

## **SCOPE OF WORK**

July 1, 2014

### **UNDERWATER INSPECTION OF ON-SYSTEM AND OFF-SYSTEM BRIDGES**

#### **I. Introduction**

This statement of work describes the work necessary for the underwater inspection of the structures listed herein. It also provides schedules for the various tasks, and other contractual obligations of the Consultant and the Colorado Department of Transportation (CDOT).

This draft scope of work has been reviewed by CDOT and reflects a plan of approach based on the known goals. One factor determining the selection of a Consultant is the ability of the consultant to analyze the project goals, evaluate the work elements, and formulate a work plan. The process may produce new approaches or modification to the project work elements. Because of that, all Consultants should be aware that the Final Scope of Work for the project will be produced with the input of the selected Consultant.

#### **II. Project**

Underwater Bridge Inspection for approximately 50 “On-System” Bridges, statewide.

\* Two and possibly three bridges require an on-site recompression chamber\*

Underwater Bridge Inspection for approximately 40 “Off-System” Bridges, statewide.

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 50 bridges, listed on the attached Exhibit A1, 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 40 bridges, listed on attached Exhibits A2 and A3, located in Counties and Cities throughout the State. These bridges are owned and maintained by the local entities.

Exhibits A1, A2, and A3 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:

Lynn E. Croswell, P.E.  
Bridge Inspection Engineer  
Colorado Department of Transportation  
4201 East Arkansas Ave. Room 107  
Denver, Colorado 80222  
(303) 757-9188

The bridge inspection engineer for the work is:

Lynn E. Croswell, P.E.  
Bridge Inspection Engineer  
Colorado Department of Transportation  
4201 East Arkansas Ave. Room 107  
Denver, Colorado 80222  
(303) 757-9188

Project management activities will be coordinated by:

Karen S. Mondragon, CEPM II  
Colorado Department of Transportation  
4201 East Arkansas Ave. Room 107  
Denver, Colorado 80222  
(303) 757-9470

Coordination may be required with the following:

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

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. The Consultant shall identify the substructure and foundation deficiencies, and 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.

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 foot square 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.

- B. The inspection of substructure and foundation elements shall extend from the waterline to the mud line and include, but not be limited to the following:
1. Concrete Pile and/or solid Piers: Check all concrete for erosion, wear, abrasion, scaling, spalling, exposure and deterioration of any exposed reinforcing steel, and all cracking.
  2. Steel Pile and/or Steel Encased Piers: Check all steel for corrosion, misalignment, and loss of section.
  3. Timber Pile: Check all timber for vermin such as marine borer, shipworm attack, termites, and powder-post beetles, etc.; for evidence of fungus decay; for damage by collision or over stressing; and for excessive weathering. All timber shall be sounded and probed with a heavy-duty 6 inch (min.) blade ice pick or awl.
  4. Blue Mesa Reservoir Bridges, Structure #s K-06-A and K-07-B: Inspect all concrete surfaces for cracks, discoloration, deformation, scaling and delamination, which could affect structural soundness. Inspect submerged riprap, fills, and foundations for signs of displacement or erosion. 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 engineer.

At least 25 percent of the rock bolts shall be tested from a representative sample of the 55 foot vertical by 60 foot horizontal rock bolted area. The plans for Structure 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.

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

5. The Engineer in charge of the inspections shall supply a Daily Diving Report to the Project Manager via email or other format as approved by the Project Manager. This report should include a brief summary of which bridges and substructure units were inspected that day.
- C. The inspection shall include depth soundings around each pier, along the fascia, and at 100' and 200' intervals upstream and downstream. Soundings shall be obtained using a continuous reading strip chart fathometer unless water conditions preclude 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.

The channel bottom, particularly around piers and abutments, shall be probed and the presence, size and condition of any riprap shall be noted.
- D. 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.
- E. If a dangerous or critical situation exists, in the opinion of the Inspection Team Leader, the on-site CDOT representative and the Bridge Management Engineer shall immediately be notified of the situation and follow up with an accurate written report.
- F. Underwater sonar imaging and 3-D laser scanning techniques shall be applied at the Blue Mesa Reservoir structures and as required by the project manager.
- G. Any abutment or pier which has a water depth less than three feet will be inspected and an inspection report will be completed to document the condition of the substructure units. The inspection will include the substructure units only, not the entire bridge.

## VI. Schedule

The Consultant shall submit a proposed schedule of inspections to the CDOT 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

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

A. The Engineer in charge of the inspections and preparation of the inspection reports must possess the following:

1. A Colorado Professional Engineer license.

B. The manager in charge of the divers must possess the following:

1. Have a minimum of five years experience in underwater structure inspection assignments in a responsible capacity.
2. Be a certified diver by a recognized commercial diving school.

C. The diver(s) who will perform the underwater inspection shall meet the qualifications as a bridge inspector in accordance with the NBIS requirements and be a certified diver with at least two years experience in underwater bridge inspection.

The firm shall submit for approval a detailed resume of each inspection team member.

## VIII. Report

A separate report shall be prepared for each bridge inspected. The report shall include a description of the condition of the bridge units inspected and the adjacent channel bottom. Recommendations for repairs or further investigations shall be included as appropriate. These reports shall be developed in the AASHTOWare Bridge Management version 5.x as specified by the project manager.

The report shall include plots of the channel bottom elevations and original color photographs of any deterioration or critical condition, clearly labeled with the Structure No., Unit No., Date, and description of the photo contents. Copies of the report shall be

submitted, signed and stamped by the registered professional engineer responsible for the inspection. Submit one copy for the On-System structures, and two copies for the Off-System structures. In addition, all materials shall be submitted in an electronic format as specified by the project manager..

The inspection team shall also complete appropriate sections of the bridge inspection report furnished by CDOT. Other forms may need to be filled out as required by the Project Manager.

IX. Insurance

Before starting work, the Firm shall submit evidence 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 update with each billing.

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 June of 2019.

Completion is defined as (1) having submitted all structure inspection reports in the required format to the Project Manager or his/her designee for review, (2) the Project Manager or his/her designee having reviewed and approved the reports and (3) presentations of the final reports given to CDOT.

Exhibit A-1  
 Provided for information only  
 COLORADO DEPARTMENT OF TRANSPORTATION  
 UNDERWATER BRIDGE INSPECTION  
 ON-SYSTEM

<u>HWY</u>	<u>M.P.</u>	<u>STR. #</u>	<u>COUNTY</u>	<u>FEATURE</u>	SSU Insp in <u>2005</u>	MAX/ MIN DPTH	Tot # SSU's
6	43.26	H-03-E	MESA	COLO RIV	2, 3	5'4'	6
13	0.18	F-05-R	GARFIELD	COLO RIV	2, 3, 4	10'4'	6
13	85.84	C-06-D	MOFFAT	YAMPA RIV	none	0'4'	3
34	90.98	C-16-DH	LARIMER	BARNES CANAL	none	6'3'	4
(perform complete inspection for the this structure)							
34	90.98	C-16-W	LARIMER	BARNES CANAL	none	6'3'	2
(perform complete inspection for this structure)							
40	105.47	C-07-A	ROUTT	YAMPA RIV	2, 3	10'5'	5
40	113.40	C-08-W	ROUTT	YAMPA RIV	Deleted 1995		5
50	70.52	I-04-K	DELTA	GUNNISON RIV	none	6'2'	4
50	32.42	H-02-CA	MESA	COLO RIV	5, 6, 7	11'4'	9
50	32.43	H-02-DZ	MESA	COLO RIV	5, 6, 7	11'4'	9
53	1.33	E-17-IR	ADAMS	CLEAR CREEK	none	4'1'	1
70	16.76	H-01-AE	MESA	N. CHAN COLO R.	S.V.	10'6'	4
70	16.77	H-01-AD	MESA	N. CHAN COLO R.	S.V.	6'4'	4
70	17.33	H-01-AB	MESA	N. CHAN COLO R.	2	6'2'	4
70	17.34	H-01-AC	MESA	N. CHAN COLO R.	2	6'2'	4
92	21.01	I-06-A	DELTA	N. FK. GUNNISON	0	4'2'	2
70	50.51	H-03-BP	MESA	COLO RIV	2	6'2'	3
70	56.99	G-03-P	MESA	COLO RIV	2, 3	6'3.5'	5
70	62.89	G-04-AA	MESA	COLO RIV	2, 3, 4	8'3'	5
70	66.90	G-04-AB	MESA	COLO RIV	3, 4	8'3.5	5
70	88.57	F-05-K	GARFIELD	COLO RIV	2, 4	7'4'	6
70	88.58	F-05-L	GARFIELD	COLO RIV	3, 4, 5	13'4'	6
70	96.35	F-06-Y	GARFIELD	COLO RIV	2, 3	7'3'	6
70	96.36	F-06-Z	GARFIELD	COLO RIV	2	7'3'	6
70	126.94	F-08-BD	GARFIELD	COLO RIV	none	5'0'	4
70	121.13	F-08-AA	GARFIELD	GRIZZLY CK	none	4'0'	2
70	121.09	F-08-AB	GARFIELD	GRIZZLY CK	none	4'0'	1
70	125.79	F-08-AS	GARFIELD	COLO RIV	none	6'2'	2
92	6.42	I-05-V	DELTA	GUNNISON RIV	2, 3	8'4'	4
141	153.65	I-03-A	MESA	GUNNISON RIV	none	5'9'	4
141	159.44	H-03-BL	MESA	COLO RIV	2, 3	6'4'	4
160	84.32	O-05-AQ	LA PLATA	LAS ANIMAS RIV	none	4'1'	1
227	0.44	L-18-R	PUEBLO	ARKANSAS RIV	S.V.	7'2.3'	13
233	0.90	K-18-BN	PUEBLO	ARKANSAS RIV	4,5	8'3.8'	7

291	2.35	J-12-AK	CHAFFEE	ARKANSAS RIV	none	3'/1'	1
318	54.86	B-04-D	MOFFAT	YAMPA RIV	none	6'/3'	3
340	1.43	H-02-GA	MESA	COLO RIV	2, 3, 4, 5, 6	8'/4.5'	7
340	12.60	H-02-S	MESA	COLO RIV	7, 8, 9	8'/4'	10
340	12.61	<u>H-02-GC</u>	MESA	<u>COLO RIV</u>	<u>7, 8, 9</u>	8'/3.5'	10
43 Bridges			No. of Category I SSU = 93				

(S.V. = Site Visit Only)



# EXHIBIT A2

Provided for information only  
 COLORADO DEPARTMENT OF TRANSPORTATION  
 UNDERWATER BRIDGE INSPECTION  
 OFF-SYSTEM COUNTY BRIDGES

<u>STR. #</u>	<u>COUNTY</u>	<u>FEATURE</u>	SSU Insp in <u>10/95</u>	MAX/ MIN <u>DPTH</u>	Tot # SSU's
DEL2200R-120-44	DELTA	GUNNISON RIV	S.V.	6'4'	6
CHA191-01.57	CHAFFEE	ARKANSAS RIV	none	4'2'	1
EAG-301-08.2	EAGLE	COLO RIV	1, 2, 3	6'4'	5
EAG-301-15.6	EAGLE	COLO RIV	2, 3, 4, 5	4'2'	5
EAG-301-23.5	EAGLE	COLO RIV	3	6'4'	7
EAG-301-27.7	EAGLE	COLO RIV	3, 4	8'3.5'	4
EAG-028-03.6A	EAGLE	COLO RIV	2	4.5'	3
GAR323-01.43	GARFIELD	COLO RIV	2	10'8'	3
GAR301-00.71	GARFIELD	COLO RIV	2, 3	13'3.5'	4
GAR300-00.80	GARFIELD	COLO RIV	2	8'7'	3
GAR108-01.59	GARFIELD	CRYSTAL RIV2	6'3'	3	
GAR109-01.44	GARFIELD	ROARING FK RIV	2		3
GAR311-12.69	GARFIELD	COLO RIV	2	9'8"	3
049001100.1005A	GRAND	COLO RIV	2	4'2.5'	4
LR19-1.1-48	LARIMER	POUDRE RIV	2, 3	6'3.5'	4
LR5-0.9-36	LARIMER	POUDRE RIV	S.V.	4'	1
LR13E-0.3-24E	LARIMER	LOVE CANAL	none	8'4'	3
(perform complete inspection for this structure)					
LR901-SO.4-S392	LARIMER	POUDRE RIV	Deleted 1995		3
LOG7.4-36.8-1	LOGAN	PAWNEE CREEK	S.V.	5'1.5'	4
MESA-G.8-39.1	MESA	COLO RIV	3, 4	7'3.5'	6
MESA-V.5-45.3	MESA	COLO RIV	2	6'3'	7
MESA-I.9-39.4A	MESA	COLO RIV	3	6'3'	5
MESA-23.08-E.76	MESA	COLO RIV	2, 3, 4	11'4'	7
MGW.7-0.0-32	MORGAN	INLET CANAL	none	6'0'	3
MOF19-01.19	MOFFAT	YAMPA RIV	3, 4, 5	5'3.5'	3
RIOB-02A-00.21	RIO BLANCO	WHITE RIV	3	8'7	4
RIOB-057-00.14	RIO BLANCO	WHITE RIV	none	6'2'	1
RGDN05-05.00W	RIO GRANDE	RIO GRAND RIV	1, 2, 3	9'0'	3
107040Z00.30902	ROUTT	YAMPA RIV	4, 5	8'2'	6
107017900.80903	ROUTT	YAMPA RIV	2	5'3.5'	4
WEL 035.0-062.0A	WELD	POUDRE RIV	1, 2	6'0'	3
<u>WEL 029.0-062.0B</u>	<u>WELD</u>	<u>POUDRE RIV</u>	<u>2</u>	<u>5'2'</u>	<u>3</u>

34 Bridges

No. of Category I SSU = 45

(S.V. = Site Visit Only)

EXHIBIT A3

Provided for information only  
COLORADO DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION  
OFF-SYSTEM CITY BRIDGES

<u>STR. #</u>	<u>CITY</u>	<u>FEATURE</u>	SSU Insp in <u>10/95</u>	MAX/ MIN DPTH	Tot # SSU's
BOLD-39-N63ST	BOULDER	FEEDER DITCH	1 – 7	4'4'	8
GLNWD-					
DEVEREUX	GARFIELD	COLO RIV	none	4'2'	2
THN-088CLD-PLR	THORTON	S. PLATTE RIV	Deleted 1995		5
D-02-PR-120	DENVER	S. PLATTE RIV	2	4'1.5'	3
D-02-PR-130A	DENVER	S. PLATTE RIV	2, 3, 4	6'4'	4
D-02-PR-150	DENVER	S. PLATTE RIV	S.V.	5'3'	4
GLWD-27TH ST	GLENWOOD SPG	ROARING FK RIV	2, 3	8'3'	4
MKR-TENTH ST	MEEKER	WHITE RIV	Deleted 1995		2
BRI-101-124	BRIGHTON	S. PLATTE RIV	2, 3, 4		
SALOOF-00.95	CHAFFEE	ARKANSAS RIV	none	4'0'	1
15 Bridges		No. of Category I SSU = 25			

(S.V. = Site Visit Only)

ATTACHMENT 1  
 Provided for information only  
 COLORADO DEPARTMENT OF TRANSPORTATION  
 UNDERWATER BRIDGE INSPECTION  
 BLUE MESA RESERVOIR  
 WATER ELEVATIONS & MISC. INFORMATION

JANUARY 1, 2009	7490.00
FEBRUARY 1, 2009	7487.00
MARCH 1, 2009	7485.50
APRIL 1, 2009	7485.00
APRIL 15, 2009	7484.90 MAX. LOW WATER
MAY 1, 2009	7497.00
JUNE 1, 2009	7515.00
JULY 1, 2009	7519.40 MAX HIGH WATER
AUGUST 1, 2009	7513.00
SEPTEMBER 1, 2009	7505.00
OCTOBER 1, 2009	7497.00
NOVEMBER 1, 2009	7493.00
DECEMBER 1, 2009	7493.00

In May 1995, a total of 10 piers for these bridges required diving. The plans for the project which constructed the bridges, Project No. CC 40-0006-26, indicate the approximate groundline elevations of those piers to be as follows:

<u>Str. K-07-A</u>	<u>Str. K-07-B</u>		
Pier 3 7461	Pier 3 7461	Pier 6 7370	Pier 9 7458
Pier 4 7375	Pier 4 7431	Pier 7 7437	
Pier 5 7422	Pier 5 7409	Pier 8 7456	

<u>Str. K-08-C</u>
Pier 3 7461
Pier 4 7461

The lowest elevation of the rock bolts at Pier 7 is approximately 7332+/-'. The maximum dive at low water is about 140'.

Ice is off the water about April 1<sup>st</sup> to the 15<sup>th</sup> 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.