



Pavement Quality Level of Service

Background Report

October 2024



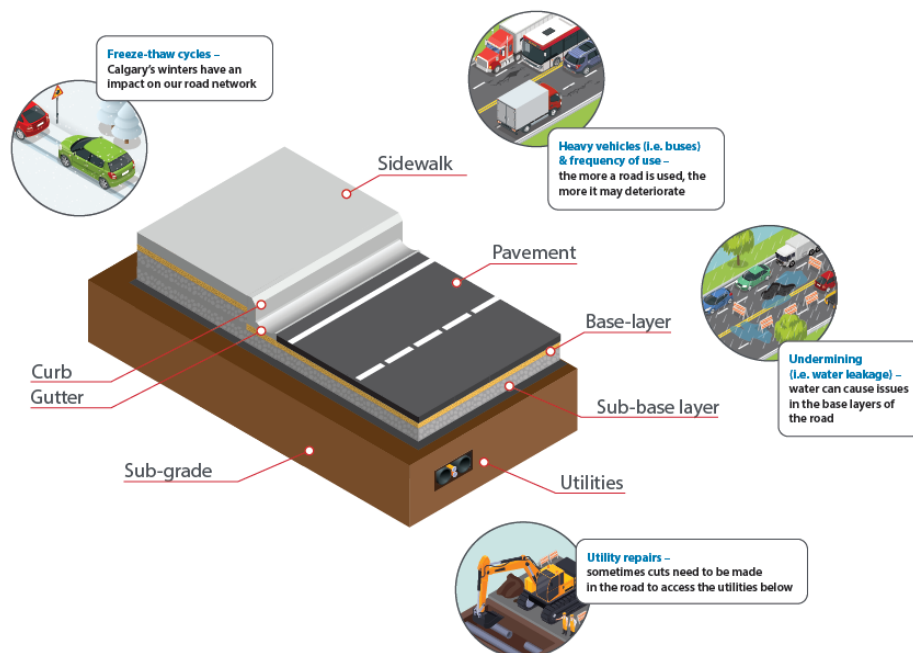
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Calgary Road Network

Calgary's road network spans approximately 17,000 lane kilometers, comprising of arterial, collector, and local roads. Arterial roads, including major routes such as Crowchild Trail and Glenmore Trail, represent about 31% of the network, or roughly 5,375 lane kilometers, with speed limits ranging from 70-90 km/hr and average daily traffic between 10,000 and 30,000 vehicles. Collector roads, which connect neighborhoods to arterial roads and have speed limits of 50-60 km/hr, constitute about 20% of the network, or approximately 3,382 lane kilometers, with daily traffic ranging from 1,000 to 10,000 vehicles. Local roads, which are neighborhood streets with speed limits of 40 km/hr, make up about 49% of the network, or around 8,326 lane kilometers, with average daily traffic of less than 1,000 vehicles.

Road Deterioration

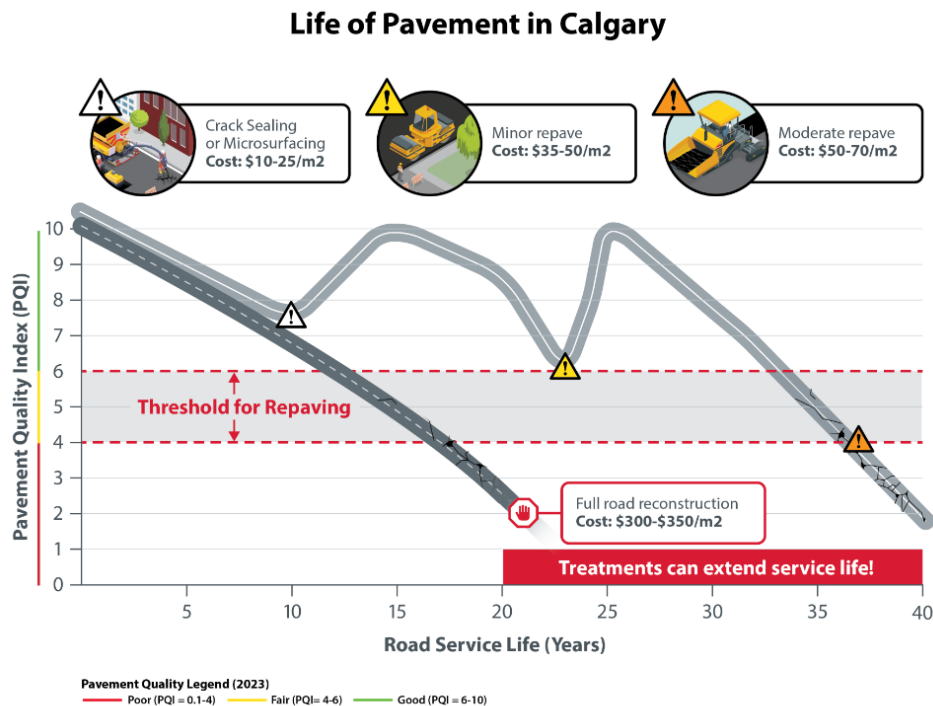


Several factors impact road deterioration. Wear and tear from increased traffic and heavier vehicles contribute to roadway degradation. Road quality is also impacted by the weakening of road base from water leaks and excavation of roads to facilitate both utility repairs and new utility construction.

Calgary's freeze-thaw cycles impact the service life of roads and contribute to the formation of potholes and pavement cracks. When comparing pothole data from January through September 2023 with the same period in 2024, there was an approximate 52 per cent increase in the number of reported potholes through 311. Crews have also filled approximately 25 per cent more potholes in 2024 over the same period (30,830 in 2024 through Oct 8. vs 24,628 during the same period in 2023). This increase in pothole 311 service requests and maintenance repair

work highlight how Calgary's road network conditions continue to deteriorate.

Road Repair Strategies



Implementing roadway repairs at the right time is the most cost-effective and efficient approach to maintain a resilient road network. This requires adequate funding levels to enable timely repairs and leads to long-term cost savings as repairs are not deferred.

Immediate repair of defects like potholes and cracks are proven cost-effective methods of maintaining road functionality and slowing deterioration.

As the pavement degrades, The City's surface overlay program (repaving) replaces the top layer of asphalt and can rejuvenate the road and extend its life.



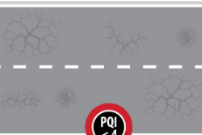
Severely deteriorated roads often require complete reconstruction to re-establish the structural integrity of base and subbase. Road reconstruction has a greater impact on roadway users as the scope is more complex, requires more traffic detours and costs five to seven times more than repaving.

Condition Assessment



Pavement Quality Index (PQI)

Measure of pavement performance that includes surface condition, pavement roughness & structural strength.

Good (PQI 6 – 10)	Fair (PQI 4 – 6)	Poor (PQI 0.1 – 4)
		
<p>PQI 10</p> <ul style="list-style-type: none">• smooth ride• few or no visible defects	<p>PQI 4-8</p> <ul style="list-style-type: none">• driving surface may be uneven in certain areas• some visible defects (rutting, potholes)	<p>PQI < 4</p> <ul style="list-style-type: none">• surface will be uneven for entire stretch of road• several visible defects

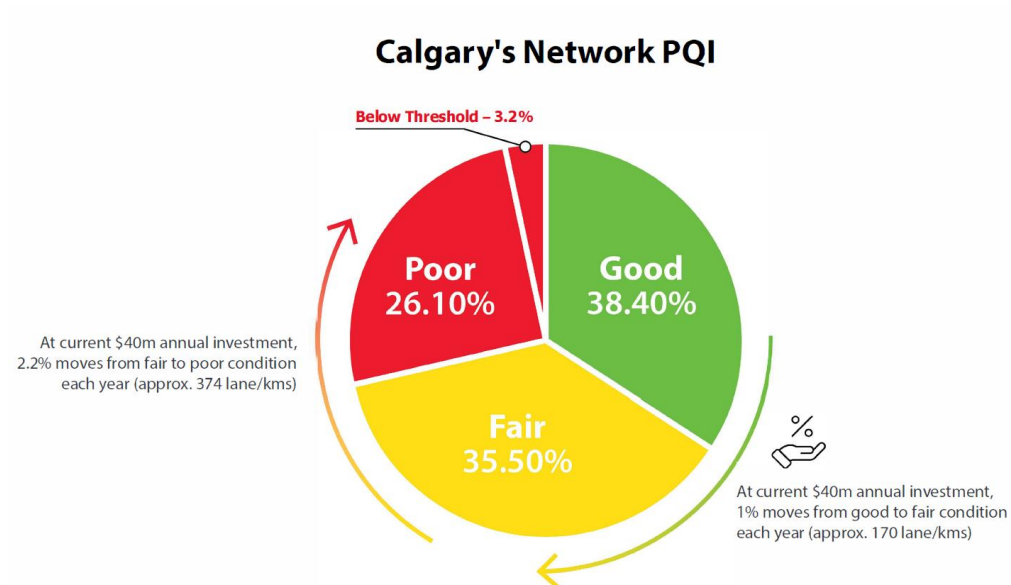
The City uses a multi-step process that aligns with industry best practices, to objectively evaluate the condition of Calgary’s road network and identify priorities for repair.

Arterial and collector roads are inspected bi-annually due to higher traffic volumes they carry. Local roads which are in neighbourhoods, are assessed every five years as they deteriorate at a slower rate.

Condition assessments involve capturing data on both the surface condition of the road, and the structure beneath the road. This data is analyzed and translated into a condition rating called a Pavement Quality Index (PQI).

Current Road Condition

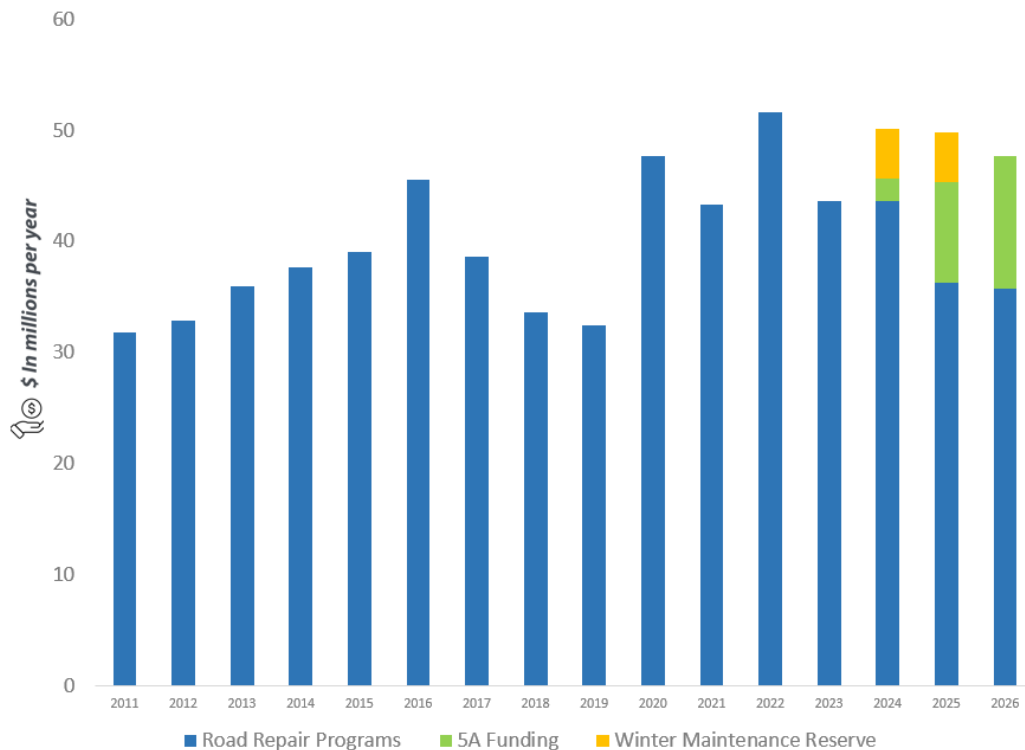
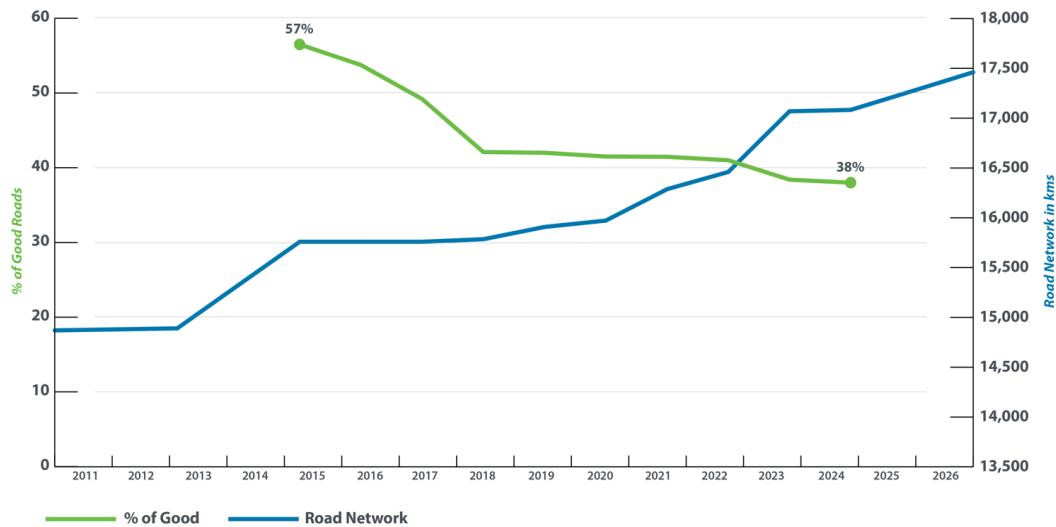
The current assessment of Calgary's road network indicates that 38 per cent is in good condition, 36 per cent is in fair condition, and 26 per cent is in poor condition. Additionally, 3.2 per cent of the road network, or 544 lane kms, are below the acceptable threshold. With the current annual investment of \$40 million, 1 per cent of the network (approximately 170 lane kms) transitions from good to fair condition each year, while 2.2 per cent (approximately 374 lane kms) deteriorates from fair to poor condition annually.



Network Growth and PQI Trend

From 2011 to 2024, the road network expanded from 14,870 lane kms to 17,461 lane kms, averaging a 1.1 per cent increase per year. It is projected to reach 17,271 lane kms in 2025 and 17,461 lane kms in 2026. From 2011 to 2026, the network will have grown by 17.4 per cent.

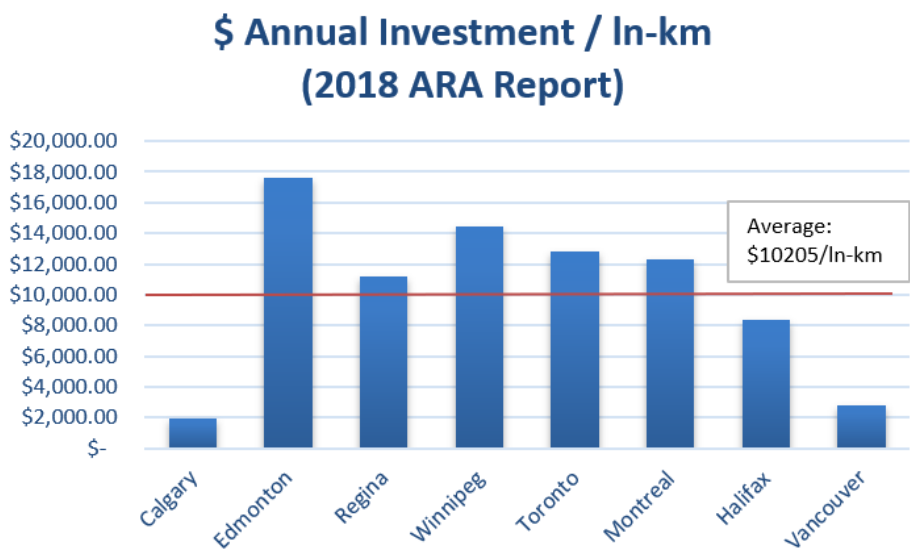
The network condition has been steadily deteriorating since 2014. In 2021, the pavement condition thresholds were adjusted to align with industry standard, but the overall downward trend remains the same.



Funding Gap

The infrastructure gap for Calgary’s road network is widening as current funding levels are unable to keep pace with the rate of asset deterioration and inflationary pressures. The annual budget has remained relatively static at an average of \$40 million per year.

Asset management best practice suggests that 2 per cent of the asset value should be allocated for maintenance. This means a budget of \$300 million should be budgeted to maintain Calgary’s roads in good repair. When comparing funding levels per lane kilometers to other Canadian cities, Calgary is significantly underfunded despite being more susceptible to road deterioration from frequent freeze thaw cycles.



Funding increases in 2023 and 2024 to \$47.8 million per year will help slow deterioration, however, additional funding is required to stop deterioration and improve overall road conditions for users and passengers.

Pavement Quality Level of Service

Toronto Metropolitan University (TMU) was engaged to analyze Calgary’s roadway data, assess condition and deterioration rates, and provide recommendations for pavement quality LOS and corresponding funding.

Reconstruction Threshold

TMU recommended that The City establish a reconstruction threshold based on roadway speeds and minimum PQI. Repairing all roads under the threshold would clear the backlog of deferred reconstruction and major repaving work and result in **\$600 million of future savings**. This innovative approach has been submitted as an engineering report to the Transportation Research Board in the United States. It has been peer-reviewed and accepted for presentation as a conference paper in Washington, DC, in 2025.

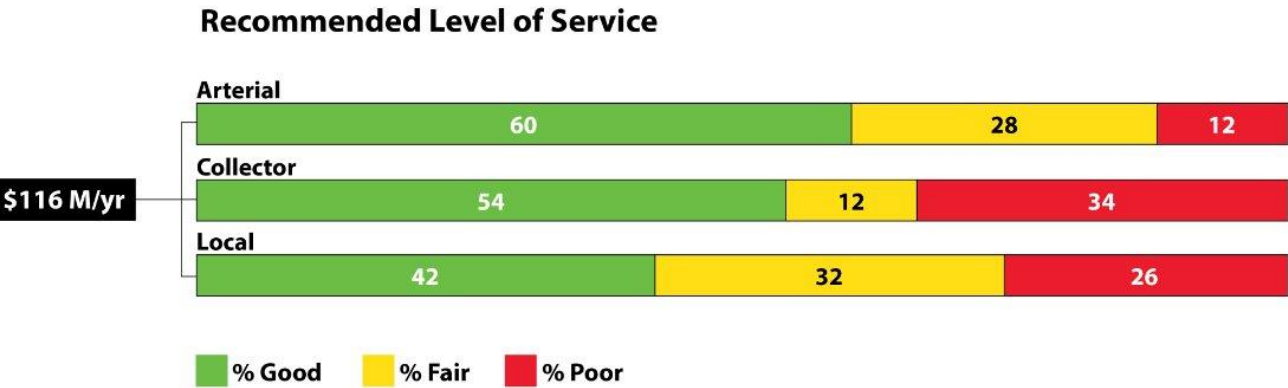
	Arterial			Collector		Local
Speed (km/h)	90	80	70	60	50	40
Minimum PQI	4.0	3.5	3.0	2.5	1.5	1.0

Level of Service Investment

TMU provided multiple LOS options and corresponding annual funding required until 2034. The following highlights show impact of the investment to the overall network condition and deterioration rate:

- At the current annual investment of \$40M, the deterioration rate would be 3.2%. This means good condition roads will drop to 26 per cent and poor conditions roads will increase to 52 per cent by 2034.
- An annual investment of \$88M would close the infrastructure gap as funding levels would keep pace with the deterioration rate. Good condition roads would be maintained at 44 per cent and poor condition roads would remain at 31 per cent.
- An annual investment of \$116M would increase arterial roads to 60 per cent good condition and improve collector roads to 54% good and local roads to 42 per cent good. At this funding level, the road network is continually improving at 1.9 per cent annually.
- An \$132M annual investment would increase all roads to 60 per cent good condition, which is

the current Canadian municipal average and aligns with sentiment from the Citizen’s view panel survey. The network would improve by 3 per cent annually.



Impacts

Safety: Poorly maintained roads can lead to accidents, causing injuries or even fatalities. This creates a sense of insecurity among residents, especially pedestrians and cyclists.

Reputation: When roads are in disrepair, it can create an impression that the city is poorly managed or neglected. This can deter potential investors, businesses, and tourists, who might prefer locations with better infrastructure.

Economic Impact: Poor roads can damage vehicles, leading to high repair costs for residents. This can be particularly burdensome for low-income families. Businesses may suffer due to decreased customer traffic and increased transportation costs. This can lead to a decline in local economic activity and job opportunities. Additionally, it is anticipated that the long-term operational expenses will increase.

Resident Dissatisfaction: Poor road conditions can lead to frustration and dissatisfaction among residents, who may feel their tax dollars are not being used effectively. This can result in negative word-of-mouth and a decline in community morale.

Environmental: Poorly maintained roads can lead to increased vehicle emissions and pollution, further tarnishing the city’s image as a sustainable and environmentally friendly place.

Social Inequality: If poor road conditions are more prevalent in certain areas, it can highlight and exacerbate social inequalities, leading to a divided community.

Reduced Accessibility: Poor road conditions can make it difficult for emergency services to reach certain areas quickly, potentially putting lives at risk.