

On the Mark, Get Set, Collect: The New Swiss Army Knife for the U.S. Army Corps of Engineers (USACE)

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ESRI USER CONFERENCE

Overview

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- **What's a JALBTCX?**
- **Static GPS base station observations**
- **A two-fold problem**
 - **Data storage of GPS data not accessible (easily) to external team members**
 - **Problems finding benchmarks**
 - **Poor directions**
 - **Environmental conditions**
- **Solution**
 - **What is Collector for ArcGIS?**
 - **What is ArcGIS Online?**

Overview

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- **Utilizing Collector**
 - Navigating to benchmarks
 - Locating benchmarks while in the field
 - Setting new GPS control points
 - Recording base station observation log information
- **Utilizing ArcGIS Online**
 - Data management
- **Benefits of Web GIS**
 - Field-to-office data sharing
 - Project progress tracking
 - Dissemination of information across multiple organizations
- **Q&A**

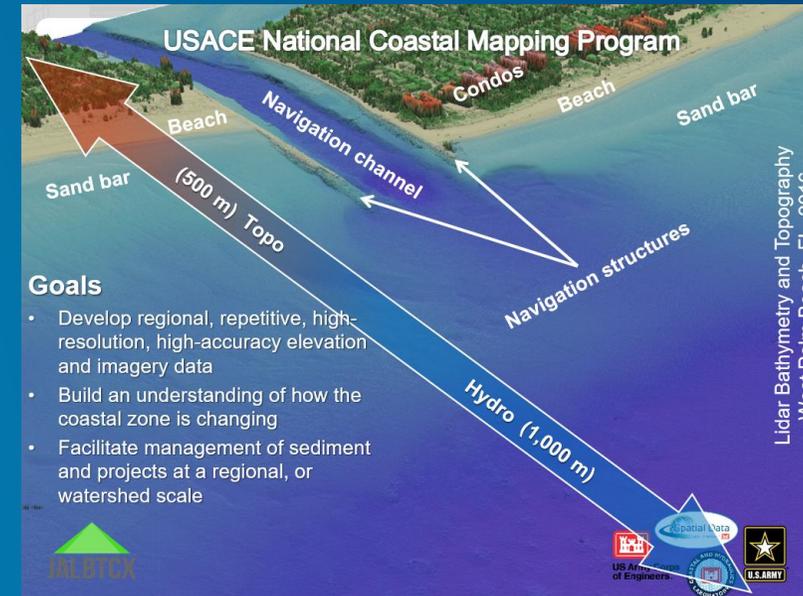
What's a JALBTCX?

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JALBTCX's mission is the following:

- to perform operations, research and development using airborne lidar bathymetry and complementary technologies
- to support the coastal mapping and charting requirements of
 - the USACE
 - the U.S. Naval Meteorology and Oceanography Command (CNMOC)

JALBTCX executes year-round survey operations worldwide using the Coastal Zone Mapping and Imaging Lidar (CZMIL) system and other industry-based coastal mapping and charting systems.



What's a JALBTCX?

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WMR-532 is a joint venture

- **between Woolpert and Optimal GEO**
 - geospatial companies
 - both specialize in the following:
 - lidar
 - orthoimagery
 - photogrammetric mapping services

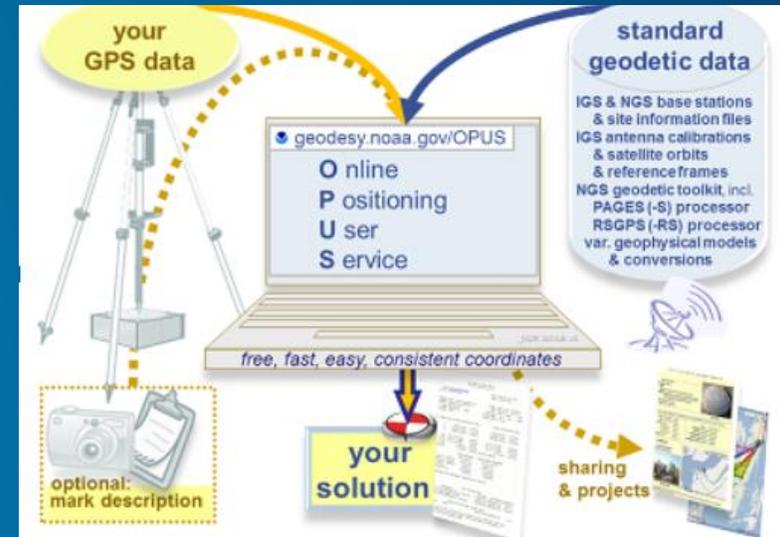
WMR-532 provides the following:

- **operations and maintenance of airborne coastal mapping and charting sensors**
- **support to the U.S. Army Corps of Engineers (USACE) and NAVOCEANO worldwide**
- **technical support to the Joint Airborne Lidar Bathymetric Technical Center of Expertise (JALBTCX)**



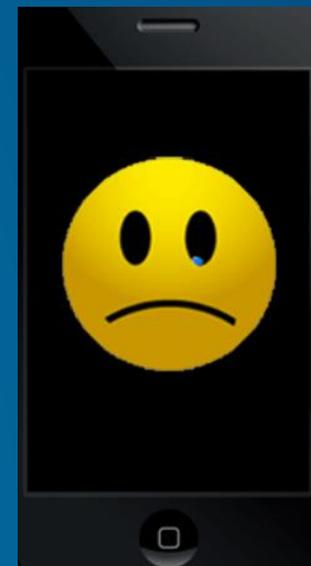
GPS control and why it matters

- Survey control is provided by static GPS data collected using the following:
 - Trimble R7 GNSS receivers
 - Zephyr Model 2 antennas
- Ground control stations are set up on NOAA National Geodetic Survey monuments, or sometimes reference points set by a contractor, in order to reference the aircraft trajectory to the NAD83(2011) ellipsoid
- Survey control monuments are verified with two or more static GPS occupations that are processed in NOAA's OPUS Projects to ensure vertical position uncertainty is less than 3 cm



A two-fold problem

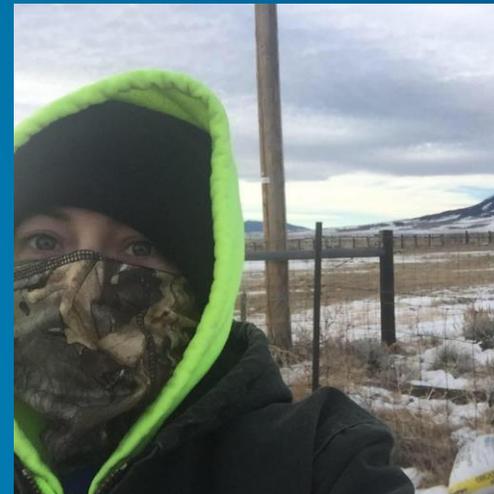
- **Data management/access**
 - **USACE's previous method of storing GPS control points was not easily accessible to external team members deployed in the field**
 - **USACE required a solution that provided secure data storage but also allowed for outside organizations to view and edit information**



A two-fold problem

- How to find what your looking for?
 - Interpreting directions for the data sheet
 - Damaged or destroyed benchmarks
 - Environmental conditions
 - Weather
 - Changes to the landscape

DD1602
DD1602
DD1602
DD1602 STATION RECOVERY (2008)
DD1602 RECOVERY NOTE BY SOUTH CAROLINA GEODETIC SURVEY 2008 (DDW)
DD1602 STATION IS LOCATED 4.4 MI (7.2 KM) EAST-SOUTHEAST OF BUCKSPORT, 4.0 MI
DD1602 (6.5 KM) WEST-NORTHWEST OF SURFSIDE BEACH, 3.8 MI (6.0 KM)
DD1602 SOUTH-SOUTHWEST OF SOCASTEE. OWNERSHIP--HORRY ELECTRIC COOPERATIVE.
DD1602
DD1602 TO REACH THE STATION FROM THE JUNCTION OVERPASS OF STATE HIGHWAYS 544
DD1602 AND 707 IN SOCASTEE, GO SOUTH-SOUTHWEST ON HIGHWAY 707 FOR 3.55 MI
DD1602 (5.7 KM) TO THE STATION ON THE RIGHT NEAR A POWER LINE STUB POLE IN
DD1602 THE NORTHWEST ANGLE OF AN ASPHALT APRON FOR VINYL HOUSE NUMBER 9164.
DD1602 STATION IS A CONCRETE POST FLUSH WITH THE GROUND AND 1.5 FT (0.5 M)
DD1602 BELOW THE HIGHWAY, 32.5 FT (9.9 M) WEST-NORTHWEST OF THE CENTER OF THE
DD1602 HIGHWAY, 14.6 FT (4.5 M) NORTHEAST OF A POWER POLE 51/42/6T, 5.5 FT
DD1602 (1.7 M) EAST-SOUTHEAST OF THE POWER LINE STUB POLE 51/42/30T, 36.4 FT
DD1602 (11.1 M) NORTH OF THE NORTH END OF 1.5-FOOT CONCRETE PIPE CULVERT
DD1602 BENEATH THE PAVED APRON, 2.0 FT (0.6 M) SOUTHEAST OF A WITNESS POST.
DD1602 RECOVERED BY R.P. MCKEOWN.

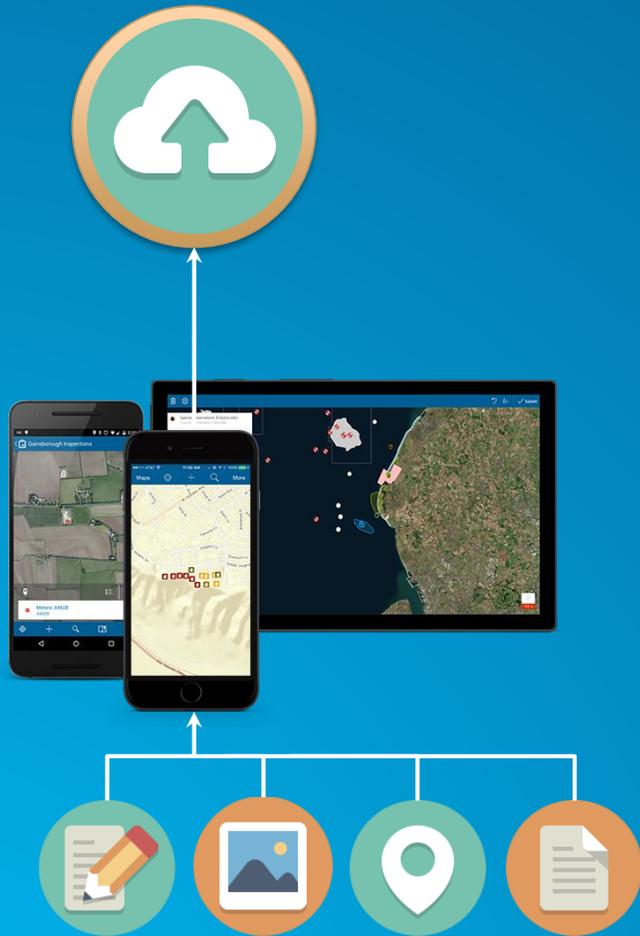


Where? It is secret! 🤫



Solution: Collector for ArcGIS and ArcGIS Online

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- **Web GIS**

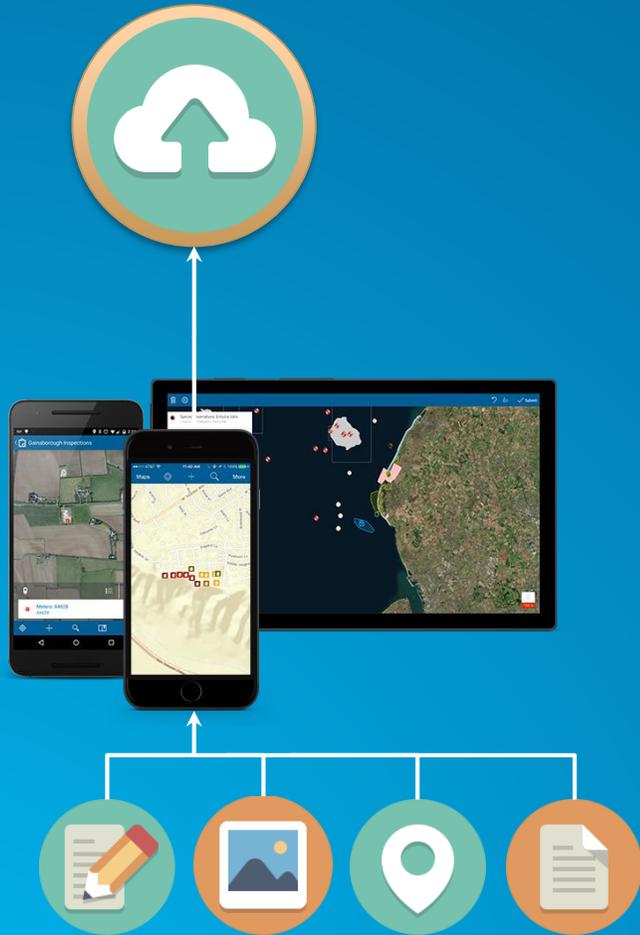
- emerging as a flexible tool for optimizing GIS workflows
- allows users to collect, view and edit data from a wide range of devices—anytime, anywhere

- **ArcGIS Online**

- an online, collaborative web GIS
- allows you to use, create, and share
 - maps
 - scenes
 - apps
 - layers
 - analytics
 - data
- access ArcGIS Online through web browsers, mobile devices, and desktop map viewers

Solution: Collector for ArcGIS and ArcGIS Online

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- **Collector for ArcGIS**

- a mobile app that puts GIS in your pocket
- allows you to
 - collect and update data in the field
 - log your current location
 - take and store photos of the features your interested in
 - put the data you capture to work so you can make more informed and timely decisions

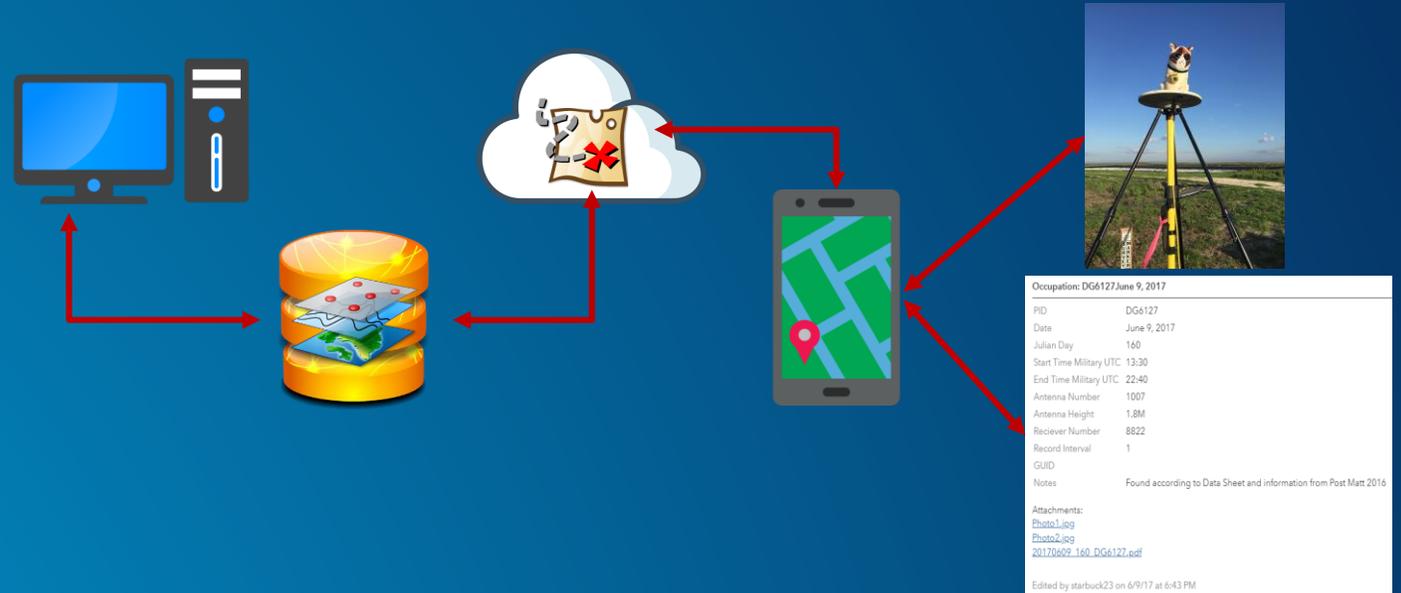
Workflow

- ArcMap

- used to create a database of static GPS survey control points from the National Geodetic Survey (NGS)
- this database was then published to ArcGIS Online
- a web map was created to make the data available for use in Collector

- Collector

- used for
 - locating benchmarks
 - recording daily GPS Base Station observations



- This workflow provided an easier and more efficient means of managing and acquiring base station information

Utilizing Collector to find benchmarks

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- Applying the Find Locations application setting with in Web Maps gave field staff the ability to search for benchmarks based on their PID and get turn-by-turn directions right in collector

Application Settings

Select the tools and capabilities to enable in applications that access this web map.

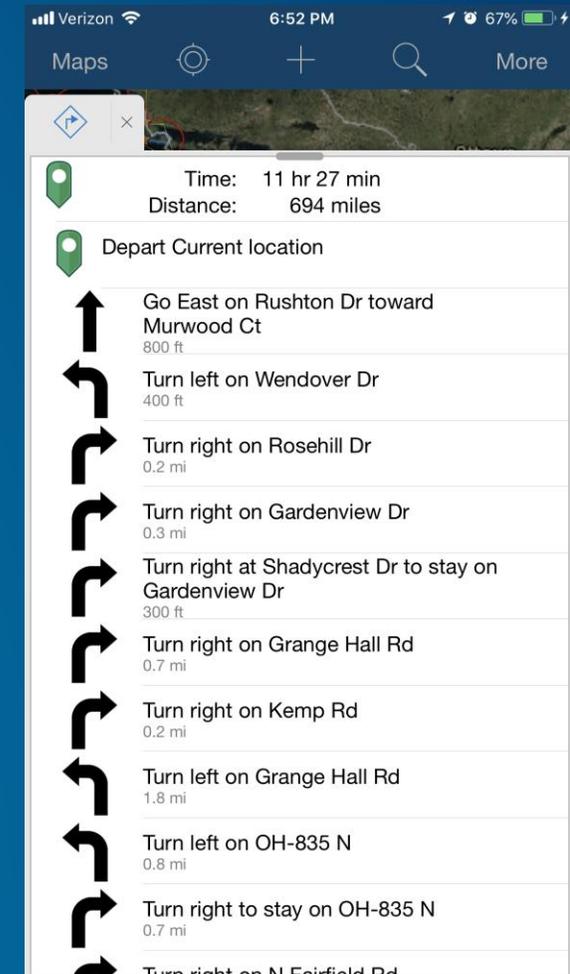
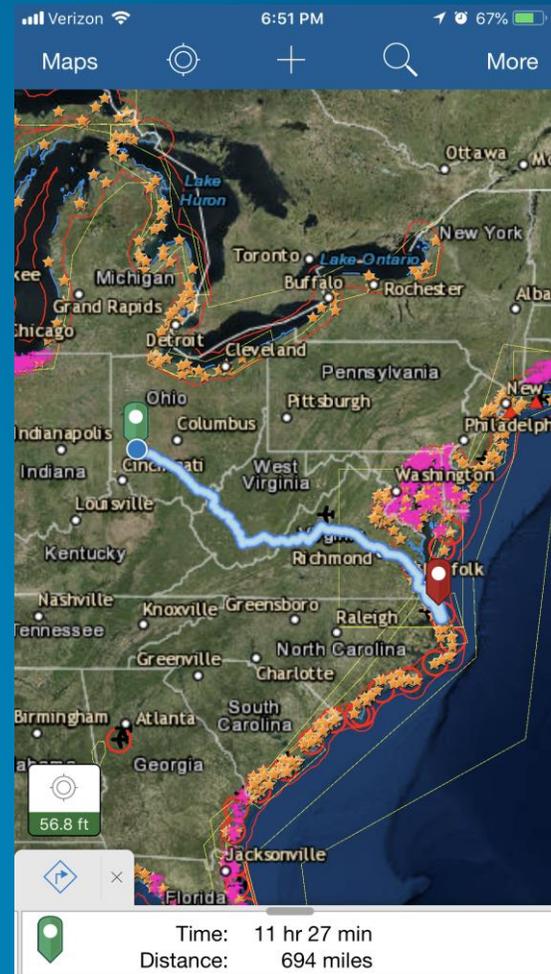
- Routing
- Measure Tool
- Basemap Selector
- Find Locations [-]

Hint text

Place or Address

By Layer

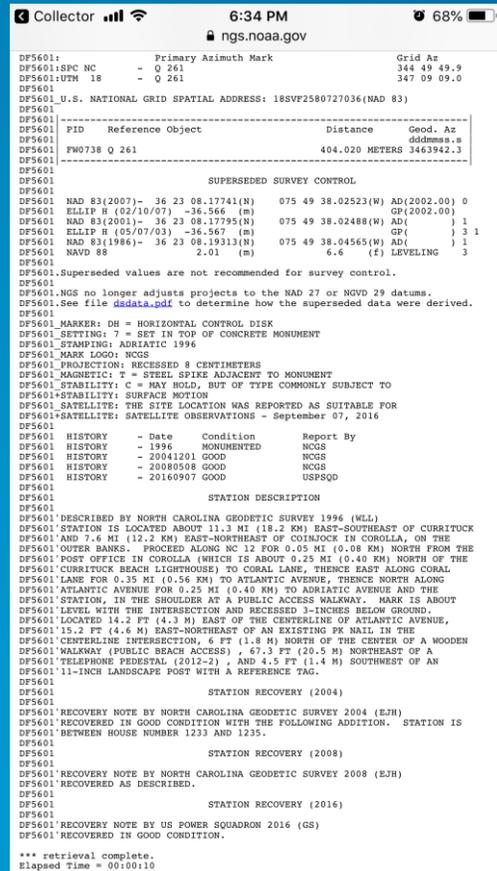
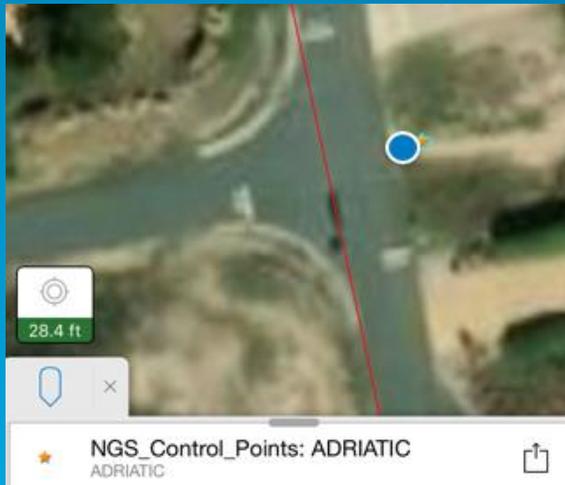
NGS_Control_Points	PID	Equals
JALBTCX_Set	Project PID	Equals



Utilizing Collector to find benchmarks

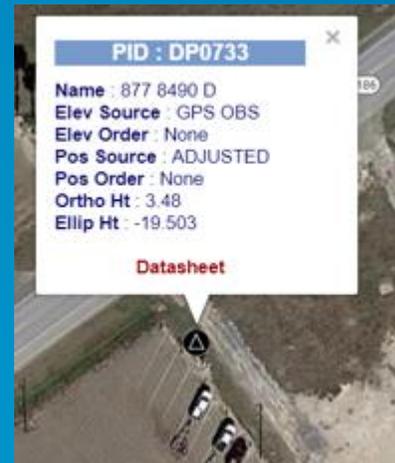
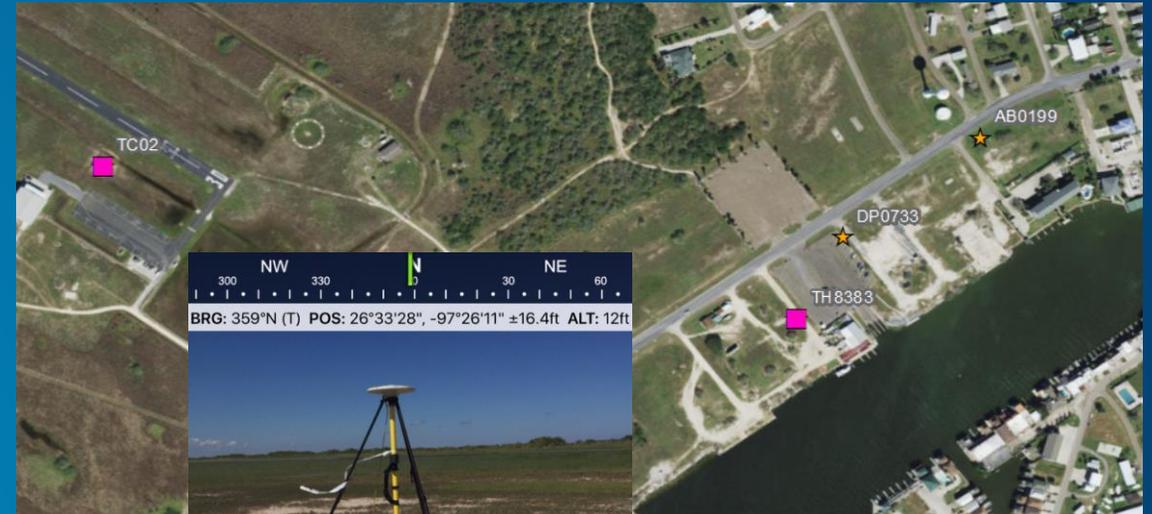
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- NGS published benchmarks are hosted as a layer to help crew locate them in the field
- The benchmark shapefile also has a link to the DATASHEET that crew members can open on their smartphones/tablets to further help them find the mark



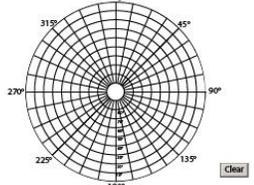
Utilizing Collector to set project GPS points

- Collector can be used to record the location of new control sites set during the course of a project
- The new control point is added to the JALBTCX Set GPS feature layer
 - anyone with access to the data can see where the new point is
 - others can locate it more easily in the field



Utilizing Collector to record base station data

- In addition to making it easier to locate benchmarks, this process replaces paper and PDF methods for logging field observations, making day-to-day operations
 - more efficient
 - easier to use
 - less prone to user-error

POINT ID (PID)		MONUMENT PHOTO		OP&S CONTROL SURVEY	
FW0683				FIELD DATA SHEET	
DESIGNATION		SURVEYOR: Jennifer Starbuck		PROJECT NAME: 2017_NCMP_EC	
865 1370 E TIDAL				PROJECT NUMBER: 77451	
DATE: Jun 24, 2017	SESSION: 1	SPATIAL REFERENCE: NAD 83		LATITUDE: 36 10 50.13 (N)	
DAY OF YEAR: 175	RECORD INTERVAL (s): 1	LONGITUDE: 075 45 22.16 (W)		EL. HGT (m): -29.713	
START TIME: 12:00		<input checked="" type="checkbox"/> PUBLISHED MONUMENT		<input type="checkbox"/> PRIMARY STATION	
END TIME: 16:00		<input checked="" type="checkbox"/> NEW OCCUPATION		<input type="checkbox"/> SECONDARY STATION	
ANTENNA INFO		MONUMENT IS:		ANTENNA MEASUREMENT	
TYPE-MODE: Zephyr Geodetic 2 - 57971		<input type="checkbox"/> FLUSH		<input type="checkbox"/> ABOVE GROUND	
1007		<input type="checkbox"/> BELOW GROUND		<input checked="" type="checkbox"/> VERTICAL - FIXED HEIGHT	
RECEIVER INFO				BLANT HEIGHT TO ARP	
TYPE-MODE: Trimble 5700 - 40406-00				ANTENNA HEIGHT (m): 1.8	
S/N NUMBER: 8622					
OBSTRUCTION DIAGRAM		OCCUPATION DESCRIPTION			
		https://www.ngs.noaa.gov/cgi-bin/ds_mark.pl?PidBox=FW0683			
		Found using data sheet. Mark is located South of the road leading into the Corp facility and East of Duck road.			
		Mark is in a disk in a plastic case and is 50 Ft S of access road and 60Ft E of Duck road. There is a 2.5 ft wooden post with a white witness sign.			
STATION SETUP		SITE MAP			
					

Occupation: FW0683 June 24, 2017

PID	FW0683
Date	June 24, 2017
Julian Day	175
Start Time Military UTC	12:00
End Time Military UTC	16:00
Antenna Number	2552
Antenna Height	1.8
Receiver Number	8328
Record Interval	1
GUID	
Notes	Mark is found on the south east side of road leading into corps facility, 2 ft in front of wood Post with white metal witnesses Post and it 100ft back from road

Attachments:
[Photo2.jpeg](#)
[Photo3.jpeg](#)
[Photo4.jpeg](#)
[Photo1.jpeg](#)
[overview.PNG](#)
[20170624_175_FW0683.pdf](#)



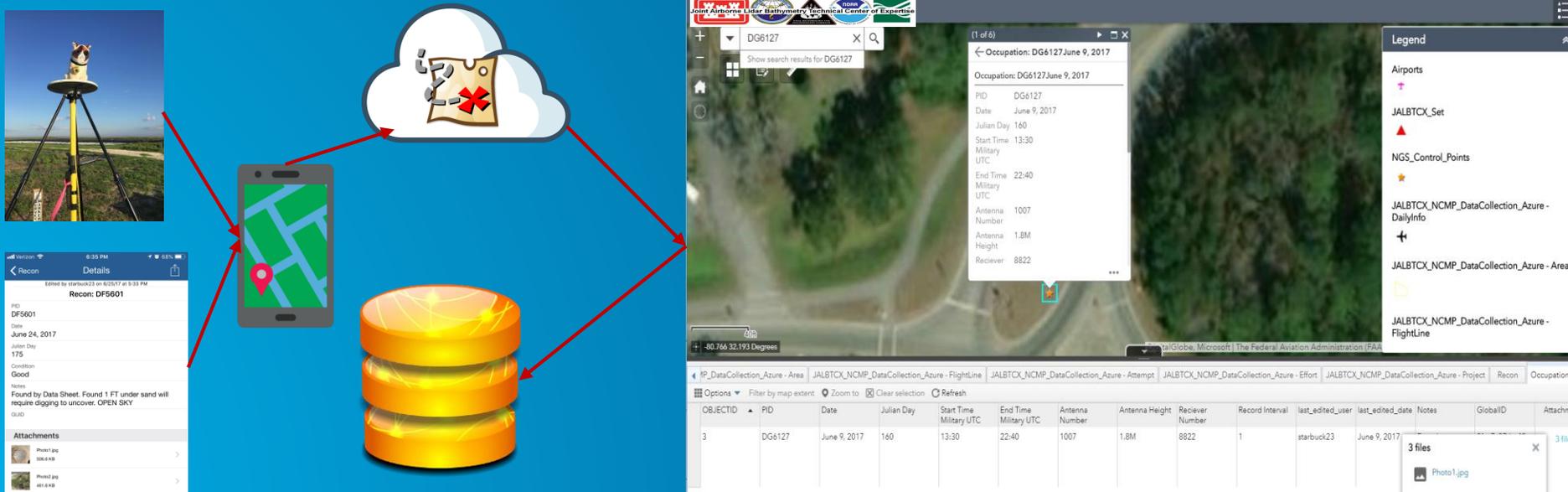
Utilizing ArcGIS Online to manage data

- The logs are also consolidated into one geodatabase that can then be accessed for the next mission so that base station operators know the following:
 - which benchmarks are verified to meet the mission's data needs
 - which ones not to spend time locating again
- This workflow was used for the most recent JALBTCX Gulf Coast acquisition efforts, which the program performs every five years
- For the next acquisition, field operations will be less labor-intensive because base station operators won't need to spend as much time locating and verifying marks



Utilizing ArcGIS Online for data management

- The resulting workflow enables benchmark locations to be accessed and field data to be collected directly on a tablet, with or without a data connection
- Field crew are able to take photos
 - base station setup
 - benchmarks
- These photos are saved as attachments to the benchmarks attribute table and become a part of the geodatabase
- Collector and ArcGIS online help keep GIS data and supporting documents all in one Geodatabase



Better understanding of Web GIS

- Streamlining information
 - Field-to-office data sharing
- Storage of information
- Project status tracking
- Dissemination of information across multiple organizations





Q&A

