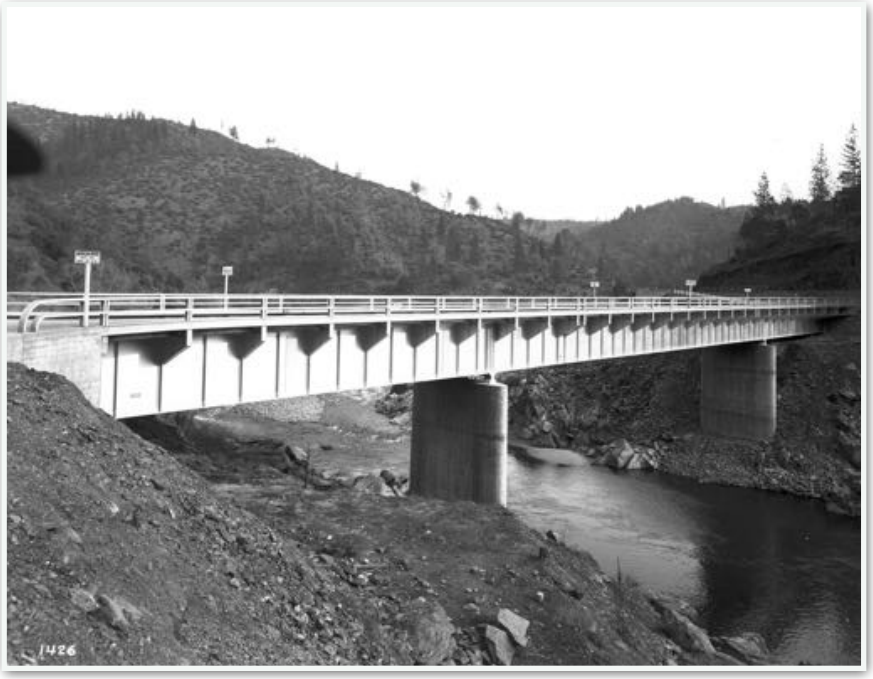
NORTH FORK AMERICAN RIVER
OLD GEORGETOWN BRIDGE
DEBRIS ASSESSMENT

State Highway 49
Placer & El Dorado Counties, California

October 30, 2020



Solutions Underwater.

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SUMMARY

The State Highway 49 Georgetown Bridge, which spans the American River, east of Auburn California, was replaced in 1948. The bridge at this location provides a valuable transportation link between Placer and El Dorado Counties.

According to historic construction details, approximately 750 tons of concrete, rebar, and structural steel were used in construction.

Figure 1

On December 23, 1964, after a failure of the partially built Hell Hole Dam, the resultant flooding destroyed the bridge and washed it into the American River. An estimated 390 tons of twisted steel rests just downstream of the current bridge on the river bottom.

The concrete bridge decking was broken into numerous sections and carried down the river. Several large pieces are scattered along both sides of the river bank below the current bridge. These large sections of concrete contain a large amount of protruding rebar.

The non-profit Protect American River Canyons (PARC) has assumed the role of stewardship in areas of concern on the river. In addition to being a major eyesore, the general consensus is the structural steel and rebar constitutes a significant hazard to the large numbers of people who frequent this public recreation area annually, using the waterway for swimming, sunbathing, rafting, kayaking and other activities. The number of injuries as a result of the debris is difficult to quantify, as many incidents are likely unreported.

In September, 2020, PARC contracted Advanced Marine to perform an assessment of the Old Georgetown Bridge steel debris in the American River.

In October, 2020, Advanced Marine divers completed a preliminary underwater survey, using a light, easily deployable surface-supplied diving system, to document and validate the amount of debris in the river for the eventual development of a removal strategy. This report documents the observed site conditions, the methods for conducting the survey, and the logistical challenges that will be faced during the salvage effort.

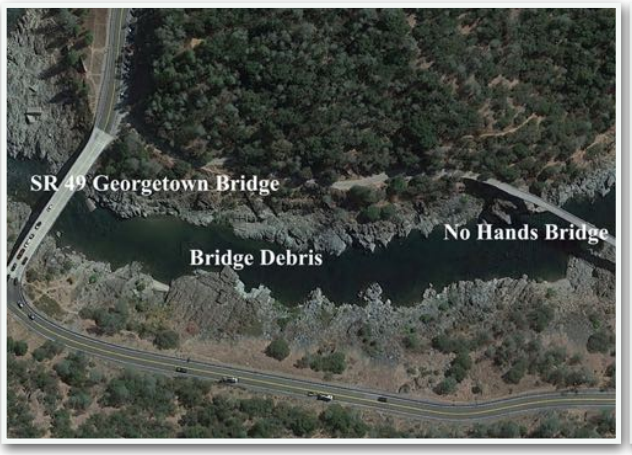

Figure 2

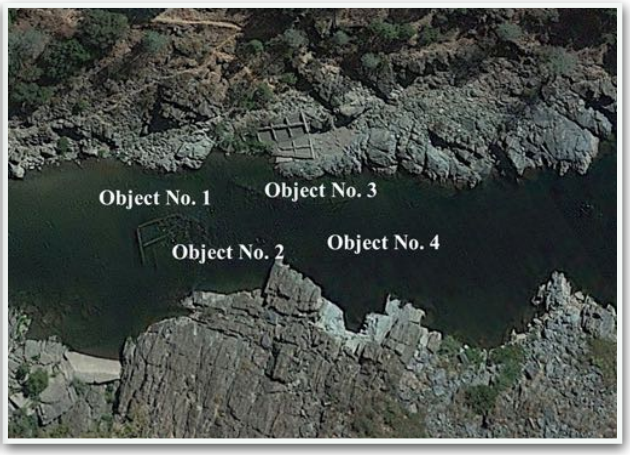

Figure 3

GENERAL INFORMATION

SITE LOCATION	Georgetown Bridge, Hwy. 49
CITY/COUNTY	Placer & El Dorado Counties
LATITUDE	38° 54.880'N
LONGITUDE	121° 2.465'W
TYPE OF SURVEY OR INSPECTION	Debris Assessment
PLACE OF SURVEY	American River (North Fork)
DATE OF SURVEY	October 30, 2020

SITE ASSESSMENT

Site Description

The debris site is in a narrow canyon several hundred feet downstream from the existing Hwy. 49 Georgetown Bridge, east of Auburn, CA. On the north and west sides of the site is State Route 49, a two lane highway. A guard rail is adjacent to the highway with a sharp drop off to the river.

There is an unimproved fire road above the site that connects the El Dorado portion of Hwy. 49 to the north and the No Hands old railroad bridge to the south. The trail is gated at Hwy. 49. This road is used extensively for hiking, biking and horse traffic. Access for vehicles is limited by trail width, also constrained by a cut through a large rock outcrop near the Hwy. 49 gate. This trail has several smaller “deer trails” that descend down to the river edge adjacent to the debris site. Pedestrian traffic in this area would need to be controlled or stopped during demolition and debris material recovery.

Figure 4

Site Access

Site access for work is also constrained by water levels, flow rates and temperature. The Advanced Marine survey, conducted in late October, was coordinated through PARC and the Placer County Water Agency (PCWA) to coincide with a scheduled hydroelectric outage, resulting in the lowest possible river levels and flow rates optimal for divers.

Bridge Failure Sequence

An estimated 390 tons of structural steel currently lays in the American River just downstream from the Hwy. 49 bridge east of Auburn, CA. This material ended up in the river as a result of the structural collapse of the previous bridge that occurred in 1964. The tonnage estimate is derived from historical research done by Protect American River Canyons (PARC).

From historical observations during the flooding and bridge collapse, several phases occurred during failure. The downstream side main girder failed first and began collapsing. Bridge decking (concrete) began to break up and lift, followed by the failure of the center main girder. The center section began to twist, followed by failure of the upstream main girder. The entire span then collapsed and was carried several hundred yards downstream to their resting points. It appears that during the failure that the main girders folded during collapse or upon striking the river bottom. Therefore, the objects in this survey appear as (4) items.

Figure 5

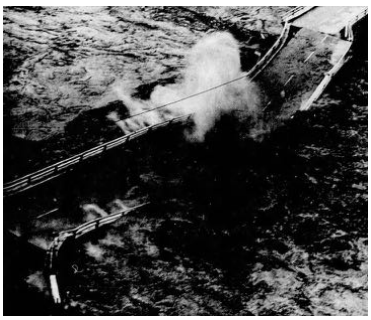

Figure 6

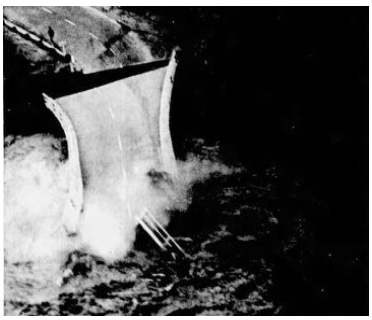

Figure 7

Debris Description

The structural steel located in the river consists of different sizes. The main girders (2) are reported to be I-beams 10 feet in height, with flanges approximately 16 inch, top and bottom, with nominal thickness of approximately 1 inch. Each main girder had a continuous length of approximately 340 feet.

Cross girders that originally supported the concrete road deck are estimated to be 10” x4” by 5/8” thick. Each cross girder is approximately 26 feet in length. Total number observed is difficult to determine as pieces have broken away, or are buried, but approximately 30-32 would be consistent with original construction.

Two main cross girder supports, which rested on the two bridge piers, are larger than typical cross deck girders, size roughly 3 feet in web height and 1 foot web depth. Likely 1 inch nominal thickness similar to main girders. These two girders are approximately 26 feet long.

Figure 8

Figure 9

Environmental Concerns

Currently, most of the main girders are partially buried by sand. The buried areas vary in coverage, but generally cover over 50 percent of each main girder height (10 feet).

Removal of debris may require the removal of sand and gravel surrounding the main girders to facilitate cutting steel sections in the water. The reduction of section sizes may be critical in allowing the beams to be effectively rolled onto the bank for additional resizing prior to removal. Regardless of the removal strategy, in-water cutting shall be required for movement and/or rigging attachment.

Figure 10

Should the salvage plan incorporate in-water jetting or excavation to expose larger portions of the debris, specialized permitting and water contamination prevention measures shall be required.

The surrounding site is sensitive ecologically. Movement and demolition of materials will require special consideration. The river canyon banks are steep and contain foliage. The fire road on south side is unimproved dirt. Smaller trails from the main fire road down the bank sides to the water exist, but are steep and dangerous. Heavy use in this area is subject to erosion.

Figure 11

Safety

In addition to the twisted and jagged structural steel girder sections partially or completely submerged, large concrete sections of old highway are resting on both banks. These concrete slabs have a large amount of exposed and protruding rebar that poses a serious hazard to recreation area users.

Permits

The area for this salvage project falls under several federal, state and county jurisdictions. Permitting through multiple agencies will require extensive coordination and collaboration.

SURVEY METHOD

Personnel & Equipment

Advanced Marine deployed a 4-person dive team, including (1) project manager, (1) dive supervisor and (2) divers. The dive supervisor and project manager possess a combined experience of over 50 years of commercial diving and marine operations experience. All divers for this project are trained and certified commercial divers, in accordance with CAL OSHA and the Association of Diving Contractors International Consensus Standards.

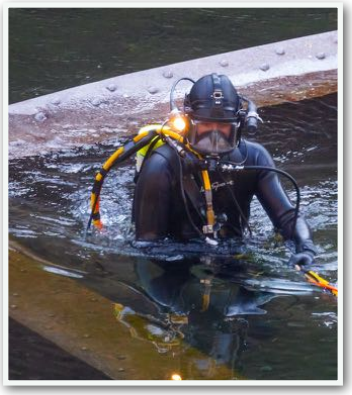

Figure 12

Due to the severe terrain and access limitations, the crew used a light surface-supplied air diving system, which includes portable high-pressure air flasks, a 5-part diving umbilical (with diver breathing gas, poly strength member, pneumofathometer, 2-way radio communications and closed-circuit video and lighting. The diver's full-face mask was outfitted with an underwater 720 line color video camera and underwater LED light. The underwater video during this survey was recorded on a DVR on the surface.

Through prior coordination with PARC and the California State Parks, Advanced Marine was granted access to the site through the Stagecoach Trail Lower Gate at the river confluence. The crew moved equipment and a small skiff to the water at the confluence using a standard 4x4 pickup and a 4-wheeled ATV. Advanced Marine floated all required equipment downstream to the debris site. All equipment was recovered at the conclusion of the survey in the reverse order.

SURVEY FINDINGS

Object Identification

From the trails overlooking the debris site during low or still water conditions, four distinct objects, comprising the two main bridge girders, can be easily seen.

For clarity during this survey, the objects have been identified in this report and the associated video as Objects No. 1 through 4. Further, each object may contain several different angles (or sections), as a result of the steel girders breaking apart during the washout event in 1964. These are identified as Sections A through H.

Measurements

In chronological order Objects 1-4, the divers measured each using a 100-ft. tape measure. The measurements include the length of each beam section and the height above river bottom at the ends of each section. Measurements may be used to compare the amount of materials used during construction to the debris present at the river site. Measurements can be viewed in list format in **Table 1**.

Object No. 3 was easily accessed by the divers on the surface, with no diving equipment required. Therefore, no underwater video was obtained. The Object No. 3 measurements are included in the annotated site photos, which are incorporated into the survey video.

Figure 13: Shows Object No. 1 Girder Section Length Measurements

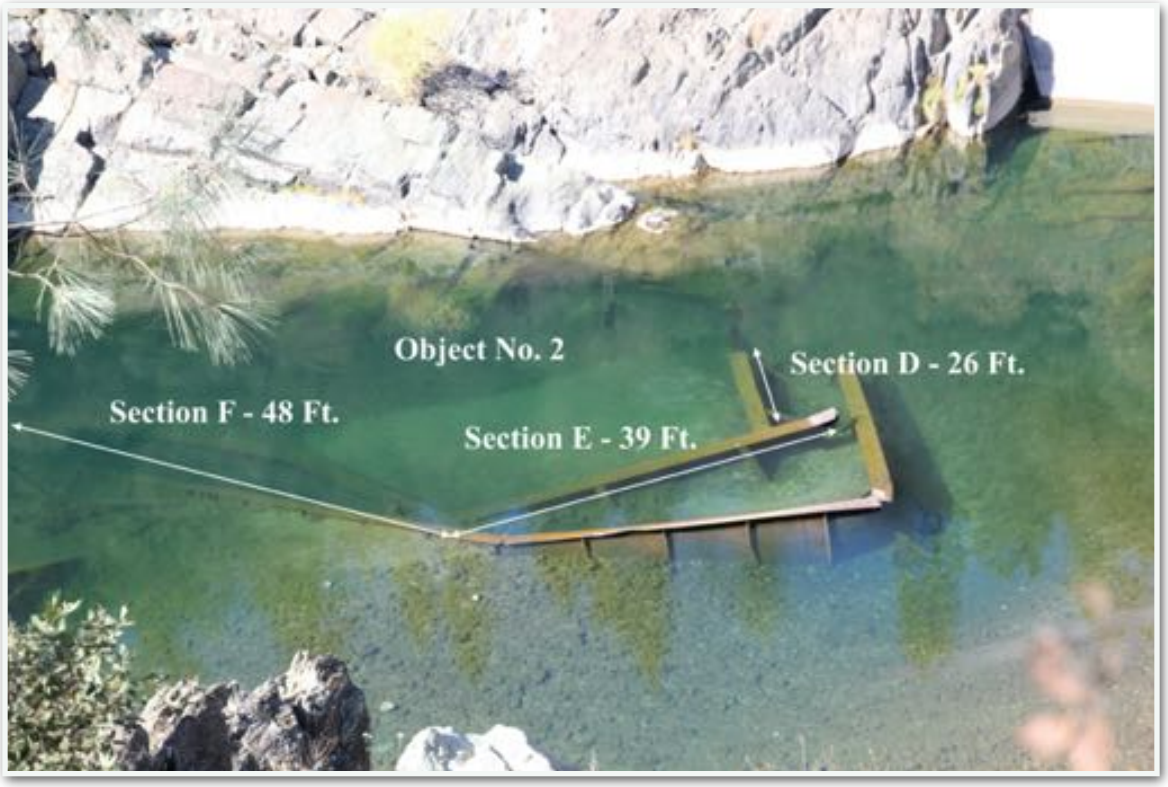

Figure 14: Shows Object No. 2 Girder Section Length Measurements

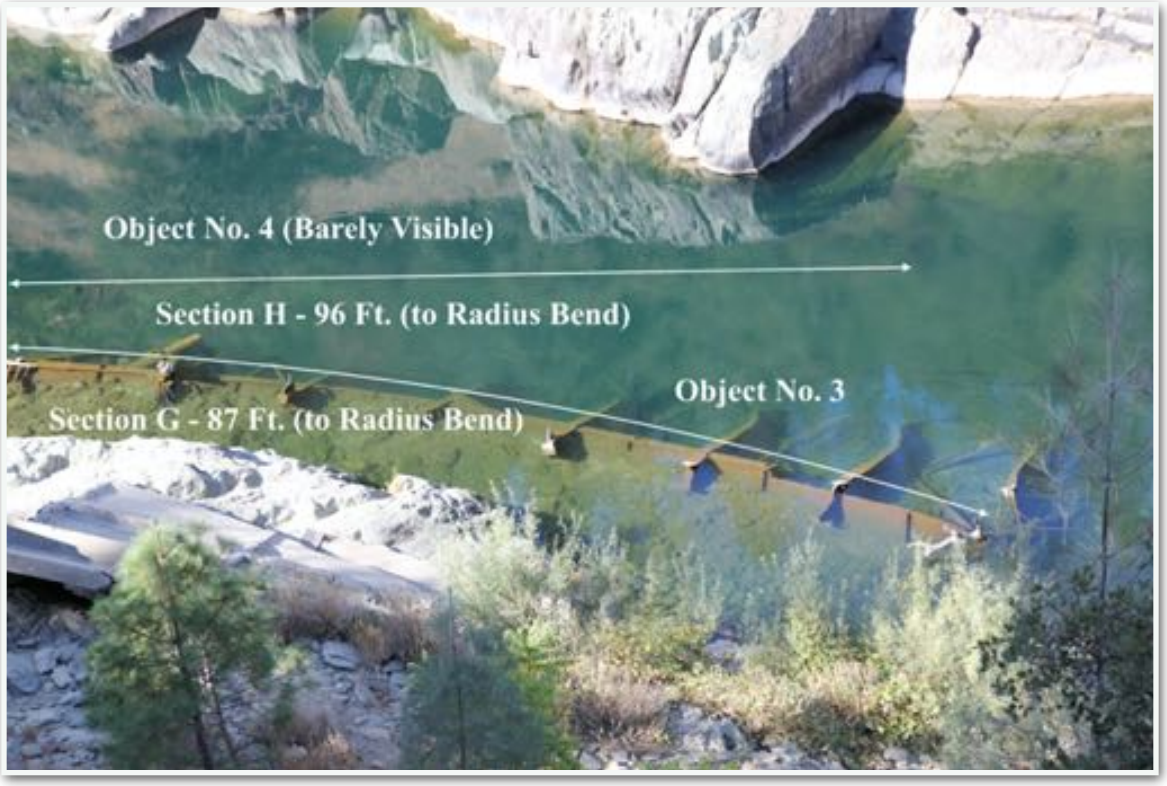

Figure 15: Shows Object No. 3 & 4 Girder Section Length Measurements

Some of the girder sections (or beams) are vertical on the river bottom, and embedded in accumulated bottom material. Object No. 4 is laying flat on the river bottom. This information is important for determining the amount of force required to overcome bottom suction and move each section out of the river, using whichever salvage method is employed.

Table 1: Steel Debris Measurements

Object No.	Section	Notes	Length (feet)	Feet Above River Bottom
1	A	Beam, Length (Upstream Face)	26.5	
		Beam, Height (West End)		6.5
	B	Beam, Length	26.5	
		Beam, Height (Upstream End)		7.5
	C	Beam, Length	54.5	
		Beam, Height (Downstream End)		4.0
		Total Measured Length of Object No. 1	**107.5**	

Object No.	Section	Notes	Length (feet)	Feet Above River Bottom
2	**D**	Beam, Length	26.0	
		Beam, Height (West End)		4.5
		Beam, Height (East End)		3.5
	E	Beam, Length	39.0	
	F	Beam, Length	48.0	
		Total Measured Length of Object No. 2	**113.0**	
3	**G**	Length, Measured from surface. No video.	87.0	
		Total Measured Length of Object No. 3	**87.0**	
4	**H**	Beam, Length (Upstream End to Radius Bend)	96.0	
		Beam, Height (Laying Flat on Bottom)		0.0
		Total Measured Length of Object No. 4	**96.0**	
		Total Length of Objects No. 1, 2, 3 & 4	**403.5**	

Visual Observations

During the taking of measurements, video of the underwater structures reveals details of the torn steel and twisting action that occurred during the 1964 washout event. Each section's orientation on the bottom can be analyzed for a future forensic re-construction, if desired, and the development of a salvage plan.

Following the survey of the defined objects, the divers conducted a hasty bottom survey downstream from the main debris site to determine the presence of additional debris. The diver(s) confirmed a small amount of random pieces scattered about a relatively confined area within about 250 ft. downstream of the main debris field. These items may be easily recovered by hand or using a small winch at the time of the removal process.

CONCLUSIONS

This site presents many significant logistical challenges for any salvage contractor.

Development of a comprehensive salvage plan will require collaboration between PARC, Advanced Marine and all pertinent entities that have regulatory oversight of the area where the debris is located.

Numerous variables will need to be addressed before any proposal and associated costs can be accurately determined. A detailed Engineer's Estimate should be performed utilizing the assessment provided and addressing all concerns noted.

PHOTO CREDITS

Figure	Page No.	Photo Source
1	3	*California Department of Transportation*, Jan. 1949
2	3	*Google Earth*, Sep. 2010
3	3	*Google Earth*, Sep. 2010
4	4	Gary Estes (PARC), 2020
5	5	*Auburn Journal*, Dec. 31, 1964, p. B-5
6	5	*Auburn Journal*, Dec. 31, 1964, p. B-5
7	5	*Auburn Journal*, Dec. 31, 1964, p. B-5
8	6	Gary Estes (PARC), 2020
9	6	Gary Estes (PARC), 2020
10	6	Gary Estes (PARC), 2020
11	6	Gary Estes (PARC), 2020
12	7	Gary Hughes (PARC), Oct. 2020
13	8	Gary Estes (PARC), 2020
14	8	Gary Estes (PARC), 2020
15	9	Gary Estes (PARC), 2020