

Bridge Over Utah/Salt Lake Canal at 14400 S

ANALYSIS AND REHABILITATION OPTIONS

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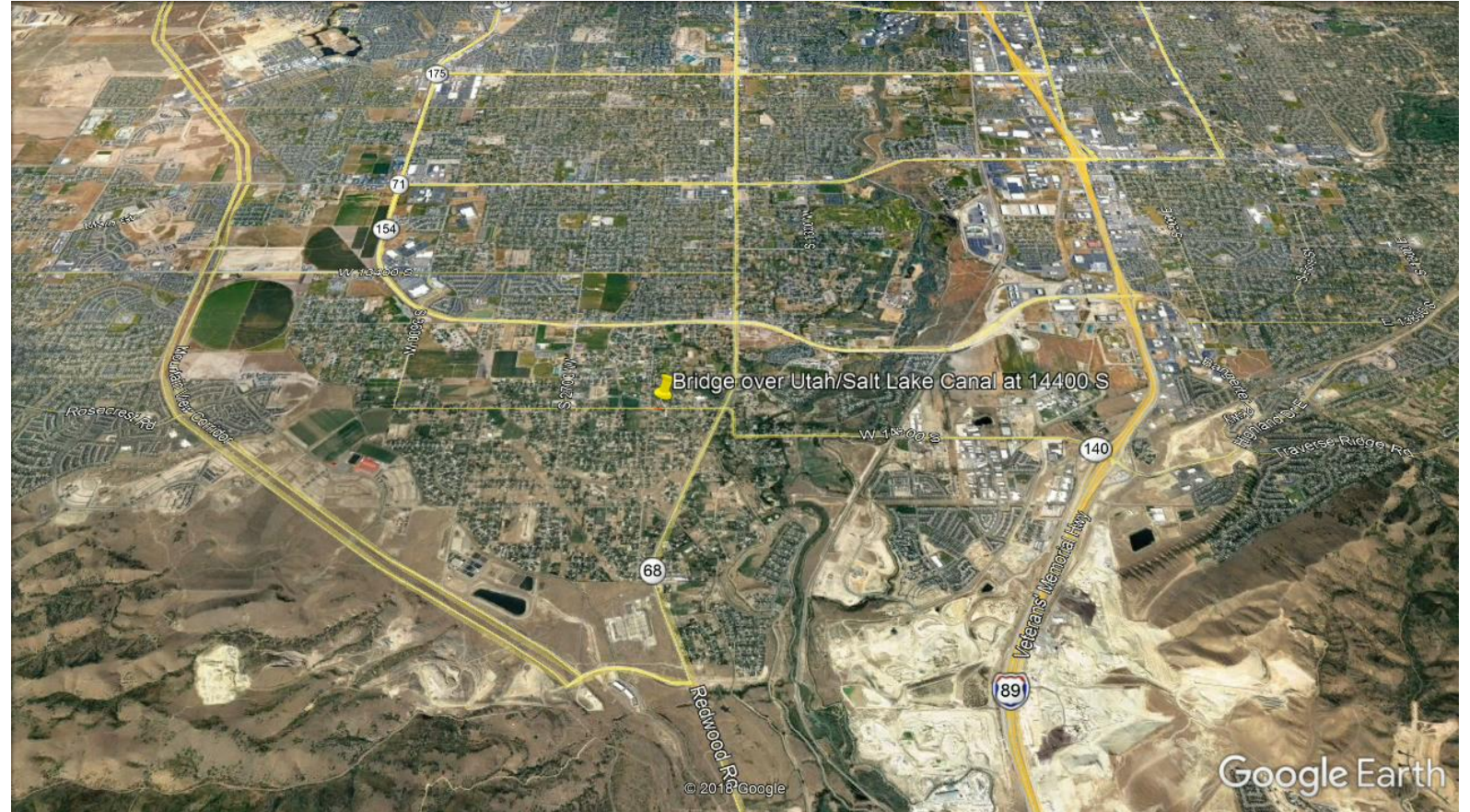
Introduction

The Problem

- Deteriorated Bridge in Bluffdale (Utah & Salt Lake Canal at 14400 S)
- Delaminated concrete and exposed rebar

Our Task

- Determine current loading capacity of the bridge
- Provide recommendations for rehabilitation
- Provide possible funding sources



Presentation Overview

Bridge Problems

Underlying Causes

Analysis & Results

Rehabilitation Options & Costs

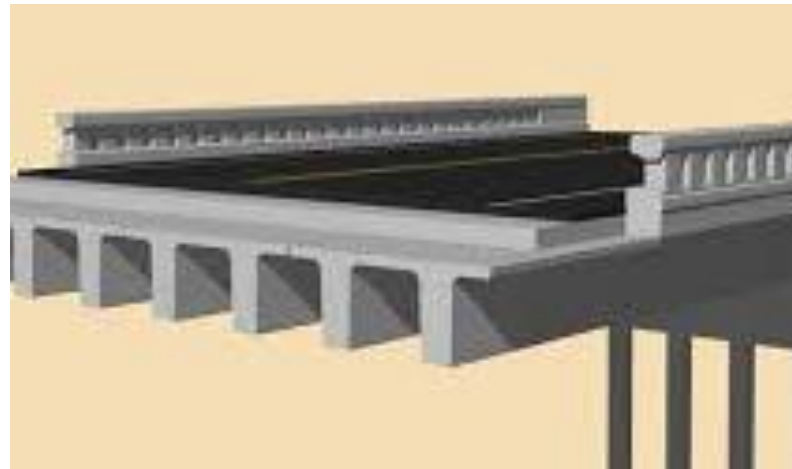
Funding Sources



The Problem: Bridge Basics

Bridge Construction

- Constructed with Double Tee Beams
- 12 Beams make up the bridge
- 2 beams are heavily damaged
- Several others are moderately damaged



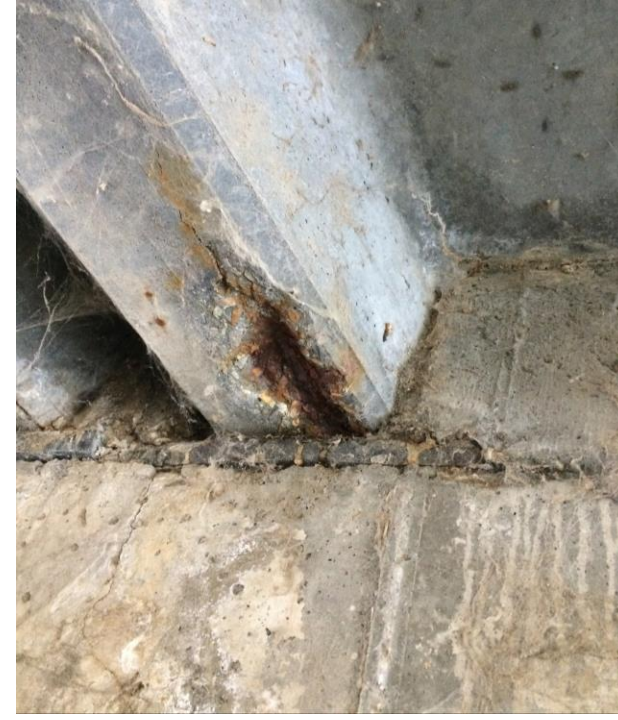
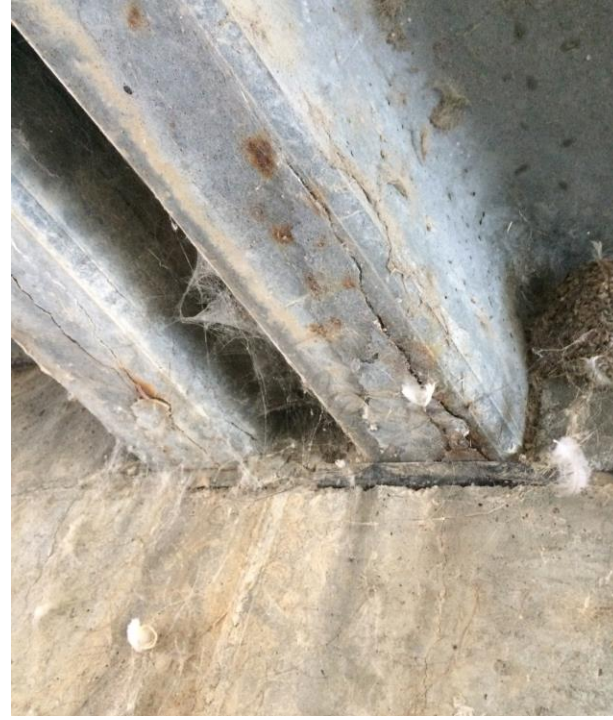




Beams 8 & 9 —
Deterioration

Corrosion in Other Beams

- Other beams show signs of significant corrosion
- Most other beams will likely have similar concrete spalling and steel corrosion to beams 8 and 9 within 5 years

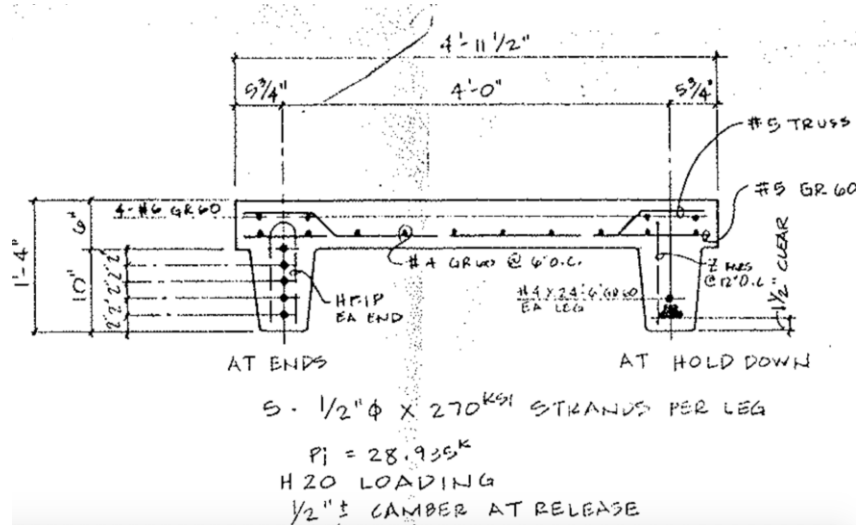




Cause of Deterioration

Improper Construction

- Designed for 1.5" of concrete under the rebar
 - Only $\frac{3}{4}$ " is present in the cracked beams
- Low concrete cover speeds up corrosion dramatically





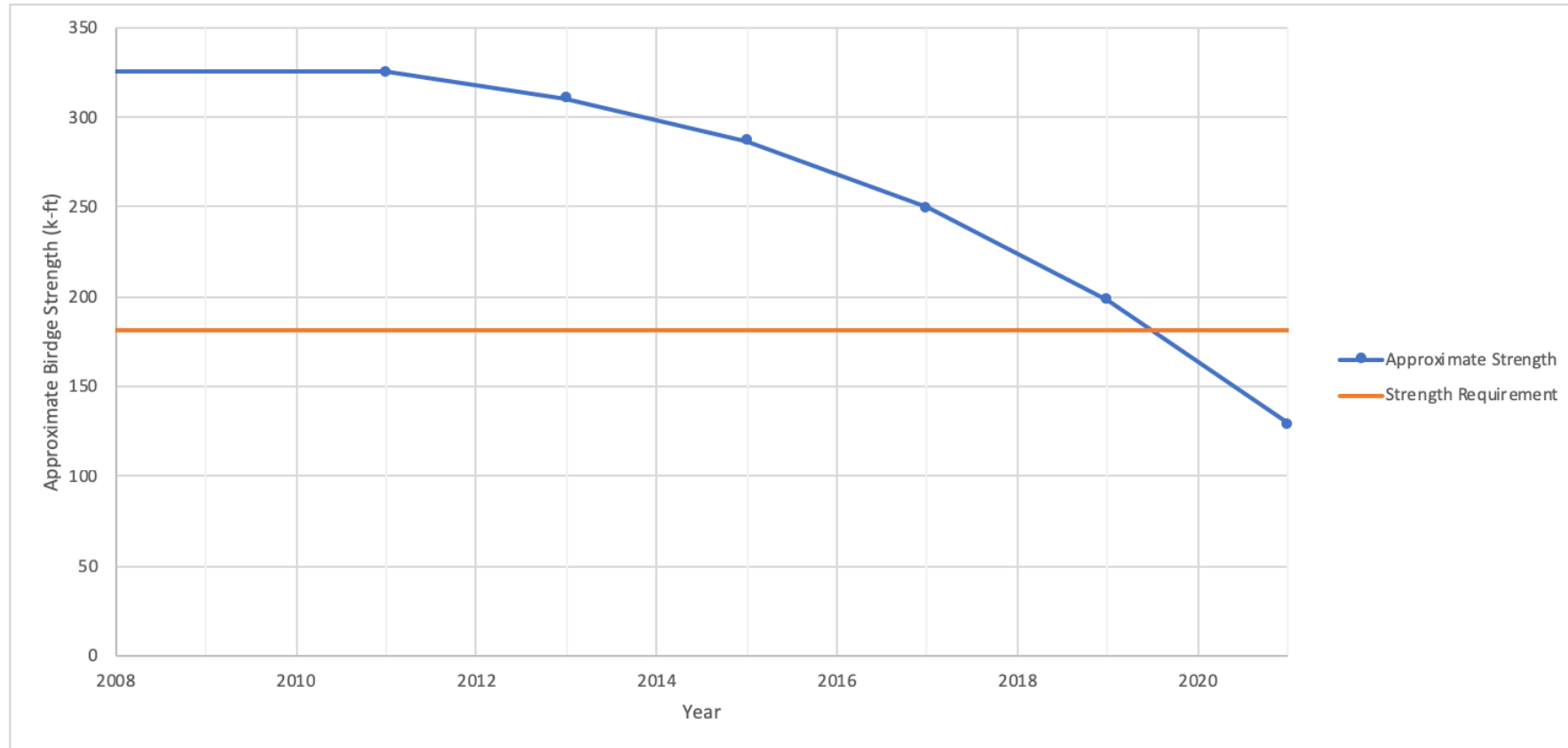
Water and Salt Seepage

- Water that seeps through the roadway soaks into concrete cracks
- The water carries deicing salt, which intensifies the steel corrosion

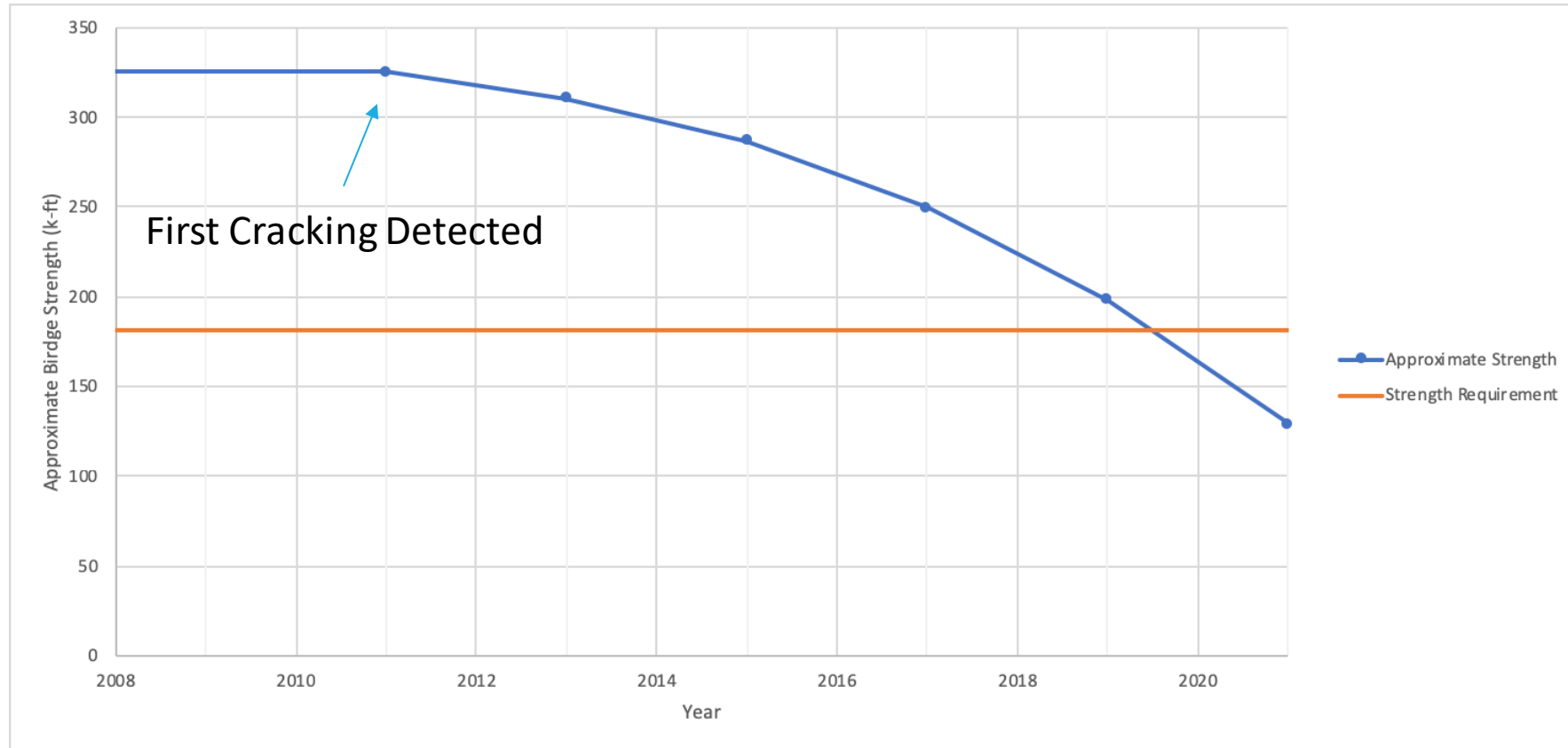


Results of Analysis

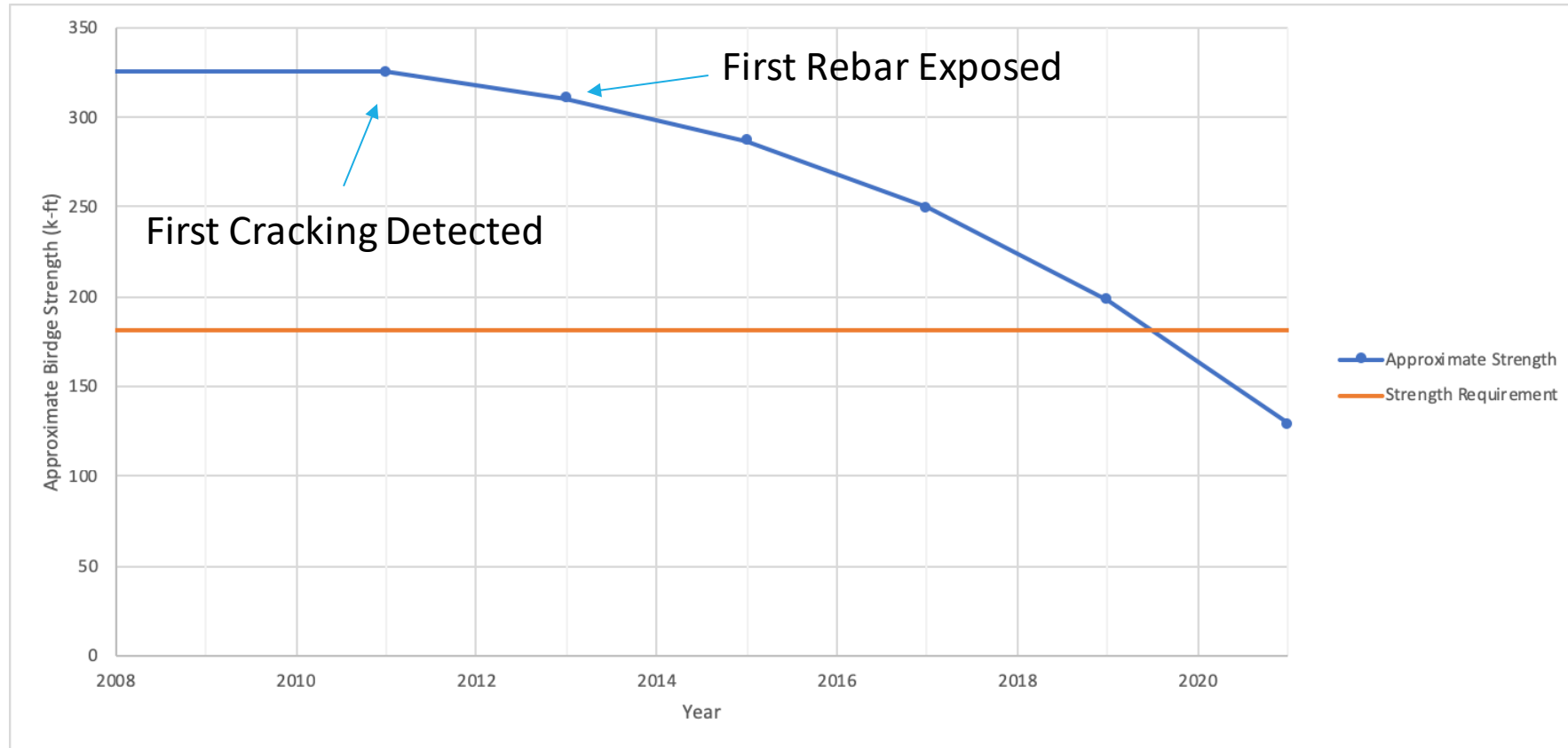
Estimated Bridge Strength



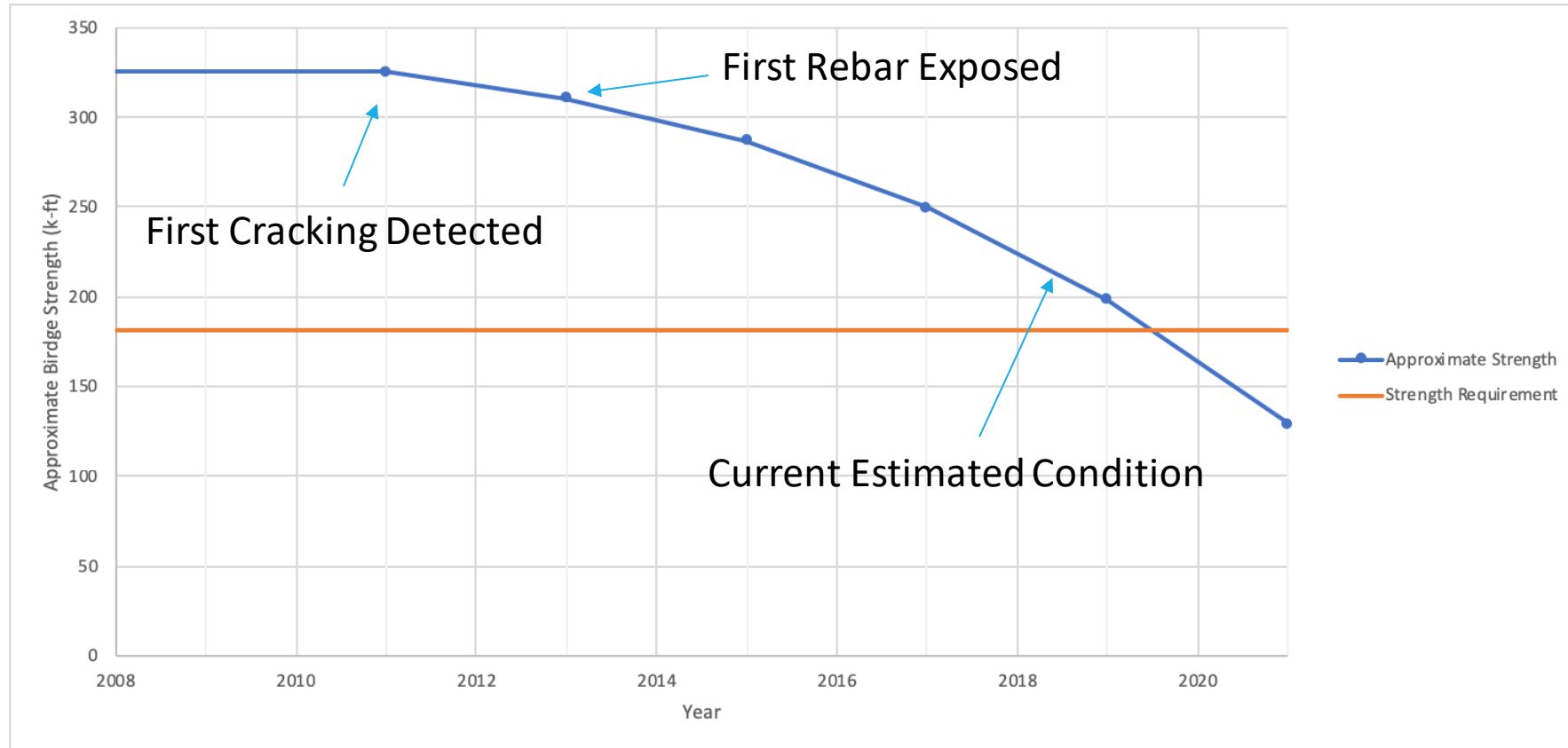
Estimated Bridge Strength



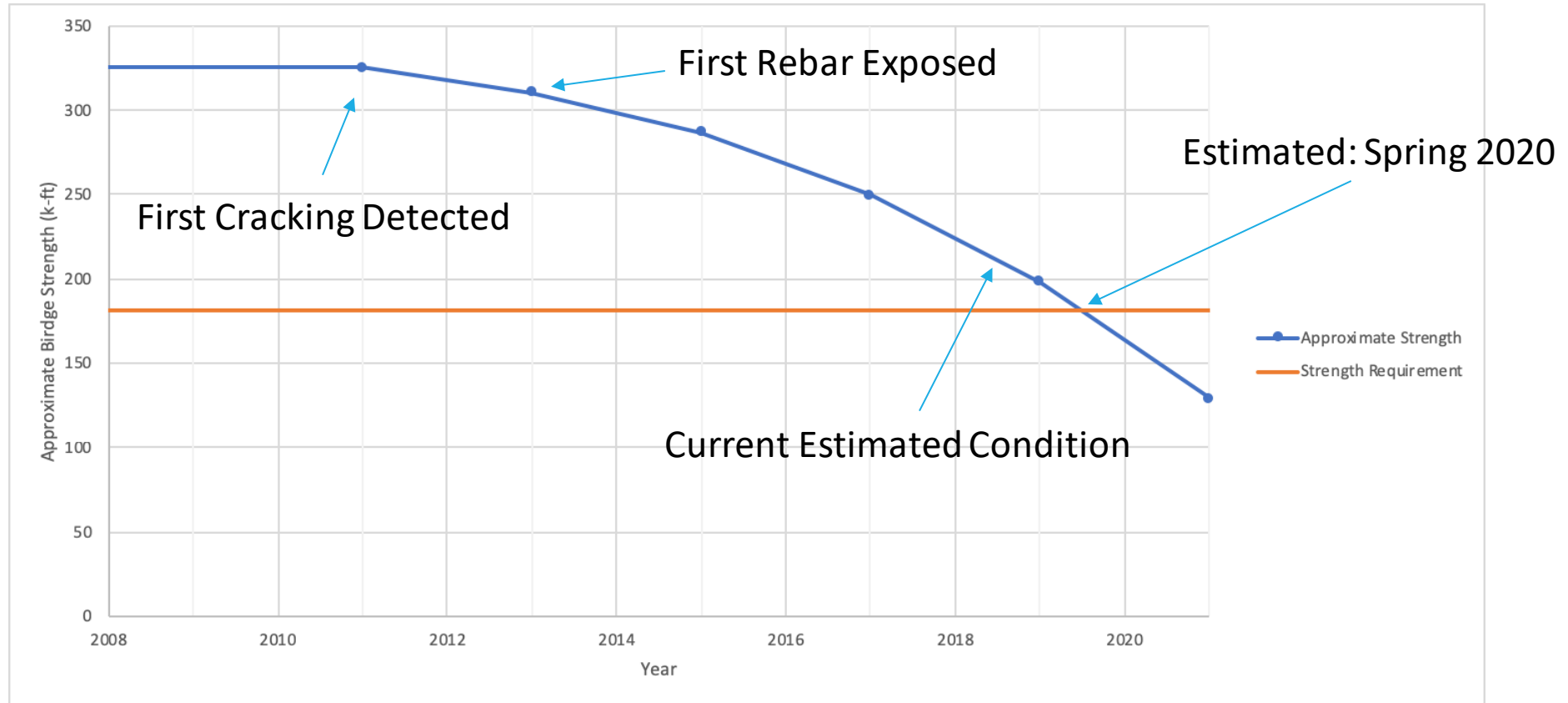
Estimated Bridge Strength



Estimated Bridge Strength



Estimated Bridge Strength





Rehabilitation Options & Cost

Bridge Options

Repair Concrete & Add Tyfo

Replace Middle Beams

Bridge Replacement: Double-Tee

Bridge Replacement: Contech

Repair Concrete & Add Tyfo

Fyfe Tyfo FRP Coatings Systems

Advantages

- Adds strength and durability to concrete
- Only one-day bridge closure

Disadvantages

- Halo effect requires sacrificial zinc anode to prevent with regular maintenance
- Does not fix corrosion issues



Replace Damaged Beams

Double-Tee Concrete Beams
(same as original beams)

Advantage

- Steel reinforcement and beam strength restored.

Disadvantages

- Other beams will continue to degrade
- Requires Road Closure and re-paving the road



Current Structure

Full Bridge Replacement

Double-Tee Concrete Bridge
(same bridge design)

Advantages

- Same bridge, better construction
- Longer life
- Problem of corrosion in steel reinforcement fixed

Disadvantages

- Thermal effects may cause water seepage and steel corrosion in the future



Current Structure

Full Bridge Replacement

CONTECH ConSpan Arch Bridge

Advantages

- Relatively low cost for extended life
- Eliminates underlying problems

Disadvantages

- Requires 2-4 week closure
- Higher upfront cost



Art Dye Park in American Fork

Advantages/Disadvantages

Solution	Total Cost	Cost Per Year of Service	Remaining Life	Short-Term or Long-Term?
Repair Concrete & apply 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 years	\$812,000-\$1,033,000	\$10,000-\$29,000	35-85 years	Long-term
Contech Replacement	\$730,000	\$10,000	75 years	Long-term

Weighted Solutions (Cost-focused)

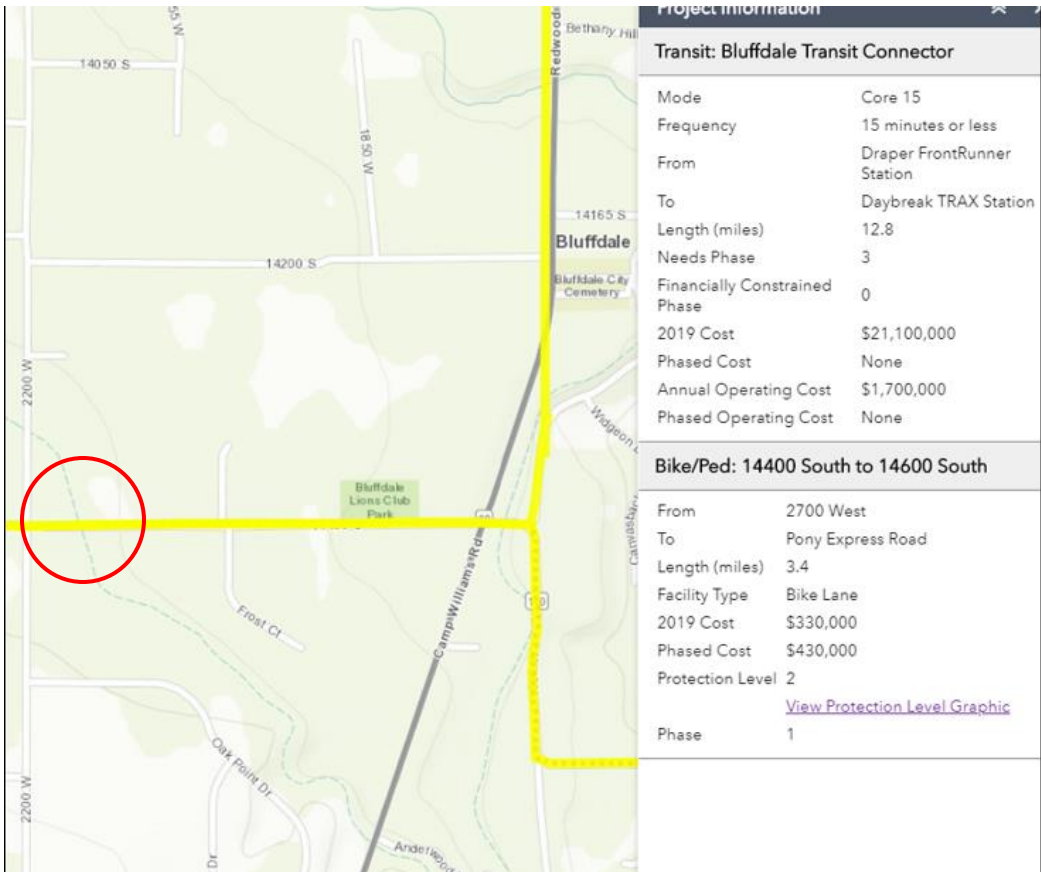
Solution	Cost Per Year (3)	Life Expectancy (2)	Short-term or Long-term? (1)	Weighted Scores
Repair Concrete with Tyfo	5	1	0	17
Replace Beams 8 & 9	1	1	0	5
Double-Tee Bridge Replacement	3	3	1	16
Short-Term solution now, full bridge replacement in 5 Years	2	4	1	15
Contech Replacement	4	5	1	23

Weighted Solutions (Life-focused)

Solution	Cost Per Year (1)	Life Expectancy (3)	Short-term or Long-term? (2)	Weighted Scores
Repair Concrete with Tyfo	5	1	0	8
Replace Beams 8 & 9	1	1	0	4
Double-Tee Bridge Replacement	3	3	1	15
Short-Term solution now, full bridge replacement in 5 Years	2	4	1	16
Contech Replacement	4	5	1	21



Funding Sources



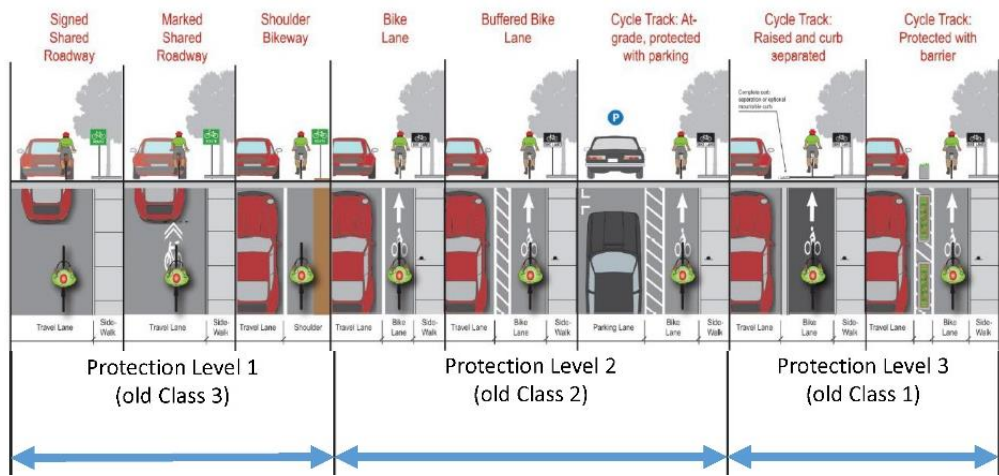
Draft Phased 2019-2050 Regional Transportation Plan

<http://wfrc.org/rtp-2019-phasing/>

Phase 1: 2019 to 2030

Phase 2: 2031 to 2040

Phase 3: 2041 to 2050



Possible Local
Funding
Sources—

Wasatch Front
Regional
Council

Surface Transportation
Program (STP)

Transportation
Alternatives Program (TAP)

Transportation and Land
Use Connection

Possible
Federal Funding
Sources

Better Utilizing
Investments to Leverage
Development (BUILD)

Infrastructure for
Rebuilding
America (INFRA)

Summary

Bridge Problems

- Rebar Deterioration
- Concrete Spalling

Analysis & Results

- Terminal Service Condition Estimate: Spring 2020
- Best Option: Contech replacement

Funding Sources

- Various Local & Federal Sources Available

