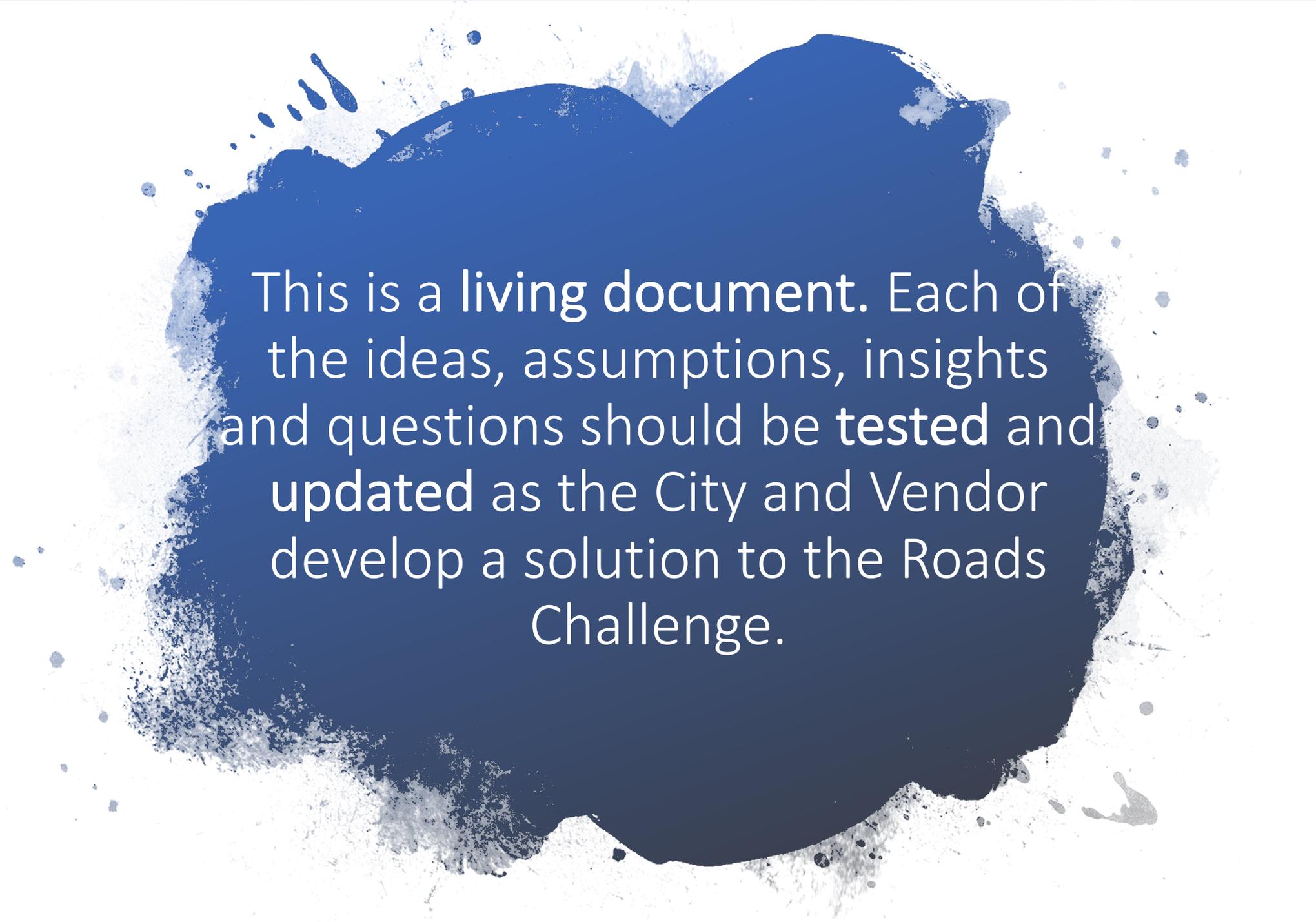# Road Data and Decision-Making

A Learning Guide for the MIX Challenge

This document was created to support the Asset Management team in planning for, selecting, and working with vendors for the "Road Monitoring Challenge."

This is a **living document.** Each of the ideas, assumptions, insights and questions should be **tested** and **updated** as the City and Vendor develop a solution to the Roads Challenge.

How Do We Currently Understand the Challenge?

- Roads deteriorate in increasingly unpredictable ways (climate change, road traffic volume)

- The current costs, range and frequency of data limit the accuracy of forecasts about how roads will deteriorate

- Forecasts are based on manual modelling

- Therefore, the Asset Management team believes collecting more data points, more frequently will significantly improve the accuracy of long-term capital planning for roads.

What Does Success for this Challenge Mean?

We need….a solution that adds new data points and increases frequency of data collection

We'd like… a solution uses this additional data
- to improve forecasting of road deterioration and/or
- to increase the granularity of road analysis

It would be amazing if…a solution uses the forecasted road conditions to recommend (and learn about) optimal road treatments
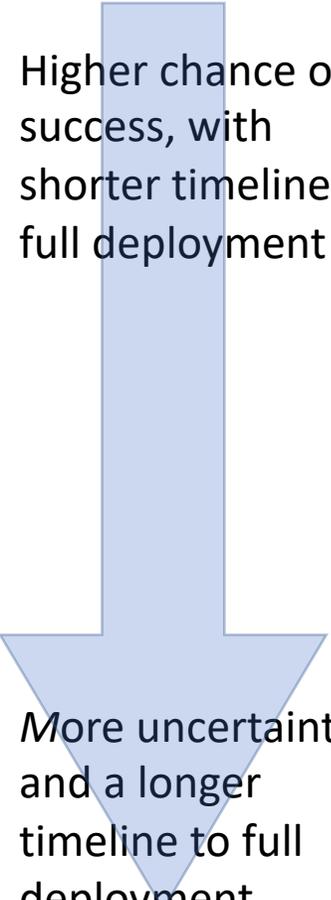
Higher chance of success, with shorter timeline to full deployment

*More uncertainty, and a longer timeline to full deployment

What Else Do We Know?

- **Asset Management is the primary user and beneficiary of any solution.** Operations are stakeholders, and *might* use the solution, and *might* benefit directly

- **Integrated planning across asset classes is NOT part of this challenge,** however solving this challenge could demonstrate a useful approach to integrated planning.

- **Data and optimized decision-making can *help* average road conditions**, but additional funding for repairs is the primary driver of improvements in average road conditions (average PCI)

Summary of Research Insights

1. Engaging residents can generate positive democratic and operational benefits, but relying solely on resident data could exacerbate inequality

2. Data analytics and artificial intelligence are not infallible - they can be subject to biases, although infrastructure projects are, in general, likely to be have lower ethical risks

3. Road conditions are a common concern for Canadians in general and for Guelph residents specifically, but the City would probably need to track and publicly report road quality in order for any improvements to register with residents

4. The bar for municipal liability in personal injury or car damage claims is reasonably high, but real-time tracking of road conditions has led to more personal injury claims (and more payouts) in Toronto

1. Will the solution engage residents?

Engaging residents can generate positive democratic and operational benefits.

Data sharing arrangements could unlock crowd-sourced data.

Different residents will participate in different ways.

Relying solely on resident data can exacerbate inequality.

Combining data gathering methods can mitigate selection bias.

There have been some challenges with residents' reporting in Toronto.

2. Will the solution include data analytics?

Solutions could be predictive (what will roads be like in future) or prescriptive (what should we do about it)

Kansas City, Missouri is a useful case study

There are tools that can help you assess "data readiness" for data-driven projects

Will you need more data?

Could you gather additional data internally? .

2.1 Data analytics continued

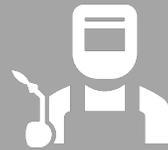The technology is not infallible, and can be subject to biases

Ethical risks are likely to be low.

This is a useful 5-step approach to data projects.

2.2 Will the solution involve artificial intelligence?

Good AI practice includes an open data policy.

Will A.I. lead to job displacement?

Job training can mitigate job displacement.

3. Do improvements in road quality translate to increased resident satisfaction?

Guelph residents are less satisfied with roads than other City services.

Roads could influence voter decisions.

Cities need to report on performance to affect resident perceptions.

Kansas uses their "Citizen Survey" to track resident satisfaction.

Daryush believes "We would need a lot of investment to improve the roads that substantially (10% increase in satisfaction). I am suggesting 10 years, which will be slightly more achievable."

4. Could the solution lead to increased claims for personal injury or vehicle damage?

Could better tracking lead to increases in claims and payouts?

Will the solution also track sidewalks?

There is a high bar for Municipal liability.