ANGEL Service
Airborne Natural Gas Emission LIDAR

EPA Natural Gas STAR Program
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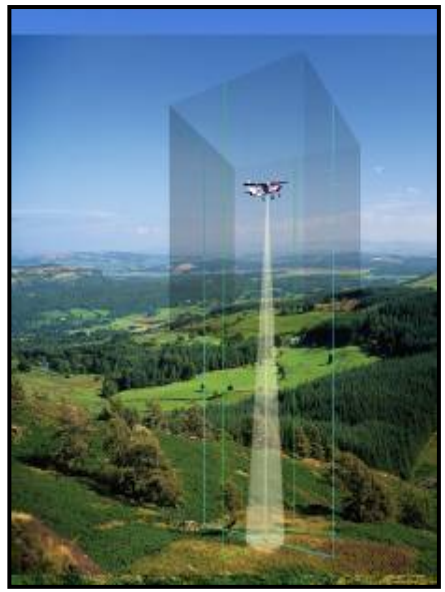
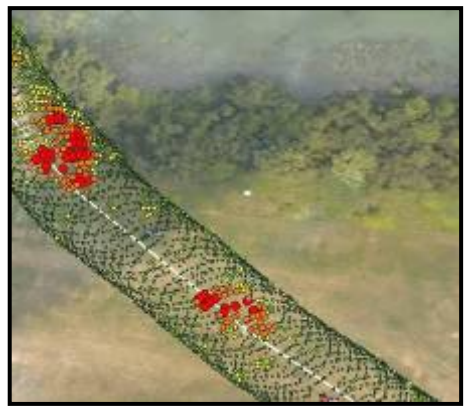
Taking Leak Surveys and Corridor Monitoring to New Heights

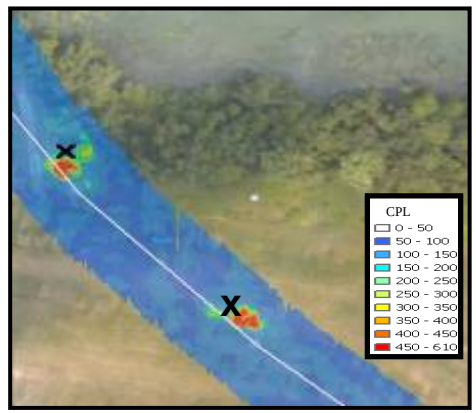
- ✓ *Differential Absorption LIDAR* (DIAL) laser technology provides accurate leak detection and quantification.
- ✓ Captures survey-grade aerial orthophotography of right-of-way (ROW) and surrounding areas.
- ✓ Captures color digital geo-video of ROW and surrounding areas.
- ✓ Non-intrusive remote surveys.
- ✓ GIS-ready datasets show exact scan locations. Assures leak survey was thoroughly completed.



ANGEL Collection Aircraft and Sensors



DIAL Scan Pattern



DIAL Results - Leaks Detected

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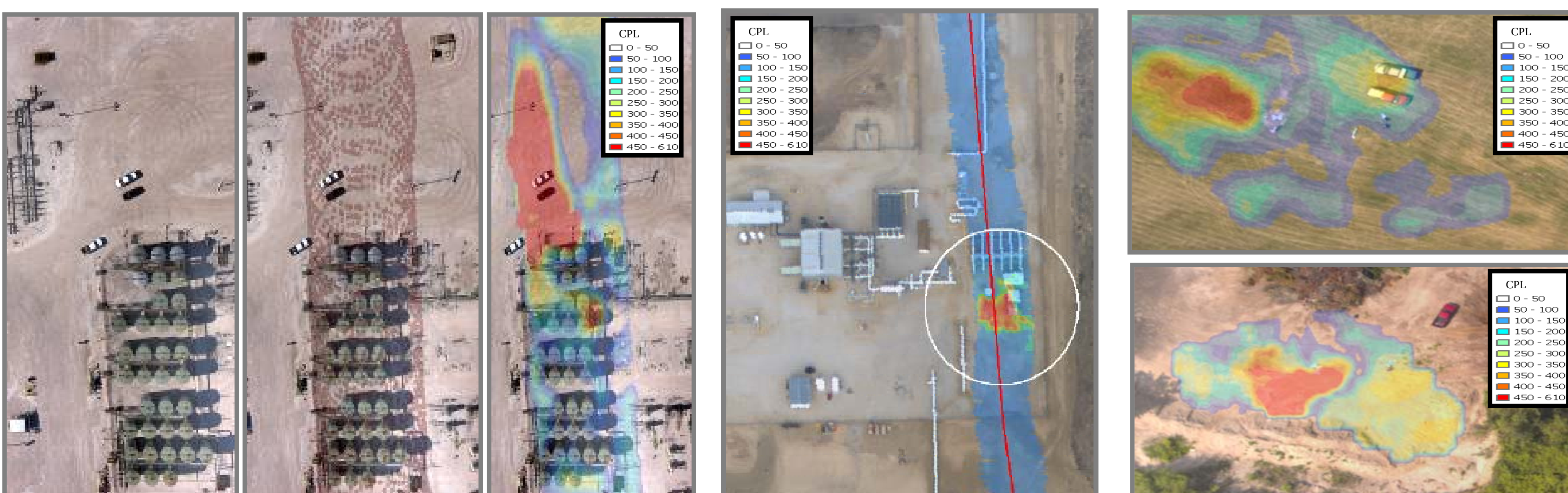
Differential Absorption LIDAR (DIAL) Laser Technology

- ✓ Detects and measures natural gas pipeline leaks and facility emissions.
- ✓ Broad area coverage -- 400 times greater coverage than traditional walking methods. 3D coverage.
- ✓ GIS-ready datasets <u>assures</u> pipeline/facility was scanned. Provides auditable results.
- ✓ Operates over varying terrain and weather conditions.

Airplane Platform Cessna Grand Caravan 208B

- ✓ Provides nationwide coverage with rapid deployment.
- ✓ Operates 120 times faster than traditional walking methods. Up to 1,000 miles of collection per day.
- ✓ Eliminates private property access issues by operating from public airspace.
- ✓ FAA approved aircraft and flight operations.



Leaks Detected using DIAL Technology from Aircraft

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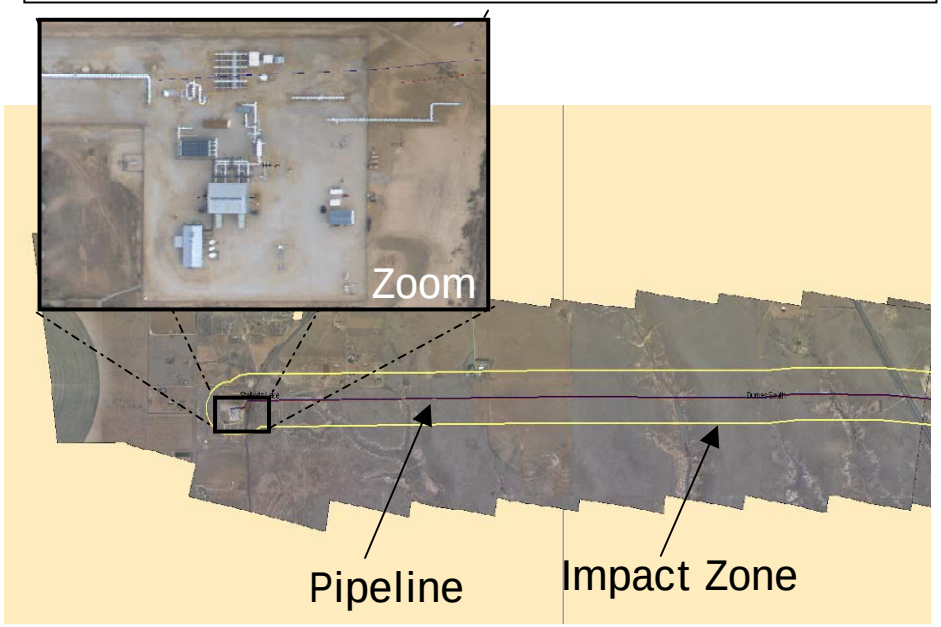
GIS Mapping Imagery

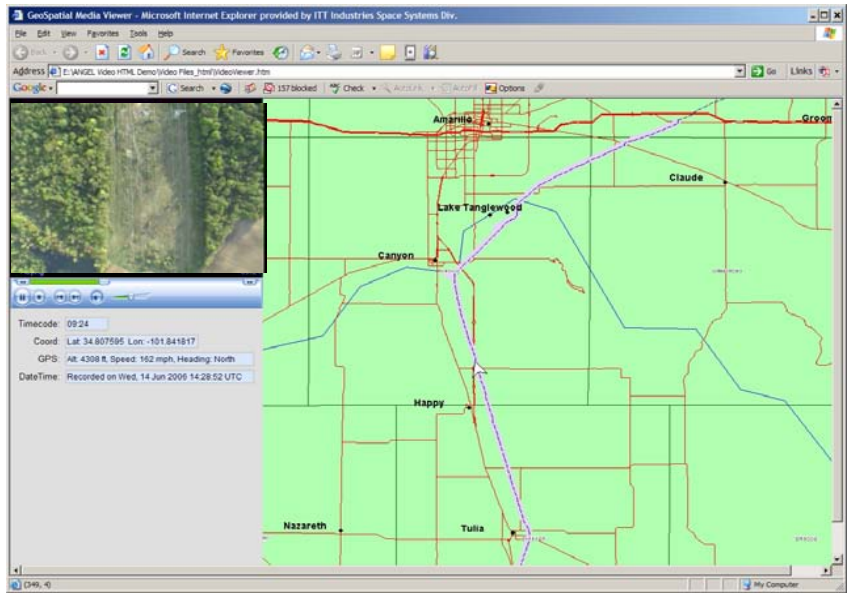
- ✓ Provides current, high-resolution imagery of your ROW and surrounding areas.
- ✓ Updates your GIS system with color, one-foot resolution, orthorectified and mosaic imagery.
- ✓ Digital sensor delivers 4,000 by 4,000 pixel images.
- ✓ Supports alignment sheets, HCA identification, threat identification, site permitting, engineering analysis, environmental studies, and emergency planning.



Mapping Imagery Provides One-Foot Ground Resolution

Digital Color Video

- ✓ Allows you to easily patrol any pipeline segment from your desktop computer.
- ✓ Encodes video data with GPS information, so precise locations can be identified.
- ✓ Play, pause, fast forward, rewind, and even print video frames from digital files.
- ✓ Provides permanent record of aerial patrolling, easement conditions, encroachment monitoring, intrusion detection, and problem areas.



Integrated Digital Video with Electronic Maps

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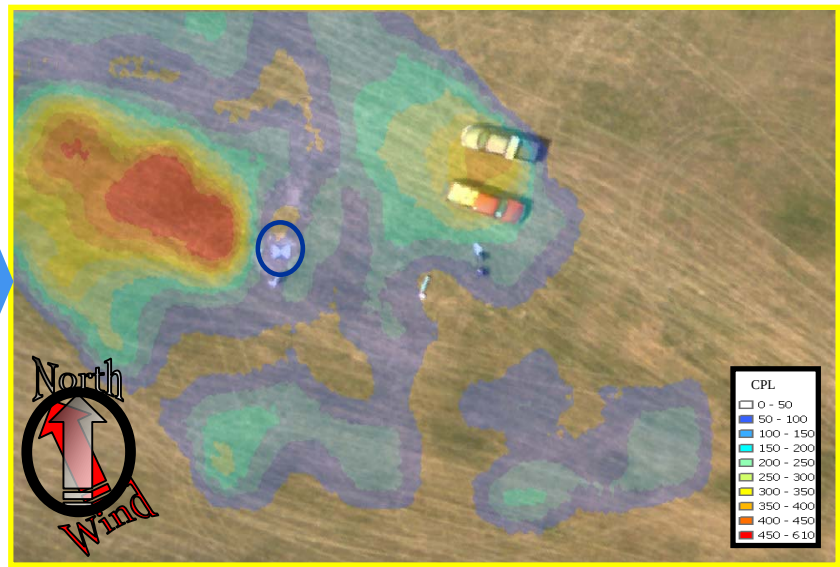
Example: Grass Field and Bare Earth – Controlled Releases – New York.



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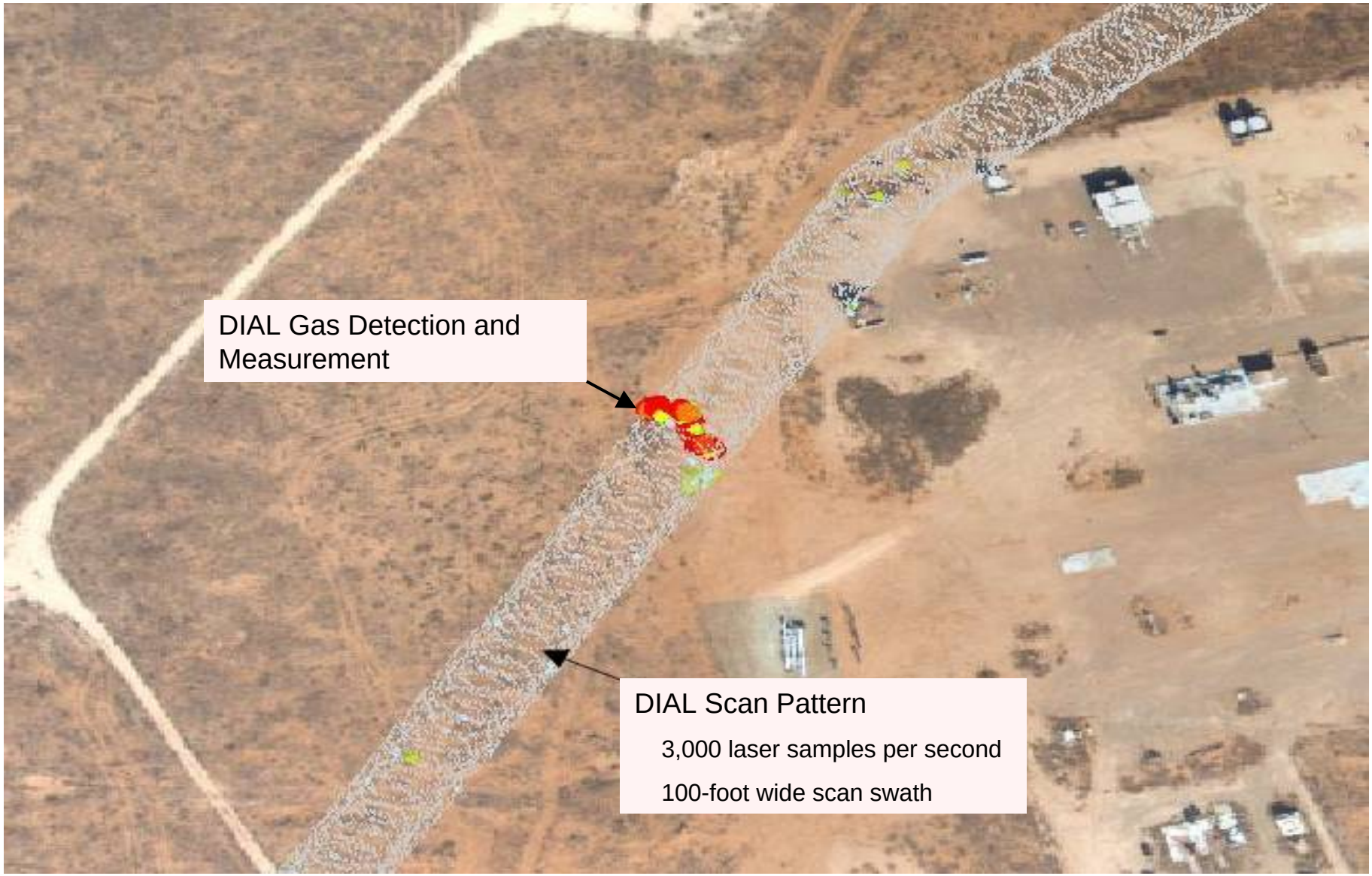
Example: Natural Gas Transmission Pipeline Route – Texas



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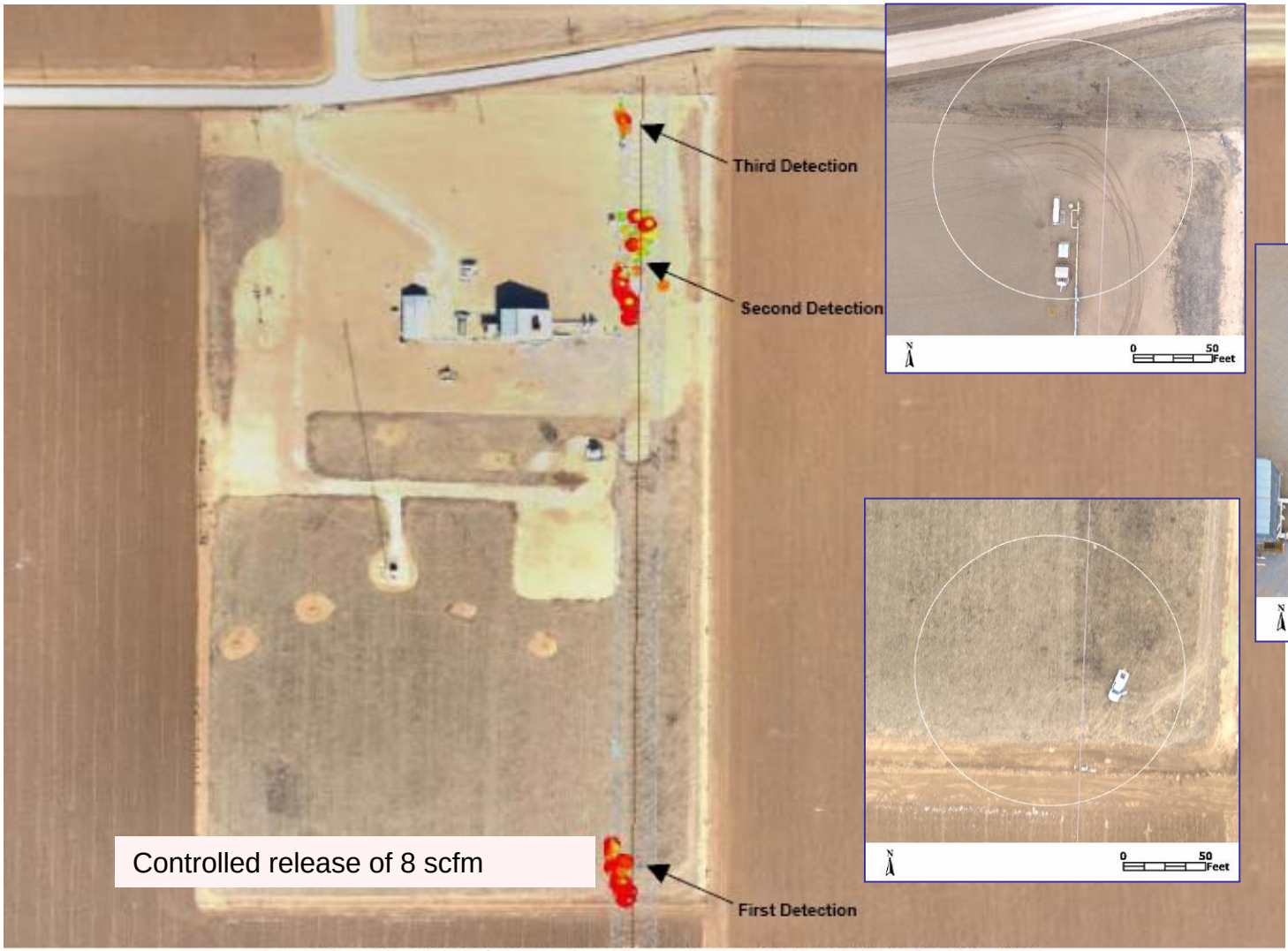
Example: Compressor Station – Natural Gas Transmission Pipeline – Texas



Location D ANGEL Service Detection, 25 Jan 06 @ 10:16 AM

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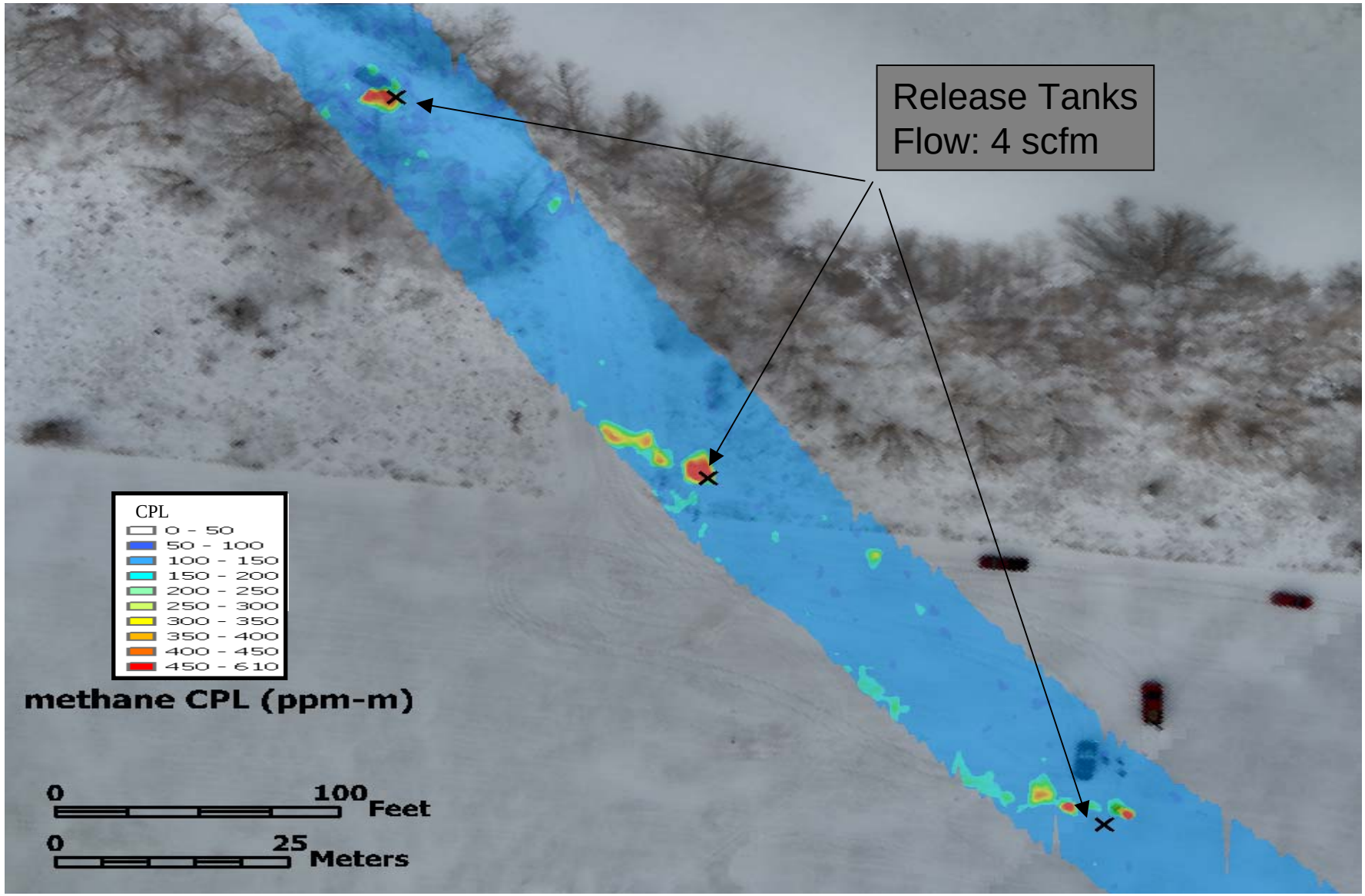
Example: Snow Covered Right-Of-Way – Controlled Release – New York.



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The ANGEL Service is Fully Operational and Commercially Available.

- Completed field validations with numerous pipeline owners/operators.
  - Over 3,000 miles of DIAL leak surveys and corridor/facility monitoring.

- Successfully completed contracts with both **US DOE** and **US DOT**.
  - RMOTC Test Range (Casper Wyoming) – September 2004.
  - HALOS (Hazardous Liquids Lidar Observation Study) – September 2006
  - Rapid Emergency Response (through October 2007)

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