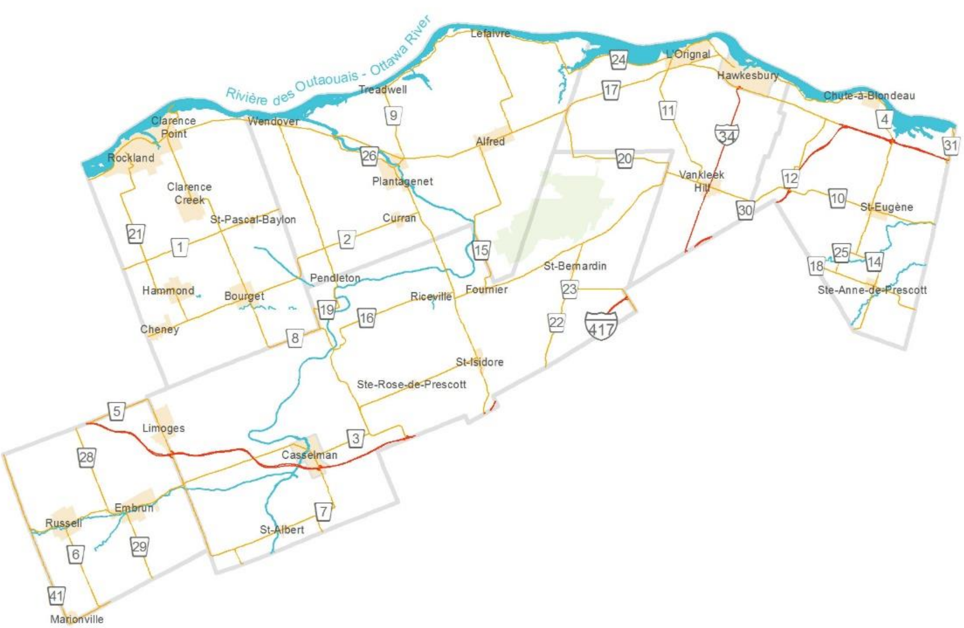
2016

Asset Management Plan



United Counties of Prescott and Russell

6/1/2016

Preface

This Asset Management Plan is intended to describe the infrastructure owned, operated, and maintained by the United Counties of Prescott-Russell (UCPR) to support its core services. It is a compilation of studies and work undertaken by UCPR in its Asset Management implementation over the past few years. The plan is aligned to the content and format described in the Province of Ontario's Guide for Municipal Asset Management Plans.

This Plan was developed by County staff and a joint effort of the following consultants and partners:

- WSCS Consulting Incorporated
- Roads and Structures: David Anderson, CET, 4 Roads Management Services Inc.
- Structures: HP Engineering
- Buildings – Includes Social Housing, Public Works Garages and Emergency Services Buildings - Prepared by ART Engineering Inc.

It is important to note that the plan has been updated and includes the inclusion of building assessments conducted.

This document identifies what has been achieved, what is being done and what needs to be done to ensure core services provided to citizens, business, and institutions attain sustainability. This document provides information regarding the implementation of Asset Management in UCPR which describes the current state of the roads and structures infrastructure with recommendations regarding the next steps to implement a comprehensive approach to asset management across the county. While this document contains some detail, many external documents contain additional levels of detail and are referenced throughout this document.

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1 EXECUTIVE SUMMARY

In the fall of 2012, the Province of Ontario, introduced a requirement for an Asset Management Plan (AMP) as a prerequisite for municipalities seeking funding assistance for capital projects from the province; effectively creating a conditional grant. To qualify for future infrastructure grants, an AMP has to be developed and approved by a municipal council.

This Asset Management Plan has been prepared for the road assets, bridge infrastructure assets, social housing and some other building assets owned by the United Counties of Prescott-Russell to provide services to its citizens. Although UCPR desires to include all of its major infrastructure assets in its plan, it has prioritized its linear assets and some building assets at this point.

The Plan is intended to provide a preliminary reference for renewing, operating, maintaining, building, replacing and disposing of UCPR's road and structure infrastructure assets. As the plan is a living document, it needs to be updated on a regular basis to reflect additional information as well as changing needs. The plan is based on the guidelines provided in the Province of Ontario Ministry of Infrastructure's Building Together Guide for Municipal Asset Management Plans.

This Plan reflects on the current and desired system condition, level of service, optimal asset management and financial strategies based on currently available data and information on the road and bridge assets.

Data Utilized

The following data and studies were utilized to assess UCPR's assets in this report:

1. 2015 PSAB 3150 Tangible Capital Asset information
2. 2015 Road Inspection data uploaded to WorkTech Asset Manager
3. 2015 Bridge Management Study conducted by HP Engineering
4. 2010-2015 Budget and Actual financial information provided by the Finance Department
5. 2014-15 Building Condition Assessment Report of Social Housing, Public Works Garages and Emergency Services Buildings undertaken by Art Engineering Inc.

UCPR's data collection is ongoing and the plan will be updated over time as more data in terms of condition, capacity, expansion and risks are available through ongoing data collection, modelling and master planning programs. This report was commissioned in late 2014 and represents the information available at that time. Additional information was provided for building assessments, roads and structures which were commissioned by the County and updated in 2015. Additional work is required to include all remaining buildings at a later date.

It is important to note that, WSCS did not undertake conditions assessments itself and relied upon the inspection information provided by UCPR and the bridge management study mentioned above. There were some data gaps requiring assumptions. These assumptions are detailed in each section of this report. As additional information is gathered, UCPR is encouraged to update this plan and treat it as a living document. It should be noted that most municipalities are in a similar position with respect to asset condition and level of service information.

1.1 REPLACEMENT COST

Table 1 below provides a summary of the quantity of assets included in the AMP and the replacement costs in 2015.

Asset Type	Length/quantity	Replacement Cost
Roads	**581.25 kms**	**$387,585,033**
Bridges and Culverts (over 3m of span)	**110 structures**	**$125,755,672**
Buildings	**83 Buildings, 319**	**$75,682,527**
Total		**$589,023,232**

Table 1: Replacement costs - 2015

Note for roads: Roads length also includes the total length of all boundary roads which we are responsible for 50% of the cost.

Note for bridges and culverts: The replacement cost includes the full replacement value of boundary road structures however the Counties are only responsible for 50% of those cost. Also note that the Nation Municipality uploaded two (2) structures from the Ste-Catherine Street road transfer, which the replacement cost are not considered since we have not yet obtained current replacement cost values however the length/quantity is considered in the table above for those two (2) structures.

Note for Buildings: Buildings only includes Social Housing, Emergency Services and Public Works Garages. The replacement costs are provided by Art Engineering Inc. and assume that the building elements would be replaced as opposed to the entire building. Therefore, there are some building components that did not include a replacement cost (example: concrete slab on grade costs were not provided as it was assumed it would have a very long life expectancy).

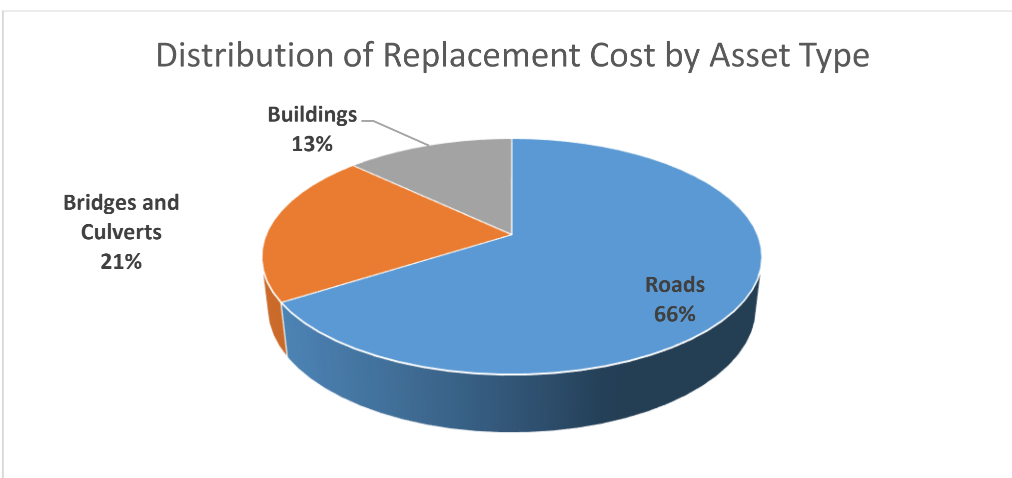


Figure 1: Percentage of Replacement Costs

1.2 CURRENT NEED

In terms of current needs based upon condition and remaining service life analysis, indicates that UCPR needs to invest $14.4 million "now" to replace key infrastructure. Since the annual capital budget from 2011 to 2015 is determined to be a yearly average of $7.85 million for roads, culverts, bridges and $500,000 for buildings there is an existing infrastructure deficit. However, the financial plan in this report will provide for the long term preservation at current levels of service. This is addressed further in this report.

Asset Type	Current need	Percentage of Current Need
Roads	**$ 8,546,666**	**59%**
Bridges & Culverts	**$ 5,560,000**	**39%**
Buildings	**$ 318,227**	**2%**
Total Needs	**$ 14,424,893**	**100%**

Table 2: Current Needs ($ and Percentage of Need)

1.3 COST BY TIME OF NEED

Table 3 shows the required investments over the next 10 years. Over 10 years indicates the total cost of replacement of the assets. However, with a comprehensive asset management approach as outlined in this plan, the combination of repair and maintenance can reduce the cost of replacement or defer reconstruction. This is explored in this report further.

Cost by Time of Need				
Asset Type	**Current need**	**1 to 5 years**	**6 to 10 years**	**Totals 0-10 Years**
Roads	$8,546,666	$16,132,647	$11,475,844	$36,155,158
Bridges and Culverts	$5,560,000	$11,996,000	$3,421,000	$20,977,000
Buildings	$318,227	$3,251,373	$4,726,792	$8,296,392
Total Needs	$14,424,893	$31,380,020	$19,623,636	$65,428,550

Table 3: Replacement/Repair Costs by Time of Need

In assessing the municipality's state of the infrastructure, we examined and graded, both the current condition and remaining service lives of the asset categories as well as the municipality's financial capacity to fund the asset's average annual requirement for sustainability (Funding vs. Need). UCPR's infrastructure ranges in condition by asset type in terms of time of need as shown in Figure 2. It is important to note that these numbers are based on condition assessments that have been completed and aged. Updated condition assessments, particularly for some structures, may result in additional requirements. The recommended approach includes a combination of time of need and replacement planning.

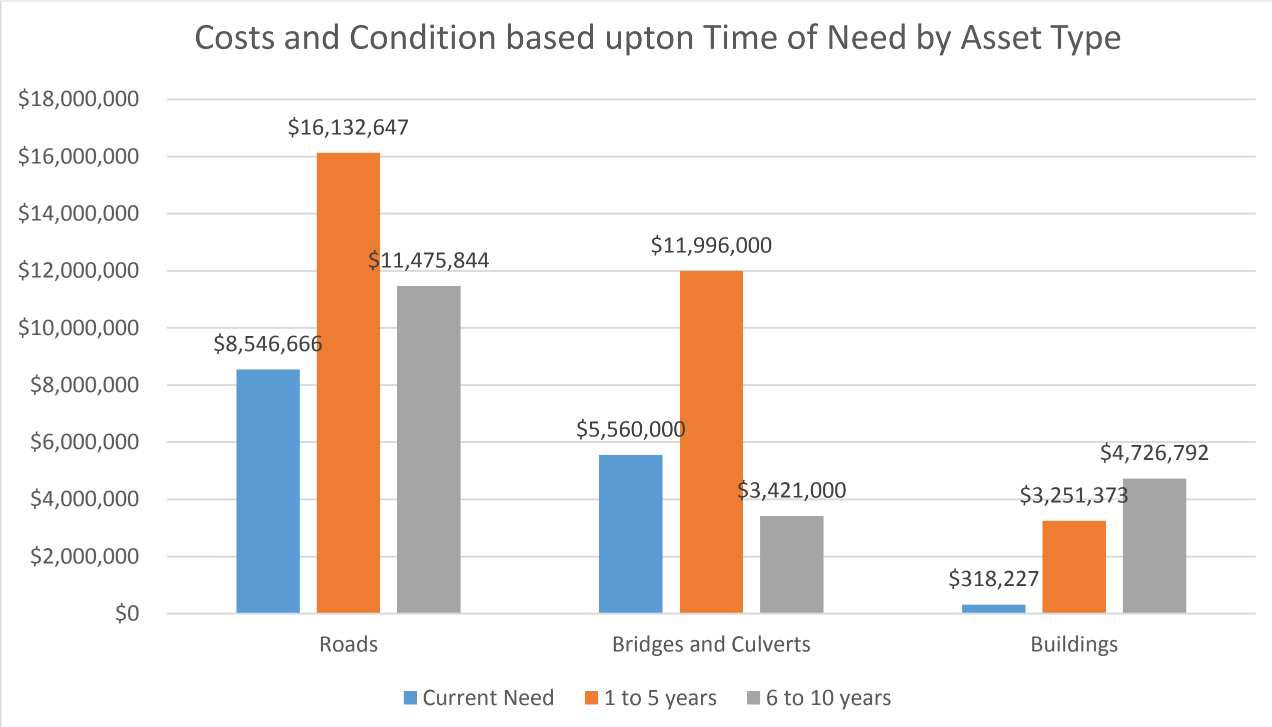


Figure 2: Costs and Condition based on Time of Need by Asset Type

1.4 ROAD SYSTEM SUMMARY

The road system appears to be in good condition from a measure of the System Adequacy. However a significant length of the road system appears to have less than 10 years remaining service life.

Approximately 30.5% (177.4 km) of the road system appears to require improvements (R1,R2, PR1 & PR2). If not addressed, the resurfacing needs will become major rehabilitation or reconstruction needs at significantly greater cost.

Based on the current review of the road system, the current system adequacy measure is 94.5 % meaning that, 5.5% of the road system is deficient in the 'NOW' time period (Poor condition). The current system adequacy is above the minimum target level that was previously established by MTO when conditional grant funding was provided. Figure 3 shows the remaining service life of the road network.

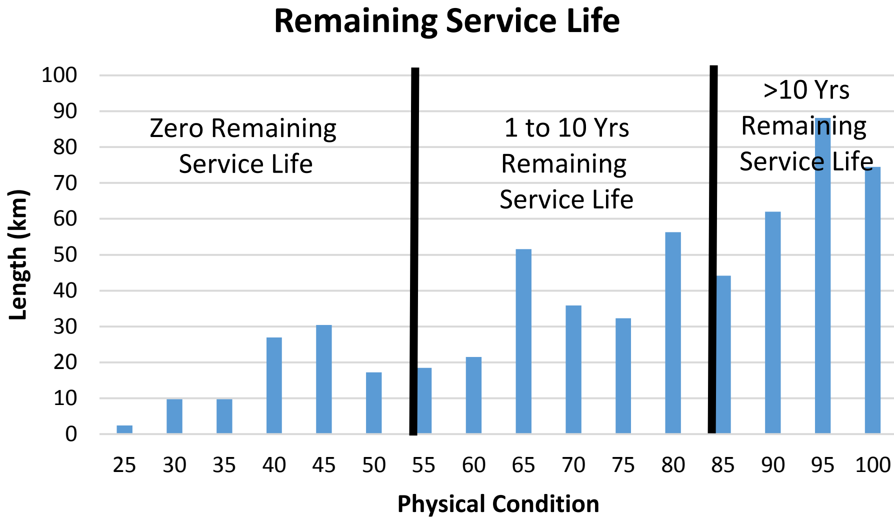


Figure 3: Remaining Service Life

Based on the condition rating of each road section, recommendations are provided in terms of improvement type, cost and time of need. Based on the current unit costs being experienced, the estimated total cost of recommended improvements is **$36,155,158.** The improvement costs include **$8,546,666** for those roads identified as NOW needs and **$27,608,491** is for road work required in the '1 to 10' year time period or for maintenance.

Based on the composition of the road system, budget recommendations have been developed for annual capital and maintenance programs as follows:

- **$7,751,700** for the roads capital/depreciation, excluding resurfacing, based upon a 50-year life cycle. (This would be similar to the PSAB 3150 amortization value using current replacement costs)
- **$5,164,274** for average annual hot mix resurfacing, based upon a 16 (16.3)-year cycle. (This would approximate an average of 34.8 km per year)

For modeling purposes, a funding level described as the 'Preservation Budget' was developed. The Preservation Budget is the total of the recommended funding levels for hot mix resurfacing: $5,164,274. The premise being that if the preservation and resurfacing programs are adequately funded then the system should be sustained. The performance modeling is discussed in depth in this report. To clarify, the required funding level to sustain or improve the road system; it is not the total of all of the above recommendations. Sustainable funding has to be between the Preservation Budget and the Capital Depreciation.

The preservation budget and performance model thereof are computer derived. Intangible values and decisions and the effects of other external forces cannot be incorporated into the model. As such the preservation model is the minimum required to maintain the system- in theory. From a more pragmatic perspective and to deal with the real life realities of maintaining a road system, it should be greater. That being said, the yearly budget recommendation for UCPR is **$7,200,000**.

Municipal pavement management strategies are critical to managing the performance of the road system, more so, if funding is limited. Funding constraints should push the strategy toward those programs that extend the life cycle of the road by providing the correct treatment at the optimum time. Resurfacing, rehabilitation, and preservation projects should be a higher priority than reconstruction projects. The objective is to "keep the good roads good".

1.5 BRIDGES AND CULVERTS SUMMARY

As mentioned above, this plan is based upon the condition assessment contained in the 2015 HP Engineering Report entitled *"Counties of Prescott and Russell; Bridge Management Study Report"*. It is important to note that the report included 41 Bridges and 63 Culverts. Please note that the Counties are not responsible for the inspection of structures located on the City of Ottawa boundary but are accountable for 50% of replacement cost. This includes 3 bridges and 1 culvert shared with City of Ottawa. Also note that the Nation Municipality uploaded two (2) structures from the Ste-Catherine Street road transfer, which the replacement cost are not considered since we have not yet obtained current replacement cost values however the length/quantity is considered in this report for those two (2) structures. That being said, the Counties currently owns 42 bridges and 64 culverts along with four (4) City of Ottawa boundary bridge.

We understand that data and structure condition ratings were completed in accordance with the most current version of the Ontario Structure Inspection Manual (OSIM). Ontario regulations require bi-annual structure appraisals. To assess the condition of the County's bridge network, bridge inspection reports were used. Bridges were classified as Good, Fair and Poor using the Bridge Condition Index (BCI) from the report and the approach outlined in the table below. The Ministry uses the Bridge Condition Index to plan maintenance and repairs. The index does not indicate the safety of a bridge.

The Bridge Condition Index

Bridge condition index

Rating	Maintenance schedule
Good: BCI Range 70 -100	Maintenance is not usually required within the next five years
Fair: BCI Range 60 -70	Maintenance work is usually scheduled within the next five years. This is the ideal time to schedule major bridge repairs to get the most out of bridge spending.
Poor: BCI Less than 60	Maintenance work is usually scheduled within one year.

Figure 4: MTO Bridge Condition Index

Asset Type	Poor	Fair	Good
Bridges	22%	49%	29%
Culverts	38%	22%	40%

Table 4: Bridges & Culverts Condition
(Data from HP Engineering Bridge Management Report 2015)

The 2015 Bridge Management Study (HP Engineering) identifies needs based on benchmarking costing methods and current unit costs being experienced for all structures at **$22,022,000**. The improvement costs include **$5,560,000** for those structures identified as NOW/Urgent needs and **$15,417,000** is for structure work required in the '1 to 10' year time period. Also included is an estimated **$1,045,000** for normal maintenance activities and engineering investigations.

The average age of the bridges is approximately 51 years and the culverts 47 years (where the age is known). Both asset groups had a 50 year design life. However, with appropriate maintenance and rehabilitation a service life of 75 years would not be unreasonable. The average age of the bridge is a significant statistic as there is a significant impact to the municipality from financial and service delivery perspectives. Notwithstanding the life expectancy of structures, other measures may drive the need to replace a structure.

Based on the composition of the structures inventory, budget recommendations have been developed for annual capital and maintenance programs as follows;

- **$2,515,113** for the structures capital/depreciation and maintenance and rehabilitation, based upon an average 50 year design life of the existing inventory ($1,676,742 assuming 75 year service life).
- **$2,201,683** for average minimum annual requirement, based upon the recommendations for the next 10 years as per the 10 Year Asset Management plan from the 2015 HP Engineering Bridge inspection report.

From a more pragmatic perspective and to deal with the real life realities of maintaining structures the yearly budget recommendation for UCPR is **$2,201,683**.

Given the age of the bridges structures there is a potential that the expenditures in the next few years will significantly ***exceed this annualized funding*** level. The funding gap can only be met by increased taxes, funding from reserves or debt financing. Since the annual capital budget from 2011 to 2015 is determined to be a yearly average of $490,000 for structures, there is an existing infrastructure deficit. However, the financial plan in this report will provide for the long term preservation at current levels of service. This is addressed further in this report.

1.6 BUILDINGS SUMMARY

Buildings are generally in good condition but need investments now to address requirements in the next 10 years

The County undertook building condition assessments for its social housing units, public works garages and emergency services buildings. The building inventory assessed is as follows:

Building Category	Total # of Buildings	Total # of Units
Social housing	75	311
Public Works Garages	3	3
Emergency Services	5	5
Grand Total	**83**	**319**

Table 5: Building Inventory - Condition Assessments

The assessments undertaken by Art Engineering Inc. in 2014 were very detailed and broken down into four key building components which shows that the remaining useful life of many of the components exceeds 15-20 years with the exception of interior finishes. The Table below shows the relative life expectancy and remaining life by building category and component.

Building Category	Average of Life Expectancy	Average of Remaining Life
Building Envelope Components	**46**	**29**
Social Housing	47	28
Public Works Garage	46	22
Emergency Services	44	37
Electrical and Mechanical Systems	**26**	**15**
Social Housing	27	14
Public Works Garage	22	8
Emergency Services	26	20
Interior Finishes	**20**	**11**
Social Housing	18	9
Public Works Garage	23	11
Emergency Services	22	15
Site Work Components	**38**	**28**
Social Housing	38	26
Public Works Garage	37	24
Emergency Services	43	35
Grand Total	**33**	**21**

Table 6: Building Components - Remaining Life at 2014

The building components were further broken down into sub-components and priorities were assigned based upon the condition assessment. The priorities were ranked as high, medium and low representing the time of need being 0-1 year for high, 1-5 years for medium and low priority indicating more than 5 years. The assessment revealed that there were only 22 high priority items as shown in the table below:

Building Component	High	Med	Low
Building Envelope Components	12	23	152
Electrical and Mechanical Systems	1	23	93
Interior Finishes		30	118
Site Work Components	9	8	78
Grand Total	**22**	**84**	**441**

Table 7: Assessment by Building Component

The high priority items were primarily identified in Social housing buildings and may represent some risk to the County. The table below summarizes these priorities.

Building Component	High
Social Housing	**16**
Building Envelope Components	**11**
Attic	6
Balconies	5
Electrical and Mechanical Systems	**1**
Electrical Distribution	1
Site Work Components	**4**
Site and Surface Drainage	4
Public Works Garage	**1**
Building Envelope Components	**1**
Superstructure	1
Emergency Services	**5**
Site Work Components	**5**
Concrete Paving	1
Site and Surface Drainage	3
Site and Surface Drainage/Well	1
Grand Total	**22**

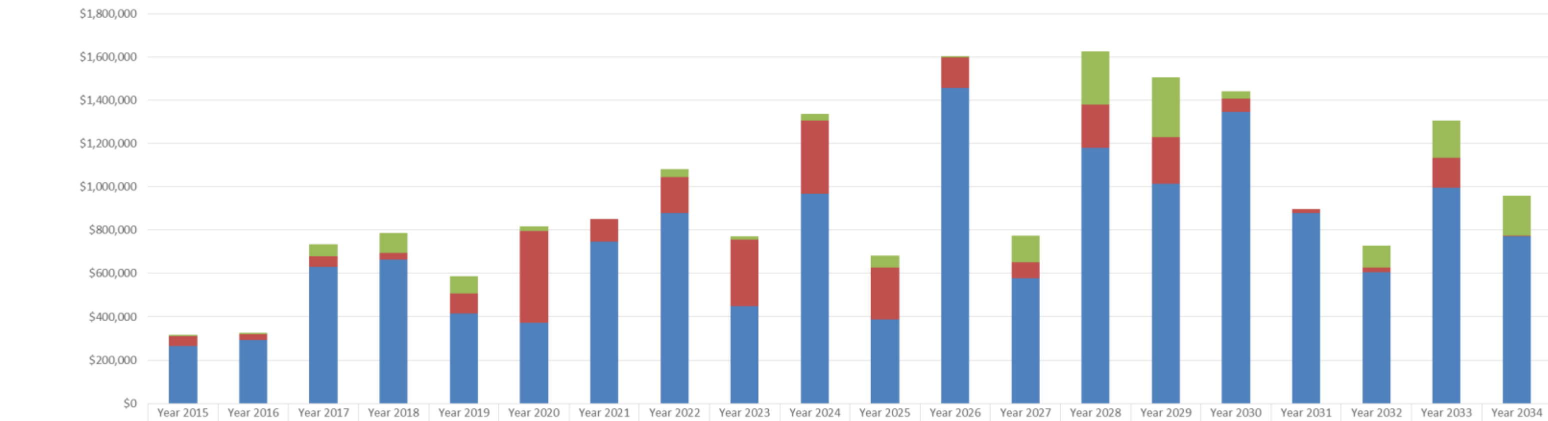
Table 8: High Priority Building Requirements

Based upon the condition assessments, the total needs over 20 years for the social housing, public works and emergency services buildings are as follows:

Building Category	Current Need	Sum of 1-5 years	Sum of 6-10 years	Sum of Over 10 Years	Sum of total needs
Social housing	$263,951	$2,376,953	$3,432,498	$8,829,669	$14,903,072
Public Works Garages	$46,006	$624,213	$1,153,298	$871,769	$2,695,286
Emergency Services	$8,270	$250,206	$140,996	$1,143,191	$1,542,663
Grand Total	**$318,227**	**$3,251,373**	**$4,726,792**	**$10,844,628**	**$19,141,021**

Table 9: Building investment required

The chart below shows the annual investment by year. It is important to note that the costs steadily increase up to 2022 and then are more significant. The average annual investment is $957,050. Therefore it is recommended that an increase in investment occur in the next few years to approach **$1 million** annually with the view to address issues early and reduce long term costs and/or build up the reserves to ensure that the funds are available to perform preventative maintenance and anticipate replacement.



	Year 2015	Year 2016	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021	Year 2022	Year 2023	Year 2024
Emergency Services	$8,270	$5,290	$55,959	$90,550	$77,633	$20,775	$0	$37,667	$15,442	$32,164
Public Works Garages	$46,006	$26,452	$47,127	$32,413	$92,230	$425,991	$104,490	$165,497	$307,093	$337,892
Social housing	$263,951	$293,374	$631,571	$663,445	$416,812	$371,751	$747,537	$880,046	$448,471	$968,549

	Year 2025	Year 2026	Year 2027	Year 2028	Year 2029	Year 2030	Year 2031	Year 2032	Year 2033	Year 2034
Emergency Services	$55,723	$6,592	$121,167	$244,235	$275,020	$35,989	$0	$103,759	$173,657	$182,772
Public Works Garages	$238,325	$140,087	$76,743	$199,050	$216,057	$59,878	$18,038	$19,528	$138,610	$3,778
Social housing	$387,896	$1,457,607	$576,736	$1,181,383	$1,013,868	$1,346,629	$879,318	$606,962	$994,754	$772,411

Values

Figure 5: Building – Financial Plan – 20 Years

1.7 FINANCIAL PLANNING

In order for an AMP to be effectively put into action, it must be integrated with financial planning and long-term budgeting.

The average recommended annual investment for roads and bridges is $9.4 million in order to address the total needs. The average recommend annual investment for buildings is $1 million (this only applies to only major building components and not regular maintenance).

If we maintain the current 2016 budget for the next ten (10) years we will have a shortfall of $21.7 million.

As shown in the report, it is recommended to follow the developed strategy as follow:

- allocate $7.2 million to roads to attain the recommended level of service
- allocate $2.2 million for bridges and culverts to maintain current level of service
- allocate $1 million for buildings to maintain current level of service

Table 10 outlines the recommended allocation based upon current budget of $7.9 million as well as the requirements to meet total needs as well as replacement over 10 years.

Asset	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Grand Total (10 Years)
Roads	7,180,948	7,169,167	7,198,465	7,175,960	7,176,932	7,183,491	7,162,407	7,188,948	7,181,342	7,190,869	71,808,529
Bridges & Culverts	1,511,600	2,511,168	2,701,500	2,150,800	2,064,500	2,119,000	2,152,300	2,241,500	2,147,460	1,376,000	20,975,828
Buildings	325,117	734,657	786,408	586,674	818,516	852,027	1,083,210	771,007	1,338,604	681,945	7,978,165
Total Recommended	9,017,665	10,414,992	10,686,373	9,913,434	10,059,948	10,154,518	10,397,917	10,201,455	10,667,406	9,248,814	100,762,522
Existing budget (2016)	7,900,000	7,900,000	7,900,000	7,900,000	7,900,000	7,900,000	7,900,000	7,900,000	7,900,000	7,900,000	79,000,000
Shortfall	-1,117,665	-2,514,992	-2,786,373	-2,013,434	-2,159,948	-2,254,518	-2,497,917	-2,301,455	-2,767,406	-1,348,814	-21,762,522

Table 10: Recommended Capital Investments – 10 Years

2 INTRODUCTION AND BACKGROUND

2.1 GOALS OF ASSET MANAGEMENT

The overall objectives of the plan are as follows:

- To provide a comprehensive reference for council, managers and UCPR staff for renewing, operating, maintaining, building, replacing and disposing of UCPR's assets;
- To reflect the current and desired system conditions, levels of service and safety; and
- To recommend optimal asset management and financial strategies; and
- To set strategic priorities to optimize decisions; and
- Maximize benefits, manage risks and provide satisfactory levels of service.

2.2 DEVELOPMENT OF THE AMP

The asset management plan was developed through consultations and the culmination of work completed by UCPR over the last year. As UCPR became aware of the need to undertake a comprehensive approach to asset management planning, it engaged consultants to assist in collecting data, performing condition assessments, and developing this strategy.

2.3 AMP-RELATIONSHIP TO OTHER PLANS

An asset management plan is a key component of the municipality's planning process linking with multiple other corporate plans and documents. For example:

- **Strategic Plan** – The strategic plan should guide the AMP in terms of service levels, policies, processes, and budgets defined in the AMP. Currently, UCPR does not have a Strategic Plan. However, it does have an Economic Development Plan among others.
- **Rate Studies**
- **The Official Plan** - The AMP should utilize and influence the land use policy directions for long-term growth and development as provided through the Official Plan.
- **Long Term Financial Plan** - The AMP should both utilize and conversely influence the financial forecasts within the long term financial plan. UCPR does not currently have a long term financial plan but has moved to longer term capital planning.
- **Capital Budget** - The decision framework and infrastructure needs identified in the AMP form the basis on which future capital budgets are prepared.
- **By-Laws**, **standards**, **and policies** - The AMP will influence and utilize policies and by-laws related to infrastructure management practices and standards.
- **Regulations** - The AMP must recognize and abide by industry and senior government regulations.

2.4 REFINEMENT OF THE AMP

The AMP is a living document that should be updated on a regular basis as new information becomes available and as UCPR changes and grows. This plan provides a horizon of the life of the assets but focuses on the next 10 years. Ideally, the plan should be updated every 3-5 years once it is complete.

As well, as infrastructure is replaced, updates to the performance model should be undertaken regularly in order to ensure that the priorities reflect changing condition ratings as well as financial decisions.

2.5 CORPORATE ASSET MANAGEMENT POLICY

Through the development of this plan, all data, analysis, life cycle projections, and budget models were provided through the Worktech software, engineering reports and with the knowledge of County staff. The software and plan will be synchronized, will evolve together, and therefore, will allow for ease of update and annual reporting of performance measures and overall results.

This will allow for continuous improvement of the plan and its projections. It is therefore recommended that the plan be revisited and updated every 3-5 years.

3 STATE OF INFRASTRUCTURE

3.1 INTRODUCTION FOR STATE OF INFRASTRUCTURE

3.1.1 Objective

To identify the state of UCPR's infrastructure today, identify priorities for the near and long term and provide for a financing strategy based upon current funding sources as well as recommendations for change. As well, the report is intended to highlight the current levels of service and a plan to develop the desired levels of service based upon community needs.

3.1.2 Scope

Within this State of the Infrastructure and assets section, the following asset categories are included:

- Road network
- Structures (Bridges and Culverts)
- Buildings (Social services, Public Works Garage and Emergency Services

3.1.3 Approach

The report is based on the seven key questions of asset management as outlined within the National Guide for Sustainable Municipal Infrastructure:

- What does UCPR own? (inventory)
- What is the replacement cost?
- What is the condition / remaining service life of the asset(s)?
- What needs to be done and when? (maintain, rehabilitate, replace)
- How much will it cost?
- What should be done in the future to improve asset management and ensure sustainability?

3.1.4 Data

The base data for the United Counties of Prescott-Russell assets came from various sources with the view to capture the most up-to-date information as follows:

- 2015 PSAB 3150 Tangible Capital Asset information
- 2015 Condition Assessment of the Road Network from UCPR completed in Worktech
- 2015 Bridge Management Study from HP Engineering
- Additional Bridge and Culvert data from WorkTech and spreadsheets from UCPR
- 2014-15 Building Condition Assessment for Social Housing, Public Works Garages and Emergency Services conducted by Art Engineering

3.2 ROADS

3.2.1 Roads – Inventory – What does UCPR own?

This section provides a review and analysis of the road system from a number of perspectives: functional classification, surface types and roadside environment. Road sections within road systems may be classified in a number of ways, to illustrate their roadside environment, surface type, functional classification, and so forth. The classifications provide assistance in developing further information with respect to the road system, such as replacement costs and performance expectations.

On January 1st, 2015, the United Counties of Prescott and Russell road network consisted of 581.25 kilometers of roadways. All of the County's roads are paved with asphalt.

3.2.1.1 Surface Types and Roadside Environment

Roadside environment and surface type criteria of a road section are useful in characterization of the road section, and in determining costs for replacement, reconstruction and rehabilitation treatments.

The Inventory Manual classifies the roadside environment as Rural, Semi-Urban or Urban. The classification is determined by length, servicing, and adjacent land use.

- ***Rural Roads*** – within areas of sparse development, or where development is less than 50% of the frontage, including developed areas extending less than 300 m on one side or 200 m on both sides, with no curbs and gutters.

- ***Semi-Urban Roads*** – within areas where development exceeds 50% of the frontage for a minimum of 300 m on one side, or 200 m on both sides, with no curbs and gutters, with or without storm/combination sewers, or for subdivisions where the lot frontages are 30 m or greater.

- ***Urban Roads*** – within areas where there are curbs and gutters on both sides, served with storm or combination sewers, or curb and gutter on one side, served with storm or combination sewers, or reversed paved shoulders with, or served by, storm or combination sewers, or for subdivisions with frontages less than 30 m.

Roadside Environment				
Surface Type	**Rural (km)**	**Semi-Urban (km)**	**Urban (km)**	**Total (Centreline-km)**
High Class Bit-asphalt	506.65	24.7	49.9	581.25
% of Total	87.17%	4.25%	8.58%	100%

*Please note that this includes the entire lane-km length of boundary roads

Table 11: Surface Type and Roadside Environment Distribution

3.2.2 Roads – Valuation/Replacement Costs – What is it Worth?

The total historical cost for roads surface and base as of 2015 in accordance with PSAB is shown on the financial statements as follows:

2015 Financial Statements			
Asset Type	**Acquisition Cost**	**Accumulated Amortization**	**Net Book Value**
Roads	$129,337,432	$81,248,857	$48,088,575

Table 12: Roads Historical Cost – Roads - 2015 Financial Statements

The estimated replacement value of all County roads, in 2015 dollars, is shown in the table below:

Roadside Environment	Replacement Cost
Rural (R)	$337,317,853
Semi-Urban (S)	$20,863,267
Urban (U)	$29,403,913
Total	$387,585,033

Table 13: Roads Replacement Costs by Road Side Environment

3.2.3 Roads – Asset condition and remaining service life

3.2.3.1 Asset Condition Rating Methodology

The provincial requirements for AMP's include asset condition assessment in accordance with standard engineering practices. The County's evaluation system was based on the Inventory Manual for Municipal Roads, 1991 (Ministry of Transportation, Ontario) methodology. Field data is obtained through a visual examination of the road system and includes: structural adequacy, level of service, maintenance demand, surface and shoulder width, surface condition, and drainage. This report is essentially a desktop analysis. As such, some data fields in the Inventory Manual, such as substandard horizontal and vertical alignment, were not populated.

Evaluations of each road section were completed in accordance with the MTO's Inventory Manual for Municipal Roads (1991). Data collected was entered directly into WorkTech's Asset Manager software. Condition ratings, Time of Need, Priority Ratings, and associated costs were then calculated by the software, in accordance with the Inventory Manual. Unit costs for construction were provided by staff. This report is essentially a desktop analysis. As such, some data fields in the Inventory Manual, such as substandard horizontal and vertical alignment, were not populated.

The Condition Ratings, developed through the scoring in the Inventory Manual, classify roads as 'NOW', '1 to 5', or '6 to 10' year needs for reconstruction. The Time of Need is a prediction of the time until the road requires reconstruction, not the time frame until action is required. For example, a road may be categorized as a '6 to 10' year need with a resurfacing recommendation. This road should be resurfaced as soon as possible to further defer the need to reconstruct.

Recommendations are made based on the defects observed and other information available in the database at the time of preparation of the report. Once a road asset reaches the project level, the municipality may select another alternative based on additional information, asset management strategy, development considerations or available funding.

Time of Need	ASTM 6344	Structural Adequacy*	Physical Condition	MTO PCI	Surface Condition	Description	Approximation PCI to SA
NOW	1-39	1 to 7	1 to 35	1 to 55	Now Needs – Reconstruction or Major Rehabilitation	Poor to Very Poor to Failed	IF PCI <=55 then, PCI / 8 = SA
1 to 5	40-55	8 to 11	36 to 55	56 to 75	1 to 5 year Needs – R2 /more extensive rehabilitation	Fair / Passable	IF PCI >55<=75 then, PCI / 7 =SA
6 to 10	55-70	12 to 14	56to 70	76 to 85	6 to 10 year Needs – R1 Resurfacing	Good	IF PCI >75<=85 then, PCI / 6 =SA
ADEQ	71-100	15 to 20	75 to 100	86 to 100	Adequate – Maintenance and Preservation	Satisfactory/ Good/ Excellent	If PCI >85 then, PCI /5.4 =SA

Table 14: Evaluation method comparison

*Structural adequacy is the methodology that UCPR is using and the table above compares other methodology formats.

3.2.3.2 Road System Adequacy and Condition by Time of Need

The Inventory Manual methodology results in overall rating of road sections by Time of Need (TON); NOW, 1 to 5, 6 to 10, or Adeq (Adequate). Table 16 below provides a breakdown of the road system by time of need and roadside environment. In order to produce Table 15, we approximated the condition ratings to a time of need.

The system adequacy is a measure of the ratio of the 'NOW' needs to the total system, and includes needs from the six critical areas described earlier in the report. The overall TON is the most severe or earliest identified need. For example a road section may appear to be in good condition, but is identified as a NOW need for capacity, indicating that it requires additional lanes.

Equation 1: System Adequacy Calculation

$$\text{System Adequacy} = \frac{\text{Total System (km)} - \text{NOW Deficiencies (km)}}{\text{Total System (km)}} \times 100$$

The United Counties of Prescott and Russell currently has a road system adequacy measure of **94.5%.** The road system currently measures **581.25** centreline-kilometres (considering boundary roads), with **31.8** kilometres rated as deficient in the 'NOW' time period.

Time of Need				
Time of Need	Rural (centreline-km)	Semi-Urban (centreline-km)	Urban (centreline-km)	Total (centreline-km)
Now	13.8	12	6	31.8
1-5	83.2	2.4	8	93.6
6-10	107.9	2.8	14.3	125

ADEQ	301.75	7.5	21.6	330.85
Total	506.65	24.7	49.9	581.25
				94.5%

Table 15: Time of Need by roadside environment

Cost by Time of Need				
Asset Type	**Current need**	**1 to 5 years**	**6 to 10 years**	**Totals 0-10 Years**
Roads	$8,546,666	$16,132,647	$11,475,844	$36,155,158

Table 16: Cost by Time of Need

The estimates provided in this report are in accordance with the formulae in the *Inventory Manual,* and utilize the unit costs as identified in Table 17. These costs include adjustment factors as per the *Inventory Manual*, such as Basic Construction, Terrain, Contingency Roadside Environment, and Engineering.

Item	Unit	2015 Costs ($)
Excavation	m^3	10.00
Hot Mix Asphalt	t	100.00
Granular A	t	15.00
Granular B	t	12.00
Manholes Adjustment	ea	500.00
Catch Basins - adjust	ea	500.00
Asphalt Planing	m^2	4.50
Asphalt Pulverizing	m^2	2.4
Crack Sealing	m	2.00
Micro-resurfacing	m^2	3.50

Table 17: Unit Costs

The traditional target adequacy for upper-tier road systems (Regions and Counties) was 75%, while a lower-tier's target adequacy was 60%. Based on these former MTO targets, which were in effect when the municipal grant system was in place, the target adequacy for the Counties should be 75%, as a minimum. The minimum target adequacies were established by MTO, to reflect the nature and purpose of the road system.

3.2.3.3 Physical Condition

The Physical Condition is an alternate method of describing the condition of a road section or the average condition of the road system. The value is the structural adequacy converted to be expressed as a value out of 100, instead of 20. This methodology lends itself to modeling and comparators that may be more easily understood. There isn't a 1:1 relationship between the weighted average physical condition and the system adequacy.

The Weighted Average Physical Condition of the road system is currently **75.6**.

3.2.3.4 Good to very Good Roads

One of the requirements of the annual FIR reporting is the percentage of the roads that are good to very good. We use a calculation similar to the system adequacy calculation to determine the good to very good roads as follows;

Equation 2: Good to Very Good Equation

$$\text{Good to Very Good} = \frac{\text{Total System (km)} - (\text{NOW} + \text{1 to 5 (km)})}{\text{Total System (km)}} \times 100$$

The percentage of good to very good roads in UCPR is **78.42%.**

3.2.3.5 Remaining Service Life

As indicated previously, the Time of Need is really a prediction model in terms of an estimate based on current condition to the time for reconstruction. The TON then also provides an estimate of the remaining life in the road system/section. The following figure summarizes the structural adequacy ratings of the road system and illustrates the estimated remaining service life of the road system.

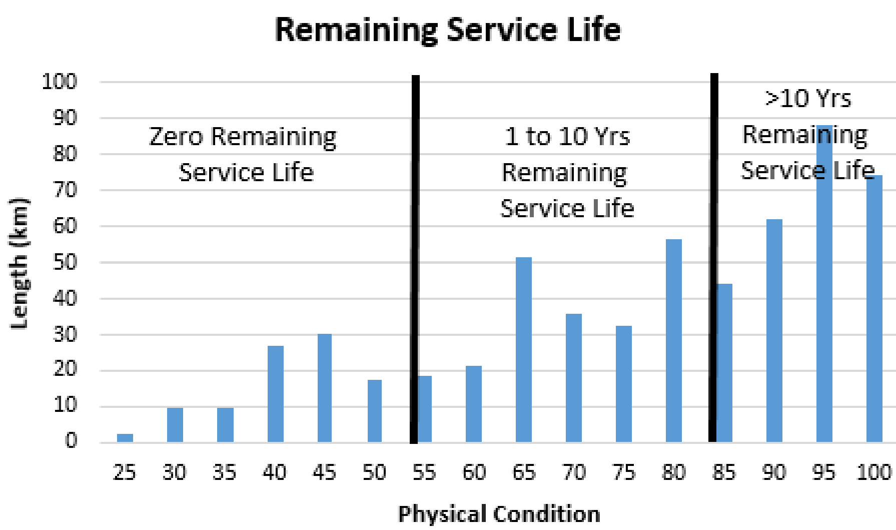


Figure 6: Remaining Service Life

3.3 STRUCTURES

3.3.1 Structures – Inventory – What Does UCPR Own?

This section of the report addresses structure assets with a span of 3 metres or greater only. This includes structures defined as bridges and culverts. The content will provide review and analysis of the structures inventory from a number of perspectives including condition rating, functional classification, roadside environment, replacement cost. Information for this section of the report is drawn from the 2015 Bridge Management Report prepared by HP Engineering

On January 1st, 2015, the United Counties of Prescott and Russell bridge network consisted of the following:

Type of Structure	Quantity	Total Length (Parallel to roadway) (m)	Total Width (Perpendicular to roadway) (m)
Bridges	42	1605.30	436.26
Culverts (>3m)	64	198.04	849
Bridges (City of Ottawa boundary)	4	64.1	60.4
Total	110	1867.44	1345.66

Table 18: Structure Summary table

Data from HP ENGINEERING 2015 Bridge Management Report & City of Ottawa report

Note that the Nation Municipality uploaded two (2) structures from the Ste-Catherine Street road transfer and the length/quantity is considered in the table above for those two (2) structures.

3.3.2 Structures – Valuation/Replacement Costs – What is it worth?

Budget costs for the replacement of bridges are usually based on the deck surface area of individual structures (m2). Therefore, benchmark replacement costs for this AMP were extracted from the 2015 HP Engineering Bride Management Study Report. In the case of culvert type structures, the plan area (or deck surface area) used in the calculation was ('length of spans' + 1 m) x ('width of roadway' + 1 m).

The total historical cost for structures as of 2015 in accordance with PSAB is shown on the financial statements as follows:

2015 Financial Statements			
Asset Type	**Acquisition Cost**	**Accumulated Amortization**	**Net Book Value**
Bridges and Culverts	$36,190,096	$17,904,427	$18,285,669

Table 19: Historical Costs – Structures – 2015 PSAB Values

The estimated replacement value of all County bridges and culverts, in 2015 dollars, is shown in the table below:

Type of Structure	Quantity	Replacement Cost
Bridges	41*	$91,413,000
Culverts (>3m)	63*	$33,347,000
Bridges (City of Ottawa boundary)	4	$995,672
Total	108	$125,755,672

Table 20: Structure replacement costs

Note that we are responsible for 50% of the cost for those four (4) boundary structures with City of Ottawa. *Also note that the Nation Municipality uploaded two (2) structures from the Ste-Catherine

Street road transfer, which the replacement cost are not considered in the table above since we have not yet obtained current replacement cost values.

The budget recommendations bear a direct relationship to the value of the structures inventory. It is estimated that the cost to replace the bridge and culvert inventory, is **$125,755,672.** This estimate is based on the replacement costs between from $8,000 and $4,500 per square metre respectively for bridges and culverts. These benchmark costs can vary considerably once specific project requirements are realized.

3.3.3 Structures – Asset condition and remaining service life

3.3.3.1 Asset Condition Rating Methodology

The provincial requirements for AMP's include asset condition assessment in accordance with standard engineering practices. Provincial legislation requires that all structures with a span of 3 metres or greater be inspected under the supervision of a structural engineer every two years, in accordance with the Ontario Structure Inspection Manual (OSIM) or equivalent. The UCPR reporting conforms to the OSIM format. Bridge and Culvert structures are rated as deficient in the 'NOW', 1 to 5 or 6 to 10 timelines due to:

- Insufficient width of structure
- Vertical clearance
- Level of Service (cannot accommodate peak hour traffic/capacity)
- Structural Capacity.
- Safety Treatments

The Condition Ratings, developed through the scoring in OSIM, classify structures as 'NOW', '1 to 5', or '6 to 10' year needs for reconstruction or rehabilitation. From an asset management perspective and similar to roads, structures with rehabilitation treatments offer the best return on investment, to further defer the need to reconstruct and maximize the value and life cycle of the asset. Safety defects are the priority.

Field data is obtained through a visual examination of each structure. Overall ratings and Time of Need are calculated based upon the condition ratings and a combination of other calculations and data.

The asset management plan utilized condition data from the 2015 HP Engineering Report entitled Counties of Prescott and Russell; Bridge Management Study Report, 41 Bridges / 63 Culverts and the WorkTech database. For structure assets, data and structure condition ratings were completed in accordance with the most current version of the Ontario Structure Inspection Manual (OSIM).

3.3.3.2 Structures Inventory Overall Condition

Relating the overall condition of the structure inventory is more complex than the road section as the bridge structure evaluations will produce a 'NOW' need for a structure due to the absence of end treatments at the corners of a structure, or the end of the guide rail on a culvert structure. To gain a sense of the condition of the overall bridge structures inventory, we used the Bridge Condition Index (BCI) information provided in the 2015 HP Engineering Report. The Bridge Condition Index (BCI) is a measurement of the overall condition of the bridge. There are different accepted methods of calculating BCI. Please note that the index does not indicate the safety of a bridge.

From the Ministry of Transportation of Ontario Website:

> *"A Bridge Condition Index (BCI) rating is a planning tool that helps the Ministry schedule maintenance and upkeep. The BCI is not used to rate or indicate the safety of a bridge. The result is organized into ranges from 0 to 100. Immediate action is taken to address any safety concerns.*
>
> *Good - BCI Range 70 -100*
> *For a bridge with a BCI greater than 70, maintenance work is not usually required within the next five years.*
>
> *Fair - BCI Range 60 -70*
> *For a bridge with a BCI between 60 and 70 the maintenance work is usually scheduled within the next five years. This is the ideal time to schedule major bridge repairs from an economic perspective.*
>
> *Poor - BCI Less than 60*
> *For a bridge with a BCI rating of less than 60, maintenance work is usually scheduled within approximately one year."*

Asset Type	Poor	Fair	Good
Bridges	22%	49%	29%
Culverts	38%	22%	40%

Table 21: Bridges & Culverts Condition
(Data from HP Engineering Bridge Management Report 2015)

For the bridge structure inventory, 22% of the structures have a BCI of less than 60, indicating that these structures would be candidates for maintenance, major rehabilitation or replacement.

For the culvert inventory, 38% of the inventory have a BCI of less than 60 indicating that these structures would be candidates for maintenance, major rehabilitation or replacement.

3.3.3.3 Structures System Adequacy and Condition by Time of Need

Relating the overall condition of the structure inventory is more complex than the road section as the bridge structure evaluations will produce a 'NOW' need for a structure due to the absence of end treatments at the corners of a structure, or the end of the guide rail on a culvert structure. To gain a sense of the condition of the overall bridge structures inventory, the current estimated replacement cost has been compared to the estimated cost of the current needs that have been identified. The following equation describes the ratio of the replacement cost to the needs costs.

Equation3: Bridge Structure Replacement to Improvement Ratio

$$\text{Adequacy Index} = \frac{\text{Total Replacement Cost} - \text{Total Needs Cost}}{\text{Total Replacement Cost}} \times 100$$

Using Equation 3, the Adequacy Index for the UCPR Bridge Structures Inventory is **88.5%** using a replacement as identified in the OSIM Report and the estimated improvement costs from the Bridge Management Study.

Applying the same calculation to the culvert structures inventory produces and Adequacy Index of **65.5%** using a replacement cost as identified in the OSIM Report and the standardized improvement costs from the Bridge Management Study.

The OSIM Manual methodology results in overall rating of Bridge and Culvert Structures by Time of Need (TON); NOW, 1 to 5, 6 to 10, or Adeq (Adequate). Table 22 provides a breakdown of the Bridge Inventory and Culvert Structure Inventories system by Time of Need.

Asset Type	Time of Need				
	< 1 year	1 to 5 years	6 to 10 years	Normal	Totals
Bridges	$3,212,000	$6,899,000	$0	$415,000	$10,526,000
Culverts	$2,348,000	$5,097,000	$3,421,000	$630,000	$11,496,000
Totals	$5,560,000	$11,996,000	$3,421,000	$1,045,000	$22,022,000

Table 22: Structures Needs, Cost by Time of Need
(Data from HP Engineering Bridge Management Report 2015)

Note that Table 22 doesn't include bridges on the City of Ottawa boundary roads however we are responsible for 50% of the cost for those four (4) boundary structures.

3.3.3.4 Record of Assumption – TON, Improvement and Replacement Costs – Structures

The methodology of this report is such that the OSIM Manual itself forms the basis of a large number of assumptions in terms of;

- Dimensional requirements for the development of improvement and replacement costs
- Structural requirements based on field ratings of elements
- Time of needs based on the ratings and subsequent calculations

3.3.3.5 Remaining Service Life

As indicated, the Time of Need is really a prediction model in terms of an estimate based on current condition to the time for reconstruction for some elements. The TON then may also provide an estimate of the remaining life in the structure. The following figures summarize two different perspectives on bridge life expectancy – design life and service life. This difference has a significant impact on development of the financial plan. Whereas structure constructed prior to 2000 had a 50 year design life, they typically had a service life in the 75 year range. Since 2000 the design life has been 75 years. To simplify the presentation the service life of 75 years has been used for both.

Remaining Design Life (50 yr. Design Life)				
Asset Type	Number of structures			
	0 Years	1 to 10 Years	>10 Years	Total
Bridges	18	11	12	41
Percentage	44%	27%	29%	100%
Culverts	28	20	15	63
Percentage	44%	32%	24%	100%

Table 23: Remaining Design Life (50 yr. Design Life)

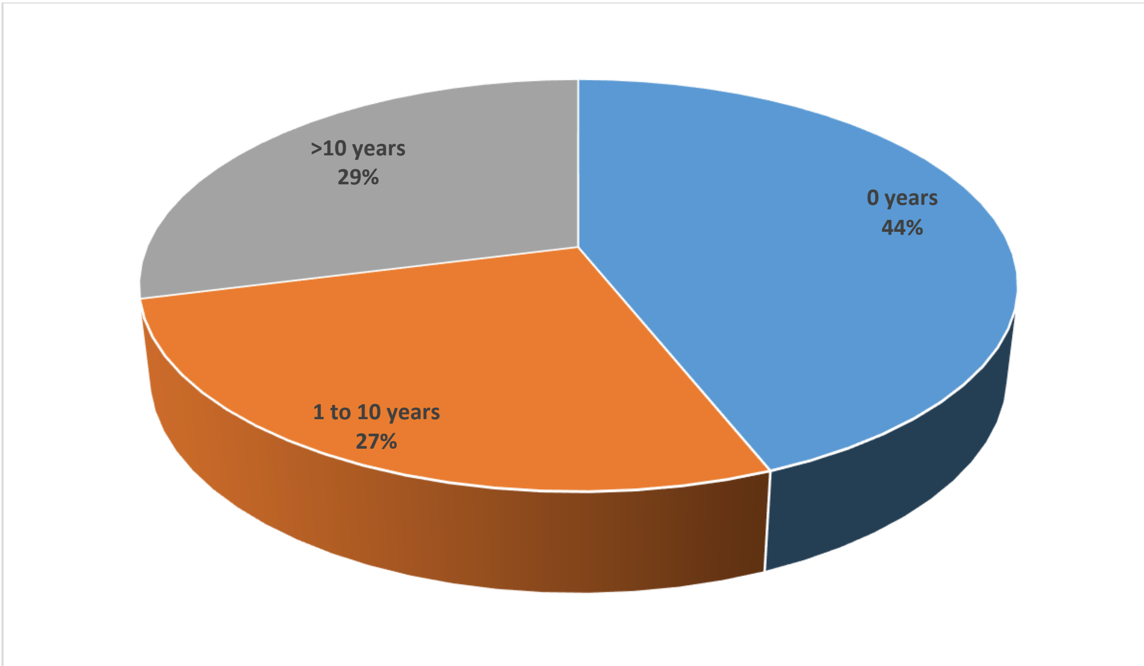


Figure 7: Remaining Design Life - Bridge Structures (50 yr. Design Life)

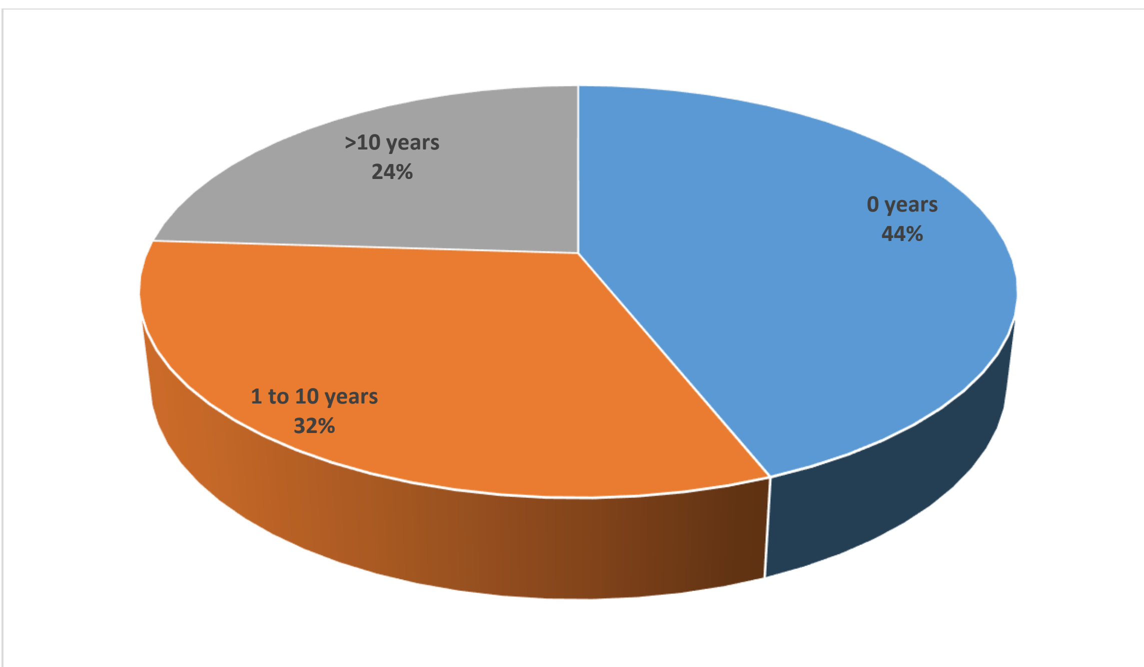


Figure 8: Remaining Design Life – Culvert Structures (50 yr. Design Life)

Anticipated Remaining Service Life (75 yr. service Life)				
Asset Type	Number of structures			
	0 Years	1 to 10 Years	>10 Years	Total
Bridges	8	2	31	41
Percentage	19%	5%	76%	100%
Culverts	1	9	53	63
Percentage	2%	14%	84%	100%

Table 24: Anticipated Remaining Service Life (75 yr. Service life)

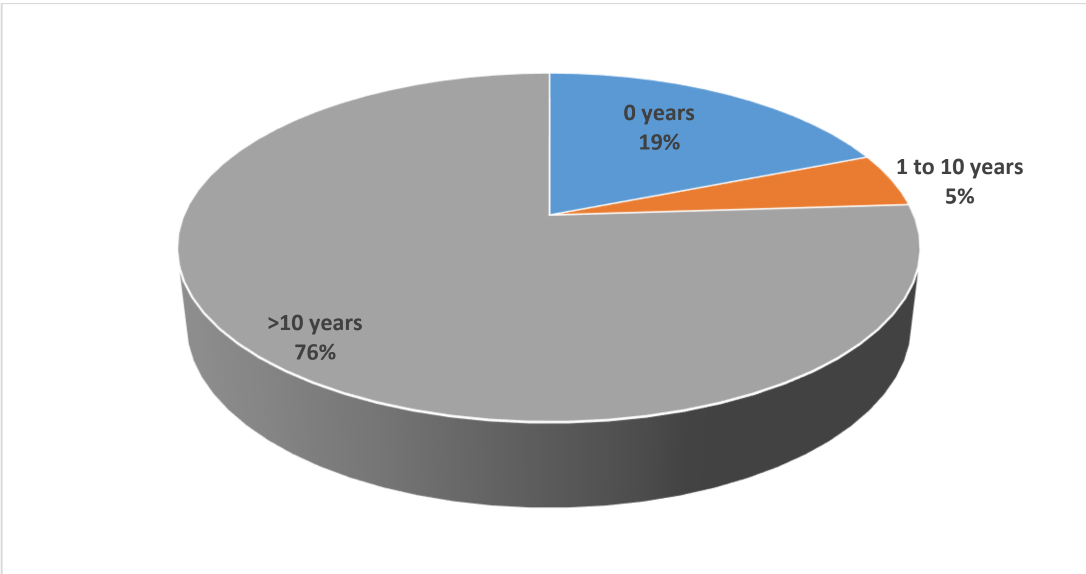


Figure 9: Anticipated Remaining Service Life – Bridge Structures (75 yr. Service life)

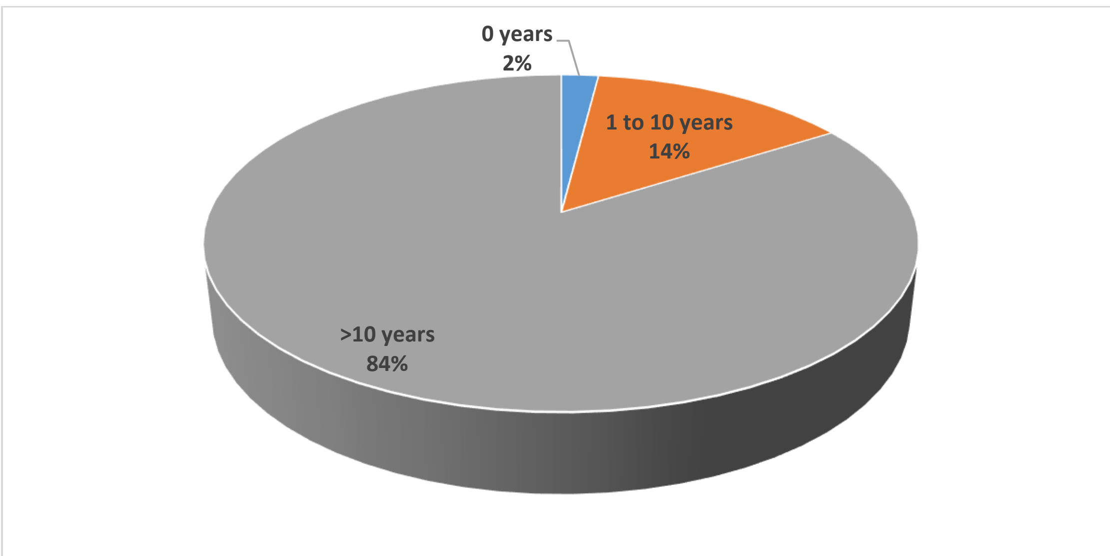


Figure 10: Anticipated Remaining Service Life – Culverts Structures (75 yr. Service life)

The condition reviews are just that; the physical condition of the structures. When other issues are considered, the time of need could change dramatically. Typically when the roads are assed a Time of

Need for Drainage is developed based on visual observation, other reports, or anecdotal information. This isn't the case for structures. It is important then, that when a structure is replaced that the size of the opening be confirmed through appropriate hydraulic modeling.

3.4 BUILDINGS

3.4.1 Buildings – Inventory – What Does UCPR Own?

The building condition assessments for social housing, public works garages and emergency services building were undertaken as a separate assignment by the County which was undertaken by Art Engineering Inc. which resulted in 3 separate reports. The reports can be obtained under separate cover and entitled:

- Building Condition Assessment & 20 Year Capital Reserve Fund Study - Social Housing dated December 16, 2014
- Building Condition Assessment & 20 Year Capital Reserve Fund Study - Public Works Buildings dated January 27, 2015
- Building Condition Assessment & 20 Year Capital Reserve Fund Study - Emergency Services dated January 19, 2015

As these were very comprehensive reports, it is not the intention to repeat the findings in this report. However, the AMP is intended to take an enterprise view of all assets and allow the County to plan and prioritize across all asset classes, some key information has been extracted from those reports in order to provide that enterprise view. It is important to note that other buildings owned and operated by the County are not included in the condition assessments or this report.

The following buildings were included in the building condition assessments:

Building Category	Total # of Buildings	Total # of Units
Social housing	**75**	**311**
2169 Laurier St. (19 Units)	1	19
345 Hamilton St. (30 Units)	1	30
472 Church St. (30 Units)	1	30
675 Portelance St. (52 Units)	1	52
69 Derby St. (14 Units)	1	14
810 Portelance St (30 Units)	1	30
Boyd St. (12 Units)	6	12
Gladstone St. (22 Units)	11	22
James St. (2 Units)	8	2
James St. (54 Units)	15	54
Portelance St. (30 Units)	27	30
Tache St. (16 Units)	2	16
Public Works Garages	**3**	**3**
1543 Notre-Dame St., Embrun	1	1

2337 Cassburn Rd., L'Orignal	1	1
582 County Rd. 9, Plantagenet	1	1
Emergency Services	**5**	**5**
1350 Cameron St., Hawkesbury	1	1
15 L'Escale St., St-Isidore	1	1
215 Industriel Rd., Embrun	1	1
466 Landry St., Rockland	1	1
584 County Rd. 9, Plantagenet	1	1
Grand Total	**83**	**319**

Table 25: Inventory of Buildings Assessed

The assessment included the following building components:

Building Component
Building Envelope Components
Attic
Balconies
Caulking
Cladding
Doors
Eavestrough, Fascia, Soffit
Exterior Finishes
Foundation
Roofing
Stairs
Stairways
Superstructure
Windows
Electrical and Mechanical Systems
Central Vacuum
Electrical Distribution
Electrical Panels
Electrical Distribution
Elevator
Exhaust Fans
Furnace
Garbage Collection
Heating/Cooling
Life Safety Systems
Security System
Sump Pump

Telephone System
Water Distribution
Water Heaters
Interior Finishes
Appliances
Cabinetry
Flooring
Interior Doors & Hardware
Lighting Fixtures
Miscellaneous Finishes
Paint
Plumbing Fixtures
Staircase upgrade
Wall Finishes
Site Work Components
Additional Structures
Asphalt Paving
Concrete Paving
Decks
Fencing
Material Storage
Site and Surface Drainage
Site Lighting
Stairs and Landings
Grand Total

Table 26: Building Elements

3.4.2 Buildings – Valuation/Replacement Costs – What is it worth?

The total historical cost for structures as of 2015 in accordance with PSAB is shown on the financial statements as follows:

2015 Financial Statements			
Asset Type	**Acquisition Cost**	**Accumulated Amortization**	**Net Book Value**
Emergency Services	$3,763,699	$686,181	$3,077,518
Public Works Garages	$596,946	$432,444	$164,502
Social Housing	$31,239,277	$30,021,868	$1,217,408
Total	$35,599,922	$31,140,494	$4,459,428

Table 27: Historical Costs – Buildings – 2015 PSAB Values

While Art Engineering Inc. determined the replacement cost for most building components, there were some that were not included as it was believed that there would be no replacement. The approach taken was that each component would be replaced as opposed to the entire building. As such, UCPR estimated the actual replacement costs. Below is a summary of replacement costs by building assessed.

Category	Location	Replacement Cost
Social Housing	Boyd St.	$3,705,588.00
	Gladstone St.	$6,613,624.00
	Taché Blvd.	$5,047,044.00
	Portelance Ave.	$9,263,970.00
	James St.	$16,089,470.00
	James St. (bungalows)	$266,250.00
	810 Portelance	$6,036,600.00
	675 Portelance	$7,353,200.00
	2169 Laurier	$2,945,050.00
	345 Hamilton	$3,958,900.00
	69 Derby	$2,417,925.00
	472 Church	$4,641,275.00
Public Works	1543 Notre-Dame St.	$833,257.00
	2337 Cassburn Rd.	$833,257.00
	582 County Road 9	$833,257.00
Emergency Services	15 L'Escale	$505,135.00
	584 County Road 9	$926,020.00
	466 Landry	$746,335.00
	215 Industriel	$677,370.00
	1350 Cameron	$1,989,000.00
Total		$75,682,527.00

Table 28: Building Replacement Costs at 2015

3.4.3 Buildings – Asset condition and remaining service life

According to the reports by Art Engineering, the building assessment reviewed the building components on the following basis:

- ***Life Expectancy:*** *The estimated life span of a building component shown in years.*
- ***Estimated Remaining Life:*** *The estimated remaining useful years of a building component, from the date of inspection until major repairs or replacement is required.*

- ***Effective Life:*** *The apparent age of the building element are based on visual inspection considering wear, tear and weathering. It is not always the actual age of the element.*

- ***Cost Estimates:*** *The total current replacement costs estimated for a building component. In certain cases it may be listed as an allowance.*

- ***Good Condition (Low Priority):*** *The building component is in adequate condition and no work is foreseen in the next 5 years.*

- ***Fair Condition (Medium Priority):*** *The building component is in deteriorating condition, but is still operational. Replacement/repair is expected in 3 to 5 years.*

- ***Poor Condition (Medium Priority):*** *The building component will require replacement or major repair within the next 1 to 3 years.*

- ***Critical Condition (High Priority):*** *The building component is past the point of economic repair or is not functioning and should be replaced or repaired within the year.*

3.4.3.1 Building Inventory by Time of Need

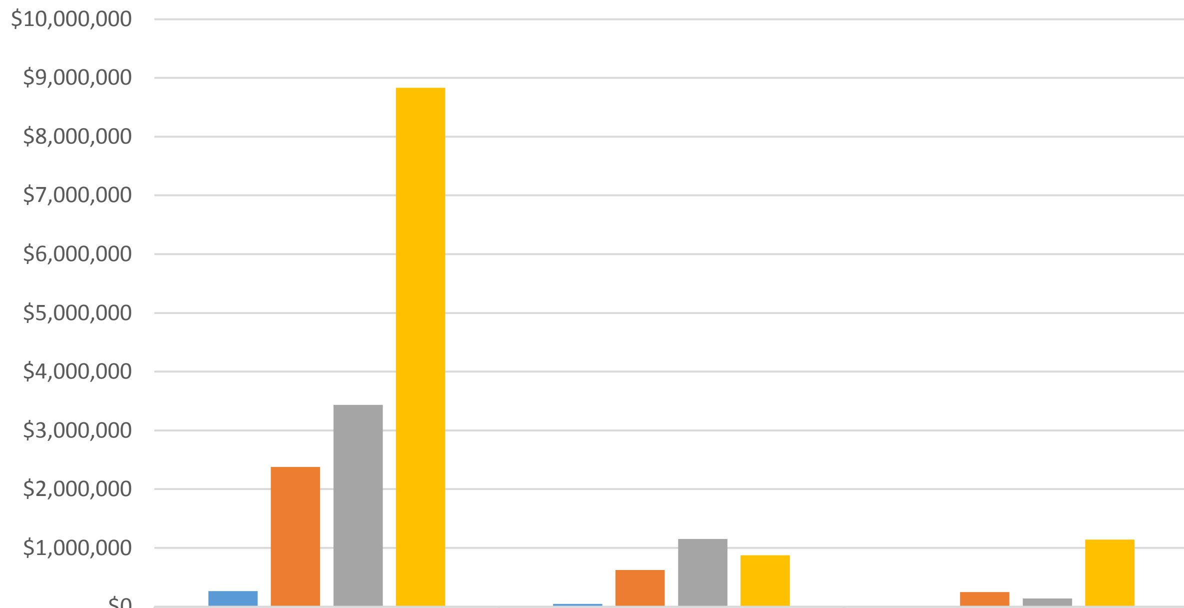
The building condition assessment provides detailed recommendations. The table below shows the required investments by building type based upon time of need

Building Category	Current Need	1-5 years	6-10 years	Over 10 Years	Total Needs
Social housing	$263,951	$2,376,953	$3,432,498	$8,829,669	$14,903,072
Public Works Garages	$46,006	$624,213	$1,153,298	$871,769	$2,695,286
Emergency Services	$8,270	$250,206	$140,996	$1,143,191	$1,542,663
Grand Total	**$318,227**	**$3,251,373**	**$4,726,792**	**$10,844,628**	**$19,141,021**

Table 29: Building Condition based upon time of need

Building Category	Average
Social housing	745,154
Public Works Garages	134,764
Emergency Services	77,133
Grand Total	**957,051**

Table 30: Average Annual Requirements



	Social housing	Public Works Garages	Emergency Services
Current Need	$263,951	$46,006	$8,270
Sum of 1-5 years	$2,376,953	$624,213	$250,206
Sum of 6-10 years	$3,432,498	$1,153,298	$140,996
Sum of Over 10 Years	$8,829,669	$871,769	$1,143,191

Figure 11: Building Condition based on Time of need

3.4.3.2 Building Inventory Overall Condition

The overall condition shown in the table below was based on the Art Engineering report but was modified by UCPR staff to be easily updated.

Asset Type	Overall Average Condition
Social Housing Bungalows	85.0%
Social Housing Semi-Detached	78.5%
Social Housing Buildings	83.4%
Emergency Services	88.8%
Public Works Garage	74.5%

Table 31: Overall Average Condition

4 DESIRED LEVEL OF SERVICE

In order to determine the "right" level of funding and what customers are willing to pay for, the County needs to establish levels of service. Without this, UCPR is operating and making decisions based on a belief that they are satisfied with the services and are not willing to pay for additional infrastructure.

Some key factors to consider are: community expectations, legislative requirement such as bridge studies, expected asset performance, long term goals and financial viability. Those municipalities that are in growth need to balance new needs with existing infrastructure requirements.

Currently, the County does not have an established system for collecting data regarding levels of services beyond the physical conditions. One of our main goals in the future is to establish a full system for the collection of levels of services and customer complaints. At the strategic level, the goals of this system are listed in the Table below.

Objective	Scope
Affordability	Costs are minimized and distributed such that access to service does not cause undue hardship to customers and businesses.
Accommodating growth	Development is not hampered by the availability of capacity.
Adequacy	Services are delivered to acceptable quality and quantity.
Reliability	Service is reliable with minimal interruption.
Safety	Meet safety requirements, as regulated by legislation.
Compliance	Assure environmental compliance, as regulated by legislation and/or operating licenses or agreements.
Customer services	Customer issues are captured and acted upon in an efficient and timely manner.

Table 32: Goals for level of service

Traditional views of performance management focused on collecting data about physical conditions of facilities and developing an engineering rehabilitation and/or maintenance plan (what to fix, what to replace). However, the performance of assets (facilities) is not limited to its physical or engineering conditions only. Equally important is the level of service (LOS) of the facility. In other words, how adequate are the facility conditions and operational status in meeting its intended functions?

Understanding the balance between physical and service conditions is crucial for the success of facility operations. Both are essential to manage and promote the socio-economic activities of the users. At the same time, they both are needed to protect public health and safety.

There is, however, little agreement about the definition or elements of LOS. This stems from the discrepancy between expected LOS and actual LOS; user desired LOS versus the needs to minimize the life cycle costs of assets and their impacts on the environment; and visual perception of service quality versus and the actual/underlying status of the asset itself.

There are several factors that influence LOS. It is important to understand/track these factors to assure that the system is proactive.

Factor	Impact
Climate Change	Examples include 1) extended winter months and more severe temperatures; 2) severe rainfall events and their associated impact on the effectiveness of the Storm water system; and 3) flooding of roads and challenges in meeting winter control requirements
Social Trends	Societal influences will continue to shape the County's strategy and priorities. Examples of such expectations include aspects like enhanced environmental stewardship and more cost-effective delivery of services.
Aging Infrastructure	The County has some infrastructure that is in better shape than many Ontario municipalities. This provides an opportunity for our County to benefit from the wealth of experiences developed in the last two decades in the area of infrastructure rehabilitation. Older parts of the network continue to deteriorate and will require increasing levels of funding to ensure that they continue to offer safe and reliable services.
Growth Forecasts	According to analysis of the latest data, the County has some areas with higher than average population growth. However, uncertainty remains if this will continue in the next two decades given the changing economic situation in Ottawa. Uncertainty is not entirely within the County's control and will continue to impact several financial and operational performance indicators.
Funding Mechanisms	Traditionally, the County has relied heavily on funding and tax levies. Changes in grant programs make it difficult to maintain service, forcing it to juggle priorities, and target where and how it invests. Continued vigilance in asset management has allowed the County to extend asset life and reduce the total cost of ownership. However, current spending is insufficient to maintain service at current levels over the long-term.

Table 33: Level of service factors

Level of Service has a different meaning for different interests. For instance, the cost per unit may not have an impact to a ratepayer whose chief concern may be service delivery. Similarly, cost or expenditure per unit may not illustrate the condition of the asset to the end user. Further, municipalities are required to report on various Municipal Performance Measures (MPMP).

We believe that multiple service measures may be required to adequately relate the condition of an asset to the various user groups; condition, operating costs, and end user. The following sections identify various measurements of service of the road system, structures and buildings.

4.1 ROADS DESIRED LEVEL OF SERVICE

4.1.1 System Adequacy

As described earlier in the report, the system adequacy is the ration of the "NOW' need roads to the total system. This is a holistic measure as, using the Inventory Manual Methodology, needs are identified in six critical areas, not just the distress on the road surface. The current system adequacy is **94.5%.**

4.1.2 Physical Condition

Physical condition is the Structural Adequacy rating multiplied by five to produce a rating of between 5 and 100. This is a measure of the amount of distress on the road however the scale is not linear. The current weighted average Physical Condition of the road system is **75.6.**

4.1.3 Good to Very Good

The province requires annual reporting on the percentage of roads that are rated as good to very good. It has been assumed that the 6-10 and adequate roads are good to very good and this has been expressed as a percentage of the system. Good to very good roads represent **78.42 %** of the road system.

4.1.4 Desired Level of Service for Roads

The desired level of service as well as the current and expected performance over the next ten years are provided in the table below:

COUNTY ASSET	CURRENT PERFORMANCE	DESIRED LEVEL OF SERVICE	EXPECTED PERFORMANCE OVER THE NEXT 10 YEARS
Roads	Average physical condition of road system is 75.6	Average physical condition of road system should be 80	Target achieved by 2024

Table 34: Overall Average Condition

4.2 STRUCTURES DESIRED LEVEL OF SERVICE

We believe that multiple service measures may be required to adequately relate the condition of an asset to the various user groups; condition, operating costs, and end user. The following sections identify various measurements of service of the structures inventory.

4.2.1 System Adequacy

We examined the database provided and believed that one means of expressing the condition of the bridge and culvert structures inventory would be a measure of the ratio of the current improvement needs to the current replacement cost. The bridge structures Adequacy Index is **88.5%** and the culvert structures Adequacy Index is **65.5%.**

4.2.2 Structure Condition

We used the Bridge Condition Index (BCI) information provided in the 2015 HP Engineering Report. The Bridge Condition Index (BCI) is a measurement of the overall condition of the bridge. There are different accepted methods of calculating BCI. Please note that the index does not indicate the safety of a bridge.

Asset Type	Poor	Fair	Good
Bridges	22%	49%	29%
Culverts	38%	22%	40%

Table 35: Bridges & Culverts Condition

(Data from HP Engineering Bridge Management Report 2015)

4.2.3 Desired Level of Service for Structures

The desired levels of service as well as the current and expected performance over the next ten years are provided in the table below:

COUNTY ASSET	CURRENT PERFORMANCE	DESIRED LEVEL OF SERVICE	EXPECTED PERFORMANCE OVER THE NEXT 10 YEARS
Bridges	78% of Bridges are rated as Fair and Good	78% of County Bridges are rated as Fair and Good	Maintain current level of service
Culverts	62% of Culverts are rated as Fair and Good	62% of County Culverts are rated as Fair and Good	Maintain current level of service

Table 36: Overall Average Condition

4.3 BUILDINGS DESIRED LEVEL OF SERVICE

4.3.1 Desired Level of Service for Buildings

The desired levels of service as well as the current and expected performance over the next ten years are provided in the table below:

COUNTY ASSET	CURRENT PERFORMANCE	DESIRED LEVEL OF SERVICE	EXPECTED PERFORMANCE OVER THE NEXT 10 YEARS
Social Housing Bungalows	Overall average condition is rated at 85.0%	Overall average condition should be maintained at 75% or better	Maintain current level of service
Social Housing Semi-Detached	Overall average condition is rated at 78.5%	Overall average condition should be maintained at 75% or better	Maintain current level of service
Social Housing Buildings	Overall average condition is rated at 83.4%	Overall average condition should be maintained at 75% or better	Maintain current level of service
Emergency Services	Overall average condition is rated at 88.8%	Overall average condition should be maintained at 75% or better	Maintain current level of service
Public Works Garage	Overall average condition is rated at 74.5%	Overall average condition should be maintained at 75% or better	Maintain current level of service

Table 37: Overall Average Condition

5 ASSET MANAGEMENT STRATEGY

5.1 OBJECTIVES AND SCOPE

The Province of Ontario's document *'Building Together- Guide for Municipal Asset Management Plans'* indicates

> 'The asset management strategy is the set of actions that, taken together, has the lowest total cost- not the set of actions that each has the lowest cost individually'

Regardless of the source of the definition, the key themes that keep being repeated are;

- Managing
- Strategic
- Effective
- Efficient
- $$$$$!!
- Service
- Optimizing asset life cycle
- Risk Management

As an absolute minimum, the objective of any asset management plan, or strategy, should be to ensure that the overall condition of an asset group does not diminish over time. The asset management strategy of an agency is heavily predicated, and inextricably linked to the available funding.

Most agencies are not fully funded, and a large number are not even funded sufficiently as to maintain the current condition of their system. In those circumstances, the strategy should be twofold;

- Focus should be on a pavement management strategy that utilizes available funding on preservation and resurfacing programs as a priority. Reconstruction and replacement candidate will remain reconstruction and replacement candidates and cost increases will be incremental with inflation. Preservation and resurfacing opportunities that are missed will escalate in cost by several hundred percent depending on site specifics.

- Develop the financial plan in order that there is sufficient funding to maintain the condition of the road system.

- Focus should be on a bridge management strategy that utilizes available funding on maintain public safety as a priority and preservation and resurfacing/rehabilitation programs as a second priority. Preservation and resurfacing opportunities that are missed will escalate in cost by several hundred percent depending on site specifics.

- Develop the financial plan in order that there is sufficient funding to maintain the condition of the asset group.

- Adjust / confirm the plan and funding requirements annually

Program funding recommendations are a function of the constitution of the assets inventory. Recommended funding for the assets inventory should include sufficient capital expenditures that would allow the replacement of infrastructure as the end of design life is approached, in addition to sufficient funding for maintenance, to ensure that that full life expectancy may be realized.

Budgetary recommendations in this report do not include items related to development and growth; those should be considered as additional. Generally, that type of improvement or expansion to the system would be funded from a different source, such as Development Charges.

Notwithstanding the need for program development to include cross asset integration, for the foreseeable future the United Counties of Prescott and Russell's will optimize and prioritize pavement preservation and rehabilitation programs as a priority. The needs in these program areas should be addressed before construction or reconstruction need.

5.2 ROAD ASSET MANAGEMENT STRATEGY

5.2.1 Priority Rating vs. Condition Rating

Information in a database may be sorted and analyzed in numerous ways. Understanding what information a data field represents, is key to the analysis. The Inventory Manual has many rated and calculated data fields and thus provides for many ways to sort data. Some commonly used representations, or sorting of information, from the database include:

- Priority Rating
- Priority Guide Number
- Structural Adequacy (Condition)

Priority Rating is a calculated field in the Inventory Manual, and is a function of the traffic count and the overall condition rating of the road section. This approach adds weight to the traffic count of the section. Although the word 'priority' is included in the field name, a road section that has a higher calculated 'Priority Rating' is not necessarily a higher priority in the broader sense of asset management.

Similarly, a municipality may choose to sort the road sections based on condition and cost per vehicle. The Priority Guide Number data field would assist in providing that analysis, as sorting on that parameter would prioritize road sections that have higher traffic and thus a lower cost per vehicle.

Developing a road capital program around the Priority Rating or Priority Guide Number fields will result in programming that would lead to a less efficient expenditure of funds and reduced system performance per budget dollar, as road sections with high traffic and in poor condition would be selected first, as opposed to selecting the best rehabilitation candidates at the appropriate time in their life cycles. The exception to this statement would be cases where rehabilitation funding is at a high enough level to ensure that the preservation program requirements can be met.

From a more current asset management perspective, project selection should be predicated by condition (Structural Adequacy). Figure 12 clearly illustrates the financial advantages of managing the road system by performing the right treatment at the right time of the asset life cycle. If appropriate strategies are not undertaken at the correct time, there is a less effective usage of the available funding.

In terms of structures, OSIM has many rated and calculated data fields and thus provides for many ways to sort data. From a more current asset management perspective, project selection should be predicated by public safety and then condition. Figure 12 is taken from a document that describes pavement management principles however, the concepts may be applied to other assets such as structures to optimize available funding. Figure 12 clearly illustrates the financial advantages of managing an asset by performing the right treatment at the right time of the asset life cycle. If appropriate strategies are not undertaken at the correct time, there is a less effective usage of the available funding. For example bridge deck waterproofing and repaving and minor deck rehabilitations performed at the appropriate condition will optimize funding and utilize the full service life of the asset.

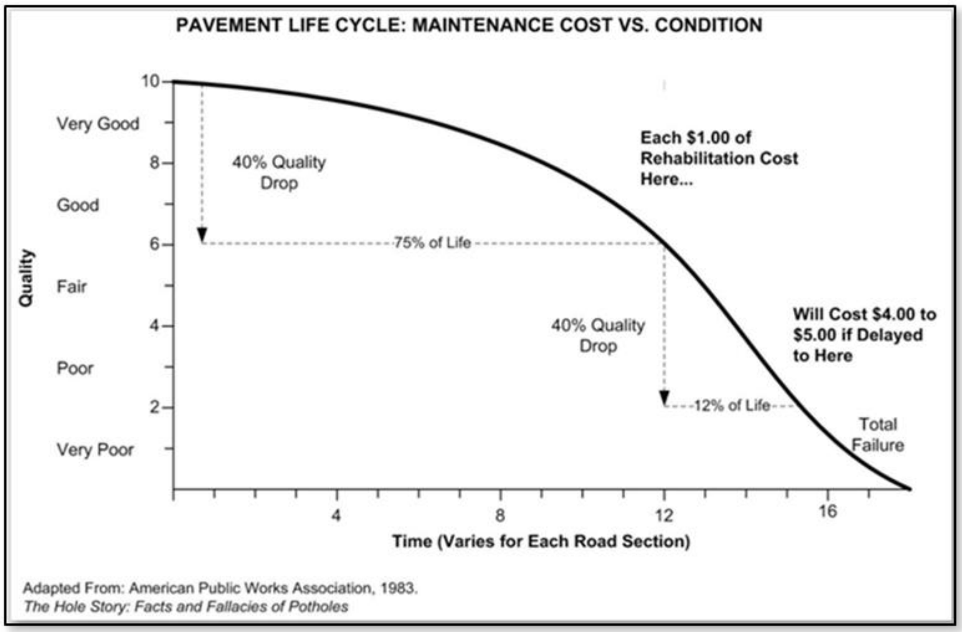


Figure 12: Treatment Cost vs. Deterioration

Ideally, if a road is constructed and maintained with timely appropriate maintenance and resurfacing, the road system will reach a point where the majority of the activities will be preservation and resurfacing. Figure 13 clearly illustrates the effect the life span of a pavement by applying the correct treatment at the correction time in the life cycle.

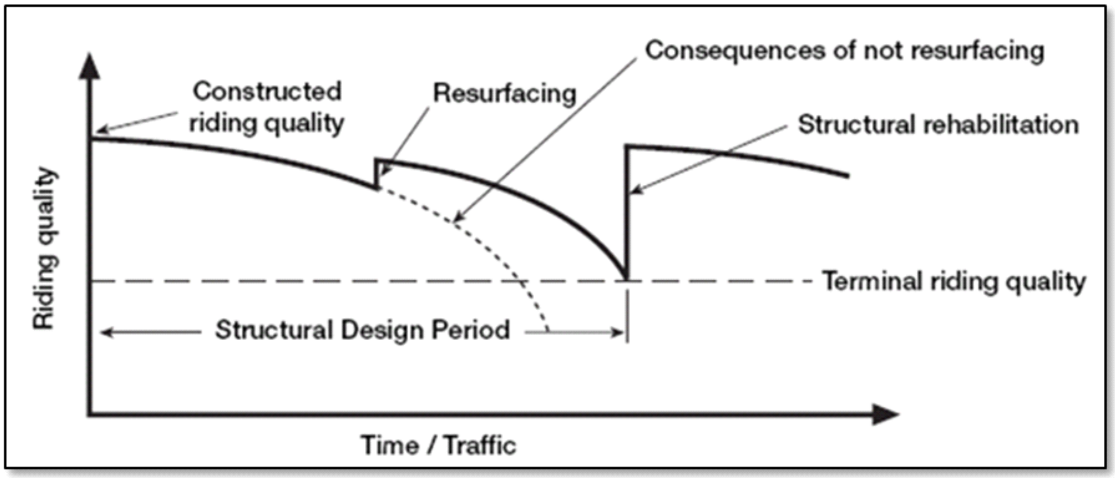


Figure 13: Pavement Management- The Right Treatment at the Right Time
Source: Wirtgen Cold Recycling Manual

If an agency's budget is fully funded, the programming will include reconstruction, resurfacing, and preservation programs. Prioritization within the different programs will vary as demands are different. However, within the resurfacing and preservation programs, the pavement condition should drive the decision making.

Where funding is limited, resurfacing and preservation programs should be prioritized over the construction program. The effect of this approach will be that 'NOW' need roads will remain 'NOW' needs. However, by virtue of their 'NOW' need condition, 'NOW' need roads will require increased maintenance and likely generate increased complaints from the driving public. To deal with this eventuality, a municipality should create a *'maintenance paving budget',* over and above the resurfacing budget. The purpose of this budget is to defer the reconstruction needs, and reduce maintenance efforts and complaints until the road can be reconstructed.

5.2.2 Cross Asset Integration and Project Prioritization

Prioritizing projects from a purely asset management perspective is a relatively straightforward exercise, regardless of funding level. Complications arise when the specific needs, commitments of the agency, and priorities of other utilities factor into the decision making process.

The road system is, in reality, a utility corridor. Multiple utilities in both urban and rural roadside environments will present conflicting demands and priorities in advancing projects. The Road Needs Study provides ratings that deal strictly with the condition of various factors as they relate to the road section. Those factors have to be considered in conjunction with needs and priorities that may exist for other utilities or pending development. In fact, the condition of other infrastructure within the road allowance may be the key element in the prioritization. For example, a road rated as a reconstruction project may have a relatively low priority rating, but a trunk storm sewer servicing a greater area may require immediate installation. The priority of the road is then dictated by the other utility, and should be integrated into the capital plan, to best serve all interests.

Less tangible priorities may also be project prioritization tools for some agencies. For example, an agency may want to advance projects that also include bus routes or bike lanes.

As a municipal road program is developed, opportunities to complete work on smaller sections adjacent to the main project, at a lesser cost than if completed as a stand-alone project, should be considered to realize economies of scale, and complete improvements that may otherwise be passed over.

5.2.3 Performance Modeling – Budget Effect on System Performance

5.2.3.1 Asset Management Plan and Strategy Analysis

The asset management plan is a function of the strategy and available financing. The development process for all elements is iterative, concurrent and holistic on a number of levels. It is complex.

The provincial guidelines for the preparation of an AMP indicate that the following must be considered;

- Options must be compared on Lifecycle cost- the total cost of constructing, maintaining, renewing and operating an infrastructure asset throughout its service life. Future costs must be discounted and inflation must be incorporated.

- Assessment of all other relevant direct and indirect costs and benefits associated with each option.
    - Direct benefits and Costs
        - Efficiencies and network effects
        - Investment scheduling to appropriately time expansion in asset lifecycles
        - Safety
        - Environmental
        - Vulnerability to climate change
    - Indirect Benefits and Costs
        - Municipal wellbeing and costs
        - Amenity values
        - Value of culturally or historically significant sites
        - Municipal image

- Assessment of Risks associated with all potential options. Each option must be evaluated based on its potential risk, using an approach that allows for comparative analysis. Risks associated with each option can be scored based on quantitative measures when reasonable estimates can be made of the probability of the risk event happening and the cost associated with the risk event. Qualitative measures can be used when reasonable estimates of probability and cost associated with the risk event cannot be made.

Significant effort (and expense) will be required to meet all of these requirements however a properly developed performance model will satisfy the majority of the requirements identified in the foregoing and is explained below.

5.2.3.2 Performance Model Overview

Key elements of a Performance Model will include;

- Deterioration Curves identifying anticipated deterioration of an appropriately constructed asset over the life cycle of the asset

- 'Trigger' points throughout the deterioration curve identifying appropriate treatments at condition ranges
- Current costing for all treatments identified

To capture the essence of the provincial requirements, development and use of a Performance Model is recommended. Through modeling and the resultant outputs the following may be addressed;

- Review of options and lifecycle effects based on a Return on Investment Analysis
- Efficiencies and network effects
- Budget requirements to achieve Level of Service goals

It is respectfully suggested that a 10 year AMP can be developed through a Performance model, however, we are of the opinion a number of other requirements that the province has identified should not be addressed until they reach the project stage. Further, a number of those requirements would be addressed through a Class Environmental Assessment process.

Through performance modeling appropriate budget levels, programming and associated costs can be determined, delivering key elements of any plan that can be refined or revisited as circumstances change. Once a model is developed, then the effect of any alternatives may also be measured.

5.2.4 Record of Assumptions – Performance Modeling

5.2.4.1 Pavement Classification for Modeling

In order to develop budget recommendations, we add an additional classification of roads differentiated by surface type, roadside environment and traffic volume. It is anticipated that each road classification will deteriorate at a different rate. Differentiation by roadside environment within a classification permits calculation of the different replacement costs to reflect the servicing and feature differences.

Asset Class	Subtype	Material	Roadside Envt	AADT Low	AADT High
HCB1	All	HCB	R	20,000	100,000
HCB2	All	HCB	R	10,000	20,000
HCB3	All	HCB	R	1,000	10,000
HCB4	All	HCB	R	1	1,000

Table 38: Road Asset Classes

Figure 14 illustrates treatment selection by time and asset classes for hot mix roads. Typical treatments and/or improvements have been superimposed over the deterioration curves, to illustrate the general timelines for implementing the treatments. Other road asset classes have been treated similarly. An important concept to remember is that as a road deteriorates the cost of rehabilitation increases. The deterioration curves, improvement types, current unit costs and current condition ratings are essentially the assumptions used to develop budget and programming recommendations in this report.

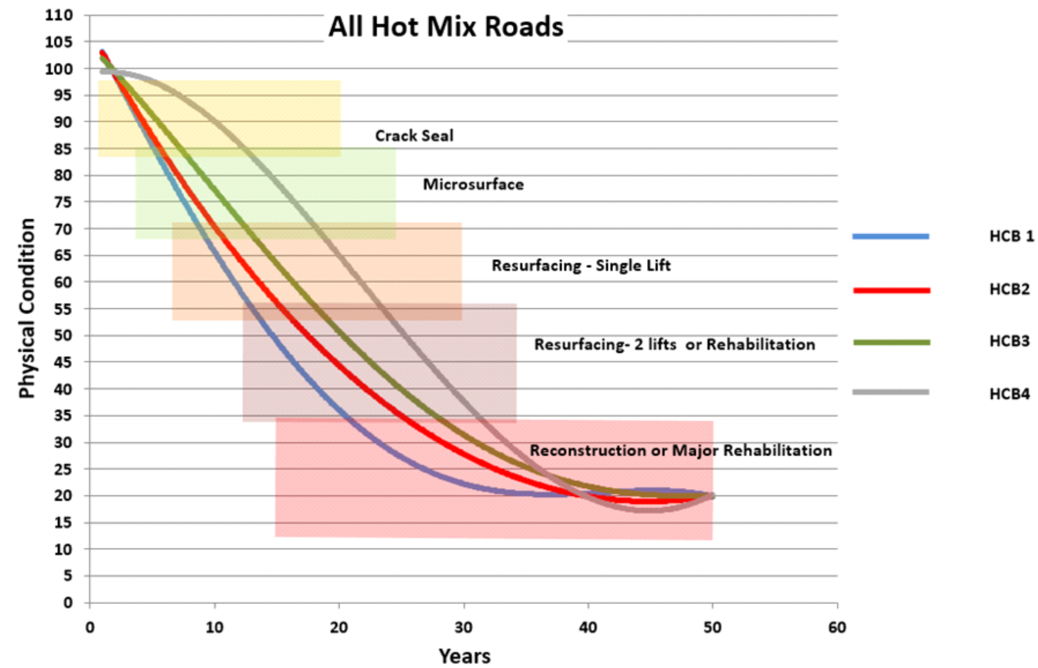


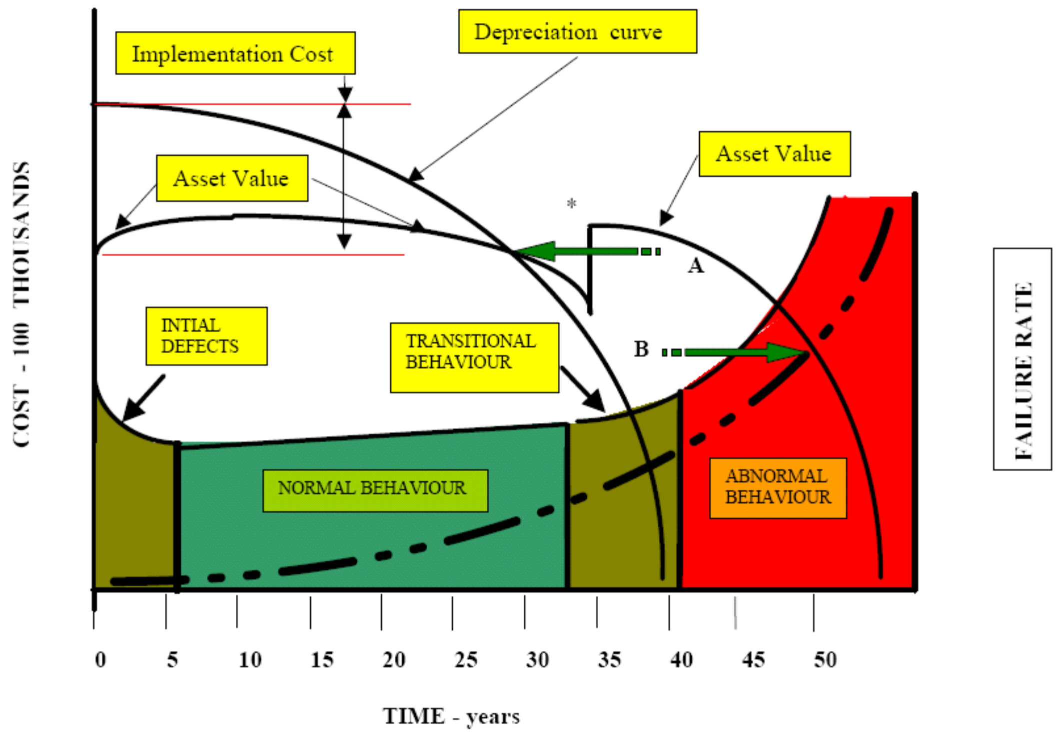
Figure 14: Treatment Selection vs. Condition

5.3 STRUCTURES – SPECIFIC ASSET MANAGEMENT STRATEGY

5.3.1 Bridge Deck and Superstructure Lifecycle Maintenance

After construction of a new bridge, some initial maintenance/rehabilitation efforts will have to be undertaken within 12 to 25 years to maintain the lifecycle of the structure. Generally, the pavement and bridge deck waterproofing should be replaced in the 12 to 20 year timeframe, with a deck rehabilitation being undertaken in the 25 to 35 year timeframe. Failure to follow a preventive and proactive maintenance schedule of timely repairs and rehabilitations will result in higher than expected repair costs, or worse, missing the optimum rehabilitation window completely.

The following graph is from the Transportation Association of Canada's (TAC) Bridge Management Guide and illustrates what is referred to as a deterioration curve.



B - Asset value = value remaining capital liability
C - Asset value = accumulated value of operating costs
* - Discontinuity occurs after rehabilitation (value increases)
— - - - - Accumulated operating costs

Figure 15: Bridge Deterioration Curve (TAC)

Similar to roads, structures (mostly bridge structures require major maintenance throughout the life cycle, in order to optimize and maximize the asset life span. Bridges require resurfacing, waterproofing and rehabilitation at the appropriate interval, dependent upon construction type and wearing surface. Different agencies categorize the expense differently, usually dependent upon the dollar value; however, bridge lifecycle minor and major rehabilitations are essentially a maintenance activity.

For structures, resurfacing and bridge deck waterproofing and rehabilitations offer a very good return on investment. When bridge structures are rehabilitated the opportunity to convert the structure to an integral or semi-integral structure will improve performance of over the longer term.

5.3.2 Condition Assessment Cycle Recommendation - Structures

The United Counties of Prescott and Russell's practice has been to update the condition of the structures inventory in accordance with the legislated requirements. The bridge and culvert structures with a span greater than 3 metres should continue to be reviewed on a two year cycle, as required by regulation.

5.3.3 Program Funding Recommendations - Structures

Program funding recommendations are a function of the constitution of the bridge and structure inventory. Recommended funding for the structures inventory should include sufficient capital expenditures that would allow the replacement of infrastructure as the end of design life is approached, in addition to sufficient funding for maintenance, to ensure that that full life expectancy may be realized.
Budgetary recommendations in this report do not include items related to development and growth; those should be considered as additional. Generally, that type of improvement or expansion to the system would be funded from a different source, such as Development Charges.

5.4 BUILDING – SPECIFIC ASSET MANAGEMENT STRATEGY

5.4.1 Building Lifecycle Maintenance

After construction of a new building, some initial maintenance/rehabilitation efforts will have to be undertaken within 12 to 25 years to maintain the lifecycle of the structure. Generally, the roof cladding, windows, HVAC system, some plumbing fixtures should be replaced in the 20 to 25 year timeframe, with the building envelope being undertaken in the 25 to 35 year timeframe. Failure to follow a preventive and proactive maintenance schedule of timely repairs and rehabilitations will result in higher than expected repair costs, or worse, missing the optimum rehabilitation window completely.

5.4.2 Condition Assessment Cycle Recommendation - Buildings

The United Counties of Prescott and Russell’s practice has been to update the condition of the building inventory every two years in accordance with good engineering practices. The buildings should continue to be reviewed on a two year cycle.

6 FINANCING STRATEGY

6.1 FINANCING STRATEGY - ROADS

Program funding recommendations are a function of the dimensional information, surface type, roadside environment, functional class of the individual assets and current unit costing. Recommended funding for the road system should include sufficient capital expenditures that would allow the replacement of infrastructure as the end of design life is approached, in addition to sufficient funding for maintenance, to ensure that that full life expectancy may be realized.

Budgetary recommendations in this report do not include items related to development and growth; those should be considered as additional. Generally, that type of improvement or expansion to the system would be funded from a different source, such as Development Charges.

The budget recommendations bear a direct relationship to the value of the road system. UCPR estimates the cost to replace the road system, to its current standard, at **$387,585,033**. The budget recommendations provided in this report are based on the constitution of the road system. This represents an opportunity to develop a financial plan in concert with the asset management plan, for a phased implementation.

6.1.1 Capital Depreciation

The estimated replacement/depreciation value of the County road system to the current standard is **$387,585,033**. This equates to an annual capital depreciation of **$7,751,700.** The annual capital depreciation is strictly a function of the replacement cost and the design life, and would best be described as an *'Accountaneering'* number. This estimate does not include bridges, culverts, cross culverts less than 3 m, sidewalks, or street lighting. The typical design life for a road structure is 50 years before reconstruction/replacement. If the life span is 50 years, then 2% of the replacement cost should be the annual contribution to the capital reserve, to ensure that it can be reconstructed in that time frame.

The estimated replacement/depreciation is based upon the replacement value of the road system over a 50-year life cycle. However, the 50-year life cycle can only be a reality if maintenance and preservation treatments such as crack sealing and hot mix asphalt overlays are delivered at the appropriate time. Inadequate maintenance and preservation will result in premature failure and increased life cycle costs.

Analogies to houses and cars sometimes make road maintenance easier to understand. If a house does not have the roof renewed within the correct time frame, there will be damage to the structure, below the roof, and if this is not dealt with, it will result in a rapid deterioration of the house. Similarly, roads require crack sealing and resurfacing at the appropriate time, during the life cycle, in order to maximize the life expectancy of the asset. Preservation and maintenance extend the useful life of the pavement, reducing life cycle costs.

6.1.2 Hot Mix Resurfacing

Roads require major maintenance throughout the life cycle, in order to optimize and maximize the asset life span. Roads require resurfacing at the appropriate interval, for the respective class of road. Different agencies categorize the expense differently, usually dependent upon the dollar value; however, resurfacing is essentially a maintenance activity.

Resurfacing schedules are dependent upon traffic loading and the percentage of commercial traffic. Higher traffic volumes and percentages of commercial traffic shorten the interval between resurfacings. Optimal resurfacing intervals will vary from ten to twenty years (or more), depending upon the road function, classification, and quality of design and construction.

The Hot Mix Asphalt Resurfacing recommendation in this report is based upon the distribution of the County's hot mix asphalt inventory. As such, the optimal budget calculation will focus on the 19-year interval (18.98), for hot mix roads.

Given the aforementioned, and the information with respect to surface type contained in Table 39, the funding for the annual resurfacing program should be **$5,164,274** per year on average, in order to maintain the system at its current adequacy level. This estimate is for the major resurfacing work only, and does not include any estimated costs for other pavement preservation activities or programs. Table 39 identifies the distribution of hot asphalt roads by asset class and the basis for the recommendation for the annual program budget recommendation.

Asset Class	L.C. Yrs	Average Annual Cost	Asset Qty. (km)
HCB1-R	10	$0	0
HCB1-S	10	$0	0
HCB1-U	10	$4,704	0.5
HCB2-R	12	$75,850	5.9
HCB2-S	12	$113,183	6.4
HCB2-U	12	$141,899	4.8
HCB3-R	15	$3,129,151	347.45
HCB3-S	15	$136,383	15.1
HCB3-U	15	$414,626	34.1
HCB4-R	20	$1,022,345	153.3
HCB4-S	20	$23,150	3.2
HCB4-U	20	$100,538	10.5
TOTALS		**$5,161,828**	**581.25**

Table 39: Hot Mix Asphalt Roads by Asset Class and Life Cycle

6.1.3 System Performance at Various Budget Levels

Deterioration curves developed by 4 Roads have been utilized for development of funding and prediction models, and based on their experience with a large cross-section of municipalities and resultant feedback, we believe that those deterioration profiles are representative.

This report includes budget recommendations for various aspects of the programming that are typical to road departments. System performance can be predicted based on the level of funding. UCPR has prepared four different 50-year performance models for the road system. The models have been prepared with the following parameters:

- Zero budget – demonstrates the effect of no work being performed on the road system and how quickly it will deteriorate
- Existing budget - **$7.3m**.This is the average road expenditures from 2010 to 2015 inclusive.
- Preservation budget - **$5.2m**.This includes the total dollar value of the budget recommendations for Hot Mix Asphalt resurfacing.
- Capital Depreciation / Amortization budget - **$7.8** full replacement cost of the road system annualized. Note that the model will not expend this amount annually when not required.

The Average Physical Condition of the road system is currently **75.6**. The performance model calculations all begin with the current Physical Condition and for purposes of the graphing, the year-end Physical Condition is displayed based on the effects that the improvements have had on the overall condition of the road system.

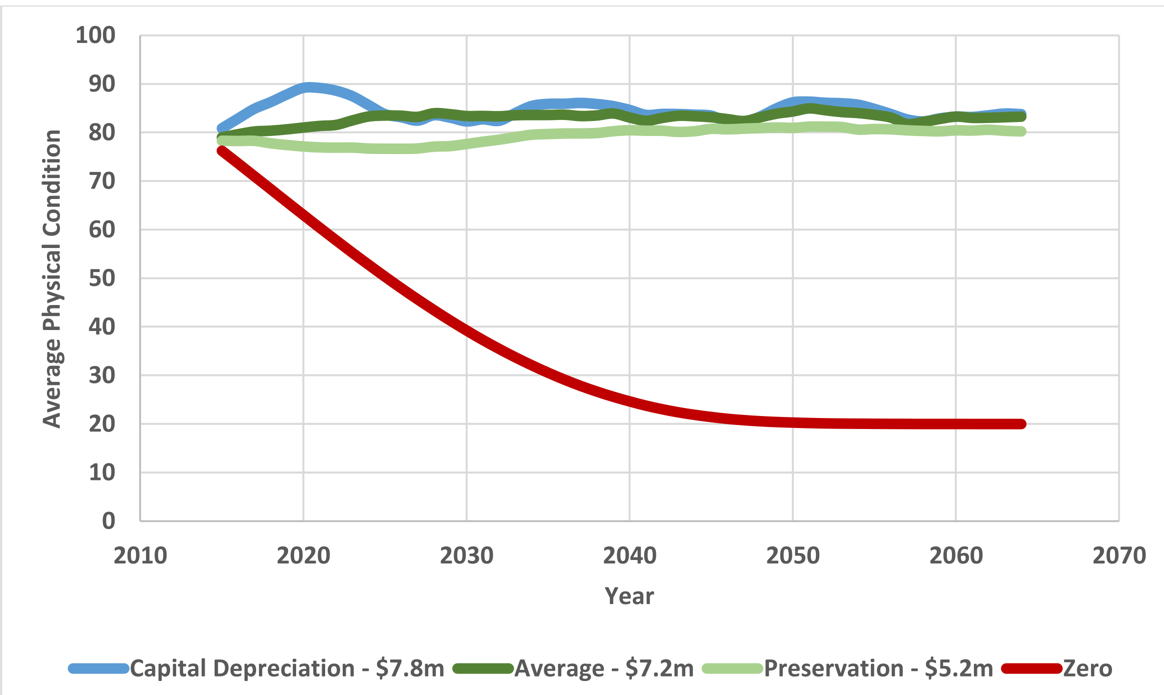


Figure 16: Performance Modeling at Various Budget Levels

In reviewing the results of the performance models, it should be understood that, with the methodology being used, the trigger for a resurfacing activity is a Physical condition of 70. The existing system has an average Physical Condition of **75.6**. At appropriate funding levels the system condition improves over time. However, the improvement in terms of the Physical Condition will only increase to approximately the mid 80's.

The deterioration curves that have been used consider an average/typical performance for the various road classes. When used in the model at a reasonable funding level the overall average system condition will remain at a similar level as the model will treat the pavements as perpetual.

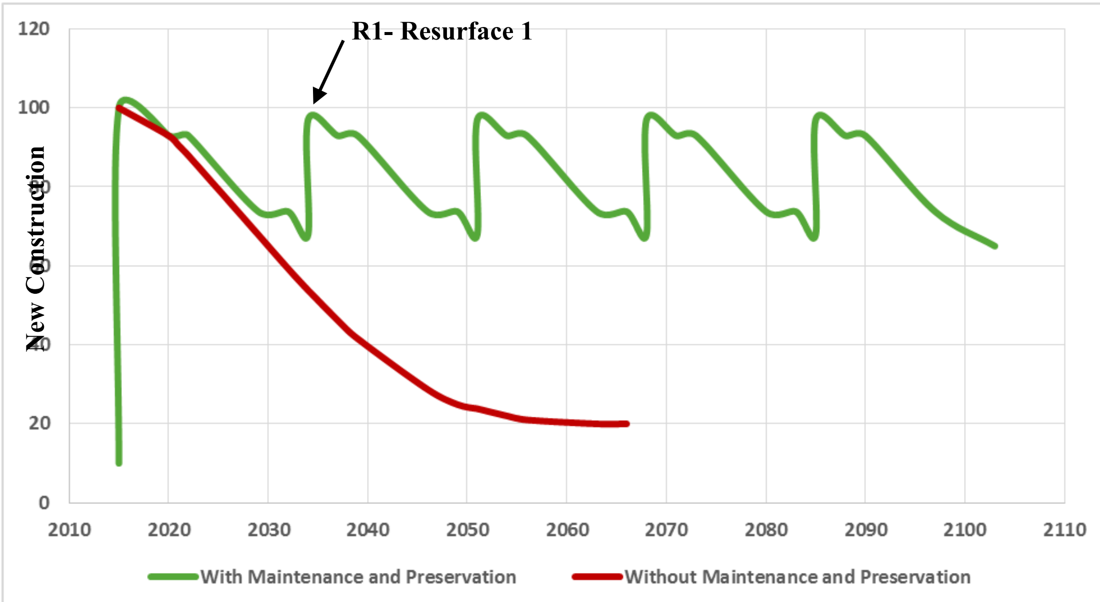


Figure 17: Graphical Representation of a Typical Life Cycle

For the purposes of a short to mid-term plan considering the pavement as performing as a perpetual pavement does not pose a problem. The aggregate road base will deteriorate over time however, the time frame where that may be contributory to the road decline would be beyond 50 years. Condition data is collected regularly and monitoring and analysis would alert the municipality to changes that are occurring.

6.1.4 Roads – How much will it Costs?

Table below shows the recommended allocation based upon the current average funding level. This will not address all needs but will maintain the current service level. Table 40 show the amount required annually based upon the time of need.

Imp.Type	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Grand Total
BS							2781910		1085493		3867403
PR1	4136933	1365388									5502321
PR2	364624	1880840	4579939	1302724	1370385		292617				9791129
R1	2679391	3922939	2618526	5873236	4048091	3609261	3462462	6800905	2294990	7190869	42500670
R2					1758456	3574230	625418	388043	3800859		10147006
Grand Total	**7,180,948**	**7,169,167**	**7,198,465**	**7,175,960**	**7,176,932**	**7,183,491**	**7,162,407**	**7,188,948**	**7,181,342**	**7,190,869**	**$71,808,529**

Table 40: 10 Year Program -Performance Model Output (Average Funding Level)

6.1.5 Recommendations – Long term sustainability

This report identifies the overall condition of the system. A regular review of the condition of the road system allow the municipality to gauge the effectiveness of the strategies, programs and funding levels over time; in effect benching marking against yourself. Regular reviews and analysis provide the opportunity to review and adjust any of the service delivery elements. It is recommended that a 3 to 5 year cycle review period with an update of the road system database.

Based on the composition of the road system, budget recommendations have been developed for annual capital and maintenance programs as follows:

- **$7,751,700** for the roads capital/depreciation, excluding resurfacing, based upon a 50-year life cycle. (This would be similar to the PSAB 3150 amortization value using current replacement costs)
- **$5,164,274** for average annual hot mix resurfacing, based upon an 16(16.3)-year cycle.(This would approximate an average of 34.8 km per year)

For modeling purposes, we have created a funding level described as the 'Preservation Budget'. The Preservation Budget is the total of the recommended funding levels for hot mix resurfacing: **$5,164,274**. The premise being that if the preservation and resurfacing programs are adequately funded then the system should be sustained. To clarify, the required funding level to sustain or improve the road system; it is *not* the total of all of the above recommendations. Sustainable funding has to be between the Preservation Budget and the Capital Depreciation. The preservation budget and performance model thereof are computer derived. Intangible values and decisions and the effects of other external forces cannot be incorporated into the model. As such the preservation model is the minimum required to maintain the system- in theory. From a more pragmatic perspective and to deal with the real life realities of maintaining a road system, it should be greater. That being said, the budget recommendation for UCPR is **$7,200,000**.

Municipal pavement management strategies are critical to managing the performance of the road system, more so, if funding is limited. Funding constraints should push the strategy toward those programs that extend the life cycle of the road by providing the correct treatment at the optimum time. Resurfacing, rehabilitation, and preservation projects should be a higher priority than reconstruction projects. The objective is to "keep the good roads good".

The prime goal of any pavement management strategy should be to maintain overall system adequacy. The funding level for road-related programming should be set at a sufficient level so as to ensure that overall system adequacy does not decrease over time.

In addition to the budgetary recommendations, the following recommendations are provided for the management of the road inventory.

- The information and budget recommendations included in this report should be used to further develop the corporate Asset Management Plan.
- The cycle for review of the road system should be continued, reviewing the entire system on a two to four year cycle.
- Programming should be reviewed to ensure that resurfacing and preservation programs are optimized.

- Traffic counts should be updated and repeated on a regular basis. The counting should include the percentage of truck traffic.
- A field audit of the road system should be conducted to confirm attribute data and identify potentially substandard alignments.
- Boundary Roads should be confirmed and reviewed to ensure appropriate agreements are in place.
- For the foreseeable future the United Counties of Prescott and Russell's priorities should be to optimize and prioritize pavement preservation and rehabilitation programs as a priority. The needs in these program areas should be addressed before construction or reconstruction need.

6.2 FINANCING STRATEGY - STRUCTURES

6.2.1 Capital Depreciation

The estimated replacement/depreciation value of the UCPR Bridge and Culvert structures Inventory to the current standard is **$125,755,672**. The estimated capital depreciation is **$2,515,113** based on a 50 year design life or **$1,676,742** per year based on a 75 year service life. The annual capital depreciation is estimated based on replacement cost and the design life or service life, and would best be described as an 'Accountaneering' number. This estimate is strictly for structures over 3m span does not include any appurtenances. The typical design life for a bridge or culvert structure is 50 years if constructed prior to 2000.

The estimated replacement/depreciation is based upon the replacement value of the structures inventory over a 50-or 75 year life cycle. However, the life cycle can only be a reality if maintenance and preservation treatments such as waterproofing and resurfacing and minor rehabilitations delivered at the appropriate time. Inadequate maintenance and preservation will result in premature failure and increased life cycle costs.

6.2.2 Structures – How much will it Costs?

Program funding recommendations are a function of the constitution of the bridge and structure inventory. Recommended funding for the structures inventory should include sufficient capital expenditures that would allow the replacement of infrastructure as the end of design life is approached, in addition to sufficient funding for maintenance, to ensure that that full life expectancy may be realized.

Budgetary recommendations in this report do not include items related to development and growth; those should be considered as additional. Generally, that type of improvement or expansion to the system would be funded from a different source, such as Development Charges.

The budget recommendations bear a direct relationship to the value of the structures inventory. UCPR estimates the cost to replace the structures inventory at **$125,755,672**. The budget recommendations provided in this report are based on the constitution of the structures inventory. This represents an opportunity to develop a financial plan in concert with the asset management plan, for a phased implementation.

6.2.3 Structures – Recommendations – Long term sustainability

Based on the composition of the structures inventory, budget recommendations have been developed for annual capital and maintenance programs as follows;

- **$2,515,113** for the structures capital/depreciation and maintenance and rehabilitation, based upon an average 50 year design life of the existing inventory ($1,676,742 assuming 75 year service life).
- **$2,201,683** for average minimum annual requirement, based upon the recommendations for the next 10 years as per the 10 Year Asset Management plan from the 2015 HP Engineering Bridge inspection report.

From a more pragmatic perspective and to deal with the real life realities of maintaining structures the budget recommendation for UCPR is **$2,201,683** as identified in the 2015 HP Engineering Bridge inspection report.

In addition to the budgetary recommendations, the following recommendations are provided for the management of the structures inventories;

- The cycle for review of the structures inventory should be continued, reviewing the entire inventory on a two year cycle.
- Structures not currently in the being reviewed should be included in the next scheduled review cycle.
- Structures with a BCI of less than 60 should be closely reviewed for replacement versus rehabilitation.
- The average annual contribution for the structures should be $2,515,113 based on a 50 year design life. Using the 50 Year contribution should provide sufficient funding to include the maintenance activities such as bridge deck waterproofing and resurfacing, and minor rehabilitations.
- Capital reserves and an annual contribution should be established for the structure assets.
- Programming for the structures inventory should be reviewed to ensure that preservation and other service life extension treatments are optimized.

6.3 FINANCING STRATEGY - BUILDINGS

6.3.1 Capital Depreciation

The estimated replacement/depreciation value of the UCPR buildings to the current standard is **$75,682,527**. The estimated capital depreciation is **$1,513,650** based on a 50 year design life. The annual capital depreciation is estimated based on replacement cost and the design life, and would best be described as an 'Accountaneering' number.

The estimated replacement/depreciation is based upon the replacement value of the building inventory over a 50 year life cycle. However, the life cycle can only be a reality if maintenance, preservation treatments and minor rehabilitations are delivered at the appropriate time. Inadequate maintenance and preservation will result in premature failure and increased life cycle costs.

6.3.2 Buildings – How much will it Costs?

As outlined in the Art Engineering Inc reports, the following recommended investments should be undertaken over the next 20 years with a total of $19.1 million.

Year	Social housing	Public Works Garages	Emergency Services	Grand Total
Year 2015	$263,951	$46,006	$8,270	$318,227
Year 2016	$293,374	$26,452	$5,290	$325,117
Year 2017	$631,571	$47,127	$55,959	$734,657
Year 2018	$663,445	$32,413	$90,550	$786,408
Year 2019	$416,812	$92,230	$77,633	$586,674
Year 2020	$371,751	$425,991	$20,775	$818,516
Year 2021	$747,537	$104,490	$0	$852,027
Year 2022	$880,046	$165,497	$37,667	$1,083,210
Year 2023	$448,471	$307,093	$15,442	$771,007
Year 2024	$968,549	$337,892	$32,164	$1,338,604
Year 2025	$387,896	$238,325	$55,723	$681,945
Year 2026	$1,457,607	$140,087	$6,592	$1,604,286
Year 2027	$576,736	$76,743	$121,167	$774,646
Year 2028	$1,181,383	$199,050	$244,235	$1,624,668
Year 2029	$1,013,868	$216,057	$275,020	$1,504,945
Year 2030	$1,346,629	$59,878	$35,989	$1,442,496
Year 2031	$879,318	$18,038	$0	$897,356
Year 2032	$606,962	$19,528	$103,759	$730,249
Year 2033	$994,754	$138,610	$173,657	$1,307,021
Year 2034	$772,411	$3,778	$182,772	$958,961
Total	$14,903,072	$2,695,286	$1,542,663	$19,141,021

Table 41: Buildings Financial Plan - 20 Years

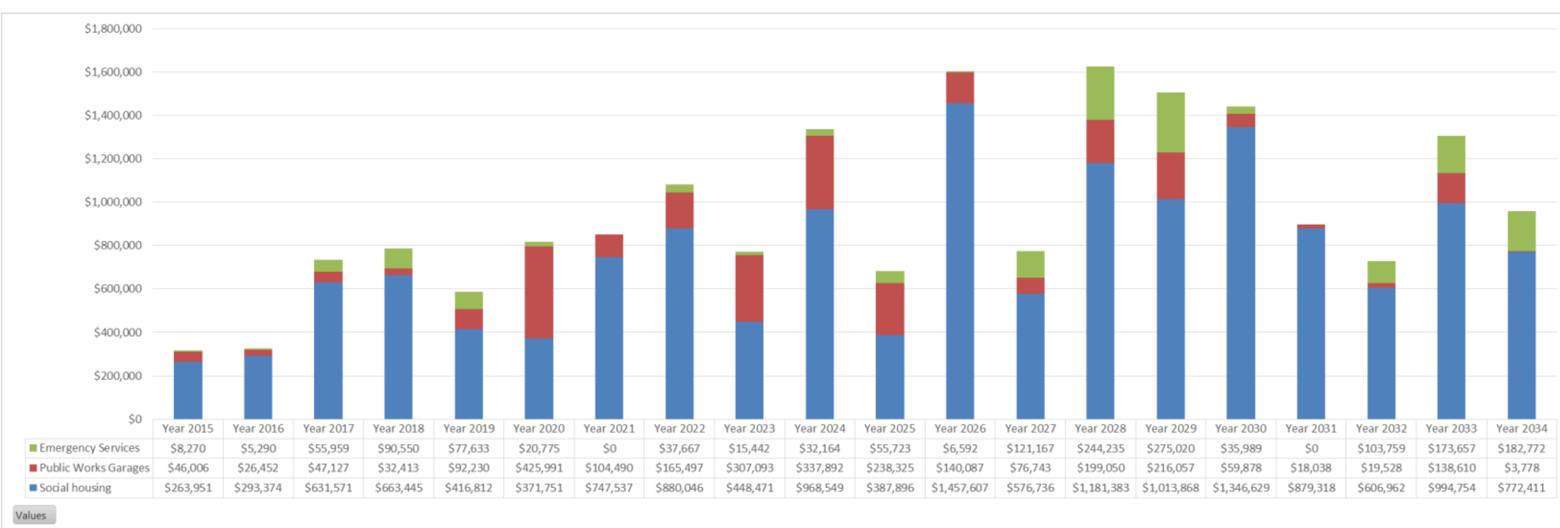


Figure 18: Building – Financial Plan – 20 Years

6.3.3 Recommendations – Long term sustainability

According to the Art Engineering Inc. Building Condition Reports, the average annual requirements is $957,051 over the next 20 years as shown in Table above. According to the 2014, 2015 and 2016 Budgets, the County allocated an average of $500,000 respectively to the three building types.

Based on the composition of the buildings, budget recommendations have been developed for annual capital and maintenance programs as follows:

- **$1,513,650** for the buildings capital/depreciation
- **$957,051** for average annual requirement, based upon the recommendations for the next 20 years.

From a more pragmatic perspective and to deal with the real life realities of maintaining buildings the budget recommendation for UCPR is **$1,000,000** as identified in the ART Engineering program.

6.4 FINANCING STRATEGY ALL ASSETS

The following tables outline the recommendations based upon current funding levels and Time of Need. As shown, the current funding levels is approximately $2.17 million short of the recommended budget when you consider the entire 10 years. Further analysis is required for recommendations with respect to debt and financing based upon the desired levels of service.

Asset	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Grand Total (10 Years)
Roads	7,180,948	7,169,167	7,198,465	7,175,960	7,176,932	7,183,491	7,162,407	7,188,948	7,181,342	7,190,869	71,808,529
Bridges & Culverts	1,511,600	2,511,168	2,701,500	2,150,800	2,064,500	2,119,000	2,152,300	2,241,500	2,147,460	1,376,000	20,975,828
Buildings	325,117	734,657	786,408	586,674	818,516	852,027	1,083,210	771,007	1,338,604	681,945	7,978,165
Total Recommended	9,017,665	10,414,992	10,686,373	9,913,434	10,059,948	10,154,518	10,397,917	10,201,455	10,667,406	9,248,814	100,762,522
Existing budget (2016)	7,900,000	7,900,000	7,900,000	7,900,000	7,900,000	7,903,800	7,900,000	7,900,000	7,900,000	7,900,000	79,000,000
Shortfall	-1,117,665	-2,514,992	-2,786,373	-2,013,434	-2,159,948	-2,254,518	-2,497,917	-2,301,455	-2,767,406	-1,348,814	-21,762,522

Table 42: Recommended Capital Investments – 10 Years

6.4.1 10 Year Program

Appendix A includes the results of a 10 Year program at the Average Budget level of $7.2m per year for the road system.

Appendix B includes the results of a 10 Year program for bridges and culverts based on HP Engineering 2015 inspection report.

Appendix C includes the results of a 20 Year program for buildings based on ART Engineering report.