CITY OF NANAIMO
THE HARBOUR CITY

Staff Report for Decision

DATE OF MEETING JANUARY 22, 2024

AUTHORED BY DAVID THOMPSON, MANAGER, ROADS AND TRAFFIC SERVICES

SUBJECT **ROADWAY ASPHALT ASSET MANAGEMENT AND MAINTENANCE PLAN**

OVERVIEW

Purpose of Report

To obtain the Governance and Priorities Committee direction on asphalt maintenance funding and associated changes to the maintenance plan.

Recommendation

That the Governance and Priorities Committee recommend that Council consider increasing the annual road maintenance budget by $1.5 million per year as part of the 2025 – 2029 Draft Financial Plan and adjusting the maintenance plan as proposed in the 2022 Pavement Condition Assessment Report, Table D-5.

BACKGROUND

The City of Nanaimo (City) operates and maintains approximately 1,110 lane kilometers of asphalt roadway (517 linear kms). This transportation network serves the commercial, personal and emergency needs of City residents and businesses in a safe, convenient manner. The current replacement value of this asset class is estimated at $374M (2021) in the City's latest Asset Management Plan.

Nanaimo's Asset Management Plan considers:

1. Technical Level of Service: How the organization provides the service using technical terms. For asphalt roadways, the primary mechanism for this component is through the setting of technical standards, Manual of Engineering Standards and Specifications (MoESS), construction inspections and condition assessment (Pavement Quality Index (PQI).
2. Customer Level of Service: How the customer receives and perceives the service. This requires feedback from the community and usually includes metrics such as quality, function and capacity (or use).

The City is required under Provincial regulation to have an Asset Management Plan and has had one in place since 2010. The purpose of this update is to inform the Governance and Priorities Committee (GPC) on the recent work by Staff and consultants to complete the Customer Level of Service work, which augments and informs the Technical Level of Service going forward and to obtain the GPC's direction on changes to the maintenance plan for this asset class.

This work was supported by a grant from Federation of Canadian Municipalities (FCM's) Municipal Asset Management Program

DISCUSSION

Technical Level of Service

The design, material specification and construction of asphalt roadways within the City is governed by the current version of the MoESS. For asphalt roadways, the most significant recent change, is minimum asphalt thickness, which was increased from 50mm to 75mm. This provides for a more robust roadway, extending useful life and reducing maintenance over its lifetime. The most significant contributor to deterioration is through water penetrating to the road base, either through pavement cracks or by flowing under from the edges. Thicker asphalt is more resistant to cracking and water penetration.

Pavement is inspected visually each year to develop the annual maintenance program, which includes:

- sealing of cracks;
- repair of shoulders;
- removal and replacement of local failures (minor patching); and,
- removal and replacement of larger sections of degraded pavement (major patching).

In addition to this maintenance program, capital renewal or replacement is planned. Efforts are made to coordinate capital renewal with utility replacements to maximize the effectiveness of each investment.

A detailed pavement condition assessment is undertaken periodically (every 3-5 years). Using laser measurements and a variety of other specialized equipment, the PQI is calculated for each roadway segment. This index is made up of measurements of Ride Comfort Surface Distress and Structural Adequacy. Each factor can be preferentially weighted in the calculation based on the road classification (Local, Collector, Arterial). In the City's model, Local roads are weighted for surface distress, whereas Collector and Arterial roads are weighted for ride comfort. Weighting is based on expected vehicle speeds and volumes for each classification.

Once pavement conditions are assessed, the values are imported to a Pavement Management System (PMS) that assesses condition against a suite of repair options. Different scenarios can be run based on constraints to repair type and funding available.

The modelling for the Asset Management Plan forecast the average PQI for the City's road network at 72.5. Results from the latest condition assessment indicate that the average PQI is 78. Unexpectedly, the industrial roads are in significantly worse condition than other classifications.

Minimum acceptable PQI scores have been set based on road classification, as follows:

- Mobility Arterial 50
- Urban Arterial 50
- Industrial Collector 45
- Mobility Collector 35
- Urban Collector 35
- Industrial Local 45
- Mobility Local 35
- Urban Local 35

The table below shows the results of the last three inspections. Notably, the average PQI has remained relatively stable with the level of expenditures on maintenance and renewal in this time period.

Year	No. Section	CL-KM	LN-KM	PQI
2022	3,488	512	1,093	78
2017	3,430	508	1,087	79
2013	3,281	496	1,060	77

Results from modelling the 2022 asphalt conditions, at current funding level, indicate that roadway conditions will deteriorate over the next 10 years. Currently, 2% of the City roadways are deficient, relative to the target minimum PQI. In 10 years, 90% of the City's roadways will fail to meet the minimum PQI established.

From a purely technical perspective, to maintain road conditions in their current state, annual funding for maintenance and renewal would need to increase significantly from the current levels to $13.6M/yr. Any increase from current levels will decrease the amount of roadways failing to meet the minimum PQI.

Customer Level of Service

In 2020, the City engaged Urban Systems to undertake a Customer Level of Service Study. The details of that effort are contained in the attachments, including public engagement results.

One of the key outcomes of the consultation, was that residents understand the importance of asset management as a responsible financial tool, preferring to invest in maintenance to achieve the best fiscal outcome. It was found that there was a small willingness to pay to maintain road conditions, rather than see them deteriorate. Within the focus groups, the willingness to pay was found to be approximately $40/yr/folio. This would increase overall funding for roadway maintenance by roughly $1.575M/yr.

This funding level does not include the benefit of any concurrent projects and the funding brought through those projects. As discussed later, this funding is highly variable, and while effective, cannot be relied upon for regular, ongoing maintenance efforts.

Current Maintenance Plan and Funding

Maintenance of roadways is by the Roads Unit at Public Works. The Roads team consists of 11 positions that are responsible for all maintenance work on the roadways, supplemented by contractors and summer labour, as required.

The 2023 budget included the following for maintenance efforts:

Item	2023 Budget	2023 Forecast Expenditures
General road repairs	$983k	$1.05M
Crack Sealing	$182k	$115k
Minor patching	$183k	$309k
Major patching*	$400k	$415k
Total	$1.75M	$1.89M

*Most carried out by contractor

A key driver for maintenance expenses is the cost of materials, which is largely tied to the price of oil. Staff have seen significant gains in productivity since purchasing a milling machine in 2018. Increases in productivity mean that more area of roadway can be repaired with the same labour effort.

Current Renewal Plan and Funding

Pavement renewal (also referred to as "road rehab") is delivered through the annual project plan and includes dedicated roadway renewal and renewals undertaken concurrently with other utility projects. Funding levels for concurrent projects vary from year to year. The 2024 – 2028 Financial Plan includes $16.4M over the next five years for pavement renewal projects.

In 2023, the following projects were completed:

- Bowen Road, Meredith to Dufferin $920k
- Needham Street, Old Victoria to View $69k
- Holyrood Drive, Marlborough to Glenayr $350k

The City also "inherits" new or rebuilt roads through the development process. During permitting, these opportunities are identified by Staff in accordance with the applicable development bylaws. This helps to provide renewed asphalt roadways at no cost to the taxpayer.

When considering this matter, the GPC should balance the level of investment for this asset class against other competing investment opportunities, while being aware of the level of service requested from users and the technical function of the City's roadways.

OPTIONS

1. That the Governance and Priorities Committee recommend that Council consider increasing the annual road maintenance budget by $1.5 million per year as part of the 2025 – 2029 Draft Financial Plan and adjusting the maintenance plan as proposed in the 2022 Pavement Condition Assessment Report, Table D-5.

    - The advantages of this option are that additional maintenance effort can be put towards this asset class to somewhat meet users desired level of service, based on the Customer Level of Service Study.

- The disadvantages of this option is that investment levels will fall short of the full funding required to maintain asphalt roadways in their current condition as modelled in the 2022 Pavement Condition Assessment Report, and as set out in the Asset Management Plan for this asset class.
- Financial Implications: Increasing the road maintenance budget by an additional $1.5 million in 2025 would increase the projected property tax increase for 2025 by approximately 1.0%

2. That the Governance and Priorities Committee recommend that Council consider increasing the annual road maintenance budget by $775,000 per year as part of the 2025 – 2029 Draft Financial Plan and adjusting the maintenance plan as proposed in the 2022 Pavement Condition Assessment Report, Table D-4.

- The advantages of this option are that additional maintenance effort can be put towards this asset class to somewhat meet users desired level of service, based on the Customer Level of Service Study.
- The disadvantages of this option is that investment levels will fall short of the full funding required to maintain asphalt roadways in their current condition as modelled in the 2022 Pavement Condition Assessment Report, and as set out in the Asset Management Plan for this asset class.
- Financial Implications: Increasing the road maintenance budget by an additional $775,000 in 2025 would increase the projected property tax increase for 2025 by approximately 0.52%

3. That the Governance and Priorities Committee recommend that Council consider increasing the annual road maintenance budget by $250,000 per year as part of the 2025 – 2029 Draft Financial Plan and adjusting the maintenance plan as proposed in the 2022 Pavement Condition Assessment Report, Table D-3.

- The advantages of this option are that additional maintenance effort can be put towards this asset class to somewhat meet users desired level of service, based on the Customer Level of Service Study.
- The disadvantages of this option is that investment levels will fall short of the full funding required to maintain asphalt roadways in their current condition as modelled in the 2022 Pavement Condition Assessment Report, and as set out in the Asset Management Plan for this asset class.
- Financial Implications: Increasing the road maintenance budget by an additional $250,000 in 2025 would increase the projected property tax increase for 2025 by approximately 0.17%.

4 That the Governance and Priorities Committee provide alternate direction to Staff.

SUMMARY POINTS

- The City is responsible for the maintenance and operation of approximately 517km of asphalt roadway with a replacement value of $374 million (2021).

- A Customer Level of Service Study was completed which found that users would like to see the roadways maintained in good condition.
- Additional maintenance effort is required to maintain roadways in their current, good condition.

ATTACHMENTS:

Attachment A – Asphalt Levels of Service What We Heard Report, Urban Systems, Oct. 14, 2022
Attachment B – Levels of Service Table, Urban Systems, Feb. 22, 2023
Attachment C – Life Cycle of a Road
Attachment D – 2022 Pavement Condition Assessment Report
Attachment E – Roadway Maintenance – Level of Service and Asset Management, PowerPoint Presentation

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General Manager, Corporate Services

Bill Sims
General Manager, Engineering & Public Works

Please use the following link to review Attachment 'D' 2022 Pavement Condition Assessment Report:

https://www.nanaimo.ca/docs/your-government/city-council/meeting-attachments/rpt_pms_20231011_fin.pdf

ATTACHMENT A

ASPHALT LEVELS OF SERVICE WHAT WE HEARD REPORT

CITY OF NANAIMO

October 14, 2022

URBAN SYSTEMS

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PREPARED FOR:

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INTRODUCTION

There are nearly 570 kilometres of paved roads in Nanaimo and maintaining the condition of the roads is one of the many important services provided by the City. This includes patching potholes, repairing rutting, sealing cracks, maintaining road shoulders, rehabilitating and resurfacing roads, and more.

The City of Nanaimo is facing challenges in achieving sustainable funding levels to maintain the current overall pavement condition of its roadway assets and to meet public and Council expectations. To address this challenge, the City engaged Urban Systems Ltd. to conduct public engagement to better understand residents' expectations for road surface conditions, and how much they're willing to pay for the services required to maintain them.

As part of this consultation, the City and Urban Systems conducted four focus groups to engage in dialogue with the community about asphalt levels of service. Focus groups were selected as the method of engagement because they allow for two-way conversation and deliberation about levels of service and willingness to pay.

The input and feedback received during the engagement process will help influence the City's decisions about road investments and guide the City in how to make the best use of the allotted funding to meet the community's expectations and needs.

Engagement Objectives

The primary engagement objectives were to:

- Inform residents of the trade-offs associated with asphalt levels of service (LOS) to equip them to provide valuable input on desired LOS.
- Gather residents' input on desired LOS for asphalt to inform City Council decisions on target LOS and funding levels.
- Gather input from a representative sample of residents and focus on the driving experience as the primary customers of the asphalt surface.

WHO WE HEARD FROM

32

PARTICIPANTS

A total of **four virtual focus groups** were held on May 11th and 12th, 2022. The goal of the focus groups was to collect resident feedback on key elements related to the study.

Hosted on Zoom, the four focus groups were identical in format, content, and discussion topics, but scheduled on different days and at different hours to allow participants the flexibility to attend the session that worked best for them. Each event lasted approximately two hours in length.

The first half of the focus group included an overview presentation of the Asphalt Levels of Service Study to provide the public with the information required to contribute knowledgeable feedback. The second half of the session captured in-depth feedback on key topics and allowed participants to ask subject matter experts specific questions.

PARTICIPANT RECRUITMENT

R.A. Malatest & Associates Ltd. was engaged to recruit a diverse sample of participants for the focus groups. The sample was drawn from a known telephone service provider (Malatest uses ASDE Survey Sampler Inc.).

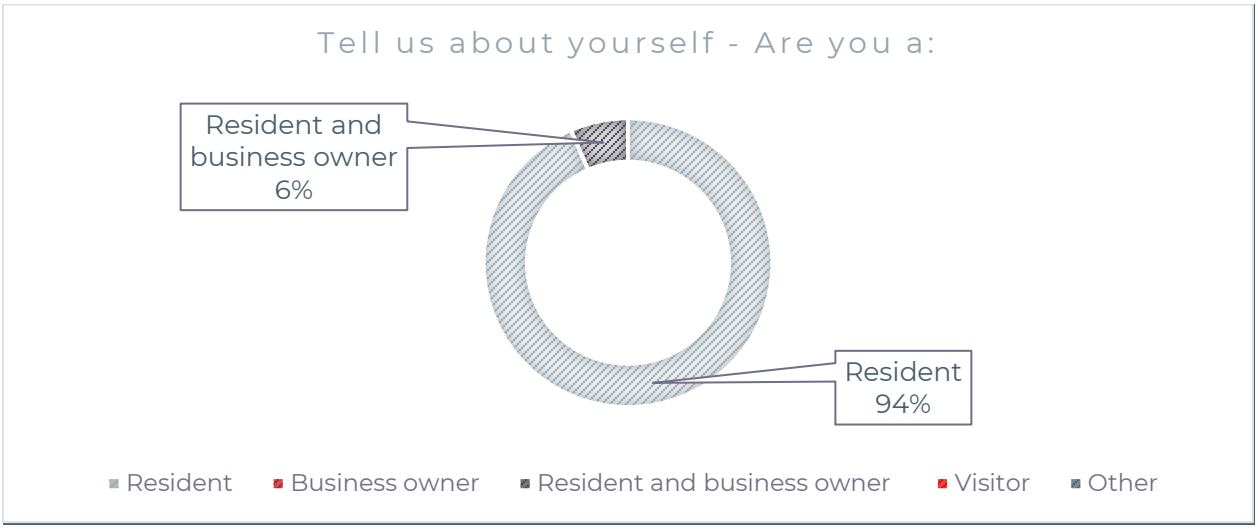
Participants were selected at random and screened to ensure they met a number of specific criteria, including residence within City boundaries. The composition of participants in each group was balanced across age, gender, and neighbourhoods of residence. As it is customary, focus group participants were provided with an honorarium incentive to encourage them to attend the focus groups, and to thank them for their time and their opinions.

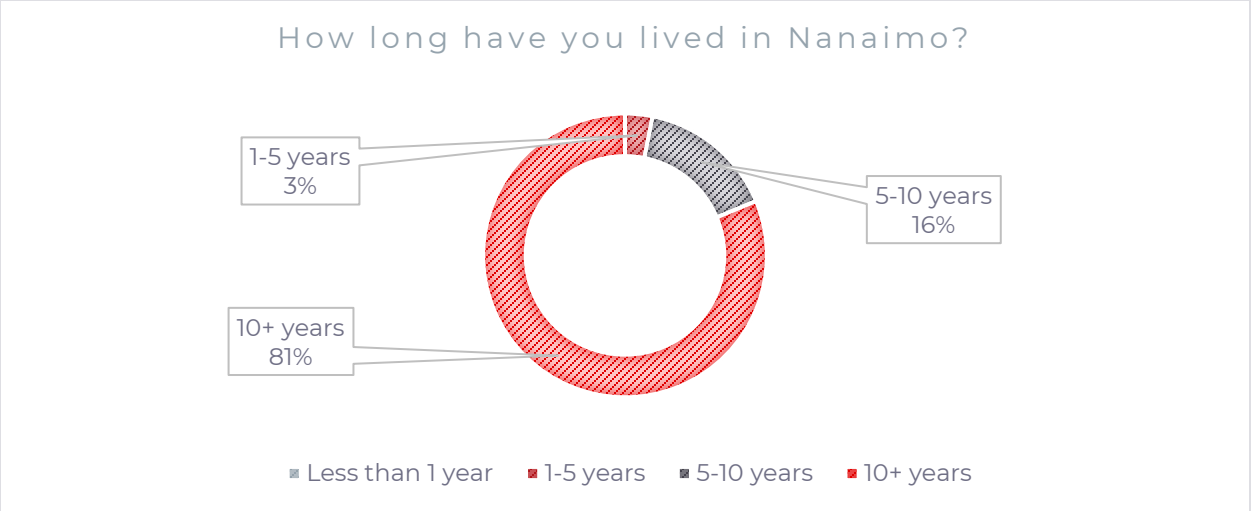
DEMOGRAPHIC POLLING

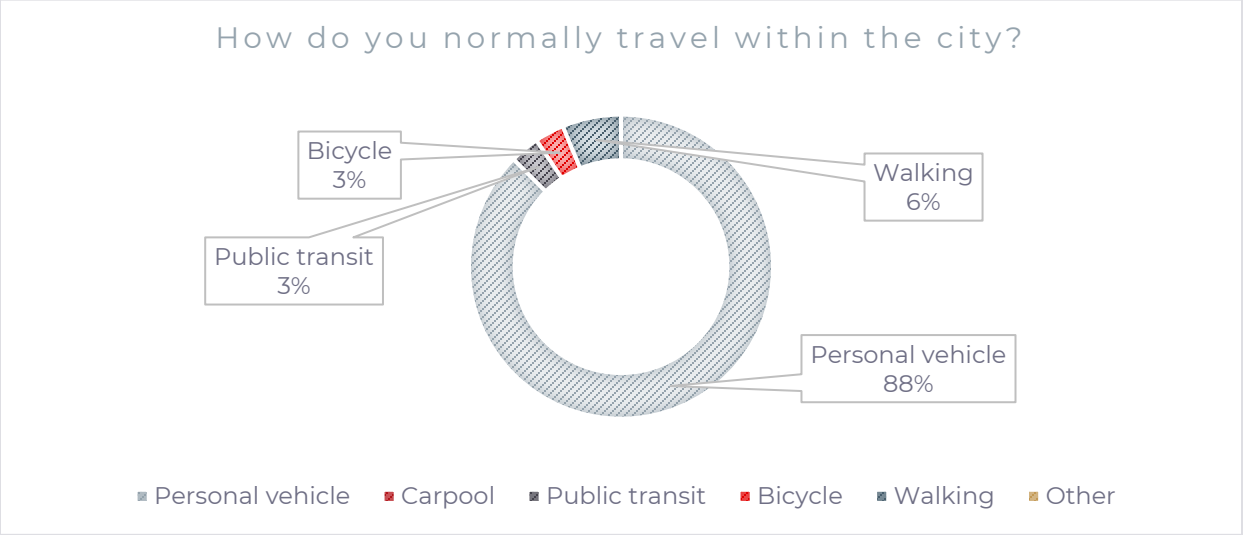
Each focus group consisted of six to nine participants, for a total of 32 participants overall. At the start of the workshop, participants were asked three demographic polling questions for staff to gain a better understanding of who was participating. Participants were asked:

- How long have you lived in Nanaimo? *(Options: Less than 1 year, 1-5 years, 5-10 years, 10+ years)*
- Tell us about yourself – are you a: *(Options: Resident, Business Owner, Resident and Business Owner or Other)*
- How do you normally travel within the City? *(Options: Personal Vehicle, Carpool, Public transit, Bicycle, Walking, Other)*

The majority of participants were residents (100%), who have lived in the City for more than 10 years (81%) and travel via personal vehicle (88%). *See results below.*







WHAT WE HEARD

Following the polling questions and the presentation of the Asphalt Levels of Service Study, participants were asked to provide input on questions related to driving experience and road conditions, priorities for road maintenance, and willingness to pay. Feedback was captured by staff note-takers using Mural, a virtual whiteboarding platform.

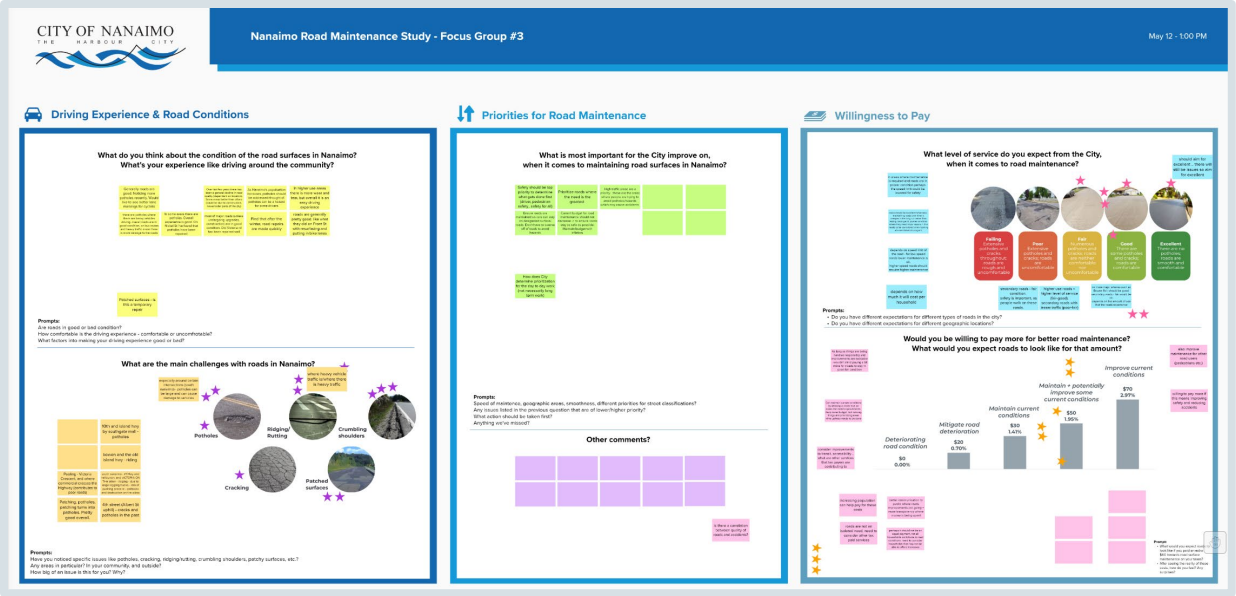


Figure 1. Example of focus group #3 Mural board

KEY THEMES

Overall, participants commonly noted that their driving experience and road conditions varied depending on where they were driving in Nanaimo. The key themes that emerged during the focus groups are summarized in the table below.

Table 1. Summary of key themes

Conditions & Driving Experience	Challenges & Opportunities	Expectations Around Level of Service
• Majority of participants expressed either neutral or positive views regarding the roads in Nanaimo • Driving experience and quality of roads varies depending on the location in the city • Safety of all road users, including pedestrians and cyclists, is a top priority	• Certain areas have higher road degradation • Areas of high use are a priority for maintenance • Overall, potholes are noted as the most disruptive form of road degradation	• Fair to good roads was the most common level of expectation • Maintaining the current road conditions is the minimum expectation from the majority of participants • Participants expressed concerns regarding increased costs to maintain roads and would like to see transparency in how funds are used
Sample of responses:		
"Generally, my experience driving in the city is fair-good. Don't see many potholes, issues are more around cracking,	*"Busy roads = potholes and ridging"*	*"Fair to Excellent - prioritize based on amount of traffic and the speed of traffic. Highly trafficked areas and areas where people are accessing the*

edge degradation - but does not look neglected"

"In higher use areas there is more wear and tear, but overall it is an easy driving experience"

"Most of the major roads (unless undergoing upgrades or construction) are in good condition. Old Victoria Road has been repaired well"

"*Depends on where you're driving. Some places are okay, others not as much*"

"*Potholes - speed of repair. especially on major roadways*"

"*High traffic areas are a priority- these are the areas where I see people are trying to avoid potholes/hazards*"

"*Prioritize roads where the need is the greatest*"

"For the main - well traveled roads: good to fair. side streets: fairish. Areas where there is the most traffic should be a priority - work within budget constraints"

highway are most important to me"

"*Main arterial roads in good condition. Small/ lower traffic roads in fair condition*"

"*How will the $70 be used? There needs to be flexibility in the plans to respond to all the issues facing Nanaimo. Lower the priority on some roads if needed*"

"*As long as things are being handled responsibly and improvements are noticeable – I wouldn't mind paying a bit more for roads to stay in good-fair condition*"

DETAILED FINDINGS

The following section dives into greater detail about the key themes that surfaced in all four focus groups.

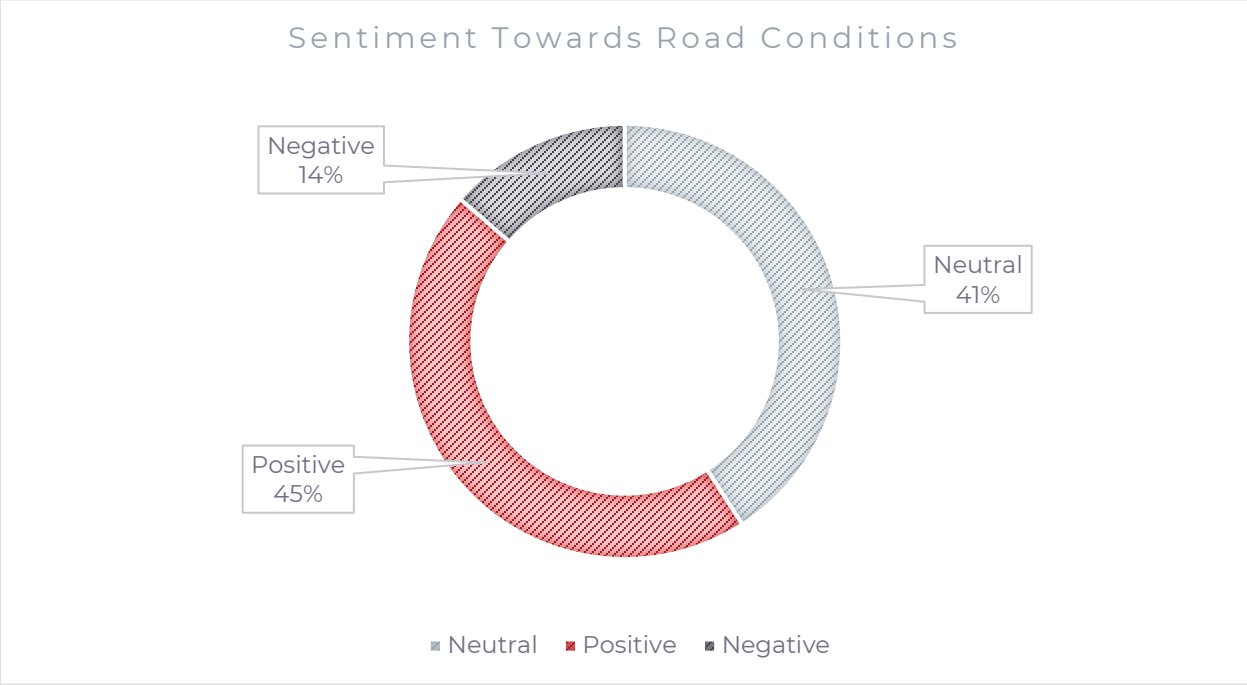
Conditions & Driving Experience

Participants were asked what they think about the condition of the road surfaces in Nanaimo, and what their experience is like driving around the community.

ROAD CONDITIONS

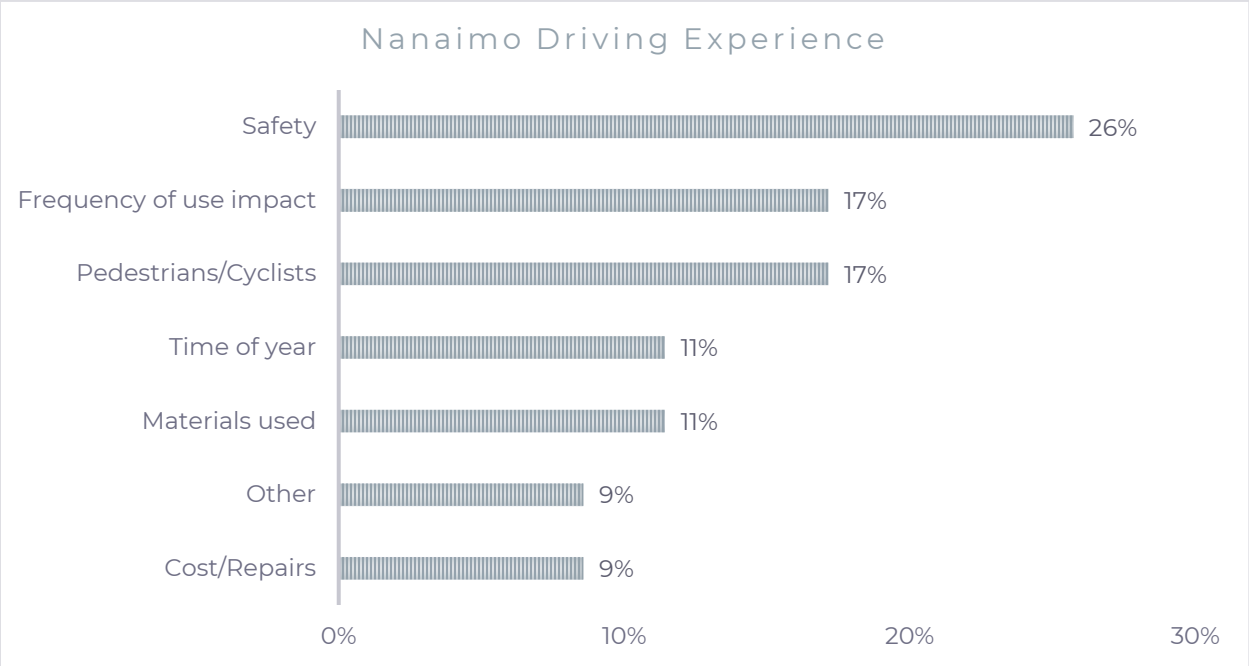
Overall, **road conditions are generally viewed as positive or neutral** (86%), with nearly half of all participants (45%) indicating that conditions are positive, and 41% selecting neutral.

Participants expressed a variety of opinions regarding the roads in Nanaimo, commenting that **conditions vary depending on location**. However, many expressed that they view the **road conditions in Nanaimo as being generally good**, or they have a neutral opinion. It was noted that perspectives on what makes a "good road" is subjective to each participant.



DRIVING EXPERIENCE

When discussing the driving experience in Nanaimo, the following key themes were discussed by participants:



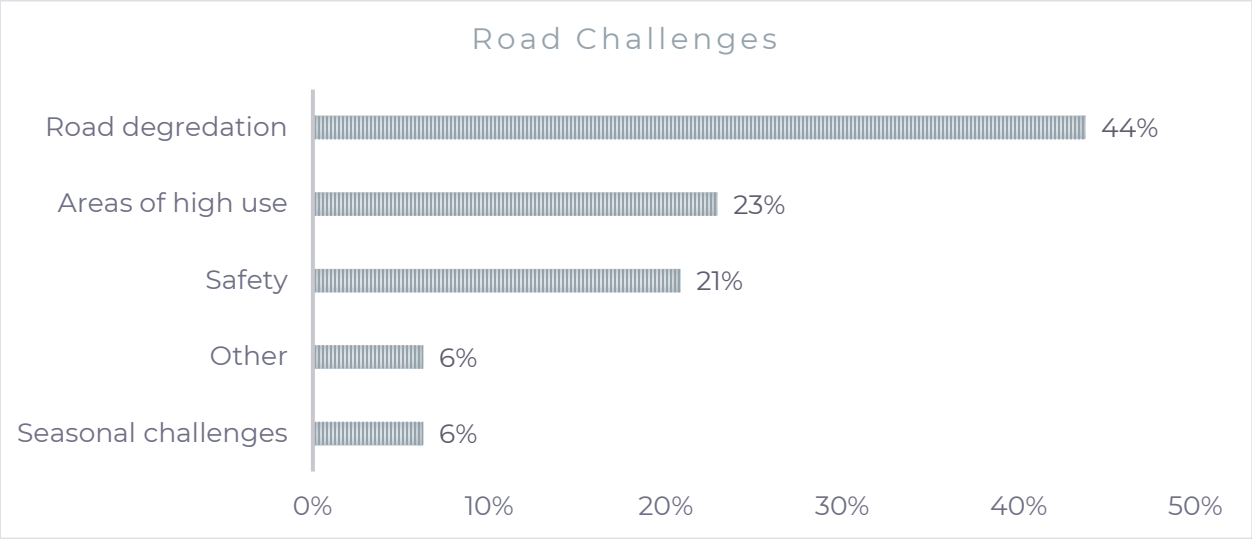
Overall, **safety of the roads** is a high priority for all users, including pedestrians and cyclists. Many participants expressed concerns regarding **unsafe road conditions**, noting hazards such as potholes, deteriorating shoulders, and high-speed vehicle traffic. The connection between areas of **high use and road conditions** was observed, with participants commenting on how poor road conditions are typically most noticeable in areas that experience higher traffic and heavier vehicle use.

Challenges & Opportunities

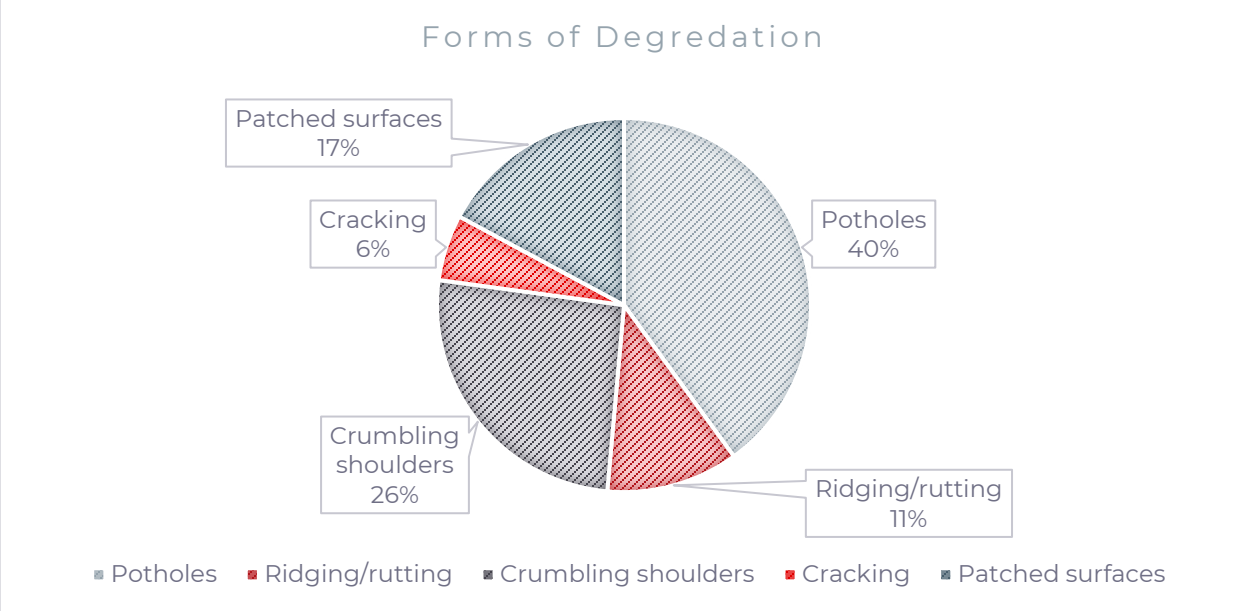
Participants were asked what the main challenges with roads in Nanaimo are, and what is most important for the City to improve on when it comes to maintaining road surfaces in Nanaimo.

CHALLENGES

Road degradation is viewed as the largest challenge with roads in Nanaimo (44%), followed by **areas of high use** (23%), and **safety** (21%).

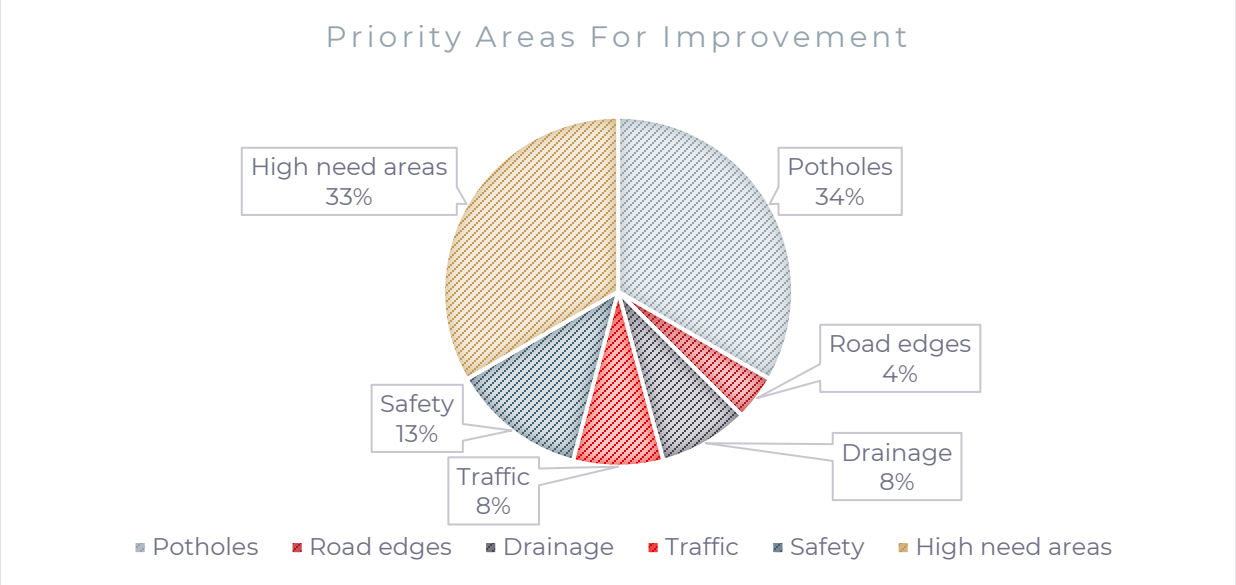


When asked to specify which forms of road degradation were most challenging or impactful, **potholes were cited as the leading issue** that should be prioritized by the City (40%), followed by **crumbling shoulders** (26%), and **patched surfaces** (17%).



OPPORTUNITIES

Participants expressed that **potholes were the top area for improvement** (34%). However, focusing on the **areas of the highest use by the community**, regardless of the form of road degradation, is also considered a high priority for the City by participants (23%).

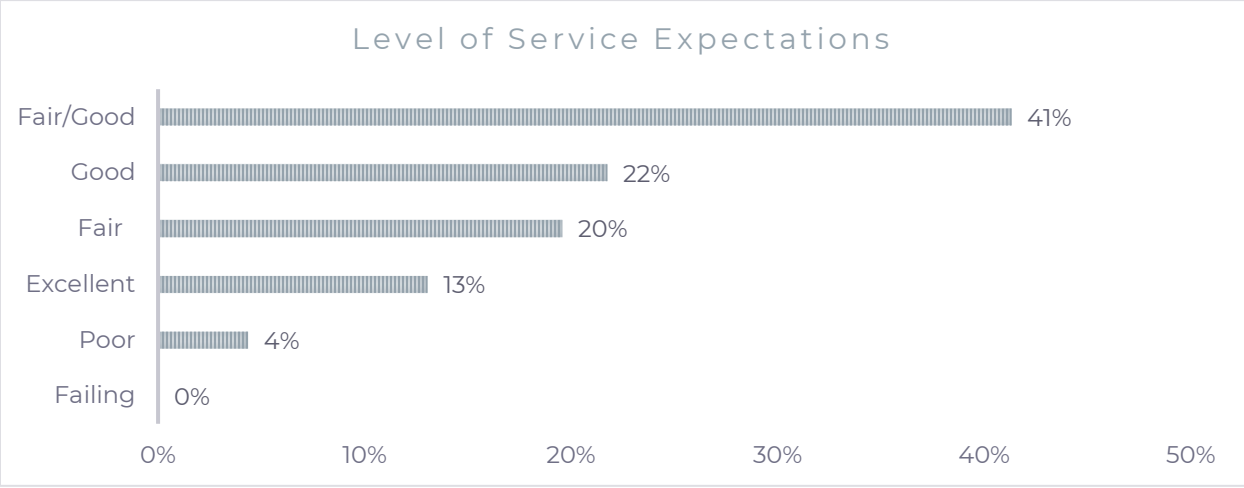


Expectations Around Level of Service

Participants were asked what level of service they expect from the City when it comes to road maintenance, and if they would be willing to pay more for better road maintenance, and what they would expect roads to look like for that amount.

LEVEL OF SERVICE

Generally, participants expect a **fair to good** level of service (41%), with higher expectations of service in areas that experience high use or heavy traffic.



WILLINGNESS TO PAY

When asked if they would be willing to pay more for better road maintenance, many participants expressed that ideally, they would want road conditions to fall somewhere between "**maintain current conditions**", and "**maintain and potentially improve road conditions**", at an approximate $40 annual tax increase.

Overall, many expressed a desire for **transparency** from the City about where funds are being allocated and the management of tax dollars.

Additionally, participants voiced concerns regarding the **overall cost of living** and an **increase in household costs**, noting that they were worried about how additional tax increases would impact community members.

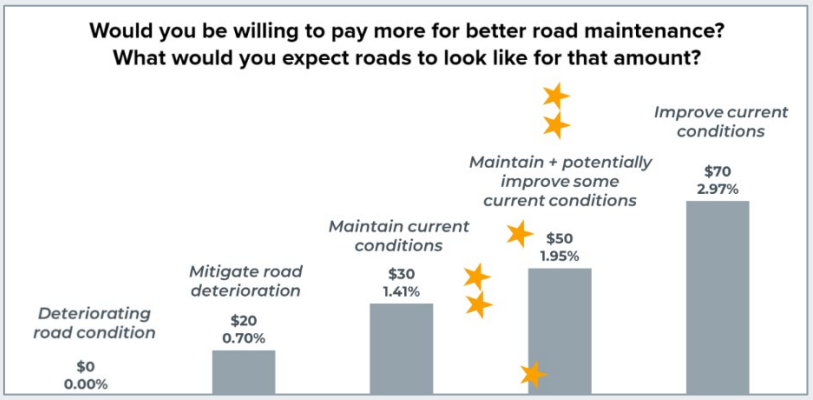
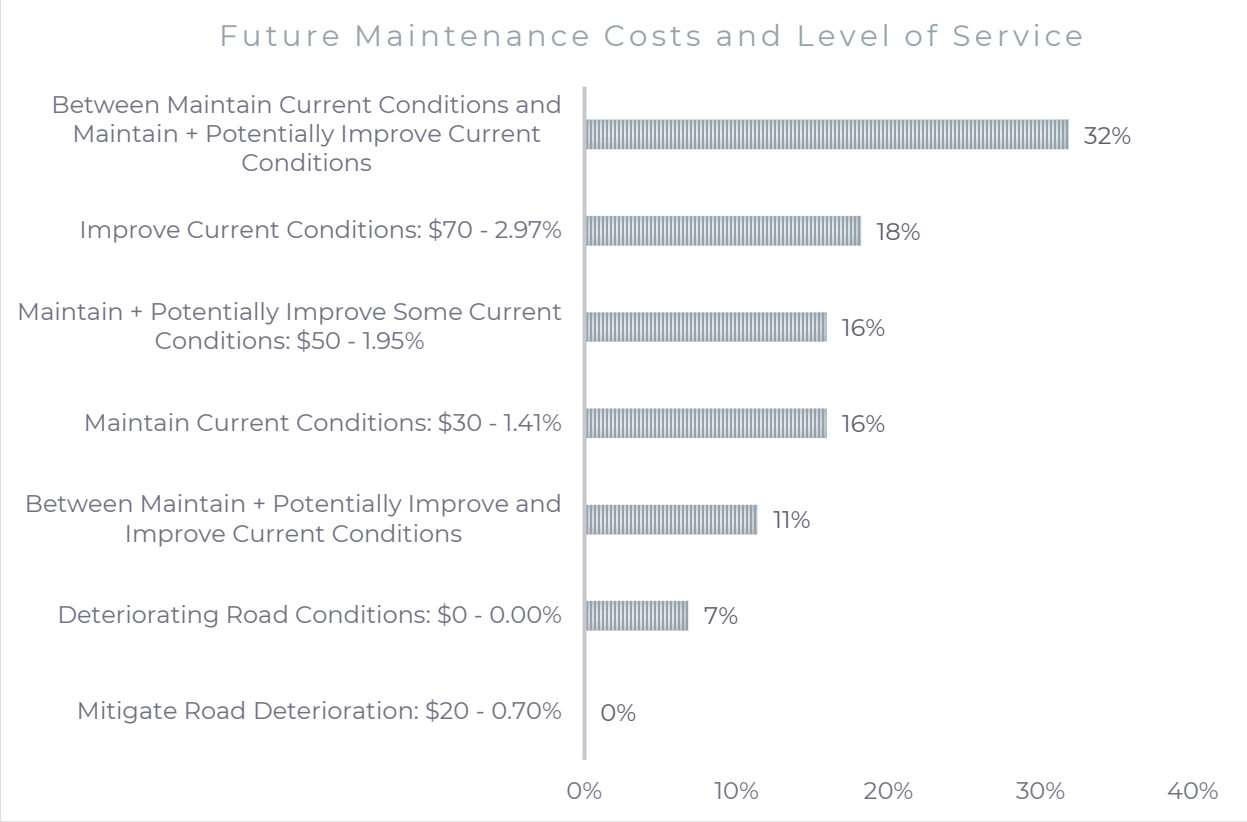


Figure 2. Participants' responses in focus group #2

Participants were shown the scale above and asked to indicate how much they would be willing to pay to improve road conditions. The numerical values represent the annual tax increase associated with the level of maintenance. Participants' responses were recorded using gold stars.



APPENDIX A: FOCUS GROUP PRESENTATION

ASPHALT LEVELS OF SERVICE FOCUS GROUP

CITY OF NANAIMO

MAY 2022

CITY OF NANAIMO
THE HARBOUR CITY

URBAN SYSTEMS

AGENDA

1. Purpose of today's session
2. Zoom tools and best practices
3. Demographic polling
4. Overview presentation of Asphalt Levels of Service
5. Feedback sessions
6. Final questions and feedback
7. Next steps and closing

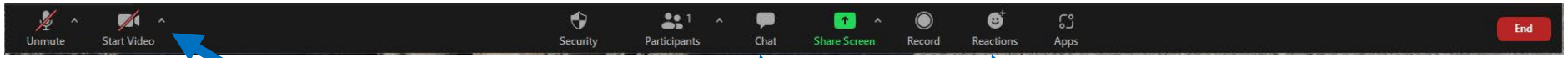
URBAN SYSTEMS

PURPOSE OF TODAY'S SESSION

1. Develop a common language about road surface conditions
2. Gather input on your driving experience in the City of Nanaimo
3. Gather input on your expectations for road surface conditions and what you're willing to pay for them

URBAN SYSTEMS

ZOOM TOOLS AND BEST PRACTICES



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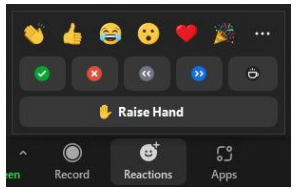


URBAN SYSTEMS

DEMOGRAPHIC POLLING

ASPHALT LEVELS OF SERVICE PRESENTATION

WHAT IS ASPHALT IN THE CONTEXT OF THIS STUDY?

We are talking about...

the black material used for constructing and maintaining the surface of the road that vehicles drive on

We are <u>not</u> talking about...

- *sidewalks*
- *bike lanes*
- *crosswalks*
- *traffic lights*
- *bypasses*
- *major highways*

These were covered in the recent Nanaimo Transportation Master Plan, which included community engagement

URBAN SYSTEMS

WHY ARE WE TALKING ABOUT ASPHALT?

- Asphalt is expensive and there are different options of road surface conditions that the City could provide
- The City hears some complaints from time to time, but wants to make sure that decisions about allocating money are informed by the opinions of the community as a whole

URBAN SYSTEMS

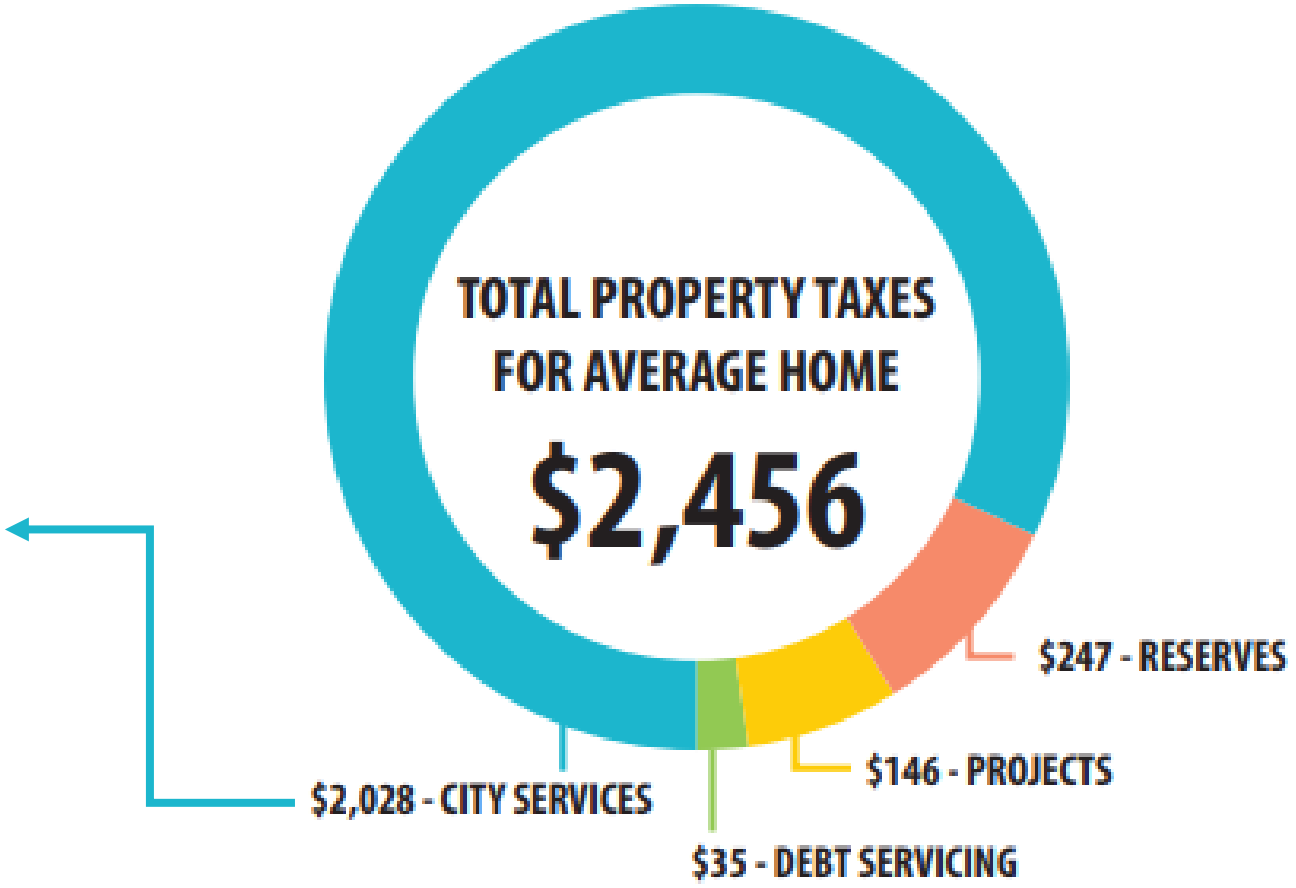
WHAT'S INVOLVED IN MAINTAINING ASPHALT?

- Repaving the surface of the road
- Repairing potholes
- Crack seal programs
- Road shoulder maintenance
- Etc.

URBAN SYSTEMS

HOW DO WE PAY FOR ROAD MAINTENANCE?

$545 – RCMP
$383 – PARKS, RECREATION & CULTURE
$313 – NANAIMO FIRE RESCUE & 911
$249 – CORPORATE SERVICES
$236 – ENGINEERING & PUBLIC WORKS
$117 – DEVELOPMENT SERVICES
$111 – CITY ADMINISTRATION
$43 – CORPORATE AND BUSINESS DEVELOPMENT
$20 – PORT OF NANAIMO CENTRE
$11 – CORPORATE FACILITIES



URBAN SYSTEMS

HOW MUCH ARE WE SPENDING ON ROAD MAINTENANCE?

- The current annual funding for maintaining and replacing roads is $3.2M
- If the current funding for road maintenance remains the same, the condition of roads will degrade
- This could look like potholes, cracking, ridging/rutting, crumbling shoulders, etc.

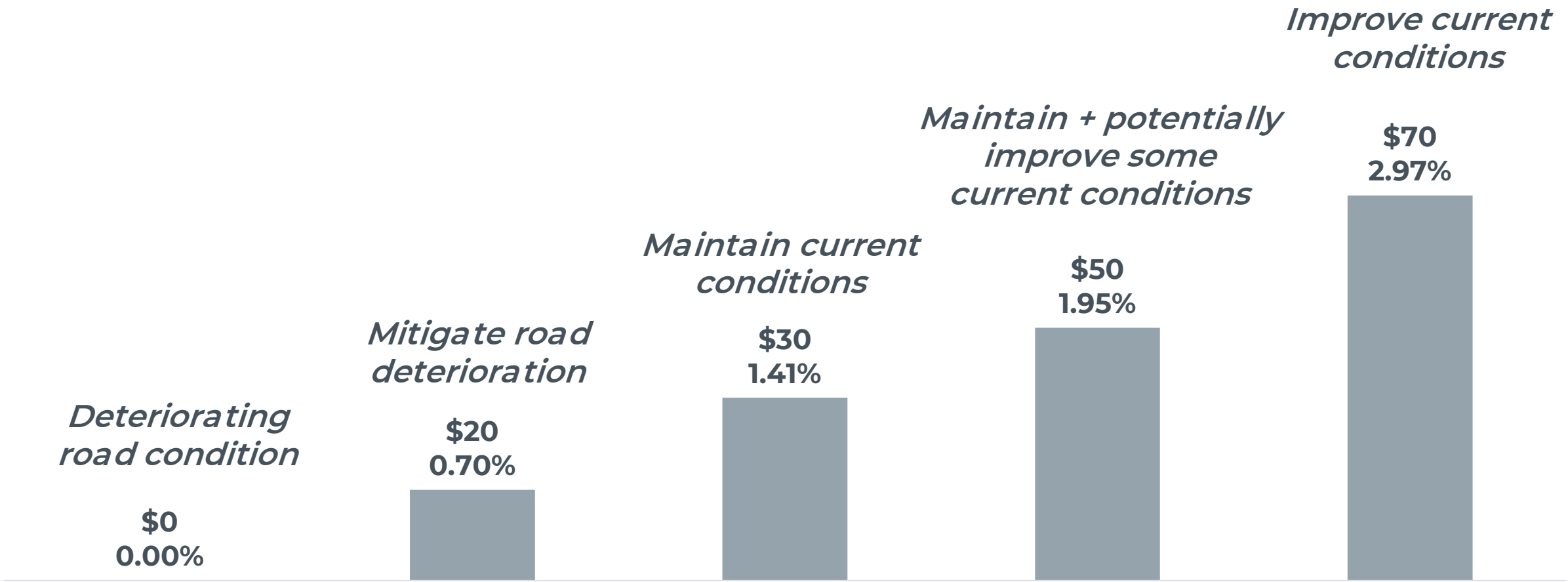
URBAN SYSTEMS

SOMETHING TO THINK ABOUT…

- When considering costs for road maintenance, it might be helpful to think about it like you would your vehicle maintenance
- Consistently paying a little bit more now (on oil changes, regular maintenance, etc.) can help prevent costly repairs later on for major problems.

URBAN SYSTEMS

HOW MUCH SHOULD WE SPEND ON MAINTAINING ROADS?



Note: does not consider inflation

URBAN SYSTEMS

COMMON ISSUES

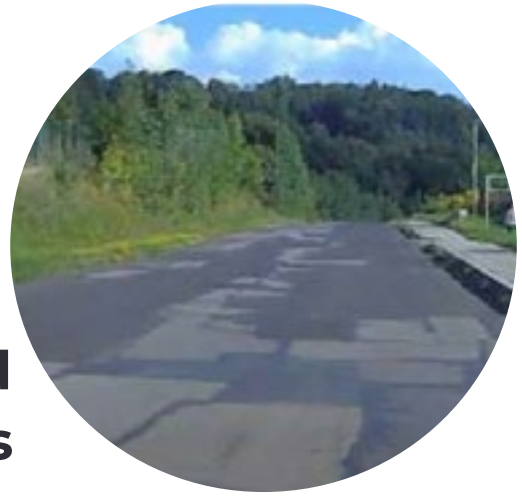
Potholes

Ridging/
Rutting

Crumbling
shoulders

Cracking

Patched
surfaces



URBAN
SYSTEMS

TYPES OF ROAD CONDITIONS

Failing
Extensive potholes and cracks throughout; roads are rough and uncomfortable

Poor
Extensive potholes and cracks; roads are uncomfortable

Fair
Numerous potholes and cracks; roads are neither comfortable nor uncomfortable

Good
There are some potholes and cracks; roads are comfortable

Excellent
There are no potholes; roads are smooth and comfortable

URBAN SYSTEMS

FEEDBACK SESSIONS

FINAL Q&A AND FEEDBACK

NEXT STEPS

1. Review and analyze all feedback
2. Incorporate feedback and comments from this session
3. Develop our final report to present to City of Nanaimo

URBAN SYSTEMS


THANK YOU

ATTACHMENT B

URBAN SYSTEMS MEMORANDUM

DATE: December 15, 2023
TO: David Thompson, MBA, P.Eng.
FROM: Jody Rechenmacher, Laura Bernier
FILE: 1296.0085.01
SUBJECT: Asphalt Levels of Service (LOS) Table

1.0 BACKGROUND

Following the City of Nanaimo's (the City) Asset Management Update in 2012, the City completed the 2017 Road Condition Assessment. The Road Condition Assessment included a comprehensive evaluation of 528 kilometres (km) of roads. This evaluation used a pavement management system to rate the roads using four (4) metrics to determine pavement performance and to develop an overall pavement performance indicator, the Pavement Quality Index (PQI). Pavement performance is rated along the PQI from failed (0) to perfect (100) and categorized into ten (10) condition ranges (poor to good). Results showed that approximately 115 km of roadways are below the acceptable PQI value of 79, with approximately 10 km of roads needing immediate rehabilitation.

Based on annual budgets, roadway investments (both capital and operational) are insufficiently funded to maintain current service levels. Current asphalt expenditures fluctuate annually, but on average are approximately $3.2 M per year, including capital and operational costs. This average annual spending falls short of the required funding of $5 M to maintain the current PQI of 79 recommended in the study.

As part of an earlier phase of this Asphalt Level of Service (LOS) Study, the City conducted a public engagement process that included detailed discussions with four focus groups (32 participants) with the goal of better understanding residents' expectations for road surface conditions, and how much they're willing to pay for the services required to maintain them. The results of the public engagement process, which are documented in the Asphalt LOS What We Heard Report, indicated that the overall quality of the service was fair to good. Participants indicated a Willingness To Pay (WTP) approximately $40 each per year (above current levels) to maintain the current asphalt conditions and potentially improve some current conditions.

2.0 PURPOSE

A key outcome of the Asphalt LOS Study is to establish a target LOS that the City will aim to provide. The process of identifying the target LOS will assist the City with making decisions about road investment levels and guide the City in how to make the best use of the allotted funding to meet the community's expectations and needs.

The purpose of this technical memo is to develop a set of draft customer and technical levels of service (LOS) measures for the City's asphalt, including current performance, proposed targets based on engagement results and gaps in performance. The memo documents the draft LOS measures and how the engagement and technical inputs informed the development of the targets.

This memo contains:

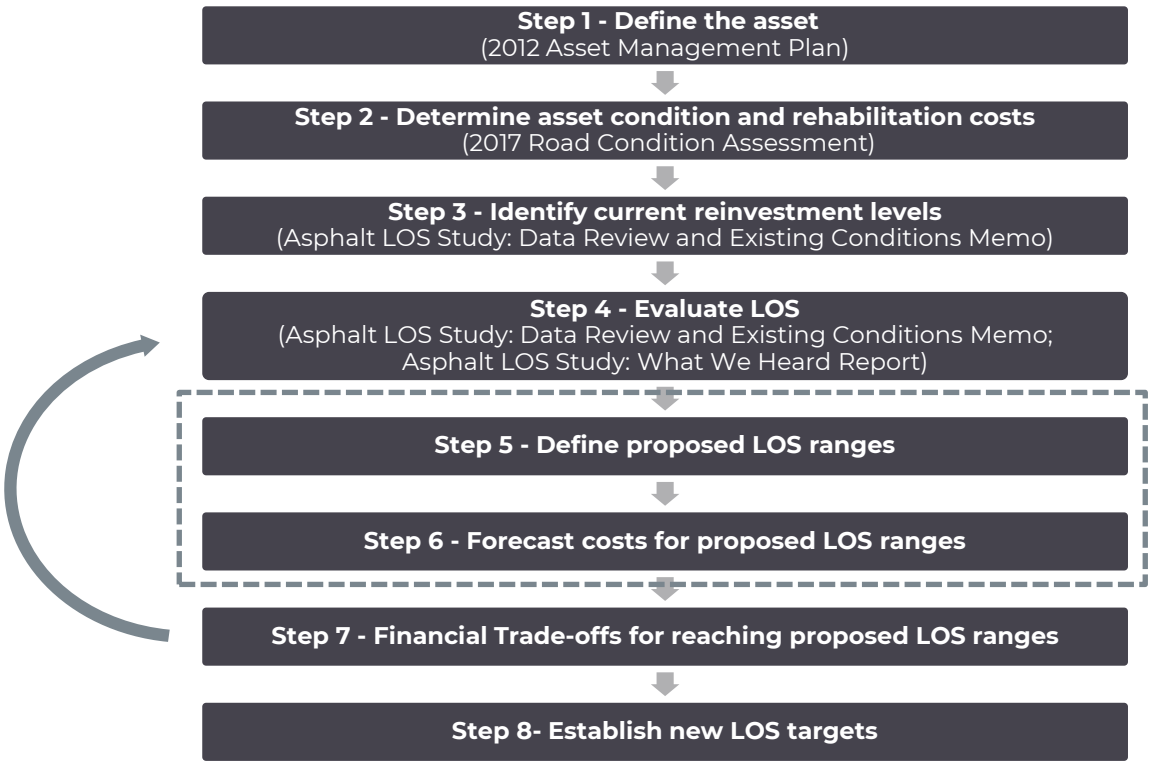
- The methodology for determining levels of service (LOS) for the City's asphalt, including the key measures for defining LOS and inputs and assumptions used to determine LOS ranges
- The resulting draft table of LOS ranges
- Next steps for determining the asphalt LOS target

3.0 METHODOLOGY

To accomplish the broader goals of the Asphalt LOS Study, the City has been following an eight-step process for establishing new LOS targets for road surfaces (Figure 1 below). The City has completed the first four steps of this process (through the Asphalt LOS Study and through previous work). The focus of this technical memo is on defining the proposed LOS ranges and forecasting the projected costs for the proposed ranges (Steps 5 and 6).

Determining the LOS ranges and their costs supports evaluating the financial trade-offs (Step 7). If rate payers are not willing to accept the proposed costs, then service levels should be reduced to the point where costs are acceptable.

Figure 1. Process for Establishing Levels of Service (LOS)



Refining and confirming the proposed LOS ranges requires iteration until LOS and WTP are aligned. The following methodology will allow the City to better understand LOS trade-offs and undertake the iterative process.

3.1 MEASURES FOR DEFINING THE PROPOSED LOS RANGES AND FORECASTED COSTS

The following measures were used to develop the proposed LOS ranges and their respective forecasted costs.

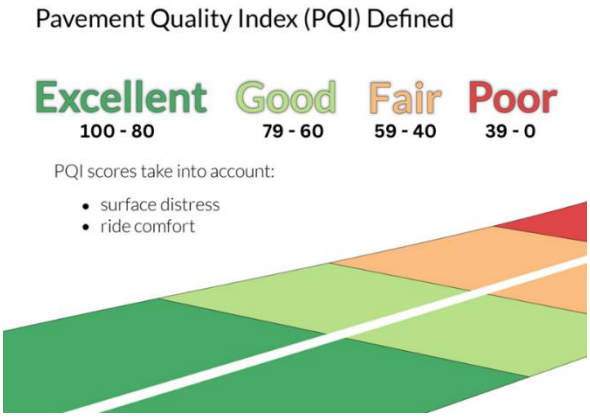
1. **Indicators** describe the quantity, quality, and reliability of current and future LOS in a way community members and Council understand.
2. **Costs** associated with providing the range of defined LOS so an informed decision can be made.
3. **Anticipated customer service feedback** on the performance of LOS ranges based on public engagement.

3.1.1 Indicators

Indicators are used to describe the quantity, quality, and reliability of the service for asphalt services:

- **Quantity:** The number of kilometers (km) of roads that will be deficient by 2027 that require major rehabilitation (2017 Road Condition Assessment).
- **Quality:** The Pavement Quality Index (PQI) provides an overall indication of the quality of pavement with regard to present and future service to the user from failed (0) to perfect (100). The PQI is derived through a combination of Riding Comfort Index (RCI), Surface Distress Index (SDI), and Structural Adequacy Index (SAI) (2017 Road Condition Assessment).

Figure 2. Understanding Pavement Quality Index (PQI)



Source: ArcGIS Hub. Pavement Quality Index (PQI): Safe and Secure Communities. Available : https://hub.arcgis.com/pages/f222847cc6cb42f48a8814be1d52bbae

- **Reliability of service:** Based on feedback from residents, reliability of the service includes the perceived ride comfort by the public, the number of unexpected disruptions in services, and the amount of significant distress areas (potholes, rutting, cracking) (see What We Heard report).

3.1.2 Costs

The City's services are largely funded through property taxes; asphalt is one service of many provided through Engineering and Public Works.

Although annual asphalt spending varies from year to year, based on annual budgets and information from City staff, asphalt budgets receive on average $3.2M of funding per year.

To develop the proposed LOS ranges, the average annual investment has been assessed as a cost per parcel. The number of parcels in Nanaimo is 36,098.

AVERAGE INVESTMENT PER YEAR = COST PER PARCEL
e.g., $3.2M = $88.65 × 36,098 parcels

3.1.3 Anticipated customer service feedback

During the public engagement (see What We Heard report), participating residents indicated that roads in Nanaimo are in “fair” to “good” condition. Feedback for enhancing the asphalt LOS was neutral, as most participants noted that their current driving experience is largely satisfactory. Primary concerns were related to the significant variability in driving conditions, emphasizing that experiences differ based on location and road class. Concerns were voiced regarding specific locations that require targeted improvements.

Residents indicated that it is important to maintain the current LOS expectations and are willing to pay an additional **$40 per year each (per parcel)** to do so. Participants expressed a strong expectation that the City continue to strategically focus these investments on improvements to high-traffic areas and road classes, and that increases should be considered within the wider context of other cost increases and competing priorities.

4.0 RESULTS

The following table summarizes LOS ranges and their respective measures and indicators.

Table 1. LOS Table based on Willingness to Pay (WTP) and 2017 Pavement Quality Index (PQI)

LOS Scenario	Indicators			Costs			Anticipated Customer Feedback	
	Average PQI (2027)	PQI Description	Quantity of deficient roads (2027)	Total Average Investment per Year	Average Cost per Parcel	Average Cost Increase per Parcel	Level of Service (LOS) Satisfaction	Willingness to pay (WTP)
Scenario 1	64	- The road is in good condition with minor observable distress. - Limited cracking or rutting may be present, but the pavement remains serviceable. - Routine maintenance is recommended to address emerging issues.	60 km	$0	$0	($88.65)	Significant Public displeasure with LOS	Significantly lower than the WTP threshold
Scenario 2	69	- The road is in good condition with minor distress. - Similar to PQI 64, with limited cracking or rutting. - The pavement is serviceable, and routine maintenance is advised	37 km	$2.0M	$55.40	($33.24)	Certain public displeasure with LOS	Significantly lower than the WTP threshold
Scenario 3	70	- The road is in good condition with minimal distress. - Minor cracking or rutting may be present, but the pavement remains in a serviceable state. - Routine maintenance is recommended to preserve the current condition	30 km	$3.0M	$83.11	($5.54)	Some public displeasure with LOS	Significantly lower than the WTP threshold
Scenario 4	75	- The road is in good condition with very minor distress. - Limited to no significant cracking or rutting. - The pavement is smooth and structurally sound, requiring routine maintenance for optimal performance	10 km	$5.0M	$138.51	$49.86	Some public displeasure with LOS	Begins to exceed WTP threshold
Scenario 5	79	- The road is in excellent condition with minimal to no distress. - A smooth surface and overall good structural and functional condition. - Routine maintenance is recommended to sustain the high-quality pavement	5 km	$5.7M	$157.90	$69.26	Meets public expectations for LOS	Exceeds WTP threshold

5.0 NEXT STEPS

The draft LOS table will be used to engage with council in a process to get feedback on proposed customer LOS targets. Council's direction on customer LOS and funding levels will be used to identify changes to the City's existing maintenance and renewal programs (technical LOS).

Technical LOS considerations will be developed by identifying the capital, operational, and maintenance activities required to deliver the target LOS. Guiding questions to identify which activities should be prioritized can include:

- Which projects will close the gap between the current and target LOS most cost effectively? Most sustainably? When will these projects be needed?
- What capital and operational projects will be needed to maintain current levels of service AND deal with pressures of growth or deteriorating assets?
- What is the impact of each project on providing or sustaining service?
- What are the impacts (on service) of actions such as cutting costs and making investments?

The updated maintenance and renewal programs will be compiled along with interim deliverables into a final report to document the project process and report to FCM.

Attachment C

Life Cycle of a Road

Assuming that the road base is constructed according to specifications, an asphalt road has a predictable maintenance cycle and useful life. The useful life varies from 25 to 40 years depending on roadway use and standards of construction at the time. Once constructed, the surface will start to weather as it is exposed to precipitation and ultraviolet light; it will go through freeze-thaw cycles and heat up during the summer; and it will be exposed to loading and unloading as traffic passes over it. This expansion, contraction and flexing results in cracks starting to develop, leading to the first maintenance activity, usually occurring between years 5 and 10: Crack Sealing. Using a polymeric rubber compound, the cracks are cleaned, filled and sealed. The cracks are usually limited to the top surface, but can project entirely through the thickness of the asphalt road. Sealing these cracks prevents water from intruding into the road base, preventing acceleration of failures.

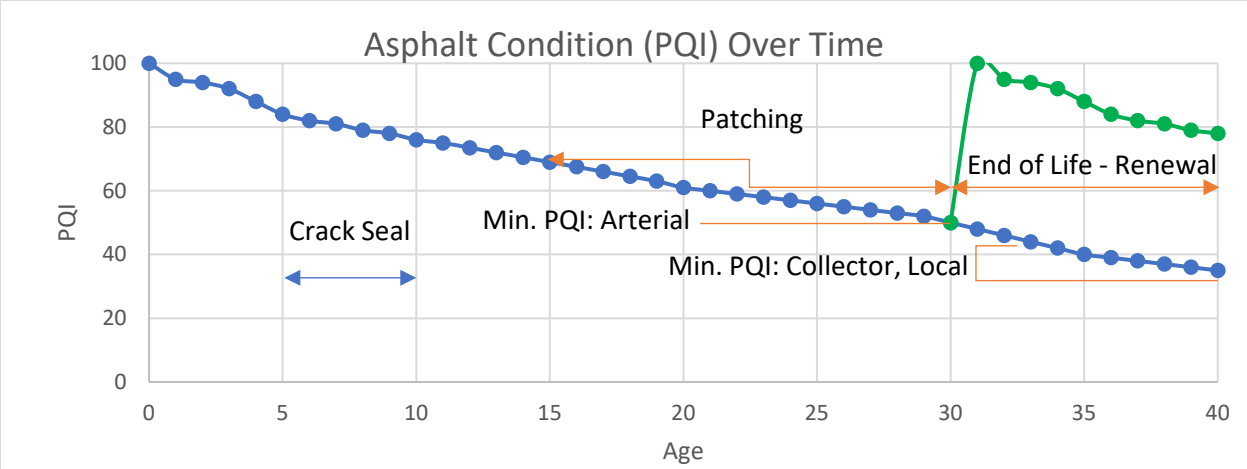
Over time, the network of cracks within a given area of asphalt exceeds the ability for additional crack sealing to be effective. At this point, localized sections of the road are removed and replaced (called patching). If water has made it through to the road base, the base will be replaced at this time as well. However, it is more typical for the top 50mm of asphalt to be milled off and replaced. This work happens as required throughout the life of the roadway and addresses issues with Surface Distress (SDI), primarily.

For Arterial and Collector roads, the performance of the roadway is driven by Ride Comfort (RCI). As this metric decreases, more significant patching is planned and undertaken. This can be larger scale patching (covered under Operating budgets) or road rehabilitation (covered under Capital budgets). Whenever possible and reasonable, this work is coordinated with other utility work that will require surface restoration work.

The life of a road can be negatively impacted by other utility works requiring removal and replacement of sections of roadway. This work introduces joints in an otherwise sealed roadway, creating a potential point of failure to be monitored. This type of work is generally unavoidable, being required for repairs, extension and installation of new underground services. Staff work with developers and engineers to minimize the long term impact on the roadway performance.

The useful life of any given roadway is highly dependent on the quality of initial construction, the loads that it experiences in that lifetime and any ingress of water to the road base. Based on City experience, that life can vary from 25 years to 40 years. At end of life, either the entire road structure is removed and replaced (if road base failure has occurred) or the top 50mm is milled off and replaced.

Each of these maintenance and renewal techniques are included in the Pavement Management System (AMS) used to record and forecast road conditions.


Asphalt Condition (PQI) Over Time
PQI
100
80
60
40
20
0
0
5
10
15
20
25
30
35
40
Age
Patching
End of Life - Renewal
Crack Seal
Min. PQI: Arterial
Min. PQI: Collector, Local

ATTACHMENT D

Please click the link below to access Attachment D - 2022 Pavement Condition Assessment Report

https://www.nanaimo.ca/docs/your-government/city-council/meeting-attachments/rpt_pms_20231011_fin.pdf

ATTACHMENT E

CITY OF NANAIMO
THE HARBOUR CITY

Roadway Maintenance – Level of Service and Asset Management

January 22, 2024

1

CITY OF NANAIMO

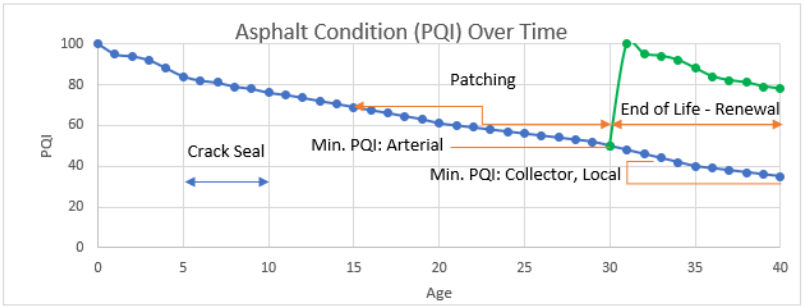
Common Issues

2

Types of Road Conditions

3

Asphalt Condition (PQI) Over Time



4

Willingness to Pay

WILLINGNESS TO PAY

When asked if they would be willing to pay more for better road maintenance, many participants expressed that ideally, they would want road conditions to fall somewhere between **"maintain current conditions"**, and **"maintain and potentially improve road conditions"**, at an approximate $40 annual tax increase.

Overall, many expressed a desire for **transparency** from the City about where funds are being allocated and the management of tax dollars.

Additionally, participants voiced concerns regarding the **overall cost of living** and an **increase in household costs**, noting that they were worried about how additional tax increases would impact community members.

Figure 2. Participants' responses in focus group #2

Participants were shown the scale above and asked to indicate how much they would be willing to pay to improve road conditions. The numerical values represent the annual tax increase associated with the level of maintenance. Participants' responses were recorded using gold stars.

5