
2021 CAPITAL BUDGET BRIEFING NOTE

2021 Budget and 2022-2030 Plan

Local Road and Major Road Rehabilitation Programs

Additional High Level estimated costs resulting from the State of Good Repair Backlog

At its meeting of January 22, 2021, the Budget Committee requested that the General Manager, Transportation Services submit a budget briefing note on the additional high level estimated costs resulting from the State of Good Repair Backlog. This briefing note responds to the Committee's request.

Issue/Background:

- The Transportation Services 10-Year Capital Plan (2021-2030) will fund \$4.060 billion of SOGR projects, providing an average of \$406.544 million annually. This funding will continue ongoing SOGR projects for infrastructure, including expressways, major and local roads, city bridges and laneways. Of this, \$619.379 million is budgeted for Major Road Rehabilitation and \$603.179 million, is budgeted for Local Road Rehabilitation. The below tables illustrate the budget, needs constraints, and total needs for the respective programs.

Major Roads Rehabilitation Program (in 000s)	2021	2022	2023	2024	2025	2026-2030	Total Ten Year Plan (Proposed)
Proposed Funding	\$58,600	\$59,822	\$58,366	\$59,534	\$60,724	\$322,333	\$619,379
Backlog	\$774,706	\$169,575	\$154,629	\$129,069	\$92,879	\$606,138	\$1,926,996
Total Needs	\$833,306	\$229,397	\$212,995	\$188,603	\$153,603	\$928,471	\$2,546,375

Local Roads Rehabilitation Program (in 000s)	2021	2022	2023	2024	2025	2026-2030	Total Ten Year Plan (Proposed)
Proposed Funding	\$70,000	\$67,222	\$58,366	\$59,534	\$60,724	\$287,333	\$603,179
Backlog	\$634,647	\$146,244	\$128,273	\$146,374	\$157,024	\$891,565	\$2,104,127
Total Needs	\$704,647	\$213,466	\$186,639	\$205,908	\$217,748	\$1,178,898	\$2,707,307

- The Total Needs of the road programs are developed by reviewing the pavement condition of the roads and developing a 10 year capital plan to maintain the roads at "Fair" to "Good" condition. The backlog is derived based on the net result of the proposed program funding and is a snapshot in time of works that will not be accommodated within the 10 year capital plan. The backlog includes the accumulation of works not completed from prior years (due to

prior years funding shortfalls) and the amount of work not funded in the future assuming the funding levels for the next 10 years as presented in the budget submission, taking into consideration future inflationary pressures and type of work required.

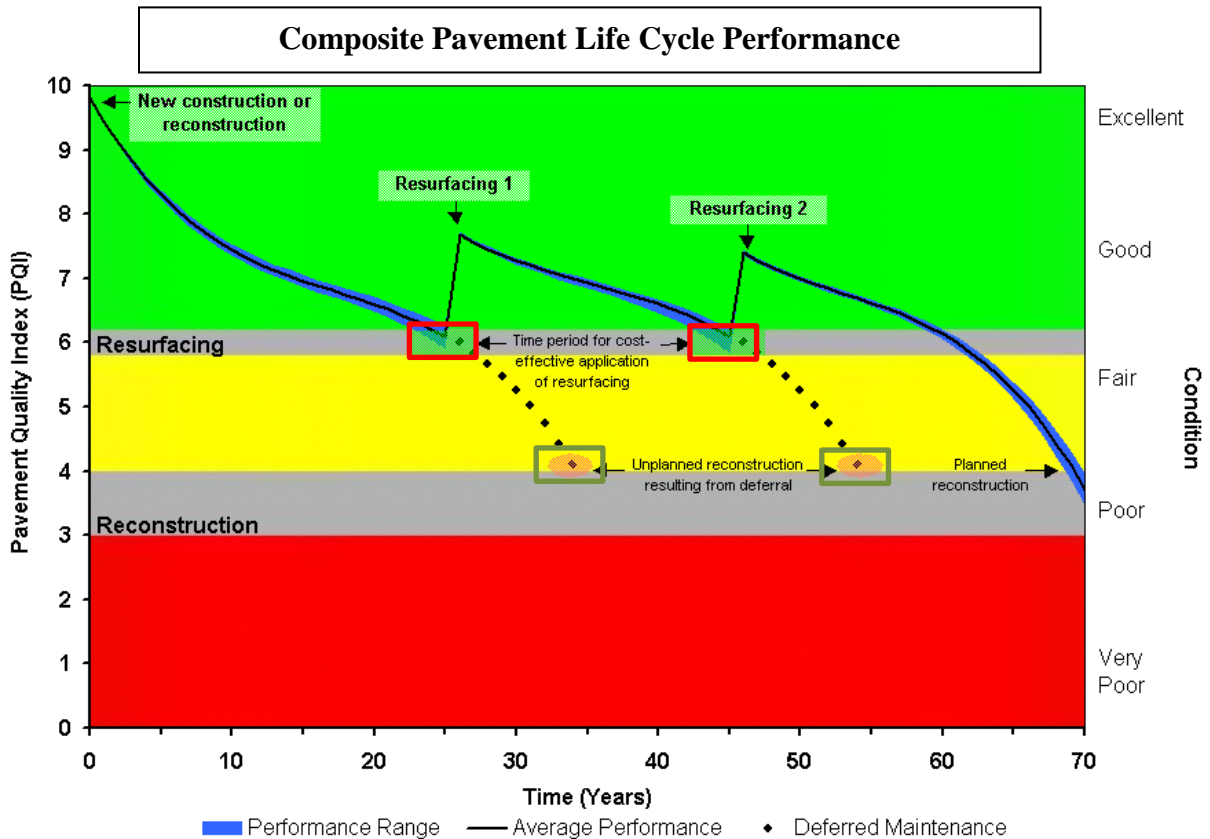
- Based on the current proposed ten year capital funding in the 2021 budget, the percentage of Major Roads in poor condition is expected to increase from 43 per cent to 54 per cent by 2030 while the percentage of Local Roads in poor condition is expected to increase from 24 per cent to 47 per cent by 2030.
- The increase in backlog reflects the increasing age of the system resulting from the significant network expansion in the 1950s through 1980s, when rehabilitation is required, and the type of rehabilitation required. This is mainly road reconstruction as the roads are reaching the end of their life cycle.
- Any reductions to the proposed program funding will increase the costs of the programs. Below are the key elements that would contribute to this change.

Inflationary pressures

- Typically, the average Canadian Consumer Price Index (CPI) over the last fifteen years has been about 1.9% (see: <http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/cpis01a-eng.htm>) and, similarly, the annual inflationary increase in road works over the last five years has been about 2%.
- Local fluctuations, depending on market conditions in any specific year, also affect the cost of road works (e.g., when the economy expands or contracts, triggering changes in demands for materials, it results in fluctuations in contractors pricing respectively).
- Short-term delays in contract delivery may result in higher bid costs arising from inflation from year-to-year (e.g., delaying a project one year, from 2021 to 2022, may result in a project being about 2% more expensive based on CPI alone).

Changes in work type required as road work needs are delayed

- Typical life cycles for pavements vary and are affected by many factors including road classification, pavement structure type, traffic volume and distribution, construction practices and workmanship, and, the ability of the owner to perform maintenance and rehabilitation as needs emerge. Performance can also be impacted by utility work and developments. As an example the life cycle and service life of a typical road is illustrated in the figure below.



Appropriate time period to complete Road Resurfacing

Appropriate time period to complete Road Reconstruction

- Minor & Major Arterial Roads that are properly maintained and rehabilitated will provide: about 75 years of total service life with 2 or 3 cycles of resurfacing before reconstruction is required; intervals between activities are typically 20-30 years.
- Local & Collector Roads that are properly maintained and rehabilitated will provide: about 100 years of total service life with 3 or 4 cycles of resurfacing before reconstruction is required; intervals between activities are typically 20-30 years.
- The City's historical rehabilitation activities are significantly weighted towards resurfacing rather than reconstruction based on typical rehabilitation cycles of resurfacing (i.e., once every 20-30 years ~ 3.3%-5% annual renewal rate) versus reconstruction (i.e., once every 75-100 years ~ 1.0%-1.3% annual renewal rate).
- The need to complete rehabilitation (resurfacing) or defer until reconstruction is based on engineering inspection and investigation, budget availability, and capacity to delivery.
- Projects that are identified for resurfacing work that cannot be completed in a timely manner will deteriorate to a point where reconstruction is required and this ultimately costs the City more as the full benefit (optimization) of the asset service life is not achieved. Furthermore, stop gap measures such as increased maintenance (e.g. pothole filling) and interim repairs (i.e., machine patching) may be needed in the interim period, in order to ensure the safety of users and prolong the life of asset as long as possible. The additional costs associated with

the interim repair and maintenance repairs will vary depending on factors such as type of the road, traffic type and volume, and extent and type of pavement deterioration.

- The table below illustrates the increase in road rehabilitation unit costs taking into consideration CPI as the only inflationary factor.

Unit Cost per m2*	2021	2022	2023	2024	2025
Local Road Resurfacing	\$84	\$86	\$87	\$89	\$91
Local Road Reconstruction	\$280	\$286	\$291	\$297	\$302
Major Road Resurfacing	\$88	\$90	\$92	\$93	\$95
Major Road Reconstruction	\$462	\$471	\$480	\$489	\$499

*For illustration purposes, unit cost includes all direct and indirect cost associated with road construction together with the rate of inflation, which is assumed to be 1.9%.

- Assuming that the work type required does not change for a particular road segment, any delay in implementation may be expected to increase the unit cost of road works by approximately 2% each year.
- The impact of this can best be illustrated by an example which assesses the Net Present Value (NPV) of two rehabilitation approaches:

Example:

Scenario: 50 year outlook of a typical local road (1 km in length), with a starting point of the asset requiring its first cycle of resurfacing.

Typical Local Road 50 Year Rehabilitation Outlook 2021-2071 (1km in length, 8m pavement)	Net Present Value (NPV)	Difference	% Difference from Base	Comments
Base Case First Resurfacing in 2021 Second Resurfacing in 2051	\$ 865,000	N/A	N/A	Base Case
Alternative Case Missed First Resurfacing in 2021 Reconstruction 15 years later in 2036, Resurfacing in 2071	\$ 1,251,000	\$ 386,000	45%	Increased cost over base case indicates less cost effective approach

*Costs are inclusive of residual and salvage value of the asset, including required maintenance work in between major capital rehabilitations (i.e. road resurfacing or road reconstruction) in order to provide minor upkeep.

- The Base Case illustrates the NPV cost if the road rehabilitation scheduled activities are followed (i.e. road resurfacings completed when required).

- The Alternative Case illustrates the NPV cost if the initial scheduled road resurfacing is deferred and the road continues to deteriorate until road reconstruction is required.
- If planned local road resurfacing is deferred, and the road continues to deteriorate, there comes a point in time when it is no longer effective or viable to resurface the road and it will then await reconstruction. During that period of time, it will require some incremental maintenance, such as pothole filling, crack repairs and even localised repairs to maintain serviceability and user safety. The timing at which the road reconstruction is required will also need to be advanced. Assuming a 2021 need was indefinitely deferred, the road reconstruction would be required in 2036 whereas in the base case scenario road reconstruction is not required within the 50 year timeframe i.e. the overall life of the road is significantly reduced.
- The illustration highlights that completing road rehabilitation at the appropriate time is the most cost effective approach and maximises the service life of the road.

Key Points:

- Transportation Services' Road Network is the most valuable asset operated and managed by the Division with replacement values of approximately \$5.91 Billion for Minor & Major Arterial Roads and \$9.17 Billion for Local & Collector Roads.
- The overall condition of the road network is in decline as a result of the increasing age of the system resulting from the significant network expansion in the 1950s through 1980s.
- At current funding levels, only around one-third of the rehabilitation needs for Major roads and Local roads can be addressed. Rehabilitation needs increase when roads are not maintained and repaired within a timeframe when the work would be effective. Missed opportunities to resurface a road may result in more costly rehabilitation work, including partial or full reconstruction being required much earlier in the overall life of the pavement than planned. As these interventions are more costly, this may further increase the backlog value. Delaying necessary state of good repair resurfacing and reconstruction work also increases operational maintenance repair activities, including the need to fill potholes, and results in increased claims/liabilities.

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