



# DATA CAPTURE TECHNOLOGY

## for Water/Wastewater Facility Management

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Presented by Spotts, Stevens and McCoy



# Unmanned Aerial Vehicles (Drones)

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# Who, What, When, Where and Why?

- Criteria for “Pilot in Charge”
  - FAA Licensed Commercial UAS Pilot
  - Insured Consultant
  - Familiar with Flight Requirements



# What will you be flying?

Quadcopter Fixed Wing



Air Craft may not exceed weight limitations of **0.55 to 55 pounds** including payload.

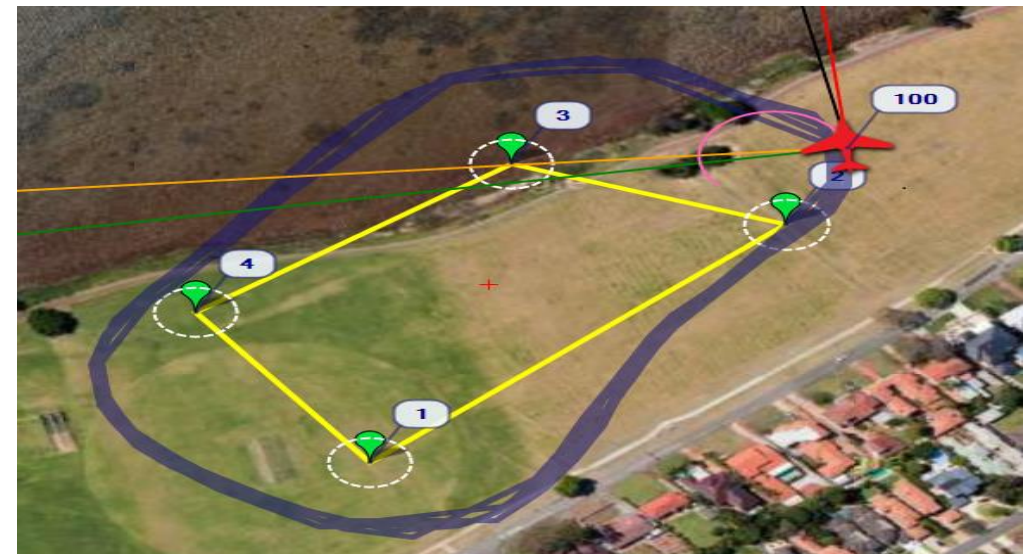


# Drone Flight Path Comparison

## QUAPCOPTER FLIGHT PATH FOR FULL TOPOGRAPHY



## FIXED WING FLIGHT PATH FOR VIDEO LOG



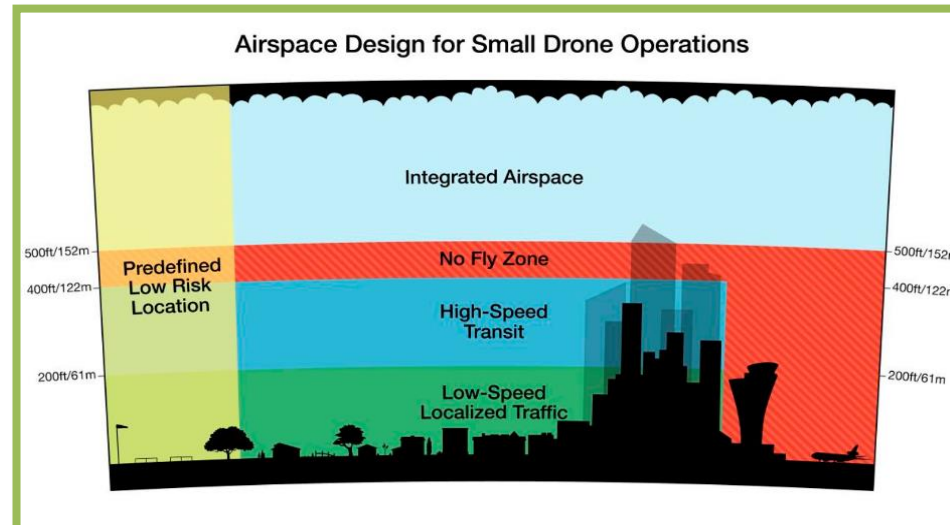
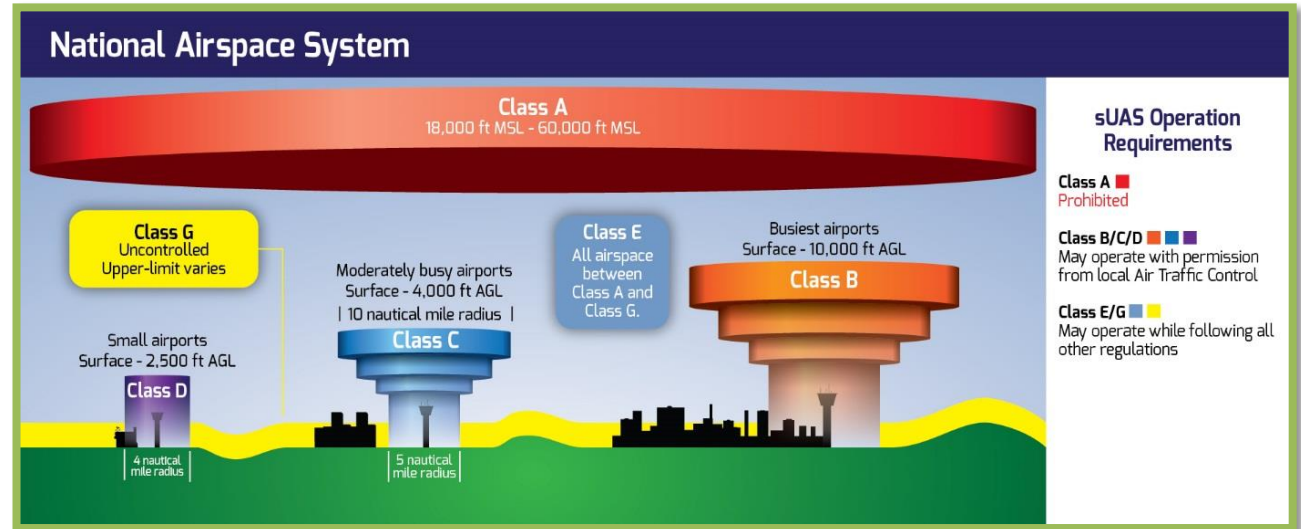
Project Scope, Population Restrictions and Desired Deliverable dictate best choice of aircraft for the data collection.



# Where can I fly my Drone?

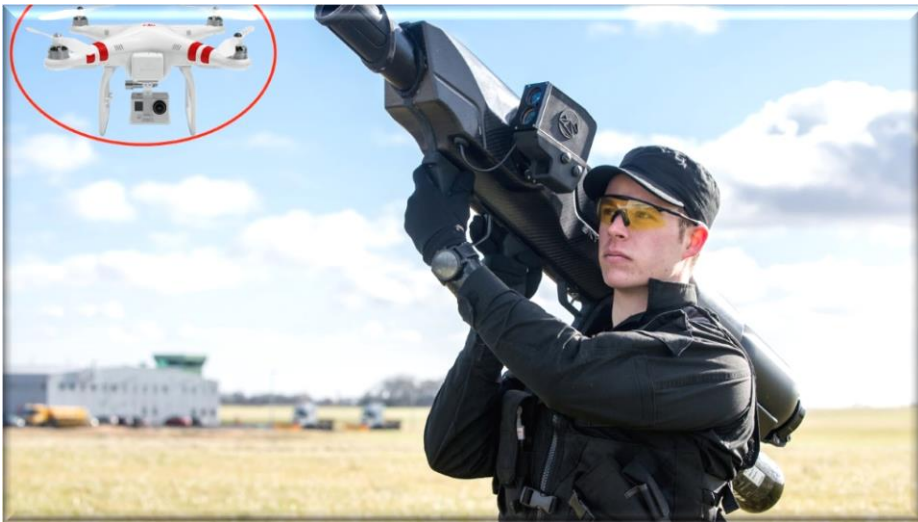
## Horizontal and Vertical Flight Restrictions

- Clear of FAA Controlled Air Space
- Clear of Dense Population
  - Homes or People
- Clear of Private Personal Space
  - Curtilage
- Only over your Project Area
  - No Speculation
- Within Line of Site



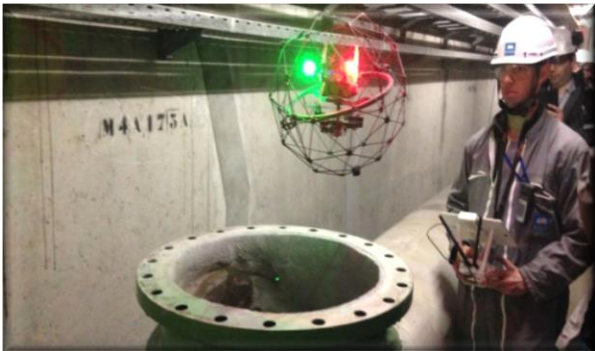
# When can I fly my Drone?

- Dawn to Dusk
  - Defined by 30 minutes after first light and 30 minutes prior to total dark (Twilight Hours)
- Clear of NOTAM Calls for Flight Restrictions
- Within guidelines of the Airspace Authorization
- Within guidelines of FAA Part 107 Waivor
- Within permission window of private land owner

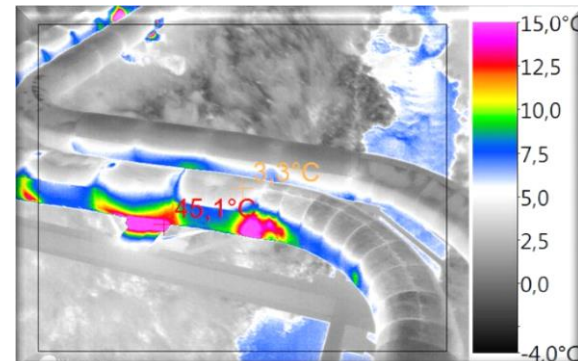


# Why Should I Use Drone Services?

Reduce Risk of Human Injury



Increase Productivity



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# What Can I Do with the Data?

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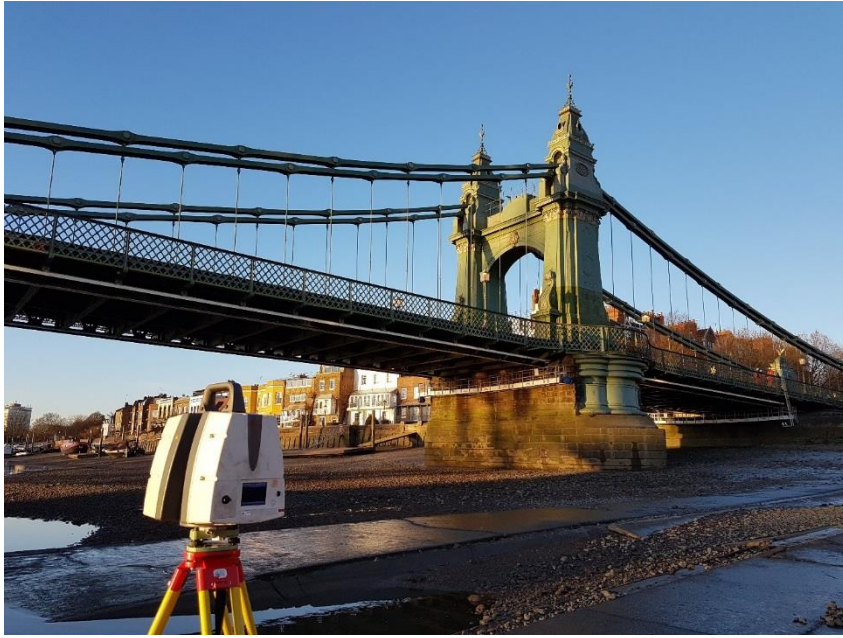


# 3D Mesh File



# High-Definition Photographs





# High Definition Scanning Field to Finish

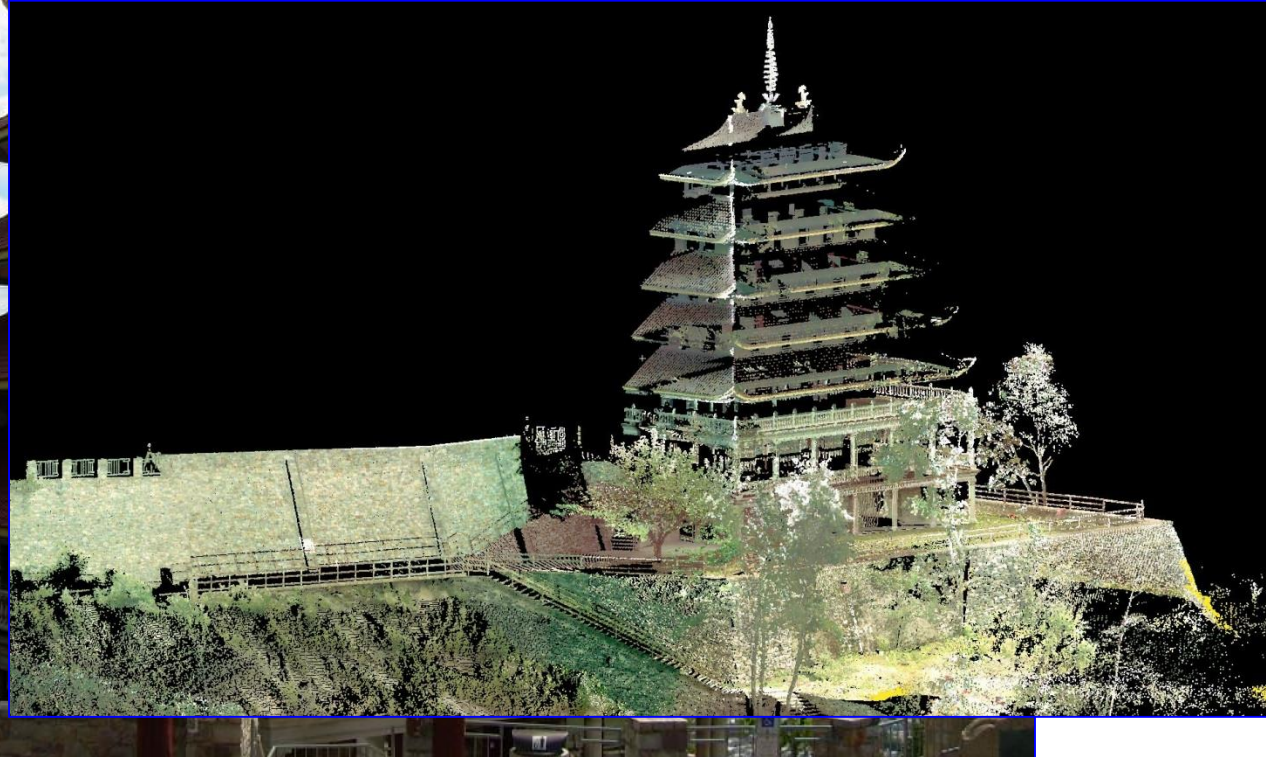
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All projects begin with collecting the raw data. ***No job is too big or too small.***



# Pagoda | Reading PA

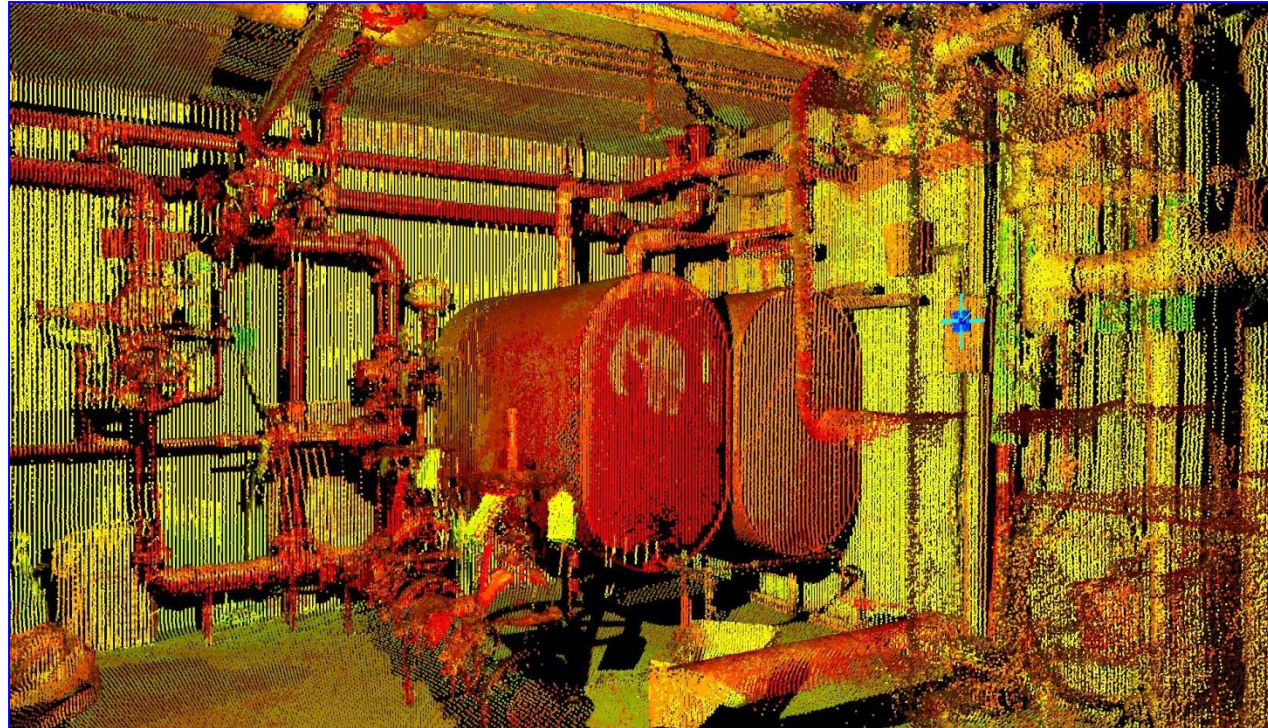
- Topographical survey project.
- Scanned area around the building for new gardens, landscaping, and parking.



# Pagoda | Reading PA



Boiler Room

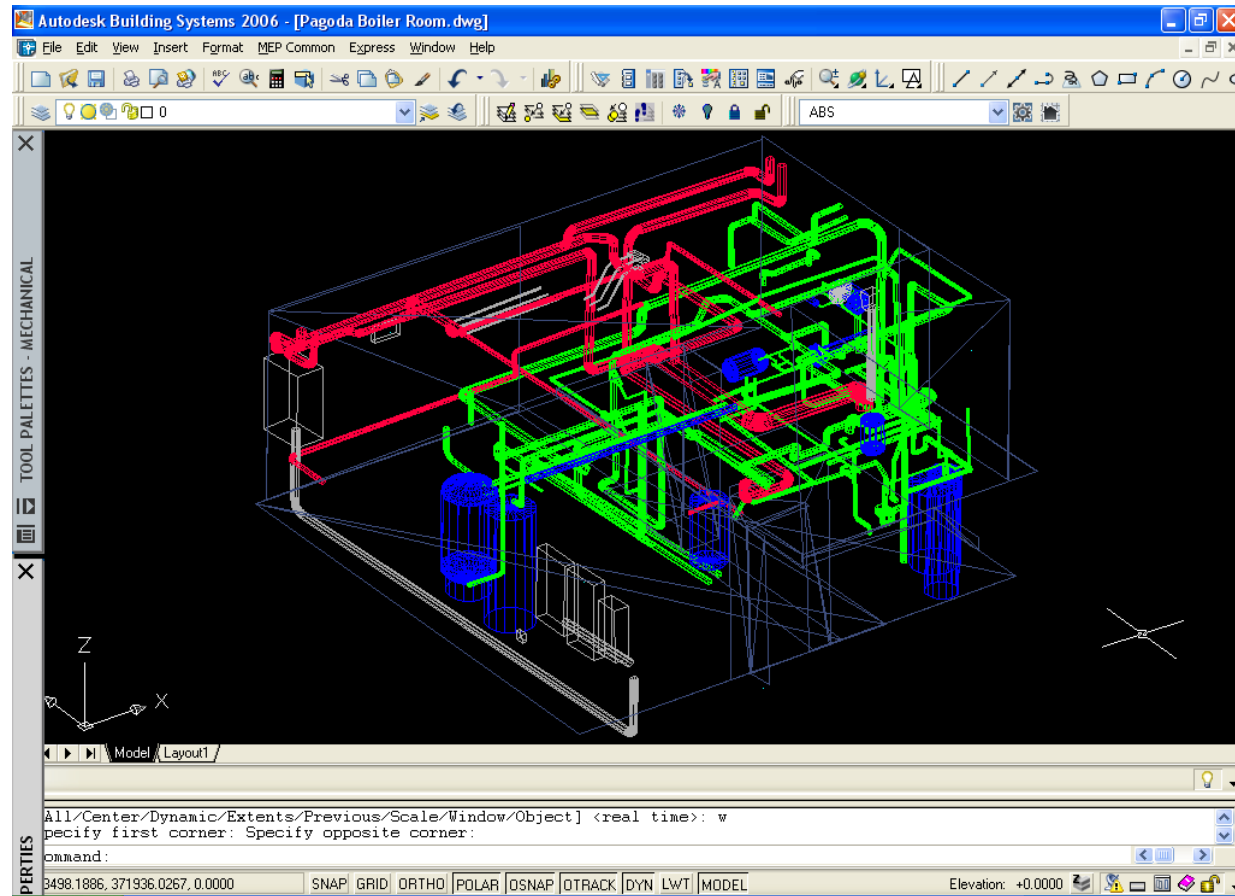


# Pagoda | Reading PA



- Imported piping from Cyclone Model.

## CAD 3D Piping Plan





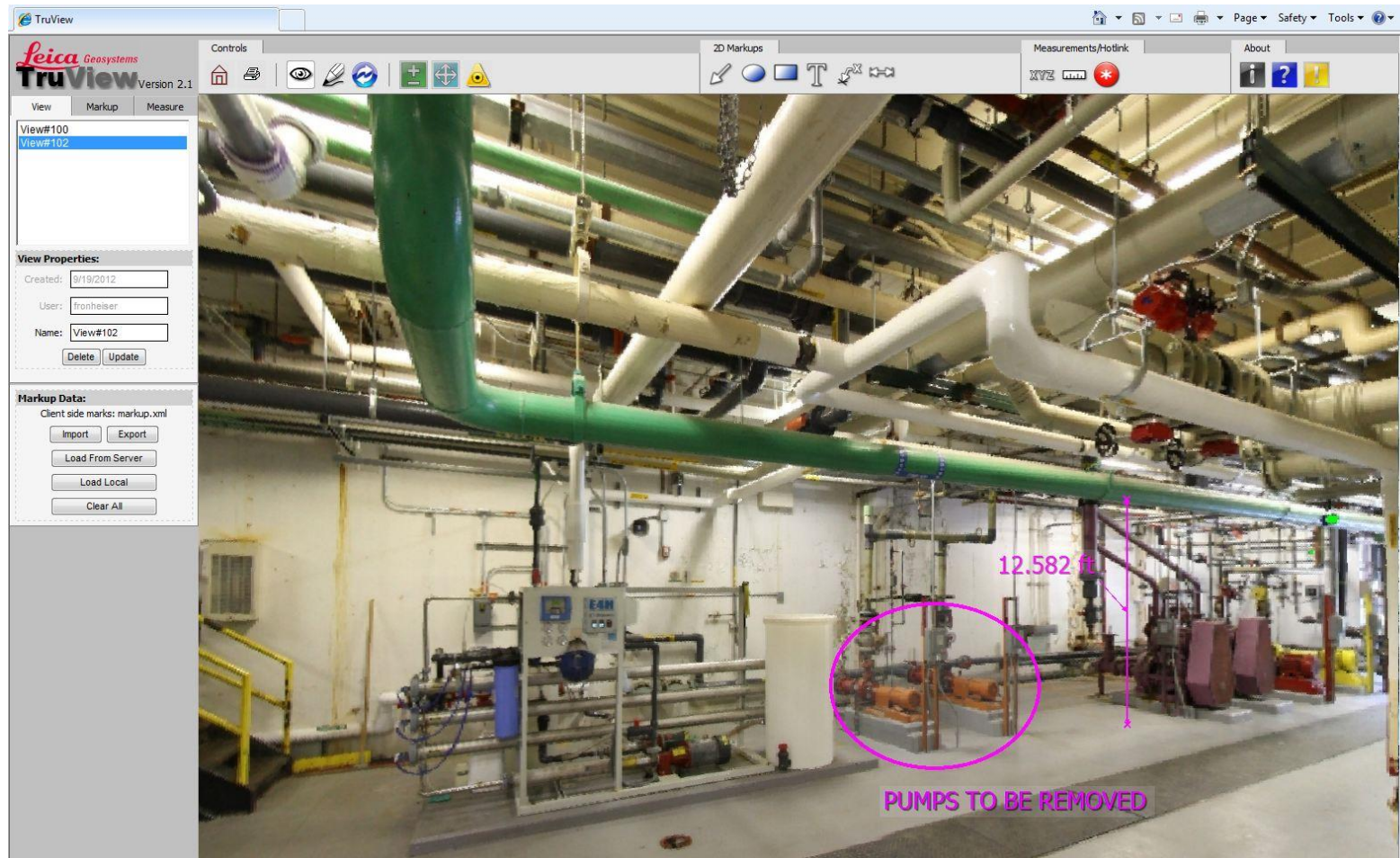
# Raw Data Point Cloud



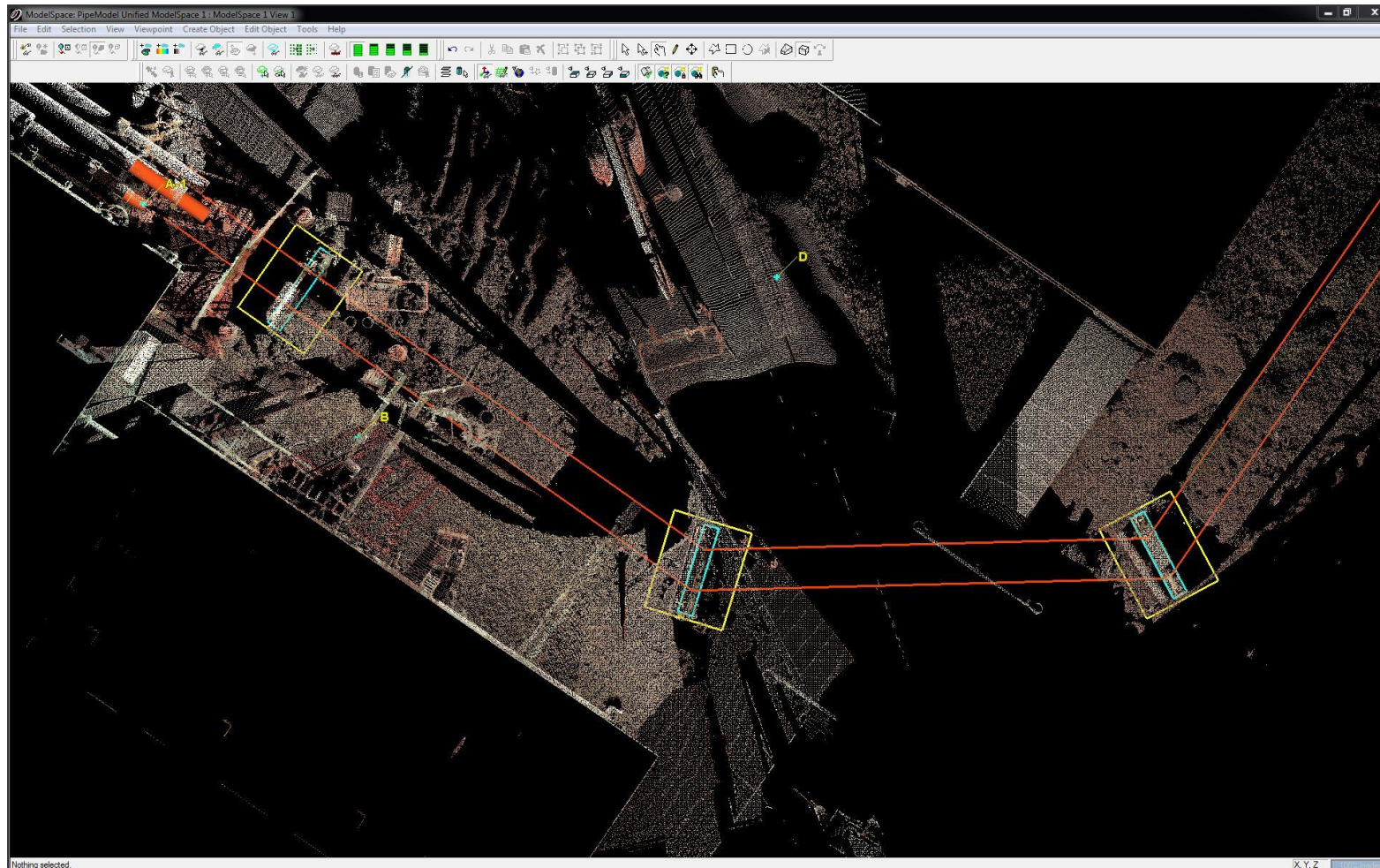
# Raw Data Point Cloud



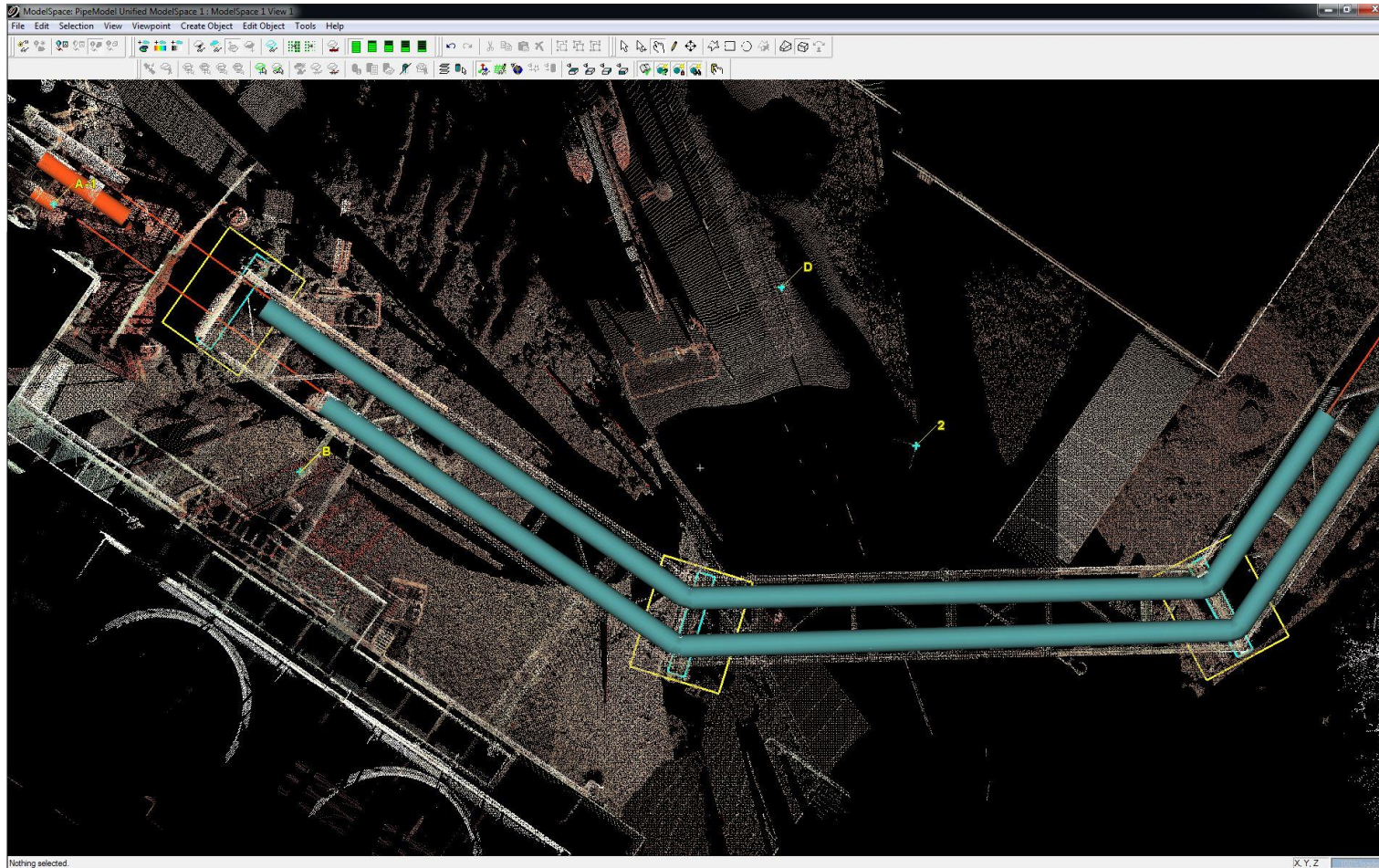
# Leica "Tru View" Data



# Point Cloud Pipe Route Design



# Pipe Design Clearance Check



# Global Positioning System (GPS)

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# Benefits of Geographic Information Systems

- The major benefit of GIS is the ability to integrate unlimited spatial data. Data that allows the user to perform analysis...making their GIS an important decision making tool.
- The ability to hyperlink (attach) plans, reports, pictures and other data to features shown on their GIS is invaluable. Limitless information is available at the user's fingertips.

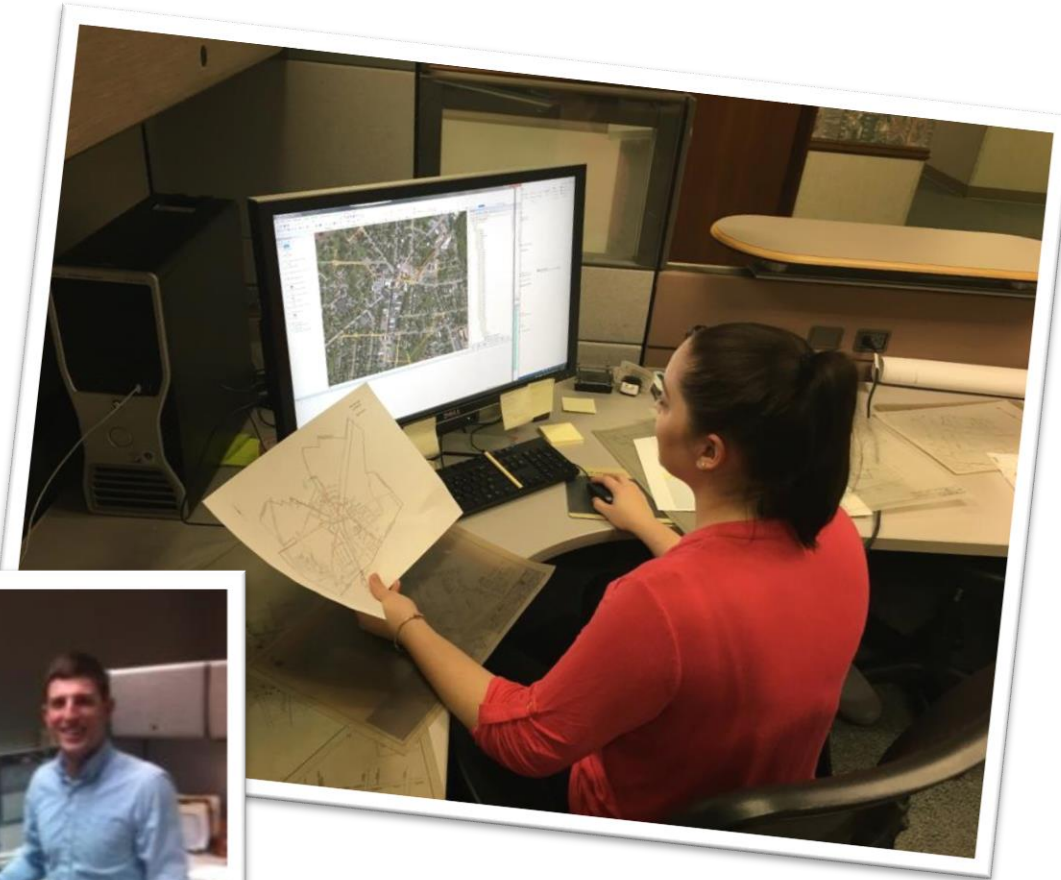


# Asset Management

- Converting paper drawings to GIS
- Locating assets in the field
- Mobile devices

## MAPS vs PLANS

- Maps are general reference/grand scale
- Plans are dimensional/level of accuracy

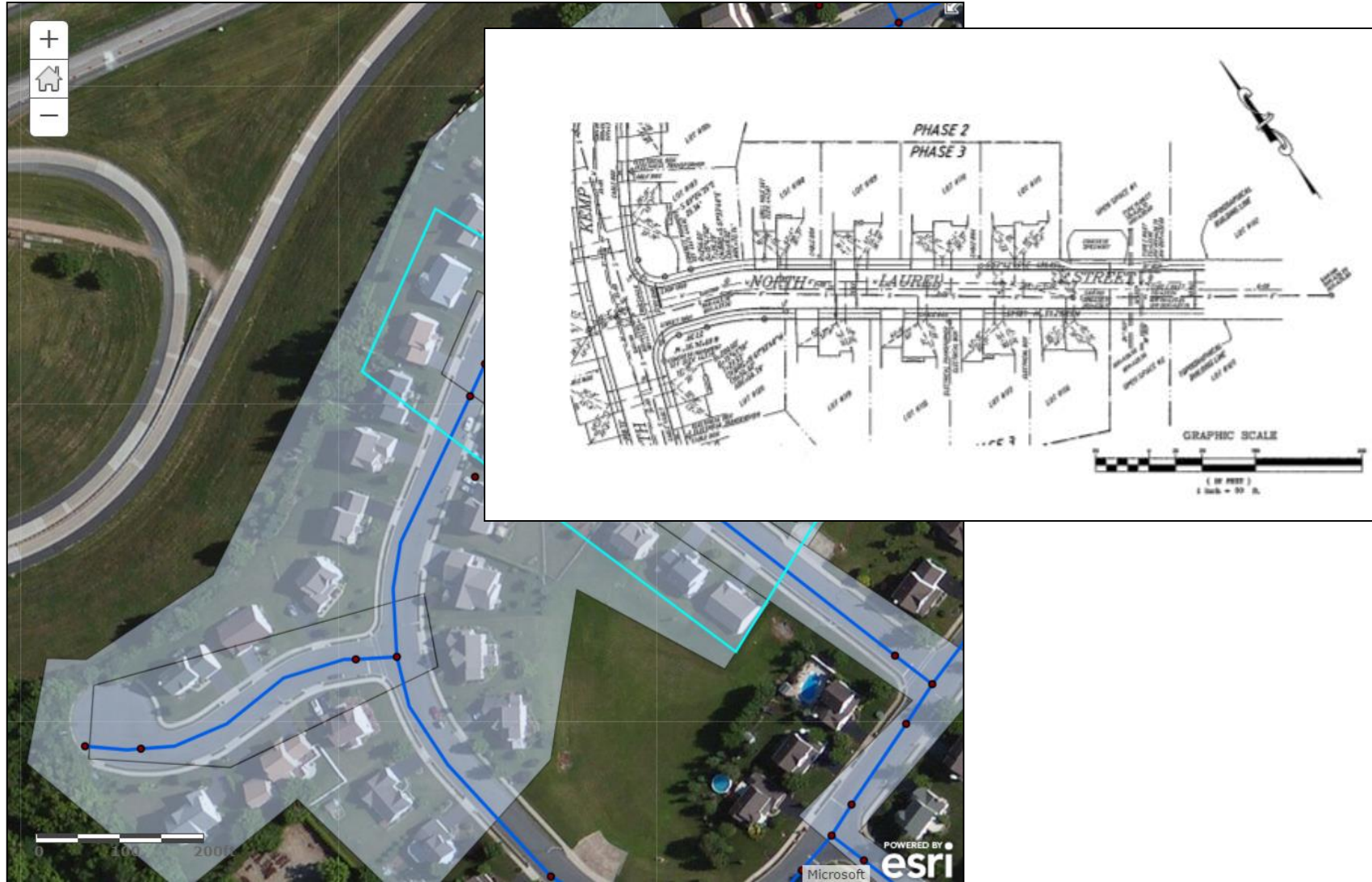




# Digitizing Historic Plans



# Record Management System



# Record Management System

(1 of 11) River Road Booster Pump Station  
Pump Diagram

Zoom to Get Directions Edit

Materials:  
Pump housing: Cast iron  
EN-JS1050  
ASTM 80-55-06  
Impeller: Stainless steel  
DIN W.-Nr. 1.4301  
AISI 304  
Material code: A  
Code for rubber: E

Technical drawing dimensions:  
10 1/4"  
7 1/2"  
15 3/8"  
22 1/8"  
5 1/2"  
7 1/2"  
9 7/8"  
14 3/8"  
PRIMING PORT (G 1/2")  
G 1/2 PLUG WITH 1/4" TAP FOR GAUGE/SENSOR  
4" ANSI 125 LB R.F.  
G 1/2"  
8x e3/4"  
1 3/4"  
8 7/8"  
7 1/2"  
9"  
10 1/2"  
13"  
3 15/16"  
4x e9/16"

Map labels: VER ST, SCHUY-KILL AV, Penn Street Boat Launch, Penn Street Courts, S PENN ST, Pettibon Recreconnections Trail, E MAIN ST

Scale: 0 100 200ft

Powered by esri

County of Chester, Esri, HERE, Garmin, INCREMENT P, Intermap, U...

# Collaborative Data Exchange

Cloud based GIS services allow seamless communications between field personnel and office managers and consultants



# Document Field Photos

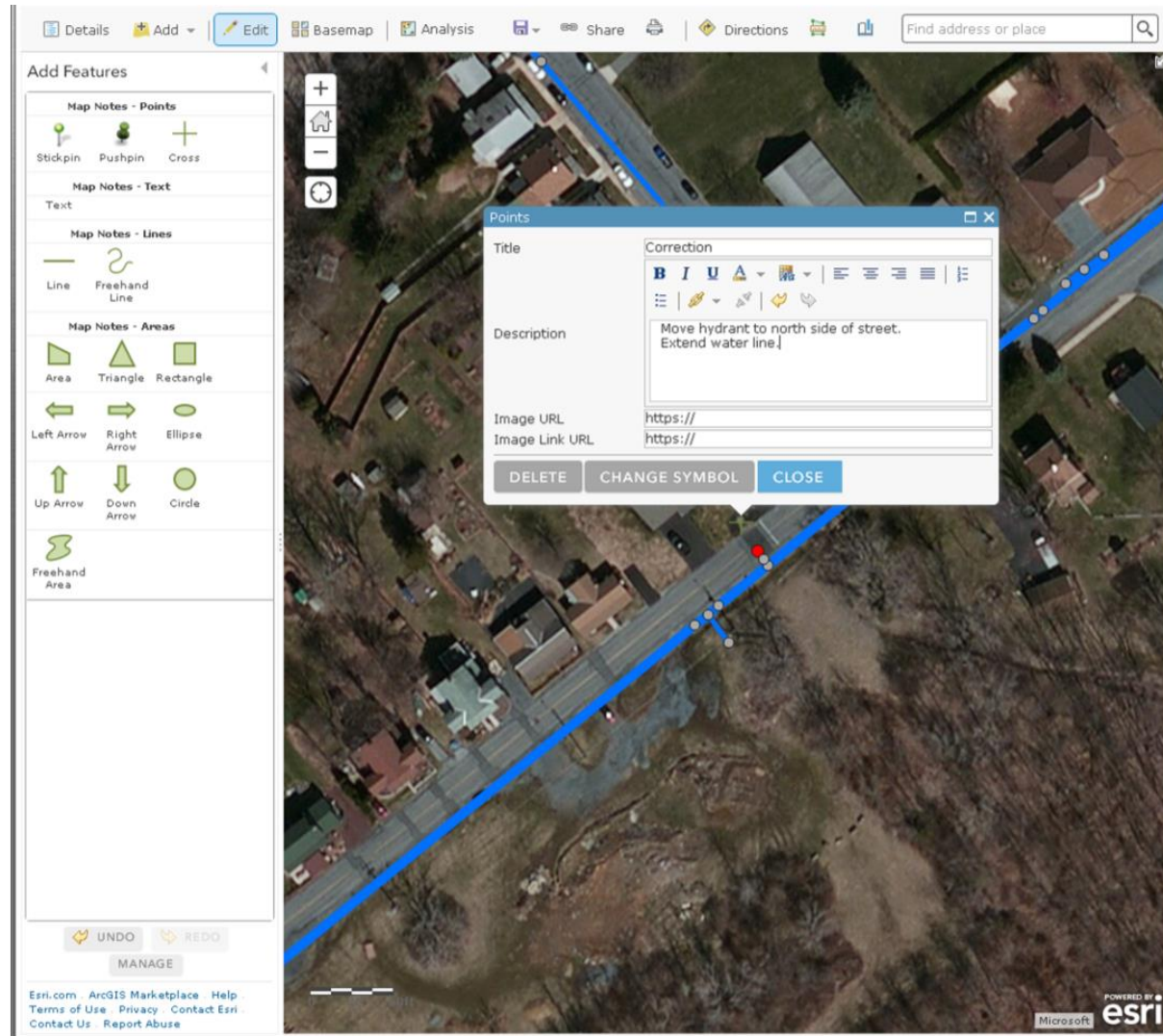
The screenshot displays an ArcGIS web interface. On the left, a legend panel lists symbols for 'Survey Point' (yellow star), 'Manhole' (orange circle), 'Fire Hydrant' (red circle), and 'Water System Junction' (grey circle). Below the legend, a 'Water Line' section shows a color-coded scale for pipe diameter (P\_dim): blue for > 24, 18, 12, 6, and light blue for < 0. The main map area shows an aerial view of a residential street with a blue line representing a water line and a red circle representing a fire hydrant. A yellow star symbol is placed on the map, and a pop-up information window is open over it. The pop-up contains the following details:

- surveyPoint**
- Address: North 3rd St
- Comment: Hoover
- Date: April 28, 2011
- Attachments: N 3rd St Hoover\_0464.J
- Edited by: WRJA\_GIS\_ac at 2:21 PM
- Zoom to: Get Direction

On the right side of the map, a large field photo is overlaid, showing a deep trench with a yellow excavator bucket at the top and two red hoses lying on the ground. The photo is taken from an elevated perspective, showing the depth of the excavation and the surrounding area.

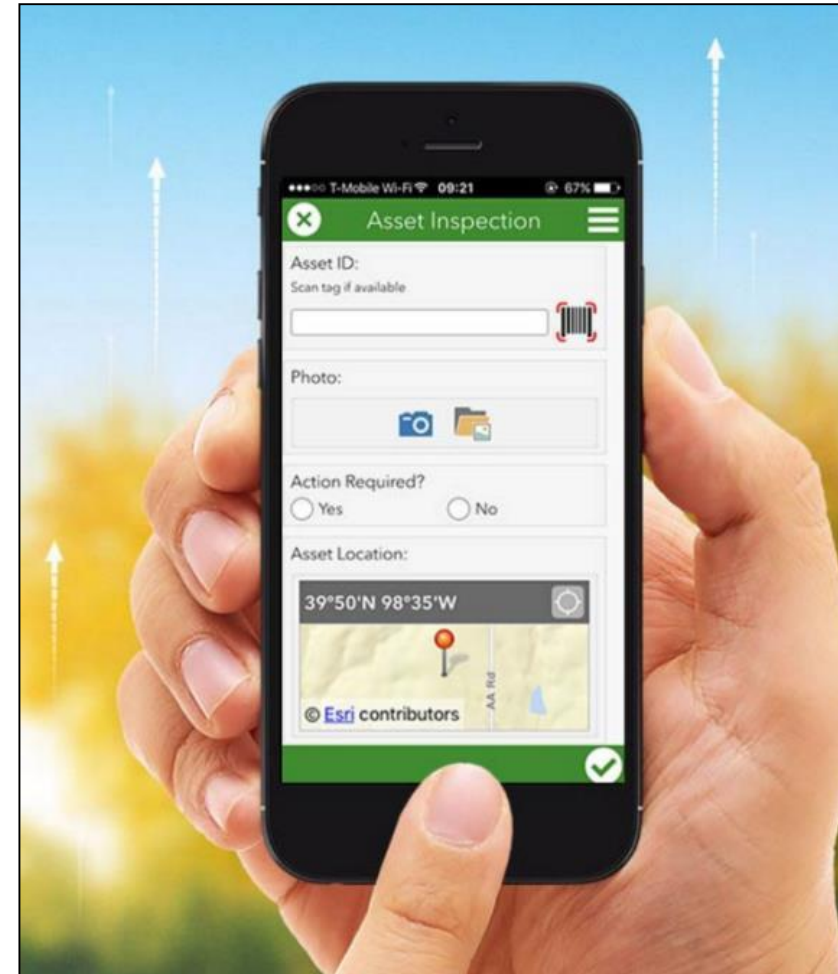
At the bottom of the interface, there are links for 'Esri.com', 'ArcGIS Marketplace', 'Help', 'Terms of Use', 'Privacy', 'Contact Esri', and 'Report Abuse'. The Microsoft ESRI logo is also visible in the bottom right corner of the map area.

# Field Corrections



# Database Population

- Field personnel can add attribute data to GIS database
  - Attribute tables in web maps
    - In the field or in the office
  - Form-based survey applications
    - Survey123 for ArcGIS



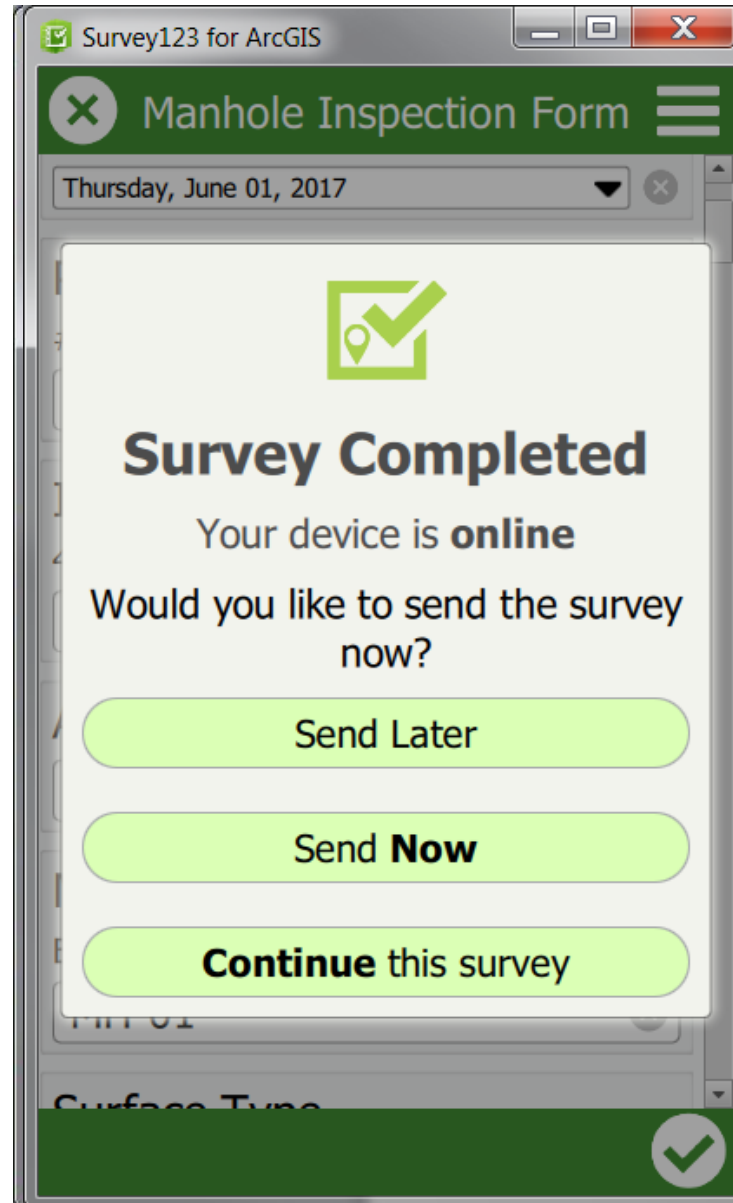
# Database Population

The screenshot displays an ArcGIS web application interface. At the top, there is a toolbar with options like 'Details', 'Add', 'Edit', 'Basemap', and 'Analysis', along with a search bar labeled 'Find address or place'. On the left, a legend identifies symbols for 'Water Valve' (blue dot), 'Meter Pit' (yellow dot), 'Fire Hydrant' (red cross), and 'Water Main' (orange line). The main map area shows an aerial view with these symbols overlaid. A popup window titled '(1 of 3)' is open over a selected 'Water Valve' feature, displaying 'Valve Number: 26' and buttons for 'Zoom to', 'Get Directions', and 'Edit'. Below the map, a table titled 'Water Valve (140 features, 1 selected)' shows a list of features with columns for 'BOX', 'JOBNO', 'FHNOSHEET', 'SIZEMAIN', and 'OPENS'. The first row is selected and contains the value '115' in the 'BOX' column. At the bottom left, there are links for 'Esri.com', 'ArcGIS Marketplace', 'Help', 'Terms of Use', 'Privacy', 'Contact Esri', 'Contact Us', and 'Report Abuse'.

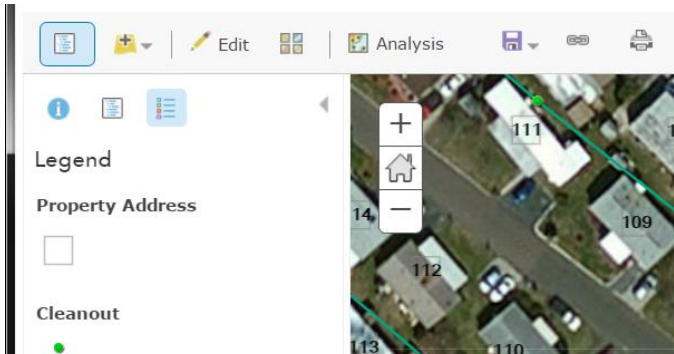
BOX	JOBNO	FHNOSHEET	SIZEMAIN	OPENS
115		0		
		0		
		0		
		0		



# Survey 123



# Sewer Manhole Inspection Reports



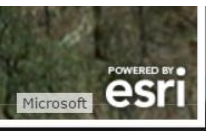
		Comments
Lid Dia.:	36"	
Lid Condition:	4	
Inside Frame Dia.:	N/A	
Frame Condition:		
Frame Seal Cond.:		
Rain Shield:	No	
Riser Material:	Brick	
Riser Condition:	5	
Chimney Mat.:	Precast Concrete	
Chimney Cond.:	4	
MH Diameter:	4'	
MH Wall Mat.:	Precast Concrete	
MH Wall Cond.:	4	
MH Bench Mat.:	Poured in Place Concrete	
MH Bench Cond.:	3	
Step Mat.:	Metal	
Step Cond.:	3	
No. of Steps:	3	
Drop Manhole:	Yes	
Inflow:	Yes	Manhole Lid
Infiltration:	No	
Surcharge:	Yes	



- 1 - Good Condition, No defects noted
- 2 - Fair Condition, minor defects, not structural
- 3 - Fair Condition, minor structural defects,
- 4 - Poor Condition, structural defects
- 5 - Poor Condition, major structural defects

Material	Condition	Shape	Diameter	From Manhole	To Manhole	Comments
VCP	4	Round	8"			
Unk	Unk	Round	Unk			
PVC	2	Round	4"			Drop
VCP	3	Round	8"			

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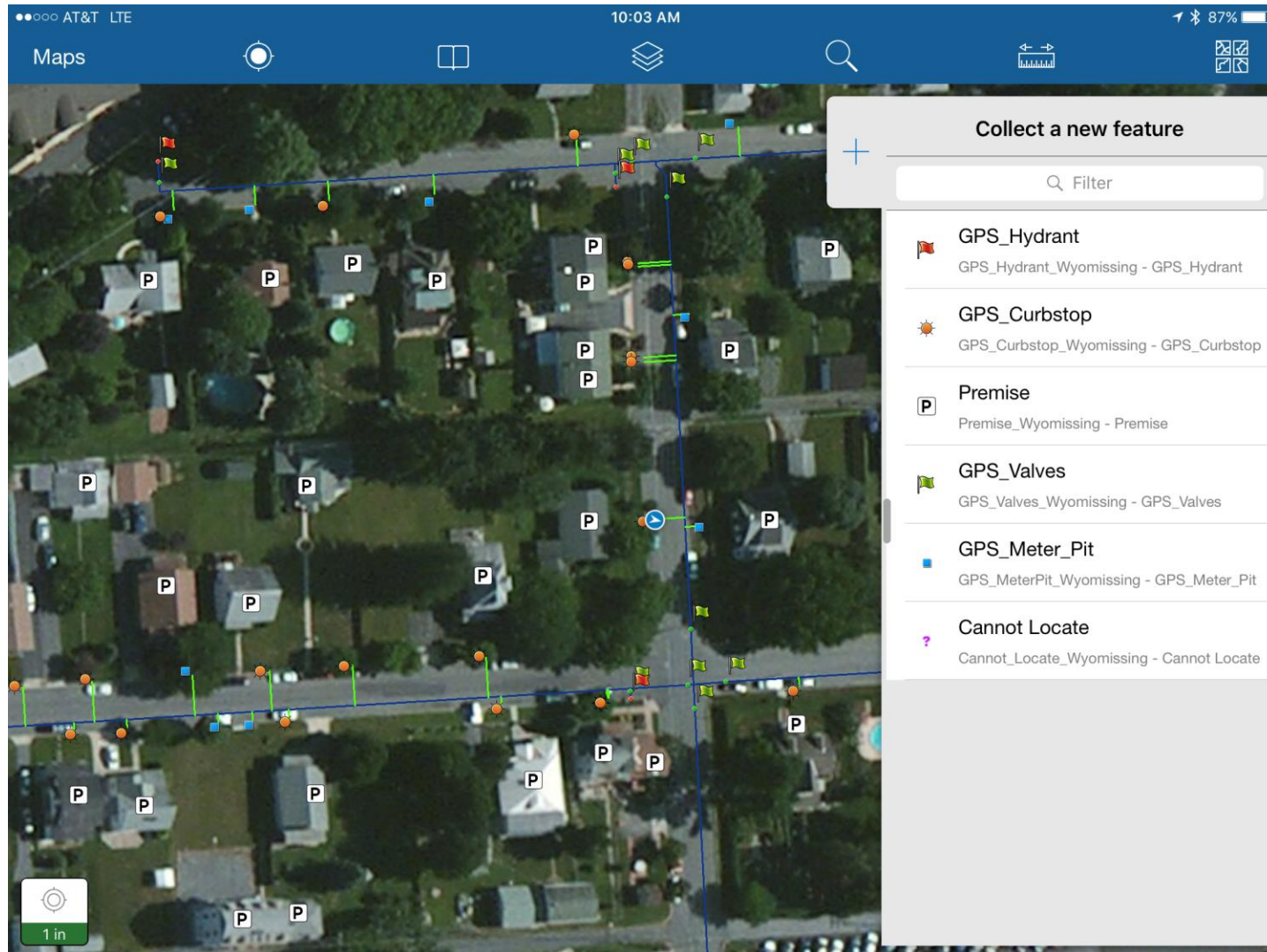


# Field Data Collection

- Mobile device (phone or tablet)
  - iPad
- RTK (Real Time Kinematic) Receiver
  - Eos Arrow 200(1 cm accuracy)
- Mobile app
  - ESRI's Collector



# Record Management System



# Questions



## **Steve Smith** | Senior Project Manager, Surveying and Data Capture

Mr. Smith has over 30 years of experience in the surveying field and has been responsible for all aspects of Boundary and Topographical surveying, Aerial Mapping, Utility and Route surveys, ALTA/ASCM survey and all phases of construction stakeout. His technical skills include robotic instrumentation, High Definition Scanning, UAS Drone Flight operations, AUTOCAD and Microsoft operating systems.

### **Contact Information**

P: 484-388-5982

E: [steve.smith@ssmgroup.com](mailto:steve.smith@ssmgroup.com)



SPOTTS | STEVENS | MCCOY

1047 North Park Road | Reading PA 19610

[ssmgroup.com](http://ssmgroup.com)

P: 610-621-2000