C1.03 - Rural Bridge Improvement Plan

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Background

The bridge on FM Road 1981 in Collingsworth County, TX, built in 1957 and located 0.21 miles west of US Highway 83, handles an average of 100 vehicles daily, including 21% trucks. The most recent TxDOT inspection (July 2021) report shows that, the bridge is deemed to be in poor condition. Both its deck and superstructure exhibit serious deterioration, affecting essential structural components and causing fatigue cracks in the steel and concrete. The bridge poses a safety hazard for the community of Collingsworth County and must be replaced.

Project Site

The site of the rural bridge is embedded between US Highway 83 and FM Road 1981 in the county of Collingsworth, Tx. This location is important due to its proximity and access from several county roads to the main highway, facilitating community connections between Samorwood, Quail, and Wellington.

Images provided by Google Earth

Project Overview

The project aims to design and plan a sustainable replacement bridge for FM Road 1981 in Collingsworth County, Texas. The goal is to replace the old bridge with a new, durable, and safer structure that will play an essential role in providing the community with travel options. The alternative solutions considered for the construction of this new bridge are Prestressed Concrete I-Girder and Steel I-Girder Beam. The Envision Manual was used for sustainability evaluation, to further examine which of the two designs would be selected. Finally, the group has conducted a cost analysis for the bridge replacement and calculated the life cycle costs for both chosen alternatives over a period of 100 years.

Design Alternatives

It was determined that the two best options for possible redesign of the bridge would be:

The prestressed concrete I-girder (T-62)

The Steel I-girder beam (Rolled).

Sustainability Evaluation

The Envision framework was chosen since its evaluation system is designed to evaluate and award points toward sustainable infrastructure projects. Not only, does this framework assess sustainability, but evaluates the social, economic, and environmental aspects of each alternative. Based on this evaluation system, the first alternative obtained **37%**, while the second alternative obtained **35%.** Of the four levels of achievement from the Envision framework, both alternatives received a silver level of achievement.

Project Summary

The Prestressed Concrete I-girder (T-62)

	Submitted Score Information			Verified Score Information		
Credit Category	Applicable	Submitted	Percentage	Applicable	Verified	Percentage
Quality of Life	200	77	39%	200	0	0%
Leadership	146	78	53%	182	0	0%
Resource Allocation	94	23	24%	196	0	0%
Natural World	148	38	26%	232	0	0%
Climate and Resilience	190	69	36%	190	0	0%
Total Points / %	778	285	37%	1000	0	0%

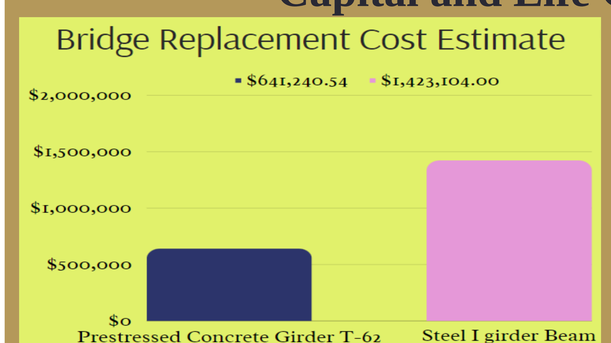
Project Summary

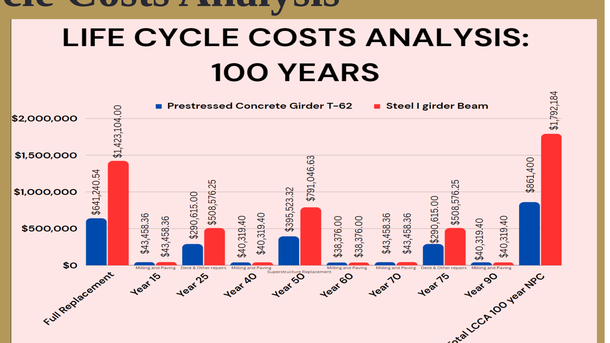
The Steel I-girder Beam (Rolled)

	Submitted Score Information			Verified Score Information		
Credit Category	Applicable	Submitted	Percentage	Applicable	Verified	Percentage
Quality of Life	200	75	38%	200	0	0%
Leadership	146	71	49%	182	0	0%
Resource Allocation	94	20	21%	196	0	0%
Natural World	128	36	28%	232	0	0%
Climate and Resilience	190	63	33%	190	0	0%
Total Points / %	758	265	35%	1000	0	0%

Scorings provided by Envision Framework Tool

Capital and Life Cycle Costs Analysis

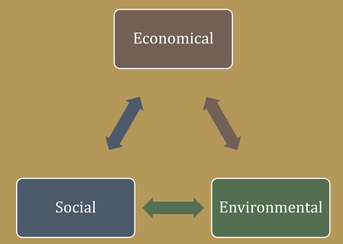




Bridge Replacement Cost and LCCA was estimated by Price bid items in TxDOT website.

Design Considerations

Based on evaluation it was determined that the residents of Wellington county need a bridge that is structurally durable, cost-effective in terms of materials and construction, and has minimal negative environmental impact.



Second Semester Plan

- ❖ Team Hopes to create preliminary design of the primary bridge components: superstructure and substructure.
- ❖ Develop a 3D model of the bridge design.
- ❖ Additionally, refine the design using computer software and programs
- ❖ Innovate and design details of the bridge structure.

Team Picture

Brie D. Luis H. Jazmin M. Rawand A.

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