COLORADO
Department of Transportation

SCOPE OF WORK (SOW)
UNDERWATER INSPECTION OF ON-SYSTEM AND OFF-SYSTEM BRIDGES
Colorado Department of Transportation

I. Introduction

The goal of this project is to update the National Bridge Inventory (NBI) through underwater inspection of bridges owned by local governments (cities and counties) or the state of Colorado, and to inform the bridge owners and the Colorado Department of Transportation (CDOT) of the conditions of the bridges. The local agencies and state of Colorado will be referred to as the "owner" hereinafter in this Scope.

The purpose of this agreement is to conduct underwater bridge inspections in accordance with the requirements of the National Bridge Inspection Standards (NBIS) and to report the findings to the state and to the owner. The inspections shall be referred to as "the work" henceforth in this scope.

II. Project

Underwater Bridge Inspection for approximately 45 On-System bridges, statewide.

Underwater Bridge Inspection for approximately 50 Off-System bridges, statewide.

Underwater Bridge Inspection for 3 Blue Mesa bridges.
Two bridges require an on-site recompression chamber.

Special and emergency underwater inspections as required throughout the length of the Contract.

III. Location and Description

The On-System portion of the project consists of approximately 48 bridges, listed on the attached Exhibit A1 and Blue Mesa, located on State Highways throughout the State. These bridges are owned and maintained by the State.

The Off-System portion of the project consists of approximately 50 bridges, listed on attached Exhibit A2, located in Counties and Cities throughout the State. These bridges are owned and maintained by the local entities.

Exhibits A1 and A2 are provided for information only. Specific structures to be inspected will be listed in the individual task orders.

IV. Scope of Work

All work performed under this contract shall be in accordance with the National Bridge Inspection Standards, the Manual for Maintenance Inspection of Bridges issued by

AASHTO and other documents as defined by individual task orders. All diving operations shall be conducted in conformance with the requirements of Subpart T, Commercial Diving Operations, Occupational Safety and Health Administration Standards and any other requirements governing such activities. The Consultant shall supply all equipment, labor, licenses, permits, and insurance necessary for the completion of the work.

The Contract Administrator for the work is:

Michael Collins P.E.
Bridge Engineer
Colorado Department of Transportation
2829 W. Howard Pl.
Denver, Colorado 80204
(303) 757-9309

The Bridge Inspection Engineer for the work is:

Lynn E. Croswell, P.E.
Bridge Inspection Engineer
Colorado Department of Transportation
2829 W. Howard Pl.
Denver, Colorado 80204
(303) 757-9188

Project management activities will be coordinated by:

Andrew Brown, PM I
Statewide Bridge Inspection Coordinator
Colorado Department of Transportation
2829 W. Howard Pl.
Denver, Colorado 80204
(303) 757-9226

Coordination may be required with the following for inspections:

Cities
Counties
Railroads
Regional Transportation District
Corps of Engineers
Urban Drainage & Flood Control District (UD & FCD)
Federal Emergency Management Agency (FEMA)

Coordination is required with the following for presentations as-needed:

Cities
Counties
CDOT Staff Bridge
CDOT Region Personnel

V. Underwater Inspection

A. The Consultant shall perform a thorough visual and tactile inspection of those piers and abutments more than 3' below the waterline, as authorized by the CDOT representative, of each structure listed in the individual task orders. All piers in the channel with a water depth less than 3' or "dry condition" at the time of inspection shall be visually inspected. The Consultant shall identify quantities and deficiencies for all inspected substructure and foundation elements in accordance with the current edition of the Manual for Bridge Element Inspection. The consultant shall also determine the need for any in-depth inspections that may be required as a result of suspected deficiencies that cannot be identified by visual/tactile inspection.

Other structure elements may need to be inspected if they were / are inaccessible at the routine inspection (deck underside, superstructure units, bearings…).

In addition, inspections shall be performed in accordance with the following references:

- Bridge Inspection Reference Manual (BIRM) – 2022
- Colorado NBI Coding Guide 2010
- Colorado Item Coding Guide (in revision)
- Colorado Bridge Inspection Manual (in revision)
- Colorado Element Coding Guide
- Recording and Coding Guide for Structure Inventory and Appraisal of the Nations Bridges – 1995
- Hydraulic Engineering Circular No:18 (HEC18) -2012
- Other references as specified in the individual task orders

B. Cleaning

Ten percent of the structure elements shall be well cleaned of any marine growth or other material obstructing detailed inspection to facilitate the inspection. This percentage may vary as directed by the CDOT Project Manager. Piles shall be cleaned in bands approximately one foot wide at the waterline, mud line and mid-height. Piers and abutments shall have one square foot areas cleaned at the nose, sides and tail at the waterline, mud line and mid-height. In-depth investigations are not part of this contract. Once identified, a separate contract may be developed to address these needs.

C. Blue Mesa Reservoir Bridges

1. Structures K-07-A and K-07-B: See Attachment 1 for additional information concerning these bridges.

   Inspection of rock bolt area and integrity testing of bolts (one location only at Str. K-07-B, Pier 7). The rock bolts shall be tested by striking the bolt end and retainer plate with a hammer. Other methods may be considered but must be approved by the CDOT Project Manager. The plans for Str. K-07-B indicate that 5,000 linear feet of rock bolts of an unknown length were installed in a 48'V x 34'H area. The bolt pattern is irregular and the actual quantity of bolts are unknown. Each bolt inspected shall be tagged with the underwater inspection date to assist in future location and categorizing of tested bolts. At least 25 percent of the rock bolts tagged should be tested.

   Provisions shall be made to accommodate CDOT and Federal Highway Administration (FHWA) personnel during the inspections. No underwater diving provisions need to be made for CDOT or FHWA personnel.

   THESE TWO BRIDGES REQUIRE AN ON-SITE RECOMPRESSION CHAMBER

2. The Engineer in charge of the inspections shall supply a Daily Diving Report to the CDOT Project Manager in the progress report section of each invoice. This report should include a brief summary of which bridges and substructure units were inspected that day.

E. Underwater and Routine inspections

1. There are two structures D-11-W and D-11-Y that require the Underwater and Routine inspection to be done at a 48-month interval. The consultant is responsible for both inspections.

F. Sounding Measurement and Channel Profile data.

Depth soundings and/or channel survey measurements shall be collected between 200' upstream and 200' downstream. Smaller waterways may require fascia offsets less than 200'. In all cases, enough data should be collected to generate an accurate bathymetric model. At a minimum, depth soundings shall be taken around each pier, along both fascias, and at 25' to 100 ' intervals upstream and downstream. Channel profile or sounding measurements shall be obtained using echo sounding, sonar, or hydrographic survey technology unless water conditions preclude the use of a boat, in which case sounding poles or lead lines may be utilized. Elevations shall be referenced to the brass cap located on the bridge or other point of known elevation, such as a bridge seat if a brass cap is not present and shall be identified on the Channel Drawing sheets.

The channel bottom, particularly around piers and abutments, shall be probed and the presence, size and condition of any riprap shall be noted.

G. Photographs and Imagery:

1. Digital color photography shall be utilized to document underwater conditions. A "clear water" box shall be available on site for use if needed to secure photographs. The following site photographs shall be taken at a minimum:

    - View upstream
    - View downstream
    - Typical substructure (for each representative substructure configuration inspected)
    - Bridge Elevation upstream
    - Bridge Elevation downstream
    - Both Embankments under the bridge
    - All CS3 and CS4 deficiencies
    - Bridge Overview (where permitted)
    - Aerial photography shall be reviewed and referenced in the channel contour drawings

2. Underwater sonar imaging and 3-D laser scanning techniques may be required at the Blue Mesa Reservoir structure piers as requested by the CDOT Project Manager.

H. Scour and Undermining

All exposed footings and culvert toe walls shall be documented with exposure and/or undermining dimensions in the report and in a detailed sketch. Pile sizes, configuration, and lengths need to be taken for all exposed piles. Information should be sufficient for use in a structural or scour analysis if requested by CDOT. All scour cones and holes should be described using a radius and depth.

I. Dangerous or Critical Situation

In the event of a critical or urgent inspection finding, the consultant shall follow the CDOT Critical Inspection Finding (CIF) and Essential Repair Letter (ERL) procedures. CIF's and ERL's shall be submitted to the CDOT Project Manager for On-System structures and the Local Government Owner for Off-System structures.

VI. Schedule

The Consultant shall submit a proposed schedule of inspections to the CDOT Project Manager at least five days prior to commencement of inspection work. The Consultant shall also inform the State of any changes to the proposed schedule. Schedules will be as specified in the individual task orders.

VII. Personnel

Detailed resumes of each inspection team member shall be submitted to the CDOT Project Manager for approval prior to beginning work.

Qualifications of inspection personnel shall conform to the requirements of the NBIS and the following:

A. The Engineer in charge of the inspections and in responsible charge of the preparation of the inspection reports must possess a Colorado Professional Engineer license.

B. The Team Leader must meet the following requirements:

1. Have a minimum of five years of experience in underwater structure inspection assignments in a responsible capacity.
2. Meet the qualifications of a bridge inspector and underwater bridge inspector in accordance with the SNBI requirements.
3. Be certified by the Association of Diving Contractors International (ADCI) as a surface supplied air diver.

C. The Diver / Team Member must meet the following requirements:

1. Be certified by the Association of Diving Contractors International (ADCI) as a surface supplied air diver.

VIII. Deliverables

All deliverables shall be submitted in electronic format. Deliverables will include a separate standalone final report for each bridge, input of all data into AASHTOWare Bridge Management software (BrM) and electronic files used to create the standalone report. All electronic files shall be named in accordance with CDOT's latest file naming convention memo.

The standalone final report must meet the following requirements:

- The report must be sealed by the engineer of record and the SIA report signed by the team leader.

- The report shall include the minimum photograph requirements documenting the site (as described above).
- Description of the condition of the bridge units inspected.
- Appropriate element coding of deficiencies and quantities for each element below the waterline, or for other elements not inspected during the routine inspection.
- Fascia sounding measurements, fascia profile drawings, and channel /contour drawings (as described above). Drawings should include both depths & elevations when possible. The fascia profile measurements must be included in a separate table in the report for comparison during a high flow event. Detailed sketches for any exposed footings or culvert toe walls shall also be included.
- Underwater Procedures in accordance with "Metrics for the Oversite of the National Bridge Inspection Program" May 2017. Any special access notes required for performing the underwater inspection must be included.
- Recommendations for repairs or further investigations shall be included as appropriate.
- The report shall include the SIA report printout from BrM as an Appendix

Electronic seed file submittal shall include the following at a minimum:

- .DGN or .DWG files used to create all drawings for the channel or substructure units
- All excel, word, and other sourcefiles used to create the report

An excel file listing all structures inspected under the contract or previous contracts will be maintained and included as part of the deliverables. This file will include but is not limited to:

- Bridge ID
- County Name
- City
- Reference Point (On-System only)
- Latitude
- Longitude

- # of Main Spans
- Structure Type
- Facility Carried
- Feature Intersected
- Last UW Insp Date
- Last Routine Insp Date
- One column listing any changes (removed from UW inspections, Site visit required to determine if it should stay on or be removed from UW inspections)
- Comments. Any comment about the changes or proposed changes.

IX. Insurance

Before starting work, the Firm shall submit documentation of the required insurance coverage as specified in the contract.

X. Method of Payment

These contracts will be paid for on a cost-plus fixed fee basis. The consulting firm will bill for their actual costs, using the negotiated rates, incurred while performing the work. Consultants will bill monthly and include a project status report with each invoice.

XI. Duration of Work

The work shall commence on the date specified in the notice to proceed and shall be completed as specified in the individual task orders.

Special and emergency underwater inspections will be conducted under separate task orders, when and if needed, through the end of the contract.

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EXHIBIT A1
ON-SYSTEM BRIDGES

Bridge ID	Facility Carried	Feature Intersected	Max Water Depth	Min Water Depth	# of SSU Inspected	Total SSU
F-08-BD	I 70 ML EBND	COLORADO RIVER	11	4	4	6
G-03-P	I 70 ML WBND	COLORADO RIVER	7	4	3	5
G-04-AA	I 70 ML EBND	COLORADO RIVER	10	2	3	5
G-04-AB	I 70 ML WBND	COLORADO RIVER	5	0	3	5
H-01-AB	I 70 ML WBND	N CHANNEL-COLORADO RVR	7	7	1	4
H-01-AC	I 70 ML EBND	N CHANNEL-COLORADO RVR	4	3	2	4
H-01-AD	I 70 ML WBND	N CHANNEL-COLORADO RVR	2	0	2	4
H-01-AE	I 70 ML EBND	N CHANNEL-COLORADO RVR	2	0	2	4
H-02-CA	US 50 ML EBND	COLORADO RIVER	8	3	3	9
H-02-DZ	US 50 + SH 789 NB	COLORADO RIVER	11	4	3	9
H-02-GA	SH 340 ML	COLORADO RIVER	8	3	5	7
H-02-GB	SH 340 ML WBND	REDLANDS POWER CANAL	4	4	1	2
H-02-GC	SH 340 ML WBND	COLORADO RIVER	5	5	3	10
H-02-R	SH 340 ML EBND	REDLANDS POWER CANAL	7	4	2	2
H-02-S	SH 340 ML EBND	COLORADO RIVER	7	2	6	10
H-03-BL	SH 141 ML	COLORADO RIVER	6	4	2	4
H-03-BP	I 70 ML WBND	COLORADO RIVER	16	2	3	9
H-03-BQ	I 70 ML EBND	COLORADO RIVER	12	2	3	9
H-03-BR	I 70 ML WBND	COLORADO RIVER	9	3	7	9
H-03-BS	I 70 ML EBND	COLORADO RIVER	8	4	7	9
H-03-E	US 6 ML	COLORADO RIVER	5	3	3	6
I-03-A	SH 141 ML	GUNNISON RIVER	9	5	3	6
I-04-K	US 50 ML EBND	GUNNISON RIVER	4	2	2	5
K-01-A	SH 141 ML	DOLORES RIVER	14	9	2	5
K-18-EP	SH 45 PUEBLO	RR, ARKANSAS RIVER	7	7	1	4

	BLVD					
O-05-J	US 550 ML	ANIMAS RIVER	7	2	4	4
I-05-VA	SH 92 ML	GUNNISON RIVER	U	U	U	4
B-04-D	SH 318 ML	YAMPA RIVER	5	3	3	5
B-16-H	US 287 ML	SPRING CREEK	6	4	2	2
C-06-D	SH 13 ML	YAMPA RIVER	5	1	2	5
C-07-A	US 40 ML	YAMPA RIVER	8	1	3	5
C-08-W	US 40 ML	YAMPA RIVER	9	9	1	3
C-17-G	I 25 SERVICE RD	DRAW SR	6	6	2	4
D-01-E	SH 64 ML	WHITE RIVER	11	3	3	5
D-11-W	US 40 ML	RED DIRT CREEK	42	42	2	2
D-11-Y	US 40 ML	PASS CREEK	U	U	U	2
E-17-IR	SH 53 ML	CLEAR CREEK	7	7	1	3
F-05-K	I 70 ML EBND	COLORADO RIVER	8	3	3	6
F-05-L	I 70 ML WBND	COLORADO RIVER	10	3	2	6
F-05-R	RAILROAD AV	COLORADO RIVER	13	6	4	6
F-06-M	I 70 ACCESS RD	COLORADO RIVER AR	7	5	2	4
F-06-Y	I 70 ML EBND	COLORADO RIVER	7	5	2	6
F-06-Z	I 70 ML WBND	COLORADO RIVER	8	1	3	6
F-08-AR	I 70 ML EBND	UP RR, COLORADO RIVER	17	3	3	7
F-08-AS	I 70 ML WBND	UP RR, COLORADO RIVER	8	3	2	4
K-07-A	US 50 ML	LAKE FK GUNNSION RIVER	130	22	3	7
K-07-B	US 50 ML	GUNNISON/BLUE MESA RES	131	17	9	11
K-08-C	SH 149 ML	GUNNISON/BLUE MESA RES.	20	10	3	6
48	Bridges				Total No. SSU inspected in 2020 =	135

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EXHIBIT A2
OFF-SYSTEM COUNTY BRIDGES

Bridge ID	Facility Carried	Feature Intersected	Max Water Depth	Min Water Depth	# of SSU Inspected	Total SSU
049001100.1005A	County Road 11	Colorado River	5	2	2	4
067032200.40036	IRR# COUNTY RD 322	LOS PINOS RIVER	5	3	2	3
085003001.5055A	JAY JAY ROAD	SPRING CREEK	6	6	1	2
085011200.00003	COUNTY ROAD R13	DOLORES RIVER	6	6	1	3
107017900.80903	County Rd 179	Yampa River	6	4	2	4
107020500.30902	County Road 205	Yampa River	12	0	2	4
ADA124-9.848	HENDERSON ROAD	SOUTH PLATTE RIVER	2	2	2	5
BOLD-39-N63RD-A	N. 63rd St (CR39)	Leggett Ditch	4	4	3	3
CHA191-01.57	COUNTY ROAD 191	ARKANSAS RIVER	5	2	2	3
DEL2200RI20-44A	COUNTY ROAD 2200	GUNNISON RIVER	5	2	2	4
DEL65OR-2.8-35A	CR650 (Excalante)	Gunnison River	6	3	2	4
EAG-028-03.6A	COUNTY ROAD 1	COLORADO RIVER	5	5	1	3
EAG-301-15.6A	COUNTY ROAD 301	COLORADO RIVER	5	3	2	4
EAG-301-23.5A	COUNTY ROAD 301	COLORADO RIVER	6	3	2	4
EAG-301-27.7A	COUNTY ROAD 301	COLORADO RIVER	6	3	2	4
GAR109-01.44	County Road 109	Roaring Fork River	5	5	1	3
GAR300-00.80	County Road 300	Colorado River	8	8	1	3
GAR301-00.71	County Road 300	Colorado River	12	7	2	4
GAR311-12.54-A	County Road 311	Colorado River	10	6	2	2
GAR311-12.69	County Road 311	Colorado River	6	6	1	3
GAR323-01.43	County Road 323	Colorado River	8	8	1	3
GLNWD-DEVEREUX	Devereux, AC To RR	Colorado River	6	4	2	4

GRJ-23.08-E.76	REDLANDS PARKWAY	COLORADO RIVER	11	1	3	7
LIN-33-3J.3	COUNTY ROAD 33	HELL CREEK	4	4	2	4
LIN-S-13.1	COUNTY ROAD S	LITTLE HORSE CREEK	9	6	3	3
LIN-24-2B.2A	COUNTY ROAD 24	SOUTH RUSH CREEK	0	0	0	0
LOG29.5-12.551A	County Road 29.5	S. Platte River Overflow	10	10	1	3
LOG7.4-36.8-1	County Road 7.4	Pawnee Creek	7	1	4	4
LR13E-0.3-24E	County Road 13E	Love/Horse Shoe Canal	0	0	0	0
LR27-2.7-38E	County Road 27	Buckhorn Creek	5	5	1	2
MESA-G.8-39.1	COUNTY ROAD G.8	COLORADO RIVER	6	2	4	6
MESA-I.9-39.4A	COUNTY ROAD I.9	COLORADO RIVER	6	1	2	4
MESA-V.5-45.3A	COUNTY ROAD 45	COLORADO RIVER	7	4	3	5
MG3-1.0-Y.5	County Road 3	Jackson Lake Inlet Canal	6	4	3	3
MOF17-13.35	County Road 17	Yampa River	6	6	1	3
MOF19-01.19	County Road 19	Yampa River	6	6	1	3
MOF53-08.35-A	County Road 53	Yampa River	5	5	1	3
OTZ-29-22.5-221	LA JUNTA 14TH ST.	KING ARROYO	6	6	2	2
PUEMAL-0.1-MALL	PUEBLO MALL DRIVE	UNNAMED DRAINAGE	4	4	3	3
RGDN05-05.00W	COUNTY ROAD 5N	RIO GRANDE RIVER	5	3	3	3
RIOB-077-00.49	County Road 77	White River	7	7	1	3
RIOB-202-00.21	County Road 202	White River	8	1	2	4
RIOB-23A-00.00	County Road 23A	White River	5	5	1	2
SALOOF-00.95	CITY F STREET	ARKANSAS RIVER	2	2	1	3
TNTH5-0.9-36-A	County Road 5	Cache La Poudre River	5	5	1	3
WEL029.0-062.0B	County Road 29	Cache La Poudre River	4	4	1	3

WEL035.0-062.0A	35th Avenue	Cache La Poudre River	0	0	2	3
WEL087.0_042.5B	County Road 87	Jackson Lake Inlet	4	3	2	2
WEL129.0-092.0A	County Road 129	South Pawnee Creek	6	5	2	2
LR63E-1.6-44H-A	County Road 63E	S. Frk of Cache La Poudre River	6	6	1	2
50	Bridges				Total No. SSU inspected in 2020 =	89

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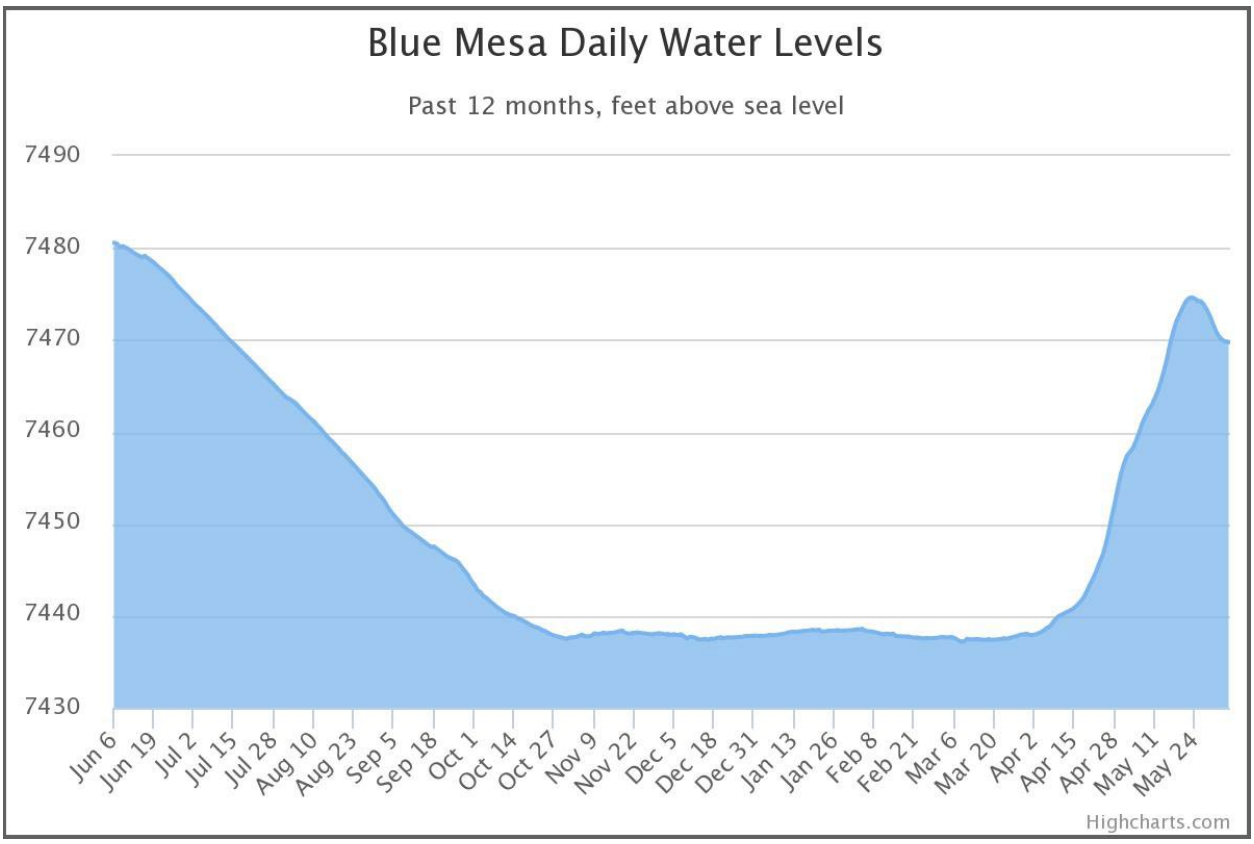
ATTACHMENT 1
Provided for information only.
BLUE MESA RESERVOIR WATER ELEVATIONS & MISC. INFORMATION



Data from http://bluemesa.water-data.com/

In 2020, a total of 12 piers for these bridges required diving. K-07-A (3 Piers between 22' and 130'), K-07-B (7 Piers between 17' and 131'), K-08-C (2 Piers between 10' and 20').

The lowest elevation of the rock bolts tagged at Pier 7 is approximately 7405 feet (correlating to 75' water depth in 2020).

Ice is off the water about April 1st to the 15th of each year to allow access to the piers.

Str. K-07-A and K-07-B are located in Gunnison County on US 50 at M.P. 132.72 and 136.19 respectively. K-07-A spans the Lake Fork of the Gunnison River and Str. K-07-B spans the Gunnison River. Structure K-08-C is located on S.H. 149 at M.P. 117.39 and spans the Gunnison River where it leaves Blue Mesa Reservoir.