

Data-Driven, Crowdsourced Road Surface Conditions

Presentation to TAMC



Introduction

Detroit

- Sam Krassenstein (CoD)
- Tom Bruff (SEMCOG)
- Ed Hug (SEMCOG)

Tactile Mobility

- Vered Mandelboum Josef (COO)
- Yagil Tzur (Head of Product)
- Eitan Grosbard (VP Business development)



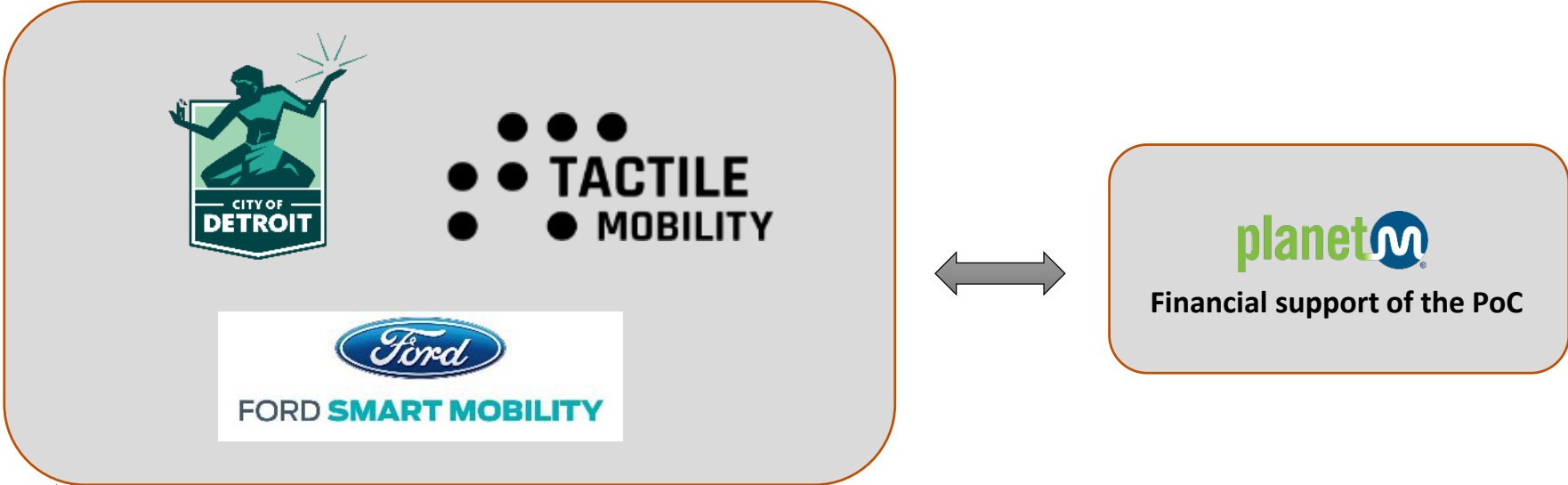
Agenda

- PoC background
- City motivation for participating
- About tactile mobility
- PoC's targets, scope and technology
- Correlation with PASER, working with SEMCOG
- How City is using the data
- City vision for using data in pavement management
- Proposal for pilot



Background

Detroit, Ford, and Tactile Mobility joined forces to showcase a collaboration for using tactile data for maintenance decision making process



City Motivation

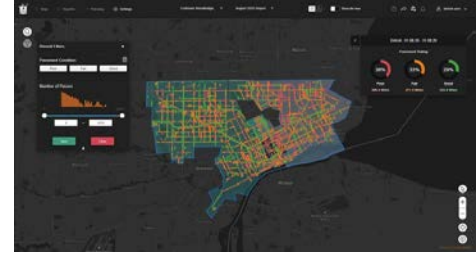
- Increase frequency and coverage of road condition data across city on both major and residential roads
- Improve accuracy of condition data by using objective system
- Identify priority repair areas based on areas of deficiency that drivers are most experiencing
- Use pavement data in long-term capital planning and short-term maintenance planning



Tactily Mobility overview



About Tactile Mobility






- Tactile Mobility is a software-based tactile sensing and data solutions.
- Our solution generates insights measuring vehicle-road dynamics with an emphasis on characterizing road conditions such as grades, banks, curvatures, slipperiness, and the locations of distresses.
- The software serves as a mapping layer that offers a near real-time view of the road network to support maintenance, live hazard detection, and post-accident analysis.



TACTILE MOBILITY – Snapshot

	<ul style="list-style-type: none"> ▪ Israeli based ▪ Founded in 2012
	<ul style="list-style-type: none"> ▪ 20M+ Kms logged ▪ 150K+ trips logged
	<ul style="list-style-type: none"> ▪ 6 OEMs (2 OEM with long-term commitment) ▪ Circa 15 PoC with OEMs
	<ul style="list-style-type: none"> ▪ 2 Road Authority Design Partners ▪ 3 cities fully mapped

	<ul style="list-style-type: none"> ▪ ~30 employees ▪ 20 engineers – top talents
	<ul style="list-style-type: none"> ▪ 7 patents ▪ Additional patents in process
	<ul style="list-style-type: none"> ▪ Production of Aftermarket units ▪ >1,000 units installed



Recently announced


newsroom
The Media Portal for Porsche

Products | Company | Technology | Digital | History | Sport & Lifestyle | Sustainability | Motorsports

Porsche Newsroom / 2019 / Company / Porsche invests in Israeli start-up Tactile Mobility

Porsche invests in Israeli start-up Tactile Mobility

10/29/2019 Porsche is intensifying its collaboration with Israeli technology company Tactile Mobility with a minority investment. The company is one of the leaders in the field of "tactile data" and is based in Haifa.



Tactile Mobility partners with HERE Technologies to expand tactile data's commercial reach

Viktor Rappenstein - Monday, December 23, 2019



FREIGHT WAVES

THE JERUSALEM POST

Porsche to install Israeli autonomous technology into future vehicles

The Haifa-based Israeli startup secured \$9 million in funding last October, with Porsche and Union Tech Ventures being the major investors in the round.

By ZACHARY MEYER - MAY 20, 2020 10:20



BMW To Install Tactile Mobility Sensing Tech In Every Model, Brand



Tactile Mobility, the City of Detroit and a Detroit-based Automaker conduct Proof of Concept to demonstrate the value of tactile data in improving road safety and maintenance

Tactile Mobility's product framework



**Tactile
Processor**



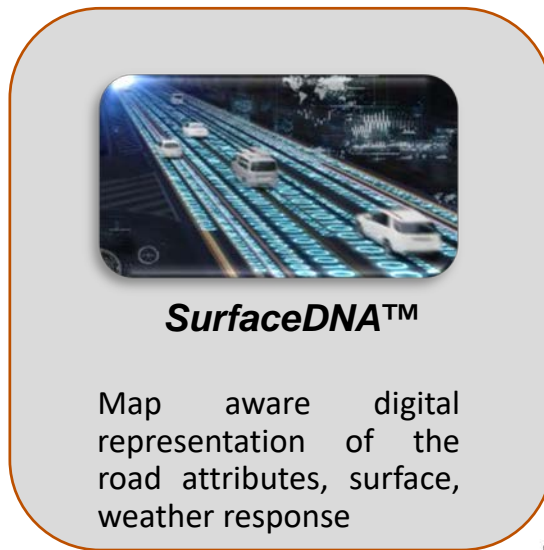
Data acquisition

Wheels on the ground



VehicleDNA™

Digital twin of the unique attributes of each vehicle, representing its health and efficiency

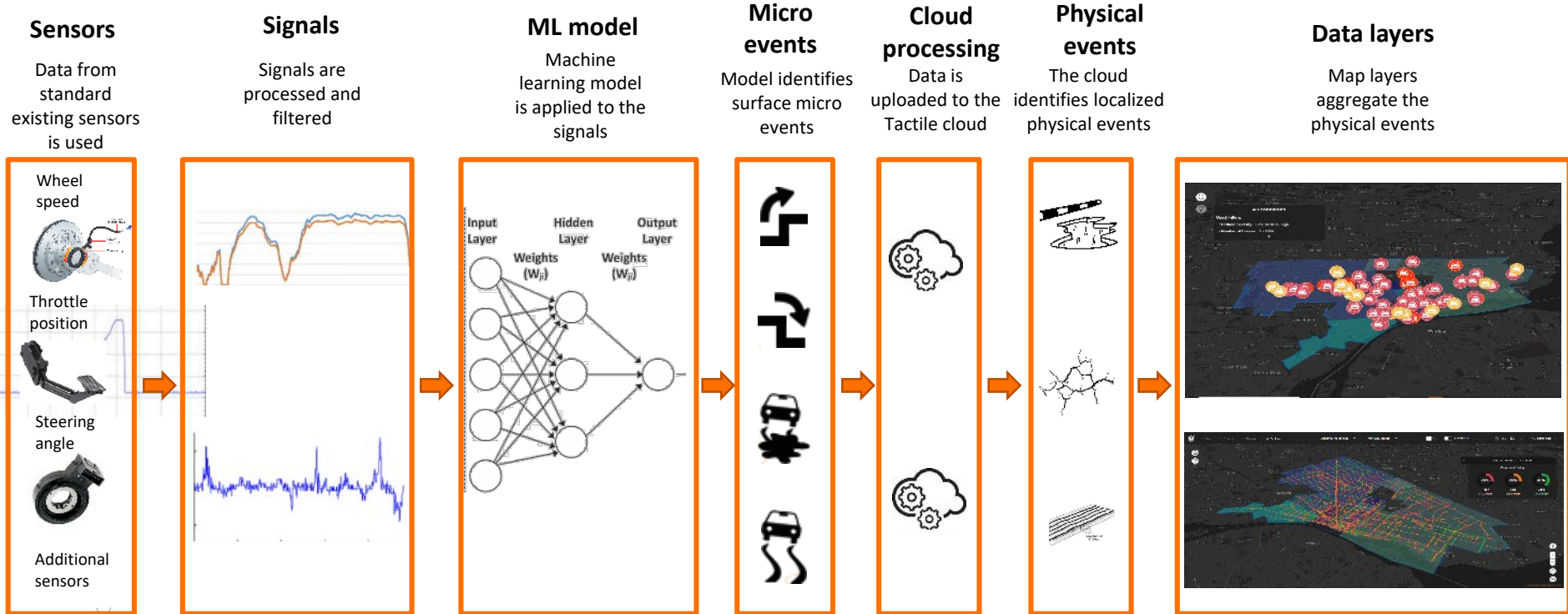


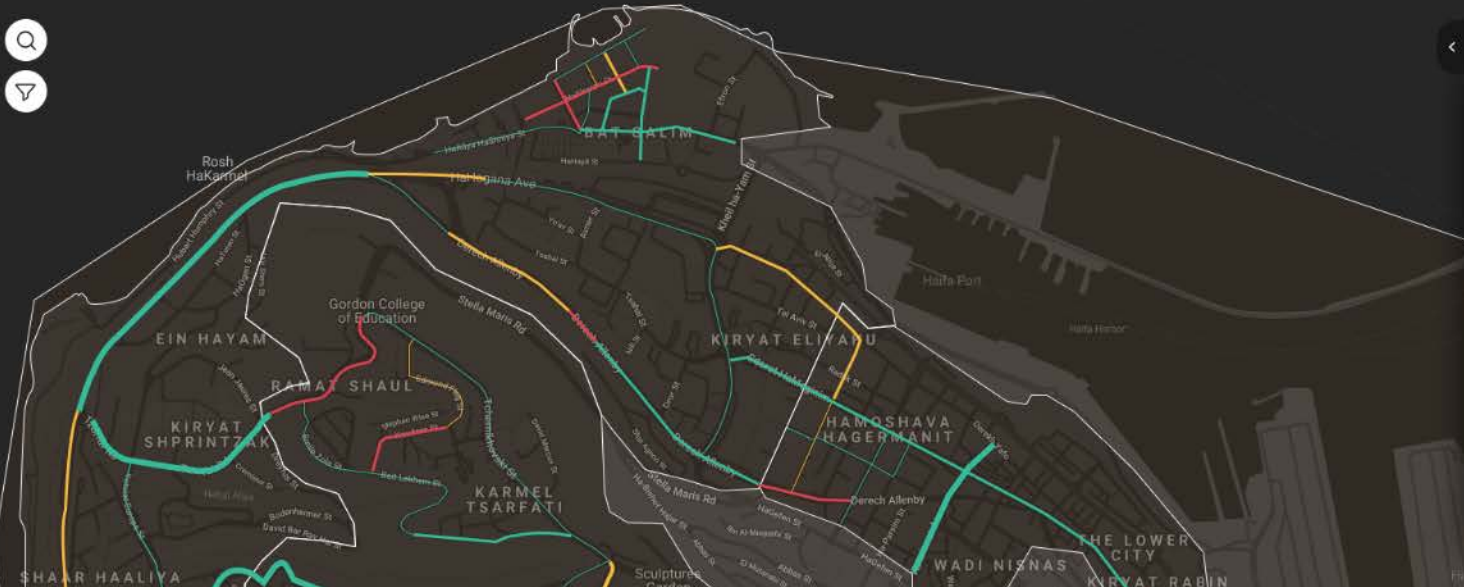
SurfaceDNA™

Map aware digital representation of the road attributes, surface, weather response



SurfaceDNA Processing Pipeline





Haifa 01.01.20 - 31.01.20

Pavement Condition by PASER

45%	20%	35%
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Functional Road Class

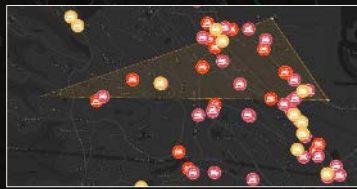
Arterial Roads	Collector Roads	Local Roads
12,430	31,000	52,210
6,215 2,107 4,198	15,500 7,750 7,750	17,403 17,403 17,403



Coverage status



PASER compliance



Potholes detection



Alerts map



Current solutions in the market

PAVEMENT RATING COMPETING TECHNOLOGIES

	Cost per data point	Sense ride quality	Spatial accuracy	Refresh rate	Coverage	Maturity	Avg cost per mile
Virtual Sensor (TM)	Low	●	◐	●	●	◑	\$50
Video/Perception analysis	Low	○	◑	◐	●	◑	\$75
Manual Survey	Low	○	◑	◑	◐	●	\$50
Survey Vehicles	High	◐	●	○	○	●	\$100



PoC's targets, scope and technology



The PoC team was comprised of:

Detroit	<ul style="list-style-type: none">▪ Sam Krassenstein (CoD)▪ Tom Bruff (SEMCOG)▪ Ed Hug (SEMCOG)▪ Charlie Tyson (PLANETM)
Tactile Mobility	<ul style="list-style-type: none">▪ Vered Mandelboum Josef (COO)▪ Yagil Tzur (Head of Product)▪ Boaz Mizrachi (CTO)
Ford	<ul style="list-style-type: none">▪ Ken McCaffrey▪ Sumit Singla



PoC's shared objectives

Improve Detroit's ability to make data-driven decisions around road repair

Demonstrates that technology meets its purpose

Enhance Product Definition

Prove Commercial Viability



PoC process

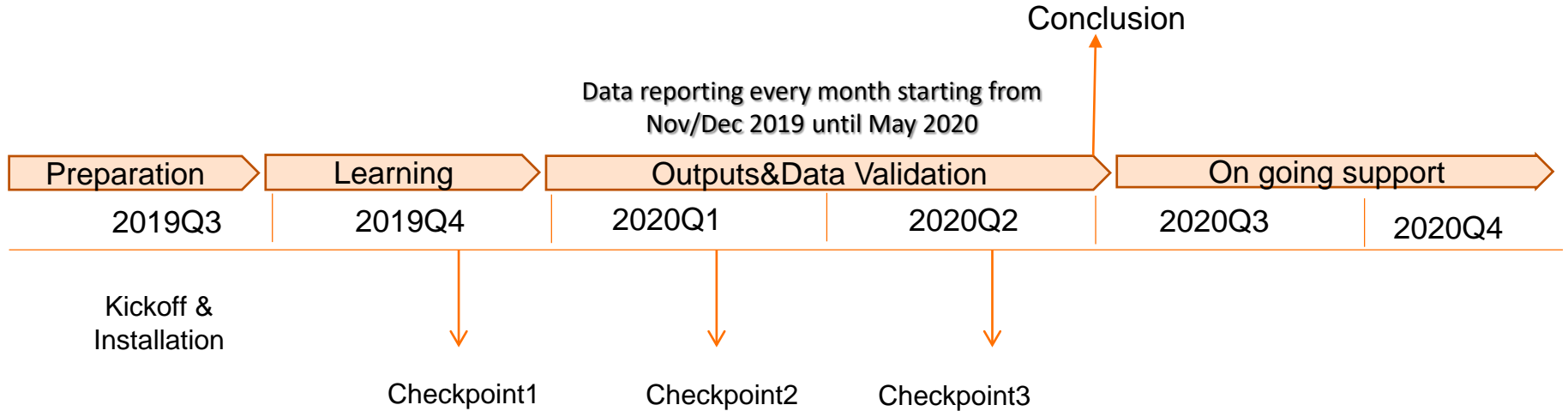
- 20 ford vehicles were installed with *TM aftermarket device
- The vehicles collected surface data passively as part of the day to day work
- The data was collected, analyzed in the cloud and the output was delivered on a monthly basis to the city (pavement rating & pothole map)



*Long term – in the vehicle ECU



Project's milestones and timeline



**Validation of PASER
(in partnership with SEMCOG)**



Validation method

1. Programmatic Validation

- Programmatically compare 2018/2019 SEMCOG's CoD PASER data to the pilot pavement rating outputs



2. Random Sampling

- Cross-validate ~ 200 segments updated 2020 ratings with the TM pavement rating outputs



3. Live Demo*

- Demonstrate on line TM ability to detect all kinds of pavement anomalies

Due to Covid19 live demo was not completed,
This shouldn't affect final findings and conclusions

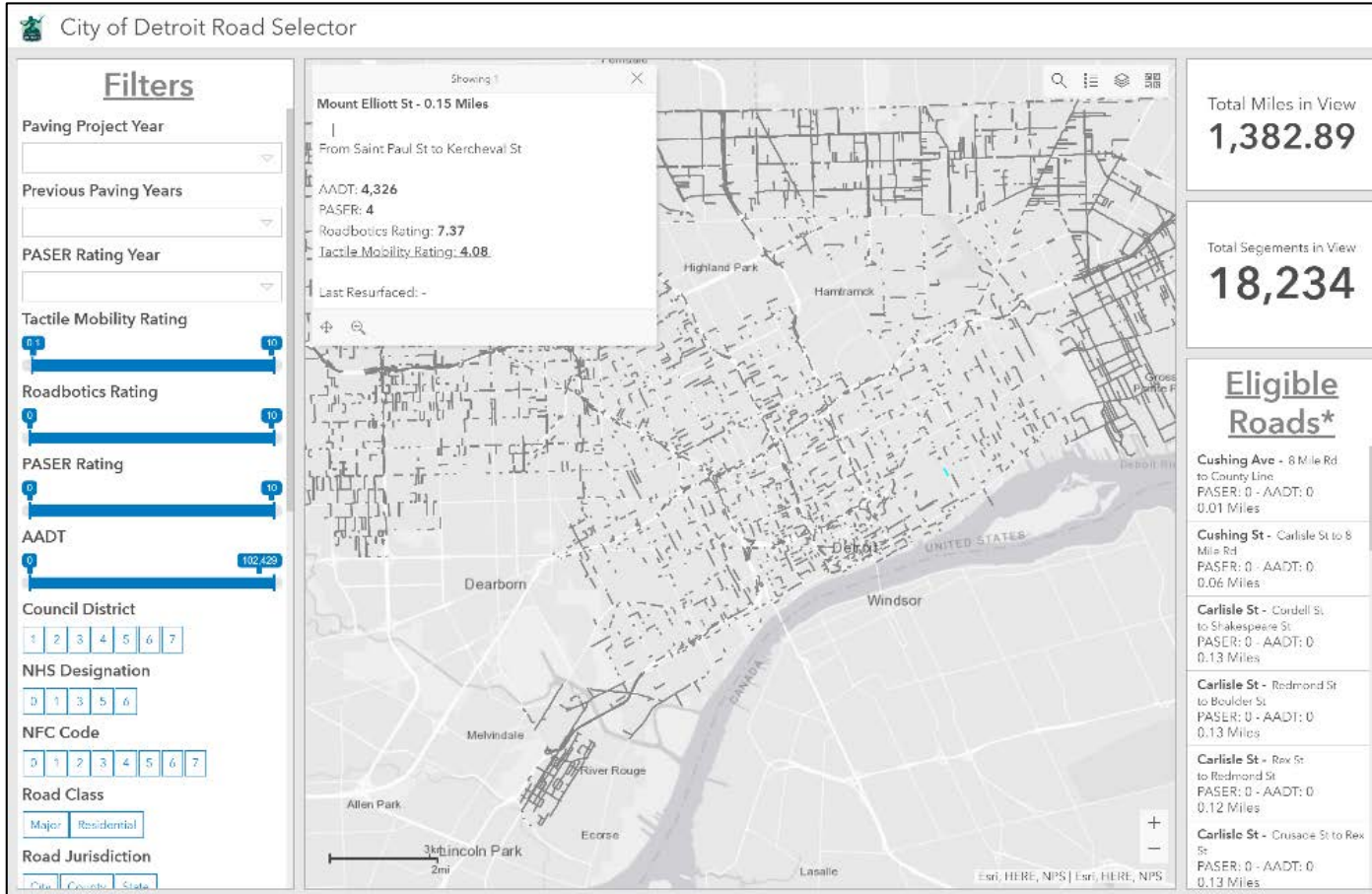


Validation process exceeded expectations: summary

- **The results from the Correlation process exceeded the KPI defined.**
 - 2018/2019 – 73% correlation (+/- 2)
 - 2020 – 87% correlation (+/- 2)
- **Correlation with the 2020 PASER data set was better than the 2019 PASER due to the “up to date” assessment**
- **Differences in scoring between PASER & Tactile emphasize the human subjectivity, differences in approach/timing**
 - Tactile focuses on ride quality, PASER focuses on visual deficiencies
 - PASER represents a single point in time, Tactile represents continuous data collection



How City is using data



- Integrated data into ArcGIS roads dashboard with PASER and other factors
- Coverage at 45% on entire road network (85% on city major)
- Data used for capital planning



City vision for using data in pavement management

- Constant, passive data collection
- Recent road condition data on all roads in City (*State, County, Major, Residential*)
- Use of data to identify emerging problem areas before they get too severe
- Improved use of data in capital planning process to focus on roads with maximum impact to citizens



Proposal for pilot

Support from TAMC to extend road data collection pilot in Detroit into 2021

Goals:

- Supplement major road PASER ratings
- Provide method to collect local road condition ratings
- Test new passive data collection methods on behalf of TAMC that could be used by other road agencies across state
- Work directly with TAMC and MDOT to determine viability of method as long term data solution

