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for All of Us®

# BELLM BRIDGE MINTURN TEMPORARY SCOUR PROTECTION DESIGN MEMO

DATE: July 13, 2023

RE: Bellm Bridge Design Minturn, CO  
Taylor St Over Eagle River  
Temporary Scour Protection Design  
SEH No. MINTU\_173117

The goal of this memorandum is to describe the temporary scour protection design for the Taylor Street Bridge over Eagle River (Bellm Bridge) in Minturn Colorado.

## Project Description

SEH was contracted to recommend temporary scour countermeasures to address an Essential Repair Finding (ERF) for the Bellm Bridge in Minturn, CO. The bridge is currently showing major signs of scour including a number of exposed footers and piers. To address the ERF, it was determined that temporary scour protection needed to be put in place to minimize further erosion and prevent potential failure of the bridge. The most recent bridge inspection report and ERF can be found in an attachment to this memo. The intent is to place riprap to prevent further scour damage to the Bellm Bridge while funding and design for permanent improvements are determined.

The Bellm Bridge exists within a regulated Zone AE floodplain with base flood elevations (BFEs) and a defined floodway. The Bellm Bridge can be found on FEMA FIRM Map number 08037C0658D effective date December 4, 2007. A FIRMette of the area has been attached to this memo.

The details, data, and site conditions, extracted from the widening plans (1976) were assumed to be "as-built" for the purpose of this memo which were considered as the basis of temporary stabilization design.

## Methodology

SEH was not able to locate any available hydraulic modeling information or reports for the reach of Eagle River that includes Bellm Bridge. SEH reached out to FEMA, the Town of Minturn, and Eagle County and found no relevant hydraulic information. With out survey information SEH used a combination of the existing hydrology study Eagle River Flood Hydrology (ERFH) completed by Water Resource Consultants for Eagle County in May of 2002, USGS StreamStats, bridge inspection reports, and the 1976 bridge widening plans to design and size scour counter measures.

The as-built drawing on Sheet 4 of the attached plans was used to create a cross-section of the bridge in order to compute the required hydraulic values to be used with HEC 23 Guideline 14 riprap sizing calculations. A spreadsheet adapted from Guideline 14 was used to complete the riprap sizing calculations which can be found attached to this memo.

The as-built drawings callout a 100-year flow of 4,900 cfs and state that water surface elevation (WSEL) at this flow rate is at the bottom of the girders for an approximate maximum depth of 8.3'. The 2003 ERFH had a 100-year flow rate for Minturn of 3490 cfs. StreamStats calculated a 100-year flow rate of 2930 cfs. For the scour design both the as-built drawing and ERFH flow rates were analyzed.

Engineers | Architects | Planners | Scientists

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The cross-section for the as-built report was used along with these flow rates to calculate flow depth and area associated with as-built drawing and the ERFH flow rates. This was completed using the Hydraflow Express Extension for Autodesk Civil 3D. Print outs can be found on the following page and attached to this memo.

Using HEC 23 Design Guideline 14 to calculate riprap size it was determined that 18" D50 Riprap with a depth of 36" is required for this protection in both the as-built and ERFH scenario. Riprap should extend to a width of 5' encircling each pier then slope at 2h:1V to the existing channel surface. Riprap should extend to a width 14' from each abutment and 25' downstream. A mark-up of the as-built plans showing the riprap can be found on the following page attached to this memo.

Riprap and bedding material and their installation shall be in accordance with current CDOT standard specifications and be done in a way to hold existing elevation where ever possible. In the areas near the piers and abutments where scour holes are formed, the top of riprap elevation should be no greater than the as-built channel section. The as-built plans use NGVD 1927 datum. The plans have been marked up to show a depth from low-chord to top of channel as originally constructed. This depth should be used as reference to determine the channel elevation in the area of the scour holes.

## **Floodplain**

The proposed riprap will be placed within the floodway and will cause a rise when compared to the current existing conditions, however a no-rise condition is anticipated when compared to the originally constructed condition. This solution is temporary in nature and will be used to provide protection against catastrophic failure of the bridge while funding and long-term solutions are found.

The temporary repairs are not anticipated to cause an increase in the floodplain as it is shown on FEMA FIRM Map number 08037C0658D. SEH also obtained a copy of FEMA floodplain map of the same area with an effective date of 1980. Upon examination these floodplains appear to be nearly identical. The elevation differences shown appear to be due to the difference in vertical datum. The 2007 map uses NAVD 1988 and the 1980 map used NGVD 1927. The widening work was completed in 1976 and would likely have been included in the 1980 mapping. Due to this, it is assumed that the floodplain mapping does not account for the scour holes that currently exist. Returning these holes to the intended elevations should have no adverse impact on the floodplain mapping.

## **Conclusion**

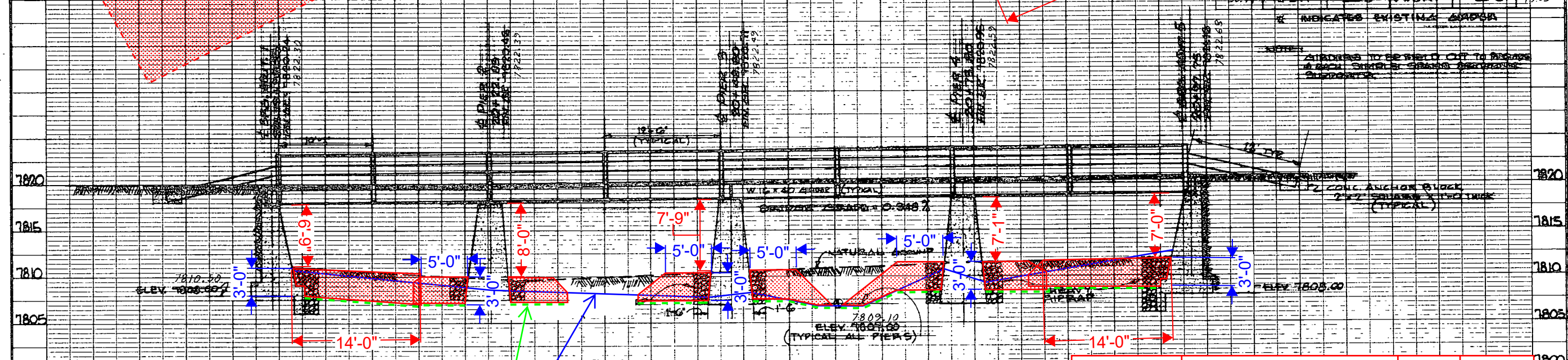
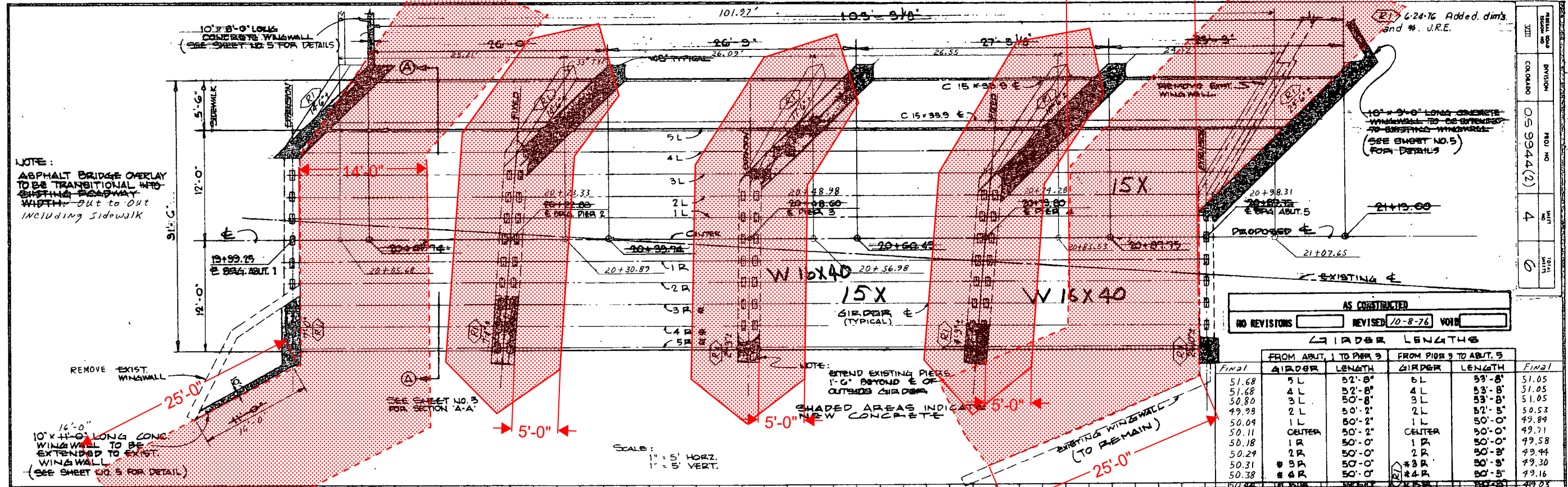
The temporary scour protection required for this bridge will be 18" D50 at a depth of 36" with appropriate bedding. The plan view of the riprap can be found on the following page and in the mark-ups to the as-built plans attached to this memo. While the addition of riprap will cause a rise relative to the current existing condition, it is anticipated that it is intended to not have an effect on the mapped floodplain. This temporary solution will provide protection against additional scour or damage to the bridge while a permanent solution is found.

David Hoesly, PE  
SEH Senior Water Resources Engineer

Attachment: Bridge Inspection Report, FIRMette, As-Built Plans, Hydraulic Calculations, Scour Calculations, 2007 FIRM Map, 1980 FIRM Map

NOTE:  
 ASPHALT BRIDGE OVERLAY  
 TO BE TRANSITIONAL INTO  
 EXISTING ROADWAY  
 WIDTH OUT TO OUT  
 INCLUDING SIDEWALK

10' x 11'-0" LONG CONC  
 WINGWALL TO BE  
 EXTENDED TO EXIST  
 WINGWALL  
 (SEE SHEET NO. 5 FOR DETAIL)



Item Number	Item Description	Unit	Quantity
203-0000	Unclassified Excavation	CY	220
211-03005	Dewatering	LS	1
506-00218	Riprap (18 Inch) D50	CY	390

**Notes**

- All quantities, dimensions, riprap limits, and channel bed shown on this sheet are approximate and based on best available knowledge. Contractor shall verify all applicable info. Any discrepancies identified shall be brought to the attention of Town and/or Town Engineer.
- Payment will be for the actual excavation volume and materials used as approved and directed by the Town Engineer.

MINTURN BRIDGE WIDENING  
 MINTURN, COLORADO  
 OS 9944 (2)  
 DECK LAYOUT

Job 76010  
 Drawn ADP  
 Appr. JEA  
 Date APRIL '76  
 Scale NOTED  
 Sheet 4

ELDORADO ENGINEERING COMPANY CONSULTING ENGINEERS - REGISTERED LAND SURVEYORS  
 818 COLORADO AVENUE P.O. BOX 669 GLENWOOD SPRINGS, COLORADO 81601 303-845-6917

**Routine Inspection**  
**Colorado Department of Transportation**  
**Structure Inspection and Inventory Report (English Units)**

Highway Number (ON) 5D: 00000 U  
 Mile Post (ON) 11: 0.016 mi  
 Linear Ref. Sys. MP: 0.016 mi

Bridge Key: MINTRN-TAYLORST    Inspection Date: 06/19/2022    Suff Rating: 73.7 ND    G/F/P Condition: Fair

NBI Reporting ID:	MINTRN-TAYLORS	Main Mat/Desgn 43A/B:	4	02	Bridge Cost 94:	0.00
District (Region/Sect):	Reg 3 MSec 2	Appr Mat/Desgn 44A/B:	0	0	Roadway Cost 95:	0.00
Tran Region 2T:	11	Main Spans Unit 45:	4		Total Cost 96:	0.00
County Code 3:	037	Approach Spans 46:	0		Year of Cost Estimate 97:	1980
037 EAGLE		Horiz Clr 47:	26.00 ft		Brdr Brdg Code/% 98A/B:	-2    0.00
Place Code 4:	50920	Max Span 48:	24.0 ft		Border Bridge Number 99:	
MINTURN		Str Length 49:	103.5 ft		Defense Highway 100:	0
Rte.(On/Under) 5A:	1	Curb Wdth L/R 50A/B:	0.0 ft	4.4 ft	Parallel Structure 101:	N
Signing Prefix 5B:	5	Width Curb to Curb 51:	26.00 ft		Direction of Traffic 102:	2
Level of Service 5C:	1	Width Out to Out 52:	33.7 ft		Temporary Structure 103:	-
Direction Suffix 5E:	0	Deck Area:	3478		Highway Systems 104:	0
Feature Intersected 6:		Min Clr Ovr Brdg 53:	99.99		Fed Lands Hiway 105:	0
EAGLE RIVER		Min Undrclr Ref 54A:	N		Year Reconstructed 106:	1986
Facility Carried 7:		Min Underclr 54B:	0.0 ft		Deck Type 107:	1
TAYLOR STREET		Min Lat Clrnce Ref R 55A:	N		Wearing Surface 108A:	1
Alias Str No.8A:		Min Lat Undrclr R 55B:	0.0 ft		Membrane 108B:	0
		Min Lat Undrclr L 56:	0.0 ft		Deck Protection 108C:	0
Prll Str No. 8P:		Deck 58:	6		Truck ADT 109:	9.00 %
N/A		Super 59:	6		Trk Net 110:	0
Location 9:		Sub 60:	5		Pier Protection 111:	!
N OF MAIN ST/SH 24		Channel/Protection 61:	7		NBIS Length 112:	Y
Max Clr 10:	99.99	Culvert 62:	N		Scour Critical 113:	3
BaseHiway Net12:	0	Oprtg Rtg Method 63:	1 LF Load Fact		Scour Watch 113M:	N
IrsinvRout 13A:	037-0-2013	Operating Rating 64:	93.50		Future ADT 114:	928
IrsubRout No13B:	00	Operating Factor 64:	-		Year of Future ADT 115:	2041
Latitude 16:	39d 35' 21.00"	Inv Rtn Method 65:	1 LF Load Fact		CDOT Str Type 120A:	CICK
Longitude 17:	106d 25' 53.00"	Inventory Rating 66:	56.10		CDOT Constr Type 120B:	00
Detour Length 19:	1 mi	Inventory Factor 66:	-		Expansion Dev/Type 124:	1
Toll Facility 20:	3	Asph/Fill Thick 66T:	0.0 in		Brdg Rail Type/Mod 125A/B:	XX    0
Custodian 21:	03	Str. Evaluation 67:	5		Posting Trucks 129A/B/C:	-    -    -
Owner 22:	03	Deck Geometry 68:	5		Str Rating Date 130:	09/11/1996
Functional Class 26:	06	Undrclr Vert/Hor 69:	N		Within 1 Mile:	NO
Year Built 27:	1950	Posting 70:	5 At/Above Lega		Special Equip 133:	0.00
Lanes On 28A:	2	Waterway Adequacy 71:	8		Vert Clr N/E 134A/B/C:	X    99.99    0.00
Lanes Under 28B:	0	Approach Alignment 72:	8		Vert Clr S/W 135A/B/C:	X    99.99    0.00
ADT 29:	748	Type Of Work 75A:	-2		Vertical Clr Date:	12/31/1900
Year of ADT 30:	2021	Work Done By 75B:	!		Weight Limit Color 139:	0, White
Design Load 31:	5 MS 18 (HS 20)	Length of Improvment 76:	0		Userkey 1, Insp System:	OFFSYS
Apr Rdwy Width 32:	26.00 ft	Insp Team Indicator 90B:	BENESCH		Userkey 4, Insp Sched:	EVN JUN C_0
Median 33:	0	Inspector Name 90C:	LOPEZ-RODRIG		Userkey 5, UW Sched:	
Skew 34:	35 °	Frequency 91:	24 months		Userkey 6, Pin Sched:	
Structure Flared 35:	0	FC Frequency 92A:			FHWA Bridge Risk:	HIGH
Sfty Rail 36a/b/c/d:	0    0    0    0	UW Frequency 92B:			FHWA UW Risk:	NA
Rail ht36h:	24.0 in	SI Frequency (Pin) 92C:			FHWA Load Rating Risk:	LOW
Hist Signif 37:	4	FC Inspection Date 93A:			CBTE:	NA
Posting status 41:	A	UW Inspection Date 93B:			Inspection Key:	VMGO
Service on/un 42A/B:	5    5	SI Date (Pin) 93C:			Date Entered:	7/8/2022 12:00:0
					Entered By:	RISCHD

Inspection Type:	Regular NBI
EOR:	Unknown

Data Responsibility: Asset Management    Inspection    Rating



**Routine Inspection**  
**Colorado Department of Transportation**  
**Structure Inspection and Inventory Report (English Units)**

Highway Number (ON) 5D: 00000 U

Mile Post (ON) 11: 0.016 mi

Linear Ref. Sys. MP: 0.016 mi

**Element Inspection Report**

Elm/Env	Description	Unit	Total Qty	% in 1	Qty. St. 1	% in 2	Qty. St. 2	% in 3	Qty. St. 3	% in 4	Qty. St. 4
12/1	<b>Re Concrete Deck</b>	sq.ft	3478	0%	0	90%	3114	10%	364	0%	0
<p>(14) wide transverse cracks up to 1/8 inch ± wide, heaviest over piers (364SF CS3 - 1130). D-cracks and spalls in concrete deck adjacent to joint angle armor (15SF CS2 - 1080) (45SF CS2 - 1130). Spall at north end is 6 inches wide x 9 feet long x 2.5 inches deep; patched with asphalt at 2020 inspection. R2 to R4 rusting along edges of stay-in-place forms in exterior girder bays and in Bay K near deck drains, with some areas of 100% section loss in east edge. Moderate abrasion with exposed aggregates throughout deck surface (3054SF CS2 - 1190).</p>											
1080/1	Delamination/Spall/Patch	sq.ft	15	0%	0	100%	15	0%	0	0%	0
See Element 12 comments.											
1130/1	Cracking (RC and Other)	sq.ft	409	0%	0	11%	45	89%	364	0%	0
See Element 12 comments.											
1190/1	Abrasion(PSC/RC)	sq.ft	3054	0%	0	100%	3054	0%	0	0%	0
See Element 12 comments.											
107/1	<b>Steel Opn Girder/Beam</b>	ft	1449	65%	939	24%	350	11%	160	0%	0
<p>R1 rusting at random locations. (350FT CS2 - 1000). Paint peeling with R2 rusting at ends of all girders over abutments (58FT CS3 - 1000). R2 rusting for 2 feet at exterior corners and along full length of top flange of exterior Girder N (102FT CS3 - 1000). Utility at south end welded to bottom flanges of Girders D, G, I, L and N. (2) kinked areas in bottom flange of Girder N in Span 1.</p>											
515/1	Steel Protective Coating	sq.ft	1449	65%	939	0%	0	0%	0	35%	510
Ineffective at areas of rust.											
1000/1	Corrosion	ft	510	0%	0	69%	350	31%	160	0%	0
See Element 107 comments.											
210/1	<b>Re Conc Pier Wall</b>	ft	111	0%	0	100%	111	0%	0	0%	0
Moderate abrasion and honeycombing at various locations of pier walls (111FT CS2 - 1190).											
1190/1	Abrasion(PSC/RC)	ft	111	0%	0	100%	111	0%	0	0%	0
See Element 210 comments.											
215/1	<b>Re Conc Abutment</b>	ft	74	0%	0	93%	69	7%	5	0%	0
<p>Moderate abrasion on both abutments (69FT CS2 - 1190). Honeycombing in 30% of original abutments. Debris and vegetation at all corners on seats. Abutment 5 (A5) has 5 exposed corroded rebars near east end (5FT CS3-1090).</p>											
1090/1	Exposed Rebar	ft	5	0%	0	0%	0	100%	5	0%	0
See Element 215 comments.											
1190/1	Abrasion(PSC/RC)	ft	69	0%	0	100%	69	0%	0	0%	0
See Element 215 comments.											
304/1	<b>Open Expansion Joint</b>	ft	74	0%	0	0%	0	92%	68	8%	6
<p>15 feet of leading angle armor on southbound side of north joint is missing and patched with asphalt for 6 feet (joint is missing and ineffective at patch) (6FT CS4 - 2350). R4 rust in angle armor of south joint in northbound lane, similar at east end of north joint angle armor. R2 rust with gouges in remainder of joint armor. Joints are full of debris (68FT CS3 - 2350).</p>											
2350/1	Debris Impaction	ft	74	0%	0	0%	0	92%	68	8%	6
See Element 304 comments.											
310/1	<b>Elastomeric Bearing</b>	each	70	0%	0	90%	63	10%	7	0%	0
<p>R2 rusting at exterior bearing plates. R2 rusting on (4) east bearing plates at north abutment (A5) (7EA CS3 - 1000). Freckled light R1-R1 rust on most bearing plates (63EA CS2 - 1000).</p>											
1000/1	Corrosion	each	70	0%	0	90%	63	10%	7	0%	0
See Element 310 comments.											
322/1	<b>Approach Roadway</b>	(EA)	1	100%	1	0%	0	0%	0	0%	0
Patched potholes and cracking at both ends of bridge.											

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326/1	Bridge Wingwalls	(EA)	4	75%	3	25%	1	0%	0	0%	0
(1) 1/32 inch wide diagonal crack in southeast wingwall. Spalls around pipes at southwest wingwall up to 2 feet in diameter. 1/8 inch wide vertical crack at northwest wingwall to north abutment (A5) interface, wingwall is pushed 1/4 inch.											
329/1	Sidewalk/Median/Curb	(LF)	207	52%	107	48%	100	0%	0	0%	0
Insignificant vertical cracks at 1 foot spacing along west curb. Medium transverse cracks at various locations in east sidewalk with S1 scaling (100FT CS2 – 1130).											
1130/1	Cracking (RC and Other)	(LF)	100	0%	0	100%	100	0%	0	0%	0
See Element 329 comments.											
331/1	Re Conc Bridge Railing	ft	104	33%	34	67%	70	0%	0	0%	0
Medium vertical cracks spaced 1 to 2 feet throughout (70FT CS2 - 1130).											
1130/1	Cracking (RC and Other)	ft	70	0%	0	100%	70	0%	0	0%	0
See Element 331 comments.											
333/1	Other Bridge Railing	ft	207	98%	202	0%	0	2%	5	0%	0
Timber rails on metal posts. (1) plank is broken for 1 foot (1FT CS3 - 7000) and split for 4 feet on west rail near mid-span (4FT CS3 - 1220).											
1220/1	Deterioration (Other)	ft	4	0%	0	0%	0	100%	4	0%	0
See Element 333 comments.											
7000/1	Damage	ft	1	0%	0	0%	0	100%	1	0%	0
See Element 333 comments.											
343/1	Pole Attachment	(EA)	5	100%	5	0%	0	0%	0	0%	0
(5) flagpoles on east side.											
501/1	Channel/Bank	(EA)	1	100%	1	0%	0	0%	0	0%	0
Boulder and rock mountain stream. Fair alignment. Large boulders in channel on upstream end of P2 and P4, disrupt flows. Light to moderate vegetation on steep banks.											
600/1	General Notes	(EA)	1	100%	1	0%	0	0%	0	0%	0
Gas utility pipe under Girder A. Follow-up inspections for scour were completed on 9-15-2010 and 11-19-2012. Utilities at southwest are actively leaking heavily onto southwest wingwall.											
9221/1	Conc Pile Cap/Ftg	(EA)	4	0%	0	0%	0	0%	0	100%	4
Special inspection for scour probing 11/19/2012: Scour at both sides of Pier 3 (P3) and Pier 4 (P4). Up to 3 feet 6 inches of exposed footings at P3, P4, and A5. Item 60 reduced due to scour at P3 and P4. 1 to 2 feet (max) ± of undercutting along the poured collar/armor on the north side of P3 (undercutting appears to only be beneath the concrete armor in front of pier). 1 foot ± of undercutting of exposed footing at downstream end of P4 at southwest corner. Undercut area of P4 bears on areas of large river rock. 2014 inspection: only able to access A1, P2, and A5. Localized scour hole downstream of Pier 2 (P2) up to 2 feet deep, no undermining. 2016 inspection: could not access due to high water flow. 2018 inspection: could not access due to swift water flow, however, visible scour observed at middle of P3 at least 3 feet deep. No scour countermeasures were in place. 2020 inspection: could not access P3 and P4 due to runoff flow. P2 concrete collar/concrete blocks are undermined up to 10 inches back on Span 2 side; A5 exposed, but not undermined; Need follow up inspection of P3 and P4 when flow subsides (February or March 2021 tentatively set for follow up inspection of P3 and P4). 2022 inspection: During the special inspection of this bridge on 9/7/2022, our inspectors noted that all piers footing are exposed. The south pier (P2) concrete collar/concrete blocks at the footing are undermined up to 10 inches back on the north side. The south pier (P3) footing is undermined up to 20 inches back on the upstream side. The south pier (P4) footing is undermined up to 24 inches back on the upstream side. The north abutment (A5) footing is also exposed and is undermined up to 13 inches back at mid-span. CS4 defect has been reviewed by Benesch Program Engineer and affects the element or structure strength and/or serviceability. Bridge owner was notified of Essential Repair Finding on 9/07/2022. POA is missing from the e-folder. After receiving the ERF, the city informed that a foundation monitoring program is in place.											

**Inspection References and Definitions:**

**Routine Inspection**  
**Colorado Department of Transportation**  
**Structure Inspection and Inventory Report (English Units)**

Highway Number (ON) 5D: 00000 U

Mile Post (ON) 11: 0.016 mi

Linear Ref. Sys. MP: 0.016 mi

Crack Width Descriptions for Reinforced Concrete:

Insignificant cracking (in.) = Less than 0.012 wide

Moderate cracking (in.) = 0.012 to 0.05 wide

Wide cracking (in.) = Greater than 0.05 wide

Rust Codes (R Codes):

R1 = Peeling of the paint, pitting, surface rust, etc., no measurable section loss.

R2 = Flaking, minor section loss (< 10% thickness loss).

R3 = Flaking, swelling, mod section loss (10% < thickness loss <30%).

R4 = Heavy section loss (> 30% thickness loss), may have holes through base metal.

Crack Width Descriptions for Prestressed Concrete:

Insignificant cracking (in.) = Less than 0.004 wide

Moderate cracking (in.) = 0.004 to 0.009 wide

Wide cracking (in.) = Greater than 0.009 wide

Concrete Scaling Codes (S Codes):

S1 = Light scale up to 1/4" deep.

S2 = Moderate scale up to 1/2" deep with agg. exposed.

S3 = Heavy scale up to 1" deep with some agg. loose or missing.

S4 = Critical scale > 1" deep with reinforcing bars exposed and general disintegration of the concrete.

**Maintenance Activity Summary**

MMS Activity	Description	Recommended	Status	Target Year	Priority
**358.03	Substructure-Scour Mitigate	6/19/2022	1	2022	High

Install scour countermeasures per HEC-23 standards at all piers and Abutment 5.

154.01	Approach Rdway-Patch Bituminous	6/6/2018	1	2023	High
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Patch potholes in asphalt at approaches.

306.04	Bridge Rail-Upgrade	6/6/2018	1	2025	Low
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Install bridge rails to meet current AASHTO/CDOT standards.

306.05	Approach Railing	6/6/2018	1	2025	Low
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Install approach rails to meet current AASHTO/CDOT standards.

353.99	Deck-Seal	6/6/2018	1	2023	High
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Seal the concrete deck to inhibit further moisture penetration.

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364.99	Joints-Replace	6/6/2018	1	2023	High
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Replace expansion devices at both ends of deck.

**Bridge Notes (Inspection > Inventory > Admin)**

Inventory route is south to north  
East side is upstream  
Superstructure is named Girder A through N from west to east  
Substructure is numbered Abutment 1 through 5 from south to north

**Inspection Notes (Inspection > Condition)**

Date: 06-19-2022 Time: 13:40 Temp: 70 Degrees Weather: Partly-cloudy SLR/KP  
ERL for scour mitigation sent to Town of Minturn.

**Scour Item 113 Documentation (Inspection > CDOT Bridge)**

MINTRN-TAYLORST SCOUR Item 113 Screening Memo 2016 06 13.pdf

**Bat Present At Bridge (Inspection > Inventory > Agency Items > userkey9)**

NO

**Inspection Access Requirements (Inspection > CDOT Bridge)**

**Scheduling Notes (Inspection > Schedule)**



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Scope:

NBI     Element     Underwater     Fracture Critical     Other    Type: Regular NBI

Team Leader Inspection Check-off:

FCM's     Vertical Clearance  
 Posting Signs     Stream Bed Profile  
 Essential Repair Verification

Inspection Team: BENESCH

Inspection Date: 06/19/2022

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Inspector: Unknown



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Inspector (Team Leader): SAM LOPEZ-RODRIGU

# EAGLE

TAYLOR STREET over EAGLE RIVER

# MINTRN-TAYLORST

Team Leader: S. LOPEZ  
Inspection Date: 6/19/2022



Roadway looking north.



Roadway looking south.

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ  
Inspection Date: 6/19/2022



Elevation looking west.



Superstructure looking north.



# EAGLE

TAYLOR STREET over EAGLE RIVER

# MINTRN-TAYLORST

Team Leader: S. LOPEZ  
Inspection Date: 6/19/2022



Channel looking east upstream.



Channel looking west downstream.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



General view of Abutment 1.



General view of Pier 2.

**EAGLE**

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



General view of Pier 3.



General view of Abutment 5.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Transverse cracking and abrasion throughout deck surface.



General view of damaged joint armor at N joint-Typical debris in joint.

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Delamination and spalls in south end of deck.



General view of south expansion joint.



**EAGLE**

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ  
Inspection Date: 6/19/2022



Cover plate missing and rust holes in armor angles at S joint near E curb.



Damaged joint angle at south joint near centerline of roadway.

# EAGLE

TAYLOR STREET over EAGLE RIVER

# MINTRN-TAYLORST

Team Leader: S. LOPEZ  
Inspection Date: 6/19/2022



Broken and settled asphalt in walkway at NE corner of deck.



West timber rail broken plank.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Failed deck forms and desintegrating deck along east overhang in Span 4.



R4 rust and holes in deck forms and exposed concrete in bays 4L and 4M.

**EAGLE**

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Metal deck has a hole at the northwest corner.



Metal deck at Bay 4N has corrosion.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Peeling paint with corrossions at ends of Girders A to K at Span 5.



Failed paint on ends of girders (Typical girders A-K).

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



View of corrosion at ends of Girder 4K.



Flaking rust and section loss in bottom flanges of Girders L, M, and N.

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ  
Inspection Date: 6/19/2022



Girder 3L has heavy corrosion.



Girder 4K has heavy corrosion.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Girder 4L has heavy corrosion.



Girder 4M has heavy corrosion.

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



General view of scour in front of A1.



Honeycombs at Pier 2.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Scour around Pier 2 footer (1 of 2).



Scour around Pier 2 footer (2 of 2).

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Pier 2 scour at downstream side (1 of 2).



Pier 2 scour at downstream side (2 of 2).



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ  
Inspection Date: 6/19/2022



Pier 2 scour at upstream side.



P3 undermined footing at upstream south side.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



P3 exposed footing at downstream side.



P4 exposed footing at north side.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



P4 exposed footing at northwest corner.



P4 exposed footing at south side.



**EAGLE**

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



P4 scour hole at SW corner upstream side.



P4 undermining at SW corner upstream side.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Abutment 5 exposed footing at downstream side.



Abutment 5 exposed footing at mid section.

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Abutment 5 exposed footing near mid length.



Abutment 5 exposed footing at northwest corner.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Abutment 5 exposed footing at north end (upstream).



Abutment 5 undermining.

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



Abutment 5 has 5 locations of exposed rebar.



NW wingwall has a vertical crack at Abutment 5 joint.



# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

Inspection Date: 6/19/2022



View of SW retention wall.



SW retention wall vertical crack.

# EAGLE

TAYLOR STREET over EAGLE RIVER

**MINTRN-TAYLORST**

Team Leader: S. LOPEZ

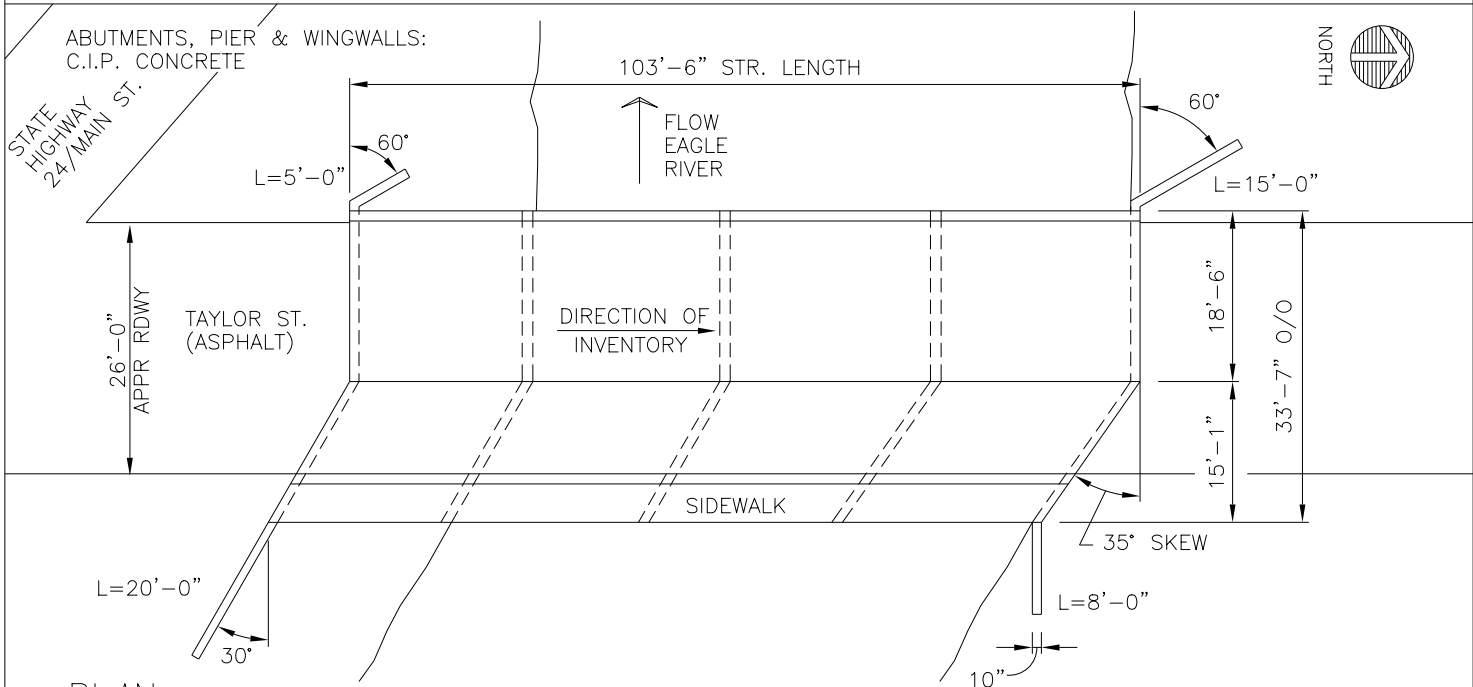
Inspection Date: 6/19/2022



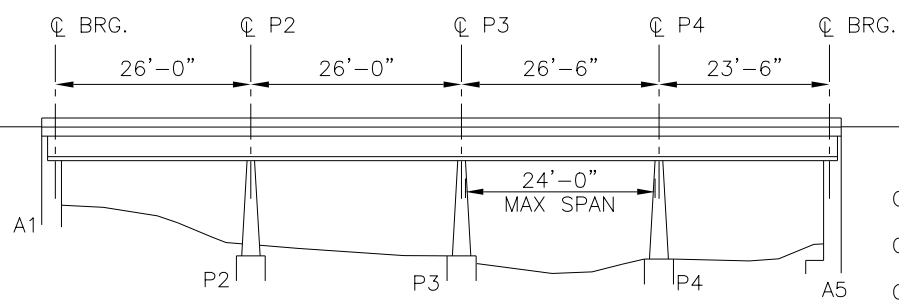
Close up view of undermining at SW retaining wall.

# MINTRN-TAYLORST

JUNE 17, 2020

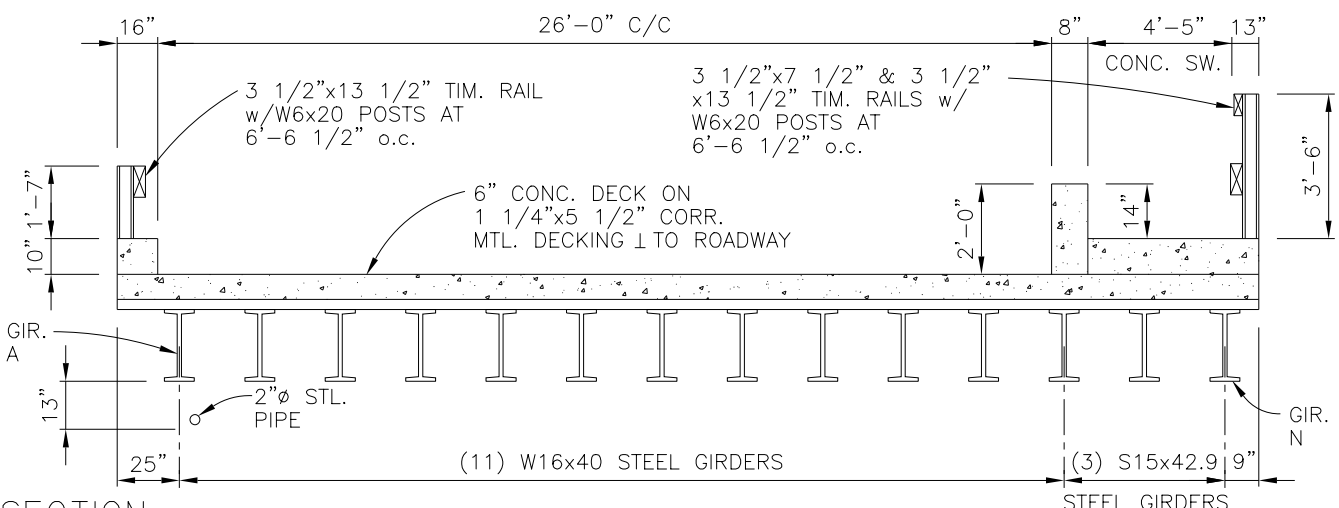


PLAN



ELEVATION  
LOOKING WEST

GIRDER SPACING	
GIR. A	GIR. H
27 3/4"	27 1/4"
GIR. B	GIR. I
28 1/2"	28 3/4"
GIR. C	GIR. J
27 3/4"	27 3/4"
GIR. D	GIR. K
28 1/4"	29 3/4"
GIR. E	GIR. L
27 3/4"	27 3/4"
GIR. F	GIR. M
28 1/4"	27 3/4"
GIR. G	GIR. N
29"	



SECTION  
LOOKING NORTH



**COLORADO DEPARTMENT OF TRANSPORTATION  
LOAD FACTOR RATING SUMMARY**

Structure # **MINTRN-TAYLORST**  
 State highway# **N. TAYLOR ST.**  
 Batch I.D. **037001**  
 Structure type **CLICK**  
 Parallel structure # **N/A**

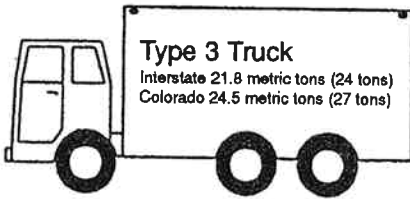
Rated using  
 Asphalt thickness: 0 mm (0 in.)  
 Colorado legal loads  
 Interstate legal loads

Structural member	<b>W16 X 40 EXT GIRDER</b>	<b>CONC DECK</b>	<b>W16 X 40 INT GIRDER</b>	
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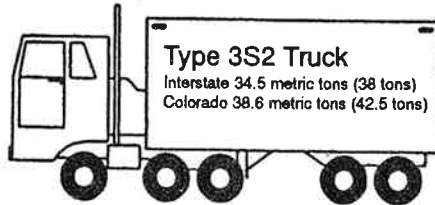
Metric tons (Tons)

Inventory	<b>53.5 (59.0)</b>	<b>50.8 (56.1)</b>	<b>57.7 (63.7)</b>	<b>( )</b>
Operating	<b>89.2 (98.4)</b>	<b>84.8 (93.5)</b>	<b>96.2 (106.1)</b>	<b>( )</b>

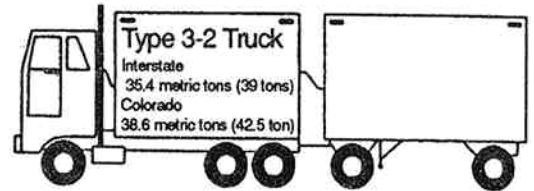
Type 3 truck	<b>( )</b>	<b>( )</b>	<b>( )</b>	<b>( )</b>
Type 3S2 truck	<b>( )</b>	<b>( )</b>	<b>( )</b>	<b>( )</b>
Type 3-2 truck	<b>( )</b>	<b>( )</b>	<b>( )</b>	<b>( )</b>
Permit truck	<b>( )</b>	<b>( )</b>	<b>( )</b>	<b>( )</b>



Metric tons ( )  
Tons



Metric tons ( )  
Tons



Metric tons ( )  
Tons

Comments **POSTING NOT REQUIRED**  
**6" CONCRETE DECK  $f'_c = 3000$   $F_y = 60000$  (ASSUMED)**  
**EXTERIOR GIRDER ("A") CONTROLS IN BENDING,  $F_y = 33000$  (-VE MOM**  
**MOMENT REQUIREMENTS GOVERN GIRDER RATING. PIER 4)**

**INSPECTED BUT NOT RATED**

**SEH, INC.**

DATE: \_\_\_\_\_ BY: \_\_\_\_\_

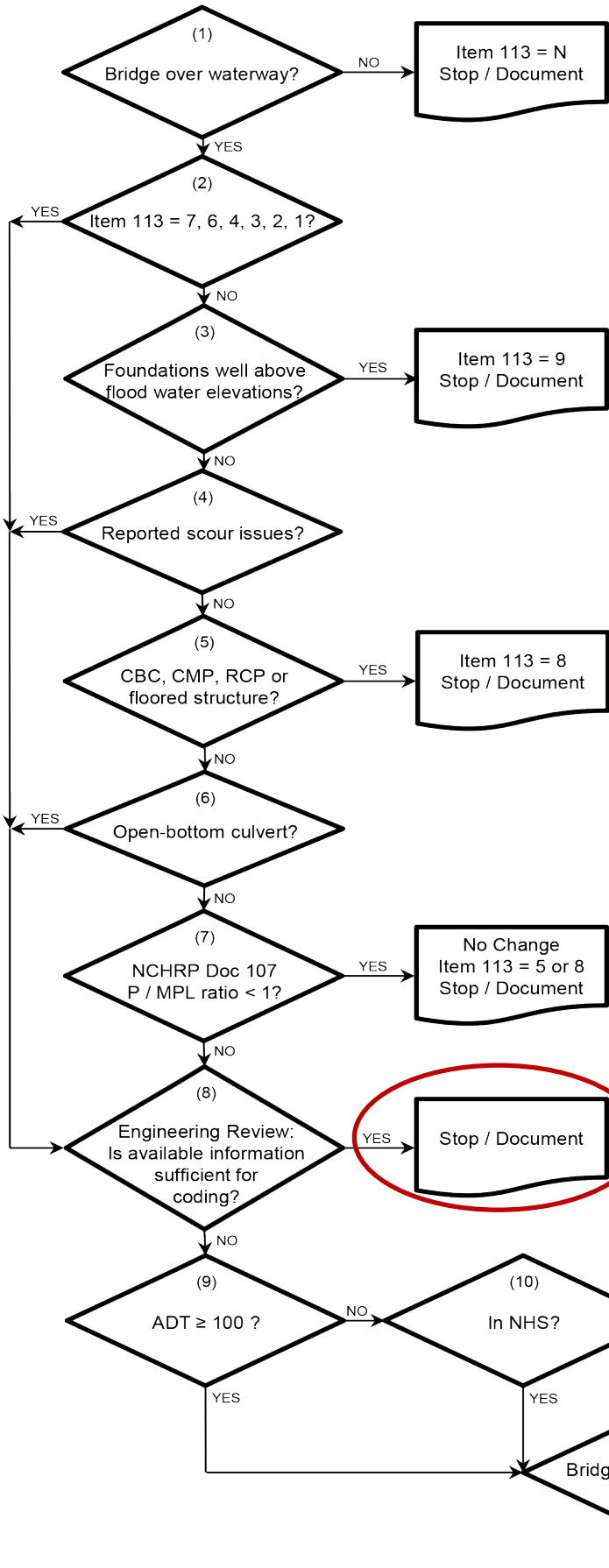
BRIDGE REINSPECTED BUT NOT RERATED BY LONCO, INC.

PLANS AVAILABLE AT TOWN OFFICES

Rated by <b>Ronald R. Alb...</b>	Date <b>9/12/96</b>	Checked by <b>[Signature]</b>	Date <b>11/20/96</b>
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### CDOT OFF-SYSTEM BRIDGE SCOUR SCREENING CHART



STRUCTURE ID: MINTRN-TAYLORST  
 FACILITY CARRIED: TAYLOR STREET  
 FEATURE INTERSECTED: EAGLE RIVER

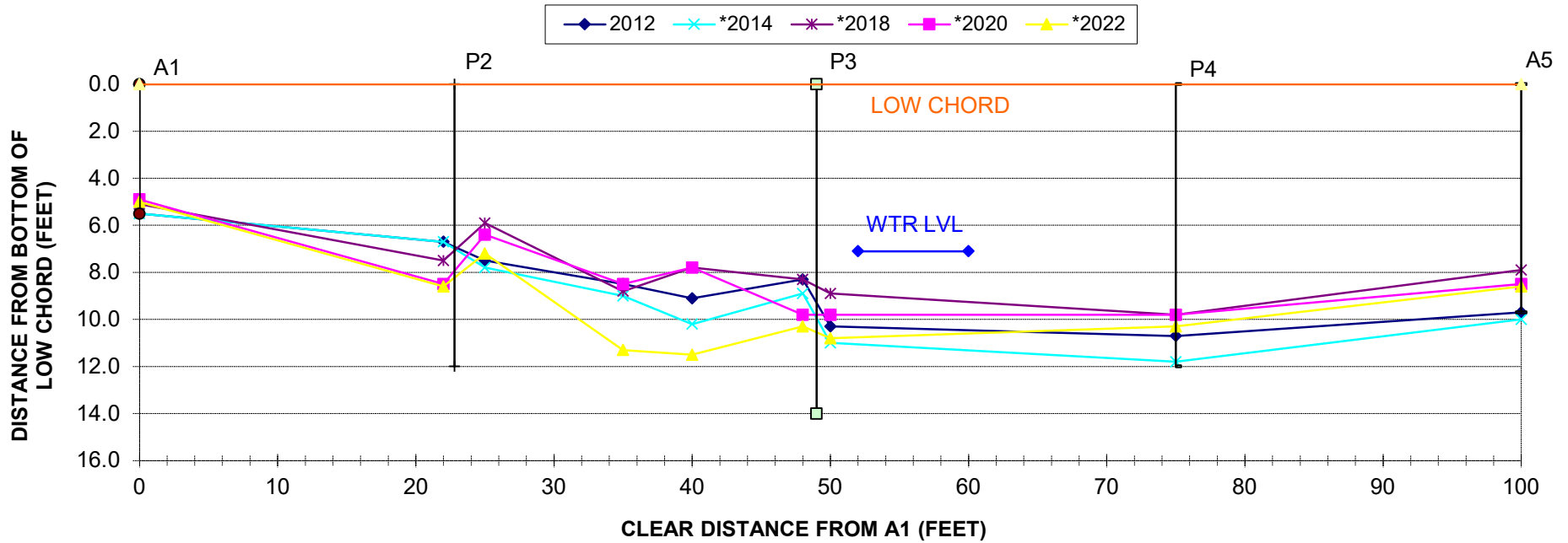
Structure Probability of Failure (P): 0.00025  
 Minimum Performance Level (MPL): 0.001  
 Ratio (P/MPL): 0.25

ITEM 113 = 3  
 POA REQUIRED (Y/N): Y  
 POA COMPLETION DATE: \_\_\_\_\_

EVALUATED BY: Kyle Nixon  
 ORGANIZATION: Stantec Consulting  
 DATE: 6/13/2016

**REVIEWER COMMENTS:**  
 This bridge is currently coded 113 = "4". It came to individual review because it was flagged for scour in the bridge inspection record. Structure is a 4 span CICK built in 1950 and reconstructed in 1986. No construction plans showing foundations are available. Foundations are assumed to be concrete spread footings. Channel bed is rocky with silt fines. Portions of abutments and piers have riprap armoring; however, photos from 2012 show that armoring is inconsistent. The 11/19/2012 special scour probing inspection found up to 3'-6" of exposed footings at P3 and P4. North side of P3 was undercut 1 - 2 ft. SW corner of P4 was undercut 1 ft. Footing is exposed at A5. The 2014 inspection report also noted a scour hole downstream of pier P2 up to 2' deep. In 2016, foundations could not be accessed due to high flow. Channel flows impact south side of pier walls and A5 midway through bridge because upstream half of bridge is skewed 35 degrees from downstream half. Streambed history shows degradation up to 2 ft in Span 3 between 2006 and 2008. Bed has been generally stable since then. Due to undercut footings, this bridge is now scour critical. The recommendation for this bridge is to change Item 113 to "3" and prepare a POA for scour countermeasures. HEC-18 analysis is not useful due to rocky streambed. (QC by LML, 4/25/2017)

### STREAMBED HISTORY



	0	22	25	35	40	48	50	75	100
2012	5.5	6.7	7.5	8.5	9.1	8.3	10.3	10.7	9.7
*2014	5.5	6.7	7.8	9.0	10.2	8.9	11.0	11.8	10.0
*2018	5.1	7.5	5.9	8.8	7.8	8.3	8.9	9.8	7.9
*2020	4.9	8.5	6.4	8.5	7.8	9.8	9.8	9.8	8.5
*2022	5.0	8.6	7.2	11.3	11.5	10.3	10.8	10.3	8.6

WTR LVL
8.3
4.8
6.9
7.1**
**

STRUCTURE NUMBER: MINTRN-TAYLORST  
 INSPECTION DATE: 6/19/2022

PERFORMED BY: KP/SLR

\* SWIFT FLOW - MEASUREMENTS MAY NOT BE ACCURATE.  
 \*\* WATER LEVEL MEASURED IN SPAN 1.



To: Michelle Metteer  
Town of Minturn/  
Town Manager

From: Rachel Spicer  
Project Manager

Date: 09/16/2022

---

## Essential Repair Finding – MINTRN-TAYLORST

The following bridge is recommended for repairs as recently discovered by the bridge inspection program:

**Responsible Party:** Town of Minturn

**Facility Carried:** Taylor Street

**Feature Intersected:** Eagle River

**ERF Color Code Classification:** **YELLOW** (See definition at end of letter)

**Structure Description:** MINTRN-TAYLORST a four-span bridge with a concrete deck on steel girders founded on concrete piers.

### Findings

During the follow-up inspection of this bridge on 9/7/2022, our inspector noted that all pier footings are exposed. The south pier (P2) north concrete collar/concrete blocks at the footing are undermined up to 10 inches back. The south pier (P3) footing is undermined up to 20 inches back on the upstream end. The south pier (P4) footing is undermined up to 24 inches back on the upstream end. The north abutment (A5) footing is also exposed and is undermined up to 13 inches back at mid-span. See the attached photos.

### Recommendations

We recommend that scour countermeasures be installed at the piers and the north abutment footing within 90 days and be installed in accordance with an engineered design. Structure should be monitored after high-flow or flood events until countermeasures are installed. The Essential Repair for this structure has been given a **YELLOW** Priority.

### Let us know your Plan of Action

CDOT would like to know your plan of action to repair or mitigate the above conditions. Please respond to this ERL within 14 days with a very brief plan of action that includes what repairs are planned and a general timeframe for when you expect repairs will be made.

Please let me know if you have any questions or if I can provide any additional information regarding this inspection.

Thank you for your time,

Rachel Spicer  
[rspicer@benesch.com](mailto:rspicer@benesch.com)

Inspector Printed Name: Samuel Lopez Rodriguez

Inspector Signature: *SOLR*

Date of Inspection: 9/07/2022

Senior Inspection Engineer Printed Name: Rachel Spicer

Senior Inspection Engineer Signature: *Rachel Spicer*

Date Reviewed: *9/16/22*

By signing here, I have determined that the above description of Essential Bridge Repairs meets the established criteria set forth by CDOT Staff Bridge and that the repair is essential. Color code prioritization has been determined and notification of the above findings has been sent to the local agencies' public works or road and bridge departments.

### **Definition, Classification and Prioritization**

Definition of Essential Bridge Repairs: Repairs necessary to ensure the safe and continued service of off-system major bridge structures. Examples of essential repair needs include but are not limited to: tension members identified as fracture critical members within the Structure File Data and which are damaged by natural or impact forces, a condition which results in a restriction of the maximum acceptable load carrying capacity of a structure to some value less than 27 Tons on the Type III, 3-axle truck at the Operating Rating level, three adjacent crushed stringers, three broken stringers in one span, two of which are adjacent to one another, stringers with rot at the ends, which may cause the stringer to fall off the timber cap, "mushrooming" for a depth of 2 inches on three adjacent stringers, rot in the top of 80 percent of all stringers in one span, which reduces the effective depth by 25 percent, rot in timber piles that affect the carrying-capacity of the structure, concrete girders with over 30 percent of the primary moment steel severed, loss of section in beam ends and/or spalls in concrete girder supports where girders have less than 80 percent bearing area remaining, steel members with over 30 percent section loss, steel or aluminum culverts including super spans with unusual section displacement and/or gaps at the point of overlap and cracks in bolt lines, scour greater than one foot since the last inspection which has caused vertical or horizontal displacement, scour under a spread footing, which has caused a loss of 15 percent of the bearing area.

When identifying a needed repair as essential, the Bridge Inspection Program Manager will classify the repair based on the appropriate time frame for addressing the problem as follows:



Classification	Legacy Color Code	Target Time Frame for Completion	Priority	Federal NBIS	Initial Notification	E-Mail Notification Time Frame	Follow-up Time Frame
Urgent Priority Repair	Orange	Within 30 days	Urgent		E-Mail Notification	Within 10 working days of finding	14 Calendar days of E-Mail
High Priority Repair	Yellow	Within 90 days	High		E-Mail Notification	Within 10 working days of finding	14 Calendar days of E-Mail
Moderate Priority Repair	Green	Within one year	Moderate		At presentation	As needed (not required)	As needed or At next inspection
Monitor	Blue	Specified in the letter	Monitor		E-Mail Notification	Within 10 working days of finding	As suggested in the notification
Low Priority Repair (maintenance item)	No Color	As funding allows	Low		Included with transfer files to Owner	N/A	At next inspection

CC:

Lynn E. Croswell, P.E., CDOT Bridge & Structure Inspection Engineer  
 Natasha Butler, P.E., CDOT Bridge Asset Management Engineer  
 Josh Dunbar, CDOT Structure Inspections Project Manager  
 Andrew Brown, CDOT Bridge Inspections Project Manager  
 Spencer Tucker, P.E., FHWA Division Bridge Engineer



**Roadway looking south.**



**Pier 2 exposed footer.**





**P3 exposed footing at downstream end.**



**P3 south side undermined footing at upstream end.**





**P4 north side exposed footing.**



**P4 northwest corner exposed footing.**





**P4 south side exposed footing.**



**P4 southwest corner undermining at upstream end.**





**Abutment 5 exposed footing.**



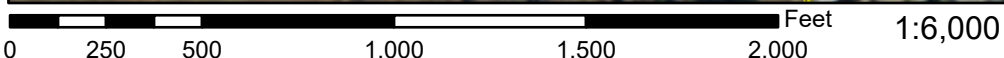
**Abutment 5 undermining at mid-section.**



# National Flood Hazard Layer FIRMMette



106°26'12"W 39°35'36"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
		Area of Undetermined Flood Hazard <i>Zone D</i>

GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Profile Baseline
		Hydrographic Feature

MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/28/2023 at 6:57 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



# STATE DEPARTMENT OF HIGHWAYS DIVISION OF HIGHWAYS - STATE OF COLORADO

COLORADO PROJECT NO. O.S.9944(2)  
EAGLE COUNTY

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO	O.S. 9944(2)	1	6

AS CONSTRUCTED		
NO REVISIONS	REVISED 10-8-76	VOID

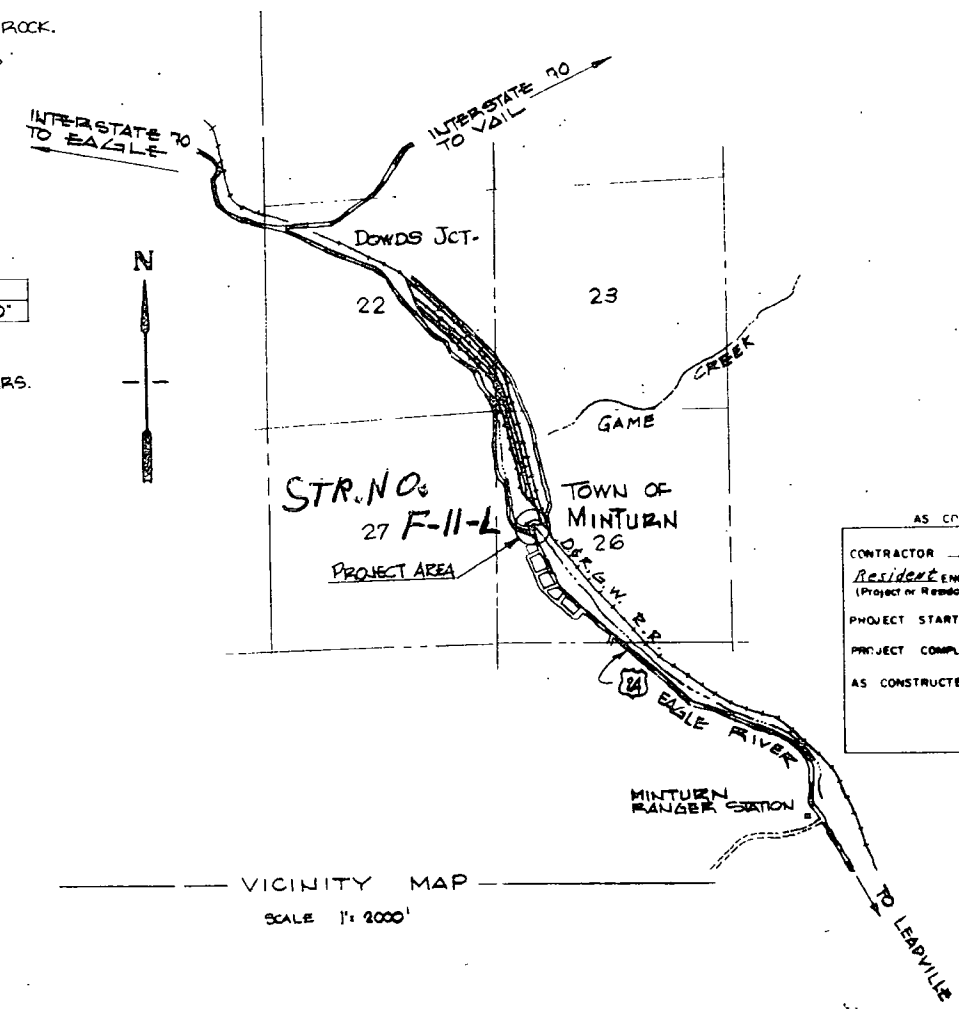
SECTION 26, T5S, R8W

### GENERAL NOTES

1. ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE DIVISION OF HIGHWAYS, STATE OF COLORADO, APPLICABLE TO THE PROJECT.
  2. ALL CONCRETE CHAMFERS SHALL BE 3/4" INCH UNLESS OTHERWISE NOTED.
  3. FOOTINGS IN ROCK SHALL NOT BE FORMED BUT SHALL BE PLACED AGAINST UNDISTURBED ROCK.
  4. FOR DETAILS OF STRUCTURE EXCAVATION & STRUCTURE BACKFILL, SEE STANDARD M-206-AB.
  5. ALL STRUCTURAL STEEL NOT OTHERWISE NOTED SHALL BE A.A.S.H.T.O. SPECIFICATION M-183 (A.S.T.M. A-36).
  6. ALL STRUCTURAL STEEL NOT OTHERWISE NOTED SHALL BE PAINTED IN ACCORDANCE WITH SECTION 509 FOR SPRUCE GREEN PAINT.
  7. NO WELDING OF ANY KIND SHALL BE PERMITTED ON THE FLANGES OF STEEL GIRDERS UNLESS SPECIFICALLY CALLED FOR ON THE PLANS.
  8. THE FOLLOWING TABLE SHOWS THE MINIMUM LAP FOR COMMON BAR SIZES.
- | BAR SIZE NUMBER | 4     | 5     | 6     | 7     | 8     | 9      | 10     | 11    |
|-----------------|-------|-------|-------|-------|-------|--------|--------|-------|
| SPLICE LENGTH   | 1'-0" | 1'-2" | 1'-8" | 2'-3" | 3'-0" | 3'-10" | 4'-10" | 6'-0" |
9. GRADE 60 REINFORCING STEEL REQUIRED FOR #5 AND LARGER BARS.
  10. GRADE 40 OR GRADE 60 REINFORCING STEEL MAY BE FURNISHED FOR #4 BARS.

**LOADING DATA**  
 LIVELOAD: A.A.S.H.T.O. HS-20-44  
 DEADLOAD: ASSUMES 25 LBS. PER SQ. FT. FOR BITUMINOUS PAVEMENT

**DESIGN DATA**  
 A.A.S.H.T.O. 1973 UNIT STRESSES, EXCEPT AS NOTED  
 REINFORCING CONCRETE: #5 BARS & LARGER  $f_c = 24,000$  P.S.I.  
                                   #4 BARS  $f_c = 20,000$  P.S.I.  
    $f_y = 12,000$  P.S.I.  $n = 10$   
 STRUCTURAL STEEL: A.A.S.H.T.O. M183 (A.S.T.M. A-36)  $F_y = 20,000$  P.S.I.



### INDEX OF SHEETS

NO.	SHEET TITLE	
①	COVER SHEET	
②	SUMMARY OF APPROXIMATE QUANTITIES	
③	EXISTING BRIDGE / DRILLING LOG	
④	DECK LAYOUT	
⑤	TYPICAL BRIDGE SECTION	
⑥	PIER & ABUTMENT DETAILS	

*H* STANDARDS		
M-206-AB	EXCAVATION AND BACKFILL FOR STRUCTURES (3 SHEETS)	4-16-76
M-500-A	LETTERS AND FIGURES FOR STRUCTURE NUMBERS	3-28-75
M-614-TB	TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION (3 SHEETS)	11-22-71

*S* STANDARDS		
S-614-52A	BARRICADES, DRUMS AND VERTICAL PANEL CHANNELIZING DEVICES	12-4-74

AS CONSTRUCTED INFORMATION

CONTRACTOR	WYCON CONST CO
Resident ENGINEER	J.E. NIMON
(Project or Revision)	
PROJECT STARTED	JULY 21, 1976
PROJECT COMPLETED	OCT 8, 1976
AS CONSTRUCTED PLANS APPROVED	<i>[Signature]</i>
Dist. Const. Engr.	11/17/77
TITLE	DATE

DIVISION OF HIGHWAYS

APPROVED

*[Signature]* 6/9/76  
 CHIEF ENGINEER DATE



NO.	REVISION	DATE	BY
	MINTURN BRIDGE WIDENING MINTURN, COLORADO		
	STEEL GIRDER BRIDGE WIDENING METAL DECK BRIDGE PLANK W/ ASPHALT OVERLAY 4 EA. SIMPLE SPANS @ 25' ± TOTAL LENGTH 100' ± OVER EAGLE RIVER AT MINTURN, TIMBER PEDESTRIAN WALKWAY		

JOB NO. 76010	
DRAWN: ADP	
APPR. J.E.N.	
SCALE -	
DATE APRIL 1976	
SHEET NO. 1	

ELDRADO ENGINEERING COMPANY CONSULTING ENGINEERS - REGISTERED LAND SURVEYORS  
 P.O. BOX 669 GLENWOOD SPRINGS, COLORADO 81601 TELEPHONE 1-303-945-6596

# SUMMARY OF APPROXIMATE QUANTITIES

AS CONSTRUCTED  
NO REVISIONS  REVISED  VOID

FEDERAL ROAD DISTRICT NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO	OS. 9944(2)	2	6

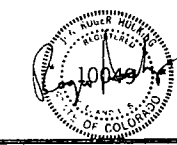
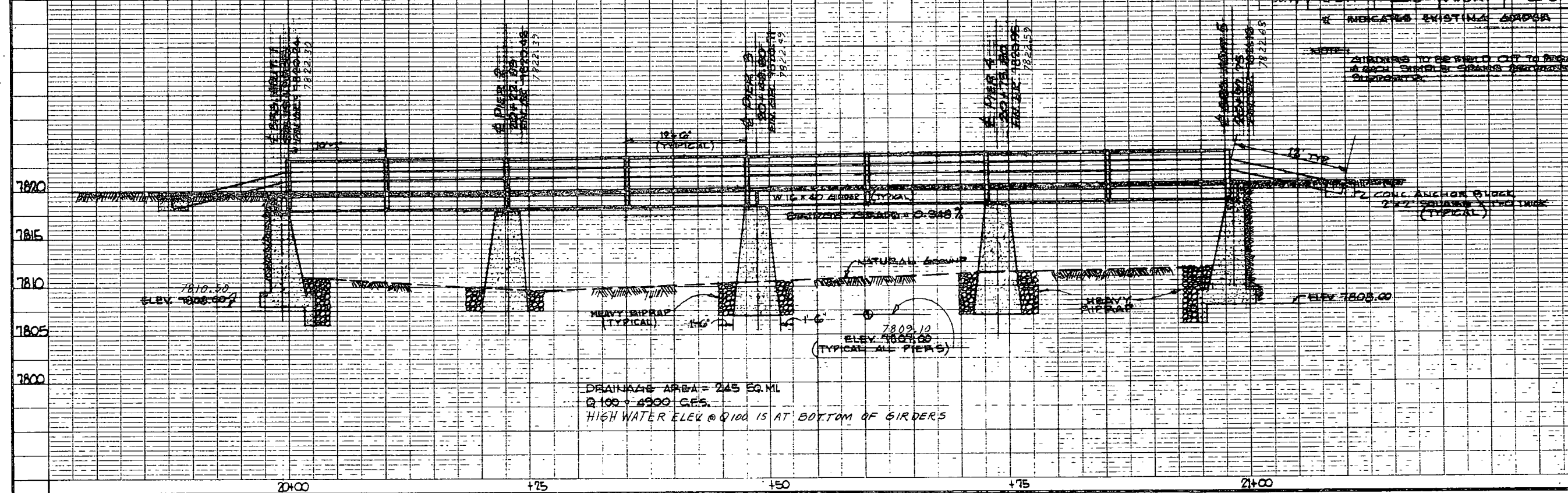
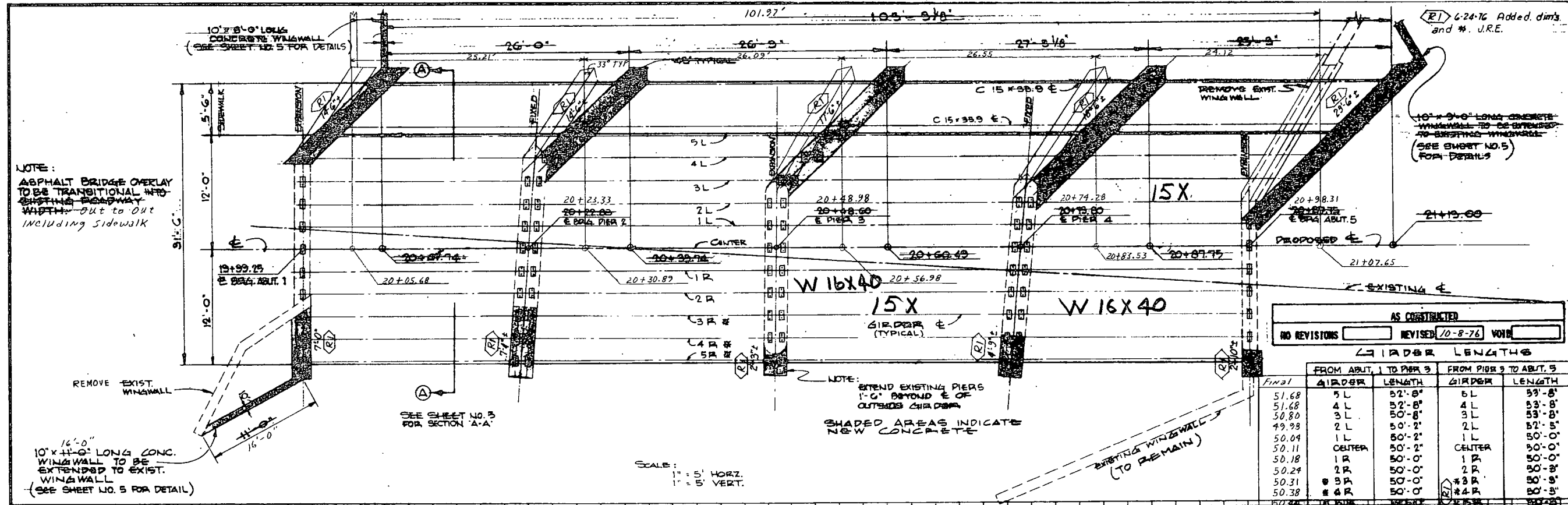
INDEX BOOK PAGE SHEET	CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	ROADWAY	STRUCTURE STA. 19+99.25 TO STA. 20+97.75	ABUT. NO. 1	PIER NO. 2	PIER NO. 3	PIER NO. 4	ABUT. NO. 5	PROJECT TOTALS	FINAL	DIFF	%
1 40	202	REMOVAL OF PORTIONS OF PRESENT STRUCTURE	LUMP SUM		•						•	•	0	100
1 40	206	STRUCTURE EXCAVATION	CU. YD.		249	108' (60)	21' (25)	15' (24)	25' (27)	74' (113)	249	243	-6	98
1 40	206	STRUCTURE BACKFILL (CLASS I)	CU. YD.		84	65' (45)				30' (39)	84	95	+11	113
1 40	210	RESET GUARD RAIL TYPE 3	LIN. FT.		200						200	192.4	-7.6	96
1 40	403	HOT BITUMINOUS PAVEMENT (GRADING 'E') (HAUL & ASPHALT)	TON	34.1 14	58						72	92.1	+20.1	128
1 40	506	HEAVY RIPRAP	CU. YD.		48	(15)	9' (7)	10' (7)	11' (7)	5' (12)	48	50	+2	104
1 40	508	TREATED TIMBER	M.F.B.M.		2.7						2.7	2.7	0	100
1 40	509	STRUCTURAL STEEL	POUND		32000						32000	34,451	+2,451	108
1 40	601	CONCRETE CLASS A (BRIDGE)	CU. YD.		176	40.91' (36)	32.29' (34)	29.48' (32)	32.71' (36)	39.54' (38)	176	179.93	-1.07	100
1 40	509	ALTER & ERECT STRUCTURAL STEEL	LUMP SUM		L.S.						L.S.	•	0	100
1 40	517	CORRUGATED STEEL BRIDGE PLANK	SQ. FT.		2400						2400	2,502	+102	104
1 40	602	REINFORCING STEEL	POUND		3570	(834) 1172	(606) 646	(506) 537	(621) 653	(315) 812	3570	3820 3,795	250 +225	107 106
1 40	606	GUARD RAIL TYPE 3 (6-3 POST SPACING)	LIN. FT.	48							48	50	+2	104
1 40	614	FLAGGING	HR.		100						100	2	-98	2
1 40	620	FIELD LABORATORY	EACH		1						1	1	0	100
1 40		F/A 01 (Pier #2 Stabilization & Add 1" Plates for Girders)									\$1,000.00	\$1,123.69	+\$123.69	112
1 40		CMO 2195 (Repair damage caused by Accident)									1,100.00	1,170.77	+70.77	106
1 40		CMO 2197 (Authorize Use of AC-10)									0.00	0.00	0	100
1 40		CMO 2198 (Change Skew of Piers)									0.00	0.00	0	100
1 40	620	SANITARY FACILITY	EACH		1						1	1	0	100
1 40	626	MOBILIZATION	LUMP SUM		•						•	•	0	100
		FORCE ACCOUNT												
	F/A01	MINOR CONTRACT REVISIONS	LUMP SUM		•						•	•	0	100

REV 11-30-76





PROJECT NO.	76010
DIVISION	05 9944 (2)
PROJECT NO.	4
DATE	APRIL 76
SCALE	NOTED
SHEET	4



MINTURN BRIDGE WIDENING  
MINTURN, COLORADO  
05 9944 (2)  
DECK LAYOUT

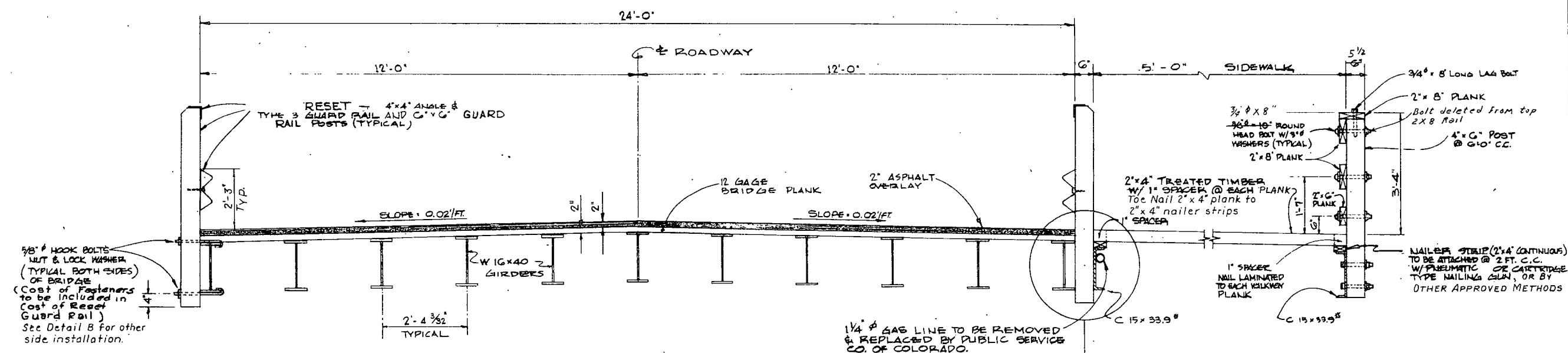
Job 76010  
Drawn JEA  
Appr. JEA  
Date APRIL 76  
Scale NOTED  
Sheet 4

ELDORADO ENGINEERING COMPANY CONSULTING ENGINEERS - REGISTERED LAND SURVEYORS  
818 COLORADO AVENUE P.O. BOX 889 GLENWOOD SPRINGS, COLORADO 81601 303-845-8817

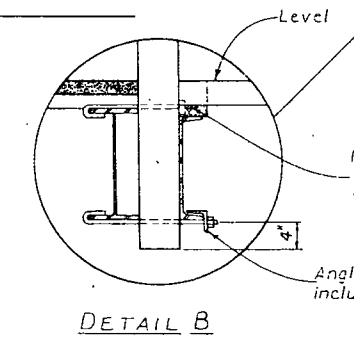
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
XIII	COLORADO	0.S. 9944 (2)	5	6

AS CONSTRUCTED

NO REVISIONS  REVISED 10-8-76  VOID



TYPICAL BRIDGE SECTION  
(SECTION A-A SHEET NO 4)  
SCALE: 3/4" = 1'-0"



NOTE:

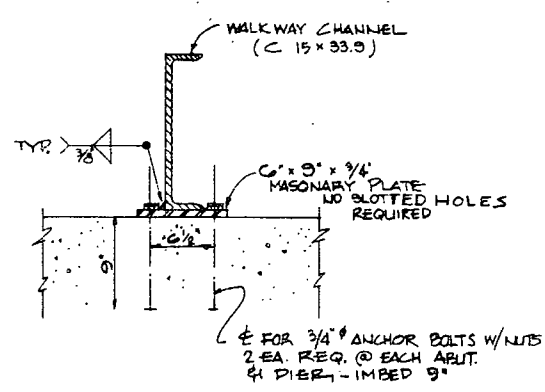
USE EXISTING STEEL CHANNELS FOR SIDEWALK SUPPORT BEAMS (C 15x33.9)

ALL TIMBER COMPONENTS TO BE TREATED IN ACCORDANCE WITH FEDERAL STANDARD FT-W-580 AND THE AMERICAN WOOD PRESERVERS STANDARD L.P. - 22

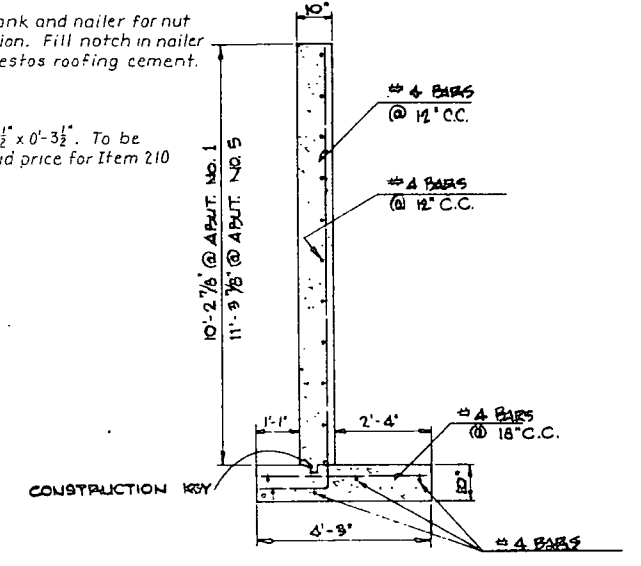
ALL WALKWAY TIMBER S4S

CONSTRUCTION SCHEDULE

- PERFORM PIER & ABUTMENT ADDITIONS ON DOWN-STREAM SIDE OF BRIDGE. CONTACT PUBLIC SERVICE CO. TO PLACE TEMPORARY GAS LINE ON DOWN STREAM SIDE.
- REMOVE EXISTING PEDESTRIAN WALKWAY.
- PERFORM PIER & ABUTMENT ADDITIONS ON UPSTREAM SIDE OF BRIDGE
- REMOVE EXISTING BRIDGE ROADWAY
- PLACE EXISTING CHANNEL BEAMS AT NEW PEDESTRIAN WALKWAY, EAST GUARDRAIL POSTS, EAST OUTSIDE GIRDER AND CONSTRUCT NEW WALKWAY COMPLETELY.
- SET NEW AND SALVAGED ROADWAY BEAMS AND CONSTRUCT ROADWAY.



TYPICAL WALKWAY BEARING DETAIL  
SCALE: 3/4" = 1'-0"



TYPICAL WINGWALL DETAIL  
SCALE: 1/2" = 1'-0"



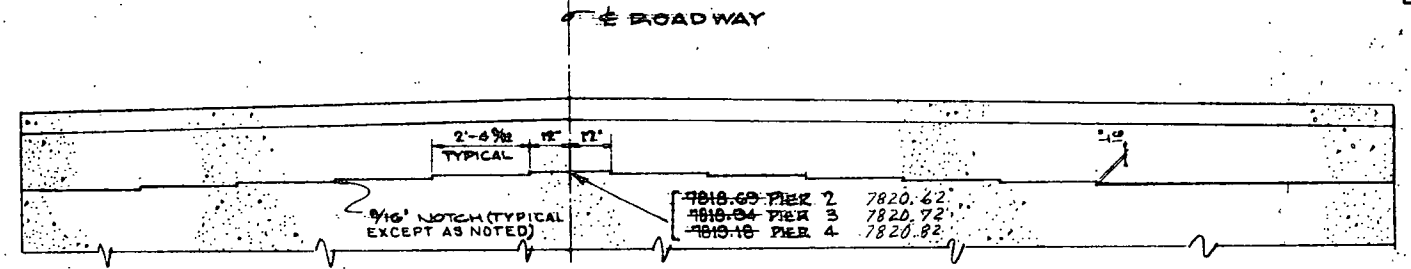
NO.	REVISION	DATE	BY

MINTURN BRIDGE WIDENING  
MINTURN, COLORADO  
0.S. 9944 (2)

TYPICAL BRIDGE SECTION

ELDORADO ENGINEERING COMPANY CONSULTING ENGINEERS - REGISTERED LAND SURVEYORS  
P.O. BOX 669 GLENWOOD SPRINGS, COLORADO 81601 TELEPHONE 1-303-449-0993

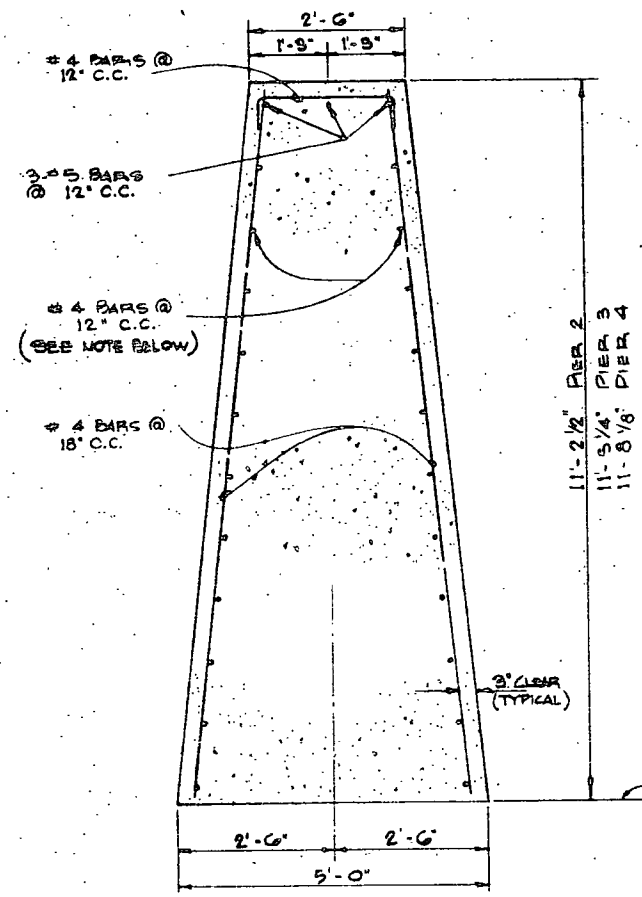
100 NO. 76010  
DRAWN: [unclear]  
SCALE: 1/2" = 1'-0"  
DATE: 10/8/76  
SHEET NO. 5 OF 6



ELEVATION BEARING SEAT

SCALE: 1/2" = 1'-0"

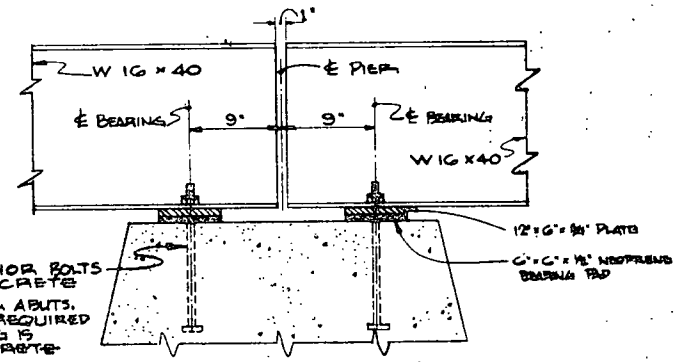
7818.60 PIER 2	7820.42
7818.84 PIER 3	7820.72
7819.18 PIER 4	7820.82



TYPICAL PIER EXTENSION DETAIL

SCALE: 3/4" = 1'-0"

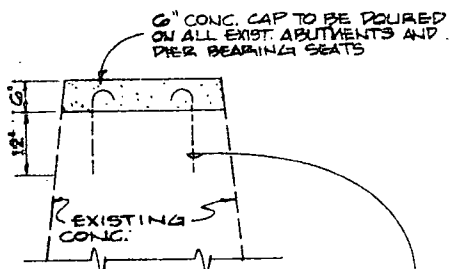
NOTE: EVERY 3RD HORIZONTAL REINFORCING BAR TO BE DRILLED & GROUTED 9" INTO EXISTING PIER WALLS. (TYPICAL PIER EXTENSIONS) INCLUDE IN ITEM 601 CONCRETE CLASS 'A' BRIDGE



PIERS NO. 2, 3, & 4 BEARING SEAT DETAIL

SCALE: 1 1/2" = 1'-0"

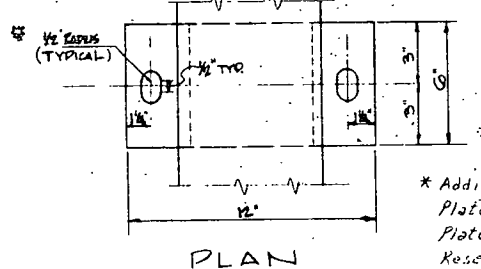
NOTE: ALL EXISTING BEARING SEATS ON ALL ABUTMENTS AND PIERS ARE TO BE RAISED 6" IN ELEVATION BY POURING A 6" CONCRETE CAP. ANCHOR BOLTS ARE TO BE EMBEDDED IN THIS 6" CAP ONLY ABOVE EXISTING CONCRETE. (SEE DETAIL 'A')



DETAIL 'A'

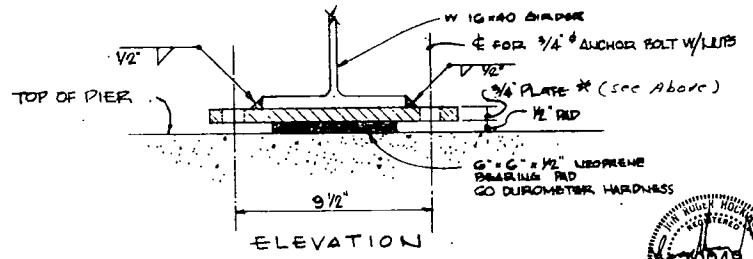
SCALE: 3/4" = 1'-0"

DRILL & GROUT #4 BARS @ 36" C.C. AS SHOWN (INCLUDE IN ITEM 601 CONCRETE) CLASS A BRIDGE



PLAN

\* Additional 1" x 6" x 7" Steel Brg Plate Placed on 3/4" x 6" x 12" Brg Plate Where Original Beams Were Rested.

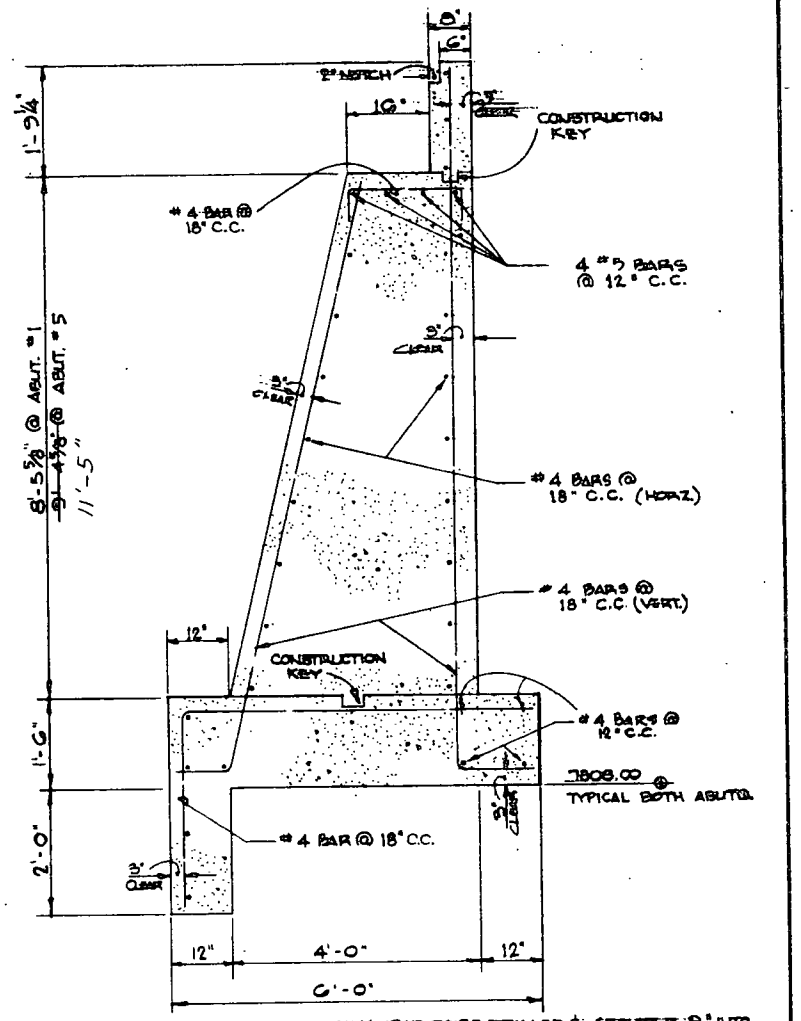


ELEVATION

TYPICAL BEARING PLATE

\* SLOTTED SOLE PLATES TO BE PROVIDED FOR ALL BEARINGS AT ABUT. 1, PIER 3 & ABUT. 5 - 1" HOLES AT PIERS 2 & 4

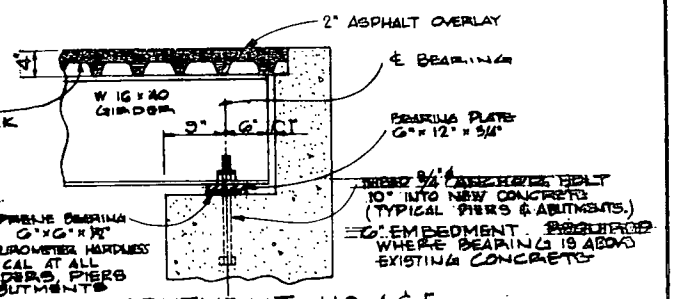
SCALE: 3" = 1'-0"



TYPICAL ABUTMENT DETAIL

SCALE: 3/4" = 1'-0"

NOTE: EVERY 3RD HORIZONTAL REINFORCING BAR TO BE DRILLED & GROUTED 9" INTO EXISTING ABUT. WALLS. (INCLUDE IN ITEM 601 CONCRETE CLASS 'A' BRIDGE)



ABUTMENT NO. 1 & 5 BEARING SEAT DETAIL

SCALE: 1" = 1'-0"

NO.	REVISION	DATE	BY

MINTURN BRIDGE WIDENING  
MINTURN, COLORADO  
O.S. 9944(2)

PIER & ABUTMENT DETAILS

JOB NO. 76010	DATE
SCALE LISTED	
SHEET NO. 6	

Eldorado Engineering Company CONSULTING ENGINEERS - REGISTERED LAND SURVEYORS  
P.O. BOX 669 GLENWOOD SPRINGS, COLORADO 81601 TELEPHONE 1-303-945-6593



# Channel Report

## Bellum Bridge @ 3490 cfs

### User-defined

Invert Elev (ft) = 7809.50  
Slope (%) = 0.50  
N-Value = 0.035

### Highlighted

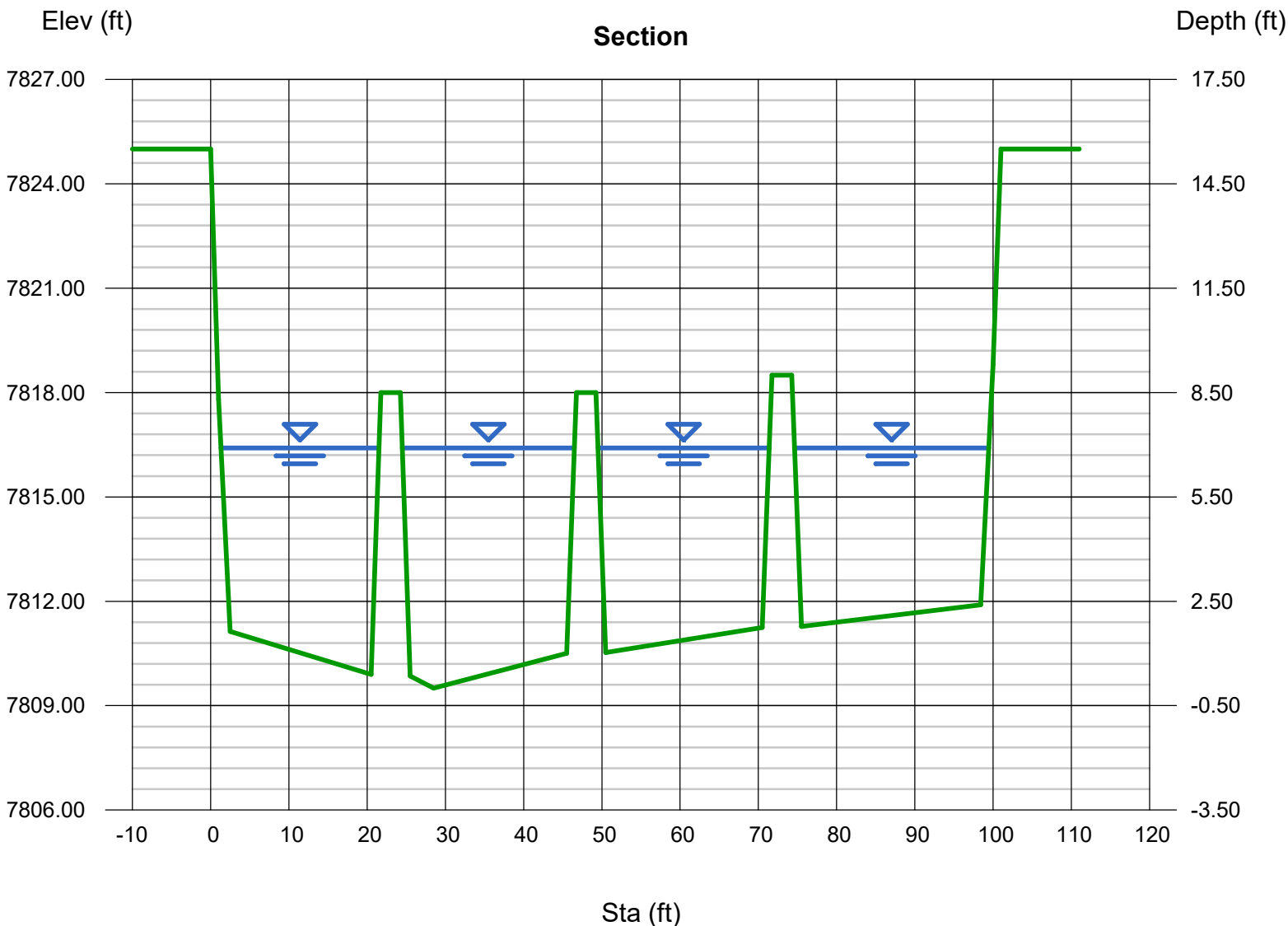
Depth (ft) = 6.91  
Q (cfs) = 3,490  
Area (sqft) = 478.53  
Velocity (ft/s) = 7.29  
Wetted Perim (ft) = 126.68  
Crit Depth, Yc (ft) = 5.10  
Top Width (ft) = 88.89  
EGL (ft) = 7.74

### Calculations

Compute by: Known Q  
Known Q (cfs) = 3490.00

### (Sta, El, n)-(Sta, El, n)...

( 0.00, 7825.00)-(1.00, 7817.80, 0.035)-(2.50, 7811.13, 0.035)-(20.50, 7809.90, 0.035)-(21.75, 7818.00, 0.035)-(24.25, 7818.00, 0.035)-(25.50, 7809.85, 0.035)  
-(28.50, 7809.50, 0.035)-(45.50, 7810.50, 0.035)-(46.75, 7818.00, 0.035)-(49.25, 7818.00, 0.035)-(50.50, 7810.53, 0.035)-(70.50, 7811.25, 0.035)-(71.75, 7818.50, 0.035)  
-(74.25, 7818.50, 0.035)-(75.50, 7811.28, 0.035)-(98.40, 7811.90, 0.035)-(100.00, 7818.80, 0.035)-(101.00, 7825.00, 0.035)



# Channel Report

## Bellum Bridge @ 4900 cfs

### User-defined

Invert Elev (ft) = 7809.50  
 Slope (%) = 0.50  
 N-Value = 0.035

### Highlighted

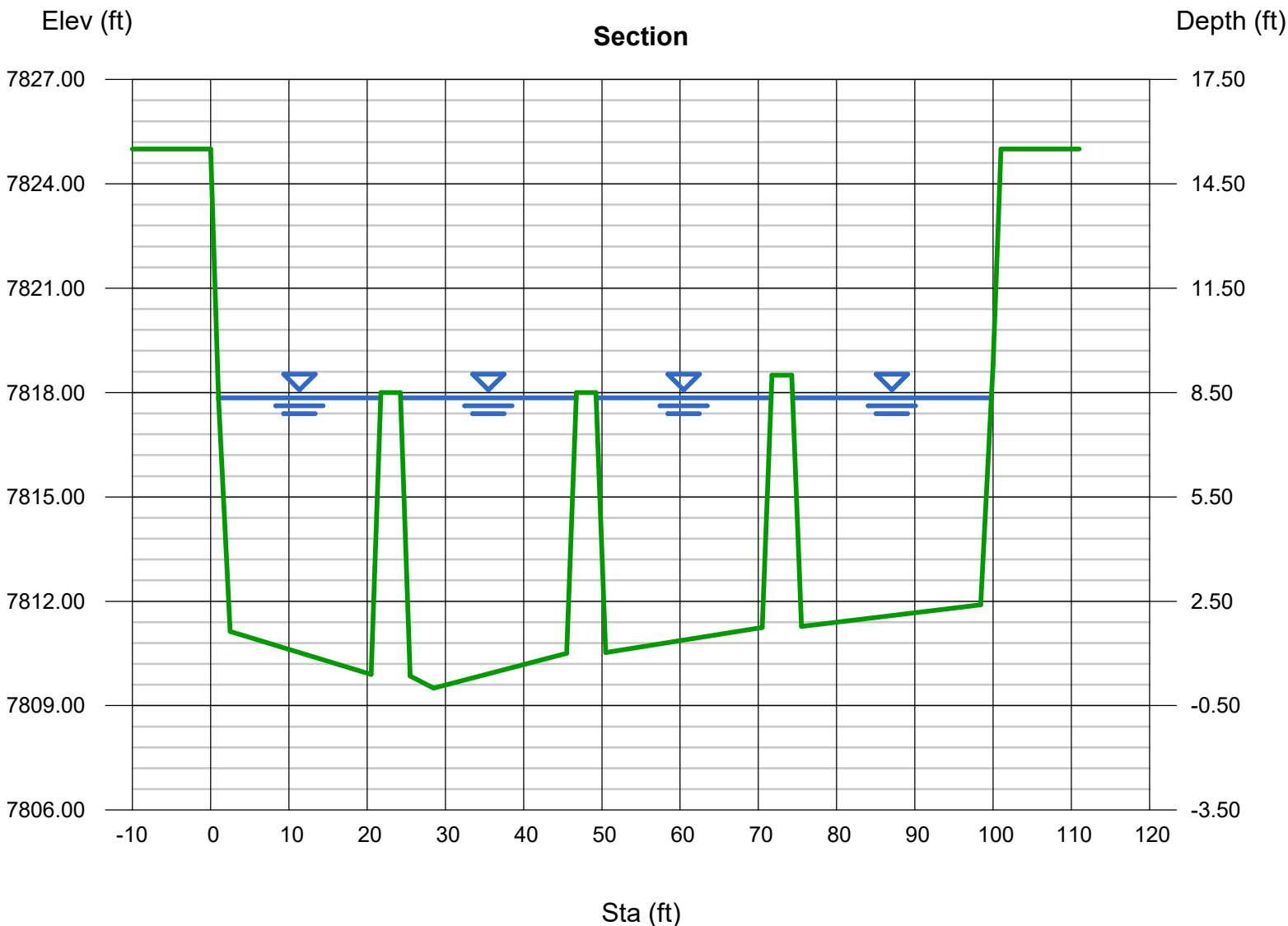
Depth (ft) = 8.35  
 Q (cfs) = 4,900  
 Area (sqft) = 608.02  
 Velocity (ft/s) = 8.06  
 Wetted Perim (ft) = 138.39  
 Crit Depth, Yc (ft) = 6.06  
 Top Width (ft) = 90.97  
 EGL (ft) = 9.36

### Calculations

Compute by: Known Q  
 Known Q (cfs) = 4900.00

### (Sta, El, n)-(Sta, El, n)...

( 0.00, 7825.00)-(1.00, 7817.80, 0.035)-(2.50, 7811.13, 0.035)-(20.50, 7809.90, 0.035)-(21.75, 7818.00, 0.035)-(24.25, 7818.00, 0.035)-(25.50, 7809.85, 0.035)  
 -(28.50, 7809.50, 0.035)-(45.50, 7810.50, 0.035)-(46.75, 7818.00, 0.035)-(49.25, 7818.00, 0.035)-(50.50, 7810.53, 0.035)-(70.50, 7811.25, 0.035)-(71.75, 7818.50, 0.035)  
 -(74.25, 7818.50, 0.035)-(75.50, 7811.28, 0.035)-(98.40, 7811.90, 0.035)-(100.00, 7818.80, 0.035)-(101.00, 7825.00, 0.035)



Eagle River Bellm Bridge Temporary Scour Protection Calculations  
 BC-84W-1.0-NSV 100yr Event Riprap Size for Scour Protection at Abutments  
 Adapted from HEC-23 (FHWA-NHI-09-112, 2009) Design Guideline 14:

$$D_{50} = y \times \left[ \frac{K}{(S_s - 1)} \right] \times \left[ \left( \frac{V_c^2}{g \times y} \right)^a \right] \quad Fr = \frac{V_c}{\sqrt{g \times y}} \quad V_c = \frac{Q_c}{A_c}$$

set – back distance (ft) from abutment toe to channel overbank

$$SBR = \frac{(\text{= 0 if abutment is within main channel})}{\text{average channel flow depth (ft)}}$$

- $D_{50}$  = median stone size (ft).
- $y$  = depth of flow in bridge opening (ft).
- $S_s$  = Specific Gravity of the riprap stone  
 = 0.89 for spill-through abutment if  $Fr \leq 0.80$ ,  
 = 1.02 for vertical abutment if  $Fr \leq 0.80$ ,  
 = 0.61 for spill-through abutment if  $Fr > 0.80$ ,  
 = 0.69 for vertical abutment if  $Fr > 0.80$ .
- $K$  = Characteristic Velocity (ft/sec).
- $V_c$  = gravitational acceleration (32.2ft/s<sup>2</sup>).
- $g$  = 1 if  $Fr \leq 0.80$ , 0.14 if  $Fr > 0.80$ .
- $a$  = Flow in characteristic area (cfs).
- $Q_c$  = Flow area in characteristic area (ft<sup>2</sup>/sec).
- $A_c$  = Flow area in characteristic area (ft<sup>2</sup>/sec).

Characteristic area: If both abutment SBR's are less than 5, characteristic area is the entire area of flow in the bridge opening; or If one abutment SBR is less than 5 and the other is not, the characteristic area for the abutment that does not have an SBR of less than 5 is the overbank area, and the characteristic area for the abutment with the SBR of less than 5 is the flow area of the channel plus the overbank for that abutment (all within the bridge opening); or if an abutment SBR is not less than 5, characteristic area for that abutment is the area of overbank flow (within the bridge opening) for that abutment.

Left	
Set-back Distance (ft):	0.00
Average Channel Flow Depth (ft):	6.20
SBR =	0.00
Characteristic Area =	Entire Flow Area
$Q_c$ (cfs):	3,490
$A_c$ (ft <sup>2</sup> ):	479
$V_c$ (ft/sec) =	7.29
$y$ (ft):	6.90
$Fr$ =	0.49
$a$ :	1.00
$S_s$ :	2.25
Abutment Type:	Vertical
$K$ :	1.02

Result:

$$D_{50} = 1.35 \quad (\text{ft})$$

Resulting Theoretical Riprap Gradation		
	Stone Size (in)	
	Min	Max
$d_{15}$	9.4	13.4
$d_{50}$	14.6	17.8
$d_{85}$	19.9	23.6
$d_{100}$	---	30.7

**USE d50 = 18", 36" Thick**

Right
N/A
<b>SBR Right &lt; 5</b>
<b>AND</b>
<b>SBR Left &lt; 5</b>
<b>Therefore</b>
<b>No difference in Riprap</b>
<b>(Left vs Right)</b>

**USE d50 = 18", 30" Thick**



Eagle River Bellm Bridge Temporary Scour Protection Calculations  
 BC-84W-1.0-NSV 500yr Event Riprap Size for Scour Protection at Abutments  
 Adapted from HEC-23 (FHWA-NHI-09-112, 2009) Design Guideline 14:

$$D_{50} = y \times \left[ \frac{K}{(S_s - 1)} \right] \times \left[ \left( \frac{V_c^2}{g \times y} \right)^a \right] \quad Fr = \frac{V_c}{\sqrt{g \times y}} \quad V_c = \frac{Q_c}{A_c}$$

set – back distance (ft) from abutment toe to channel overbank

$$SBR = \frac{(\text{= 0 if abutment is within main channel})}{\text{average channel flow depth (ft)}}$$

- $D_{50}$  = median stone size (ft).
- $y$  = depth of flow in bridge opening (ft).
- $S_s$  = Specific Gravity of the riprap stone  
 = 0.89 for spill-through abutment if  $Fr \leq 0.80$ ,  
 = 1.02 for vertical abutment if  $Fr \leq 0.80$ ,  
 = 0.61 for spill-through abutment if  $Fr > 0.80$ ,  
 = 0.69 for vertical abutment if  $Fr > 0.80$ .
- $K$  = Characteristic Velocity (ft/sec).
- $g$  = gravitational acceleration (32.2ft/s<sup>2</sup>).
- $a$  = 1 if  $Fr \leq 0.80$ , 0.14 if  $Fr > 0.80$ .
- $Q_c$  = Flow in characteristic area (cfs).
- $A_c$  = Flow area in characteristic area (ft<sup>2</sup>/sec).

Characteristic area: If both abutment SBR's are less than 5, characteristic area is the entire area of flow in the bridge opening; or If one abutment SBR is less than 5 and the other is not, the characteristic area for the abutment that does not have an SBR of less than 5 is the overbank area, and the characteristic area for the abutment with the SBR of less than 5 is the flow area of the channel plus the overbank for that abutment (all within the bridge opening); or if an abutment SBR is not less than 5, characteristic area for that abutment is the area of overbank flow (within the bridge opening) for that abutment.

Left	
Set-back Distance (ft):	0.00
Average Channel Flow Depth (ft):	6.90
SBR =	0.00
Characteristic Area =	Entire Flow Area
$Q_c$ (cfs):	4,900
$A_c$ (ft <sup>2</sup> ):	643
$V_c$ (ft/sec) =	7.62
$y$ (ft):	8.30
$Fr$ =	0.47
$a$ :	1.00
$S_s$ :	2.25
Abutment Type:	Vertical
$K$ :	1.02

Right	
N/A	
<b>SBR Right &lt; 5</b>	
<b>AND</b>	
<b>SBR Left &lt; 5</b>	
<b>Therefore</b>	
<b>No difference in Riprap</b>	
<b>(Left vs Right)</b>	
	
<div style="background-color: #90EE90; padding: 5px; border: 1px solid black; width: fit-content; margin: auto;">USE d50 = 24", 42" Thick</div>	

Result:

$$D_{50} = 1.47 \text{ (ft)}$$

Resulting Theoretical Riprap Gradation		
	Stone Size (in)	
	Min	Max
$d_{15}$	10.2	14.7
$d_{50}$	15.9	19.4
$d_{85}$	21.7	25.8
$d_{100}$	---	33.6
<div style="background-color: #90EE90; padding: 5px; border: 1px solid black; width: fit-content; margin: auto;">USE d50 = 18", 36" Thick</div>		

# NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation (BFEs)** and/or **Floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevation (CBFEs)** shown on this map apply only landward of 0.0' North American Vertical Datum (NAVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at [www.ngs.noaa.gov](http://www.ngs.noaa.gov) or contact the National Geodetic Survey at the following address:

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit their website at [www.ngs.noaa.gov](http://www.ngs.noaa.gov).

**Base map** information shown on this FIRM was provided in digital format by Eagle County Geographic Information Systems.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

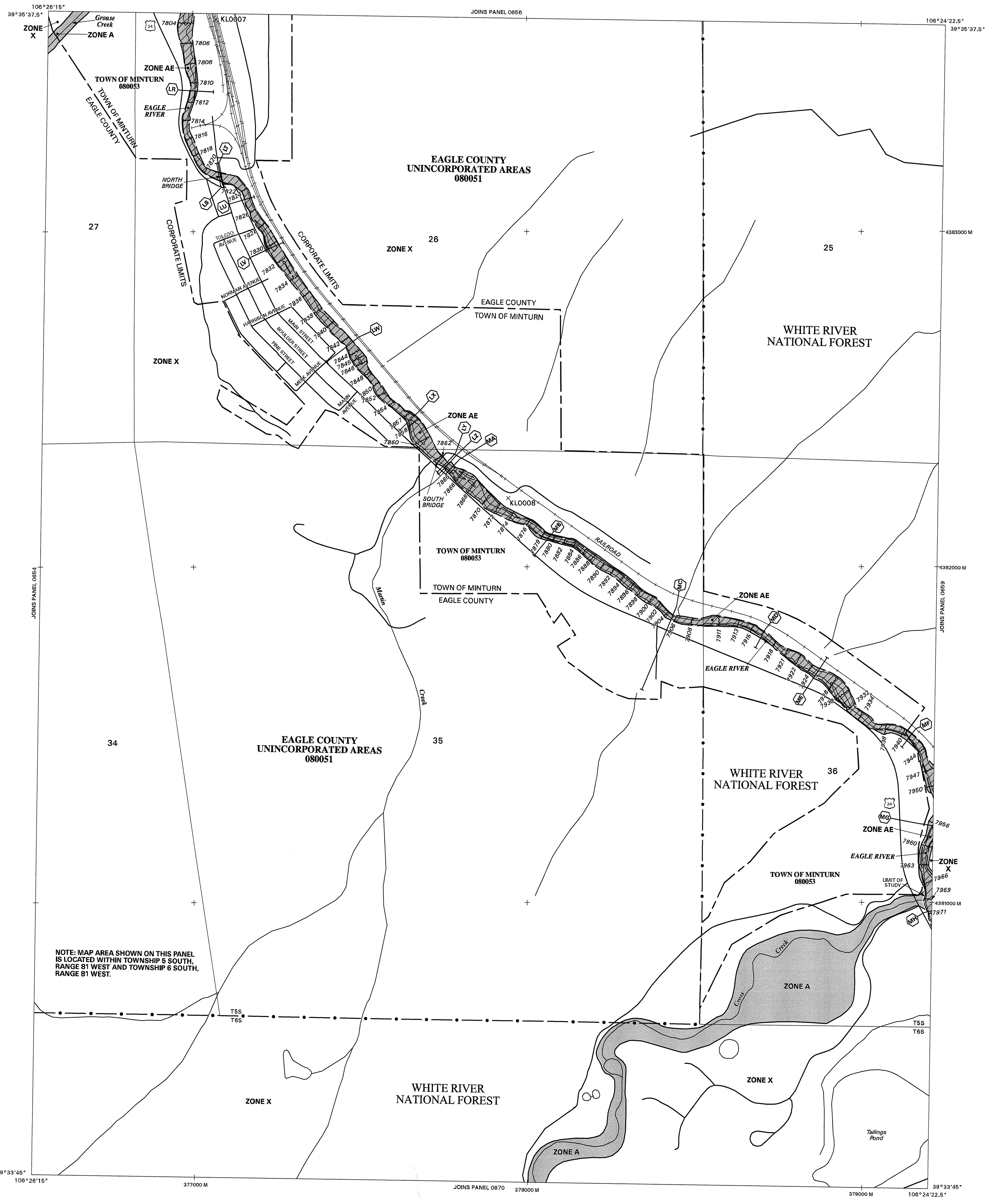
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for information on all related products available from FEMA:

Phone: 800-358-9616  
FAX: 800-358-9620  
[www.fema.gov/msc](http://www.fema.gov/msc)

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at [www.fema.gov](http://www.fema.gov).

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 8 SOUTH, RANGE 81 WEST AND TOWNSHIP 6 SOUTH, RANGE 81 WEST.

# LEGEND

## SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

- ZONE A** No base flood elevations determined.
- ZONE AE** Base flood elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AR** Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.
- ZONE A99** Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

**FLOODWAY AREAS IN ZONE AE**  
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**  
**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**  
**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.  
**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**  
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

**OTHERWISE PROTECTED AREAS (OPAs)**  
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
- Base Flood Elevation line and value; elevation in feet\*
- Base Flood Elevation value where uniform within zone; elevation in feet\*

- \*Referenced to the North American Vertical Datum of 1988
- Cross Section Line
- Transect Line

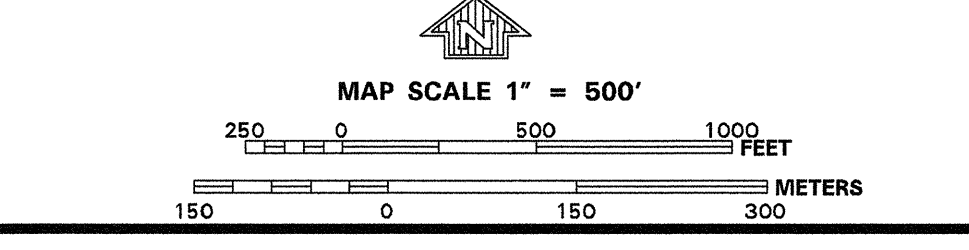
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)  
4276000M  
600000 FT  
5000-foot grid ticks

Bench mark (see explanation in Notes to Users section of this FIRM panel).  
M1.5  
River Mile

**MAP REPOSITORY**  
Refer to Repository Listing on Index Map  
**EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**  
DECEMBER 4, 2007  
**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.



**PANEL 0658D**

**FIRM**  
**FLOOD INSURANCE RATE MAP**  
EAGLE COUNTY,  
COLORADO  
AND INCORPORATED AREAS

**PANEL 658 OF 1125**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
EAGLE COUNTY UNINCORPORATED AREAS	06051	0658	D
MINTURN, TOWN OF	08053	0658	D

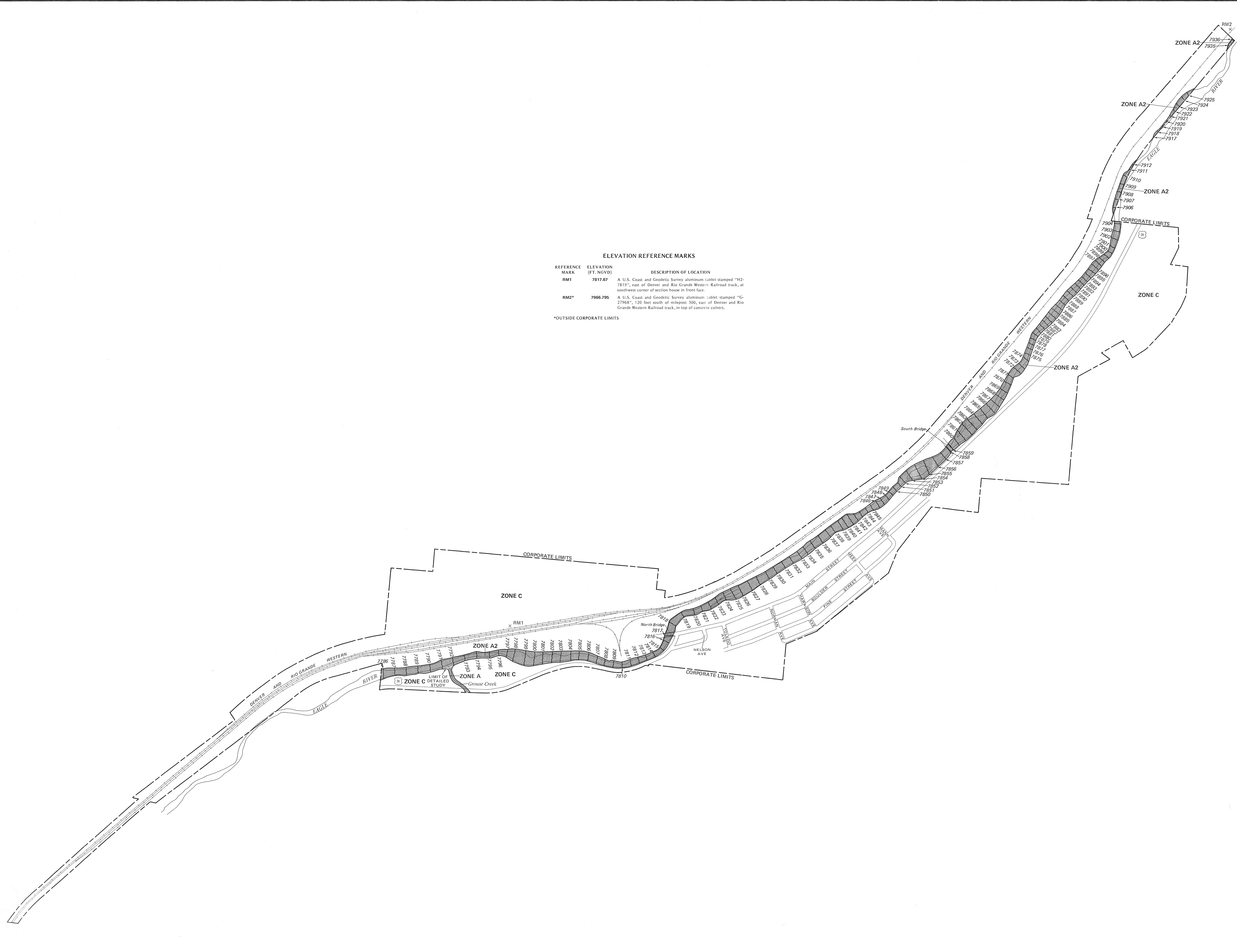
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
**08037C0658D**

**EFFECTIVE DATE:**  
**DECEMBER 4, 2007**

Federal Emergency Management Agency





**ELEVATION REFERENCE MARKS**

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM1	7817.87	A U.S. Coast and Geodetic Survey aluminum tablet stamped "H2-7819", east of Denver and Rio Grande Western Railroad track, at southwest corner of section house in front face.
RM2*	7966.796	A U.S. Coast and Geodetic Survey aluminum tablet stamped "G-27968", 120 feet south of milepost 300, east of Denver and Rio Grande Western Railroad track, in top of concrete culvert.

\*OUTSIDE CORPORATE LIMITS

**KEY TO MAP**

500-Year Flood Boundary	---	<b>ZONE B</b>
100-Year Flood Boundary	---	<b>ZONE A1</b>
Zone Designations* With Date of Identification e.g., 13/2/74	---	<b>ZONE A2</b>
100-Year Flood Boundary	---	<b>ZONE A3</b>
500-Year Flood Boundary	---	<b>ZONE B</b>
Base Flood Elevation Line With Elevation In Feet**	-----513-----	
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)	
Elevation Reference Mark	RM7x	
River Mile	M1.5	

\*\*Referenced to the National Geodetic Vertical Datum of 1929

**\*EXPLANATION OF ZONE DESIGNATIONS**

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A90	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

**NOTES TO USER**

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

INITIAL IDENTIFICATION:  
AUGUST 16, 1974

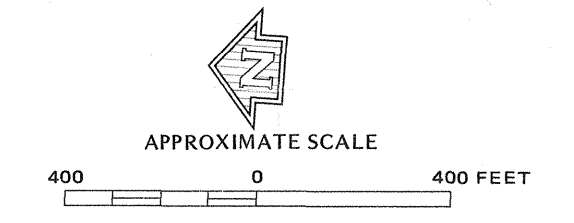
FLOOD HAZARD BOUNDARY MAP REVISIONS:  
APRIL 9, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:  
SEPTEMBER 17, 1980

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.



**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM**  
FLOOD INSURANCE RATE MAP

**TOWN OF MINTURN, COLORADO**  
EAGLE COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER  
080053 0001 B

EFFECTIVE DATE:  
SEPTEMBER 17, 1980

U.S. DEPARTMENT OF HOUSING  
AND URBAN DEVELOPMENT  
FEDERAL INSURANCE ADMINISTRATION