Preliminary Present Value End of Life (PVEOL) Analysis

Network area:	Highway:	RP:	BSN:	Structure name:	Owner:	Far North District Council
Northland	Kaitaia - Awaroa Road	23729		**Kaitaia-Awaroa Culvert No. D41**	RCA:	Far North District Council

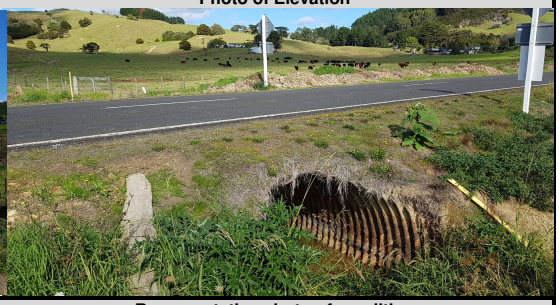
General Structure Data		PVEOL Questions:	Yes/No	Brief explanation of restrictions
Year constructed:	1975	Is the bridge over 80 year old	No	
One Network Road Classification (ONRC):	Primary Collector	Is there significant maintenance required in the next 3 years	Yes	
Vehicles per day:	487	Is the bridge inspected in accordance with NZTA-S6	Yes	
% heavy vehicles:	10.0%	Is the bridge on special inspections	Yes	
Number of Spans	1	Has a live load assessment been carried out based on the known condition	No	
Total Length of Bridge	2.5m (diameter)	Are there any brittle and/or vulnerable details on the bridge	Yes	
Road width between Kerbs/rails	11m (at soffit level), 15m (at invert)	Are there live load or speed restrictions across the bridge	No	

Structure description

Kaitaia-Awaroa Road culvert D41 is a corrugated steel pipe that is 2.5m in diameter and is approximately 11 m long at soffit level and is 15m long at invert level. It is situated on a two-lane sealed road. Prior to draining,the majority of the culvert was permanently submerged. Both the inlet and outlet of the culvert are un-armoured. The depth of fill over the culvert is approximately 0.5m. No barriers are present.

Photo from Road Level

Photo of Elevation



Current Condition	Briefly explain the current defects	Representative photo of condition
Parapets / Barriers / Surfacing	N/A	

Maintenance Interventions Required	Year	Cost ($k)
1.)		
2.)		
3.)		
4.)		

Current Condition	Briefly explain the current defects	Representative photo of condition
Superstructure	The culvert is heavily corroded with severe corrosion and flaking of the steel structure along its entire length. The corrosion covers approximately 60-70% of the internal area of the culvert and above mid height (the vertical return point) of the culvert on both sides. The flaking is very severe in the bottom third of the culvert.	

Maintenance Interventions Required	Year	Cost ($k)
1.) Repair the culvert by welding on new steel reinforcing and placing of extensive concrete lining if possible and permitted by Resource Consent.	2021	$125
2.) General maintenance	2026	$25
3.) Replace the culvert	2031	$275

Current Condition	Briefly explain the current defects	Representative photo of condition
Substructure		

Maintenance Interventions Required	Year	Cost ($k)
1.)		
2.)		
3.)		
4.)		

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Other general photos to represent current condition

Hypothetical "like for like" bridge Replacement	
Total Length of Bridge	2.6m
Road width between Kerbs/rails	11m
NZTA replacement rate (m2)	N/A
Replacement cost	$275,000

Brief discussion

Costs include for establishment, traffic management and nominal approach works. Costs do not include for consultancy fees, resource consent fees or geotechnical investigation fees.

Maintenance Scenarios

Scenario 1 - Minimal / Routine Maintenance and look to replace the bridge as early as possible (1-3 years)

Component	Maintenance Interventions Required	Year	Cost ($k)	NPV ($k) 4% discount
All	Install new reinforced concrete culvert	2021	$275	$264
		Totals	**$275**	**$264**

Scenario 2 - Maintain the bridge in the medium term (3-10 years) followed by bridge replacement

Component	Maintenance Interventions Required	Year	Cost ($k)	NPV ($k) 4% discount
Culvert	Repair steel culvert	2021	$125	$120
Culvert	General maintenance	2026	$25	$20
Culvert	Install new reinforced concrete culvert	2031	$275	$179
		Totals	**$425**	**$319**

Proposed Strategy

Having considered the condition of the culvert, there is potential that significant, potentially catastrophic, failure may occur within 1 to 3 years if maintenance actions or replacement are not undertaken. The PVEOL analysis over 10 years of asset life gives a 17% ($55K) saving which shows that the culvert is at the end of its economic life, and therefore the preferable option is to replace the culvert immediately. Due to the deterioration of the structure, the culvert will require replacement in the short to medium term as corrosion of the original structure continues, irrespective of any maintenance works level chosen. At 46 years old, the structure is also effectively at the end of its useful design life.

Document preparation

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Document review - Waka Kotahi response

Reviewed by:	Liam Coleman	**Title:**	Team Lead Structural Performance	**Date:**	30/09/2021

Outcome:	**Comments:**
APPROVED	Note the $6600/m2 needs to be used to see what the replacement cost is. But this will not affect the decision which is to replace over heavy mainteance