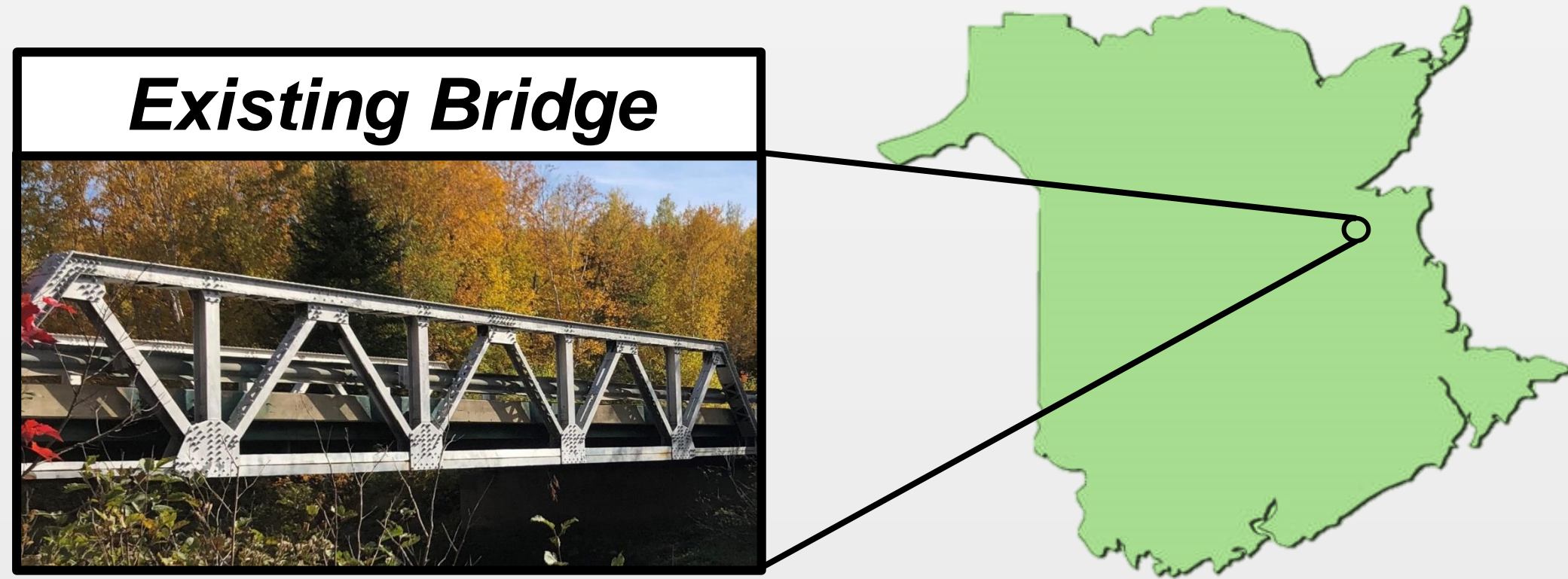


## Background

Bay du Vin Bridge no. 5 located south-east of Miramichi is in need of replacement due to high water elevations damaging the bottom of the bridge, along with inadequate dimensions with respect to TAC standards.



## Goal and Objectives

NBDTI has requested the design of three alternative bridges to replace Bay du Vin Bridge no. 5 utilizing steel, concrete or timber to serve as a feasibility study between the three materials.

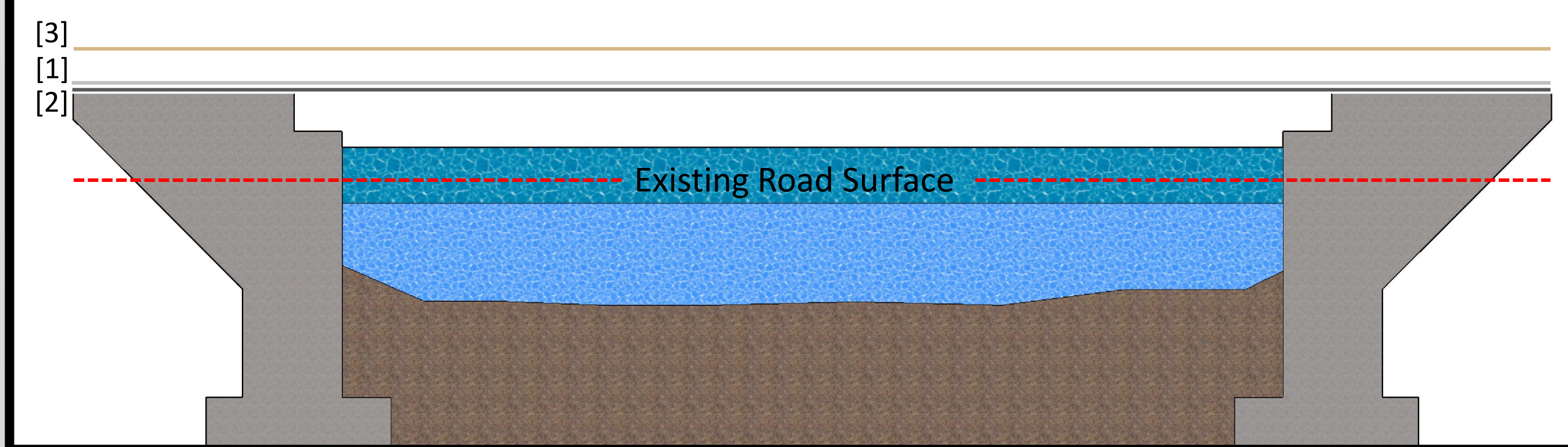
This was achieved by completing the following objectives:

- Determination of the new bridge elevation to accommodate future high water.
- Design of the timber, steel and concrete bridges in accordance with CSA-S6 along with realignment of the approaching roads.
- Sustainability & lifecycle cost assessment for comparison of the building material.

## New High-Water Elevation

Predicted Peak Flow	Predicted Raise in High Water Elevation	Bottom of Existing Bridge Elevation	Bottom of Proposed Bridge Elevation	Proposed Height Increase of the Bottom Chord
144 m <sup>3</sup> /s	1.15 m	35.50 m	37.23 m	1.73m

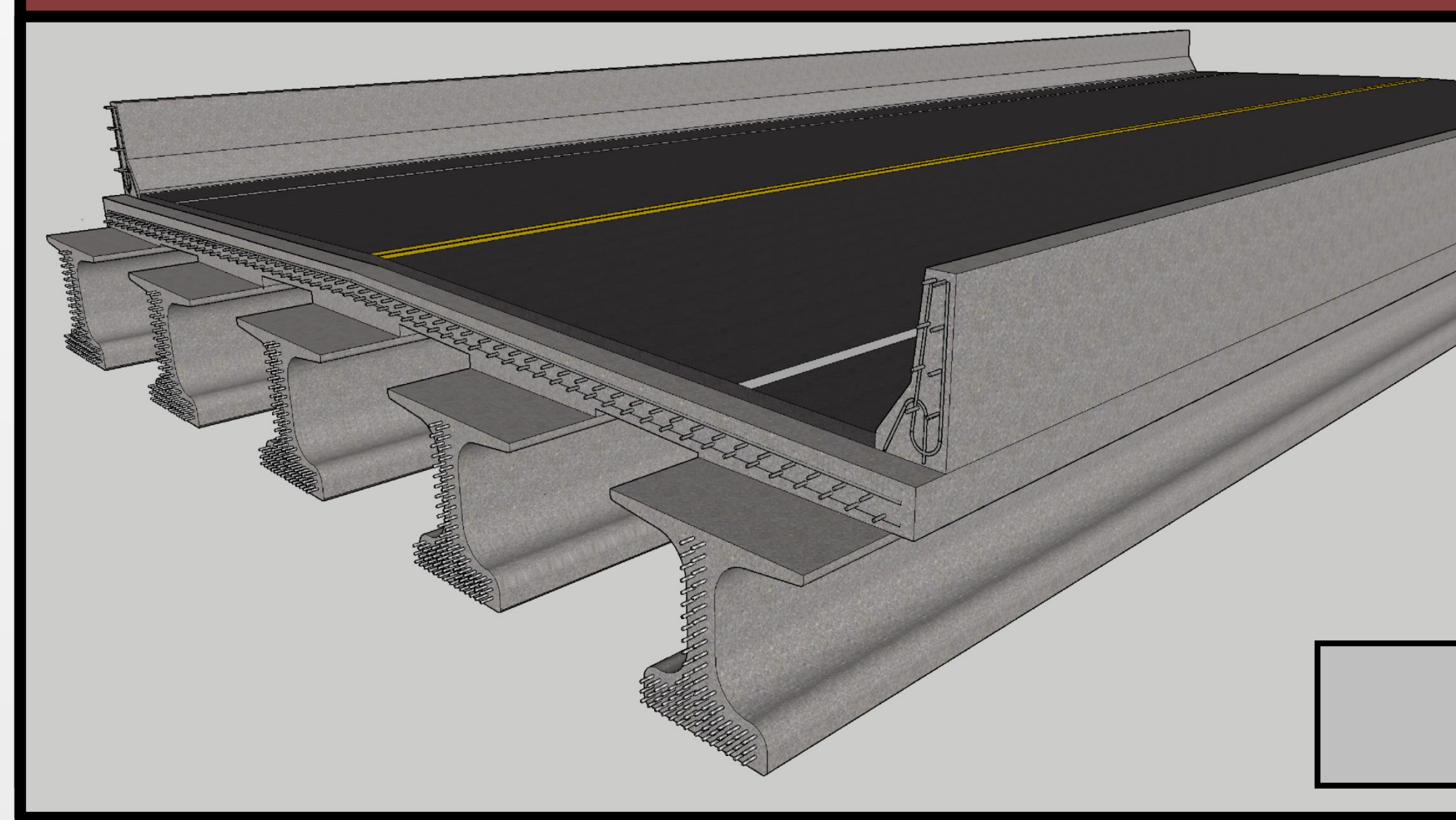
### Road Elevations



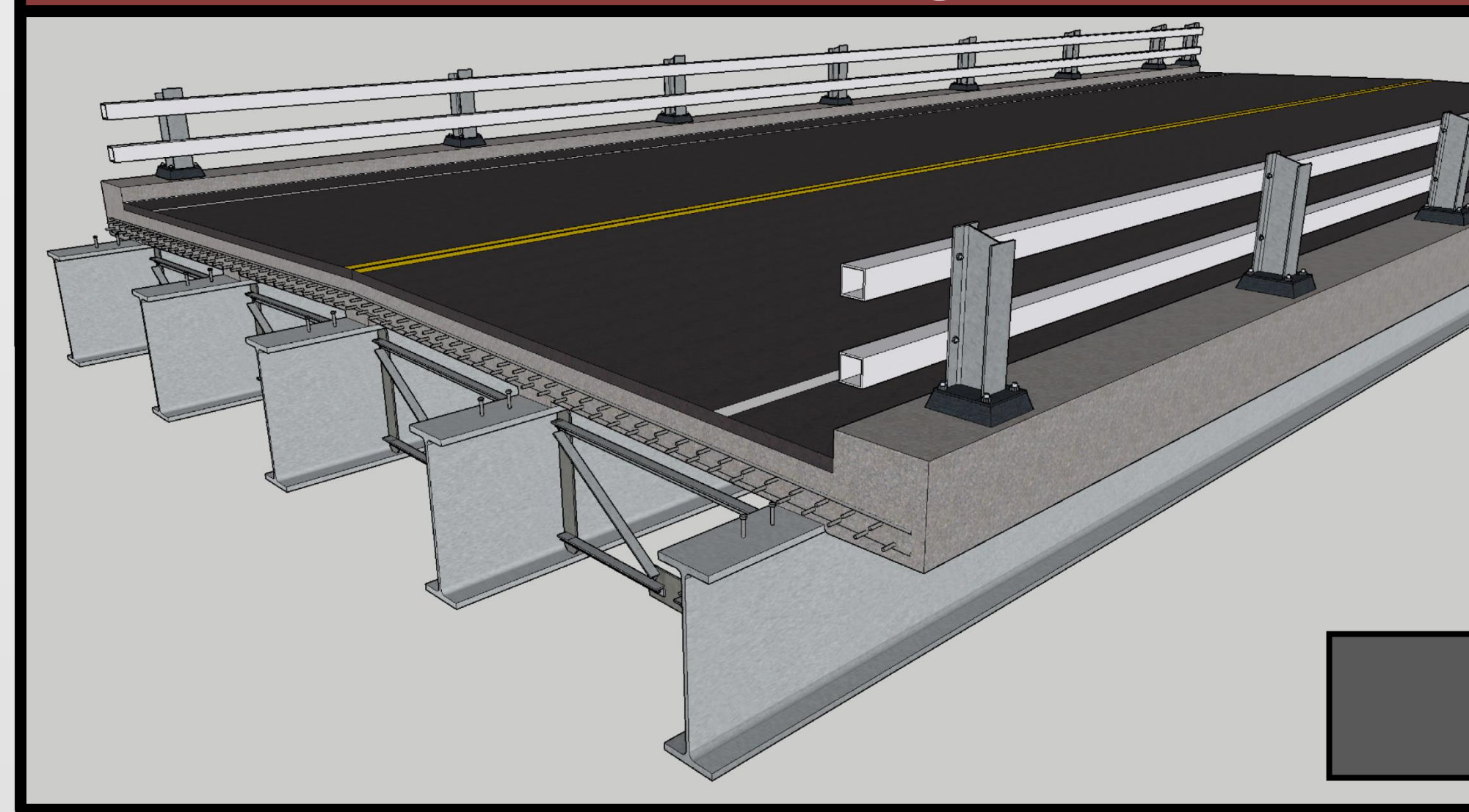
### Road Work

Bridge Type	Surface Elevation Increase (m)	Total Fill Volume (m <sup>3</sup> )
[1] Concrete	1.58	295
[2] Steel	1.49	165
[3] Timber	2.12	1135

## Concrete Bridge



## Steel Bridge

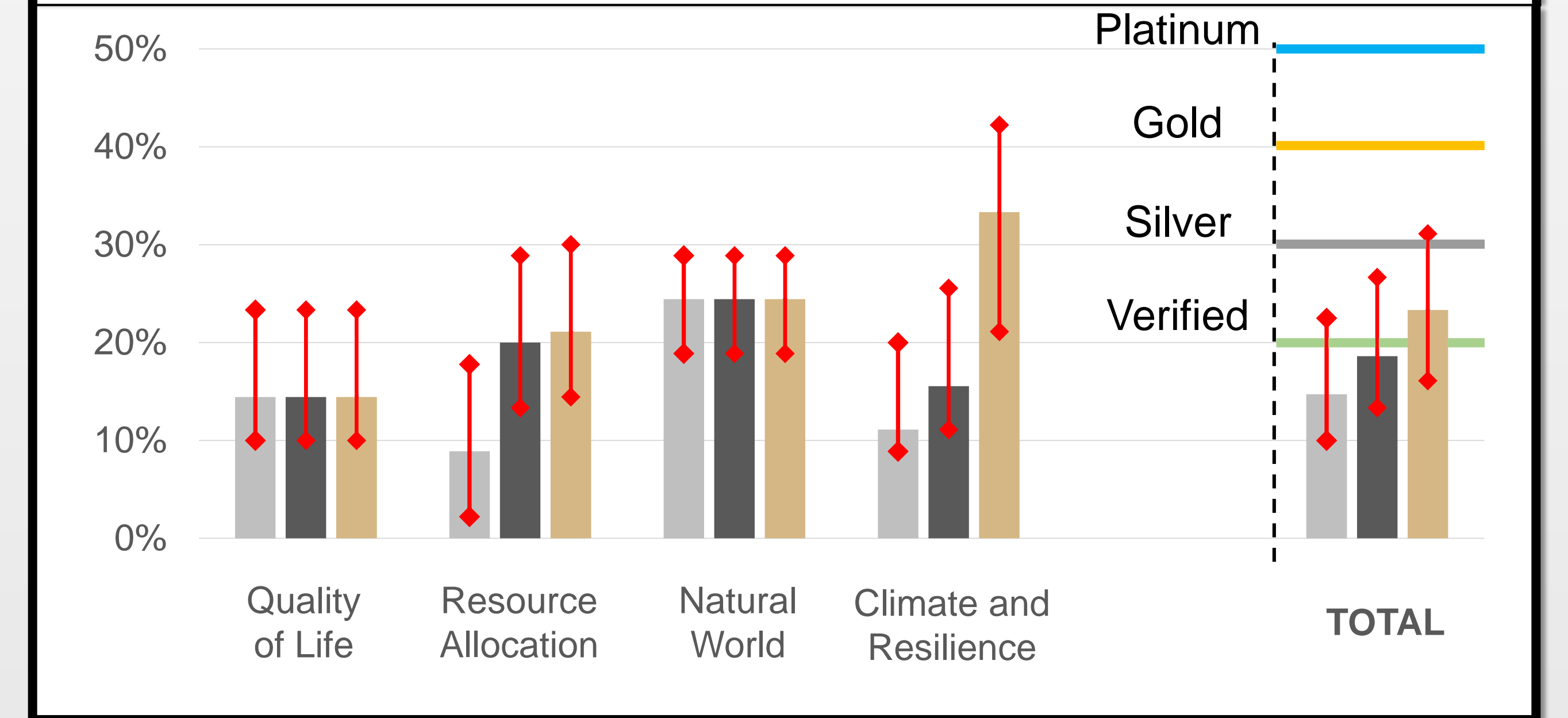


## Timber Bridge



## Sustainability Assessment

A sustainability assessment was completed using the Envision credit system provided by the Institute for Sustainable Infrastructure where material and infrastructure were evaluated.

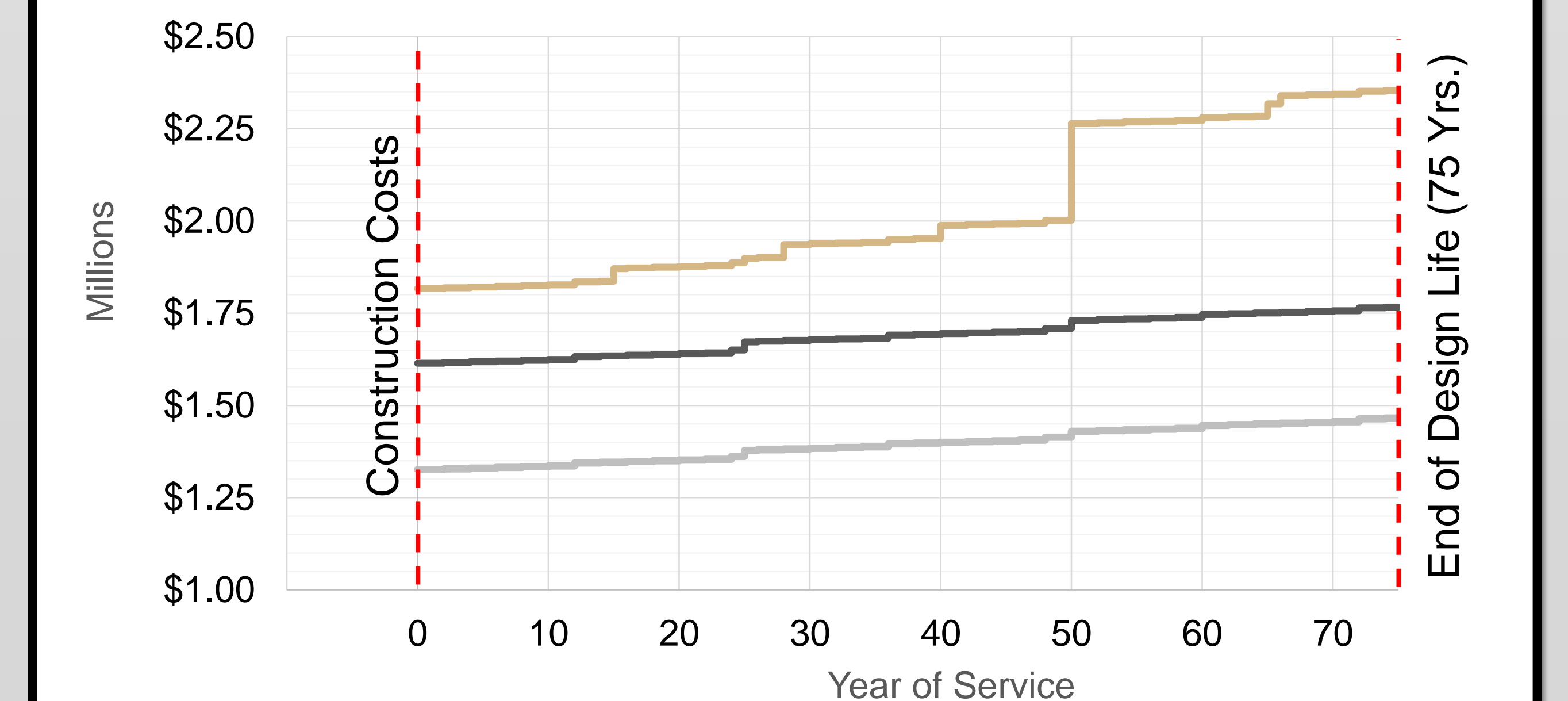


\* Variance is due to some sub-criteria being subjective in evaluation

## Cost Estimate

Bridge Type	Concrete	Steel	Timber
Design	\$ 99,000	\$ 120,000	\$ 135,000
Construction	\$ 1,229,000	\$ 1,495,000	\$ 1,683,000
Low Estimate	\$ 860,000	\$ 1,047,000	\$ 1,178,000
<b>Cost</b>	<b>\$ 1,328,000</b>	<b>\$ 1,615,000</b>	<b>\$ 1,818,000</b>
High Estimate	\$ 1,843,000	\$ 2,243,000	\$ 2,624,000
Operation & Maintenance (Present worth of 75 year life)	\$ 40,000	\$ 45,000	\$ 151,000

## Lifecycle Costs



## Bridge Details

Bridge Type	Beams			Deck		Barriers (TL-4/PL-2)	Lateral Bracing
	# of	Depth (mm)	Type	Depth (mm)	Type		
Concrete	5	1000	New England Bulb Tees	225	Reinforced Concrete	New-Jersey Shaped	None
Steel	5	923	W920x313 I-Beam			Alaskan Multi-State Railing	K-Bracings near supports
Timber	9	1330	Glued-Laminated	235	Transverse Glued-Laminated With Floor Beams	Crash Tested Timber Barrier	4 Sets of Timber Diaphragms

## Summary of Results

From the analysis, 2020 Bridgeworks concludes:

- An expected high water elevation rise of 1.15m for a 1 in 100-year event while considering climate change.
- Timber was found to be most sustainable; however, has an increased lifecycle cost.
- Steel and concrete resulted in similar maintenance costs with timber requiring additional intermediate repairs.
- Concrete resulted in the lowest total cost followed by steel and timber, respectively.