Municipality of Shuniah

Asset Management Plan Development

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FINAL

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REPORT

GENIVAR

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1. EXECUTIVE SUMMARY

GENIVAR Inc has prepared an asset management plan for the Municipality of Shuniah to assist with the maintaining, renewing, replacing, and funding of their assets. The assets included are 12 bridges and approximately 235 km of roadway located throughout the municipality. The bridges and roads have been inspected and the results have been inputted into Municpal DataWorks (MDW). The Bridge Condition Index (BCI) and Pavement Condition Index (PCI) have been calculated with MDW.

The asset management plan provides an evaluation of the current performance and characteristics of the local infrastructure. It also provides recommended levels of service based on recent trends for both roads and bridges. The plan then provides a basic financial strategy based on this information. This is broken down into work to be done within certain timeframes.

Most of the assets are in fair to good condition; however there are three assets that are in poor condition:

- SB-09 Walkinshaw Creek Bridge
- SB-10 Amethyst Ave Bridge
- R-0004-0 Copenhagen Road

The next bridge inspection should be undertaken in 2015 and the next road inspection in 2016. In addition, the municipality should become as familiar as possible with MDW and update the asset's information regularly. This will assist with managing the assets and predicting financial needs reasonably well.

2. INTRODUCTION

GENIVAR was retained to assist with the development of a comprehensive asset management plan that the Municipality of Shuniah can utilize as a tool to assist with decisions regarding the building, operating, maintaining, renewing, replacing, disposing and funding of their roads and 12 structures.

2.1 PURPOSE

The purpose of the asset management plan is to attempt to establish a workable document which will assist with decisions related to how the municipality's infrastructure will be managed to ensure that it is capable of providing the levels of service required to support the municipality's goals. An asset management plan is a business strategy to effectively and efficiently allocate available funds amongst valid and competing asset needs. It links expectations for asset conditions, performance, and availability with management and investment strategies. The asset management plan identifies the recommended work for the assets to perform at the level of service expected.

2.2 SCOPE

The municipality's assets consist of 12 structures and approximately 235 km of roadway. GENIVAR completed an evaluation of these assets and prepared this asset management plan. The investigation undertaken by GENIVAR with respect to this plan and any conclusions or recommendations made in this plan reflect GENIVAR's professional opinion based on the sites' conditions observed at the time of the inspections and on information available at the time of preparation of this plan. Extrapolation of visual detail data was necessary where there was no access.

The asset management plan is anticipated to be valid for 10 years with diminishing returns and should be updated regularly. The plan should be evaluated and improved through updated data at every scheduled road or bridge inspection.

The bridge inspections were performed according to the *Ontario Structure Inspection Manual* (OSIM); and the road inspections were completed with the *Manual for Condition Rating of Flexible Pavements* (SP-024), the *Manual for Condition Rating of Surface-Treated Pavements* (SP-021), and the *Manual for Condition Rating of Gravel Surface Roads* (SP-025).

3 CURRENT ASSET CONDITION

All assets have a natural service life span. To keep bridges and roads in a safe and usable condition, regular maintenance should be scheduled based on inspection results, and service conditions. According to the Ontario Regulation 104/97, every public bridge in Ontario must undergo an inspection every two years by a trained inspector who is either a professional engineer or under their direction. The inspector reviews and rates each bridge component. These ratings are used in determining the bridge's current condition index.

Similarly, roads are to be inspected every three years, so that the municipality can be aware of changing conditions and can plan maintenance and rehabilitation with confidence. Inspections should be carried out in late spring or in summer conditions to allow for the effects of frost heaving to dissipate, and the road to stabilize.

3.1 INVENTORY OF ASSETS

All assets' key inventory information, including their geometrics such as length, width, location and other appropriate dimensions is stored in Municipal DataWorks (MDW). The road assets have already been segmented into manageable lengths by others in 2007. The inventory is listed in section 3.4 of this plan.

3.2 ASSET'S CURRENT YEAR VALUE

The asset's estimated current year value is the difference between the purchase price (cost at the beginning of the year before additions in 2012) and the final accumulated amortization. These values were found in the "Capital Asset 2012 Continuity" spreadsheet provided by the Municipality of Shuniah. For assets with missing information or that have been fully depreciated, the asset's estimated current value is taken as the ratio of their condition index and GENIVAR's professional opinion of probable replacement cost. These assets are the following:

Structures

- SB-07 Blind Creek Culvert
- SB-09 Walkinshaw Creek Bridge
- SB-10 Amethyst Avenue Bridge
- SB-11 Compressor Station Road Bridge

Roads

- R-0004-0 Copenhagen Road
- R-0007-2 Compressor Station Road
- R-0009-0 Trowbridge Road
- R-0011-0 Alder Road
- R-0012-0 Hampton Drive
- R-0013-0 Clover Road (North)
- R-0014-0 East Floral Beach Road
- R-0015-0 Green Point Road
- R-0016-0 Charles Road
- R-0018-0 Wild Goose Bay Road
- R-0021-0 Sunrise Beach Drive
- R-0025-0 Silver Beach Drive
- R-0027-0 Silver Harbour Drive
- R-0029-1 Coral Bay Drive (Gravel)
- R-0029-2 Coral Bay Drive (HBC)
- R-0033-0 Crystal Beach Avenue
- R-0038-1 Amethyst Avenue
- R-0039-2 Birch Beach Road (Gravel)
- R-0040-1 Eldorado Beach Road (HCB)
- R-0043-2 Nelson Drive (HCB)
- R-0044-0 Nelson Point
- R-0045-1 Mackenzie Heights Road (HCB)
- R-0045-2 Mackenzie Heights Roads (Gravel 1)
- R-0045-3 Mackenzie Heights Roads (Gravel 2)
- R-0047-2 West Loon Drive
- R-0051-0 Community Hall Road (Pass Lake East Rd)
- R-0052-0 Bak Road
- R-0053-0 Bass Lake Road
- R-0054-0 Bryan Avenue
- R-0055-0 Duncan Avenue
- R-0056-1 McConnell Road (North)
- R-0057-0 Otte Road
- R-0058-0 Walkinshaw Road
- R-0060-0 Superior Shores Road
- R-0067-0 Knobel Point

According to the Canadian Highway Bridge Design Code (CHBDC), a bridge structure is to have a 75 year lifespan. Due to the lack of information on the assets' construction history and repair details, it is GENIVAR's professional opinion that the useful lifespan of the existing structures be set at 50 years. The estimated lifespan of the road is 15 years.

The remaining useful life of each asset type is also taken as the ratio of their condition index. Both the remaining useful life and current year value are listed in section 3.4 of this plan.

3.3 ASSET CONDITION

The current condition of the bridges was established with the Bridge Condition Index (BCI) as per the Ontario Structure Inspection Manual (OSIM), and the Pavement Condition Index (PCI) was provided as per MTO guidelines. These values were determined after inputting the inspection results into MDW. This plan includes two binders of inspection reports with labelled photographs: one for bridges and the other for roads. The assets' condition is presented in section 3.4 of this plan.

The assets are generally in fair to good condition and are providing the expected levels of service. To be in a good condition:

- Structures must have a BCI above 70
- Arterial roads must have a PCI above 85
- Collector and local roads must have a PCI above 80

3.3.1 Bridge Condition Index

The structures in the municipality were visually inspected where safe access could be gained to determine their current condition and engineering characteristics.

The Bridge Condition Index (BCI) is a planning tool which assists with the scheduling of maintenance and upkeep. The BCI result is organized into ranges from 0 to 100. A higher number indicates a better overall condition. The BCI is a basic economic indication of the general percentage of the current value of an asset to its replacement cost. The current values are determined by the condition of each element required to be inspected and rated. Information data is provided into MDW and a BCI is produced. The Ministry Transportation Ontario's (MTO) guidelines for BCI are summarized in the table below

71 - 100	Good	Not usually required within the next five years
60 - 70	Fair	Usually scheduled within the next five years. This is the ideal time to schedule major bridge repairs from an economic perspective.
0 - 59	Poor	Usually scheduled within approximately one year

MDW has capabilities to calculate the PCI based on riding comfort and surface conditions. The Pavement Condition Index (PCI) is a simple, convenient and inexpensive way to monitor the condition of the surface of roads, identify maintenance and rehabilitation needs, and ensure that road maintenance budgets are spent wisely. It rates the current condition of the surface of a road network.

The Riding Condition Rating (RCR) is the degree of riding comfort which the pavement provides to the travelling public. GENIVAR drove over the road section at the posted speed and classified the riding condition according to the descriptions in the table below. The RCR has also been inputted into MDW.

Riding Quality		
[illegible]	[illegible]	Guidelines
10	Excellent	Very smooth ride
7 - 9	Good	Smooth ride with a few bumps or depressions
4 - 6	Fair	Still comfortable ride with intermittent bumps or depressions
2 - 3	Poor	Uncomfortable ride with frequent bumps or depressions
1	Very Poor	Uncomfortable ride with constant bumps or depressions resulting in rattle and shake of rating vehicle; cannot maintain posted speed and must steer constantly to avoid bumps or depressions

The PCI is used as a guide for rehabilitation and maintenance decisions. A higher number indicates a better road condition. The table below provides a guideline for the improvements required for various road classifications. Using the PCI can help identify trigger points for preventive maintenance that can stop a road from deteriorating to the point that it needs expensive rehabilitation. It is based on ride comfort at posted speeds and surface conditions such as potholes, washboard, wheel rutting, or distortion.

86 - 100	81 - 100	81 - 100	Adequate
76 - 85	71 - 80	66 - 80	6 to 10 years
56 - 75	51 - 70	46 - 65	1 to 5 years
50 - 55	45 - 50	40 - 45	Rehabilitate within 1 year
0 - 49	0 - 44	0 - 39	Reconstruct within 1 year

5.4 ASSET NEEDS

The performance deficiencies and recommended work have been identified in the table below. GENIVAR's opinion of probable cost for treatments is also included. According to "Bank of Canada" (www.bankofcanada.ca), Canada's current inflation is 0.4% (April 2013). This rate was applied towards the total recommended work in the near future. It is understood that the Municipality of Shuniah budgets approximately $800,000 per year for capital expenditure work.

For the structures table, please note "Maint." refers to maintenance; this is where the municipality's road crew may complete the recommended work under the operations budget and not the capital expenditure budget.

To highlight the roads in worst conditions, the road assets are sorted from smallest to largest PCI.

3.4.1 Structures

Asset ID	Name	Type	BCI	Remaining Useful Life (years)	Estimated Current Year Value	Condition	Recommended Work	Year	Year 2 Work	Year 3 Work
SB-01	Isku Park Rd	Bridge	94	47	$307,776	Good	Clean/remove granular	Maint.		
							Attach wooden post blocking to structure at northwest corner	Maint.		
							Fix potholes at approaches	$300		
SB-02	Bass Lake Rd	Bridge	64.31	32	$36,667	Fair	Replace damaged posts		$1,500	
							Tighten loose bolts	Maint.		
SB-03	McKenzie Station Rd	Bridge	65.33	33	$257,778	Fair	Gravel approaches require grading	Maint.		
							Replace guiderail section		$1,500	
							Replace southeast object marker sign	$150		
SB-04	East Loon Lake Rd	Bridge	63.42	32	$35,000	Fair	Detailed timber investigation	$1,000		
							Relocate south approach load posting sign	Maint.		
SB-05	Road No. 5 North	Bridge	69.31	35	$51,875	Fair	Clean granular from bottom flange of girders	Maint.		
							Tighten loose nuts at all posts	Maint		

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
							Remove granular from timber wearing surface	Maint.	
							Replace wearing surface		$20,000
							Switch southwest and southeast object marker signs	Maint.	
							Install missing narrow bridge sign at east approach	Maint.	
SB-06	Wildgoose Creek	Culvert	84.82	42	$173,609	Good	Replace broken wooden post blocking on north guiderail center post	Maint.	
SB-07	Blind Creek	Culvert	73.17	37	$27,400	Good	Remove trees growing on culvert		$5,000
							Replace existing concrete retaining wall at south with rock protection		$5,200
SB-08	Mitchell Rd	Bridge	86.22	43	$61,667	Good	Replace missing/damaged wooden post blocking. Tighten bolts	Maint.	
							Replace railing system			$9,000
							Additional rock protection required over exposed geotextile		$1,200	
							Reinstall signs on posts	Maint.	

Asset ID	Name	Type	BCI	Remaining Useful Life (years)	Estimated Current Year Value	Condition	Recommended Work	1 Year	10 Year	25 Year
							Remove granular on all structural steel components and wearing surface	Maint.		
SB-09	Walkinshaw Creek	Bridge	48.01	24	$132,000	Poor	Replace superstructure		$100,000	
SB-10	Amethyst Ave	Bridge	56.77	28	$42,600	Poor	Patch potholes		$1,200	
							Attach southeast railing to post. Tighten all connections.	Maint.		
SB-11	Compressor Station Rd	Culvert	94.33	47	$283,000	Good	None			
SB-12	Silver Beach Rd	Bridge	73.28	37	$37,000	Good	Place rock protection in front of abutments		$2,400	
							Total	$1,600	$138,000	$9,000
							Total with 0.04% inflation		$140,782	$9,181

5.4.2 Roads

Asset ID	Name	Type	PCI	Length (km)	Remaining Useful Life (years)	Estimated Current Year Value	Distress Manifestation	Recommended Work	1 Year	[illegible]	[illegible]
R-0004-0	Copenhagen Road	HCB	43	1.9	6.45	$161,000	Distortion Longitudinal wheel cracking Ravelling & loss of aggregate	Cold milling with machine patching	$375,000		
R-0043-2	Nelson Drive (HCB)	HCB	54	0.9	8.1	$96,000	Edge cracking Distortion Longitudinal wheel cracking	Manual chip seal		$27,000	
R-0065-0	Amethyst Harbour Bailey Point Ave.	HCB	56	0.2	8.4	$2,302	Longitudinal wheel cracking Edge cracking	Manual chip seal		$6,000	
R-0058-0	Walkinshaw Road	Gravel	60	2.2	9	$96,000	Loose gravel Washboard	Dragging & rolling		$14,300	
R-0061-0	Cedar Bay Road	Gravel	65	0.15	9.75	$483	Distortion Rutting	Dragging & rolling		$800	
R-0050-1	Road No5 South (Surf Treat)	High Float	66	0.7	9.9	$8,069	Loss of cover aggregate Edge cracking	Manual chip seal			$21,000

Section ID	Name	Type	PCI	Length (km)	Remaining Useful Life (Years)	Estimated Current Year Value	Distress Manifestation	Recommended Work	1 Year	5 Year	10 Year
R-0012-0	Hampton Drive	HCB	69	1	10.35	$106,000	Ravelling & loss of aggregates Centreline cracking	Manual chip seal			$22,500
R-0011-0	Alder Road	HCB	71	0.5	10.65	$137,000	Longitudinal wheel cracking Edge cracking Transverse cracking	Manual chip seal			$7,500
R-0028-0	Coral Bay Road	HCB	71	0.75	10.65	$25,213	Ravelling & loss of surface aggregate Longitudinal wheel cracking Edge cracking	Manual chip seal			$22,500
R-0005-0	Isku Park Road	Gravel	72	0.8	10.8	$3,973	Flat/reverse crown Potholes Washboard	Dragging & rolling Grading & addition of gravel			$2,800
R-0050-2	Road No5 South (Gravel)	Gravel	75	12.3	11.25	$37,677	Loose Gravel Distortion	Dragging & rolling			$43,100
R-0056-2	McConnell Road (South)	Gravel	75	0.35	11.25	$518	Potholes Rutting	Dragging & rolling			$700

Asset ID	Name	Type	PCI	Length (km)	Remaining Useful Life (years)	Estimated Future Work Value	Distress Manifestation	Recommended Work	1st Year	2nd Year	Total
R-0029-2	Coral Bay Drive (HCB)	HCB	76	2.2	11.4	$20,000	Longitudinal wheel cracking Rippling & shoving	Cold milling with machine patching			$57,200
R-0035-0	Sunnyside Beach Avenue	HCB	77	1.2	11.55	$10,666	Cracking	Rout & seal			$2,400
R-0069-0	Grann Drive	Gravel	78	5.8	11.7	$22,924	Potholes Washboard	Dragging & rolling			$11,600
R-0047-3	West Loon Drive (Gravel 2)	Gravel	79	2.8	11.85	$73,452	Potholes Washboard	Dragging & rolling			$9,800
R-0043-1	Nelson Drive (Gravel)	Gravel	80	1.2	12	$6,791	Potholes Washboard	Dragging & rolling			$4,200
R-0052-0	Bak Road	Gravel	80	0.25	12	$15,000	Loose Gravel	Dragging & rolling			$900
R-0060-0	Superior Shores Road	Gravel	80	10.4	12	$603,000	Potholes Washboard	Dragging & rolling			$20,800
R-0007-1	Compressor Station Road (Gravel 1)	Gravel	81	2.2	12.15	$13,284	Loose gravel Rutting	Dragging & rolling			$7,700
R-0067-0	Knobel Point	Gravel	82	0.2	12.3	$12,000	Pothole Distortion	Dragging & rolling			$400

Asset ID	Name	Type	PCI	Length (km)	Width (m)	Estimated Value ($)	Distress Manifestation	Recommended Work	Year	Cost	Cost
R-0007-2	Compressor Station Road (HCB)	HCB	83	0.25	12.45	$42,000	Ravelling & loss of surface aggregate	Hot-mix asphalt resurfacing			$19,200
R-0014-0	East Floral Beach Road	Gravel	83	0.2	12.45	$12,000	Potholes Washboard				$400
R-0030-0	Mackenzie Beach Road	HCB	83	1.1	12.45	$25,952	Cracking	Manual patching			$3,500
R-0036-0	Amethyst Harbour Road	HCB	83	0.8	12.45	$13,333	Edge cracking Transverse cracking	Manual chip seal			$18,000
R-0045-2	Mackenzie Heights Road (Gravel 1)	Gravel	83	0.75	12.45	$46,000	Loose gravel Distortion	Dragging & rolling			$1,500
R-0056-1	McConnell Road (North)	Gravel	83	0.7	12.45	$42,000	Loose gravel Dust	Dragging & rolling			$1,400
R-0057-0	Otte Road	Gravel	83	1	12.45	$61,000	Rutting Distortion				$2,000
R-0059-0	Pearl Bay Road	Gravel	83	0.5	12.45	$2,775	Potholes				$1,000
R-0048-2	East Loon Road (Gravel)	Gravel	84	2.7	12.6	$9,124	Rutting Distortion	Dragging & rolling			$9,500
R-0002-2	Mackenzie Station Road North	Gravel	85	2.5	12.75	$24,077	Loose gravel Washboard	Dragging & rolling			$8,800

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R-0008-0	Mount Baldy Road	Gravel	85	2.2	12.75	$16,832	Loose gravel Washboard	Dragging & rolling			$4,000
R-0020-0	Haugen Road	HCB	85	0.6	12.75	$12,355	Transverse cracking	Rout & seal cracks			$1,200
R-0037-0	Amethyst Harbour South Bay Ave.	HCB	85	0.7	12.75	$17,529	Meander cracking Transverse cracking	Rout & seal cracks			$300
R-0063-0	Amethyst Harbour Cliff Avenue	HCB	85	0.3	12.75	$4,917	Distortion Centreline cracking	Rout & seal cracks			$100
R-0002-1	Mackenzie Station Road South	HCB	86	0.4	12.9	$9,598	Edge cracking	Manual chip seal			$9,000
R-0041-0	O'Connor Point	Gravel	86	0.2	12.9	$1,388	Loose gravel potholes	Dragging & rolling			$400
R-0031-0	Mackenzie Beach Avenue	HCB	87	2.7	13.05	$80,328	Pothole Cracking	Manual patching Rout & seal cracks			$4,300
R-0022-0	Grandview Beach Road	HCB	88	0.1	13.2	$663,840	Edge cracking	Manual chip seal			$1,500
R-0032-0	Crystal Beach Road	HCB	88	0.25	13.2	$4,148	Transverse cracking	Rout & seal cracks			$100

Asset ID	Road	Type	PCI	Length (km)	Surface Width (m)	Estimated Current Value	Distress Manifestation	Recommended Work	Year	Cost	Budget
R-0046-0	West Loon Road	HCB	88	1	13.2	$16,818	Pothole Edge cracking	Manual patching			$3,200
R-0055-0	Duncan Avenue	Gravel	88	0.5	13.2	$33,000	Loose gravel Dust	Dragging & rolling			$1,800
R-0001-0	Lakeshore Drive	HCB	89	16.6	13.35	$2,669,085	Cracking	Rout & seal cracks			$5,000
R-0006-0	Mitchell Road	Gravel	89	2.2	13.35	$16,495	Washboard Rutting	Dragging & rolling			$4,400
R-0007-3	Compressor Station Road (Gravel 2)	Gravel	89	0.6	13.35	$271,550	Loose gravel Washboard	Dragging & rolling			$2,100
R-0009-0	Trowbridge Road	Gravel	89	2.9	13.35	$188,000	Loose gravel Washboard	Dragging & rolling			$5,800
R-0038-1	Amethyst Avenue	Gravel	89	0.5	13.35	$88,000	Dust Potholes	Dragging & rolling			$1,000
R-0044-0	Nelson Point	Gravel	89	0.1	13.35	$7,000	Potholes Rutting	Dragging & rolling			$400
R-0047-1	West Loon Drive (Gravel 1)	Gravel	89	0.5	13.35	$10,975	Loose gravel Potholes	Dragging & rolling			$1,000
R-0048-1	East Loon Road (HCB)	HCB	89	0.7	13.35	$10,813	Mid-lane cracking	Manual chip seal			$10,500

Asset ID	Name	Type	PCI	Length (km)	Remaining Useful Life (years)	Estimated Current Year Value	Distress Manifestation	Recommended Work	1 Year	5 Yr	10 Yr
R-0010-0	North Star Road	HCB	90	0.25	13.5	$24,944	Distortion Cracking	Manual patching			$800
R-0033-0	Crystal Beach Avenue	HCB	90	1.4	13.5	$249,000	Cracking	Rout & seal cracks			$300
R-0053-0	Bass Lake Road	HCB	90	1.7	13.5	$112,000	Ravelling & loss of surface aggregate Rippling & shoving	Manual patching			$5,400
R-0038-2	Amethyst Avenue	HCB	91	0.8	13.65	$20,740	Cracking	Rout &seal cracks			$200
R-0039-1	Birch Beach Road (HCB)	HCB	91	1.1	13.65	$89,690	Transverse cracking Ravelling & loss of surface aggregates	Rout & seal cracks			$200
R-0040-2	Eldorado Beach Road (Gravel)	Gravel	91	1.25	13.65	$7,641	Loose gravel Rutting	Dragging & rolling			$2,500
R-0045-3	Mackenzie Heights Road (Gravel 2)	Gravel	91	0.3	13.65	$20,000	Loose gravel Dust	Dragging & rolling			$600
R-0018-0	Wild Goose Bay Road	Gravel	92	0.1	13.8	$7,000	Loose gravel Washboard	Dragging & rolling			$200

Asset ID	Name	Type	PCI	Length (km)	Remaining Useful Life (years)	Estimated Current Year Value	Distress Manifestation	Recommended Work	3 Years	5 Years	
R-0039-2	Birch Beach Road (Gravel)	Gravel	92	2.6	13.8	$174,000	Loose gravel Rutting	Dragging & rolling			$7,800
R-0040-1	Eldorado Beach Road (HCB)	HCB	92	1	13.8	$182,000	Centreline cracking Flushing	Rout & seal cracks			$1,600
R-0051-0	Community Hall Road (Pass Lake East Rd)	Gravel	92	5.4	13.8	$361,000	Loose gravel Dust	Dragging & rolling			$10,800
R-0068-0	Amethyst Harbour North Bay Avenue	HCB	92	0.6	13.8	$9,382	Edge cracking Transverse cracking	Rout & seal cracks			$200
R-0003-0	Spruce River Road	HCB	93	1.2	13.95	$192,805	Cracking	Rout & seal cracks			$2,400
R-0017-0	Pebbly Beach Road	HCB	93	0.09	13.95	$6,249	Ravelling & loss of surface aggregate	None			
R-0019-0	Blind Creek Drive	Gravel	93	0.7	13.95	$3,829	Loose gravel Rutting	Dragging & rolling			$2,500
R-0029-1	Coral Bay Drive (Gravel)	Gravel	93	0.5	13.95	$34,000	Loose gravel Dust	Dragging & rolling			$1,000
R-0062-0	Scott Drive (HCB)	HCB	93	2.2	13.95	$37,418	Cracking	Rout & Seal			$2,600

Asset ID	Name	Type	PCI	Length (km)	Remaining Life (years)	Estimated Current Year Value	Distress Manifestation	Recommended Work	4 Years	5 Years	
R-0049-0	Road No5 North	HCB	94	0.55	14.1	$13,036	Manual patching Rout & seal cracks				$1,800
R-0054-0	Bryan Avenue	Gravel	94	0.3	14.1	$21,000	Loose gravel Dust	Dragging & rolling			$600
R-0066-0	Amethyst Harbour Store Avenue	HCB	94	0.25	14.1	$3,447	Edge cracking Transverse cracking	Rout & seal cracks			$100
R-0013-0	Clover Road (North)	Gravel	95	0.39	14.25	$28,000	Loose gravel Rutting	Dragging & rolling			$800
R-0034-0	Sunnyside Beach Road	HCB	95	0.25	14.25	$43,343	Ravelling & loss of surface aggregate	None			
R-0024-0	Silver Beach Road	HCB	96	0.6	14.4	$113,571	Edge cracking	Manual chip seal			$4,500
R-0042-0	Nelson Road	Gravel	96	1.4	14.4	$8,634	Dust	None			
R-0016-0	Charles Road	Gravel	97	0.3	14.55	$21,000	Loose gravel	None			
R-0021-0	Sunrise Beach Drive	HCB	97	0.9	14.55	$64,000	Ravelling & loss of surface aggregate Random cracking	None			
R-0023-0	Grandview Beach Drive	HCB	97	0.35	14.55	$1,424	Transverse cracking	Rout & seal cracks			$100

Asset ID	Name	Type	PCI	Length (km)	Area (sq. m)	Estimated current year value	Distress Manifestation	Recommended Work	1st Year	2nd Year	3rd Year
R-0026-0	Silver Harbour Road (HCB)	HCB	97	1.2	14.55	$289,215	Centreline cracking	Rout & seal cracks			$200
R-0027-0	Silver Harbour Drive	HCB	97	0.35	14.55	$25,000	Adequate	None			
R-0064-0	Amethyst Harbour East Bay Avenue	HCB	97	0.4	14.55	$6,254	Transverse cracking	Rout & seal cracks			$100
R-0025-0	Silver Beach Drive	HCB	99	1.35	14.85	$97,000	Centreline cracking	Rout & seal cracks			$300
R-0045-1	Mackenzie Heights Road (HCB)	HCB	99	0.5	14.85	$98,000	Flushing	None			
R-0047-2	West Loon Drive (Surf Treat)	High Float	99	0.3	14.85	$59,000	Adequate	None			
R-0015-0	Green Point Road	Gravel	100	0.1	15	$8,000	Adequate	None			
								Total	$375,000	$48,100	$412,000
								Total with 0.4% inflation		$49,070	$428,780

It must be recognized that the recommended work given as the remedial measure for a particular distress manifestation is not necessarily the ultimate remedy, nor will the treatment necessarily effectively correct the cause or causes of the distress. The recommended work may only slow distress deterioration.

Patching will cover and temporarily disguise pavement distress. However, detailed investigations on the extent and type of patching, when reviewed over a period, will indicate whether the pavement deficiency is due to structural inadequacy, faulty materials, or some other cause.

The following is GENIVAR's professional opinion of probable unit costs for the recommended work. These estimates include material and labour.

- Dragging & rolling, $10,000/km
- Rout & seal cracks $2/m
- Patching $5/m^2
- Cold milling with machine patching $130,000/km
- Manual chip seal $75/m^2

4. RECOMMENDATIONS

4.1 NON-INFRASTRUCTURE SOLUTIONS

Non-infrastructure solutions can produce lower, more sustainable costs in maintaining existing assets. Non-infrastructure solutions include solutions that do not include the physical repairs of the assets. It is an organizational approach that will aid in the future by lowering cost, having organized data, saving time, and therefore resulting in efficiency. Inspection reports should identify the maintenance work required, within a timeframe for the work, and an opinion of probable cost. To extend the service life of an asset, the municipality should use the information acquired from the inspections to update their financial plan accordingly and ensure that the plan is implemented. For this municipality, it is recommended that staff personnel be trained in using their asset management software, Municipal DataWorks. MDW is a management tool that stores the asset's historical data and provides an organized future path forward.

Municipal DataWorks is a powerful tool dedicated solely to asset management. It has capabilities to analyze and determine condition indexes, current values, useful lives, and much more on a variety of asset types. There are many municipalities that have adopted this management system and tutorial videos are available online and through the developers. GENIVAR has also given the Municipality of Shuniah a CD containing all the tutorial videos and manuals on MDW. The software has the capabilities to store data and show the attributes of an asset, show the condition of an asset and track repairs, and turn data into information useable by policy-makers in understanding the level of investment required to maintain infrastructure.

It is important to accurately keep the Municipal DataWorks up to date; or the municipality increases the risk of having inconsistent and inaccurate information produced. This would make the value of assets incorrect and future values very difficult to determine. It also compromises any other asset information such as construction costs, replacement information, or useful life.

Mr. Brian Anderson (brian@ogra.org) of the Ontario Good Roads Association (OGRA) is the primary contact for Municipal DataWorks technical support, and will be able to assist the Municipality if needed.

5.2 MAINTENANCE ACTIVITIES

Regular maintenance is essential to managing municipal assets. The expected level of service often relies on maintenance activities. It is imperative that the municipality schedules regular inspections for their assets. Inspectors identify the needs for maintenance work and the required timeframe. They will also identify if immediate action should be taken to address any safety concerns. Regular maintenance can add significant life to assets and save the municipality money. Routine maintenance and minor repair work to an element can be normally performed without professional engineering direction.

All 12 bridges are to be inspected every two years; this will cost approximately $15,000 biennially. It is also suggested that roads are to be inspected every three years; which will cost approximately $20,000 per inspection. GENIVAR recommends inspections be carried out in late spring or in summer for a more detailed and accurate result. The information regarding the characteristics, value, and condition of assets should be updated into MDW after every inspection.

5.2.1 Structures

Preventative actions can have substantial impacts on the life and preservation of the assets. Sand and debris trap moisture and when removed from the structure, it can prevent damages to significant elements. Bridge maintenance may include:

- Repairing impact damage or deterioration
- Ensuring deck drainage is free of debris
- Tightening railing systems to posts
- Regularly removing debris and sand from joints and bearings
- Removing obstructions restricting water flow
- Correcting bumps and depressions occurring at the approaches

4.2.2 Bituminous Surfaces

The major objectives for maintaining bituminous surfaces are to provide a smooth, safe riding surface free from defects, eliminate hazards to traffic, and protect the investment in the road surface. The maintenance may include:

- Repairing areas susceptible to water ponding
- Correcting bleeding surfaces constituting a hazard to the road user
- Providing drainage to decrease or prevent frost heaving and washouts
- Eliminating the cause for prolonged water ponding to a depth greater than 50 mm

4.2.3 Gravel Surfaces

The major objectives for maintaining gravel surfaces are also to provide a smooth, safe riding surface free from defects, eliminate hazards to traffic, and protect the investment in the road surface. The maintenance may include:

- Signing/flagging soft wet areas, such as frost boils that move under traffic until the problem is rectified
- Removing rocks greater than 50 mm in diameter that heaved to the surface by frost action or grading
- Maintaining a crown with a crossfall of approximately 2%
- Removing gravel windrows in excess of 100 mm at the outside edge of the road or at intersections
- Applying calcium chloride annually for dust control (0.6 kg/m^2)

The main objectives are to reduce the hazards of icy road conditions to motorists, economic losses to the community caused by workers not being able to get to their job, and to facilitate the handling of emergency services. The level of service is provided in the table below.

Plow	Yes	Yes
Standards	As bare as possible	As bare as possible
Expected Time of Completion	Within 7 hours from time ploughing begins	Within 36 hours from time ploughing begins
Snow Pickup	To maintain traffic capacity	To maintain one passable lane as required
Salt	Yes if required	Yes if required
Sand	Yes	Yes
Remarks	Important	Devote effort to these roads only after other levels are assured, excepting icy hills and bridges shall receive attention as required

4.2 REHABILITATION ACTIVITIES

Rehabilitation of the assets is necessary when the levels of service do not conform to the standards. Significant repairs designed to extend the life of the asset are determined at every inspection. It is essential to schedule the regular inspections to monitor the asset's conditions.

The rehabilitation activities determined from the field inspection are provided below. The work recommended will improve the asset's rating and help ensure that the asset provides the desired level of service.

Rehabilitation over replacement is advantageous when there are only few components that need repair. Occasionally, the number of repairs is too extensive and rehabilitation is deemed unfeasible. This judgement is different for every case and sometimes replacement is the more cost effective alternative when considering future repairs.

4.3 Structures

[illegible] ID	[illegible] Name	[illegible] Type	[illegible] (m)	[illegible] Work
SB-02	Bass Lake Rd	Bridge	64.31	→ Replace damaged posts
SB-03	McKenzie Station Rd	Bridge	65.33	→ Replace guiderail section
SB-05	Road No. 5 North	Bridge	69.31	→ Replace wearing surface
SB-07	Blind Creek	Culvert	73.17	→ Remove trees growing on culvert → Replace existing concrete retaining wall at south with rock protection
SB-08	Mitchell Rd	Bridge	86.22	→ Replace railing system → Additional rock protection required over exposed geotextile
SB-09	Walkinshaw Creek	Bridge	48.01	→ Replace superstructure
SB-10	Amethyst Ave	Bridge	56.77	→ Patch potholes
SB-12	Silver Beach Rd	Bridge	73.28	→ Place rock protection in front of abutments

Rehabilitation is undertaken to do the following:

- Seal the surface to prevent water from getting down into the susceptible layers
- Smooth the roughened surface
- Remove the cause of the bump or hole
- Strengthen the structurally inadequate section

Priority for work carried out on a bituminous surface is to be in the following order; arterial roads, collector roads, and then residential streets. Below shows two assets for examples. See section 3.4.2 for details.

R-0043-2	Nelson Drive	54	- Edge cracking - Distortion - Longitudinal wheel cracking	- Manual chip seal
R-0065-0	Amethyst Harbour Bailey Point Ave	56	- Longitudinal wheel cracking - Edge cracking	- Manual chip seal

General rehabilitation activities may include:

- Sealing cracks wider than 25 mm
- Correcting depressions or bumps greater than 50 mm over a distance of 3 m or less
- Correcting ruts or corrugations greater than 25 mm deep in the wheel paths
- Repairing surface alligatoring or checking. Conditions causing extensive areas of these deficiencies shall be investigated and corrected
- Repairing broken pavement edges, potholes, breaks or raveled areas longer than 75 mm in diameter
- Correcting severe surface polishing causing excessively slippery conditions

It should be understood that the recommended work suggested for gravel roads are short-term. Below are two assets, for example. See section 3.4.2 for details.

R-0058-0	Walkinshaw Road	60	→ Loose gravel → Washboard	→ Dragging & rolling
R-0061-0	Cedar Bay Road	65	→ Loose gravel → Rutting	→ Dragging & rolling

General rehabilitation activities may include:

- Correcting the causes of water lying on the surface of the road
- Repairing potholes in excess of 100 mm in depth
- Correcting washboard conditions (corrugations)

4.4 Replacement

Replacement is considered when extensive damage or deterioration has occurred to the asset. Replacing assets is sometimes costly and requires considerable additional review; such as detailed investigations. These activities are expected to occur once an asset has reached the end of its useful life and renewal/rehabilitation is no longer an option.

4.4.1 Structures

No structures are required to be replaced; however, it is recommended for a bridge to undergo a detailed timber investigation

ID	Name	Type	Length	Action
SB-04	East Loon Lake Rd	Bridge	63.42	→ Detailed timber investigation

It was identified that the interior deck soffit has several longitudinal members that are cracked and split. There was also separation of the nail and the laminates, and some deterioration. Water may easily enter and start decaying the timber.

A detailed timber investigation can identify the condition of the timber and determine whether or not the deck will need replacement in the near future.

4.4.2 Surface Distress

The density and severity of the distresses were high and the cause may be in the subgrade. Therefore, GENIVAR recommends a replacement of this asset.

ID	Name	Length	Distress	Action
R-0004-0	Copenhagen Road	43	→ Distortion → Longitudinal wheel cracking → Ravelling & loss of aggregate	→ Cold milling with machine patching

4.4 DISPOSAL ACTIVITIES

There is no disposal activity anticipated; as the assets generally meet the level of service expected.

The level of service defines the current and future operating conditions of assets using qualitative measures. The operating conditions and level of service are normally defined by the municipality, and the characteristics generally include speed, travel time, delay, traffic interruptions, and convenience.

The level of service also describes what the governing body, 'customer' or community wants, how much it will cost to achieve, and whether it is affordable. Therefore, the levels of service should be specific and measureable, and linked to the strategic objectives and outcomes of the municipality.

4.5 OVERVIEW OF RISKS

Understanding risks is important to the safety and functionality of the community as it relates to its infrastructure. Having assets perform at the expected level of service is important for the municipality. If the assets have to shut down or are compromised, it becomes inconvenient for all.

Condition Index BCI 48.01	Walkinshaw Creek Bridge (SB-04) requires superstructure replacement	Bridge closure will block access to residences north of bridge	Current load limit: 10/17/24 tonnes	Replace superstructure with a modular bridge for faster erection
Condition Index BCI 56.77	Amethyst Ave Bridge's (SB-10) railing system is not attach to posts	Pedestrians may fall into stream if they lean against railing system	None	Attach railing to posts and tighten all connections
Condition Index PCI 48.01	Copenhagen Road (R-0004-0) requires reconstruction	Drivers will take detours to get around the construction	Load restriction in effect: 5 tonnes per axle	Cold milling with machine patching

5 FINANCIAL STRATEGY

A management strategy of planned actions will enable the assets to provide the desired levels of service and extend their useful lives. The values of the past two years were found in the "Statement of Revenue and Expenditures" provided by the Municipality of Shuniah. This forecast will help the municipality prepare for expenses associated with maintenance, rehabilitation, and replacement costs. The following demonstrates the work recommended and GENIVAR's opinion of probable costs; categorized by 1 year, 1 - 5 years, and 6 - 10 years timeframes.

5.1 EXPENDITURE FORECASTS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Non-infrastructure solutions	-	-	-	-	$49	-
Maintenance activities	Bridges	-	$30,000	$45,000	-	$5,638
	Roads	-	$20,000	$40,000	$40,325	$449,545
Renewal/ rehabilitation activities	Bridges	$600	$138,000	$9,000	-	-
	Roads	-	$48,100	$412,000	$162,312	$14,898
Replacement activities	Bridges	$1,000	-	-	-	-
	Roads	$375,000	-	-	$345,432	$39,446
	Total	$376,600	$236,100	$506,000	$548,118	$509,526
Total with 0.4% inflation applied		-	$240,860	$516,201	-	-

It is understood that the Municipality of Shuniah budgets approximately $800,000 per year for capital expenditure work; approximately $500,000 of which they spend on roads and bridges. The assets are well maintained and are meeting the level of service expected. No significant funding shortfalls relative to financial requirements have been identified. See section 3.4 of this plan for the development of the expenditure forecasts.

6 ADDITIONAL CONSIDERATIONS

6.1 MUNICIPAL REPORTING

GENIVAR recommends that the municipality receives BCI and PCI values at every inspection. These will be an excellent and easy way to monitor the conditions of the assets over the years, and forecast replacement when necessary.

It is also recommended that inspections include recommended work; categorized by 1 year, 1 – 5 years, and 6 – 10 years. If the available funds are not sufficient, then strategic decisions must be made in an effort to maintain the required level of service within the municipality. The work must be prioritized by considering the municipality's level of service expectations.

6.2 PLAN UPDATES

This plan will cover the period from May 2013 to May 2023 with diminishing returns. The financial needs should be updated when regular inspections are completed and when conditions are re-assessed; every 2 years for bridges, and 3 years for roads. It is highly recommended to perform inspections during the spring/summer months for a better representation of the actual conditions.

CONCLUSION

Asset management is one of the most cost effective ways to balance the preservation, upgrade and replacement of assets. The implementation of the plan will provide guidance for the Municipality of Shuniah to meet the asset's level of service and improve the infrastructure over the timeframe of this plan.

GENIVAR encourages the Municipality of Shuniah to continue using MDW for long-term transportation planning, capital program development, and performance accountability. Being aware of the conditions and the total costs will improve the municipality's ability to select options for operations, maintenance, renewal and replacement of roads and bridges.

The investigation undertaken by GENIVAR with respect to this plan and any recommendations made in this plan reflect GENIVAR's professional opinion based on the sites' conditions observed at the time of the inspections and on information available at the time of preparation of this plan. Extrapolation of visual detail data was necessary where there was no access.

This report was prepared by:

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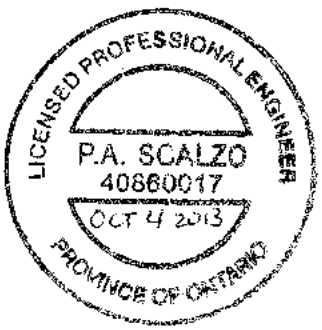
Concurred with:



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