EAGLE HAWK℠

Improving District Heating Maintenance Programs w/ Drone Technology

CampusEnergy2020
THE POWER TO CHANGE
FEBRUARY 10-14 ▲ SHERATON DENVER DOWNTOWN ▲ DENVER, CO

Problem

- District heating systems are aging & leaking
- Leaks are expensive and can be hard to locate
- Traditional inspection methods are ineffective and/or expensive
- Reactive maintenance results in higher costs and unplanned energy losses

Traditional Thermal Inspection Methods

Walking

- Slow
- Lack Perspective
- Limited Data
- No GIS Info

Pickup Truck

- Still need to walk parts of system
- Limited Perspective
- Limited Data
- No GIS Info

Helicopter

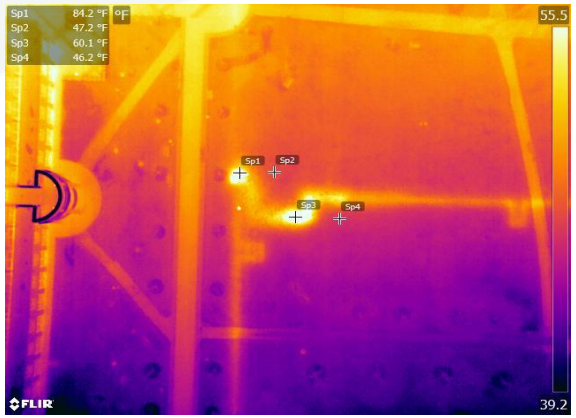
- Expensive
- Disruptive
- Shaky Video
- Limited Data
- No GIS Info

Airplane

- Expensive
- High Altitude
- Limited Data
- Lacks Detail

Drone-Enabled Inspections

- Scalable & Affordable
- Efficient
- Effective
- Safe
- Smooth Video
- High-Res Visual
- Radiometric Thermal Data
- GIS Ready



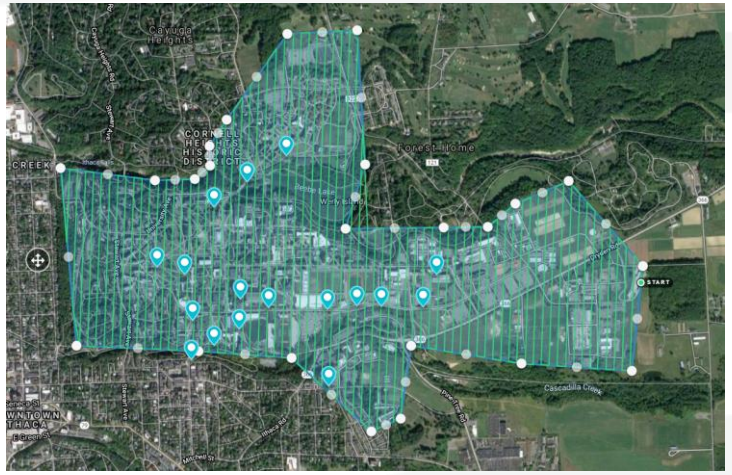
Equipment

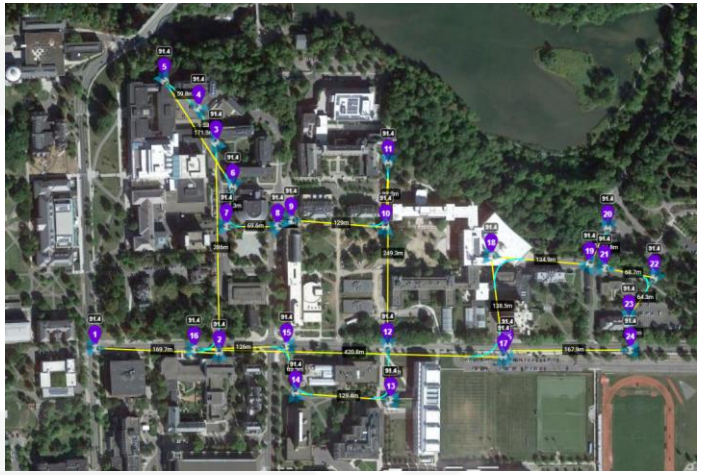
- FAA Part 107 Certified Pilots
- FAA Registered Aircraft
- Aviation Insurance $3M - $5M

Process

Daytime

- Map Campus
- Capture Pre-Programmed Video

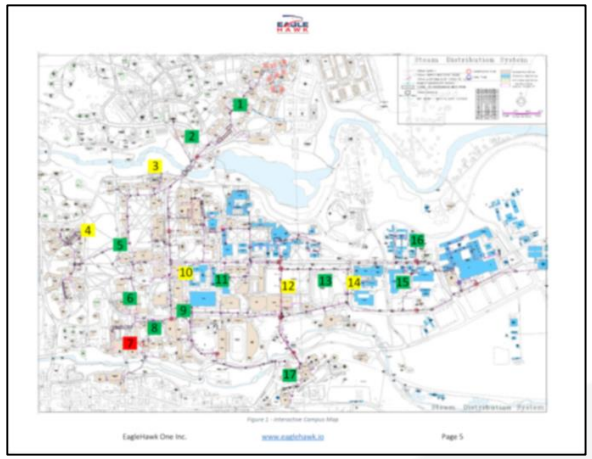




Nighttime

- Capture Pre-Programmed Thermal Video
- Capture Radiometric Thermal Images

Deliverables



Comprehensive & Detailed Interactive Report

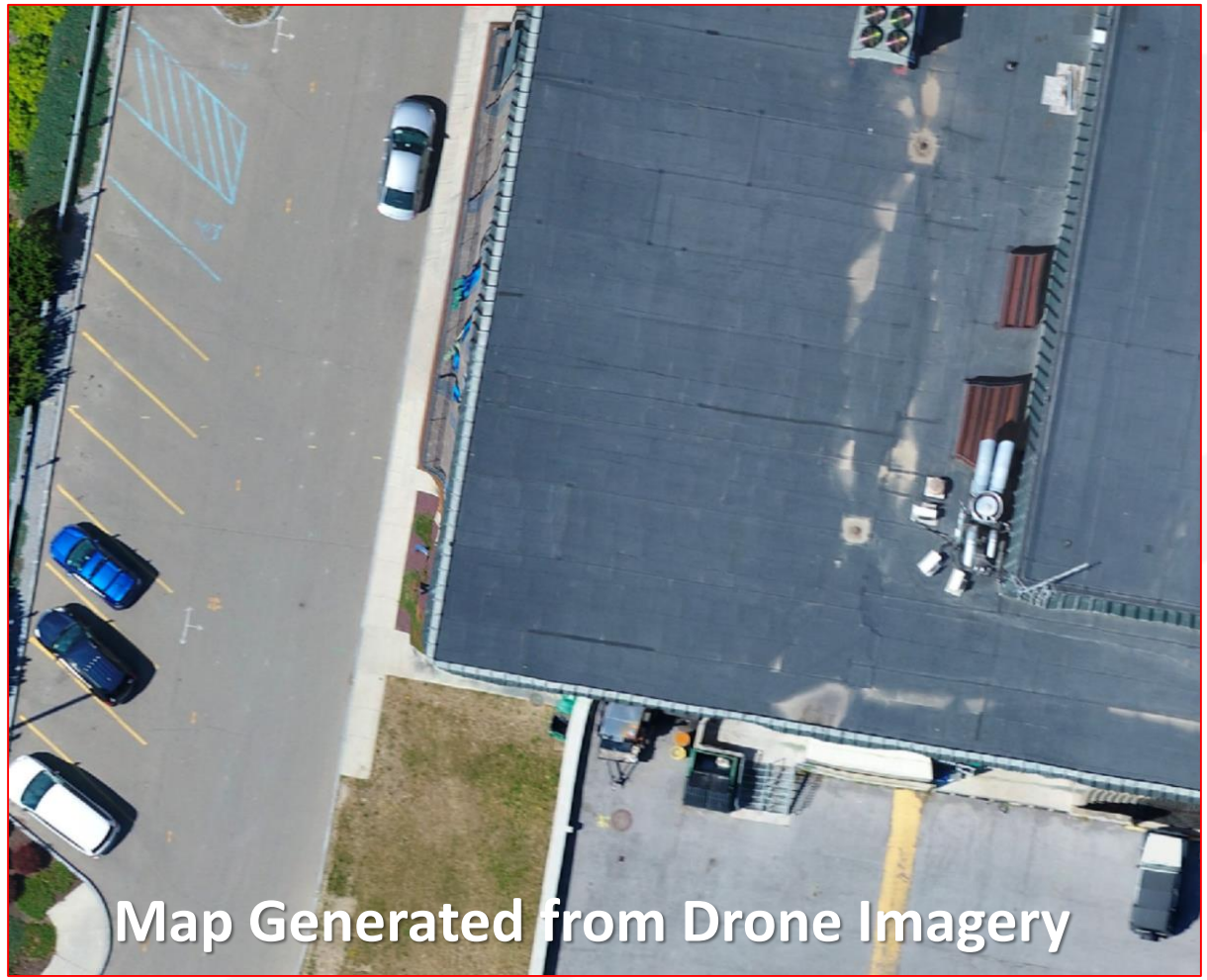
Picture-in-Picture Video

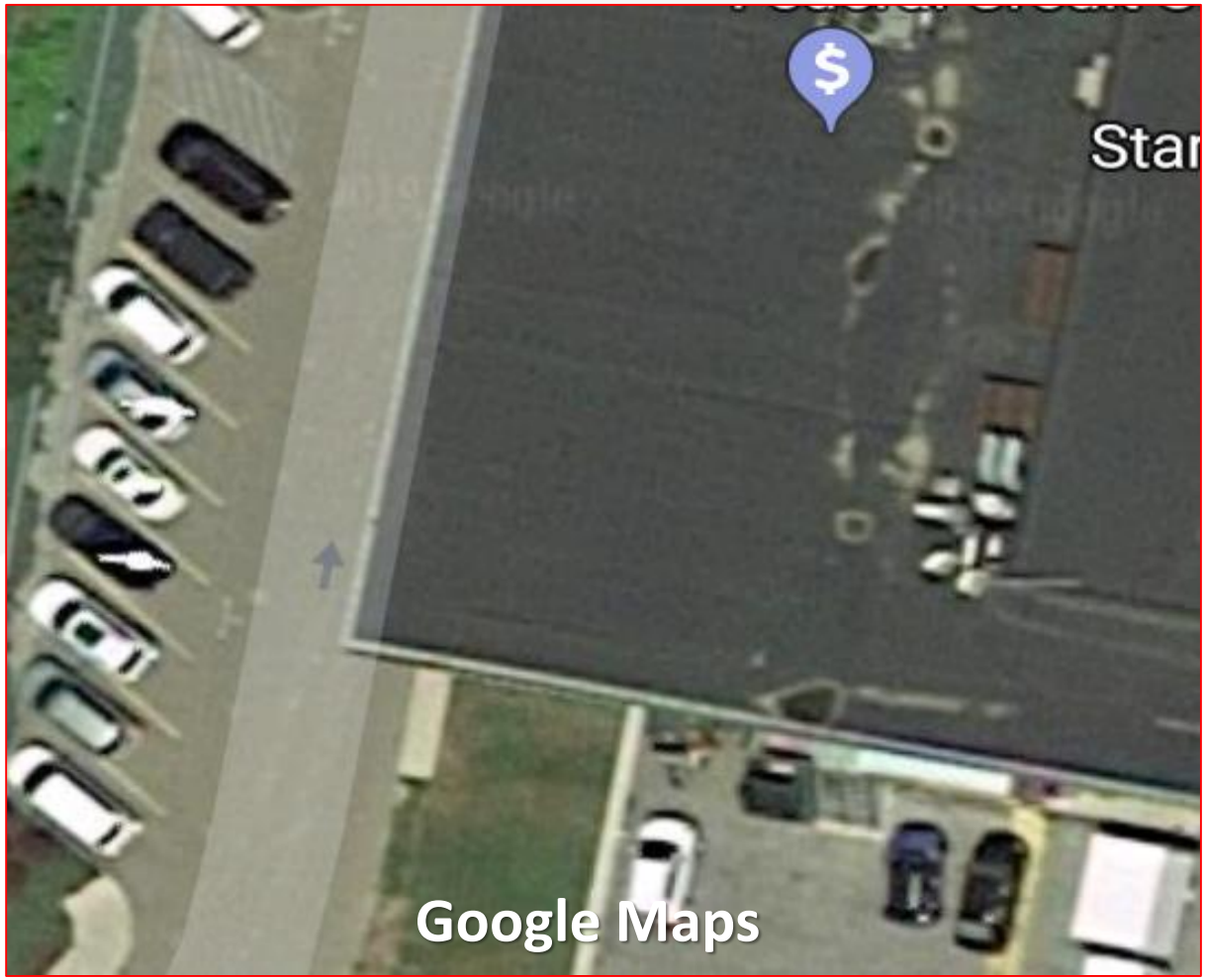
Picture-in-Picture Video

Map Data

Quick & easy integration with existing systems

Map Data

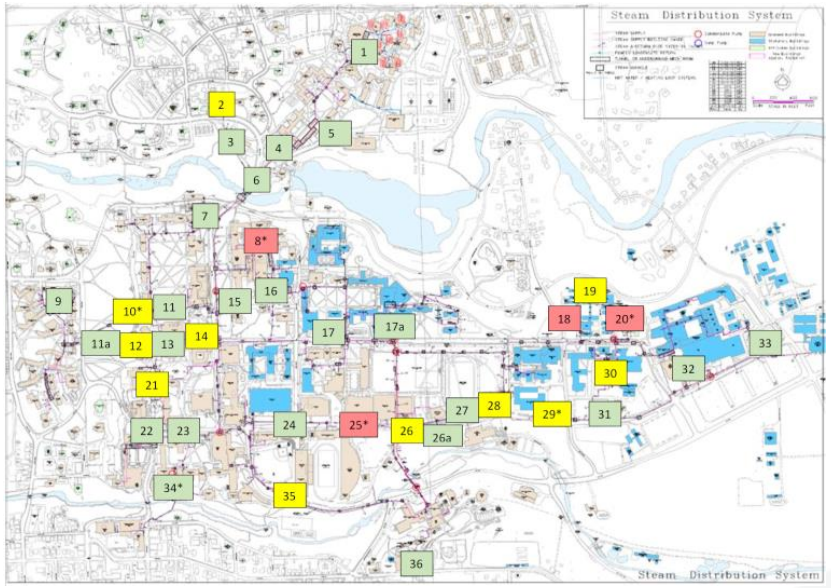




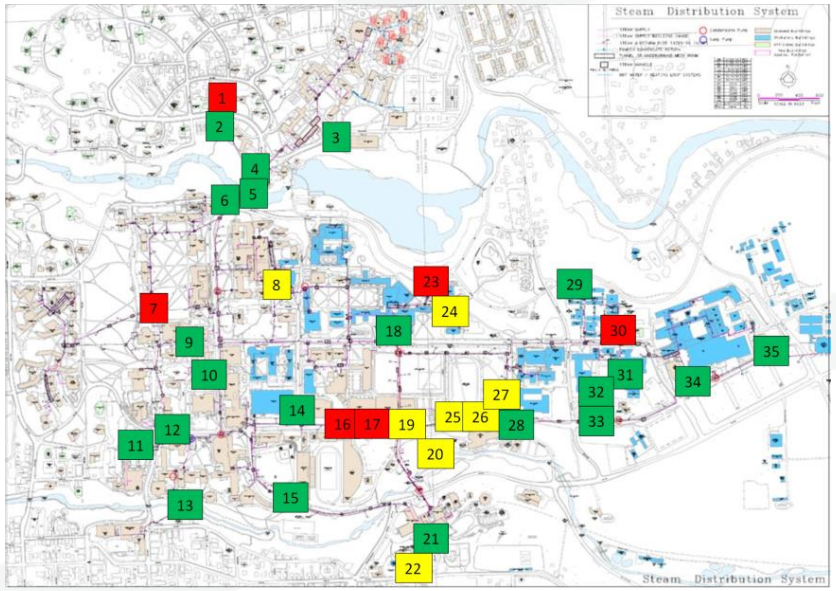
Case Study 1

The Benefits of Recurring Inspections

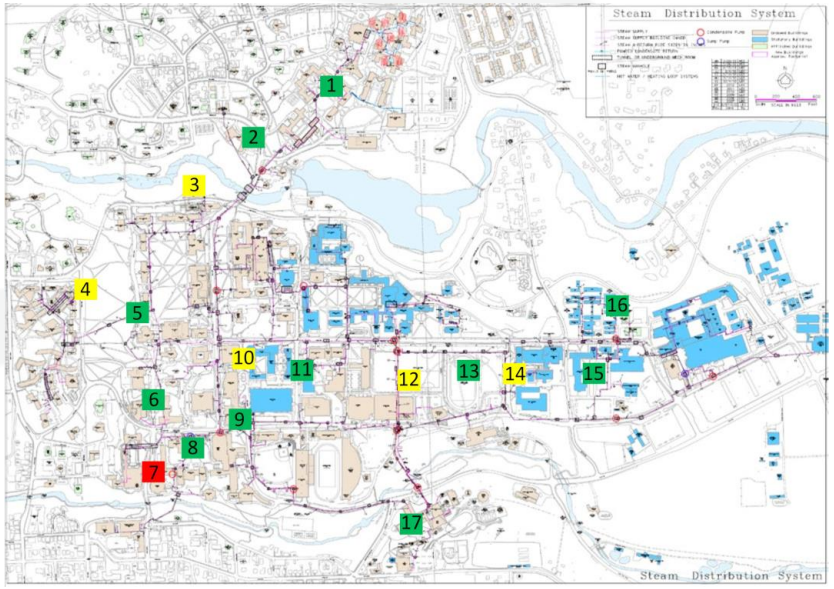
Case Study 1 – Ivy League School #1



April 2018

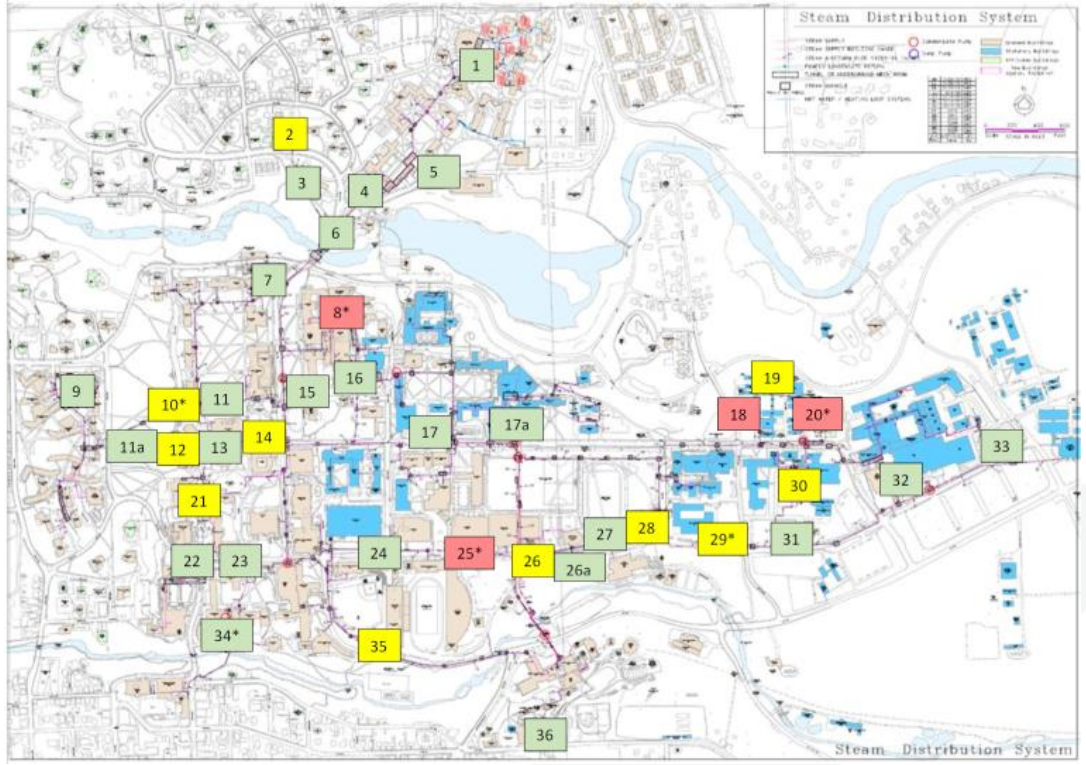


Dec 2018



Nov 2019

Case Study 1 – First Inspection

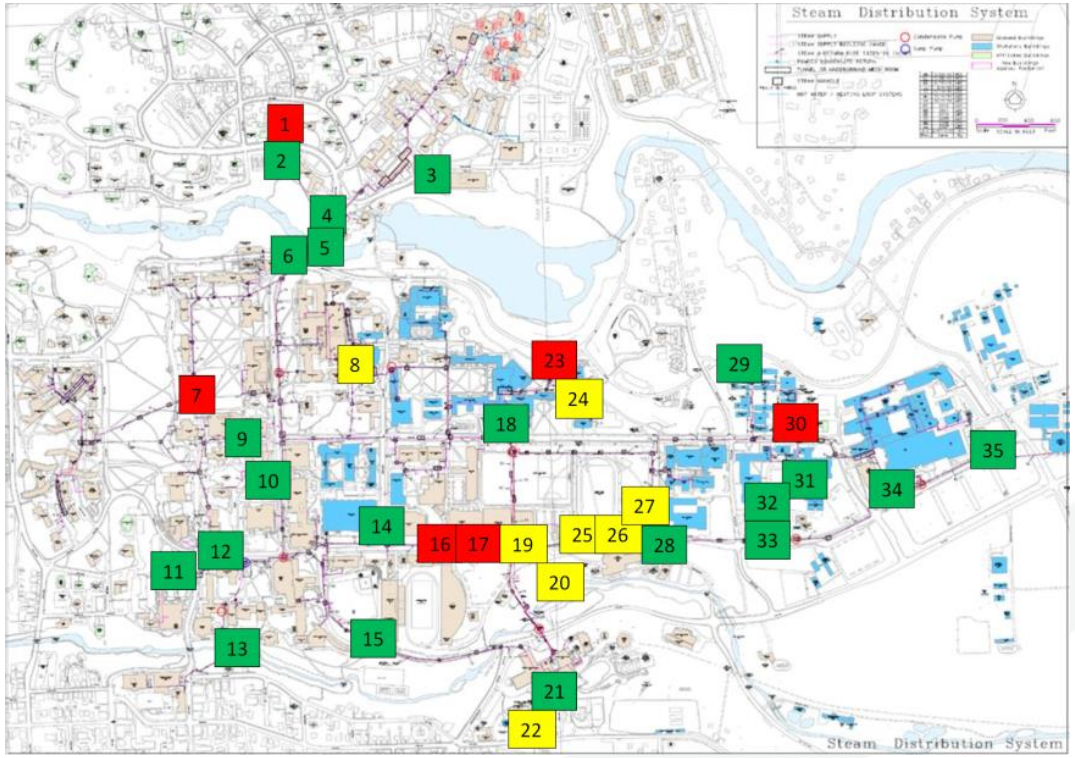


April 2018

39 Areas of Concern:

- 4 Major
- 11 Minor
- 24 Monitor

Case Study 1 – Second Inspection

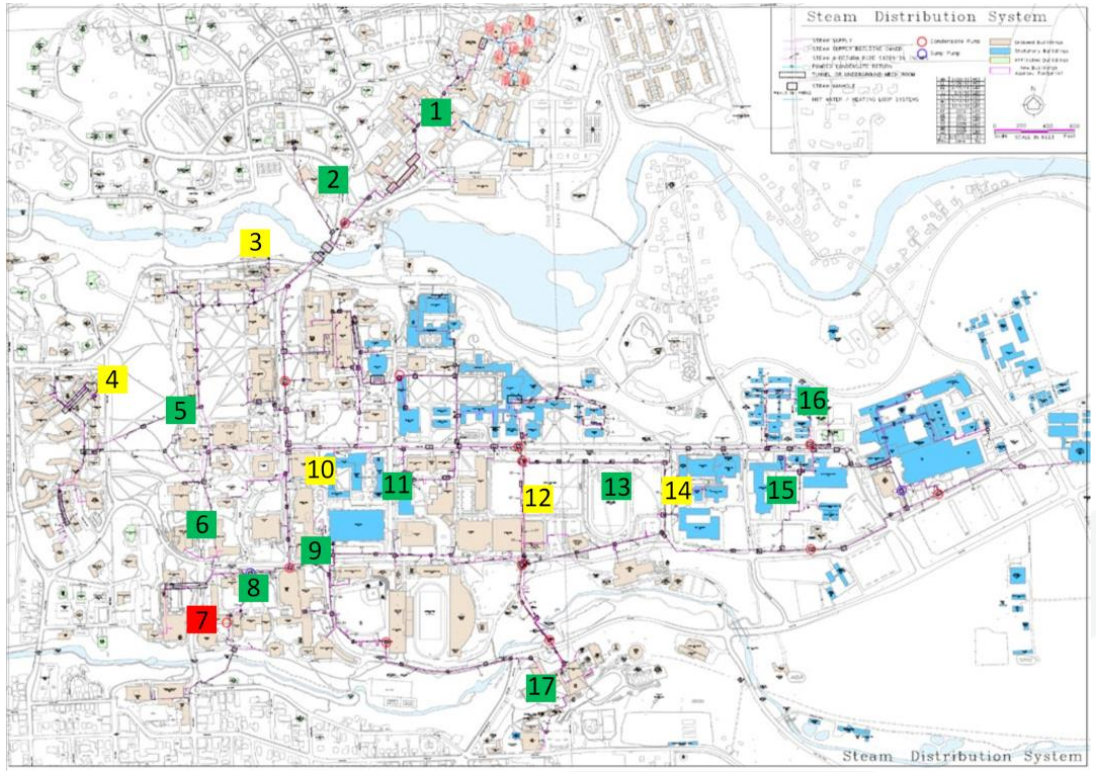


Dec 2018

35 Areas of Concern:

- 6 Major
- 8 Minor
- 21 Monitor

Case Study 1 – Third Inspection



Dec 2019

17 Areas of Concern:

- 1 Major
- 5 Minor
- 11 Monitor

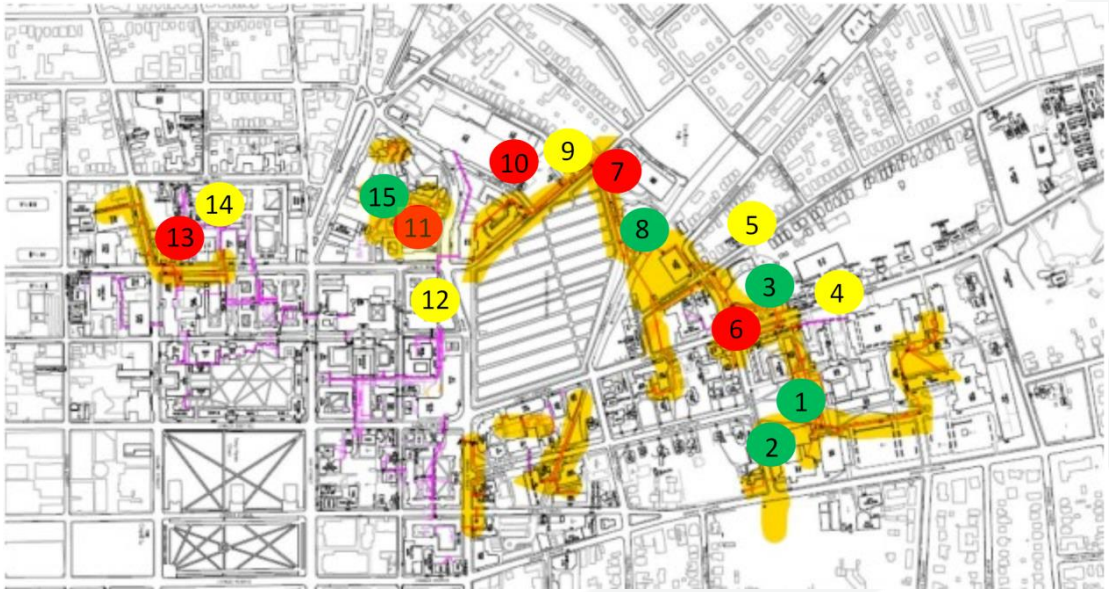
Case Study 1 – Summary

- Established annual inspection program
  - Previously done every 3 years
- Data used to make effective repairs & improvements
  - Reduced the number of areas of concern over 3 years
- Early detection of major issues
  - Cost savings in reducing energy and condensate losses

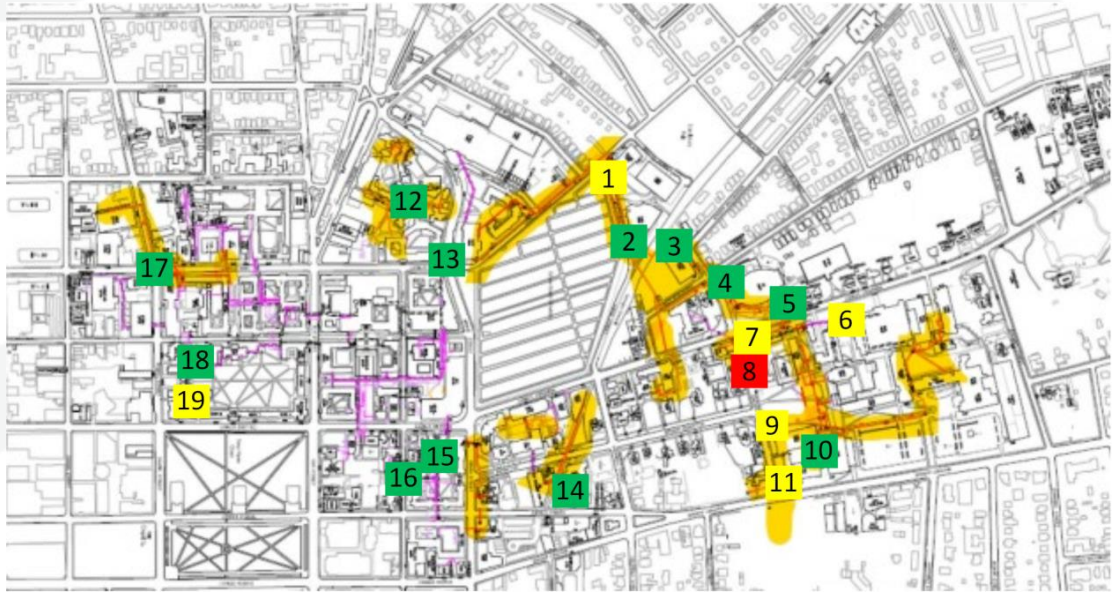
Case Study 2

The Benefits of Recurring Inspections

Case Study 2 – Ivy League School #2

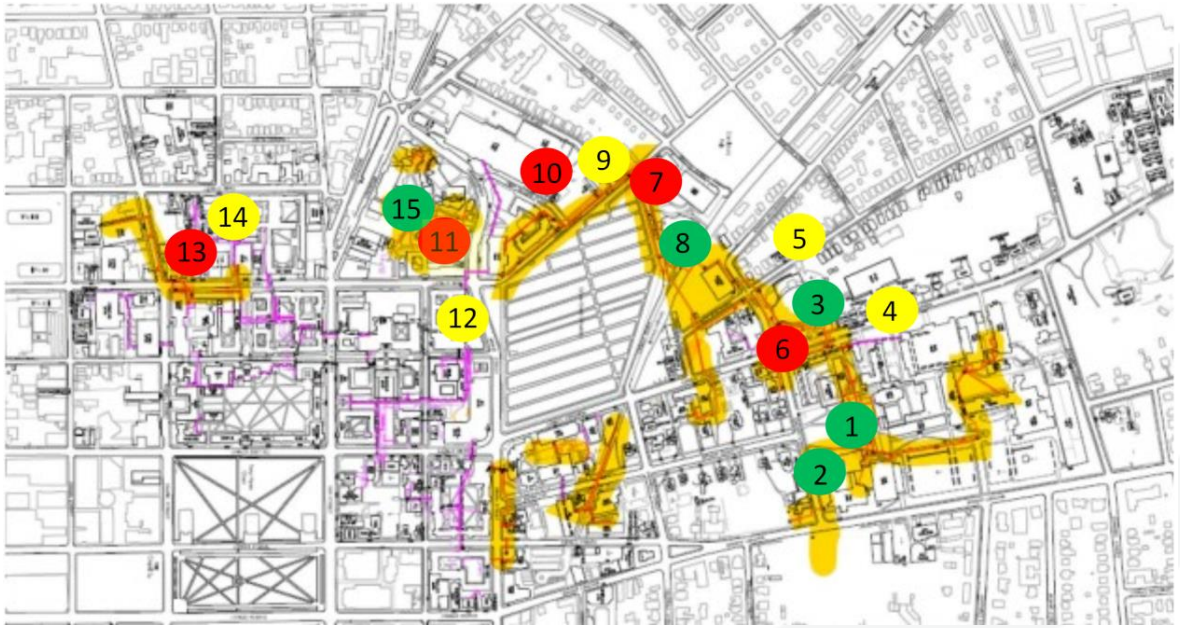


Mar 2019



Dec 2019

Case Study 2 – First Inspection

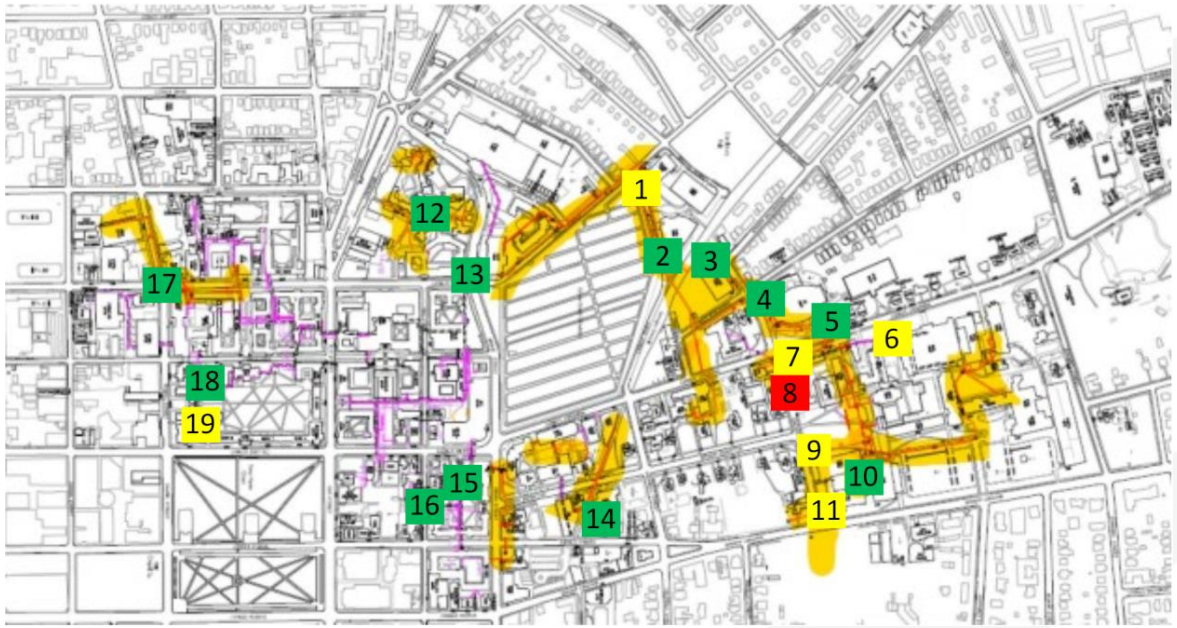


Mar 2019

15 Areas of Concern:

- 5 Major
- 5 Minor
- 5 Monitor

Case Study 2 – Second Inspection



Dec 2019

19 Areas of Concern:

- 1 Major
- 5 Minor
- 13 Monitor

Case Study 2 – Summary

- Established annual inspection program
  - Previously no formal aerial inspection program
- Data used to make effective repairs & improvements
  - Reduced the number of major areas of concern over 3 years
- Early detection of major issues
  - Cost savings in reducing energy and condensate loses

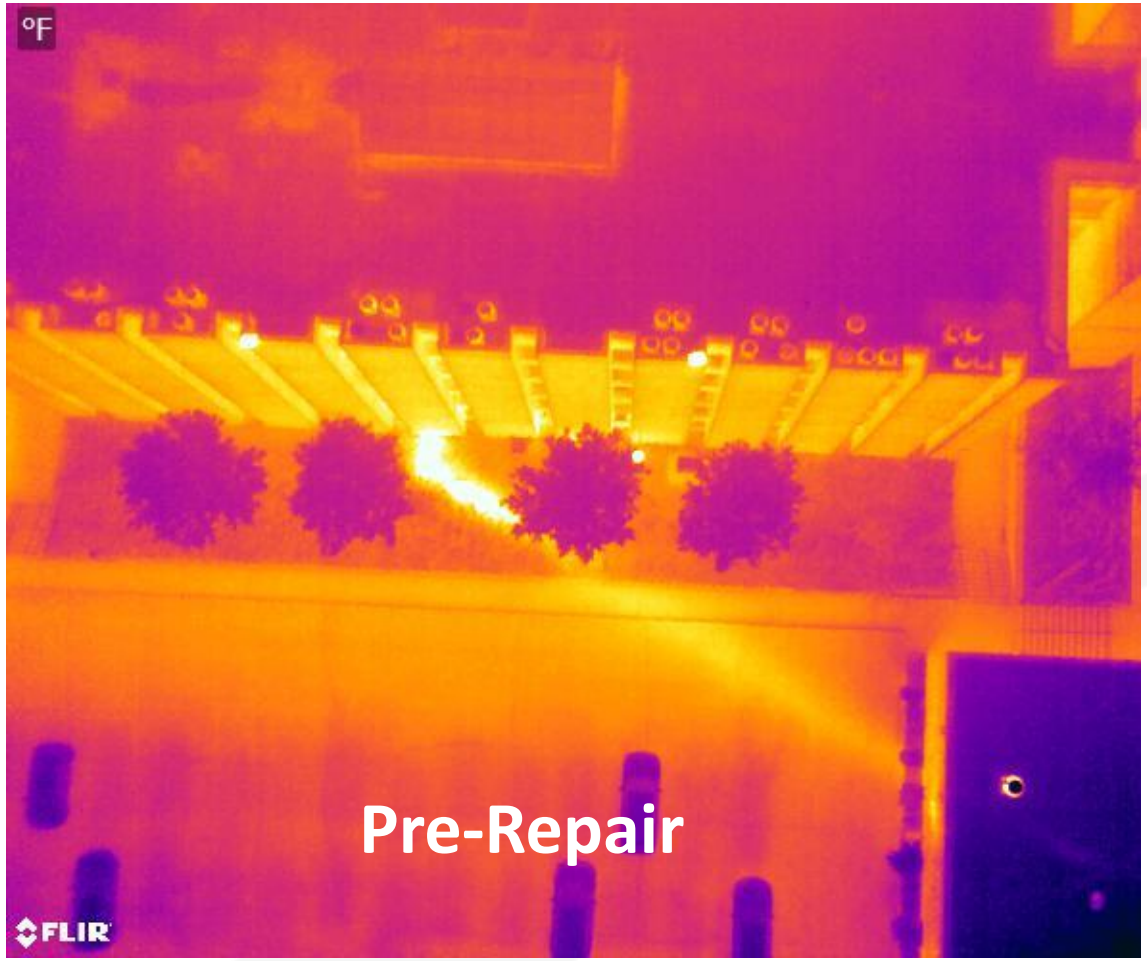
Case Study 3

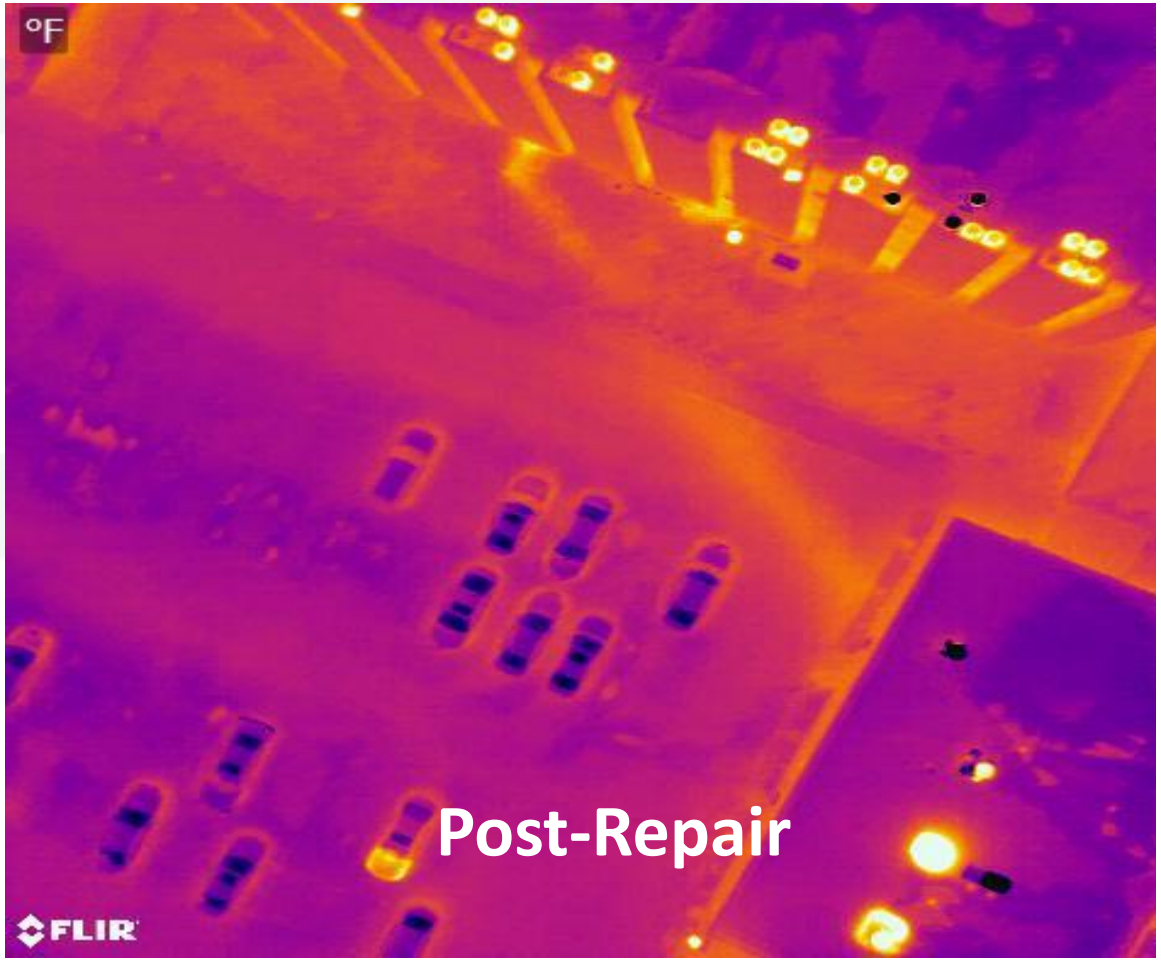
Pre & Post Repair Inspection Results

Case Study 3 – Pre-Repair Inspection

Case Study 3 – Repair

Case Study 3 – Post-Repair Inspection





Case Study 3 – Summary

- Pinpointed the location of the leak
- Reduced digging and making expensive holes
- Helped save 30 – 40 % in total project costs

Lessons Learned

- Preventative maintenance and early detection works!
  - Reduce costs and energy losses
  - Proven ROI
- Drone-enabled inspections are more effective and affordable.
  - Enabling annual inspection programs
  - First inspection helps create a baseline and roadmap
- Good data makes a facilities manager's life easier!

Questions?

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