Seattle Department of Transportation Train Detection and Prediction Pilot Program

ITS Washington
Seattle Department of Transportation and TRAINFO
12/11/2018

City of Seattle

Seattle train crossing impacts

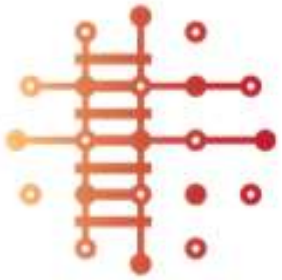
- South Lander St needs to be closed over 100 times per day for trains
- Delays affect freight, commuters, local businesses, and the public
- Vehicular delays average over 4 ½ hours each day
- Every year these idling vehicles produce 1000 tons of CO2

Life safety issues

- Seattle Fire Station 14 is located in SODO
- Rail closures could not be modeled in their dispatch software
- Engine crews are forced to make routing decisions with limited information

TRAINFO Pilot

Find a solution to actively detect and predict the arrival time and duration of rail crossings in the area with a high degree of accuracy



TRAINFO

Evaluation criteria

Objective	Measure of effectiveness	Hypothesis
To detect train crossings	Number of mainline track train crossings detected by technology	100% of mainline track train crossings will be detected
To measure the duration of train crossing blockage	Accuracy of crossing blockage measurement	100% of train crossing blocking events will be measured to within ±5 seconds
To predict train arrivals and blockage duration	Accuracy of predicted event measurements	90% of train arrivals and blockage events will be predicted to within ±60 seconds

About TRAINFO - What We Do

Monitor blocked rail crossings

Quantify traffic delay at rail crossings

Reduce traffic delay at rail crossings

About TRAINFO - How We Do It

Train Data - Proprietary Train Detection Sensors

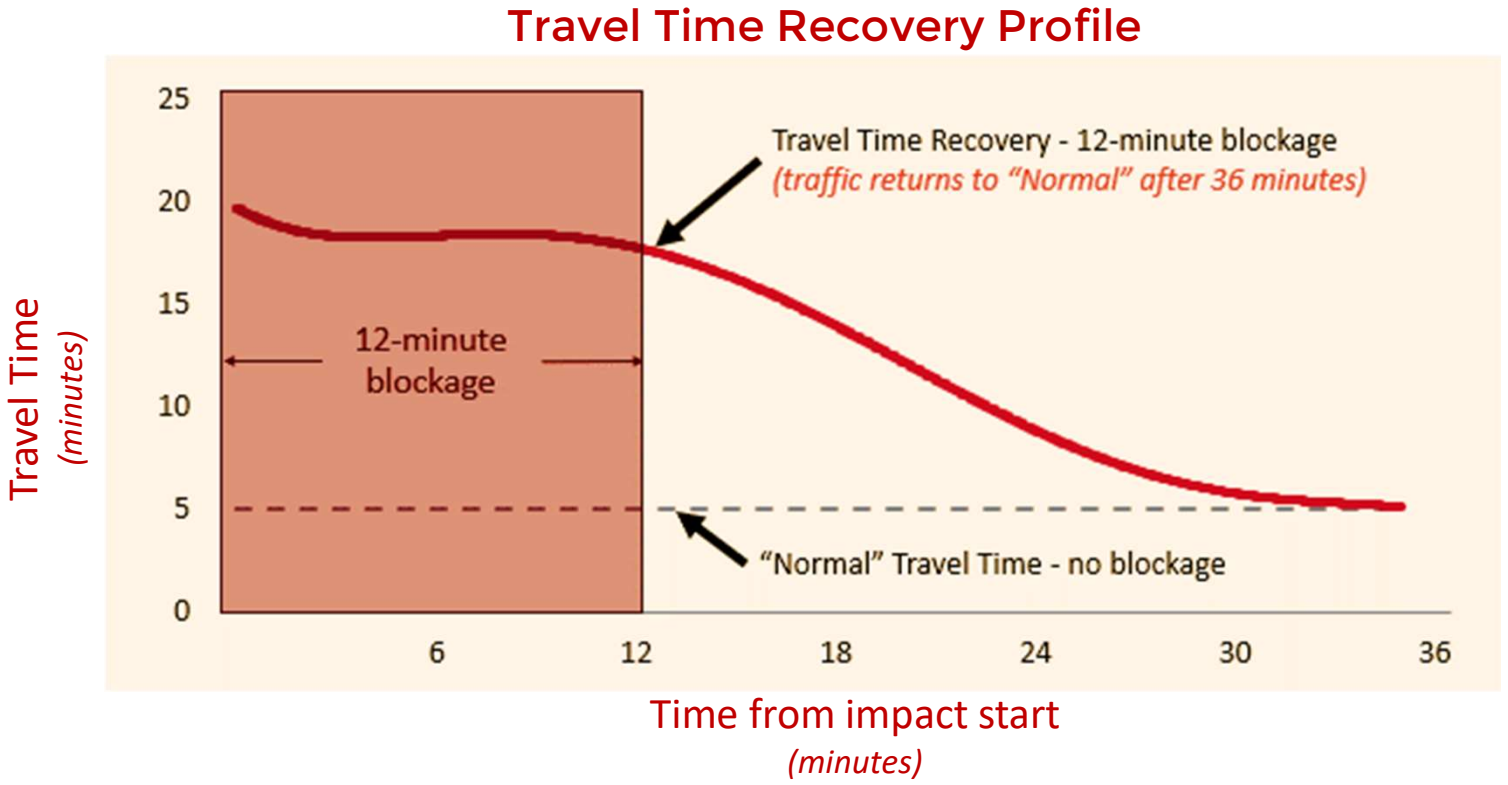
- Off rail property
- Easy to install
- No field configuration
- Minimal maintenance

About TRAINFO – How We Do It

Travel Time Data – Bluetooth Sensors

- Roadside sensors
- Easy to install
- Minimal maintenance

About TRAINFO – How We Do It



About TRAINFO - Train Movement Predictions

Rural Crossings

Typical Performance

Prediction Time
10+ min before blockage

Arrival Accuracy
99%
+/- 1 min

Duration Accuracy
90%
+/- 1 min

Urban Crossings

Typical Performance

Prediction Time
1-10 min before blockage

Arrival Accuracy
90%
+/- 1 min

Duration Accuracy
90%
+/- 2 min

Switching Yards

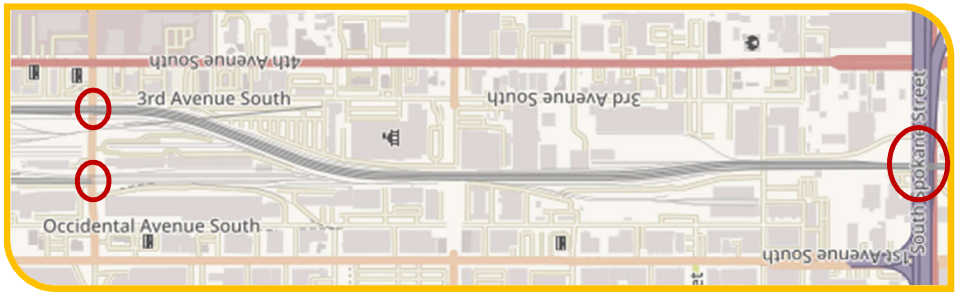
Typical Performance

Prediction Time
Not provided (even RR don't know)

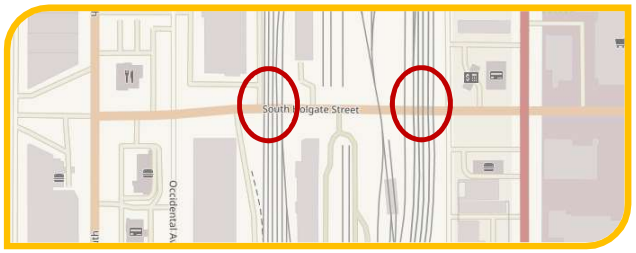
Arrival Accuracy
N/A

Duration Accuracy
Qualitative

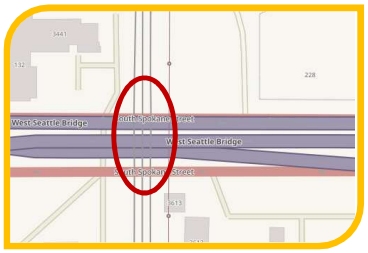
Seattle Pilot



Holgate Ave.



Spokane Ave.



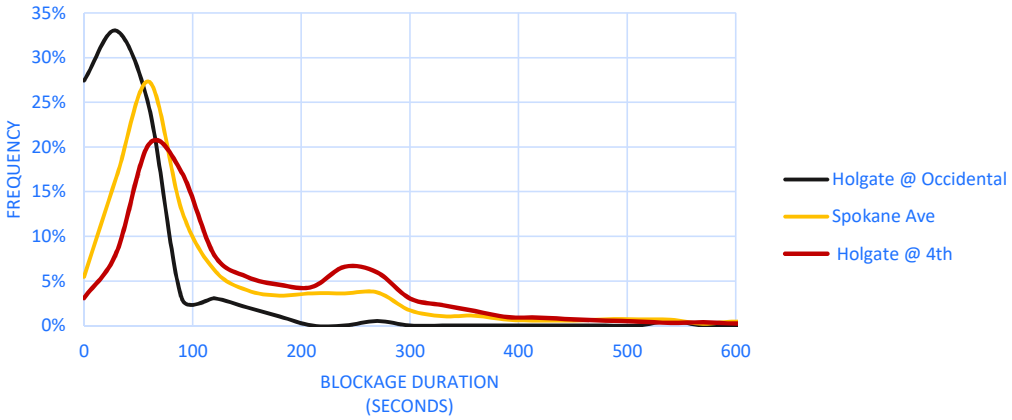
Unique Challenges

- High variability in blockage duration
- Many train building and switching moves
- Complex rail infrastructure
- Combination of commuter and freight traffic
- Proximity to rail yards

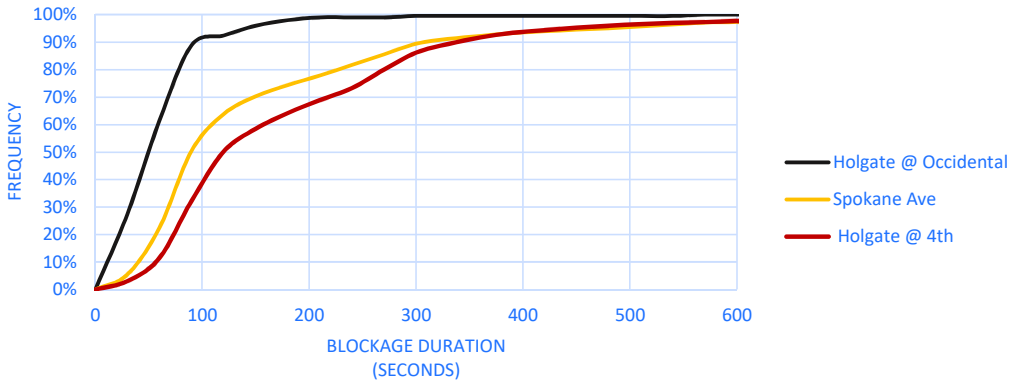
Seattle Pilot: Variability in Crossing Duration

Crossing	Avg Duration (sec)	Standard Dev. (sec)	90% (sec)	99% (sec)	Avg Weekly Volume
Holgate @ Occidental	61	53	104	222	20
Spokane Ave	138	160	283	739	513
Holgate @ 4th	184	213	339	969	577

DISTRIBUTION OF BLOCKAGE DURATION BY CROSSING



CUMULATIVE DISTRIBUTION OF BLOCKAGE DURATION BY CROSSING



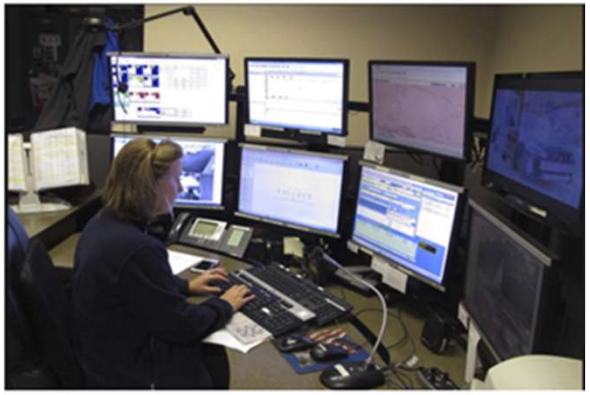
Pilot Results

Objective	Outcome
To detect train crossings	100% of mainline track train crossings were detected
To measure the duration of train crossing blockage	100% accurate ± 5 seconds
To predict train arrivals and blockage duration	90% ± 60 seconds*

Planned integration strategy

Sign Messaging

SFD Dispatch Integration



Dynamic Timing Changes

Questions?

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www.seattle.gov/transportation