

# U.S. Air Force Base Utilizes AI and Other Emerging Technologies to Improve Resiliency of Underground Assets

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Half Associates

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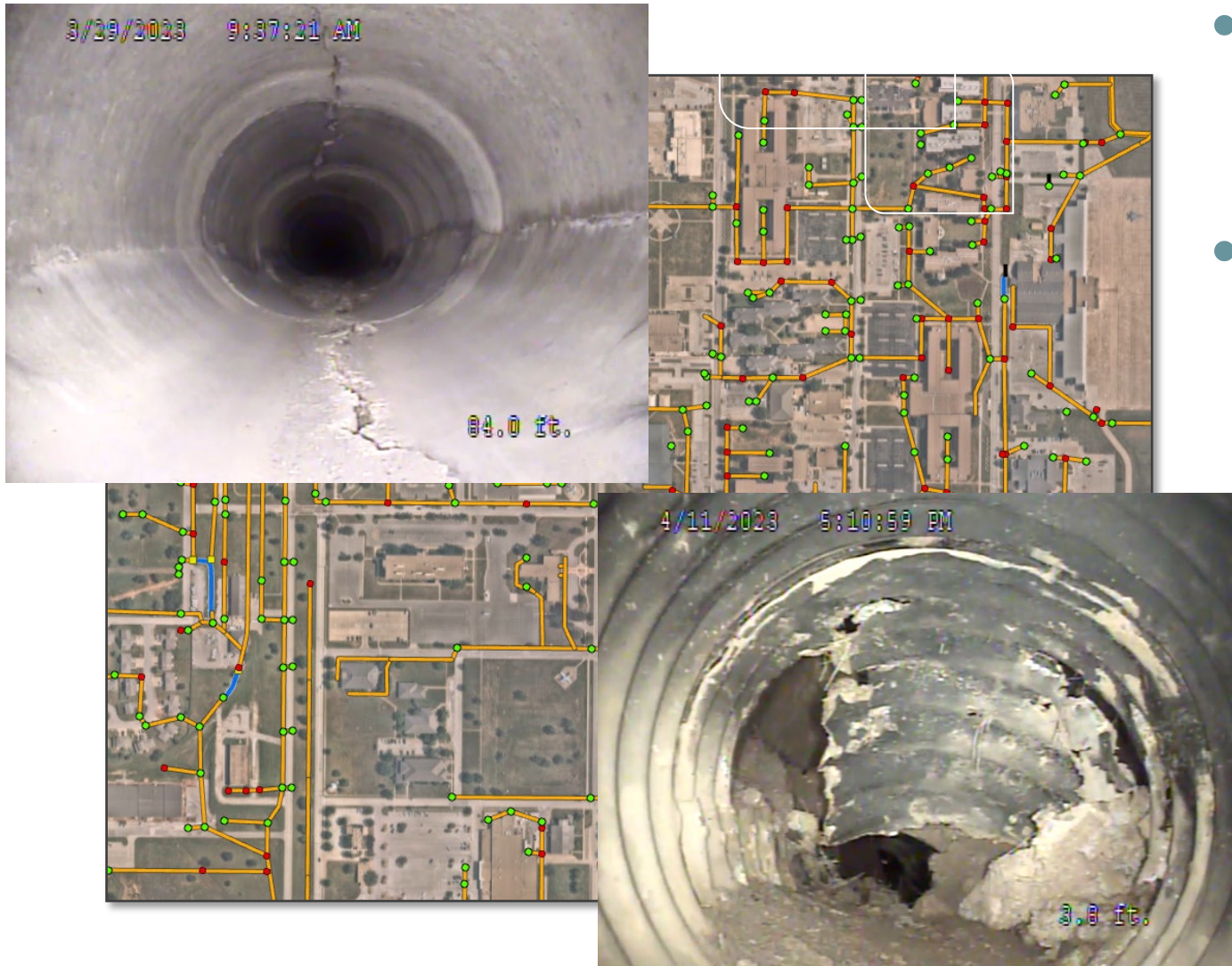
# Agenda

- PROJECT OVERVIEW
- LEVEL OF SERVICE CHALLENGES
- HIGH-IMPACT DATA & DELIVERABLES
- PRIORITIZE CORRECTIVE ACTIONS
- RESILIENCY ADVANTAGES
- LESSONS LEARNED



# PROJECT OVERVIEW

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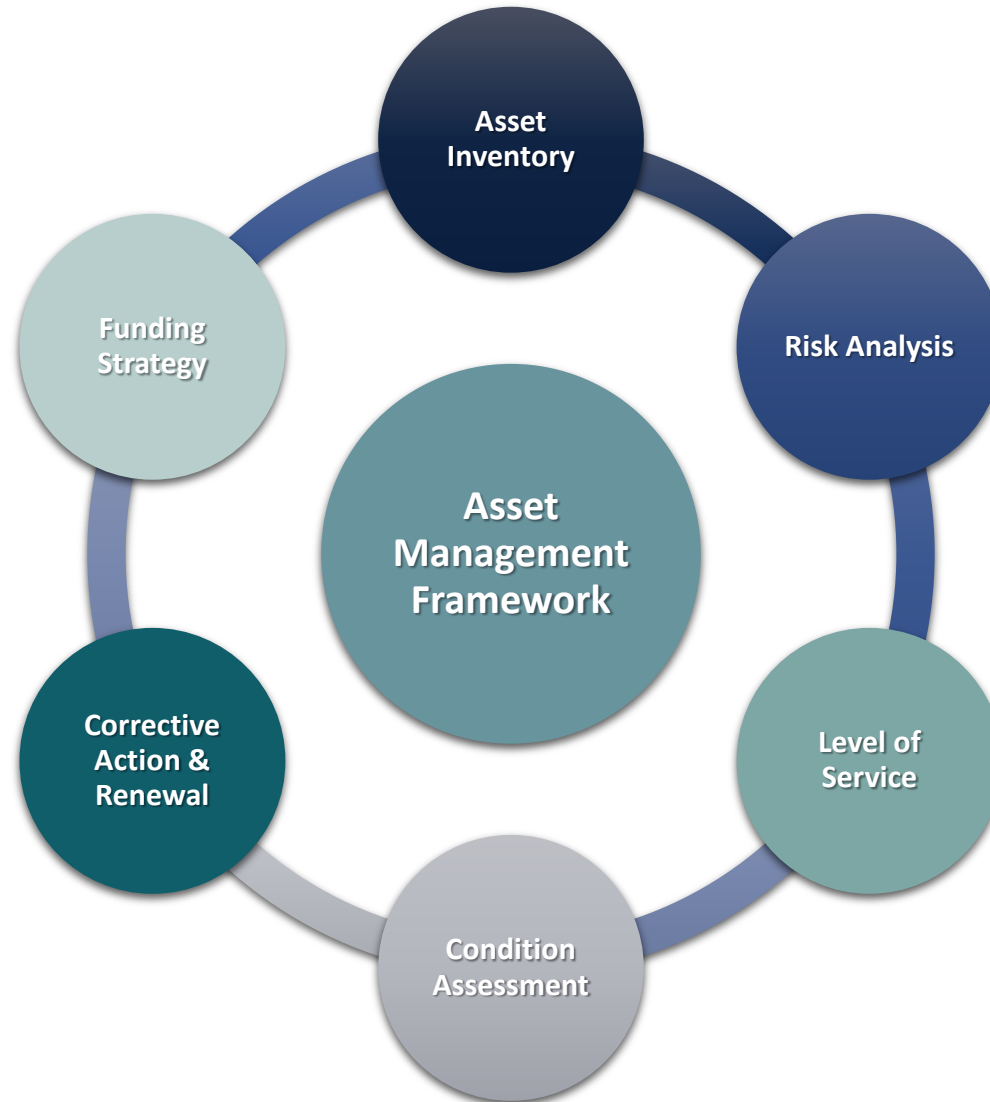
- **Contracting** - Sheppard Air Force Base contracted SLA-Cynergy JV and Halff.
- **Goal** - Multi-disciplinary project team leveraged survey, CCTV and manhole inspection, GeoBase integration, and engineering evaluation. Produced high-impact digital asset inventory, evaluation, & drainage modeling in 15-month period of performance.

A photograph of a large, multi-story brick building with a white eagle emblem on its facade. The text "U.S. AIR FORCE", "Sheppard Air Force Base", and "Main Gate" is overlaid on the image in white.

U.S. AIR FORCE  
Sheppard Air Force Base  
Main Gate

# LEVEL OF SERVICE CHALLENGES

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A large brick wall with a white eagle logo and text. The eagle is positioned at the top center. Below it, the text reads "U.S. AIR FORCE", "Sheppard Air Force Base", and "Main Gate" in descending order. The wall is made of reddish-brown bricks. There are green trees and bushes in the foreground and background.

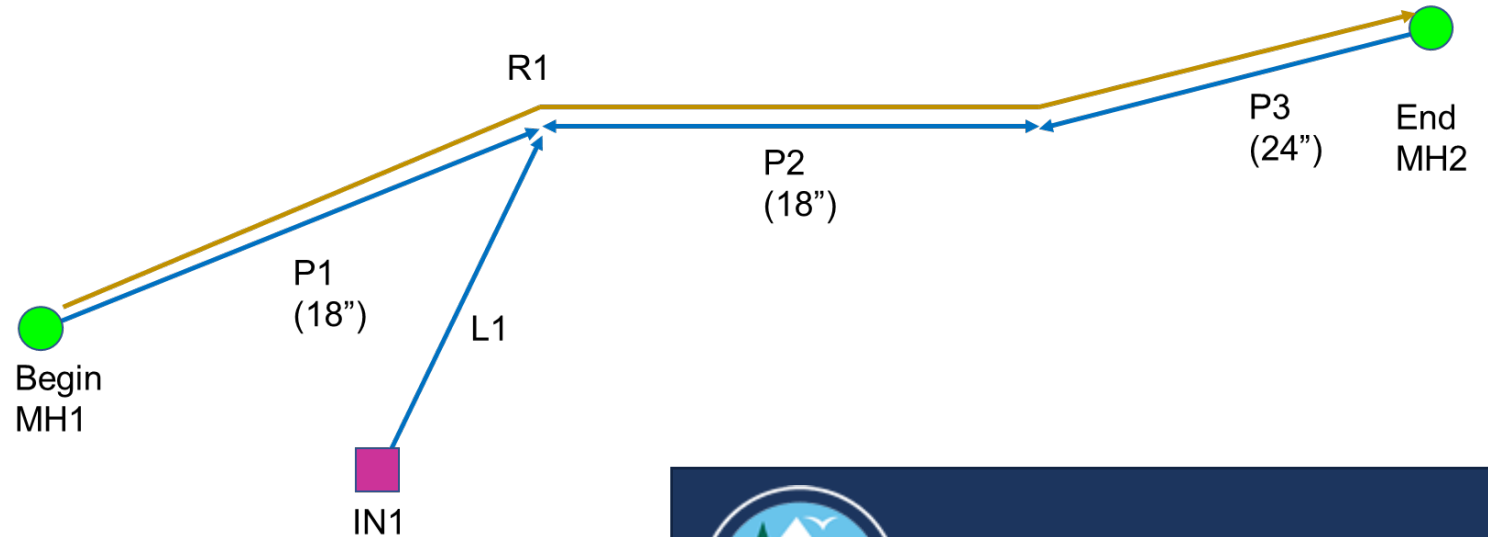
U.S. AIR FORCE  
Sheppard Air Force Base  
Main Gate

# HIGH-IMPACT DATA & DELIVERABLES

# HIGH-IMPACT DATA & DELIVERABLES

## Evaluation Requirements

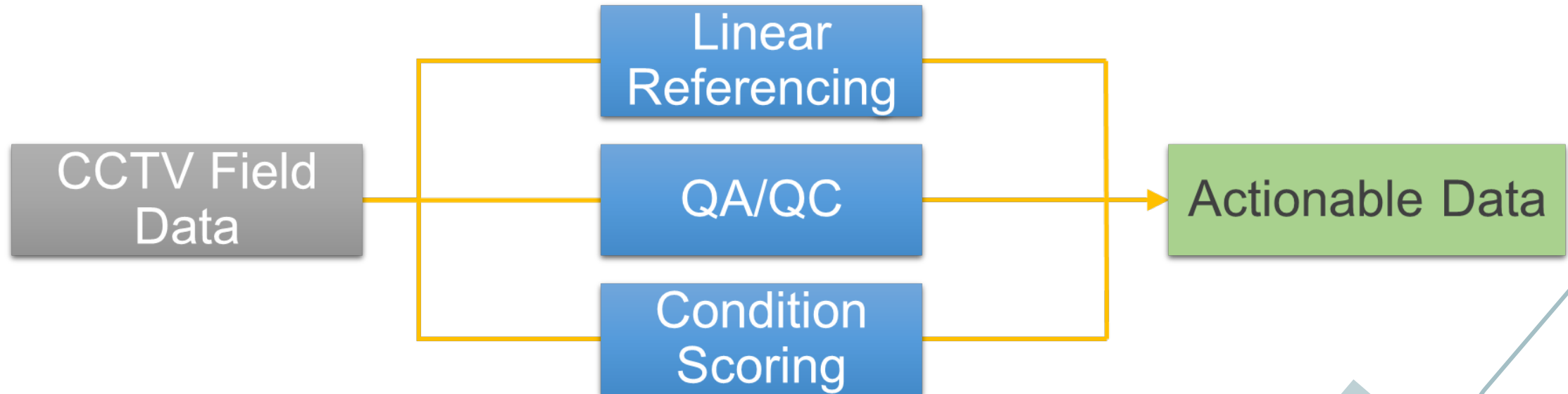
- Survey = 1,250 point assets (Manholes, inlets, discharge points)
- Condition assessment (CCTV) = 105,000 LF
- Condition assessment (MH Inspection) = 1,150 Manholes





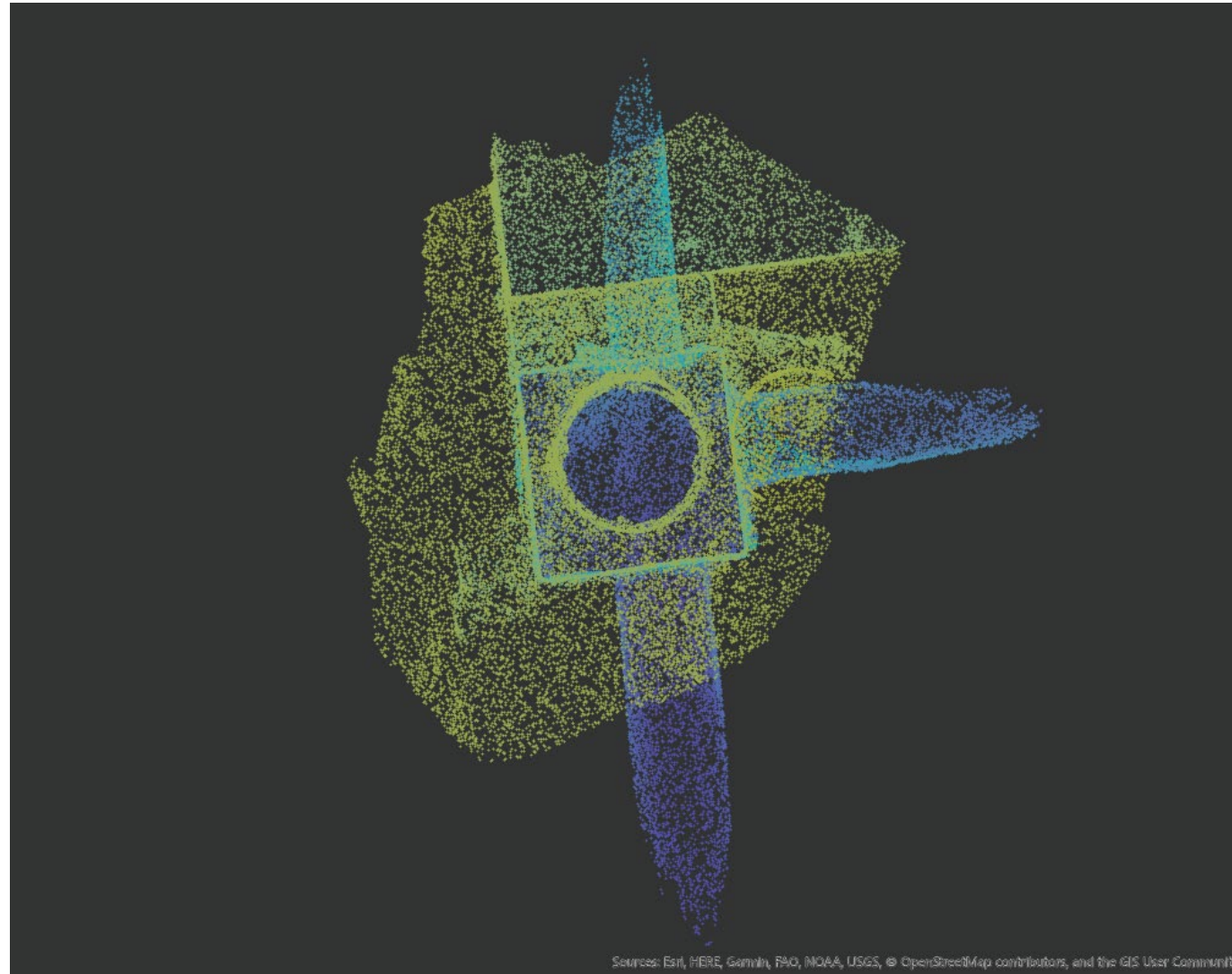
# HIGH-IMPACT DATA & DELIVERABLES

## Raw Data vs Actionable Data



# ■ | HIGH-IMPACT DATA & DELIVERABLES

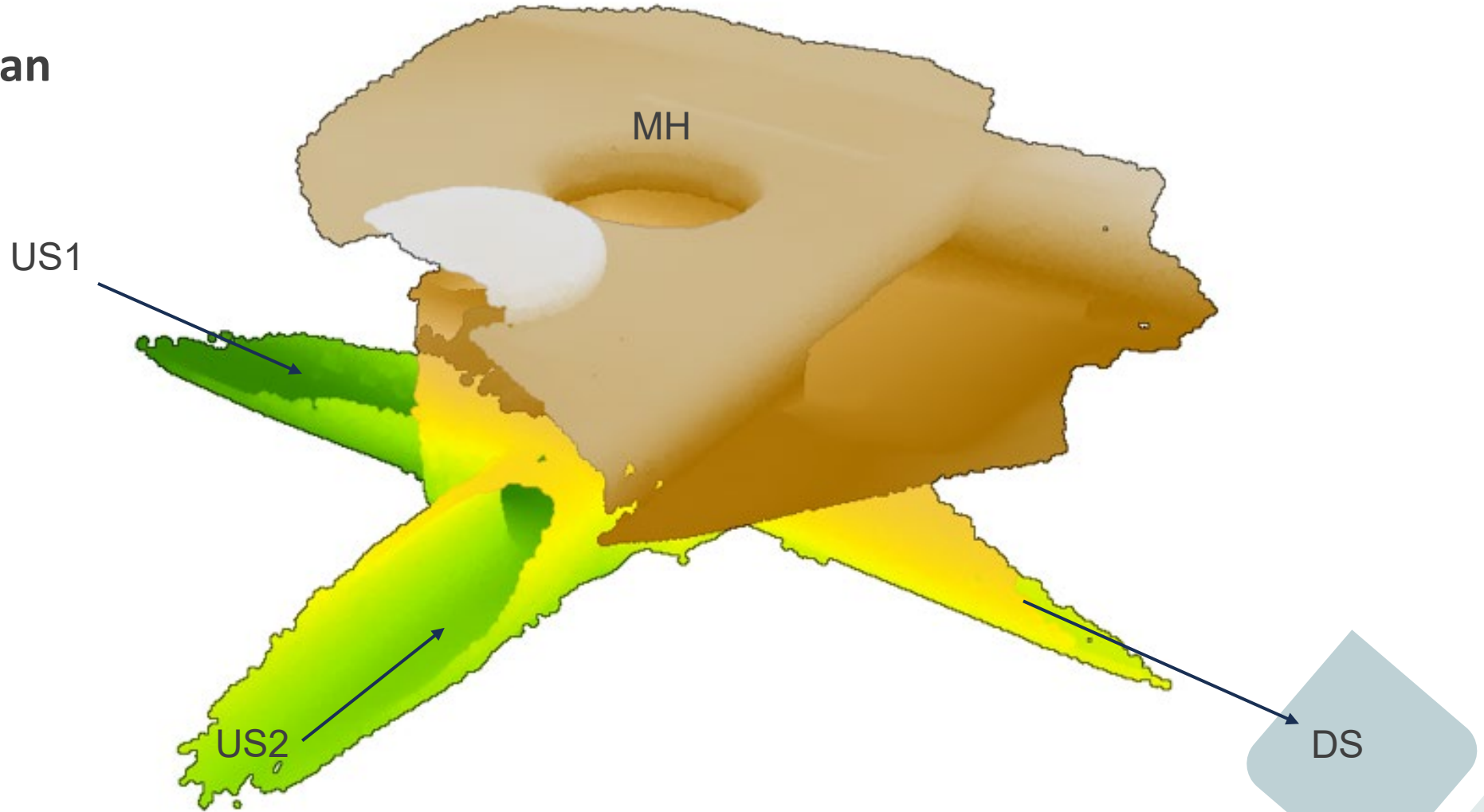
## LiDAR Scan Output



Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

# HIGH-IMPACT DATA & DELIVERABLES

LiDAR Scan  
Output



# HIGH-IMPACT DATA & DELIVERABLES

MH 360

Inspection

Output

360 Player - D04-0000411\_050823

File Reports Views Panorama

- Surveys
  - Node ID: D04-0000411
    - Components
    - Pipe Connections
      - Pipe #: 1
      - Observations
  - Node ID: D04-0000410
  - Node ID: D04-0000224
  - Node ID: D04-0000413
    - Components
      - Cover
      - Cover Insert
      - Adjustment Ring
      - Frame
      - Chimney
      - Cone
      - Wall
      - Bench
      - Channel/Step
    - Pipe Connections
      - Pipe #: 1
      - Observations

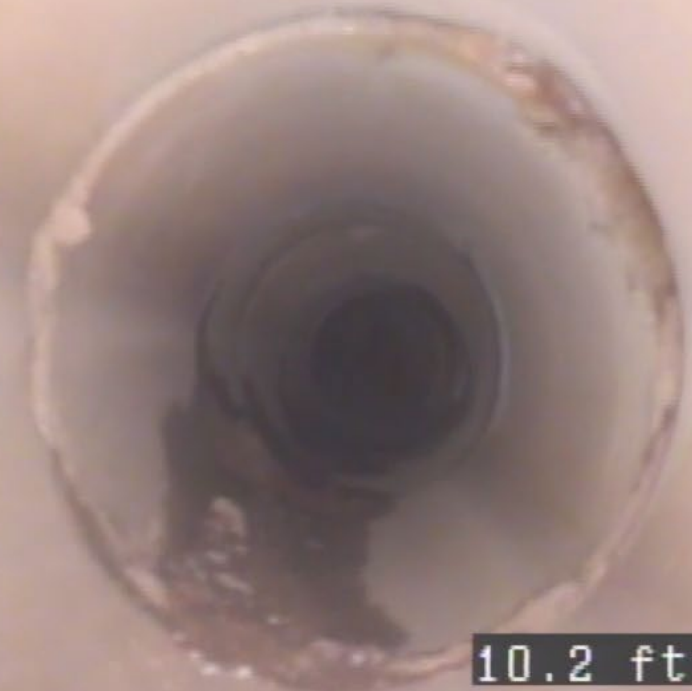
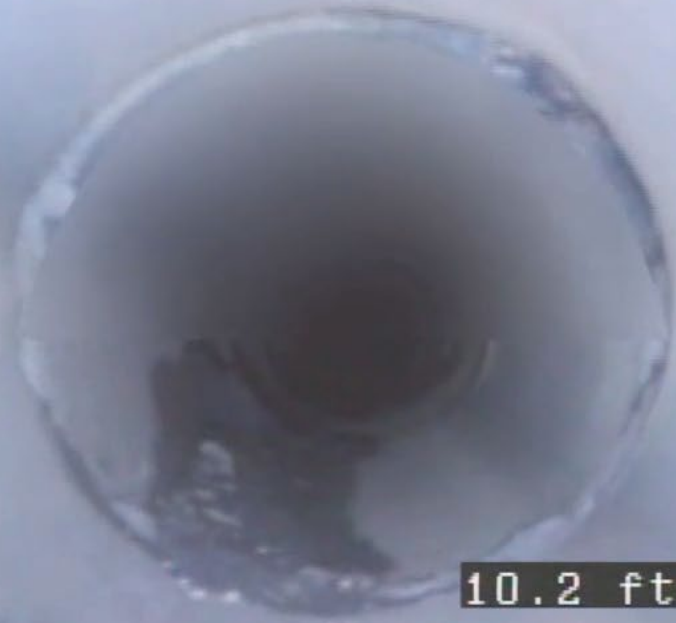


# HIGH-IMPACT DATA & DELIVERABLES

AI QA/QC – Sample #1

AI Model Overlay

Original Video



# HIGH-IMPACT DATA & DELIVERABLES

## AI QA/QC – Sample #2

### AI Model Overlay

Distance: 17.6 ft.  
D - Deformed  
Clock from:  
Clock to:  
Rating: 4  
Dimension  
Dimension  
%: 10 %

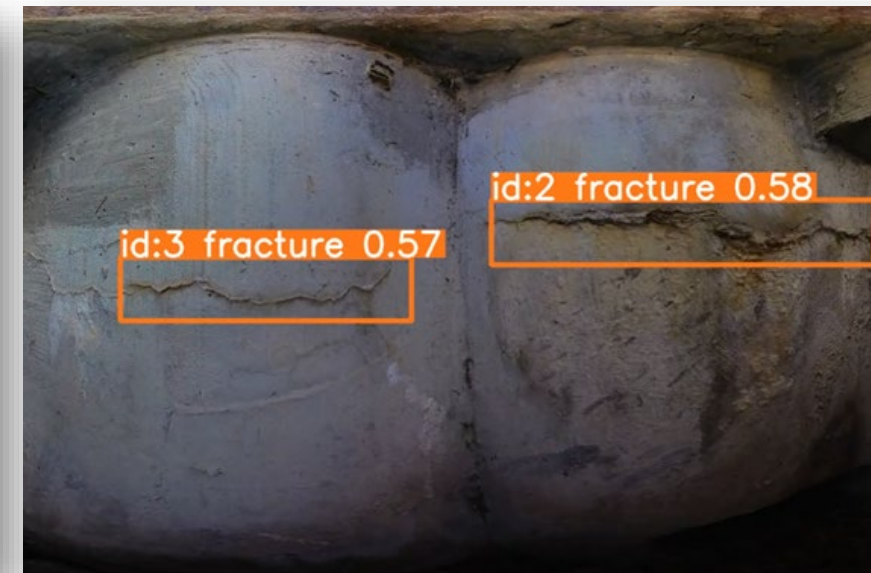
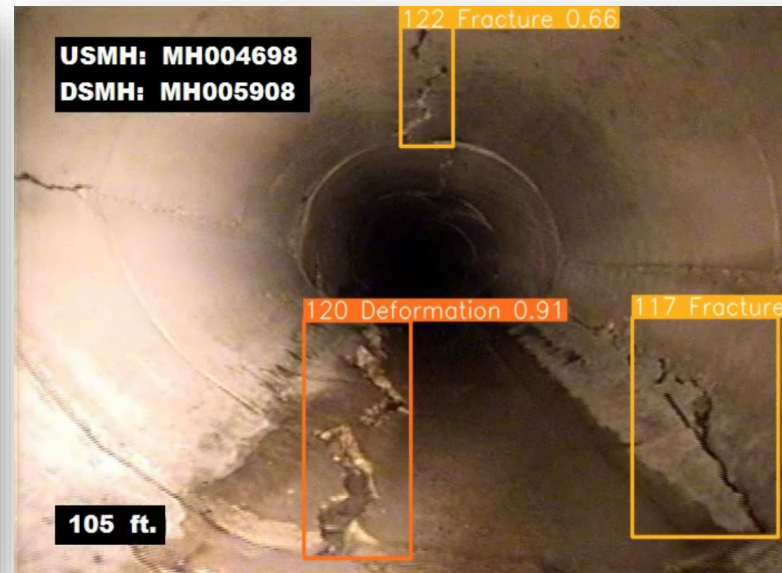
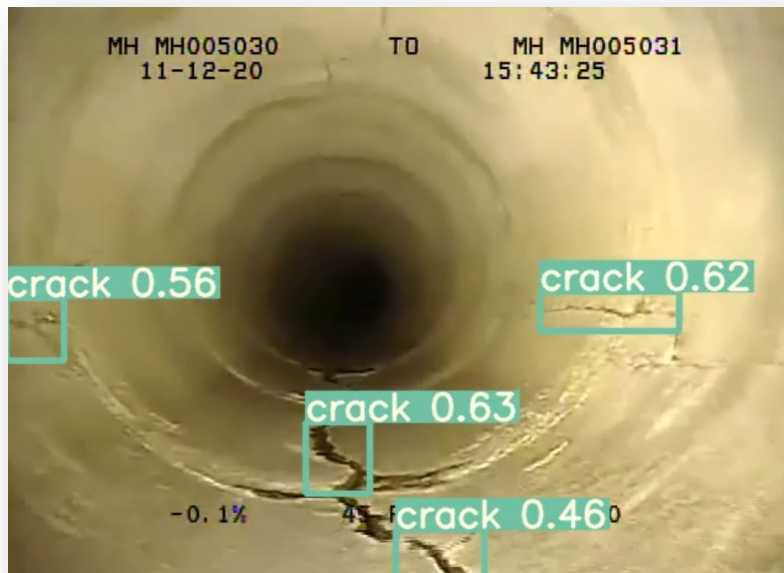
### Original Video

17.6 ft.

# HIGH-IMPACT DATA & DELIVERABLES

## Quality Assurance and Control

- Data completion and GIS referencing (100%)
- AI computer vision - “Second opinion” QC (100%); Pipes & Manholes; Standardized Scoring
- Expert human-in-the-loop review (15-20%)



# ■ HIGH-IMPACT DATA & DELIVERABLES

## United States Air Force GeoBase Program

- USAF strategic program
- GIS integration, mission support, and uniformity across installations
- Effective asset tracking & renewal prioritization



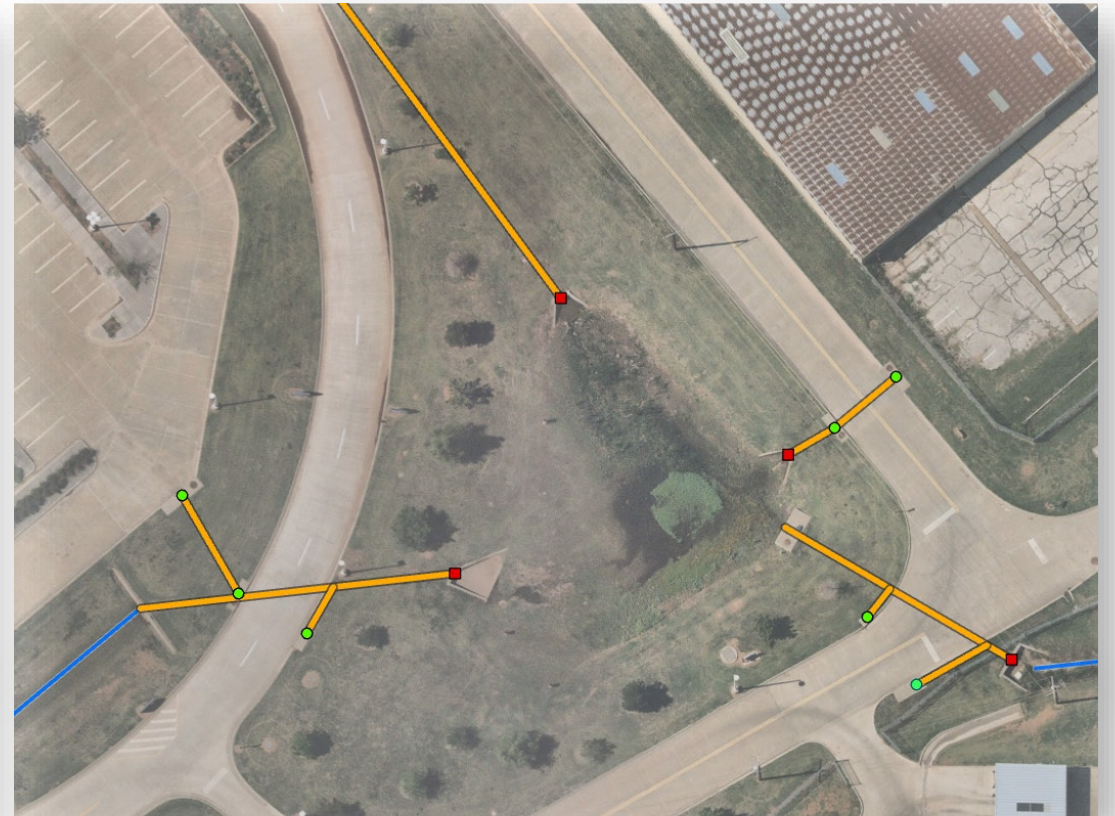
# U.S. AIR FORCE

Guardians Above and Below | 16



# HIGH-IMPACT DATA & DELIVERABLES

## Example - GeoBase corrections



# HIGH-IMPACT DATA & DELIVERABLES

## GeoBase Assets

- Manhole
- Inlet
- Discharge Point
- Gravity Main
- Open Drainage

## Data Sources



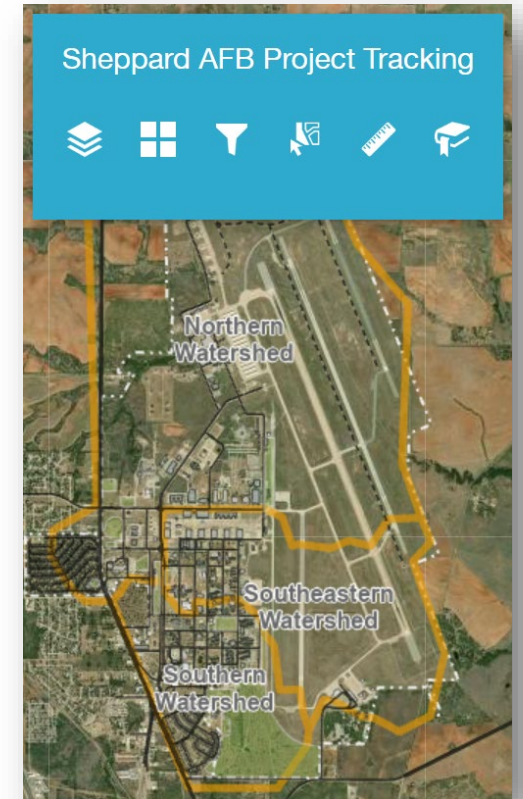
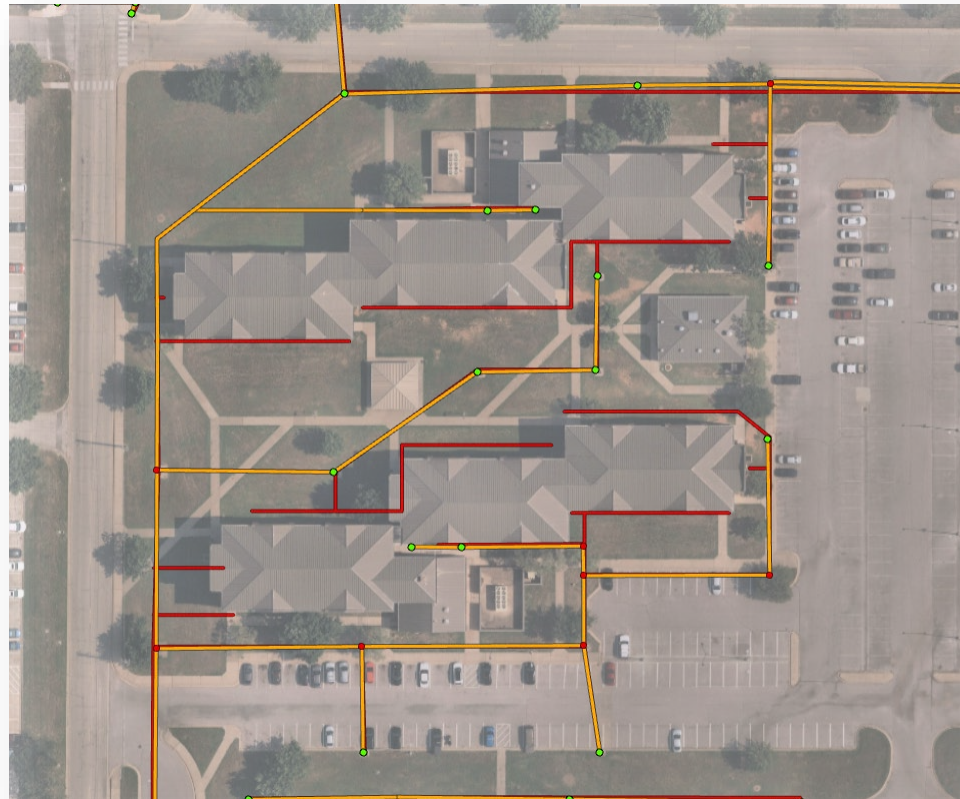
- Traditional survey



- PACP Inspection



- Asset Inspection



A photograph of a large brick sign at the main gate of Sheppard Air Force Base. The sign features the U.S. Air Force eagle logo at the top, followed by the text "U.S. AIR FORCE", "Sheppard Air Force Base", and "Main Gate" in white. The background shows a brick wall and some greenery.

U.S. AIR FORCE  
Sheppard Air Force Base  
Main Gate

# PRIORITIZE CORRECTIVE ACTIONS

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## Evaluation

### Process/Considerations

- PACP grades 3 to 5 evaluated
- Storm drains and Manholes independently evaluated for corrective action
- Standardized scoring applied
- Rehab methods matrix – trenchless vs open-cut; O&M vs Structural
- Responsible group, response time (relative), score, rank



# PRIORITIZE CORRECTIVE ACTIONS

## Recommendations in GIS Platform

Find address or place

Layer List

- Observation Points
  - ▲ B - broken
  - ⚡ C - crack
  - ⊙ D - deposits
  - ⊕ DEF - deformed
  - ⚡ F - fracture
  - ▲ H - hole

Observation Points | Routes | Half Survey Locations | SwInlet | SwManhole | SwDischargePoint | SwCulverts | SwGravityLine | SwOpenDrainage | RecommendationsTBL | MH\_ConnectionsTBL | MH\_InspectionsTBL

Options Filter by map extent Zoom to Clear selection Refresh

Segment ID	Diameter	Size Equivalent (in)	Code	Description	Grade	Count	Year Inspected	Recommendation	SDCD	Access Point ID	Distance to Access	Group
D05-0000129		9,999	JOL	Joint Offset Large	4	1	2,023	Joint repair needed to stabilize joint offset (53')	6.83	D04-0000042	7	

711 records 1 selected

A large, rectangular sign for the U.S. Air Force Sheppard Air Force Base Main Gate. The sign is mounted on a brick wall and features a white eagle logo at the top. Below the logo, the text "U.S. AIR FORCE" is written in a large, bold, sans-serif font. Underneath that, "Sheppard Air Force Base" is written in a slightly smaller, bold, sans-serif font, and "Main Gate" is written in a smaller, regular, sans-serif font at the bottom. The background of the sign is a light blue color with a subtle pattern of small white dots.

U.S. AIR FORCE  
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# RESILIENCY ADVANTAGES

# DRAINAGE MODELING

## Hydrology and Hydraulics modeling

- Autodesk Storm & Sanitary Analysis (SSA)
- HEC-RAS

Detailed watershed mapping

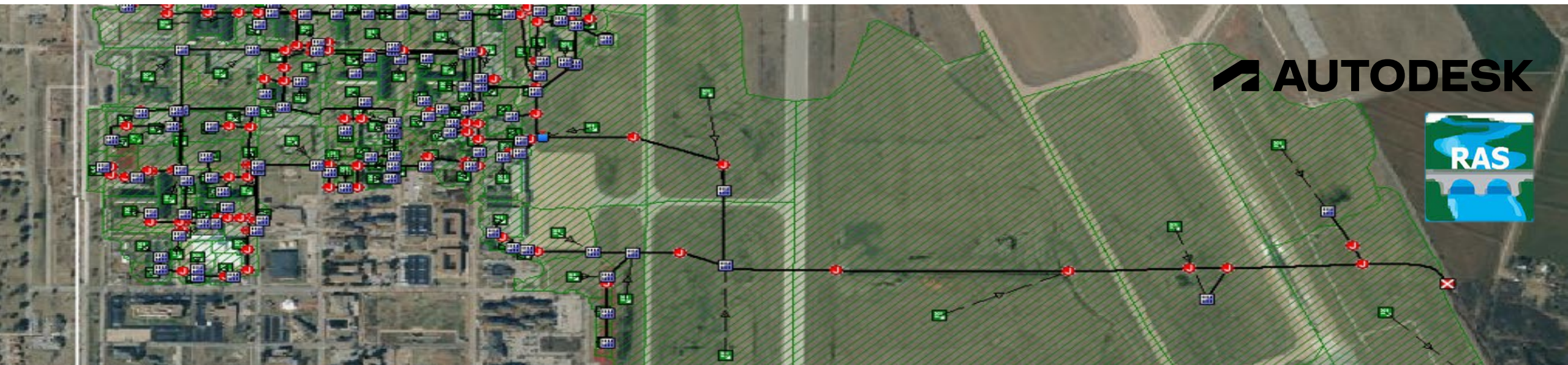
1

GeoBase updates and site visits informed drainage network

2

Master plan of needed pipe sizes for future use

3



# RESILIENCY ADVANTAGES

- Known problems areas based on both condition and size
- Plan for future development
- Can incorporate climate change, sea level rise, and other resiliency risk factors
- Predict future failures
- Targeted improvements to get the best benefit for cost

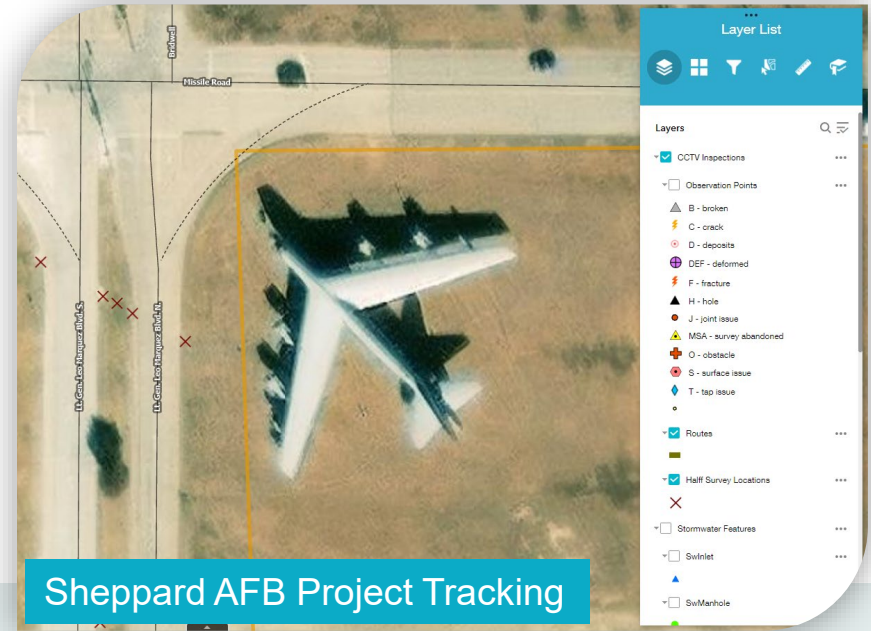
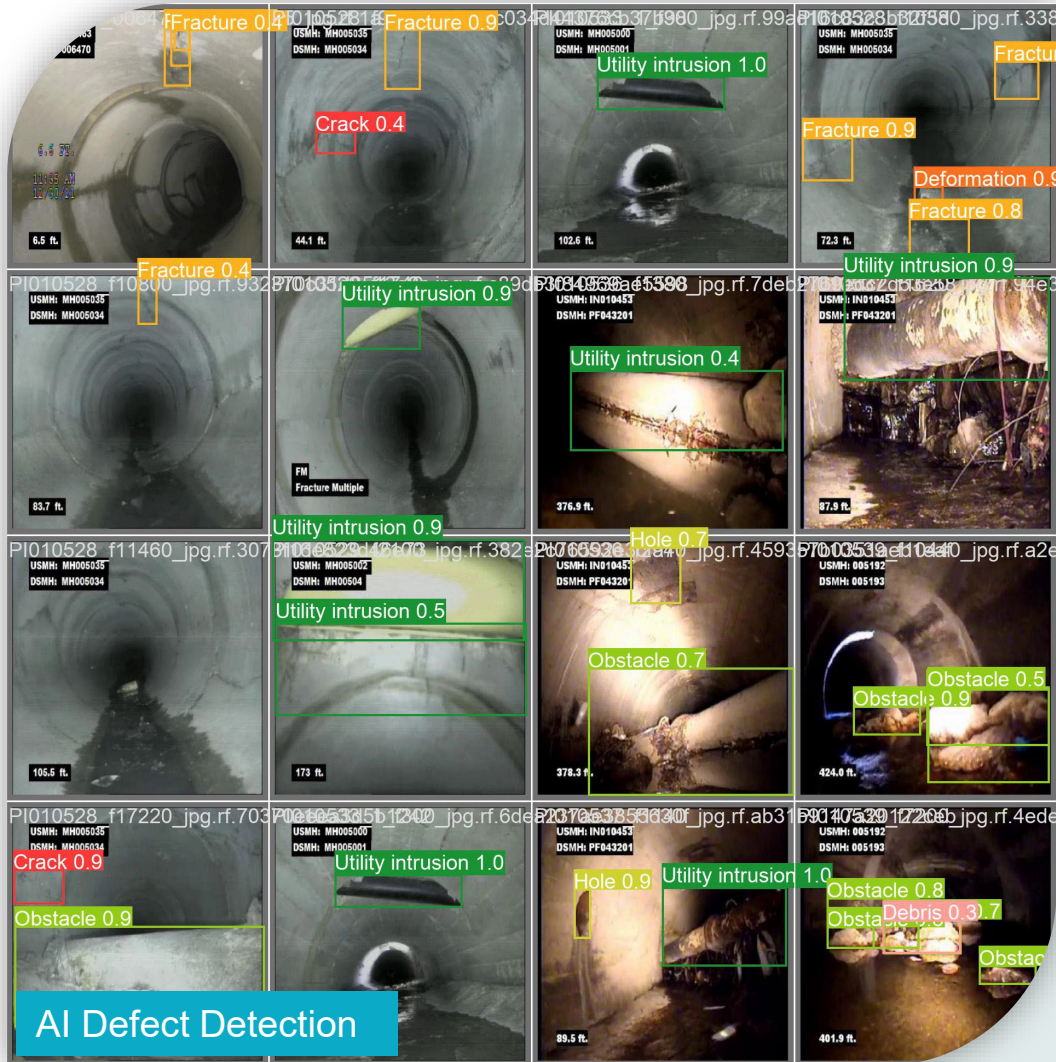


A photograph of a large brick sign at the main gate of Sheppard Air Force Base. The sign features the U.S. Air Force wings logo at the top, followed by the text "U.S. AIR FORCE", "Sheppard Air Force Base", and "Main Gate" in white. The background shows a brick wall and some greenery.

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# LESSONS LEARNED

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Sheppard AFB Project Tracking

- Communication across multiple disciplines
- Schedule Base access, procedures, and training
- Follow survey with condition assessment
- High-impact deliverables are possible – engage today’s technology
- AI application = enhanced efficiency + accuracy
- Resiliency mindset to reduce risk + add value

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Q&A

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