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Sufficiency Rating Refinement & Detour Routing Automation

Problem Background

- **Nova Scotia Department of Public Works** (NSDPW) is responsible for **4100+ bridges** along 23,000 km of provincial highways

Initial Conditions

- No standardized bridge repair or maintenance identification processes
- No streamlined detour calculation process in place for any of the **4100+ bridges**
- Detour calculations carried out using Google Maps

Project Scope

- Review and refine bridge **Sufficiency Rating** (SR) documentation
- Develop a tool to generate an SR for each of the provinces' **4100+ bridges**
- Implement a planning tool to calculate detour routes along the highway network
- Generate bridge deterioration models

Tool Creation

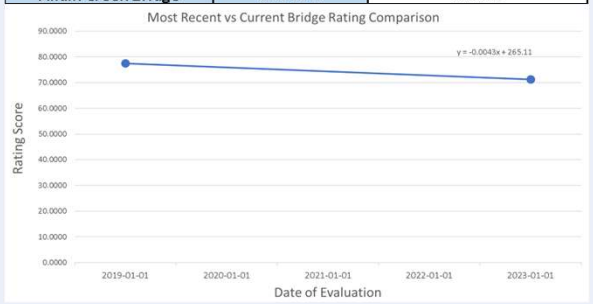
- Reviewed existing SR documentation
- SR flow charts created from the existing methodology
- SR & bridge deterioration tools created based on flow charts and guidance from a structural assessment and retrofit research advisor
- Detour routing tool created using Google API, JavaScript, HTML, and CSS

Acknowledgements

- Dr. Pemberton Cyrus, P.Eng., FEC
- Dr. Fadhi Oudah, P.Eng.
- Will Crocker, P.Eng.

Bridge Deterioration Modeling

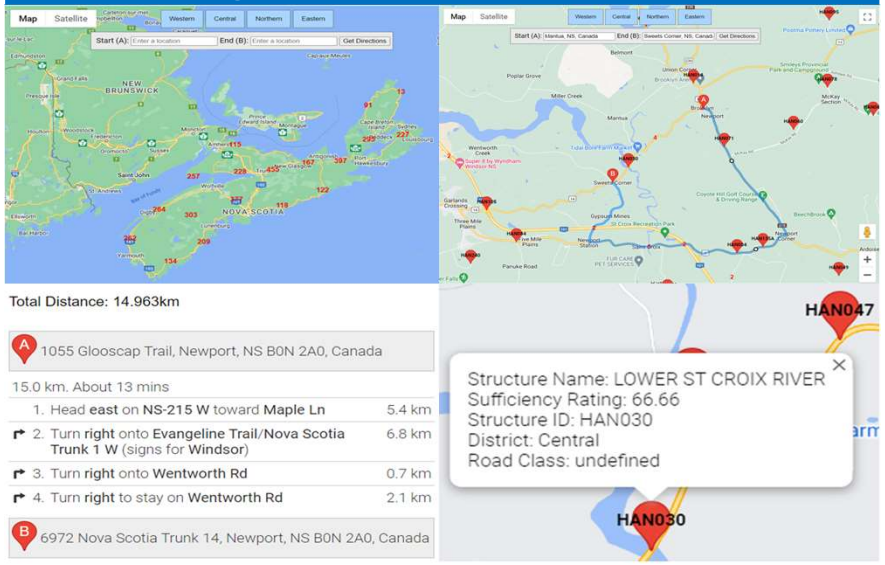
Structure Name	Date (YYYY-MM-DD)	Structure ID
Allain Creek Bridge	2023-03-12	ANN001



Overall	
Date	Value
2023-03-12	71.2042
2019-06-19	77.51
Bridge Decreasing per day:	
-0.00463	

Prediction Models	
Based on the next inspection date	
Next Inspection Date (YYYY-MM-DD)	2025-03-02
Predicted Value	67.8661
Based on a value	
SR Value is equal too	40.00
Predicted Date	2041-08-23

Detour Routing



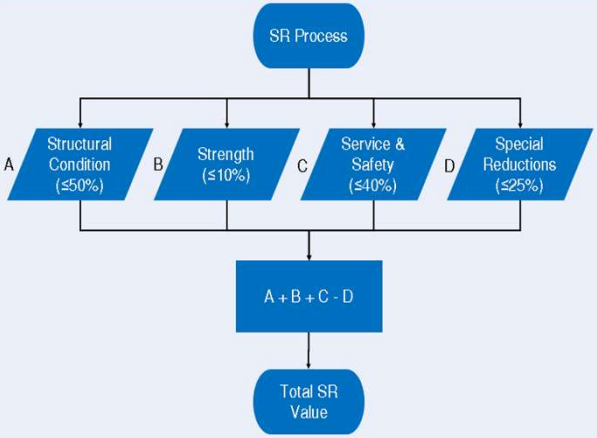
Implementation

1. Real-time bridge deterioration levels and detour routes may be calculated
2. Adoption of dynamic detour routing & bridge deterioration processes
3. Publication of SR & detour tools for organizational-wide information sharing
4. Distribution of standard work instructions

Defining a Sufficiency Rating

- Using four impact categories, the SR evaluates the current ranking of a **bridge relative to all other bridges** along the highway network
- The SR represents:
  - Present Condition
  - Level of Service
  - Safety
  - Approach Roads

Sufficiency Rating Breakdown



Final Design Outcomes

- Streamlined SR methodologies & process flow models
- Complex bridge deterioration modeling capabilities
- Live asset management capabilities
- Improved communication between the Structures Asset Management Engineer and District Bridge Engineers
- Dynamic detour routing tool which identifies and displays the **most effective route based** on SR, road class, district, & criticality to the highway network
- Upwards of **6,000** lines of code