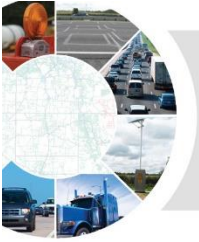


# District 3 Mobile Imaging Pilot Project

Southeastern Surveying & Mapping Corp.





# Southeastern Surveying & Mapping Corp.

Thomas Felsmaier

- RCI Project Manager

Kirk Hall, EI, GISP

- GIS Department Manager

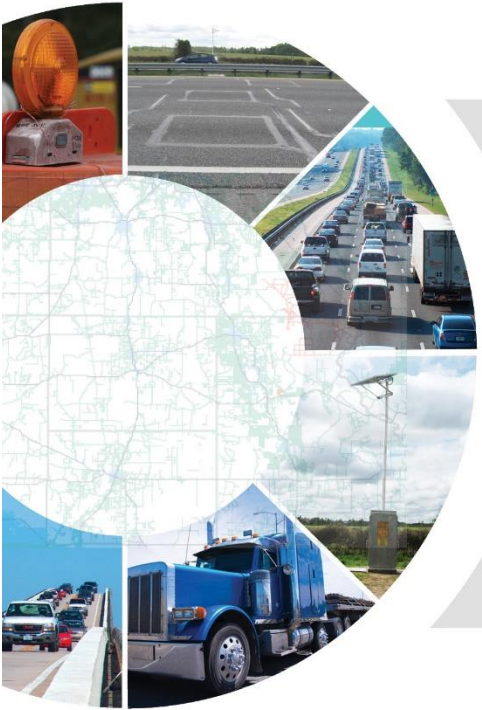
Patrick Phillips, GISP

- Sr. GIS Analyst

Anthony Biondella

- GIS Developer



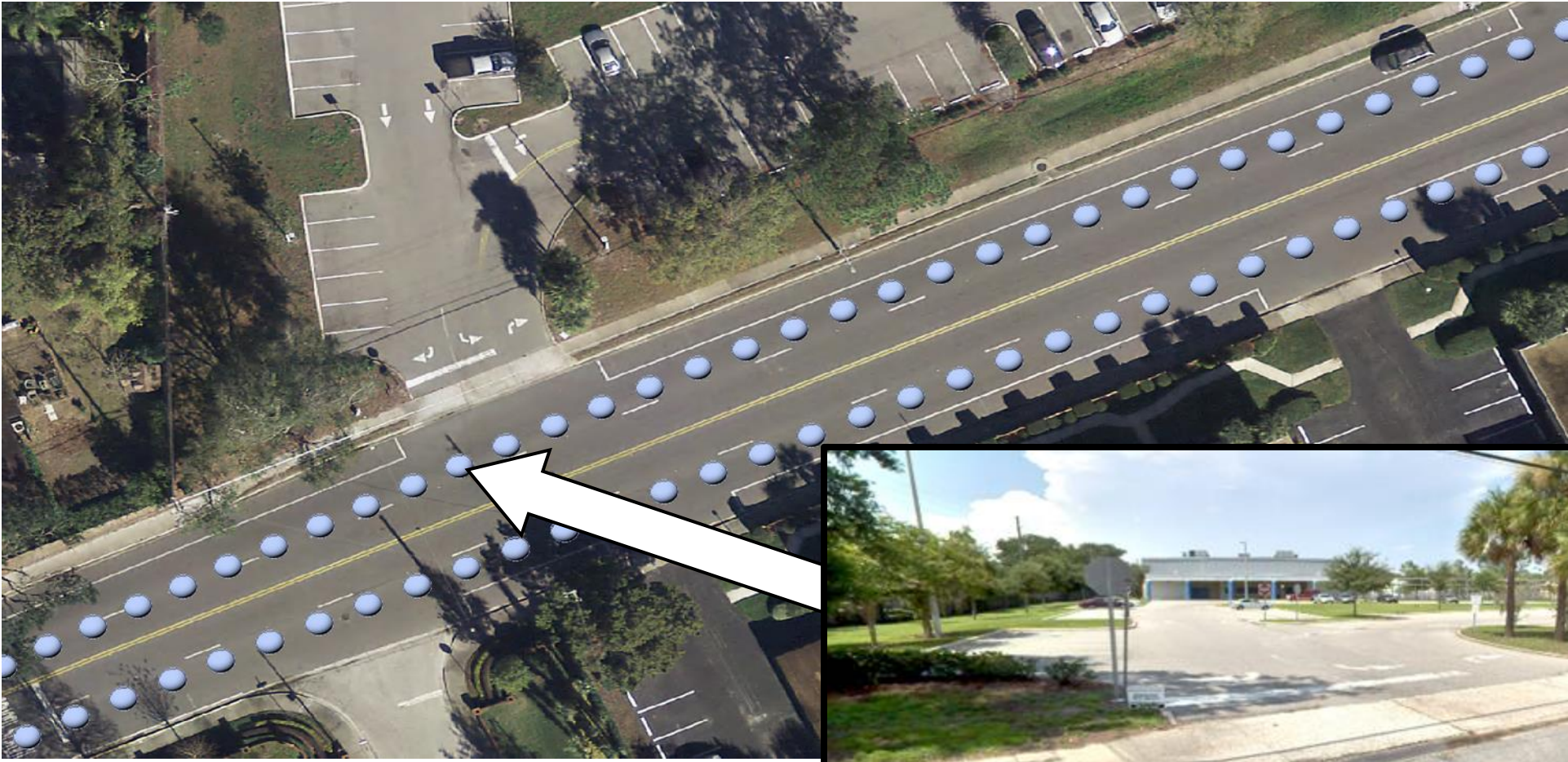


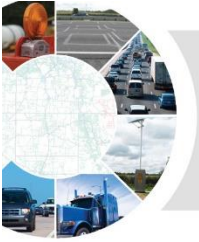
# SSMC's Background with Mobile Imaging



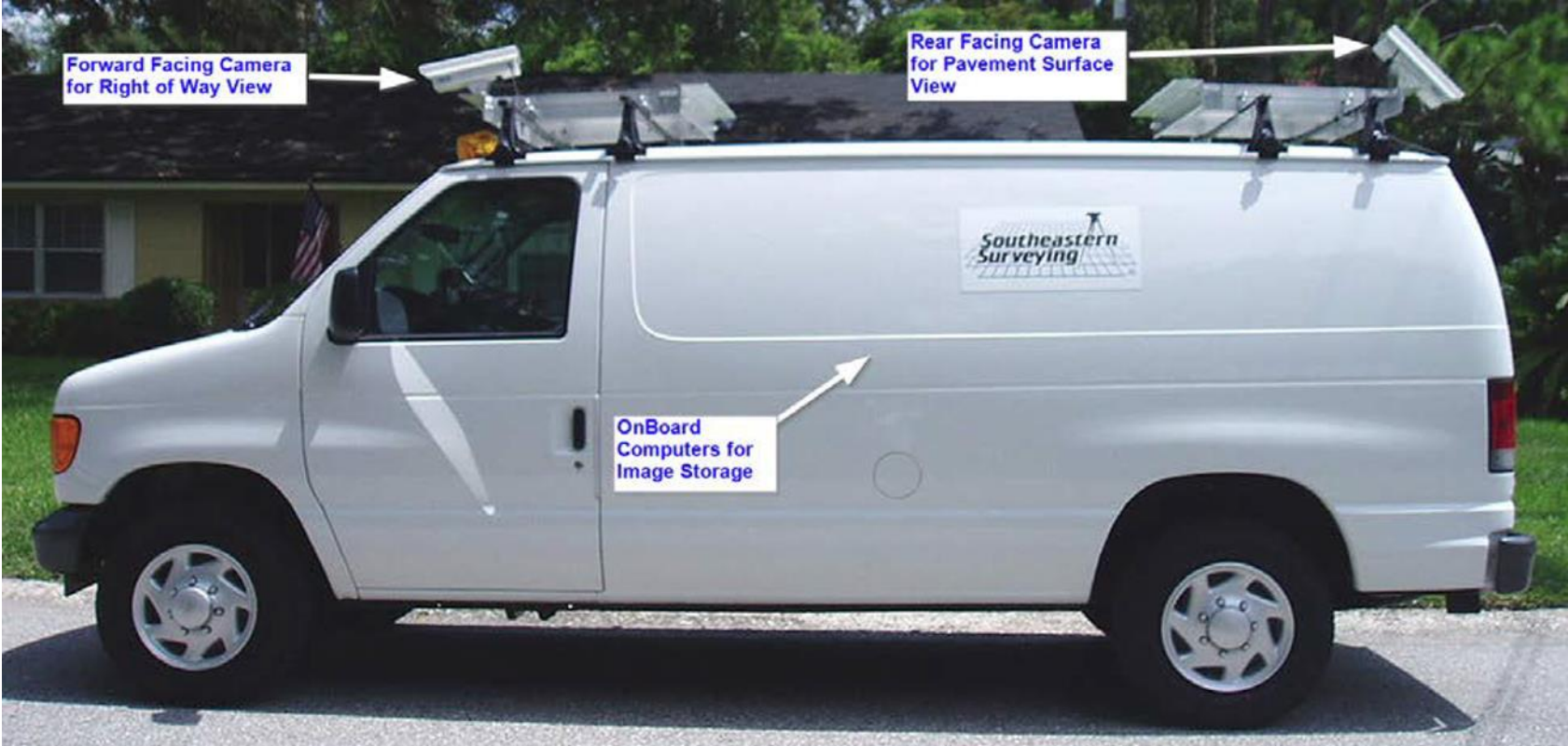


# What is Mobile Imaging?





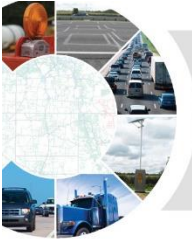
# How do we collect Mobile Imaging?



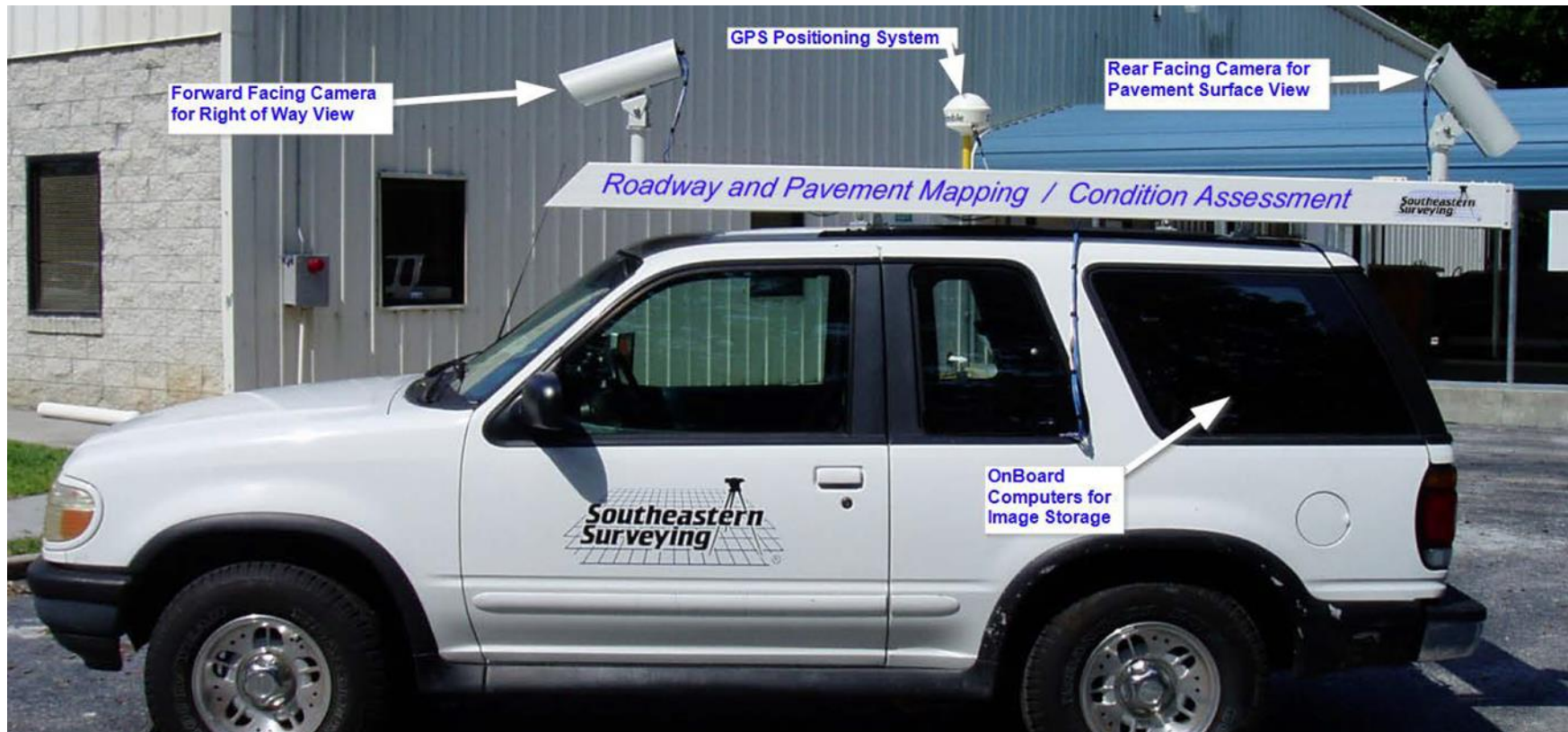
**2007: SSMC's 1<sup>st</sup> Generation Mobile Imaging Vehicle**





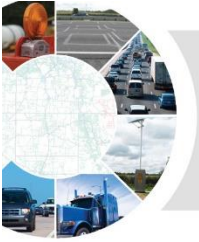


# How do we collect Mobile Imaging?

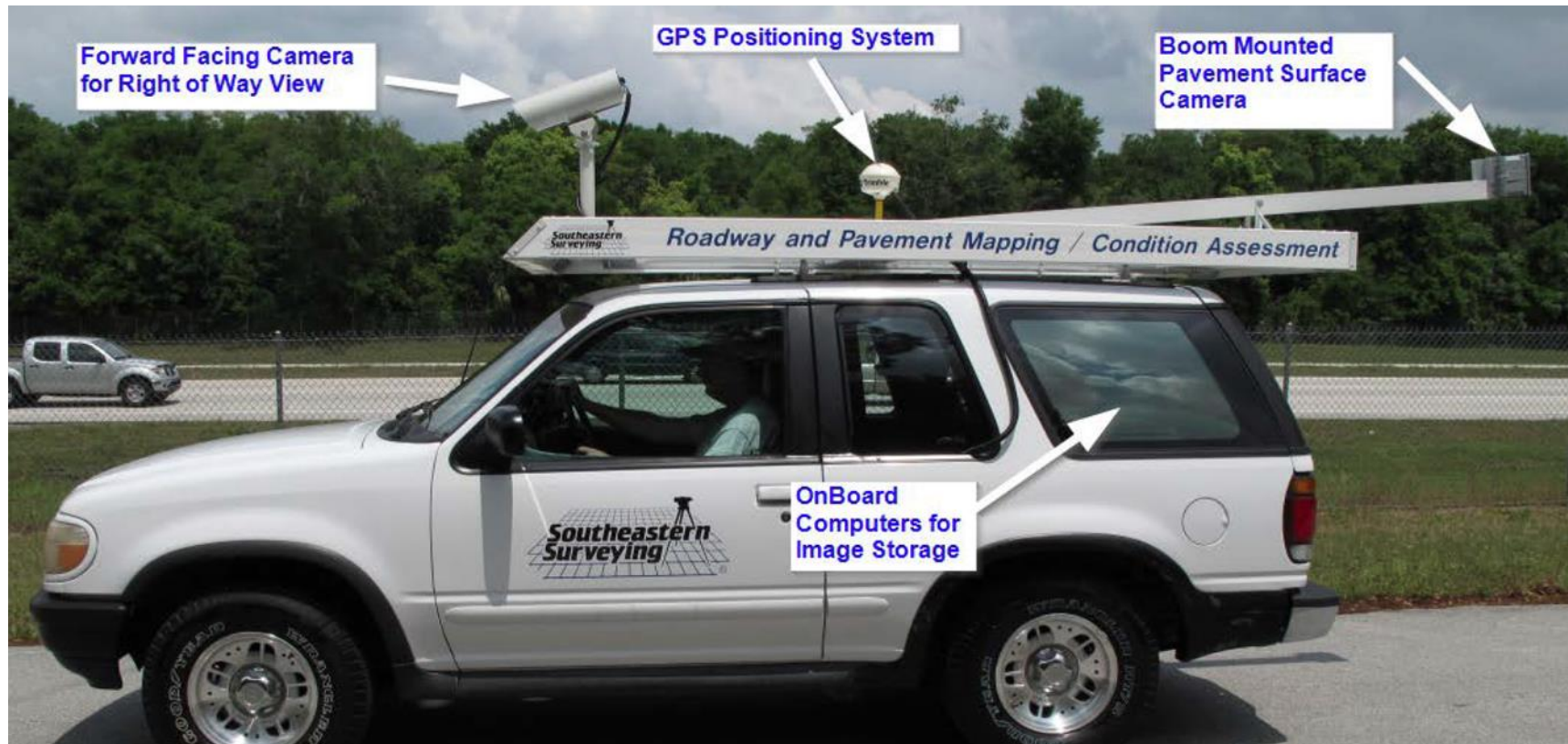


2009: SSMC's 2<sup>nd</sup> Generation Mobile Imaging Vehicle





# How do we collect Mobile Imaging?



## 2010: SSMC's 3<sup>rd</sup> Generation Mobile Imaging Vehicle







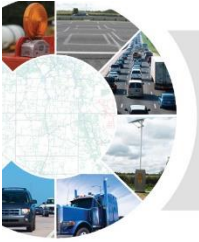
# How do we collect Mobile Imaging?



## 2014: SSMC's 4<sup>th</sup> Generation Mobile Imaging Vehicle







# How do we collect Mobile Imaging?



**2016: SSMC's 5<sup>th</sup> Generation Mobile Imaging Vehicle**





# How do we collect Mobile Imaging?

## Vehicle Composition



**Dual Antenna  
RTK GNSS**

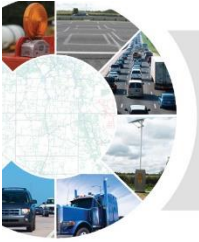
**Inside Vehicle: On-Board  
Servers, Real Time Display, &  
Inertial Measuring Unit**



**Distance  
Measuring  
Instrument**

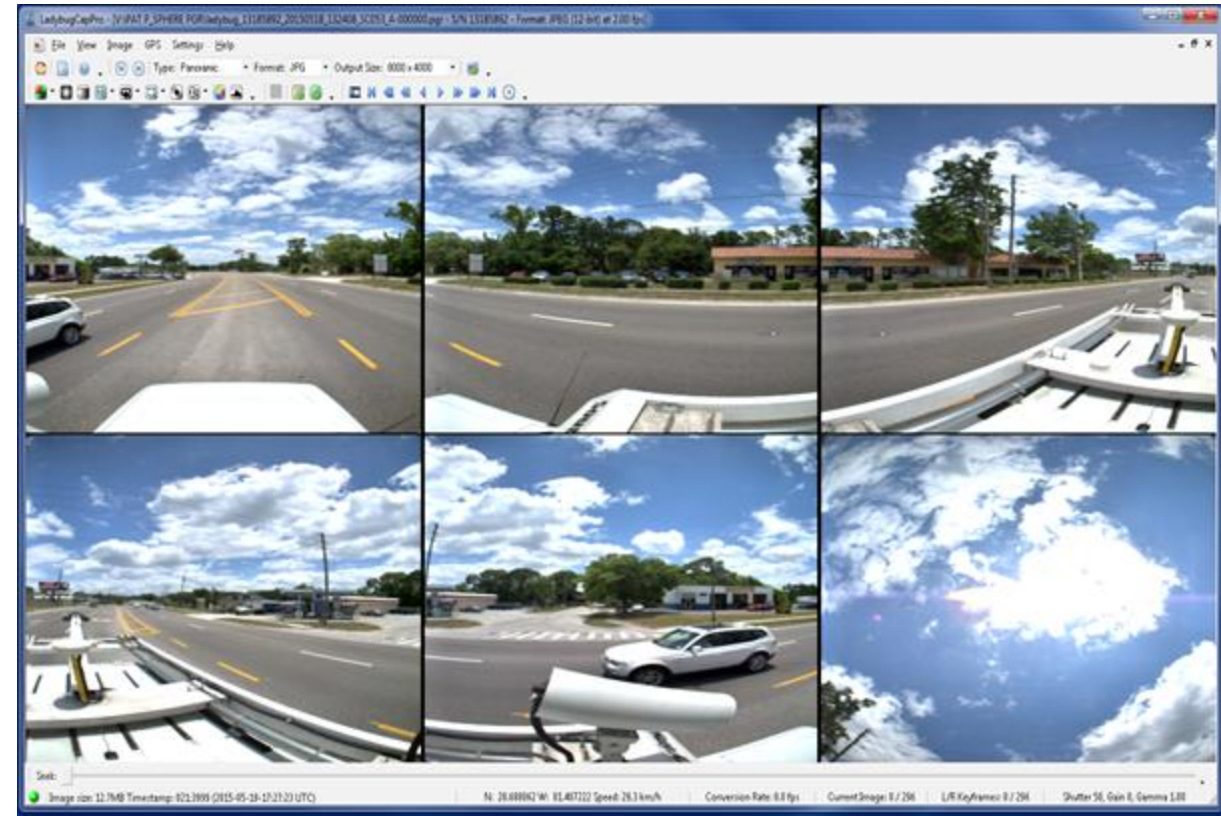
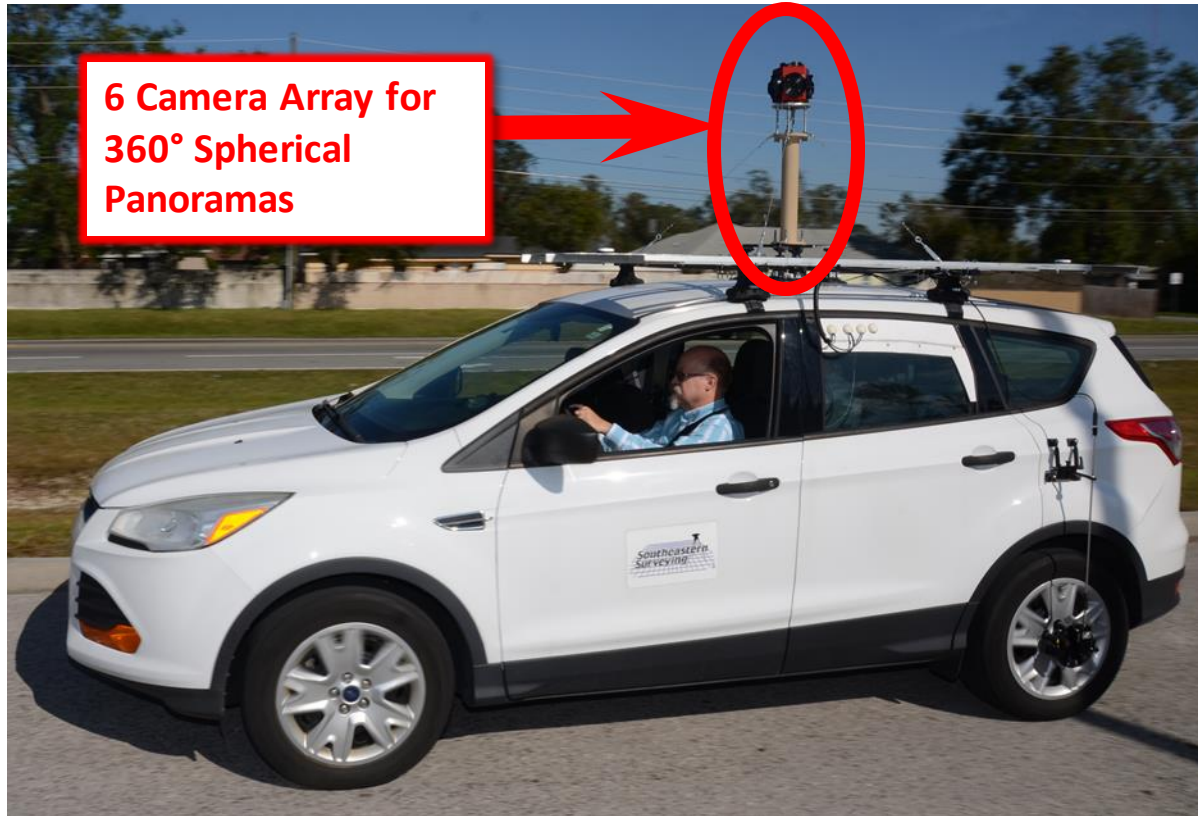






# How do we collect Mobile Imaging?

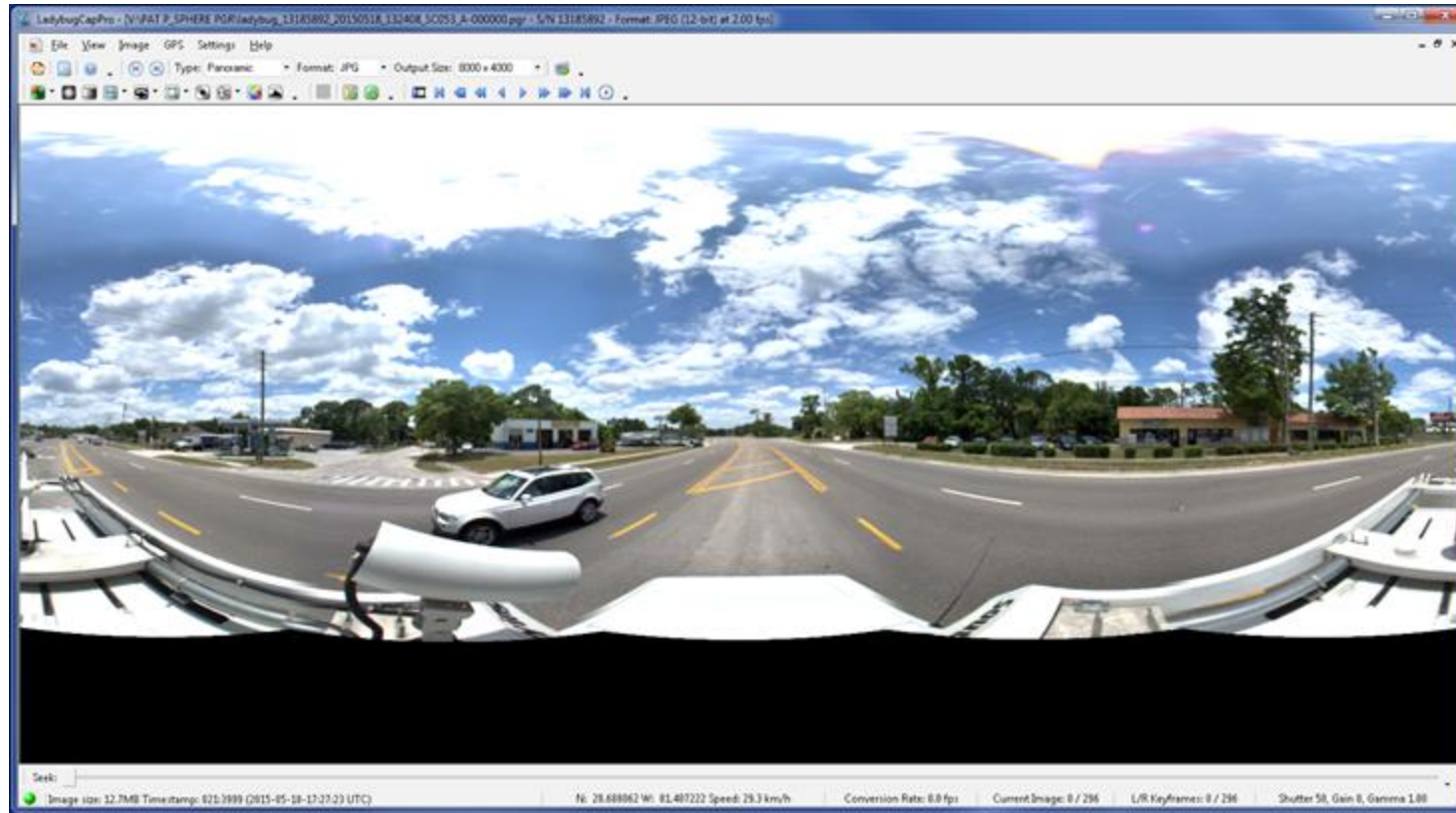
## Vehicle Composition





# Using Mobile Imaging for Mapping

## Six Images Become One Equirectangular Panorama





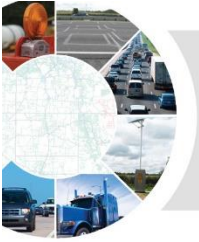


# Using Mobile Imaging for Mapping

## Establish Image Position and Heading

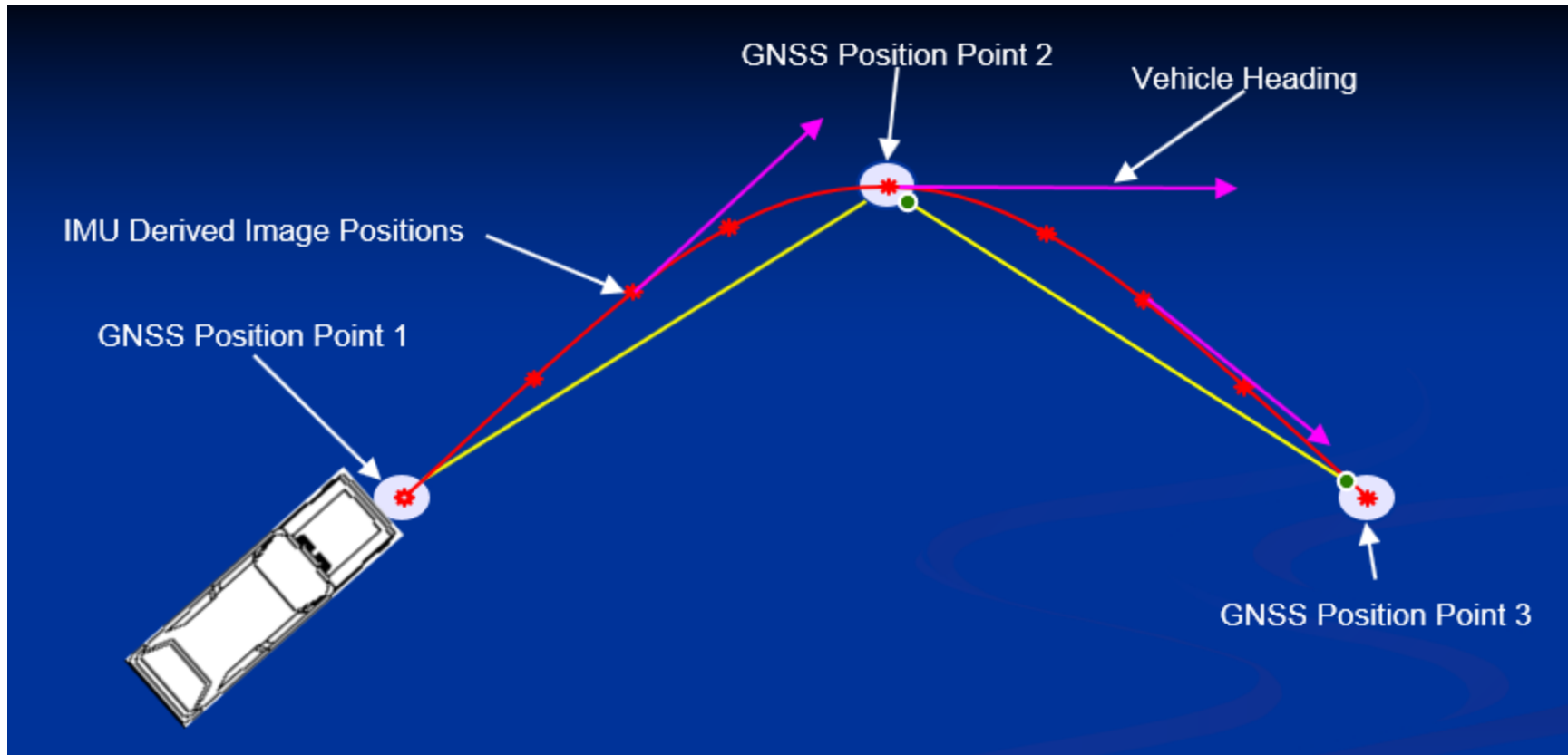
```
ladybug_frame_gps_info_297.txt - Notepad
File Edit Format View Help
FRAME, SEQID, CYCLE, SEC, CYCLE COUNT, SIZE, GAMMA, GAIN0, GAIN1, GAIN2, GAIN3, GAIN4, GAIN5, SHUTTER0, SHUTTER1, SHUTTER2, SHUTTER3, SHUTTER4, SHUTTER5, LAT, LON, ALT, UTC
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```





# Using Mobile Imaging for Mapping

## Establish Image Position and Heading

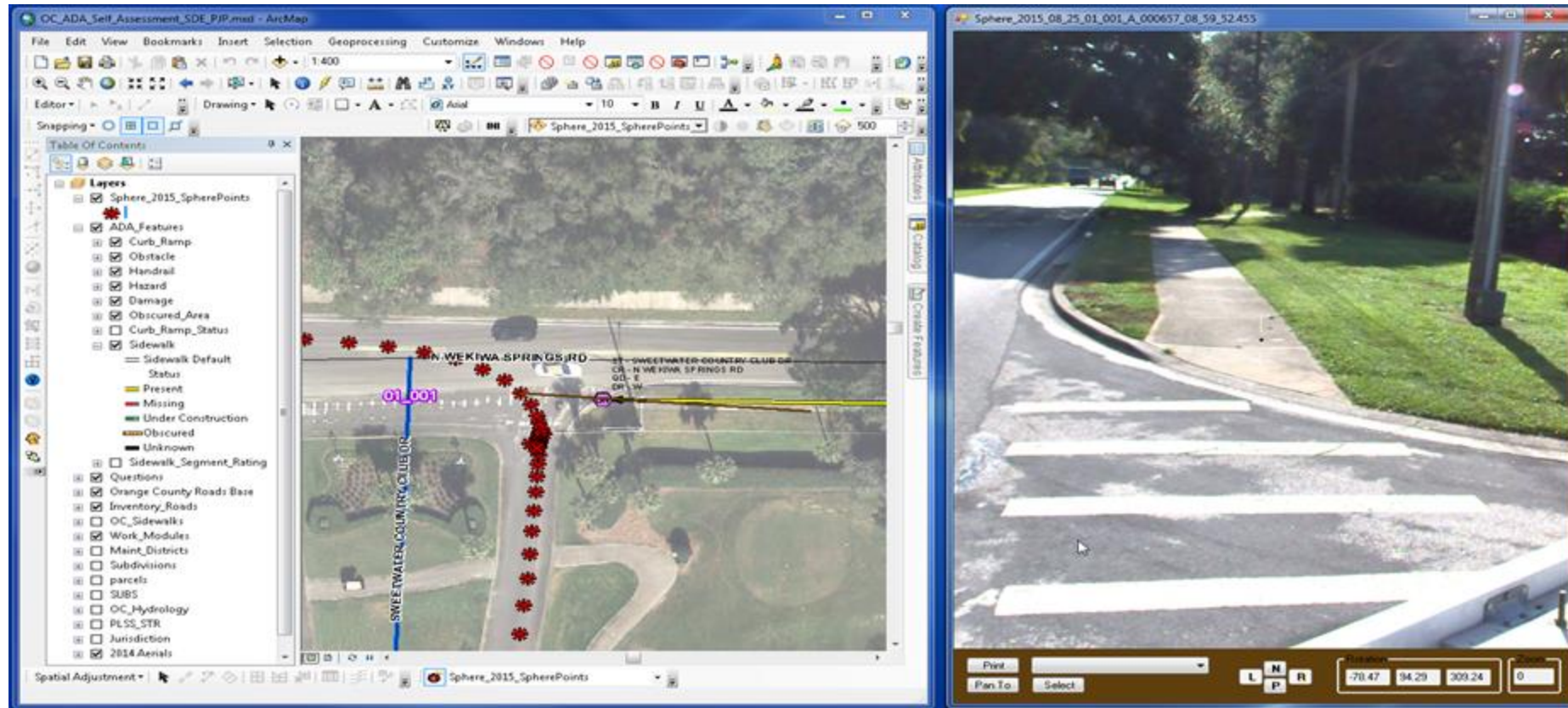


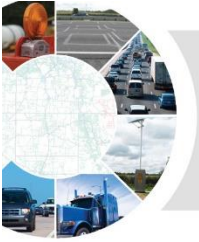




# Using Mobile Imaging for Mapping

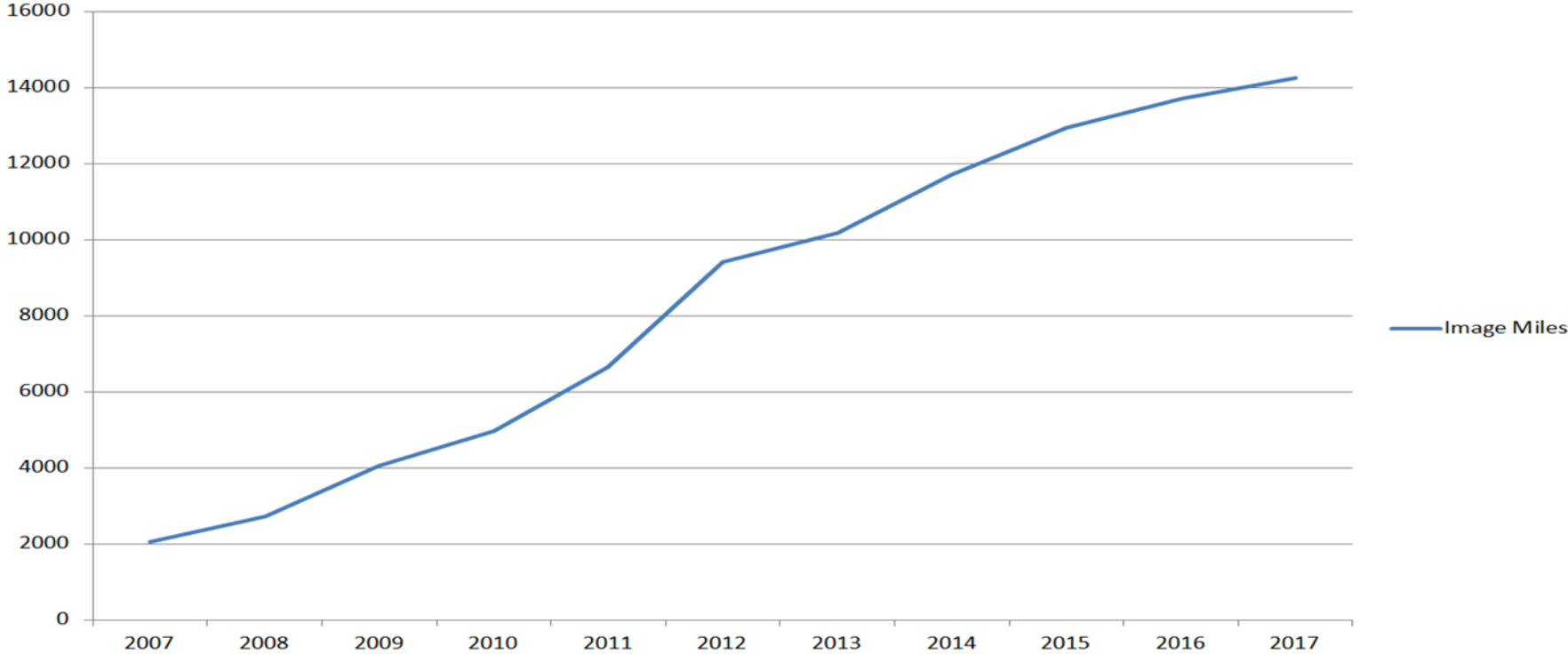
## Graphics in GIS Representing Position and Viewing Direction





# Mobile Imaging Project Experience

Cumulative Miles of Imagery Collected



**Over 14,000 lane miles of imagery since 2007.**

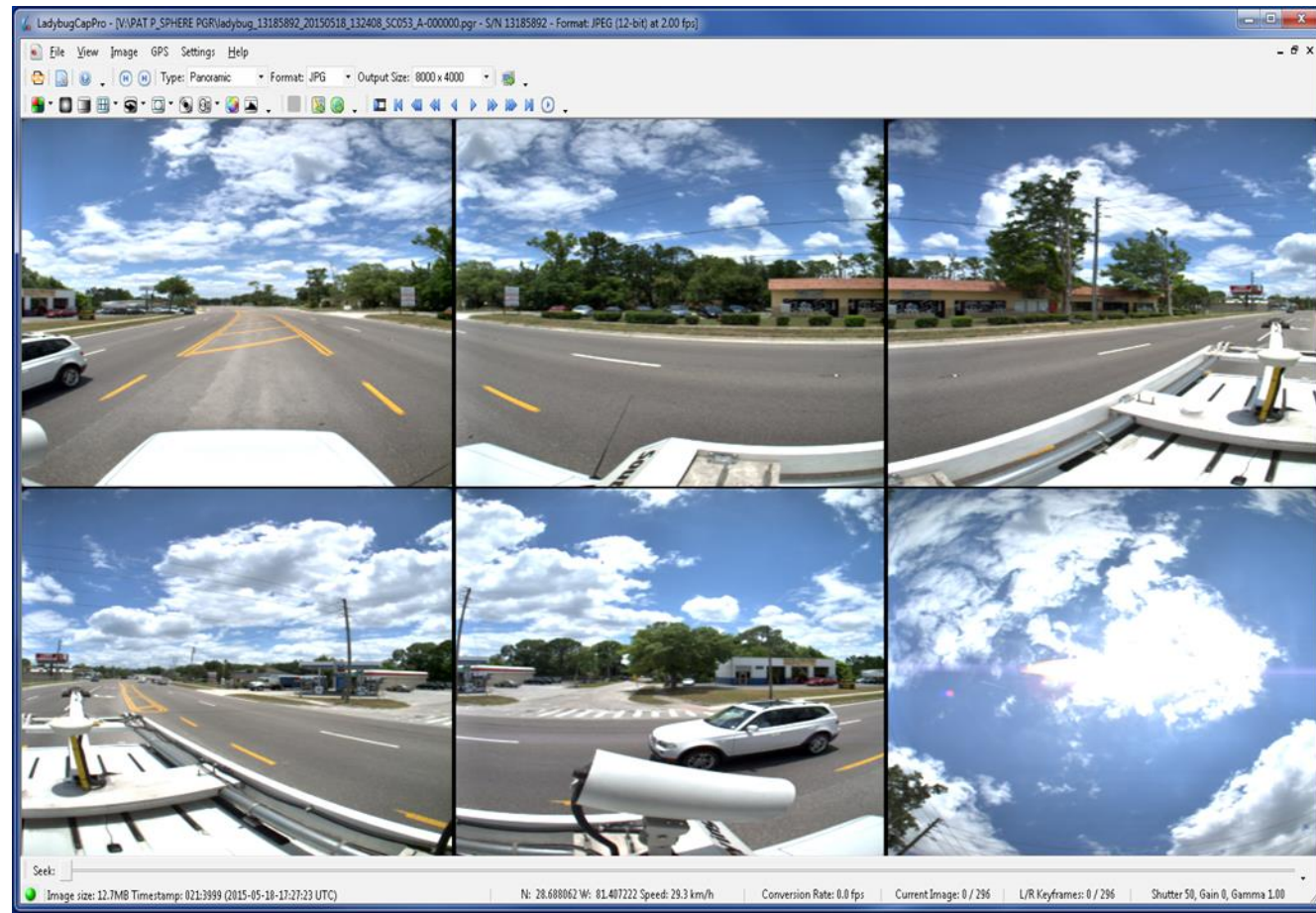






# Advantages of Mobile Imaging?

- Limits non-vehicular interactions with traffic. SAFETY!
- No proprietary software needed. No costs for any users.
- Ease of use and minimal training needed to use data.
- Eliminates repeated field visits.
- 1/10 the storage requirements and 1/10 the collection cost of LiDAR.



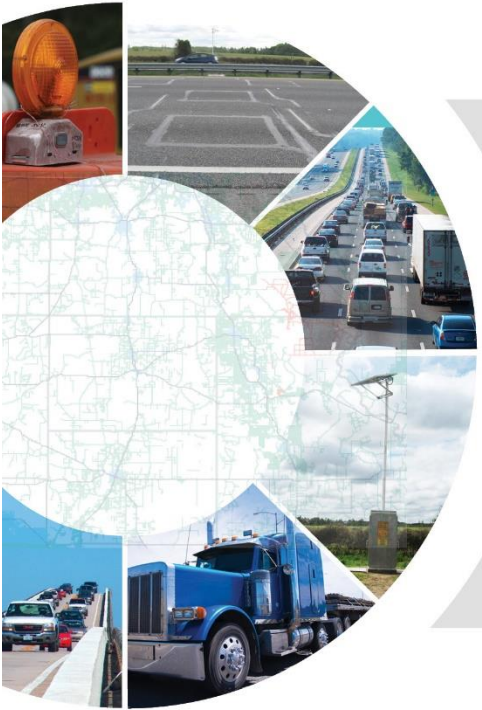


# FDOT Videolog Status

- Last updated 2017.
- Two images comprised of a forward-facing and oblique right.
- Unable to collect measurements or identify MP's of non-perpendicular characteristics.







# Mobile Imaging Pilot and FDOT



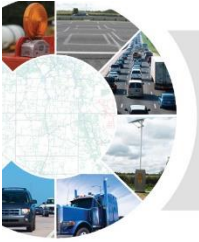
# Mobile Imaging Pilot Goals

- Improve upon FDOT's previous videolog.
  - Collect measurements and mile points for features and characteristics.
- Gets all Districts and Departments using same data sources.
- Safer way to collect roadway data.

Beg. MP	End. MP	Characteristics	Value	Unit	Side	Offset	Char. Updated
28.830		90 DEGREES LEFT	AIRPORT RD/THOMPSON	D	C		POINTINTERLOCK
28.835		90 DEGREES LEFT	PINE RD	D	C		Char. Updated
29.003		90 DEGREES RIGHT	CR/STIMMER ISLAND	D	C		KNPOISS 10/12/2017
29.038		90 DEGREES RIGHT	CARRAWAY CR	D	C		KN330JB 05/18/2005
29.120		90 DEGREES RIGHT	CARRAWAY CR	D	C		KNMETJX 04/01/2015
29.211		90 DEGREES LEFT	PLANTATION CR	D	C		KNMETJX 04/01/2015
29.819		90 DEGREES LEFT	CR/STWIVER RD	D	C		KNMETJX 04/01/2015
29.875		90 DEGREES LEFT	11TH ST/MIRYAN DR	D	C		KN330JB 05/18/2005
29.721		90 DEGREES LEFT	10TH ST	D	C		KN330JB 05/18/2005
29.786		90 DEGREES LEFT	9TH ST	D	C		KN330JB 05/18/2005
28.840		90 DEGREES LEFT	8TH ST	D	C		KNMETJX 04/01/2015
28.897		90 DEGREES LEFT	7TH ST	D	C		KNPOISS 10/12/2017
29.901		90 DEGREES LEFT	6TH ST	D	C		ROICNVRT 12/13/2001
30.000		90 DEGREES LEFT	5TH ST	D	C		KN330JB 05/18/2005
		90 DEGREES LEFT	W 4TH ST	D	C		KN330JB 05/18/2005
		90 DEGREES LEFT	W A AVE	D	C		ROICNVRT 12/13/2001
		90 DEGREES LEFT	BOAT RAMP	D	C		KN330JB 05/18/2005
		90 DEGREES LEFT	BOAT RAMP	D	C		KN330JB 05/18/2005
		90 DEGREES LEFT	BOAT RAMP	D	C		KNMETJX 04/01/2015
		90 DEGREES LEFT	BOAT RAMP	D	C		KNMETJX 04/01/2015
		90 DEGREES LEFT	BOAT RAMP	D	C		KNPOISS 10/12/2017
		90 DEGREES LEFT	BOAT RAMP	D	C		KNPOISS 10/12/2017







# Mobile Imaging Pilot

- We were given 4 roadways in District 3 totaling 49.136 centerline miles.
  - 46160000 – US98/SR-30A/PANAMA CITY BEACH PKWY
  - 48003000 – US-98/SR-289/N 9TH AVE
  - 55010000 – US-27/SR-63/MONROE ST
  - 57050000 – SR-85/S FERDON BLVD





# Mobile Imaging Pilot

- We then used the mobile imaging vehicle to create a "videolog" of the routes and collect the following RCI features:
  - F212 – Through Lanes
  - F213 – Auxiliary Lanes
  - F214 – Outside Shoulders
  - F215 – Medians
  - F216 – Bike Lanes and Sidewalks
  - F219 – Inside Shoulders
  - F251 - Intersections

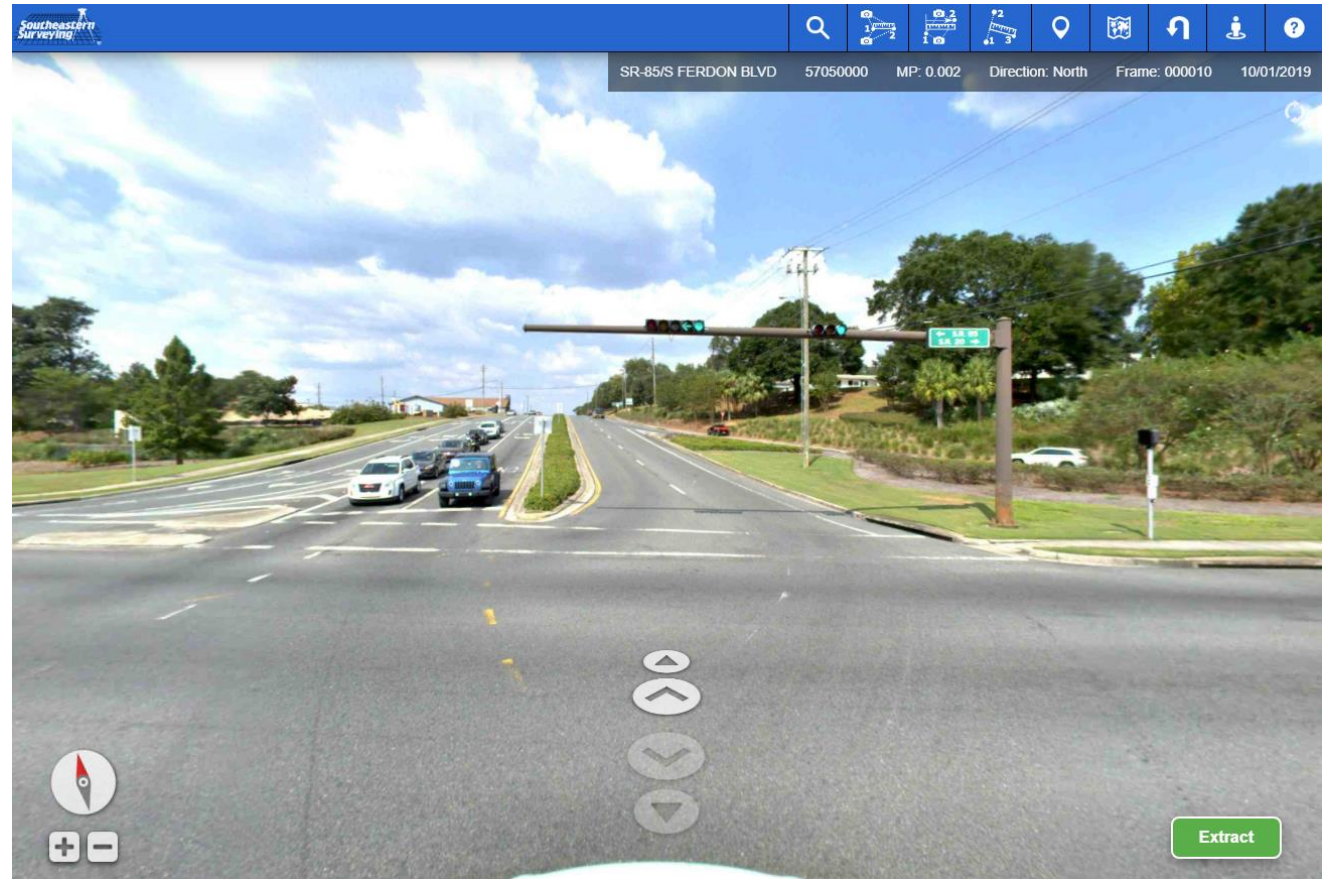






# Mobile Imaging Pilot – Must Haves

- Need to transition our viewer to ArcGIS Online.
  - No software investment or licensing fees for FDOT.
- Keep it familiar but build upon old Videolog.
- Measurement tools need to be user friendly.
- ACCURATE!





# Mobile Imaging Pilot – Roadway Information

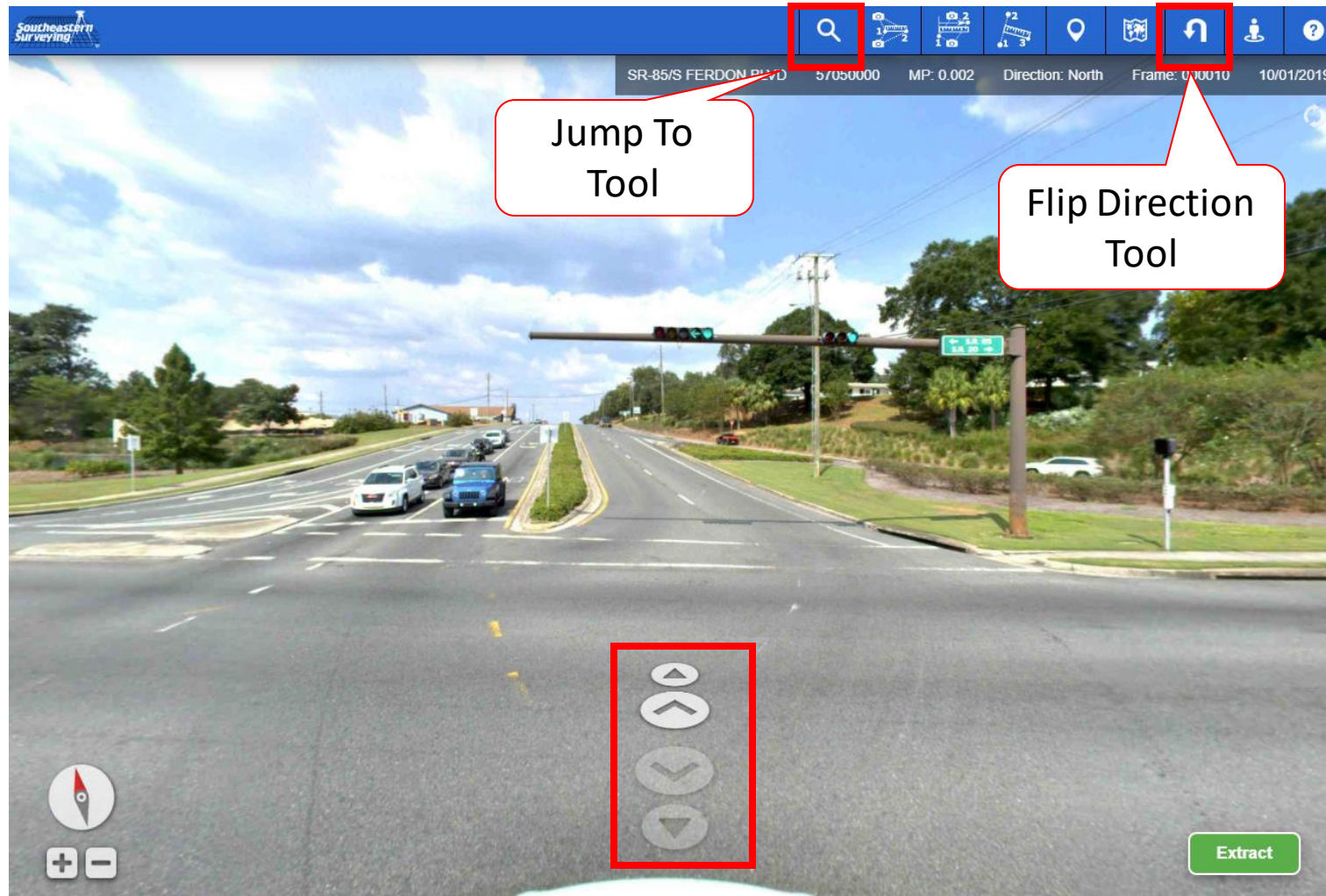
The screenshot displays a mobile application interface for roadway imaging. At the top, a blue header contains the 'Southeastern Surveying' logo and a series of navigation icons. Below the header, a red-bordered box highlights a data overlay with the following information: SR-85/S FERDON BLVD, 57050000, MP: 0.002, Direction: North, Frame: 000010, and 10/01/2019. The main view is a wide-angle photograph of a multi-lane road with traffic lights and a green street sign. At the bottom, there are navigation controls including a compass, zoom in/out buttons, and a central vertical stack of directional arrows. A green 'Extract' button is located in the bottom right corner of the image area.





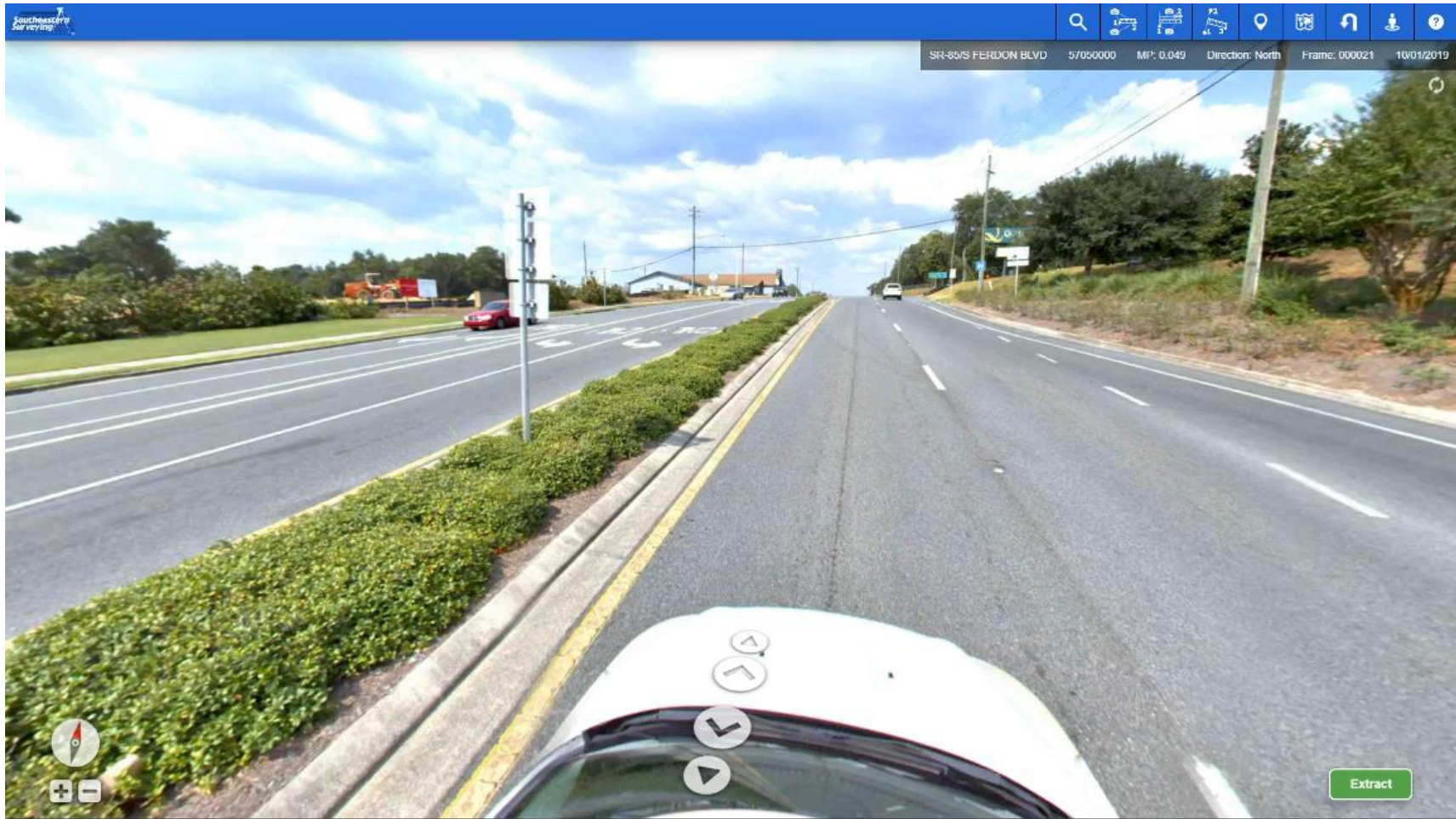


# Mobile Imaging Pilot - Navigation





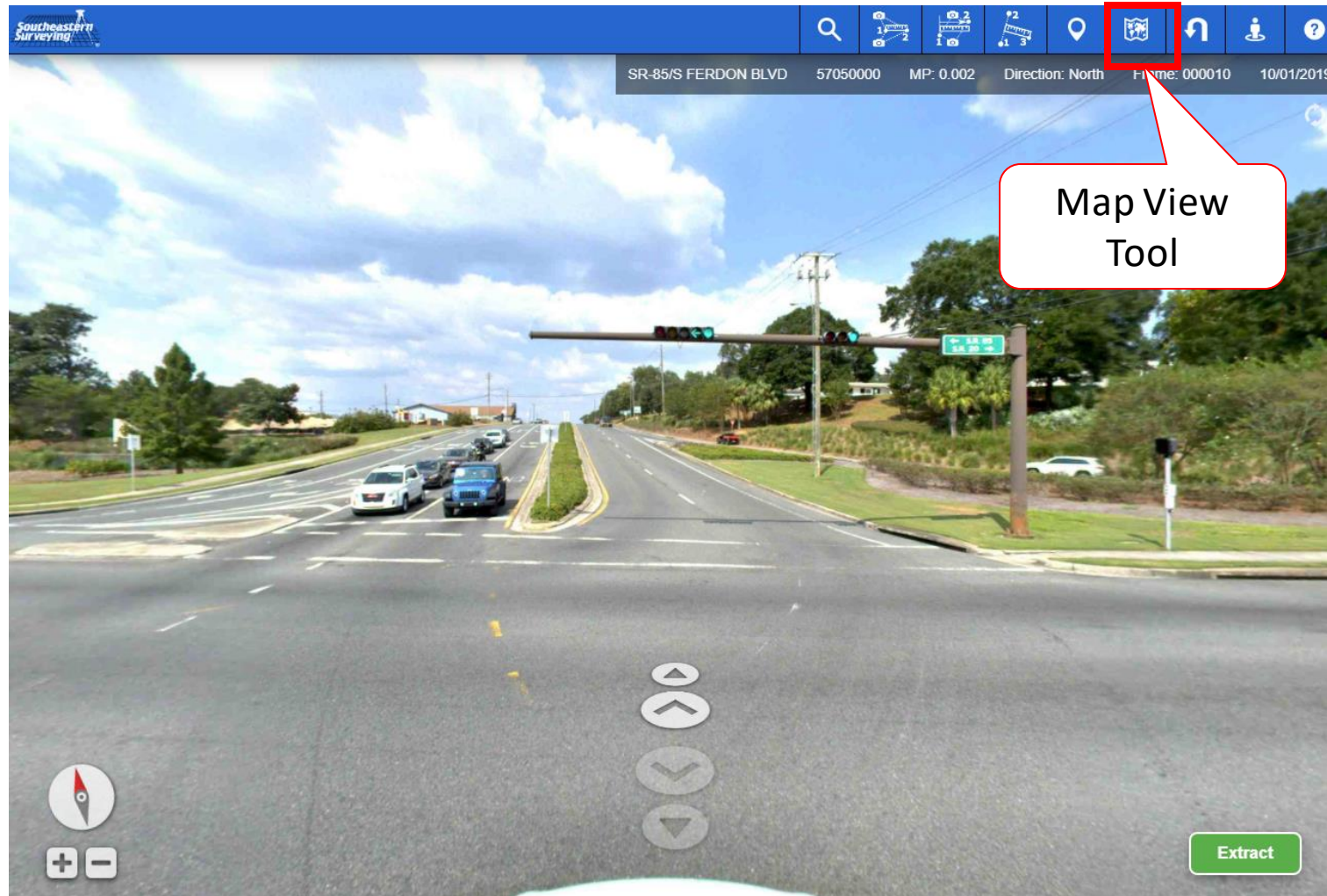
# Mobile Imaging Pilot - Navigation







# Mobile Imaging Pilot - Navigation

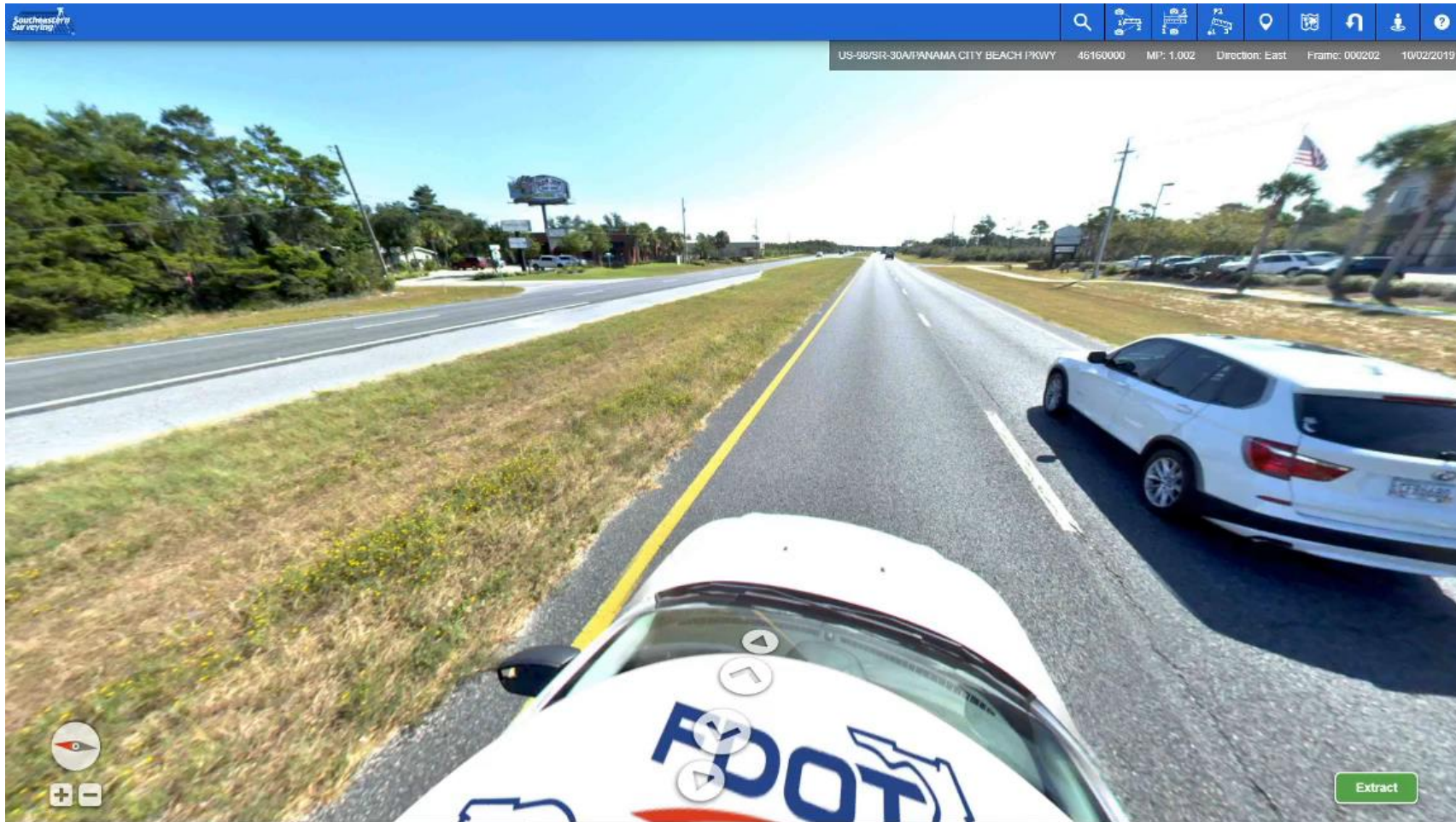


Map View Tool





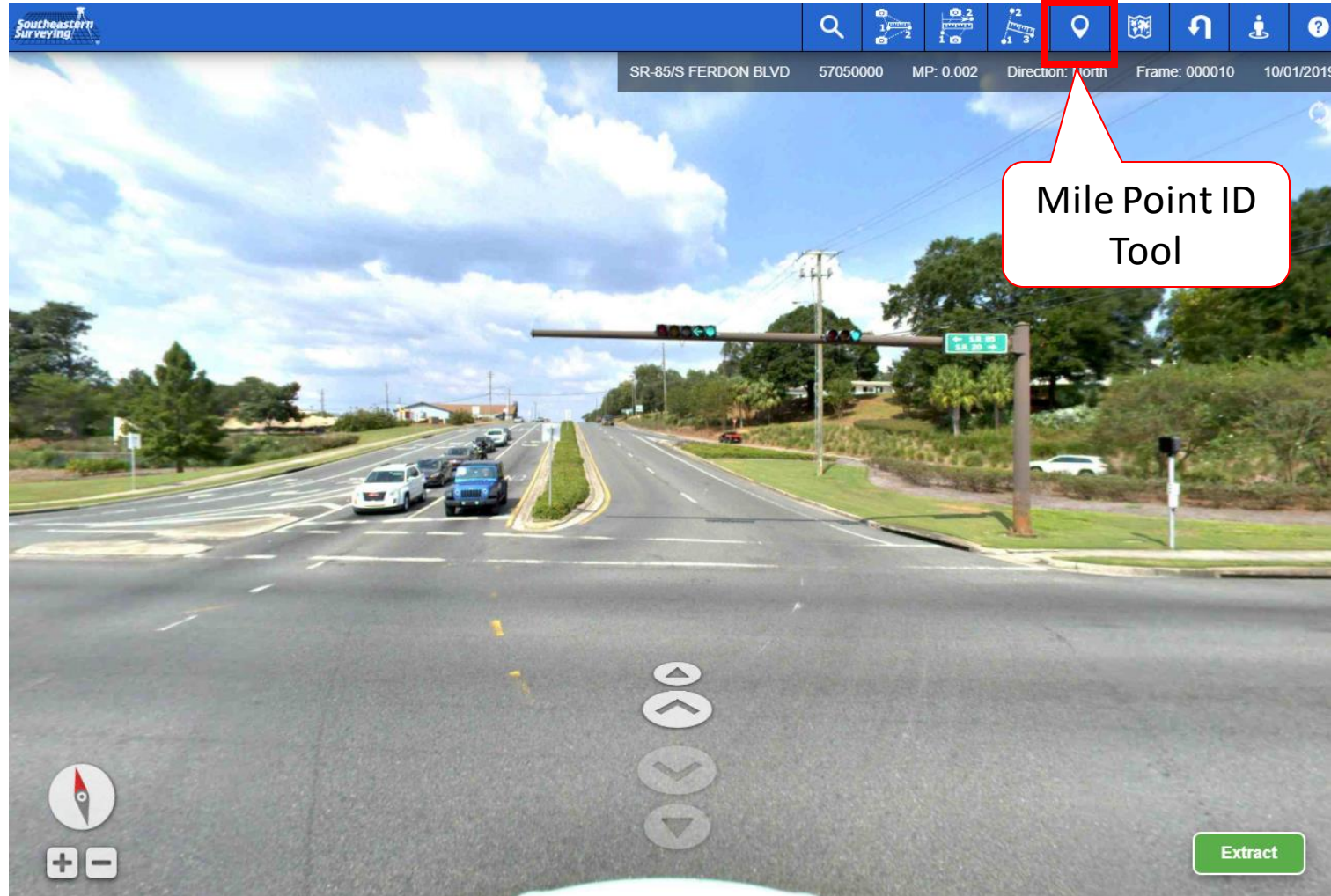
# Mobile Imaging Pilot - Navigation







# Mobile Imaging Pilot – Mile Point Identifier





# Mobile Imaging Pilot – Mile Point Identifier







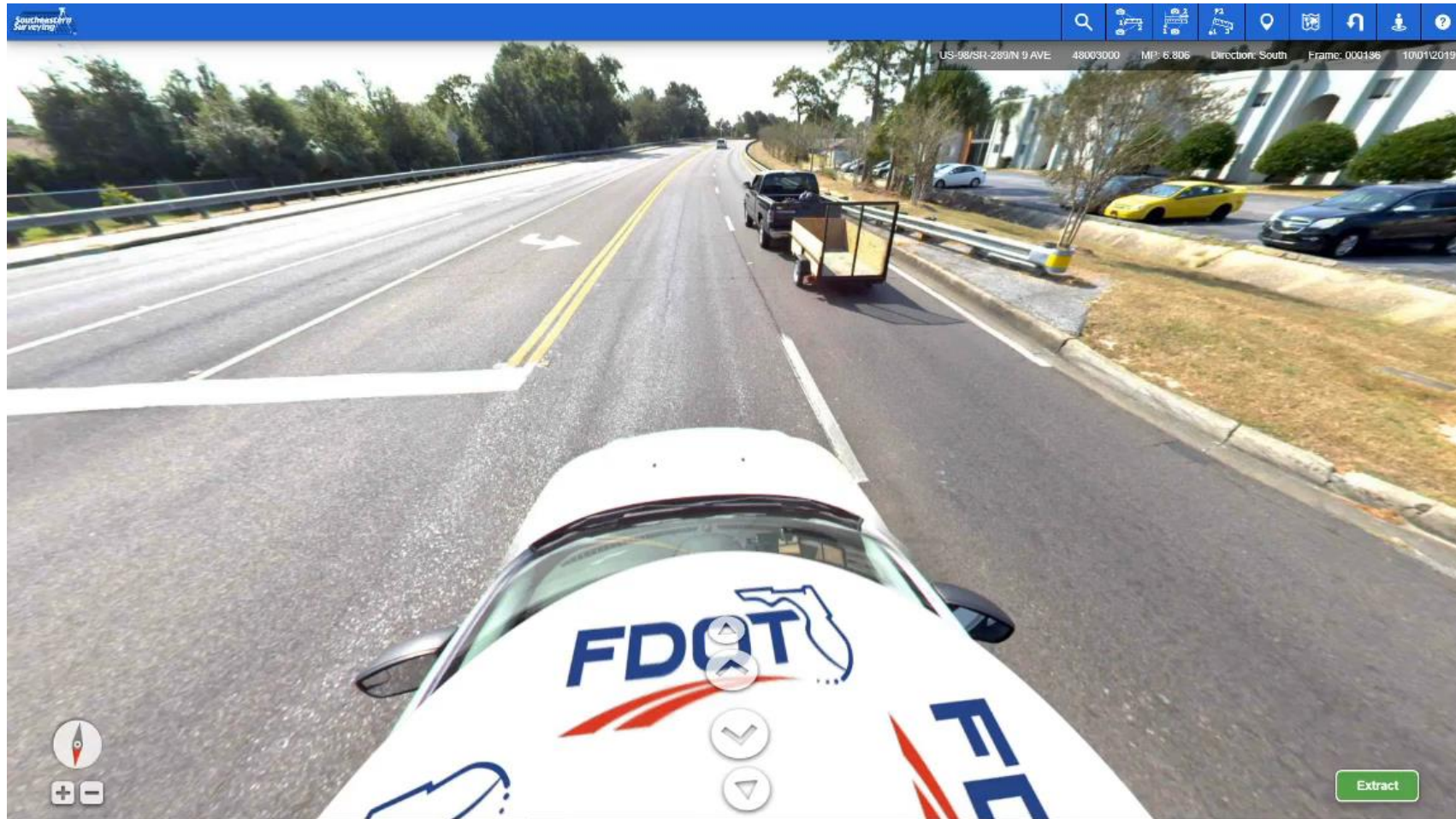
# Mobile Imaging Pilot – Feature Measurements







# Mobile Imaging Pilot – F212 Measurement





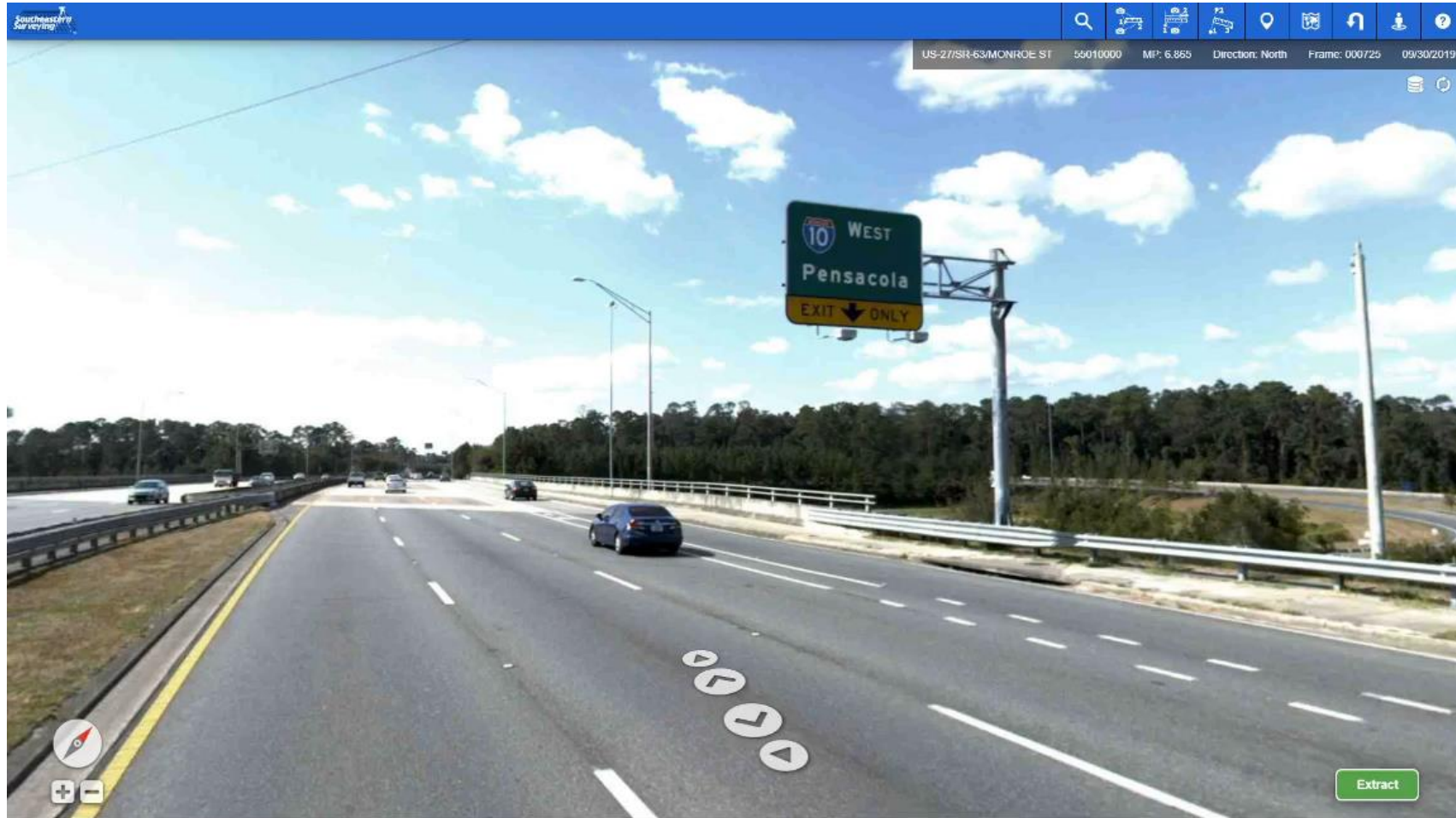
# Mobile Imaging Pilot – F215 Measurement

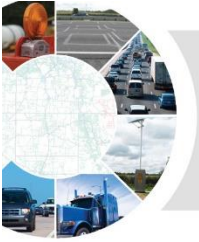






# Mobile Imaging Pilot – Sign Measurement



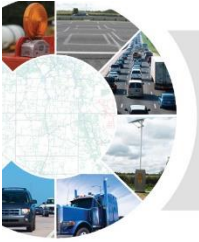


# Mobile Imaging Pilot Timeliness

- Mobile Imaging of the roadways took two days due to the distance separating the segments from one another.
  - 50 miles of roadway could be collected daily with a condensed cluster of segments.
- Images can be uploaded for measurement and mapping within 48 hours after capture.
- On average, 1.1 miles of data was extracted per technician per hour.



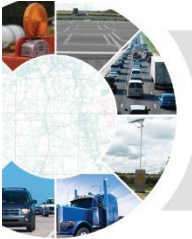




# Mobile Imaging Pilot Timeliness

In the time it took to collect F213 (Auxiliary Lanes) by traditional means in the field, we were able to collect F212, F213, F214, F215, F216, F219 & F251 from the office.



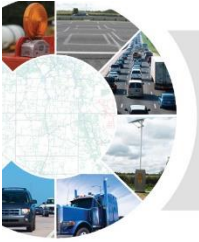


# Mobile Imaging Pilot Inventory Methodology

- Inventoried roadways as if they were new roadways with no previous data associated other than total length.
- Measurements were collected at easily identifiable roadway markings with those locations being notated.
  - Asphalt cracking, stop bars, spilt paint markings, curb & gutter joints...
- Identifiable measurements were visited in the field to obtain field measurements.





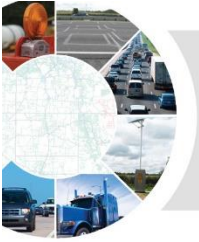


# Mobile Imaging Pilot Accuracy – Through Lanes

- 25 through lane measurements
- Average difference of 6.05" or 0.504'.

Roadway	Milepoint	Side	Field Measure	Viewer	Difference (Feet)	Difference (Inches)
55010000	1.261	R	24	23.774	-0.226	-2.7
	1.261	L	25.1	24.611	-0.489	-5.9
	4.192	L	23.5	22.542	-0.958	-11.5
	4.197	R	24	24.065	0.065	0.8
	6.189	R	23.8	24.601	0.801	9.6
	9.106	R	23.1	23.901	0.801	9.6
	9.107	L	23.95	24.176	0.226	2.7
	9.509	R	22.9	23.231	0.331	4.0
48003000	9.509	L	23.6	22.845	-0.755	-9.1
	0.115	C	45	44.621	-0.379	-4.5
	0.575	C	45.15	45.76	0.610	7.3
	0.949	R	21.9	21.317	-0.583	-7.0
	1.287	C	45.8	46.158	0.358	4.3
	1.366	L	19.7	18.769	-0.931	-11.2
	1.350	R	20.1	19.715	-0.385	-4.6
	2.457	C	45	45.048	0.048	0.6
	3.202	C	44.95	44.971	0.021	0.3
	4.783	L	23.9	24.531	0.631	7.6
	4.785	R	24.15	24.55	0.400	4.8
	5.968	L	22.2	23.17	0.970	11.6
46160000	5.968	R	22.3	22.858	0.558	6.7
	6.816	L	23.3	22.901	-0.399	-4.8
	6.803	R	23.3	24.06	0.760	9.1
	13.501	L	22	22.52	0.520	6.2
	13.496	R	21.8	21.4	-0.400	-4.8





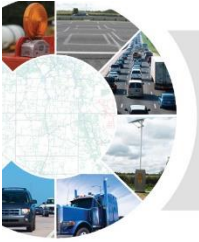
# Mobile Imaging Pilot Accuracy – Auxiliary Lanes

- 27 auxiliary lane measurements
- Average difference of 5.03" or 0.419'.

Roadway	Milepoint	Side	Field Measure	Viewer	Difference	Difference (Inches)
57010000	0.012	L	13.55	13.950	0.400	4.8
	0.171	R	16.2	16.624	0.424	5.1
	0.267	R	10.7	10.841	0.141	1.7
	9.160	R	14.0	13.061	-0.939	-11.3
	17.359	L	8.2	7.889	-0.311	-3.7
	17.492	R	13.4	13.399	-0.001	0.0
	18.251	L	13.02	12.824	-0.196	-2.4
55010000	1.258	R	11.3	11.341	0.041	0.5
	4.211	L	12.7	12.920	0.220	2.6
46160000	0.383	R	15.9	16.163	0.263	3.2
	0.863	R	16.6	17.166	0.566	6.8
	1.092	L	16.48	16.552	0.072	0.9
	1.096	L	12.04	11.394	-0.646	-7.8
	2.427	R	13.85	14.111	0.261	3.1
	3.347	L	18.45	18.416	-0.034	-0.4
	5.487	R	11.9	11.025	-0.875	-10.5
	6.070	R	15.6	15.005	-0.595	-7.1
	7.071	R	15.39	14.617	-0.773	-9.3
	9.259	R	12.4	12.694	0.294	3.5
	9.244	R	13.85	14.322	0.472	5.7
	10.106	R	16.42	15.705	-0.715	-8.6
	10.193	R	16.68	16.027	-0.653	-7.8
	12.008	R	11.6	12.296	0.696	8.4
	12.214	R	10.6	9.993	-0.607	-7.3
	12.790	R	15.24	14.905	-0.335	-4.0
	13.496	R	11.0	10.930	-0.070	-0.8
13.496	R	18.1	17.379	-0.721	-8.7	







# Mobile Imaging Pilot Accuracy – Median

- 10 median measurements
- Average difference of 4.03" or 0.336'.

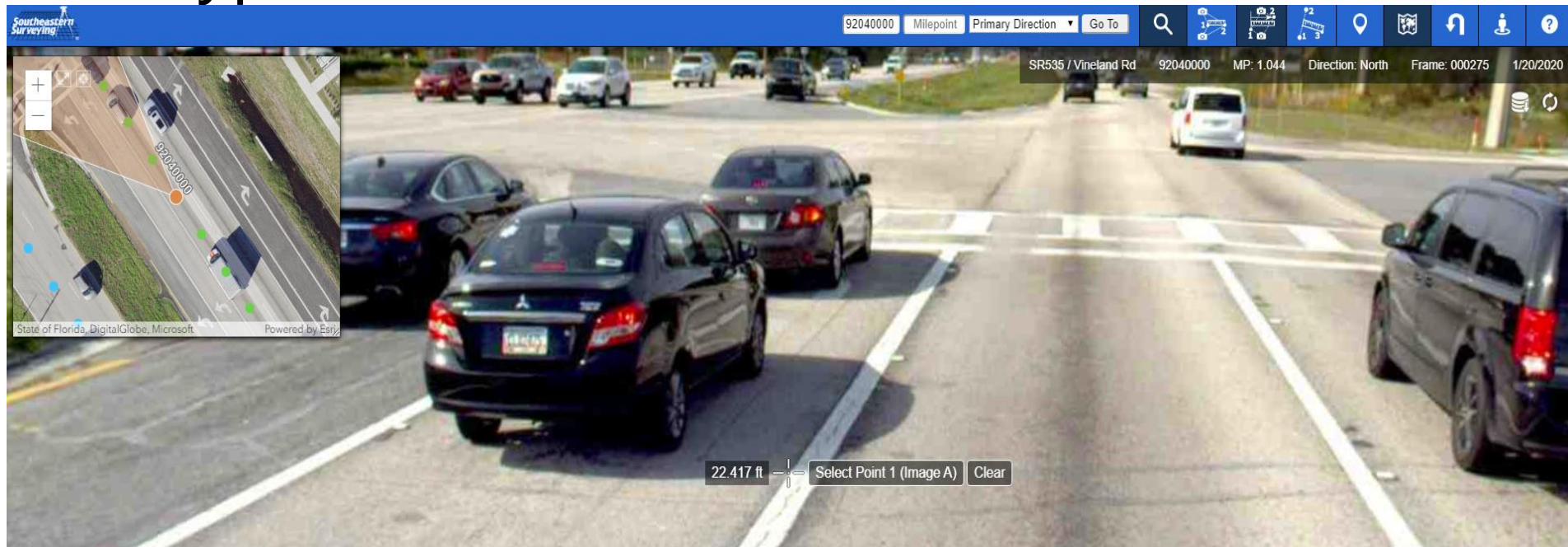
Roadway	Milepoint	Field Measure	Viewer	Difference	Difference (Inches)
55010000	1.263	29	28.377	-0.623	-7.5
	4.204	30.8	30.858	0.058	0.7
	9.106	15.9	16.096	0.196	2.4
	9.507	10.9	10.663	-0.237	-2.8
48003000	4.901	12.3	12.400	0.100	1.2
	5.695	11.84	12.365	0.525	6.3
	5.957	26.4	25.922	-0.478	-5.7
	6.396	12.655	12.400	-0.255	-3.1
46160000	6.864	22.3	22.400	0.100	1.2
	13.501	26.6	25.810	-0.790	-9.5



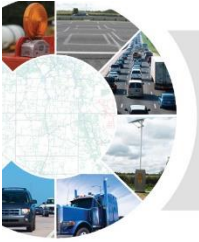


# Mobile Imaging Pilot Accuracy – Overall

Upon compiling all our measurements, we calculated an average root mean square error of **0.4968 feet** for all feature types.







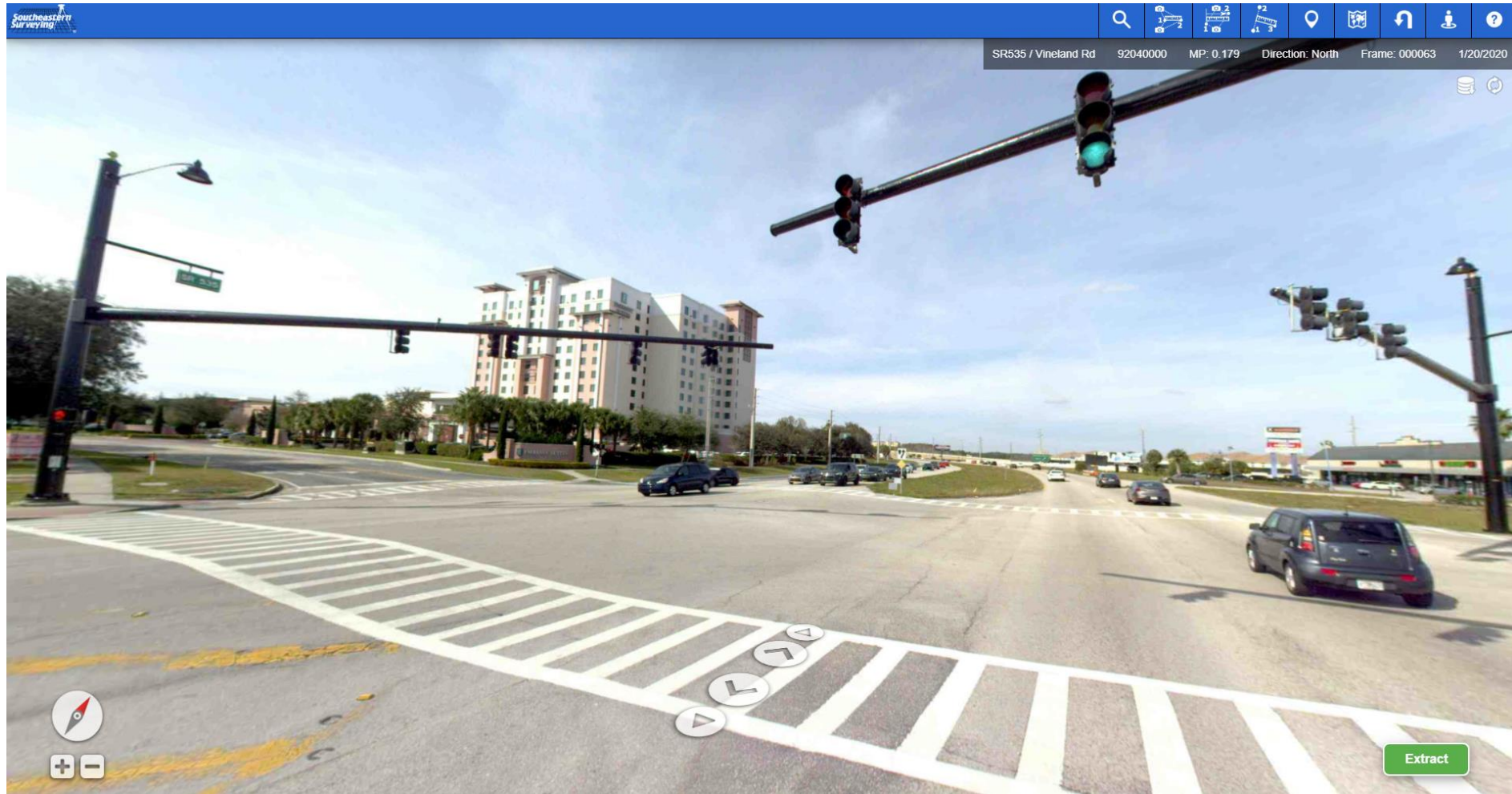
## Collect Once, Use Many Times

- Collected imagery can become a single source of knowledge for all FDOT Departments.
  - Planning – RCI
  - Maintenance – Signage, Striping, Turnouts
  - Traffic Operations – Speed Limits, Signals
  - Safety – ADA Compliance, Bike/Ped Facilities
- Everyone uses an inventory pass that shares identical mile points.
- No software license cost for use of imagery and web-viewer.
  - No software installation required. Just go to a web address.

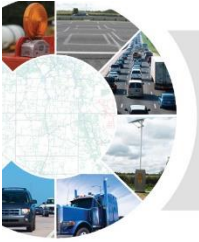




# Mobile Imaging Pilot – 92040000







# Mobile Imaging Website

The screenshot shows the website interface for Southeastern Surveying and Mapping Corporation. At the top, there is a navigation bar with links for Home, Services, About Us, and Contact Us. The main heading reads "Southeastern Surveying and Mapping Corporation" followed by "Spherical Panorama Photo Log Demo". Below this is a form with the label "Roadway ID:" and a text input field containing "Section Number". A blue "Submit" button is positioned to the right of the input field. At the bottom of the page, there is a blue footer containing the slogan "Proven commitment to our clients' success." and social media icons for Facebook and LinkedIn.

<http://www.southeasternsurveying.com/sphere>

