

CEEn-2018CPST-001

Bluffdale Bridge Options

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INTRODUCTION

The City of Bluffdale has a bridge spanning the Utah & Salt Lake Canal at 14400 South. The latest UDOT inspection revealed that the concrete on some of the prestressed concrete beams has suffered delamination and both rebar and prestressing strand is now exposed. The City is concerned that the bridge may not be safe for operation.

The purpose of this project is to 1. Analyze the current bridge loading capacity, 2. Provide recommendations for rehabilitation (replacement or repair), and 3. Provide possible funding sources that the City could use to fund its rehabilitation. As part of this project, this capstone team provided information about the following:

1. Existing Conditions of the Bridge
2. Structure Evaluation Method & Evaluation Results
3. Recommendations of Bridge Revetments
4. Costs of Possible Revetments
5. Potential Funding Sources

CURRENT CONDITION

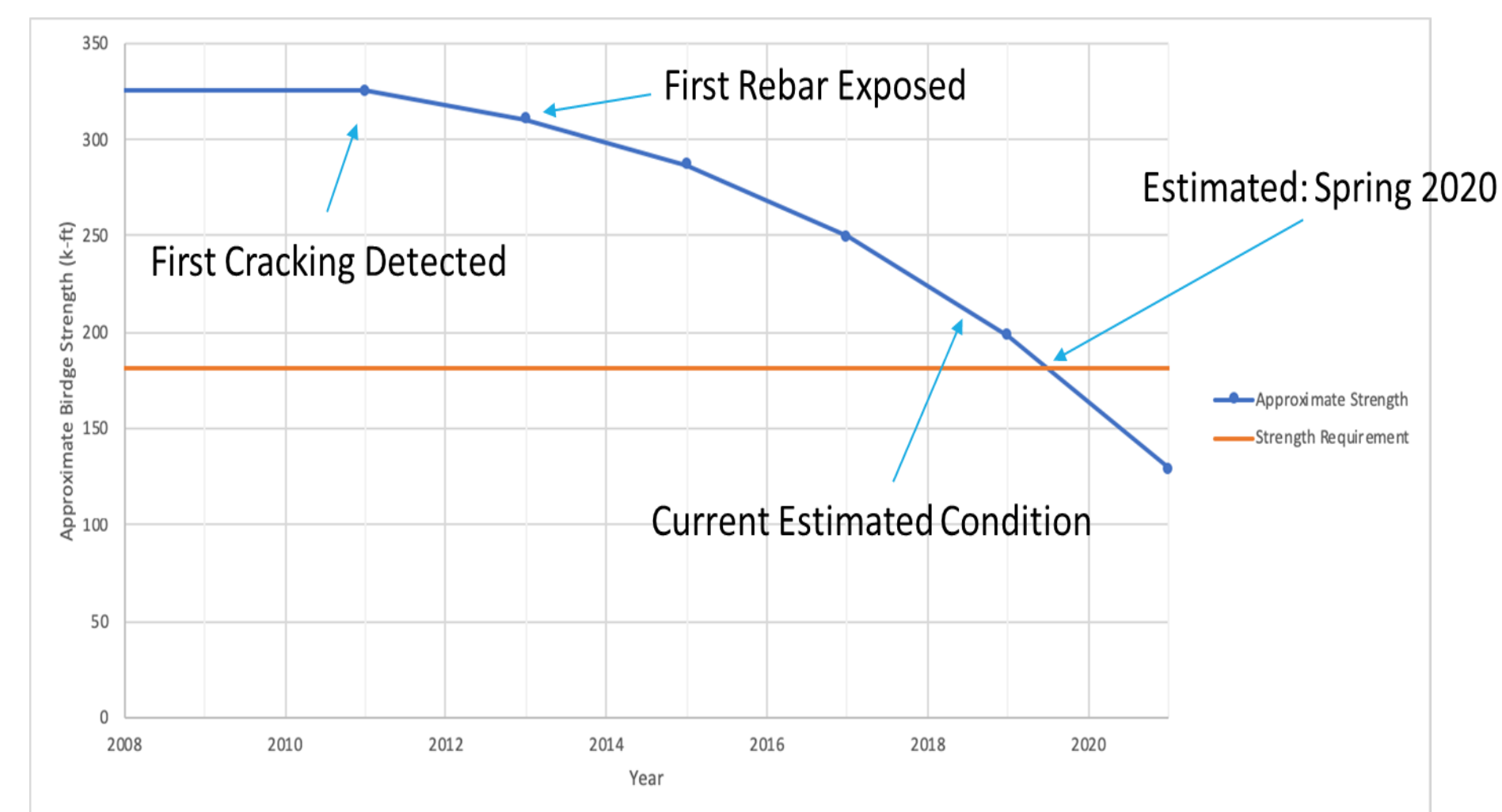
The team performed three separate site visits (October 2018, January 2019, and March 2019) to determine the current condition of the structure. The section below summarizes the recorded observations.

- The Bridge is comprised of 12 prestressed double-tee beams. Two of the beams (beams 8 & 9) exhibit significant loss of concrete, rebar, and prestressed strands.
- Other girders show significant longitudinal cracking, similar to the cracking found in beams 8 & 9 five years ago.
- All abutment walls/bearing points appear to be in good condition.
- Follow up visits show a progressive deterioration. For example, beams 8 & 9 have lost 6 inches of concrete between the October 2018 and January 2019 site visits.



ANALYSIS AND RESULTS

Based on the conditions discovered, the team performed an analysis based on the techniques outlined by the American Association of State Highway and Transportation Officials (AASHTO) and the Precast Concrete Institute (PCI). Demands were calculated using AASHTO LRFD design for HS-20 loading and calculated capacity using ACI 318-95, assuming approximately two prestressed strands and the bottom rebar have been completely lost. Based on this analysis, the bridge is estimated to reach its terminal service condition by Spring 2020.



REHABILITATION OPTIONS

Four options for rehabilitation and/or repair were evaluated. The tables below summarize the information for each method and how the best option was identified.

Based on these findings, the team recommends the CONTECH ConSpan Arch Bridge replacement option. While requiring a higher upfront cost and an extended bridge closure, this option has the lowest cost per year of life and ultimately eliminates the conditions which allowed the corrosion and spalling to initially occur.



Advantages/Disadvantages

Solution	Total Cost	Cost Per Year of Service	Remaining Life	Short-Term or Long-Term?
Repair Concrete & Add Tyfo	\$25,000 - \$29,000	\$6,000-\$7,000	5 years	Short-term
Replace Beams 8 & 9	\$221,000	\$44,000	5 years	Short-term
Double-Tee Replacement	\$711,000	\$14,000-\$24,000	30-50 years	Long-term
Short-Term solution now, full bridge replacement in 5-yr	\$812,000-\$1,033,000	\$10,000-\$29,000	35-85 years	Long-term
Contech Replacement	\$730,000	\$10,000	75 years	Long-term

Life-Weighted Comparison

Cost Per Year (1)	Life Expectancy (3)	Short-term or Long-term? (2)	Weighted Scores
5	1	0	8
1	1	0	4
3	3	1	15
2	4	1	16
4	5	1	21

FUNDING

Unfortunately, there are few funding sources (local and federal) that directly fund a bridge replacement; however, including the cost of a bridge replacement into a larger plan (e.g. restructuring the area for better bike paths) will allow the bridge to be eligible for many more grants.

The list of federal grants operated through local entities are listed here:

- Surface Transportation Block Grant
- Transportation Alternatives Program (TAP)
- Transportation and Land Use Connections (TLUC)

Several federal sources may also be available through these programs:

- Better Utilizing Investments to Leverage Development (BUILD)
- Infrastructure for Rebuilding America (INFRA)

The TAP, TLUC, BUILD, and INFRA grant programs all require incorporating the bridge replacement with a larger plan. The eligibility details, as well as deadlines, are found on their respective websites.

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