



# GPS Forensics

ROBSON FORENSIC EXPERT

Matthew Peterson, CFCE

DIGITAL FORENSICS

# Summary

- Background
- What is GPS Forensics?
- Cases and Devices with Location Data
- Real Data, Real Issues, Real Pitfalls
- Discussion/Questions

\*\*Videos and select information redacted for web-posting\*\*

# Background

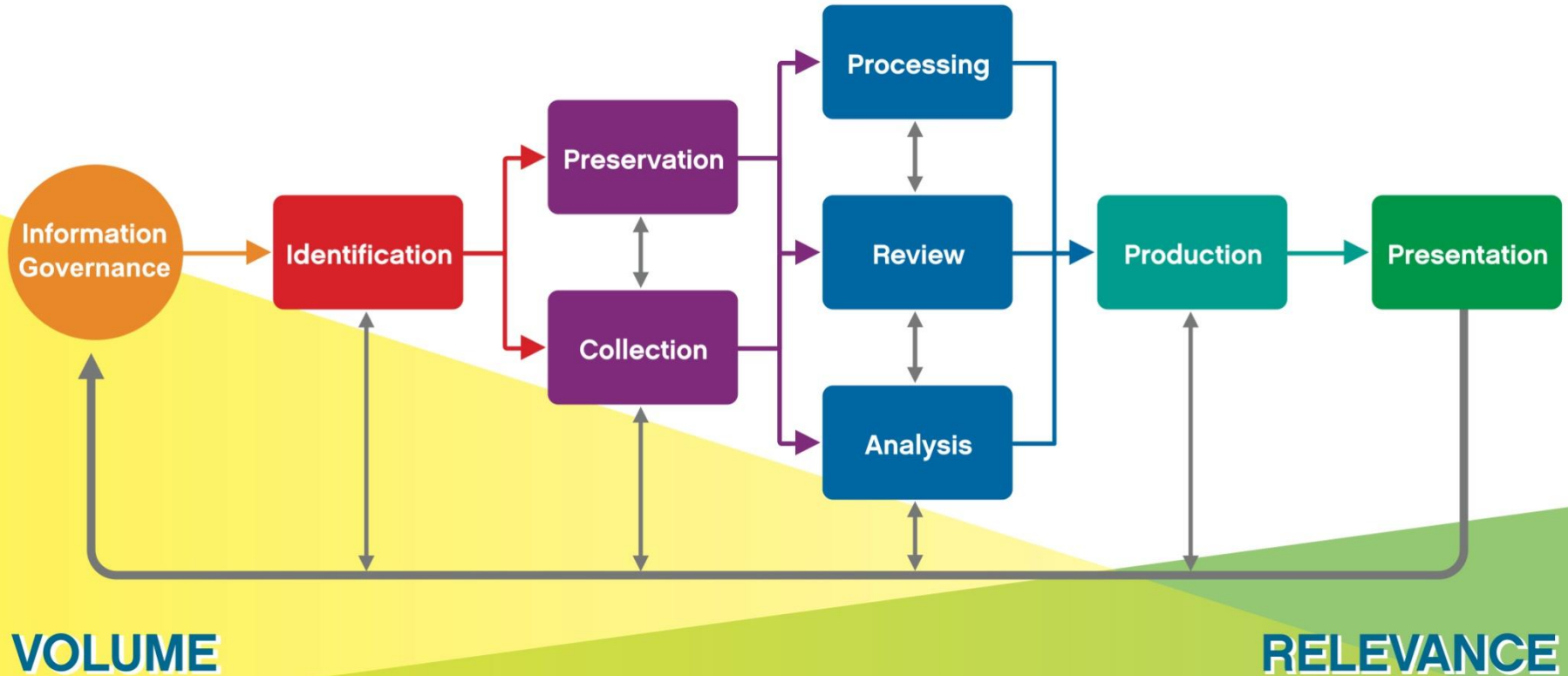
## US Coast Guard

- Maritime Navigation and Law Enforcement.
- Provided digital forensic support to over 12 other Federal, State, and Local Agencies.
- Extracted/Analyzed Hundreds of GPS units.

Certified Forensic Computer Examiner (CFCE)

Cellebrite Certified Physical Analyst (CCPA)

# GPS Forensics - Legal Realm



Electronic Discovery Reference Model / © 2014 / v3.0 / edrm.net

# Location Data Applicability

Nearly any type of case in which ***location, timing, and activities*** are a factor.

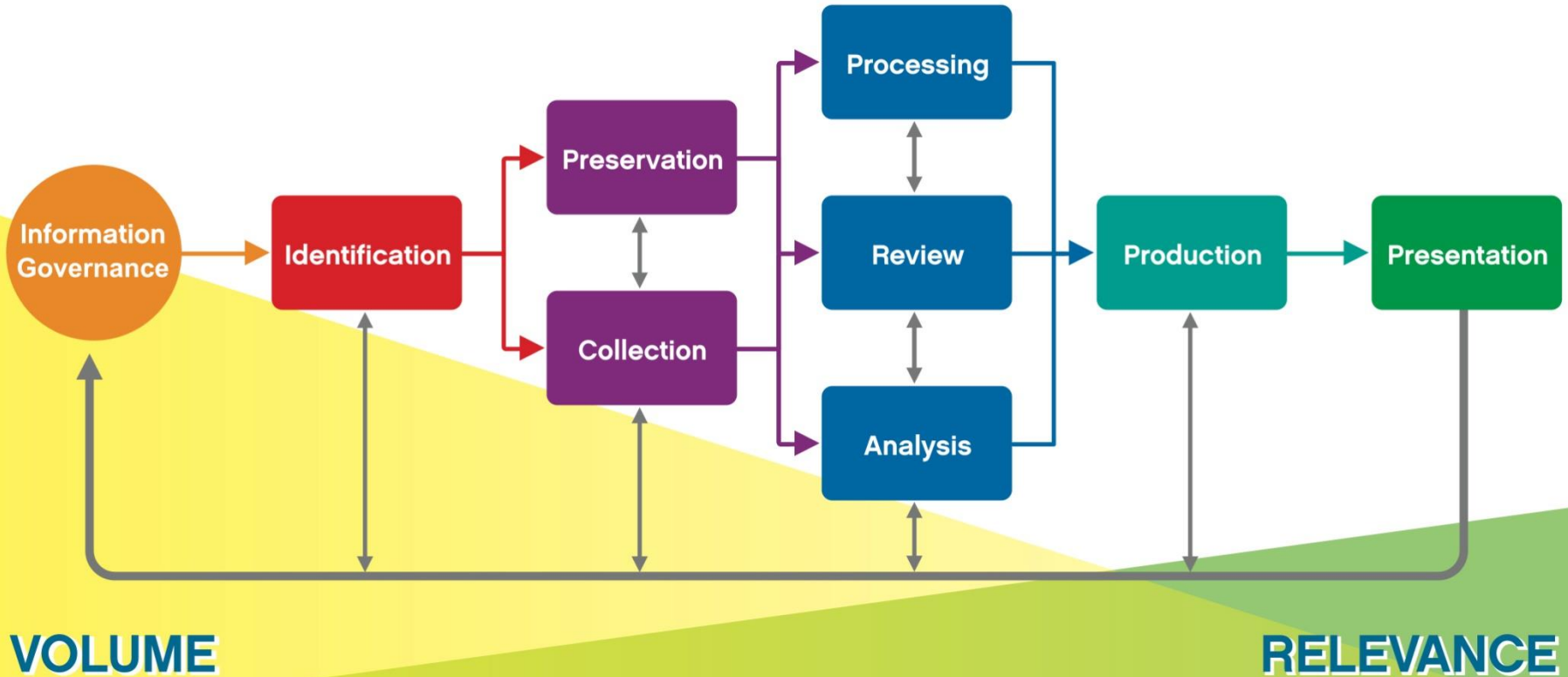
- Distracted Driving
- Dram Shop
- Adult/Child Supervision
- Fire and Explosion
- Workplace Safety
- ...



# Devices with Location Data

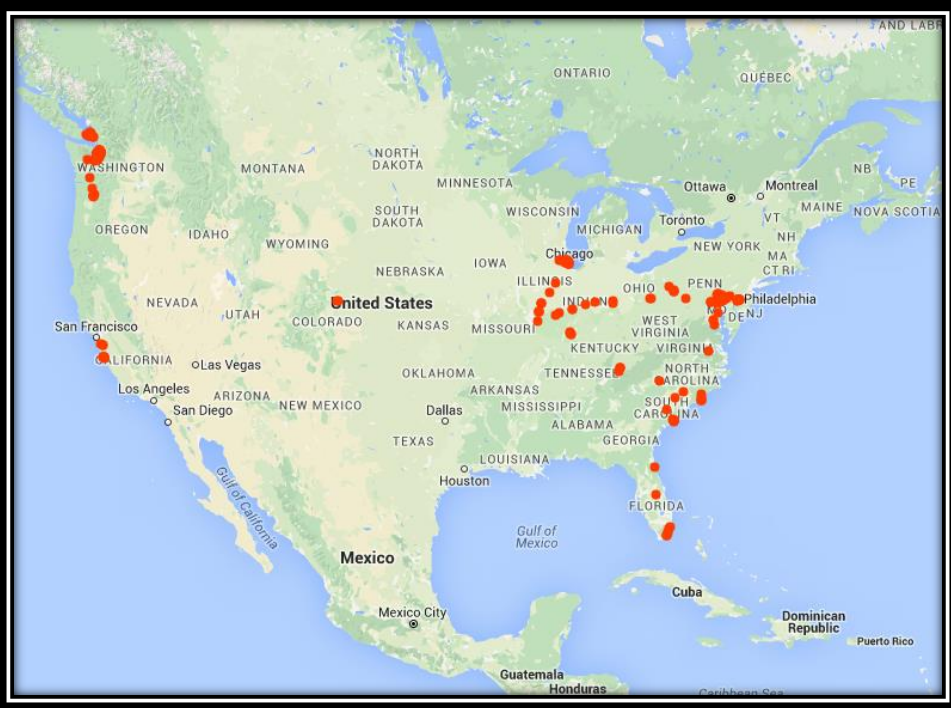
- Cellular Phones / Smart Phones
- Laptops with GPS Feed (maritime)
- GPS Navigation Units
  - Hiking
  - Bicycling
  - Maritime
  - Automotive
- Vehicle Infotainment / Telematics Systems
- Fitness Trackers
- Other Mobile Devices

# Real Data, Real Issues



Electronic Discovery Reference Model / © 2014 / v3.0 / edrm.net

# Smart Phones



The top left shows a photograph of a clear glass filled with water. A dashed line connects this photo to a map below. The map shows a street grid with a red pin on W Lemon St. Landmarks like 'Alley Kat' and 'CVS Pharmacy - Photo' are visible. A red circle highlights the GPS metadata table on the right.

Filename	20160106_203538.jpg
Make	samsung
Model	SPH-L720
Software	L720VPUGOK3
DateTime	2016:01:01 20:35:38
DateTimeOriginal	2016:01:01 20:35:38
DateTimeDigitized	2016:01:01 20:35:38
GPS information:	
GPSVersionID	2.2.0.0
GPSLatitudeRef	N
GPSLatitude	40 2 38.8392 (40.044122)
GPSLongitudeRef	W
GPSLongitude	76 18 27.1008 (76.307528)
GPSTimeStamp	203538
GPSDateStamp	2016:01:06
SceneCaptureType	Night scene

Select Metadata





# Analysis & Presentation

Index	Elevation	Leg Distanc	Leg Time	Leg Speed	Leg Course	Time	Position	Temperature
1 0 ft	53 ft	0:00:04	9 mph	87.6° true	07/13/2016 13:39:45	N39° 56.162' W75° 09.747'	77.0 °F	
2 0 ft	57 ft	0:00:05	8 mph	109.1° true	07/13/2016 13:39:49	N39° 56.162' W75° 09.736'	77.0 °F	
3 0 ft	27 ft	0:00:04	5 mph	114.6° true	07/13/2016 13:39:54	N39° 56.159' W75° 09.725'	77.0 °F	
4 0 ft	11 ft	0:00:17	0.4 mph	94.9° true	07/13/2016 13:39:58	N39° 56.157' W75° 09.719'	77.0 °F	
5 0 ft	63 ft	0:00:04	11 mph	72.1° true	07/13/2016 13:40:15	N39° 56.157' W75° 09.717'	77.0 °F	
6 0 ft	62 ft	0:00:05	9 mph	16.9° true	07/13/2016 13:40:19	N39° 56.160' W75° 09.704'	77.0 °F	
7 0 ft	104 ft	0:00:07	10 mph	7.5° true	07/13/2016 13:40:24	N39° 56.170' W75° 09.700'	77.0 °F	
8 0 ft	90 ft	0:00:06	10 mph	12.7° true	07/13/2016 13:40:31	N39° 56.187' W75° 09.697'	77.0 °F	
9 0 ft	119 ft	0:00:07	12 mph	10.1° true	07/13/2016 13:40:37	N39° 56.202' W75° 09.693'	77.0 °F	
10 0 ft	112 ft	0:00:07	11 mph	12.4° true	07/13/2016 13:40:44	N39° 56.221' W75° 09.689'	77.0 °F	
11 0 ft	84 ft	0:00:06	9 mph	17.7° true	07/13/2016 13:40:51	N39° 56.239' W75° 09.684'	77.0 °F	
12 0 ft	73 ft	0:00:04	12 mph	359.0° true	07/13/2016 13:40:57	N39° 56.252' W75° 09.678'	77.0 °F	
13 0 ft	32 ft	0:00:02	11 mph	6.6° true	07/13/2016 13:41:01	N39° 56.264' W75° 09.678'	77.0 °F	
14 0 ft	114 ft	0:00:07	11 mph	13.8° true	07/13/2016 13:41:03	N39° 56.269' W75° 09.678'	77.0 °F	
15 0 ft	21 ft	0:00:01	14 mph	354.1° true	07/13/2016 13:41:10	N39° 56.287' W75° 09.672'	77.0 °F	
16 0 ft	68 ft	0:00:04	12 mph	15.2° true	07/13/2016 13:41:11	N39° 56.291' W75° 09.672'	77.0 °F	
17 0 ft	120 ft	0:00:06	14 mph	15.1° true	07/13/2016 13:41:15	N39° 56.302' W75° 09.668'	77.0 °F	
18 0 ft	171 ft	0:00:08	15 mph	7.6° true	07/13/2016 13:41:21	N39° 56.320' W75° 09.663'	77.0 °F	
19 0 ft	37 ft	0:00:02	12 mph	18.8° true	07/13/2016 13:41:29	N39° 56.337' W75° 09.657'	77.0 °F	
20 0 ft	57 ft	0:00:03	13 mph	13.8° true	07/13/2016 13:41:31	N39° 56.341' W75° 09.657'	77.0 °F	
21 0 ft	152 ft	0:00:09	12 mph	11.8° true	07/13/2016 13:41:34	N39° 56.343' W75° 09.657'	77.0 °F	
22 0 ft	179 ft	0:00:09	14 mph	2.1° true	07/13/2016 13:41:43	N39° 56.343' W75° 09.657'	77.0 °F	
23 0 ft	187 ft	0:00:09	14 mph	11.6° true	07/13/2016 13:41:52	N39° 56.343' W75° 09.657'	77.0 °F	
24 0 ft	76 ft	0:00:06	9 mph	12.7° true	07/13/2016 13:42:01	N39° 56.343' W75° 09.657'	77.0 °F	
25 0 ft	96 ft	0:00:06	11 mph	12.0° true	07/13/2016 13:42:07	N39° 56.343' W75° 09.657'	77.0 °F	
26 0 ft	39 ft	0:00:02	13 mph	6.1° true	07/13/2016 13:42:13	N39° 56.343' W75° 09.657'	77.0 °F	
27 0 ft	74 ft	0:00:04	13 mph	13.5° true	07/13/2016 13:42:15	N39° 56.343' W75° 09.657'	77.0 °F	
28 0 ft	120 ft	0:00:05	16 mph	4.0° true	07/13/2016 13:42:19	N39° 56.343' W75° 09.657'	77.0 °F	
29 0 ft	25 ft	0:00:03	6 mph	22.3° true	07/13/2016 13:42:24	N39° 56.343' W75° 09.657'	77.0 °F	
30 1 ft	5 ft	0:00:01	3.4 mph	189.1° true	07/13/2016 13:42:27	N39° 56.343' W75° 09.657'	77.0 °F	

The screenshot shows an Excel spreadsheet with the following data:

Index	Elevation	Leg Distanc	Leg Time	Leg Speed	Leg Course	Time	Position
38	37 3 ft	19 ft	0:00:01	13 mph	99.8° true	07/13/2016 13:43:08	N39° 56.52
39	38 1 ft	17 ft	0:00:01	12 mph	102.7° true	07/13/2016 13:43:09	N39° 56.52
40	39 0 ft	50 ft	0:00:03	11 mph	99.0° true	07/13/2016 13:43:10	N39° 56.52
41	40 1 ft	10 ft	0:00:01	7 mph	107.7° true	07/13/2016 13:43:13	N39° 56.52
42	41 3 ft	7 ft	0:00:01	5 mph	101.2° true	07/13/2016 13:43:14	N39° 56.52
43	42 4 ft	2 ft	0:00:01	1.5 mph	101.1° true	07/13/2016 13:43:15	N39° 56.52
			0:00:16	4.2 mph	92.4° true	07/13/2016 13:43:16	N39° 56.52
			0:00:05	13 mph	96.2° true	07/13/2016 13:43:32	N39° 56.52
			0:00:05	13 mph	101.2° true	07/13/2016 13:43:37	N39° 56.51
			0:00:01	16 mph	98.9° true	07/13/2016 13:43:42	N39° 56.51
			0:00:01	14 mph	103.6° true	07/13/2016 13:43:43	N39° 56.51
			0:00:01	12 mph	103.3° true	07/13/2016 13:43:44	N39° 56.51
			0:00:01	12 mph	113.1° true	07/13/2016 13:43:45	N39° 56.51
			0:00:03	13 mph	98.2° true	07/13/2016 13:43:46	N39° 56.51

The Windows error dialog box displays the following text:

Windows can't open this file:  
 File: 2016-07-13-16-39-32.ft

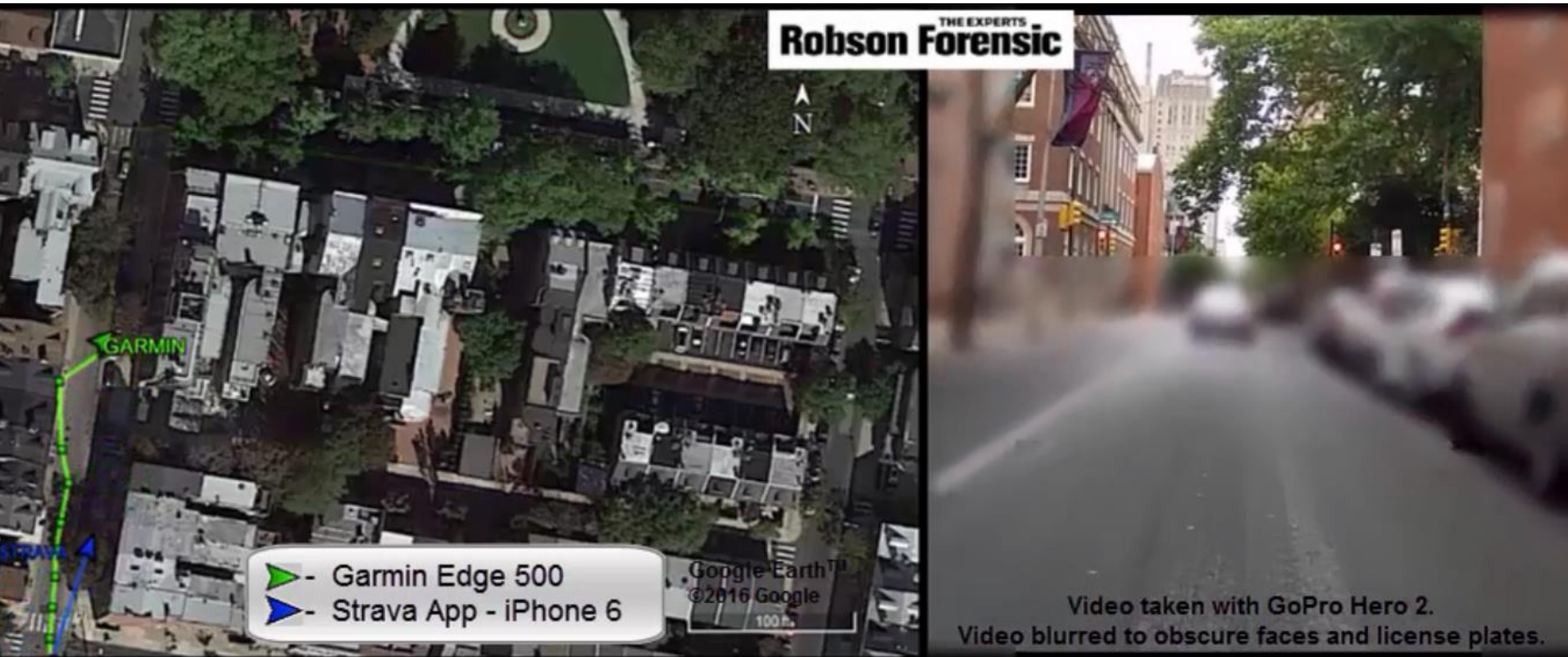
To open this file, Windows needs to know what program you want to use to open it. Windows can go online to look it up automatically, or you can manually select from a list of programs that are installed on your computer.

What do you want to do?

- Use the Web service to find the correct program
- Select a program from a list of installed programs

Buttons: OK, Cancel

## Present as PDF, Excel, or Native Format?

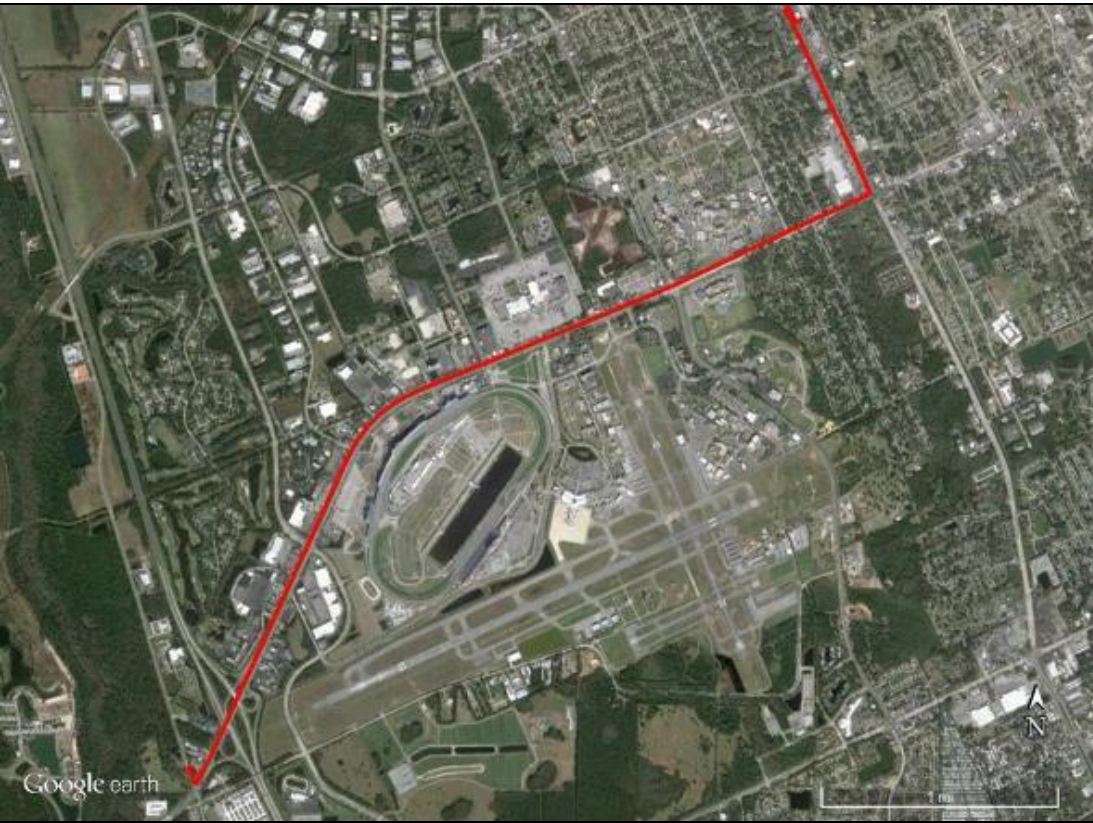


**\*\*Screenshot of animated sequence\*\***



**\*\*Screenshot of animated sequence\*\***

# Vehicle Infotainment Systems



Date/Time	Event Identifier	Event Type	Action
11/24/2014 01:41:29 PM	Driver door was closed at 2014-11-24 13:41:29	Door	closed
11/24/2014 01:41:22 PM	Driver door was opened at 2014-11-24 13:41:22	Door	opened
11/24/2014 01:09:32 PM	Driver door was closed at 2014-11-24 13:09:32	Door	closed
11/24/2014 01:09:26 PM	Driver door was opened at 2014-11-24 13:09:26	Door	opened
11/24/2014 01:09:07 PM	Driver door was closed at 2014-11-24 13:09:07	Door	closed
11/24/2014 01:09:01 PM	Driver door was opened at 2014-11-24 13:09:01	Door	opened
11/24/2014 01:05:42 PM	Passenger door was closed at 2014-11-24 13:05:42	Door	closed
11/24/2014 12:33:47 PM	Passenger door was closed at 2014-11-24 12:33:47	Door	closed
11/24/2014 08:46:23 AM	Driver door was closed at 2014-11-24 08:46:23	Door	closed
11/24/2014 08:46:19 AM	Driver door was opened at 2014-11-24 08:46:19	Door	opened
11/24/2014 08:45:37 AM	Passenger door was closed at 2014-11-24 08:45:37	Door	closed
11/24/2014 08:45:27 AM	Passenger door was opened at 2014-11-24 08:45:27	Door	opened
11/24/2014 08:45:20 AM	Driver door was closed at 2014-11-24 08:45:20	Door	closed
11/24/2014 08:45:14 AM	Driver door was opened at 2014-11-24 08:45:14	Door	opened

Start Time	Phone Number	Contact Name	Call Type
02/25/2014 02:58:06 PM	8 [REDACTED]		Incoming
02/25/2014 05:03:28 PM	5 [REDACTED]	An [REDACTED]	Incoming
02/26/2014 12:08:25 AM	8 [REDACTED]		Incoming
02/27/2014 04:34:37 PM	5 [REDACTED]		Incoming
02/28/2014 05:22:54 PM	5 [REDACTED]		Incoming
02/28/2014 08:39:06 PM	3 [REDACTED]		Incoming
03/01/2014 02:18:10 PM	6 [REDACTED]		Incoming
03/01/2014 05:08:04 PM	5 [REDACTED]	Mom	Incoming
03/01/2014 05:31:53 PM	5 [REDACTED]	Alm [REDACTED]	Incoming
03/01/2014 07:11:28 PM	6 [REDACTED]		Incoming



**\*\*Screenshot of animated sequence\*\***

# Contact Information

**Matthew Peterson, CFCE**

Digital Forensics

206.262.7923

mpeterson@robsonforensic.com

[www.robsonforensic.com](http://www.robsonforensic.com)