PSD RESEARCH CONSULTING SOFTWARE

Infrastructure Risk Review

West Lincoln
Your Future Naturally

October 2020

RESEARCH CONSULTING SOFTWARE

Table of Contents

Introduction

The Township of West Lincoln has retained Public Sector Digest (PSD) to develop a Risk Assessment Framework for its infrastructure and assets.

Risk and criticality models and analysis are key elements of good asset management practices and programs. They are now recognized nationally and internationally as best practice. Through their use, an asset manager can determine which infrastructure is critical to the organization and can also rank and rate the level of business risk associated with all infrastructure stock. This can be achieved at the organizational level, the asset category level, the individual asset level, and the asset component level.

This becomes extremely useful when limited internal resources are available to address a significant number of capital and operating needs.

In addition, risk is a key measure in regard to the level of service being supplied to the community at large. Important questions need to be asked and quantified. For instance, how much risk is currently associated with the delivery of infrastructure services? And, what is being done to reduce or mitigate risks? A good risk model will quantify the first question and therefore initiate analysis and management processes to address the second.

Risk Framework Summary

Risk management creates and protects value. It is part of decision making and an integral part of organizational processes. Risk management deals with uncertainty in a systematic, structured and timely manner using the best available information to reach the best possible decisions. Therefore, it is imperative that municipalities gather the best possible information in order to make the most informed decisions. The Risk Framework Report Card in this section illustrates the strength of the Township in these areas.

Developing a risk program involves many separate considerations. One of the core pillars to a wider risk program is to generate a comprehensive risk framework. Prior to undertaking this process with PSD, the Township had some incorporated risk analysis as part of its capital project prioritization process. The Township possesses some information and data to support such a framework. To assess probability of failure, the Township currently has a combination of both age-based condition, historical data, and has some replacement costs to calculate consequence of failure severity. Taken together, the Township receives an overall C grade. The details of the Township's risk management framework are found below.

Scope

This project focused on developing a Risk Assessment Framework for the following asset types:

Detailed models:

- Roads
- Bridges & Culverts
- Water
- Wastewater
- Stormwater

High-level models:

- Facilities
- Parks
- Rolling Stock
- Equipment

The asset types were identified due to their overall value relative to the Township's entire asset portfolio, the level of detailed asset data available, and their criticality level.

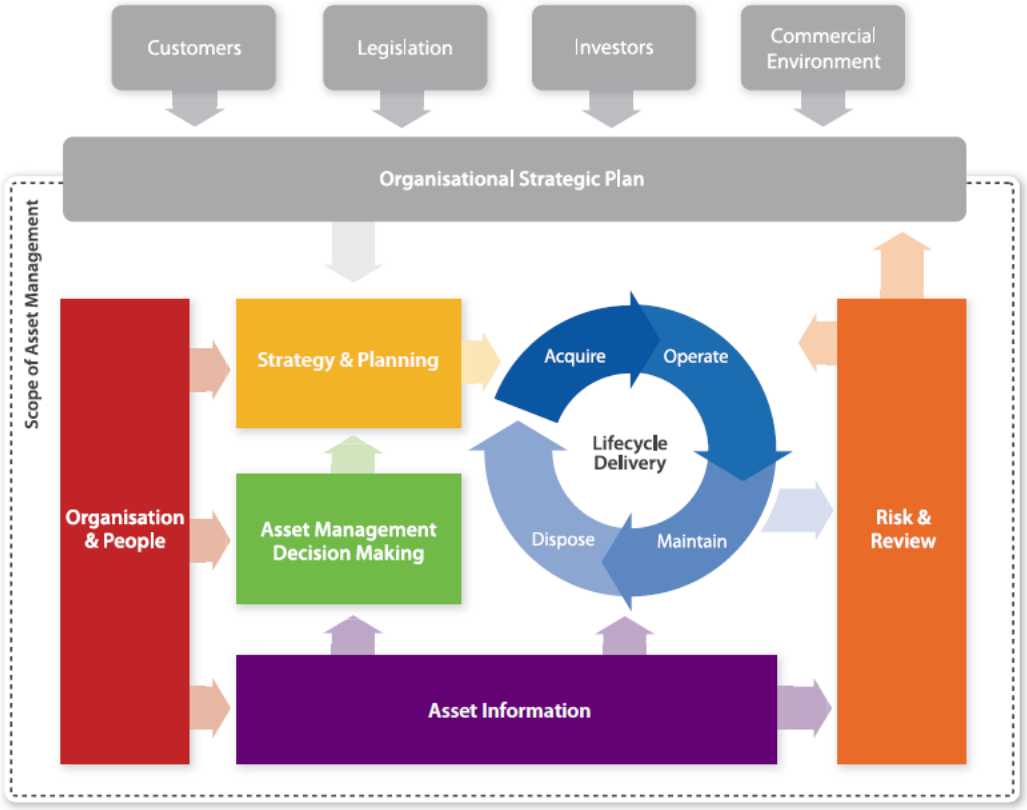
Risk Management Fundamentals

A municipality's assets are often the leading edge of its exposure to external risk. As such, it is important that policies, processes, and procedures are put in place in order to manage and mitigate organizational risk exposure. Minimizing risk exposure and using a risk-based analysis to drive asset management decision-making and capital project prioritization helps to prevent consequential asset failure and major service disruption.

In addition, infrastructure renewal and replacement needs typically exceed available financial resources. To ensure that these limited funds are allocated optimally, it is important that project prioritization parameters are developed to ensure that the right projects come forward into short- and long-term capital planning.

A robust risk management framework allows one to determine the probability and consequence of failure at both the Asset Category and individual asset level and use that data to optimize capital funding decisions.

The graphic below identifies the inputs and outputs of risk management in the wider process of asset management. After asset data and information is evaluated through the organization's risk management framework, the outputs should inform both the approach to lifecycle management and feed into the Organizational Strategic Plan.



Regulatory Requirements

Asset management planning for municipal infrastructure (O. Reg. 588/17) requires that municipalities in Ontario begin to implement risk considerations as part of their asset management program.

The following are the key statements dictating the approach that municipalities should take when incorporating risk. The O. Reg. statement in its entirety is listed first, followed by PSD's interpretation.

Asset management plans, current levels of service
O. Reg. 588/17, s 5

5.(2)4. For each asset category, the lifecycle activities that would need to be undertaken to maintain the current levels of service for each of the 10 years following the year for which the current levels of service are determined and the costs of providing those activities based on an assessment of the following:

i. The full lifecycle of the assets.

ii. The options for which lifecycle activities could potentially be undertaken to maintain the current levels of service

iii. The risks associated with the options referred to in subparagraph ii.

Interpretation: Lifecycle activity options that are implemented to maintain current levels of service must be informed by associated risks. For example, if a Municipality is to temporarily shut down water services to fix a water main, staff must consider the risks to the environment, to businesses, to homeowners etc.

Asset management plans, proposed levels of service
O. Reg. 588/17, s 6

6.(1) Subject to subsection (2), by July 1, 2024, every asset management plan prepared under section 5 must include the following additional information:

2. An explanation of why the proposed levels of service under paragraph 1 are appropriate for the Township, based on an assessment of the following:

i. The options for the proposed levels and the risks associated with those options to the long-term sustainability of the Township.

Interpretation: When developing an asset management plan to meet the requirements for 2024, the document must include reference to risk considerations when outlining proposed levels of service.

6.(1)4. A lifecycle management and financial strategy that sets out the following information with respect to the assets in each asset category for the 10-year period referred to in paragraph 1:

i. An identification of the lifecycle activities that would need to be undertaken to provide the proposed levels of service described in paragraph 1, based on an assessment of the following:

A. The full lifecycle of the assets.

B. The options for which lifecycle activities could potentially be undertaken to achieve the proposed levels of service.

C. The risks associated with the options referred to in sub-subparagraph B.

Interpretation: Proposed lifecycle activities will require risk considerations when identifying possible optional lifecycle management strategies.

6.(1)4.

iv. If, based on the funding projected to be available, the Township identifies a funding shortfall for the lifecycle activities identified in subparagraph i,

A. an identification of the lifecycle activities, whether set out in subparagraph i or otherwise, that the Township will undertake, and

B. if applicable, an explanation of how the Township will manage the risks associated with not undertaking any of the lifecycle activities identified in subparagraph i.

Interpretation: Municipalities need to identify possible risks in the event that there is a funding shortfall and identified lifecycle activities are not able to be undertaken.

The central emphasis in this regulation is that risk must be a consideration when both undertaking and failing to undertake lifecycle activities, as well as the provision of a level of service reflective of the community. More generally, O. Reg. 588/17 mandates that risk needs to be considered in asset management planning. It needs to be a lens to view asset management through; as each component of an asset management program is developed, risk needs to be factored into the decision-making process.

Methodology

A risk assessment framework, when applied to asset management, should provide an asset risk rating to assist with the management of infrastructure. This requires the development of quantitative models that can leverage the asset data and information at the disposal of the Township.

A good risk model will:

- Assist with the prioritization of resources
- Ensure vital services are available
- Prioritize and streamline inspection and condition assessment programs
- Prioritize and optimize operations and maintenance programs
- Prioritize and optimize capital budget processes and program delivery
- Ensure that available money and resources are applied to the right asset at the right time

Approach and Parameters

Integrating a risk management framework into your asset management program requires the translation of risk potential into a quantifiable format. This will allow you to compare and analyze individual assets across your entire asset portfolio.

Asset risk is typically defined using the following formula:

$$\boldsymbol{Risk = Probability\ of\ Failure(POF) \times Consequence\ of\ Failure(COF)}$$

Probability of Failure (POF)

The probability of failure relates to the likelihood that an asset will fail at a given time. The current physical condition and service life remaining are two commonly used risk parameters in determining this likelihood.

The values or ranges used to determine an asset's POF are aligned with the following qualitative rating scale:

Probability of Failure
Rare
Unlikely
Possible
Likely
Almost Certain

Consequence of Failure (COF)

The consequence of failure describes the overall effect that an asset's failure will have on an organization's asset management goals. Consequences of failure can range from non-eventful to impactful: a small diameter water main break in a subdivision may cause several rate payers to be without water service for a short time. However, a larger trunk water main may break outside a hospital, leading to significantly higher consequences. In this report, the COF parameters will aim to align with the Triple Bottom Line (economic, social, environmental) approach to risk management as well as other fields including operational, health and safety, and strategic.

	Economic	The monetary consequences of asset failure for the organization and its customers
	Social	The consequences of asset failure on the social dimensions of the community
	Environmental	The consequence of asset failure on an asset's surrounding environment
	Operational	The consequence of asset failure on the Township's day-to-day operations
	Health and Safety	The consequence of asset failure on the health and well-being of the community
	Strategic	The consequence of asset failure on strategic planning

The values or ranges used to determine an asset's consequence of failure are aligned with the following qualitative rating scale:

Consequence of Failure
Insignificant
Minor
Moderate
Major
Severe

Risk Models: Core Infrastructure

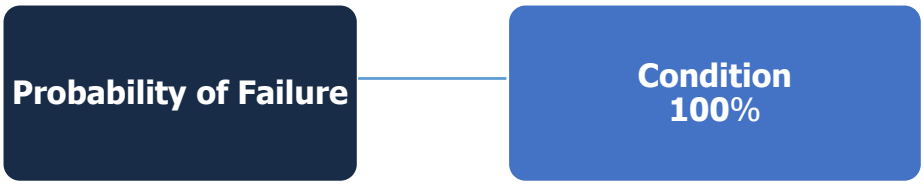
The strength of a risk management framework depends on the reliability and availability of asset attribute data and the use of risk models designed to leverage that data. The integration of meaningful asset attribute data that represent the contributing factors to the probability and consequence of an asset's failure will provide increased confidence in capital project decision-making and support evidence-based budget deliberations. While more data does not necessarily mean better outcomes, the careful selection of risk parameters can enhance asset management decision-making.

This section outlines the parameters that are recommended by PSD to calculate both the Consequence of Failure and the Probability of Failure for core infrastructure asset classes outlined within the scope of the project. These parameters and their associated weightings were determined by Township staff leveraging current and/or potential attribute data available. Further collaboration with municipal staff will define customized risk framework for the Township's core infrastructure.

Paved Roads

Probability of Failure

The following hierarchy identifies the recommended criteria to be used to calculate each asset's probability of failure, including recommended weightings.



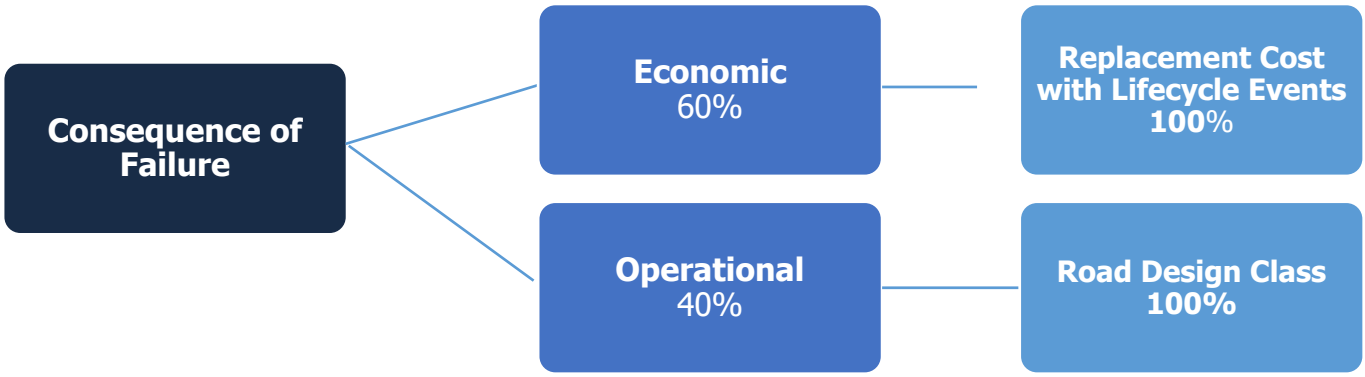
Condition assessment data from a 2019 Road Needs Study (RNS) performed by ARA has been used to determine the probability of failure for the Township's road network. Condition rating criteria has been defined using Pavement Condition Index (PCI) ratings as outlined below and takes into account annual daily traffic counts of the road. If an asset does not have an assessed condition value, then an age-based estimate of its current condition is used. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration.

Condition

PCI Range	Probability of Failure
80 - 100	Rare
60 - 80	Unlikely
40 -60	Possible
20 - 40	Likely
0 - 20	Almost Certain

Consequence of Failure

The following hierarchy identifies the recommended criteria and sub-criteria to be used to calculate each asset's consequence of failure, including all recommended weightings and sub-weightings.



Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost with Lifecycle Events	$0 - $25000	1 - Insignificant
	$25000 - $50000	2 – Minor
	$50000 - $100000	3 - Moderate
	$100000 - $150000	4 - Major
	Greater than $150000	5 - Severe

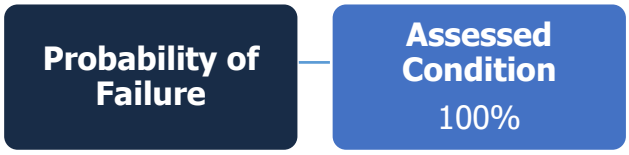
Operational

Sub-Criteria	Range	Consequence of Failure
Road Design Class	5,6	1 - Insignificant
	4	2 – Minor
	3	3 - Moderate
	2	4 - Major
	1	5 - Severe

Bridges & Culverts

Probability of Failure

The following hierarchy identifies the recommended criteria to be used to calculate each asset's probability of failure, including recommended weightings.



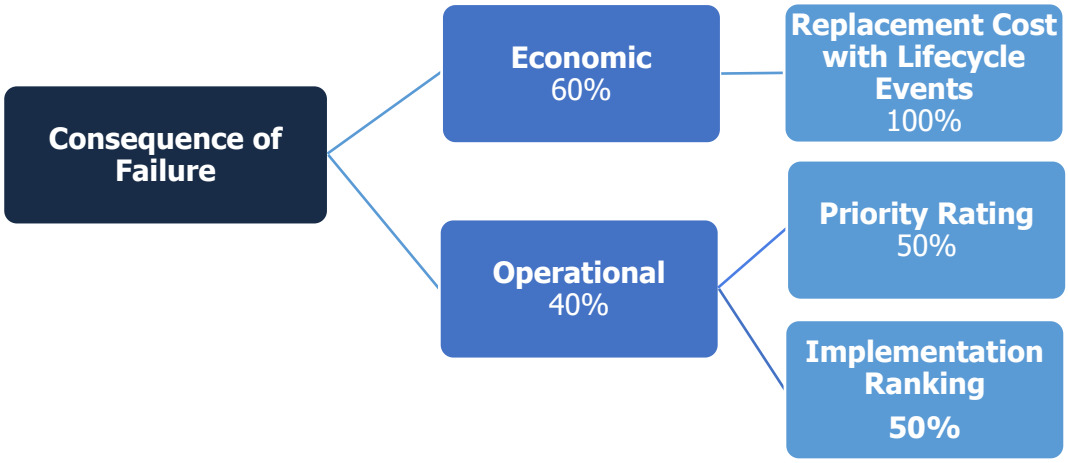
Assessed condition from the 2019 Ontario Structural Inspection Manual (OSIM) reports has been used to calculate the probability of failure. Condition rating criteria has been defined using industry bridge condition index (BCI) ratings as outlined below. If an asset does not have an assessed condition value, then an age-based estimate of its current condition is used. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration.

Condition

Bridge Condition Index (BCI) Range	Probability of Failure
80 - 100	Rare
60 - 80	Unlikely
40 -60	Possible
20 - 40	Likely
0 - 20	Almost Certain

Consequence of Failure

The following hierarchy identifies the recommended criteria and sub-criteria to be used to calculate each asset's consequence of failure, including all recommended weightings and sub-weightings.



Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost with Lifecycle Events	$0 - $100,000	1 - Insignificant
	$100,000 - $250,000	2 – Minor
	$250,000 - $750,000	3 - Moderate
	$750,000 - $1,000,000	4 - Major
	Greater than $1,000,000	5 - Severe

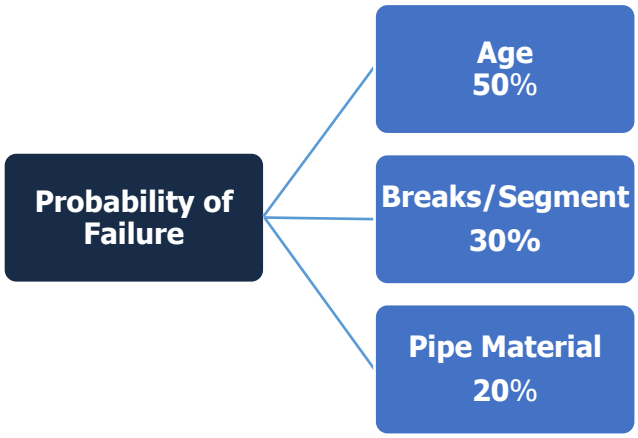
Operational

Sub-Criteria	Range	Consequence of Failure
Priority Rating	10-20 Years	2 – Minor
	5-10 Years	3 - Moderate
	1-5 Years	4 - Major
	Immediate/Now	5 - Severe
Sub-Criteria	Range	Consequence of Failure
Implementation Ranking	Low	2 - Minor
	Medium	3 - Moderate
	High	4 - Major

Water Mains

Probability of Failure

The following hierarchy identifies the recommended criteria to be used to calculate each asset's probability of failure, including recommended weightings.



A combination of age, pipe material and the number of breaks per asset segment will be used as an indicator of probability of failure. Age-based estimates are calculated using the In-Service Date, Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration.

Age

Condition Range	Probability of Failure
80 - 100	Rare
60 - 80	Unlikely
40 -60	Possible
20 - 40	Likely
0 - 20	Almost Certain

Breaks/Segment

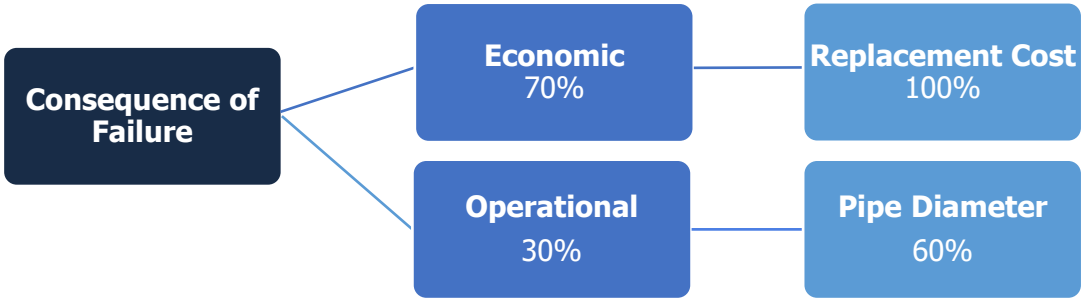
Condition Range	Probability of Failure
0-1	Rare
1-2	Unlikely
2-4	Possible
4-6	Likely
6+	Almost Certain

Pipe Material

Range	Probability of Failure
PVC	Rare
Precast Concrete	Unlikely
Concrete	Possible
AC	Likely
Ductile Iron	Almost Certain

Consequence of Failure

The following hierarchy identifies the criteria, and sub-criteria used to calculate each asset's consequence of failure, including all weightings and sub-weightings.



Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost ($)	$0 - $10000	1 - Insignificant
	$10000 - $20000	2 - Minor
	$20000 - $50000	3 - Moderate
	$50000 - $100000	4 - Major
	Greater than $100000	5 - Severe

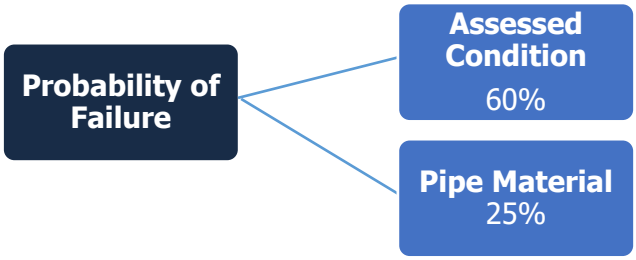
Operational

Sub-Criteria	Range	Consequence of Failure
Pipe Diameter (mm)	0-100	1 - Insignificant
	100-150	2 - Minor
	150-250	3 - Moderate
	250-350	4 - Major
	Greater than 350	5 – Severe
Sub-Criteria	Range	Consequence of Failure
Breaks/Segment	0-2	1 - Insignificant
	2-4	2 - Minor
	4-6	3 - Moderate
	6-8	4 - Major
	8+	5 – Severe

Sanitary Mains

Probability of Failure

The following hierarchy identifies the recommended criteria to be used to calculate each asset's probability of failure, including recommended weightings.



The Township has recently performed CCTV inspections on its underground sanitary network. Where available, those condition inspection values will be utilized. Condition rating criteria has been defined using NASSCO condition rating criteria. However, assets with no assessed condition will use age-based condition and pipe material to determine the probability of failure for the Township's sewers. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration.

Pipe Material

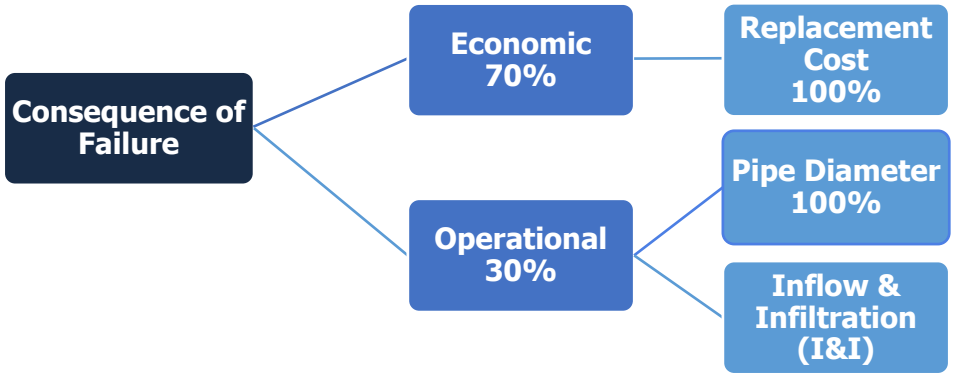
Range	Probability of Failure
PVC	Rare
Concrete	Possible
AC	Likely

Condition

Condition Index (CI) Range	Probability of Failure
0-1	Rare
2-3	Unlikely
3-4	Possible
4-5	Likely
5	Almost Certain

Consequence of Failure

The following hierarchy identifies the criteria, and sub-criteria used to calculate each asset's consequence of failure, including all weightings and sub-weightings.



Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost ($)	$0 - $10,000	1 - Insignificant
	$10,000 - $20,000	2 - Minor
	$20,000 - $50,000	3 - Moderate
	$50,000 - $100,000	4 - Major
	Greater than $100,000	5 - Severe

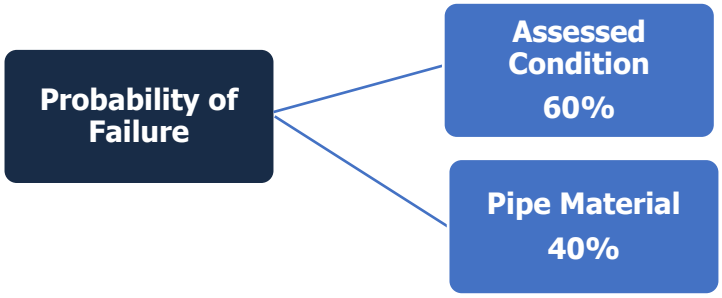
Operational

Sub-Criteria	Range	Consequence of Failure
Pipe Diameter (mm)	Less Than 100	1 - Insignificant
	100-200	2 - Minor
	200-250	3 - Moderate
	250-300	4 - Major
	Greater Than 300	5 - Severe
Sub-Criteria	Range	Consequence of Failure
Inflow and Infiltration (I&)	Low	2 - Minor
	Medium	3 - Moderate
	High	4 - Major

Storm Mains

Probability of Failure

The following hierarchy identifies the recommended criteria to be used to calculate each asset's probability of failure, including recommended weightings.



If there are no CCTV inspections, the risk model will utilize age-based condition instead of the assessed condition ratings from the CCTV inspections. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration.

Condition

Condition Index (CI) Range	Probability of Failure
0-1	1- Rare
2-3	2- Unlikely
3-4	3- Possible
4-5	4- Likely
5	5- Almost Certain

Pipe Material

Range	Probability of Failure
PVC	Rare
Concrete	Possible
AC	Likely

Consequence of Failure

The following hierarchy identifies the criteria, and sub-criteria used to calculate each asset's consequence of failure, including all weightings and sub-weightings.

Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost ($)	$0 - $10,000	1 - Insignificant
	$10,000 - $20,000	2 - Minor
	$20,000 - $50,000	3 - Moderate
	$50,000 - $10,0000	4 - Major
	Greater than $100,000	5 - Severe

Operational

Sub-Criteria	Range	Consequence of Failure
Pipe Diameter	Less than 250	1 - Insignificant
	250-300	2 - Minor
	300-450	3 - Moderate
	450-675	4 - Major
	Greater than 675	5 - Severe

Risk Models: Additional Classes

This section broadly outlines the parameters that are recommended to calculate both the Consequence of Failure and the Probability of Failure for the additional asset classes outlined within the scope of the project. These parameters and their associated weightings were determined by PSD's project consultant by leveraging current and/or potential attribute data available.

Facilities

Probability of Failure

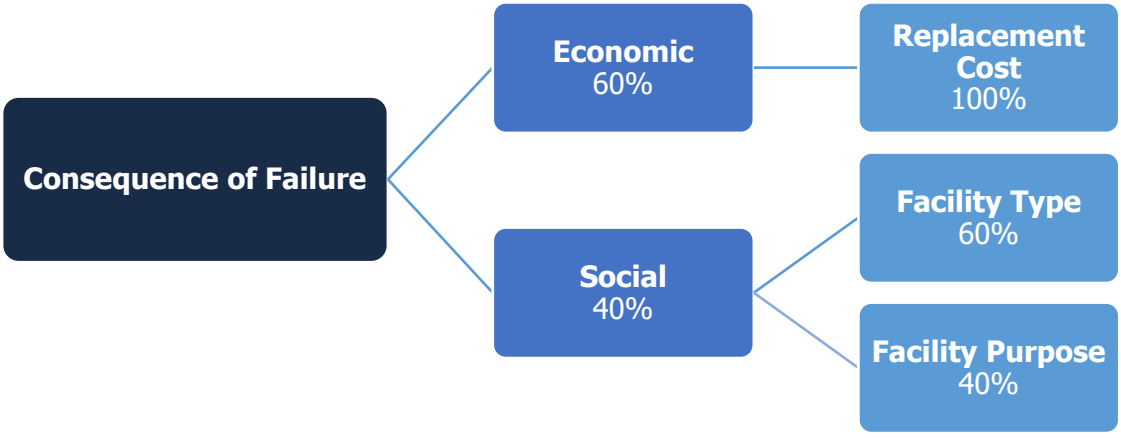
Age-based condition will be used to determine the probability of failure for the Township's facilities. Assessed condition values will be applied where available. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration. Condition rating criteria has been defined using the software default ratings as outlined below.

Condition

Probability of Failure	Range
Rare	Greater than 80
Unlikely	60 - 80
Possible	40 - 60
Likely	20 - 40
Almost Certain	0 - 20

Consequence of Failure

The following hierarchy identifies the criteria, and sub-criteria used to calculate each asset's consequence of failure, including all weightings and sub-weightings.



Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost	$0 - $100,000	1 - Insignificant
	$100,000 - $500,000	2 - Minor
	$500,000 - $2,000,000	3 - Moderate
	$2,000,000 - $10,000,000	4 - Major
	Greater than $10,000,000	5 - Severe

Social

Sub-Criteria	Value	Consequence of Failure
Facility Type	Storage	1 - Insignificant
	Barns	1 - Insignificant
	Library	3 - Moderate
	Day Care	3 - Moderate
	Municipal Office/Admin of Justice	3 - Moderate
	Community Halls	3 - Moderate
	Recreation Arenas	4 - Major
	Public Works/Operations	4 - Major
	Fire Station/Bulk Stations	5 - Severe
Sub-Criteria	**Value**	**Consequence of Failure**
Facility Purpose	Educational	2 - Minor
	Quality of Life	3 - Moderate
	Security	4 - Major
	Public Health	5 - Severe

Parks

Probability of Failure

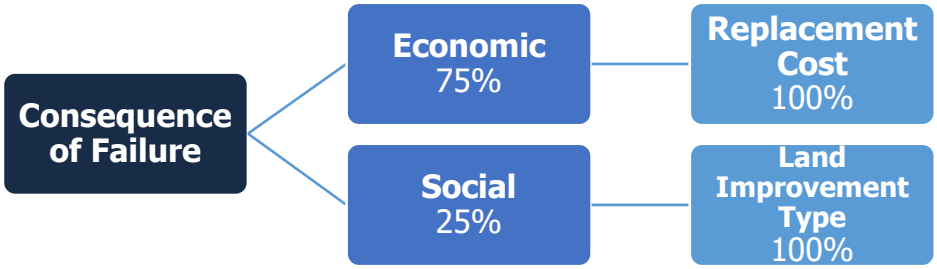
Age-based condition will be used to determine the probability of failure for the Township's parks unless assessed condition values are available to be used. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration. Condition rating criteria has been defined using the software default ratings as outlined below.

Condition

Probability of Failure	Range
Rare	Greater than 80
Unlikely	60 - 80
Possible	40 - 60
Likely	20 - 40
Almost Certain	0 - 20

Consequence of Failure

The following hierarchy identifies the criteria, and sub-criteria used to calculate each asset's consequence of failure, including all weightings and sub-weightings.



Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost	$0 - $5,000	1 - Insignificant
	$5,000 - $10,000	2 - Minor
	$10,000 - $30,000	3 - Moderate
	$30,000 - $100,000	4 - Major
	Greater than $100,000	5 - Severe

Social

Sub-Criteria	Value	Consequence of Failure
Land Improvement Type	Stormwater ponds	1 - Insignificant
	Landscaping	1 - Insignificant
	Trails, Pathways	2 - Minor
	Parking Lots	2 - Minor
	Playgrounds	3 - Moderate
	Sidewalks, Signage	3 - Moderate
	Sports Courts	4 - Major

Rolling Stock

Probability of Failure

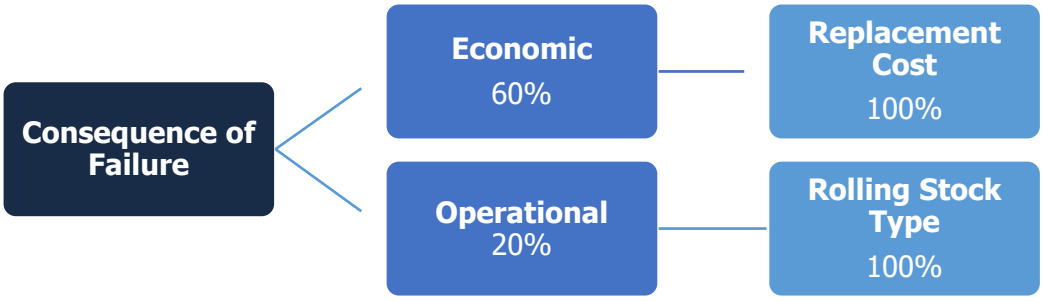
Age-based condition will be used to determine the probability of failure for the Township's Rolling Stock. Assessed condition values will be applied where available. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration. Condition rating criteria has been defined using the software default ratings as outlined below.

Condition

Probability of Failure	Range
Rare	80 - 100
Unlikely	60 - 80
Possible	40 - 60
Likely	20 - 40
Almost Certain	0 - 20

Consequence of Failure

The following hierarchy identifies the criteria, and sub-criteria used to calculate each asset's consequence of failure, including all weightings and sub-weightings.



Operational

Sub-Criteria	Range	Consequence of Failure
Replacement Cost $/unit	$0 - $25,000	1 - Insignificant
	$25,000 - $75,000	2 - Minor
	$75,000 - $125,000	3 - Moderate
	$125,000 - $200,000	4 - Major
	Greater than $200,000	5 - Severe

Operational

Sub-Criteria	Value	Consequence of Failure
Rolling Stock Type	Off Road (ATV), Small Equipment	1 – Insignificant
	Light Duty Vehicle	1 – Insignificant
	Medium Duty Vehicle	2 - Minor
	Heavy Duty Vehicle	4 – Major
	Heavy Machinery	5 - Severe

Sub-Criteria	Value	Consequence of Failure
Rolling Stock Purpose	Trailers	1 – Insignificant
	Mowers, Tractors	2 - Minor
	Pickup Trucks	2 – Minor
	Tandem Trucks, Graders, Ice Resurfacers	4 – Major
	Fire Trucks	5 - Severe

Machinery & Equipment

Probability of Failure

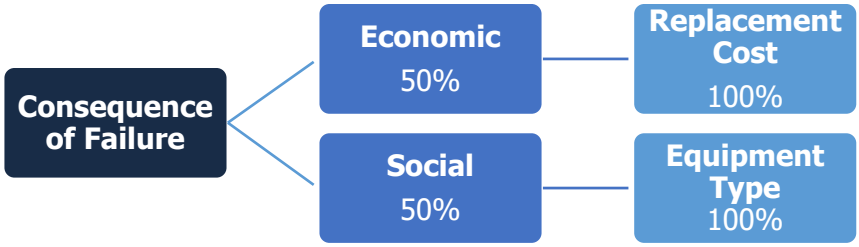
Age-based condition will be used to determine the probability of failure for the Township's equipment. Assessed condition values will be applied where available. Age-based estimates are calculated using the In-Service Date and Estimated Useful Life to determine the percentage of life consumed and then modeled based on an asset's expected rate of deterioration. Condition rating criteria has been defined using the software default ratings as outlined below.

Condition

Probability of Failure	Range
Rare	80 - 100
Unlikely	60 - 80
Possible	40 - 60
Likely	20 - 40
Almost Certain	0 - 20

Consequence of Failure

The following hierarchy identifies the criteria, and sub-criteria used to calculate each asset's consequence of failure, including all weightings and sub-weightings.



Economic

Sub-Criteria	Range	Consequence of Failure
Replacement Cost ($/unit)	$0 - $5,000	1 - Insignificant
	$5,000 - $10,000	2 - Minor
	$10,000 - $25,000	3 - Moderate
	$25,000 - $50,000	4 - Major
	Greater than $50,000	5 - Severe

Social

Sub-Criteria	Value	Consequence of Failure
Equipment Type	Administration & Finance	2 - Minor
	Maintenance, Recreation	3 - Moderate
	Library (Books)	4 - Major
	IT (Electronics)	5 - Severe
	Operations, Fire (Bunker Gear, SCBAs)	5 - Severe

Recommendations

In determining probability of failure, for example, the Township should eventually seek to schedule regular condition assessments on all core infrastructure assets. In the nearer term, however, it may be more feasible to begin conducting some assessment protocols on all assets. Similarly, staff should move towards considering a wide number of indicators to determine a more accurate sense of risk consequence. With that said, it may be more feasible to begin introducing separate indicators individually rather than all at once.

Generating a risk matrix and framework is only part of a wider and more comprehensive risk management program, as identified below. Most of the information found in the following table is a rating scale taken from the Institute of Public Works Engineering Australasia (IPWEA) and their corresponding International Infrastructure Management Manual (IIMM).

Level of Development	Action	Estimated Impact	Estimated Effort
Minimum	Educate staff involved in maintenance/renewal decisions on critical assets.	High	Low
Core	Generate risk framework.	High	Medium
	Identify risk categories, risk events, high risks, and critical assets.	Medium	Medium
	Document risk management strategies for critical assets and high risks.	High	Medium
Intermediate	Develop systematic risk analysis to assist key decision making.	High	High
	Develop risk register and monitor and manage consistently across the organization.	High	High
	Align strategic, tactical, and operational risks and risk registers.	High	Medium
Advanced	Generate formal risk management policy.	Medium	Medium
	Quantify risk and evaluate risk mitigation options.	Medium	Medium
	Integrate risk into all aspects of decision making.	High	High
	Incorporate the effects of climate change into infrastructure risk framework	High	Medium