# Transportation Asset Management

## Roads and Sidewalks in St. Albert

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Transportation Infrastructure Engineer
***City of St. Albert***



# Overview

- Introduction
- Pavements
- Sidewalks
- Close

# Introduction

- City of St. Albert Major Transportation Infrastructure:
  - Roads (~900 Lane km’s)
  - Sidewalks (450 CL kms)
  - Trails (70 CL kms)
  - Bridges (22)
  - Parking lots (41)

# Introduction

- St. Albert used to publish its infrastructure report in local news papers (2004)



SaintCity • November 12, 2004 www.saintcitynews.com Page 29

## How long will our infrastructure last?

OUR INFRASTRUCTURE ASSETS have a range of lifespans. For example, a trail that was built 10 years ago is expected to last another 10 years. Drainage pipes built 30 years ago won't need to be replaced for about another 45 years.

Regardless of when they will need to be replaced, they all need ongoing maintenance. Figure 2 shows the average age and average remaining effective life of City infrastructure.

**Condition of Assets**

As one would expect, as infrastructure gets older, its condition deteriorates. With all assets, we get to a point where this deterioration is unacceptable.

At this point, it needs to be repaired or replaced. We refer to these issues as our maintenance backlog and long-term annual maintenance.




**Figure 2: Average age and average remaining effective life (years)**



## Where we go from here

**Infrastructure Review Phase 2**

Infrastructure Review Phase 2, which will begin soon, is an opportunity to collect more detailed information on current infrastructure and plan our future funding so the most critical assets get attention first.

**Infrastructure Strategy and stakeholder team**

Managing infrastructure is a long-term challenge that needs a long-term solution and Phase 2 of the Infrastructure Review will set out a Strategy for dealing with infrastructure into the future.

As part of this Strategy we plan to engage a stakeholder team, including representatives of St. Albert taxpayers, to monitor infrastructure issues, help develop strategies and deal with them on an ongoing basis.

**We are not alone but we're ahead of the pack**

Every town and city in North America is grappling with the infrastructure challenge at some level. The City of St. Albert is lucky in that our infrastructure is relatively new.

Not many municipalities of our size are addressing the infrastructure issue in as comprehensive and far-sighted manner as St. Albert.

Infrastructure will continue to be a challenge and that's why the City of St. Albert is developing and implementing a strategy to deal with the issue in the years to come. It's not likely that property taxes alone can address the funding gap.

**Funding from other levels of government**

Because property taxes alone aren't likely to address the gap between the cost of responsibly managing infrastructure and the amount of available funding, we are working to convince other levels of government to help cover the cost.

**Avoid a knee-jerk reaction**

The City of St. Albert believes it's far more sensible to plan for the future now to avoid a knee-jerk reaction to the infrastructure challenge some time down the road.

For further information on the City of St. Albert Infrastructure Review, phone General Manager of Planning and Engineering, Guy Boston on 459-1654 or Infrastructure Manager, Todd Wyman on 459-1744.

## What infrastructure needs attention?

BECAUSE OF OUR careful approach to long-term planning, St. Albert is ahead of most other municipalities in understanding the inventory and condition of our infrastructure. As part of the Infrastructure Review Phase 1, the City has identified many of its assets and found out how much they are worth and how long they are expected to last. (Table 1)

| Type | Buildings | Parks | Trails | Roads | Traffic Signals | Sidewalks | Bridges | Transit Vehicles | Public Works Equip. | Water | Wastewater | Stormwater |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inventory | 61 (746,000 ft²) | 80 | 36 km | 600 lane km | 80 | 400 km | 10 | 42 | 176 | 288 km | 239 km | 200 km |
| Value (millions) | $85.2 | 55 | $3.6 | $209 | 5.2 | $45.9 | $18.9 | $18.9 | $9.4 | $21.3 | $29.0 | $22.1 |
| Useful Life Remaining | 49% | 84% | 52% | 43% | 74% | 43% | 66% | 40% | 47% | 63% | 63% | 63% |

**Table 1: Infrastructure snapshot**

**Maintenance Backlog**

The City is constantly maintaining its infrastructure to keep it in good condition. This is balanced by the reality of fiscal limitations. Because of the high cost of maintaining infrastructure, some work that is required has to be deferred until adequate funding can be secured. This, of course, has to be carefully weighed against the cost of deferral.

At the moment, the City of St. Albert has a $46.8 million backlog of maintenance it has not yet been able to fund. This is a pressing issue (Figure 3).

**Long-term Annual Maintenance**

In order to manage and reduce the maintenance backlog into the future, we need to properly fund our long-term annual maintenance needs, otherwise our backlog will continue to grow.

**Infrastructure Growth**

Not only do we have to address our maintenance backlog and our long-term annual maintenance, we also have to prepare for the maintenance of new infrastructure that's required as the City grows.




**Figure 3: Maintenance Backlog ($46.8 million)**

Municipal and Federal programs may be able to assist in funding this work. While we cannot depend on this funding, we certainly will use it when it becomes available. By keeping a list of necessary maintenance projects we can act quickly when those funding opportunities arise.

THE CITY OF St. Albert

# Introduction

- This presentation will review St. Albert's experience with 2 systems
  - Pavement Management
  - Sidewalk/Trail Management

# Pavement Management



# Pavement Management

- The City maintains several road asset types
  - Highway
  - Arterial
  - Collector
  - Local
  - Lanes/Parking lots

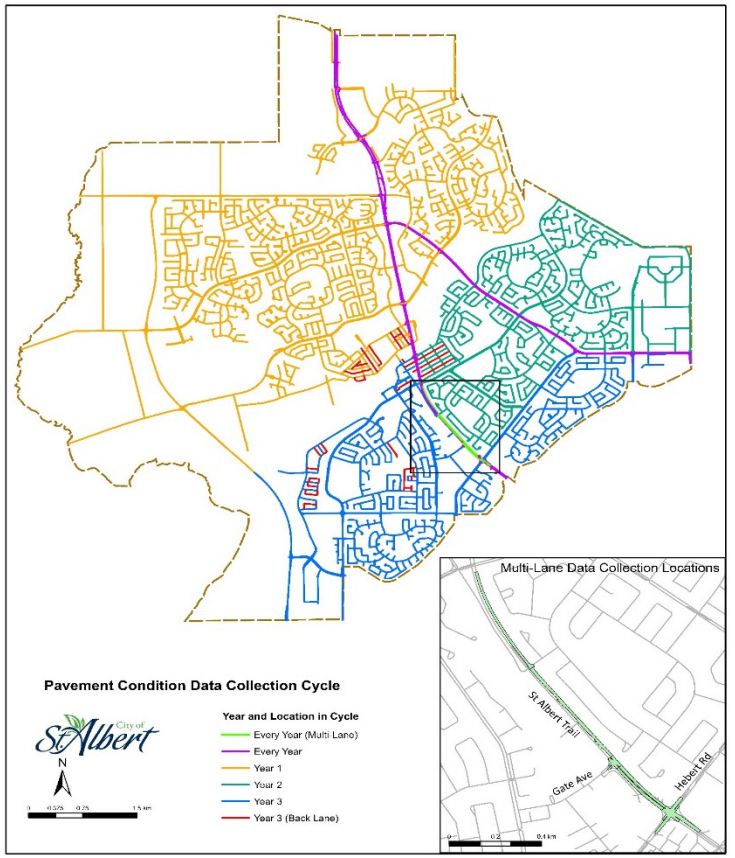
# Pavement Management

- When road work commences, it is typically to improve a combination of the following
  - Surface Regularity (i.e. smoothness)
  - Appearance
  - Water Drainage
  - Durability
  - Resistance to Rutting
  - Resistance to Cracking
  - Skid Resistance
  - Noise Reduction

**What Residents Most Notice**

# Pavement Management

- The City has a consultant collect data across the City in thirds

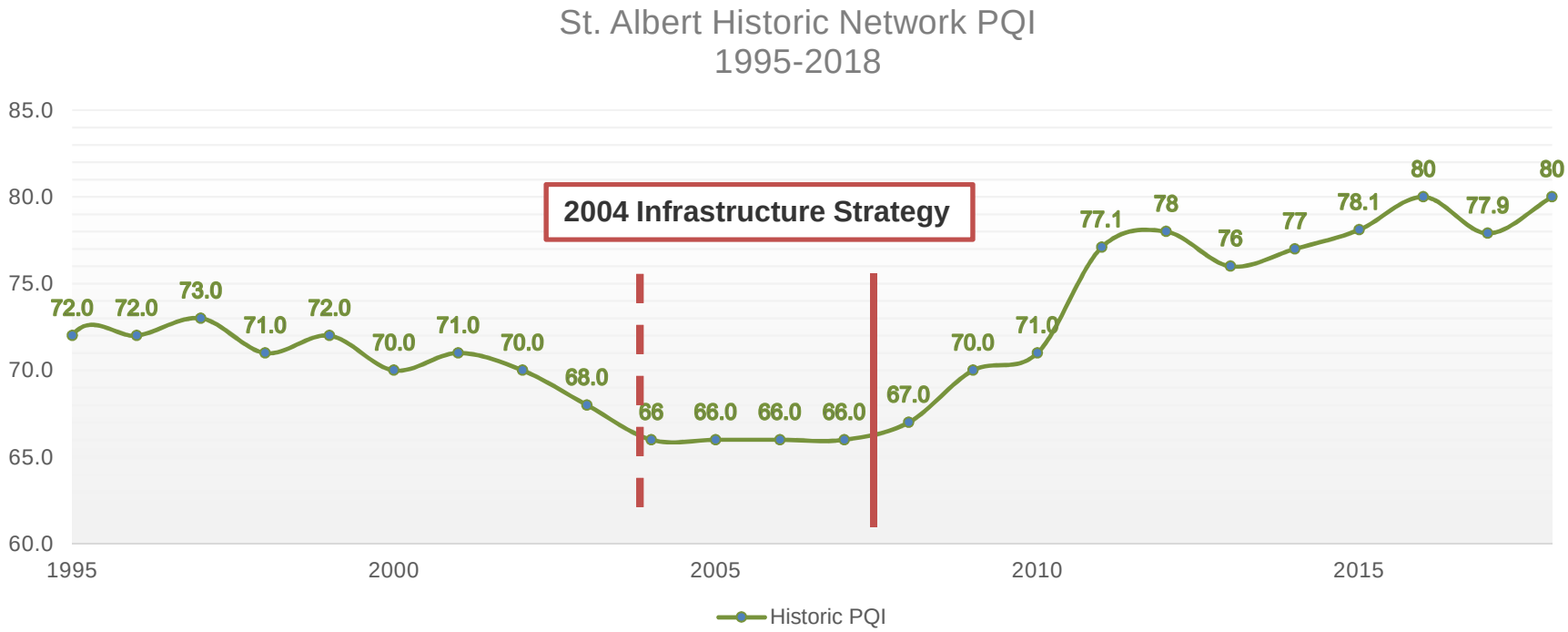


# Pavement Management

Quality Metrics

| | |
|---|---|
| Strength | SAI – Structural Adequacy Index |
| + | + |
| Bumpiness | RCI – Ride Condition Index |
| + | + |
| Cracking/Defects | SDI – Surface Distress Index |
| = | = |
| Reported Quality | PQI – Pavement Quality Index |

# Pavement Management



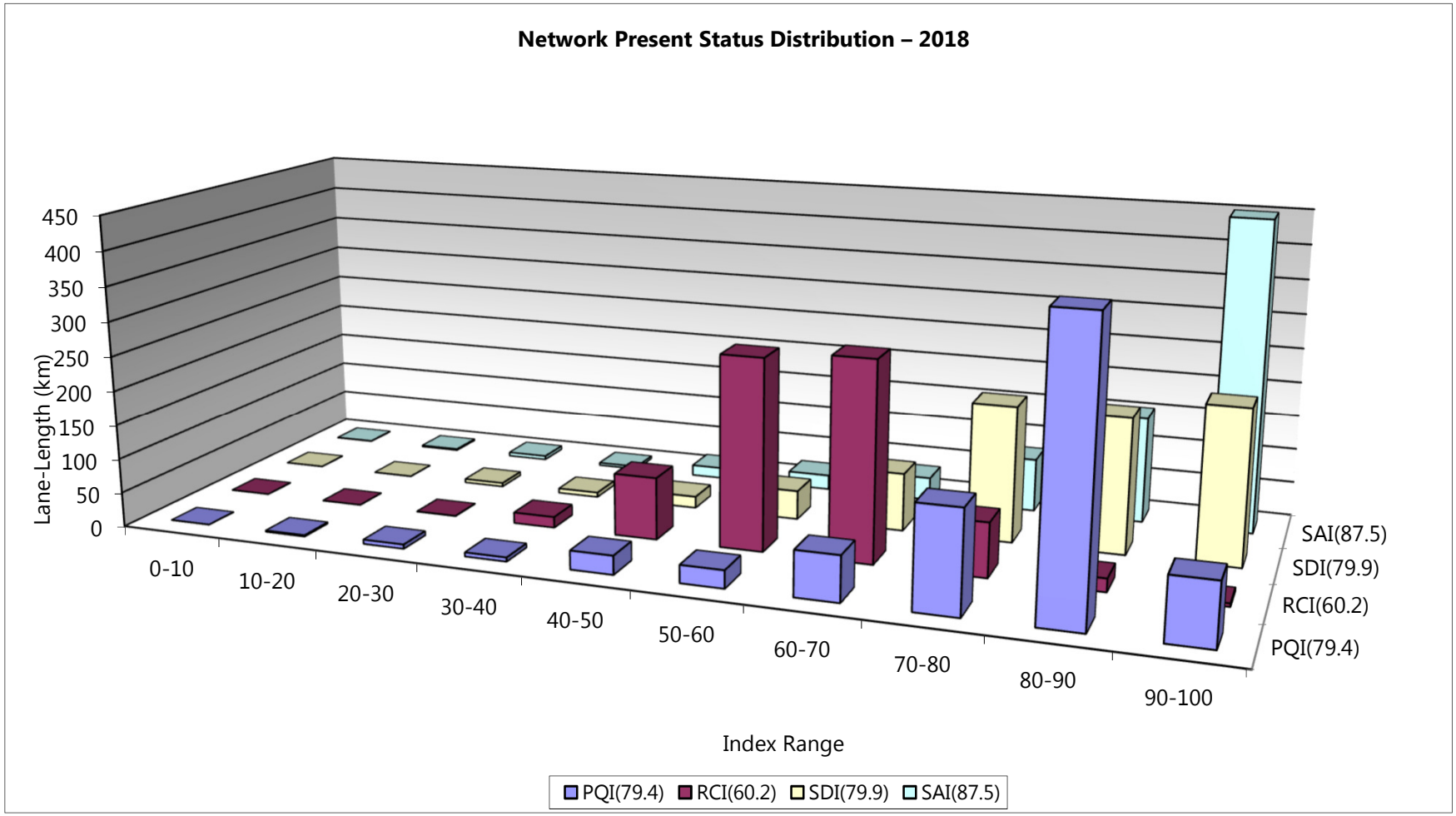
# Pavement Management

- For comparison, the Alberta Pavement Managers User Group conducted a voluntary survey of pavement indices across the province

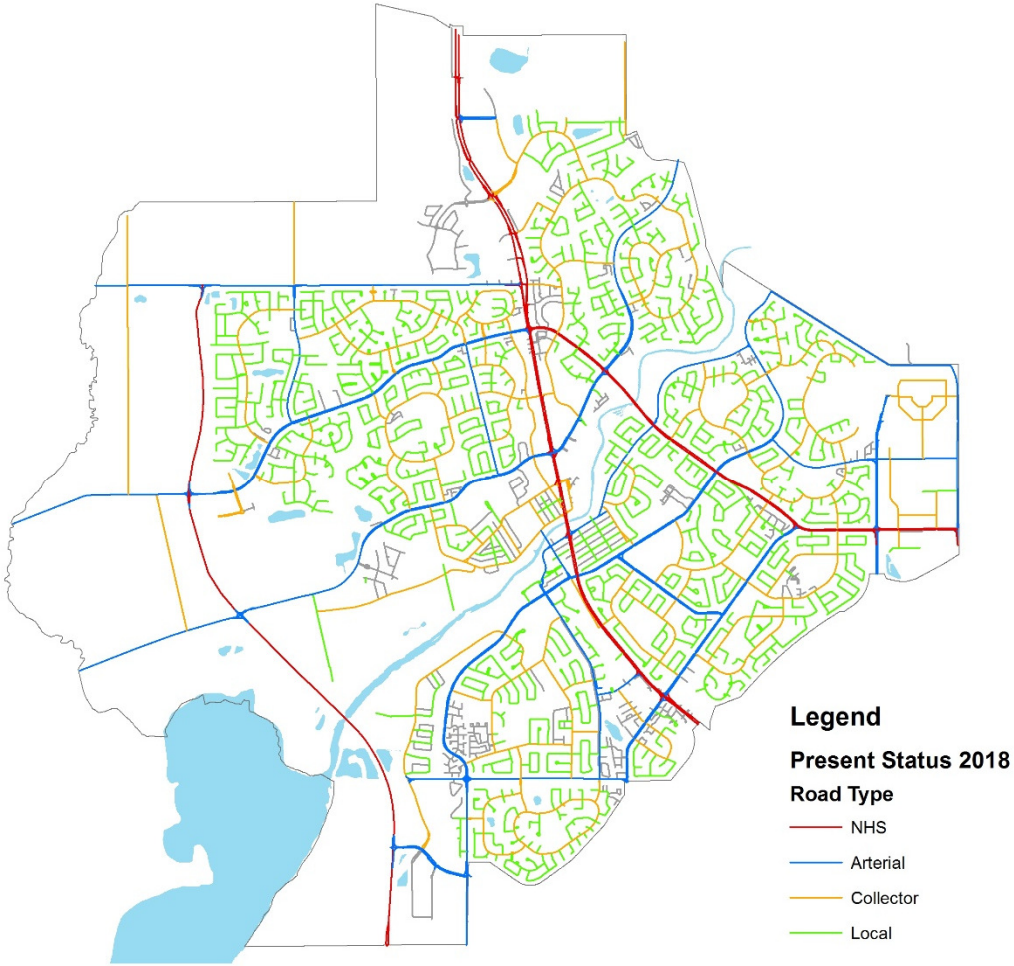
**Alberta Provincial Pavement Comparators [1]**

| Metric | PQI | RCI | SDI | SAI |
|---|---|---|---|---|
| Average | 64.9 | 51.7 | 65.3 | 66.7 |
| Median | 63.9 | 50.7 | 64 | 63.6 |

# Pavement Network Status

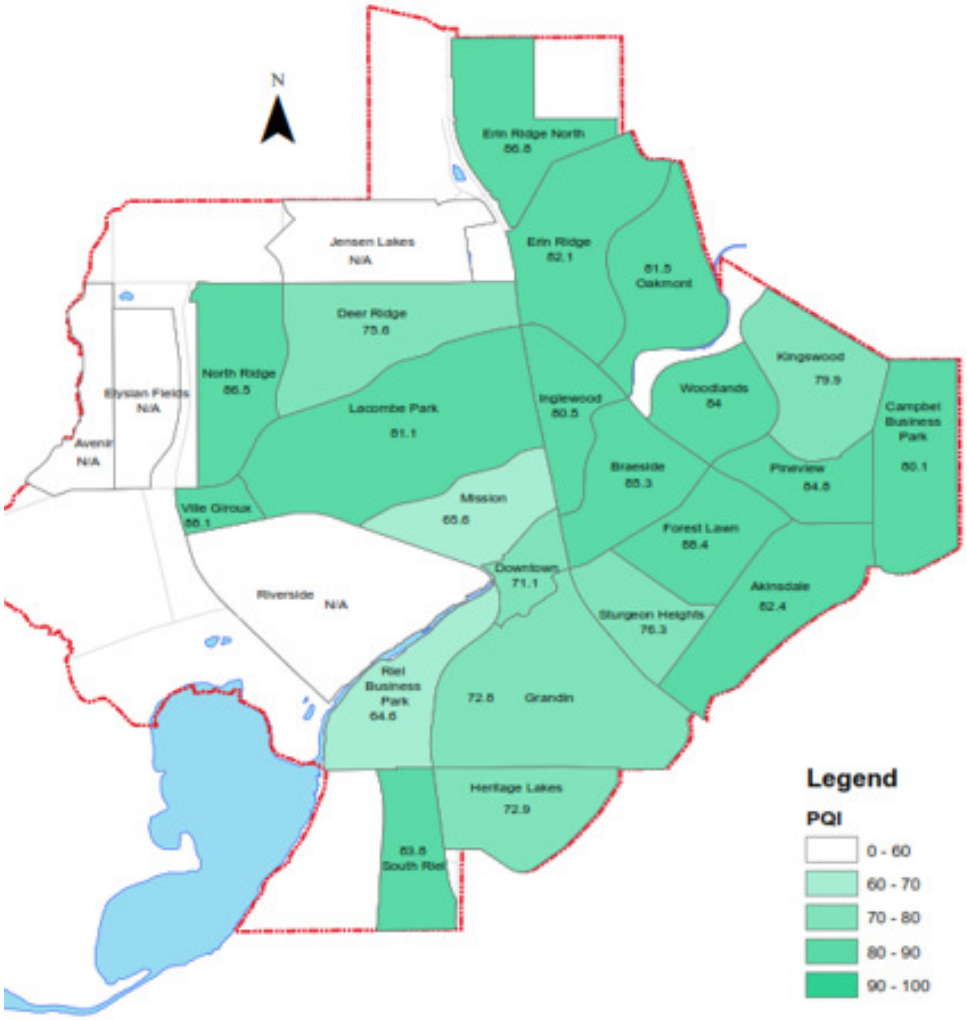


# Pavement Network Status

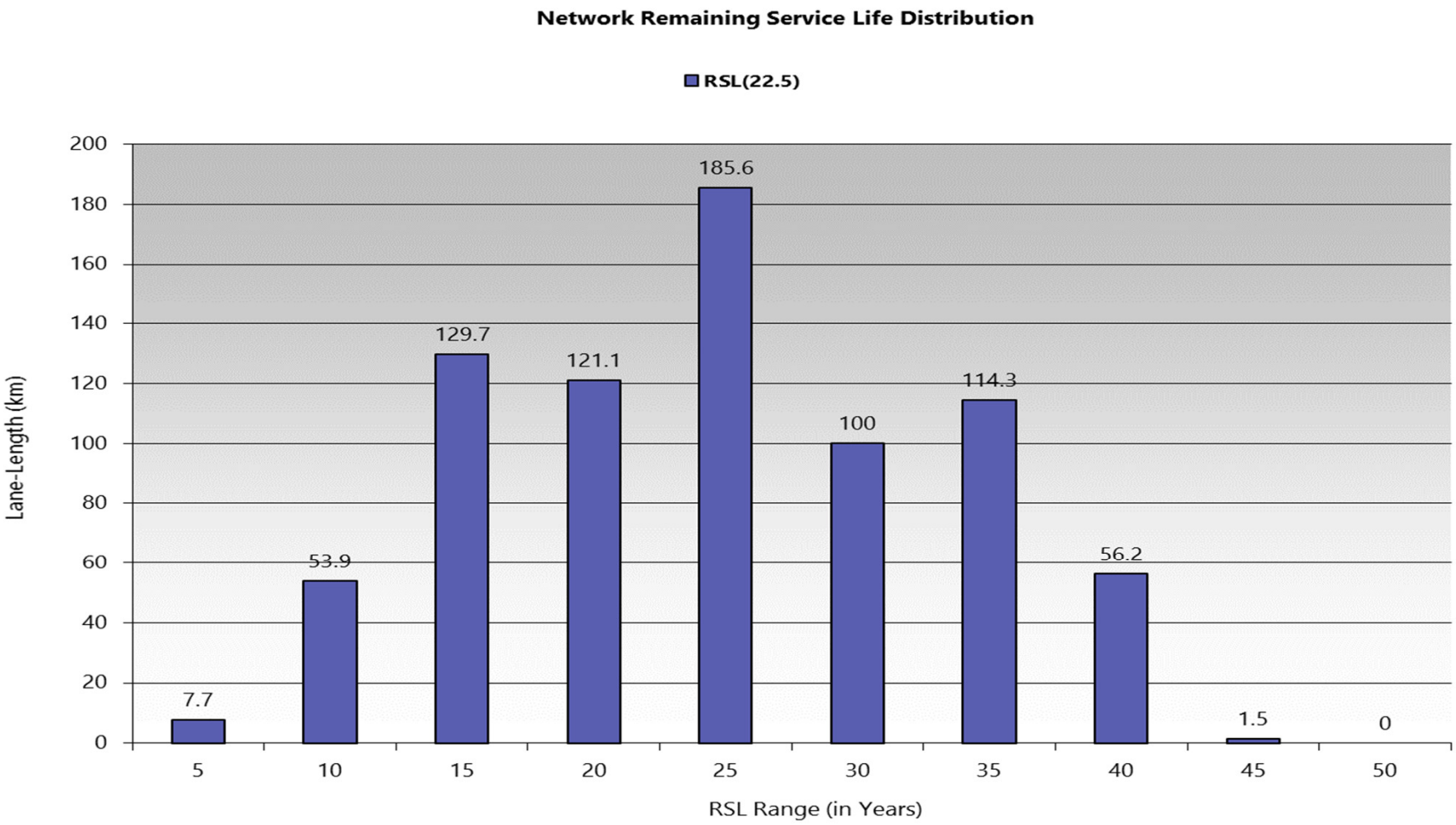



| | PQI | SDI | RCI | SAI |
|---|---|---|---|---|
| NHS | 79.2 | 80.9 | 67.8 | 78.3 |
| Arterial | 76.6 | 77.4 | 63 | 88.7 |
| Collector | 80.7 | 79.8 | 60.6 | 89.4 |
| Local | 78.5 | 78.9 | 56.5 | 88 |

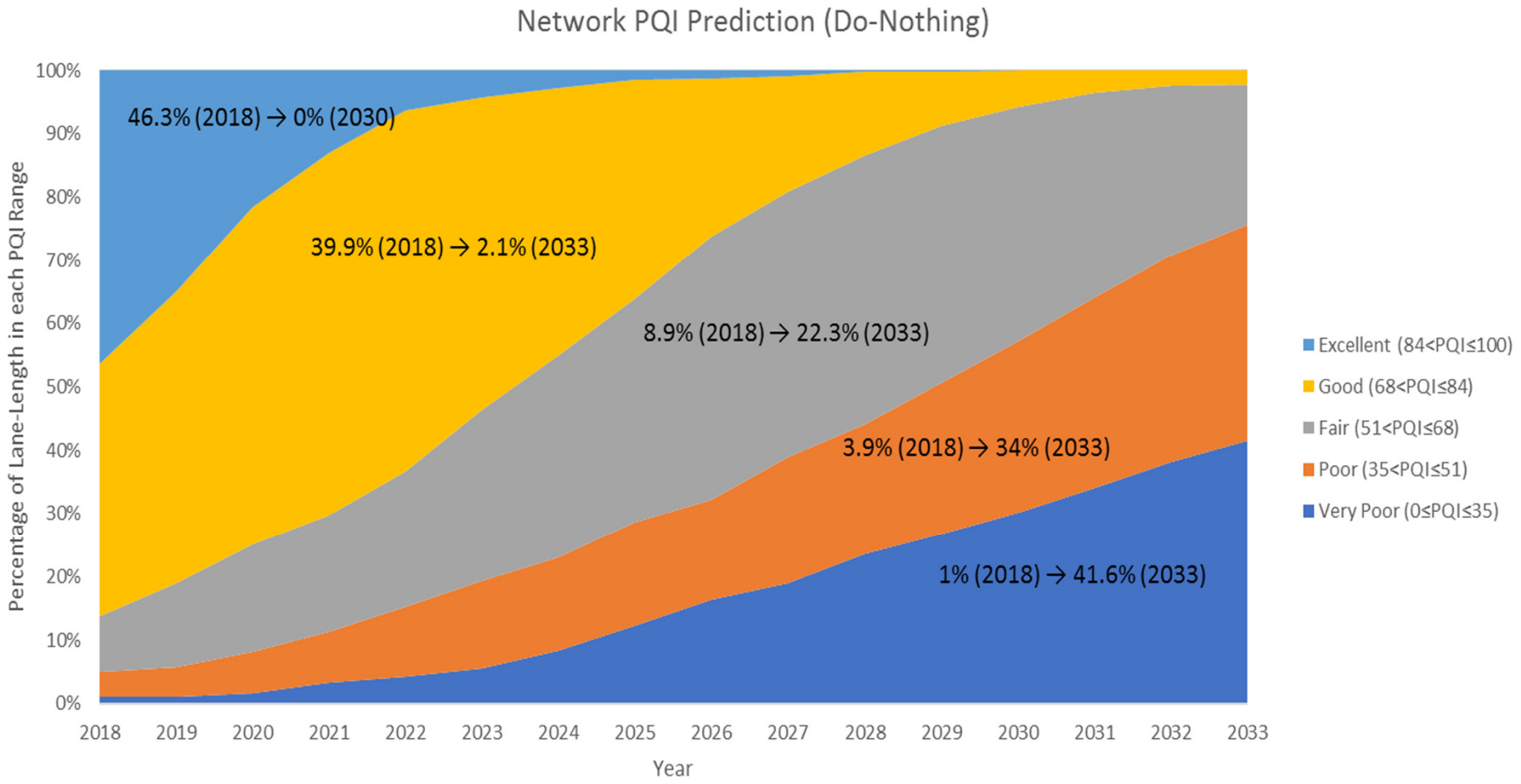
# Pavement Network Status



# Pavement Management



# Pavement Management



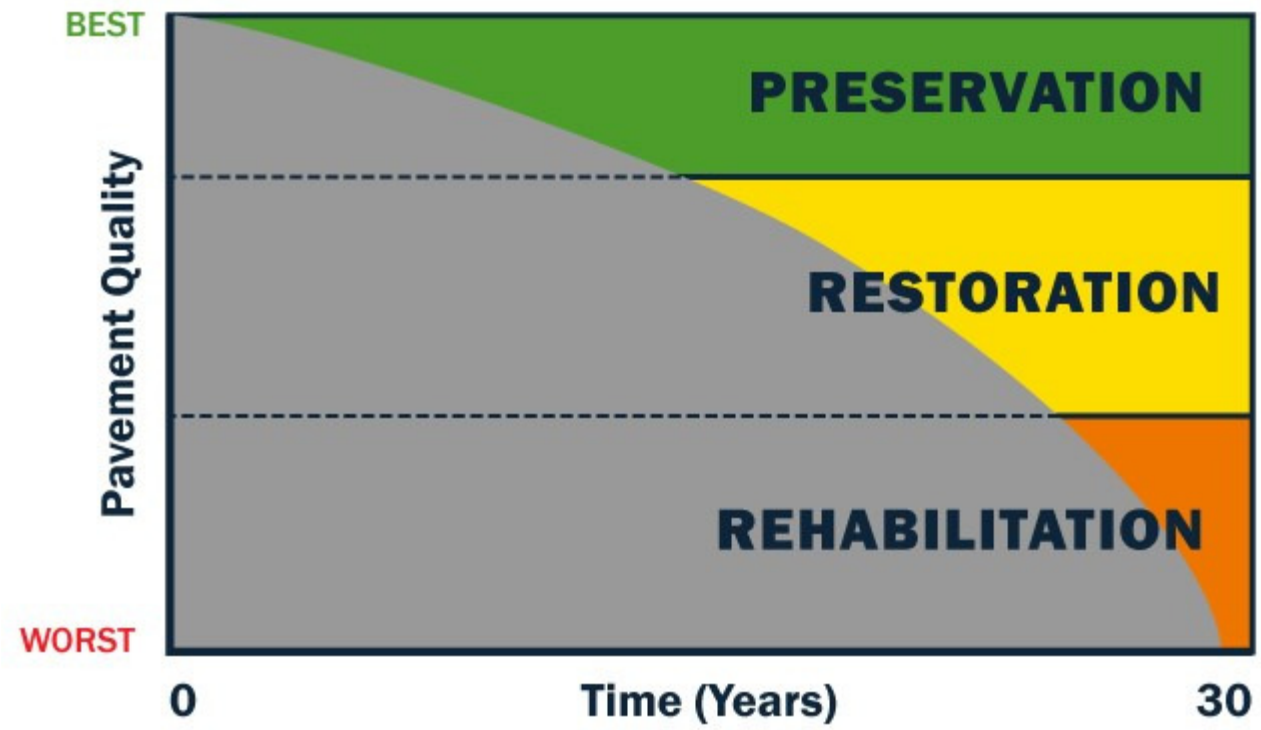
# Pavement Management

- From 2008 to 2015, the city invested heavily in 3 major treatments
  - Mill & Inlay ***(Formerly Mill & Overlay)***
    - Where a specified depth of asphalt is removed and replaced
  - Reconstruction
    - Complete road structure is replaced
  - Crack Sealing
    - Where cracks are sealed
- Additionally, new developments were built to better engineered specifications

# Pavement Management

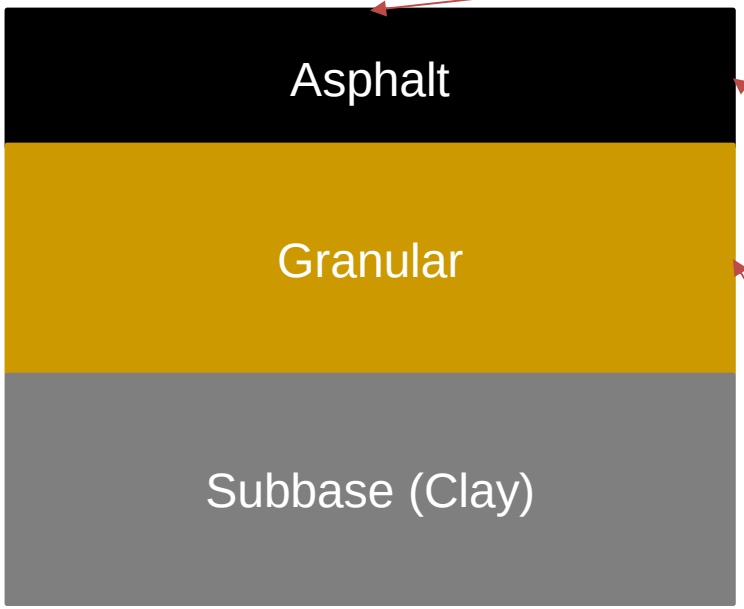
- After 2015, the City began using new asphalt technologies and by 2017 has split the programs into 3 categories
  - Preservation
    - Designed to maintain the current road's quality and extend the time until the next treatment.
  - Restoration
    - Restoration treatments are used when the road's quality has deteriorated past the point of preservation
  - Rehabilitation
    - Rehabilitation is used when the road is close or past the end of its lifecycle. When this occurs, there are very few other options except to reconstruct the full road.

# Pavement Management




St. Albert Treatment Chart [2]

# Pavement Management




**Preservation:**
**Adds to existing Structure**

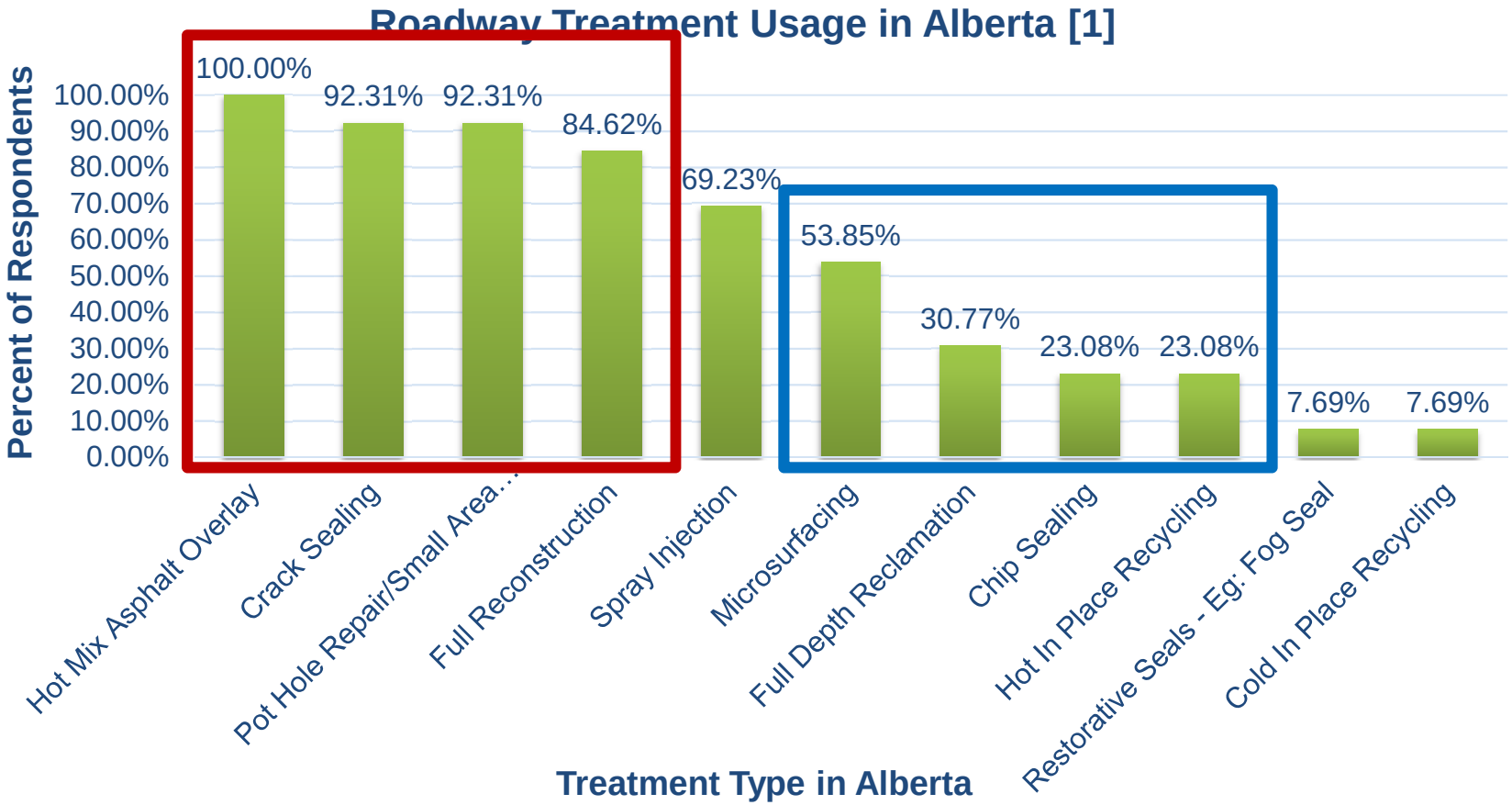
**Restoration:**
**Removes and replaces some or all of existing asphalt**

**Rehabilitation:**
**Removes or recycles some or all of existing structure**

# Microsurfacing

- Moving towards a preservation focused program means employing more microsurfacing
- Most residents are unfamiliar with microsurfacing and why the City uses it
  - This unfamiliarity is consistent across the province

# Microsurfacing



# Microsurfacing

- So why is the City using microsurfacing?
  - Cost efficient
  - Saves future funds
  - Extends pavement life
  - Increases friction
  - Decreases tire noise
  - Maintains current levels of service longer

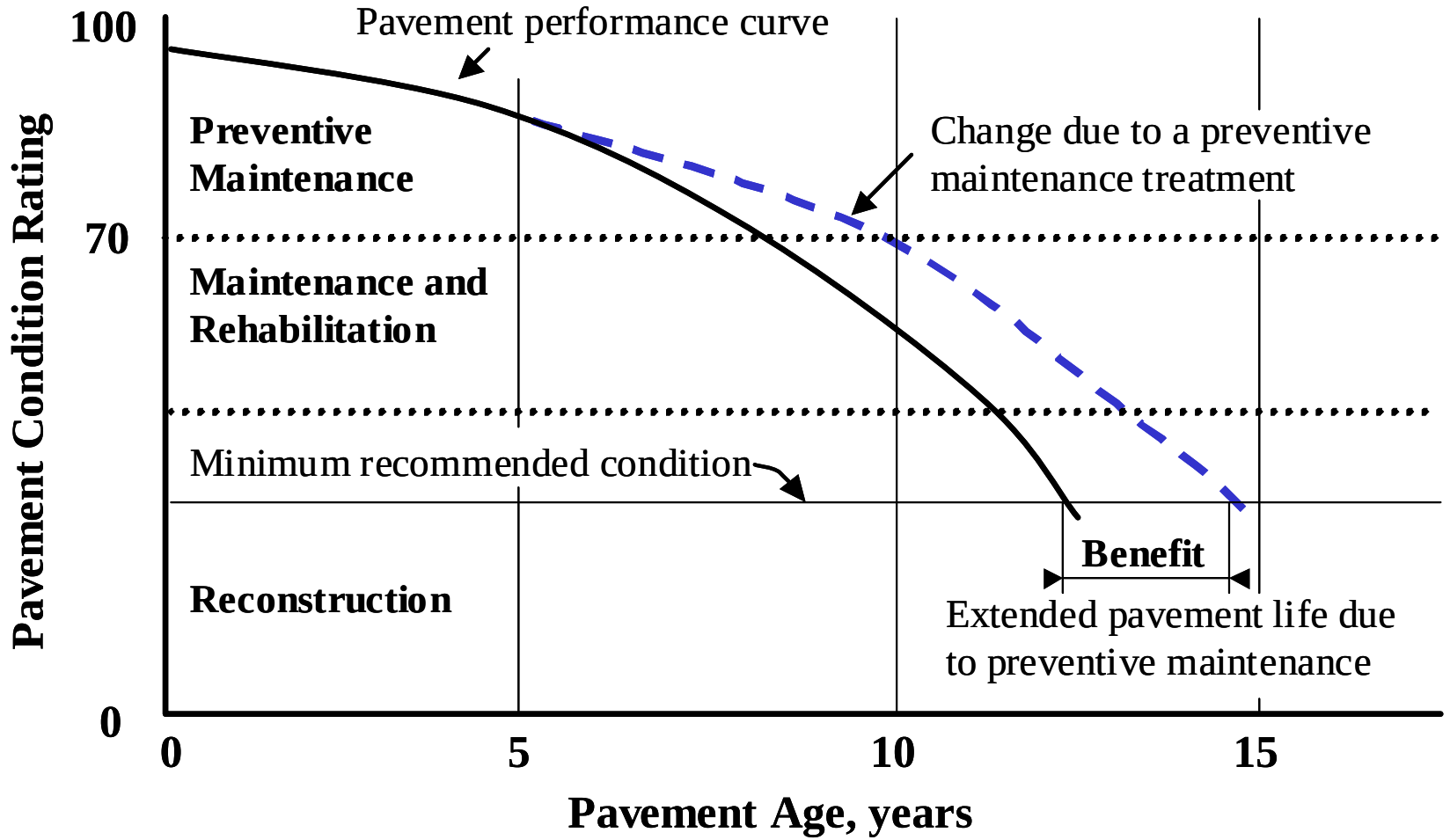
# Microsurfacing





**Microsurfacing on Bellerose Drive**

# Microsurfacing

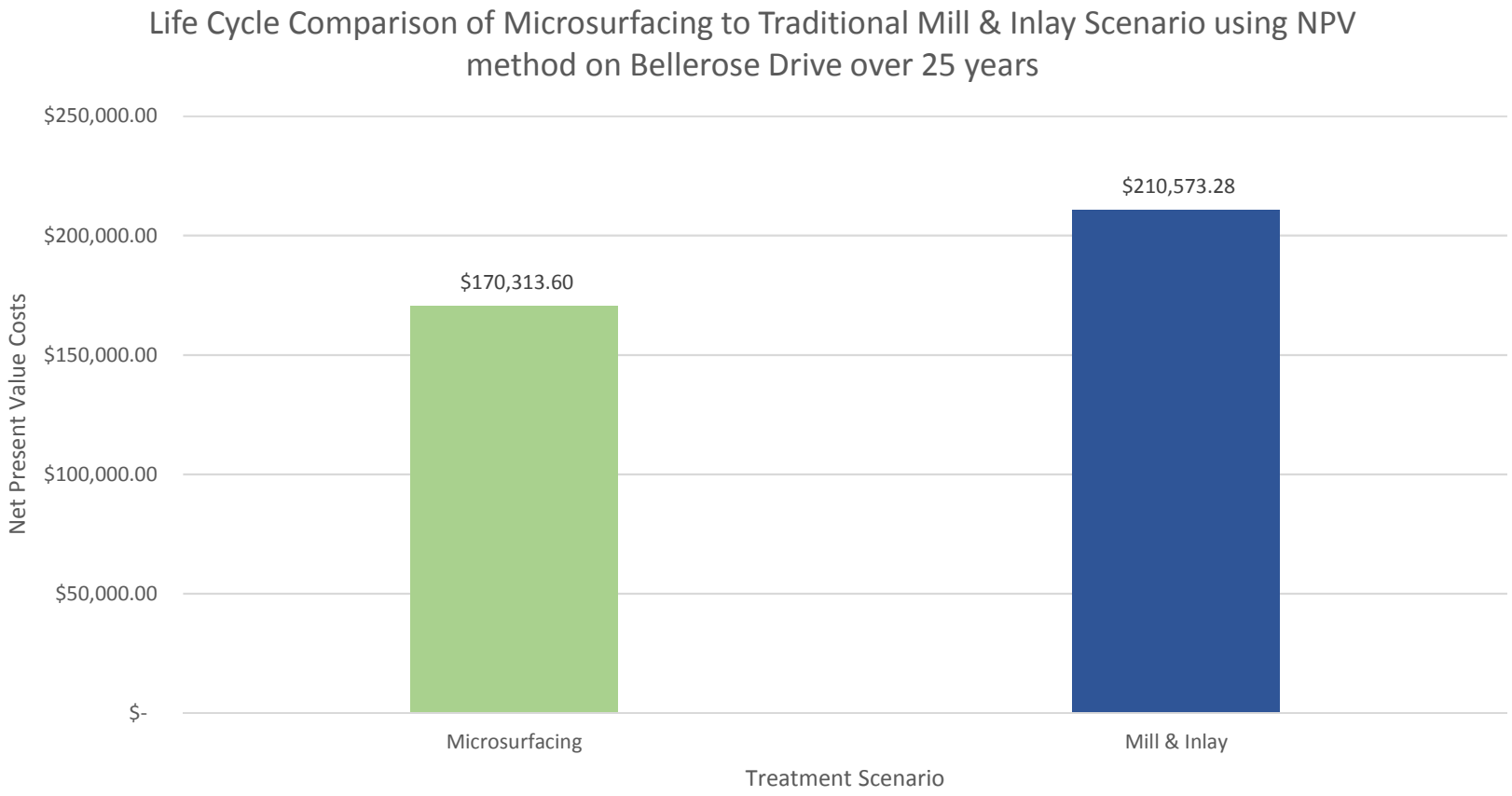



Treatment Performance [3]

# Microsurfacing

- In 2019, the City microsurfaced Bellerose Drive and received several questions about its cost effectiveness.
- To address this, a Net Present Value analysis was done comparing the use of microsurfacing to traditional mill and inlay strategies

# Microsurfacing

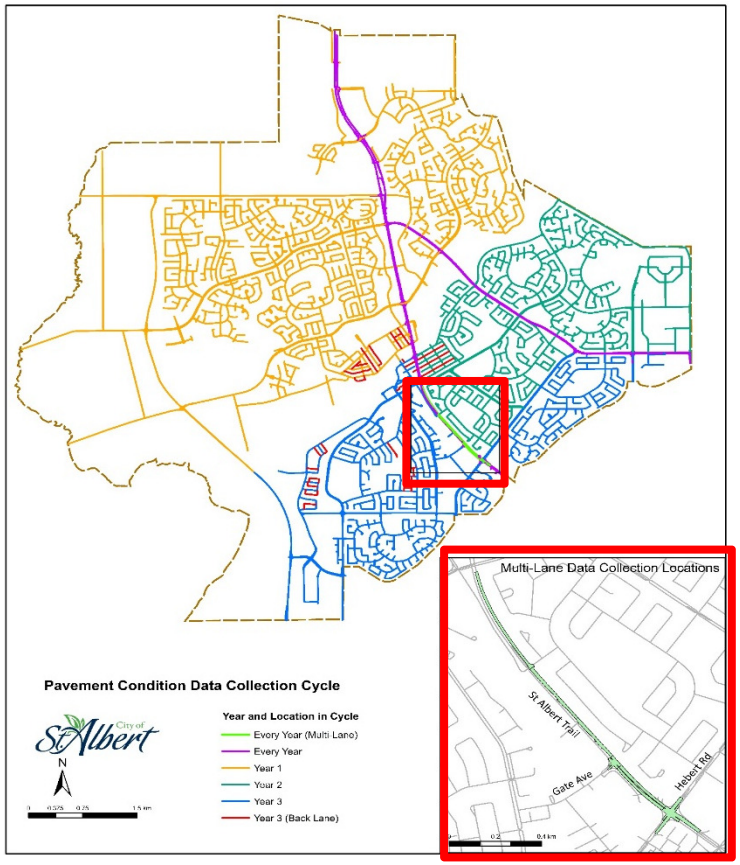


# Pavement Materials

- In conjunction with the City's improvements to it's pavement management approach; the City began researching additional properties associated with the new materials:
  - Stone Mastic Asphalt (SMA)
  - Microsurfacing
  - High Traffic (HT) Asphalt

# Pavement Test Section

- These materials were reviewed in a test section on SAT



# Pavement Test Section

**Aged Asphalt**



**HT Asphalt**



**SMA Asphalt**



**Microsurfacing**



# Pavement Test Section

- What has the City so far learned from this test section?
  - Microsurfacing reduces tire pavement noise by **2.7 dBA** and increases friction/skid resistance by as much as **15%**
  - SMA is very durable and has anti-stripping (**pot hole prevention**) properties and shows the **longest life expectancy**
  - HT asphalt provides **ease of installation and middle ground of costs** between materials

# Closing

- The City's pavement network is in a good position to take advantage of preservation practices
- New materials like microsurfacing are new to the community and residents will have questions
- The City is investing in stronger, more durable asphalts when considering restoration/rehab programs
- The City is engaged in ongoing research and iterative improvement to make best use of road technologies

# Sidewalk Management

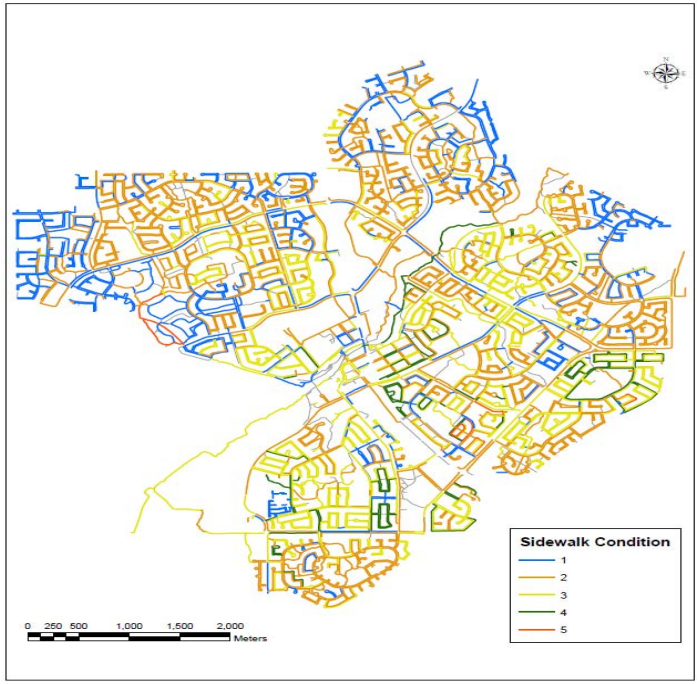


# Sidewalks

- Sidewalks and Trails in St. Albert
  - ~450 CL kms of Sidewalk
  - ~70 CL kms of trails
- Maintenance and repairs are shared between Public Works and Engineering
  - Condition rating and capital planning is done by Engineering

# Sidewalks

- The City of St. Albert began doing complete assessments of it’s sidewalks in 2011.



# 2013 Assessment

- In 2013, the City opted to develop their own internal guidelines and data collection methods
  - Would help develop consistency in rating across organization
  - Create an in-house knowledge set
  - Done using previously purchased “off the shelf” technology and software

# Sidewalks

- This assessment had two main phases:
  - Research and develop the criteria
  - Assess the network before end of summer
- Was able to complete the work by August 2013

# Sidewalks - Deficiencies

- Distortions
  - Distortions are when the slabs have begun to move independently from one another. This may include joint displacements, heaves or dips, crack displacements or tree roots.
- Defects
  - Defects are when loss of material from the slabs has been noticed. This may include potholes, popups, edge loss or presence of utilities (such as valves).
- Surface Conditions
  - Surface conditions are when an issue is affecting the walking surface itself. These include spalling, vegetation cover or pooling of water.
- Cracking
  - Cracking is when a slab has broken or failed. The types of cracks that were assessed were longitudinal, transverse and corner cracks.

# Sidewalks - Conditions

**Sidewalk Assessment Condition Ratings**

| Condition Rating | Description |
|---|---|
| 1 | New and uniform |
| 2 | Slightly used, weathered, fairly uniform |
| 3 | Issues may be present, aged, weathered – acceptable state |
| 3.5 | Imminent Repairs – acceptable state |
| 4 | Repairs required in section |
| 5 | Priority repairs in section |

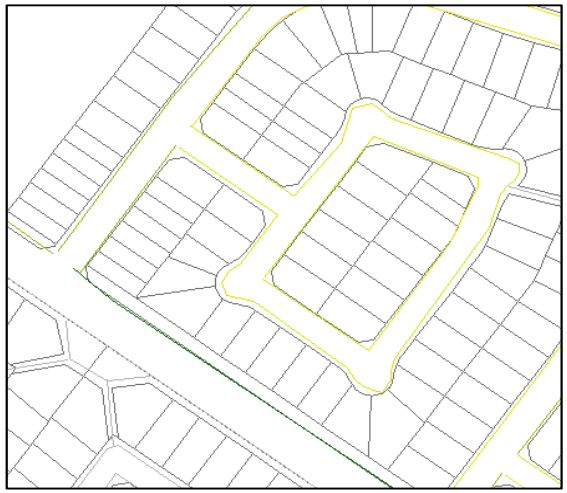
# Sidewalks



**Sample Photo of Data Collector (2013)**

# Sidewalks – 2013 Program

- Foundation of current program
- Trimble GPS device
- Condition rating assigned to each street



**2013 Sidewalk Assessment Condition Rated Street**

# Sidewalks – Sidewalk Update

- In 2016 the City opted to do a full reset of it's data with lessons learned from the 2013 data collection

# Sidewalks – Sidewalk Update

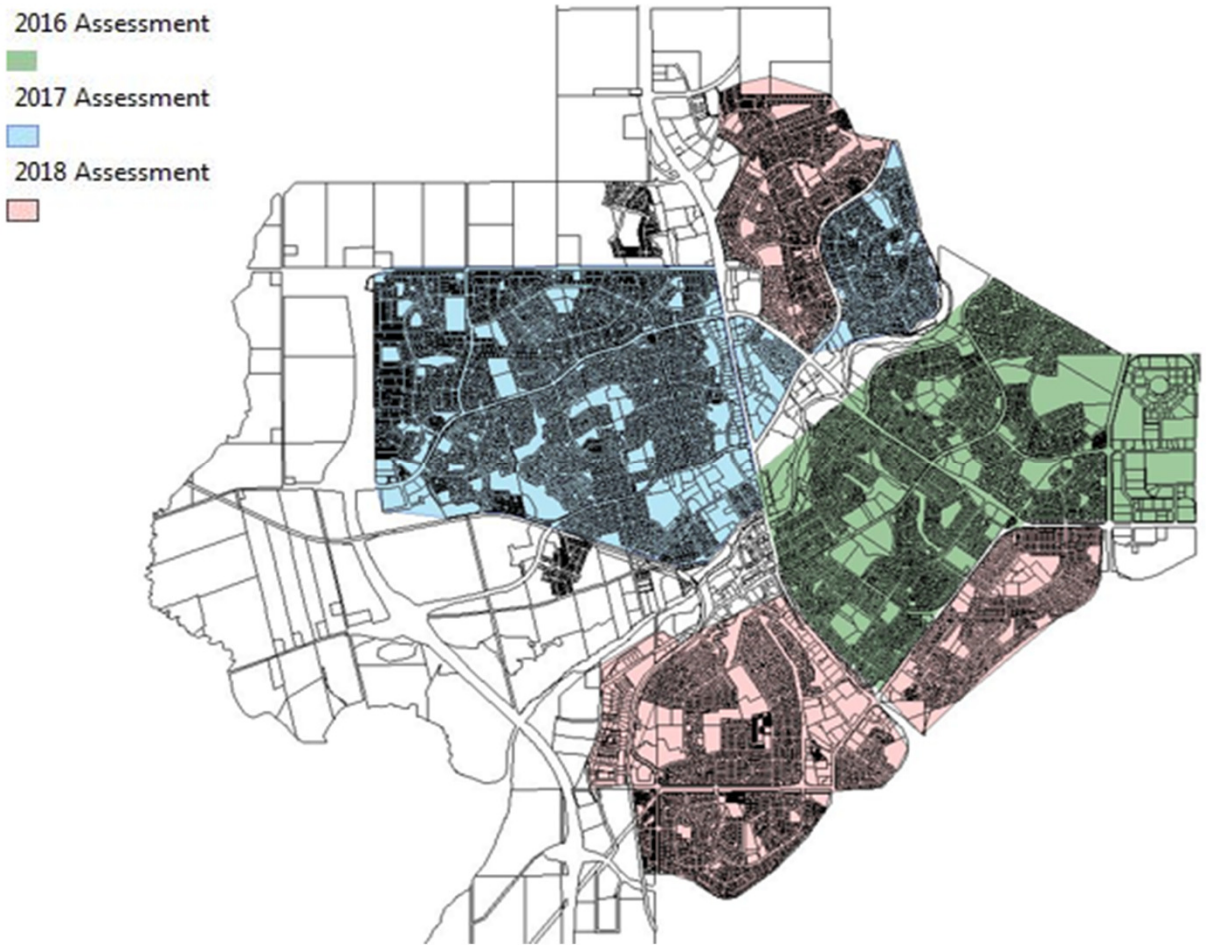
**Comparison between 2013 and 2016-18 sidewalk assessment programs**

| 2013 | 2016-2018 |
|---|---|
| 1 Year | 3 Years |
| Quick review of entire city | Detailed analysis |
| Less data | More data |
| Entire street given condition ratings | 10 m segments given condition ratings |
| Trimble GPS device | iPad Mini 4 |

# Sidewalks – Sidewalk Update

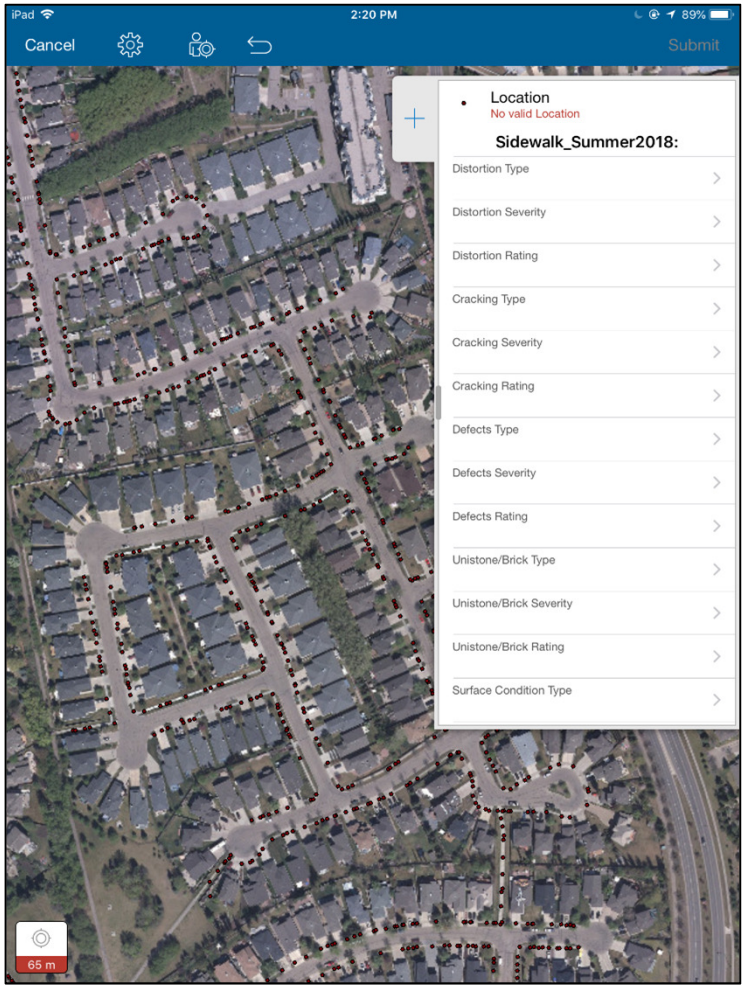
- To accomplish these goals, the City invested in new technology for GIS
  - Split City into 1/3 segments
  - Used ESRI Collector App
  - Purchased an iPad Mini to do assessment

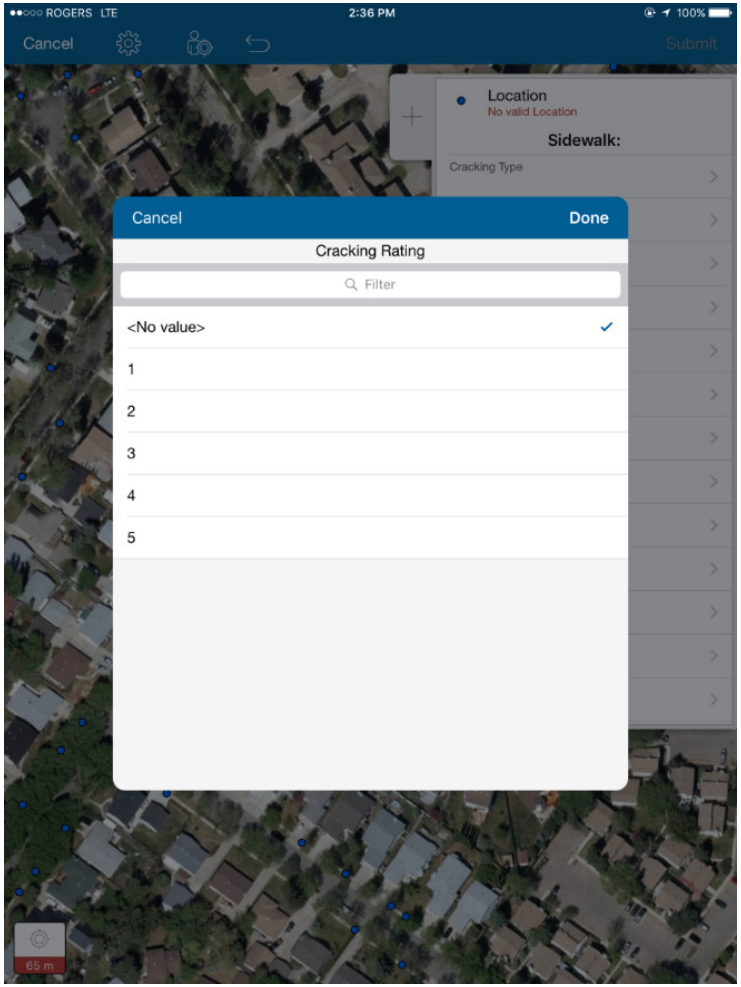
# Sidewalks - App




**Overview of Sidewalk Condition Rating in St. Albert**

# Sidewalks - App




**Screenshot of ArcGIS Collector App**

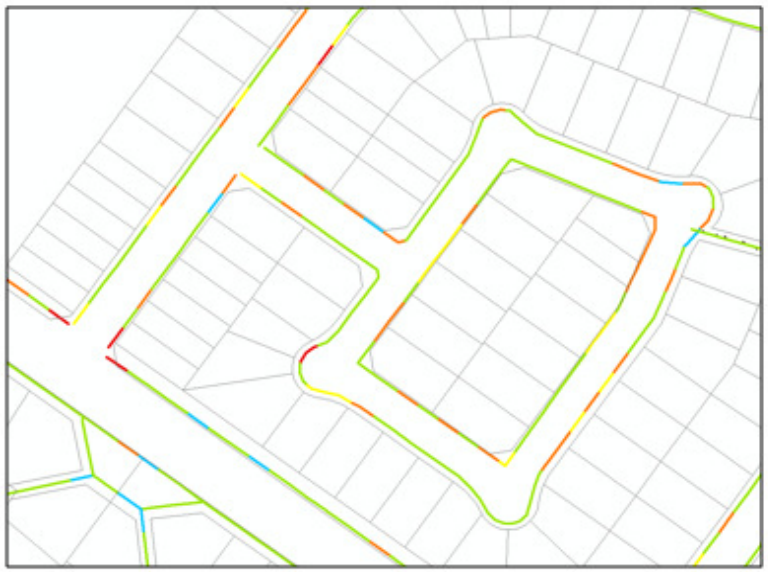
# Sidewalks - Analysis

- Analysis
  - 10 meter sidewalk segments (6 panels)
  - Points grouped by nearest 10 meter segment
  - ArcMap points transferred to Excel
  - Algorithms condition rate (1-5) the segments

# Sidewalks - Analysis



Individual points



Conditioned line segments

Legend:
- 1
- 2
- 3
- 3.5
- 4
- 5

# Sidewalks - Results

- How much data was collected?

**Summary of Sidewalk Points Collected Per Year**

| Year | Est. Kms Walked | Data Points Collected | Neighborhoods Rated | Average Points per km |
|---|---|---|---|---|
| 2016 | 127 | 32,000 | 7 | 252 |
| 2017 | 167 | 56,000 | 5 | 335 |
| 2018 | 133 | 47,000 | 7 | 353 |
| Total | 427 | 135,000 | 19 | Average: 314 |

# Sidewalks - Results

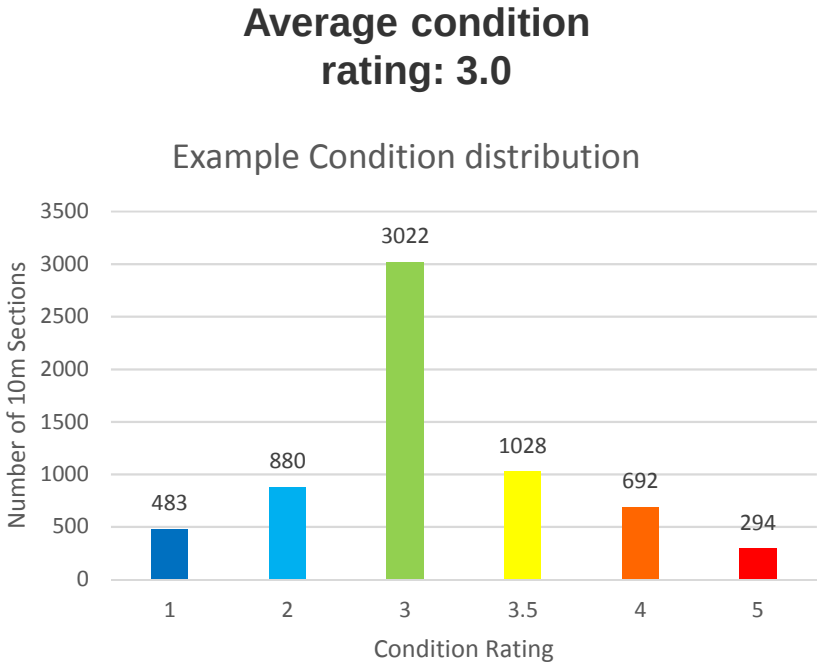
- The following are sample results of what the City can now export in detail:
  - Overall Neighborhood Statistics
  - Overall City Condition Map
  - Trip Hazard Maps

# Sidewalks - Results

- Sample Neighborhood

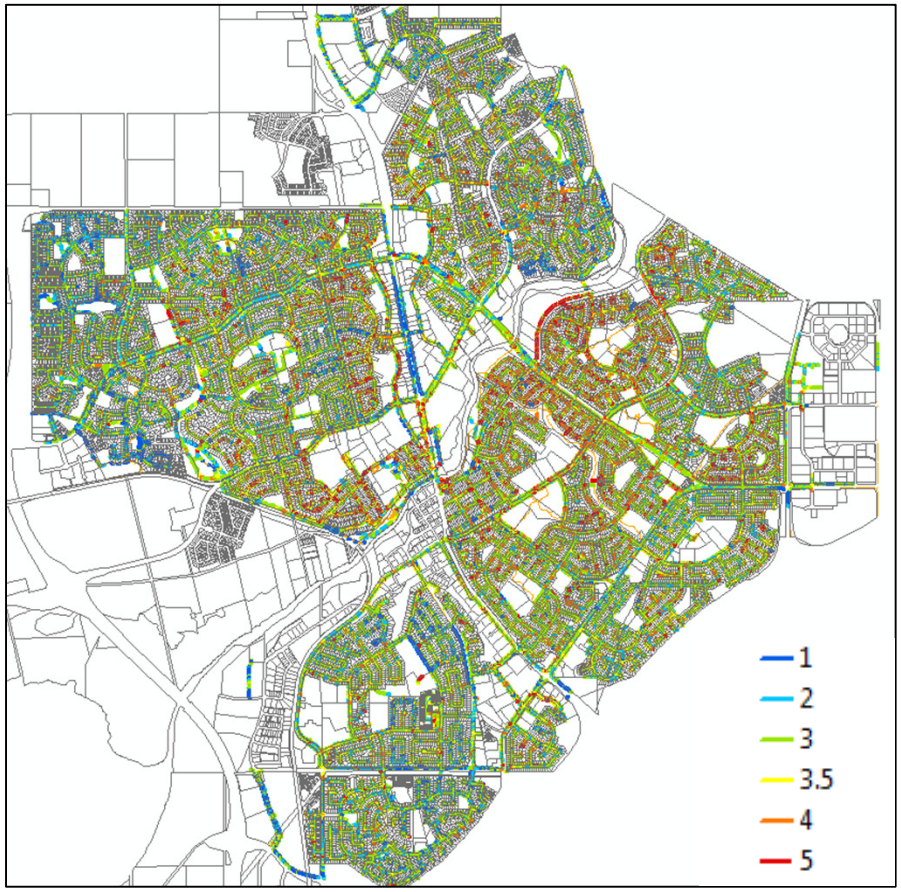



**Condition Map of Sample Neighborhood**




**Condition Distribution**

# Sidewalks - Results



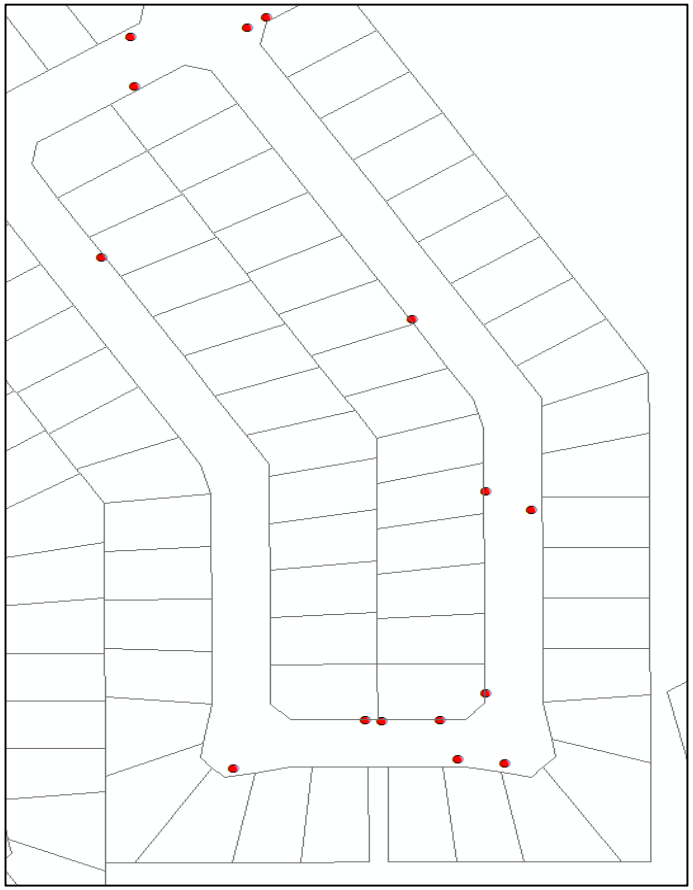

Condition rating of St. Albert with parcels




Condition rating of St. Albert excluding parcels

# Sidewalks - Results

- Number of shave-able trip hazards: 1013
- Number of trip hazards: 2035
- Percentage of shave-able trip hazards: 49.8%

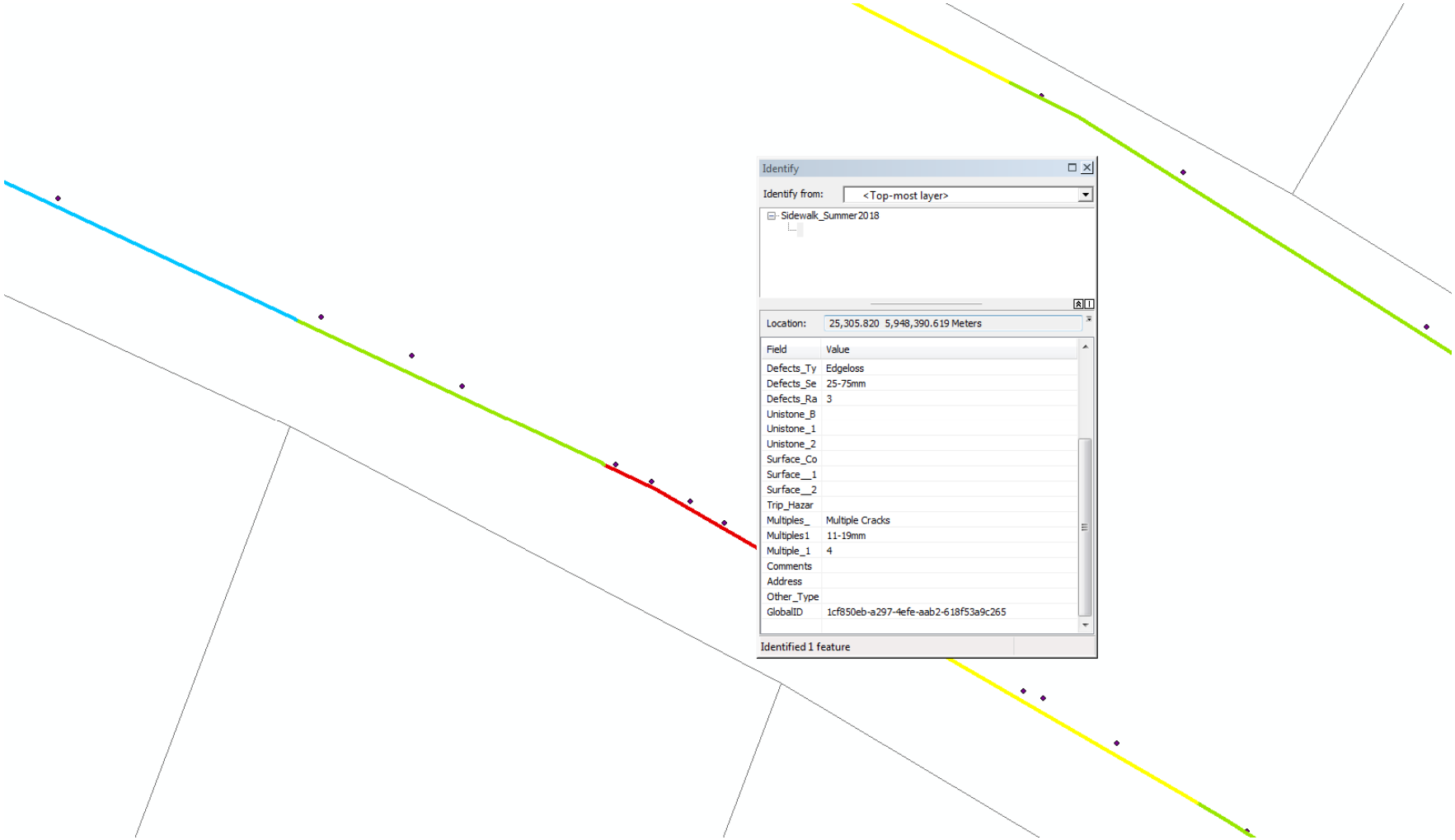


**Trip hazards in a neighborhood**

# Sidewalks - Results



# Sidewalks - Results



# Sidewalks - Results



# Sidewalks - Results



# Close

- The City of St. Albert has built it's own internal rating system using GIS
- While the results are promising and provide condition data around the network more work is needed in the following areas:
  - Continued ground truthing and calibration
  - Continuous accumulation of work history data
  - Development and Implementation of a "priority" index to complement and direct condition data

# Questions?

Thank you for your time.

# References


- [1] “A Study on Pavement Network Condition and Reporting in the Province of Alberta Through a Questionnaire Survey”, ***Newstead, Hashemian, Bayat***, TAC, Regina SK, 2018
- [2] City of St. Albert, “Road Treatments”, 7 June 2019 [Online], Available: https://stalbert.ca/dev/construction/transportation/road-repairs/
- [3] Hein, D. 2008. Life-Cycle Costing for Innovative Pavement Preservation Treatments—How to Know if the Investment Is Worth It. 2008 Pavement Rehabilitation and Preservation Workshop. Ontario Good Roads Association, Ontario