APPENDIX I

Level of Service Condition Criteria

Memo

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Subject: Wellington RMAP – Level of Service Condition Criteria (Phase 6)

Our File: 20-3297

1.0 Introduction and Background

As asset management practices advance in Ontario (in alignment with O.Reg. 588/17), level of service (LOS) is more broadly defined to include the user experience, the design capability of the network to perform its function and the current performance of the road assets.

The purpose of this memo is to review the Level of Service (LOS) condition criteria used in the 2013 County of Wellington Asset Management Plan (2013 AMP) and recommend updates that reflect current performance and proposed LOS targets that align with the new asset management regulation (O.Reg. 588/17). These updates should be applied to both existing and recommended roadway expansions identified in the Road Master Action Plan (RMAP).

Background

In 1999 the Province downloaded over 100 km of road to the County, all of which is approaching the end of its 20 year lifecycle. The County needs to review the current Level of Service condition criteria to determine if it reflects the current targets for performance, and whether the implementation of the asset strategy from the 2013 plan is meeting the desired LOS targets. Any gap between current and target will need to be addressed with consideration of financial capabilities to achieve the proposed LOS.

The establishment of a LOS Condition Criteria aligns with the vision of the RMAP:

"To connect people and goods across the County safely, conveniently, efficiently and sustainably."

Eight corresponding goals are identified to achieve the transportation vision for the County. Two of the eight goals identify the importance and relevance of establishing a Level of Service condition criteria: Goal #6 and Goal #7.

Goal #6: Be Fiscally-Responsible When Making Investment Decisions

Goal #6: *The decision to maintain or expand the County's transportation network will be fiscally-responsible, and consider funding opportunities, lifecycle costing and ability to cost-effectively achieve strategic priorities when prioritizing transportation investments*

The LOS condition criteria will help achieve this goal by defining current and target LOS related to condition. Then conducting a gap analysis between the target LOS condition criteria and the current condition of the each road segment in the network. This information will help to prioritize and schedule roads for condition improvement which can be utilized in the decision-making process to maintain or expand the network.

Goal #7: Develop Transparent Policy Tools that Guide Investment Decisions in the Transportation Network

Goal #7: *The County will develop open and transparent policy tools and frameworks to guide decision-making to address immediate operational concerns and long-term investment needs of the County's transportation network. These will improve accountability of decisions and priorities made.*

Including LOS condition criteria, as part of the framework to guide decision-making, will broaden the understanding of the required investments in the road network to include maintaining the LOS and consideration of the full lifecycle of roads. There is an impact on both the operating and capital budgets and the implementation of asset management strategies to include full lifecycle of the road infrastructure.

2.0 Review of Current Level of Service and Best Practices

The review of current LOS condition criteria at the County considered the following:

- How road condition was reported in the County's 2013 AMP;
- What new condition information and strategies since the 2013 AMP; and
- What guidance is provided in the County's Strategic Asset Management Policy.

The review of best practices for LOS condition criteria include:

- How pavement condition informs level of service;
- What is required by O.Reg. 588/17 for road LOS; and
- Review of similar communities on how they report on road condition LOS.

Highlights from this review are presented below for each of these topics.

2.1 Current LOS at the County

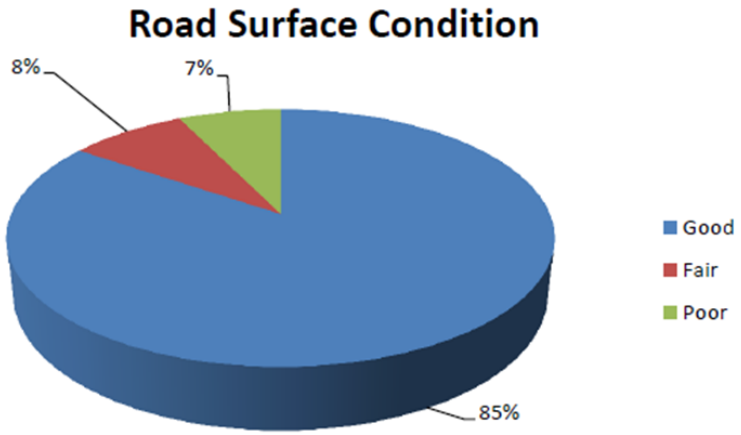
County's 2013 Asset Management Plan

The condition assessment of roads in the County's 2013 Asset Management Plan (AMP) was organized into three rating categories: good, fair and poor.

The plan reported that 85% of the road surface condition was good (greater than 75 PCI), 8% was fair (70 to 75 PCI and requiring capital investment within 5 years), and 7% was poor (less than 70 PCI and needing immediate attention). This is illustrated in **Figure 1**.

The 2013 AMP identified that a PCI of 70 or greater would be suitable, although it was noted in the report that the LOS condition target was not yet adopted by Council.

The asset management strategy is to maintain a PCI of 75 or higher with appropriate maintenance of a road surface until the last five years of the road's lifecycle, at which time the surface would be identified for rehabilitation or renewal within the five-year capital budget.



Condition Assessment	PCI
Good – regular maintenance, no major capital requirements	>75
Fair – capital requirements within 5 years	70-75
Poor – Immediate attention	<70

Figure 1: 2013 Road Surface Condition (excerpt from 2013 AMP)

Since the 2013 AMP

The 2018 condition assessment for roads was reviewed. The assessment uses a four-point scale. The County is moving to a five-point scale in the 2021 AMP, which aligns with the Canadian Infrastructure Report Card and other best practices. The 2021 AMP states the current level of service.

The establishment of target level of service will be set in the future based on recommendations from Roads staff that will be proposed for Council approval. Proposed levels of service will be modelled in CityWide to help staff understand the financial impacts. The requirement in include proposed level of service in the AMP, under O.Reg. 588/17, is July 2025.

In 2021, the County is updating the road needs study with current road surface condition information, and there is a plan to update this on a three-year cycle. It was also noted that the current asset management strategy has a greater focus on more preservation of road surfaces with surface treatment.

Strategic Asset Management Policy (TR-19-05)

The County's Strategic Asset Management Policy (TR-19-05) was adopted in 2019 as required by O.Reg. 588/17. The following are highlights from the policy that specifically references levels of service or transportation:

- Asset management is an integrated approach, involving all County departments, to realize value through the effective management of existing and new assets. The intent is to maximize benefits, reduce risk and **provide acceptable levels of service** to the community in a sustainable manner.
- **Transportation** is a service delivered to the community. The asset group is Transportation Infrastructure which include assets such as roads, bridges, culverts and guide rails.
- One of the key principles in the policy speaks to service delivery. See insert below.

> Service Delivery to Residents - The County will:
>
> - Clearly define **levels of service** that balance community expectations, regulatory requirements, risk, affordability and available resources.
> - Manage assets in order to efficiently and effectively deliver the agreed upon **levels of service**.
> - Continually monitor and review the agreed upon **levels of service** to ensure that they support community and council expectations and other strategic objectives.
> - Ensure transparency and accountability to the community on **service delivery**. This will include regular communications to council and shared information with the public on service performance.
> - Provide opportunities for public engagement where residents and other stakeholders served by the County can provide input into asset management planning through the existing Strategic and Master Planning processes.
> - Comply with all relevant legislation, regulatory and statutory requirements.

2.2 Best Practices for LOS

How Pavement Condition Informs LOS

The level of service of a road network is closely connected to the condition of the pavement. The worse the condition of the road, the lower the level of service. The condition of roads is measured by using the Pavement Condition Index (PCI) which takes into account the physical condition of the road (e.g. cracking, potholes) measured by a visual inspection. A new road is assigned a PCI of 100, and over time, as the road ages and through wear and tear, the PCI number drops to 0, which is the worst possible condition. See **Figure 2** which illustrates how the condition of the road deteriorates over time and the

lifecycle activities recommended: preventative maintenance; maintenance and rehabilitation; and reconstruction.

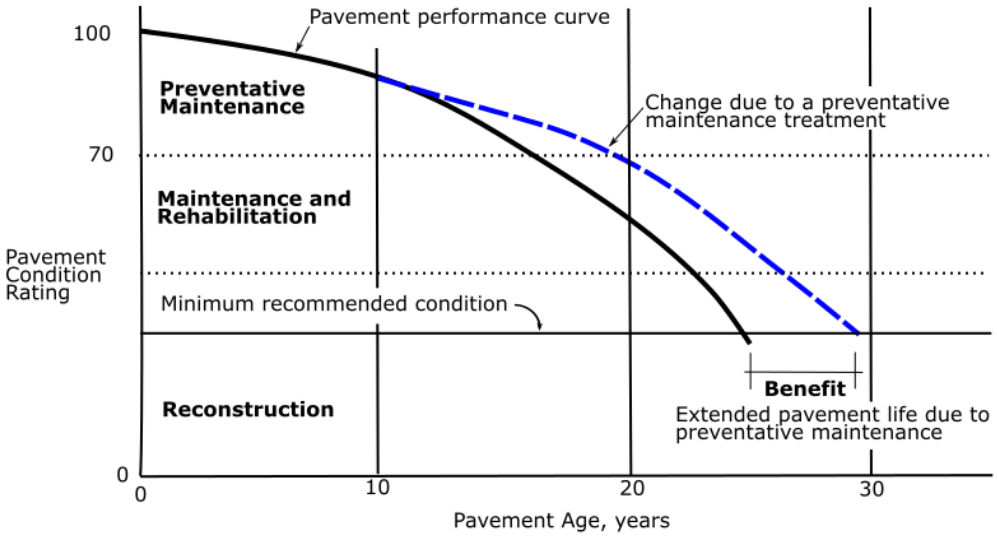


Figure 2: Pavement Condition and Lifecycle Activities

This is a common approach in asset management that reflects the decay of the asset over time. See **Table 1** with PCI ranges and associated condition descriptions (ASTM D6433-90). The last column in presents a recommended 5-point scale for asset management reporting, which aligns with the Canadian Infrastructure Report Card.

Table 1: Pavement Condition Index Description Groups (ASTM D6433-90)

Pavement Condition Index (PCI)	ASTM Condition Description	Recommended 5-point scale
100 to 86	Good	Very Good
85 to 71	Satisfactory	Good
70 to 56	Fair	Fair
55 to 41	Poor	Poor
40 to 26	Very Poor	Very Poor
25 to 11	Serious	Very Poor
10 to 0	Failed	Very Poor

According to Report SP-024 published in August 1989 by the Ministry of Transportation (Manual for condition rating of flexible pavements – Distress manifestations), there are eight categories for flexible pavement rating as presented in **Table 2**. Pavement Condition Rating (PCR) is an assessment of overall

pavement performance, both functionally and structurally. It is derived from serviceability based on evaluation of pavement riding comfort and of pavement surface distresses.

Table 2: Description of Pavement Condition Rating (MTO SP-024)

Pavement Condition Rating	Description of Pavement	Rideability Description
90 to 100	Excellent condition with few cracks	Excellent with few areas of slight distortion
75 to 90	Good condition with frequent very slight or slight cracking	Good with few slightly rough and uneven sections
65 to 75	Fairly good condition with slight cracking, slight or very slight dishing and a few areas of slight alligatoring	Fairly good with intermittent rough and uneven sections
50 to 65	Fair condition with intermittent moderate and frequent slight cracking, and with intermittent slight or moderate alligatoring and dishing	Fair and surface is slightly rough and uneven
40 to 50	Poor to fair condition with frequent moderate cracking and dishing, and intermittent moderate alligatoring	Poor to fair and surface is moderately rough and uneven
30 to 40	Poor to fair condition with frequent moderate alligatoring and extensive moderate cracking and dishing	Poor to fair and surface is moderately rough and uneven
20 to 30	Poor condition with moderate alligatoring and extensive severe cracking and dishing	Poor and the surface is very rough and uneven
0 to 20	Poor to very poor condition with extensive sever cracking, alligatoring and dishing	Poor and surface is very rough and uneven

The comparison of the condition rating categories is presented in **Figure 3**.

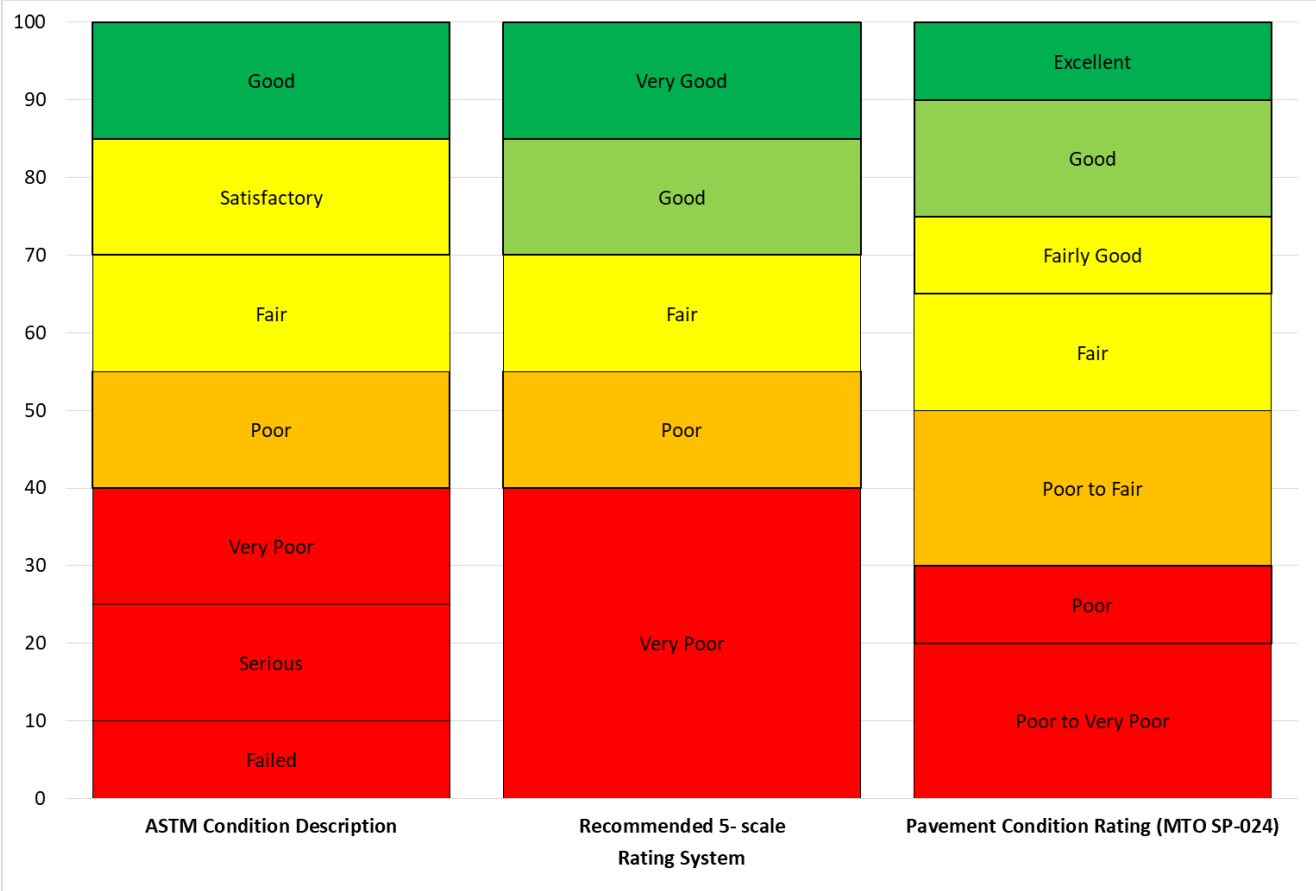


Figure 3: Comparison of the Condition Rating Categories

2.3 What is Required by O.Reg. 588/17

The new asset management regulation (O.Reg. 588/17 Asset Management Planning for Municipal Infrastructure) identifies levels of service as a requirement for reporting on the current service provided as well as the target level in the future. Levels of Service (LOS) description is required from the customer LOS as well as the technical LOS perspective, as well as the reporting on performance of the assets. This is illustrated in **Figure 4**.

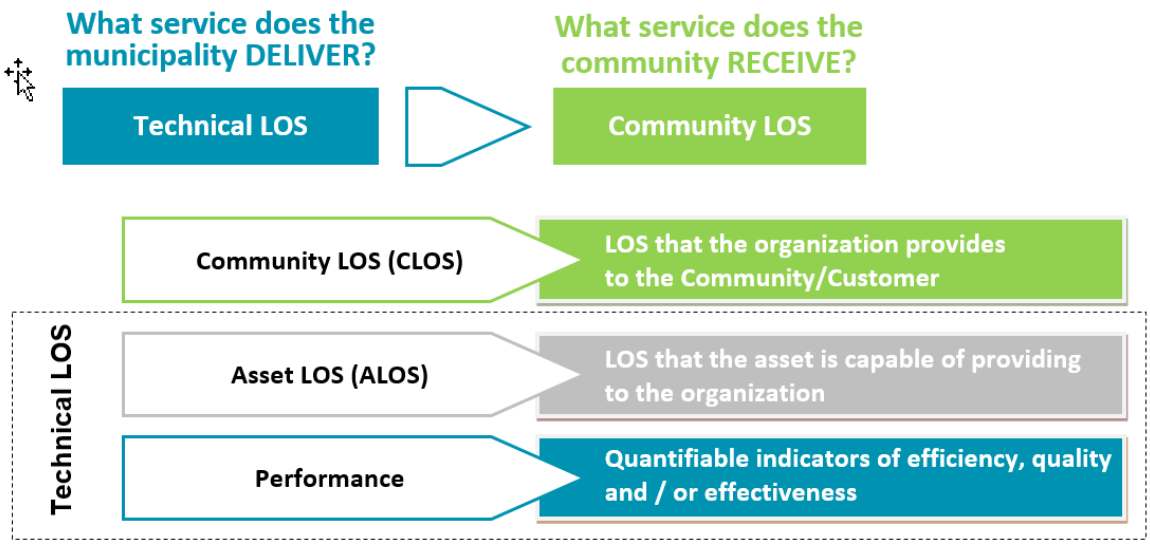


Figure 4: Levels of Service (O.Reg. 588/17 and Alignment with ISO55000)

The regulation is prescriptive on the minimum reporting on levels of service for core assets. For roads, the regulation identifies the reporting requirements stated in the regulations for scope and quality. **Table 3** illustrates highlights from the regulation.

Table 3: Levels of Service for Roads (excerpt from O.Reg. 588/17)

Service Attribute	Community Levels of Service (qualitative descriptions)	Technical Levels of Service (technical metrics)
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity.	Number of lane-kilometres of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the municipality.
Quality	Description or images that illustrate the different levels of road class pavement condition.	1. For paved roads in the municipality, the average pavement condition index value. 2. For unpaved roads in the municipality, the average surface condition (e.g. excellent, good, fair or poor).

2.4 Review of Similar Communities

How are similar communities addressing level of service for roads? With the implementation of the new regulation, and the extension to July 2022 to meet the requirements for core infrastructure, there was limited information available for review.

Information from three communities was available:

- City of Waterloo;
- United Counties of Leeds and Grenville (UCLG); and
- Town of Tecumseh.

These communities were chosen based on their similar geographic profiles (e.g. mix of rural and urban) or were located nearby, or both. Table 4 provides a comparison of the condition rating of the peer communities with the County.

Table 4: Comparison of Condition Ratings with Similar Communities

Condition Rating	Waterloo	UCLG	Tecumseh	Wellington[1]
1 – Very Good	81 to 100	90 to 100	90 to 100	-
2 – Good	61 to 80	80 to 90	75 to 90	**Greater than 75**
3 – Fair	41 to 60	60 to 80	65 to 75	**70 to 75**
4 – Poor	21 to 40	40 to 60	50 to 65	**Less than 70**
5 – Very Poor	0 to 20	0 to 40	Below 50	-

NOTE[1]: County of Wellington 2013 AMP used a three point condition rating system. In the 2018 pavement condition evaluation, a four point condition rating system was used. The current draft 2021 AMP uses a five point condition rating system. Local municipalities are proposing to use the same five point condition rating system

Highlight from the Town of Tecumseh

From the Road Needs Study 2019 for the Town of Tecumseh, their proposed 5-year maintenance/ rehabilitation program is based on the following:

- Reconstruction works for pavements with a PCI rating less than 45;
- Rehabilitation works such as resurfacing for pavements with ratings from 45 to 55; and
- Maintenance such as crack sealing for pavements with a PCI rating from 55 to 70.

The recommended maintenance program is projected to result in a weighted average PCI rating of 75 in 5 years, which is a slight decline from the current weighted average PCI rating of 77. The resulting level of service still exceeds the Town's objective of maintaining an average PCI of 70, as identified in the Town's Asset Management Plan.

Highlight from United Counties of Leeds and Grenville (UCLF)

In the 2018 AMP for UCLG, the average condition of the road network was reported to be 76 PCI, an overall Fair rating (Condition Category 3). In addition to the overall average condition, UCLG also assigned an importance level to each road and then reported on the condition of roads based on their importance score. The purpose for considering importance is to identify higher priorities for

improvement (i.e. higher importance = higher priority). See **Figure 5** for the condition of roads reported by length of road lanes and importance.

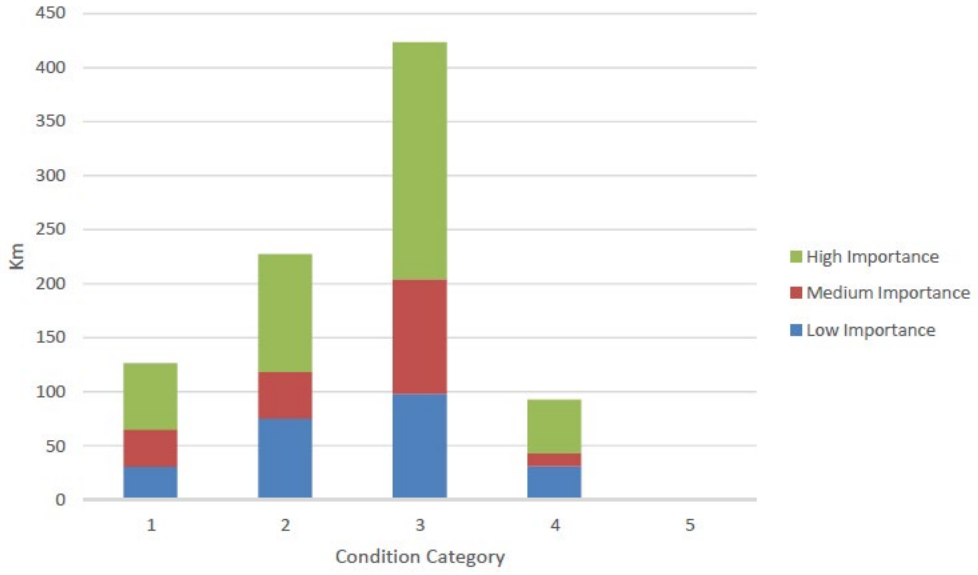


Figure 5: Condition of Roads (km and Importance) - United Counties of Leeds and Grenville

2.5 Conclusion

The review of best practices and levels of service identified opportunities to advance asset management principles and align future asset management plans with LOS condition requirements of O.Reg. 588/17.

There is limited information available from comparator municipalities on how condition LOS is being reported and what target LOS are being set. As municipalities in Ontario advance their asset management practices to align with O.Reg. 588/17, this information will become more readily available.

Further discussion and recommendations are presented in the next section.

3.0 Discussion and Recommendations

3.1 Consider Current Condition of Road in Modelling

Transportation assessment identifies problems in the network – capacity, safety, speed. The assessment assumes that the road condition is adequate to the role and function (i.e. planning level of service of 1,200 vehicles per lane assumes good pavement condition). Layering in information about the current condition of the road could provide a more realistic assessment of current operations. For example, if the current capacity problem is tied to poor road condition, then the priority is to improve the condition of the road to regain the capacity LOS of the road. Impacts on travel speed would show up when the PCI < 50 on a segment of road.

RECOMMENDATION-1: Any roads that currently have PCI < 50 should be assessed with a lower capacity in network modelling and identified as a constraint until the condition of the road is improved.

3.2 Condition Rating Categories

Condition rating categories provide a framework to report to Council and the public on the current condition of the road network. The selection of which PCI ratings constitute "very good" or "good", and what makes up "poor" and "very poor" is at the municipality's discretion. These "buckets" help to organize the network and to report, as well as to identify, the strategy for maintaining the assets going forward. Five condition categories align with the Canadian Infrastructure Report Card and have been adopted as a best practice in analysis and reporting. See **Table 5** for recommended condition descriptions that align with the ASTM categories and the MTO categories.

Table 5: Recommended Condition Categories

Pavement Condition Index (PCI)	Recommended 5-Point Scale
100 to 86	Very Good
85 to 71	Good
70 to 56	Fair
55 to 41	Poor
40 to 0	Very Poor

When looking at a short term horizon, five years out, the five point scale can help to prioritize road segments for condition improvement and how you can take care of some things projected to be poor to move up your average number. (Roads in poor condition now will degrade faster than roads in good condition.)

RECOMMENDATION-2: Expand number of condition categories (to 5) to assist in lifecycle planning and project prioritization.

NOTE: A five point scale is used in the current draft 2021 AMP. Other local municipalities are proposing to use the same five point scale.

3.3 Minimum LOS Reporting (O.Reg. 588/17)

The regulation requires reporting on the scope and quality of the road network for Level of Service. As presented in Table 3 in the earlier section, the technical LOS for quality is:

- Average pavement condition index value for the paved roads in the municipality.
- For unpaved roads, reporting is required for the average surface condition (e.g. excellent, good, fair or poor)

RECOMMENDATION-3: Meet the minimum LOS reporting requirements as required by O.Reg. 588/17 for scope and quality.

3.4 Importance of Roads within the Network

A more advanced approach is to identify categories of roads such as importance (or criticality factor) for roads and to report on the average within each category. For example, a municipality could identify roads with a higher volume to be of higher importance and establish a target LOS that is higher for those roads, than for roads that have less traffic. This is the "greater public benefit" approach. This could align (but not in all cases) with the class of road, where arterial roads would have higher traffic counts and rural and urban roads would be less.

The class of road could be divided into sub-categories with ranking of importance within each. For example, which roads (and routes) are most important to the community? In this example, roads near a hospital, near a school, emergency detour routes, etc. may be ranked higher. See example from UCLG in **Figure 5** (earlier section) which presents a breakdown of the length of pipe (km) by importance and condition. This helps with prioritization of roads for condition improvement.

RECOMMENDATION-4: Consider importance of roads within the network in prioritizing lifecycle activities. Report on the average condition of each category of importance, as well as the overall average of paved and unpaved as per Recommendation-1.

3.5 Traffic Usage of the Road

Other ways to measure the service level for a road network could be to consider the usage of the road such as:

- Speed (match higher speed with better condition);
- Higher volume (match higher Average Annual Daily Traffic (AADT) with better condition); and
- Traffic usage (e.g. agricultural or truck traffic).

With an understanding of current and projected traffic in the road network, road sections with high priority usage as noted above could be set with a better average condition of those sections of the network.

This alignment with usage and community experience delivers a higher level of service in areas of the network where the users will notice and appreciate the investment to maintain higher level of service (i.e. condition of the road).

Other usage such as heavy truck traffic cause greater wear and tear on the roads. Part of the lifecycle strategy could be to rebuild these high traffic areas with more robust roadways that can withstand and wear more "gracefully", providing a higher level of service with less additional maintenance on the roadway.

Specialty vehicles such as agricultural vehicles or cart and buggy can impact not only the main section of the roadway but also the shoulders of the roadway. Regular use of gravel shoulders by horse and buggy can cause rutting in the shoulders and loss of granulars.

Also, horseback riding or specialty vehicles such as ATVs or other off-road vehicles can cause specific wear on the shoulders and on the paved surfaces. Special considerations may be required to accommodate cycling traffic.

RECOMMENDATION-5: Consider traffic usage of the roadway in establishing the target LOS for each section of the network and incorporate traffic usage in the prioritization of lifecycle activities to meet the LOS.

3.6 Surface Type (Paved vs Gravel)

Another strategy employed by rural municipalities is to consider the lifecycle approach of roads and to develop a plan to prioritize the conversion of gravel to paved surfaces or paved surface to gravel (as an interim strategy until adequate funding can be secured for a road rebuild).

RECOMMENDATION-6: Consider the option of converting surface type for road sections to gravel for roads that are near the end of their useful life when the road has lower traffic usage, even as a temporary measure until funding can be secured for road rebuild.

3.7 Consider Climate Change Impacts on the Roads

Increasing summer temperatures due to climate change can increase the rutting in asphalt paved surfaces, as well as increased stormwater and flooding in the spring due to faster snow melts can play havoc with the road base, especially if another freeze thaw cycle follows the melt.

RECOMMENDATION-7: Consider climate change impacts on the road network, both in terms of short-term impacts on LOS (e.g. when flooding occurs) and long-term impacts on road condition LOS (e.g. increasing free thaw cycles).