

Using iPads for Field Data Collection



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Maintenance Division - Washington State Department of Transportation

2016 Western States Forum - Yreka, California

Our Team

Maintenance Division

- *Joe Schmit – Technology Resource Manager*
- *Max Schade – Field and Tech Support*
- *Oai Tang – Data Management and GIS Manager*
- *Keisha Chinn – GIS Specialist*

IT Division

- *Josh Hudson – Lead App Developer*
- *Brian Blood – App Developer*
- *Reed Hunter – Lead GIS Developer*

**Wildlife Carcass Removal Report**CROSS CULVERT INVENTORY FOR STATE RT. 26 CONTROL SECTION 3830 PAGE 2

Whitman County

MP.	#	DATE	INLET	SIZE	END TYPE	TYPE	LENGTH	COMMENTS
		16 SEP 79	R or L		R	L	CULVERT	
102.3	1		L	18"	P	P	M-G	110'
102.35	2		L	18"	P	P	M-G	110'
102.4	3		L	24"	B	B	M-G	90'
102.45	4		L	18"	P	P	M-G	50'
102.5	5		L	24"	H	H	M-G	80'
102.55	6		L	18"	P	P	M-G	80'
102.6	7		L	18"	P	P	M-G	60'
102.83	8		L	24"	B	B	M-G	130'
103.05	1		L	24"	H	H	M-G	60'
103.3	2		L	24"	P	P	M-G	55'
103.4	3		L	18"	P	P	M-G	52'
103.6	4		L	24"	P	P	M-G	80'
103.7	5		L	18"	P	P	M-G	75'
103.75	6		L	18"	P	P	M-G	80'
104.2	1		L	18"	P	P	M-G	60'
104.3	2		L	24"	P	P	M-G	60'
104.7	3		L	24"	P	P	M-G	80'
104.8	4		L	24"	P	P	M-G	100'
104.9	5		L	30"	H	P	M-G	90'
105.2	1		L	18"	P	P	M-G	110'
105.3	2		L	18"	P	P	M-G	90'
105.4	3		L	30"	P	P	M-G	75'
105.5	4		L	18"	P	P	M-G	75'
105.7	5		L	30"	H	H	M-G	50'
105.9	6		L	24"	H	H	M-G	60'



(1 of 2)

	Material
Maintenance Equipment #	WSI 036
Sensor Reading Date	3/14/2016 4:00 AM
Granular Name	Salt
Material Type	Solid
Road Temp.	28°
Air Temp.	32°



Washington State
Department of Transportation

Report Date: 3/20/2016 11:13:03 AM

Feature Activity Coverage Report

Selection Criteria

Feature Type: Catch Basin

Activity: All

Start Date: 7/1/2015 12:00:00 AM

End Date: 6/30/2016 11:59:59 PM

SR:

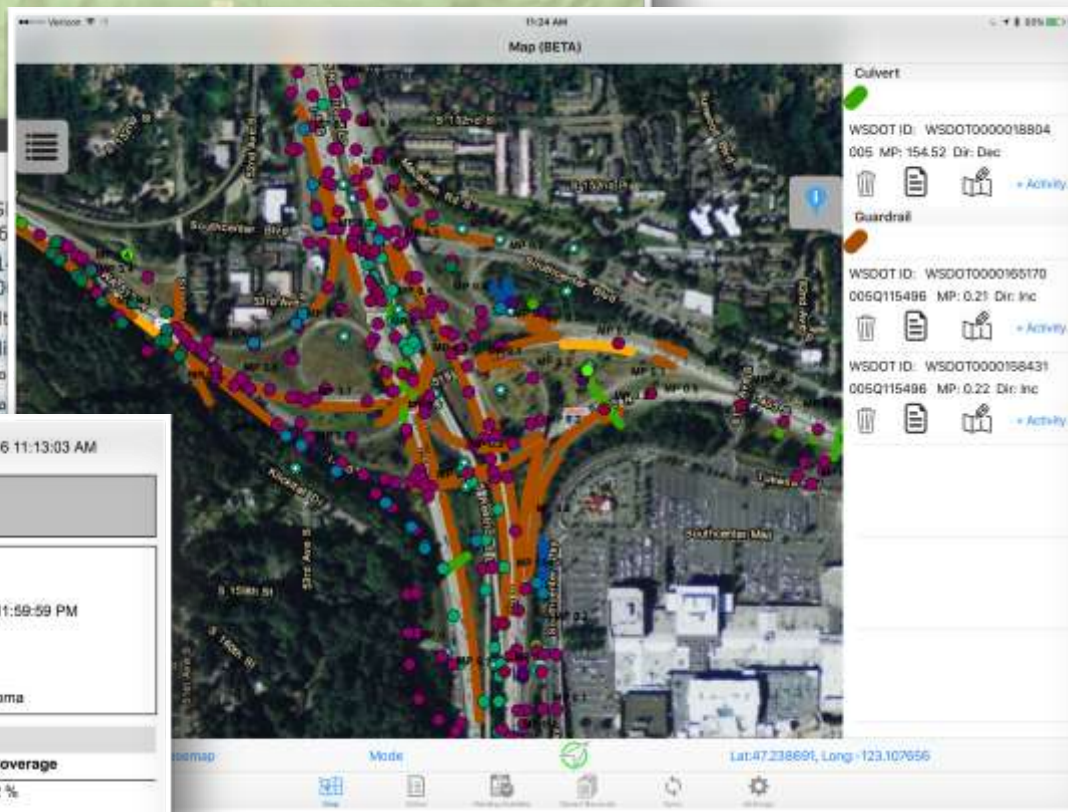
Start Mile Post:

End Mile Post:

Region: Olympic

Maintenance Area: Area 1 Tacoma

Catch Basin	HATS Feature Count	Total Feature Count	% Coverage
Cleaning: 511	5925		8.62 %
Inspection: 3674	5925		62.01 %
Repair: 2	5925		0.03 %



Culvert

WSDOT ID: WSDOT0000018804
005 MP: 154.52 Dir: Dec

+ Activity

Guardrail

WSDOT ID: WSDOT0000165170
006Q115496 MP: 0.21 Dir: Inc

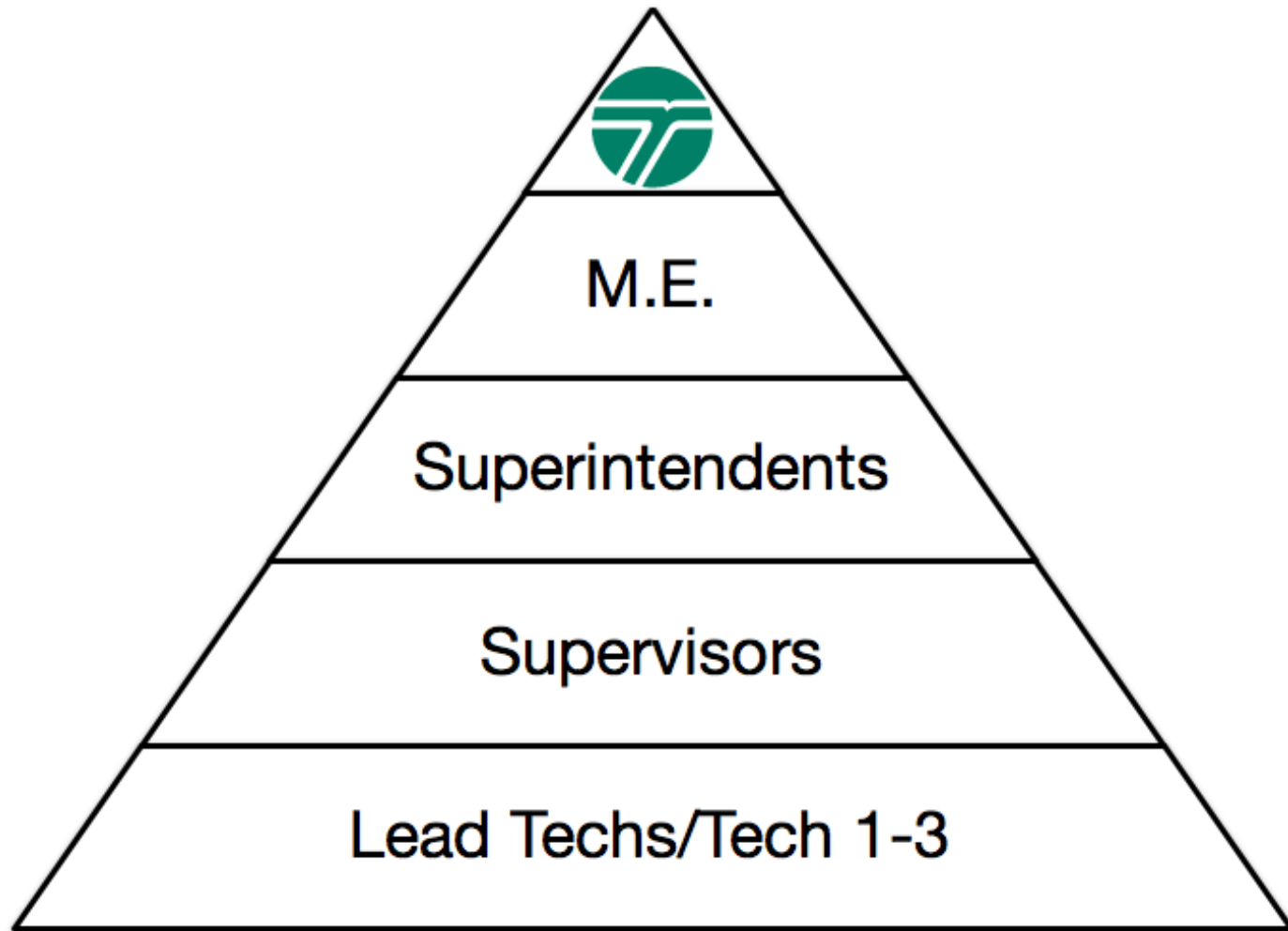
+ Activity

WSDOT ID: WSDOT0000158431
005Q115496 MP: 0.22 Dir: Inc

+ Activity

*Get the right information
into the right peoples hands
in a format that allows
them to quickly understand
and make decisions.*

Empowered, Efficient and Effective



Highway Activities Tracking System (HATS) - Application

- Web app (developed in house)
 - .NET MVC web front end
 - Microsoft SQL Server 2014 back end database
 - ESRI ArcGIS SDE, ArcGIS Server
- Mobile app (developed in house)
 - iOS Swift for iPad
 - ESRI iOS SDK for GIS
 - SQLite database (for mobile offline sync)

Data stored on device

 ActivityRecords	zero KB	1/11/16, 4:05 PM
 FileLibrary	30.6 MB	6/1/16, 3:58 PM
 HATS-basemap.geodatabase	279.2 MB	1/11/16, 4:04 PM
 HATS-basemap.geodatabase-shm	32 KB	6/8/16, 8:36 AM
 HATS-basemap.geodatabase-wal	zero KB	1/11/16, 4:04 PM
 HATS-features.geodatabase	74.3 MB	6/8/16, 8:36 AM
 HATS-features.geodatabase-shm	32 KB	6/8/16, 8:36 AM
 HATS-features.geodatabase-wal	zero KB	6/8/16, 8:36 AM
 hatsDB.sqlite3	254.8 MB	6/1/16, 3:58 PM

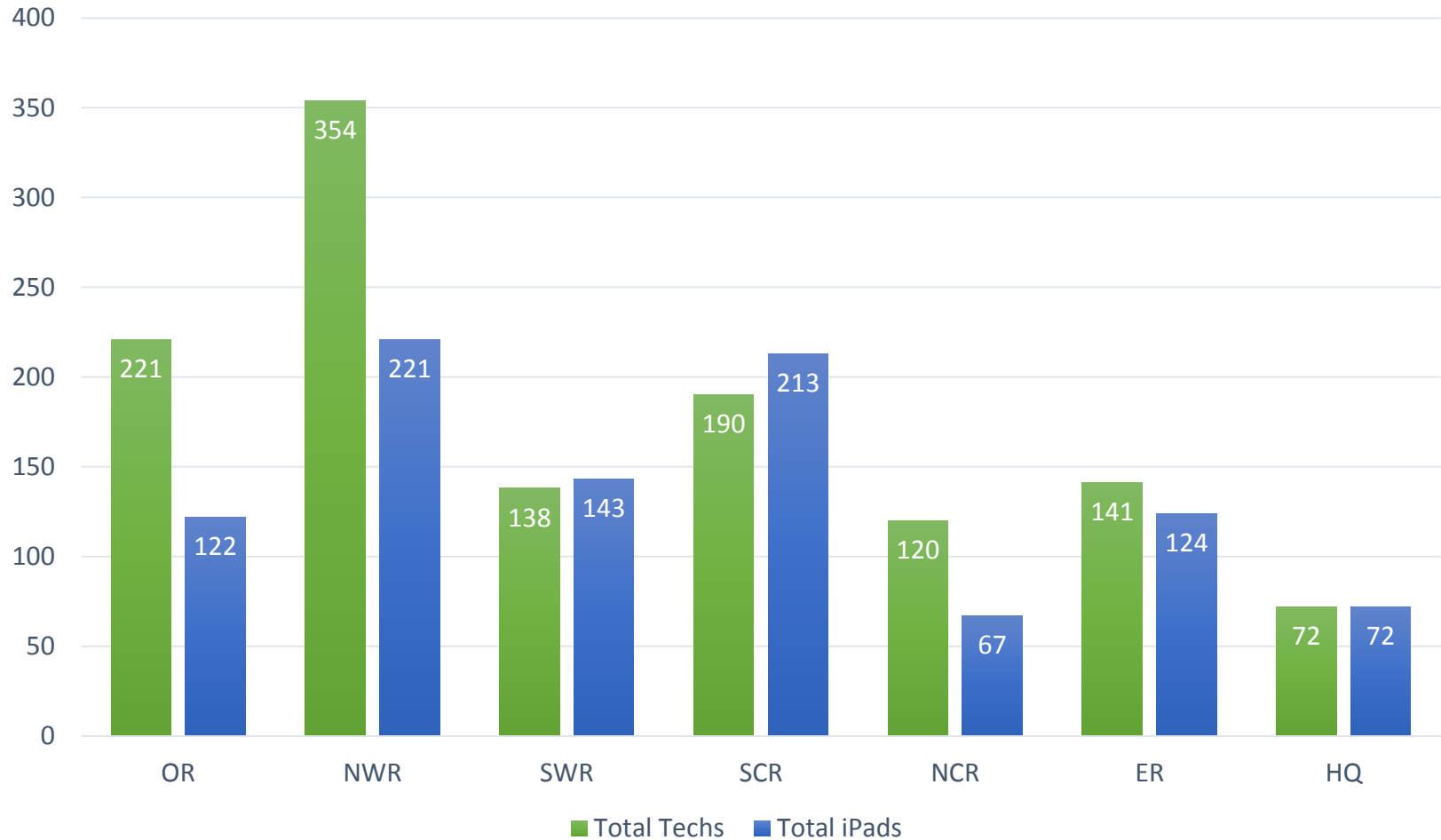
Entire app and data consumes roughly 600 MB of 32 GB storage

HATS – Mobile Hardware

- 1,200 iPad Air 2
 - 32 GB storage
 - Cellular chip (Verizon) – provides integrated GPS and A-GPS capabilities
 - GPS is recreational grade (+/- 10m)
 - Ruggedized with LifeProof Nuud case, hand and shoulder straps and floatation jacket when working on/around water
 - Four year life cycle



Employee to iPad Breakdown



Wireless Infrastructure

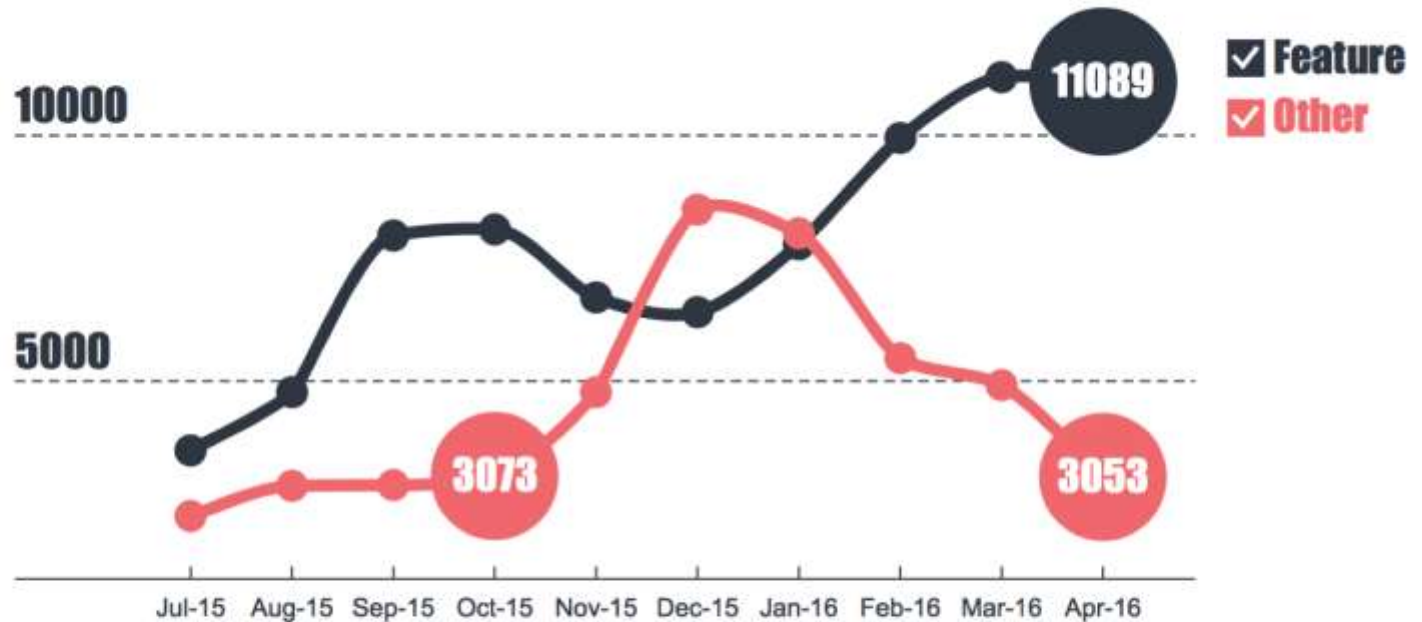
- The project required an overhaul and build out of existing wireless network
- 270 - Cisco[®] Aironet[®] 2700 Series wireless access points installed – connected shops in the yard and crew room
 - 2.4GHz 2.2dBi swivel dipole antenna primarily used
 - \$1100 per unit
- Implemented Controlled Based Wireless, Identity Services Engine (ISE) and Certificate Authority
 - WPA2, AES, WSDOT Active Directory username and password credentials, EAP-Fast and internally generated certificate

Cost Breakdown

- \$1.5 million overall
 - \$750k – iPad hardware and LifeProof protective gear
 - \$300k – Application development
 - \$300k – Wireless infrastructure
 - \$130k – ESRI software licensing
 - \$30k – Meraki MDM

Data Collection Breakdown

HATS Data



Total Records Collected Since July 1, 2015

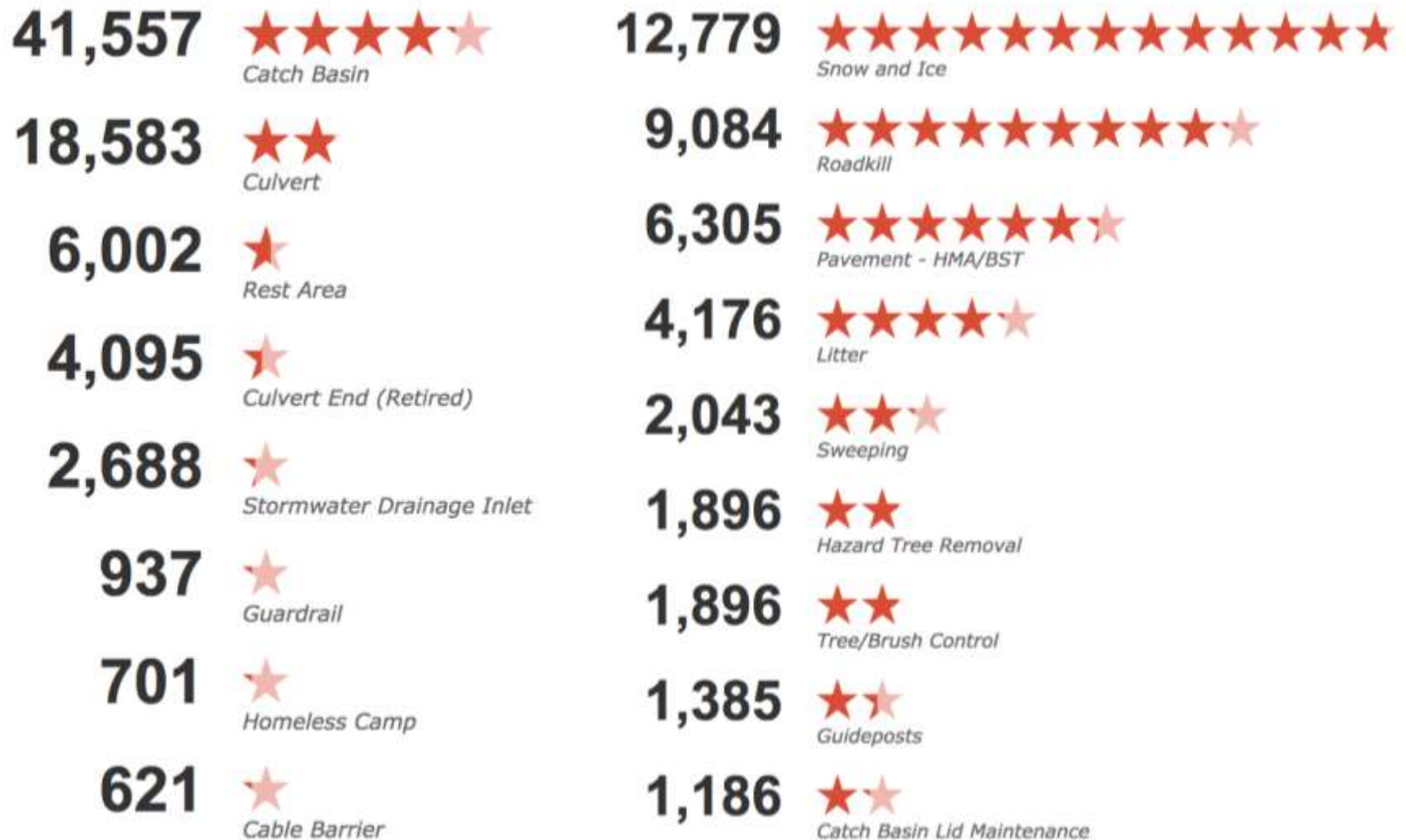
123,335

Data analysis

Winter increase in "other record" activities due to snow and ice data collection.

Spring/summer increase in feature based activities due to BMP, NPDES and drainage inspection requirements.

Data Collection Breakdown



Live Application Demo

- Screenshots follow in an effort to summarize the demonstration.

Map (BETA)



Basemap

Mode

Lat:47.238629, Long:-123.107791

Map (BETA)

- Barriers 
- Drainage 
- Other 
- Roadside Features 
- Roadway Features 
- Stormwater Features 
- Basemap 



Basemap

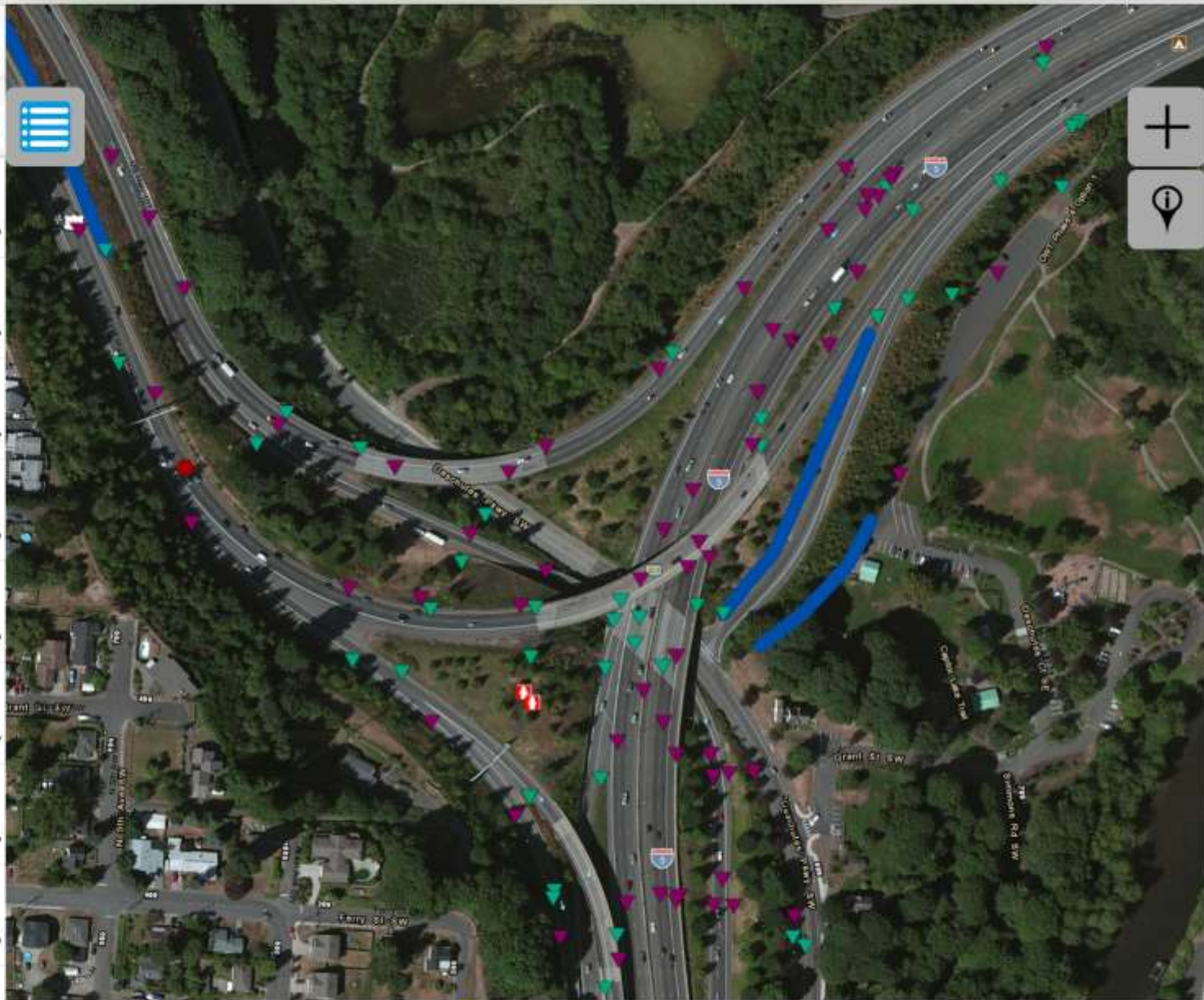
Mode

Lat:47.238629, Long:-123.107791



Map (BETA)

- Barriers  
- Drainage  
- Catch Basin  
- Concrete Inlet  
- Culvert  
- Culvert End  
- Drop Inlet  
- Grate Inlet  
- Manhole  
- Pipe  
- Stormwater Drainage Inlet



Basemap

Mode



Lat:47.238629, Long:-123.107791



Map



Other



Pending Activities



Saved Records



File Library



Sync



Settings

Map (BETA)



What do you want to
add to the map?

Concrete Inlet
Constructed Treatment Wetl...
Continuous Inflow Bio Swale

Culvert

Culvert End
Detention Pond
Detention Tank

Cancel Sketch

Undo

Redo

Delete Vertex

Restart

+ Collect GPS

Lat: 47.023219

Long: -122.903433

Length: 435.24 ft

Save Sketch

Basemap

Mode

Lat:47.238629, Long:-123.107791



Map



Other



Pending Activities



Saved Records



File Library



Sync



Settings

Cancel

Add Attributes

Save Feature

Attributes

Access Instructions

Gate locked, Key in knox box, code is 1234#

Material Type

Please select one.

- ☐ Clay
- ☒ Concrete
- ☐ Other Add Note
- ☐ Polyvinyl Chloride – PVC
- ☐ Corrugated Polyethylene – PE
- ☐ High Density Polyethylene – HDPE
- ☐ Galvanized Steel
- ☐ Aluminum Alloy
- ☐ Aluminized Steel
- ☐ Ductile Iron
- ☐ Unknown
- ☐ Plain Steel

Diameter

24

Diameter Units

Please select one.

- ☐ Feet

Verizon

12:18 PM

97%

Cancel

Add Attributes

Save Feature

Attributes

Access Instructions

Gate locked, Key in knox box, code is 1234#

Material Type

Please select one.

☐

Clay

☒

Concrete

☐

Other Add Note☐☐☐☐☐☐☐☐☐

Culvert Added

Culvert has been added to this device's map inventory.

The new feature will be available on the web and other devices after the next sync.

Ok

Diameter

24

Diameter Units

Please select one.

☐

Feet

22

Map (BETA)



Culvert

WSDOT ID: WSDOT0001010723
005S110489 MP: 0.43 Dir: Ramp
Length: 248.01 ft

Source: HATS **Added:** 10-07-2015 11:20 AM

[+ Activity](#)

Basemap

Mode



Lat:47.238629, Long:-123.107791



Map



Other



Pending Activities



Saved Records



File Library

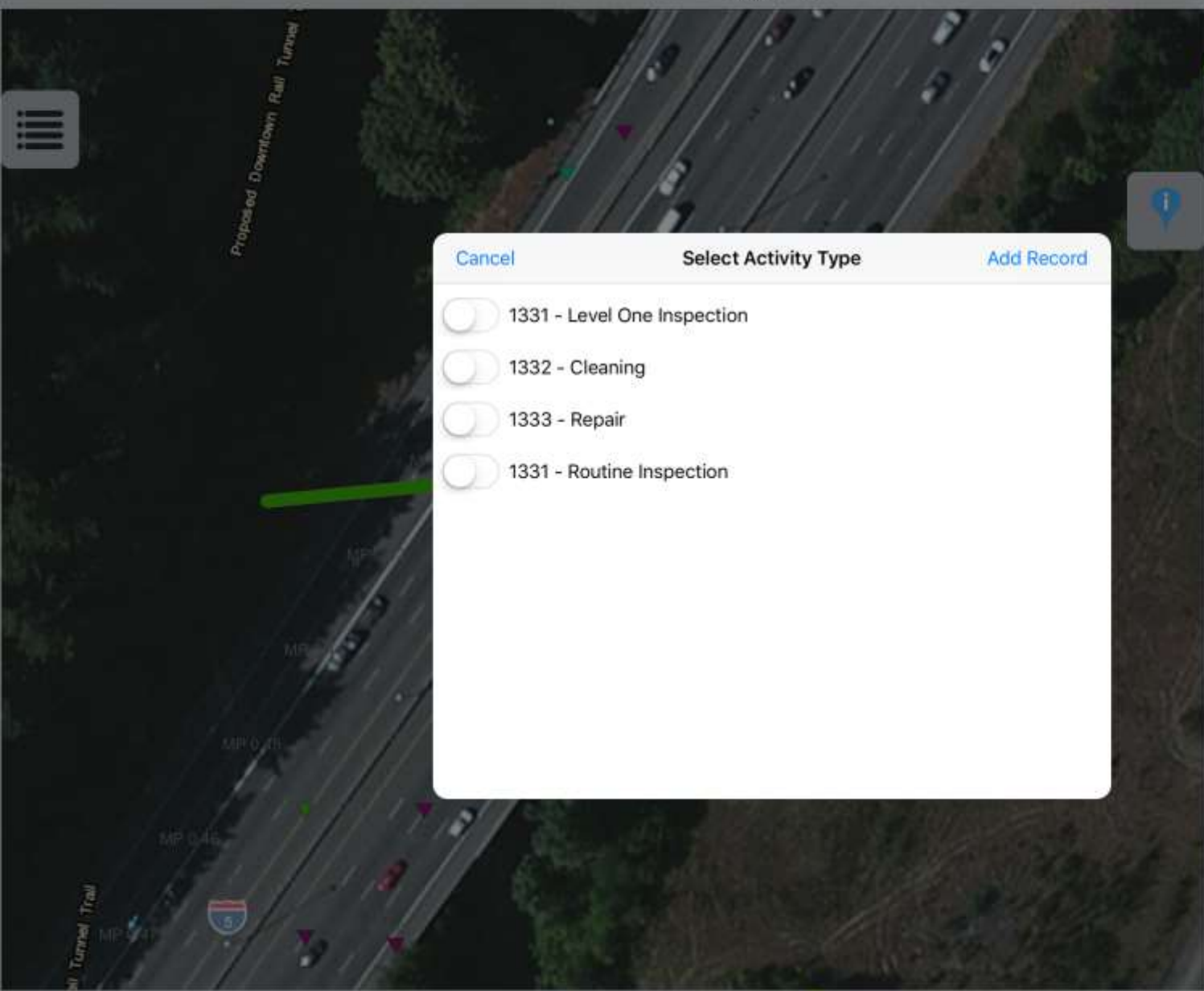


Sync



Settings

Map (BETA)



Culvert

WSDOT ID: WSDOT0001010723
005S110489 MP: 0.43 Dir: Ramp
Length: 248.01 ft

Source: Added:
HATS 10-07-2015 11:20 AM

+ Activity

Cancel Select Activity Type Add Record

☐

1331 - Level One Inspection

☐

1332 - Cleaning

☐

1333 - Repair

☐

1331 - Routine Inspection

Map (BETA)



Update the Feature Location

Undo

Redo

Delete Vertex

Restart

+Collect GPS

Lat: 47.028700

Long: -122.894756

Length: 248.01 ft

Save

Cancel

Basemap

Mode

Lat:47.238629, Long:-123.107791



Map



Other



Pending Activities



Saved Records



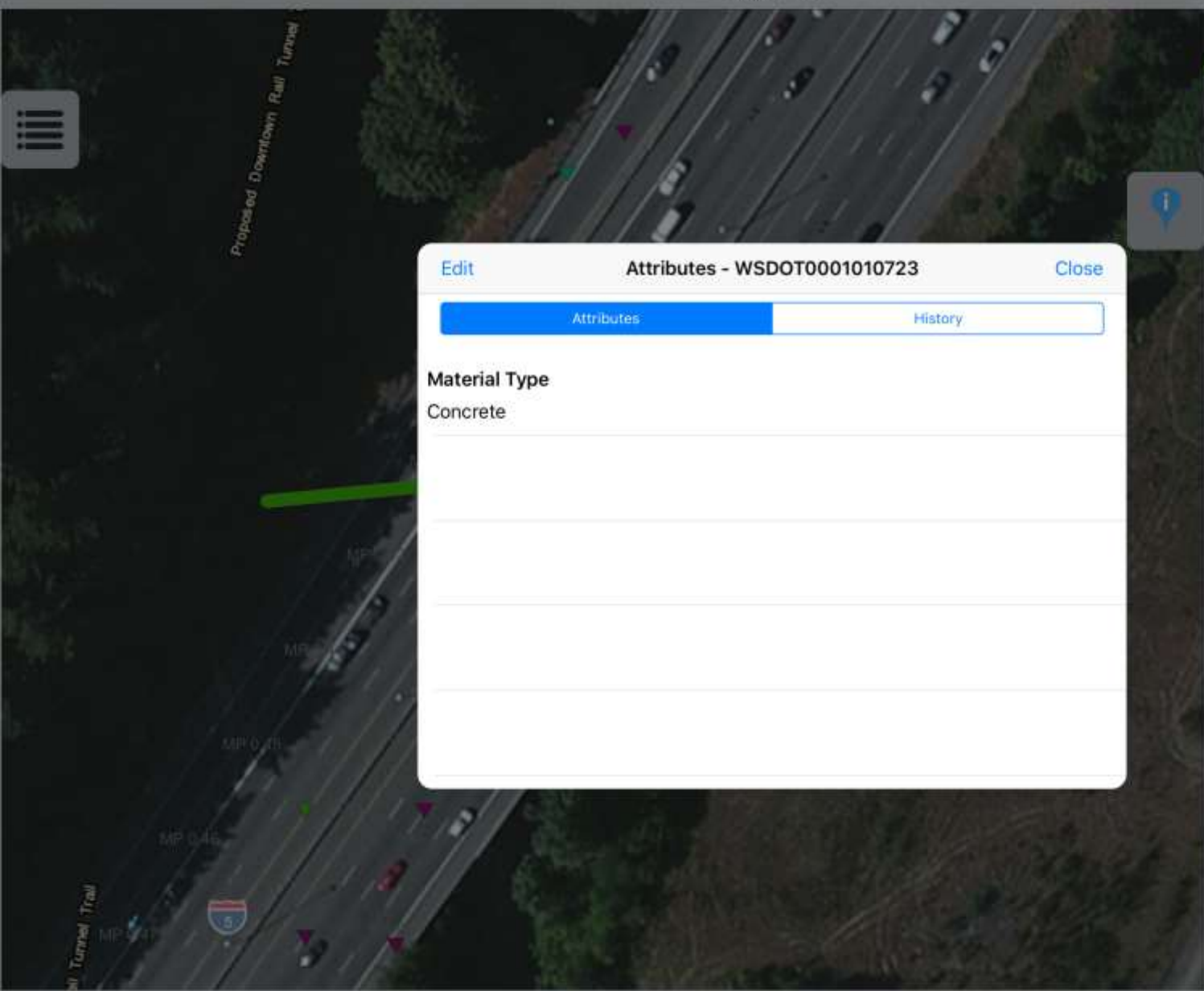
File Library



Sync



Settings



Culvert

WSDOT ID: WSDOT0001010723

005S110489 MP: 0.43 Dir: Ramp

Length: 248.01 ft

Source: HATS

Added: 10-07-2015 11:20 AM

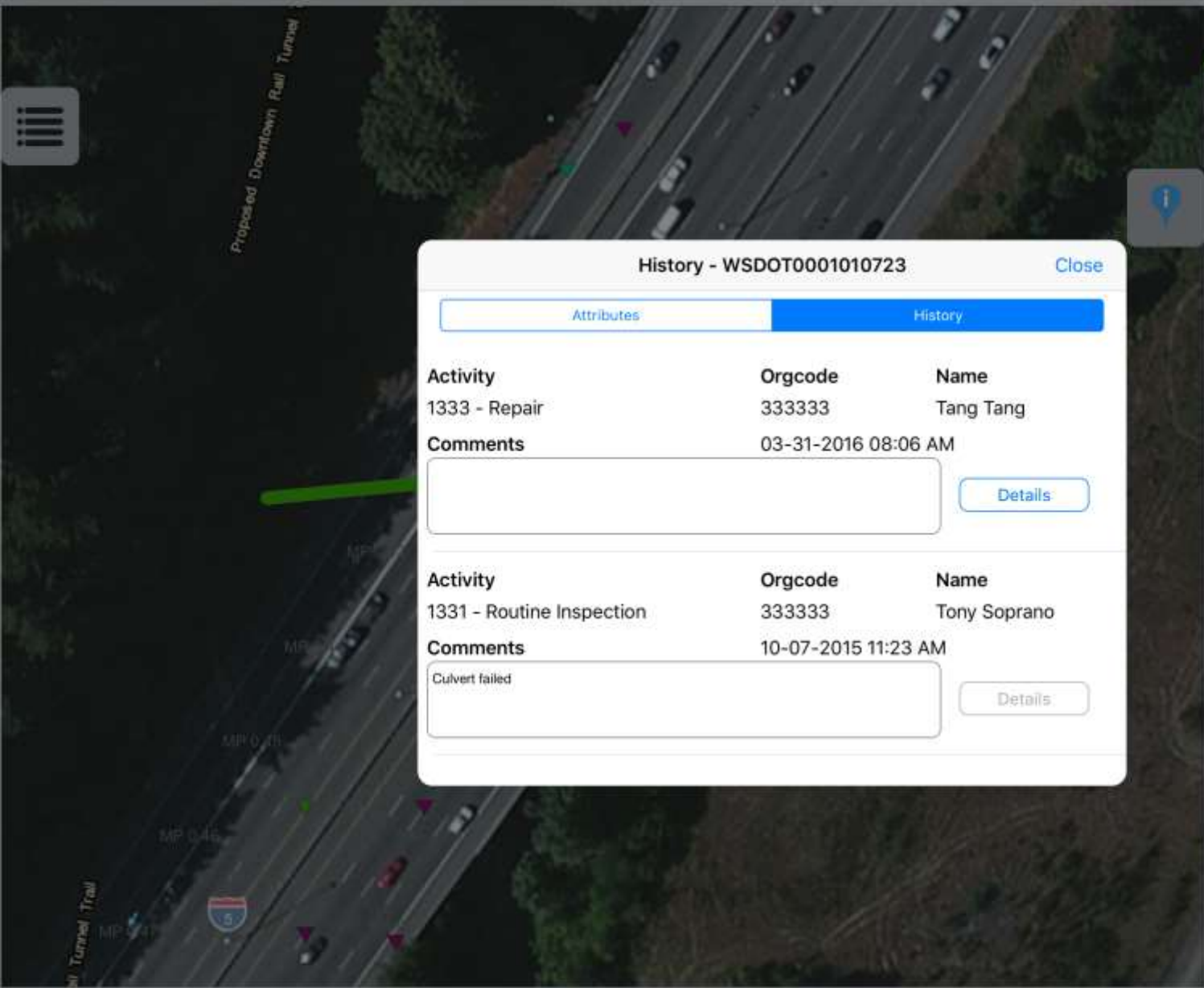
   + Activity

Attributes - WSDOT0001010723

Attributes History

Material Type

Concrete



Culvert

WSDOT ID: WSDOT0001010723

005S110489 MP: 0.43 Dir: Ramp

Length: 248.01 ft

Source: HATS

Added: 10-07-2015 11:20 AM

+ Activity

History - WSDOT0001010723 Close

Attributes

History

Activity

1333 - Repair

Orgcode

333333

Name

Tang Tang

Comments

03-31-2016 08:06 AM

Details

Activity

1331 - Routine Inspection

Orgcode

333333

Name

Tony Soprano

Comments

10-07-2015 11:23 AM

Culvert failed

Details

Map (BETA)

Culvert

WSDOT ID: WSDOT0001010723
005S110489 MP: 0.43 Dir: Ramp
Length: 248.01 ft

Source: HATS **Added:** 10-07-2015 11:20 AM



+ Activity

Cancel

Hide Feature

Hide Feature

Select Reason To Hide Feature:

- ☐ City Limits
- ☐ Duplicate
- ☐ Private Approach
- ☐ Removed
- ☐ Retired
- ☐ Temporarily Inactive

Basemap

Mode

Lat:47.238629, Long:-123.107791



File Library (BETA)

SAFETY

Lead Tech's Role In Safety

Describes a Lead Tech's Role in the Safety Culture.

Region: All Maintenance Area: All

Downloaded

Download

Open

Reasonable Suspicion Supervisor Training

What constitutes Reasonable Suspicion? How to approach the employee with the supervisor's concerns. Documentation. What are the liabilities to employees and supervisors with regards to reasonable suspicion testing? Signs and symptoms.

Region: All Maintenance Area: All

Not Downloaded

Download

Open

TRAINING VIDEOS

Add Feature Activity Records

Shows how to create a feature activity record for a feature.

Region: All Maintenance Area: All

Not Downloaded

Download

Open

Hide Feature

Shows how to hide a feature on the map.

Region: All Maintenance Area: All

Not Downloaded

Download

Open

Region Clear

