.08	583.23	0.000042	0.23	160.84	81.77	0.02
Glen Arbor	2061.60*	2 Year	70.00	580.12	583.92		583.92	0.000152	0.41	179.02	74.91	0.04
Glen Arbor	2061.60*	50 Year	145.00	580.12	584.97		584.98	0.000207	0.60	261.68	82.86	0.06
Glen Arbor	2061.60*	100 Year	165.00	580.12	585.21		585.22	0.000217	0.64	281.51	85.64	0.06
Glen Arbor	2061.60*	500 Year	220.00	580.12	585.80		585.81	0.000239	0.74	334.31	93.83	0.06
Glen Arbor	2061.60*	Base Flow	35.00	580.12	583.23		583.23	0.000105	0.28	128.80	70.47	0.04
Glen Arbor	1965.9	2 Year	70.00	580.93	583.89		583.90	0.000410	0.57	126.17	65.18	0.07
Glen Arbor	1965.9	50 Year	145.00	580.93	584.94		584.95	0.000431	0.77	196.95	69.52	0.08
Glen Arbor	1965.9	100 Year	165.00	580.93	585.18		585.19	0.000435	0.81	213.38	70.54	0.08
Glen Arbor	1965.9	500 Year	220.00	580.93	585.76		585.78	0.000445	0.91	255.42	73.08	0.08
Glen Arbor	1965.9	Base Flow	35.00	580.93	583.21		583.21	0.000408	0.43	82.27	62.97	0.07
Glen Arbor	1842.40*	2 Year	70.00	580.95	583.85		583.85	0.000272	0.48	147.67	72.12	0.06
Glen Arbor	1842.40*	50 Year	145.00	580.95	584.90		584.91	0.000309	0.67	226.44	78.12	0.07
Glen Arbor	1842.40*	100 Year	165.00	580.95	585.13		585.14	0.000315	0.71	244.85	79.32	0.07
Glen Arbor	1842.40*	500 Year	220.00	580.95	585.72		585.73	0.000329	0.80	292.11	83.57	0.07
Glen Arbor	1842.40*	Base Flow	35.00	580.95	583.17		583.17	0.000241	0.35	99.73	68.45	0.05
Glen Arbor	1718.9	2 Year	70.00	580.97	583.82		583.83	0.000188	0.42	173.77	78.86	0.05
Glen Arbor	1718.9	50 Year	145.00	580.97	584.87		584.87	0.000229	0.59	258.54	84.80	0.06
Glen Arbor	1718.9	100 Year	165.00	580.97	585.10		585.11	0.000236	0.63	278.52	86.56	0.06
Glen Arbor	1718.9	500 Year	220.00	580.97	585.68		585.69	0.000251	0.72	330.24	90.97	0.06
Glen Arbor	1718.9	Base Flow	35.00	580.97	583.15		583.15	0.000153	0.30	120.60	77.84	0.04
Glen Arbor	1585.50*	2 Year	70.00	581.04	583.79		583.80	0.000248	0.46	156.56	76.26	0.06
Glen Arbor	1585.50*	50 Year	145.00	581.04	584.83		584.84	0.000285	0.64	238.38	81.98	0.06
Glen Arbor	1585.50*	100 Year	165.00	581.04	585.07		585.07	0.000292	0.68	257.62	83.80	0.06
Glen Arbor	1585.50*	500 Year	220.00	581.04	585.65		585.66	0.000305	0.77	307.69	88.74	0.07
Glen Arbor	1585.50*	Base Flow	35.00	581.04	583.12		583.12	0.000215	0.34	105.93	74.17	0.05
Glen Arbor	1452.10*	2 Year	70.00	581.12	583.76		583.76	0.000340	0.52	139.63	74.52	0.06
Glen Arbor	1452.10*	50 Year	145.00	581.12	584.79		584.80	0.000364	0.71	218.84	79.54	0.07
Glen Arbor	1452.10*	100 Year	165.00	581.12	585.02		585.03	0.000368	0.75	237.51	81.86	0.07
Glen Arbor	1452.10*	500 Year	220.00	581.12	585.60		585.61	0.000377	0.84	286.51	87.21	0.08
Glen Arbor	1452.10*	Base Flow	35.00	581.12	583.09		583.09	0.000322	0.39	91.51	69.05	0.06
Glen Arbor	1318.70*	2 Year	70.00	581.20	583.70		583.71	0.000481	0.59	123.84	71.04	0.08
Glen Arbor	1318.70*	50 Year	145.00	581.20	584.73		584.74	0.000474	0.78	200.42	78.03	0.08
Glen Arbor	1318.70*	100 Year	165.00	581.20	584.96		584.97	0.000474	0.82	218.76	80.90	0.08
Glen Arbor	1318.70*	500 Year	220.00	581.20	585.54		585.55	0.000472	0.92	267.02	85.79	0.08
Glen Arbor	1318.70*	Base Flow	35.00	581.20	583.03		583.03	0.000520	0.46	77.62	66.43	0.07
Glen Arbor	1185.3	2 Year	70.00	581.27	583.62		583.63	0.000730	0.68	108.52	67.68	0.09
Glen Arbor	1185.3	50 Year	145.00	581.27	584.66		584.67	0.000641	0.87	182.55	77.95	0.09
Glen Arbor	1185.3	100 Year	165.00	581.27	584.89		584.90	0.000628	0.91	200.85	80.03	0.09
Glen Arbor	1185.3	500 Year	220.00	581.27	585.47		585.48	0.000603	1.00	248.51	84.56	0.09
Glen Arbor	1185.3	Base Flow	35.00	581.27	582.94		582.94	0.001010	0.57	63.04	64.90	0.10
Glen Arbor	1123.53*	2 Year	70.00	580.76	583.58		583.59	0.000544	0.63	118.13	69.43	0.08
Glen Arbor	1123.53*	50 Year	145.00	580.76	584.62		584.63	0.000521	0.82	198.81	84.27	0.08
Glen Arbor	1123.53*	100 Year	165.00	580.76	584.85		584.87	0.000525	0.86	219.03	95.71	0.09
Glen Arbor	1123.53*	500 Year	220.00	580.76	585.43		585.45	0.000512	0.96	284.72	130.20	0.09
Glen Arbor	1123.53*	Base Flow	35.00	580.76	582.89		582.89	0.000638	0.50	71.56	64.72	0.08
Glen Arbor	1061.77*	2 Year	70.00	580.26	583.55		583.56	0.000408	0.58	131.32	79.85	0.07
Glen Arbor	1061.77*	50 Year	145.00	580.26	584.60		584.60	0.000398	0.74	249.46	131.37	0.07
Glen Arbor	1061.77*	100 Year	165.00	580.26	584.83		584.84	0.000388	0.77	280.07	132.34	0.07
Glen Arbor	1061.77*	500 Year	220.00	580.26	585.41		585.42	0.000367	0.83	357.85	134.79	0.07
Glen Arbor	1061.77*	Base Flow	35.00	580.26	582.86		582.86	0.000411	0.44	81.07	65.32	0.07
Glen Arbor	1000.0	2 Year	70.00	579.75	583.54	581.14	583.54	0.000260	0.49	183.99	123.94	0.06

HEC-RAS Plan: Exist w base Q River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	1000.0	50 Year	145.00	579.75	584.58	581.53	584.58	0.000260	0.63	318.16	131.44	0.06
Glen Arbor	1000.0	100 Year	165.00	579.75	584.81	581.61	584.82	0.000260	0.65	348.82	132.43	0.06
Glen Arbor	1000.0	500 Year	220.00	579.75	585.39	581.82	585.40	0.000260	0.72	426.73	134.91	0.06
Glen Arbor	1000.0	Base Flow	35.00	579.75	582.84	580.86	582.84	0.000260	0.38	101.51	105.02	0.05

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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: CR675 Crystal River
Project File : CR675CrystalRiver.prj
Run Date and Time: 1/3/2022 4:37:09 PM

Project in English units

Project Description:
HEC-RAS model analyzes Crystal River from just downstream of M22 (does not include M22 structures in existing or proposed plans) and extends 9,162' upstream through the first two structures under County Road 675.

Energy
slope uased for the starting water surface elevations is
slope=(586.35-583.88)/(10162.2-1185.3) = 0.00028 ft/ft

Base Flow is 35 cfs.
EGLE flow data was increased by the base flow, 35 cfs, for each storm event.

PLAN DATA

Plan Title: Prop Bridges 12-2020 w base flow nearM22
Plan File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near M22\CR675CrystalRiver.p07

Geometry Title: Proposed Conditions 12/2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near M22\CR675CrystalRiver.g05

```
          Flow Title    : Crystal River @ M22 w/ 35 cfs base flow
          Flow File     : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR
675 near M22\CR675CrystalRiver.f02

Plan Summary Information:
Number of:  Cross Sections =   66    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    2    Lateral Structures =    0

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

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



FLOW DATA

Flow Title: Crystal River @ M22 w/ 35 cfs base flow
Flow File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near
M22\CR675CrystalRiver.f02

Flow Data (cfs)


  River           Reach           RS                  2 Year         50 Year
100 Year        500 Year       Base Flow
  Crystal River   Glen Arbor      10162.2               70             145
   165             220              35



Boundary Conditions


  River           Reach           Profile                       Upstream
    Downstream


  Crystal River   Glen Arbor      2 Year
```

Normal S = 0.00026
  Crystal River   Glen Arbor   50 Year
Normal S = 0.00026
  Crystal River   Glen Arbor   100 Year
Normal S = 0.00026

GEOMETRY DATA

Geometry Title: Proposed Conditions 12/2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near M22\CR675CrystalRiver.g05

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor   RS: 10162.2

INPUT
Description: XSEC 15 (STA. 101+62.2)
Station Elevation Data   num=   16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-112.89	590.16	-65.46	589.51	-53.51	589.14	-48.53	586.34	-33.78	584.4
-19.04	583.68	0	584.21	11.21	583.66	24.06	583.65	34.21	585.36
38.97	586.36	43.58	586.77	91.43	586.97	109.55	585.06	144.24	585.42
184.38	591.16								

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
-112.89	.15	-48.53	.05	38.97	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-48.53	38.97	138.65	138.65	138.65	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor   RS: 10023.5*

INPUT
Description: Interpolated Section 51
Station Elevation Data   num=   23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-123.1	590.2	-103.8	590	-57.3	589	-39.2	585.96	-28.8	584.32
-20.62	583.94	-15.46	583.65	-6.3	583.78	1.78	583.97	11.93	583.5

```
   23.56  583.47   29.38  584.31   33.96  585.05   38.83     586    40.9  586.49
   43.17  586.68   85.67     587   88.19  587.01  105.23  585.42  137.87  585.72
   189.3     586   206.1     589   231.1   589.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -123.1     .15   -39.2     .05   38.83     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -39.2   38.83           138.65  138.65  138.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9884.90*

INPUT
Description: Interpolated Section 50
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    -198   590.5  -149.3 586.122 -148.08  585.58 -136.12  584.24  -128.8  583.92
 -124.17  583.62 -115.97   583.6 -108.74  583.74  -99.65  583.33  -89.24  583.28
  -83.28  584.02   -78.6  584.74  -73.61  585.63  -71.67   586.2  -69.55   586.2
  -29.72   586.2   -10.6   584.5    -2.6   584.4     7.4   584.5    24.5   586.2
   158.2   586.2   175.6     589

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -198     .15  -149.3     .05  -73.61     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -149.3  -73.61           138.65  138.65  138.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9746.25*

INPUT
Description: Interpolated Section 49
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -192.3   590.5  -147.6     586  -145.6   585.2 -135.04  584.16 -128.57  583.89
 -124.49  583.58 -117.25  583.42 -110.86   583.5 -102.83  583.17  -93.64  583.09
  -87.54  583.73  -82.75  584.43  -77.65  585.27     -14  585.27      -5   584.3
       6   584.1      17   584.3      26  585.27    88.5     587   194.6     593
   209.1     593
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-192.3	.15	-147.6	.05	-77.65	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-147.6	-77.65	138.65	138.65	138.65	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 9607.60*

INPUT
Description: Interpolated Section 48
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-94.5	590.1	-38.44	586.46	-38.43	586.46	-28.42	586.35	-27.55	586.24
-23.02	584.81	-13.86	584.08	-8.25	583.87	-4.71	583.55	1.58	583.24
7.12	583.26	14.08	583	22.07	582.91	48.29	583.44	53.19	584.12
58.41	584.91	60.09	586.29	82.9	586.2	125.6	586.2	158.7	595
178.7	595.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-94.5	.15	-23.02	.05	58.41	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-23.02	58.41	138.65	138.65	138.65	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 9468.95*

INPUT
Description: Interpolated Section 47
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-146.9	589.55	-31.68	585.7	-31.67	585.7	-21.91	585.64	-21.07	585.52
-16.65	584.43	-8.88	583.99	-4.12	583.85	-1.12	583.52	4.2	583.06
8.9	583.03	14.8	582.84	21.57	582.72	27.93	583.14	32.94	583.8
38.27	584.54	39.82	586.22	41.52	586.3	73.33	587.17	75.21	587.17
102.5	589.95								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-146.9	.15	-16.65	.05	38.27	.15

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.65   38.27           138.65  138.65  138.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9330.3

INPUT
Description: XSEC 14 (STA. 93+30.3)
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -65.92  589.05  -36.06  586.12  -24.92  584.94   -15.4  584.94  -10.27  584.05
       0  583.83    6.83  582.88   21.07  582.54   27.57  582.85   38.13  584.18
   39.55  586.15   70.24  587.21  131.92  587.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -65.92     .15  -10.27     .05   38.13     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -10.27   38.13           105.8   105.8   105.8             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 9224.50*

INPUT
Description: Interpolated Section 46
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -71.22  588.46  -44.24  586.68  -34.17  585.97  -33.44  585.96  -25.56  585.75
  -20.92  585.18  -11.86  583.61  -10.91  583.38   -5.84  582.94   -1.84  582.85
    6.72  582.69   10.53  583.22    15.5  583.26   22.82  582.69   27.21  583.14
   29.25  583.46   34.35  584.88   35.82  586.15   35.91  586.17    44.2  586.32
   67.59  587.11   77.05  587.27  131.46  587.64

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -71.22     .15  -20.92     .05   34.35     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -20.92   34.35           105.8   105.8   105.8             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Glen Arbor RS: 9118.7

INPUT
Description: XSEC 13 (STA. 91+18.7)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-76.53	587.87	-42.76	586.99	-31.58	586.32	-22.9	583.08	-15.04	582.92
-7.62	582.85	0	583.9	9.94	583.98	24.57	582.85	27.91	583.7
30.56	585.57	32.18	586.18	40.75	586.21	74.73	587.32	130.99	588.02

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-76.53	.15	-31.58	.05	30.56	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-31.58	30.56	126.9	126.9	126.9	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8986.6

INPUT
Description: XSEC 12 (STA. 89+86.6)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-49.97	590.12	-44.87	589.84	-35.87	589.18	-31.04	588	-27.27	587
-20.87	584.83	-7.46	581.87	5.31	580.55	12.79	581.1	18.08	583.23
20.22	584.83	22.62	585.88	38.48	586.54	62.31	587.58	81.6	588
118.5	589	136.3	590	145.3	591				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-49.97	.15	-27.27	.05	22.62	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-27.27	22.62	12.6	12.6	12.6	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8974

INPUT
Description: US Face Culvert (Interpolated Section 45)
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
  -52.16  590.11  -46.49  589.84  -43.86  589.68  -42.54  589.58  -42.35  589.61
  -41.95  589.58  -41.57  589.27  -36.49  588.86  -31.25  587.76  -31.12  587.72
  -29.07  587.09  -26.93  586.46  -21.03  584.43  -19.99  584.19   -8.94  581.83
   -8.67  581.77     3.1  580.62    5.99  580.84   11.09  581.16   11.35   581.2
   13.44  582.03   17.19  583.18   19.55  584.53   22.19  585.41   28.64  585.96
   34.14  586.49   37.06  586.62   59.39  587.63   60.28  587.66   73.84  588.03
   77.47  588.12    89.7  588.46  112.05  589.06  128.74  589.94  137.17   590.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -52.16     .15  -26.93     .05   22.19     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
        -26.93   22.19               55      55      55             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -52.16  -29.85     591       F
   41.03  137.17     591       F

BRIDGE


RIVER: Crystal River
REACH: Glen Arbor         RS: 8946.1

INPUT
Description: 2nd Bridge crossing CR 675 from M22
Distance from Upstream XS =     8.6
Deck/Roadway Width        =    38.6
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      13
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
 -153.96  590.97          -65.69  591.32           -29.7  591.19
  -29.65  591.19  589.65  -11.54  591.12  589.57  -11.53  591.12  589.24
   22.91     591  589.08   22.92     591  589.41   41.03  590.88  589.33
   41.04  590.88           57.94  590.83          107.94  590.63
  157.94  590.43

Upstream Bridge Cross Section Data
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -52.16  590.11  -46.49  589.84  -43.85  589.68  -42.54  589.58  -42.35  589.61
  -41.95  589.58  -41.57  589.27  -37.51  588.94  -29.85  585.11  -22.35   581.8
   33.73   581.8   41.03   585.5      45  586.62   59.39  587.63   60.28  587.66
   73.84  588.03   77.47  588.12    89.7  588.46  112.05  589.06  128.74  589.94
  137.17   590.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
  -52.16     .15  -29.85     .06   41.03     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -29.85   41.03            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -52.16  -29.85     591       F
   41.03  137.17     591       F

Downstream  Deck/Roadway Coordinates
    num=      13
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
 -153.96  590.97          -65.69  591.32           -29.7  591.19
  -29.65  591.19  589.65  -11.54  591.12  589.57  -11.53  591.12  589.24
   22.91     591  589.08   22.92     591  589.41   41.03  590.88  589.33
   41.04  590.88           57.94  590.83          107.94  590.63
  157.94  590.43

Downstream Bridge Cross Section Data
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -62.36  590.06  -54.05  589.84  -50.18  589.73  -48.25  589.58  -47.97   589.8
  -47.39  589.75  -39.37  587.37  -32.91  586.65  -29.85  585.12  -22.35   581.8
   33.73   581.8   41.03   585.5   45.77  587.88   46.39  587.91   55.71  588.59
    58.2  588.68   66.61  588.98   81.97  589.32   93.44  589.65   99.24  589.89

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -62.36     .15  -29.85     .06   41.03     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -29.85   41.03            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -62.36  -29.85     591       F
   41.03   99.24     591       F

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

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
```

```
  -29.65   585.8  -22.35   581.8
Downstream     num=       2
     Sta    Elev     Sta    Elev
  -29.65   585.8  -22.35   581.8

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   33.73   581.8   41.03   585.8
Downstream     num=       2
     Sta    Elev     Sta    Elev
   33.73   581.8   41.03   585.8

Number of Piers =  2

Pier Data
Pier Station     Upstream=  -11.53    Downstream=  -11.53
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590

Pier Data
Pier Station     Upstream=   22.91    Downstream=   22.91
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     575    1.17     590

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       Yarnell                KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

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

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8919.20*

INPUT
Description: DS Face Culvert (Interpolated Section 44)
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-62.36	590.06	-54.05	589.84	-50.18	589.73	-48.25	589.58	-47.97	589.8
-47.39	589.75	-46.83	588.1	-39.37	587.37	-31.69	586.51	-31.49	586.42
-28.49	585.15	-25.34	583.94	-21.78	582.59	-21.15	582.37	-14.47	581.34
-14.31	581.32	-7.2	580.96	-3.05	581.28	4.27	581.54	4.64	581.67
7.64	582.8	13.02	582.93	16.41	583.12	20.21	583.23	24.64	585.01
28.42	586.89	30.42	587	45.77	587.88	46.39	587.91	55.71	588.59
58.2	588.68	66.61	588.98	81.97	589.32	93.44	589.65	99.24	589.89

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-62.36	.15	-25.34	.05	20.21	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-25.34	20.21	11.9	11.9	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-62.36	-29.85	591	F
41.03	99.24	591	F

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8907.3

INPUT
Description: XSEC 11 (STA. 89+07.3)
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-64.55	590.05	-51.54	589.74	-49.47	589.58	-49.17	589.84	-48.55	589.79
-47.96	587.85	-31.78	586.24	-28.36	584.73	-25	583.402	-21.4	581.98
-15.66	581.23	-9.41	581.03	-4.99	581.37	2.81	581.62	6.4	582.96
19.78	582.76	23.78	584.81	27.19	586.97	43.41	587.97	51.82	588.71
61.66	589.09	91.11	589.69						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-64.55	.15	-25	.05	19.78	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-25 19.78 164.83 164.83 164.83 .1 .3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8742.47*

INPUT
Description: Interpolated Section 43
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-76.14	589.38	-63.13	589.39	-59.35	589.23	-56.68	589.04	-56.29	589.2
-55.49	589.14	-54.73	587.82	-48.78	587.33	-40.91	586.4	-34.4	585.73
-33.85	585.68	-29.44	584.42	-25.11	583.28	-20.76	582.34	-19.77	582.27
-13.82	581.68	-8.67	581.46	-6.27	581.3	-2.55	581.67	4.03	582.08
4.86	582.35	7.05	582.99	18.33	582.83	23.52	584.7	23.87	584.85
27.94	586.42	30.33	586.63	31.56	586.75	45.94	587.69	48.98	587.77
59.89	588.21	72.65	588.39	79.92	588.43	110.84	589.73		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-76.14	.15	-25.11	.05	18.33	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-25.11 18.33 164.83 164.83 164.83 .1 .3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 8577.63*

INPUT
Description: Interpolated Section 42
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-87.72	588.7	-71.79	588.98	-67.16	588.72	-63.89	588.5	-63.41	588.56
-62.43	588.49	-61.5	587.8	-54.21	587.27	-44.57	586.02	-36.59	585.19
-35.93	585.11	-30.52	584.1	-25.21	583.17	-20.12	582.7	-18.96	582.66
-11.99	582.14	-5.94	581.82	-3.14	581.58	-.11	581.96	5.24	582.53
5.92	582.72	7.7	583.03	16.88	582.89	23.26	584.6	23.68	584.72
28.69	585.86	31.63	586.18	33.14	586.37	50.81	587.56	54.55	587.57
67.95	587.7	83.63	587.7	92.57	587.66	130.58	589.76		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-87.72	.15	-25.21	.05	16.88	.15

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.21   16.88           164.83  164.83  164.83             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 8412.8

INPUT
Description: XSEC 10 (STA. 84+12.8)
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -99.31  588.03  -80.45  588.56  -59.64  587.21  -48.23  585.64  -38.79  584.64
  -25.32  583.05  -18.15  583.06   -3.22  582.19       0  581.85    6.98  583.08
   15.43  582.96    23.5  584.59   32.93  585.73   34.72  585.98   55.68  587.42
  105.22  586.89  150.31   589.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -99.31     .15  -25.32     .05   15.43     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.32   15.43           170.23  170.23  170.23             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 8242.58*

INPUT
Description: Interpolated Section 41
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -106.79   588.3 -104.79  588.34  -85.66  588.73  -62.34  587.75  -51.44  586.76
  -49.56  586.51  -38.98   585.3  -34.01  584.69  -31.34  584.26  -23.89  583.15
  -17.61  583.05  -12.52   582.7   -4.52  582.28    -1.7  582.02    1.68   582.4
    6.06   582.9    8.83  583.14   19.46  583.06   21.57   583.1   29.71  584.43
   31.78  584.65   38.33  585.27   39.23  585.37   41.03  585.58   62.18  586.94
   67.88  586.97   68.87  586.95  108.73  586.88  112.16   586.9  157.65  589.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -106.79     .15  -23.89     .05   21.57     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -23.89   21.57           170.23  170.23  170.23             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Glen Arbor RS: 8072.35*

INPUT
Description: Interpolated Section 40
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-114.27	588.58	-112.05	588.59	-90.87	588.89	-65.05	588.29	-52.97	587.66
-50.89	587.38	-39.18	585.95	-33.67	585.26	-30.71	584.69	-22.47	583.26
-17.07	583.03	-12.7	582.67	-5.83	582.36	-3.4	582.18	1.12	582.56
6.97	583.04	10.67	583.2	24.89	583.13	27.72	583.24	35.93	584.27
38.01	584.45	44.62	584.93	45.53	585	47.35	585.18	68.68	586.46
74.43	586.58	75.43	586.55	115.64	586.83	119.11	586.91	165	589.68

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-114.27	.15	-22.47	.05	27.72	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-22.47	27.72	170.23	170.23	170.23	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7902.13*

INPUT
Description: Interpolated Section 39
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-121.75	588.85	-119.32	588.85	-96.08	589.06	-67.75	588.83	-54.51	588.55
-52.22	588.24	-39.37	586.61	-33.33	585.83	-30.09	585.12	-21.04	583.36
-16.53	583.02	-12.87	582.65	-7.13	582.45	-5.11	582.34	.56	582.72
7.89	583.18	12.52	583.26	30.32	583.21	33.86	583.38	42.14	584.12
44.25	584.26	50.91	584.58	51.83	584.64	53.66	584.78	75.18	585.98
80.98	586.19	81.99	586.16	122.56	586.78	126.05	586.92	172.35	589.62

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-121.75	.15	-21.04	.05	33.86	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-21.04	33.86	170.23	170.23	170.23	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7731.9

INPUT
Description: XSEC 9 (STA. 77+31.9)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-129.23	589.12	-126.58	589.1	-56.04	589.44	-32.99	586.4	-29.46	585.55
-19.61	583.47	-13.05	582.62	-6.81	582.51	0	582.88	8.8	583.32
35.75	583.29	40	583.515	50.48	584.07	57.2	584.23	87.53	585.8
88.55	585.76	129.47	586.73	179.69	589.56				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-129.23	.15	-19.61	.05	40	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-19.61	40	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7558.02*

INPUT
Description: Interpolated Section 38
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-80.7	588.8	-32.23	586.33	-28.7	585.49	-23.39	584.38	-18.86	583.42
-15.91	583.09	-11.48	582.61	-9.76	582.58	-6.92	582.53	-5.9	582.5
-4.46	582.46	2.12	582.82	10.62	583.25	36.66	583.24	40.77	583.45
50.99	584.01	57.55	584.17	67.97	584.72	74.66	585.12	87.15	585.81
88.15	585.78	108.73	586.34	128.08	586.81	161.3	590.1		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-80.7	.15	-18.86	.05	40.77	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-18.86	40.77	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 7384.15*

INPUT
Description: Interpolated Section 37

```
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -88.2     590  -33.86  586.61  -32.55   586.4  -31.48  586.26  -27.95  585.43
  -22.63  584.34   -18.1  583.36  -14.83  583.05   -9.91  582.59   -7.99  582.58
   -4.84  582.52   -3.71  582.47   -2.11  582.41    4.24  582.76   12.44  583.18
   37.57  583.18   41.53  583.39   51.51  583.94    57.9  584.11   68.06  584.65
   74.59  585.11   86.77  585.82   87.74   585.8  107.82  586.42  126.69  586.88
  174.49  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -88.2     .15   -18.1     .05   41.53     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -18.1   41.53           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 7210.27*

INPUT
Description: Interpolated Section 36
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -126.93   589.1     -92   588.8  -33.11  586.56  -31.79  586.33  -30.72  586.19
  -27.19  585.37  -21.88  584.29  -17.35  583.31  -13.75  583.01   -8.33  582.58
   -6.23  582.57   -2.76   582.5   -1.52  582.44     .24  582.36    6.36   582.7
   14.27   583.1   38.48  583.13    42.3  583.33   52.02  583.88   58.25  584.05
   68.15  584.59   74.51   585.1   86.39  585.84   87.34  585.81  106.91  586.51
   125.3  586.96  171.89  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -126.93     .15  -17.35     .05    42.3     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -17.35    42.3           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 7036.39*

INPUT
Description: Interpolated Section 35
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

```
 -126.16   589.4     -92  588.88  -32.35  586.51  -31.04  586.26  -29.97  586.11
  -26.44  585.31  -21.12  584.24  -16.59  583.26  -12.66  582.97   -6.76  582.57
   -4.47  582.56    -.69  582.49     .67   582.4    2.59  582.31    8.48  582.64
   16.09  583.03   39.39  583.07   43.06  583.27   52.53  583.81    58.6  583.99
   68.25  584.53   74.44  585.08   86.01  585.85   86.93  585.83  105.99  586.59
   142.4   589.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -126.16     .15  -16.59     .05   43.06     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.59   43.06           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6862.52*

INPUT
Description: Interpolated Section 34
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -125.4   589.1    -100   586.2  -29.21  586.04  -25.68  585.26  -20.37   584.2
  -15.84  583.21  -11.58  582.92   -5.19  582.56    -2.7  582.55    1.39  582.47
    2.86  582.37    4.94  582.26    10.6  582.58   17.91  582.96    40.3  583.02
   43.83  583.21   53.04  583.75   58.95  583.93   68.34  584.46   74.37  585.07
   85.63  585.86   86.53  585.85  105.08  586.67   128.3     589

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -125.4     .15  -15.84     .05   43.83     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.84   43.83           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6688.64*

INPUT
Description: Interpolated Section 33
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -124.63   588.5    -100   586.5  -30.84   586.4  -29.53  586.12  -28.46  585.97
  -24.93   585.2  -19.61  584.15  -15.08  583.15   -10.5  582.88   -3.62  582.54
    -.94  582.54    3.47  582.46    5.05  582.34    7.29  582.21   12.72  582.52
```

```
   19.73  582.89   41.21  582.96   44.59  583.15   53.56  583.68   59.31  583.87
   68.44   584.4    74.3  585.06   85.25  585.87   86.12  585.87   113.4   589.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -124.63     .15  -15.08     .05   44.59     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.08   44.59           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6514.76*

INPUT
Description: Interpolated Section 32
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -61.5   587.5  -14.33   583.1   -9.42  582.84   -2.04  582.53     .82  582.53
    5.55  582.44    7.24  582.31    9.64  582.16   14.84  582.46   21.55  582.82
   42.12  582.91   45.36  583.09   54.07  583.62   59.66  583.81   68.53  584.33
   74.23  585.04   84.87  585.88   85.72  585.88     107   588.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -61.5     .15  -14.33     .05   45.36     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -14.33   45.36           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6340.88*

INPUT
Description: Interpolated Section 31
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    -139     590    -115   585.3  -67.02  585.08  -61.71  584.06  -57.18  583.05
  -51.94   582.8  -44.07  582.52  -41.02  582.52  -35.98  582.43  -34.17  582.27
  -31.61  582.11  -26.64   582.4  -20.23  582.75  -19.58  582.85  -16.48  583.03
   -8.02  583.55   -2.59  583.75    6.02  584.27   11.56  585.03   21.89   585.9
   22.71   585.9   39.74  586.92    65.4   588.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
    -139     .15  -57.18     .05  -16.48     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -57.18  -16.48           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 6167.01*

INPUT
Description: Interpolated Section 30
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -159.6   591.5 -146.62   588.4 -125.97  586.25 -124.66   585.9 -123.59  585.76
 -120.06  585.02 -114.75  584.01    -105   583.2  -36.42     583  -30.86  582.76
   -22.5   582.5  -19.25  582.52   -13.9  582.41  -11.98  582.24   -9.26  582.06
   -4.52  582.34     1.6  582.67   20.33   582.8   23.29  582.97    31.5  583.49
   36.76  583.69   45.12  584.21   50.49  585.02   60.51  585.91   61.31  585.92
   77.83     587

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -159.6     .15  -36.42     .05   23.29     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -36.42   23.29           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 5993.13*

INPUT
Description: Interpolated Section 29
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -158.2   591.5 -122.06  588.28 -101.42  586.19  -100.1  585.83  -99.03  585.69
  -95.51  584.96   -90.2  583.97  -75.67  582.94  -69.78  582.72  -60.93  582.49
  -57.49  582.51  -51.82   582.4  -49.79  582.21  -46.91  582.01   -42.4  582.28
  -36.58   582.6  -18.76  582.75  -15.95  582.91   -7.99  583.42   -2.89  583.63
    5.21  584.14   10.41     585   20.13  585.92    20.9  585.94   36.92  587.08
   51.96   587.5   90.08  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -158.2     .15  -75.67     .05  -15.95     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -75.67  -15.95           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 5819.25*

INPUT
Description: Interpolated Section 28
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -120.6   592.5  -95.06  586.14  -93.75  585.76  -92.68  585.61  -89.15   584.9
  -83.84  583.92  -79.31  582.89   -58.1  582.68  -33.76  582.48  -30.13   582.5
  -24.14  582.38     -22  582.18  -18.96  581.96  -14.68  582.22   -9.16  582.53
    7.75  582.69   10.42  582.85   18.12  583.36   23.06  583.57    30.9  584.08
   35.94  584.99   45.35  585.93    46.1  585.95    61.6  587.16   76.17  587.57
   104.4   588.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -120.6     .15   -58.1     .05   10.42     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -58.1   10.42           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 5645.38*

INPUT
Description: Interpolated Section 27
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -149.3     594  -119.1  588.05  -109.1  586.09 -107.79  585.69 -106.72  585.54
  -103.2  584.84  -97.89  583.87  -93.36  582.84  -46.32  582.64  -36.48  582.46
  -32.66  582.49  -26.37  582.37  -24.11  582.14  -20.91  581.91  -16.86  582.16
  -11.64  582.46    4.36  582.64    6.88  582.79   14.33  583.29   19.11  583.51
    26.7  584.02   31.57  584.98   40.67  585.94    41.4  585.97    51.6  587.24
    56.6   588.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -149.3     .15  -46.32     .05    6.88     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -46.32    6.88             223  173.88      96             .1       .3
```

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 5471.50*

INPUT
Description: Interpolated Section 26
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-46.18	587.94	-25.55	586.04	-24.24	585.62	-23.17	585.47	-19.64	584.78
-14.33	583.83	-9.8	582.78	-2.93	582.6	7.39	582.45	11.4	582.48
18.01	582.35	20.38	582.11	23.75	581.86	27.56	582.1	32.48	582.39
47.57	582.58	49.95	582.73	57.15	583.23	61.76	583.45	69.09	583.95
73.8	584.96	82.59	585.95	83.29	585.99	97.78	587.33	111.39	587.73

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-46.18	.15	-9.8	.05	49.95	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-9.8	49.95	223	173.88	93	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 5297.62*

INPUT
Description: Interpolated Section 25
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-89.1	588.47	-86.45	588.33	-86.02	588.31	-64.49	587.85	-60.9	587.87
-55.39	585.99	-54.08	585.55	-53.01	585.4	-49.49	584.73	-44.18	583.78
-39.65	582.73	-32.45	582.55	-21.64	582.44	-17.44	582.47	-10.51	582.34
-8.03	582.08	-4.5	581.81	-.92	582.04	3.71	582.31	17.88	582.53
20.12	582.67	27.06	583.16	31.51	583.39	38.59	583.89	43.13	584.95
51.61	585.97	52.29	586.01	66.26	587.41	79.4	587.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-89.1	.15	-39.65	.05	20.12	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-39.65	20.12	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 5123.75*

INPUT
Description: Interpolated Section 24
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.3	588.43	-81.7	588.28	-81.3	588.26	-60.2	587.76	-54.84	585.93
-53.52	585.48	-52.45	585.33	-48.93	584.67	-43.62	583.74	-39.1	582.68
-31.57	582.51	-20.27	582.43	-15.87	582.46	-8.63	582.32	-6.04	582.05
-2.35	581.76	1	581.98	5.33	582.24	18.59	582.47	20.68	582.61
27.37	583.1	31.66	583.33	38.48	583.82	42.86	584.94	51.03	585.98
51.68	586.02	65.15	587.49	74.2	588.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-84.3	.15	-39.1	.05	20.68	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-39.1	20.68	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4949.87*

INPUT
Description: Interpolated Section 23
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-89.6	588.38	-86.9	588.23	-86.5	588.2	-60.6	587.66	-55.68	585.88
-54.37	585.41	-53.3	585.26	-49.77	584.61	-44.47	583.69	-39.94	582.63
-32.09	582.47	-20.29	582.41	-15.71	582.46	-8.16	582.31	-5.44	582.01
-1.6	581.71	1.52	581.92	5.55	582.17	17.9	582.42	19.85	582.55
26.29	583.03	30.41	583.27	36.97	583.76	41.18	584.92	49.05	585.99
49.68	586.04	62.64	587.57						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-89.6	.15	-39.94	.05	19.85	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-39.94	19.85	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River

REACH: Glen Arbor RS: 4775.99*

INPUT
Description: Interpolated Section 22
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100.6	588.34	-98	588.17	-97.6	588.15	-76	587.56	-67.1	587.53
-62.55	585.83	-61.24	585.34	-60.17	585.18	-56.65	584.55	-51.34	583.64
-46.82	582.57	-38.64	582.43	-26.35	582.4	-21.58	582.45	-13.71	582.29
-10.88	581.98	-6.88	581.66	-3.99	581.86	-.26	582.1	11.18	582.36
12.98	582.49	19.17	582.97	23.14	583.21	29.44	583.7	33.48	584.91
41.04	586	41.64	586.06	54.1	587.65				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-100.6	.15	-46.82	.05	12.98	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-46.82	12.98	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4602.12*

INPUT
Description: Interpolated Section 21
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-115.43	588.29	-112.79	588.12	-112.36	588.09	-90.83	587.46	-54.21	587.42
-52.39	587.36	-31.77	585.78	-30.46	585.27	-29.39	585.11	-25.86	584.49
-20.56	583.6	-16.03	582.52	-7.53	582.39	5.25	582.39	10.22	582.44
18.4	582.28	21.34	581.95	25.5	581.61	28.16	581.8	31.59	582.03
42.12	582.31	43.78	582.42	49.71	582.9	53.52	583.15	59.56	583.63
63.44	584.9	70.69	586.01	71.27	586.08	88.4	588.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-115.43	.15	-16.03	.05	43.78	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-16.03	43.78	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4428.24*

INPUT
Description: Interpolated Section 20
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-89.2	588.24	-86.5	588.06	-86.1	588.03	-64.6	587.37	-61.2	587.31
-55.9	585.2	-54.83	585.04	-51.31	584.43	-46	583.55	-41.48	582.47
-32.65	582.35	-19.38	582.37	-14.22	582.43	-5.72	582.26	-2.67	581.92
1.65	581.56	4.08	581.74	7.21	581.96	16.83	582.26	18.34	582.36
24.02	582.84	27.67	583.09	33.45	583.57	50	589.1		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-89.2	.15	-41.48	.05	18.34	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-41.48	18.34	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4254.36*

INPUT
Description: Interpolated Section 19
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-65.9	588.2	-63.3	588.01	-62.7	587.98	-51	587.13	-46.05	585.12
-44.98	584.97	-41.45	584.37	-36.15	583.51	-31.63	582.42	-22.47	582.31
-8.7	582.36	-3.36	582.42	5.45	582.25	8.62	581.88	13.1	581.51
15.3	581.68	18.14	581.88	26.84	582.2	28.21	582.3	33.64	582.77
37.12	583.03	42.65	583.5	56.2	588	61.2	589	63.4	589.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-65.9	.15	-31.63	.05	28.21	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-31.63	28.21	173.88	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 4080.48*

INPUT
Description: Interpolated Section 18
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

-68.9	588.15	-66.3	587.95	-65.9	587.92	-44.3	587.01	-40.4	585.62
-39.09	585.05	-38.02	584.9	-34.5	584.31	-29.19	583.46	-24.67	582.36
-19.19	582.27	-4.93	582.35	.6	582.41	9.73	582.23	13.01	581.85
17.65	581.46	19.62	581.62	22.16	581.81	29.95	582.15	31.17	582.24
36.35	582.71	39.67	582.97	44.94	583.44	48.33	584.86	54.65	586.05
55.15	586.13	65.57	587.98	75.37	588.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-68.9	.15	-24.67	.05	31.17	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-24.67	31.17	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 3906.61*

INPUT
Description: Interpolated Section 17
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-109.2	588.1	-106.5	587.9	-106.1	587.86	-86	587.08	-85.47	586.98
-83.66	586.9	-63.04	585.57	-61.73	584.98	-60.66	584.83	-57.14	584.25
-51.84	583.41	-47.32	582.31	-37.5	582.22	-22.76	582.34	-17.03	582.4
-7.59	582.22	-4.2	581.82	.6	581.41	2.34	581.56	4.58	581.74
11.45	582.09	12.54	582.18	17.46	582.64	20.62	582.91	25.64	583.38
28.86	584.84	34.87	586.06	35.35	586.15	45.26	588.06	50.2	588.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-109.2	.15	-47.32	.05	12.54	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-47.32	12.54	173.88	173.88	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 3732.73*

INPUT
Description: Interpolated Section 16
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-111.6	588.06	-109	587.84	-108.5	587.81	-87	586.98	-74.42	586.86
-72.6	586.78	-51.99	585.52	-50.68	584.91	-49.61	584.76	-46.09	584.19

```
  -40.78  583.37  -36.26  582.26  -26.12  582.18  -10.89  582.32   -4.97   582.4
    4.79   582.2    8.29  581.79   13.25  581.36   14.76   581.5    16.7  581.67
   22.66  582.04    23.6  582.12   28.28  582.58   31.27  582.85   36.03  583.31
   39.08  584.83   44.79  586.07   45.25  586.16   54.65  588.14      63   590.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -111.6     .15  -36.26     .05    23.6     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -36.26    23.6           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3558.85*

INPUT
Description: Interpolated Section 15
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -135.83  588.01 -133.19  587.79 -132.76  587.75 -111.25  586.88  -64.66  586.75
  -62.84  586.67  -42.23  585.46  -40.92  584.84  -39.85  584.68  -36.33  584.14
  -31.03  583.32  -26.51  582.21  -16.04  582.14    -.32  582.31    5.79  582.39
   15.86  582.19   19.48  581.75    24.6  581.31   25.88  581.44   27.52   581.6
   32.57  581.98   33.37  582.06   37.79  582.51   40.62  582.79   45.12  583.25
      53     589    64.2   589.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -135.83     .15  -26.51     .05   33.37     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -26.51   33.37           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3384.98*

INPUT
Description: Interpolated Section 14
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -110.07  587.97 -107.42  587.73    -107   587.7  -85.48  586.79   -38.9  586.64
  -37.08  586.55  -16.48  585.41  -15.17  584.77   -14.1  584.61  -10.58  584.08
   -5.27  583.28    -.75  582.15   10.04   582.1   26.26   582.3   32.56  582.38
   42.94  582.17   46.67  581.72   51.95  581.26   52.99  581.38   54.35  581.53
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   58.48  581.93   59.13     582    63.3  582.45   65.97  582.73   70.22  583.18
    81.4   589.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -110.07     .15    -.75     .05   59.13     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -.75   59.13           173.88  173.88  173.88             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3211.1

INPUT
Description: XSEC 8 (STA. 32+11.1)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -109.3  587.92 -106.23  587.64  -84.72  586.69  -38.14  586.53  -15.72  585.36
  -14.41   584.7   -4.52  583.23       0   582.1   11.12  582.06   34.32  582.37
   45.02  582.16   48.86  581.69    54.3  581.21    59.9  581.94   70.31  583.12
   72.87  584.79   85.91  588.39  112.07  589.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -109.3     .15       0     .05    59.9     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    59.9           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 3050.95*

INPUT
Description: Interpolated Section 13
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -109.05  587.88 -106.24  587.65  -86.54  586.82  -43.87  586.43  -23.34  585.42
  -22.14  584.91  -18.58  584.46  -13.08  583.65  -10.77  583.12   -8.94  582.34
    1.23  582.11    6.05  582.07   22.45  582.16   32.24  581.95   35.75  581.58
   40.72   581.2   44.11  581.41   49.28  581.77   53.37  582.26   54.09  582.68
   58.15   583.4   62.85  584.09   65.18  585.48   69.38  586.66   77.06  588.49
   100.9  589.62

Manning's n Values        num=       3
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     Sta   n Val     Sta   n Val     Sta   n Val
 -109.05     .15   -8.94     .05   53.37     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -8.94   53.37           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2890.80*

INPUT
Description: Interpolated Section 12
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -108.8  587.84 -106.25  587.66  -88.35  586.94   -49.6  586.32  -30.95  585.48
  -29.86  585.13  -26.64   584.8  -21.64  584.07  -19.54  583.64  -17.88  582.57
   -8.65  582.16   -4.29  582.01   10.58  581.95   19.46  581.75   22.64  581.48
   27.15  581.18   32.43  581.42   40.47  581.84   46.83  582.57   47.49  583.33
   51.15  584.26   55.39  585.07    57.5  586.16   61.28  587.26   68.22  588.59
   89.72  589.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -108.8     .15  -17.88     .05   46.83     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -17.88   46.83           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2730.65*

INPUT
Description: Interpolated Section 11
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -108.55   587.8 -106.25  587.68  -90.17  587.07  -55.33  586.22  -38.57  585.53
  -37.59  585.34  -34.69  585.13  -30.19  584.49  -28.31  584.16  -26.81  582.81
  -18.54  582.21  -14.62  581.94   -1.29  581.75    6.67  581.54    9.53  581.37
   13.57  581.17   20.74  581.42   31.66  581.91    40.3  582.89   40.88  583.98
   44.15  585.12   47.93  586.04   49.81  586.85   53.19  587.86   59.37  588.69
   78.55  589.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -108.55     .15  -26.81     .05    40.3     .15
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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -26.81    40.3           160.15  160.15  160.15             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2570.5

INPUT
Description: XSEC 7 (STA. 25+70.5)
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -108.3  587.76  -42.74  585.47  -37.08  584.68  -35.75  583.05  -24.96  581.88
       0  581.16    9.05  581.43   22.85  581.98   33.77   583.2   34.28  584.63
   37.15  585.98   45.09  588.46   67.38   589.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -108.3     .15  -35.75     .05   33.77     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -35.75   33.77           143.1   143.1   143.1             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 2427.35*

INPUT
Description: Interpolated Section 10
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -89.42  587.29  -82.47  587.08  -64.74  586.32  -58.91  585.93  -53.99   585.3
  -39.48  584.13  -34.65  583.66  -29.92  582.91  -28.81  582.02  -21.44  581.47
  -20.55  581.37  -11.35  580.81   -1.47  580.51     5.1  580.75    7.11   580.8
   10.76   580.9   19.97  581.97    20.2  581.98   30.56  582.65   30.98  583.45
    33.4  584.58   36.76  585.83   40.02  587.29    40.1  587.31   53.72  589.22
   58.88   589.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -89.42     .15  -28.81     .05   30.56     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -28.81   30.56           143.1   143.1   143.1             .1       .3

CROSS SECTION
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RIVER: Crystal River
REACH: Glen Arbor RS: 2284.2

INPUT
Description: XSEC 6 (STA. 22+84.2)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70.54	586.82	-64.96	586.69	-50.72	585.91	-46.04	585.38	-42.09	584.32
-30.43	582.58	-21.86	580.98	-16.76	580.94	-9.78	580.09	-2.94	579.86
3.27	580.14	8.62	580.22	17.33	581.97	27.34	582.1	32.39	584.44
35.04	586.15	46.19	589	50.39	590				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70.54	.15	-21.86	.05	27.34	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-21.86	27.34	32.5	32.5	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2261.22*

INPUT
Description: US Face Culvert (Interpolated Section 9)
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70.98	586.91	-65.52	586.77	-51.6	586.05	-51.43	586.03	-47.03	585.55
-43.17	584.62	-41.17	584.34	-36.87	583.44	-31.77	582.59	-23.39	580.94
-18.49	580.75	-18.06	580.75	-14.26	580.38	-10.78	580.04	-9.55	580
-3.63	579.76	-.06	579.95	2.31	580.07	3	580.13	5.97	580.34
8.71	580.4	12.93	581.1	18.01	581.9	21.27	581.95	28.69	582.03
31.35	582.99	34.86	584.53	38	586.28	38.1	586.33	49.65	588.57
51.72	588.97	56.86	589.89						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70.98	.15	-23.39	.05	28.69	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-23.39	28.69	63	63	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-70.98	-25.5	590	F
29.5	56.86	590	F

BRIDGE

RIVER: Crystal River
REACH: Glen Arbor RS: 2225.7

INPUT
Description: 1st Bridge crossing CR 675 from M22
Distance from Upstream XS = 8.9
Deck/Roadway Width = 43.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 9

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-85.6	587.82		-71.23	588.09		-25.48	588.79	
-25.43	588.79	586.2	29.38	589.79	587.2	29.39	589.79	
50.14	590.09		134.33	590.43		184.33	590.63	

Upstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70.98	586.91	-65.52	586.77	-51.6	586.05	-51.43	586.03	-47.03	585.55
-43.17	584.62	-41.17	584.34	-36.87	583.44	-31.77	582.59	-25.43	580.5
-23.08	580.5	-21.84	580.5	.59	580.5	24.36	580.5	29.38	581.8
31.35	582.99	34.86	584.53	38	586.28	38.1	586.33	49.65	588.57
51.72	588.97	56.86	589.89						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70.98	.15	-31.77	.06	29.38	.15

Bank Sta: Left	Right	Coeff Contr.	Expan.
-31.77	29.38	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-70.98	-25.5	590	F
29.5	56.86	590	F

Downstream Deck/Roadway Coordinates
num= 9

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-85.6	587.82		-71.23	588.09		-25.48	588.79	
-25.43	588.79	586.2	29.38	589.79	587.2	29.39	589.79	
50.14	590.09		134.33	590.43		184.33	590.63	

Downstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-72.19	587.16	-67.07	587	-54.02	586.44	-53.86	586.43	-49.73	586.01
-46.11	585.45	-44.24	585.23	-40.22	583.66	-35.43	582.63	-27.58	580.83

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  -25.43   580.5     .59   580.5   24.36   580.5   29.38   581.8   32.41  581.82
   36.39  582.68   41.64  584.77   46.34  586.79   46.49  586.82   63.78  588.59
   66.88  588.89   74.56  589.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -72.19     .15  -27.58     .06   29.38     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -27.58   29.38             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -72.19   -25.5     590       F
    29.5   74.56     590       F

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

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   -25.5   580.5   -24.5   580.5
Downstream     num=       2
     Sta    Elev     Sta    Elev
   -25.5   580.5   -24.5   580.5

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   24.36   580.5   29.38   581.8
Downstream     num=       2
     Sta    Elev     Sta    Elev
   24.36   580.5   29.38   581.8

Number of Bridge Coefficient Sets =  1

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

High Flow Method
       Energy Only
```

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

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2198.27*

INPUT
Description: DS Face Culvert (Interpolated Section 8)
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-72.19	587.16	-67.07	587	-54.02	586.44	-53.86	586.43	-49.73	586.01
-46.11	585.45	-44.24	585.23	-40.22	583.66	-35.43	582.63	-27.58	580.83
-22.11	580.22	-21.63	580.21	-17.39	580.05	-13.5	579.89	-12.14	579.87
-5.53	579.49	-1.34	579.77	1.44	579.95	2.25	580.11	5.73	580.76
8.95	580.9	13.91	581.34	19.86	581.72	23.69	581.77	32.41	581.82
36.39	582.68	41.64	584.77	46.34	586.79	46.49	586.82	63.78	588.59
66.88	588.89	74.56	589.61						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-72.19	.15	-27.58	.05	32.41	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-27.58 32.41 32.5 32.5 32.5 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-72.19	-25.5	590	F
29.5	74.56	590	F

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2157.3

INPUT
Description: XSEC 5 (STA. 21+57.3)
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-72.97	587.32	-55.44	586.69	-46.24	585.81	-42.39	583.8	-30.3	580.76
-24.47	579.87	-19.43	579.84	-13.82	579.78	-6.77	579.32	-2.17	579.66
.88	579.88	5.58	581.04	14.54	581.5	25.27	581.66	34.82	581.69
39.66	582.47	51.76	587.12	72.97	588.6	86.09	589.42		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-72.97	.15	-30.3	.05	34.82	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.3	34.82	95.7	95.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 2061.60*

INPUT
Description: Interpolated Section 7
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-60.08	587.55	-56.01	587.34	-49.09	586.3	-43.51	585.18	-43.32	585.15
-41.9	584.39	-40.9	583.87	-33.32	581.58	-28.76	580.79	-28.34	580.75
-24.81	580.65	-20.42	580.5	-14.9	580.12	-9.99	580.59	-6.73	580.9
-5.75	581.07	-1.71	581.55	6.75	581.79	7.86	581.8	18.15	581.75
19.32	581.8	29.52	582.13	30.85	582.96	36.37	584.68	37.86	584.75
58.7	587.08	79.6	587.5	95.24	588.02	117.83	588.72		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-60.08	.15	-33.32	.05	29.52	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-33.32	29.52	95.7	95.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1965.9

INPUT
Description: XSEC 4 (STA. 19+65.9)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-47.19	587.77	-45.54	587.6	-40.47	584.53	-39.82	584.14	-36.34	582.39
-32.74	581.64	-23.03	580.93	-13.3	582.03	0	582.13	12.13	581.86
24.22	582.57	26.11	584.1	33.94	587.02	95.3	587.04	149.58	588.02

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-47.19	.15	-36.34	.05	24.22	.15

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -36.34   24.22            123.5   123.5   123.5             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 1842.40*

INPUT
Description: Interpolated Section 6
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -53.76  588.59  -52.33  588.45  -50.72  588.13  -45.81  586.53  -41.35  585.92
  -40.15  585.75  -39.94  585.73  -34.95  583.55  -34.34  583.26  -33.72  582.38
  -27.71  581.57   -26.9   581.5  -18.53  581.23  -11.52  580.95    -2.7  581.75
   -2.44  581.77    9.07  581.91    9.97  581.91   21.28  581.78   21.95   581.8
   32.56  582.28   33.98  583.11   39.88  584.86      40  584.87   42.16  585.64
   43.88  585.73   62.47  586.95   86.09  587.02  126.96  587.64

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -53.76     .15  -33.72     .05   32.56     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -33.72   32.56            123.5   123.5   123.5             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Glen Arbor         RS: 1718.9

INPUT
Description: XSEC 3 (STA. 17+18.9)
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -60.34   589.4  -58.25   589.2  -48.74  587.06  -40.18  587.38   -32.9  584.38
     -32  583.97   -31.1  582.37  -21.55  581.39   -9.82  581.22       0  580.97
    8.18  581.51    19.1  581.69   31.05   581.7    40.9  581.99    45.9  582.72
   47.35  584.26   48.51  584.44      61  586.87  104.34  587.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -60.34     .15   -31.1     .05    40.9     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -31.1    40.9            133.4   133.4   133.4             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Glen Arbor RS: 1585.50*

INPUT
Description: Interpolated Section 5
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-69.42	588.74	-66.65	588.57	-54.06	586.86	-42.72	587.01	-41.29	586.67
-38.73	585.78	-35.9	585.02	-35.1	584.74	-33.68	584.12	-33.07	583.95
-31.88	583.61	-30.69	582.37	-21.69	581.64	-21.26	581.6	-9.69	581.34
0	581.04	7.56	581.51	10.52	581.57	17.64	581.73	26.45	581.82
28.68	581.82	37.78	582.04	40.65	582.75	42.98	583.16	44.48	584.42
45.69	584.64	56.09	586.81	58.68	587.24	89.36	588.18	103.74	588.16

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-69.42	.15	-30.69	.05	37.78	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.69	37.78	133.4	133.4	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1452.10*

INPUT
Description: Interpolated Section 4
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-78.5	588.09	-75.06	587.94	-59.37	586.67	-45.25	586.65	-43.48	586.4
-40.28	585.41	-36.76	584.77	-35.77	584.47	-34.01	583.66	-33.24	583.53
-31.76	583.25	-30.28	582.38	-21.4	581.84	-20.98	581.81	-9.56	581.46
0	581.12	6.93	581.51	9.65	581.58	16.18	581.78	24.26	581.95
26.31	581.95	34.65	582.09	37.64	583.11	40.05	583.6	41.62	584.57
42.87	584.83	53.67	587.24	56.35	587.61	88.21	589.24	103.13	589.08

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-78.5	.15	-30.28	.05	34.65	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.28	34.65	133.4	133.4	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1318.70*

INPUT
Description: Interpolated Section 3
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-87.59	587.43	-83.46	587.31	-64.69	586.47	-47.79	586.28	-45.66	586.14
-41.84	585.05	-37.63	584.53	-36.44	584.19	-34.33	583.21	-33.42	583.1
-31.64	582.89	-29.86	582.38	-21.11	582.04	-20.69	582.01	-9.43	581.58
0	581.2	6.31	581.51	8.78	581.59	14.73	581.82	22.08	582.07
23.94	582.07	31.53	582.14	34.62	583.47	37.13	584.03	38.75	584.73
40.05	585.03	51.24	587.66	54.03	587.98	87.06	590.29	102.53	589.99

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-87.59	.15	-29.86	.05	31.53	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-29.86	31.53	133.4	133.4	133.4	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1185.3

INPUT
Description: XSEC 2 (STA. 11+85.3)
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-96.67	586.77	-47.85	585.87	-43.4	584.69	-38.49	584.29	-37.11	583.92
-34.65	582.75	-29.45	582.38	-20.82	582.24	0	581.27	7.91	581.6
19.89	582.2	28.41	582.19	31.61	583.83	48.82	588.09	85.91	591.35
101.93	590.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-96.67	.15	-29.45	.05	28.41	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-29.45	28.41	61.77	61.77	61.77	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1123.53*

INPUT

Description: Interpolated Section 2
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-92.49	586.85	-92.49	585.52	-57.22	584.86	-47.27	584.76	-43.14	583.98
-38.59	583.73	-37.32	583.49	-35.04	582.71	-30.22	582.48	-22.83	582.14
-22.47	582.13	-12.28	581.46	-3.77	580.76	2.64	581.36	4.86	581.25
5.92	581.2	17.93	582.04	22.09	582.2	27.22	582.27	31.07	583.49
41.77	585.31	49.94	587.29	51.76	587.68	65.52	589.44	96.35	590.99
110.63	590.79	115.6	590.78						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-92.49	.15	-30.22	.05	27.22	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.22	27.22	61.77	61.77	61.77	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1061.77*

INPUT
Description: Interpolated Section 1
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-88.31	586.92	-88.31	584.28	-55.85	583.64	-46.68	583.64	-42.89	583.27
-38.7	583.17	-37.52	583.05	-35.42	582.68	-30.99	582.59	-24.44	582.04
-24.12	582.02	-15.09	581.22	-7.54	580.26	-.59	581.21	1.81	580.9
2.96	580.76	15.97	581.88	20.47	582.2	26.04	582.34	30.53	583.15
43.03	584.59	52.57	586.86	54.7	587.27	70.77	589.79	106.78	590.63
123.46	590.56	129.28	590.67						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-88.31	.15	-30.99	.05	26.04	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-30.99	26.04	61.77	61.77	61.77	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Glen Arbor RS: 1000.0

INPUT
Description: XSEC 1 (STA. 10+00)
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.13	587	-84.13	583.03	-54.47	582.43	-31.76	582.69	-26.05	581.94
-17.89	580.97	-11.31	579.75	-3.83	581.06	0	580.31	18.86	582.2
24.85	582.42	44.29	583.87	55.2	586.43	76.02	590.14	136.3	590.33
142.95	590.55								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-84.13	.15	-31.76	.05	24.85	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-31.76	24.85	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Crystal River

Reach	River Sta.	n1	n2	n3
Glen Arbor	10162.2	.15	.05	.15
Glen Arbor	10023.5*	.15	.05	.15
Glen Arbor	9884.90*	.15	.05	.15
Glen Arbor	9746.25*	.15	.05	.15
Glen Arbor	9607.60*	.15	.05	.15
Glen Arbor	9468.95*	.15	.05	.15
Glen Arbor	9330.3	.15	.05	.15
Glen Arbor	9224.50*	.15	.05	.15
Glen Arbor	9118.7	.15	.05	.15
Glen Arbor	8986.6	.15	.05	.15
Glen Arbor	8974	.15	.05	.15
Glen Arbor	8946.1	Bridge		
Glen Arbor	8919.20*	.15	.05	.15
Glen Arbor	8907.3	.15	.05	.15
Glen Arbor	8742.47*	.15	.05	.15
Glen Arbor	8577.63*	.15	.05	.15
Glen Arbor	8412.8	.15	.05	.15
Glen Arbor	8242.58*	.15	.05	.15
Glen Arbor	8072.35*	.15	.05	.15
Glen Arbor	7902.13*	.15	.05	.15
Glen Arbor	7731.9	.15	.05	.15
Glen Arbor	7558.02*	.15	.05	.15
Glen Arbor	7384.15*	.15	.05	.15
Glen Arbor	7210.27*	.15	.05	.15
Glen Arbor	7036.39*	.15	.05	.15
Glen Arbor	6862.52*	.15	.05	.15
Glen Arbor	6688.64*	.15	.05	.15
Glen Arbor	6514.76*	.15	.05	.15
Glen Arbor	6340.88*	.15	.05	.15

Glen Arbor	6167.01*	.15	.05	.15
Glen Arbor	5993.13*	.15	.05	.15
Glen Arbor	5819.25*	.15	.05	.15
Glen Arbor	5645.38*	.15	.05	.15
Glen Arbor	5471.50*	.15	.05	.15
Glen Arbor	5297.62*	.15	.05	.15
Glen Arbor	5123.75*	.15	.05	.15
Glen Arbor	4949.87*	.15	.05	.15
Glen Arbor	4775.99*	.15	.05	.15
Glen Arbor	4602.12*	.15	.05	.15
Glen Arbor	4428.24*	.15	.05	.15
Glen Arbor	4254.36*	.15	.05	.15
Glen Arbor	4080.48*	.15	.05	.15
Glen Arbor	3906.61*	.15	.05	.15
Glen Arbor	3732.73*	.15	.05	.15
Glen Arbor	3558.85*	.15	.05	.15
Glen Arbor	3384.98*	.15	.05	.15
Glen Arbor	3211.1	.15	.05	.15
Glen Arbor	3050.95*	.15	.05	.15
Glen Arbor	2890.80*	.15	.05	.15
Glen Arbor	2730.65*	.15	.05	.15
Glen Arbor	2570.5	.15	.05	.15
Glen Arbor	2427.35*	.15	.05	.15
Glen Arbor	2284.2	.15	.05	.15
Glen Arbor	2261.22*	.15	.05	.15
Glen Arbor	2225.7	Bridge		
Glen Arbor	2198.27*	.15	.05	.15
Glen Arbor	2157.3	.15	.05	.15
Glen Arbor	2061.60*	.15	.05	.15
Glen Arbor	1965.9	.15	.05	.15
Glen Arbor	1842.40*	.15	.05	.15
Glen Arbor	1718.9	.15	.05	.15
Glen Arbor	1585.50*	.15	.05	.15
Glen Arbor	1452.10*	.15	.05	.15
Glen Arbor	1318.70*	.15	.05	.15
Glen Arbor	1185.3	.15	.05	.15
Glen Arbor	1123.53*	.15	.05	.15
Glen Arbor	1061.77*	.15	.05	.15
Glen Arbor	1000.0	.15	.05	.15

SUMMARY OF REACH LENGTHS

River: Crystal River

Reach	River Sta.	Left	Channel	Right
Glen Arbor	10162.2	138.65	138.65	138.65

Glen Arbor	10023.5*	138.65	138.65	138.65
Glen Arbor	9884.90*	138.65	138.65	138.65
Glen Arbor	9746.25*	138.65	138.65	138.65
Glen Arbor	9607.60*	138.65	138.65	138.65
Glen Arbor	9468.95*	138.65	138.65	138.65
Glen Arbor	9330.3	105.8	105.8	105.8
Glen Arbor	9224.50*	105.8	105.8	105.8
Glen Arbor	9118.7	126.9	126.9	126.9
Glen Arbor	8986.6	12.6	12.6	12.6
Glen Arbor	8974	55	55	55
Glen Arbor	8946.1	Bridge		
Glen Arbor	8919.20*	11.9	11.9	11.9
Glen Arbor	8907.3	164.83	164.83	164.83
Glen Arbor	8742.47*	164.83	164.83	164.83
Glen Arbor	8577.63*	164.83	164.83	164.83
Glen Arbor	8412.8	170.23	170.23	170.23
Glen Arbor	8242.58*	170.23	170.23	170.23
Glen Arbor	8072.35*	170.23	170.23	170.23
Glen Arbor	7902.13*	170.23	170.23	170.23
Glen Arbor	7731.9	173.88	173.88	173.88
Glen Arbor	7558.02*	173.88	173.88	173.88
Glen Arbor	7384.15*	173.88	173.88	173.88
Glen Arbor	7210.27*	173.88	173.88	173.88
Glen Arbor	7036.39*	173.88	173.88	173.88
Glen Arbor	6862.52*	173.88	173.88	173.88
Glen Arbor	6688.64*	173.88	173.88	173.88
Glen Arbor	6514.76*	173.88	173.88	173.88
Glen Arbor	6340.88*	173.88	173.88	173.88
Glen Arbor	6167.01*	173.88	173.88	173.88
Glen Arbor	5993.13*	173.88	173.88	173.88
Glen Arbor	5819.25*	173.88	173.88	173.88
Glen Arbor	5645.38*	223	173.88	96
Glen Arbor	5471.50*	223	173.88	93
Glen Arbor	5297.62*	173.88	173.88	173.88
Glen Arbor	5123.75*	173.88	173.88	173.88
Glen Arbor	4949.87*	173.88	173.88	173.88
Glen Arbor	4775.99*	173.88	173.88	173.88
Glen Arbor	4602.12*	173.88	173.88	173.88
Glen Arbor	4428.24*	173.88	173.88	173.88
Glen Arbor	4254.36*	173.88	173.88	173.88
Glen Arbor	4080.48*	173.88	173.88	173.88
Glen Arbor	3906.61*	173.88	173.88	173.88
Glen Arbor	3732.73*	173.88	173.88	173.88
Glen Arbor	3558.85*	173.88	173.88	173.88
Glen Arbor	3384.98*	173.88	173.88	173.88
Glen Arbor	3211.1	160.15	160.15	160.15
Glen Arbor	3050.95*	160.15	160.15	160.15
Glen Arbor	2890.80*	160.15	160.15	160.15
Glen Arbor	2730.65*	160.15	160.15	160.15
Glen Arbor	2570.5	143.1	143.1	143.1

Glen Arbor	2427.35*	143.1	143.1	143.1
Glen Arbor	2284.2	32.5	32.5	32.5
Glen Arbor	2261.22*	63	63	63
Glen Arbor	2225.7	Bridge		
Glen Arbor	2198.27*	32.5	32.5	32.5
Glen Arbor	2157.3	95.7	95.7	95.7
Glen Arbor	2061.60*	95.7	95.7	95.7
Glen Arbor	1965.9	123.5	123.5	123.5
Glen Arbor	1842.40*	123.5	123.5	123.5
Glen Arbor	1718.9	133.4	133.4	133.4
Glen Arbor	1585.50*	133.4	133.4	133.4
Glen Arbor	1452.10*	133.4	133.4	133.4
Glen Arbor	1318.70*	133.4	133.4	133.4
Glen Arbor	1185.3	61.77	61.77	61.77
Glen Arbor	1123.53*	61.77	61.77	61.77
Glen Arbor	1061.77*	61.77	61.77	61.77
Glen Arbor	1000.0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Crystal River

Reach	River Sta.	Contr.	Expan.
Glen Arbor	10162.2	.1	.3
Glen Arbor	10023.5*	.1	.3
Glen Arbor	9884.90*	.1	.3
Glen Arbor	9746.25*	.1	.3
Glen Arbor	9607.60*	.1	.3
Glen Arbor	9468.95*	.1	.3
Glen Arbor	9330.3	.1	.3
Glen Arbor	9224.50*	.1	.3
Glen Arbor	9118.7	.1	.3
Glen Arbor	8986.6	.1	.3
Glen Arbor	8974	.1	.3
Glen Arbor	8946.1	Bridge	
Glen Arbor	8919.20*	.1	.3
Glen Arbor	8907.3	.1	.3
Glen Arbor	8742.47*	.1	.3
Glen Arbor	8577.63*	.1	.3
Glen Arbor	8412.8	.1	.3
Glen Arbor	8242.58*	.1	.3
Glen Arbor	8072.35*	.1	.3
Glen Arbor	7902.13*	.1	.3
Glen Arbor	7731.9	.1	.3
Glen Arbor	7558.02*	.1	.3
Glen Arbor	7384.15*	.1	.3

Glen Arbor	7210.27*		.1	.3
Glen Arbor	7036.39*		.1	.3
Glen Arbor	6862.52*		.1	.3
Glen Arbor	6688.64*		.1	.3
Glen Arbor	6514.76*		.1	.3
Glen Arbor	6340.88*		.1	.3
Glen Arbor	6167.01*		.1	.3
Glen Arbor	5993.13*		.1	.3
Glen Arbor	5819.25*		.1	.3
Glen Arbor	5645.38*		.1	.3
Glen Arbor	5471.50*		.1	.3
Glen Arbor	5297.62*		.1	.3
Glen Arbor	5123.75*		.1	.3
Glen Arbor	4949.87*		.1	.3
Glen Arbor	4775.99*		.1	.3
Glen Arbor	4602.12*		.1	.3
Glen Arbor	4428.24*		.1	.3
Glen Arbor	4254.36*		.1	.3
Glen Arbor	4080.48*		.1	.3
Glen Arbor	3906.61*		.1	.3
Glen Arbor	3732.73*		.1	.3
Glen Arbor	3558.85*		.1	.3
Glen Arbor	3384.98*		.1	.3
Glen Arbor	3211.1		.1	.3
Glen Arbor	3050.95*		.1	.3
Glen Arbor	2890.80*		.1	.3
Glen Arbor	2730.65*		.1	.3
Glen Arbor	2570.5		.1	.3
Glen Arbor	2427.35*		.1	.3
Glen Arbor	2284.2		.1	.3
Glen Arbor	2261.22*		.3	.5
Glen Arbor	2225.7	Bridge		
Glen Arbor	2198.27*		.3	.5
Glen Arbor	2157.3		.1	.3
Glen Arbor	2061.60*		.1	.3
Glen Arbor	1965.9		.1	.3
Glen Arbor	1842.40*		.1	.3
Glen Arbor	1718.9		.1	.3
Glen Arbor	1585.50*		.1	.3
Glen Arbor	1452.10*		.1	.3
Glen Arbor	1318.70*		.1	.3
Glen Arbor	1185.3		.1	.3
Glen Arbor	1123.53*		.1	.3
Glen Arbor	1061.77*		.1	.3
Glen Arbor	1000.0		.1	.3

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor

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)	
Glen Arbor	10162.2	2 Year	70.00	583.65	586.22		586.22	0.000291	0.39	207.82	137.09	0.05
Glen Arbor	10162.2	50 Year	145.00	583.65	587.49		587.49	0.000197	0.45	431.39	209.28	0.04
Glen Arbor	10162.2	100 Year	165.00	583.65	587.76		587.76	0.000185	0.46	487.47	211.62	0.04
Glen Arbor	10162.2	500 Year	220.00	583.65	588.39		588.40	0.000167	0.49	624.39	217.22	0.04
Glen Arbor	10162.2	Base Flow	35.00	583.65	585.35		585.36	0.000430	0.36	100.68	106.43	0.06
Glen Arbor	10023.5*	2 Year	70.00	583.47	586.17		586.18	0.000304	0.42	199.38	173.17	0.05
Glen Arbor	10023.5*	50 Year	145.00	583.47	587.46		587.46	0.000185	0.45	470.92	245.63	0.04
Glen Arbor	10023.5*	100 Year	165.00	583.47	587.73		587.73	0.000172	0.46	537.25	248.73	0.04
Glen Arbor	10023.5*	500 Year	220.00	583.47	588.37		588.37	0.000152	0.48	699.13	256.14	0.04
Glen Arbor	10023.5*	Base Flow	35.00	583.47	585.30		585.30	0.000423	0.37	94.30	70.21	0.06
Glen Arbor	9884.90*	2 Year	70.00	583.28	586.14		586.14	0.000248	0.38	219.80	130.44	0.05
Glen Arbor	9884.90*	50 Year	145.00	583.28	587.44		587.44	0.000133	0.39	624.30	329.89	0.04
Glen Arbor	9884.90*	100 Year	165.00	583.28	587.71		587.71	0.000121	0.39	714.04	334.57	0.04
Glen Arbor	9884.90*	500 Year	220.00	583.28	588.36		588.36	0.000104	0.40	933.06	345.74	0.03
Glen Arbor	9884.90*	Base Flow	35.00	583.28	585.24		585.24	0.000362	0.35	114.54	103.07	0.05
Glen Arbor	9746.25*	2 Year	70.00	583.09	586.11		586.11	0.000191	0.35	288.89	204.89	0.04
Glen Arbor	9746.25*	50 Year	145.00	583.09	587.42		587.43	0.000124	0.38	596.97	257.73	0.04
Glen Arbor	9746.25*	100 Year	165.00	583.09	587.69		587.70	0.000119	0.40	667.89	265.22	0.04
Glen Arbor	9746.25*	500 Year	220.00	583.09	588.34		588.34	0.000111	0.42	844.79	283.04	0.04
Glen Arbor	9746.25*	Base Flow	35.00	583.09	585.19		585.20	0.000323	0.33	123.50	106.03	0.05
Glen Arbor	9607.60*	2 Year	70.00	582.91	586.08		586.09	0.000144	0.33	212.56	86.89	0.04
Glen Arbor	9607.60*	50 Year	145.00	582.91	587.40		587.41	0.000133	0.42	426.75	183.12	0.04
Glen Arbor	9607.60*	100 Year	165.00	582.91	587.68		587.68	0.000132	0.44	477.18	188.32	0.04
Glen Arbor	9607.60*	500 Year	220.00	582.91	588.32		588.33	0.000132	0.49	602.74	200.69	0.04
Glen Arbor	9607.60*	Base Flow	35.00	582.91	585.16		585.17	0.000158	0.26	134.53	82.86	0.04
Glen Arbor	9468.95*	2 Year	70.00	582.72	586.05		586.06	0.000290	0.48	155.73	81.95	0.05
Glen Arbor	9468.95*	50 Year	145.00	582.72	587.38		587.38	0.000272	0.61	313.29	159.08	0.05
Glen Arbor	9468.95*	100 Year	165.00	582.72	587.65		587.65	0.000268	0.63	357.98	169.88	0.05
Glen Arbor	9468.95*	500 Year	220.00	582.72	588.29		588.30	0.000262	0.69	475.92	195.53	0.06
Glen Arbor	9468.95*	Base Flow	35.00	582.72	585.13		585.14	0.000314	0.37	94.45	58.32	0.05
Glen Arbor	9330.3	2 Year	70.00	582.54	586.01		586.02	0.000287	0.50	159.15	74.51	0.05
Glen Arbor	9330.3	50 Year	145.00	582.54	587.34		587.34	0.000297	0.65	293.24	180.37	0.06
Glen Arbor	9330.3	100 Year	165.00	582.54	587.61		587.61	0.000292	0.68	342.74	183.15	0.06
Glen Arbor	9330.3	500 Year	220.00	582.54	588.26		588.26	0.000282	0.73	463.34	189.74	0.06
Glen Arbor	9330.3	Base Flow	35.00	582.54	585.09		585.09	0.000298	0.39	94.66	65.13	0.05
Glen Arbor	9224.50*	2 Year	70.00	582.69	585.98		585.99	0.000284	0.48	150.49	70.00	0.05
Glen Arbor	9224.50*	50 Year	145.00	582.69	587.31		587.31	0.000287	0.63	279.66	135.95	0.06
Glen Arbor	9224.50*	100 Year	165.00	582.69	587.58		587.58	0.000289	0.66	322.69	180.11	0.06
Glen Arbor	9224.50*	500 Year	220.00	582.69	588.23		588.23	0.000277	0.71	448.25	199.12	0.06
Glen Arbor	9224.50*	Base Flow	35.00	582.69	585.06		585.06	0.000294	0.37	95.31	54.78	0.05
Glen Arbor	9118.7	2 Year	70.00	582.85	585.95		585.95	0.000335	0.48	146.34	62.16	0.05
Glen Arbor	9118.7	50 Year	145.00	582.85	587.27		587.28	0.000315	0.62	265.40	126.94	0.06
Glen Arbor	9118.7	100 Year	165.00	582.85	587.55		587.55	0.000314	0.65	303.78	156.95	0.06
Glen Arbor	9118.7	500 Year	220.00	582.85	588.19		588.20	0.000300	0.70	427.43	207.52	0.06
Glen Arbor	9118.7	Base Flow	35.00	582.85	585.02		585.03	0.000378	0.39	90.80	57.89	0.05
Glen Arbor	8986.6	2 Year	70.00	580.55	585.92		585.92	0.000177	0.44	159.83	47.70	0.04
Glen Arbor	8986.6	50 Year	145.00	580.55	587.24		587.24	0.000262	0.64	245.64	82.60	0.05
Glen Arbor	8986.6	100 Year	165.00	580.55	587.51		587.51	0.000275	0.68	269.01	89.83	0.05
Glen Arbor	8986.6	500 Year	220.00	580.55	588.15		588.16	0.000307	0.78	336.34	118.95	0.06
Glen Arbor	8986.6	Base Flow	35.00	580.55	585.00		585.00	0.000102	0.29	118.99	41.99	0.03
Glen Arbor	8974	2 Year	70.00	580.62	585.92	581.80	585.92	0.000165	0.43	165.41	53.52	0.04
Glen Arbor	8974	50 Year	145.00	580.62	587.23	582.25	587.24	0.000238	0.62	248.62	80.16	0.05
Glen Arbor	8974	100 Year	165.00	580.62	587.50	582.35	587.51	0.000251	0.67	267.80	87.03	0.05
Glen Arbor	8974	500 Year	220.00	580.62	588.15	582.60	588.16	0.000287	0.77	313.59	111.67	0.06
Glen Arbor	8974	Base Flow	35.00	580.62	585.00	581.49	585.00	0.000099	0.29	121.69	43.65	0.03
Glen Arbor	8946.1		Bridge									
Glen Arbor	8919.20*	2 Year	70.00	580.96	585.75	581.98	585.75	0.000135	0.41	180.13	56.05	0.04
Glen Arbor	8919.20*	50 Year	145.00	580.96	586.99	582.39	587.00	0.000215	0.63	251.01	66.20	0.05
Glen Arbor	8919.20*	100 Year	165.00	580.96	587.26	582.49	587.26	0.000233	0.67	267.77	73.29	0.05
Glen Arbor	8919.20*	500 Year	220.00	580.96	587.90	582.72	587.91	0.000275	0.79	312.17	90.95	0.06
Glen Arbor	8919.20*	Base Flow	35.00	580.96	584.93	581.72	584.93	0.000080	0.27	135.29	52.33	0.03
Glen Arbor	8907.3	2 Year	70.00	581.03	585.75		585.75	0.000130	0.41	183.50	55.94	0.04
Glen Arbor	8907.3	50 Year	145.00	581.03	586.99		586.99	0.000211	0.62	257.76	66.75	0.05
Glen Arbor	8907.3	100 Year	165.00	581.03	587.26		587.26	0.000229	0.67	276.61	73.80	0.05
Glen Arbor	8907.3	500 Year	220.00	581.03	587.90		587.91	0.000271	0.79	329.31	90.19	0.06
Glen Arbor	8907.3	Base Flow	35.00	581.03	584.92		584.93	0.000076	0.26	138.60	52.76	0.03

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	8742.47*	2 Year	70.00	581.30	585.73		585.73	0.000165	0.44	175.35	60.50	0.04
Glen Arbor	8742.47*	50 Year	145.00	581.30	586.95		586.96	0.000251	0.66	259.58	80.15	0.05
Glen Arbor	8742.47*	100 Year	165.00	581.30	587.21		587.22	0.000268	0.71	281.68	86.45	0.06
Glen Arbor	8742.47*	500 Year	220.00	581.30	587.85		587.86	0.000307	0.82	342.05	105.67	0.06
Glen Arbor	8742.47*	Base Flow	35.00	581.30	584.91		584.91	0.000103	0.29	128.25	55.18	0.03
Glen Arbor	8577.63*	2 Year	70.00	581.58	585.69		585.70	0.000217	0.48	170.11	69.41	0.05
Glen Arbor	8577.63*	50 Year	145.00	581.58	586.90		586.91	0.000297	0.69	266.75	92.44	0.06
Glen Arbor	8577.63*	100 Year	165.00	581.58	587.17		587.17	0.000311	0.74	291.84	98.37	0.06
Glen Arbor	8577.63*	500 Year	220.00	581.58	587.79		587.80	0.000358	0.86	363.97	156.39	0.07
Glen Arbor	8577.63*	Base Flow	35.00	581.58	584.89		584.89	0.000147	0.33	118.62	59.17	0.04
Glen Arbor	8412.8	2 Year	70.00	581.85	585.65		585.66	0.000289	0.52	169.11	80.63	0.05
Glen Arbor	8412.8	50 Year	145.00	581.85	586.85		586.86	0.000348	0.71	278.84	104.42	0.06
Glen Arbor	8412.8	100 Year	165.00	581.85	587.11		587.12	0.000357	0.75	309.55	134.28	0.06
Glen Arbor	8412.8	500 Year	220.00	581.85	587.73		587.74	0.000383	0.85	414.02	185.98	0.07
Glen Arbor	8412.8	Base Flow	35.00	581.85	584.86		584.86	0.000224	0.37	110.65	66.59	0.04
Glen Arbor	8242.58*	2 Year	70.00	582.02	585.61		585.61	0.000284	0.50	170.34	83.06	0.05
Glen Arbor	8242.58*	50 Year	145.00	582.02	586.79		586.80	0.000332	0.68	286.11	111.69	0.06
Glen Arbor	8242.58*	100 Year	165.00	582.02	587.05		587.06	0.000357	0.74	322.52	169.22	0.06
Glen Arbor	8242.58*	500 Year	220.00	582.02	587.67		587.68	0.000348	0.80	432.71	185.99	0.06
Glen Arbor	8242.58*	Base Flow	35.00	582.02	584.82		584.82	0.000227	0.36	110.85	68.67	0.04
Glen Arbor	8072.35*	2 Year	70.00	582.18	585.56		585.56	0.000282	0.48	174.72	89.68	0.05
Glen Arbor	8072.35*	50 Year	145.00	582.18	586.74		586.74	0.000327	0.66	301.06	147.92	0.06
Glen Arbor	8072.35*	100 Year	165.00	582.18	586.99		587.00	0.000327	0.69	342.54	168.22	0.06
Glen Arbor	8072.35*	500 Year	220.00	582.18	587.62		587.62	0.000316	0.74	451.98	183.44	0.06
Glen Arbor	8072.35*	Base Flow	35.00	582.18	584.78		584.78	0.000237	0.35	111.86	73.77	0.04
Glen Arbor	7902.13*	2 Year	70.00	582.34	585.51		585.51	0.000285	0.46	181.57	98.60	0.05
Glen Arbor	7902.13*	50 Year	145.00	582.34	586.68		586.69	0.000305	0.62	322.61	156.22	0.06
Glen Arbor	7902.13*	100 Year	165.00	582.34	586.94		586.95	0.000302	0.64	364.60	168.38	0.06
Glen Arbor	7902.13*	500 Year	220.00	582.34	587.56		587.57	0.000290	0.70	474.58	184.00	0.06
Glen Arbor	7902.13*	Base Flow	35.00	582.34	584.74		584.74	0.000262	0.35	112.42	81.27	0.05
Glen Arbor	7731.9	2 Year	70.00	582.51	585.46		585.46	0.000291	0.45	190.62	110.00	0.05
Glen Arbor	7731.9	50 Year	145.00	582.51	586.63		586.64	0.000284	0.58	346.37	160.20	0.05
Glen Arbor	7731.9	100 Year	165.00	582.51	586.89		586.90	0.000278	0.60	388.95	169.06	0.05
Glen Arbor	7731.9	500 Year	220.00	582.51	587.52		587.52	0.000266	0.65	499.77	184.92	0.05
Glen Arbor	7731.9	Base Flow	35.00	582.51	584.69		584.69	0.000301	0.35	113.23	91.53	0.05
Glen Arbor	7558.02*	2 Year	70.00	582.46	585.41		585.41	0.000287	0.45	190.39	108.22	0.05
Glen Arbor	7558.02*	50 Year	145.00	582.46	586.58		586.59	0.000285	0.58	340.88	156.04	0.05
Glen Arbor	7558.02*	100 Year	165.00	582.46	586.84		586.85	0.000283	0.61	383.16	170.71	0.05
Glen Arbor	7558.02*	500 Year	220.00	582.46	587.47		587.48	0.000268	0.66	496.33	189.39	0.05
Glen Arbor	7558.02*	Base Flow	35.00	582.46	584.64		584.64	0.000295	0.35	113.73	91.10	0.05
Glen Arbor	7384.15*	2 Year	70.00	582.41	585.36		585.36	0.000283	0.45	190.34	106.50	0.05
Glen Arbor	7384.15*	50 Year	145.00	582.41	586.54		586.54	0.000283	0.58	335.55	145.95	0.05
Glen Arbor	7384.15*	100 Year	165.00	582.41	586.79		586.80	0.000283	0.61	374.99	159.95	0.06
Glen Arbor	7384.15*	500 Year	220.00	582.41	587.42		587.43	0.000274	0.66	483.72	183.30	0.06
Glen Arbor	7384.15*	Base Flow	35.00	582.41	584.59		584.59	0.000288	0.35	114.42	90.77	0.05
Glen Arbor	7210.27*	2 Year	70.00	582.36	585.31		585.31	0.000279	0.44	190.18	104.81	0.05
Glen Arbor	7210.27*	50 Year	145.00	582.36	586.49		586.49	0.000281	0.58	331.18	138.94	0.05
Glen Arbor	7210.27*	100 Year	165.00	582.36	586.74		586.75	0.000284	0.61	368.86	154.45	0.06
Glen Arbor	7210.27*	500 Year	220.00	582.36	587.38		587.38	0.000279	0.67	477.77	187.31	0.06
Glen Arbor	7210.27*	Base Flow	35.00	582.36	584.54		584.54	0.000281	0.34	115.02	90.35	0.05
Glen Arbor	7036.39*	2 Year	70.00	582.31	585.26		585.27	0.000275	0.44	190.10	103.41	0.05
Glen Arbor	7036.39*	50 Year	145.00	582.31	586.44		586.44	0.000280	0.58	327.62	134.13	0.05
Glen Arbor	7036.39*	100 Year	165.00	582.31	586.70		586.70	0.000282	0.61	363.48	144.47	0.05
Glen Arbor	7036.39*	500 Year	220.00	582.31	587.33		587.33	0.000279	0.67	462.58	169.19	0.06
Glen Arbor	7036.39*	Base Flow	35.00	582.31	584.49		584.49	0.000276	0.34	115.62	89.94	0.05
Glen Arbor	6862.52*	2 Year	70.00	582.26	585.22		585.22	0.000273	0.44	189.79	101.91	0.05
Glen Arbor	6862.52*	50 Year	145.00	582.26	586.39		586.39	0.000283	0.59	342.86	200.36	0.05
Glen Arbor	6862.52*	100 Year	165.00	582.26	586.65		586.65	0.000274	0.60	395.74	208.48	0.05
Glen Arbor	6862.52*	500 Year	220.00	582.26	587.28		587.29	0.000250	0.64	532.04	220.65	0.05
Glen Arbor	6862.52*	Base Flow	35.00	582.26	584.44		584.45	0.000271	0.34	116.06	89.66	0.05
Glen Arbor	6688.64*	2 Year	70.00	582.21	585.17		585.17	0.000270	0.44	189.65	100.55	0.05
Glen Arbor	6688.64*	50 Year	145.00	582.21	586.34		586.34	0.000277	0.58	319.64	120.11	0.05
Glen Arbor	6688.64*	100 Year	165.00	582.21	586.60		586.60	0.000285	0.62	361.28	192.65	0.06
Glen Arbor	6688.64*	500 Year	220.00	582.21	587.24		587.24	0.000267	0.66	488.26	205.18	0.05
Glen Arbor	6688.64*	Base Flow	35.00	582.21	584.40		584.40	0.000266	0.34	116.65	89.27	0.05

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	6514.76*	2 Year	70.00	582.16	585.12		585.13	0.000255	0.43	201.80	111.31	0.05
Glen Arbor	6514.76*	50 Year	145.00	582.16	586.29		586.30	0.000256	0.56	347.97	137.31	0.05
Glen Arbor	6514.76*	100 Year	165.00	582.16	586.55		586.56	0.000255	0.58	383.99	141.95	0.05
Glen Arbor	6514.76*	500 Year	220.00	582.16	587.19		587.20	0.000253	0.64	478.48	153.47	0.05
Glen Arbor	6514.76*	Base Flow	35.00	582.16	584.35		584.35	0.000255	0.33	121.88	96.48	0.05
Glen Arbor	6340.88*	2 Year	70.00	582.11	585.06		585.07	0.000497	0.61	144.42	78.84	0.07
Glen Arbor	6340.88*	50 Year	145.00	582.11	586.23		586.24	0.000455	0.75	297.85	148.02	0.07
Glen Arbor	6340.88*	100 Year	165.00	582.11	586.49		586.50	0.000440	0.77	336.94	153.67	0.07
Glen Arbor	6340.88*	500 Year	220.00	582.11	587.13		587.14	0.000407	0.82	440.08	167.37	0.07
Glen Arbor	6340.88*	Base Flow	35.00	582.11	584.29		584.29	0.000484	0.47	87.59	69.09	0.06
Glen Arbor	6167.01*	2 Year	70.00	582.06	585.02		585.02	0.000137	0.31	326.45	170.59	0.04
Glen Arbor	6167.01*	50 Year	145.00	582.06	586.20		586.20	0.000136	0.41	538.25	191.31	0.04
Glen Arbor	6167.01*	100 Year	165.00	582.06	586.46		586.46	0.000136	0.43	588.68	197.46	0.04
Glen Arbor	6167.01*	500 Year	220.00	582.06	587.10		587.10	0.000138	0.48	720.72	211.96	0.04
Glen Arbor	6167.01*	Base Flow	35.00	582.06	584.25		584.25	0.000148	0.25	198.38	161.41	0.03
Glen Arbor	5993.13*	2 Year	70.00	582.01	584.99		584.99	0.000245	0.42	203.72	106.00	0.05
Glen Arbor	5993.13*	50 Year	145.00	582.01	586.16		586.17	0.000255	0.56	338.86	125.35	0.05
Glen Arbor	5993.13*	100 Year	165.00	582.01	586.42		586.43	0.000258	0.59	372.09	131.37	0.05
Glen Arbor	5993.13*	500 Year	220.00	582.01	587.06		587.07	0.000262	0.66	461.36	146.73	0.05
Glen Arbor	5993.13*	Base Flow	35.00	582.01	584.22		584.22	0.000244	0.33	125.24	97.21	0.04
Glen Arbor	5819.25*	2 Year	70.00	581.96	584.96		584.96	0.000159	0.34	257.04	125.19	0.04
Glen Arbor	5819.25*	50 Year	145.00	581.96	586.13		586.13	0.000172	0.46	413.91	143.39	0.04
Glen Arbor	5819.25*	100 Year	165.00	581.96	586.39		586.39	0.000174	0.48	451.56	147.74	0.04
Glen Arbor	5819.25*	500 Year	220.00	581.96	587.03		587.03	0.000178	0.54	549.78	158.53	0.04
Glen Arbor	5819.25*	Base Flow	35.00	581.96	584.19		584.19	0.000152	0.26	163.70	116.76	0.04
Glen Arbor	5645.38*	2 Year	70.00	581.91	584.93		584.93	0.000167	0.35	278.29	134.95	0.04
Glen Arbor	5645.38*	50 Year	145.00	581.91	586.10		586.10	0.000180	0.47	445.71	151.56	0.04
Glen Arbor	5645.38*	100 Year	165.00	581.91	586.36		586.36	0.000182	0.50	485.30	154.95	0.04
Glen Arbor	5645.38*	500 Year	220.00	581.91	587.00		587.00	0.000187	0.56	587.26	163.36	0.05
Glen Arbor	5645.38*	Base Flow	35.00	581.91	584.16		584.16	0.000160	0.27	177.44	126.87	0.04
Glen Arbor	5471.50*	2 Year	70.00	581.86	584.89		584.89	0.000253	0.43	189.55	93.69	0.05
Glen Arbor	5471.50*	50 Year	145.00	581.86	586.06		586.06	0.000276	0.58	307.85	109.74	0.05
Glen Arbor	5471.50*	100 Year	165.00	581.86	586.31		586.32	0.000281	0.62	336.84	115.32	0.05
Glen Arbor	5471.50*	500 Year	220.00	581.86	586.95		586.96	0.000289	0.69	414.96	129.17	0.06
Glen Arbor	5471.50*	Base Flow	35.00	581.86	584.12		584.13	0.000236	0.33	120.58	85.87	0.04
Glen Arbor	5297.62*	2 Year	70.00	581.81	584.85		584.85	0.000254	0.43	188.80	92.81	0.05
Glen Arbor	5297.62*	50 Year	145.00	581.81	586.01		586.01	0.000278	0.58	305.16	107.74	0.05
Glen Arbor	5297.62*	100 Year	165.00	581.81	586.27		586.27	0.000282	0.62	333.27	111.05	0.06
Glen Arbor	5297.62*	500 Year	220.00	581.81	586.90		586.91	0.000290	0.69	406.73	119.29	0.06
Glen Arbor	5297.62*	Base Flow	35.00	581.81	584.08		584.08	0.000236	0.32	120.61	85.29	0.04
Glen Arbor	5123.75*	2 Year	70.00	581.76	584.80		584.81	0.000256	0.43	187.67	91.98	0.05
Glen Arbor	5123.75*	50 Year	145.00	581.76	585.96		585.97	0.000282	0.59	302.15	105.81	0.05
Glen Arbor	5123.75*	100 Year	165.00	581.76	586.22		586.22	0.000286	0.62	329.72	109.17	0.06
Glen Arbor	5123.75*	500 Year	220.00	581.76	586.85		586.86	0.000295	0.70	401.64	116.87	0.06
Glen Arbor	5123.75*	Base Flow	35.00	581.76	584.04		584.04	0.000237	0.33	120.34	84.70	0.04
Glen Arbor	4949.87*	2 Year	70.00	581.71	584.76		584.76	0.000260	0.44	186.37	91.18	0.05
Glen Arbor	4949.87*	50 Year	145.00	581.71	585.91		585.92	0.000287	0.59	299.03	104.24	0.05
Glen Arbor	4949.87*	100 Year	165.00	581.71	586.17		586.17	0.000291	0.62	326.04	107.23	0.06
Glen Arbor	4949.87*	500 Year	220.00	581.71	586.80		586.81	0.000300	0.70	396.38	114.36	0.06
Glen Arbor	4949.87*	Base Flow	35.00	581.71	584.00		584.00	0.000239	0.33	119.87	84.11	0.04
Glen Arbor	4775.99*	2 Year	70.00	581.66	584.71		584.72	0.000264	0.44	184.94	90.40	0.05
Glen Arbor	4775.99*	50 Year	145.00	581.66	585.86		585.87	0.000292	0.59	295.80	102.71	0.06
Glen Arbor	4775.99*	100 Year	165.00	581.66	586.12		586.12	0.000296	0.63	322.30	105.39	0.06
Glen Arbor	4775.99*	500 Year	220.00	581.66	586.75		586.76	0.000306	0.71	391.14	112.05	0.06
Glen Arbor	4775.99*	Base Flow	35.00	581.66	583.96		583.96	0.000242	0.33	119.31	83.51	0.04
Glen Arbor	4602.12*	2 Year	70.00	581.61	584.67		584.67	0.000270	0.44	183.19	89.61	0.05
Glen Arbor	4602.12*	50 Year	145.00	581.61	585.81		585.81	0.000299	0.60	292.28	101.54	0.06
Glen Arbor	4602.12*	100 Year	165.00	581.61	586.06		586.07	0.000305	0.63	318.68	106.60	0.06
Glen Arbor	4602.12*	500 Year	220.00	581.61	586.70		586.70	0.000315	0.71	389.87	118.85	0.06
Glen Arbor	4602.12*	Base Flow	35.00	581.61	583.92		583.92	0.000247	0.33	118.46	82.89	0.04
Glen Arbor	4428.24*	2 Year	70.00	581.56	584.62		584.62	0.000277	0.44	181.39	89.01	0.05
Glen Arbor	4428.24*	50 Year	145.00	581.56	585.76		585.76	0.000304	0.60	287.81	97.30	0.06
Glen Arbor	4428.24*	100 Year	165.00	581.56	586.01		586.02	0.000308	0.63	312.58	98.69	0.06
Glen Arbor	4428.24*	500 Year	220.00	581.56	586.64		586.65	0.000319	0.71	375.81	102.15	0.06
Glen Arbor	4428.24*	Base Flow	35.00	581.56	583.87		583.88	0.000253	0.33	117.45	82.32	0.05
Glen Arbor	4254.36*	2 Year	70.00	581.51	584.57		584.57	0.000285	0.45	179.48	88.52	0.05

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	4254.36*	50 Year	145.00	581.51	585.70		585.71	0.000312	0.61	284.91	96.77	0.06
Glen Arbor	4254.36*	100 Year	165.00	581.51	585.96		585.96	0.000316	0.64	309.47	98.15	0.06
Glen Arbor	4254.36*	500 Year	220.00	581.51	586.58		586.59	0.000326	0.72	372.16	101.59	0.06
Glen Arbor	4254.36*	Base Flow	35.00	581.51	583.83		583.83	0.000261	0.33	116.29	81.77	0.05
Glen Arbor	4080.48*	2 Year	70.00	581.46	584.52		584.52	0.000331	0.48	167.70	83.26	0.06
Glen Arbor	4080.48*	50 Year	145.00	581.46	585.64		585.65	0.000364	0.65	267.14	92.97	0.06
Glen Arbor	4080.48*	100 Year	165.00	581.46	585.90		585.90	0.000369	0.69	290.73	95.00	0.06
Glen Arbor	4080.48*	500 Year	220.00	581.46	586.52		586.53	0.000380	0.77	351.82	100.28	0.07
Glen Arbor	4080.48*	Base Flow	35.00	581.46	583.78		583.78	0.000304	0.36	108.62	76.95	0.05
Glen Arbor	3906.61*	2 Year	70.00	581.41	584.46		584.47	0.000310	0.46	173.62	86.46	0.05
Glen Arbor	3906.61*	50 Year	145.00	581.41	585.58		585.59	0.000338	0.62	275.91	95.78	0.06
Glen Arbor	3906.61*	100 Year	165.00	581.41	585.83		585.84	0.000345	0.66	300.50	100.89	0.06
Glen Arbor	3906.61*	500 Year	220.00	581.41	586.46		586.47	0.000356	0.74	367.44	113.75	0.06
Glen Arbor	3906.61*	Base Flow	35.00	581.41	583.73		583.73	0.000288	0.34	112.49	80.27	0.05
Glen Arbor	3732.73*	2 Year	70.00	581.36	584.41		584.41	0.000325	0.47	170.50	85.67	0.05
Glen Arbor	3732.73*	50 Year	145.00	581.36	585.52		585.53	0.000352	0.63	271.19	94.33	0.06
Glen Arbor	3732.73*	100 Year	165.00	581.36	585.77		585.78	0.000359	0.67	295.30	99.54	0.06
Glen Arbor	3732.73*	500 Year	220.00	581.36	586.39		586.40	0.000370	0.75	361.28	112.66	0.06
Glen Arbor	3732.73*	Base Flow	35.00	581.36	583.68		583.68	0.000306	0.35	110.23	79.54	0.05
Glen Arbor	3558.85*	2 Year	70.00	581.31	584.35		584.35	0.000344	0.47	166.74	84.32	0.06
Glen Arbor	3558.85*	50 Year	145.00	581.31	585.46		585.47	0.000367	0.64	264.53	90.40	0.06
Glen Arbor	3558.85*	100 Year	165.00	581.31	585.71		585.72	0.000374	0.68	287.47	94.96	0.06
Glen Arbor	3558.85*	500 Year	220.00	581.31	586.33		586.34	0.000385	0.76	349.88	106.37	0.07
Glen Arbor	3558.85*	Base Flow	35.00	581.31	583.62		583.63	0.000329	0.36	107.58	78.62	0.05
Glen Arbor	3384.98*	2 Year	70.00	581.26	584.29		584.29	0.000368	0.48	163.21	84.08	0.06
Glen Arbor	3384.98*	50 Year	145.00	581.26	585.40		585.40	0.000385	0.65	260.63	90.47	0.06
Glen Arbor	3384.98*	100 Year	165.00	581.26	585.64		585.65	0.000392	0.69	283.45	95.12	0.06
Glen Arbor	3384.98*	500 Year	220.00	581.26	586.26		586.27	0.000401	0.77	346.03	107.35	0.07
Glen Arbor	3384.98*	Base Flow	35.00	581.26	583.56		583.57	0.000359	0.37	104.55	78.03	0.05
Glen Arbor	3211.1	2 Year	70.00	581.21	584.22		584.22	0.000397	0.50	158.88	83.19	0.06
Glen Arbor	3211.1	50 Year	145.00	581.21	585.33		585.33	0.000409	0.66	255.25	90.47	0.06
Glen Arbor	3211.1	100 Year	165.00	581.21	585.57		585.58	0.000416	0.70	277.97	95.48	0.07
Glen Arbor	3211.1	500 Year	220.00	581.21	586.19		586.20	0.000424	0.79	341.18	109.53	0.07
Glen Arbor	3211.1	Base Flow	35.00	581.21	583.50		583.50	0.000400	0.38	100.88	77.21	0.06
Glen Arbor	3050.95*	2 Year	70.00	581.20	584.16		584.16	0.000388	0.50	150.58	79.49	0.06
Glen Arbor	3050.95*	50 Year	145.00	581.20	585.26		585.27	0.000406	0.66	243.42	87.78	0.06
Glen Arbor	3050.95*	100 Year	165.00	581.20	585.51		585.51	0.000411	0.70	265.03	90.34	0.07
Glen Arbor	3050.95*	500 Year	220.00	581.20	586.12		586.13	0.000421	0.79	325.12	105.03	0.07
Glen Arbor	3050.95*	Base Flow	35.00	581.20	583.44		583.44	0.000375	0.37	96.40	70.54	0.05
Glen Arbor	2890.80*	2 Year	70.00	581.18	584.10		584.10	0.000372	0.49	147.29	72.34	0.06
Glen Arbor	2890.80*	50 Year	145.00	581.18	585.20		585.20	0.000403	0.66	234.04	85.70	0.06
Glen Arbor	2890.80*	100 Year	165.00	581.18	585.44		585.45	0.000408	0.70	255.04	86.93	0.07
Glen Arbor	2890.80*	500 Year	220.00	581.18	586.05		586.06	0.000417	0.79	312.45	100.96	0.07
Glen Arbor	2890.80*	Base Flow	35.00	581.18	583.38		583.38	0.000347	0.36	97.46	66.81	0.05
Glen Arbor	2730.65*	2 Year	70.00	581.17	584.04		584.04	0.000361	0.48	148.15	69.22	0.06
Glen Arbor	2730.65*	50 Year	145.00	581.17	585.13		585.14	0.000397	0.65	228.65	78.92	0.06
Glen Arbor	2730.65*	100 Year	165.00	581.17	585.37		585.38	0.000404	0.69	248.30	82.96	0.06
Glen Arbor	2730.65*	500 Year	220.00	581.17	585.99		586.00	0.000415	0.78	302.78	97.36	0.07
Glen Arbor	2730.65*	Base Flow	35.00	581.17	583.32		583.32	0.000339	0.35	99.10	67.91	0.05
Glen Arbor	2570.5	2 Year	70.00	581.16	583.99		583.99	0.000260	0.47	149.77	70.57	0.06
Glen Arbor	2570.5	50 Year	145.00	581.16	585.08		585.09	0.000284	0.64	227.98	75.17	0.06
Glen Arbor	2570.5	100 Year	165.00	581.16	585.32		585.33	0.000289	0.68	246.40	77.41	0.06
Glen Arbor	2570.5	500 Year	220.00	581.16	585.93		585.94	0.000297	0.77	297.65	92.96	0.07
Glen Arbor	2570.5	Base Flow	35.00	581.16	583.28		583.28	0.000250	0.35	99.70	69.73	0.05
Glen Arbor	2427.35*	2 Year	70.00	580.51	583.96		583.96	0.000172	0.44	163.96	69.81	0.05
Glen Arbor	2427.35*	50 Year	145.00	580.51	585.04		585.05	0.000229	0.64	247.72	85.44	0.06
Glen Arbor	2427.35*	100 Year	165.00	580.51	585.28		585.29	0.000239	0.68	268.69	89.06	0.06
Glen Arbor	2427.35*	500 Year	220.00	580.51	585.89		585.90	0.000257	0.77	324.86	95.50	0.06
Glen Arbor	2427.35*	Base Flow	35.00	580.51	583.25		583.25	0.000122	0.30	117.29	62.95	0.04
Glen Arbor	2284.2	2 Year	70.00	579.86	583.94		583.94	0.000132	0.43	182.92	70.84	0.04
Glen Arbor	2284.2	50 Year	145.00	579.86	585.01		585.02	0.000202	0.65	263.22	77.94	0.06
Glen Arbor	2284.2	100 Year	165.00	579.86	585.25		585.26	0.000215	0.69	281.97	79.20	0.06
Glen Arbor	2284.2	500 Year	220.00	579.86	585.85		585.86	0.000245	0.80	331.39	84.81	0.06
Glen Arbor	2284.2	Base Flow	35.00	579.86	583.24		583.24	0.000079	0.28	135.48	64.64	0.03
Glen Arbor	2261.22*	2 Year	70.00	579.76	583.93	580.73	583.94	0.000122	0.42	172.45	72.74	0.04
Glen Arbor	2261.22*	50 Year	145.00	579.76	585.00	581.10	585.01	0.000198	0.64	231.31	80.48	0.06

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	2261.22*	100 Year	165.00	579.76	585.24	581.18	585.25	0.000213	0.69	244.40	81.89	0.06
Glen Arbor	2261.22*	500 Year	220.00	579.76	585.85	581.36	585.86	0.000249	0.81	277.56	86.96	0.06
Glen Arbor	2261.22*	Base Flow	35.00	579.76	583.24	580.48	583.24	0.000070	0.27	134.03	67.56	0.03
Glen Arbor	2225.7		Bridge									
Glen Arbor	2198.27*	2 Year	70.00	579.49	583.93	580.49	583.93	0.000098	0.38	182.42	80.43	0.04
Glen Arbor	2198.27*	50 Year	145.00	579.49	584.99	580.87	585.00	0.000166	0.60	241.02	85.80	0.05
Glen Arbor	2198.27*	100 Year	165.00	579.49	585.23	580.95	585.24	0.000180	0.65	254.06	86.96	0.05
Glen Arbor	2198.27*	500 Year	220.00	579.49	585.82	581.15	585.83	0.000214	0.77	286.57	92.60	0.06
Glen Arbor	2198.27*	Base Flow	35.00	579.49	583.23	580.25	583.23	0.000054	0.24	144.15	76.01	0.03
Glen Arbor	2157.3	2 Year	70.00	579.32	583.93		583.93	0.000065	0.31	246.97	86.08	0.03
Glen Arbor	2157.3	50 Year	145.00	579.32	584.99		584.99	0.000106	0.48	341.17	90.89	0.04
Glen Arbor	2157.3	100 Year	165.00	579.32	585.23		585.23	0.000114	0.52	362.82	91.96	0.04
Glen Arbor	2157.3	500 Year	220.00	579.32	585.82		585.82	0.000133	0.60	417.95	94.70	0.05
Glen Arbor	2157.3	Base Flow	35.00	579.32	583.23		583.23	0.000036	0.20	188.58	81.77	0.02
Glen Arbor	2061.60*	2 Year	70.00	580.12	583.92		583.92	0.000152	0.41	179.02	74.91	0.04
Glen Arbor	2061.60*	50 Year	145.00	580.12	584.97		584.98	0.000207	0.60	261.68	82.86	0.06
Glen Arbor	2061.60*	100 Year	165.00	580.12	585.21		585.22	0.000217	0.64	281.51	85.64	0.06
Glen Arbor	2061.60*	500 Year	220.00	580.12	585.80		585.81	0.000239	0.74	334.31	93.83	0.06
Glen Arbor	2061.60*	Base Flow	35.00	580.12	583.23		583.23	0.000105	0.28	128.80	70.47	0.04
Glen Arbor	1965.9	2 Year	70.00	580.93	583.89		583.90	0.000410	0.57	126.17	65.18	0.07
Glen Arbor	1965.9	50 Year	145.00	580.93	584.94		584.95	0.000431	0.77	196.95	69.52	0.08
Glen Arbor	1965.9	100 Year	165.00	580.93	585.18		585.19	0.000435	0.81	213.38	70.54	0.08
Glen Arbor	1965.9	500 Year	220.00	580.93	585.76		585.78	0.000445	0.91	255.42	73.08	0.08
Glen Arbor	1965.9	Base Flow	35.00	580.93	583.21		583.21	0.000408	0.43	82.27	62.97	0.07
Glen Arbor	1842.40*	2 Year	70.00	580.95	583.85		583.85	0.000272	0.48	147.67	72.12	0.06
Glen Arbor	1842.40*	50 Year	145.00	580.95	584.90		584.91	0.000309	0.67	226.44	78.12	0.07
Glen Arbor	1842.40*	100 Year	165.00	580.95	585.13		585.14	0.000315	0.71	244.85	79.32	0.07
Glen Arbor	1842.40*	500 Year	220.00	580.95	585.72		585.73	0.000329	0.80	292.11	83.57	0.07
Glen Arbor	1842.40*	Base Flow	35.00	580.95	583.17		583.17	0.000241	0.35	99.73	68.45	0.05
Glen Arbor	1718.9	2 Year	70.00	580.97	583.82		583.83	0.000188	0.42	173.77	78.86	0.05
Glen Arbor	1718.9	50 Year	145.00	580.97	584.87		584.87	0.000229	0.59	258.54	84.80	0.06
Glen Arbor	1718.9	100 Year	165.00	580.97	585.10		585.11	0.000236	0.63	278.52	86.56	0.06
Glen Arbor	1718.9	500 Year	220.00	580.97	585.68		585.69	0.000251	0.72	330.24	90.97	0.06
Glen Arbor	1718.9	Base Flow	35.00	580.97	583.15		583.15	0.000153	0.30	120.60	77.84	0.04
Glen Arbor	1585.50*	2 Year	70.00	581.04	583.79		583.80	0.000248	0.46	156.56	76.26	0.06
Glen Arbor	1585.50*	50 Year	145.00	581.04	584.83		584.84	0.000285	0.64	238.38	81.98	0.06
Glen Arbor	1585.50*	100 Year	165.00	581.04	585.07		585.07	0.000292	0.68	257.62	83.80	0.06
Glen Arbor	1585.50*	500 Year	220.00	581.04	585.65		585.66	0.000305	0.77	307.69	88.74	0.07
Glen Arbor	1585.50*	Base Flow	35.00	581.04	583.12		583.12	0.000215	0.34	105.93	74.17	0.05
Glen Arbor	1452.10*	2 Year	70.00	581.12	583.76		583.76	0.000340	0.52	139.63	74.52	0.06
Glen Arbor	1452.10*	50 Year	145.00	581.12	584.79		584.80	0.000364	0.71	218.84	79.54	0.07
Glen Arbor	1452.10*	100 Year	165.00	581.12	585.02		585.03	0.000368	0.75	237.51	81.86	0.07
Glen Arbor	1452.10*	500 Year	220.00	581.12	585.60		585.61	0.000377	0.84	286.51	87.21	0.08
Glen Arbor	1452.10*	Base Flow	35.00	581.12	583.09		583.09	0.000322	0.39	91.51	69.05	0.06
Glen Arbor	1318.70*	2 Year	70.00	581.20	583.70		583.71	0.000481	0.59	123.84	71.04	0.08
Glen Arbor	1318.70*	50 Year	145.00	581.20	584.73		584.74	0.000474	0.78	200.42	78.03	0.08
Glen Arbor	1318.70*	100 Year	165.00	581.20	584.96		584.97	0.000474	0.82	218.76	80.90	0.08
Glen Arbor	1318.70*	500 Year	220.00	581.20	585.54		585.55	0.000472	0.92	267.02	85.79	0.08
Glen Arbor	1318.70*	Base Flow	35.00	581.20	583.03		583.03	0.000520	0.46	77.62	66.43	0.07
Glen Arbor	1185.3	2 Year	70.00	581.27	583.62		583.63	0.000730	0.68	108.52	67.68	0.09
Glen Arbor	1185.3	50 Year	145.00	581.27	584.66		584.67	0.000641	0.87	182.55	77.95	0.09
Glen Arbor	1185.3	100 Year	165.00	581.27	584.89		584.90	0.000628	0.91	200.85	80.03	0.09
Glen Arbor	1185.3	500 Year	220.00	581.27	585.47		585.48	0.000603	1.00	248.51	84.56	0.09
Glen Arbor	1185.3	Base Flow	35.00	581.27	582.94		582.94	0.001010	0.57	63.04	64.90	0.10
Glen Arbor	1123.53*	2 Year	70.00	580.76	583.58		583.59	0.000544	0.63	118.13	69.43	0.08
Glen Arbor	1123.53*	50 Year	145.00	580.76	584.62		584.63	0.000521	0.82	198.81	84.27	0.08
Glen Arbor	1123.53*	100 Year	165.00	580.76	584.85		584.87	0.000525	0.86	219.03	95.71	0.09
Glen Arbor	1123.53*	500 Year	220.00	580.76	585.43		585.45	0.000512	0.96	284.72	130.20	0.09
Glen Arbor	1123.53*	Base Flow	35.00	580.76	582.89		582.89	0.000638	0.50	71.56	64.72	0.08
Glen Arbor	1061.77*	2 Year	70.00	580.26	583.55		583.56	0.000408	0.58	131.32	79.85	0.07
Glen Arbor	1061.77*	50 Year	145.00	580.26	584.60		584.60	0.000398	0.74	249.46	131.37	0.07
Glen Arbor	1061.77*	100 Year	165.00	580.26	584.83		584.84	0.000388	0.77	280.07	132.34	0.07
Glen Arbor	1061.77*	500 Year	220.00	580.26	585.41		585.42	0.000367	0.83	357.85	134.79	0.07
Glen Arbor	1061.77*	Base Flow	35.00	580.26	582.86		582.86	0.000411	0.44	81.07	65.32	0.07
Glen Arbor	1000.0	2 Year	70.00	579.75	583.54	581.14	583.54	0.000260	0.49	183.99	123.94	0.06

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	1000.0	50 Year	145.00	579.75	584.58	581.53	584.58	0.000260	0.63	318.16	131.44	0.06
Glen Arbor	1000.0	100 Year	165.00	579.75	584.81	581.61	584.82	0.000260	0.65	348.82	132.43	0.06
Glen Arbor	1000.0	500 Year	220.00	579.75	585.39	581.82	585.40	0.000260	0.72	426.73	134.91	0.06
Glen Arbor	1000.0	Base Flow	35.00	579.75	582.84	580.86	582.84	0.000260	0.38	101.51	105.02	0.05

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: CR 675 Crystal River
Project File : CR675CrystalRive.prj
Run Date and Time: 1/3/2022 4:40:41 PM

Project in English units

Project Description:
HEC-RAS model analyzes Crystal River for the channel reach for the third waterway crossing along CR 675 from M22. The model begins 1434.6 feet downstream of CR 675 and ends 1300.6' upstream of CR 675.

Energy slope used
for the starting water surface elevations is
slope=(588.89-586.68)/(18565.3-15886.4) = 0.0008 ft/ft

PLAN DATA

Plan Title: Prop Crystal R Dam w Base 12-2020
Plan File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.p07

Geometry Title: Prop Cond Crystal R @ FisherLake 12-2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.g05

Flow Title   : Crystal River DS Fisher Lake Dam w base
Flow File   : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR

675 near Fisher Lake\CR675CrystalRive.f02

Plan Summary Information:
Number of: Cross Sections =   33   Multiple Openings =   0
            Culverts   =   0   Inline Structures =   0
            Bridges   =   1   Lateral Structures =   0

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

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

FLOW DATA

Flow Title: Crystal River DS Fisher Lake Dam w base
Flow File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.f02

Flow Data (cfs)

River	Reach	RS	2 Year	50 Year	100 Year	500 Year	Base Flow
Crystal River	Fisher Lake	18565.3	70	145	165	220	35

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Crystal River	Fisher Lake	2 Year		
Normal S = 0.0008				
Crystal River	Fisher Lake	50 Year		
Normal S = 0.0008				

```
  Crystal River   Fisher Lake     100 Year
Normal S = 0.0008
```

GEOMETRY DATA

Geometry Title: Prop Cond Crystal R @ FisherLake 12-2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.g05

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 18565.3

INPUT
Description: XSEC 121 (Sta. 185+65.3)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-57.64	592.22	-51.82	591.76	-47.72	590.44	-46.29	588.98	-33.93	587.27
-26.8	586.8	-18.02	587.61	-9.25	587.53	0	587.19	8.34	587.33
22.44	588.8	23.27	590.22	30.37	591.21	35	592	40	593

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-57.64	.15	-46.29	.05	22.44	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-46.29	22.44	179.2	179.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 18386.1

INPUT
Description: XSEC 120 (Sta. 183+86.1)
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-52.39	593.36	-32.81	593.15	-27.88	591.97	-25.53	588.84	-19.8	587.28
-6.57	587.09	0	587.06	4.93	587.35	14.76	587.26	20.92	587.7
34.31	587.59	41.16	588.96	42.06	590.36	46.37	592.06	63.54	592.65
91.6	594	99.6	595	107.7	596	111.5	596.3		

Manning's n Values num= 3

```
     Sta   n Val     Sta   n Val     Sta   n Val
  -52.39     .15  -25.53     .05   41.16     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.53   41.16            387.5   387.5   387.5             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17998.6

INPUT
Description: XSEC 119 (Sta. 179+98.6)
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -48.21  592.93  -35.15  591.03  -33.29  588.49  -28.38   587.9  -21.44  587.16
  -12.35  587.21   -7.72  586.88       0  587.12     5.3  586.65   15.23  587.19
   25.13     587   36.15  588.71   36.78   588.5   40.36  591.59   50.75  592.89
    63.9     593    80.1     593    84.4     594    89.5     595    95.8     596

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -48.21     .15  -33.29     .05   36.15     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -33.29   36.15           111.65  111.65  111.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17886.9*

INPUT
Description: Interpolated Section 10
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -53.72  593.23  -46.95  593.04  -37.42  590.74  -36.32  589.94   -35.1  588.48
  -30.15   587.8  -25.56   587.2  -23.16  587.15  -14.35  587.47  -14.01  587.48
   -9.35  587.39   -8.75  587.41   -2.14  587.13   -1.57  587.13    1.55  586.92
    3.77  586.53    6.82  586.62   14.63  586.97   15.44  586.98   23.93  586.98
   25.46  587.06   37.51   588.6   38.13  588.57   39.47  589.33   41.62   591.1
   45.77  592.93   51.76  593.57    60.4  593.97   64.58  594.14   74.67   594.5
   80.39   594.7   84.58  595.34   89.24  595.97   89.55  596.01    95.7  596.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -53.72     .15   -35.1     .05   37.51     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -35.1   37.51           111.65  111.65  111.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17775.3

INPUT
Description: XSEC 118 (Sta. 177+75.3)
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -59.22  593.54  -51.11  593.93  -38.37  590.04   -36.9  588.47   -27.3  586.99
  -16.01  587.73  -10.37  587.92   -3.72  587.16       0     587    2.23  586.41
    5.55  586.44   14.91  586.79   24.13  586.94   38.88  588.49   40.79  588.98
   46.93  593.74   61.19  594.97    75.1     596    89.3     597    95.6  597.34

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -59.22     .15   -36.9     .05   38.88     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -36.9   38.88           110.85  110.85  110.85             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17664.4*

INPUT
Description: Interpolated Section 9
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -60.78  593.59   -52.2  593.75  -48.02  593.12  -38.83  589.59  -38.73  589.56
  -37.18   588.4  -25.87  587.28  -22.69  587.26  -15.56  587.63  -12.57  587.62
   -5.93  587.51      .4     587     1.9  586.89    6.28   586.7    8.91  586.34
   11.01  586.44   16.95  586.85    20.4  587.03   22.79   587.2   32.14  588.51
   33.72  588.87    34.5  589.28   38.82  592.69   38.91  592.72   50.32  593.95
   50.67  593.99   62.22  595.31   74.02  596.63   79.25  597.17

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -60.78     .15  -37.18     .05   32.14     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -37.18   32.14           110.85  110.85  110.85             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Fisher Lake RS: 17553.6

INPUT
Description: XSEC 117 (Sta. 175+53.6)
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-62.34	593.65	-48.89	593.52	-39.2	589.12	-37.46	588.33	-20.78	587.35
-12.58	587.7	5.8	586.69	15.59	586.28	20.44	587.18	25.39	588.53
27.27	588.86	30.78	591.69	39.87	592.96	62.9	597		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-62.34	.15	-37.46	.05	25.39	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-37.46	25.39	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17492.4*

INPUT
Description: Interpolated Section 8
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100.01	593.07	-66.44	592.65	-63.84	592.66	-38.16	589.59	-37.77	589.53
-33.82	588.94	-33.39	588.63	-33.09	588.11	-19.58	587.33	-18.1	587.27
-10.73	587.58	-9.61	587.54	5.78	586.63	8.24	586.51	14.58	586.16
20.22	587.17	25.98	588.53	27.88	588.78	31.44	590.92	38.93	591.73
40.3	591.96	40.66	592.03	53.64	594.76	61.95	595.94	64.01	596.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-100.01	.15	-33.09	.05	25.98	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-33.09	25.98	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17431.2*

INPUT

Description: Interpolated Section 7
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-137.69	592.48	-83.02	591.76	-78.78	591.8	-36.97	589.99	-36.35	589.94
-29.92	589.42	-29.22	588.87	-28.72	587.89	-16.74	587.22	-15.43	587.19
-8.89	587.46	-7.89	587.44	5.77	586.56	7.94	586.44	13.58	586.04
20	587.16	26.56	588.53	28.5	588.71	32.11	590.16	39.7	590.75
41.08	591.02	41.45	591.1	54.61	594.31	63.03	595.25	65.12	596.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-137.69	.15	-28.72	.05	26.56	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-28.72	26.56	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17370.0*

INPUT
Description: Interpolated Section 6
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-175.36	591.9	-99.61	590.88	-93.73	590.94	-35.79	590.4	-34.92	590.35
-26.01	589.9	-25.04	589.12	-24.36	587.67	-13.89	587.1	-12.75	587.11
-7.04	587.34	-6.17	587.35	5.75	586.5	7.65	586.38	12.57	585.92
19.79	587.15	27.15	588.52	29.11	588.63	32.77	589.39	40.46	589.76
41.87	590.07	42.24	590.17	55.57	593.86	64.11	594.55	66.23	595.79

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-175.36	.15	-24.36	.05	27.15	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-24.36	27.15	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17308.8

INPUT
Description: XSEC 116 (Sta. 173+08.8)
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-213.04	591.32	-116.19	590	-34.6	590.8	-22.1	590.38	-20.86	589.36

```
  -19.99  587.45  -11.05  586.99   -4.45  587.25    7.36  586.31   11.56   585.8
   27.74  588.52   41.23  588.77   42.65  589.12   56.54  593.41   65.19  593.85
   67.34  595.39

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -213.04     .15  -19.99     .05   27.74     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -19.99   27.74             12.4    12.4    12.4             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17296.4

INPUT
Description: XSEC 115 (Sta. 172+96.4)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -48.01  593.76  -38.55  593.28  -31.39   592.2  -17.47  589.38  -14.96   588.8
     -11 587.042   -9.24  586.26   -2.92  586.01    3.11  585.54      16 587.664
   17.01  587.83   20.24  589.31   23.67   590.5   30.19  592.03   34.93  592.34
   45.45  591.88   69.38  593.17  100.77  593.88

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -48.01     .15     -11     .05      16     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           -11      16              8.4     8.4     8.4             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17288.0*

INPUT
Description: US Face of Triple Culvert
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -44.7  593.77  -36.01  593.13  -29.43  592.01  -16.64   589.2  -14.34  588.63
  -14.19  588.56   -10.7  586.99   -8.86  586.26    -7.3  586.18   -2.27  585.92
    -.51  585.78    4.03  585.41    6.11  585.77   17.27  587.55   18.22  587.77
   18.34  587.83   21.27  589.22   24.14  590.29   24.51  590.41   30.65  591.73
   35.12  591.99   44.91  591.55   45.04  591.54   67.61  592.78   97.21  593.54

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
   -44.7     .15   -10.7     .05   17.27     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -10.7   17.27               54      54      54             .1       .3

BRIDGE


RIVER: Crystal River
REACH: Fisher Lake        RS: 17264.7

INPUT
Description: Proposed Timber Bridge CR 675 over Crystal River
Distance from Upstream XS =    14.9
Deck/Roadway Width        =    36.2
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  -199.5  594.43         -159.47  594.77         -114.82  594.97
  -64.82   595.2           -32.7  595.35          -32.64  595.35  593.79
  -13.34  595.43  593.89  -13.33  595.43  593.56   23.37  595.61  593.73
   23.38  595.61  594.06   42.69  595.71  594.16   42.71  595.71
   85.18  595.89           101.6  595.97          231.58  596.36

Upstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -44.7  593.77  -37.27  593.27  -32.64   588.1  -25.98     586       0     586
   36.03     586   42.69   588.1      48  591.54   67.61  592.78   97.21  593.54

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -44.7     .15  -32.64     .05   36.03     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -32.64   36.03             .1       .3

Downstream  Deck/Roadway Coordinates
    num=      15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  -199.5  594.43         -159.47  594.77         -114.82  594.97
  -64.82   595.2           -32.7  595.35          -32.64  595.35  593.79
  -13.34  595.43  593.89  -13.33  595.43  593.56   23.37  595.61  593.73
   23.38  595.61  594.06   42.69  595.71  594.16   42.71  595.71
   85.18  595.89           101.6  595.97          231.58  596.36

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -40.5  593.77  -38.68  593.64  -32.64   588.1  -25.98     586       0     586
   36.03     586   42.69   588.1      45     590   56.23   590.3   74.33  591.38

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -40.5     .15  -32.64     .05   42.69     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -32.64   42.69             .1       .3

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

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
  -32.65   588.3  -25.98     586
Downstream     num=       2
     Sta    Elev     Sta    Elev
  -32.65   588.3  -25.98     586

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   36.03     586    42.7   588.3
Downstream     num=       2
     Sta    Elev     Sta    Elev
   36.03     586    42.7   588.3

Number of Piers =  2

Pier Data
Pier Station     Upstream=  -13.33    Downstream=  -13.33
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5

Pier Data
Pier Station     Upstream=   23.37    Downstream=   23.37
```

```
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       Yarnell                KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

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

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17234.0*

INPUT
Description: DS Face of Triple Culvert
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -23.43  593.85  -19.68  592.16  -16.84  590.78  -11.32  588.02  -10.32  587.51
  -10.26  587.47   -8.75  586.68   -6.42  586.29   -4.44  586.03    1.94  585.36
    4.16  585.12    9.91   584.6   12.36  585.12   25.45  586.83   26.03  587.38
    26.1  587.46    27.9  588.67   29.65  589.81   29.87  589.81   33.63  589.83
   36.37  589.74   42.35  589.38   42.43  589.38   56.23   590.3   74.33  591.38

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -23.43     .15   -8.75     .05   25.45     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -8.75   25.45              9.5     9.5     9.5             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Fisher Lake RS: 17224.5

INPUT
Description: XSEC 114 (Sta. 172+24.5)
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-19.69	593.86	-9.57	587.28	-8.41	586.63	-3.94	586	4.98	585
10.95	584.46	13.46	585	26.89	586.7	27.47	587.39	30.62	589.72
41.9	589	70.3	591						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-19.69	.15	-8.41	.05	26.89	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-8.41	26.89	58.15	58.15	58.15	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17166.3*

INPUT
Description: Interpolated Section 5
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-28.71	593.59	-17.89	587.35	-17.64	587.21	-16.65	586.53	-9.46	586.05
-8.36	585.99	-3.09	585.76	4.9	585.48	7.27	585.41	14.51	585.18
16.47	585.5	26.94	586.63	27.62	587.01	31.31	588.33	33.63	588.37
44.53	588.26	58.96	588.93	77.8	590.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-28.71	.15	-16.65	.05	26.94	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-16.65	26.94	58.15	58.15	58.15	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17108.2

INPUT
Description: XSEC 113 (Sta. 171+08.2)
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-37.72	593.33	-25.95	587.28	-24.9	586.43	-13.46	586.06	-6.2	585.96
8.09	585.96	18.07	585.9	27	586.568	34.66	587.14	63.7	588
85.3	590								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-37.72	.15	-24.9	.05	27	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-24.9	27	29.5	29.5	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17078.7*

INPUT
Description: Interpolated Section 4
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-64.74	593.61	-57.06	592.66	-52.38	591.78	-45.84	589.81	-24.23	587.61
-22.64	587.26	-21.09	586.86	-18.88	586.41	-15.59	586.05	-10.66	585.96
-7.61	585.94	-5.45	585.89	-1.37	585.83	2.28	585.83	4.82	585.83
7.23	585.82	11.98	585.62	16.23	585.9	19.33	586.18	21.38	586.61
22.63	586.78	29.67	587.11	38.85	587.35	57.04	587.8	61.11	587.9
72.52	588.49	78.09	589.23	84.5	590.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-64.74	.15	-18.88	.05	21.38	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-18.88	21.38	29.5	29.5	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17049.2

INPUT
Description: XSEC 112 (Sta. 170+49.2)
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-91.75	593.9	-78.54	593.09	-70.5	592	-59.25	589	-22.06	587.72
-16.67	586.78	-12.86	586.39	-10.86	585.81	-6.01	585.88	-2.22	585.69
0	585.7	3.01	585.71	5.9	585.35	10.35	585.59	13.61	585.93
15.76	586.66	17.11	586.9	34.56	587.31	54.14	587.72	70.8	588

```
    76.8     589    83.7     591

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -91.75     .15  -12.86     .05   15.76     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -12.86   15.76            42.75   42.75   42.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17006.4*

INPUT
Description: Interpolated Section 3
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -78.07  592.45  -67.47  591.84  -61.01  591.17  -52.37  589.57  -51.98  589.49
  -38.46  588.71  -26.77  588.32  -22.11  587.98  -19.28  587.53  -17.78  587.12
  -16.55  586.84  -14.73  586.21  -12.84  585.89   -8.27  585.85    -4.7   585.7
   -3.33  585.68   -2.61  585.67     .23  585.63    2.95   585.4    5.96  585.49
   10.99  585.61   14.03  585.73   16.87  585.78   20.76   586.1    22.2  586.39
   24.28  586.67   33.81  587.01   40.87  587.27   54.55  587.76   61.82  588.08
   69.98  588.42   79.65  589.88   83.97  590.84   86.07  591.07   93.45   592.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -78.07     .15  -14.73     .05   20.76     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -14.73   20.76            42.75   42.75   42.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16963.7

INPUT
Description: XSEC 111 (Sta. 169+63.7)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -64.4     591     -45     590   -34.5     589  -25.68  588.72  -20.03  587.96
  -17.97  587.05  -16.59  586.03   -5.89  585.66       0  585.45    4.35  585.54
   16.03  585.69   25.75  585.54   29.51  586.39   39.66  586.86   61.76  587.94
    78.2     589    93.1     593   103.2   593.6

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
   -64.4     .15  -16.59     .05   25.75     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.59   25.75             51.6    51.6    51.6             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16912.1*

INPUT
Description: Interpolated Section 2
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -85.2   591.5  -73.81   590.8  -64.16  589.63  -59.22  589.04  -56.82  589.08
  -44.71  589.11  -41.45     589  -37.04  588.95  -28.55  588.49  -23.44  588.03
  -20.32  587.48  -20.28  587.47  -17.27  586.63  -16.27  586.25  -15.25  585.77
   -7.79  585.25   -3.68  584.96     .49  585.06    1.73  585.08    4.02  585.07
   11.67  585.41   12.12  585.42   20.98  585.42   24.28  586.46   24.47   586.5
   33.18  586.83   45.52  587.31   52.56  587.98   66.98  589.48   73.98  591.02
   80.04  592.17    88.9   592.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -85.2     .15  -15.25     .05   20.98     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.25   20.98             51.6    51.6    51.6             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16860.5

INPUT
Description: XSEC 110 (Sta. 168+60.5)
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    -106     592     -91     591   -78.3     589   -71.8     588   -52.7     589
   -42.6     589  -24.69  587.81  -20.59     587  -15.25  585.96  -13.91   585.5
   -7.36  584.48   -2.19  584.61       0  584.55    7.74  585.16   16.21  585.31
   19.21   586.6   37.31  587.08   61.77  590.89    74.6     592

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -106     .15  -13.91     .05   16.21     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -13.91   16.21            52.75   52.75   52.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16807.7*

INPUT
Description: Interpolated Section 1
Station Elevation Data    num=      31
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -75.5  591.17  -69.06  590.66  -65.92  590.39   -57.8  589.12  -54.35  588.59
  -53.65  588.49  -41.44   588.8  -38.22  588.76  -34.99  588.55  -27.11  587.65
  -23.54   587.3  -20.92  586.77  -17.51  586.09  -16.65  585.82  -11.85  584.83
   -5.97  584.14   -1.51  584.66    -.66  584.66    1.59   584.6    6.16  584.71
    9.55   584.9   14.09  585.01   18.25  585.88   22.77  586.88   23.99  586.99
   45.84  587.41   50.05  587.52   77.97  589.48   86.91  590.79  104.53  592.95
  106.25  593.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -75.5     .15  -16.65     .05   18.25     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.65   18.25            52.75   52.75   52.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16755.0

INPUT
Description: XSEC 109 (Sta. 167+55.0)
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -45  590.35   -42.2     590   -35.8     589  -28.78  588.51  -23.95  587.12
   -19.4  586.14  -12.73  584.62   -4.58   583.8       0  584.74    7.88  584.52
   16.02  584.79   20.29  586.45   27.96  587.36   57.16  587.81   100.1     589
   135.6     594   137.9  594.22

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -45     .15   -19.4     .05   20.29     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -19.4   20.29            153.9   153.9   153.9             .1       .3
```

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 16601.1

INPUT
Description: XSEC 108 (Sta. 16+01.1)
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-125.69	590.72	-76.48	588.37	-33.1	589.18	-15.78	588.02	-14.67	586.82
-6.38	584.11	0	584.64	12.78	583.61	23.3	587.04	25.81	588.14
34.25	587	76.35	587.67	123.57	588.94	187.43	592.51		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-125.69	.15	-14.67	.05	23.3	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-14.67	23.3	120.7	120.7	120.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 16480.4

INPUT
Description: XSEC 107 (Sta. 164+80.4)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-93.6	591.2	-85	590	-66.5	589	-39.2	589	-23.83	588
-21.1	587.09	-16.73	585.72	-9.8	583.97	-3.5	583.93	0	584.31
7.62	584.39	16.2	586.15	26.47	587.19	33.02	588.91	50.8	589
61.9	589	76.6	590	85.6	590.3				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-93.6	.15	-23.83	.05	33.02	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-23.83	33.02	152.7	152.7	152.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 16327.7

INPUT

```
Description: XSEC 106 (Sta. 163+27.7)
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -53.7   591.2   -40.7     590  -32.35  588.01  -24.22  586.93  -20.57  585.27
  -15.54  584.49   -5.11  583.74       0  583.66       9  584.54   13.64  585.44
   19.46  586.89   26.16  588.13    41.2     590    51.3     591

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -53.7     .15  -24.22     .05   19.46     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -24.22   19.46             123.7   123.7   123.7             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16204.0

INPUT
Description: XSEC 105 (Sta. 162+04.0)
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -68.3     592   -47.6     591  -26.23   588.5  -21.55  586.98   -16.5  585.47
     -14 585.086   -5.81  583.83       0  583.36   11.67  583.85   16.74  584.74
   21.07  587.07   30.49  587.96    44.4     589    60.3     591    63.8   591.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -68.3     .15     -14     .05   16.74     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           -14   16.74             93.2    93.2    93.2             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16110.8

INPUT
Description: XSEC 104 (Sta. 161+10.8)
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -59.5     590   -39.8     588  -27.34  587.91  -24.07   586.9  -20.95  585.58
  -15.03   584.4   -5.57  582.46       0  582.52    1.76  582.76    7.25  584.54
   11.32  584.78   17.15  587.18   24.48  587.92    43.7     588    63.4   590.5
    77.8   593.4
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -59.5     .15  -15.03     .05   11.32     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.03   11.32            103.8   103.8   103.8             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16007.0

INPUT
Description: XSEC 103 (Sta. 160+07.0)
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -121.22  592.61  -84.07  586.19  -67.26  585.13   -45.9  586.79  -40.85  587.75
  -20.42  587.66  -18.95     587  -15.37  585.53   -8.67   584.1   -3.83   582.9
       0  582.37    8.62  583.27   13.47  585.02   18.68  586.09   22.96  586.91
   29.11  587.59   63.43  587.87  118.79  587.78  150.81     596

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -121.22     .15  -15.37     .05   13.47     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.37   13.47            120.6   120.6   120.6             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
 -121.22  -40.85  587.75       T

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 15886.4

INPUT
Description: XSEC 102 (Sta. 158+30.1)
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -87.73   593.1  -37.81  587.58  -27.81  586.59  -18.84  585.51  -16.35  584.69
  -10.19  582.38       0  582.07    4.44   583.7   11.22  585.49   15.23  586.76
   25.62  587.24    60.4   587.9   115.8   587.8   147.8     596

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -87.73     .15  -16.35     .05   11.22     .15
```

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-16.35	11.22	56.3	56.3	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 15830.1

INPUT
Description: XSEC 101 (Sta. 158+30.1)
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-54.01	590.6	-36.8	587.44	-30.76	586.8	-23.04	585.6	-17.13	584.42
-11.48	582.45	0	581.6	6.93	584.47	13.79	585.74	21.27	587.51
55.4	587.9	110.8	587.8	142.8	596				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-54.01	.15	-17.13	.05	13.79	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-17.13	13.79	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Crystal River

Reach	River Sta.	n1	n2	n3
Fisher Lake	18565.3	.15	.05	.15
Fisher Lake	18386.1	.15	.05	.15
Fisher Lake	17998.6	.15	.05	.15
Fisher Lake	17886.9*	.15	.05	.15
Fisher Lake	17775.3	.15	.05	.15
Fisher Lake	17664.4*	.15	.05	.15
Fisher Lake	17553.6	.15	.05	.15
Fisher Lake	17492.4*	.15	.05	.15
Fisher Lake	17431.2*	.15	.05	.15
Fisher Lake	17370.0*	.15	.05	.15
Fisher Lake	17308.8	.15	.05	.15
Fisher Lake	17296.4	.15	.05	.15
Fisher Lake	17288.0*	.15	.05	.15
Fisher Lake	17264.7	Bridge		
Fisher Lake	17234.0*	.15	.05	.15
Fisher Lake	17224.5	.15	.05	.15
Fisher Lake	17166.3*	.15	.05	.15
Fisher Lake	17108.2	.15	.05	.15

Fisher Lake	17078.7*	.15	.05	.15
Fisher Lake	17049.2	.15	.05	.15
Fisher Lake	17006.4*	.15	.05	.15
Fisher Lake	16963.7	.15	.05	.15
Fisher Lake	16912.1*	.15	.05	.15
Fisher Lake	16860.5	.15	.05	.15
Fisher Lake	16807.7*	.15	.05	.15
Fisher Lake	16755.0	.15	.05	.15
Fisher Lake	16601.1	.15	.05	.15
Fisher Lake	16480.4	.15	.05	.15
Fisher Lake	16327.7	.15	.05	.15
Fisher Lake	16204.0	.15	.05	.15
Fisher Lake	16110.8	.15	.05	.15
Fisher Lake	16007.0	.15	.05	.15
Fisher Lake	15886.4	.15	.05	.15
Fisher Lake	15830.1	.15	.05	.15

SUMMARY OF REACH LENGTHS

River: Crystal River

Reach	River Sta.	Left	Channel	Right
Fisher Lake	18565.3	179.2	179.2	179.2
Fisher Lake	18386.1	387.5	387.5	387.5
Fisher Lake	17998.6	111.65	111.65	111.65
Fisher Lake	17886.9*	111.65	111.65	111.65
Fisher Lake	17775.3	110.85	110.85	110.85
Fisher Lake	17664.4*	110.85	110.85	110.85
Fisher Lake	17553.6	61.2	61.2	61.2
Fisher Lake	17492.4*	61.2	61.2	61.2
Fisher Lake	17431.2*	61.2	61.2	61.2
Fisher Lake	17370.0*	61.2	61.2	61.2
Fisher Lake	17308.8	12.4	12.4	12.4
Fisher Lake	17296.4	8.4	8.4	8.4
Fisher Lake	17288.0*	54	54	54
Fisher Lake	17264.7	Bridge		
Fisher Lake	17234.0*	9.5	9.5	9.5
Fisher Lake	17224.5	58.15	58.15	58.15
Fisher Lake	17166.3*	58.15	58.15	58.15
Fisher Lake	17108.2	29.5	29.5	29.5
Fisher Lake	17078.7*	29.5	29.5	29.5
Fisher Lake	17049.2	42.75	42.75	42.75
Fisher Lake	17006.4*	42.75	42.75	42.75
Fisher Lake	16963.7	51.6	51.6	51.6
Fisher Lake	16912.1*	51.6	51.6	51.6
Fisher Lake	16860.5	52.75	52.75	52.75

Fisher Lake	16807.7*	52.75	52.75	52.75
Fisher Lake	16755.0	153.9	153.9	153.9
Fisher Lake	16601.1	120.7	120.7	120.7
Fisher Lake	16480.4	152.7	152.7	152.7
Fisher Lake	16327.7	123.7	123.7	123.7
Fisher Lake	16204.0	93.2	93.2	93.2
Fisher Lake	16110.8	103.8	103.8	103.8
Fisher Lake	16007.0	120.6	120.6	120.6
Fisher Lake	15886.4	56.3	56.3	56.3
Fisher Lake	15830.1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Crystal River

Reach	River Sta.	Contr.	Expan.
Fisher Lake	18565.3	.1	.3
Fisher Lake	18386.1	.1	.3
Fisher Lake	17998.6	.1	.3
Fisher Lake	17886.9*	.1	.3
Fisher Lake	17775.3	.1	.3
Fisher Lake	17664.4*	.1	.3
Fisher Lake	17553.6	.1	.3
Fisher Lake	17492.4*	.1	.3
Fisher Lake	17431.2*	.1	.3
Fisher Lake	17370.0*	.1	.3
Fisher Lake	17308.8	.1	.3
Fisher Lake	17296.4	.1	.3
Fisher Lake	17288.0*	.1	.3
Fisher Lake	17264.7 Bridge		
Fisher Lake	17234.0*	.1	.3
Fisher Lake	17224.5	.1	.3
Fisher Lake	17166.3*	.1	.3
Fisher Lake	17108.2	.1	.3
Fisher Lake	17078.7*	.1	.3
Fisher Lake	17049.2	.1	.3
Fisher Lake	17006.4*	.1	.3
Fisher Lake	16963.7	.1	.3
Fisher Lake	16912.1*	.1	.3
Fisher Lake	16860.5	.1	.3
Fisher Lake	16807.7*	.1	.3
Fisher Lake	16755.0	.1	.3
Fisher Lake	16601.1	.1	.3
Fisher Lake	16480.4	.1	.3
Fisher Lake	16327.7	.1	.3
Fisher Lake	16204.0	.1	.3

Fisher Lake	16110.8	.1	.3
Fisher Lake	16007.0	.1	.3
Fisher Lake	15886.4	.1	.3
Fisher Lake	15830.1	.1	.3

HEC-RAS Plan: Existing Dam w Base River: Crystal River Reach: Fisher Lake

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)	
Fisher Lake	18565.3	2 Year	70.00	586.80	589.56		589.56	0.000322	0.52	134.86	69.74	0.07
Fisher Lake	18565.3	50 Year	145.00	586.80	590.68		590.69	0.000304	0.68	214.93	75.07	0.07
Fisher Lake	18565.3	100 Year	165.00	586.80	590.95		590.96	0.000296	0.71	235.64	77.85	0.07
Fisher Lake	18565.3	500 Year	220.00	586.80	591.70		591.71	0.000267	0.77	296.25	84.86	0.07
Fisher Lake	18565.3	Base Flow	35.00	586.80	588.87		588.87	0.000341	0.40	86.82	67.94	0.06
Fisher Lake	18386.1	2 Year	70.00	587.06	589.50		589.51	0.000318	0.52	133.83	67.54	0.07
Fisher Lake	18386.1	50 Year	145.00	587.06	590.63		590.64	0.000307	0.69	210.79	69.61	0.07
Fisher Lake	18386.1	100 Year	165.00	587.06	590.90		590.91	0.000301	0.73	229.85	70.51	0.07
Fisher Lake	18386.1	500 Year	220.00	587.06	591.65		591.66	0.000275	0.79	283.57	72.97	0.07
Fisher Lake	18386.1	Base Flow	35.00	587.06	588.81		588.81	0.000323	0.40	87.17	65.80	0.06
Fisher Lake	17998.6	2 Year	70.00	586.65	589.40		589.40	0.000248	0.48	147.17	71.77	0.06
Fisher Lake	17998.6	50 Year	145.00	586.65	590.52		590.53	0.000253	0.64	229.20	73.90	0.06
Fisher Lake	17998.6	100 Year	165.00	586.65	590.80		590.80	0.000250	0.67	249.53	74.42	0.06
Fisher Lake	17998.6	500 Year	220.00	586.65	591.55		591.56	0.000230	0.74	307.30	79.06	0.06
Fisher Lake	17998.6	Base Flow	35.00	586.65	588.70		588.70	0.000237	0.36	97.73	70.36	0.05
Fisher Lake	17886.9*	2 Year	70.00	586.53	589.37		589.37	0.000240	0.47	151.52	75.36	0.06
Fisher Lake	17886.9*	50 Year	145.00	586.53	590.49		590.50	0.000239	0.62	237.77	77.97	0.06
Fisher Lake	17886.9*	100 Year	165.00	586.53	590.77		590.78	0.000235	0.65	259.27	78.76	0.06
Fisher Lake	17886.9*	500 Year	220.00	586.53	591.53		591.54	0.000215	0.71	320.78	83.28	0.06
Fisher Lake	17886.9*	Base Flow	35.00	586.53	588.67		588.68	0.000235	0.35	99.80	73.57	0.05
Fisher Lake	17775.3	2 Year	70.00	586.41	589.34		589.35	0.000230	0.45	156.32	78.97	0.06
Fisher Lake	17775.3	50 Year	145.00	586.41	590.47		590.47	0.000226	0.60	246.91	82.48	0.06
Fisher Lake	17775.3	100 Year	165.00	586.41	590.74		590.75	0.000221	0.63	269.78	83.74	0.06
Fisher Lake	17775.3	500 Year	220.00	586.41	591.51		591.51	0.000200	0.68	334.96	87.22	0.06
Fisher Lake	17775.3	Base Flow	35.00	586.41	588.65		588.65	0.000230	0.34	102.17	76.56	0.05
Fisher Lake	17664.4*	2 Year	70.00	586.34	589.31		589.32	0.000305	0.51	138.77	72.94	0.06
Fisher Lake	17664.4*	50 Year	145.00	586.34	590.44		590.45	0.000287	0.67	223.14	77.01	0.07
Fisher Lake	17664.4*	100 Year	165.00	586.34	590.71		590.72	0.000279	0.70	244.52	78.07	0.07
Fisher Lake	17664.4*	500 Year	220.00	586.34	591.48		591.49	0.000249	0.75	305.39	81.04	0.07
Fisher Lake	17664.4*	Base Flow	35.00	586.34	588.62		588.62	0.000324	0.39	88.94	70.08	0.06
Fisher Lake	17553.6	2 Year	70.00	586.28	589.27		589.28	0.000383	0.57	125.25	67.32	0.07
Fisher Lake	17553.6	50 Year	145.00	586.28	590.40		590.41	0.000354	0.74	203.44	71.21	0.07
Fisher Lake	17553.6	100 Year	165.00	586.28	590.68		590.69	0.000343	0.77	223.27	72.16	0.07
Fisher Lake	17553.6	500 Year	220.00	586.28	591.45		591.46	0.000304	0.83	279.76	74.80	0.07
Fisher Lake	17553.6	Base Flow	35.00	586.28	588.58		588.58	0.000418	0.44	79.33	63.65	0.07
Fisher Lake	17492.4*	2 Year	70.00	586.16	589.25		589.25	0.000385	0.58	121.99	64.55	0.07
Fisher Lake	17492.4*	50 Year	145.00	586.16	590.38		590.39	0.000368	0.76	200.77	75.30	0.08
Fisher Lake	17492.4*	100 Year	165.00	586.16	590.66		590.67	0.000357	0.80	222.04	78.08	0.08
Fisher Lake	17492.4*	500 Year	220.00	586.16	591.43		591.44	0.000316	0.86	286.23	89.67	0.07
Fisher Lake	17492.4*	Base Flow	35.00	586.16	588.55		588.55	0.000395	0.45	78.70	59.48	0.07
Fisher Lake	17431.2*	2 Year	70.00	586.04	589.23		589.23	0.000395	0.60	117.91	59.45	0.07
Fisher Lake	17431.2*	50 Year	145.00	586.04	590.36		590.36	0.000394	0.80	193.25	80.02	0.08
Fisher Lake	17431.2*	100 Year	165.00	586.04	590.63		590.64	0.000383	0.84	216.88	90.01	0.08
Fisher Lake	17431.2*	500 Year	220.00	586.04	591.41		591.42	0.000331	0.89	295.64	112.42	0.08
Fisher Lake	17431.2*	Base Flow	35.00	586.04	588.53		588.53	0.000382	0.45	77.42	55.59	0.07
Fisher Lake	17370.0*	2 Year	70.00	585.92	589.20		589.21	0.000415	0.63	113.48	56.99	0.08
Fisher Lake	17370.0*	50 Year	145.00	585.92	590.33		590.34	0.000422	0.84	187.80	77.32	0.08
Fisher Lake	17370.0*	100 Year	165.00	585.92	590.61		590.62	0.000410	0.87	212.10	101.88	0.08
Fisher Lake	17370.0*	500 Year	220.00	585.92	591.39		591.40	0.000341	0.91	326.74	183.86	0.08
Fisher Lake	17370.0*	Base Flow	35.00	585.92	588.50		588.51	0.000383	0.47	75.22	51.81	0.07
Fisher Lake	17308.8	2 Year	70.00	585.80	589.17		589.18	0.000443	0.66	113.05	63.60	0.08
Fisher Lake	17308.8	50 Year	145.00	585.80	590.30		590.31	0.000443	0.87	195.57	121.46	0.08
Fisher Lake	17308.8	100 Year	165.00	585.80	590.58		590.59	0.000422	0.89	237.20	177.57	0.08
Fisher Lake	17308.8	500 Year	220.00	585.80	591.37		591.38	0.000311	0.87	419.75	262.97	0.07
Fisher Lake	17308.8	Base Flow	35.00	585.80	588.48		588.48	0.000400	0.49	72.06	47.96	0.07
Fisher Lake	17296.4	2 Year	70.00	585.54	589.16	586.76	589.17	0.000677	1.00	70.36	36.41	0.10
Fisher Lake	17296.4	50 Year	145.00	585.54	590.27	587.21	590.30	0.001020	1.51	96.36	44.85	0.13
Fisher Lake	17296.4	100 Year	165.00	585.54	590.54	587.30	590.58	0.001065	1.61	102.80	47.06	0.14
Fisher Lake	17296.4	500 Year	220.00	585.54	591.32	587.55	591.37	0.001105	1.83	120.88	54.17	0.14
Fisher Lake	17296.4	Base Flow	35.00	585.54	588.47	586.46	588.48	0.000400	0.65	54.32	32.63	0.07
Fisher Lake	17288.0*	2 Year	70.00	585.41	589.13	586.68	589.16	0.001162	1.40	49.84	37.43	0.14
Fisher Lake	17288.0*	50 Year	145.00	585.41	590.20	587.24	590.28	0.001958	2.20	65.96	45.12	0.18
Fisher Lake	17288.0*	100 Year	165.00	585.41	590.47	587.36	590.56	0.002085	2.36	69.95	47.21	0.19
Fisher Lake	17288.0*	500 Year	220.00	585.41	591.22	587.69	591.34	0.002253	2.71	81.22	54.13	0.21

HEC-RAS Plan: Existing Dam w Base River: Crystal River Reach: Fisher Lake (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Fisher Lake	17288.0*	Base Flow	35.00	585.41	588.46	586.36	588.47	0.000615	0.88	39.79	33.63	0.10
Fisher Lake	17264.7		Culvert									
Fisher Lake	17234.0*	2 Year	70.00	584.60	587.74	586.41	587.81	0.004532	2.11	33.14	37.30	0.25
Fisher Lake	17234.0*	50 Year	145.00	584.60	588.85	586.95	588.98	0.005015	2.91	49.76	41.16	0.28
Fisher Lake	17234.0*	100 Year	165.00	584.60	589.10	587.09	589.25	0.005088	3.08	53.54	42.05	0.29
Fisher Lake	17234.0*	500 Year	220.00	584.60	589.65	587.42	589.85	0.005599	3.56	61.82	52.76	0.31
Fisher Lake	17234.0*	Base Flow	35.00	584.60	587.10	586.01	587.14	0.003526	1.48	23.57	35.30	0.21
Fisher Lake	17224.5	2 Year	70.00	584.46	587.75	585.81	587.77	0.001161	1.13	62.97	38.24	0.13
Fisher Lake	17224.5	50 Year	145.00	584.46	588.87	586.30	588.91	0.001361	1.58	95.16	41.50	0.15
Fisher Lake	17224.5	100 Year	165.00	584.46	589.13	586.40	589.17	0.001389	1.67	102.77	46.18	0.15
Fisher Lake	17224.5	500 Year	220.00	584.46	589.70	586.66	589.76	0.001537	1.93	119.94	64.77	0.16
Fisher Lake	17224.5	Base Flow	35.00	584.46	587.10	585.50	587.11	0.000829	0.77	45.44	36.48	0.10
Fisher Lake	17166.3*	2 Year	70.00	585.18	587.69		587.70	0.000888	0.84	84.70	48.02	0.11
Fisher Lake	17166.3*	50 Year	145.00	585.18	588.83		588.84	0.000764	1.07	151.86	77.19	0.11
Fisher Lake	17166.3*	100 Year	165.00	585.18	589.09		589.11	0.000733	1.11	172.56	81.74	0.11
Fisher Lake	17166.3*	500 Year	220.00	585.18	589.66		589.68	0.000720	1.22	221.49	89.59	0.11
Fisher Lake	17166.3*	Base Flow	35.00	585.18	587.05		587.06	0.000884	0.64	54.95	45.16	0.10
Fisher Lake	17108.2	2 Year	70.00	585.90	587.64		587.65	0.001122	0.84	92.29	78.05	0.12
Fisher Lake	17108.2	50 Year	145.00	585.90	588.79		588.80	0.000647	0.92	199.01	101.12	0.10
Fisher Lake	17108.2	100 Year	165.00	585.90	589.05		589.06	0.000596	0.94	225.99	104.47	0.10
Fisher Lake	17108.2	500 Year	220.00	585.90	589.63		589.64	0.000553	1.02	288.08	111.79	0.10
Fisher Lake	17108.2	Base Flow	35.00	585.90	586.98		586.99	0.001786	0.74	48.57	58.12	0.14
Fisher Lake	17078.7*	2 Year	70.00	585.62	587.59		587.61	0.001476	1.00	80.58	72.84	0.14
Fisher Lake	17078.7*	50 Year	145.00	585.62	588.76		588.78	0.000832	1.07	191.99	110.16	0.11
Fisher Lake	17078.7*	100 Year	165.00	585.62	589.03		589.04	0.000754	1.08	221.77	114.76	0.11
Fisher Lake	17078.7*	500 Year	220.00	585.62	589.61		589.62	0.000677	1.15	290.64	123.83	0.11
Fisher Lake	17078.7*	Base Flow	35.00	585.62	586.92		586.93	0.002221	0.87	41.14	46.92	0.15
Fisher Lake	17049.2	2 Year	70.00	585.35	587.53		587.55	0.002364	1.31	65.22	65.91	0.17
Fisher Lake	17049.2	50 Year	145.00	585.35	588.73		588.75	0.001178	1.31	186.75	126.58	0.13
Fisher Lake	17049.2	100 Year	165.00	585.35	589.00		589.02	0.001032	1.30	222.09	136.02	0.13
Fisher Lake	17049.2	500 Year	220.00	585.35	589.58		589.60	0.000850	1.32	302.58	140.24	0.12
Fisher Lake	17049.2	Base Flow	35.00	585.35	586.83		586.85	0.003504	1.14	31.52	33.66	0.19
Fisher Lake	17006.4*	2 Year	70.00	585.40	587.45		587.47	0.001628	1.08	76.15	64.87	0.14
Fisher Lake	17006.4*	50 Year	145.00	585.40	588.69		588.71	0.000909	1.16	182.77	109.55	0.12
Fisher Lake	17006.4*	100 Year	165.00	585.40	588.96		588.98	0.000819	1.16	213.70	116.38	0.11
Fisher Lake	17006.4*	500 Year	220.00	585.40	589.55		589.57	0.000730	1.23	286.09	129.71	0.11
Fisher Lake	17006.4*	Base Flow	35.00	585.40	586.69		586.71	0.002992	1.00	36.06	41.05	0.18
Fisher Lake	16963.7	2 Year	70.00	585.45	587.40		587.41	0.001103	0.89	91.34	69.40	0.12
Fisher Lake	16963.7	50 Year	145.00	585.45	588.66		588.67	0.000652	0.99	196.95	98.12	0.10
Fisher Lake	16963.7	100 Year	165.00	585.45	588.93		588.95	0.000609	1.01	225.42	109.59	0.10
Fisher Lake	16963.7	500 Year	220.00	585.45	589.52		589.54	0.000564	1.09	293.65	120.14	0.10
Fisher Lake	16963.7	Base Flow	35.00	585.45	586.58		586.59	0.002469	0.88	42.10	50.91	0.16
Fisher Lake	16912.1*	2 Year	70.00	584.96	587.35		587.36	0.000881	0.89	92.05	65.73	0.11
Fisher Lake	16912.1*	50 Year	145.00	584.96	588.62		588.64	0.000629	1.04	189.74	89.76	0.10
Fisher Lake	16912.1*	100 Year	165.00	584.96	588.90		588.92	0.000601	1.07	215.70	97.54	0.10
Fisher Lake	16912.1*	500 Year	220.00	584.96	589.49		589.51	0.000590	1.18	285.76	130.02	0.10
Fisher Lake	16912.1*	Base Flow	35.00	584.96	586.48		586.49	0.001434	0.79	45.82	41.28	0.13
Fisher Lake	16860.5	2 Year	70.00	584.48	587.30		587.32	0.000779	0.92	91.12	60.86	0.11
Fisher Lake	16860.5	50 Year	145.00	584.48	588.59		588.61	0.000647	1.12	186.33	98.46	0.10
Fisher Lake	16860.5	100 Year	165.00	584.48	588.87		588.88	0.000623	1.16	215.59	111.58	0.10
Fisher Lake	16860.5	500 Year	220.00	584.48	589.46		589.48	0.000613	1.26	290.69	133.78	0.10
Fisher Lake	16860.5	Base Flow	35.00	584.48	586.42		586.43	0.000977	0.76	48.27	36.43	0.11
Fisher Lake	16807.7*	2 Year	70.00	584.14	587.27		587.28	0.000580	0.81	96.11	61.90	0.09
Fisher Lake	16807.7*	50 Year	145.00	584.14	588.56		588.57	0.000491	0.98	205.20	103.34	0.09
Fisher Lake	16807.7*	100 Year	165.00	584.14	588.84		588.85	0.000483	1.02	237.12	124.84	0.09
Fisher Lake	16807.7*	500 Year	220.00	584.14	589.43		589.45	0.000474	1.11	314.54	137.07	0.09
Fisher Lake	16807.7*	Base Flow	35.00	584.14	586.38		586.39	0.000678	0.64	55.27	39.50	0.09
Fisher Lake	16755.0	2 Year	70.00	583.80	587.23		587.24	0.000808	0.70	104.40	51.26	0.08
Fisher Lake	16755.0	50 Year	145.00	583.80	588.53		588.54	0.000734	0.88	212.11	112.28	0.08
Fisher Lake	16755.0	100 Year	165.00	583.80	588.81		588.82	0.000711	0.91	245.56	126.41	0.08
Fisher Lake	16755.0	500 Year	220.00	583.80	589.40		589.42	0.000694	0.98	326.23	141.35	0.08
Fisher Lake	16755.0	Base Flow	35.00	583.80	586.34		586.35	0.000893	0.55	63.74	40.36	0.08

HEC-RAS Plan: Existing Dam w Base River: Crystal River Reach: Fisher Lake (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Fisher Lake	16601.1	2 Year	70.00	583.61	587.08		587.09	0.001222	0.81	87.16	43.98	0.09
Fisher Lake	16601.1	50 Year	145.00	583.61	588.40		588.42	0.000935	0.95	203.29	127.49	0.09
Fisher Lake	16601.1	100 Year	165.00	583.61	588.69		588.70	0.000865	0.97	245.20	163.91	0.09
Fisher Lake	16601.1	500 Year	220.00	583.61	589.29		589.30	0.000763	1.00	365.22	225.66	0.08
Fisher Lake	16601.1	Base Flow	35.00	583.61	586.18		586.19	0.001211	0.64	54.53	33.39	0.09
Fisher Lake	16480.4	2 Year	70.00	583.93	586.90		586.91	0.001858	0.86	80.96	44.10	0.11
Fisher Lake	16480.4	50 Year	145.00	583.93	588.27		588.28	0.001366	0.97	150.18	58.48	0.10
Fisher Lake	16480.4	100 Year	165.00	583.93	588.56		588.58	0.001285	0.99	168.33	64.16	0.10
Fisher Lake	16480.4	500 Year	220.00	583.93	589.17		589.19	0.001233	1.08	221.48	134.07	0.10
Fisher Lake	16480.4	Base Flow	35.00	583.93	585.99		586.00	0.002035	0.76	46.28	33.03	0.11
Fisher Lake	16327.7	2 Year	70.00	583.66	586.66		586.67	0.001414	0.81	86.32	42.13	0.10
Fisher Lake	16327.7	50 Year	145.00	583.66	588.09		588.10	0.001018	0.96	157.56	58.60	0.09
Fisher Lake	16327.7	100 Year	165.00	583.66	588.39		588.41	0.000978	1.00	175.94	62.21	0.09
Fisher Lake	16327.7	500 Year	220.00	583.66	589.00		589.02	0.001014	1.13	216.02	69.65	0.10
Fisher Lake	16327.7	Base Flow	35.00	583.66	585.69		585.70	0.001952	0.72	48.49	36.13	0.11
Fisher Lake	16204.0	2 Year	70.00	583.36	586.49		586.50	0.001202	0.87	85.98	39.92	0.10
Fisher Lake	16204.0	50 Year	145.00	583.36	587.96		587.97	0.001051	1.10	153.21	54.99	0.10
Fisher Lake	16204.0	100 Year	165.00	583.36	588.26		588.28	0.001040	1.15	170.89	60.03	0.10
Fisher Lake	16204.0	500 Year	220.00	583.36	588.86		588.88	0.001146	1.32	210.06	71.84	0.10
Fisher Lake	16204.0	Base Flow	35.00	583.36	585.46		585.47	0.001792	0.75	47.41	34.48	0.11
Fisher Lake	16110.8	2 Year	70.00	582.46	586.39		586.40	0.000950	0.85	90.76	38.11	0.09
Fisher Lake	16110.8	50 Year	145.00	582.46	587.86		587.88	0.000982	1.13	153.92	51.06	0.09
Fisher Lake	16110.8	100 Year	165.00	582.46	588.16		588.18	0.001043	1.22	176.34	86.39	0.10
Fisher Lake	16110.8	500 Year	220.00	582.46	588.75		588.78	0.001109	1.36	230.52	96.87	0.10
Fisher Lake	16110.8	Base Flow	35.00	582.46	585.33		585.34	0.001115	0.69	52.94	32.33	0.09
Fisher Lake	16007.0	2 Year	70.00	582.37	586.28		586.29	0.001206	0.89	82.02	69.03	0.10
Fisher Lake	16007.0	50 Year	145.00	582.37	587.75		587.77	0.001158	1.17	147.80	140.63	0.10
Fisher Lake	16007.0	100 Year	165.00	582.37	588.05		588.07	0.001089	1.19	207.63	214.70	0.10
Fisher Lake	16007.0	500 Year	220.00	582.37	588.66		588.67	0.000904	1.18	338.92	220.54	0.09
Fisher Lake	16007.0	Base Flow	35.00	582.37	585.19		585.20	0.001606	0.76	46.26	29.72	0.10
Fisher Lake	15886.4	2 Year	70.00	582.07	586.15		586.16	0.000987	0.85	86.18	37.47	0.09
Fisher Lake	15886.4	50 Year	145.00	582.07	587.62		587.64	0.000976	1.11	163.67	83.85	0.09
Fisher Lake	15886.4	100 Year	165.00	582.07	587.93		587.95	0.000969	1.16	197.01	157.28	0.09
Fisher Lake	15886.4	500 Year	220.00	582.07	588.54		588.56	0.000913	1.22	296.09	165.24	0.09
Fisher Lake	15886.4	Base Flow	35.00	582.07	585.03		585.04	0.001115	0.69	50.81	26.85	0.09
Fisher Lake	15830.1	2 Year	70.00	581.60	586.10	582.97	586.11	0.000800	0.76	97.54	41.60	0.08
Fisher Lake	15830.1	50 Year	145.00	581.60	587.57	583.51	587.59	0.000801	1.00	171.26	64.32	0.08
Fisher Lake	15830.1	100 Year	165.00	581.60	587.88	583.63	587.90	0.000801	1.05	197.53	139.26	0.09
Fisher Lake	15830.1	500 Year	220.00	581.60	588.50	583.93	588.51	0.000801	1.14	291.63	156.08	0.09
Fisher Lake	15830.1	Base Flow	35.00	581.60	584.98	582.62	584.98	0.000800	0.62	57.54	29.59	0.07

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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: CR 675 Crystal River
Project File : CR675CrystalRive.prj
Run Date and Time: 1/3/2022 4:40:41 PM

Project in English units

Project Description:
HEC-RAS model analyzes Crystal River for the channel reach for the third waterway crossing along CR 675 from M22. The model begins 1434.6 feet downstream of CR 675 and ends 1300.6' upstream of CR 675.

Energy slope used
for the starting water surface elevations is
slope=(588.89-586.68)/(18565.3-15886.4) = 0.0008 ft/ft

PLAN DATA

Plan Title: Prop Crystal R Dam w Base 12-2020
Plan File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.p07

Geometry Title: Prop Cond Crystal R @ FisherLake 12-2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.g05

Flow Title   : Crystal River DS Fisher Lake Dam w base
Flow File   : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR

675 near Fisher Lake\CR675CrystalRive.f02

Plan Summary Information:
Number of: Cross Sections =   33   Multiple Openings =   0
            Culverts   =   0   Inline Structures =   0
            Bridges   =   1   Lateral Structures =   0

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

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

FLOW DATA

Flow Title: Crystal River DS Fisher Lake Dam w base
Flow File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.f02

Flow Data (cfs)

River	Reach	RS	2 Year	50 Year	100 Year	500 Year	Base Flow
Crystal River	Fisher Lake	18565.3	70	145	165	220	35

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Crystal River	Fisher Lake	2 Year		
Normal S = 0.0008				
Crystal River	Fisher Lake	50 Year		
Normal S = 0.0008				

```
  Crystal River   Fisher Lake     100 Year
Normal S = 0.0008
```

GEOMETRY DATA

Geometry Title: Prop Cond Crystal R @ FisherLake 12-2020
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Crystal River along CR 675 near Fisher Lake\CR675CrystalRive.g05

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 18565.3

INPUT
Description: XSEC 121 (Sta. 185+65.3)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-57.64	592.22	-51.82	591.76	-47.72	590.44	-46.29	588.98	-33.93	587.27
-26.8	586.8	-18.02	587.61	-9.25	587.53	0	587.19	8.34	587.33
22.44	588.8	23.27	590.22	30.37	591.21	35	592	40	593

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-57.64	.15	-46.29	.05	22.44	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-46.29	22.44	179.2	179.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 18386.1

INPUT
Description: XSEC 120 (Sta. 183+86.1)
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-52.39	593.36	-32.81	593.15	-27.88	591.97	-25.53	588.84	-19.8	587.28
-6.57	587.09	0	587.06	4.93	587.35	14.76	587.26	20.92	587.7
34.31	587.59	41.16	588.96	42.06	590.36	46.37	592.06	63.54	592.65
91.6	594	99.6	595	107.7	596	111.5	596.3		

Manning's n Values num= 3

```
     Sta   n Val     Sta   n Val     Sta   n Val
  -52.39     .15  -25.53     .05   41.16     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.53   41.16            387.5   387.5   387.5             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17998.6

INPUT
Description: XSEC 119 (Sta. 179+98.6)
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -48.21  592.93  -35.15  591.03  -33.29  588.49  -28.38   587.9  -21.44  587.16
  -12.35  587.21   -7.72  586.88       0  587.12     5.3  586.65   15.23  587.19
   25.13     587   36.15  588.71   36.78   588.5   40.36  591.59   50.75  592.89
    63.9     593    80.1     593    84.4     594    89.5     595    95.8     596

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -48.21     .15  -33.29     .05   36.15     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -33.29   36.15           111.65  111.65  111.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17886.9*

INPUT
Description: Interpolated Section 10
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -53.72  593.23  -46.95  593.04  -37.42  590.74  -36.32  589.94   -35.1  588.48
  -30.15   587.8  -25.56   587.2  -23.16  587.15  -14.35  587.47  -14.01  587.48
   -9.35  587.39   -8.75  587.41   -2.14  587.13   -1.57  587.13    1.55  586.92
    3.77  586.53    6.82  586.62   14.63  586.97   15.44  586.98   23.93  586.98
   25.46  587.06   37.51   588.6   38.13  588.57   39.47  589.33   41.62   591.1
   45.77  592.93   51.76  593.57    60.4  593.97   64.58  594.14   74.67   594.5
   80.39   594.7   84.58  595.34   89.24  595.97   89.55  596.01    95.7  596.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -53.72     .15   -35.1     .05   37.51     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -35.1   37.51           111.65  111.65  111.65             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17775.3

INPUT
Description: XSEC 118 (Sta. 177+75.3)
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -59.22  593.54  -51.11  593.93  -38.37  590.04   -36.9  588.47   -27.3  586.99
  -16.01  587.73  -10.37  587.92   -3.72  587.16       0     587    2.23  586.41
    5.55  586.44   14.91  586.79   24.13  586.94   38.88  588.49   40.79  588.98
   46.93  593.74   61.19  594.97    75.1     596    89.3     597    95.6  597.34

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -59.22     .15   -36.9     .05   38.88     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -36.9   38.88           110.85  110.85  110.85             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17664.4*

INPUT
Description: Interpolated Section 9
Station Elevation Data    num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -60.78  593.59   -52.2  593.75  -48.02  593.12  -38.83  589.59  -38.73  589.56
  -37.18   588.4  -25.87  587.28  -22.69  587.26  -15.56  587.63  -12.57  587.62
   -5.93  587.51      .4     587     1.9  586.89    6.28   586.7    8.91  586.34
   11.01  586.44   16.95  586.85    20.4  587.03   22.79   587.2   32.14  588.51
   33.72  588.87    34.5  589.28   38.82  592.69   38.91  592.72   50.32  593.95
   50.67  593.99   62.22  595.31   74.02  596.63   79.25  597.17

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -60.78     .15  -37.18     .05   32.14     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -37.18   32.14           110.85  110.85  110.85             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Fisher Lake RS: 17553.6

INPUT
Description: XSEC 117 (Sta. 175+53.6)
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-62.34	593.65	-48.89	593.52	-39.2	589.12	-37.46	588.33	-20.78	587.35
-12.58	587.7	5.8	586.69	15.59	586.28	20.44	587.18	25.39	588.53
27.27	588.86	30.78	591.69	39.87	592.96	62.9	597		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-62.34	.15	-37.46	.05	25.39	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-37.46	25.39	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17492.4*

INPUT
Description: Interpolated Section 8
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100.01	593.07	-66.44	592.65	-63.84	592.66	-38.16	589.59	-37.77	589.53
-33.82	588.94	-33.39	588.63	-33.09	588.11	-19.58	587.33	-18.1	587.27
-10.73	587.58	-9.61	587.54	5.78	586.63	8.24	586.51	14.58	586.16
20.22	587.17	25.98	588.53	27.88	588.78	31.44	590.92	38.93	591.73
40.3	591.96	40.66	592.03	53.64	594.76	61.95	595.94	64.01	596.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-100.01	.15	-33.09	.05	25.98	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-33.09	25.98	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17431.2*

INPUT

Description: Interpolated Section 7
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-137.69	592.48	-83.02	591.76	-78.78	591.8	-36.97	589.99	-36.35	589.94
-29.92	589.42	-29.22	588.87	-28.72	587.89	-16.74	587.22	-15.43	587.19
-8.89	587.46	-7.89	587.44	5.77	586.56	7.94	586.44	13.58	586.04
20	587.16	26.56	588.53	28.5	588.71	32.11	590.16	39.7	590.75
41.08	591.02	41.45	591.1	54.61	594.31	63.03	595.25	65.12	596.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-137.69	.15	-28.72	.05	26.56	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-28.72	26.56	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17370.0*

INPUT
Description: Interpolated Section 6
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-175.36	591.9	-99.61	590.88	-93.73	590.94	-35.79	590.4	-34.92	590.35
-26.01	589.9	-25.04	589.12	-24.36	587.67	-13.89	587.1	-12.75	587.11
-7.04	587.34	-6.17	587.35	5.75	586.5	7.65	586.38	12.57	585.92
19.79	587.15	27.15	588.52	29.11	588.63	32.77	589.39	40.46	589.76
41.87	590.07	42.24	590.17	55.57	593.86	64.11	594.55	66.23	595.79

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-175.36	.15	-24.36	.05	27.15	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-24.36	27.15	61.2	61.2	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17308.8

INPUT
Description: XSEC 116 (Sta. 173+08.8)
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-213.04	591.32	-116.19	590	-34.6	590.8	-22.1	590.38	-20.86	589.36

```
  -19.99  587.45  -11.05  586.99   -4.45  587.25    7.36  586.31   11.56   585.8
   27.74  588.52   41.23  588.77   42.65  589.12   56.54  593.41   65.19  593.85
   67.34  595.39

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -213.04     .15  -19.99     .05   27.74     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -19.99   27.74             12.4    12.4    12.4             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17296.4

INPUT
Description: XSEC 115 (Sta. 172+96.4)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -48.01  593.76  -38.55  593.28  -31.39   592.2  -17.47  589.38  -14.96   588.8
     -11 587.042   -9.24  586.26   -2.92  586.01    3.11  585.54      16 587.664
   17.01  587.83   20.24  589.31   23.67   590.5   30.19  592.03   34.93  592.34
   45.45  591.88   69.38  593.17  100.77  593.88

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -48.01     .15     -11     .05      16     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           -11      16              8.4     8.4     8.4             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17288.0*

INPUT
Description: US Face of Triple Culvert
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -44.7  593.77  -36.01  593.13  -29.43  592.01  -16.64   589.2  -14.34  588.63
  -14.19  588.56   -10.7  586.99   -8.86  586.26    -7.3  586.18   -2.27  585.92
    -.51  585.78    4.03  585.41    6.11  585.77   17.27  587.55   18.22  587.77
   18.34  587.83   21.27  589.22   24.14  590.29   24.51  590.41   30.65  591.73
   35.12  591.99   44.91  591.55   45.04  591.54   67.61  592.78   97.21  593.54

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
   -44.7     .15   -10.7     .05   17.27     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -10.7   17.27               54      54      54             .1       .3

BRIDGE


RIVER: Crystal River
REACH: Fisher Lake        RS: 17264.7

INPUT
Description: Proposed Timber Bridge CR 675 over Crystal River
Distance from Upstream XS =    14.9
Deck/Roadway Width        =    36.2
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  -199.5  594.43         -159.47  594.77         -114.82  594.97
  -64.82   595.2           -32.7  595.35          -32.64  595.35  593.79
  -13.34  595.43  593.89  -13.33  595.43  593.56   23.37  595.61  593.73
   23.38  595.61  594.06   42.69  595.71  594.16   42.71  595.71
   85.18  595.89           101.6  595.97          231.58  596.36

Upstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -44.7  593.77  -37.27  593.27  -32.64   588.1  -25.98     586       0     586
   36.03     586   42.69   588.1      48  591.54   67.61  592.78   97.21  593.54

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -44.7     .15  -32.64     .05   36.03     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -32.64   36.03             .1       .3

Downstream  Deck/Roadway Coordinates
    num=      15
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  -199.5  594.43         -159.47  594.77         -114.82  594.97
  -64.82   595.2           -32.7  595.35          -32.64  595.35  593.79
  -13.34  595.43  593.89  -13.33  595.43  593.56   23.37  595.61  593.73
   23.38  595.61  594.06   42.69  595.71  594.16   42.71  595.71
   85.18  595.89           101.6  595.97          231.58  596.36

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -40.5  593.77  -38.68  593.64  -32.64   588.1  -25.98     586       0     586
   36.03     586   42.69   588.1      45     590   56.23   590.3   74.33  591.38

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -40.5     .15  -32.64     .05   42.69     .15

Bank Sta: Left   Right    Coeff Contr.   Expan.
        -32.64   42.69             .1       .3

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

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
  -32.65   588.3  -25.98     586
Downstream     num=       2
     Sta    Elev     Sta    Elev
  -32.65   588.3  -25.98     586

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
   36.03     586    42.7   588.3
Downstream     num=       2
     Sta    Elev     Sta    Elev
   36.03     586    42.7   588.3

Number of Piers =  2

Pier Data
Pier Station     Upstream=  -13.33    Downstream=  -13.33
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5

Pier Data
Pier Station     Upstream=   23.37    Downstream=   23.37
```

```
Upstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5
Downstream     num=       2
    Width   Elev    Width   Elev
    1.17     584    1.17   594.5

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       Yarnell                KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

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

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17234.0*

INPUT
Description: DS Face of Triple Culvert
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -23.43  593.85  -19.68  592.16  -16.84  590.78  -11.32  588.02  -10.32  587.51
  -10.26  587.47   -8.75  586.68   -6.42  586.29   -4.44  586.03    1.94  585.36
    4.16  585.12    9.91   584.6   12.36  585.12   25.45  586.83   26.03  587.38
    26.1  587.46    27.9  588.67   29.65  589.81   29.87  589.81   33.63  589.83
   36.37  589.74   42.35  589.38   42.43  589.38   56.23   590.3   74.33  591.38

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -23.43     .15   -8.75     .05   25.45     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -8.75   25.45              9.5     9.5     9.5             .1       .3

CROSS SECTION
```

RIVER: Crystal River
REACH: Fisher Lake RS: 17224.5

INPUT
Description: XSEC 114 (Sta. 172+24.5)
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-19.69	593.86	-9.57	587.28	-8.41	586.63	-3.94	586	4.98	585
10.95	584.46	13.46	585	26.89	586.7	27.47	587.39	30.62	589.72
41.9	589	70.3	591						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-19.69	.15	-8.41	.05	26.89	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-8.41	26.89	58.15	58.15	58.15	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17166.3*

INPUT
Description: Interpolated Section 5
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-28.71	593.59	-17.89	587.35	-17.64	587.21	-16.65	586.53	-9.46	586.05
-8.36	585.99	-3.09	585.76	4.9	585.48	7.27	585.41	14.51	585.18
16.47	585.5	26.94	586.63	27.62	587.01	31.31	588.33	33.63	588.37
44.53	588.26	58.96	588.93	77.8	590.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-28.71	.15	-16.65	.05	26.94	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-16.65	26.94	58.15	58.15	58.15	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17108.2

INPUT
Description: XSEC 113 (Sta. 171+08.2)
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-37.72	593.33	-25.95	587.28	-24.9	586.43	-13.46	586.06	-6.2	585.96
8.09	585.96	18.07	585.9	27	586.568	34.66	587.14	63.7	588
85.3	590								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-37.72	.15	-24.9	.05	27	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-24.9	27	29.5	29.5	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17078.7*

INPUT
Description: Interpolated Section 4
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-64.74	593.61	-57.06	592.66	-52.38	591.78	-45.84	589.81	-24.23	587.61
-22.64	587.26	-21.09	586.86	-18.88	586.41	-15.59	586.05	-10.66	585.96
-7.61	585.94	-5.45	585.89	-1.37	585.83	2.28	585.83	4.82	585.83
7.23	585.82	11.98	585.62	16.23	585.9	19.33	586.18	21.38	586.61
22.63	586.78	29.67	587.11	38.85	587.35	57.04	587.8	61.11	587.9
72.52	588.49	78.09	589.23	84.5	590.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-64.74	.15	-18.88	.05	21.38	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-18.88	21.38	29.5	29.5	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 17049.2

INPUT
Description: XSEC 112 (Sta. 170+49.2)
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-91.75	593.9	-78.54	593.09	-70.5	592	-59.25	589	-22.06	587.72
-16.67	586.78	-12.86	586.39	-10.86	585.81	-6.01	585.88	-2.22	585.69
0	585.7	3.01	585.71	5.9	585.35	10.35	585.59	13.61	585.93
15.76	586.66	17.11	586.9	34.56	587.31	54.14	587.72	70.8	588

```
    76.8     589    83.7     591

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -91.75     .15  -12.86     .05   15.76     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -12.86   15.76            42.75   42.75   42.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 17006.4*

INPUT
Description: Interpolated Section 3
Station Elevation Data    num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -78.07  592.45  -67.47  591.84  -61.01  591.17  -52.37  589.57  -51.98  589.49
  -38.46  588.71  -26.77  588.32  -22.11  587.98  -19.28  587.53  -17.78  587.12
  -16.55  586.84  -14.73  586.21  -12.84  585.89   -8.27  585.85    -4.7   585.7
   -3.33  585.68   -2.61  585.67     .23  585.63    2.95   585.4    5.96  585.49
   10.99  585.61   14.03  585.73   16.87  585.78   20.76   586.1    22.2  586.39
   24.28  586.67   33.81  587.01   40.87  587.27   54.55  587.76   61.82  588.08
   69.98  588.42   79.65  589.88   83.97  590.84   86.07  591.07   93.45   592.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -78.07     .15  -14.73     .05   20.76     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -14.73   20.76            42.75   42.75   42.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16963.7

INPUT
Description: XSEC 111 (Sta. 169+63.7)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -64.4     591     -45     590   -34.5     589  -25.68  588.72  -20.03  587.96
  -17.97  587.05  -16.59  586.03   -5.89  585.66       0  585.45    4.35  585.54
   16.03  585.69   25.75  585.54   29.51  586.39   39.66  586.86   61.76  587.94
    78.2     589    93.1     593   103.2   593.6

Manning's n Values        num=       3
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```
     Sta   n Val     Sta   n Val     Sta   n Val
   -64.4     .15  -16.59     .05   25.75     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.59   25.75             51.6    51.6    51.6             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16912.1*

INPUT
Description: Interpolated Section 2
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -85.2   591.5  -73.81   590.8  -64.16  589.63  -59.22  589.04  -56.82  589.08
  -44.71  589.11  -41.45     589  -37.04  588.95  -28.55  588.49  -23.44  588.03
  -20.32  587.48  -20.28  587.47  -17.27  586.63  -16.27  586.25  -15.25  585.77
   -7.79  585.25   -3.68  584.96     .49  585.06    1.73  585.08    4.02  585.07
   11.67  585.41   12.12  585.42   20.98  585.42   24.28  586.46   24.47   586.5
   33.18  586.83   45.52  587.31   52.56  587.98   66.98  589.48   73.98  591.02
   80.04  592.17    88.9   592.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -85.2     .15  -15.25     .05   20.98     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.25   20.98             51.6    51.6    51.6             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16860.5

INPUT
Description: XSEC 110 (Sta. 168+60.5)
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    -106     592     -91     591   -78.3     589   -71.8     588   -52.7     589
   -42.6     589  -24.69  587.81  -20.59     587  -15.25  585.96  -13.91   585.5
   -7.36  584.48   -2.19  584.61       0  584.55    7.74  585.16   16.21  585.31
   19.21   586.6   37.31  587.08   61.77  590.89    74.6     592

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -106     .15  -13.91     .05   16.21     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -13.91   16.21            52.75   52.75   52.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16807.7*

INPUT
Description: Interpolated Section 1
Station Elevation Data    num=      31
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -75.5  591.17  -69.06  590.66  -65.92  590.39   -57.8  589.12  -54.35  588.59
  -53.65  588.49  -41.44   588.8  -38.22  588.76  -34.99  588.55  -27.11  587.65
  -23.54   587.3  -20.92  586.77  -17.51  586.09  -16.65  585.82  -11.85  584.83
   -5.97  584.14   -1.51  584.66    -.66  584.66    1.59   584.6    6.16  584.71
    9.55   584.9   14.09  585.01   18.25  585.88   22.77  586.88   23.99  586.99
   45.84  587.41   50.05  587.52   77.97  589.48   86.91  590.79  104.53  592.95
  106.25  593.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -75.5     .15  -16.65     .05   18.25     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -16.65   18.25            52.75   52.75   52.75             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16755.0

INPUT
Description: XSEC 109 (Sta. 167+55.0)
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -45  590.35   -42.2     590   -35.8     589  -28.78  588.51  -23.95  587.12
   -19.4  586.14  -12.73  584.62   -4.58   583.8       0  584.74    7.88  584.52
   16.02  584.79   20.29  586.45   27.96  587.36   57.16  587.81   100.1     589
   135.6     594   137.9  594.22

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -45     .15   -19.4     .05   20.29     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -19.4   20.29            153.9   153.9   153.9             .1       .3
```

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 16601.1

INPUT
Description: XSEC 108 (Sta. 16+01.1)
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-125.69	590.72	-76.48	588.37	-33.1	589.18	-15.78	588.02	-14.67	586.82
-6.38	584.11	0	584.64	12.78	583.61	23.3	587.04	25.81	588.14
34.25	587	76.35	587.67	123.57	588.94	187.43	592.51		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-125.69	.15	-14.67	.05	23.3	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-14.67	23.3	120.7	120.7	120.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 16480.4

INPUT
Description: XSEC 107 (Sta. 164+80.4)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-93.6	591.2	-85	590	-66.5	589	-39.2	589	-23.83	588
-21.1	587.09	-16.73	585.72	-9.8	583.97	-3.5	583.93	0	584.31
7.62	584.39	16.2	586.15	26.47	587.19	33.02	588.91	50.8	589
61.9	589	76.6	590	85.6	590.3				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-93.6	.15	-23.83	.05	33.02	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-23.83	33.02	152.7	152.7	152.7	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 16327.7

INPUT

```
Description: XSEC 106 (Sta. 163+27.7)
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -53.7   591.2   -40.7     590  -32.35  588.01  -24.22  586.93  -20.57  585.27
  -15.54  584.49   -5.11  583.74       0  583.66       9  584.54   13.64  585.44
   19.46  586.89   26.16  588.13    41.2     590    51.3     591

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -53.7     .15  -24.22     .05   19.46     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -24.22   19.46             123.7   123.7   123.7             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16204.0

INPUT
Description: XSEC 105 (Sta. 162+04.0)
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -68.3     592   -47.6     591  -26.23   588.5  -21.55  586.98   -16.5  585.47
     -14 585.086   -5.81  583.83       0  583.36   11.67  583.85   16.74  584.74
   21.07  587.07   30.49  587.96    44.4     589    60.3     591    63.8   591.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -68.3     .15     -14     .05   16.74     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           -14   16.74             93.2    93.2    93.2             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16110.8

INPUT
Description: XSEC 104 (Sta. 161+10.8)
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -59.5     590   -39.8     588  -27.34  587.91  -24.07   586.9  -20.95  585.58
  -15.03   584.4   -5.57  582.46       0  582.52    1.76  582.76    7.25  584.54
   11.32  584.78   17.15  587.18   24.48  587.92    43.7     588    63.4   590.5
    77.8   593.4
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -59.5     .15  -15.03     .05   11.32     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.03   11.32            103.8   103.8   103.8             .1       .3

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 16007.0

INPUT
Description: XSEC 103 (Sta. 160+07.0)
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -121.22  592.61  -84.07  586.19  -67.26  585.13   -45.9  586.79  -40.85  587.75
  -20.42  587.66  -18.95     587  -15.37  585.53   -8.67   584.1   -3.83   582.9
       0  582.37    8.62  583.27   13.47  585.02   18.68  586.09   22.96  586.91
   29.11  587.59   63.43  587.87  118.79  587.78  150.81     596

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -121.22     .15  -15.37     .05   13.47     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -15.37   13.47            120.6   120.6   120.6             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
 -121.22  -40.85  587.75       T

CROSS SECTION


RIVER: Crystal River
REACH: Fisher Lake        RS: 15886.4

INPUT
Description: XSEC 102 (Sta. 158+30.1)
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -87.73   593.1  -37.81  587.58  -27.81  586.59  -18.84  585.51  -16.35  584.69
  -10.19  582.38       0  582.07    4.44   583.7   11.22  585.49   15.23  586.76
   25.62  587.24    60.4   587.9   115.8   587.8   147.8     596

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -87.73     .15  -16.35     .05   11.22     .15
```

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-16.35	11.22	56.3	56.3	.1	.3

CROSS SECTION

RIVER: Crystal River
REACH: Fisher Lake RS: 15830.1

INPUT
Description: XSEC 101 (Sta. 158+30.1)
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-54.01	590.6	-36.8	587.44	-30.76	586.8	-23.04	585.6	-17.13	584.42
-11.48	582.45	0	581.6	6.93	584.47	13.79	585.74	21.27	587.51
55.4	587.9	110.8	587.8	142.8	596				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-54.01	.15	-17.13	.05	13.79	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-17.13	13.79	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Crystal River

Reach	River Sta.	n1	n2	n3
Fisher Lake	18565.3	.15	.05	.15
Fisher Lake	18386.1	.15	.05	.15
Fisher Lake	17998.6	.15	.05	.15
Fisher Lake	17886.9*	.15	.05	.15
Fisher Lake	17775.3	.15	.05	.15
Fisher Lake	17664.4*	.15	.05	.15
Fisher Lake	17553.6	.15	.05	.15
Fisher Lake	17492.4*	.15	.05	.15
Fisher Lake	17431.2*	.15	.05	.15
Fisher Lake	17370.0*	.15	.05	.15
Fisher Lake	17308.8	.15	.05	.15
Fisher Lake	17296.4	.15	.05	.15
Fisher Lake	17288.0*	.15	.05	.15
Fisher Lake	17264.7	Bridge		
Fisher Lake	17234.0*	.15	.05	.15
Fisher Lake	17224.5	.15	.05	.15
Fisher Lake	17166.3*	.15	.05	.15
Fisher Lake	17108.2	.15	.05	.15

Fisher Lake	17078.7*	.15	.05	.15
Fisher Lake	17049.2	.15	.05	.15
Fisher Lake	17006.4*	.15	.05	.15
Fisher Lake	16963.7	.15	.05	.15
Fisher Lake	16912.1*	.15	.05	.15
Fisher Lake	16860.5	.15	.05	.15
Fisher Lake	16807.7*	.15	.05	.15
Fisher Lake	16755.0	.15	.05	.15
Fisher Lake	16601.1	.15	.05	.15
Fisher Lake	16480.4	.15	.05	.15
Fisher Lake	16327.7	.15	.05	.15
Fisher Lake	16204.0	.15	.05	.15
Fisher Lake	16110.8	.15	.05	.15
Fisher Lake	16007.0	.15	.05	.15
Fisher Lake	15886.4	.15	.05	.15
Fisher Lake	15830.1	.15	.05	.15

SUMMARY OF REACH LENGTHS

River: Crystal River

Reach	River Sta.	Left	Channel	Right
Fisher Lake	18565.3	179.2	179.2	179.2
Fisher Lake	18386.1	387.5	387.5	387.5
Fisher Lake	17998.6	111.65	111.65	111.65
Fisher Lake	17886.9*	111.65	111.65	111.65
Fisher Lake	17775.3	110.85	110.85	110.85
Fisher Lake	17664.4*	110.85	110.85	110.85
Fisher Lake	17553.6	61.2	61.2	61.2
Fisher Lake	17492.4*	61.2	61.2	61.2
Fisher Lake	17431.2*	61.2	61.2	61.2
Fisher Lake	17370.0*	61.2	61.2	61.2
Fisher Lake	17308.8	12.4	12.4	12.4
Fisher Lake	17296.4	8.4	8.4	8.4
Fisher Lake	17288.0*	54	54	54
Fisher Lake	17264.7	Bridge		
Fisher Lake	17234.0*	9.5	9.5	9.5
Fisher Lake	17224.5	58.15	58.15	58.15
Fisher Lake	17166.3*	58.15	58.15	58.15
Fisher Lake	17108.2	29.5	29.5	29.5
Fisher Lake	17078.7*	29.5	29.5	29.5
Fisher Lake	17049.2	42.75	42.75	42.75
Fisher Lake	17006.4*	42.75	42.75	42.75
Fisher Lake	16963.7	51.6	51.6	51.6
Fisher Lake	16912.1*	51.6	51.6	51.6
Fisher Lake	16860.5	52.75	52.75	52.75

Fisher Lake	16807.7*	52.75	52.75	52.75
Fisher Lake	16755.0	153.9	153.9	153.9
Fisher Lake	16601.1	120.7	120.7	120.7
Fisher Lake	16480.4	152.7	152.7	152.7
Fisher Lake	16327.7	123.7	123.7	123.7
Fisher Lake	16204.0	93.2	93.2	93.2
Fisher Lake	16110.8	103.8	103.8	103.8
Fisher Lake	16007.0	120.6	120.6	120.6
Fisher Lake	15886.4	56.3	56.3	56.3
Fisher Lake	15830.1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Crystal River

Reach	River Sta.	Contr.	Expan.
Fisher Lake	18565.3	.1	.3
Fisher Lake	18386.1	.1	.3
Fisher Lake	17998.6	.1	.3
Fisher Lake	17886.9*	.1	.3
Fisher Lake	17775.3	.1	.3
Fisher Lake	17664.4*	.1	.3
Fisher Lake	17553.6	.1	.3
Fisher Lake	17492.4*	.1	.3
Fisher Lake	17431.2*	.1	.3
Fisher Lake	17370.0*	.1	.3
Fisher Lake	17308.8	.1	.3
Fisher Lake	17296.4	.1	.3
Fisher Lake	17288.0*	.1	.3
Fisher Lake	17264.7 Bridge		
Fisher Lake	17234.0*	.1	.3
Fisher Lake	17224.5	.1	.3
Fisher Lake	17166.3*	.1	.3
Fisher Lake	17108.2	.1	.3
Fisher Lake	17078.7*	.1	.3
Fisher Lake	17049.2	.1	.3
Fisher Lake	17006.4*	.1	.3
Fisher Lake	16963.7	.1	.3
Fisher Lake	16912.1*	.1	.3
Fisher Lake	16860.5	.1	.3
Fisher Lake	16807.7*	.1	.3
Fisher Lake	16755.0	.1	.3
Fisher Lake	16601.1	.1	.3
Fisher Lake	16480.4	.1	.3
Fisher Lake	16327.7	.1	.3
Fisher Lake	16204.0	.1	.3

Fisher Lake	16110.8	.1	.3
Fisher Lake	16007.0	.1	.3
Fisher Lake	15886.4	.1	.3
Fisher Lake	15830.1	.1	.3

HEC-RAS Plan: Proposed near Fisher Lake River: Crystal River Reach: Fisher Lake

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)	
Fisher Lake	18565.3	2 Year	70.00	586.80	589.36		589.36	0.000463	0.58	120.78	69.43	0.08
Fisher Lake	18565.3	50 Year	145.00	586.80	590.41		590.42	0.000413	0.75	195.03	72.35	0.08
Fisher Lake	18565.3	100 Year	165.00	586.80	590.66		590.67	0.000403	0.78	213.26	74.84	0.08
Fisher Lake	18565.3	500 Year	220.00	586.80	591.24		591.26	0.000398	0.87	258.67	80.79	0.08
Fisher Lake	18565.3	Base Flow	35.00	586.80	588.74		588.74	0.000471	0.45	78.05	66.35	0.07
Fisher Lake	18386.1	2 Year	70.00	587.06	589.27		589.28	0.000477	0.59	118.36	67.22	0.08
Fisher Lake	18386.1	50 Year	145.00	587.06	590.34		590.35	0.000426	0.77	190.69	68.70	0.08
Fisher Lake	18386.1	100 Year	165.00	587.06	590.59		590.60	0.000416	0.80	207.93	69.48	0.08
Fisher Lake	18386.1	500 Year	220.00	587.06	591.17		591.18	0.000414	0.90	249.05	71.40	0.08
Fisher Lake	18386.1	Base Flow	35.00	587.06	588.65		588.65	0.000476	0.45	76.98	64.44	0.07
Fisher Lake	17998.6	2 Year	70.00	586.65	589.10		589.11	0.000410	0.56	126.28	71.22	0.07
Fisher Lake	17998.6	50 Year	145.00	586.65	590.19		590.19	0.000366	0.72	204.52	73.26	0.07
Fisher Lake	17998.6	100 Year	165.00	586.65	590.44		590.45	0.000358	0.75	223.12	73.74	0.07
Fisher Lake	17998.6	500 Year	220.00	586.65	591.02		591.03	0.000359	0.84	266.51	74.85	0.08
Fisher Lake	17998.6	Base Flow	35.00	586.65	588.48		588.48	0.000403	0.42	82.58	67.88	0.07
Fisher Lake	17886.9*	2 Year	70.00	586.53	589.06		589.06	0.000413	0.55	128.20	74.57	0.07
Fisher Lake	17886.9*	50 Year	145.00	586.53	590.15		590.15	0.000353	0.70	210.78	77.06	0.07
Fisher Lake	17886.9*	100 Year	165.00	586.53	590.40		590.41	0.000343	0.73	230.45	77.72	0.07
Fisher Lake	17886.9*	500 Year	220.00	586.53	590.98		590.99	0.000341	0.82	276.38	79.91	0.08
Fisher Lake	17886.9*	Base Flow	35.00	586.53	588.43		588.44	0.000430	0.42	82.46	70.98	0.07
Fisher Lake	17775.3	2 Year	70.00	586.41	589.01		589.02	0.000415	0.54	130.29	78.24	0.07
Fisher Lake	17775.3	50 Year	145.00	586.41	590.11		590.11	0.000339	0.68	217.46	80.84	0.07
Fisher Lake	17775.3	100 Year	165.00	586.41	590.36		590.37	0.000328	0.71	238.25	82.00	0.07
Fisher Lake	17775.3	500 Year	220.00	586.41	590.95		590.96	0.000324	0.79	286.97	84.67	0.07
Fisher Lake	17775.3	Base Flow	35.00	586.41	588.38		588.39	0.000461	0.43	82.25	74.22	0.07
Fisher Lake	17664.4*	2 Year	70.00	586.34	588.95		588.96	0.000594	0.62	112.94	71.80	0.09
Fisher Lake	17664.4*	50 Year	145.00	586.34	590.06		590.07	0.000444	0.76	194.48	75.55	0.08
Fisher Lake	17664.4*	100 Year	165.00	586.34	590.32		590.33	0.000424	0.79	214.02	76.55	0.08
Fisher Lake	17664.4*	500 Year	220.00	586.34	590.90		590.92	0.000412	0.88	259.46	78.81	0.08
Fisher Lake	17664.4*	Base Flow	35.00	586.34	588.32		588.32	0.000741	0.51	68.47	67.16	0.09
Fisher Lake	17553.6	2 Year	70.00	586.28	588.88		588.88	0.000818	0.71	98.81	65.95	0.10
Fisher Lake	17553.6	50 Year	145.00	586.28	590.01		590.02	0.000564	0.85	175.48	69.84	0.09
Fisher Lake	17553.6	100 Year	165.00	586.28	590.27		590.28	0.000535	0.88	193.72	70.73	0.09
Fisher Lake	17553.6	500 Year	220.00	586.28	590.85		590.87	0.000515	0.98	235.77	72.75	0.09
Fisher Lake	17553.6	Base Flow	35.00	586.28	588.22		588.22	0.001172	0.61	57.01	59.78	0.11
Fisher Lake	17492.4*	2 Year	70.00	586.16	588.82		588.83	0.000846	0.74	95.30	61.61	0.10
Fisher Lake	17492.4*	50 Year	145.00	586.16	589.97		589.98	0.000592	0.88	170.74	71.19	0.09
Fisher Lake	17492.4*	100 Year	165.00	586.16	590.23		590.24	0.000563	0.92	189.68	73.81	0.09
Fisher Lake	17492.4*	500 Year	220.00	586.16	590.82		590.83	0.000542	1.01	234.75	79.70	0.09
Fisher Lake	17492.4*	Base Flow	35.00	586.16	588.14		588.15	0.001265	0.64	54.82	57.45	0.12
Fisher Lake	17431.2*	2 Year	70.00	586.04	588.77		588.78	0.000895	0.77	91.27	57.82	0.11
Fisher Lake	17431.2*	50 Year	145.00	586.04	589.93		589.94	0.000637	0.93	162.22	67.77	0.10
Fisher Lake	17431.2*	100 Year	165.00	586.04	590.19		590.21	0.000608	0.96	180.77	74.20	0.10
Fisher Lake	17431.2*	500 Year	220.00	586.04	590.78		590.80	0.000588	1.06	230.63	95.11	0.10
Fisher Lake	17431.2*	Base Flow	35.00	586.04	588.06		588.07	0.001341	0.67	52.20	53.13	0.12
Fisher Lake	17370.0*	2 Year	70.00	585.92	588.71		588.72	0.000984	0.82	86.34	54.35	0.11
Fisher Lake	17370.0*	50 Year	145.00	585.92	589.89		589.90	0.000696	0.98	155.98	67.04	0.10
Fisher Lake	17370.0*	100 Year	165.00	585.92	590.15		590.17	0.000663	1.01	174.52	73.19	0.10
Fisher Lake	17370.0*	500 Year	220.00	585.92	590.74		590.76	0.000638	1.12	226.82	116.81	0.10
Fisher Lake	17370.0*	Base Flow	35.00	585.92	587.98		587.98	0.001505	0.72	48.70	48.73	0.13
Fisher Lake	17308.8	2 Year	70.00	585.80	588.65		588.66	0.001133	0.88	80.52	55.05	0.12
Fisher Lake	17308.8	50 Year	145.00	585.80	589.84		589.86	0.000750	1.02	156.56	66.44	0.11
Fisher Lake	17308.8	100 Year	165.00	585.80	590.11		590.13	0.000711	1.06	175.52	86.86	0.11
Fisher Lake	17308.8	500 Year	220.00	585.80	590.70		590.72	0.000657	1.14	260.12	202.69	0.10
Fisher Lake	17308.8	Base Flow	35.00	585.80	587.87		587.88	0.001819	0.79	44.20	44.08	0.14
Fisher Lake	17296.4	2 Year	70.00	585.54	588.62		588.64	0.001176	1.10	66.84	33.31	0.13
Fisher Lake	17296.4	50 Year	145.00	585.54	589.81		589.85	0.001209	1.48	110.76	41.29	0.14
Fisher Lake	17296.4	100 Year	165.00	585.54	590.08		590.11	0.001211	1.55	121.97	43.36	0.14
Fisher Lake	17296.4	500 Year	220.00	585.54	590.66		590.71	0.001290	1.76	148.68	48.16	0.15
Fisher Lake	17296.4	Base Flow	35.00	585.54	587.85		587.87	0.001158	0.84	42.53	29.89	0.12
Fisher Lake	17288.0*	2 Year	70.00	585.41	588.62	586.65	588.63	0.000972	1.03	71.63	34.31	0.12
Fisher Lake	17288.0*	50 Year	145.00	585.41	589.81	587.10	589.83	0.001042	1.39	116.92	42.24	0.13
Fisher Lake	17288.0*	100 Year	165.00	585.41	590.07	587.20	590.10	0.001050	1.47	128.37	44.15	0.13
Fisher Lake	17288.0*	500 Year	220.00	585.41	590.65	587.45	590.70	0.001132	1.67	155.49	48.91	0.14

HEC-RAS Plan: Proposed near Fisher Lake River: Crystal River Reach: Fisher Lake (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Fisher Lake	17288.0*	Base Flow	35.00	585.41	587.85	586.36	587.86	0.000903	0.77	46.52	30.98	0.11
Fisher Lake	17264.7		Bridge									
Fisher Lake	17234.0*	2 Year	70.00	584.60	587.75		587.76	0.001034	0.97	73.24	37.32	0.12
Fisher Lake	17234.0*	50 Year	145.00	584.60	588.88		588.90	0.001034	1.30	117.57	41.26	0.13
Fisher Lake	17234.0*	100 Year	165.00	584.60	589.14		589.16	0.001031	1.36	128.32	42.17	0.13
Fisher Lake	17234.0*	500 Year	220.00	584.60	589.71		589.74	0.001090	1.55	154.60	54.54	0.14
Fisher Lake	17234.0*	Base Flow	35.00	584.60	587.11		587.11	0.000885	0.70	49.87	35.30	0.10
Fisher Lake	17224.5	2 Year	70.00	584.46	587.74		587.75	0.000838	0.90	78.89	38.23	0.11
Fisher Lake	17224.5	50 Year	145.00	584.46	588.87		588.89	0.000885	1.22	123.89	41.49	0.12
Fisher Lake	17224.5	100 Year	165.00	584.46	589.13		589.15	0.000889	1.29	134.92	46.07	0.12
Fisher Lake	17224.5	500 Year	220.00	584.46	589.70		589.73	0.000947	1.47	166.47	64.73	0.13
Fisher Lake	17224.5	Base Flow	35.00	584.46	587.10		587.11	0.000671	0.64	54.89	36.47	0.09
Fisher Lake	17166.3*	2 Year	70.00	585.18	587.69		587.70	0.000888	0.84	84.70	48.02	0.11
Fisher Lake	17166.3*	50 Year	145.00	585.18	588.83		588.84	0.000764	1.07	151.86	77.19	0.11
Fisher Lake	17166.3*	100 Year	165.00	585.18	589.09		589.11	0.000733	1.11	172.56	81.74	0.11
Fisher Lake	17166.3*	500 Year	220.00	585.18	589.66		589.68	0.000720	1.22	221.49	89.59	0.11
Fisher Lake	17166.3*	Base Flow	35.00	585.18	587.05		587.06	0.000884	0.64	54.95	45.16	0.10
Fisher Lake	17108.2	2 Year	70.00	585.90	587.64		587.65	0.001122	0.84	92.29	78.05	0.12
Fisher Lake	17108.2	50 Year	145.00	585.90	588.79		588.80	0.000647	0.92	199.01	101.12	0.10
Fisher Lake	17108.2	100 Year	165.00	585.90	589.05		589.06	0.000596	0.94	225.99	104.47	0.10
Fisher Lake	17108.2	500 Year	220.00	585.90	589.63		589.64	0.000553	1.02	288.08	111.79	0.10
Fisher Lake	17108.2	Base Flow	35.00	585.90	586.98		586.99	0.001786	0.74	48.57	58.12	0.14
Fisher Lake	17078.7*	2 Year	70.00	585.62	587.59		587.61	0.001476	1.00	80.58	72.84	0.14
Fisher Lake	17078.7*	50 Year	145.00	585.62	588.76		588.78	0.000832	1.07	191.99	110.16	0.11
Fisher Lake	17078.7*	100 Year	165.00	585.62	589.03		589.04	0.000754	1.08	221.77	114.76	0.11
Fisher Lake	17078.7*	500 Year	220.00	585.62	589.61		589.62	0.000677	1.15	290.64	123.83	0.11
Fisher Lake	17078.7*	Base Flow	35.00	585.62	586.92		586.93	0.002221	0.87	41.14	46.92	0.15
Fisher Lake	17049.2	2 Year	70.00	585.35	587.53		587.55	0.002364	1.31	65.22	65.91	0.17
Fisher Lake	17049.2	50 Year	145.00	585.35	588.73		588.75	0.001178	1.31	186.75	126.58	0.13
Fisher Lake	17049.2	100 Year	165.00	585.35	589.00		589.02	0.001032	1.30	222.09	136.02	0.13
Fisher Lake	17049.2	500 Year	220.00	585.35	589.58		589.60	0.000850	1.32	302.58	140.24	0.12
Fisher Lake	17049.2	Base Flow	35.00	585.35	586.83		586.85	0.003504	1.14	31.52	33.66	0.19
Fisher Lake	17006.4*	2 Year	70.00	585.40	587.45		587.47	0.001628	1.08	76.15	64.87	0.14
Fisher Lake	17006.4*	50 Year	145.00	585.40	588.69		588.71	0.000909	1.16	182.77	109.55	0.12
Fisher Lake	17006.4*	100 Year	165.00	585.40	588.96		588.98	0.000819	1.16	213.70	116.38	0.11
Fisher Lake	17006.4*	500 Year	220.00	585.40	589.55		589.57	0.000730	1.23	286.09	129.71	0.11
Fisher Lake	17006.4*	Base Flow	35.00	585.40	586.69		586.71	0.002992	1.00	36.06	41.05	0.18
Fisher Lake	16963.7	2 Year	70.00	585.45	587.40		587.41	0.001103	0.89	91.34	69.40	0.12
Fisher Lake	16963.7	50 Year	145.00	585.45	588.66		588.67	0.000652	0.99	196.95	98.12	0.10
Fisher Lake	16963.7	100 Year	165.00	585.45	588.93		588.95	0.000609	1.01	225.42	109.59	0.10
Fisher Lake	16963.7	500 Year	220.00	585.45	589.52		589.54	0.000564	1.09	293.65	120.14	0.10
Fisher Lake	16963.7	Base Flow	35.00	585.45	586.58		586.59	0.002469	0.88	42.10	50.91	0.16
Fisher Lake	16912.1*	2 Year	70.00	584.96	587.35		587.36	0.000881	0.89	92.05	65.73	0.11
Fisher Lake	16912.1*	50 Year	145.00	584.96	588.62		588.64	0.000629	1.04	189.74	89.76	0.10
Fisher Lake	16912.1*	100 Year	165.00	584.96	588.90		588.92	0.000601	1.07	215.70	97.54	0.10
Fisher Lake	16912.1*	500 Year	220.00	584.96	589.49		589.51	0.000590	1.18	285.76	130.02	0.10
Fisher Lake	16912.1*	Base Flow	35.00	584.96	586.48		586.49	0.001434	0.79	45.82	41.28	0.13
Fisher Lake	16860.5	2 Year	70.00	584.48	587.30		587.32	0.000779	0.92	91.12	60.86	0.11
Fisher Lake	16860.5	50 Year	145.00	584.48	588.59		588.61	0.000647	1.12	186.33	98.46	0.10
Fisher Lake	16860.5	100 Year	165.00	584.48	588.87		588.88	0.000623	1.16	215.59	111.58	0.10
Fisher Lake	16860.5	500 Year	220.00	584.48	589.46		589.48	0.000613	1.26	290.69	133.78	0.10
Fisher Lake	16860.5	Base Flow	35.00	584.48	586.42		586.43	0.000977	0.76	48.27	36.43	0.11
Fisher Lake	16807.7*	2 Year	70.00	584.14	587.27		587.28	0.000580	0.81	96.11	61.90	0.09
Fisher Lake	16807.7*	50 Year	145.00	584.14	588.56		588.57	0.000491	0.98	205.20	103.34	0.09
Fisher Lake	16807.7*	100 Year	165.00	584.14	588.84		588.85	0.000483	1.02	237.12	124.84	0.09
Fisher Lake	16807.7*	500 Year	220.00	584.14	589.43		589.45	0.000474	1.11	314.54	137.07	0.09
Fisher Lake	16807.7*	Base Flow	35.00	584.14	586.38		586.39	0.000678	0.64	55.27	39.50	0.09
Fisher Lake	16755.0	2 Year	70.00	583.80	587.23		587.24	0.000808	0.70	104.40	51.26	0.08
Fisher Lake	16755.0	50 Year	145.00	583.80	588.53		588.54	0.000734	0.88	212.11	112.28	0.08
Fisher Lake	16755.0	100 Year	165.00	583.80	588.81		588.82	0.000711	0.91	245.56	126.41	0.08
Fisher Lake	16755.0	500 Year	220.00	583.80	589.40		589.42	0.000694	0.98	326.23	141.35	0.08
Fisher Lake	16755.0	Base Flow	35.00	583.80	586.34		586.35	0.000893	0.55	63.74	40.36	0.08

HEC-RAS Plan: Proposed near Fisher Lake River: Crystal River Reach: Fisher Lake (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Fisher Lake	16601.1	2 Year	70.00	583.61	587.08		587.09	0.001222	0.81	87.16	43.98	0.09
Fisher Lake	16601.1	50 Year	145.00	583.61	588.40		588.42	0.000935	0.95	203.29	127.49	0.09
Fisher Lake	16601.1	100 Year	165.00	583.61	588.69		588.70	0.000865	0.97	245.20	163.91	0.09
Fisher Lake	16601.1	500 Year	220.00	583.61	589.29		589.30	0.000763	1.00	365.22	225.66	0.08
Fisher Lake	16601.1	Base Flow	35.00	583.61	586.18		586.19	0.001211	0.64	54.53	33.39	0.09
Fisher Lake	16480.4	2 Year	70.00	583.93	586.90		586.91	0.001858	0.86	80.96	44.10	0.11
Fisher Lake	16480.4	50 Year	145.00	583.93	588.27		588.28	0.001366	0.97	150.18	58.48	0.10
Fisher Lake	16480.4	100 Year	165.00	583.93	588.56		588.58	0.001285	0.99	168.33	64.16	0.10
Fisher Lake	16480.4	500 Year	220.00	583.93	589.17		589.19	0.001233	1.08	221.48	134.07	0.10
Fisher Lake	16480.4	Base Flow	35.00	583.93	585.99		586.00	0.002035	0.76	46.28	33.03	0.11
Fisher Lake	16327.7	2 Year	70.00	583.66	586.66		586.67	0.001414	0.81	86.32	42.13	0.10
Fisher Lake	16327.7	50 Year	145.00	583.66	588.09		588.10	0.001018	0.96	157.56	58.60	0.09
Fisher Lake	16327.7	100 Year	165.00	583.66	588.39		588.41	0.000978	1.00	175.94	62.21	0.09
Fisher Lake	16327.7	500 Year	220.00	583.66	589.00		589.02	0.001014	1.13	216.02	69.65	0.10
Fisher Lake	16327.7	Base Flow	35.00	583.66	585.69		585.70	0.001952	0.72	48.49	36.13	0.11
Fisher Lake	16204.0	2 Year	70.00	583.36	586.49		586.50	0.001202	0.87	85.98	39.92	0.10
Fisher Lake	16204.0	50 Year	145.00	583.36	587.96		587.97	0.001051	1.10	153.21	54.99	0.10
Fisher Lake	16204.0	100 Year	165.00	583.36	588.26		588.28	0.001040	1.15	170.89	60.03	0.10
Fisher Lake	16204.0	500 Year	220.00	583.36	588.86		588.88	0.001146	1.32	210.06	71.84	0.10
Fisher Lake	16204.0	Base Flow	35.00	583.36	585.46		585.47	0.001792	0.75	47.41	34.48	0.11
Fisher Lake	16110.8	2 Year	70.00	582.46	586.39		586.40	0.000950	0.85	90.76	38.11	0.09
Fisher Lake	16110.8	50 Year	145.00	582.46	587.86		587.88	0.000982	1.13	153.92	51.06	0.09
Fisher Lake	16110.8	100 Year	165.00	582.46	588.16		588.18	0.001043	1.22	176.34	86.39	0.10
Fisher Lake	16110.8	500 Year	220.00	582.46	588.75		588.78	0.001109	1.36	230.52	96.87	0.10
Fisher Lake	16110.8	Base Flow	35.00	582.46	585.33		585.34	0.001115	0.69	52.94	32.33	0.09
Fisher Lake	16007.0	2 Year	70.00	582.37	586.28		586.29	0.001206	0.89	82.02	69.03	0.10
Fisher Lake	16007.0	50 Year	145.00	582.37	587.75		587.77	0.001158	1.17	147.80	140.63	0.10
Fisher Lake	16007.0	100 Year	165.00	582.37	588.05		588.07	0.001089	1.19	207.63	214.70	0.10
Fisher Lake	16007.0	500 Year	220.00	582.37	588.66		588.67	0.000904	1.18	338.92	220.54	0.09
Fisher Lake	16007.0	Base Flow	35.00	582.37	585.19		585.20	0.001606	0.76	46.26	29.72	0.10
Fisher Lake	15886.4	2 Year	70.00	582.07	586.15		586.16	0.000987	0.85	86.18	37.47	0.09
Fisher Lake	15886.4	50 Year	145.00	582.07	587.62		587.64	0.000976	1.11	163.67	83.85	0.09
Fisher Lake	15886.4	100 Year	165.00	582.07	587.93		587.95	0.000969	1.16	197.01	157.28	0.09
Fisher Lake	15886.4	500 Year	220.00	582.07	588.54		588.56	0.000913	1.22	296.09	165.24	0.09
Fisher Lake	15886.4	Base Flow	35.00	582.07	585.03		585.04	0.001115	0.69	50.81	26.85	0.09
Fisher Lake	15830.1	2 Year	70.00	581.60	586.10	582.97	586.11	0.000800	0.76	97.54	41.60	0.08
Fisher Lake	15830.1	50 Year	145.00	581.60	587.57	583.51	587.59	0.000801	1.00	171.26	64.32	0.08
Fisher Lake	15830.1	100 Year	165.00	581.60	587.88	583.63	587.90	0.000801	1.05	197.53	139.26	0.09
Fisher Lake	15830.1	500 Year	220.00	581.60	588.50	583.93	588.51	0.000801	1.14	291.63	156.08	0.09
Fisher Lake	15830.1	Base Flow	35.00	581.60	584.98	582.62	584.98	0.000800	0.62	57.54	29.59	0.07

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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: Outlet Channel Tucker Lake at CR 675
Project File : 2020430002_TuckerLake.prj
Run Date and Time: 1/4/2022 10:02:44 AM

Project in English units

Project Description:
HEC-RAS model analyzes the outlet channel from Tucker Lake for the channel reach for the waterway crossing under CR 675. The model begins 236 feet downstream of CR 675 and ends 616' upstream of CR 675.

Energy slope for
starting water surface elevations is slope=(597.0-592.66)/(20917.3-20065.5) = 0.0051 ft/ft

PLAN DATA

Plan Title: Proposed Conditions w Alum Box Culvert
Plan File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR 675\2020430002_TuckerLake.p04

Geometry Title: Proposed Conditions Alum Box Culvert
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR 675\2020430002_TuckerLake.g04

Flow Title : Outlet Channel Tucker Lake
Flow File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker

Lake at CR 675\2020430002_TuckerLake.f01

Plan Summary Information:
Number of: Cross Sections =   13   Multiple Openings =   0
            Culverts   =   1   Inline Structures =   0
            Bridges   =   0   Lateral Structures =   0

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

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

FLOW DATA

Flow Title: Outlet Channel Tucker Lake
Flow File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR 675\2020430002_TuckerLake.f01

Flow Data (cfs)

River	Reach	RS	Base	2 Year	50 Year	100 Year	500 Year
Outlet Channel	DS Tucker Lake	20917.3	3	4	38	63	123

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Outlet Channel	DS Tucker Lake	Base	Normal S = 0.0051	
Outlet Channel	DS Tucker Lake	2 Year	Normal S = 0.0051	

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  Outlet Channel  DS Tucker Lake  50 Year
Normal S = 0.0051
  Outlet Channel  DS Tucker Lake  100 Year
Normal S = 0.0051




GEOMETRY DATA

Geometry Title: Proposed Conditions Alum Box Culvert
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR
675\2020430002_TuckerLake.g04

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20917.3

INPUT
Description: XSEC 206 (STA. 209+17.3)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -725.12  599.37 -651.62  599.02 -545.57  599.04 -458.81   598.8  -368.3  598.88
 -293.08  598.43 -226.08  598.26 -150.38  597.95   -91.4  597.78  -51.85  597.59
  -25.01   597.6  -15.69     597     -11   596.5     1.5   596.3    14.5   596.5
    19.6     597   32.22  597.99   32.23     600

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -725.12     .15  -25.01     .06   32.22     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.01   32.22               78      78      78             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20839.3*

INPUT
Description: Interpolated Section 7
Station Elevation Data    num=      28
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -591.11  600.27  -531.1  599.09 -515.73  598.85 -444.52  598.77 -373.68  598.52
  -372.8  598.52 -299.78  598.54 -238.37   598.2 -224.04  598.17 -183.67  598.07
 -141.26  597.91 -121.86  597.84   -73.7  597.73  -69.63  597.71  -41.41  597.62
```

```
   -19.5  597.65  -18.63  597.09  -15.97   596.9  -10.88  596.58   -9.37  596.43
   -6.54  596.24     -.5  596.22    5.02  596.02   15.14  596.37   19.12   596.8
   19.93  596.87   28.95  597.87   28.96  600.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -591.11     .15   -19.5     .06   28.95     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -19.5   28.95               78      78      78             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20761.3*

INPUT
Description: Interpolated Section 6
Station Elevation Data    num=      28
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -457.11  601.18 -410.59  599.15 -398.67  598.67 -343.47   598.5 -288.55  598.24
 -287.87  598.24 -231.27  598.19 -183.66  597.98 -172.55  597.95 -141.25  597.88
 -108.38  597.78  -93.34  597.74  -56.01  597.67  -52.85  597.67  -30.98  597.66
  -13.99   597.7  -13.19  596.65  -10.74  596.44   -6.07  596.15   -4.69  596.04
   -2.09  595.98    3.46  596.05    8.53  595.73   15.79  596.25   18.63  596.59
   19.21  596.65   25.67  597.75   25.68  601.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -457.11     .15  -13.99     .06   25.67     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -13.99   25.67               78      78      78             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20683.3

INPUT
Description: XSEC 205 (STA. 206+83.3)
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -323.1  602.08 -281.61  598.49 -202.94  597.96 -121.06  597.73   -75.5  597.64
  -36.07  597.62   -8.48  597.75   -7.75   596.2   -5.52  595.99       0  595.65
    7.43  595.87   12.05  595.45    18.5  596.44    22.4  597.63   22.41     602

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
  -323.1     .15   -8.48     .06    22.4     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -8.48    22.4             83.28   83.28   83.28             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20600.0*

INPUT
Description: Interpolated Section 5
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -295.39  601.89 -257.98  599.18  -257.9  599.18 -229.71   598.3 -197.27  597.97
 -187.05  597.91 -117.11  597.72 -113.21   597.7  -72.13  597.53  -49.39  597.46
  -36.58  597.36   -11.7  597.28  -10.97  595.84  -10.45  595.61   -8.71  595.44
   -3.14     595   -2.61     595    4.37  595.09       7  594.88    9.04  594.62
   10.48  594.89   13.17  595.24   16.03  595.77   16.64  595.88   21.23  597.14
   22.05  600.97   22.05  601.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -295.39     .15   -11.7     .06   21.23     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -11.7   21.23             83.28   83.28   83.28             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20516.7*

INPUT
Description: Interpolated Section 4
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -267.68   601.7 -234.35  599.88 -234.28  599.87 -209.16  598.32 -180.26  597.91
 -171.15  597.87 -108.84  597.71 -105.37  597.68  -68.77  597.41   -48.5  597.28
  -37.09  597.09  -14.93   596.8  -14.18  595.48  -13.66  595.08   -11.9  594.88
   -6.27  594.36   -5.74  594.33    1.31   594.3    3.97  594.13    6.03  593.79
    7.69  594.13   10.78  594.49   14.07  595.18   14.77  595.32   20.06  596.65
   21.68  599.95   21.69   601.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -267.68     .15  -14.93     .06   20.06     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -14.93   20.06            83.28   83.28   83.28             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20433.4*

INPUT
Description: Interpolated Section 3
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -239.98  601.51 -210.72  600.57 -210.66  600.57 -188.62  598.35 -163.25  597.85
 -155.26  597.82 -100.57  597.69  -97.52  597.65   -65.4   597.3  -47.62  597.11
   -37.6  596.83  -18.15  596.32   -17.4  595.12  -16.87  594.54   -15.1  594.33
   -9.41  593.71   -8.87  593.67   -1.75  593.52     .93  593.38    3.01  592.96
    4.89  593.38    8.39  593.75   12.12  594.59   12.91  594.76   18.89  596.15
   21.32  598.94   21.33  601.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -239.98     .15  -18.15     .06   18.89     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -18.15   18.89            83.27   83.27   83.27             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
 -239.98    -138     601       F

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20350.2

INPUT
Description: XSEC 204 (STA. 203+50.2)
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -212.27  601.32 -187.04  601.26 -168.07  598.37 -146.24  597.79   -92.3  597.67
  -46.73  596.94  -21.37  595.85  -20.08     594     -12     593    -2.1  592.63
       0  592.13     2.1  592.63       6     593   10.16     594   17.72  595.66
   20.96  597.92   20.97     601

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -212.27     .15  -21.37     .06   17.72     .15
```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-21.37 17.72 25.2 25.2 25.2 .1 .3

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20325.0*

INPUT
Description: US Face of Culvert (Interpolated Section 2)
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-209.2	601.16	-187.92	600.93	-184.11	600.75	-177.14	599.62	-165.24	598.16
-153.85	597.87	-143.53	597.66	-105.36	597.61	-89.88	597.56	-55.15	597.08
-44.56	596.93	-19.34	596.05	-18.99	595.52	-11	595	-7	593
-2	593	3	593	7	595	12.49	594.86	17.65	595.89
20.76	597.05	24.35	598.07	24.37	600.43	24.37	601		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-209.2	.15	-19.34	.06	17.65	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-19.34 17.65 47 47 47 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-209.2	-10.25	601	F
6.25	24.37	601	F

CULVERT

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20301.5

INPUT
Description: Single Pipe Culvert along CR 675 at Outlet Channel Tucker Lake
Distance from Upstream XS = 7.5
Deck/Roadway Width = 30
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 15

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-250.3	602.07		-198.7	601.83		-148.2	601.56	
-99.7	601.29		-64.06	601.09		-14.06	600.81	
-9.88	600.79		-9.87	600.79		5.8	600.7	
5.81	600.7		30.69	600.56		109.26	600.88	
150.2	601.22		199.6	601.6		249.9	601.89	

Upstream Bridge Cross Section Data
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-209.2	601.16	-187.92	600.93	-184.11	600.75	-177.14	599.62	-165.24	598.16
-153.85	597.87	-143.53	597.66	-105.36	597.61	-89.88	597.56	-55.15	597.08
-44.56	596.93	-19.34	596.05	-18.99	595.52	-11	595	-7	593
-2	593	3	593	7	595	12.49	594.86	17.65	595.89
20.76	597.05	24.35	598.07	24.37	600.43	24.37	601		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-209.2	.15	-19.34	.05	17.65	.15

Bank Sta: Left Right Coeff Contr. Expan.
-19.34 17.65 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-209.2	-10.25	601	F
6.25	24.37	601	F

Downstream Deck/Roadway Coordinates
num= 15

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-250.3	602.07		-198.7	601.83		-148.2	601.56	
-99.7	601.29		-64.06	601.09		-14.06	600.81	
-9.88	600.79		-9.87	600.79		5.8	600.7	
5.81	600.7		30.69	600.56		109.26	600.88	
150.2	601.22		199.6	601.6		249.9	601.89	

Downstream Bridge Cross Section Data
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-203.7	600.87	-182.63	600.31	-178.85	599.83	-171.95	598.58	-160.17	597.78
-148.89	597.51	-138.67	597.43	-100.87	597.43	-85.55	597.36	-51.16	597.04
-40.67	596.92	-15.7	596.4	-15.39	595.91	-11	595	-7	593
-2	593	3	593	7	595	10.79	594.96	12.74	595.54
17.51	596.31	23.52	597.65	30.43	598.35	30.47	599.42	30.47	601

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-203.7	.15	-15.7	.05	17.51	.15

Bank Sta: Left Right Coeff Contr. Expan.
-15.7 17.51 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-203.7	-10.25	601	F
6.25	30.47	601	F

Upstream Embankment side slope = 2 horiz. to 1.0 vertical

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

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1  Conspan Arch    6.67    16.5
FHWA Chart # 60- Span/Rise ratio approximate 2:1
FHWA Scale # 1 - 0 degree wing wall angle
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 1      45     .024     .024        1                   .5
      1
Upstream   Elevation =  592.04
           Centerline Station = -2
Downstream Elevation =  592.04
           Centerline Station = -2

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20278.0*

INPUT
Description: DS Face of Culvert (Interpolated Section 1)
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -203.7  600.87 -182.63  600.31 -178.85  599.83 -171.95  598.58 -160.17  597.78
 -148.89  597.51 -138.67  597.43 -100.87  597.43  -85.55  597.36  -51.16  597.04
  -40.67  596.92   -15.7   596.4  -15.39  595.91     -11     595      -7     593
      -2     593       3     593       7     595   10.79  594.96   12.74  595.54
   17.51  596.31   23.52  597.65   30.43  598.35   30.47  599.42   30.47     601

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -203.7     .15   -15.7     .06   17.51     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -15.7   17.51             39.8    39.8    39.8             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -203.7  -10.25     601       F
    6.25   30.47     601       F
```

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20238.2

INPUT
Description: XSEC 203 (STA. 202+38.2)
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-199.16	600.63	-178.26	599.8	-167.67	597.73	-144.8	597.22	-97.17	597.28
-47.86	597	-12.69	596.69	-12.42	596.22	-11.64	595.14	-6.6	594.48
-4.4	593.95	0	593.85	2.7	593.59	6	594.73	9.72	594.99
12.95	596.1	17.4	596.65	25.79	598.15	35.51	598.58	35.51	601

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-199.16	.15	-12.69	.06	17.4	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-12.69	17.4	67.4	67.4	.1	.3

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20170.8

INPUT
Description: XSEC 202 (STA. 201+70.8)
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-418.05	602.25	-315.83	601.14	-219.74	601.56	-170.3	598.8	-128.2	597.13
-57.34	596.93	-13.09	597.26	-10.87	596.58	-7.7	594.87	-5.2	593.5
-4.21	593.08	4	593.5	10.89	594.92	14.18	596.54	21.55	597.86
38.06	597.83	88.13	598.09	144.99	600.06	195.67	600.03	250.78	600.74
334.67	603.86								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-418.05	.15	-13.09	.06	21.55	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-13.09	21.55	105.3	105.3	.1	.3

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20065.5

INPUT
Description: XSEC 201 (STA. 200+65.5)
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-363.15	600.85	-286.31	597.44	-232.33	597.33	-163.17	598.42	-119.93	596.85
-59.81	597.14	-13.39	596.38	-8.75	592.66	-2	592.8	2	593
5.86	595.26	11.86	594.89	15.69	594.4	18.49	596.3	25.68	598.33
53.5	596.75	96.67	597.48	158.02	600.34	217.6	602.19	313.13	603.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-363.15	.15	-13.39	.06	18.49	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-13.39	18.49	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Outlet Channel

Reach	River Sta.	n1	n2	n3
DS Tucker Lake	20917.3	.15	.06	.15
DS Tucker Lake	20839.3*	.15	.06	.15
DS Tucker Lake	20761.3*	.15	.06	.15
DS Tucker Lake	20683.3	.15	.06	.15
DS Tucker Lake	20600.0*	.15	.06	.15
DS Tucker Lake	20516.7*	.15	.06	.15
DS Tucker Lake	20433.4*	.15	.06	.15
DS Tucker Lake	20350.2	.15	.06	.15
DS Tucker Lake	20325.0*	.15	.06	.15
DS Tucker Lake	20301.5	Culvert		
DS Tucker Lake	20278.0*	.15	.06	.15
DS Tucker Lake	20238.2	.15	.06	.15
DS Tucker Lake	20170.8	.15	.06	.15
DS Tucker Lake	20065.5	.15	.06	.15

SUMMARY OF REACH LENGTHS

River: Outlet Channel

Reach	River Sta.	Left	Channel	Right
DS Tucker Lake	20917.3	78	78	78

DS Tucker Lake	20839.3*	78	78	78
DS Tucker Lake	20761.3*	78	78	78
DS Tucker Lake	20683.3	83.28	83.28	83.28
DS Tucker Lake	20600.0*	83.28	83.28	83.28
DS Tucker Lake	20516.7*	83.28	83.28	83.28
DS Tucker Lake	20433.4*	83.27	83.27	83.27
DS Tucker Lake	20350.2	25.2	25.2	25.2
DS Tucker Lake	20325.0*	47	47	47
DS Tucker Lake	20301.5	Culvert		
DS Tucker Lake	20278.0*	39.8	39.8	39.8
DS Tucker Lake	20238.2	67.4	67.4	67.4
DS Tucker Lake	20170.8	105.3	105.3	105.3
DS Tucker Lake	20065.5	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Outlet Channel

Reach	River Sta.	Contr.	Expan.
DS Tucker Lake	20917.3	.1	.3
DS Tucker Lake	20839.3*	.1	.3
DS Tucker Lake	20761.3*	.1	.3
DS Tucker Lake	20683.3	.1	.3
DS Tucker Lake	20600.0*	.1	.3
DS Tucker Lake	20516.7*	.1	.3
DS Tucker Lake	20433.4*	.1	.3
DS Tucker Lake	20350.2	.1	.3
DS Tucker Lake	20325.0*	.3	.5
DS Tucker Lake	20301.5	Culvert	
DS Tucker Lake	20278.0*	.3	.5
DS Tucker Lake	20238.2	.1	.3
DS Tucker Lake	20170.8	.1	.3
DS Tucker Lake	20065.5	.1	.3

HEC-RAS Plan: Existing River: Outlet Channel Reach: DS Tucker Lake

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)	
DS Tucker Lake	20917.3	Base	3.00	596.30	596.83		596.83	0.002084	0.25	11.93	31.90	0.07
DS Tucker Lake	20917.3	2 Year	4.00	596.30	596.90		596.90	0.002090	0.28	14.44	33.40	0.07
DS Tucker Lake	20917.3	50 Year	38.00	596.30	599.39		599.39	0.000042	0.13	719.61	757.35	0.01
DS Tucker Lake	20917.3	100 Year	63.00	596.30	601.02		601.02	0.000006	0.07	1954.56	757.35	0.01
DS Tucker Lake	20917.3	500 Year	123.00	596.30	601.17		601.17	0.000020	0.13	2066.42	757.35	0.01
DS Tucker Lake	20839.3*	Base	3.00	596.02	596.68		596.68	0.001741	0.24	12.35	30.37	0.07
DS Tucker Lake	20839.3*	2 Year	4.00	596.02	596.75		596.75	0.001944	0.28	14.52	32.12	0.07
DS Tucker Lake	20839.3*	50 Year	38.00	596.02	599.39		599.39	0.000036	0.13	693.56	575.35	0.01
DS Tucker Lake	20839.3*	100 Year	63.00	596.02	601.02		601.02	0.000008	0.08	1686.51	620.07	0.01
DS Tucker Lake	20839.3*	500 Year	123.00	596.02	601.17		601.17	0.000025	0.15	1777.38	620.07	0.01
DS Tucker Lake	20761.3*	Base	3.00	595.73	596.58		596.58	0.000968	0.20	14.82	30.82	0.05
DS Tucker Lake	20761.3*	2 Year	4.00	595.73	596.62		596.62	0.001322	0.25	16.24	31.77	0.06
DS Tucker Lake	20761.3*	50 Year	38.00	595.73	599.39		599.39	0.000037	0.14	630.14	441.72	0.01
DS Tucker Lake	20761.3*	100 Year	63.00	595.73	601.02		601.02	0.000011	0.10	1383.07	479.19	0.01
DS Tucker Lake	20761.3*	500 Year	123.00	595.73	601.17		601.17	0.000035	0.18	1452.74	482.52	0.01
DS Tucker Lake	20683.3	Base	3.00	595.45	596.53		596.53	0.000392	0.16	18.43	26.70	0.03
DS Tucker Lake	20683.3	2 Year	4.00	595.45	596.55		596.55	0.000631	0.21	19.02	26.78	0.04
DS Tucker Lake	20683.3	50 Year	38.00	595.45	599.38		599.38	0.000046	0.16	519.70	314.35	0.02
DS Tucker Lake	20683.3	100 Year	63.00	595.45	601.02		601.02	0.000016	0.12	1049.91	333.28	0.01
DS Tucker Lake	20683.3	500 Year	123.00	595.45	601.16		601.16	0.000054	0.23	1097.53	334.93	0.02
DS Tucker Lake	20600.0*	Base	3.00	594.62	596.52		596.52	0.000039	0.08	38.85	30.30	0.01
DS Tucker Lake	20600.0*	2 Year	4.00	594.62	596.54		596.54	0.000067	0.10	39.36	30.37	0.02
DS Tucker Lake	20600.0*	50 Year	38.00	594.62	599.38		599.38	0.000034	0.15	514.30	282.47	0.01
DS Tucker Lake	20600.0*	100 Year	63.00	594.62	601.02		601.02	0.000015	0.13	996.20	305.44	0.01
DS Tucker Lake	20600.0*	500 Year	123.00	594.62	601.16		601.16	0.000052	0.24	1038.88	307.36	0.02
DS Tucker Lake	20516.7*	Base	3.00	593.79	596.52	594.24	596.52	0.000009	0.05	62.87	34.32	0.01
DS Tucker Lake	20516.7*	2 Year	4.00	593.79	596.54	594.33	596.54	0.000016	0.06	63.42	34.39	0.01
DS Tucker Lake	20516.7*	50 Year	38.00	593.79	599.38	594.75	599.38	0.000025	0.14	490.23	247.72	0.01
DS Tucker Lake	20516.7*	100 Year	63.00	593.79	601.02	594.94	601.02	0.000014	0.13	945.84	276.90	0.01
DS Tucker Lake	20516.7*	500 Year	123.00	593.79	601.16	595.27	601.16	0.000049	0.25	983.73	279.40	0.02
DS Tucker Lake	20433.4*	Base	3.00	592.96	596.52	593.45	596.52	0.000003	0.03	91.04	45.01	0.00
DS Tucker Lake	20433.4*	2 Year	4.00	592.96	596.54	593.50	596.54	0.000005	0.04	91.75	45.62	0.00
DS Tucker Lake	20433.4*	50 Year	38.00	592.96	599.38	594.00	599.38	0.000021	0.15	402.28	220.14	0.01
DS Tucker Lake	20433.4*	100 Year	63.00	592.96	601.02	594.20	601.02	0.000013	0.13	899.51	246.00	0.01
DS Tucker Lake	20433.4*	500 Year	123.00	592.96	601.15	594.55	601.15	0.000044	0.25	932.60	250.16	0.02
DS Tucker Lake	20350.2	Base	3.00	592.13	596.52	592.63	596.52	0.000001	0.02	124.43	55.92	0.00
DS Tucker Lake	20350.2	2 Year	4.00	592.13	596.54	592.71	596.54	0.000002	0.03	125.17	56.31	0.00
DS Tucker Lake	20350.2	50 Year	38.00	592.13	599.37	593.24	599.38	0.000021	0.16	263.37	195.63	0.01
DS Tucker Lake	20350.2	100 Year	63.00	592.13	601.02	593.44	601.02	0.000011	0.13	860.67	206.42	0.01
DS Tucker Lake	20350.2	500 Year	123.00	592.13	601.15	593.81	601.15	0.000037	0.25	887.75	207.28	0.02
DS Tucker Lake	20324.0*	Base	3.00	592.47	596.52	592.97	596.52	0.000059	0.20	15.25	52.13	0.02
DS Tucker Lake	20324.0*	2 Year	4.00	592.47	596.53	593.01	596.54	0.000104	0.26	15.31	52.60	0.02
DS Tucker Lake	20324.0*	50 Year	38.00	592.47	599.33	594.11	599.36	0.001512	1.43	26.50	199.15	0.10
DS Tucker Lake	20324.0*	100 Year	63.00	592.47	600.94	594.68	601.00	0.002012	1.91	32.94	213.47	0.12
DS Tucker Lake	20324.0*	500 Year	123.00	592.47	601.15	595.78	601.15	0.000044	0.26	891.63	232.38	0.02
DS Tucker Lake	20301.5		Culvert									
DS Tucker Lake	20277.0*	Base	3.00	593.08	596.50	593.57	596.50	0.000106	0.24	12.75	38.98	0.02
DS Tucker Lake	20277.0*	2 Year	4.00	593.08	596.50	593.62	596.51	0.000188	0.31	12.76	39.08	0.03
DS Tucker Lake	20277.0*	50 Year	38.00	593.08	596.80	594.73	596.91	0.012663	2.73	13.93	54.46	0.26
DS Tucker Lake	20277.0*	100 Year	63.00	593.08	597.11	595.30	597.38	0.026044	4.15	15.20	80.18	0.37
DS Tucker Lake	20277.0*	500 Year	123.00	593.08	597.61	596.40	598.41	0.065856	7.16	17.19	176.47	0.61
DS Tucker Lake	20238.2	Base	3.00	593.59	596.50		596.50	0.000015	0.06	50.75	28.78	0.01
DS Tucker Lake	20238.2	2 Year	4.00	593.59	596.50		596.50	0.000027	0.08	50.78	28.79	0.01
DS Tucker Lake	20238.2	50 Year	38.00	593.59	596.70		596.71	0.001815	0.67	56.74	31.88	0.09
DS Tucker Lake	20238.2	100 Year	63.00	593.59	596.97		596.98	0.003167	0.97	69.47	63.62	0.12
DS Tucker Lake	20238.2	500 Year	123.00	593.59	597.61		597.63	0.003855	1.27	157.31	185.08	0.13
DS Tucker Lake	20170.8	Base	3.00	593.08	596.50		596.50	0.000009	0.05	56.11	24.82	0.01
DS Tucker Lake	20170.8	2 Year	4.00	593.08	596.50		596.50	0.000016	0.07	56.13	24.83	0.01
DS Tucker Lake	20170.8	50 Year	38.00	593.08	596.60		596.61	0.001319	0.65	58.60	25.45	0.08
DS Tucker Lake	20170.8	100 Year	63.00	593.08	596.76		596.77	0.003099	1.00	62.71	26.84	0.12
DS Tucker Lake	20170.8	500 Year	123.00	593.08	597.26		597.29	0.006734	1.54	100.89	149.39	0.17
DS Tucker Lake	20065.5	Base	3.00	592.66	596.50	592.91	596.50	0.000005	0.04	77.57	39.92	0.00
DS Tucker Lake	20065.5	2 Year	4.00	592.66	596.50	592.94	596.50	0.000008	0.05	77.57	39.92	0.01
DS Tucker Lake	20065.5	50 Year	38.00	592.66	596.50	593.50	596.50	0.000737	0.49	77.57	39.92	0.06
DS Tucker Lake	20065.5	100 Year	63.00	592.66	596.50	593.77	596.51	0.002026	0.82	77.57	39.92	0.09
DS Tucker Lake	20065.5	500 Year	123.00	592.66	596.50	594.28	596.54	0.007721	1.60	77.57	39.92	0.18

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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: Outlet Channel Tucker Lake at CR 675
Project File : 2020430002_TuckerLake.prj
Run Date and Time: 1/4/2022 10:02:44 AM

Project in English units

Project Description:
HEC-RAS model analyzes the outlet channel from Tucker Lake for the channel reach for the waterway crossing under CR 675. The model begins 236 feet downstream of CR 675 and ends 616' upstream of CR 675.

Energy slope for
starting water surface elevations is slope=(597.0-592.66)/(20917.3-20065.5) = 0.0051 ft/ft

PLAN DATA

Plan Title: Proposed Conditions w Alum Box Culvert
Plan File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR 675\2020430002_TuckerLake.p04

Geometry Title: Proposed Conditions Alum Box Culvert
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR 675\2020430002_TuckerLake.g04

Flow Title : Outlet Channel Tucker Lake
Flow File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker

Lake at CR 675\2020430002_TuckerLake.f01

Plan Summary Information:
Number of: Cross Sections =   13   Multiple Openings =   0
            Culverts   =   1   Inline Structures =   0
            Bridges   =   0   Lateral Structures =   0

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

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

FLOW DATA

Flow Title: Outlet Channel Tucker Lake
Flow File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR 675\2020430002_TuckerLake.f01

Flow Data (cfs)

River	Reach	RS	Base	2 Year	50 Year	100 Year	500 Year
Outlet Channel	DS Tucker Lake	20917.3	3	4	38	63	123

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Outlet Channel	DS Tucker Lake	Base	Normal S = 0.0051	
Outlet Channel	DS Tucker Lake	2 Year	Normal S = 0.0051	

```
  Outlet Channel  DS Tucker Lake  50 Year
Normal S = 0.0051
  Outlet Channel  DS Tucker Lake  100 Year
Normal S = 0.0051




GEOMETRY DATA

Geometry Title: Proposed Conditions Alum Box Culvert
Geometry File : p:\2020430002.00\HEC-RAS Modeling\Outlet Channel Tucker Lake at CR
675\2020430002_TuckerLake.g04

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20917.3

INPUT
Description: XSEC 206 (STA. 209+17.3)
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -725.12  599.37 -651.62  599.02 -545.57  599.04 -458.81   598.8  -368.3  598.88
 -293.08  598.43 -226.08  598.26 -150.38  597.95   -91.4  597.78  -51.85  597.59
  -25.01   597.6  -15.69     597     -11   596.5     1.5   596.3    14.5   596.5
    19.6     597   32.22  597.99   32.23     600

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -725.12     .15  -25.01     .06   32.22     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -25.01   32.22               78      78      78             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20839.3*

INPUT
Description: Interpolated Section 7
Station Elevation Data    num=      28
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -591.11  600.27  -531.1  599.09 -515.73  598.85 -444.52  598.77 -373.68  598.52
  -372.8  598.52 -299.78  598.54 -238.37   598.2 -224.04  598.17 -183.67  598.07
 -141.26  597.91 -121.86  597.84   -73.7  597.73  -69.63  597.71  -41.41  597.62
```

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   -19.5  597.65  -18.63  597.09  -15.97   596.9  -10.88  596.58   -9.37  596.43
   -6.54  596.24     -.5  596.22    5.02  596.02   15.14  596.37   19.12   596.8
   19.93  596.87   28.95  597.87   28.96  600.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -591.11     .15   -19.5     .06   28.95     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -19.5   28.95               78      78      78             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20761.3*

INPUT
Description: Interpolated Section 6
Station Elevation Data    num=      28
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -457.11  601.18 -410.59  599.15 -398.67  598.67 -343.47   598.5 -288.55  598.24
 -287.87  598.24 -231.27  598.19 -183.66  597.98 -172.55  597.95 -141.25  597.88
 -108.38  597.78  -93.34  597.74  -56.01  597.67  -52.85  597.67  -30.98  597.66
  -13.99   597.7  -13.19  596.65  -10.74  596.44   -6.07  596.15   -4.69  596.04
   -2.09  595.98    3.46  596.05    8.53  595.73   15.79  596.25   18.63  596.59
   19.21  596.65   25.67  597.75   25.68  601.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -457.11     .15  -13.99     .06   25.67     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -13.99   25.67               78      78      78             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20683.3

INPUT
Description: XSEC 205 (STA. 206+83.3)
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -323.1  602.08 -281.61  598.49 -202.94  597.96 -121.06  597.73   -75.5  597.64
  -36.07  597.62   -8.48  597.75   -7.75   596.2   -5.52  595.99       0  595.65
    7.43  595.87   12.05  595.45    18.5  596.44    22.4  597.63   22.41     602

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
  -323.1     .15   -8.48     .06    22.4     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -8.48    22.4             83.28   83.28   83.28             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20600.0*

INPUT
Description: Interpolated Section 5
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -295.39  601.89 -257.98  599.18  -257.9  599.18 -229.71   598.3 -197.27  597.97
 -187.05  597.91 -117.11  597.72 -113.21   597.7  -72.13  597.53  -49.39  597.46
  -36.58  597.36   -11.7  597.28  -10.97  595.84  -10.45  595.61   -8.71  595.44
   -3.14     595   -2.61     595    4.37  595.09       7  594.88    9.04  594.62
   10.48  594.89   13.17  595.24   16.03  595.77   16.64  595.88   21.23  597.14
   22.05  600.97   22.05  601.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -295.39     .15   -11.7     .06   21.23     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -11.7   21.23             83.28   83.28   83.28             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20516.7*

INPUT
Description: Interpolated Section 4
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -267.68   601.7 -234.35  599.88 -234.28  599.87 -209.16  598.32 -180.26  597.91
 -171.15  597.87 -108.84  597.71 -105.37  597.68  -68.77  597.41   -48.5  597.28
  -37.09  597.09  -14.93   596.8  -14.18  595.48  -13.66  595.08   -11.9  594.88
   -6.27  594.36   -5.74  594.33    1.31   594.3    3.97  594.13    6.03  593.79
    7.69  594.13   10.78  594.49   14.07  595.18   14.77  595.32   20.06  596.65
   21.68  599.95   21.69   601.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -267.68     .15  -14.93     .06   20.06     .15
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -14.93   20.06            83.28   83.28   83.28             .1       .3

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20433.4*

INPUT
Description: Interpolated Section 3
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -239.98  601.51 -210.72  600.57 -210.66  600.57 -188.62  598.35 -163.25  597.85
 -155.26  597.82 -100.57  597.69  -97.52  597.65   -65.4   597.3  -47.62  597.11
   -37.6  596.83  -18.15  596.32   -17.4  595.12  -16.87  594.54   -15.1  594.33
   -9.41  593.71   -8.87  593.67   -1.75  593.52     .93  593.38    3.01  592.96
    4.89  593.38    8.39  593.75   12.12  594.59   12.91  594.76   18.89  596.15
   21.32  598.94   21.33  601.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -239.98     .15  -18.15     .06   18.89     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -18.15   18.89            83.27   83.27   83.27             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
 -239.98    -138     601       F

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20350.2

INPUT
Description: XSEC 204 (STA. 203+50.2)
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -212.27  601.32 -187.04  601.26 -168.07  598.37 -146.24  597.79   -92.3  597.67
  -46.73  596.94  -21.37  595.85  -20.08     594     -12     593    -2.1  592.63
       0  592.13     2.1  592.63       6     593   10.16     594   17.72  595.66
   20.96  597.92   20.97     601

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -212.27     .15  -21.37     .06   17.72     .15
```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-21.37 17.72 25.2 25.2 25.2 .1 .3

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20325.0*

INPUT
Description: US Face of Culvert (Interpolated Section 2)
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-209.2	601.16	-187.92	600.93	-184.11	600.75	-177.14	599.62	-165.24	598.16
-153.85	597.87	-143.53	597.66	-105.36	597.61	-89.88	597.56	-55.15	597.08
-44.56	596.93	-19.34	596.05	-18.99	595.52	-11	595	-7	593
-2	593	3	593	7	595	12.49	594.86	17.65	595.89
20.76	597.05	24.35	598.07	24.37	600.43	24.37	601		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-209.2	.15	-19.34	.06	17.65	.15

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-19.34 17.65 47 47 47 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-209.2	-10.25	601	F
6.25	24.37	601	F

CULVERT

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20301.5

INPUT
Description: Single Pipe Culvert along CR 675 at Outlet Channel Tucker Lake
Distance from Upstream XS = 7.5
Deck/Roadway Width = 30
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 15

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-250.3	602.07		-198.7	601.83		-148.2	601.56	
-99.7	601.29		-64.06	601.09		-14.06	600.81	
-9.88	600.79		-9.87	600.79		5.8	600.7	
5.81	600.7		30.69	600.56		109.26	600.88	
150.2	601.22		199.6	601.6		249.9	601.89	

Upstream Bridge Cross Section Data
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-209.2	601.16	-187.92	600.93	-184.11	600.75	-177.14	599.62	-165.24	598.16
-153.85	597.87	-143.53	597.66	-105.36	597.61	-89.88	597.56	-55.15	597.08
-44.56	596.93	-19.34	596.05	-18.99	595.52	-11	595	-7	593
-2	593	3	593	7	595	12.49	594.86	17.65	595.89
20.76	597.05	24.35	598.07	24.37	600.43	24.37	601		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-209.2	.15	-19.34	.05	17.65	.15

Bank Sta: Left Right Coeff Contr. Expan.
-19.34 17.65 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-209.2	-10.25	601	F
6.25	24.37	601	F

Downstream Deck/Roadway Coordinates
num= 15

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-250.3	602.07		-198.7	601.83		-148.2	601.56	
-99.7	601.29		-64.06	601.09		-14.06	600.81	
-9.88	600.79		-9.87	600.79		5.8	600.7	
5.81	600.7		30.69	600.56		109.26	600.88	
150.2	601.22		199.6	601.6		249.9	601.89	

Downstream Bridge Cross Section Data
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-203.7	600.87	-182.63	600.31	-178.85	599.83	-171.95	598.58	-160.17	597.78
-148.89	597.51	-138.67	597.43	-100.87	597.43	-85.55	597.36	-51.16	597.04
-40.67	596.92	-15.7	596.4	-15.39	595.91	-11	595	-7	593
-2	593	3	593	7	595	10.79	594.96	12.74	595.54
17.51	596.31	23.52	597.65	30.43	598.35	30.47	599.42	30.47	601

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-203.7	.15	-15.7	.05	17.51	.15

Bank Sta: Left Right Coeff Contr. Expan.
-15.7 17.51 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-203.7	-10.25	601	F
6.25	30.47	601	F

Upstream Embankment side slope = 2 horiz. to 1.0 vertical

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

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1  Conspan Arch    6.67    16.5
FHWA Chart # 60- Span/Rise ratio approximate 2:1
FHWA Scale # 1 - 0 degree wing wall angle
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                 1      45     .024     .024        1                   .5
      1
Upstream   Elevation =  592.04
           Centerline Station = -2
Downstream Elevation =  592.04
           Centerline Station = -2

CROSS SECTION


RIVER: Outlet Channel
REACH: DS Tucker Lake     RS: 20278.0*

INPUT
Description: DS Face of Culvert (Interpolated Section 1)
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -203.7  600.87 -182.63  600.31 -178.85  599.83 -171.95  598.58 -160.17  597.78
 -148.89  597.51 -138.67  597.43 -100.87  597.43  -85.55  597.36  -51.16  597.04
  -40.67  596.92   -15.7   596.4  -15.39  595.91     -11     595      -7     593
      -2     593       3     593       7     595   10.79  594.96   12.74  595.54
   17.51  596.31   23.52  597.65   30.43  598.35   30.47  599.42   30.47     601

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -203.7     .15   -15.7     .06   17.51     .15

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -15.7   17.51             39.8    39.8    39.8             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  -203.7  -10.25     601       F
    6.25   30.47     601       F
```

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20238.2

INPUT
Description: XSEC 203 (STA. 202+38.2)
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-199.16	600.63	-178.26	599.8	-167.67	597.73	-144.8	597.22	-97.17	597.28
-47.86	597	-12.69	596.69	-12.42	596.22	-11.64	595.14	-6.6	594.48
-4.4	593.95	0	593.85	2.7	593.59	6	594.73	9.72	594.99
12.95	596.1	17.4	596.65	25.79	598.15	35.51	598.58	35.51	601

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-199.16	.15	-12.69	.06	17.4	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-12.69	17.4	67.4	67.4	.1	.3

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20170.8

INPUT
Description: XSEC 202 (STA. 201+70.8)
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-418.05	602.25	-315.83	601.14	-219.74	601.56	-170.3	598.8	-128.2	597.13
-57.34	596.93	-13.09	597.26	-10.87	596.58	-7.7	594.87	-5.2	593.5
-4.21	593.08	4	593.5	10.89	594.92	14.18	596.54	21.55	597.86
38.06	597.83	88.13	598.09	144.99	600.06	195.67	600.03	250.78	600.74
334.67	603.86								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-418.05	.15	-13.09	.06	21.55	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-13.09	21.55	105.3	105.3	.1	.3

CROSS SECTION

RIVER: Outlet Channel
REACH: DS Tucker Lake RS: 20065.5

INPUT
Description: XSEC 201 (STA. 200+65.5)
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-363.15	600.85	-286.31	597.44	-232.33	597.33	-163.17	598.42	-119.93	596.85
-59.81	597.14	-13.39	596.38	-8.75	592.66	-2	592.8	2	593
5.86	595.26	11.86	594.89	15.69	594.4	18.49	596.3	25.68	598.33
53.5	596.75	96.67	597.48	158.02	600.34	217.6	602.19	313.13	603.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-363.15	.15	-13.39	.06	18.49	.15

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-13.39	18.49	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Outlet Channel

Reach	River Sta.	n1	n2	n3
DS Tucker Lake	20917.3	.15	.06	.15
DS Tucker Lake	20839.3*	.15	.06	.15
DS Tucker Lake	20761.3*	.15	.06	.15
DS Tucker Lake	20683.3	.15	.06	.15
DS Tucker Lake	20600.0*	.15	.06	.15
DS Tucker Lake	20516.7*	.15	.06	.15
DS Tucker Lake	20433.4*	.15	.06	.15
DS Tucker Lake	20350.2	.15	.06	.15
DS Tucker Lake	20325.0*	.15	.06	.15
DS Tucker Lake	20301.5	Culvert		
DS Tucker Lake	20278.0*	.15	.06	.15
DS Tucker Lake	20238.2	.15	.06	.15
DS Tucker Lake	20170.8	.15	.06	.15
DS Tucker Lake	20065.5	.15	.06	.15

SUMMARY OF REACH LENGTHS

River: Outlet Channel

Reach	River Sta.	Left	Channel	Right
DS Tucker Lake	20917.3	78	78	78

DS Tucker Lake	20839.3*	78	78	78
DS Tucker Lake	20761.3*	78	78	78
DS Tucker Lake	20683.3	83.28	83.28	83.28
DS Tucker Lake	20600.0*	83.28	83.28	83.28
DS Tucker Lake	20516.7*	83.28	83.28	83.28
DS Tucker Lake	20433.4*	83.27	83.27	83.27
DS Tucker Lake	20350.2	25.2	25.2	25.2
DS Tucker Lake	20325.0*	47	47	47
DS Tucker Lake	20301.5	Culvert		
DS Tucker Lake	20278.0*	39.8	39.8	39.8
DS Tucker Lake	20238.2	67.4	67.4	67.4
DS Tucker Lake	20170.8	105.3	105.3	105.3
DS Tucker Lake	20065.5	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Outlet Channel

Reach	River Sta.	Contr.	Expan.
DS Tucker Lake	20917.3	.1	.3
DS Tucker Lake	20839.3*	.1	.3
DS Tucker Lake	20761.3*	.1	.3
DS Tucker Lake	20683.3	.1	.3
DS Tucker Lake	20600.0*	.1	.3
DS Tucker Lake	20516.7*	.1	.3
DS Tucker Lake	20433.4*	.1	.3
DS Tucker Lake	20350.2	.1	.3
DS Tucker Lake	20325.0*	.3	.5
DS Tucker Lake	20301.5	Culvert	
DS Tucker Lake	20278.0*	.3	.5
DS Tucker Lake	20238.2	.1	.3
DS Tucker Lake	20170.8	.1	.3
DS Tucker Lake	20065.5	.1	.3

HEC-RAS Plan: Prp Alm Box Culv River: Outlet Channel Reach: DS Tucker Lake

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)	
DS Tucker Lake	20917.3	Base	3.00	596.30	596.83		596.83	0.002116	0.25	11.87	31.86	0.07
DS Tucker Lake	20917.3	2 Year	4.00	596.30	596.90		596.90	0.002133	0.28	14.34	33.34	0.08
DS Tucker Lake	20917.3	50 Year	38.00	596.30	598.01		598.02	0.001961	0.52	100.00	197.88	0.08
DS Tucker Lake	20917.3	100 Year	63.00	596.30	598.39		598.39	0.001552	0.56	193.59	309.86	0.08
DS Tucker Lake	20917.3	500 Year	123.00	596.30	598.94		598.94	0.001414	0.65	405.58	541.39	0.08
DS Tucker Lake	20839.3*	Base	3.00	596.02	596.67		596.67	0.001826	0.25	12.15	30.20	0.07
DS Tucker Lake	20839.3*	2 Year	4.00	596.02	596.74		596.74	0.002060	0.28	14.23	31.89	0.07
DS Tucker Lake	20839.3*	50 Year	38.00	596.02	597.84		597.84	0.002500	0.61	72.76	149.78	0.10
DS Tucker Lake	20839.3*	100 Year	63.00	596.02	598.25		598.26	0.001938	0.65	160.67	277.08	0.09
DS Tucker Lake	20839.3*	500 Year	123.00	596.02	598.82		598.82	0.001651	0.73	373.65	516.91	0.09
DS Tucker Lake	20761.3*	Base	3.00	595.73	596.56		596.56	0.001054	0.21	14.40	30.55	0.05
DS Tucker Lake	20761.3*	2 Year	4.00	595.73	596.60		596.60	0.001492	0.26	15.57	31.32	0.06
DS Tucker Lake	20761.3*	50 Year	38.00	595.73	597.61		597.62	0.003395	0.74	51.45	38.79	0.11
DS Tucker Lake	20761.3*	100 Year	63.00	595.73	598.07		598.08	0.002857	0.81	118.92	229.27	0.11
DS Tucker Lake	20761.3*	500 Year	123.00	595.73	598.67		598.68	0.002106	0.85	319.91	424.39	0.10
DS Tucker Lake	20683.3	Base	3.00	595.45	596.51		596.51	0.000426	0.17	17.95	26.63	0.04
DS Tucker Lake	20683.3	2 Year	4.00	595.45	596.52		596.52	0.000727	0.22	18.19	26.67	0.05
DS Tucker Lake	20683.3	50 Year	38.00	595.45	597.26		597.27	0.006074	0.98	38.92	29.43	0.15
DS Tucker Lake	20683.3	100 Year	63.00	595.45	597.74		597.76	0.006115	1.17	61.88	144.96	0.16
DS Tucker Lake	20683.3	500 Year	123.00	595.45	598.46		598.47	0.003487	1.11	233.97	299.53	0.12
DS Tucker Lake	20600.0*	Base	3.00	594.62	596.50		596.50	0.000041	0.08	38.29	30.22	0.01
DS Tucker Lake	20600.0*	2 Year	4.00	594.62	596.51		596.51	0.000072	0.10	38.39	30.23	0.02
DS Tucker Lake	20600.0*	50 Year	38.00	594.62	596.95		596.96	0.002578	0.73	52.10	32.06	0.10
DS Tucker Lake	20600.0*	100 Year	63.00	594.62	597.38		597.39	0.003329	0.95	67.62	60.09	0.12
DS Tucker Lake	20600.0*	500 Year	123.00	594.62	598.20		598.21	0.002792	1.09	198.77	241.02	0.11
DS Tucker Lake	20516.7*	Base	3.00	593.79	596.50		596.50	0.000010	0.05	62.24	34.23	0.01
DS Tucker Lake	20516.7*	2 Year	4.00	593.79	596.50		596.50	0.000017	0.06	62.31	34.24	0.01
DS Tucker Lake	20516.7*	50 Year	38.00	593.79	596.83		596.83	0.000920	0.52	73.66	37.35	0.06
DS Tucker Lake	20516.7*	100 Year	63.00	593.79	597.21		597.22	0.001436	0.72	93.13	64.46	0.08
DS Tucker Lake	20516.7*	500 Year	123.00	593.79	598.02		598.03	0.001764	0.96	196.29	208.43	0.09
DS Tucker Lake	20433.4*	Base	3.00	592.96	596.50	593.45	596.50	0.000003	0.03	90.21	44.29	0.00
DS Tucker Lake	20433.4*	2 Year	4.00	592.96	596.50	593.50	596.50	0.000006	0.04	90.29	44.36	0.01
DS Tucker Lake	20433.4*	50 Year	38.00	592.96	596.79	594.00	596.79	0.000354	0.38	104.38	55.38	0.04
DS Tucker Lake	20433.4*	100 Year	63.00	592.96	597.13	594.20	597.14	0.000634	0.55	125.85	69.55	0.06
DS Tucker Lake	20433.4*	500 Year	123.00	592.96	597.91	594.55	597.92	0.001005	0.80	212.13	186.69	0.07
DS Tucker Lake	20350.2	Base	3.00	592.13	596.50		596.50	0.000001	0.02	125.06	55.46	0.00
DS Tucker Lake	20350.2	2 Year	4.00	592.13	596.50		596.50	0.000002	0.03	125.15	55.50	0.00
DS Tucker Lake	20350.2	50 Year	38.00	592.13	596.77		596.77	0.000156	0.29	140.70	62.04	0.03
DS Tucker Lake	20350.2	100 Year	63.00	592.13	597.10		597.10	0.000308	0.43	163.07	76.43	0.04
DS Tucker Lake	20350.2	500 Year	123.00	592.13	597.85		597.86	0.000586	0.67	243.77	169.30	0.06
DS Tucker Lake	20325.0*	Base	3.00	593.00	596.50	593.14	596.50	0.000007	0.06	52.50	51.58	0.01
DS Tucker Lake	20325.0*	2 Year	4.00	593.00	596.50	593.17	596.50	0.000012	0.08	52.52	51.63	0.01
DS Tucker Lake	20325.0*	50 Year	38.00	593.00	596.75	593.73	596.76	0.000819	0.67	56.66	59.49	0.06
DS Tucker Lake	20325.0*	100 Year	63.00	593.00	597.07	594.00	597.09	0.001680	1.02	61.86	75.21	0.09
DS Tucker Lake	20325.0*	500 Year	123.00	593.00	597.78	594.51	597.82	0.003594	1.67	73.56	172.66	0.14
DS Tucker Lake	20301.5		Culvert									
DS Tucker Lake	20278.0*	Base	3.00	593.00	596.50	593.14	596.50	0.000007	0.06	52.50	38.96	0.01
DS Tucker Lake	20278.0*	2 Year	4.00	593.00	596.50	593.17	596.50	0.000012	0.08	52.52	39.04	0.01
DS Tucker Lake	20278.0*	50 Year	38.00	593.00	596.75	593.73	596.76	0.000822	0.67	56.59	51.98	0.06
DS Tucker Lake	20278.0*	100 Year	63.00	593.00	597.06	594.00	597.08	0.001695	1.02	61.69	74.06	0.09
DS Tucker Lake	20278.0*	500 Year	123.00	593.00	597.75	594.51	597.79	0.003673	1.68	73.08	183.38	0.14
DS Tucker Lake	20238.2	Base	3.00	593.59	596.50		596.50	0.000015	0.06	50.75	28.78	0.01
DS Tucker Lake	20238.2	2 Year	4.00	593.59	596.50		596.50	0.000027	0.08	50.78	28.79	0.01
DS Tucker Lake	20238.2	50 Year	38.00	593.59	596.70		596.71	0.001815	0.67	56.74	31.88	0.09
DS Tucker Lake	20238.2	100 Year	63.00	593.59	596.97		596.98	0.003167	0.97	69.47	63.62	0.12
DS Tucker Lake	20238.2	500 Year	123.00	593.59	597.61		597.63	0.003855	1.27	157.31	185.08	0.13
DS Tucker Lake	20170.8	Base	3.00	593.08	596.50		596.50	0.000009	0.05	56.11	24.82	0.01
DS Tucker Lake	20170.8	2 Year	4.00	593.08	596.50		596.50	0.000016	0.07	56.13	24.83	0.01
DS Tucker Lake	20170.8	50 Year	38.00	593.08	596.60		596.61	0.001319	0.65	58.60	25.45	0.08
DS Tucker Lake	20170.8	100 Year	63.00	593.08	596.76		596.77	0.003099	1.00	62.71	26.84	0.12
DS Tucker Lake	20170.8	500 Year	123.00	593.08	597.26		597.29	0.006734	1.54	100.89	149.39	0.17
DS Tucker Lake	20065.5	Base	3.00	592.66	596.50	592.91	596.50	0.000005	0.04	77.57	39.92	0.00
DS Tucker Lake	20065.5	2 Year	4.00	592.66	596.50	592.94	596.50	0.000008	0.05	77.57	39.92	0.01
DS Tucker Lake	20065.5	50 Year	38.00	592.66	596.50	593.50	596.50	0.000737	0.49	77.57	39.92	0.06
DS Tucker Lake	20065.5	100 Year	63.00	592.66	596.50	593.77	596.51	0.002026	0.82	77.57	39.92	0.09
DS Tucker Lake	20065.5	500 Year	123.00	592.66	596.50	594.28	596.54	0.007721	1.60	77.57	39.92	0.18

West and Middle Bridge
WCB 2021/01/12

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor

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)	
Glen Arbor	10162.2	2 Year	70.00	583.65	585.38		585.39	0.000406	0.71	103.44	109.46	0.11
Glen Arbor	10162.2	50 Year	145.00	583.65	586.35		586.36	0.000266	0.77	226.93	140.98	0.10
Glen Arbor	10162.2	100 Year	165.00	583.65	586.57		586.58	0.000243	0.79	257.77	147.25	0.09
Glen Arbor	10162.2	500 Year	220.00	583.65	587.10		587.11	0.000210	0.85	350.31	205.85	0.09
Glen Arbor	10023.5*	2 Year	70.00	583.47	585.32		585.33	0.000396	0.73	96.33	70.54	0.11
Glen Arbor	10023.5*	50 Year	145.00	583.47	586.32		586.33	0.000265	0.81	224.09	176.91	0.10
Glen Arbor	10023.5*	100 Year	165.00	583.47	586.53		586.54	0.000241	0.83	263.19	183.00	0.09
Glen Arbor	10023.5*	500 Year	220.00	583.47	587.07		587.08	0.000206	0.87	375.16	241.09	0.09
Glen Arbor	9884.90*	2 Year	70.00	583.28	585.27		585.28	0.000356	0.69	117.80	104.20	0.10
Glen Arbor	9884.90*	50 Year	145.00	583.28	586.28		586.29	0.000251	0.81	252.75	309.75	0.09
Glen Arbor	9884.90*	100 Year	165.00	583.28	586.50		586.51	0.000220	0.81	321.86	313.59	0.09
Glen Arbor	9884.90*	500 Year	220.00	583.28	587.04		587.05	0.000168	0.80	494.84	323.01	0.08
Glen Arbor	9746.25*	2 Year	70.00	583.09	585.23		585.23	0.000327	0.68	126.88	106.93	0.10
Glen Arbor	9746.25*	50 Year	145.00	583.09	586.25		586.26	0.000193	0.74	318.92	211.53	0.08
Glen Arbor	9746.25*	100 Year	165.00	583.09	586.48		586.48	0.000177	0.75	367.56	221.87	0.08
Glen Arbor	9746.25*	500 Year	220.00	583.09	587.02		587.03	0.000152	0.79	495.99	246.67	0.08
Glen Arbor	9607.60*	2 Year	70.00	582.91	585.20		585.20	0.000148	0.51	137.37	83.01	0.07
Glen Arbor	9607.60*	50 Year	145.00	582.91	586.23		586.24	0.000128	0.65	226.69	137.90	0.07
Glen Arbor	9607.60*	100 Year	165.00	582.91	586.45		586.46	0.000127	0.69	261.44	164.51	0.07
Glen Arbor	9607.60*	500 Year	220.00	582.91	587.00		587.01	0.000121	0.75	354.81	175.43	0.07
Glen Arbor	9468.95*	2 Year	70.00	582.72	585.17		585.17	0.000296	0.74	96.36	58.48	0.10
Glen Arbor	9468.95*	50 Year	145.00	582.72	586.20		586.21	0.000262	0.94	167.78	86.36	0.10
Glen Arbor	9468.95*	100 Year	165.00	582.72	586.42		586.44	0.000259	0.99	188.49	99.27	0.10
Glen Arbor	9468.95*	500 Year	220.00	582.72	586.97		586.99	0.000252	1.09	252.82	135.68	0.10
Glen Arbor	9330.3	2 Year	70.00	582.54	585.13		585.13	0.000282	0.76	96.92	65.48	0.10
Glen Arbor	9330.3	50 Year	145.00	582.54	586.16		586.17	0.000268	0.99	170.10	76.29	0.10
Glen Arbor	9330.3	100 Year	165.00	582.54	586.38		586.40	0.000268	1.04	188.21	85.08	0.10
Glen Arbor	9330.3	500 Year	220.00	582.54	586.93		586.95	0.000270	1.16	240.63	106.49	0.11
Glen Arbor	9224.50*	2 Year	70.00	582.69	585.10		585.10	0.000276	0.72	97.33	55.04	0.10
Glen Arbor	9224.50*	50 Year	145.00	582.69	586.13		586.15	0.000254	0.93	161.08	72.28	0.10
Glen Arbor	9224.50*	100 Year	165.00	582.69	586.36		586.37	0.000253	0.98	178.65	84.98	0.10
Glen Arbor	9224.50*	500 Year	220.00	582.69	586.90		586.92	0.000251	1.09	231.75	109.16	0.10
Glen Arbor	9118.7	2 Year	70.00	582.85	585.06		585.07	0.000350	0.75	93.04	58.05	0.10
Glen Arbor	9118.7	50 Year	145.00	582.85	586.10		586.12	0.000294	0.93	155.89	62.98	0.10
Glen Arbor	9118.7	100 Year	165.00	582.85	586.33		586.34	0.000290	0.97	171.54	76.12	0.10
Glen Arbor	9118.7	500 Year	220.00	582.85	586.88		586.90	0.000276	1.07	220.39	102.06	0.10
Glen Arbor	8986.6	2 Year	70.00	580.55	585.04		585.05	0.000098	0.58	120.74	42.21	0.06
Glen Arbor	8986.6	50 Year	145.00	580.55	586.08		586.09	0.000166	0.87	167.61	51.92	0.08
Glen Arbor	8986.6	100 Year	165.00	580.55	586.30		586.31	0.000178	0.93	179.91	57.96	0.08
Glen Arbor	8986.6	500 Year	220.00	580.55	586.85		586.86	0.000206	1.07	215.50	72.34	0.09
Glen Arbor	8974	2 Year	70.00	580.62	585.04	581.80	585.05	0.000095	0.57	123.52	43.90	0.06
Glen Arbor	8974	50 Year	145.00	580.62	586.08	582.25	586.09	0.000154	0.85	173.96	55.66	0.08
Glen Arbor	8974	100 Year	165.00	580.62	586.30	582.35	586.31	0.000166	0.90	186.75	58.63	0.08
Glen Arbor	8974	500 Year	220.00	580.62	586.85	582.60	586.86	0.000188	1.05	221.47	70.28	0.09
Glen Arbor	8946.1		Bridge									
Glen Arbor	8919.20*	2 Year	70.00	580.96	584.96	581.98	584.97	0.000078	0.53	137.17	52.52	0.05
Glen Arbor	8919.20*	50 Year	145.00	580.96	585.89	582.39	585.90	0.000130	0.82	188.02	56.66	0.07
Glen Arbor	8919.20*	100 Year	165.00	580.96	586.10	582.49	586.11	0.000141	0.89	199.66	57.56	0.08
Glen Arbor	8919.20*	500 Year	220.00	580.96	586.61	582.72	586.63	0.000166	1.04	228.97	60.46	0.09
Glen Arbor	8907.3	2 Year	70.00	581.03	584.96		584.96	0.000074	0.52	140.50	52.90	0.05
Glen Arbor	8907.3	50 Year	145.00	581.03	585.89		585.90	0.000126	0.82	191.41	56.48	0.07
Glen Arbor	8907.3	100 Year	165.00	581.03	586.10		586.11	0.000137	0.88	203.12	57.27	0.08
Glen Arbor	8907.3	500 Year	220.00	581.03	586.61		586.63	0.000163	1.04	233.49	62.11	0.09
Glen Arbor	8742.47*	2 Year	70.00	581.30	584.95		584.95	0.000101	0.58	130.22	55.40	0.06
Glen Arbor	8742.47*	50 Year	145.00	581.30	585.87		585.88	0.000161	0.89	183.93	62.23	0.08
Glen Arbor	8742.47*	100 Year	165.00	581.30	586.07		586.08	0.000173	0.96	196.87	64.73	0.09
Glen Arbor	8742.47*	500 Year	220.00	581.30	586.58		586.60	0.000201	1.12	231.38	72.14	0.09
Glen Arbor	8577.63*	2 Year	70.00	581.58	584.92		584.93	0.000145	0.65	120.68	59.51	0.07
Glen Arbor	8577.63*	50 Year	145.00	581.58	585.83		585.85	0.000212	0.97	179.88	71.35	0.09
Glen Arbor	8577.63*	100 Year	165.00	581.58	586.04		586.05	0.000225	1.04	194.61	74.99	0.10
Glen Arbor	8577.63*	500 Year	220.00	581.58	586.54		586.56	0.000252	1.20	234.43	84.19	0.10
Glen Arbor	8412.8	2 Year	70.00	581.85	584.89		584.90	0.000225	0.75	112.87	67.18	0.09
Glen Arbor	8412.8	50 Year	145.00	581.85	585.79		585.81	0.000289	1.07	180.30	82.69	0.11

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	8412.8	100 Year	165.00	581.85	585.99		586.01	0.000299	1.13	197.09	85.64	0.11
Glen Arbor	8412.8	500 Year	220.00	581.85	586.49		586.51	0.000321	1.29	242.46	96.51	0.12
Glen Arbor	8242.58*	2 Year	70.00	582.02	584.85		584.86	0.000224	0.72	113.16	69.30	0.09
Glen Arbor	8242.58*	50 Year	145.00	582.02	585.74		585.76	0.000277	1.02	182.06	86.43	0.10
Glen Arbor	8242.58*	100 Year	165.00	582.02	585.94		585.96	0.000285	1.08	199.66	91.24	0.11
Glen Arbor	8242.58*	500 Year	220.00	582.02	586.44		586.46	0.000302	1.22	247.84	103.27	0.11
Glen Arbor	8072.35*	2 Year	70.00	582.18	584.82		584.82	0.000232	0.70	114.41	74.42	0.09
Glen Arbor	8072.35*	50 Year	145.00	582.18	585.70		585.71	0.000270	0.97	187.57	93.14	0.10
Glen Arbor	8072.35*	100 Year	165.00	582.18	585.89		585.91	0.000275	1.03	206.41	98.00	0.10
Glen Arbor	8072.35*	500 Year	220.00	582.18	586.39		586.41	0.000285	1.16	257.81	110.26	0.11
Glen Arbor	7902.13*	2 Year	70.00	582.34	584.78		584.78	0.000253	0.69	115.33	81.92	0.09
Glen Arbor	7902.13*	50 Year	145.00	582.34	585.65		585.67	0.000270	0.94	195.94	101.82	0.10
Glen Arbor	7902.13*	100 Year	165.00	582.34	585.85		585.86	0.000271	0.98	216.41	106.31	0.10
Glen Arbor	7902.13*	500 Year	220.00	582.34	586.34		586.36	0.000278	1.11	273.44	131.17	0.11
Glen Arbor	7731.9	2 Year	70.00	582.51	584.73		584.74	0.000290	0.70	116.66	92.42	0.10
Glen Arbor	7731.9	50 Year	145.00	582.51	585.61		585.62	0.000274	0.91	207.00	113.49	0.10
Glen Arbor	7731.9	100 Year	165.00	582.51	585.80		585.82	0.000273	0.95	229.85	120.90	0.10
Glen Arbor	7731.9	500 Year	220.00	582.51	586.30		586.31	0.000268	1.05	295.08	143.74	0.10
Glen Arbor	7558.02*	2 Year	70.00	582.46	584.68		584.69	0.000283	0.69	117.34	92.03	0.10
Glen Arbor	7558.02*	50 Year	145.00	582.46	585.56		585.57	0.000269	0.90	206.86	111.61	0.10
Glen Arbor	7558.02*	100 Year	165.00	582.46	585.76		585.77	0.000267	0.94	229.29	116.01	0.10
Glen Arbor	7558.02*	500 Year	220.00	582.46	586.25		586.27	0.000264	1.05	292.02	137.33	0.10
Glen Arbor	7384.15*	2 Year	70.00	582.41	584.63		584.64	0.000275	0.69	118.24	91.76	0.09
Glen Arbor	7384.15*	50 Year	145.00	582.41	585.51		585.53	0.000264	0.90	206.91	109.82	0.10
Glen Arbor	7384.15*	100 Year	165.00	582.41	585.71		585.72	0.000262	0.94	229.02	114.05	0.10
Glen Arbor	7384.15*	500 Year	220.00	582.41	586.20		586.22	0.000261	1.05	289.71	132.10	0.10
Glen Arbor	7210.27*	2 Year	70.00	582.36	584.58		584.59	0.000267	0.68	119.06	91.38	0.09
Glen Arbor	7210.27*	50 Year	145.00	582.36	585.47		585.48	0.000259	0.89	206.85	108.04	0.10
Glen Arbor	7210.27*	100 Year	165.00	582.36	585.67		585.68	0.000258	0.94	228.61	112.06	0.10
Glen Arbor	7210.27*	500 Year	220.00	582.36	586.16		586.18	0.000257	1.04	287.66	127.71	0.10
Glen Arbor	7036.39*	2 Year	70.00	582.31	584.54		584.55	0.000260	0.68	119.89	90.96	0.09
Glen Arbor	7036.39*	50 Year	145.00	582.31	585.42		585.44	0.000255	0.89	206.93	106.55	0.10
Glen Arbor	7036.39*	100 Year	165.00	582.31	585.62		585.63	0.000254	0.93	228.38	110.39	0.10
Glen Arbor	7036.39*	500 Year	220.00	582.31	586.12		586.13	0.000254	1.04	286.05	124.11	0.10
Glen Arbor	6862.52*	2 Year	70.00	582.26	584.49		584.50	0.000254	0.67	120.57	90.53	0.09
Glen Arbor	6862.52*	50 Year	145.00	582.26	585.38		585.39	0.000251	0.88	206.77	105.01	0.10
Glen Arbor	6862.52*	100 Year	165.00	582.26	585.58		585.59	0.000251	0.93	227.91	108.73	0.10
Glen Arbor	6862.52*	500 Year	220.00	582.26	586.07		586.09	0.000255	1.04	284.49	134.60	0.10
Glen Arbor	6688.64*	2 Year	70.00	582.21	584.45		584.46	0.000248	0.67	121.42	90.03	0.09
Glen Arbor	6688.64*	50 Year	145.00	582.21	585.34		585.35	0.000247	0.88	206.80	103.60	0.10
Glen Arbor	6688.64*	100 Year	165.00	582.21	585.53		585.55	0.000248	0.92	227.65	107.18	0.10
Glen Arbor	6688.64*	500 Year	220.00	582.21	586.03		586.04	0.000248	1.03	282.77	116.15	0.10
Glen Arbor	6514.76*	2 Year	70.00	582.16	584.41		584.42	0.000239	0.66	127.33	97.53	0.09
Glen Arbor	6514.76*	50 Year	145.00	582.16	585.30		585.31	0.000236	0.86	221.28	115.33	0.09
Glen Arbor	6514.76*	100 Year	165.00	582.16	585.49		585.51	0.000236	0.91	244.56	119.96	0.10
Glen Arbor	6514.76*	500 Year	220.00	582.16	585.99		586.00	0.000235	1.01	306.65	131.77	0.10
Glen Arbor	6340.88*	2 Year	70.00	582.11	584.35		584.36	0.000458	0.93	91.37	69.77	0.12
Glen Arbor	6340.88*	50 Year	145.00	582.11	585.23		585.25	0.000477	1.24	159.99	112.78	0.13
Glen Arbor	6340.88*	100 Year	165.00	582.11	585.42		585.45	0.000473	1.30	185.10	131.86	0.14
Glen Arbor	6340.88*	500 Year	220.00	582.11	585.92		585.94	0.000452	1.41	252.27	141.15	0.14
Glen Arbor	6167.01*	2 Year	70.00	582.06	584.31		584.31	0.000167	0.55	207.49	162.08	0.07
Glen Arbor	6167.01*	50 Year	145.00	582.06	585.19		585.20	0.000155	0.70	355.94	173.34	0.08
Glen Arbor	6167.01*	100 Year	165.00	582.06	585.39		585.40	0.000154	0.73	390.67	176.52	0.08
Glen Arbor	6167.01*	500 Year	220.00	582.06	585.89		585.90	0.000152	0.81	480.22	184.84	0.08
Glen Arbor	5993.13*	2 Year	70.00	582.01	584.27		584.28	0.000232	0.65	130.41	97.81	0.09
Glen Arbor	5993.13*	50 Year	145.00	582.01	585.16		585.17	0.000231	0.85	221.56	108.52	0.09
Glen Arbor	5993.13*	100 Year	165.00	582.01	585.35		585.37	0.000232	0.90	243.35	111.56	0.09
Glen Arbor	5993.13*	500 Year	220.00	582.01	585.85		585.86	0.000233	1.00	300.45	119.55	0.10
Glen Arbor	5819.25*	2 Year	70.00	581.96	584.24		584.24	0.000153	0.53	170.11	117.36	0.07
Glen Arbor	5819.25*	50 Year	145.00	581.96	585.13		585.13	0.000157	0.71	278.42	127.57	0.08
Glen Arbor	5819.25*	100 Year	165.00	581.96	585.32		585.33	0.000158	0.75	303.99	130.54	0.08
Glen Arbor	5819.25*	500 Year	220.00	581.96	585.82		585.83	0.000161	0.84	370.45	138.19	0.08
Glen Arbor	5645.38*	2 Year	70.00	581.91	584.21		584.21	0.000184	0.59	184.07	127.42	0.08

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

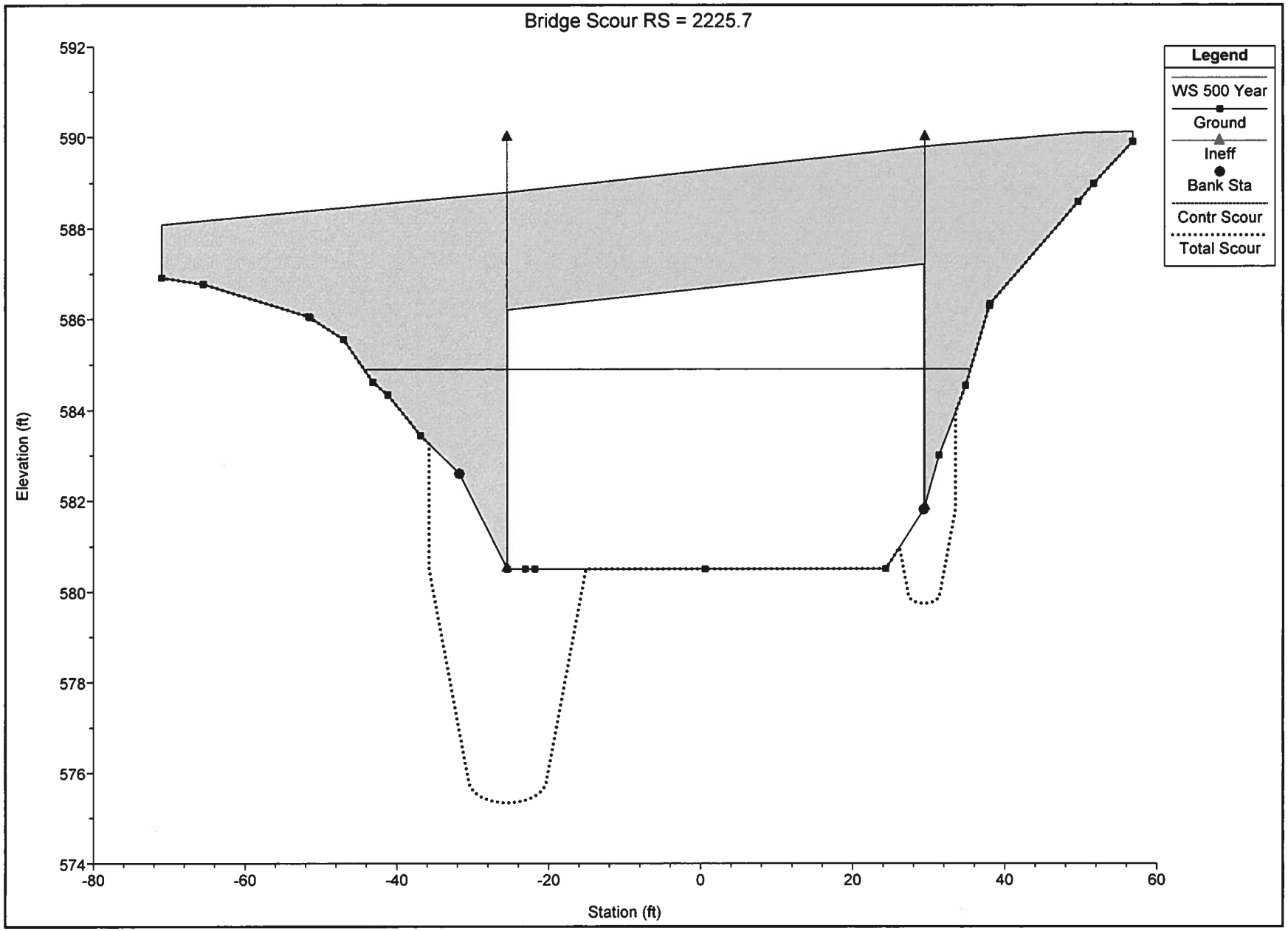
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	5645.38*	50 Year	145.00	581.91	585.10		585.10	0.000189	0.79	300.98	137.15	0.08
Glen Arbor	5645.38*	100 Year	165.00	581.91	585.29		585.30	0.000191	0.83	328.39	140.02	0.09
Glen Arbor	5645.38*	500 Year	220.00	581.91	585.79		585.80	0.000194	0.93	399.41	147.33	0.09
Glen Arbor	5471.50*	2 Year	70.00	581.86	584.17		584.18	0.000224	0.65	124.82	86.37	0.09
Glen Arbor	5471.50*	50 Year	145.00	581.86	585.05		585.07	0.000234	0.87	205.01	95.69	0.09
Glen Arbor	5471.50*	100 Year	165.00	581.86	585.25		585.26	0.000236	0.91	224.15	98.45	0.10
Glen Arbor	5471.50*	500 Year	220.00	581.86	585.74		585.76	0.000241	1.03	274.35	105.39	0.10
Glen Arbor	5297.62*	2 Year	70.00	581.81	584.13		584.14	0.000223	0.64	124.99	85.80	0.09
Glen Arbor	5297.62*	50 Year	145.00	581.81	585.02		585.03	0.000234	0.87	204.37	94.66	0.09
Glen Arbor	5297.62*	100 Year	165.00	581.81	585.21		585.22	0.000236	0.91	223.27	97.33	0.10
Glen Arbor	5297.62*	500 Year	220.00	581.81	585.70		585.72	0.000241	1.03	272.77	103.93	0.10
Glen Arbor	5123.75*	2 Year	70.00	581.76	584.10		584.10	0.000223	0.64	124.87	85.21	0.09
Glen Arbor	5123.75*	50 Year	145.00	581.76	584.97		584.99	0.000235	0.87	203.42	93.68	0.09
Glen Arbor	5123.75*	100 Year	165.00	581.76	585.17		585.18	0.000237	0.91	222.08	96.28	0.10
Glen Arbor	5123.75*	500 Year	220.00	581.76	585.66		585.68	0.000243	1.03	270.91	102.58	0.10
Glen Arbor	4949.87*	2 Year	70.00	581.71	584.06		584.06	0.000224	0.65	124.57	84.63	0.09
Glen Arbor	4949.87*	50 Year	145.00	581.71	584.93		584.94	0.000237	0.87	202.32	92.81	0.09
Glen Arbor	4949.87*	100 Year	165.00	581.71	585.13		585.14	0.000239	0.92	220.77	95.31	0.10
Glen Arbor	4949.87*	500 Year	220.00	581.71	585.62		585.63	0.000245	1.03	268.94	101.27	0.10
Glen Arbor	4775.99*	2 Year	70.00	581.66	584.02		584.02	0.000226	0.65	124.18	84.05	0.09
Glen Arbor	4775.99*	50 Year	145.00	581.66	584.89		584.90	0.000239	0.87	201.13	91.98	0.09
Glen Arbor	4775.99*	100 Year	165.00	581.66	585.09		585.10	0.000241	0.92	219.36	94.37	0.10
Glen Arbor	4775.99*	500 Year	220.00	581.66	585.58		585.59	0.000247	1.04	266.89	99.97	0.10
Glen Arbor	4602.12*	2 Year	70.00	581.61	583.98		583.98	0.000229	0.65	123.52	83.44	0.09
Glen Arbor	4602.12*	50 Year	145.00	581.61	584.85		584.86	0.000242	0.88	199.66	91.20	0.10
Glen Arbor	4602.12*	100 Year	165.00	581.61	585.05		585.06	0.000245	0.92	217.66	93.41	0.10
Glen Arbor	4602.12*	500 Year	220.00	581.61	585.53		585.55	0.000251	1.04	264.56	98.71	0.10
Glen Arbor	4428.24*	2 Year	70.00	581.56	583.94		583.94	0.000233	0.65	122.74	82.90	0.09
Glen Arbor	4428.24*	50 Year	145.00	581.56	584.81		584.82	0.000246	0.88	198.20	90.65	0.10
Glen Arbor	4428.24*	100 Year	165.00	581.56	585.00		585.02	0.000249	0.93	216.01	92.35	0.10
Glen Arbor	4428.24*	500 Year	220.00	581.56	585.49		585.50	0.000254	1.04	261.87	95.82	0.10
Glen Arbor	4254.36*	2 Year	70.00	581.51	583.90		583.90	0.000238	0.66	121.84	82.39	0.09
Glen Arbor	4254.36*	50 Year	145.00	581.51	584.76		584.78	0.000251	0.88	196.69	90.23	0.10
Glen Arbor	4254.36*	100 Year	165.00	581.51	584.96		584.97	0.000253	0.93	214.38	91.96	0.10
Glen Arbor	4254.36*	500 Year	220.00	581.51	585.44		585.46	0.000258	1.05	259.95	95.35	0.10
Glen Arbor	4080.48*	2 Year	70.00	581.46	583.85		583.86	0.000276	0.70	114.12	77.56	0.10
Glen Arbor	4080.48*	50 Year	145.00	581.46	584.72		584.73	0.000290	0.95	184.31	84.91	0.10
Glen Arbor	4080.48*	100 Year	165.00	581.46	584.91		584.92	0.000293	1.00	200.90	86.68	0.11
Glen Arbor	4080.48*	500 Year	220.00	581.46	585.39		585.41	0.000299	1.13	244.01	91.04	0.11
Glen Arbor	3906.61*	2 Year	70.00	581.41	583.81		583.81	0.000257	0.67	118.68	80.92	0.09
Glen Arbor	3906.61*	50 Year	145.00	581.41	584.67		584.68	0.000266	0.90	191.58	88.16	0.10
Glen Arbor	3906.61*	100 Year	165.00	581.41	584.86		584.87	0.000268	0.95	208.77	89.85	0.10
Glen Arbor	3906.61*	500 Year	220.00	581.41	585.34		585.36	0.000273	1.07	253.26	93.89	0.10
Glen Arbor	3732.73*	2 Year	70.00	581.36	583.76		583.77	0.000269	0.68	116.82	80.24	0.09
Glen Arbor	3732.73*	50 Year	145.00	581.36	584.62		584.63	0.000275	0.91	188.98	87.41	0.10
Glen Arbor	3732.73*	100 Year	165.00	581.36	584.81		584.83	0.000277	0.96	206.00	89.04	0.10
Glen Arbor	3732.73*	500 Year	220.00	581.36	585.30		585.31	0.000281	1.08	249.92	92.74	0.11
Glen Arbor	3558.85*	2 Year	70.00	581.31	583.71		583.72	0.000284	0.69	114.62	79.32	0.10
Glen Arbor	3558.85*	50 Year	145.00	581.31	584.57		584.58	0.000286	0.92	185.70	86.08	0.10
Glen Arbor	3558.85*	100 Year	165.00	581.31	584.76		584.78	0.000287	0.97	202.43	87.61	0.10
Glen Arbor	3558.85*	500 Year	220.00	581.31	585.25		585.26	0.000289	1.09	245.21	89.64	0.11
Glen Arbor	3384.98*	2 Year	70.00	581.26	583.66		583.67	0.000304	0.71	112.18	78.85	0.10
Glen Arbor	3384.98*	50 Year	145.00	581.26	584.52		584.53	0.000299	0.93	183.04	86.03	0.11
Glen Arbor	3384.98*	100 Year	165.00	581.26	584.71		584.73	0.000299	0.98	199.75	87.64	0.11
Glen Arbor	3384.98*	500 Year	220.00	581.26	585.19		585.21	0.000300	1.10	242.52	89.71	0.11
Glen Arbor	3211.1	2 Year	70.00	581.21	583.61		583.61	0.000329	0.72	109.24	78.10	0.10
Glen Arbor	3211.1	50 Year	145.00	581.21	584.47		584.48	0.000315	0.95	179.56	85.22	0.11
Glen Arbor	3211.1	100 Year	165.00	581.21	584.66		584.67	0.000314	1.00	196.12	86.81	0.11
Glen Arbor	3211.1	500 Year	220.00	581.21	585.14		585.16	0.000313	1.11	238.56	89.43	0.11
Glen Arbor	3050.95*	2 Year	70.00	581.20	583.56		583.56	0.000291	0.69	104.99	71.89	0.10
Glen Arbor	3050.95*	50 Year	145.00	581.20	584.42		584.43	0.000291	0.92	171.56	81.70	0.10
Glen Arbor	3050.95*	100 Year	165.00	581.20	584.61		584.63	0.000291	0.97	187.47	83.50	0.11
Glen Arbor	3050.95*	500 Year	220.00	581.20	585.09		585.11	0.000292	1.09	228.71	87.10	0.11

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	2890.80*	2 Year	70.00	581.18	583.51		583.52	0.000261	0.66	106.51	67.55	0.09
Glen Arbor	2890.80*	50 Year	145.00	581.18	584.37		584.39	0.000269	0.90	167.73	75.47	0.10
Glen Arbor	2890.80*	100 Year	165.00	581.18	584.57		584.58	0.000271	0.94	182.48	77.79	0.10
Glen Arbor	2890.80*	500 Year	220.00	581.18	585.05		585.07	0.000276	1.06	221.40	84.33	0.11
Glen Arbor	2730.65*	2 Year	70.00	581.17	583.47		583.48	0.000245	0.64	109.29	68.16	0.09
Glen Arbor	2730.65*	50 Year	145.00	581.17	584.33		584.34	0.000255	0.87	168.74	71.18	0.10
Glen Arbor	2730.65*	100 Year	165.00	581.17	584.52		584.54	0.000257	0.92	182.57	72.88	0.10
Glen Arbor	2730.65*	500 Year	220.00	581.17	585.01		585.02	0.000263	1.04	218.72	77.63	0.10
Glen Arbor	2570.5	2 Year	70.00	581.16	583.43		583.44	0.000245	0.63	110.67	69.92	0.09
Glen Arbor	2570.5	50 Year	145.00	581.16	584.29		584.30	0.000249	0.85	171.18	70.92	0.10
Glen Arbor	2570.5	100 Year	165.00	581.16	584.48		584.50	0.000251	0.90	184.82	71.15	0.10
Glen Arbor	2570.5	500 Year	220.00	581.16	584.96		584.98	0.000255	1.01	219.44	74.11	0.10
Glen Arbor	2427.35*	2 Year	70.00	580.51	583.41		583.41	0.000131	0.56	127.26	64.03	0.07
Glen Arbor	2427.35*	50 Year	145.00	580.51	584.26		584.27	0.000179	0.82	185.69	73.85	0.08
Glen Arbor	2427.35*	100 Year	165.00	580.51	584.45		584.47	0.000187	0.87	200.06	76.63	0.09
Glen Arbor	2427.35*	500 Year	220.00	580.51	584.93		584.95	0.000206	1.01	238.36	83.77	0.09
Glen Arbor	2284.2	2 Year	70.00	579.86	583.39		583.40	0.000091	0.53	145.65	66.02	0.06
Glen Arbor	2284.2	50 Year	145.00	579.86	584.24		584.25	0.000149	0.82	204.66	73.51	0.08
Glen Arbor	2284.2	100 Year	165.00	579.86	584.43		584.44	0.000160	0.89	218.73	74.86	0.08
Glen Arbor	2284.2	500 Year	220.00	579.86	584.90		584.92	0.000186	1.04	254.81	77.37	0.09
Glen Arbor	2261.22*	2 Year	70.00	579.76	583.39	580.73	583.40	0.000080	0.51	142.58	68.84	0.05
Glen Arbor	2261.22*	50 Year	145.00	579.76	584.24	581.10	584.25	0.000136	0.79	189.01	74.86	0.07
Glen Arbor	2261.22*	100 Year	165.00	579.76	584.42	581.16	584.44	0.000147	0.85	199.40	76.39	0.08
Glen Arbor	2261.22*	500 Year	220.00	579.76	584.90	581.36	584.91	0.000174	1.01	225.42	79.84	0.09
Glen Arbor	2225.7		Bridge									
Glen Arbor	2198.27*	2 Year	70.00	579.49	583.39	580.49	583.39	0.000061	0.46	152.61	77.11	0.05
Glen Arbor	2198.27*	50 Year	145.00	579.49	584.23	580.87	584.23	0.000109	0.73	198.81	81.94	0.07
Glen Arbor	2198.27*	100 Year	165.00	579.49	584.41	580.95	584.42	0.000119	0.79	209.16	82.90	0.07
Glen Arbor	2198.27*	500 Year	220.00	579.49	584.89	581.15	584.90	0.000144	0.94	235.05	85.27	0.08
Glen Arbor	2157.3	2 Year	70.00	579.32	583.39		583.39	0.000042	0.38	201.24	82.78	0.04
Glen Arbor	2157.3	50 Year	145.00	579.32	584.22		584.23	0.000074	0.60	272.89	87.43	0.06
Glen Arbor	2157.3	100 Year	165.00	579.32	584.41		584.42	0.000080	0.65	289.42	88.28	0.06
Glen Arbor	2157.3	500 Year	220.00	579.32	584.88		584.89	0.000096	0.76	331.49	90.41	0.07
Glen Arbor	2061.60*	2 Year	70.00	580.12	583.38		583.38	0.000114	0.52	139.55	71.45	0.06
Glen Arbor	2061.60*	50 Year	145.00	580.12	584.21		584.22	0.000160	0.77	201.34	76.42	0.08
Glen Arbor	2061.60*	100 Year	165.00	580.12	584.40		584.41	0.000168	0.82	215.72	77.38	0.08
Glen Arbor	2061.60*	500 Year	220.00	580.12	584.87		584.88	0.000186	0.95	252.73	81.69	0.09
Glen Arbor	1965.9	2 Year	70.00	580.93	583.35		583.36	0.000400	0.77	91.56	63.44	0.11
Glen Arbor	1965.9	50 Year	145.00	580.93	584.18		584.20	0.000391	1.03	145.17	66.21	0.12
Glen Arbor	1965.9	100 Year	165.00	580.93	584.37		584.38	0.000391	1.08	157.54	67.02	0.12
Glen Arbor	1965.9	500 Year	220.00	580.93	584.83		584.85	0.000392	1.21	189.19	69.04	0.12
Glen Arbor	1842.40*	2 Year	70.00	580.95	583.32		583.32	0.000243	0.64	109.95	69.14	0.09
Glen Arbor	1842.40*	50 Year	145.00	580.95	584.14		584.16	0.000265	0.88	169.02	73.77	0.10
Glen Arbor	1842.40*	100 Year	165.00	580.95	584.33		584.34	0.000269	0.93	182.81	74.82	0.10
Glen Arbor	1842.40*	500 Year	220.00	580.95	584.79		584.81	0.000278	1.06	218.24	77.46	0.11
Glen Arbor	1718.9	2 Year	70.00	580.97	583.29		583.30	0.000159	0.55	132.21	78.06	0.07
Glen Arbor	1718.9	50 Year	145.00	580.97	584.12		584.13	0.000188	0.77	197.07	79.54	0.08
Glen Arbor	1718.9	100 Year	165.00	580.97	584.30		584.31	0.000193	0.82	211.86	80.36	0.09
Glen Arbor	1718.9	500 Year	220.00	580.97	584.77		584.78	0.000205	0.93	250.06	84.04	0.09
Glen Arbor	1585.50*	2 Year	70.00	581.04	583.27		583.27	0.000219	0.61	116.92	74.66	0.08
Glen Arbor	1585.50*	50 Year	145.00	581.04	584.09		584.10	0.000243	0.85	179.12	77.65	0.09
Glen Arbor	1585.50*	100 Year	165.00	581.04	584.27		584.28	0.000247	0.90	193.50	78.33	0.10
Glen Arbor	1585.50*	500 Year	220.00	581.04	584.73		584.75	0.000256	1.02	230.32	81.23	0.10
Glen Arbor	1452.10*	2 Year	70.00	581.12	583.23		583.24	0.000319	0.70	101.64	69.97	0.10
Glen Arbor	1452.10*	50 Year	145.00	581.12	584.05		584.06	0.000324	0.94	161.58	75.63	0.11
Glen Arbor	1452.10*	100 Year	165.00	581.12	584.23		584.25	0.000325	0.99	175.55	76.32	0.11
Glen Arbor	1452.10*	500 Year	220.00	581.12	584.69		584.71	0.000328	1.12	211.20	78.71	0.11
Glen Arbor	1318.70*	2 Year	70.00	581.20	583.18		583.19	0.000497	0.82	87.39	67.99	0.12
Glen Arbor	1318.70*	50 Year	145.00	581.20	583.99		584.01	0.000446	1.06	144.91	72.98	0.13
Glen Arbor	1318.70*	100 Year	165.00	581.20	584.18		584.20	0.000440	1.11	158.42	73.88	0.13
Glen Arbor	1318.70*	500 Year	220.00	581.20	584.64		584.66	0.000430	1.24	193.10	77.04	0.13
Glen Arbor	1185.3	2 Year	70.00	581.27	583.08		583.10	0.000900	1.00	72.73	65.51	0.16
Glen Arbor	1185.3	50 Year	145.00	581.27	583.92		583.94	0.000648	1.21	128.71	69.06	0.15

HEC-RAS Plan: Proposed Bridges River: Crystal River Reach: Glen Arbor (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Arbor	1185.3	100 Year	165.00	581.27	584.10		584.13	0.000625	1.26	141.65	70.50	0.15
Glen Arbor	1185.3	500 Year	220.00	581.27	584.57		584.59	0.000587	1.39	175.43	76.44	0.15
Glen Arbor	1123.53*	2 Year	70.00	580.76	583.04		583.05	0.000591	0.89	81.65	65.66	0.13
Glen Arbor	1123.53*	50 Year	145.00	580.76	583.88		583.90	0.000501	1.13	139.65	74.77	0.13
Glen Arbor	1123.53*	100 Year	165.00	580.76	584.07		584.09	0.000492	1.18	153.95	78.10	0.13
Glen Arbor	1123.53*	500 Year	220.00	580.76	584.53		584.56	0.000475	1.30	191.46	83.29	0.14
Glen Arbor	1061.77*	2 Year	70.00	580.26	583.01		583.02	0.000397	0.79	91.50	67.09	0.11
Glen Arbor	1061.77*	50 Year	145.00	580.26	583.86		583.88	0.000387	1.04	159.43	103.62	0.12
Glen Arbor	1061.77*	100 Year	165.00	580.26	584.05		584.06	0.000384	1.09	179.83	114.72	0.12
Glen Arbor	1061.77*	500 Year	220.00	580.26	584.51		584.53	0.000372	1.20	238.46	130.66	0.12
Glen Arbor	1000.0	2 Year	70.00	579.75	583.00	581.14	583.00	0.000260	0.69	118.99	115.00	0.09
Glen Arbor	1000.0	50 Year	145.00	579.75	583.84	581.53	583.85	0.000260	0.90	222.62	128.05	0.10
Glen Arbor	1000.0	100 Year	165.00	579.75	584.03	581.61	584.04	0.000260	0.94	246.72	129.10	0.10
Glen Arbor	1000.0	500 Year	220.00	579.75	584.50	581.82	584.51	0.000260	1.05	307.53	131.09	0.10

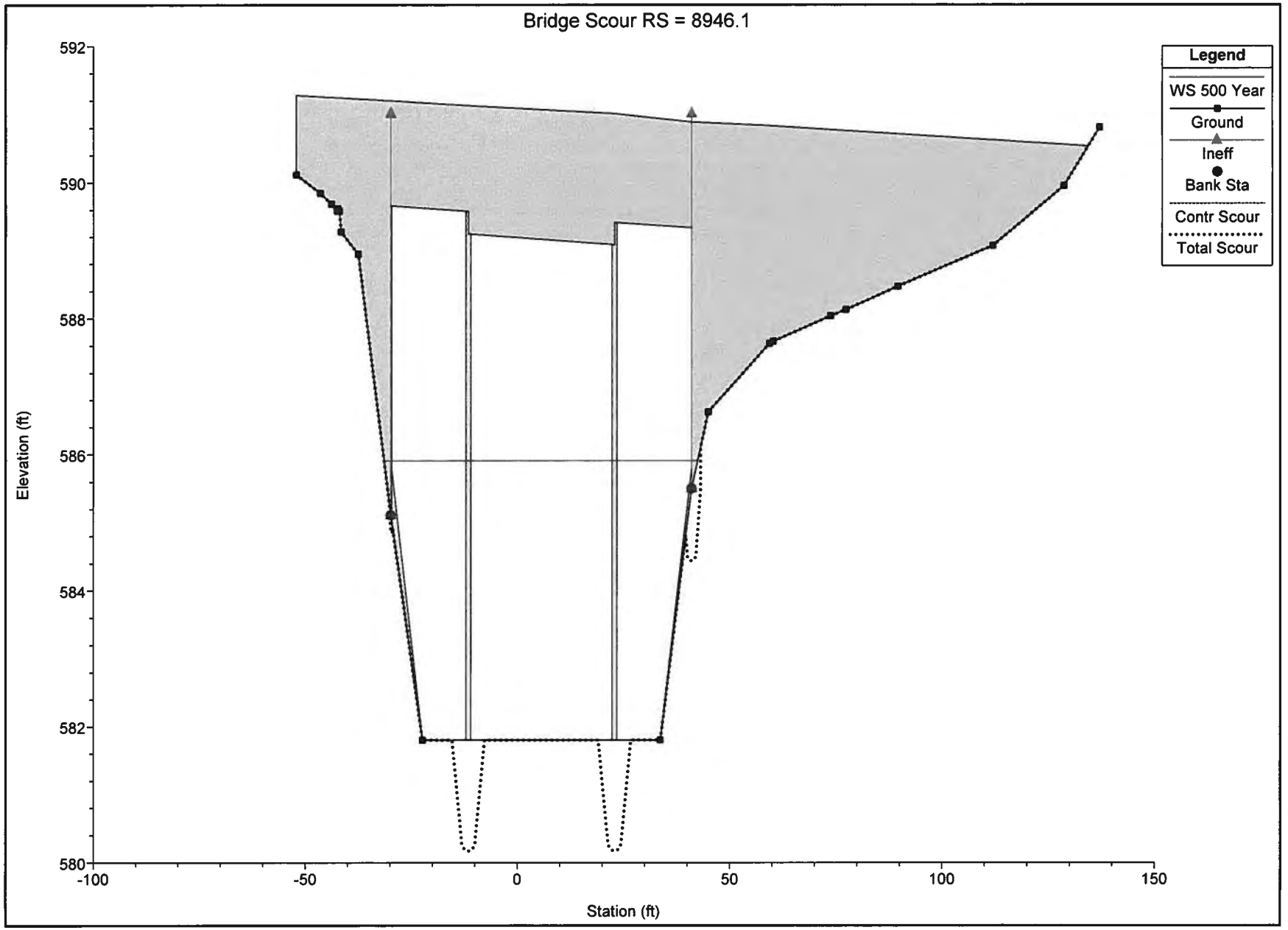

Bridge Scour RS = 2225.7
Legend
WS 500 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
592
590
588
586
584
582
580
578
576
574
-80
-60
-40
-20
0
20
40
60
Station (ft)

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	1.98	4.11	1.46
	Approach Velocity (ft/s):	0.21	1.04	0.16
	Br Average Depth (ft):		4.34	
	BR Opening Flow (cfs):		220.00	
	BR Top WD (ft):		54.81	
	Grain Size D50 (mm):	2.01	2.01	2.01
	Approach Flow (cfs):	9.34	209.29	1.36
	Approach Top WD (ft):	22.40	49.20	5.77
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):		0.00	
	Critical Velocity (ft/s):		2.66	
	Equation:		Clear	

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (ft):	-25.43	29.38
	Toe Sta at appr (ft):	-15.52	27.34
	Abutment Length (ft):	28.74	5.77
	Depth at Toe (ft):	4.40	3.10
	K1 Shape Coef:	1.00 - Vertical abutment	
	Degree of Skew (degrees):	90.00	90.00
	K2 Skew Coef:	1.00	1.00
	Projected Length L' (ft):	28.74	5.77
	Avg Depth Obstructed Ya (ft):	2.42	1.46
	Flow Obstructed Qe (cfs):	34.34	1.36
	Area Obstructed Ae (sq ft):	69.49	8.41
Results			
	Scour Depth Ys (ft):	5.16	2.07
	Qe/Ae = Ve:	0.49	0.16
	Froude #:	0.06	0.02
	Equation:	Froehlich	Froehlich


Bridge Scour RS = 8946.1
Legend
WS 500 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
592
590
588
586
584
582
580
-100
-50
0
50
100
150
Station (ft)

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):		4.13	0.49
	Approach Velocity (ft/s):		1.07	0.09
	Br Average Depth (ft):		3.68	
	BR Opening Flow (cfs):		220.00	
	BR Top WD (ft):		68.34	
	Grain Size D50 (mm):		2.01	2.01
	Approach Flow (cfs):		219.01	0.99
	Approach Top WD (ft):		49.44	22.90
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):		0.00	
	Critical Velocity (ft/s):		2.66	
	Equation:		Clear	

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	1.17
	Grain Size D50 (mm):	2.01000
	Depth Upstream (ft):	6.20
	Velocity Upstream (ft/s):	1.25
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	38.60
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	2.44000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	1.63
	Froude #:	0.09
	Equation:	CSU equation

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (ft):	-29.65	41.03
	Toe Sta at appr (ft):	-27.07	22.62
	Abutment Length (ft):	0.14	22.90
	Depth at Toe (ft):	1.82	1.35
	K1 Shape Coef:	1.00 - Vertical abutment	
	Degree of Skew (degrees):	90.00	90.00
	K2 Skew Coef:	1.00	1.00
	Projected Length L' (ft):	0.14	22.90
	Avg Depth Obstructed Ya (ft):	0.17	0.49
	Flow Obstructed Qe (cfs):	0.00	0.99
	Area Obstructed Ae (sq ft):	0.02	11.19
Results			
	Scour Depth Ys (ft):	0.17	1.06
	Qe/Ae = Ve:	0.00	0.09

Froude #:	0.00	0.02
Equation:	Froehlich	Froehlich

East Bridge
WCB 2024/01/12

HEC-RAS Plan: Proposed near Fisher Lake River: Crystal River Reach: Fisher Lake

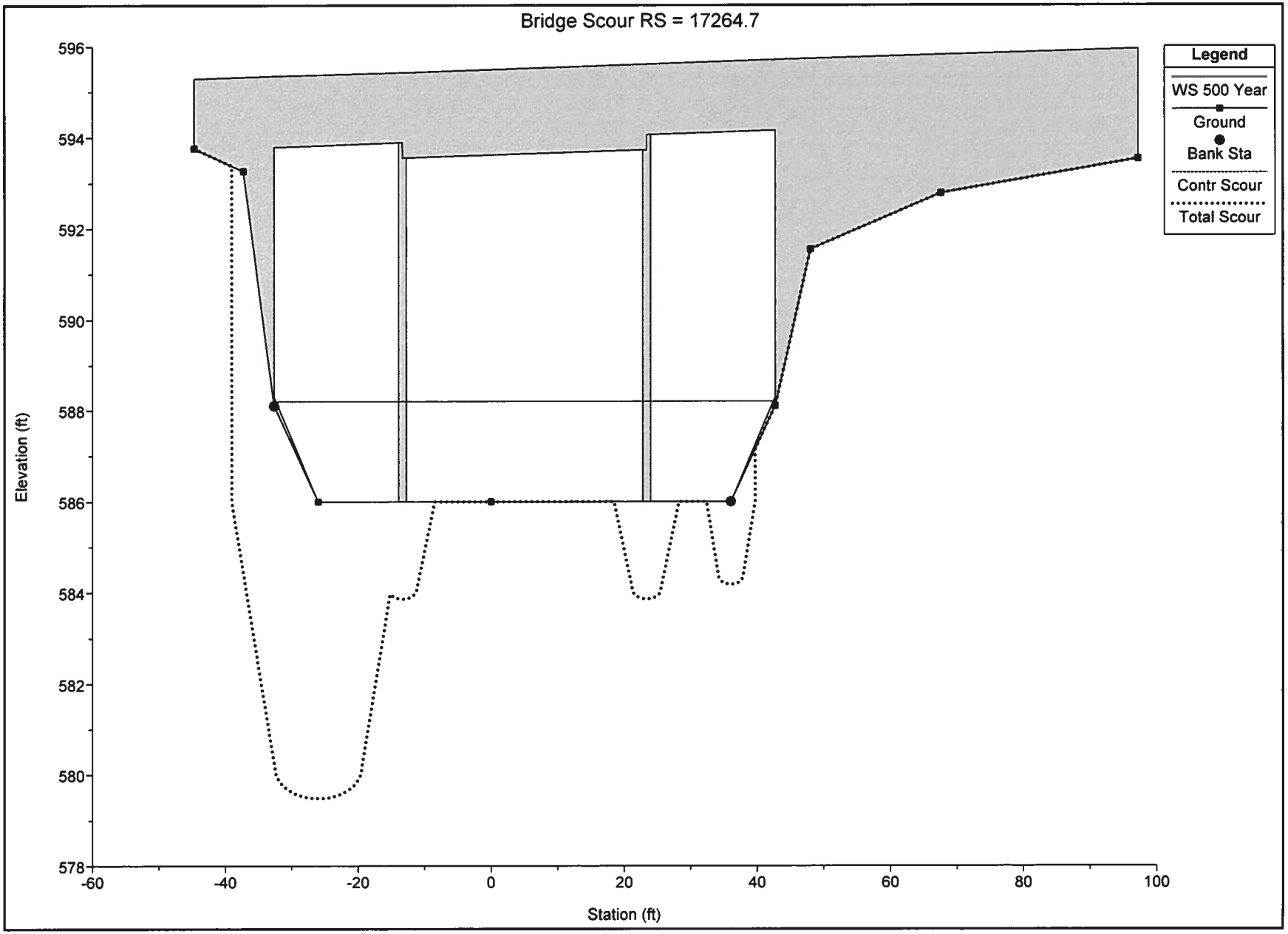
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Fisher Lake	18565.3	2 Year	70.00	586.80	588.92		588.93	0.000471	0.78	90.32	68.34	0.12
Fisher Lake	18565.3	50 Year	145.00	586.80	589.64		589.66	0.000473	1.04	140.40	69.87	0.13
Fisher Lake	18565.3	100 Year	165.00	586.80	589.81		589.83	0.000471	1.09	152.07	70.13	0.13
Fisher Lake	18565.3	500 Year	220.00	586.80	590.23		590.26	0.000464	1.22	182.04	70.87	0.13
Fisher Lake	18386.1	2 Year	70.00	587.06	588.83		588.84	0.000477	0.79	88.82	66.01	0.12
Fisher Lake	18386.1	50 Year	145.00	587.06	589.55		589.57	0.000491	1.06	137.18	67.61	0.13
Fisher Lake	18386.1	100 Year	165.00	587.06	589.72		589.74	0.000489	1.11	148.49	67.84	0.13
Fisher Lake	18386.1	500 Year	220.00	587.06	590.15		590.17	0.000484	1.25	177.53	68.43	0.14
Fisher Lake	17998.6	2 Year	70.00	586.65	588.66		588.67	0.000404	0.74	95.10	69.93	0.11
Fisher Lake	17998.6	50 Year	145.00	586.65	589.38		589.39	0.000429	1.00	145.82	71.73	0.12
Fisher Lake	17998.6	100 Year	165.00	586.65	589.54		589.56	0.000430	1.05	157.85	72.05	0.12
Fisher Lake	17998.6	500 Year	220.00	586.65	589.97		589.99	0.000427	1.18	188.86	72.86	0.13
Fisher Lake	17886.9*	2 Year	70.00	586.53	588.62		588.62	0.000423	0.73	95.58	73.42	0.11
Fisher Lake	17886.9*	50 Year	145.00	586.53	589.33		589.34	0.000428	0.98	148.56	75.28	0.12
Fisher Lake	17886.9*	100 Year	165.00	586.53	589.50		589.51	0.000426	1.03	161.20	75.62	0.12
Fisher Lake	17886.9*	500 Year	220.00	586.53	589.93		589.95	0.000417	1.15	193.83	76.50	0.13
Fisher Lake	17775.3	2 Year	70.00	586.41	588.57		588.58	0.000441	0.73	96.09	76.18	0.11
Fisher Lake	17775.3	50 Year	145.00	586.41	589.28		589.30	0.000426	0.96	151.54	78.84	0.12
Fisher Lake	17775.3	100 Year	165.00	586.41	589.45		589.47	0.000420	1.01	164.83	79.21	0.12
Fisher Lake	17775.3	500 Year	220.00	586.41	589.88		589.90	0.000406	1.12	199.14	80.17	0.12
Fisher Lake	17664.4*	2 Year	70.00	586.34	588.50		588.52	0.000687	0.86	81.10	69.42	0.14
Fisher Lake	17664.4*	50 Year	145.00	586.34	589.22		589.24	0.000599	1.11	132.15	72.66	0.14
Fisher Lake	17664.4*	100 Year	165.00	586.34	589.39		589.41	0.000582	1.16	144.47	73.14	0.14
Fisher Lake	17664.4*	500 Year	220.00	586.34	589.82		589.85	0.000546	1.27	176.38	74.62	0.14
Fisher Lake	17553.6	2 Year	70.00	586.28	588.41		588.42	0.001041	1.02	68.70	62.57	0.17
Fisher Lake	17553.6	50 Year	145.00	586.28	589.14		589.16	0.000817	1.26	116.18	66.85	0.16
Fisher Lake	17553.6	100 Year	165.00	586.28	589.31		589.34	0.000784	1.31	127.68	67.44	0.16
Fisher Lake	17553.6	500 Year	220.00	586.28	589.75		589.78	0.000717	1.43	157.46	68.95	0.16
Fisher Lake	17492.4*	2 Year	70.00	586.16	588.34		588.36	0.001067	1.06	66.36	58.41	0.17
Fisher Lake	17492.4*	50 Year	145.00	586.16	589.08		589.11	0.000859	1.31	111.46	63.17	0.17
Fisher Lake	17492.4*	100 Year	165.00	586.16	589.26		589.29	0.000826	1.37	122.51	64.62	0.17
Fisher Lake	17492.4*	500 Year	220.00	586.16	589.70		589.73	0.000761	1.50	151.77	68.46	0.17
Fisher Lake	17431.2*	2 Year	70.00	586.04	588.27		588.29	0.001122	1.10	63.45	54.24	0.18
Fisher Lake	17431.2*	50 Year	145.00	586.04	589.03		589.06	0.000924	1.38	106.20	58.71	0.18
Fisher Lake	17431.2*	100 Year	165.00	586.04	589.20		589.23	0.000891	1.44	116.51	59.37	0.18
Fisher Lake	17431.2*	500 Year	220.00	586.04	589.64		589.68	0.000827	1.58	143.47	63.53	0.18
Fisher Lake	17370.0*	2 Year	70.00	585.92	588.20		588.22	0.001238	1.17	59.66	50.03	0.19
Fisher Lake	17370.0*	50 Year	145.00	585.92	588.96		589.00	0.001031	1.47	100.15	55.68	0.19
Fisher Lake	17370.0*	100 Year	165.00	585.92	589.14		589.18	0.000994	1.53	110.05	56.63	0.19
Fisher Lake	17370.0*	500 Year	220.00	585.92	589.59		589.63	0.000924	1.67	136.24	62.46	0.19
Fisher Lake	17308.8	2 Year	70.00	585.80	588.11		588.14	0.001444	1.28	54.92	45.61	0.20
Fisher Lake	17308.8	50 Year	145.00	585.80	588.89		588.93	0.001201	1.58	95.18	62.36	0.20
Fisher Lake	17308.8	100 Year	165.00	585.80	589.07		589.11	0.001146	1.64	106.43	63.17	0.20
Fisher Lake	17308.8	500 Year	220.00	585.80	589.52		589.57	0.001041	1.78	135.38	65.00	0.20
Fisher Lake	17296.4	2 Year	70.00	585.54	588.09		588.12	0.001129	1.45	49.65	30.93	0.19
Fisher Lake	17296.4	50 Year	145.00	585.54	588.84		588.91	0.001469	2.10	74.18	34.35	0.23
Fisher Lake	17296.4	100 Year	165.00	585.54	589.01		589.09	0.001520	2.23	80.21	35.48	0.24
Fisher Lake	17296.4	500 Year	220.00	585.54	589.45		589.55	0.001624	2.54	96.27	38.45	0.25
Fisher Lake	17288.0*	2 Year	70.00	585.41	588.08	586.65	588.11	0.000897	1.34	53.96	32.01	0.17
Fisher Lake	17288.0*	50 Year	145.00	585.41	588.84	587.10	588.89	0.001224	1.96	79.30	35.63	0.21
Fisher Lake	17288.0*	100 Year	165.00	585.41	589.01	587.20	589.08	0.001275	2.09	85.56	36.69	0.22
Fisher Lake	17288.0*	500 Year	220.00	585.41	589.44	587.45	589.53	0.001382	2.39	102.15	39.62	0.23
Fisher Lake	17264.7		Bridge									
Fisher Lake	17234.0*	2 Year	70.00	584.60	587.25		587.28	0.001002	1.28	55.08	35.74	0.18
Fisher Lake	17234.0*	50 Year	145.00	584.60	587.94		587.99	0.001301	1.85	80.33	37.97	0.22
Fisher Lake	17234.0*	100 Year	165.00	584.60	588.10		588.16	0.001339	1.96	86.53	38.53	0.22
Fisher Lake	17234.0*	500 Year	220.00	584.60	588.51		588.59	0.001414	2.24	102.60	39.96	0.23
Fisher Lake	17224.5	2 Year	70.00	584.46	587.25		587.27	0.000774	1.17	60.30	36.86	0.16
Fisher Lake	17224.5	50 Year	145.00	584.46	587.93		587.98	0.001066	1.72	86.19	38.77	0.20
Fisher Lake	17224.5	100 Year	165.00	584.46	588.09		588.15	0.001107	1.83	92.51	39.24	0.20
Fisher Lake	17224.5	500 Year	220.00	584.46	588.50		588.57	0.001191	2.10	108.84	40.43	0.22
Fisher Lake	17166.3*	2 Year	70.00	585.18	587.20		587.22	0.000964	1.15	61.44	45.76	0.17
Fisher Lake	17166.3*	50 Year	145.00	585.18	587.87		587.91	0.001100	1.60	93.41	48.83	0.20

HEC-RAS Plan: Proposed near Fisher Lake River: Crystal River Reach: Fisher Lake (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Fisher Lake	17166.3*	100 Year	165.00	585.18	588.04		588.08	0.001106	1.69	101.37	49.56	0.20
Fisher Lake	17166.3*	500 Year	220.00	585.18	588.45		588.50	0.001117	1.90	124.08	68.31	0.21
Fisher Lake	17108.2	2 Year	70.00	585.90	587.12		587.14	0.001749	1.28	56.65	60.12	0.22
Fisher Lake	17108.2	50 Year	145.00	585.90	587.80		587.84	0.001345	1.57	105.93	84.06	0.21
Fisher Lake	17108.2	100 Year	165.00	585.90	587.97		588.01	0.001268	1.62	120.30	89.95	0.21
Fisher Lake	17108.2	500 Year	220.00	585.90	588.39		588.43	0.001107	1.73	159.42	96.00	0.20
Fisher Lake	17078.7*	2 Year	70.00	585.62	587.05		587.08	0.002318	1.54	47.32	50.13	0.26
Fisher Lake	17078.7*	50 Year	145.00	585.62	587.74		587.79	0.001895	1.92	91.61	80.01	0.25
Fisher Lake	17078.7*	100 Year	165.00	585.62	587.90		587.96	0.001791	1.98	105.67	88.32	0.25
Fisher Lake	17078.7*	500 Year	220.00	585.62	588.33		588.39	0.001558	2.10	145.74	100.69	0.24
Fisher Lake	17049.2	2 Year	70.00	585.35	586.92		586.99	0.004130	2.10	34.75	35.56	0.34
Fisher Lake	17049.2	50 Year	145.00	585.35	587.61		587.71	0.003463	2.62	71.01	70.45	0.34
Fisher Lake	17049.2	100 Year	165.00	585.35	587.78		587.89	0.003258	2.69	83.78	81.68	0.33
Fisher Lake	17049.2	500 Year	220.00	585.35	588.22		588.33	0.002715	2.80	126.63	108.66	0.32
Fisher Lake	17006.4*	2 Year	70.00	585.40	586.76		586.82	0.003710	1.87	39.06	43.25	0.32
Fisher Lake	17006.4*	50 Year	145.00	585.40	587.51		587.58	0.002509	2.20	79.99	66.72	0.29
Fisher Lake	17006.4*	100 Year	165.00	585.40	587.69		587.76	0.002317	2.25	92.48	72.79	0.28
Fisher Lake	17006.4*	500 Year	220.00	585.40	588.14		588.22	0.001945	2.36	128.80	87.62	0.27
Fisher Lake	16963.7	2 Year	70.00	585.45	586.62		586.66	0.003377	1.69	44.19	51.85	0.30
Fisher Lake	16963.7	50 Year	145.00	585.45	587.43		587.48	0.001789	1.85	93.87	70.22	0.24
Fisher Lake	16963.7	100 Year	165.00	585.45	587.62		587.67	0.001633	1.89	107.42	74.48	0.24
Fisher Lake	16963.7	500 Year	220.00	585.45	588.09		588.15	0.001366	1.99	144.77	85.05	0.22
Fisher Lake	16912.1*	2 Year	70.00	584.96	586.48		586.52	0.002291	1.60	45.64	41.24	0.26
Fisher Lake	16912.1*	50 Year	145.00	584.96	587.35		587.40	0.001525	1.88	92.02	65.73	0.23
Fisher Lake	16912.1*	100 Year	165.00	584.96	587.54		587.59	0.001437	1.94	104.94	68.57	0.23
Fisher Lake	16912.1*	500 Year	220.00	584.96	588.01		588.08	0.001283	2.08	139.42	76.24	0.22
Fisher Lake	16860.5	2 Year	70.00	584.48	586.38		586.42	0.001709	1.58	46.63	36.09	0.23
Fisher Lake	16860.5	50 Year	145.00	584.48	587.26		587.32	0.001439	1.98	88.69	60.40	0.23
Fisher Lake	16860.5	100 Year	165.00	584.48	587.46		587.52	0.001396	2.06	100.66	62.63	0.23
Fisher Lake	16860.5	500 Year	220.00	584.48	587.94		588.01	0.001326	2.25	131.99	69.37	0.23
Fisher Lake	16807.7*	2 Year	70.00	584.14	586.31		586.34	0.001253	1.36	52.36	38.79	0.20
Fisher Lake	16807.7*	50 Year	145.00	584.14	587.21		587.25	0.001079	1.73	92.34	58.32	0.20
Fisher Lake	16807.7*	100 Year	165.00	584.14	587.40		587.45	0.001061	1.81	104.89	70.03	0.20
Fisher Lake	16807.7*	500 Year	220.00	584.14	587.88		587.94	0.001011	1.98	142.74	84.42	0.20
Fisher Lake	16755.0	2 Year	70.00	583.80	586.26		586.28	0.000875	1.16	60.37	39.75	0.16
Fisher Lake	16755.0	50 Year	145.00	583.80	587.17		587.20	0.000797	1.50	100.87	50.43	0.17
Fisher Lake	16755.0	100 Year	165.00	583.80	587.36		587.40	0.000791	1.57	111.03	52.91	0.17
Fisher Lake	16755.0	500 Year	220.00	583.80	587.85		587.89	0.000784	1.75	144.60	84.94	0.18
Fisher Lake	16601.1	2 Year	70.00	583.61	586.10		586.12	0.001172	1.35	51.67	32.86	0.19
Fisher Lake	16601.1	50 Year	145.00	583.61	587.00		587.05	0.001210	1.73	83.98	38.26	0.20
Fisher Lake	16601.1	100 Year	165.00	583.61	587.20		587.25	0.001180	1.80	93.02	52.86	0.20
Fisher Lake	16601.1	500 Year	220.00	583.61	587.69		587.75	0.001107	1.97	127.56	88.20	0.20
Fisher Lake	16480.4	2 Year	70.00	583.93	585.90		585.94	0.002050	1.62	43.20	32.27	0.25
Fisher Lake	16480.4	50 Year	145.00	583.93	586.82		586.87	0.001857	1.88	77.30	43.00	0.25
Fisher Lake	16480.4	100 Year	165.00	583.93	587.02		587.08	0.001798	1.91	86.43	45.69	0.24
Fisher Lake	16480.4	500 Year	220.00	583.93	587.53		587.59	0.001577	1.98	110.99	50.19	0.23
Fisher Lake	16327.7	2 Year	70.00	583.66	585.59		585.62	0.002047	1.56	44.82	35.49	0.25
Fisher Lake	16327.7	50 Year	145.00	583.66	586.58		586.62	0.001405	1.75	83.01	41.64	0.22
Fisher Lake	16327.7	100 Year	165.00	583.66	586.79		586.84	0.001344	1.79	92.11	42.98	0.22
Fisher Lake	16327.7	500 Year	220.00	583.66	587.33		587.39	0.001145	1.90	116.71	49.06	0.21
Fisher Lake	16204.0	2 Year	70.00	583.36	585.34		585.38	0.001963	1.63	43.32	33.47	0.24
Fisher Lake	16204.0	50 Year	145.00	583.36	586.41		586.46	0.001228	1.89	82.53	39.47	0.21
Fisher Lake	16204.0	100 Year	165.00	583.36	586.62		586.68	0.001190	1.97	91.29	40.60	0.21
Fisher Lake	16204.0	500 Year	220.00	583.36	587.17		587.24	0.001121	2.16	114.39	44.31	0.21
Fisher Lake	16110.8	2 Year	70.00	582.46	585.20		585.24	0.001170	1.48	48.95	31.40	0.19
Fisher Lake	16110.8	50 Year	145.00	582.46	586.31		586.36	0.000973	1.86	87.44	37.69	0.19
Fisher Lake	16110.8	100 Year	165.00	582.46	586.53		586.58	0.000980	1.96	95.81	38.74	0.20
Fisher Lake	16110.8	500 Year	220.00	582.46	587.07		587.15	0.000994	2.20	117.79	41.52	0.20
Fisher Lake	16007.0	2 Year	70.00	582.37	585.05		585.09	0.001708	1.65	42.41	26.71	0.23
Fisher Lake	16007.0	50 Year	145.00	582.37	586.19		586.25	0.001220	1.93	78.59	66.54	0.21
Fisher Lake	16007.0	100 Year	165.00	582.37	586.41		586.47	0.001198	2.02	86.74	72.36	0.21
Fisher Lake	16007.0	500 Year	220.00	582.37	586.96		587.03	0.001155	2.23	108.74	85.74	0.21
Fisher Lake	15886.4	2 Year	70.00	582.07	584.89		584.92	0.001152	1.49	47.02	25.87	0.19

HEC-RAS Plan: Proposed near Fisher Lake River: Crystal River Reach: Fisher Lake (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Fisher Lake	15886.4	50 Year	145.00	582.07	586.06		586.11	0.000984	1.83	82.81	36.42	0.19
Fisher Lake	15886.4	100 Year	165.00	582.07	586.28		586.34	0.000988	1.93	91.13	38.95	0.19
Fisher Lake	15886.4	500 Year	220.00	582.07	586.83		586.90	0.000995	2.16	114.47	47.05	0.20
Fisher Lake	15830.1	2 Year	70.00	581.60	584.84	582.97	584.86	0.000800	1.32	53.49	28.13	0.16
Fisher Lake	15830.1	50 Year	145.00	581.60	586.02	583.51	586.06	0.000800	1.64	94.02	40.68	0.17
Fisher Lake	15830.1	100 Year	165.00	581.60	586.24	583.63	586.28	0.000801	1.73	103.29	43.05	0.17
Fisher Lake	15830.1	500 Year	220.00	581.60	586.79	583.93	586.85	0.000801	1.93	128.77	48.95	0.18


Bridge Scour RS = 17264.7
Legend
WS 500 Year
Ground
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
596
594
592
590
588
586
584
582
580
578
-60
-40
-20
0
20
40
60
80
100
Station (ft)

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	1.02	3.14	0.99
	Approach Velocity (ft/s):	0.39	2.54	0.38
	Br Average Depth (ft):		2.09	1.10
	BR Opening Flow (cfs):		217.48	2.52
	BR Top WD (ft):		66.05	6.38
	Grain Size D50 (mm):		2.01	2.01
	Approach Flow (cfs):	2.71	215.57	1.73
	Approach Top WD (ft):	6.81	27.00	4.64
	K1 Coefficient:	0.590	0.640	0.590
Results				
	Scour Depth Ys (ft):		0.00	0.00
	Critical Velocity (ft/s):		2.54	2.09
	Equation:		Live	Clear

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	1.17
	Grain Size D50 (mm):	2.01000
	Depth Upstream (ft):	4.01
	Velocity Upstream (ft/s):	2.72
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	36.20
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	2.44000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	2.14
	Froude #:	0.24
	Equation:	CSU equation

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (ft):	-25.98	36.03
	Toe Sta at appr (ft):	-4.34	16.00
	Abutment Length (ft):	13.47	4.64
	Depth at Toe (ft):	3.44	3.44
	K1 Shape Coef:	1.00 - Vertical abutment	
	Degree of Skew (degrees):	90.00	90.00
	K2 Skew Coef:	1.00	1.00
	Projected Length L' (ft):	13.47	4.64
	Avg Depth Obstructed Ya (ft):	2.08	0.99
	Flow Obstructed Qe (cfs):	55.38	1.73
	Area Obstructed Ae (sq ft):	27.99	4.59
Results			
	Scour Depth Ys (ft):	6.51	1.83
	Qe/Ae = Ve:	1.98	0.38

Froude #:	0.24	0.07
Equation:	Froehlich	Froehlich

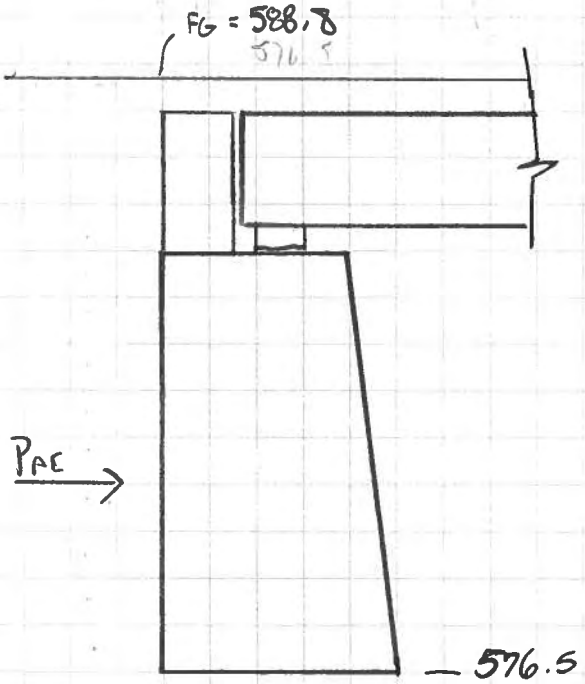
Gosling Czubak
engineering sciences, inc.

Engineers • Surveyors
Landscape Architecture
Environmental Services
1280 Business Park D., Traverse City, MI 49686-8607
231-946-9191 • 800-968-1062 • Fax: 231-941-4603

JOB NUMBER _____
SHEET _____ OF _____
DATE _____
COMPUTED BY _____
CHECKED _____

CLIENT _____
SUBJECT CROSSING 1

CURTAIN WALL ABUTMENT DESIGN



SOIL $\gamma = 115\ lb/ft^3$
$\phi = 30°$

$H = 12.3\ FT$

$P_{AE} = \frac{1}{2}\gamma H^2 K_a$

$= \frac{1}{2}(115\ lb/ft^3)(12.3\ FT)^2(.33)$

$K_a = \tan^2(45 - \frac{\phi}{2}) = .33$

$P_{AE} = 2870.7\ lb/ft$

TRAFFIC LOAD

PUT HL-93 AXLE RIGHT AT BACK SIDE OF ABUTMENT.

60k AXLE – TREAT AS POINT LOAD

$P_H = .78\frac{Q_P}{H} = \frac{.78(60)}{12.3} = 3.8\ K$

$\times 2$ LANE $= 7.6k$

$2871\ lb/ft \times 1.25(LF) \times 41\ FT = 147139\ lb$
$7.6 \times 1.75 \times 1.3 = 17.3 = 17300\ lb > 164439\ k$

$\div 8 = 20554\ k/PILE < 24000$

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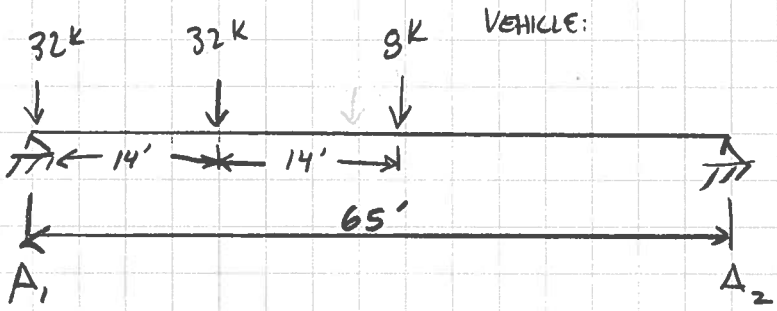
JOB NUMBER 2020430002
SHEET _____ OF _____
DATE _____
COMPUTED BY RMV
CHECKED _____

CLIENT _____
SUBJECT CROSSING 1

LIVE LOAD

VEHICLE LIVE LOAD TO ABUTMENT



$$R_{A_1} = 32\,k + \frac{32(65-14) + 8(37)}{65} = 61.7\,k \quad \times 2\ \text{LANE} = 123.4\ K - \text{HS20}$$

TANDEM HL-93 MOD :

60 K AXLE OVER ABUT.

LANE: .64 K/FT (65/2) = 20.8 K

TANDEM + LANE = 60 + 20.8 × 2 LANES × 1.2 (HL93 MOD) = 193.92 K·P ←

HL-93 MOD LIVE LOAD

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DEAD LOADS

W33 x 141

BIT - USE ACC BIT, THICKNESS VARIES .49' @ EDGES TO .74' @ ℄.

AVG THICK = 21 FT² / 34 FT = .62 FT = 7.4 in

7.4 x 110 = 814 lb/syd

DC BIT = 814 lb/syd x (65' x 34' ÷ 2 / 9) = **99,941 lb / ABUT**

SUPERSTRUCTURE

BEAMS - W33 x 141 (ASSUMED) → USE W33 x 152

152 lb/ft x 65 FT x 8 Beams = 79,040 lb BEAMS

DIAPHRAGMS - ASSUME W21 x 44

31.44 FT x 44 lb/ft x 4 = 5533 lb DIAPHRAGM

GUARDRAIL - 12 lb/ft x 65 ft x 2 = 1560 lb

W8 x 18 x 4.73 = 85 lb
W16 x 26 x 1.5 = 39 lb
> 124 lb x 12 x 2 = 2976 lb

> 4536 lb GUARDRAIL

TOTAL SUPERSTRUCT RXN = $\frac{79040 + 5533 + 4536}{2}$ = **44,555 lb / ABUT**

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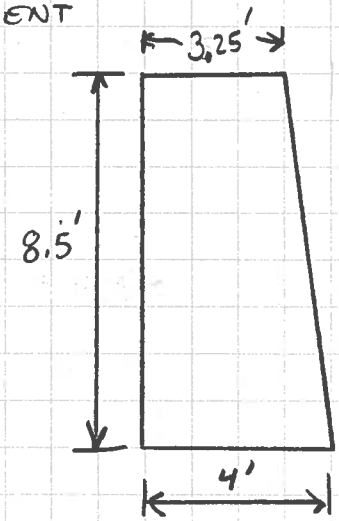
CONCRETE ABUTMENT + BACKWALL

BACKWALL - $1' \times 3' \times 150\ lb/ft^3 = 450\ lb/ft$

ABUTMENT



$A = 3.25' \times 8.5' = 27.625\ FT^2$

$\frac{1}{2} \times .75' \times 8.5' = 3.1875\ FT^2$

$30.81\ FT^2$

$WT = 150\ lb/ft^3 \times 30.81\ FT^2 = 4622\ lb/ft$

LENGTH OF SUPER = 38.11 FT

$38.11 \times (4622 + 450) = 193{,}294\ lb/ABUT$

LOAD SUMMARY →

	LOAD	LRFD LOAD FACTOR	
LL =	193.92 K	1.75	= 339.4
BIT =	99.9 K	1.25	= 124.9
SUPER =	44.6 K	1.25	= 55.8
CONC =	193.3 K	1.25	= 241.6
			761.7 KIP

761.7 KIP / 6 PILES = 126.95 KIP/PILE

$\Phi_{dyn} * R_n = R_R$, $R_R/\Phi_{dyn} = R_n$, $R_n = 126.95/.5 = 253.9\ K \rightarrow 260\ K$

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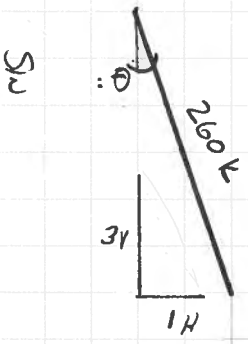


$\tan\theta = \frac{1}{3}$, $\theta = 18.4°$

$\sin\theta = \frac{CAP_x}{260K}$, $CAP_x = 260 \sin 18.4$

$= 82 K$

↳ TABLE FROM MDOT INDICATES LATERAL LOAD RESISTANCE OF HP12×53 $P_u = 140_{TON} = 32$ kip

$\frac{32\,000}{280000} = \frac{x}{240000}$, $x = 24.0$ K

TOTAL PILE RESISTANCE PER ABUT:

4 VERT @ 260 K/EA
4 BATT @ 260 COS 18.4 = 246 K/EA

2024 K/ABUT

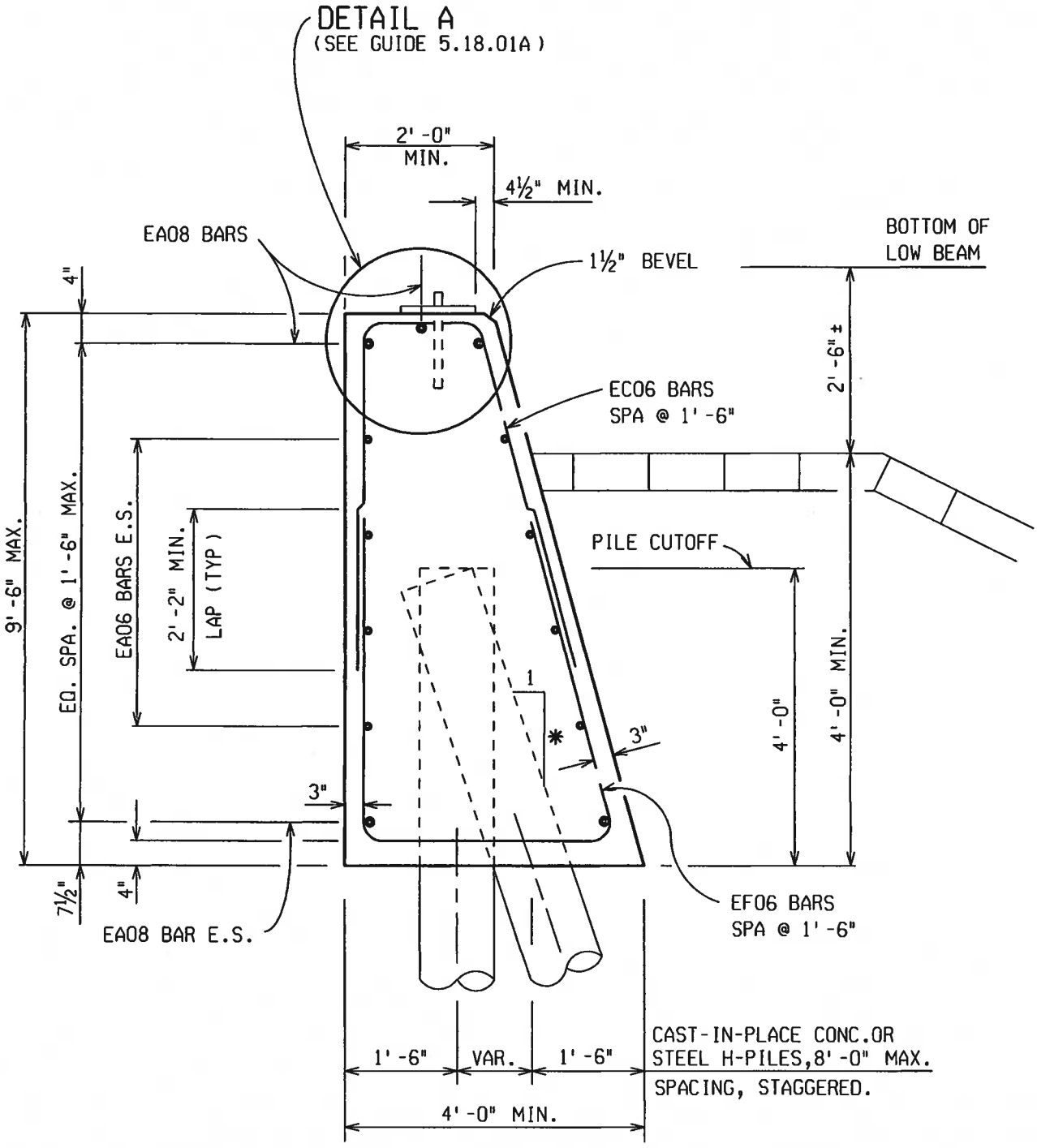
761.7/.5 = 1523

$1523 = 4x + 4(x \cos 18.4)$,

$1523 = 4x + 3.796x$, $x = 195 := \underline{210 \text{ Kip}}$

STEEL PER MDOT CURTAIN WALL ABUTMENT DETAIL

DRAWN BY: BLT CHECKED BY: VZ APPROVED BY: TGF	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT CURTAINWALL ABUTMENT	ISSUED: 05/04/06 SUPERSEDES: 11/27/01



* FOR PILE BATTER, SEE BRIDGE DESIGN MANUAL 7.03.09

FOR ADDITIONAL REINFORCING DETAILS, SEE GUIDES 6.20.01 AND 6.20.03.

PREPARED BY DESIGN SUPPORT AREA	5.18.01

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JOB NUMBER 20204300 02.
SHEET 1 OF
DATE 8 JAN 2021
COMPUTED BY RMV
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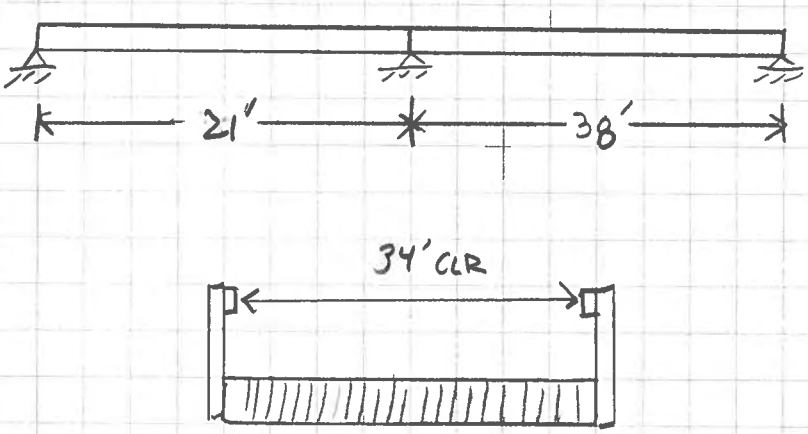
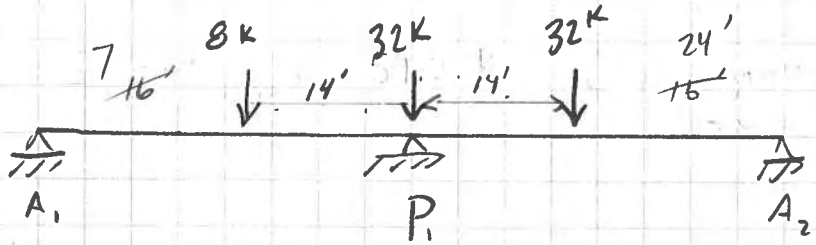
CLIENT
SUBJECT CRYSTAL RIVER CROSSINGS - PRELIM FDN (273) - UPATED w/ 21'-38'-21' SPAN CONFIG.

BRIDGE SCHEMATIC



LIVE LOAD: DESIGN LANES: 34'/12' = 2.83 → 2 LANES FOR LL

VEHICLE:



$R_{P_1} = 32^K + 8^K\left(\frac{7'}{21'}\right) + 32^K\left(\frac{14'}{38'}\right) = 54.9^K$

R_{P_1} W/ TRUCK ENTIRELY ON 38' SPAN = 54.3 K

TANDEM: FOR HL-93 MOD, TANDEM = 60 K AXLE

$R_{P_1} = 60^K$ (axle over PIER)

LANE: $.64\ K/ft\left(\frac{21}{2}\right) + .64\left(\frac{38}{2}\right) = 18.9\ K$

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LIVE LOAD = TANDEM + LANE (HL-93 MOD FACTOR)

$= (60K + 18.9K) \times 2 \text{ LANES} \times 1.2 = 189.36\ K$

DEAD LOAD

TIMBER : $50\ lb/ft^3$

DECK : $24''/12 \times (34 \text{ CLR} + 1' + 1') \times 38' \times 50\ lb/ft^3 = 136{,}800\ lb$ 38' SPAN

$14'/12 \times (34' + 1' + 1') \times 21' \times 50\ lb/ft^3 = 44{,}100\ lb$ 21 SPAN

$R_{DECK} = 136800/2 + 44100/2 = 90{,}450\ lb = 90.5\ kip$

RAIL : $(.5 \times 1) \times 2 \times 50 = 50\ lb/ft$ RAIL & CURB

POSTS : $.67 \times 1 \times 4 \times 50\ lb/ft^3 = 134\ lb/ea \times 6 = 804\ lb/30\ FT = 26.8$

$50 + 26.8 = 76.8\ lb/ft \rightarrow 85$

$85\ lb/ft \times \left(\frac{38}{2} + \frac{21}{2}\right) \times 2 \text{ SIDES} = 5.1\ K = R_{RAIL}$ ✓

BIT : AVG THICK $= \left[1.5'' \times 34 + \left(\frac{3 \times 17}{2}\right)2\right] \div 34 = 3\ in$

$110\ lb/syd/in \rightarrow 34' \times \left(\frac{38'}{2} + \frac{21'}{2}\right)/9 = \frac{112}{113.3}\ syd \times 330\ lb/syd = 36960\ lb$

$R_{wear} = 37\ K$

TIMBER PILE CAP $= \frac{14'' \times 14''}{144} = 1.36\ FT^3 \times 50\ lb/ft^3 \times 44' = 2994$

$= 3\ K$

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SUBJECT _____

LOADS: LL = 189.4 K

DL Deck = 90.5K
Rail = 5.1 K
Bit = 37 K
Cop = 3 K
/ 135.6 K

LRFD ⇒ $1.25(135.6) + 1.75(189.4) = 500.95$ kip

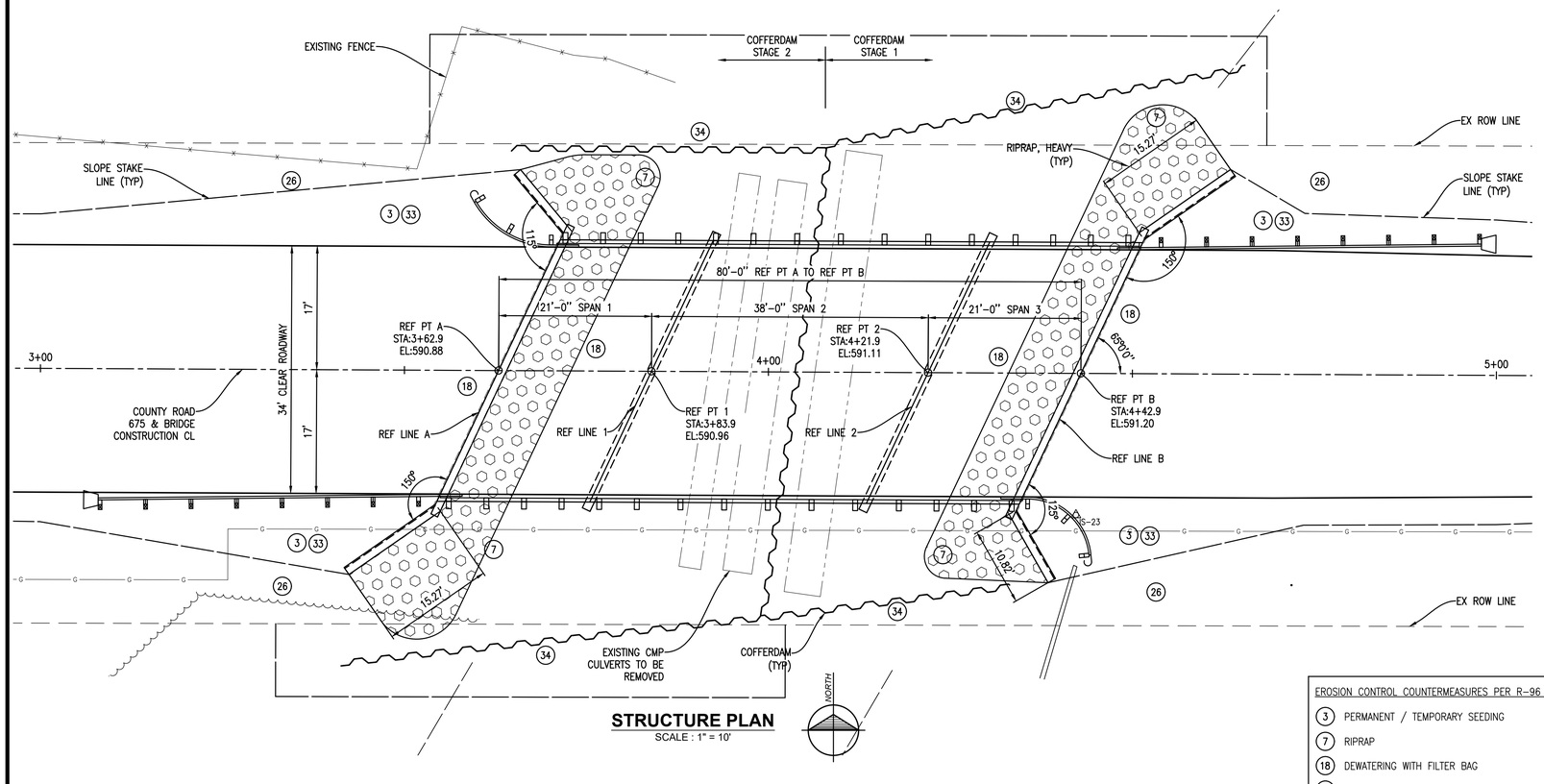
$R_R = 500.95$ kip ÷ 8 piles / pier = 62.62 kip/pile

$\phi_{dyn} \times R_n = R_R$

$R_R / \phi_{dyn} = R_n$, $R_n = 62.62 / .5 = 125.2 =$ 125 kips

↓

130 kips



STRUCTURE PLAN
SCALE : 1" = 10'

SUMMARY OF HYDRAULIC ANALYSIS											
		EXISTING				PROPOSED					
		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		WATER SURF. ELEV. (FT)		VELOCITY (FPS)			
FLOOD DATA	BASE + FLOOD (CFS)	U/S FACE OF CULVERTS	D/S FACE OF CULVERTS	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	U/S FACE OF BRIDGE	D/S FACE OF BRIDGE	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
2-YR	70	585.18	584.98	0.7	1.0	585.04	584.96	0.6	0.5	188.3	-0.14
50-YR	145	586.80	586.04	0.7	1.6	586.08	585.89	0.9	0.8	250.6	-0.72
100-YR	165	587.29	586.31	0.7	1.7	586.30	586.10	0.9	0.9	265.0	-0.99

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 513.2 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

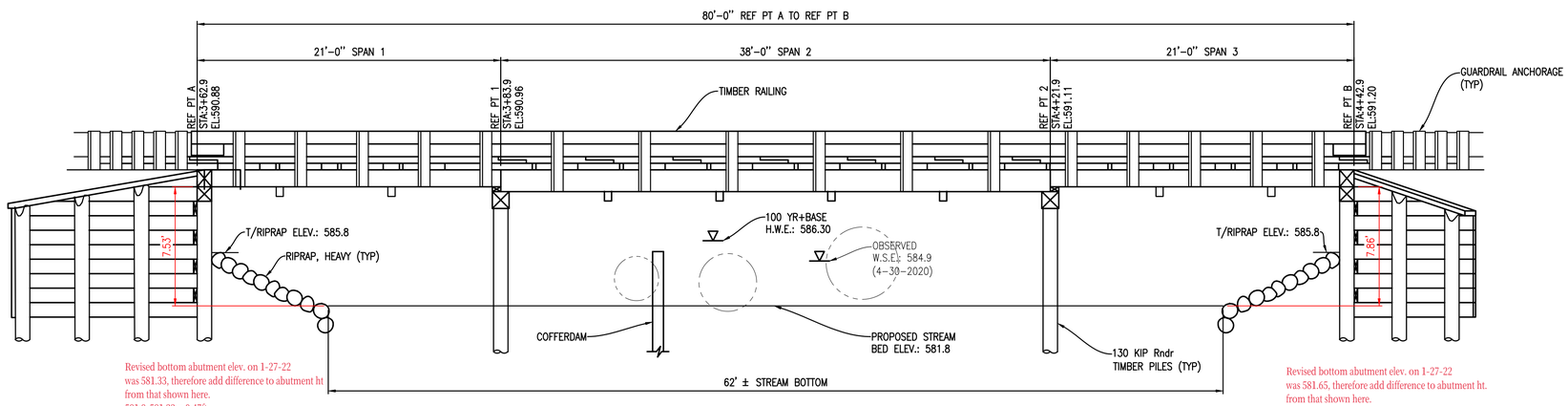
THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

MISCELLANEOUS QUANTITIES

1	LS	MOBILIZATION
1	LS	TRAFFIC CONTROL
2	EA	CULV, REM, 24 INCH TO 48 INCH
1	EA	CULV, REM, OVER 48 INCH
150	FT	GUARDRAIL, REM
50	CYD	EMBANKMENT, CIP
650	CYD	EXCAVATION, CHANNEL
800	CYD	EXCAVATION, EARTH
200	CYD	BACKFILL, STRUCTURE, CIP
200	CYD	EXCAVATION, FDN
100	FT	EROSION CONTROL, SILT FENCE
900	SYD	AGGREGATE BASE, 6 INCH
55	SYD	SHOULDER, CL II, 3 INCH
1090	SYD	HMA SURFACE, REM
200	TON	HMA, LVSP
1	LS	TEMPORARY STREAM CONTROL
1	LS	STRUCTURE, TIMBER,34' X 80', FURN
1	LS	STRUCTURE, TIMBER, 34' X 80', INSTALL
25	FT	GUARDRAIL, TYPE B
2	EA	GUARDRAIL APPROACH TERMINAL, TYPE 2B
6	EA	GUARDRAIL REFLECTOR
150	SYD	RIPRAP, HEAVY
290	SYD	SLOPE RESTORATION
1	LS	UTILITY POLE RELOCATION

EROSION CONTROL COUNTERMEASURES PER R-96 SERIES STANDARD PLAN

- (3) PERMANENT / TEMPORARY SEEDING
- (7) RIPRAP
- (18) DEWATERING WITH FILTER BAG
- (26) SILT FENCE
- (33) MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS
- (34) COFFERDAMS



STRUCTURE ELEVATION
NO SCALE

Revised bottom abutment elev. on 1-27-22 was 581.33, therefore add difference to abutment ht from that shown here.
581.8-581.33 = 0.47ft.
Abutment height = 7.53'+0.47' = 8ft.
(this note added by A.Paladino 1-28-22)

Revised bottom abutment elev. on 1-27-22 was 581.65, therefore add difference to abutment ht. from that shown here.
581.8-581.65 = 0.15ft.
Abutment height = 7.86'+0.15' = 8ft.
(this note added by A.Paladino 1-28-22)

THE DESIGN OF THIS STRUCTURE IS BASED ON 1.2 TIMES THE CURRENT ASSHTO LRFD BRIDGE DESIGN SPECIFICATION HL-93 LOADING WITH THE EXCEPTION THAT THE DESIGN TANDEM PORTION OF THE HL-93 LOAD DEFINITION SHALL BE REPLACED BY A SINGLE 60 KIP AXLE LOAD BEFORE APPLICATION OF THIS 1.2 FACTOR. THE RESULTING LOAD IS DESIGNATED HL-93 MOD. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/800 OF THE SPAN LENGTH.

WITHOUT THE PREVENTIVE MEASURES SHOWN ON THESE PLANS, THERE IS A POSSIBILITY THAT STREAM BED SCOUR MAY OCCUR. THE ESTIMATED TOTAL SCOUR DEPTH IS CALCULATED TO BE 1 FEET AT ABUTMENT A, 1.6 FEET AT PIER 1, 1.6 FEET AT PIER 2, AND 1.1 FEET AT ABUTMENT B. THESE DEPTHS ARE BASED ON A 500 YEAR RUNOFF EVENT.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN PAYMENT FOR RIPRAP.

THE RIPRAP QUANTITY IS BASED ON THE LATERAL DIMENSIONS OF THE AREA TO BE PROTECTED, REGARDLESS OF THE NUMBER OF LAYERS REQUIRED.

THE INTENT OF THE FLOW DIVERSION AND STAGING SEQUENCE DESCRIBED IS TO FACILITATE RIPRAP PLACEMENT, CONTAIN SEDIMENTATION, AND MAINTAIN STREAM FLOW. ALTERNATE METHODS OF STREAM DIVERSION SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

RIPRAP SHALL BE NATURAL FIELD STONE.

PROPOSED CONSTRUCTION STAGING SEQUENCE:

STAGE 1:
1. REMOVE ROAD EMBANKMENT OVER EXISTING CULVERTS TO TOP OF CULVERTS.
2. PLACE STAGE 1 COFFERDAM BETWEEN EXISTING CULVERTS ISOLATING EAST CULVERT FROM THE STREAM. MAINTAIN STREAM FLOW THROUGH WEST CULVERTS.
3. REMOVE THE EAST CULVERT AND EXCAVATE WEST PART OF STREAM CHANNEL.
4. CONSTRUCT ABUTMENT B AND PIER 2, AND PLACE RIPRAP AT ABUTMENT B.

STAGE 2:
1. REMOVE FLOW DIVERSION ISOLATING THE EAST SIDE AND PLACE IN THE WEST PART OF THE STREAM ISOLATING THE WEST CULVERT FROM THE STREAM. MAINTAIN STREAM FLOW THOUGH THE EAST SIDE OF THE NEWLY EXCAVATED CHANNEL.
2. REMOVE THE WEST CULVERT AND EXCAVATE WEST PART OF STREAM CHANNEL.
3. CONSTRUCT ABUTMENT A AND PIER 1, AND PLACE RIPRAP AT ABUTMENT A.
4. REMOVE FLOW DIVERSION.
5. CONSTRUCT THE SUPERSTRUCTURE AND APPROACHES.

SCALE 1" = 10'
0' 10' 20'

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1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
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No.	Date	Revision	By
3	12-10-2021	ROAD COMMISSION REVIEW	RMV
2	02-05-2021	PARTNER REVIEW PLAN SET	RMV
1	12-22-2020	CROSSINGS 1, 2, & 3 REVISIONS	RMV

GENERAL PLAN OF STRUCTURE - CROSSING 2
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued: ----
Date Surveyed: ----
Designed By: ----
Drawn By: ----
Checked By: ----
Scale: ----
Original sheet size is 22x34

Location: ---- ---- ---- ---- ----

Project Number: 2020430002

Sheet: C2.2

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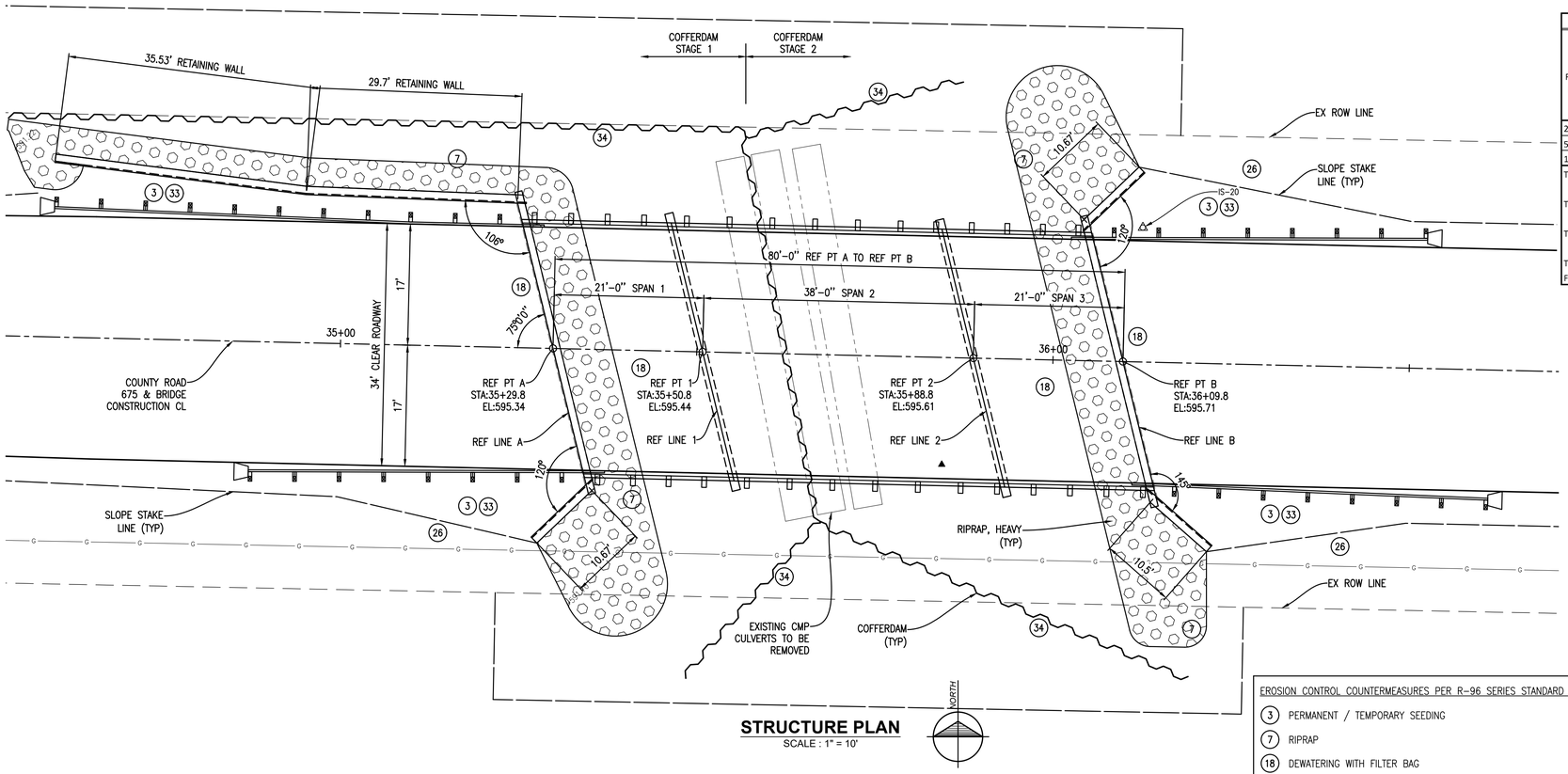


STRUCTURE PLAN
SCALE : 1" = 10'

SUMMARY OF HYDRAULIC ANALYSIS											
		EXISTING				PROPOSED					
		WATER SURF. ELEV. (FT)		VELOCITY (FPS)		WATER SURF. ELEV. (FT)		VELOCITY (FPS)			
FLOOD DATA	BASE + FLOOD (CFS)	U/S FACE OF CULVERTS	D/S FACE OF CULVERTS	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	U/S FACE OF BRIDGE	D/S FACE OF BRIDGE	U/S CHANNEL (170 FT) (FPS)	D/S CHANNEL (@ STR) (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS ELEV. U/S OF PROPOSED STRUCTURE (FT)
2-YR	70	589.25	587.22	0.6	2.8	588.08	587.25	1.3	1.3	79.2	-1.17
50-YR	145	590.42	587.86	0.8	4.2	588.84	587.94	2.0	1.9	126.8	-1.58
100-YR	165	590.70	588.01	0.8	4.4	589.01	588.10	2.1	2.0	138.2	-1.69

THE BASE + FLOOD FLOW ASSUMES A 35 CFS BASE FLOW FROM WATERSHED.

THE MAXIMUM AREA BELOW LOW CHORD IS 556.0 SQUARE FEET.

THE CONTRIBUTING DRAINAGE AREA TO THIS CROSSING IS 34.5 SQUARE MILES.

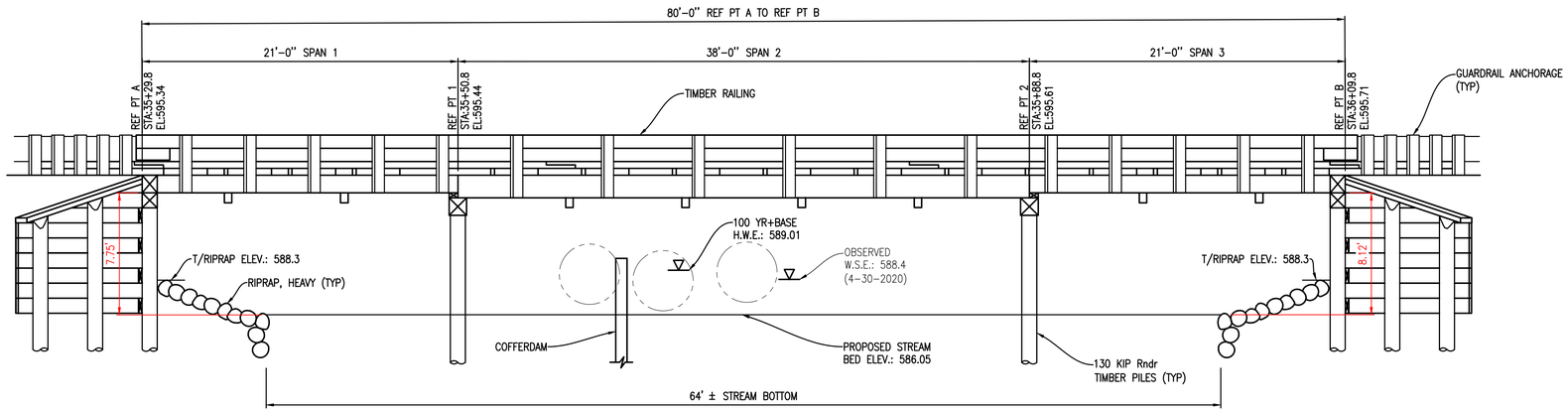
THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THIS HYDRAULIC TABLE AR TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOOD PLAIN.

MISCELLANEOUS QUANTITIES

1	LS	MOBILIZATION
1	LS	TRAFFIC CONTROL
3	EA	CULV, REM, 24 INCH TO 48 INCH
245	FT	GUARDRAIL, REM
50	CYD	EMBANKMENT, CIP
735	CYD	EXCAVATION, CHANNEL
700	CYD	EXCAVATION, EARTH
275	CYD	BACKFILL, STRUCTURE, CIP
275	CYD	EXCAVATION, FDN
100	FT	EROSION CONTROL, SILT FENCE
1335	SYD	AGGREGATE BASE, 6 INCH
160	SYD	SHOULDER, CL II, 3 INCH
1530	SYD	HMA SURFACE, REM
280	TON	HMA, LVSP
1	LS	TEMPORARY STREAM CONTROL
1	LS	STRUCTURE, TIMBER, 34'X 80', FURN
1	LS	STRUCTURE, TIMBER, 34'X 80', INSTALL
1	LS	TIMBER RETAINING WALL LAGGING
1	LS	TIMBER RETAINING WALL LAGGING INSTALL
20	FT	GUARDRAIL, TYPE B
4	EA	GUARDRAIL APPROACH TERMINAL, TYPE 2B
10	EA	GUARDRAIL REFLECTOR
170	SYD	RIPRAP, HEAVY
780	SYD	SLOPE RESTORATION

EROSION CONTROL COUNTERMEASURES PER R-96 SERIES STANDARD PLAN

- (3) PERMANENT / TEMPORARY SEEDING
- (7) RIPRAP
- (18) DEWATERING WITH FILTER BAG
- (26) SILT FENCE
- (33) MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS
- (34) COFFERDAMS



STRUCTURE ELEVATION
NO SCALE

Revised bottom abutment elev. on 1-27-22
was 585.79, therefore add difference to abutment ht
from that shown here.
586.05 - 585.79 = 0.26 ft.
Abutment Height = 7.75'+0.26' = 8ft.
(This note added by A.Paladino 1-28-22)

Revised bottom abutment elev. on 1-27-22
was 586.16 therefore subtract difference to abutment ht
from that shown here.
586.05 - 586.16=-0.11ft.
Abutment Height = 8.12'-0.11' = 8ft.
(This note added by A.Paladino 1-28-22

THE DESIGN OF THIS STRUCTURE IS BASED ON 1.2 TIMES THE CURRENT ASSHTO LRFD BRIDGE DESIGN SPECIFICATION HL-93 LOADING WITH THE EXCEPTION THAT THE DESIGN TANDEM PORTION OF THE HL-93 LOAD DEFINITION SHALL BE REPLACED BY A SINGLE 60 KIP AXLE LOAD BEFORE APPLICATION OF THIS 1.2 FACTOR. THE RESULTING LOAD IS DESIGNATED HL-93 MOD. LIVE LOAD PLUS DYNAMIC LOAD ALLOWANCE DEFLECTION DOES NOT EXCEED 1/800 OF THE SPAN LENGTH.

WITHOUT THE PREVENTIVE MEASURES SHOWN ON THESE PLANS, THERE IS A POSSIBILITY THAT STREAM BED SCOUR MAY OCCUR. THE ESTIMATED TOTAL SCOUR DEPTH IS CALCULATED TO BE 6.5 FEET AT ABUTMENT A, 2.1 FEET AT PIER 1, 2.1 FEET AT PIER 2, AND 1.8 FEET AT ABUTMENT B. THESE DEPTHS ARE BASED ON A 500 YEAR RUNOFF EVENT.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYTMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN PAYMENT FOR RIPRAP.

THE RIPRAP QUANTITY IS BASED ON THE LATERAL DIMENSIONS OF THE AREA TO BE PROTECTED, REGARDLESS OF THE NUMBER OF LAYERS REQUIRED.

THE INTENT OF THE FLOW DIVERSION AND STAGING SEQUENCE DESCRIBED IS TO FACILITATE RIPRAP PLACEMENT, CONTAIN SEDIMENTATION, AND MAINTAIN STREAM FLOW. ALTERNATE METHODS OF STREAM DIVERSION SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

RIPRAP SHALL BE NATURAL FIELD STONE.

PROPOSED CONSTRUCTION STAGING SEQUENCE:

STAGE 1:
1. REMOVE ROAD EMBANKMENT OVER EXISTING CULVERTS TO TOP OF CULVERTS.
2. PLACE STAGE 1 COFFERDAM BETWEEN EXISTING CULVERTS ISOLATING WEST CULVERT FROM THE STREAM. MAINTAIN STREAM FLOW THROUGH EAST CULVERTS.
3. REMOVE THE WEST CULVERT AND EXCAVATE WEST PART OF STREAM CHANNEL.
4. CONSTRUCT ABUTMENT A AND PIER 1, AND PLACE RIPRAP AT ABUTMENT A.

STAGE 2:
1. REMOVE FLOW DIVERSION ISOLATING THE WEST SIDE AND PLACE IN THE EAST PART OF THE STREAM ISOLATING THE EAST CULVERTS FROM THE STREAM. MAINTAIN STREAM FLOW THOUGH THE WEST SIDE OF THE NEWLY EXCAVATED CHANNEL.
2. REMOVE THE EAST CULVERTS AND EXCAVATE EAST PART OF STREAM CHANNEL.
3. CONSTRUCT ABUTMENT B AND PIER 2, AND PLACE RIPRAP AT ABUTMENT B.
4. REMOVE FLOW DIVERSION.
5. CONSTRUCT THE SUPERSTRUCTURE AND APPROACHES.

SCALE 1" = 10'
0' 10' 20'

Gosling Czubak
engineering sciences, inc.
1280 Business Park Dr.
Traverse City, Michigan
231-946-9191 phone
info@goslingczubak.com
www.goslingczubak.com

CIVIL ENGINEERING
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DRILLING
LANDSCAPE ARCHITECTURE

No.	Date	Revision	By
3	12-10-2021	ROAD COMMISSION REVIEW	RMV
2	02-05-2021	PARTNER REVIEW PLAN SET	RMV
1	12-22-2020	CROSSINGS 1, 2, & 3 REVISIONS	RMV

GENERAL PLAN OF STRUCTURE - CROSSING 3
CR 675 STREAM CROSSINGS PROJECTS
LEELANAU COUNTY ROAD COMMISSION

Date Issued: ----
Date Surveyed: ----
Designed By: ----
Drawn By: ----
Checked By: ----
Scale: ----

Original sheet size is 22x34

Location:

Project Number: 2020430002

Sheet: **C3.3**

P:\2020\2020002\DWG\CAD\Data\C3D\2020430002_PS_Final Plans.dwg Tab: C3.3 Saved by: mmerchawee 12/10/2021 6:53 PM Plotted By: Bob Vorschawee P.E. 12/14/2021 11:19 AM

Trapezoidal Riprap-Lined Waterway Design.xlsm

Landowner	Leelanau CRC		County	Leelanau			V 11.2019	
Computed By	RMV/WCB		Date	1/28/2021			11/15/2019	
Checked by			Date					

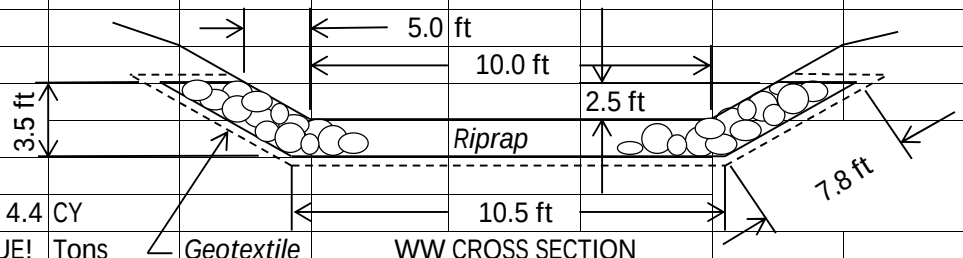
Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.

Design flow, Q=	35	cfs			WW horiz. Length=	5.0	ft
Slope, S=	2%	ft/ft =	50.00	:1	U/S WW F.L. elev=	593.1	ft
Bottom Width, W=	10	ft			D/S WW F.L. elev=	593.0	ft
Side slope, Z=	2	:1			Waterway drop=	0.1	ft
Safety factor=	1.2		Typically 1.2		WW length along slope=	5.0	ft
Rock shape =	Rounded						
Min. req'd D50=	2.48	in			*Spreadsheet formatting key:*		
D50 used=	4.00	in			XXX	*=Input cells*	
n=	0.031				X.XX	*=Output from "Solve" button*	
Freeboard=	0.25	ft			X.XX	*=Other computed output*	
					Red text	*=Instructions, warnings, info*	
Flow depth, d=	0.66	ft	Calculated				
Critical depth, d_c=	0.69	ft					
Critical slope, S_c=	0.017	ft/ft	$0.7S_c$ =	0.0118	ft/ft		
			$1.3S_c$ =	0.0218	ft/ft		
Design slope, S=	0.0200	ft/ft	*0.7Sc<S<1.3Sc. Select a different slope or bottom width.*				
Velocity=	4.71	fps			Est. riprap unit wt=	di	Tons/CY
			Rock shape = Rounded		Rock Gs =	2.65	

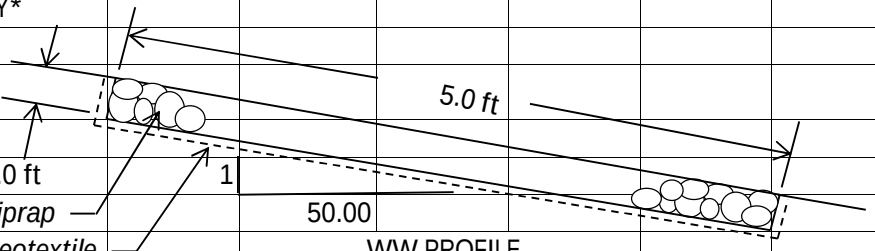
Riprap thickness:			Required riprap gradation for D50 selected				
Minimum=	0.67	ft	%	Rock dia., inches		Rock weight, lb	
Provided=	1.00	ft	Smaller	min.	max.	min.	max.
			100	6.0	8.0	13	32
Sideslope height:			85	5.2	7.2	9	23
Minimum=	0.91	ft	50	4.0	6.0	4	13
Provided=	2.50	ft	10	3.2	5.2	2	9

Quantities:		
Riprap volume=	4.4	CY
Approx. weight=	#VALUE!	Tons
Geotextile area=	23.8	SY*

*Geotextile area includes actual covered surfaces only (no extra for laps or anchorage)



WW CROSS SECTION



WW PROFILE