

# What's the **current state** of your road?

Utilizing the strength in numbers enabling an up-to-date inventory throughout the entire road network!



# NIRA Dynamics quick facts

software solutions for next level of mobility

Founded in 2001 as a spin-off from  
Linköping University

HQ in Sweden, global presence  
- 120 employees  
- Offices in US, Brazil, Germany, China, Japan

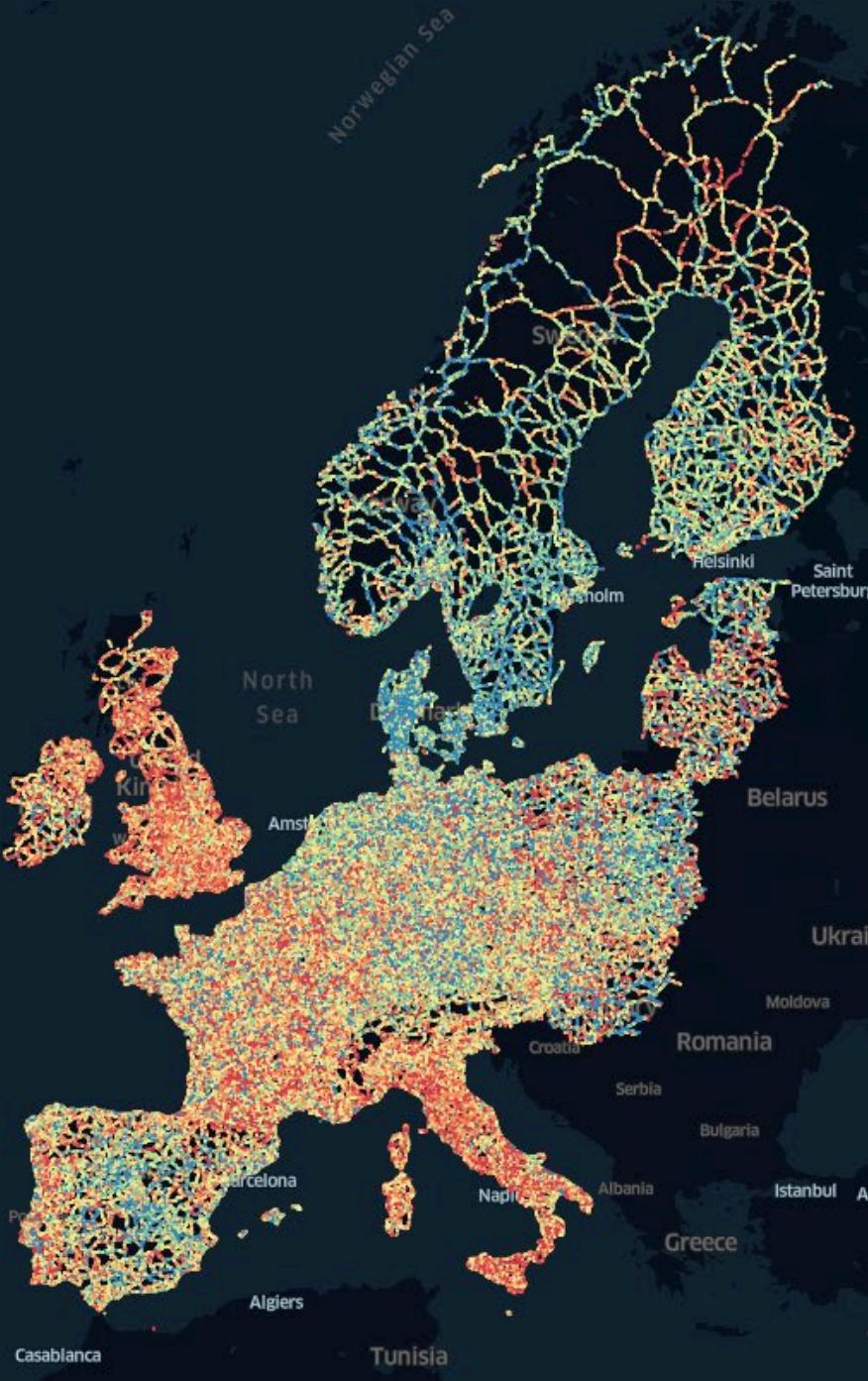
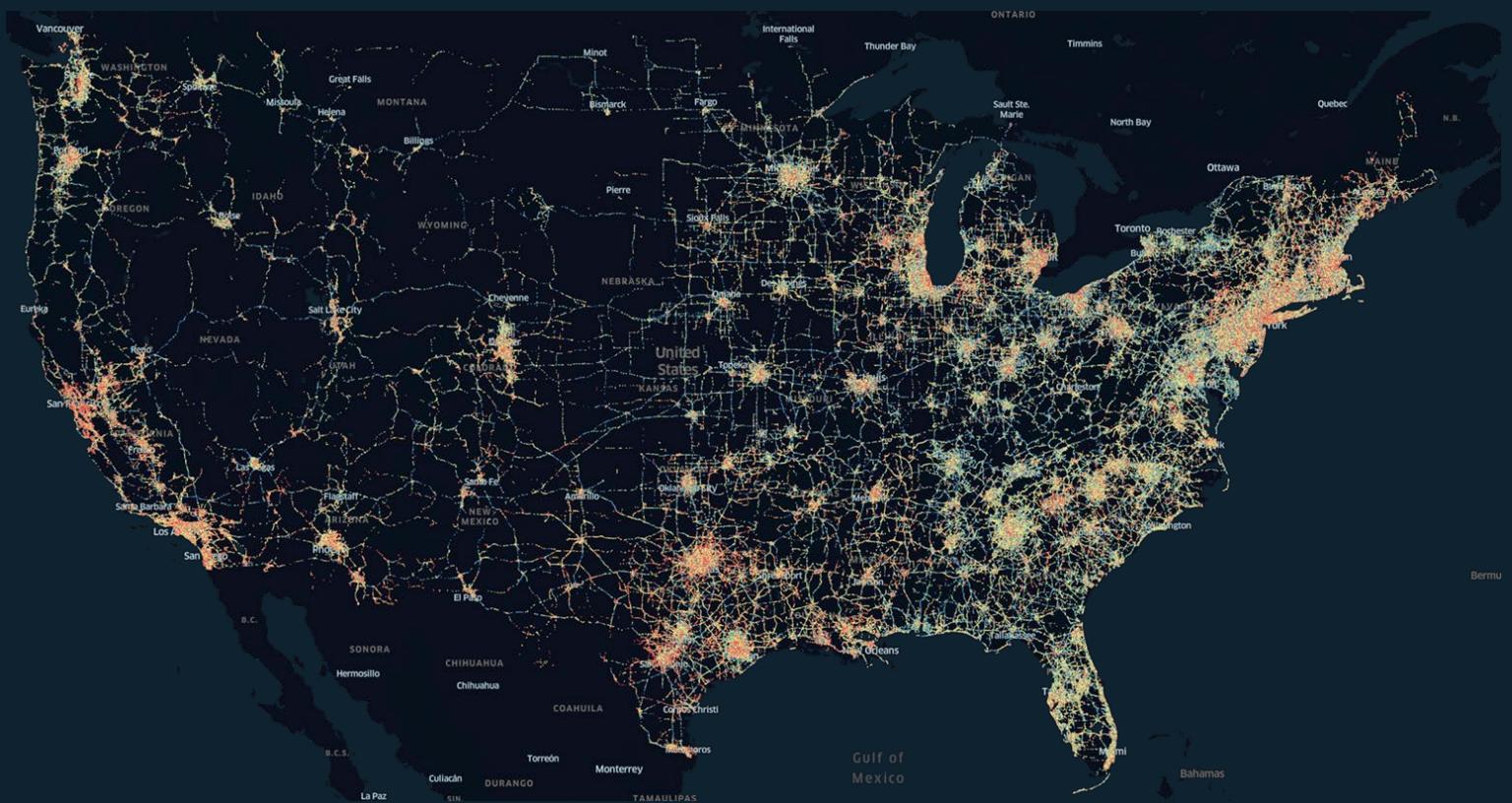
Software and virtual sensor pioneers  
On the market since 2006, in all VW Group models

Annual turnover ~30M €

**75 million+**  
vehicles equipped with  
onboard analytics

**1.5 million+**  
connected vehicles  
gathering  
road surface data

# Global Coverage



# Connected products

Driver must approve data sending

LIVE

Volkswagen Group



AUDI CARIAD

Tire Grip Indicator data



OEM Backend

NIRA



WEATHER DATA



NIRA Backend



RESULTS  
Friction Map &  
Roughness Map



PRODUCTS

ROAD HEALTH

WINTER ROAD INSIGHTS

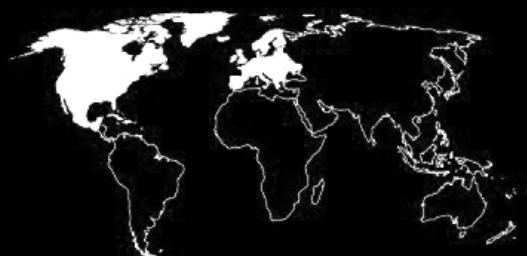
ROAD SAFETY

RSA

RSC

Using the unique volume power of the Volkswagen Group with over 2.000.000 vehicles p.a.

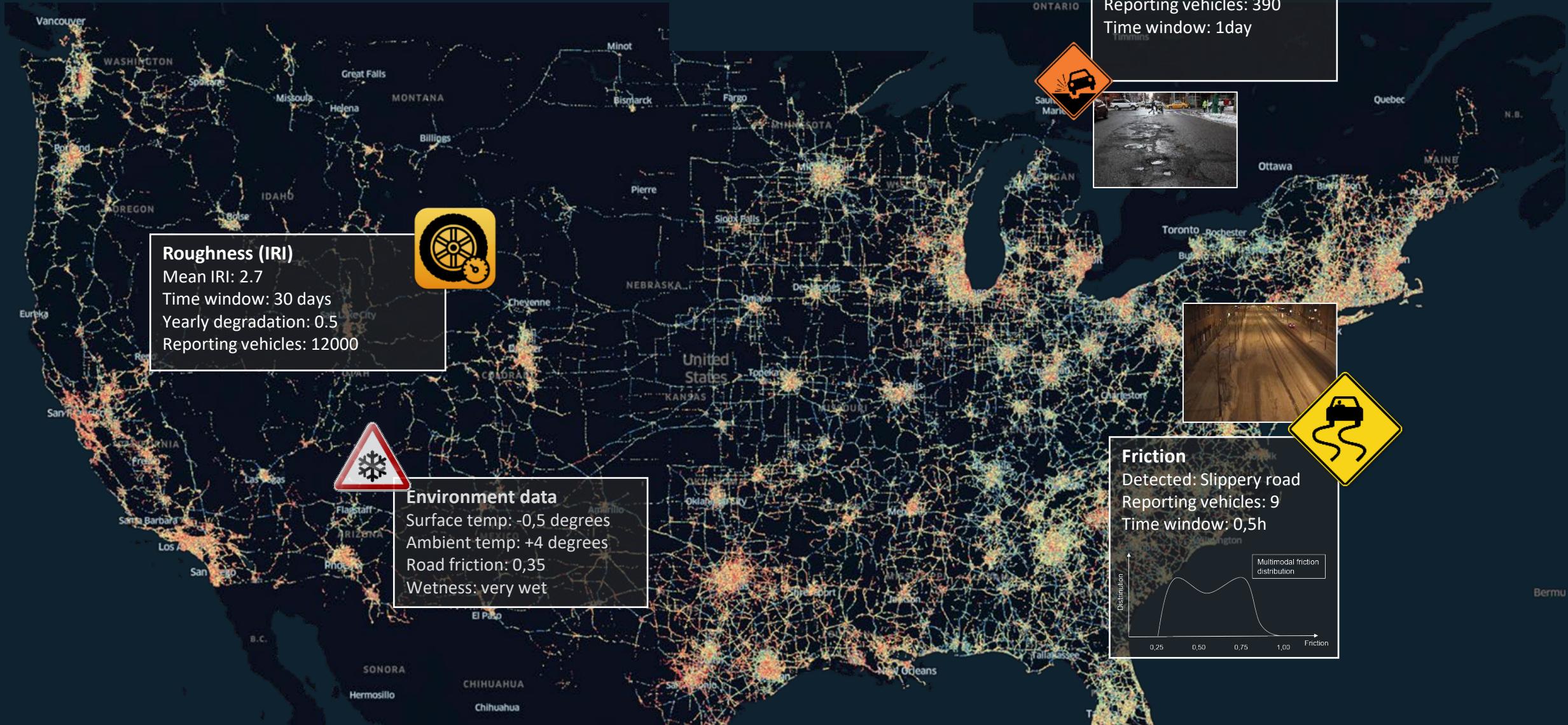
Already available in Europe & North America



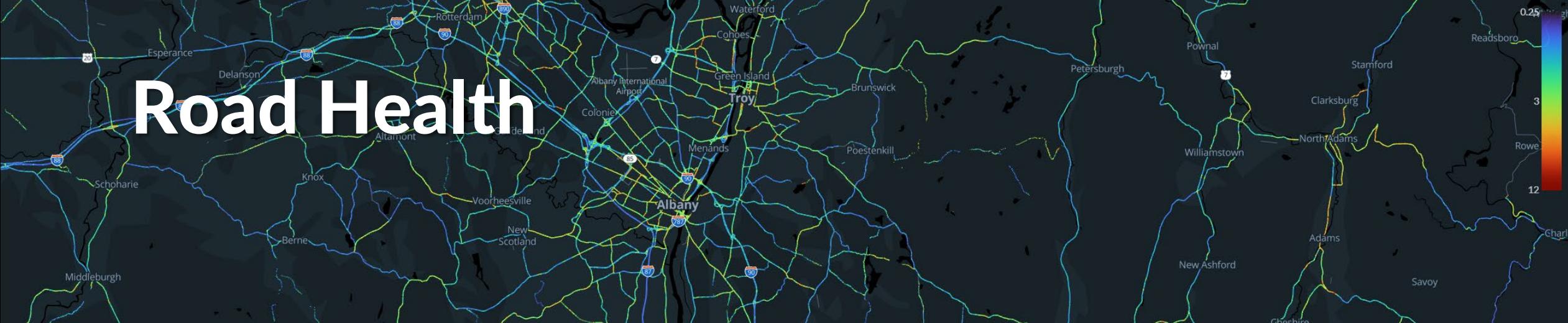
GDPR-compliant  
anonymized  
aggregated data

**NIRA**  
DYNAMICS

# RSI Insights



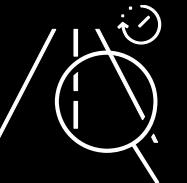
# Road Health



## Asset Inventory

**Up-to-date inventory status of the entire road network collected during the last few days**

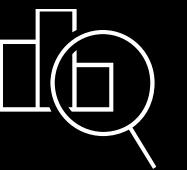
- Instantly see the winter wear effect
- Data driven response to public complaints
- Validate long-term maintenance plans with actual state



## Follow-up

**How well are the roads maintained?**

- Evaluate newly paved roads
- Confirm that the ordered work was performed and performed to the specified standard
- Immediate notification if the road starts failing at an early stage



## KPI & Trends

**Objective evaluation of the entire road network**

- Trends can be built on daily measurements enabling pinpointing of segments that has substructural damages or just in dire need of maintenance.
- KPI's becomes powerful when the local city network can be compared on a national level and be the basis for budget allocation.



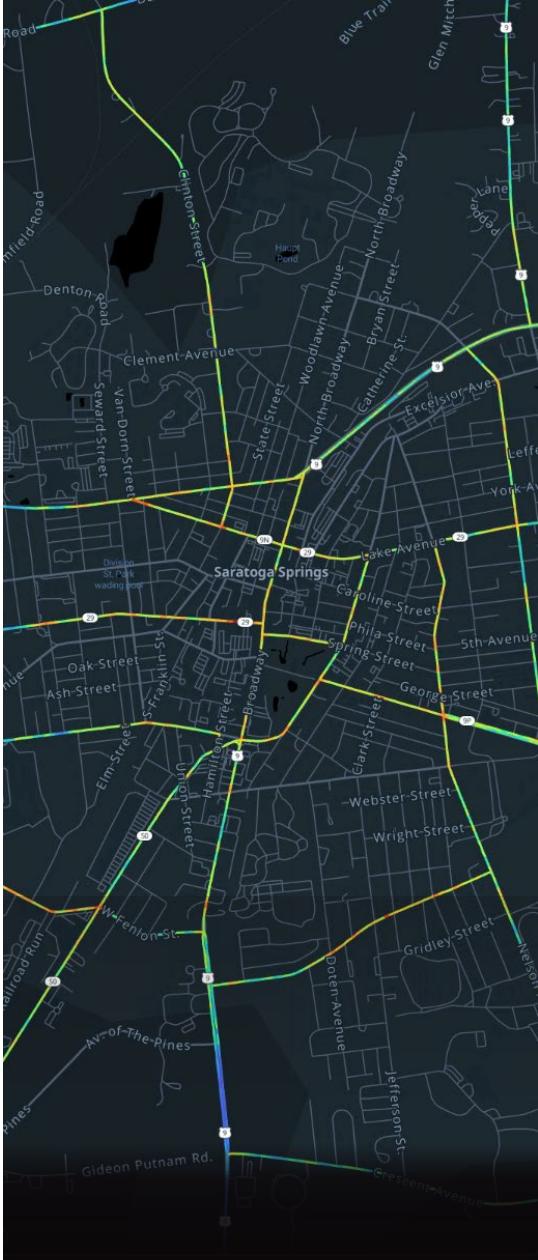
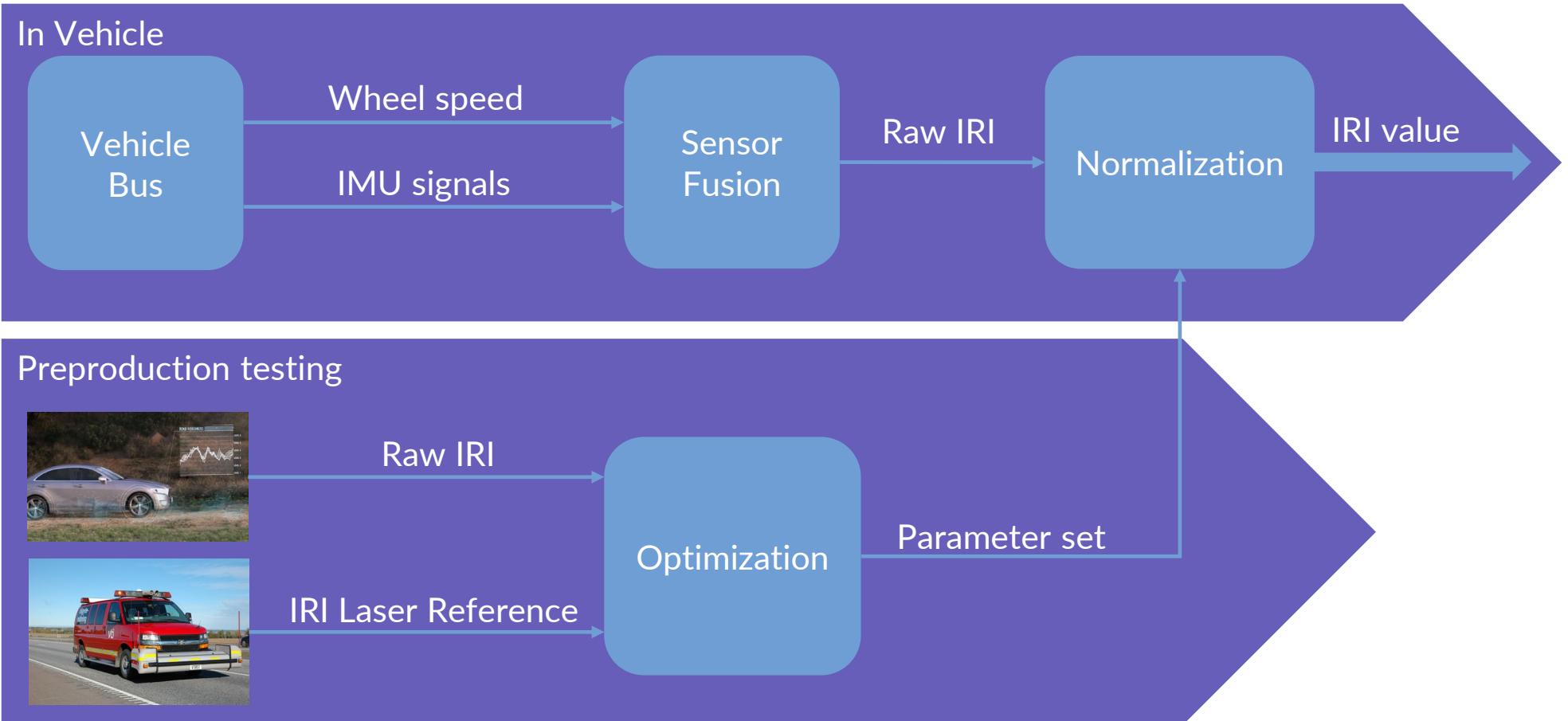
## Sudden change alert

**High confidence regional alerts for hazardous road conditions**

Pothole and road damage alerts with easy-to-use online tools for quick response without extensive educational efforts.

Get alerts of sudden changes of IRI or new potholes and obstacles.

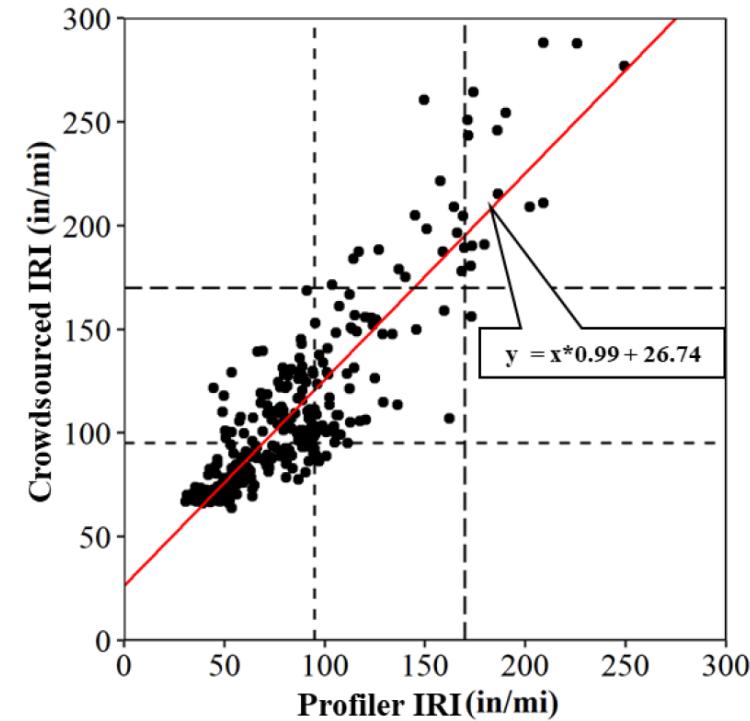
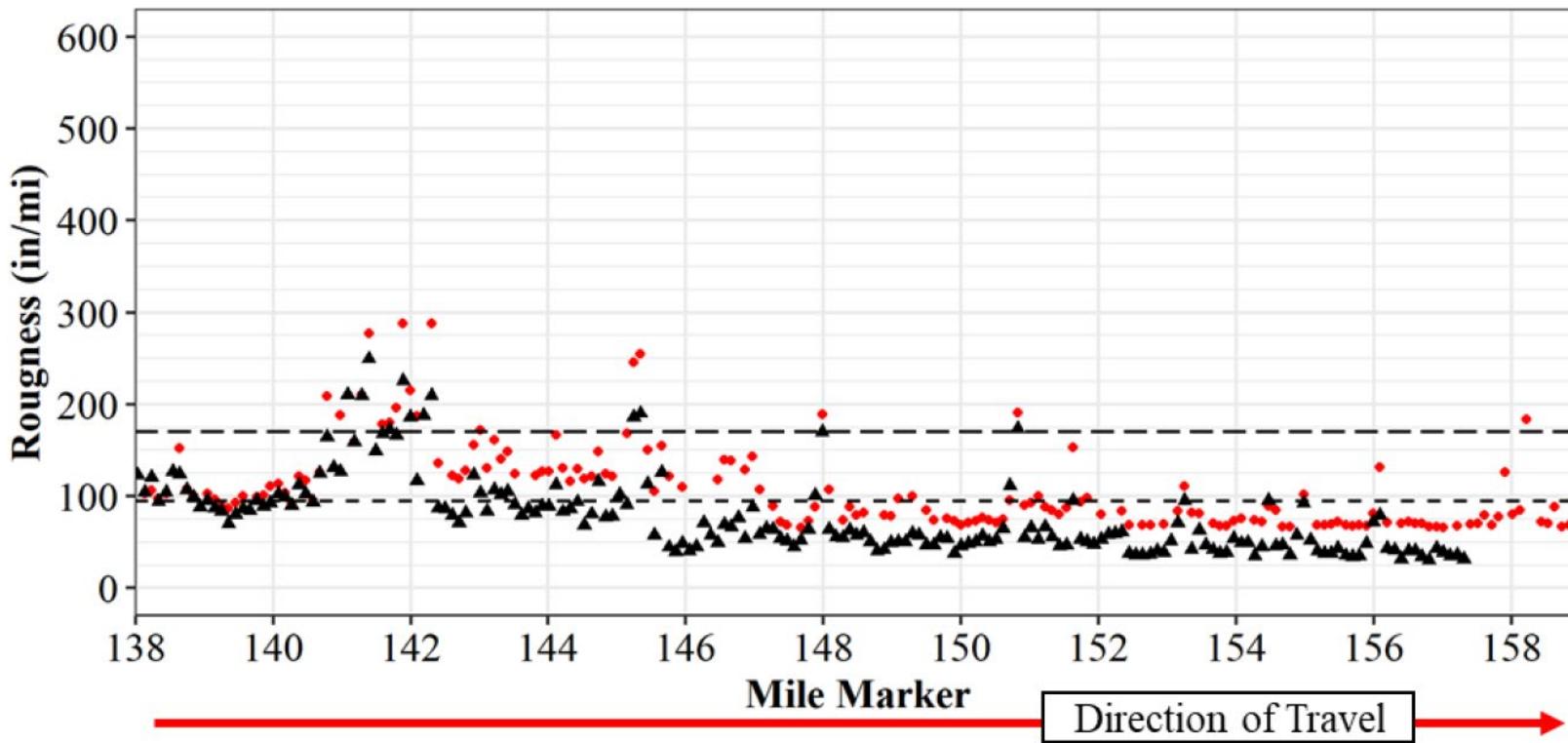
# IRI Value Creation



# IRI Accuracy - Crowd sourcing

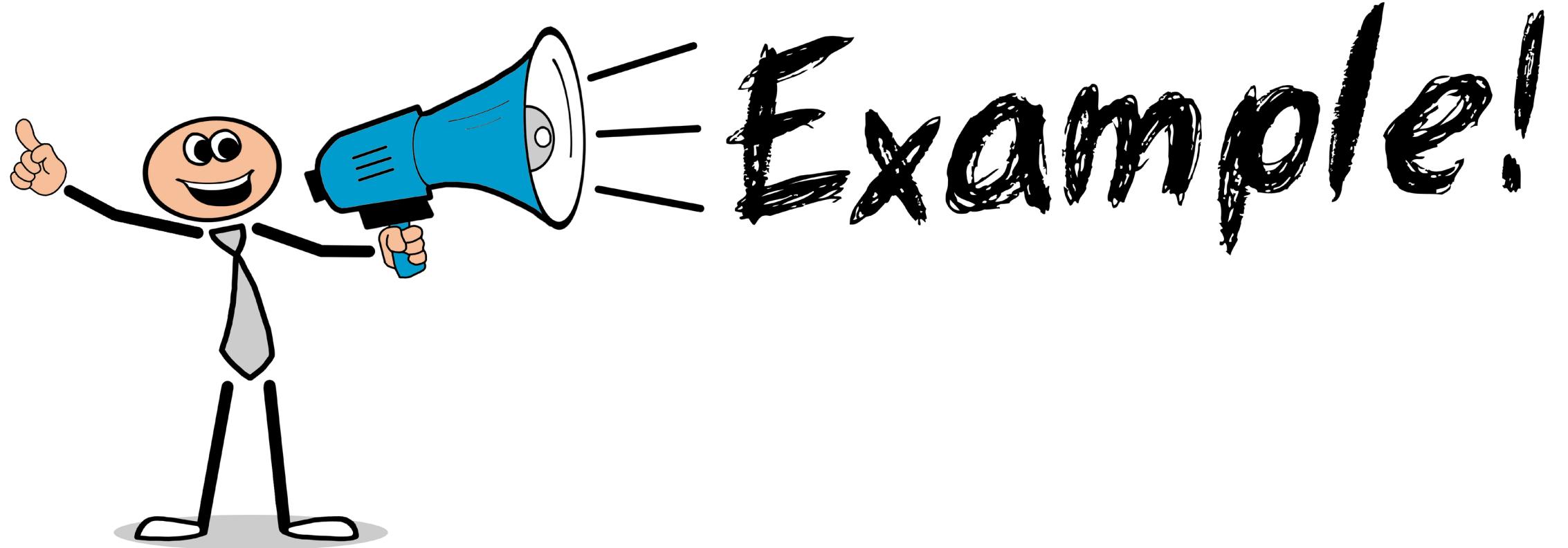
▲ Average Profile Roughness

● Average Crowdsourced Roughness



White paper written at **Purdue University, Indiana**

Justin Anthony Mahlberg, Howell Li, Darcy M. Bullock, Dustin K. Leslie



# Road Health Defect detection in NL



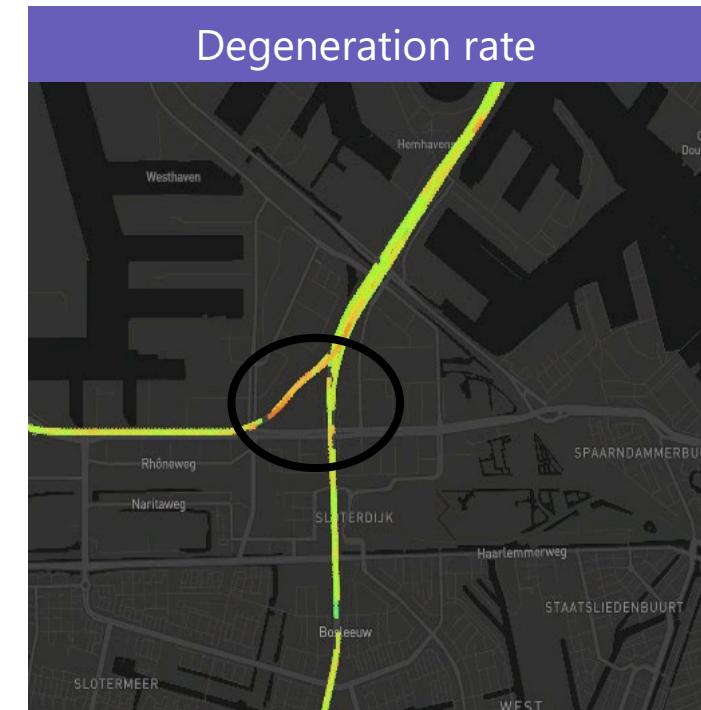
Rijkswaterstaat  
Ministerie van Infrastructuur en Waterstaat



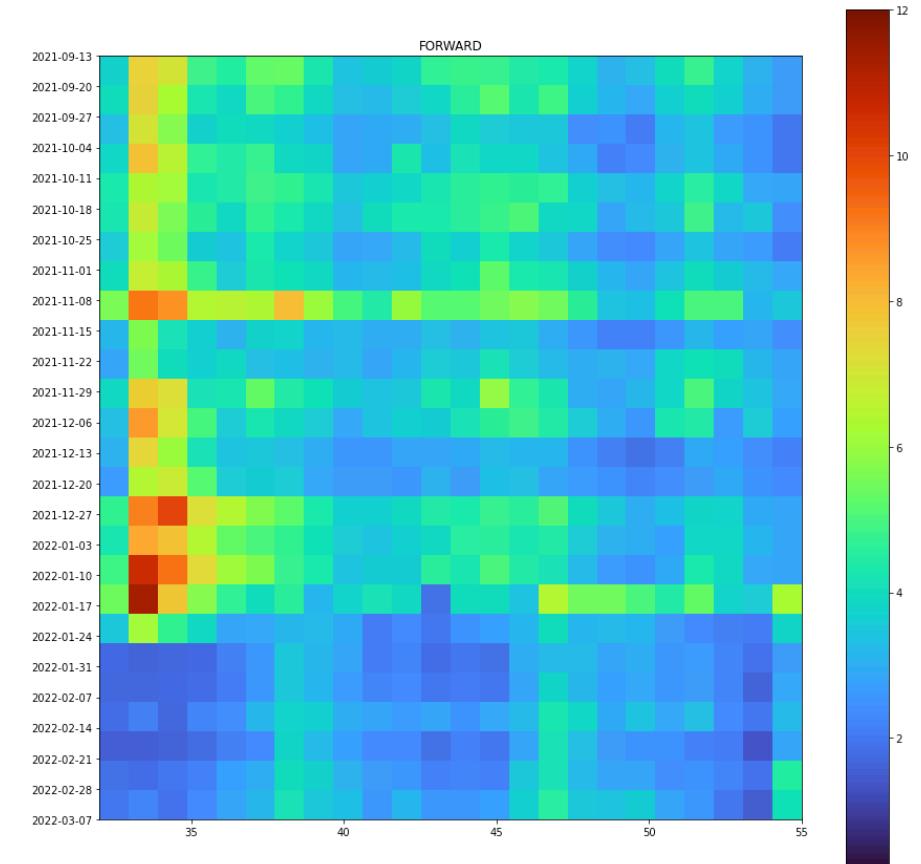
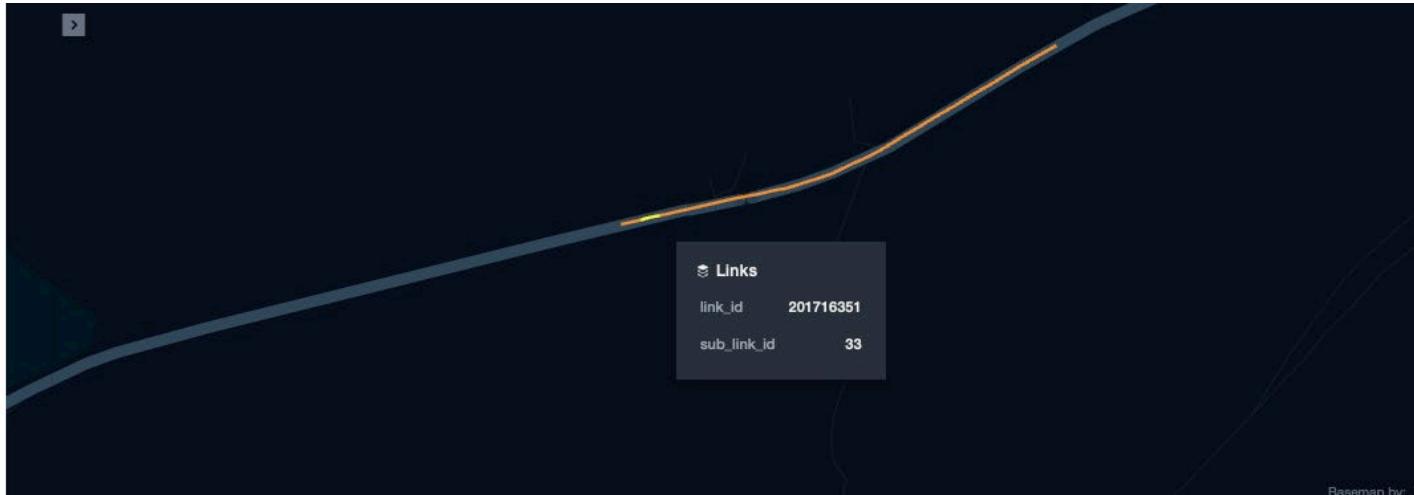
One of the main roads into Amsterdam shows rapid degeneration after resurfacing. This was due to a new asphalt layer not aligned with bridge joints.

## Other examples

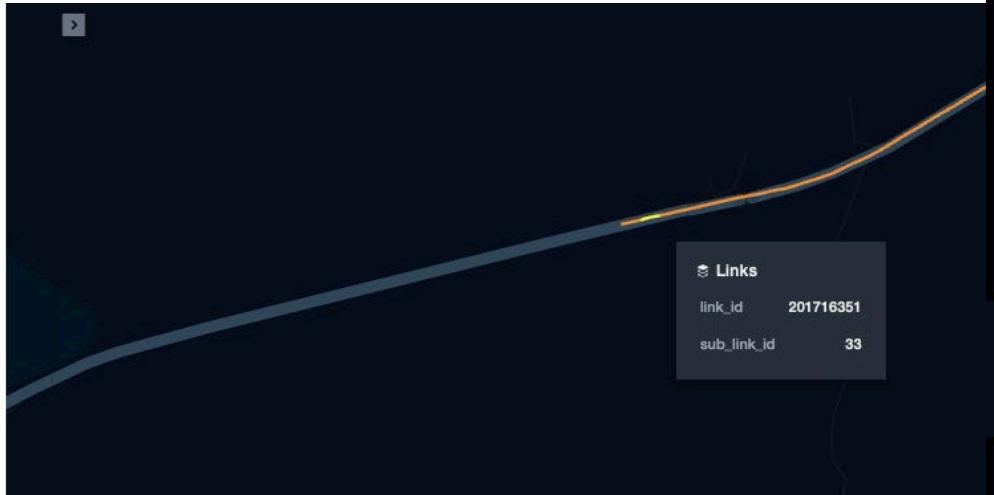
- Damage drainage
- Moving concrete blocks
- Nearby construction
- Truck rims
- Swelling slag



# Road Monitoring in Scotland



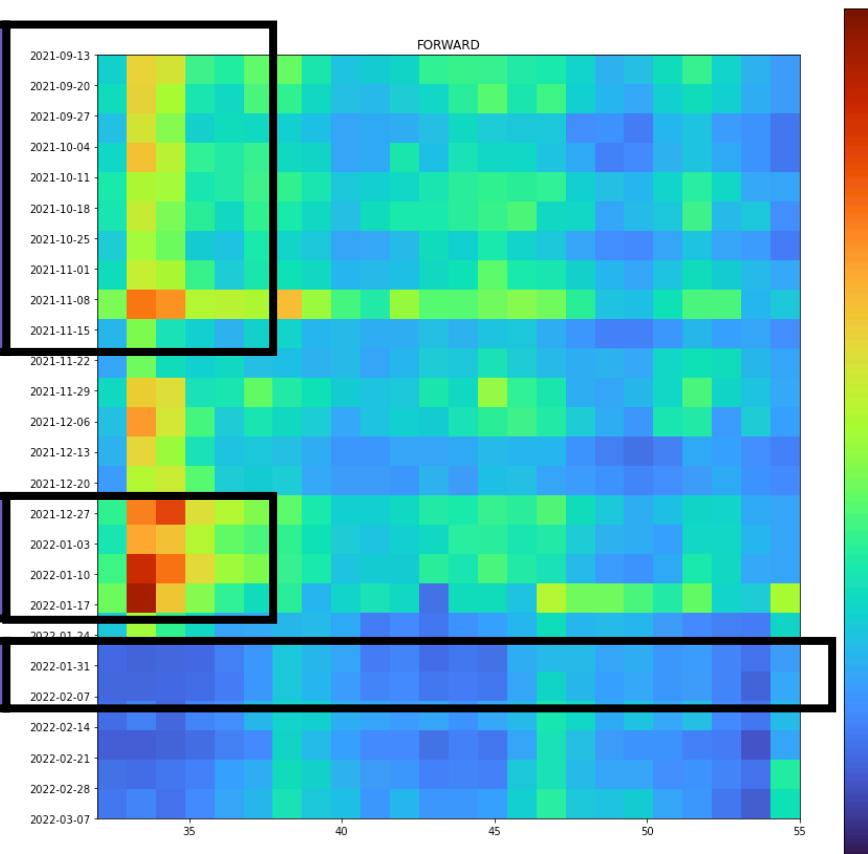
# Road Monitoring in Scotland



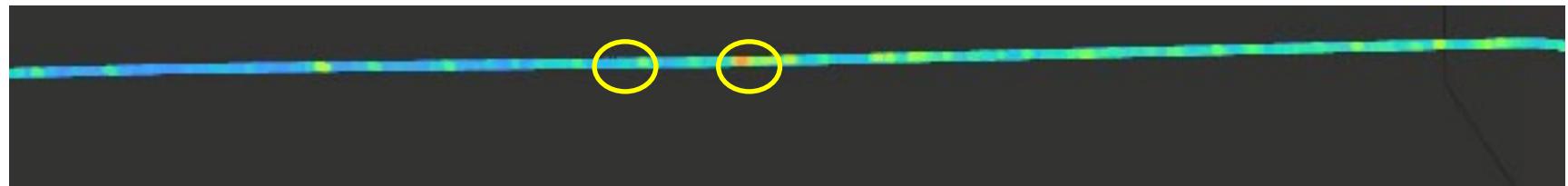
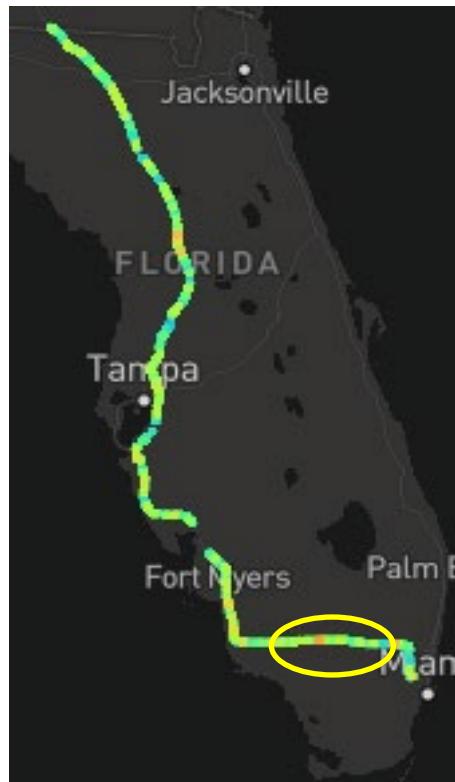
Reports from drivers

Maintenance work

Verification



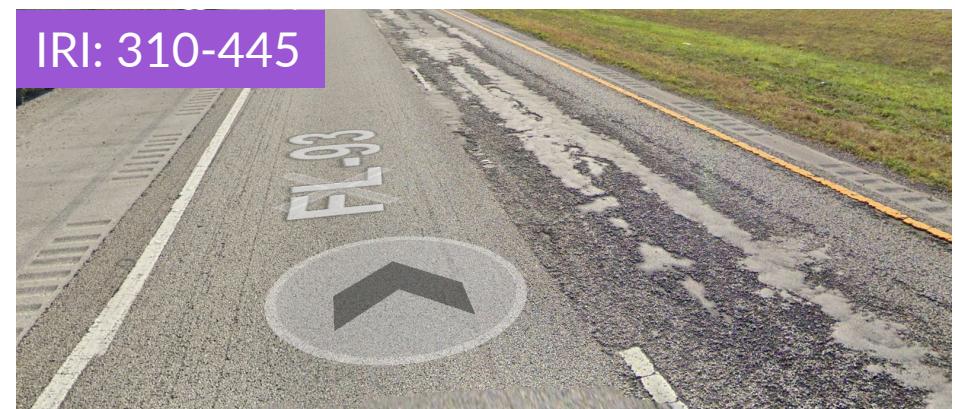
# I-75 locations with low and high IRI



IRI:60-125



IRI: 310-445



Google street views, collected March 2022

I-75 451379360 -10

I-75 488717016 -227

# Alert on road state change!

Small reconstruction of the road where the surface was partly repaved



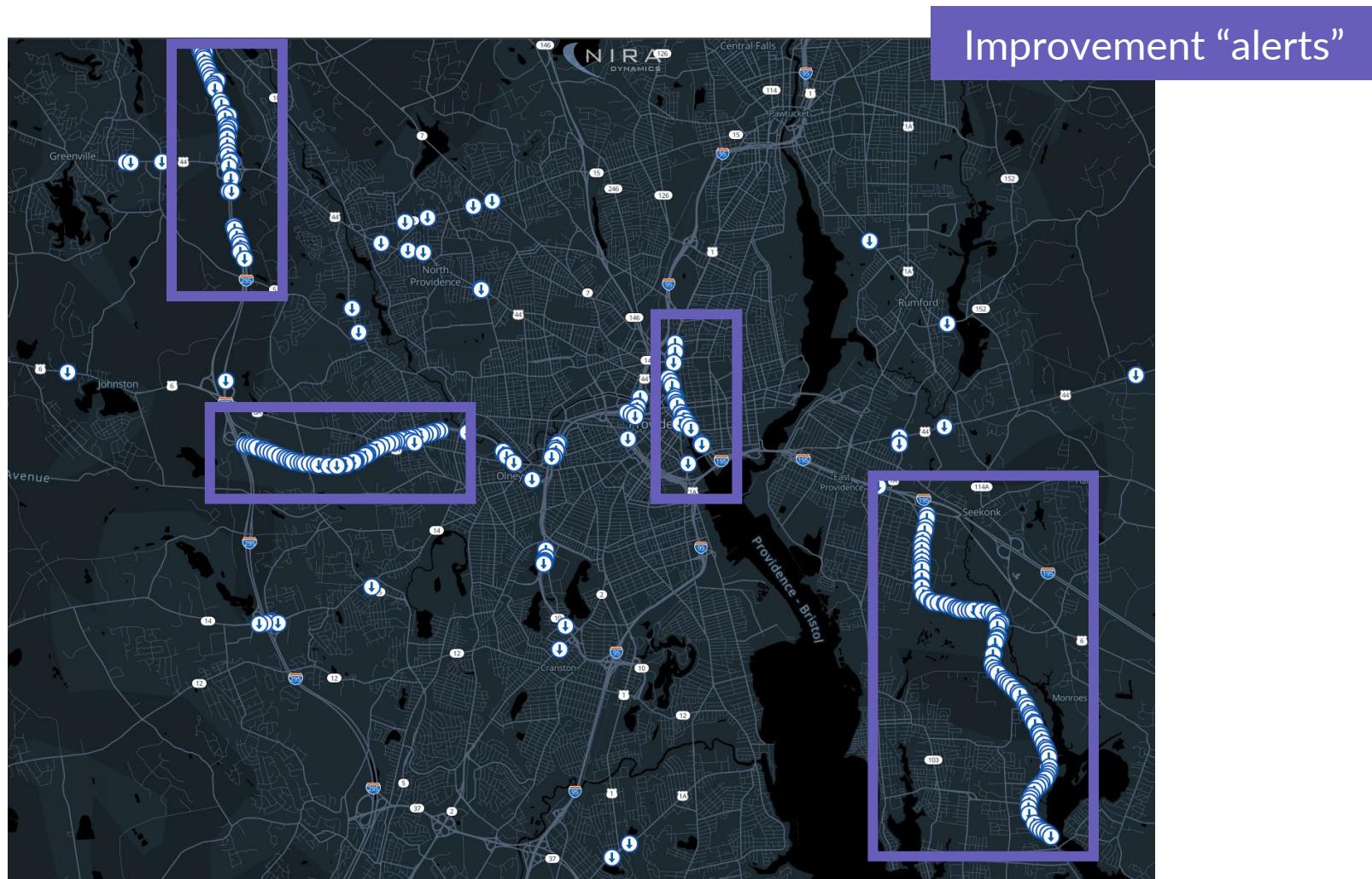
Two alerts due to local damage



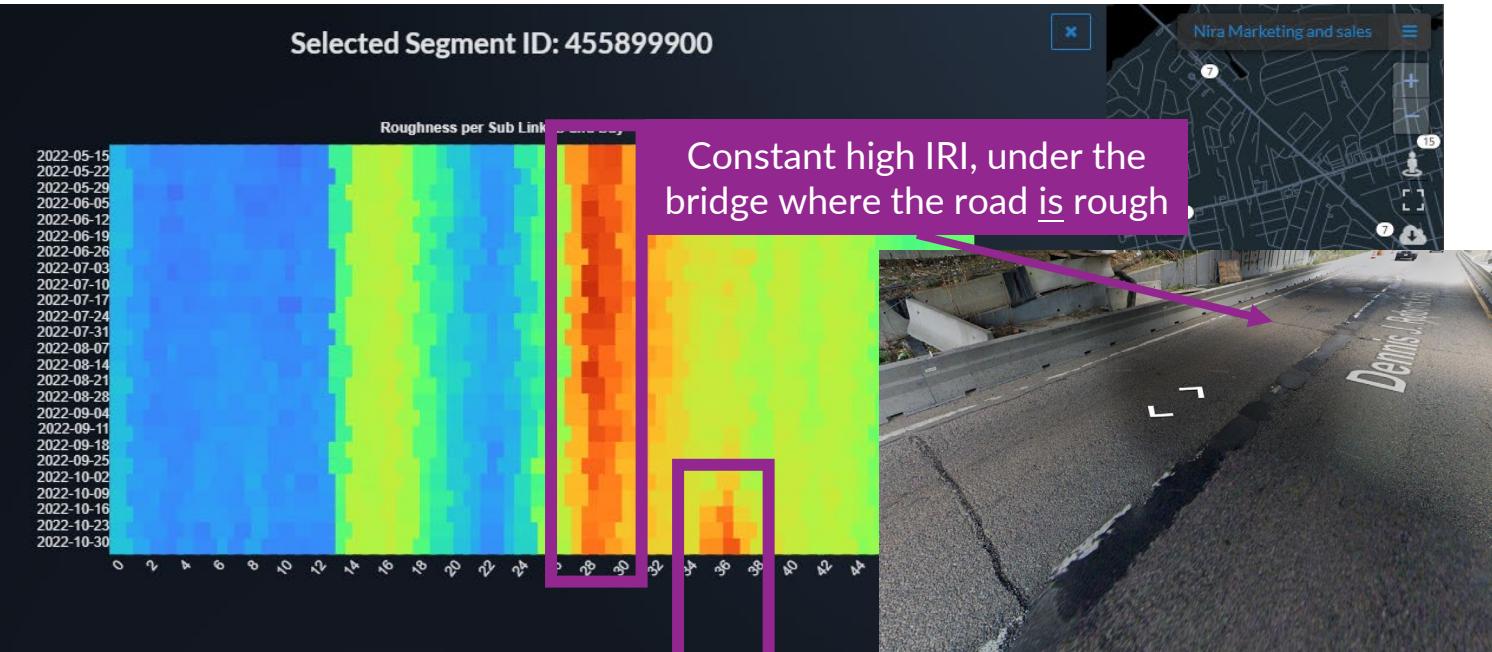
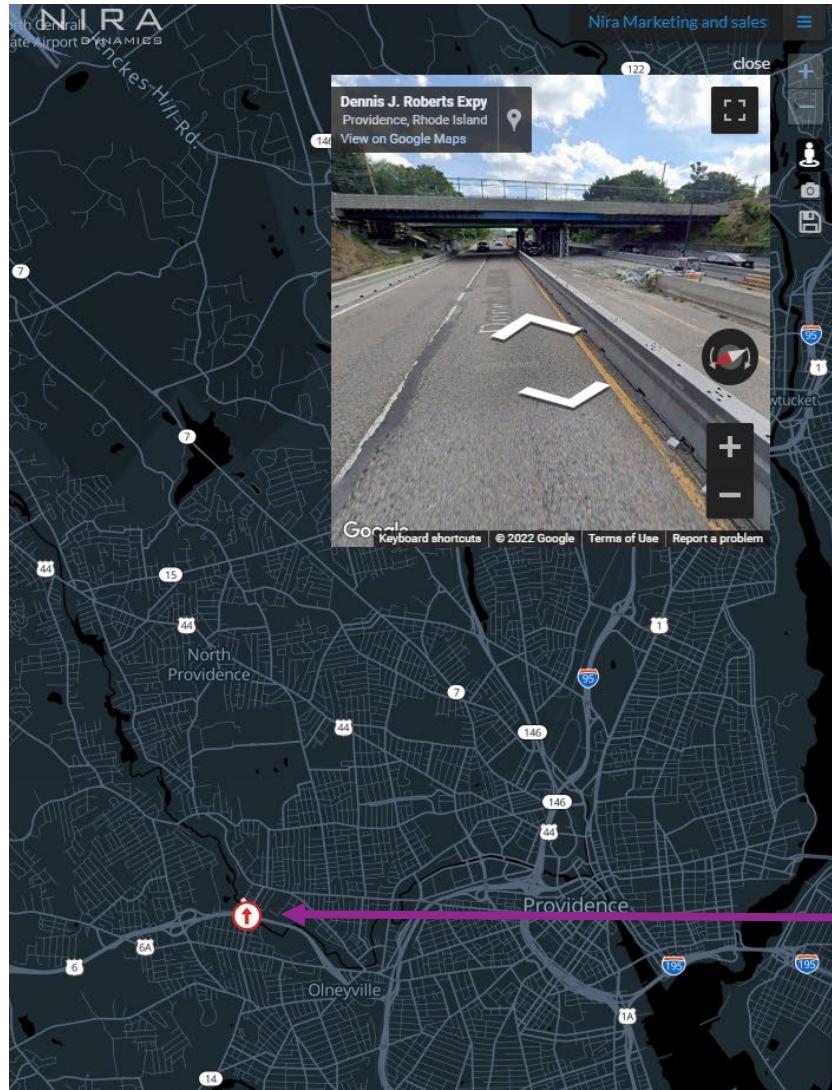
Major resurfacing for the on and off ramps of the highway



# Remotely validate seasonal maintenance

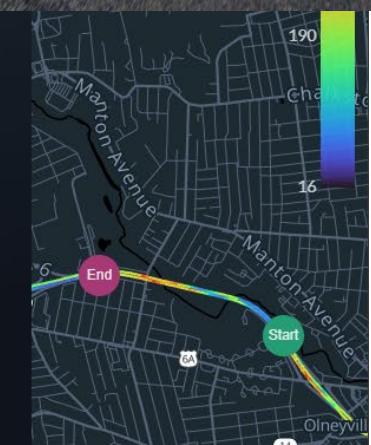


# Road degeneration on the high traffic roads!

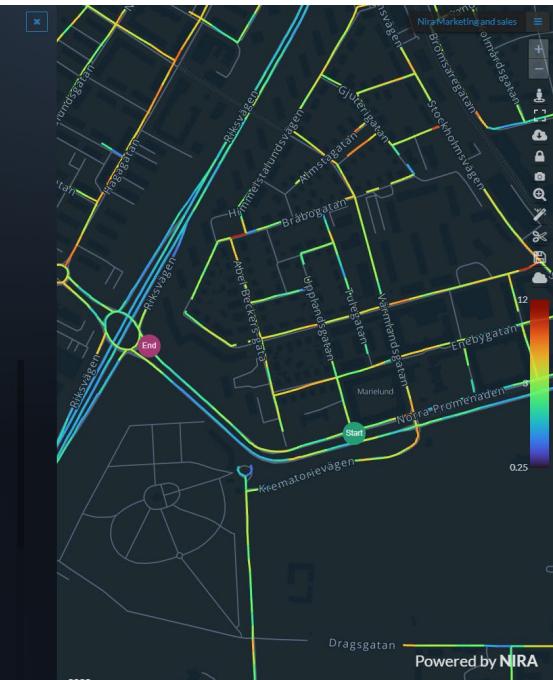
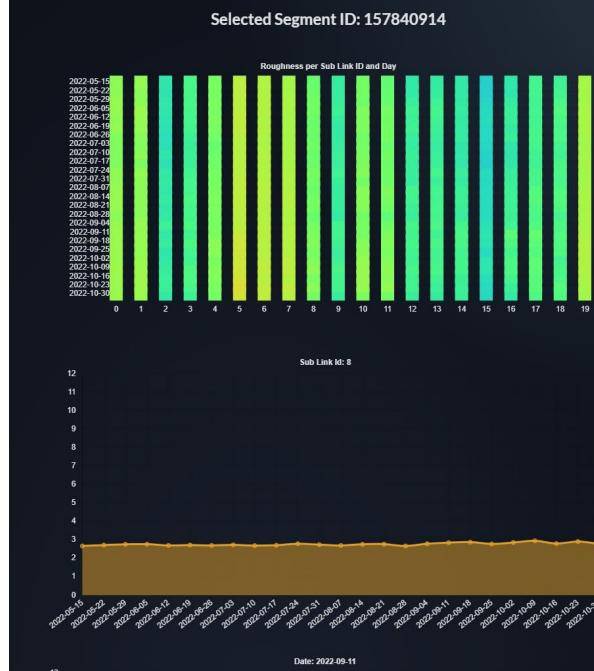


But what's this showing up in early October and increasing in intensity?

Same location as the alert was triggered on



# Historic development of the road state



# Slippery When Wet 22Q2 in the UK

Requirements for detection

- Wipers active
- Area wetness detected
- Friction  $\leq 0.7$
- High confidence detections only

