Regional Municipality of Peel

Stormwater Servicing Plan for Regional Road Infrastructure

Levels of Service Summary Report

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1 INTRODUCTION

The Regional Municipality of Peel is developing a Stormwater Servicing Plan for regional road infrastructure to provide efficient stormwater servicing to existing and future Regional road infrastructure by considering existing ageing infrastructure, growth, natural environment, climate change and compliance within regulatory framework.

The project goals are to:

- Provide a strategic, economical, and optimized stormwater servicing plan that will guide the Region of Peel to 2041;
- Establish the tools and processes necessary to move from an opportunistic servicing approach to a planned, evidence-based servicing strategy;
- Set the stage for future updates and improvements as more information becomes available.

Levels of Service (LOS) are key business drivers, which influence the outcomes of the Stormwater Servicing Plan, and are used to inform the lifecycle strategies to deliver the expected service levels. The LOS provide 'line of sight' from strategic objectives to specific assets' actions and treatments. Defining Customer and Technical Levels of Service is also a requirement under O.Reg. 588/17.

An industry best practice review was completed to develop a LOS framework and performance measures. This framework will help the Region to establish a relationship between the asset performance being provided by the Region's infrastructure system and the associated operating and capital expenditures required to achieve that performance.

The purpose of this report was to document the approach used to develop the LOS framework and performance measures. The LOS align higher level corporate objectives with the general public's understanding of the services provided by the Region's infrastructure systems (the Customer LOS) and the technical details and performance measure of managing that infrastructure (the Technical LOS). The LOS inform the planned actions (which include lifecycle strategies) required to deliver the expected service levels. This link enables the Region to gain an understanding of the costs associated with delivering its services to the community.

2 BEST PRACTICES REVIEW

As part of the Region's LOS development, a comprehensive review of relevant LOS guidelines, manuals, and frameworks was completed. The purpose of this review was to:

- Provide perspective on LOS guidelines, manuals, frameworks and other LOS approaches that have already been established in other jurisdictions;
- Assist in developing a LOS framework that aligns with local and international best practices;
- Inform a specific framework structure that meets the unique needs and practices within the Region

The following subsections provide a brief overview of the guidelines and LOS structures reviewed.

2.1 Review of Relevant Guidelines and Manuals

2.1.1 Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure

O.Reg. 588/17, was created under the Infrastructure for *Jobs and Prosperity Act, 2015*. The purpose of the regulation is to implement best practices and provide consistency amongst municipalities in advancing AM processes/plans.

Municipalities were required to prepare a Strategic Asset Management Policy by July 1, 2019 and are required to prepare AMPs by July 1, 2021 (for core assets) and July 1, 2023 (for all other assets). The regulation stipulates that the AMPs shall include reporting on current LOS and current performance. Furthermore, by July 1, 2024, every AMP must also include reporting on proposed LOS and proposed performance for a 10-year forecast period.

The regulation also provides specific prescribed LOS for core infrastructure assets, which include water, wastewater, stormwater management, roads, bridges and culvert assets.

The prescribed LOS are displayed in a table format as follows:

- Service attribute: a one-word description on what is expected from the asset group.
- Community LOS: qualitative descriptions, images, or maps that describe end-user experience.
- Technical LOS: metrics that describe what the municipality provides.

The service attributes provided within the tables include: scope, reliability, and quality. All tables include scope as a service attribute. The scope attribute refers to what areas and how much of those areas of the municipality are able to receive services from the asset group. For example, for stormwater management assets the scope Technical LOS metric is percentage of properties resilient to 100-year storm. For water assets, the scope Technical LOS metric is percentage of properties connected to the municipal water system.

The reliability and quality service attributes generally detail the condition or performance of the assets. For example, reliability metrics can pertain to service interruptions or shut downs. Quality metrics can pertain to condition ratings of assets.

O.Reg. 588/17 is the primary driver behind the structure and format of the Region's stormwater LOS framework. The Region's framework is organized in a table, similar to the tables provided in the regulation. Furthermore, the Region has also tied each of its LOS to a corresponding service attribute.

The Region's LOS framework has also included columns to describe current and proposed performance. This will ensure that the framework is aligned with the regulatory requirements to report on these measures.

The prescribed LOS from O.Reg. 588/17 are incorporated into the Region's LOS framework, and are identified to distinguish from the measures developed by the Region.

2.1.2 National Asset Management Steering Committee

The National Asset Management Steering Committee (NAMSC) is an organization that aims to promote and advance AM. In 2007, they published the *Developing Levels of Service and Performance Measures: Creating Customer Value from Community Assets* guideline.

The purpose of this guideline is to provide jurisdictions with guidance and real examples so those jurisdictions can develop or revise their own LOS frameworks to ensure that customer/community needs and expectations are shown in the frameworks.

Of particular relevance is that the guidelines suggest a framework should be made for each service provided by a municipality (as opposed to one framework for each asset group).

The LOS framework tables generated from the guideline have 4 columns:

- *Customer value;*
- *Level of service;*
- *Customer performance measure;* and,
- *Technical performance measure*.

These guidelines emphasize that the performance measures should be SMART (Specific, Measurable, Achievable, Relevant, and Timebound). This means that the performance measures will cover a specific aspect of the service, are measurable with achievable targets, are relevant to the LOS and strategic objective and it is clear when the targets will be achieved.

The Region's LOS framework was developed to embody the principles of customer values (called service attributes), customer performance measures and technical performance measures.

2.1.3 ISO 55000 Series – ISO 55000, ISO 55001, ISO 55002

ISO 55000 is an international standard that provides an overview of AM and AM systems. The standard does not explicitly discuss LOS frameworks or the process of developing LOS frameworks, but does include insight on the importance of establishing LOS including the fundamentals and elements required. The standard defines LOS as "parameters, or combination of parameters, which reflect social, political, environmental and economic outcomes that the organization delivers."

ISO 55000 recognizes that performance evaluation is one of the key elements in operating an AM system. It describes how it is necessary for an organization to measure asset performance against AM objectives to determine if those objectives have been met and to understand if the assets are providing services that meet customer/community expectations.

Similar to the NAMSC guideline (which uses the term performance measure), ISO 55002 states that these AM objectives should be SMART and can be either quantitative or qualitative.

The Region has adopted these concepts into the development of its LOS framework.

2.1.4 InfraGuide: Decision Making and Investment Planning

InfraGuide is a guideline for developing AMPs that was funded by the Canadian federal government (Infrastructure Canada). It describes the fundamental concepts, components and considerations of developing an AMP. The guide includes several case studies of successful AMP implementations. The framework for an AMP requires understanding the LOS expectation for the services.

The guide defines LOS as “the defined service quality for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability, and cost.” InfraGuide recognizes that both businesses and residents have expectations on the LOS from infrastructure and understanding their expectations is a key element in decision making.

A key element in developing an AMP is monitoring the performance of assets which is related to establishing LOS. After the LOS has been established, it is necessary to monitor the performance of assets to ensure that those LOS are being met and maintained over the long-term.

The Region’s LOS framework was developed in alignment with these concepts.

2.2 Relevant Levels of Service Frameworks in Municipalities

A comprehensive review was completed on readily accessible AMPs that include LOS frameworks for the following municipalities:

- Guelph, Ontario
- London, Ontario
- Hamilton, Ontario
- Halton, Ontario
- Porirua, New Zealand
- London, England
- Port Lincoln, Australia

The above-mentioned municipalities from Ontario were generally selected based on their level of AM maturity (i.e. municipalities with established LOS). Furthermore, municipalities with differing populations, geographic locations and tiers (i.e. regional and local) were reviewed to provide a representation of the municipal AM landscape in southern Ontario.

International municipalities were also reviewed to provide a reference point to international best practices. A comparison of best practices is provided below in Subsection 2.3, and these elements were incorporated into the Region’s LOS framework.

Additionally, the ongoing work from the Town of Caledon, Credit Valley Conservation (CVC) and the Region’s CAM team were reviewed to ensure alignment and avoid contradictions. Examples are provided in Appendix A.

2.3 LOS Framework Comparison

Existing LOS frameworks were analyzed with respect to adherence to the Regulation’s requirement, type of measures, LOS themes, and presentation of measures and results to an external audience. This information was reviewed to derive best practices, with respect to ease of communication, ability to convey customer and technical service levels in a

meaningful and quantifiable manner. The following observations from the review of municipal LOS tables were assessed as best practices:

- All of the Ontario municipality LOS frameworks are generally structured to reflect the guidance from the manuals summarized in Section 2.1.
- Frameworks were generally service-focused, striving to link Customer LOS and objectives to asset performance. This was typically achieved through displaying the information in tables which presented customer and technical measures by the service provided.
- All frameworks include a one word or very short phrase which outline an aspect of the service that the customer expects, such as safe, reliable, accessible, etc. These one-word descriptions are often referred to differently depending on the framework (i.e. customer values, service attributes or LOS attributes).
- The one-word or short phrase (i.e. service attribute) was used to provide a link between strategic objectives and Customer and Technical LOS.
- One municipality (Porirua) included a column to identify the source of the input data used to measure each performance measure.

The review also uncovered common aspects that are not best practices and have not been incorporated into the Region's LOS Framework:

- Not all jurisdictions had clearly defined customer/community LOS. Some frameworks did not specify if performance measures were customer/community or technical.
- Most frameworks did not include LOS targets. Note that O.Reg. 588/17 requires municipalities to report on current and proposed LOS. These targets are necessary to support the capital recommendations and projected infrastructure needs in the AMP.

3 LEVEL OF SERVICE FRAMEWORK

Following the best practice review, a preliminary suite of level of service metrics were developed. The approach used connects both technical metrics and customer metrics in a single level of service framework. The new landscape of AM that aligns with ISO 55000 which defines asset performance as the ability for an asset to fulfill its objectives or requirements. This means that the performance of an asset is directly proportional to the level of service it provides. Levels of service are also at the core of O.Reg. 588/17 which requires municipalities to understand the cost to achieve higher or lower levels of service.

3.1 Approach to Levels of Service

The approach to developing levels of service aligns with international best practices while also remaining consistent with the requirement of O.Reg. 588/17. The technical performance indicators are aligned to community values and corporate priorities. These technical performance indicators are then combined with the professional judgement of staff to establish a performance rating for each asset.

Over time, the Region will leverage more data-driven performance indicators to understand how well assets are performing. However, it should be emphasized that the professional judgment of staff and external subject matter experts will always be an important lens to determine asset performance (i.e. to establish the degree to which an asset is meeting expectations) based on the available performance indicator data.

3.2 Managing Asset Performance

3.2.1 Customer Levels of Service

The first layer of asset performance management starts with the community focused information. These support the external-facing communication of the State of the Infrastructure to Council and residents. Strategic LOS are statements or qualitative descriptions of services levels that describe the main vision or objective of service provision and align to the strategic goals and vision of the Region. Customer LOS are service measures that are expressed in non-technical terms that describe the general public's understanding of services being provided by infrastructure systems, as described in the following points:

1. A service statement that briefly describes the kind of service that is provided to the community. The service statement for stormwater is, “Provide efficient stormwater servicing for existing and future regional road infrastructure by taking into account existing ageing infrastructure, growth, natural environment, climate change and compliance within the regulatory framework.” It is included above the LOS Framework.
2. The Service Attributes that cover all aspects of the service that reflect corporate or community values. The Service Attributes also include statements that provide context for each term. The Service Attributes include:
    - Reliable;
    - Accessible;
    - Safe;
    - Environmentally Sustainable; and
    - Aesthetic.
3. The current performance is a value that indicates the current performance for each performance measure for the most recent complete calendar year (which is 2020 at the time of writing).
4. The planned annual expenditures is the annual cost to achieve the current performance.

The headings for the customer section of the LOS Framework is provided in Table 1.

Table 1: Customer Performance Measures.

Service Attribute	Service Attribute Statement	Community Performance Measures	
		Current Performance	Planned Annual Expenditures ($M)

3.2.2 Technical Levels of Service

Technical LOS are technical indicators applied against assets and overall systems that define the performance requirements to support Customer LOS. Technical LOS are used to determine which criteria will be used to drive business decisions. These types of metrics generally attempt to quantify the severity and extent of an asset’s (or asset system’s) deficiency. Technical subject matter experts then define the threshold when the deficiency of an asset is not meeting its performance objectives. Technical indicators were developed through the Best Practice Review. Additional performance indicators were supplemented from workshops with the Region’s Technical Advisory Group (TAG), lower-tier municipalities and conservation authorities. Further discussion of the workshops is discussed in Section 4. The following points describe the Technical LOS headings in Table 2:

1. Assets are the applicable assets involved with monitoring the performance indicator.
2. The performance indicator is
3. The performance indicator values should be tracked on an annual basis. For now, there is the current year (2020).
4. Data source is the data source that will be used to track the performance indicator. This can include data that is not readily available but may be in the future.

Table 2: Technical Performance Indicators

Technical Performance Indicators			
Assets	Performance Indicator	2020 Value	Data Source

3.3 Current Levels of Service

O.Reg. 588/17 requires municipalities to report current LOS performance in their Asset Management Plan (AMP) for core assets by July 1st, 2021, and for non-core assets by July 1st, 2023. The regulation requires the Region to report on certain mandated LOS for core assets, as well as other LOS that the Region has established for its assets. The regulatory metrics for stormwater were kept in a separate table from LOS Framework because they do not appropriately indicate Region’s stormwater performance. They will need to be tracked for compliance, but the Region should focus on monitoring and reporting on the performance measures outlined in the LOS Framework.

3.4 Proposed Levels of Service

O.Reg. 588/17 requires municipalities to report proposed LOS performance in the AMP for all assets by July 1st, 2024, for each of the 10 years following the year in which current LOS is reported. In alignment with the 2024 regulatory requirements, the Region will also document the 10-year proposed LOS in the LOS table.

It is recommended that these values be updated over time, as the LOS strategy and general AM System within the Region becomes more mature. Best practices for determining proposed LOS will leverage data analytics, SME judgement and public input.

4 WORKSHOPS

A total of five meetings were held to ensure the integration and coordination with the Region's internal and external stakeholders. The first two were discussions with Corporate Asset Management (CAM) and Credit Valley Conservation (CVC) during the development of the preliminary LOS Framework. This helped establish a baseline to present to the larger stakeholder list. The workshop slide deck is provided in Appendix B.

A workshop was held with the Region's Technical Advisory Group (TAG) to present the draft level of service framework and describe the overall structure of the framework (i.e. describe the logic behind the columns/rows in the table). Additionally, two other workshops were held with the lower-tier municipalities and conservation authorities respectively.

The workshop objectives were to discuss, review and validate:

- Service attributes, statements and performance indicators;
- Alignment with all stakeholders for consistent terminology and performance scoring;
- The implementation of indicators that could be tracked now and should be tracked in the future; and
- Integration and coordination with external stakeholders.

Through the various working sessions, different themes and strategies to service delivery were discussed, which guided the development of LOS that reflected the decision-making process and objectives. Discussion with all stakeholders resulted in selection of measures that are useful in supporting asset lifecycle decision-making and/or important in understanding asset or service performance.

Following the completion of the workshops, the feedback received was amalgamated into the LOS Framework, and provided to all stakeholders for further review and validation. The second round of feedback was received, and remaining questions were addressed. This was to ensure that this process was a collaborative effort that allowed all stakeholders an opportunity to provide input and impact the result. The feedback and responses are provided in Appendix C. The final LOS framework is provided in Appendix D.

5 CONCLUSION

The Stormwater Management is focused on ensuring that stormwater infrastructure improves water quality, reduces environmental risks, is safe and complements the community, as indicated by its Strategic LOS. In particular, protection against flooding is an area that is central to the delivery of stormwater management services.

Reliability measures for the stormwater management service generally pertain to asset condition, which in the case of linear assets is determined by CCTV inspection data. In the case of stormwater structures such as ponds, condition is measured by sediment levels, and performance pertain to dredging/cleaning of the ponds or facility condition assessments for the pumping stations.

Several measures pertain to ensuring that the stormwater system has sufficient capacity to convey flows. It is important to note that the road network can be considered a stormwater management asset (referred to as the 'Major System' from the perspective that it participates in the conveyance of stormwater. The pipe network is referred to as the 'Minor System'. Note that road assets are also related to the service of transportation and managed separately from stormwater.

The stormwater system is measured against its capacity to convey flows of a 10-yr and 100-year wet weather event. The storm events have the potential to cause safety and environmental issues associated with flooding.

Note that environmental sustainability, particularly with respect to climate change, is integrated into many measures for stormwater assets. Although some measures are specifically related to environmental sustainability, many others have verbiage to indicate that the measure should 'consider the impacts of climate change'. While not specifically related to environmental sustainability, these measures include an environmental component, which aligns with the Region's strategic objectives to mitigate the impacts of climate change.

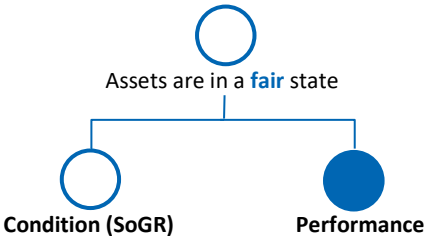
The importance of LOS resides in the understanding of what the broader community values in the services provided by stormwater infrastructure. The framework developed will ensure that there is a holistic understanding of not only what assets support stormwater management services and the characteristics of stormwater management across the Region, but also the development of the strategic objectives and levels of service that will be used in subsequent tasks of this project to help evaluate and select alternative strategies.

Appendix A: Examples of Regional Stakeholders LOS

Corporate Asset Management

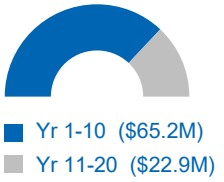
2021 Stormwater Management Systems AMIP

Infrastructure Risk Management Rating



Condition (SoGR) Score Distribution

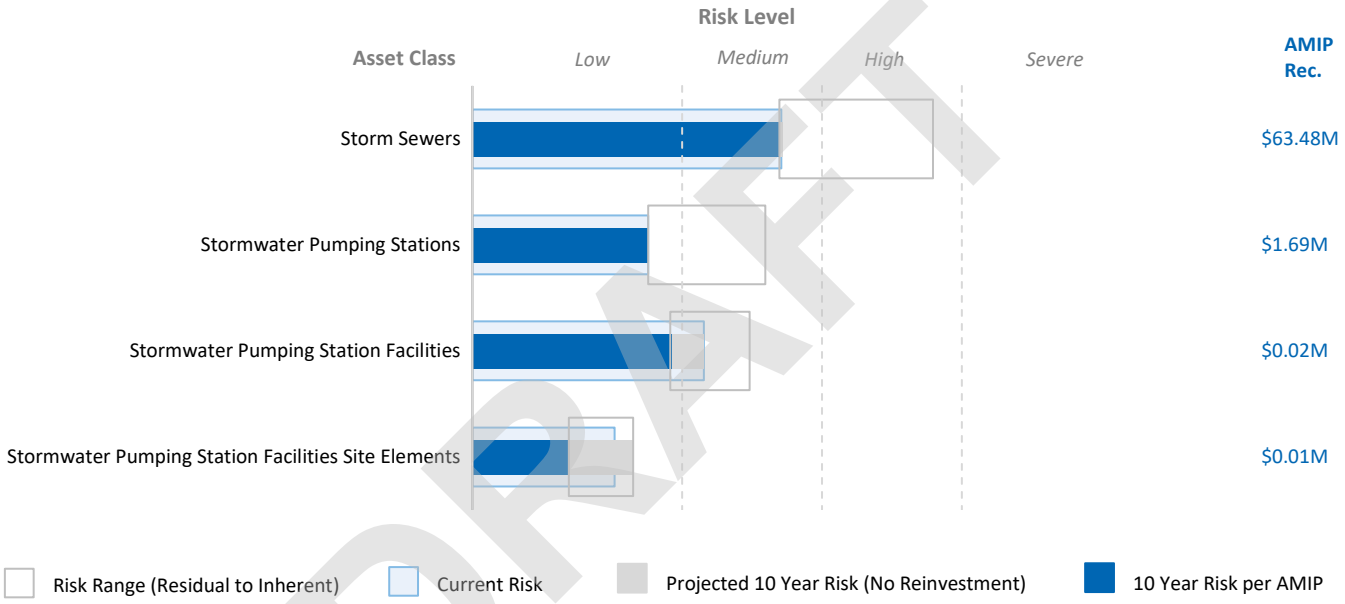
SoGR Capital Reinvestment Outlook



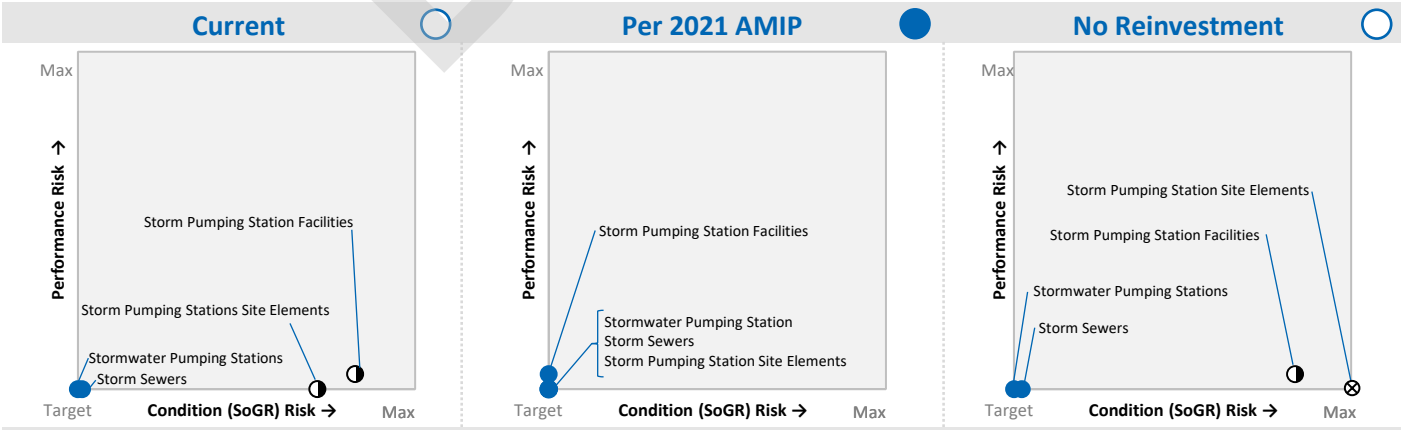
2019 Replacement Value

$351.2M

Risk Profile with *10 Year AMIP Capital Recommendations (**$65.2M**)*



Asset Risk Mapping – Deviation from Asset Targets



Infrastructure Risk Management Ratings

- **Very Good State –** Almost all assets in the portfolio are achieving the desired targets.
- **Good State –** Most asset in the portfolio are achieving the desired targets.
- **Fair State –** Many asset in the portfolio are <u>not</u> achieving the desired targets.
- **Poor State –** Most asset in the portfolio are <u>not</u> achieving the desired targets.
- **Very Poor State –** Almost all assets in the portfolio are <u>not</u> achieving the desired targets.

Condition (SoGR) Scores

- **A** New or like new condition
- **B** In a good state of repair
- **C** Some non-critical defects; some critical repairs in the near term
- **D** Some critical defects; many critical repairs in the near term
- **F** Many critical defects; immediate repair or replacement

Recommendations per Asset Management Strategy

1. It is recommended (per Table 1) that the 2021 10-year Capital Budget and Forecast include a total of approximately **$65.2 Million** (including allowances for design, contract administration and contingencies) to achieve SoGR asset levels of service targets for the Stormwater Management Systems asset portfolio.
2. It is further recommended that efforts continue to produce an Asset Management Plan for these assets in order to develop a more robust and supportable capital plan and to better inform CAM's asset management life cycle and level of service assumptions and the Asset Management Investment Plan recommendations.

Current State of the Infrastructure

There are currently condition assessments underway for the entire Stormwater network by the Transportation Program which is anticipated to be completed by the end of year 2020. Work is in progress to incorporate additional storm assets into the asset management strategy. If this work is completed in sufficient time, the data will be updated and could impact the capital recommendations, SoGR scores, and risk assessments in the Post Budget AMIP.

The Stormwater Management Systems portfolio is comprised of storm sewers, pumping stations equipment and facilities. The Stormwater Management Systems infrastructure portfolio covered by the current asset management strategy has an estimated replacement value of **$351.2 Million** (2019 values excluding land).

Current Infrastructure

- Storm Sewers have been inventoried, assessed and are now included as an asset class with associated risk analysis and capital recommendations.
- The Stormwater Management Systems Infrastructure Risk Management Rating remains '**fair**' consistent with last year's rating. The Risk Management Ratings take into account approved funding that is available for SoGR (State of Good Repair) and Performance Enhancement projects.
- The current condition Risk Management Rating is '**fair**'. This is an increase from last year's rating of '**poor**', primarily due to completion of the rehabilitation works at the Malton 4 Corners pumping station and addition of storm sewers where 80% of the network is in a good state of repair.
- The current performance Risk Management Rating remains '**very good**', consistent with last year's rating
- The Condition (SoGR) Score Distribution shows majority of the assets are in a good state of repair, scoring an "**A**", except for the assets at the Finch Pumping Station and some storm sewers, which are scoring "**F**".

Current Risk

- Overall, the portfolio has some Current Risk above the Residual (Target) Risk in the Stormwater Pumping Stations Facilities and Site Elements asset classes as seen in the Risk Profile and Current Risk Mapping.
- The outstanding current risk in the Stormwater Pumping Stations Facilities and Site Elements asset classes is attributed to the rehabilitation requirements at the Finch Pumping Station. Both the asset classes are not anticipated to present a significant service risk and are being monitored by the Program as work is being planned to rehabilitate Finch Pumping Station.

Asset Management Investment Plan

Capital Requirements Analysis

- The 10 year costs to address the ongoing state of good repair needs for the Stormwater Management Systems portfolio are estimated at **$65.2 Million** (including allowances for design, contract administration and contingencies).
- The annual capital reinvestment rate of the 10-year capital recommendations for the Stormwater Systems Portfolio's linear assets equates to **1.8%** of the infrastructure's estimated replacement value which exceeds the best practice annual capital infrastructure reinvestment rates for linear assets of between 1.0% and 1.3 %. This high reinvestment rate is indicative of historical under reinvestment in storm sewers.
- The annual capital reinvestment rate of the 10-year capital recommendations for the Stormwater Systems Portfolio's non-linear assets equates to **1.6%** of the infrastructure's estimated replacement value which is slightly lower than the best practice annual capital infrastructure reinvestment rates for non-linear assets of between 1.7% and 2.0 %.

- The Capital SoGR Reinvestment Outlook shows that the 11-20 year reinvestment requirements to restore/sustain the portfolio are trending **significantly lower** than the 1-10 expenditure requirements. This is expected given that the anticipated rehabilitation investments for storm sewers are in the first 10 years due to historic under reinvestment, thus requiring less SoGR work in the next 10 year time frame. This outlook will likely change once the condition assessments that are underway are completed and incorporated into the analysis.

Forecasted Infrastructure

- With the AMIP recommended reinvestment, the overall portfolio of Stormwater Management Systems assets is expected to increase to '**very good**' in relation to the approved ALOS targets.

Forecasted Risk

- Under the AMIP, there is projected to be very little remaining risk above Residual (Target) risk in 10 years as seen in the Risk Profiles and Risk Mapping.

Priorities

Storm Water Management Systems Condition Assessments

- There are currently condition assessments underway for the entire Stormwater network by the Transportation Program which is anticipated to be completed by the end of year 2020. It is recommended that the Program validate and assess the data from the new condition assessments as soon as the data is available. Updates from the validation will be included for the analysis of the portfolio in future reporting.

Storm Sewers Lifecycle Model

- Storm Sewer asset class is being modeled for the first time. There is opportunity to improve the lifecycle strategy on the rehabilitation cycles and costs. Program and CAM will work together to refine the lifecycle model as more data is available.

Preparation for Compliance with O reg. 588/17: Asset Management Planning for Municipal Infrastructure

- The Province has introduced a regulation that requires all municipalities to have asset management plans to support their capital plans and applications for infrastructure funding. The asset management plans must include a fully updated inventory of the assets, asset levels of service and full lifecycle costs including: construction, operations, energy, maintenance, rehabilitation and disposal costs. Therefore, it is recommended that each Program accountable for Regional assets begin to take immediate steps to document processes for the collection and maintenance of the required asset data and to track and/or predict the full lifecycle costs for all of the assets under their control. In order to be compliant with the Provincial regulation, the asset management plans for assets in this portfolio must be completed by July 2021.

Table 1 **AMIP Recommendations** (in Millions)[1]

Asset Class	SoGR	Performance	Total
Storm Sewers	$63.48	-	$63.48
Stormwater Pumping Stations	$1.69	-	$1.69
Stormwater Pumping Stations Facilities	$0.02	-	$0.02
Stormwater Pumping Stations Facilities Site Elements	$0.01	-	$0.01
Total	**$65.2**	**-**	**$65.2**

Note: [1]Dollar values are rounded to the nearest hundred thousand.

Service to Asset (S2A) Diagram

Service	Service Outcome	Customer Level of Service	Service Category	Service Improvement Objectives	Asset Class	Threat	Risk Type Weighting	Inherent Risk	Inherent Risk	Asset Level of Service (Control)	ALoS Weighting	Residual Risk	Current Risk
Roads and Transportation	To ensure that PW facilities are safe, fully support Program servicing needs and are kept in a state of good repair	The facilities are structurally sound and in a state of good repair The facilities fully meet the Programs' services requirements The facilities provide a safe, healthy environment for staff and the public The facilities are accessible as required	Stormwater Management Systems	Low impact development treatments and capacity review (upsize of pipes) to the road network impacting longer term work requirements (storm water) Data collection for Ditches & Minor Culverts and incorporated into Storm Water Management System (storm)	Stormwater Pumping Stations	Condition Failure	5	168 Medium	210 Medium	Maintain Equipment at a Condition Rating = C (Fair)	5	126 Low	168 Medium
						Lack of critical back up systems during a mechanical failure	5	251 High		Backup capacity for all critical equipment (mechanical)	5		
						Electrical Failure				Ensure standby power or sufficient wet well storage to meet Ministry of the Environment regulations	5		
						Forcemain failure				Secondary forcemain or storage capacity	5		
					Storm Sewers	Structural defects, blockages and failures (pipe collapse)	5	281 High	281 High	PACP Condition Grade ≤ Level 3	5	161 Medium	162 Medium
					Medium Industrial	Poor Building and Property Condition	5	177 Medium	198 Medium	Facility Condition Index (FCI) Rating 2 TLOS = B	5	141 Low	141 Low
						Inadequate Building Quality and Relationship to Current Standards				Building Quality and Relationship to Current Standards 2 TLOS = C	1		
						Poor Environmental Sustainability				Environmental Sustainability 2 TBD TLOS = A -F			
						Inadequate Facility Finishes and Fixtures	3	234 Medium		Facility Finishes and Fixtures 2 TLOS = C	2		
						Insufficient Capacity and Change Adaptability for Program Requirements				Capacity and Change Adaptabilty for Program Requirements 2 TLOS = B	4		
						Inadequate Building Environment and Security				Building Environment and Security 2 TLOS = B	4		
						Unavailable and/or Inadequate Building Amenities for Service Delivery				Building Amenities for Service Delivery 2 TLOS = C	3		
						Poor or Inadequate Accessibility Features				Accessibility Features 2 TLOS = C	1		
					Taransportation Facilities Site Elements	Poor Building Site Condition	5	115 Low	115 Low	Poor Building Site Condition	3	69 Low	115 Low

[1]Criticality Weighting Guide - TLOS (Appendix A)
1 - Unimportant
2 - Relatively Unimportant
3 - Relatively Important
4 - Important
5 - Very Important

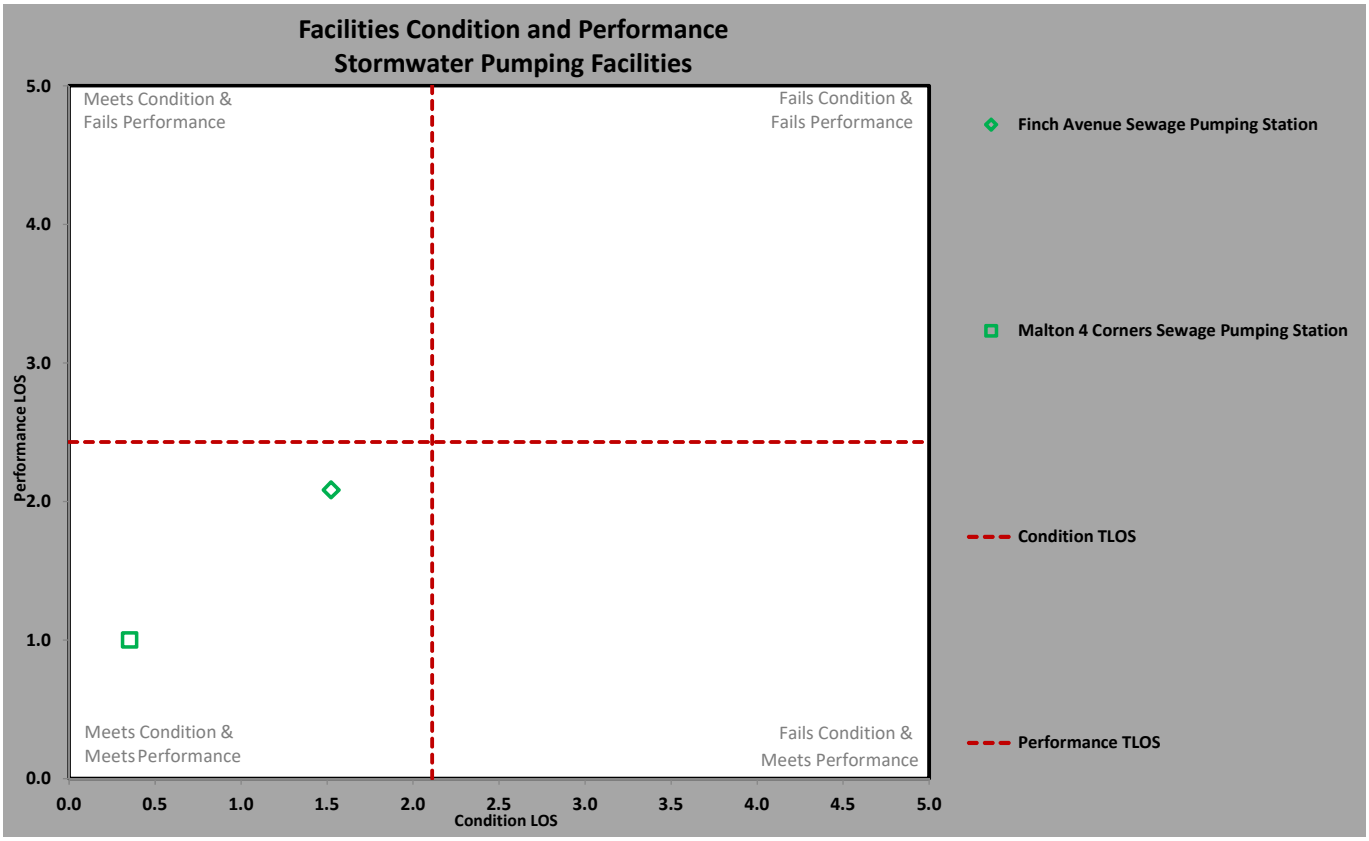
[2]Condition Rating Guide (Appendix B)
A - Very Good
B - Good
C - Fair
D - Poor
F - Fail

Risk Level Thresholds

0 - 150	Low
151 - 250	Medium
251 - 350	High
> 350	Severe

Condition Related TLOS
Performance Related TLOS
Currently Unmeasured TLOS

								Property Scoring	
							Building Number	64-6165	64-6196
Wastewater Medium Industrial	Cat. Weight	Cat. Target TLOS	Cat. Target TLOS	TLOS Category	Criteria Weight	Evaluation Criteria	Eval. Method	Finch Avenue Sewage Pumping Station	Malton 4 Corners Sewage Pumping Station
Condition Weighting 5	1	3	C	Facilities Quality and Relationship to Current Standards	2	Absence of Controlled Materials (i.e. PCBs, asbestos)	Yes/No	No	Yes
					2	Compliance with all current Codes and Regulations	Yes/No	Yes	Yes
						Category Score:		**3.0**	**1.0**
						Facility Condition Score		**1.5**	**0.4**
Performance Weighting 3	2	3	C	Finishes	3	Condition of interior common area finishes	A-F	C	A
					3	Condition of exterior finishes, landscaping, fencin if applicable	A-F	D	A
						Category Score:		**3.5**	**1.0**
Facility Performance Assessment	4	2	B	Capacity and change Adaptability	2	Adequacy to meet existing occupant capacity	A-F	D	A
					4	Building adaptability to Program changes/ service improvements	A-F	D	A
					5	Site capacity capabilities for future expansion	Yes/No	Yes	Yes
					3	Adaptability to technology improvements	A-F	B	A
						Category Score:		**2.5**	**1.0**
	4	2	B	Building Environment and Security	3	Ambient environment acceptability (including air quality, temperature control, noise levels, odour	A-F	B	A
					3	Lighting levels	Yes/No	Yes	Yes
					5	Environmental condition and safety (hazardous gas detectors - CO2, CO, methane etc)	Yes/No	Yes	Yes
					5	Site security (Security service, security access features, occupant education, external lighting etc.)	A-F	B	A
						Category Score:		**1.5**	**1.0**
	3	3	C	Building Amenities	2	Sufficiency of parking capacity	A-F	C	A
					1	Visibility of entrance signage	Yes/No	Yes	Yes
					1	Access to public transit	Yes/No	No	Yes
					4	Access for service vehicles (emergency, waste management, delivery etc.)	Yes/No	Yes	Yes
					3	Adequacy of storage space	Yes/No	Yes	Yes
					2	Adequacy of meeting/training space	A-F	**N/A**	A
						Category Score:		**1.7**	**1.0**
					13			0.37	0.21
	1	3	C	*Accessibility	1	Accessibility of common area building amenities as required to meet Program Service needs (door handles, automatic door openers, taps, han rails etc) Weighting = 1	Yes/No	Yes	Yes
						Category Score:		**1.0**	**1.0**
						Facility Performance Score		**2.1**	**1.0**
		2.23		***Facility Target TLOS***		***Overall Facility Score***		**1.7**	**0.6**


Facilities Condition and Performance
Stormwater Pumping Facilities
Meets Condition & Fails Performance
Fails Condition & Fails Performance
Meets Condition & Meets Performance
Fails Condition & Meets Performance
Performance LOS
Condition LOS
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Finch Avenue Sewage Pumping Station
Malton 4 Corners Sewage Pumping Station
Condition TLOS
Performance TLOS

CAM Storm Assets Levels of Service and Data Source

Service	Service Category	Asset Class	Level of Service	What does this mean?	Measure	Council LoS	Data Source
Roads & Transportation	Stormwater Management Systems	Stormwater Pumping Stations (Process Equipment)	Maintain Equipment at a Condition Rating = C (Fair)	Equipment is maintained in a fair condition	SoGR	Approved	Both Condition and Performance Data is collected through Desktop Exercise which is in an Excel Spreadsheet during Validation Workshop
			Backup capacity for all critical equipment (mechanical)	Can continue to operate if largest piece of equipment fails	Performance	Approved	
			Ensure standby power or sufficient wet well storage to meet Ministry of the Environment regulations	Enough Standby Power to operate without electricity or enough storage to prevent overflows	Performance	Approved	
			Secondary forcemain or storage capacity	Twinned or enough capacity to prevent overflows	Performance	Approved	
		Storm Sewers	Maintain PACP Condition Grade = Level 3 for storm sewers	Replace when storm sewer is no longer in good condition	SoGR	Approved	Storm Sewers inventory and unit costs is collected via email in an Excel spreadsheet from the Program as of the year end of the previous year
			Sufficient storm sewer and overland capacity to accommodate major storm events	Sewer pipes and other storm management assets have enough capacity to handle major storm events and not cause flooding	Performance	Approved	Currently not used
	Transportation Facilities	Stormwater Pumping Stations Facilities	Building Condition = B (Good)	Building Condition - Based on Facility Condition Index	SoGR	Approved	Condition Data: • Facilities Condition Data "(Forward Works Plan) is collected via email in an Excel spreadsheet from the Workplace Planning and Asset Management (WPAM) section of RPAM, as of the year end of the previous year. Performance Data: • Performance data (Facilities Condition & Performance Scoring Sheet (FCPEM) is collected through Desktop Exercises during Validation Workshops or sent to the Program via email for completion.
			Building Quality and Relationship to Current Standards = C (Fair)	Building's compliance with current code	Performance	Approved	
			Facility Finishes and Fixtures = C (Fair)	Condition of Finishes and Fixtures	Performance	Approved	
			Capacity and Change Adaptability for Program Requirements = B (Good)	Building Capacity and suitability to service delivery	Performance	Approved	
			Building Environment and Security = B (Good)	Site and Security	Performance	Approved	
			Building Amenities for Service Delivery = C (Fair)	Amenities suitability for Service Delivery	Performance	Approved	
			Accessibility Features = C (Fair)	Building Accessibility	Performance	Approved	
		Stormwater Pumping Stations Facilities Site Elements	Building Site Condition = B (Good)	Maintain Building Site in an acceptable Condition (as per Condition Index)	SoGR	Approved	

Town of Caledon

Town of Caledon 2019 Level of Serivce Table

STORMWATER INFRASTRUCTURE SERVICE AREA LOS REGISTER

Service provided Customer LOS Attribute	LOS Statements	S. No.	Asset Class	Key Service Objectives	Performance Measures Indicators KPI	KPI Type - Asset, service or Operational?	LOS Data ownership	Is KPI available (can we get the data from the sources right now?)	Priority (H,M,L)	Comments/Follow-up	Threats	Risks					Level of Risk (High, Medium, Low)	Follow-up questions and comments
												Regulatory	Financial	Safety	Social (Reputation)	Environmental		
Reliability		1	Stormwater pipes	Provide a reliable, continuous and effective delivery of stormwater services	Length of stormwater pipe inspected in good to very good condition	Asset	Capital	Yes	H	CCTV inspection currently underway. Town's AMP. Age based	Partial or complete pipe failures or collapse or structural blockages		impact	impact	social impact	release contaminants	H	
Reliability		2	Stormwater ponds	Provide a reliable, continuous and effective delivery of stormwater services	# of ponds inspected in good to very good condition	Asset	Operations	Yes	H	Town's AMP. Age based	over-capacity						M	How often are we supposed to do condition assessment on ponds? Do we have accurate data on it? 2008 and 2016. Should be done annually.
Safety & regulatory		3	All stormwater infrastructure	Providing service that is safe to the community, integrated with industry best practices of drainage systems and rainwater management, complies with all the regulatory requirements and suports the protection of the community	% of properties resilient to a 5-year storm	Service based	Conservation authorities	Yes	H	**Required by O. Reg. 588/17 2021**	Design standards at the age of development		liability	property damage	flooding	Low confidence and potential impact on the image	erosion, natural spaces	M	
Safety & regulatory		4	All stormwater infrastructure (ponds & regulated areas)	Providing service that is safe to the community, integrated with industry best practices of drainage systems and rainwater management, complies with all the regulatory requirements and suports the protection of the community	% of properties resilient to a 100-year storm	Service based	Conservation authorities	Yes	H	**Required by O. Reg. 588/17 2021**	Design standards at the age of development		liability	property damage	life threatening	Low confidence and potential impact on the image	erosion, natural spaces	M	
Reliability		5	Pretreatment devices (all of them)	Provide a sustainable delivery of stormwater services and infrastructure which supports the protection of environment	# of pretreatment devices in good to very good condition (or avg. condition of pretreatment devices)	Asset		No	L	Not yet tracked	resources	liability					water quality	M	Discussion - we can include this in our high priority list when we regularly do our inspection for pretreatment devices and get the data periodically to keep track of. Also, because linear stormwater infrastructure are the highest valued items relative to other asset classes, it's efficient to keep track and stay focused on linear assets considering our limitations to resources, staff, funding etc.
Reliability		6	Catchbasins	Provide a sustainable delivery of stormwater services and infrastructure which supports the protection of environment	# of outfalls in good to very good condition (or avg. condition of outfalls)	Asset		No	M	Not yet tracked	resources		impact					M	Discussion - we can include this in our high priority list when we regularly do our inspection for pretreatment devices and get the data periodically to keep track of. Also, because linear stormwater infrastructure are the highest valued items relative to other asset classes, it's efficient to keep track and stay focused on linear assets considering our limitations to resources, staff, funding etc.
Cost effectiveness or affordability		7	All stormwater infrastructure	Provide efficient stormwater service	% of planned maintenance activities performed per year	Operational		No	L	Not enough evidence	Not having enough resources.	liability (pretreatment devices)		lifecycle				M	
Reliability		8	Stormwater on Town's roads	Provide a reliable, continuous and effective delivery of stormwater services	Length of roadway at risk of flooding from design storm event	Operational		No	L	CVC and TRCA flood maps to look at the roads at risk of flooding	not meeting design objectives							L	
Reliability		9	All stormwater infrastructure	no. unplanned services closures and minimum traffic disruptions	# of drainage complaints per year	Asset		No	L	No data yet. But easy to get the data	unpredictability of climate change					in news etc.		L	Does drainage complaints directly relates to the performance or health of assets? Can there by drainage issues even when ponds/stormwater infrastructure is in good health?
Responsiveness		10	All stormwater infrastructure	Customer issues responded within 24 hours	% of service requests inspected through a work order within 48 hours	Operational		No	L	No data yet - not tracked			liability					L	
Responsiveness		11	All stormwater infrastructure	Customer issues responded within 24 hours	% of service requests inspected communicated back to customer within 48 hours	Operational		No	L	No data yet - not tracked			liability					L	
Safety & regulatory		12	All stormwater infrastructure	Ask amadeo	No. of insurance claims per year due to stormwater issues	Service based		No	L	No data yet - not tracked	Ask Amadeo. Higher than insurance budget							L	
Reliability		13	Catchbasins	Provide a sustainable delivery of stormwater services and infrastructure which supports the protection of environment	% of catchbasins cleaned annually	Operational		Yes	M	follow-up with Cassie & operations. Catchbasins are cleaned every year from May to October	resources	liability					water quality	H	
Reliability		14	Stormwater pipes		% of stormwater pipes flushed annually	Operational		No	L	No data yet. Not currently done.								M	
Sustainability		15	Water Balance Facilities/Green infrastructure		# of green infrastructure practices inspected	Asset		Not possible to track quite yet.	L		resources	liability					impact (protection and restoration)	L	
Safety & regulatory		16	All stormwater infrastructure	Make stormwater services & infrastructure available for everyone	% of stormwater infrastructure complying with ECA	Operations		Yes	M	Yes, easy to get the data	Not having enough resources. Database of ECAs not yet developed		liability	penalty				H	compliance of all stormwater infrastructure does not necessarily means the asset is performing bad. Correct? Town does not comply with ECAs to some extent - doesn't mean that the assets are performing bad?
Cost effectiveness or affordability		17	All stormwater infrastructure		O&M Cost / km of stormwater pipe	Asset		No	M	No data yet. Not currently done.								H	
Cost effectiveness or affordability		18	All stormwater infrastructure		Annual capital reinvement rate	Operational		Yes	M	There is some inconsistencies in our curret replacement valuation. (annual capital expenditure/total asset class replacement value)*100								L	
Safety & regulatory		19	Landscaping	Preserve and re-establish the natural hydrologic process to protect, restore and replenish surface water and groundwater resources (water quantity)	% of Town that manages the 90% of stormevent.	Service based		No	L	Not tracked yet. It's for new developments. Already in the agreement. Aligns directly with the 2015 master plan.	on private property					social reputation isues (potentiall impact other infrastructure and ultimately the town) - no bylaw		L	
Safety & regulatory		20	Stormwater watercourses and ponds	Reduce the impacts of erosion on aquatic and terrestrial habitat and property (water quantity)	% of areas at high risk of erosion (Stream condition index - SCI (preferred - confirm with CVC on HIT tool)	Asset		No	M	confirm with CVC on HIT tool. Aligns directly with the 2015 master plan.	degradation of natural system. Urbanization				erosion on private properties, emergecy responses				
Safety & regulatory		21	Ditches	Provide a sustainable delivery of stormwater services and infrastructure which supports the protection of environment	% compliance with ditch cleaning requirements	Operational		Yes	M	ditch cleaning budget every year - confirm with Cassie and operations	resources	Follow-up with operations on this			transportation route or private properties			H	
Availability		22	Stormwater pipes	Provide a reliable, continuous and effective delivery of stormwater services	# of pipe blockage incidents per year	Asset		No	M	No data yet. Not currently done.	failure of the infrastructure due to age, storm event or condition		impact		impact	social impact	release contaminants	M	
Availability		23	Stormwater pipes	Provide a reliable, continuous and effective delivery of stormwater services	# of pipe failure incidents per year	Asset		No	M	No data yet. Not currently done.	failure of the infrastructure due to age, storm event or condition		impact		impact	social impact	release contaminants	M	
Safety		24	All stormwater infrastructure	Minimize the threat to life and property from flooding (water quantity)	Scheduled to revisit in 2021 with the next update on stormwater master plan. Aligns directly with the master plan.						2021								
Sustainability		25	All stormwater infrastructure	Protect, enhance and restore natural features and functions such as wetlands, riparian and ecological corridors (natural environment)	Scheduled to revisit in 2021 with the next update on stormwater master plan. Aligns directly with the master plan.						2021								
Sustainability		26	All stormwater infrastructure	Improve warmwater and coldwater fisheries if appropriate (natural environment)	Scheduled to revisit in 2021 with the next update on stormwater master plan. Aligns directly with the master plan.					climate change plan update 2021, master plan update	2021								

Credit Valley Conservation

Table Error! No text of specified style in document.**-1: Summarized Provincial Requirements for Stormwater Infrastructure Planning**

Regulation Topic	Regulation/Policy[1]	Question	Risk(s) of Noncompliance
Stormwater Planning			
Growth Planning	GPGGH 2.2.8.3 c-d-e, GPGGH 4.2.1.1	Are growth planning and growth area settlement boundary expansions supported by watershed plans and stormwater master plans?	*Risks to aquatic/terrestrial ecosystems *Increased flooding risks *Legal liability *Regulatory liability
Watershed Planning	GPGGH 4.2.1.1, ORMCP 24 (1)	Are upper and single-tier municipalities partnering with lower-tier municipalities and conservation authorities to ensure watershed planning is undertaken?	*Risks to aquatic/ terrestrial ecosystems *Increased flooding risks *Legal liability *Regulatory liability (potential fines associated with ECA enforcement) *Increased risk of infrastructure failure *Financial risks (unanticipated expenditures) *Increased need for monitoring/maintenance
Stormwater Planning Scope	Provincial Policy Statement (PPS) 2.2.1; Growth Plan for the Greater Golden Horseshoe (GPGGH), GGPGH 3.2.7.1a, GPGGH 3.2.7.2 a, GPGGH 4.2.1.3; GPGGH 3.2.6.4; PPS 2.2.1b; Oak Ridges Moraine Conservation Plan 2017 (ORMCP) 45 (0.2), 46(3)	Is stormwater master planning or equivalent informed by the relevant watershed/subwatershed plans? Are watershed/subwatershed plans up to date and reflective of PPS and Growth Plan requirements with consideration for climate change impacts?	
	PPS 1.6.1; GPGGH 3.2.1.2 d, 3.2.1.4, 4.2.10.1 d, 4.2.10.2 a	Does stormwater infrastructure planning incorporate consideration of climate change impacts?	
	GPGGH 3.2.1.4, 4.2.10.1 c	Have stormwater infrastructure risks and vulnerabilities (other than climate change) been assessed?	
	PPS 1.6.1; GPGGH 2.2.8.3 b, GPGGH 3.2.1.2 c; GPGGH 3.2.7.1g	Are full life-cycle costs of stormwater infrastructure considered in planning?	
	PPS 1.6.3; GPGGH 3.2.7.1f	Does stormwater infrastructure optimize use of current facilities and consider adaptive reuse and retrofits?	
Stormwater Planning Contents and Scope		Does stormwater planning:	*Risks to aquatic/terrestrial ecosystems *Decline in overall watershed health *Decline in surface and groundwater quality *Increased flooding risks *Legal liability *Increased risk of infrastructure failure *Financial risks (unanticipated expenditures) *Increased need for monitoring/maintenance
	PPS 1.6.6.7 a	“minimize, or, where possible, prevent increases in contaminant loads” [2]	
	PPS 1.6.6.7 b	“minimize changes in water balance and erosion”	

[1] Not all these regulations are in scope for this project.
[2] Statements with quotation marks in this document are direct quotes from respective policies. Statements without quotation marks are interpretations of legislative requirements.

Regulation Topic	Regulation/Policy[1]	Question	Risk(s) of Noncompliance
	PPS 1.6.6.7 c	“not increase (replaced with 'mitigate' in 2019 draft PPS) risks to human health and safety and property damage”	
	PPS 1.8.1 g, PPS 1.6.6.7 d	“maximize the extent and function of vegetative and pervious surfaces”	
	PPS 1.6.6.7 e; ORMCP 45(0.2)	“promote stormwater management best practices, including stormwater attenuation and re-use, and low impact development.”	
		Protect, improve, or restore the quality and quantity of water by:	
	PPS 2.2.1a	“using the watershed as the ecologically meaningful scale for integrated and long-term planning, which can be a foundation for considering cumulative impacts of development”	
	PPS 2.2.1b	“minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts”	
	PPS 2.2.1c	“identifying water resource systems consisting of ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas, which are necessary for the ecological and hydrological integrity of the watershed”	
	PPS 2.2.1d; PPS 2.1.2	“maintaining, restoring, or improving links and related functions among ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas”	
	PPS 2.2.1 d- e; *Clean Water Act* (2006)	“implementing necessary restrictions on development and site alteration to: 1. protect all municipal drinking water supplies and designated vulnerable areas; and 2. protect, improve or restore vulnerable surface and ground water, sensitive surface water features and sensitive ground water features, and their hydrologic functions”	
	PPS 2.2.1f	“planning for efficient and sustainable use of water resources, through practices for water conservation and sustaining water quality”	
	PPS 2.2.1g	“ensuring consideration of environmental lake capacity, where applicable”	
	PPS 2.2.1h	“ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces”	
Stormwater Master Plan Contents and Scope		Do stormwater master plans or equivalent for serviced settlement areas meet the following criteria:	*Decline in watershed health *Increase in flooding risks *Decline in surface and groundwater water quality *Legal liability *Regulatory liability (potential fines associated with ECA enforcement) *Increased risk of infrastructure failure *Financial risks (unanticipated expenditures) *Increased need for monitoring/maintenance
	GPGGH 3.2.7.1a, ORMCP 45(0.2) a	“informed by *watershed planning* or equivalent”	
	GPGGH 3.2.7.1b	“protect the *quality and quantity* of water by assessing existing stormwater facilities and systems”	

Regulation Topic	Regulation/Policy[1]	Question	Risk(s) of Noncompliance
	GPGGH 3.2.7.1c	"characterize existing environmental conditions"	
	GPGGH 3.2.7.1d	"examine the cumulative environmental impacts of stormwater from existing and planned development, including an assessment of how extreme weather events will exacerbate these impacts and the identification of appropriate adaptation strategies"	
	GPGGH 3.2.7.1e ORMCP 45(0.2) d	"incorporate appropriate *low impact development* and *green infrastructure*"	
	GPGGH 3.2.7.1f	"identify the need for stormwater retrofits, where appropriate"	
	GPGGH 3.2.7.1g	"identify the full life-cycle costs of the stormwater *infrastructure*, including maintenance costs, and develop options to pay for these costs over the long-term"	
	GPGGH 3.2.7.1h	"include an implementation and maintenance plan"	
Environmental Compliance Approvals (ECAs)	*Environmental Protection Act* (EPA)/*Ontario Water Resources Act* (OWRA)	Are all stormwater ECAs in the municipality tracked and compliant?	*Decline in watershed health *Increase in flooding risks *Decline in surface and groundwater water quality *Legal liability *Regulatory liability (potential fines associated with ECA enforcement) *Increased risk of infrastructure failure *Financial risks (unanticipated expenditures) *Increased need for monitoring/maintenance
Development Plans	GPGGH 3.2.1.2; 3.2.7.1 a, 3.2.7.2a, 4.2.1.3, ORMCP 24 (4)	Is large-scale development and other serviced settlement area development informed by stormwater planning (master plan or equivalent) that are based on watershed and subwatershed plans?	*Decline in watershed health *Increase in flood risk *Decline in surface and groundwater water quality *Increased risk to drinking water supply *Legal liability *Increased risk of infrastructure failure *Financial risks (unanticipated expenditures)
		Are proposals for large-scale development proceeding by way of a secondary plan, plan of subdivision, vacant land plan of condominium, or site plan supported by a stormwater management plan or equivalent that:	
	GPGGH 3.2.7.2a	"is informed by a *subwatershed plan* or equivalent"	
	GPGGH 3.2.7.2b	"incorporates an integrated treatment approach to minimize stormwater flows and reliance on stormwater ponds, which includes *appropriate low impact development* and *green infrastructure*"	
	GPGGH 3.2.7.2c	"establishes planning, design, and construction practices to minimize vegetation removal, grading and soil compaction, sediment erosion, and impervious surfaces"	
	GPGGH 3.2.7.2d	"aligns with the *stormwater master plan* or equivalent for the *settlement area*, where applicable"	
Asset Management Planning			
Asset Management Plan Contents and Scope	Build Together Guidance Document	Do municipal AMPs contain:	*Lack of access to federal/provincial funds *Financial risks (unanticipated expenditures) *Legal liability *Increased need for monitoring/maintenance
		An introduction identifying relationships of AMP to existing documents (i.e. master plans, stormwater design criteria, watershed plans) and which assets are included in the plan (i.e. green and grey infrastructure)	

Regulation Topic	Regulation/Policy[1]	Question	Risk(s) of Noncompliance
		A statement of local infrastructure describing asset types and quantity/extent, accounting valuation of assets, replacement cost, age distribution and age as a proportion of expected useful life, and asset condition (good, fair, poor, based on standard engineering practices)	*Regulatory liability (potential fines associated with ECA enforcement)
		A desired levels of service - performance measures, targets, and timeframes to achieve this LOS, as well as an assessment of current asset performance relative to these targets	
		An asset management strategy - actions to meet the desired levels of service and a risk assessment of the available options	
		A financing strategy – showing actual and annual expenditure forecasts, breakdown of yearly revenues, addresses assumptions and alternative scenarios, and identifies funding shortfalls	
	O. Reg. 588/17 3(1) 5 (July 1, 2019)	Does the strategic asset management strategy (SAMS) commit to considering climate change vulnerability in levels of service and life-cycle management of infrastructure, and disaster planning?	
	O. Reg. 588/17 3(1)6 (July 1, 2019)	Does the SAMS confirm that the AMP will be in conformance with any financial plans related to the municipality's water assets, including any financial plans prepared under the *Safe Drinking Water Act, 2002*?	
	O. Reg. 588/17 3(1)9 (July 1, 2019)	Does the SAMS commit "to coordinate planning for asset management, where municipal infrastructure assets connect or are interrelated with those of its upper-tier municipality, neighbouring municipalities, or jointly owned municipal bodies"?	
	O. Reg. 588/17 5(2) 3 (July 1, 2021)	Does the AMP include the age, condition, and replacement cost of stormwater assets?	
	O. Reg. 588/17 6 (2) (July 1, 2024)	Does the AMP include a description of proposed levels of service and their associated risks to the long-term sustainability of the municipality, and how those proposed levels of service differ from the current levels of service?	
		Are current and desired levels of service for stormwater included and evaluated in the AMP?	
	O. Reg. 588/17 Table 3 (July 1, 2021)	Community levels of service (qualitative descriptions): "description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system"	
	O. Reg. 588/17 Table 3 (July 1, 2021)	Technical levels of service (technical metrics): "1. Percentage of properties in municipality resilient to a 100-year storm. 2. Percentage of the municipal stormwater management system resilient to a five-year storm."	

Appendix B: Levels of Service Workshop Slide Deck

Stormwater Servicing Master Plan for Regional Road Infrastructure

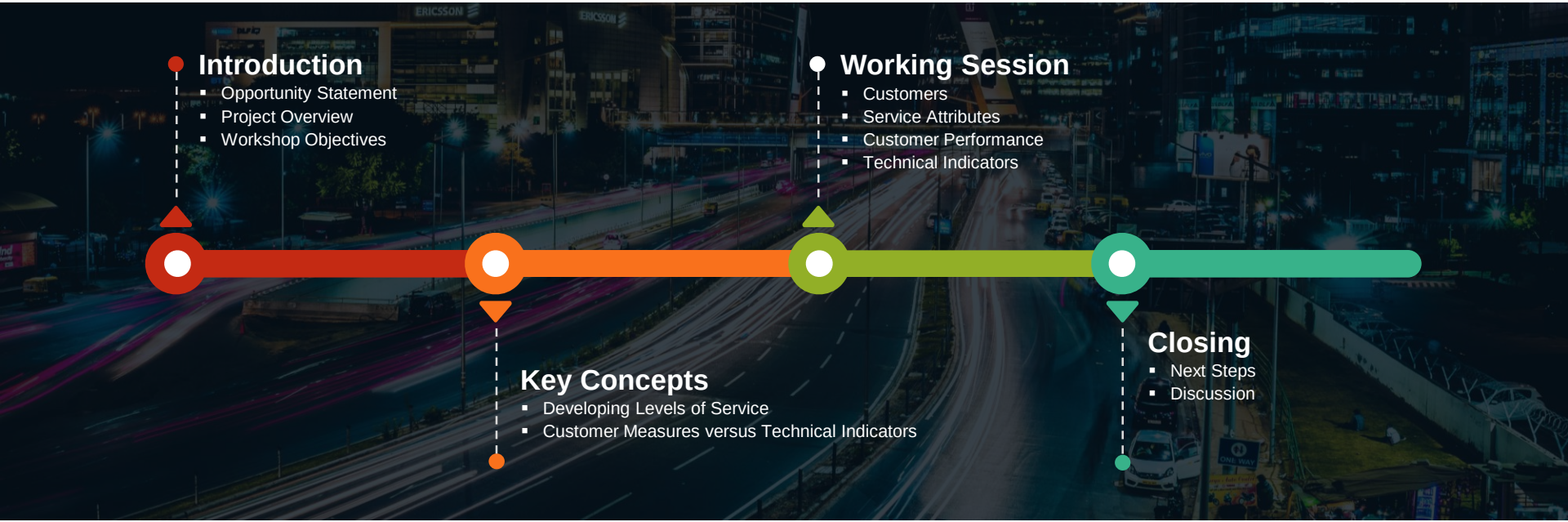
Region of Peel

James Jorgensen
David Baldesarra
Zachary Francisco

Levels of Service Workshop

June 8th, 2020

Agenda


Introduction
Opportunity Statement
Project Overview
Workshop Objectives
Working Session
Customers
Service Attributes
Customer Performance
Technical Indicators
Key Concepts
Developing Levels of Service
Customer Measures versus Technical Indicators
Closing
Next Steps
Discussion

Opportunity Statement

Provide efficient stormwater servicing for existing and future regional road infrastructure by taking into account existing ageing infrastructure, growth, natural environment, climate change and compliance within the regulatory framework.

Project Overview

Task 1: Phase 1 EA – Identification of Problems and Opportunities

- Kickoff and initial external stakeholder meetings held
- PIC1 completed

Task 2: Hydraulic Model

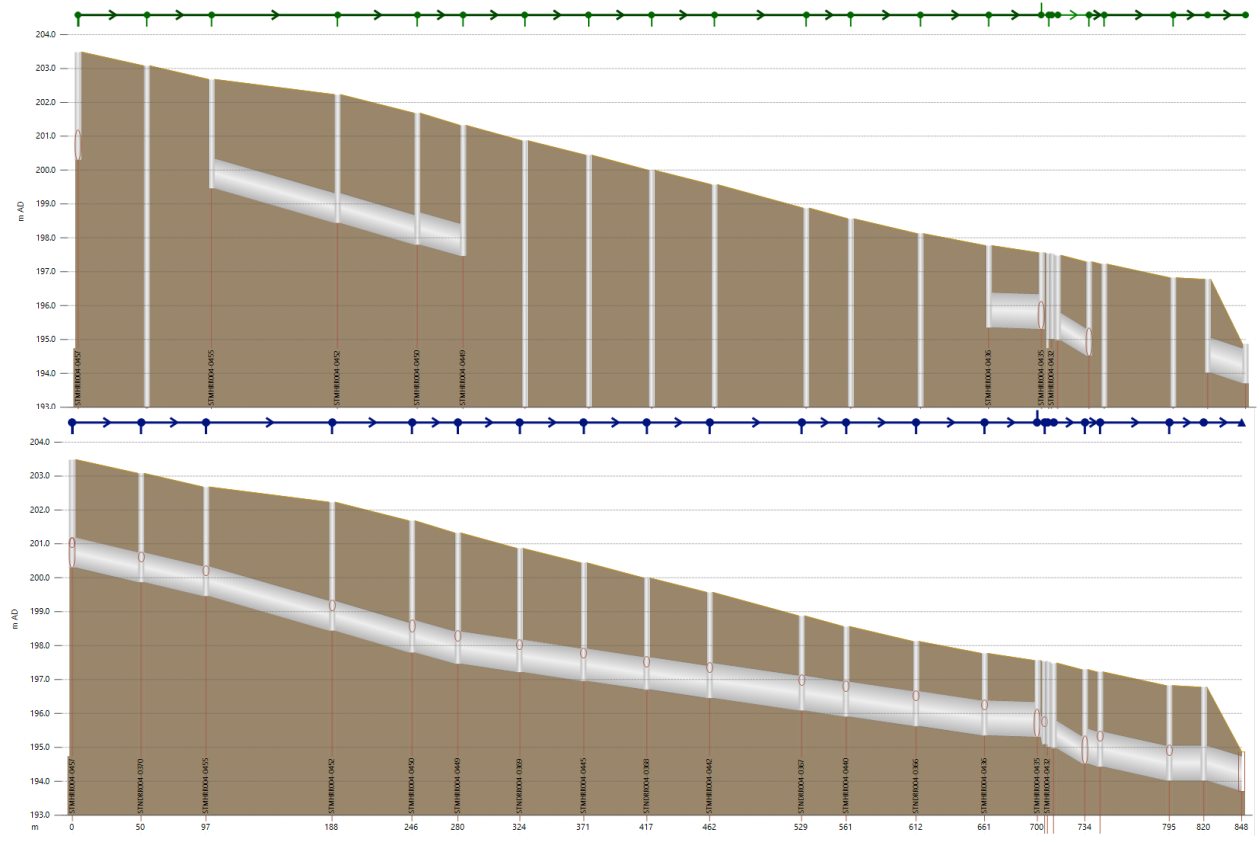
- Data review completed
- Preliminary development of hydraulic model

Task 3: Levels of Service (LOS)

- Preliminary development of LOS framework

Hydraulic Model

Hydraulic Model



Project Overview

The project will focus on establishing:

- A risk-based framework for LOS that will make the Region compliant with Ontario's new AM regulation (O. Reg. 588/17);
- The impact of the Master Plan strategies on achieving the stormwater LOS goals and their impact on the lifecycle funding needs;
- Developing an optimal implementation plan that best achieves the stormwater goals and objectives

Workshop Objectives

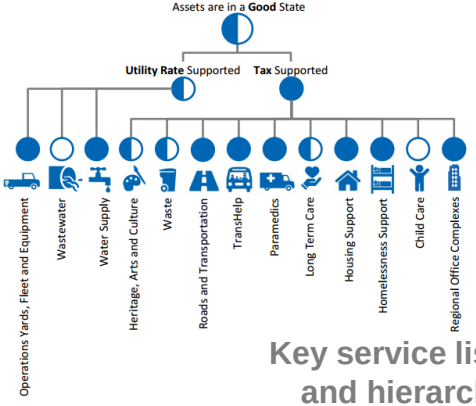
Discuss, review and validate:

- Service attributes, statements and performance indicators
- Alignment with CAM, Transportation and other stakeholders for consistent terminology and performance scoring
- Indicators that could be tracked now
- The implementation of indicators that should be tracked in the future

Developing Levels of Service

Customers and service attributes

Allocation of each asset to the services



Key service list and hierarchy

Technical performance indicators

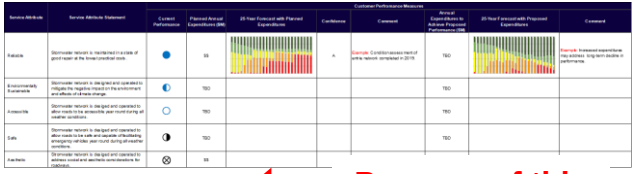
Technical Performance Indicators	
Performance Indicator	**Data Source**
Reliability Objectives	
Percentage of stormwater sewers above a condition grade of C.	2019 Condition Assessment data
Percentage of other stormwater assets that have not exceeded their estimated service lives.	Desktop review of stormwater GIS data
Environmental Sustainability Objectives	
Percentage of stormwater network with insufficient capacity to convey flows of a 5-year storm event that considers the impact of climate change	Hydraulic model, Future IDF Data Analysis
Percentage of major system with insufficient capacity to convey flows of a 100-year wet weather event that considers the impact of climate change	2D Hydrologic Model (out of project scope), vulnerability maps
Percentage of outfalls that meet water quality objectives	CVC and TRCA Maps and Staff Knowledge
Percentage of stormwater management ponds that meet effluent water quality objectives	Hansen Work Order Data, Staff Knowledge
Percentage of stormwater sewers with water quality treatment control	Desktop review of stormwater GIS data
Accessibility Objectives	
Percentage of stormwater network with sufficient capacity to convey flows of a 5-year storm event.	Hydraulic model
Percentage of major system with sufficient capacity to convey flows of a 100-year wet weather event.	2D Hydrologic Model (out of project scope), vulnerability maps
Safety Objectives	
Percentage of regional road network prone to flooding.	Vulnerability maps
Average annual calls or complaints related to stormwater flooding damaging property?	Call center
Percentage of critical emergency routes that maintain accessibility during a 100-year wet weather event.	Hydraulic model
Social and Aesthetic Objectives	
Percentage of regional road network that a Low Impact Design has been implemented.	Desktop review of stormwater GIS data

Amalgamate into a Level of Service Framework

Key deliverables:
LOS framework
LOS Summary Report

BluePlan ENGINEERING

Developing Levels of Service

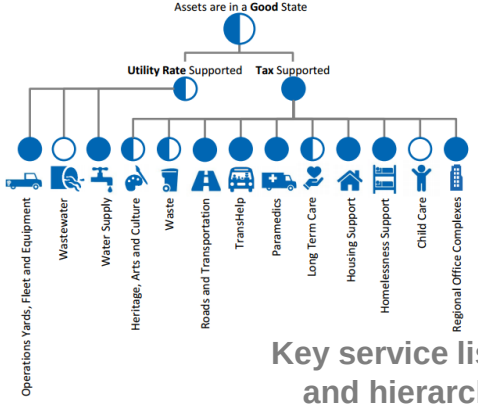


Customers and service attributes

Purpose of this Workshop

CAM Reviewing for Stormwater

Allocation of each asset to the services



Key service list and hierarchy

Technical performance indicators

Performance Indicators	Data Source
Reliability Objectives	
Percentage of stormwater sewers above a condition grade of C.	2019 Condition Assessment data
Percentage of other stormwater assets that have not exceeded their estimated service lives.	Desktop review of stormwater GIS data
Environmental Sustainability Objectives	
Percentage of stormwater network with insufficient capacity to convey flows of a 5-year storm event that considers the impact of climate change	Hydraulic model, Future IDF Data Analysis
Percentage of major system with insufficient capacity to convey flows of a 100-year wet weather event that considers the impact of climate change	2D Hydrologic Model (out of project scope), vulnerability maps
Percentage of outfalls that meet water quality objectives	CVC and TRCA Maps and Staff Knowledge
Percentage of stormwater management ponds that meet effluent water quality objectives	Hansen Work Order Data, Staff Knowledge
Percentage of stormwater sewers with water quality treatment control	Desktop review of stormwater GIS data
Accessibility Objectives	
Percentage of stormwater network with sufficient capacity to convey flows of a 5-year storm event.	Hydraulic model
Percentage of major system with sufficient capacity to convey flows of a 100-year wet weather event.	2D Hydrologic Model (out of project scope), vulnerability maps
Safety Objectives	
Percentage of regional road network prone to flooding.	Vulnerability maps
Average annual calls or complaints related to stormwater flooding damaging property?	Call center
Percentage of critical emergency routes that maintain accessibility during a 100-year wet weather event.	Hydraulic model
Social and Aesthetic Objectives	
Percentage of regional road network that a Low Impact Design has been implemented.	Desktop review of stormwater GIS data

Amalgamate into a Level of Service Framework

Key deliverables:
LOS framework
LOS Summary Report

CAM Reviewing for Stormwater

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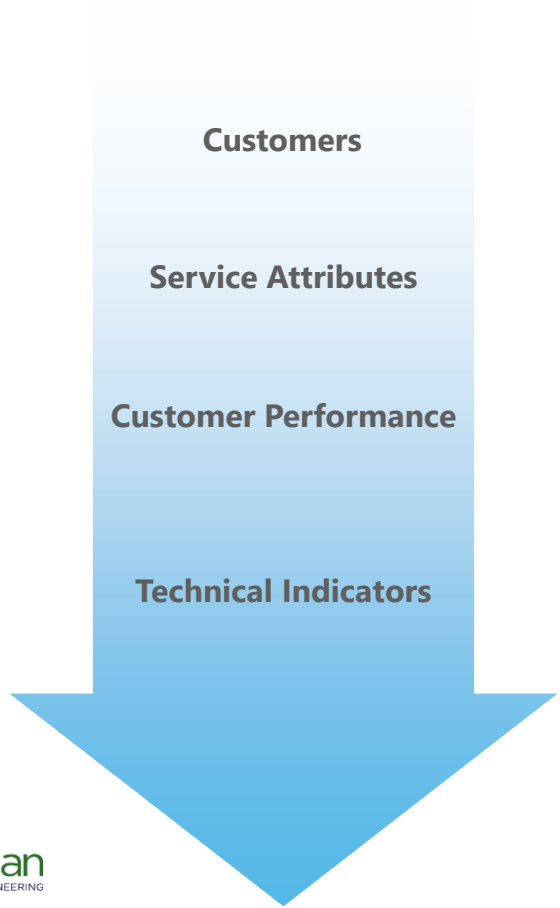
Working Session Outline



Customers

Who are your primary customers?
Who do you generally hear feedback from the most?

Service Attributes

What does the community care about?
(i.e. Reliable, Safe, Operational, Accessible etc.)

Customer Performance

How do we measure community expectations?

Technical Indicators

What are the key considerations to decision-making?
If your budget was cut in half, where would you see the biggest impact?
If your budget was increased, what would you do with it?
At what asset level do you make budgeting decisions?

Level of Service Approach

- Customer Performance Measures
  - Relate to how the customer receives the service in terms that they can understand
  - Uses common language to communicate to Council and the community

- Technical Performance Indicators
  - How the Region of Peel provides and tracks its services
  - Technical language and concepts used by asset owners specific to their service

Customers and Performance Measures

- Who are the regional road customers?
  - Residents, businesses, internal vs. external
- What is their expectation of performance?
  - No interruption of service, or short times till service resumption
  - Accessible, reliable, quality, environmentally sustainable, etc.
- How do you measure this?
  - The ability of an asset to fulfill the organization’s objectives or requirements
  - An asset with good performance is one which is meeting the expectations of the community

Service Attributes

- Reliable,
- Safe,
- Operational,
- Accessible,
- Convenient,
- Livable Community,
- Quality,
- Quantity,
- Environmentally Conscious,
- Compliance,
- Shine or Aesthetic.

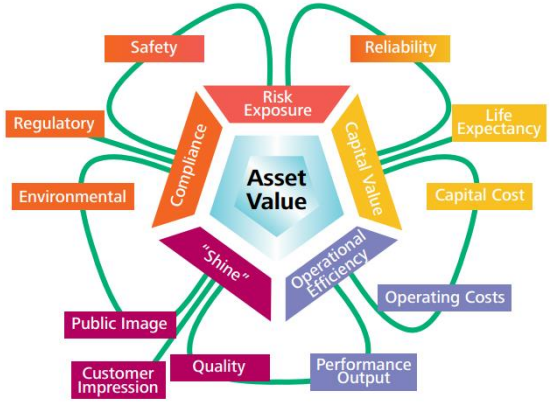


Figure 3: Dimensions of Asset Value ('Shamrock' diagram courtesy of the Woodhouse Partnership Ltd)

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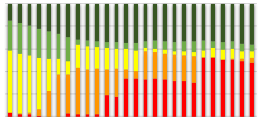
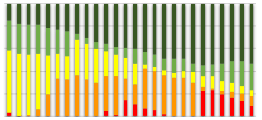
Establishing a Service-Driven Performance Framework

Service Statement:

Provide efficient stormwater servicing for existing and future regional road infrastructure by taking into account existing ageing infrastructure, growth, natural environment, climate change and compliance within the regulatory framework.

Service Attribute	Service Attribute Statement	Customer Perfromance Measures							
		Current Performance	Planned Annual Expenditures ($M)	25-Year Forecast with Planned Expenditures	Confidence	Comment	Annual Expenditures to Achieve Proposed Performance ($M)	25-Year Forecast with Proposed Expenditures	Comment
Reliable	Stormwater network is maintained in a state of good repair at the lowest practical costs.	●	$$		A	Example: Condition assessment of entrie network completed in 2019.	TBD		Example: Increased expenditures may address long-term decline in performance.
Environmentally Sustainable	Stormwater network is designed and operated to mitigate the negative impact on the environment and effects of climate change.	◐	TBD				TBD		
Accessible	Stormwater network is desiged and operated to allow roads to be accessible year round during all weather conditions.	○	TBD				TBD		
Safe	Stormwater network is desiged and operated to allow roads to be safe and capable of facilitating emergency vehicles year round during all weather conditions.	◑	TBD				TBD		
Aesthetic	Stromwater network is desiged and operated to address social and aesthetic considerations for roadways.	⊗	$$				TBD		

Technical Levels of Service

- What are the key considerations to decision-making?
  - What data/information do you look at?
  - What metrics or indicators do you use to increase or decrease budgets?
  - Who do you consult?
  - How much new/existing information is considered?
- If your budget was cut in half, where would you see the biggest impact?
- If your budget was increased, what would you do with it?
- Does any other group have an influence over your decisions?
  - Council
  - SMT

Technical Performance Indicators

- How can we quantify Customer Performance?
  - Customer complaints
  - Regulatory requirements
  - Physical asset condition
  - Computer modelling results
- How do assets support Customer Performance?
- What triggers the need to spend money on an asset?
  - Poor Condition or capacity restraints = not meeting reliability objectives
  - No outfall control measures near an ESA = not meeting environmental quality objectives

Establishing a Service-Driven Performance Framework

- Technical Indicators

Technical Performance Indicators			
Assets	**Performance Indicator**	**2020 Value**	**Data Source**
Stormwater Sewers	Percentage with a condition assessment grade of 3 or better.		2019 Condition Assessment data
Stormwater Structures (i.e. OGS, LIDS, Pumping stations)	Percentage that have not exceeded their estimated service lives.		Desktop review of stormwater GIS data
Stormwater Management Ponds, LID, OGS and Ditches	Percentage of Low Impact Developments that are maintained to design specifications/meet cleaning requirements/CA standards.		
Stormwater Network	Percentage with insufficient capacity to convey flows of a 10-year storm event that considers the impact of climate change.		Hydraulic model, Future IDF Data Analysis
Major Stormwater System (Stormwater Network and roads)	Percentage with insufficient capacity to convey flows of a 100-year wet weather event that considers the impact of climate change.		2D Hydrologic Model (out of project scope), vulnerability maps
Outfalls	Percentage that meet water quality objectives.		CVC and TRCA Maps and Staff Knowledge
Stormwater Management Ponds	Percentage that meet effluent water quality objectives.		Hansen Work Order Data, Staff Knowledge
Stormwater Network	Percentage with water quality treatment control (i.e. OGS or LID).		Desktop review of stormwater GIS data
Stormwater Network	Percentage with sufficient capacity to convey flows of a 10-year storm event.		Hydraulic model
Major Stormwater System (Stormwater Network and roads)	Percentage with sufficient capacity to convey flows of a 100-year wet weather event.		2D Hydrologic Model (out of project scope), vulnerability maps
Stormwater Network	Percentage that experiences X or less annual complaint calls related to stormwater flooding damages.		
Stormwater Network	Percentage where a Low Impact Design improves the aesthetics for the roadway.		Desktop review of stormwater GIS data

Data Used in Levels of Service Development

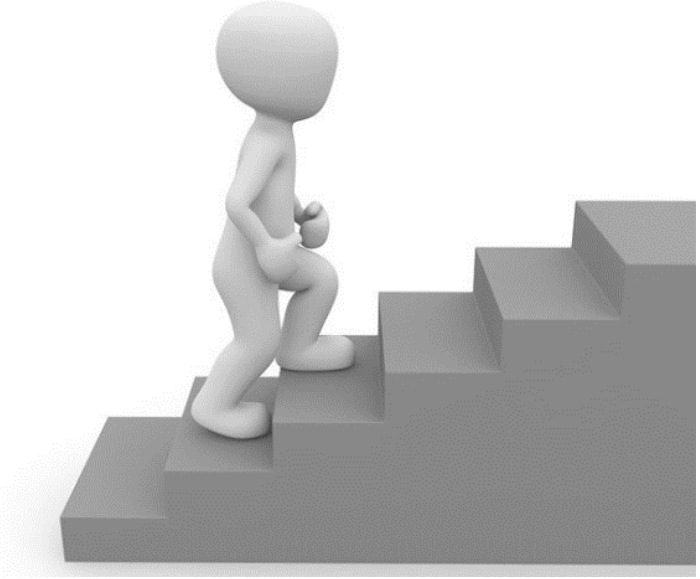
- Any current Levels of Service and asset hierarchies
- Asset Inventories and Register Data
- Capital and Operating Budgets
- Work Order System Data
- Condition Data
- Capacity Data

Discussion - Alignment with Stakeholders

- How does stormwater impact roads LOS?
- How do the Region's levels of service differ from the lower-tier municipalities?
- What are the Conservation Authorities view from a watershed perspective?
- How do the levels of service align between all of these stakeholders?

Next Steps

- Review and Validate Service Attribute and Statement
- Review and Validate Technical Performance Indicators table
- LOS refinements based on feedback
- LOS Summary Report



Thank You

Questions and Discussion

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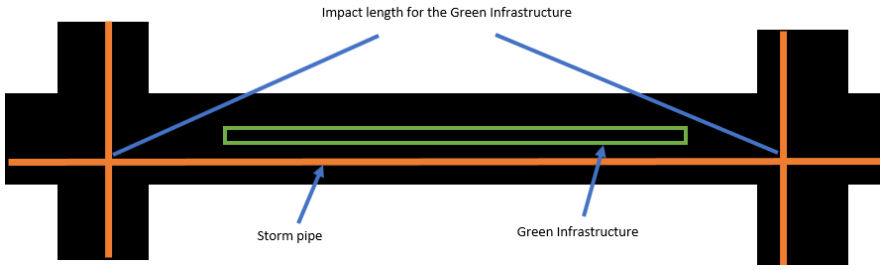
Appendix C: Workshop Feedback and Responses

Stakeholder	Question/Comment	Response
Corporate Asset Management	**Technical Indicator: Percentage that are under the maximum allowable defect score determined through condition assessment.** - Wording is confusing as a higher score (1-5) means worse condition. % under the max defect score sounds like it is asking for % in a good state... is this correct? if so, consider re-wording for clarity.	The response from the workshop was that the stormwater mains were following the same criteria as the wastewater methodology. This methodology goes beyond the maximum PACP score of 1-5. The quick score is used instead and converted into a defect score. The defect score is used because a pipe with several grade 3 defects may be in worse shape than a pipe with only 1 grade 4/5 defect. We can provide the logic memo that describes this methodology further.
	Technical Indicator: Percentage of Low Impact Developments that are maintained to design specifications/meet cleaning requirements/CA standards. - this one has quite a bit in it and may have to be broken out into several indicators**.**	It would be the same indicator for different assets, it can be broken out if it is beneficial for reporting.
	Technical Indicator: Percentage that experiences X or less annual complaint calls related to stormwater flooding damages or safety concerns. - Can be tricky as sometimes the flooding is caused by an upstream feature not owned by Peel, however, we get the complaint. Would this indicator include these cases as well?	The Region would have to identify the cause of the complaint and tie it to the appropriate asset. In the case of an upstream issue no Regional pipe should get the complaint associated with it. This metric is only useful if customer complaints were to impact capital planning decisions.
	Technical Indicator: Percentage with insufficient capacity to convey flows of a 10-year storm event that considers the impact of climate change. - Not sure what this one means... "considers the impact of climate change)**.**	A simulated future storm event would be run through the model. The storm event would imitate the potential impacts of climate change
	Technical Indicator: Percentage with insufficient capacity to convey flows of a 100-year wet weather event that considers the impact of climate change. - Same comment as above in regard to climate change.	Response above.

Stakeholder	Question/Comment	Response
	Technical Indicator: Percentage with flow control devices. - If the asset is "storm network", how is the % with control devices calculated?	Good point, flow control devices are the solution to the metric that should be tracked. This metric was intended to track the percentage of the network that are failing flood control objectives and therefore require a flow control device. It was to answer, "do we have enough flow control devices"? The above metric was intended to answer, "are the assets we have meeting our standards"? However, both are trying to achieve flood control objective. Therefore, I suggest removing "Percentage with flow control devices." and changing "Outfalls and Stormwater Management Ponds" to "Stormwater Network" for the above metric. The calculation would be the percentage of the system that have flow controlling devices where required and work properly if present.
	Technical Indicator: Percentage with water quality treatment control (i.e. OGS or LID). - Same comment as previous - how is the percentage calculated against the entire network?	Response above.
Credit Valley Conservation	In general, the asset Levels of Service developed by the Region are very comprehensive and CVC has not identified any major concerns.	Noted.

Stakeholder	Question/Comment	Response
	The Asset Levels of Service focus on stormwater management and related urban flooding resulting from the undersized sewers and overland conveyance constraints. We know that roads and bridges are also flooded due to undersized structures (culvert, bridge, etc.) which makes it difficult to separate urban flooding from riverine flooding. CVC recommends recognizing urban flooding and riverine flooding. Preferably, we recommended that the study include conveyance capacity of bridges and culverts under the Attributes: “Accessible”, “Safe” and “Environmentally Sustainable”. This will also help to support stormwater management strategies in reducing the frequency of flooding under future climate scenarios.	The intent of this suggestions is valid. However, the scope of the Peel SW Master Plan relates to the Regional stormwater infrastructure. This project will provide an understanding of the capacity constraints of the regional stormwater assets. All regional owned SW assets are included in the hydraulic model, for which an estimated capacity can be derived.
	Consistent with the PPS and Growth Plan requirements, Peel’s levels of service references climate change, but it is unclear what climate scenarios are being used to set these service targets (i.e. 2050 or 2080 climate scenarios, which climate models are being used?). For your reference as part of the Peel Climate Change Partnership (Flood Resiliency Strategy), the attached climate conditions and scenarios have been used in the development of flood mitigation plans for Crooksville Creek, Alton and Bolton. Given different climate model projections, consideration for defining a climate scenario and/or defining a specific rainfall depth may assist in the measurement of these levels of service and reduce potential risk on not meeting targets.	We are still finalizing the approach. However, it is expected that a climate change adjusted IDF curve will be used as a simulation input into the 1d hydraulic model to assess the impacts of climate change on regional assets and to ensure that identified solutions are tested with the same approach. The climate change adjusted IDF curve will be created using the IDF CC tool or similar (https://www.idf-cc-uwo.ca/).

Stakeholder	Question/Comment	Response
	The Region of Peel's Official Plan Monitoring and Measuring (M&M) Report (https://www.peelregion.ca/planning/pdf/measuring-and-monitoring-report.pdf) includes water quality and quantity targets, has there been consideration as to if/how these may be incorporated within the master plan to support efficiencies?	This a valid comment and the Master Plan team will ensure that the report comments on the alignment with the official plan. The Master Plan has set of Policy statements which align with those of The Official Plan. It is expected that the Master Plan could be used to inform the M&M reporting in the future. For example, as per page 80 of the M&M report the Master Plan outputs will assist in future analysis to account for stormwater retrofits in the assessment of urbanized areas with stormwater management service available.
	In the Environmentally Sustainable section in the framework table: For "Percentage with sufficient capacity to convey flows of a 10-year storm event that considers the impact of climate change," we suggest you refer to and ensure consistency with the Draft Provincial LID Manual.	Metric has been reworded to align with the Region's Stormwater Criteria and Procedure Manual. A design storm will be applied to the model to simulate the impacts of climate change.
	In the Environmentally Sustainable section in framework table: For watershed level of service targets please consider using Peel's 2019 SWM Design Criteria. As per Figure 4.2 in Peel's SWM Design Criteria https://www.peelregion.ca/public-works/design-standards/pdf/sewer-design-update.pdf, a control hierarchy has been proposed whereby stormwater management practices are preferentially selected to control the 90th percentile rainfall volume (27-28mm).	Acknowledged

Stakeholder	Question/Comment	Response
	In Appendix C - Feedback on workshop in spring: In reference to CVC staff feedback, some cells in the response column from the consultant are Coloured in yellow with no response – What does this mean? CVC expects that these comments will be addressed and considers them to be outstanding comments at this time. Is more information required to respond to the comments? As it is presented in the report, it remains unclear as to how climate change will be measured. The 20, 50 and 80 storm events are very different. We suggest you consider specific storm events and duration under consideration of climate change, as for example today's 1:100-year storm will not remain a 1:100-year storm by 2050.	We are still finalizing the approach. However, it is expected that a climate change adjusted IDF curve will be used as a simulation input into the 1d hydraulic model to assess the impacts of climate change on regional assets and to ensure that identified solutions are tested with the same approach. The climate change adjusted IDF curve will be created using the IDF CC tool or similar (https://www.idf-cc-uwo.ca/). The Master Plan team would be pleased to discuss the approach to climate change further with CVC to ensure it is being addressed appropriately.
Toronto and Region Conservation Authority	How can a percentage can be calculated for a continuous network? For example, how a "Percentage that incorporates Green Infrastructure" would be calculated for a stormwater servicing network.	It would be a percentage by length, Green infrastructure can be associated with a certain impact length. An illustrative example provided on the below. 
	How about overall stormwater management at the region-wide level? perhaps one indicator could look at distribution of assets along the treatment train: on-site, conveyance, and end-of-pipe?	The performance measures are set up to be viewed at any level of granularity.

Stakeholder	Question/Comment	Response
	Service Attribute Statement: Stormwater network is maintained in a state of good repair. - Are there data sources that can provide information on which assets frequently near or exceed their design capacity, number of service disruptions, or time to recovery? These are important indicators from a reliability and resilience standpoint.	The design capacity and time to recovery are addressed in the accessible, safe and Environmentally Sustainable indicators. Agreed, number/frequency of service disruptions is a useful indicator for reliability. It applies more to the structures where operations may have to take assets out of service to perform planned/unplanned maintenance. An advanced indicator would be "Percentage of assets that have annual service interruptions below objective." The objectives may differ between asset type and would require further discussions and analysis on maintenance activities.
	Technical Indicator: Percentage with sufficient capacity to convey flows of a 10-year storm event. - Will other storm events be included or just the 10-year storm event?	For this indicator just the 10-year because that is the Regions design criteria. Other storms are applied for different performance indicators such as to assess the impact of climate change.
	Technical Indicator: Percentage with sufficient capacity to accommodate major storm events. - Consider defining which major storm events will be analyzed	Changed indicator to "Percentage with sufficient capacity to accommodate major storm events.
	Technical Indicator: Percentage with insufficient capacity to convey flows of a 10-year storm event that considers the impact of climate change. - Suggest "sufficient" for consistency; all other performance indicators represent ideal/desired performance	Agreed, changed to sufficient.
	Technical Indicator: Percentage with insufficient capacity to convey flows of a 100-year wet weather event that considers the impact of climate change. - Same as above, suggest "sufficient"	Agreed, changed to sufficient.

Stakeholder	Question/Comment	Response
	Technical Indicator: Percentage that experiences X or less annual complaint calls related to stormwater flooding damages or safety concerns. - Would complaint calls be focused at the site-level or consider downstream impacts?	It may require both, the Region would have to identify the cause of the complaint and tie it to the appropriate asset.
	Technical Indicator: Percentage that meet water volume objectives. - Consider runoff reduction targets**.**	Noted, included as part of the data sources.
	Technical Indicator: Percentage where a Low Impact Design and Green Infrastructure improves the aesthetics for the roadway. - Aesthetic is subjective, especially through a desktop review - what are the evaluation criteria? Perhaps replace this indicator with community satisfaction? Thermal comfort would also be a good indicator if there's capacity to measure this**.**	It is subjective but it can be quantified from the reasoning for including the feature in past/future capital projects. LIDs and Green infrastructure provide multiple benefits, including beautifying the ROW. The desktop review could assign aesthetic scores to portions of the network where these assets are present. Community satisfaction is important and should be monitored as well. Thermal comfort is an interesting indicator but may be too advanced right now.
Peel Transportation, Public Works	**Assets (Stormwater Sewers) for Technical Indicator: Percentage that are under the maximum allowable defect score determined through condition assessment.** - Does this include manholes and catch basins.	The PACP condition assessments do not include manholes or catch basins. However, they are typically renewed with the mainline. The manholes and catch basins can be separated out if there is performance data to support them or if money is being spent solely on them (i.e. work order to repair, etc.). They can be included in "Percentage that have not exceeded their estimated service lives."
	Technical Indicator: Percentage that are under the maximum allowable defect score determined through condition assessment. - Change to "Percentage of storm sewer network that is under the maximum allowable defect score determined through condition assessment."	Agreed, changed

Stakeholder	Question/Comment	Response
	Technical Indicator: Percentage that have a condition rating of C (Fair) or better. - Change to "Percentage of stormwater pumping stations that have a condition rating of C (Fair) or better."	Agreed, changed to "Percentage of stormwater pumping station equipment that have a condition rating of C (Fair) or better."
	Assets (Stormwater Structures (i.e. OGS, LIDS, Pumping Stations - building components)) for Technical Indicator: Percentage that have not exceeded their estimated service lives. - Recommend a comprehensive list. Does this include storm sewers, culverts, manholes, catch basins?	It includes all assets that do not have assessed performance data available. Age/ESL is used as the bare minimum to estimate performance. This metric would not include storm sewers because they have condition assessments. Culverts would be candidates, but installation year or year of last major renewal would be required. As stated above, manholes and catch basins can be included here or their performance can be assumed to be proportional to the mainline.
	Technical Indicator: Percentage that have not exceeded their estimated service lives. - Change to "Percentage of stormwater network that has not exceeded their estimated service lives. (number/length)"	Agreed, changed to "Percentage of Stormwater Structures that has not exceeded their estimated service lives." We would typically weight the percentages by replacement cost or impacted customer instead of number/length. Added comments in the data source.
	Technical Indicator: Percentage of assets that are maintained to design specifications/meet cleaning requirements/CA standards. - Change to "Percentage of catchment area that is inspected and maintained to meet requirements outlined in Stormwater Operations and Maintenance Manual." Is this taken annually at the end of the calendar year? Or is this at any given time? Should this be 100%? Should include all catchments with or without stormwater management facilities	The original metric would be the proportion of those assets that have met their maintenance specifications annually. If an asset has a 3 year maintenance cycle, it would still meet the maintenance spec in year 2 if it work was performed in year 1. The same could apply to the changed wording if there are inspection/maintenance frequencies outlined in the Operations and Maintenance Manual. We would still report on the annual status and yes ideally it should be 100%.

Stakeholder	Question/Comment	Response
	New Technical Indicator: Percentage of storm sewer network flushed annually.	Does this contribute to performance? Will more flushing improve the reliability of the storm sewers? Flushing is a reactive maintenance activity to remove blockages and sediment. Would it be more useful to track the sewers with frequent blockages? Therefore, intervention may be required because it is costing too much to maintain the sewer. Metric could be percentage of storm sewers on frequent flushing list. (then define frequent flushing and create the list). Then you can see if the storm network is seeing more overall blockages annually.
	Technical Indicator: Percentage with sufficient capacity to convey flows of a 10-year storm event. - Change to "Percentage of catchment area with sufficient capacity to convey flows of a 10-year storm event."	Change to "Percentage of catchment area that meets the Minor System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual."
	Technical Indicator: Percentage with sufficient capacity to accommodate major storm events - Change to "Percentage of catchment area with sufficient capacity to convey flows of a 100-year storm event". Does sufficient capacity include allowing one lane of traffic in each direction or something equivalent?	Yes, sufficient capacity as defined as the allowable flow spread in the SW Criteria and Procedure Manual. Changed to "Percentage of catchment area that meets the Major System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual."
	Technical Indicator: Percentage that experiences X or less annual complaint calls related to stormwater flooding damages or safety concerns. - Change to "Percentage of catchment area that experiences X or less annual complaint calls related to stormwater flooding damages or safety concerns."	Agreed, changed

Stakeholder	Question/Comment	Response
	Technical Indicator: Percentage with sufficient capacity to convey flows of a 10-year storm event that considers the impact of climate change. - Change to "Percentage of catchment area with sufficient capacity to convey flows of a 10-year storm event that considers the impact of climate change."	Changed to "Percentage of catchment area that meets the Minor System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual with a simulated climate change storm event applied to the hydraulic model."
	Technical Indicator: Percentage with sufficient capacity to convey flows of a 100-year wet weather event that considers the impact of climate change. - Change to "Percentage of catchment area with sufficient capacity to convey flows of a 100-year storm event that considers the impact of climate change."	Changed to "Percentage of catchment area that meets the Major System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual with a simulated climate change storm event applied to the hydrologic model."
	Technical Indicator: Percentage that meet water quality objectives. - Change to "Percentage of catchment area that meets water quality objectives." Will water quality/flood control/volume reduction objectives be prepared for each sewer shed?	Agreed, changed. Water quality objective s will not be determined as part of this project.
	Technical Indicator: Percentage that meet flood control objectives. - Change to "Percentage of catchment area that meets flood control objectives."	Agreed, changed
	Technical Indicator: Percentage with flow control devices. - remove, duplication of previous indicator	Agreed, removed
	New Technical Indicator: "Percentage of catchment area that meets erosion control objectives"	Agreed, added
	Technical Indicator: Percentage that meet water volume objectives. - Change to "Percentage of catchment area that meets water balance objectives."	Agreed, changed

Stakeholder	Question/Comment	Response
	Technical Indicator: Percentage with flow control devices. - remove, duplication of water quality indicator	Agreed, removed
	Technical Indicator: Percentage that incorporates Green Infrastructure. - Change to "Percentage of catchment area that incorporates vegetation with stormwater treatment."	Agreed, changed
	Technical Indicator: Percentage where a Low Impact Design and Green Infrastructure improves the aesthetics for the roadway. - Change to "Percentage of catchment area where stormwater Infrastructure improves the aesthetics of the roadway."	Agreed, changed
Peel Road Operations and Maintenance	No comments	Acknowledged

Stakeholder	Question/Comment	Response
	LOS Service Statement (LOS Framework Table (xls) – Row 4). The current statement has been modified with suggested ~~deletions~~ and additions below. "Provide ~~efficient~~ safe reliable stormwater servicing for existing and future regional road infrastructure, Region of Peel properties and private property which abut and drain to Region of Peel stormwater infrastructure by taking ~~into account~~ an adaptive management approach that optimizes the use of existing ageing infrastructure, the demands of growth, preservation and enhancement of the natural environment, adapting to climate change and compliance with~~in~~ the regulatory framework."	
Peel OCCEM	Rationale: 1. Suggest striking the term 'efficient' and replacing it with "safe reliable" to be consistent with language used in the 2019 Enterprise Asset Management Plan and primary objective of stormwater servicing. 2. Currently the LOS service statement only references regional roads, whereas there are several other sources of stormwater runoff entering the network. Suggest that these additional sources are recognized by adding "Region of Peel properties and private property which abut and drain to Region of Peel stormwater infrastructure" to acknowledge other sources of stormwater runoff entering the regions stormwater management infrastructure. This is in keeping with Section 1.1 of the Region of Peel's Public Works Stormwater Design Criteria and Procedural	Agreed, changed

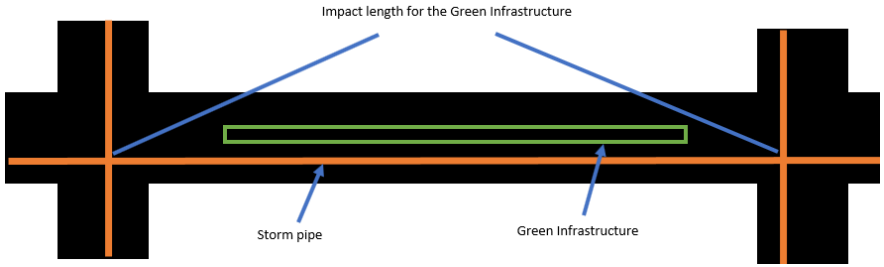
Stakeholder	Question/Comment	Response
	Manual (Version 2.1) which recognizes these additional sources of stormwater runoff into the network. 3. Suggest replacing “taking into account” with “adaptive management approach that optimizes” as this is a more action-oriented way of framing the stormwater management LOS.	

Stakeholder	Question/Comment	Response
	Service Attributes ('Environmentally Sustainable' Attribute LOS Framework Table (xls) – Rows 15-22). The current statement has been modified with suggested ~~deletions~~ and additions below. "Stormwater network is designed and operated to ~~mitigate the negative impact~~ positively contribute to a vibrant urban environment ~~on the environment and effects of climate change.~~" Rationale: 1. Suggest strengthening the language from 'mitigate negative impact' to making a positive contribution to the environment (whilst acknowledging that the environment exists within an urban context). Another alternative is to "preserve and enhance the natural environment." At minimum, I suggest that the LOS should aim for no negative impact to the environment. 2. Suggest removing 'effects of climate change' from this service attribute and moving this to its own dedicated service attribute, as this service attribute can then focus on the delivery of current stormwater management criteria.	Agreed, changed

Stakeholder	Question/Comment	Response
	Service Attributes (New Service Attribute 'Adapting to Climate Change') "Stormwater network is designed and operated to reduce the vulnerability of systems to the impacts of climate change" Sample performance indicators: • Infrastructure upgraded to better adapt to changes associated with climate change • Number of infrastructure/systems classified as highly vulnerable to climate change • % of storm network sized to account for increased flows associated with climate change Rationale: This service attribute can track the risk of the stormwater network's risk/vulnerability to climate change and efforts being made to address these issues.	Agreed to make new attribute, included "Number of infrastructure/systems classified as highly vulnerable to climate change" and moved "Percentage of catchment area that meets the Minor and Major System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual with a simulated climate change storm event applied to the hydraulic model." from Environmentally Sustainable. The metrics "Infrastructure upgraded to better adapt to changes associated with climate change" and "% of storm network sized to account for increased flows associated with climate change" are similar. The first one is an action rather than a performance (i.e. as you upgrade one would assume performance increases, but we want to measure the actual performance to determine that to be the case). the second one would be cover under the metrics "Percentage of catchment area that meets the Minor and Major System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual with a simulated climate change storm event applied to the hydraulic model."

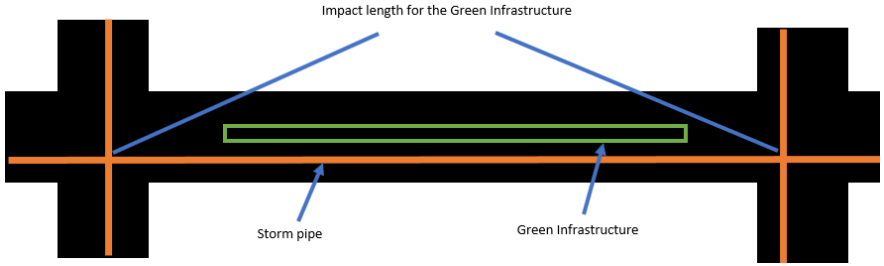
Stakeholder	Question/Comment	Response
	Service Attributes (New Service Attribute 'Equity') Suggest the creation of a new service attribute: Equity "Apply an equity lens to the management of the storm network" Sample performance indicators: • Number of vulnerable people/households better protected from flooding Rationale: Vulnerable populations are more strongly affected by climate events and take longer to recover from extreme weather events. The Stormwater Management LOS should help address these exposures through a climate equity lens.	All properties should be protected from flooding. The vulnerable populations would have a higher criticality and therefore may get priority in decision making, but the levels of service objectives are the same across the network. Did not include for now.
	General (Service attribute statements) The service attribute statements refer to 'design' and 'operation' and 'maintenance' but they do not reference rehabilitation and replacement. Should rehabilitation and replacement be incorporated into the LOS attribute statements and be more explicitly discussed in the context of stormwater management LOS?	Agreed, the 2019 AMP statements were used. Changed wording to "managed" instead of "designed and operated".
Peel Transportation, Public Works	**Level of Service Statement** - How can this be measured?	It is a statements or qualitative descriptions of services levels that describe the main vision or objective of service provision and align to the strategic goals and vision of the City. The metric are the means of measuring whether the statement is being achieved.
	Performance indicator column - add another column to break assets out	Assets were already broken out in column K.

Stakeholder	Question/Comment	Response
	Technical Indicator: "Percentage of storm sewer network that is under the maximum allowable defect score determined through condition assessment." - How are we able to measure this - what is the ? possibly use; asset system capable to perform to design specifications/criteria?	The response from the workshop was that the stormwater mains were following the same criteria as the wastewater methodology. This methodology goes beyond the maximum PACP score of 1-5. The quick score is used instead and converted into a defect score. The defect score is used because a pipe with several grade 3 defects may be in worse shape than a pipe with only 1 grade 4/5 defect.
	Technical Indicator: "Percentage that have a condition rating of C (Fair) or better." Shouldn't we want to maintain the equipment at a condition rating of B (Good) or better? If the pumps fail, there will be flooding in Malton. What about Pump Capacity? What is the design rating? Shouldn't we strive for a condition rating of B (good) as these assets are located in high volutem areas - should be kept aesthetically pleasing?	Rating C (Fair) was set in the workshop. The Region can discuss internally what the target rating should be. The impacts of pump capacity are covered in the metric "Percentage of catchment area that meets the Minor System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual."
	Technical Indicator: "Percentage that have not exceeded their estimated service lives." Asset: Stormwater Structures (i.e. OGS, LIDS, Pumping Stations - building components) - building components should be separated	The assets were grouped based on how they are measured as opposed to similarity between each other.
	Technical Indicator: "Percentage that have not exceeded their estimated service lives." how do we measure this? We would need to determine estimate life expectancy	You have answered your own question.
	Technical Indicator: "Percentage with sufficient capacity to convey flows of a 100-year wet weather event that considers the impact of climate change." Assets: Major Stormwater System (Stormwater Network and roads) - two very different assets	That serve the same function in this context. Roads function as open channels for the flow of rainwater. The assets were grouped based on how they are measured as opposed to similarity between each other.

Stakeholder	Question/Comment	Response
	Technical Indicator: "Percentage with flow control devices where required and work properly if present." - how can we measure and track this value?	This metric was intended to track the percentage of the network that are failing flood control objectives and therefore require a flow control device. It was to answer, "do we have enough flow control devices"? It was intended to answer, "are the assets we have meeting our standards"? Both are trying to achieve flood control objective. The Region would need to review their stormwater network and assess the areas that are failing their flood control objectives and assess whether their existing assets are performing as designed.
	Technical Indicator: "Percentage where a Low Impact Design and Green Infrastructure improves the aesthetics for the roadway." - how can we measure this? what is the target?	It would be a percentage by length, Green infrastructure can be associated with a certain impact length. An illustrative example provided on the below. 
	How does this storm LOS framework align with WW's?	The LOS follow similar frameworks, and both include the need to address the respective LOS from OREG 588/17. Staff from wastewater planning attended the workshops to ensure alignment.
	MHs, CBs or CB leads are not mentioned specifically in the LOS framework.	Their performance is assumed to be that of the main. The Region can break out these assets if there are efforts to implement inspection programs specific to these assets or if future work would be planned to renew these assets even if the main is left alone.

Stakeholder	Question/Comment	Response
	Who will provide guidance as to what some of these targets should be? For example, % where a LID design and green infrastructure improves the aesthetics for the roadway?	Staff's knowledge, discussions with council and/or public engagement. It is recommended that the Region tracks annual values for a couple years before committing to a target.
	It wasn't mentioned in the LOS reports, but were the ECA conditions and metrics reviewed? If so, are those reflected in the LOS framework?	Yes, Regional staff brought forward ECA metrics that should be included in the framework.
	Row 7 headings: could a brief comment be added to explain each heading title?	Section 3.2.1 and 3.2.2 describe these headings in further detail.
	Cell E7: how was 25 years determined for future planned expenditures?	Not determined yet. This would be the cost to achieve the target.
	Cell F7: what does "confidence" mean?	Data and assumptions used to measure performance
	Cells H7 and I7: are these numbers coming from CAM?	Not necessarily. Further analysis would have to be completed for each metric to understand the target's cost impacts.
	Cell L8: does not specify max allowable defect score… didn't we decide on 3? I think this is what WW has also.	The response from the workshop was that the stormwater mains were following the same criteria as the wastewater methodology. This methodology goes beyond the maximum PACP score of 1-5. The quick score is used instead and converted into a defect score. The defect score is used because a pipe with several grade 3 defects may be in worse shape than a pipe with only 1 grade 4/5 defect.
	Cells K10 and K11: LID and OGS show up in both cells, are these referring to the same assets?	Yes, they have two metrics to measure their reliability.
	Cell K11: green infrastructure is mentioned here which is a major asset class on its own. Should it be removed from the storm LOS framework?	LOS Framework is an asset-centric service approach. Green Infrastructure plays a role in the stormwater service. It can still be included in other LOS Frameworks. We would still want to capture how it relates to stormwater within this framework.

Stakeholder	Question/Comment	Response
	Cell K16: has roads included as part of the major stormwater system. How is the conveyance provided by the road itself calculated in this case against a 100-year storm?	Ideally this would be through a 2D Hydrologic model. Other assumptions and desktop analysis could be used. For example, stormwater vulnerability maps were produced as part of a separate study. Information from these maps could be used to come to a performance score.
	Cell L10: Is service life a placeholder until we have a good inspection program in place? Ideally, we are tracking condition data rather than service life expectancy.	Precisely.
	Cell B13: what does “all weather conditions” mean? 100-year storm?	This statement was taken from the 2019 Enterprise AMP. It can be revised to reflect the Region's design guidelines.
	Cell L14: can you clarify what this mean? This one will be tricky to define. We may want to simplify or remove if we are already tracking how resilient our system is against 10- and 100-year storms	The Region would have to identify the cause of the complaint and tie it to the appropriate asset. In the case of an upstream issue no Regional pipe should get the complaint associated with it. Agreed, this metric is only useful if customer complaints were to impact capital planning decisions.
	Cells L15 and L12: they both reference a 10-year storm with L15 citing Climate Change as an addition. What does Climate Change add on?	An increased rainfall event is applied to the model to imitate the impact of potential future storms.
	Cells L19 and L21: do we have enough information to figure out where we need flow control devices or water but don’t have them?	This may be a future metric to track.
	Cell L22: how would this be calculated?	Change to "Percentage of catchment area that incorporates vegetation with stormwater treatment."

Stakeholder	Question/Comment	Response
	Cell L23: “improving aesthetics for the roadway” could be very subjective. How would calculate this metric?	Agreed that it would be subjective. However, this would specific to stormwater. It be quantified by a percentage by length, Green infrastructure can be associated with a certain impact length. An illustrative example provided on the below. 
	Comments/additions to performance indicators measures, below: • % sewer shed/ drainage area that has water quality control • % sewer shed/ drainage area that has water quantity control • % sewer shed/ drainage area that has erosion controls • % sewer shed/ drainage area that has water balance control	Changed to: • Percentage of drainage area that meets water quality objectives. • Percentage of drainage area that meets flood control objectives. • Percentage of drainage area that meets erosion control objectives • Percentage of drainage area that meets water balance objectives. This way it captures the areas that don't have solutions and are not problems.

Appendix D: Stormwater Levels of Service Framework

Asset Levels of Service Framework
DRAFT

Service Category: Stormwater
Level of Service Statement: **Provide safe reliable stormwater servicing for existing and future regional road infrastructure, Region of Peel properties and private property which abut and drain to Region of Peel stormwater infrastructure by an adaptive management approach that optimizes the use of existing ageing infrastructure, the demands of growth, preservation and enhancement of the natural environment, adapting to climate change and compliance with the regulatory framework.**

Service Attribute	Service Attribute Statement	Community Performance Measures								Technical Performance Indicators			
		Current Performance	Planned Annual Expenditures ($M)	25-Year Forecast with Planned Expenditures	Confidence	Comment	Annual Expenditures to Achieve Proposed Performance ($M)	25-Year Forecast with Proposed Expenditures	Comment	Assets	Performance Indicator	2020 Value	Data Source
Reliable	Stormwater network is managed in a state of good repair.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Stormwater Sewers	Percentage of storm sewer network that is under the maximum allowable defect score determined through condition assessment.	TBD	PACP Condition Assessment data. Weighted by replacement value
										Stormwater Pumping Stations (equipment)	Percentage of Stormwater Pumping Stations (equipment) that have a condition rating of C (Fair) or better.	TBD	Desktop Exercise which is in an Excel Spreadsheet during Validation Workshop. Weighted by replacement value
										Stormwater Structures (i.e. OGS, LIDS, Pumping Stations - building components)	Percentage of Stormwater Structure that have not exceeded their estimated service lives.	TBD	Desktop review of stormwater GIS data. Weighted by replacement value
										Stormwater Management Ponds, LID, Green Infrastructure, OGS and Ditches	Percentage of assets that are maintained to design specifications/meet cleaning requirements/CA standards.	TBD	Hansen Work Order Data (being implemented now, Ponds will have a depth to monitor against)
Accessible	Stormwater network is managed to allow roads to be accessible year round for 10-year rainfall events	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Stormwater Network	Percentage of catchment area that meets the Minor System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual.	TBD	Hydraulic model
Safe	Stormwater network is managed to allow roads to be safe and capable of facilitating emergency vehicles year round during all weather conditions.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Major Stormwater System (Stormwater Network and roads)	Percentage of catchment area that meets the Major System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual.	TBD	2D Hydrologic Model (out of project scope), vulnerability maps
										Stormwater Network	Percentage of catchment area that experiences X or less annual complaint calls related to stormwater flooding damages or safety concerns.	TBD	Procedures outlined in the Operations Manual for receiving, responding and recording public complaints, including recording any follow-up actions taken.
Environmentally Sustainable	Stormwater network is managed to positively contribute to a vibrant urban environment.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Outfalls and Stormwater Management Ponds	Percentage of drainage area that meets water quality objectives.	TBD	Hansen Work Order Data, Conservation Authority and Staff Knowledge. (Must meet all temperature, TSS and other objectives specific to each asset)
										Outfalls and Stormwater Management Ponds	Percentage of drainage area that meets flood control objectives.	TBD	Hansen Work Order Data, Conservation Authority and Staff Knowledge. (Must meet all flood control objectives specific to each asset)
										Stormwater Network	Percentage of drainage area that meets erosion control objectives	TBD	Stormwater reports
										Stormwater Network	Percentage of drainage area that meets water balance objectives.	TBD	Stormwater reports
										Stormwater Network	Percentage of drainage area that incorporates vegetation with stormwater treatment.	TBD	Desktop review of stormwater GIS data
Adaptable to Climate Change	Stormwater network is managed to reduce the vulnerability of systems to the impacts of climate change	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Stormwater Network	Percentage of assets classified as highly vulnerable to climate change	TBD	Desktop review
										Stormwater Network	Percentage of catchment area that meets the Minor System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual with a simulated climate change storm event applied to the hydraulic model.	TBD	Hydraulic model, Future IDF Data Analysis
										Major Stormwater System (Stormwater Network and roads)	Percentage of catchment area that meets the Major System's allowable flow spread as outlined in the Stormwater Criteria and Procedure Manual with a simulated climate change storm event applied to the hydrologic model.	TBD	2D Hydrologic model (out of project scope), vulnerability maps
Aesthetic	Stormwater network is managed to address social and aesthetic considerations for roadways.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Stormwater Network	Percentage of catchment area where stormwater infrastructure improves the aesthetics of the roadway.	TBD	Desktop review of stormwater GIS data