

# Reducing Methane Emissions One Alt-FEMP at a Time



**Terence Trefiak**

Senior Vice President, LDAR Division

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# Presenter



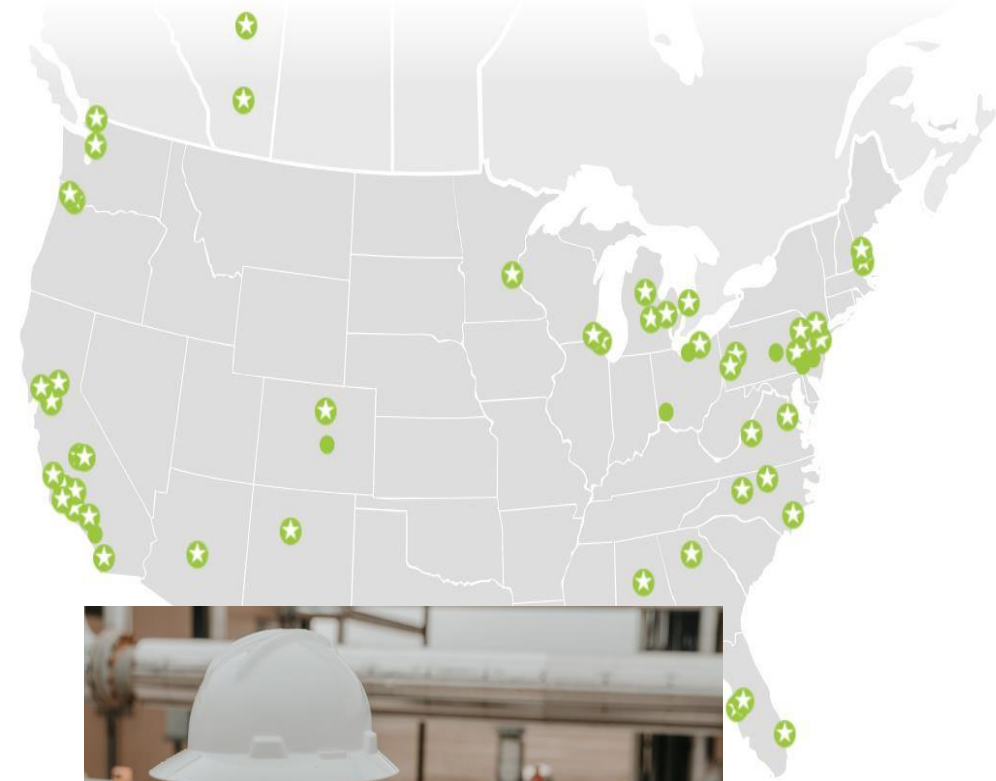
**Terence Trefiak**  
Senior Vice President,  
LDAR

- Professional Engineer with a degree in chemical engineering
- 21 years of experience in working in fugitive emission management
- Specializes Optical Gas Imaging for GHG and LDAR compliance.
- Wealth of experience in the use of a variety of other fugitive emission detection and measurement equipment





- Founded in 2007 we are the largest provider of Optical Gas Imaging (OGI) LDAR Services in North America (over 30,000 surveys)
- Provides a full range of fugitive emission management services to the Oil & Gas and Petrochemical Industries
- Specializing in the use of OPTICAL GAS IMAGING to detect hydrocarbon gas leaks and vents
- Provide OGI LDAR in 7 Provinces and 42 States
- Currently perform OGI LDAR and GHG services for over 1,500 sites in USA & over 7,600 sites in Canada



# LDAR Technologies

## 1. Micro Detection

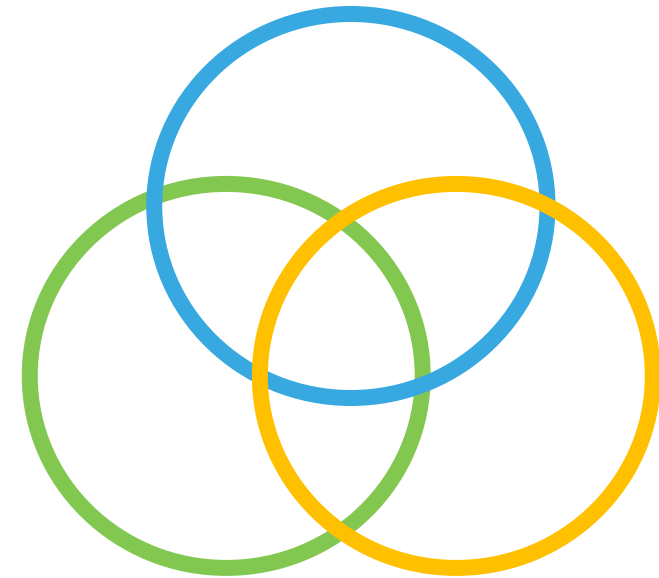
- Instruments to find/measure the exact point source of emissions

## 2. Macro Detection

- Systems to screen large areas to determine areas of elevated emissions

## 3. Program Management

- Database, hardware and software to collect field data and manage LDAR program



# ALT FEMP

- Alternative Fugitive Emission Management Program
- Using a new technology or combination of technologies in an LDAR program to reduce cost and/or reduce emissions
- Usually require regulatory approval
  - Application
  - Modelling
  - Pilot Test
  - Performance Monitoring



# The Perceived Roadblocks to Technology

- “Our State/Provincial regulator/permit will not approve”
- “We will be out of compliance”
- “Our costs will go up”
- “The change will require more work from Operations”
- “We will find too many leaks”
- “We won’t find all the leaks”
- “We can’t measure leaks”

**FALSE**



# MICRO Technologies



OGI Cameras



Secondary Flow Measurement



PPM Measurement  
Bascom Turner Gas Rover  
Sensit PMD



Bubble Test  
Snoop



Flow Rate Quantification  
Bacharach Hi Flow Sampler



# Leak Measurement

PPM Reading	EPA Emission Factor (EF) Calc (Table 2-10) lbs/hour	Emission Factor ft <sup>3</sup> /min	Actual ft <sup>3</sup> /min	% Error	Leak Weight	Severity
500	0.0003	0.0001	0.0001	18%	1	Minute
10,000	0.0029	0.0011	0.0010	9%	10	Very Small
50,000	0.0096	0.0036	0.01	-180%	100	Small
100,000	0.0160	0.0060	0.25	-4098%	2,500	Medium
500,000	0.0521	0.0194	1	-5045%	10,000	Large
1,000,000	0.0867	0.0323	2 to 200+	-5,653% to -575,187%+	20,000 to 200,000+	Very Large

- There is **not a direct correlation between concentration and rate**, but all LDAR programs use ppm as basis for size
- **PPM is a poor tool to calculate a leak rate**, and the fact that most instruments max out at 100,000 ppm is very limiting
- Changing mindset from finding all leaks equally to focusing on the largest leaks first will reduce over 99% of emissions.
- This can only be done with technologies like OGI





OGI

Method 21



# MICRO Technologies

- Spot – Boston Dynamics
- Configure with OGI, Laser, Acoustic, Sensors
- Advantageous in toxic or hazardous areas



# Latest MACRO Technologies

- MOBILE

- AERIAL

- Drone
    - Fixed Wing
    - Satellite

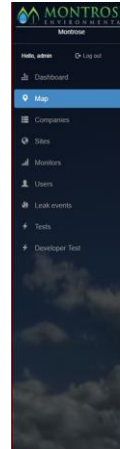
- LAND

- Vehicle Based

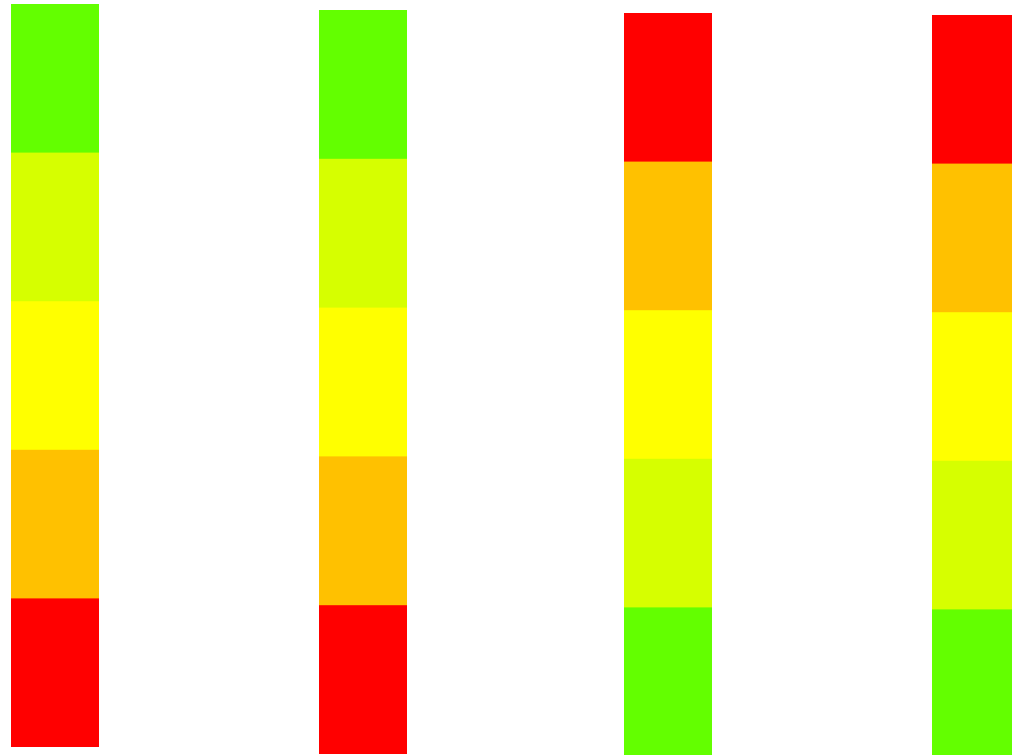
- STATIONARY

- SENSOR ARRAYS

- 24/7 Coverage
    - Triangulation Detection



# MACRO Technologies



Satellite

Fixed Wing

Vehicle

Heli Drone

Real-time Sensor Array

Coverage

Efficiency

Accuracy

Detection  
Limit



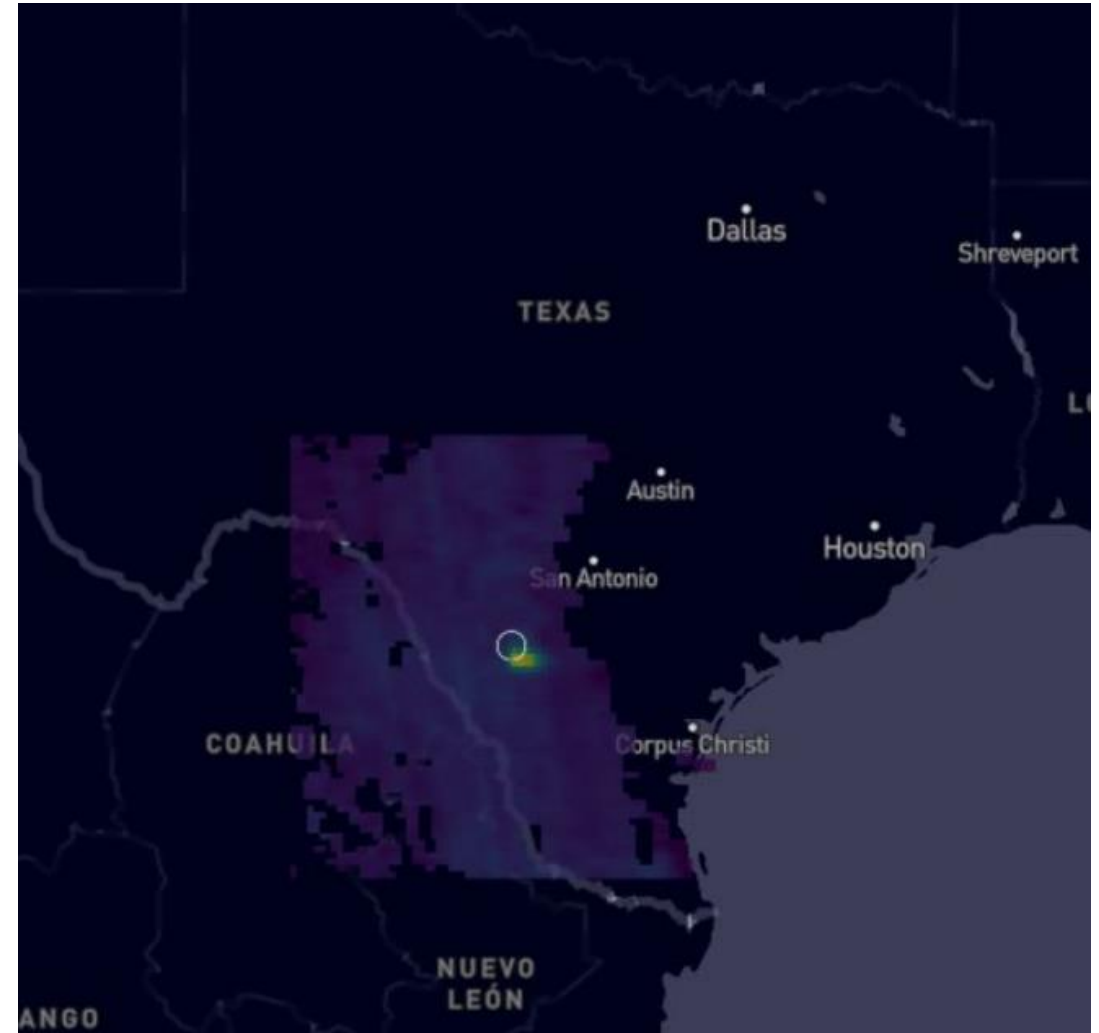
# Macro Screening

## Satellite

- Effective in detecting large emission events
- Very large coverage
- Costs are high and lower detection limit is limiting

## Texas – Energy Transfer

- ETC Texas Pipeline reported a “line break” that lasted from 8:08 a.m. to 9:17 a.m. local time March 17
- caused a release of 52,150 scf (767 cfm)
- leak came from a 16-inch pipe, part of a vast web of unregulated gathering lines across the U.S.
- Timing matched a plume of methane observed by a satellite that firm Kayrros SAS called the most severe in the U.S. in a year



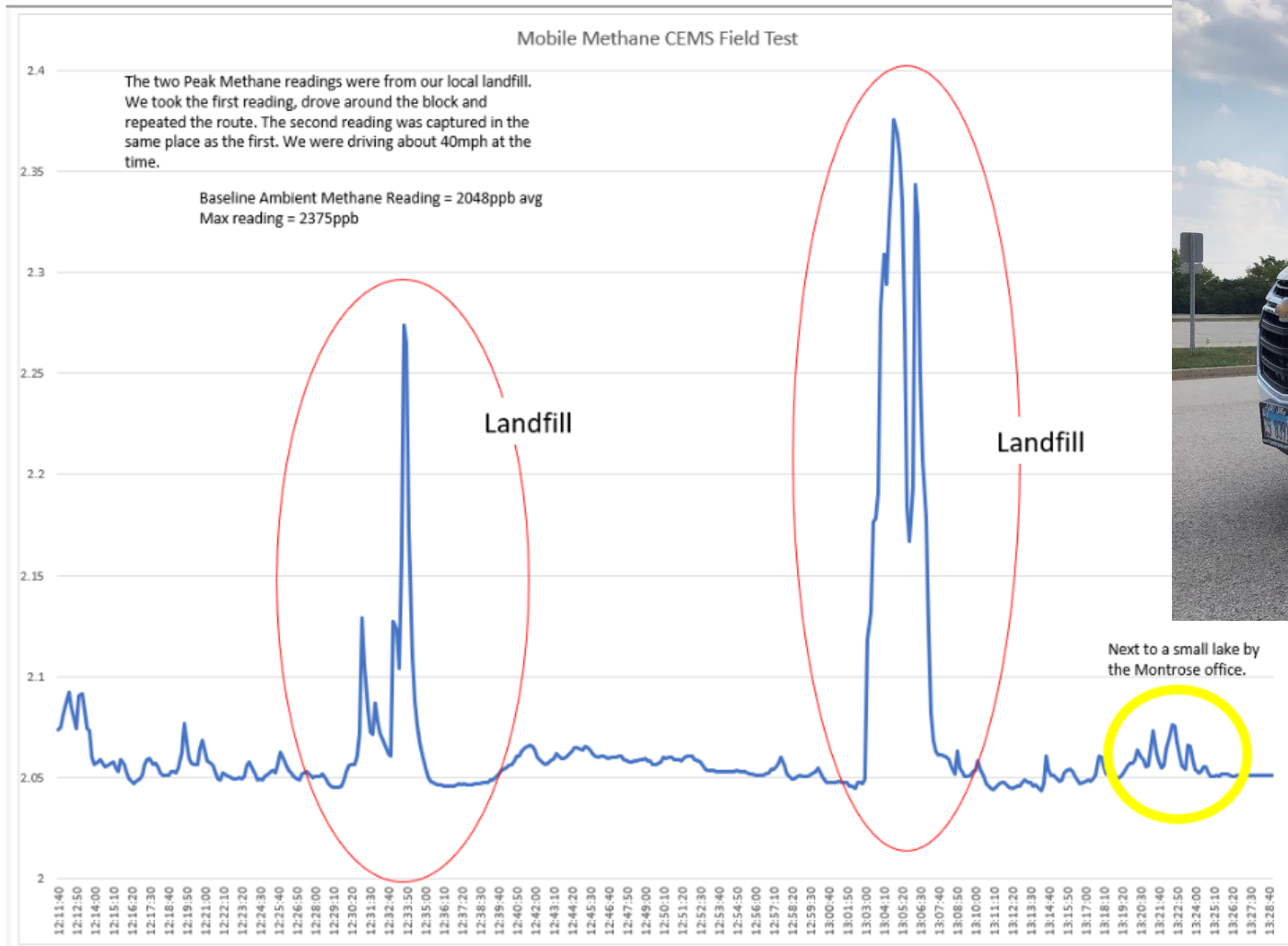
# Macro Screening

## Mobile Vehicle Based Systems

- Utilize the Picarro G2301 methane analyser
- Combined with wind/met data and custom software to triangulate emission sources
- System analyser can be changed out for specific gas stream detection



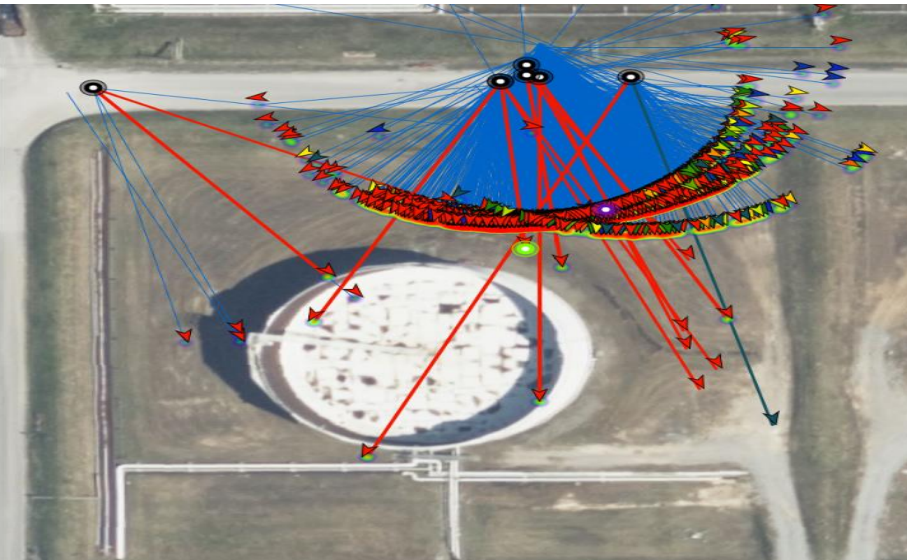
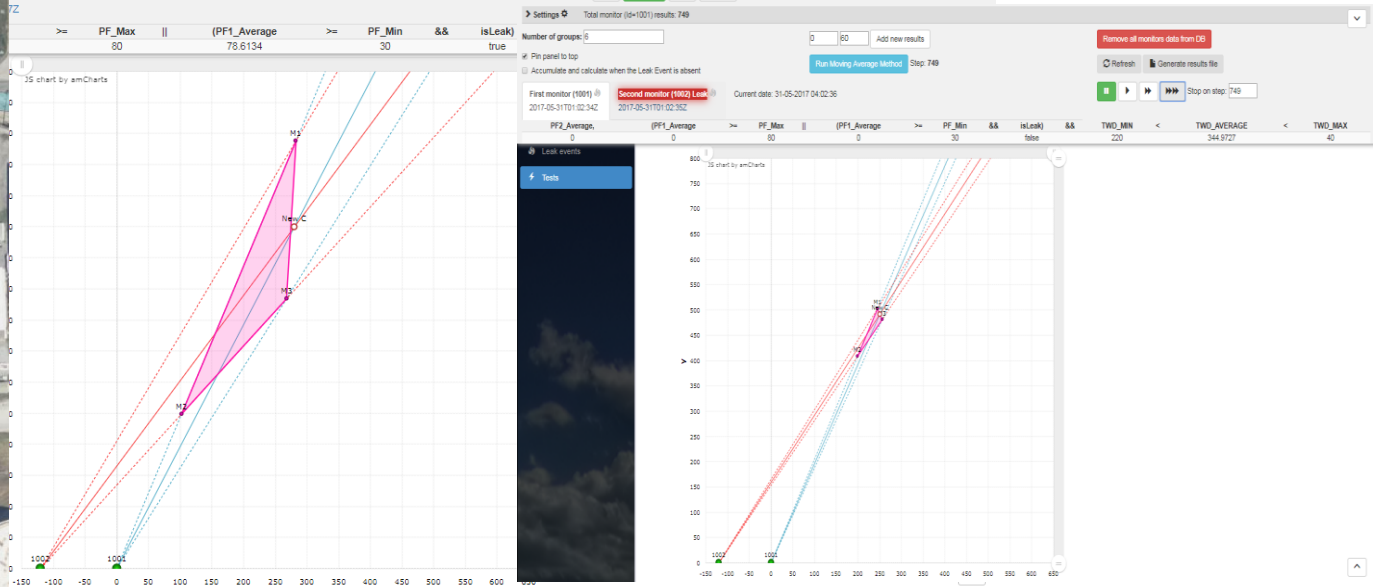
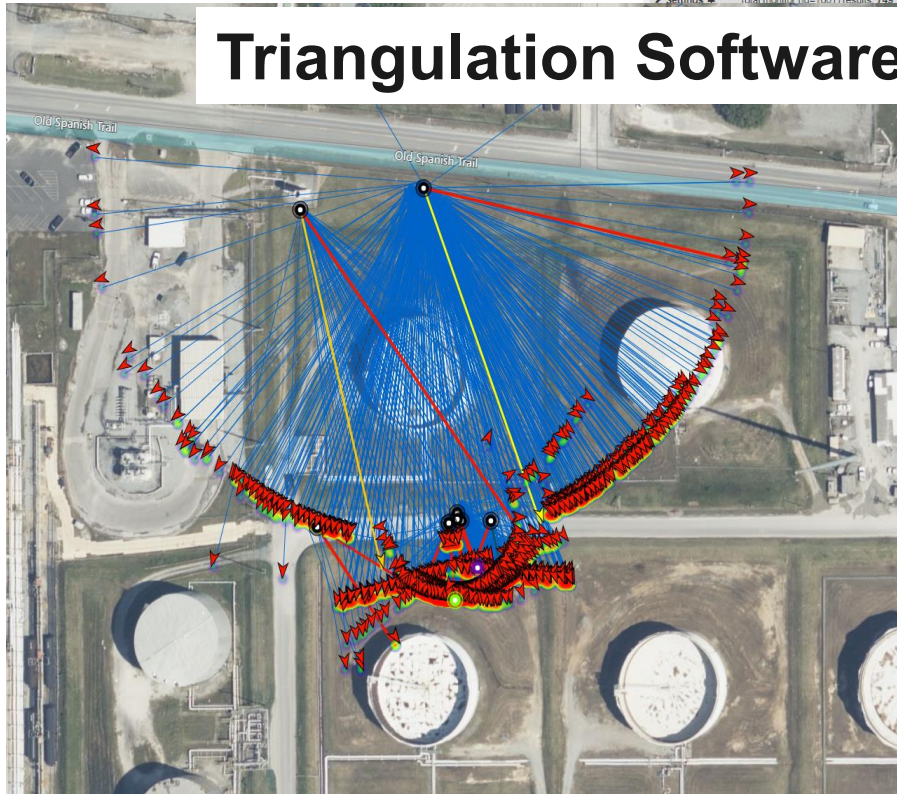
# MMD - Sensitivity



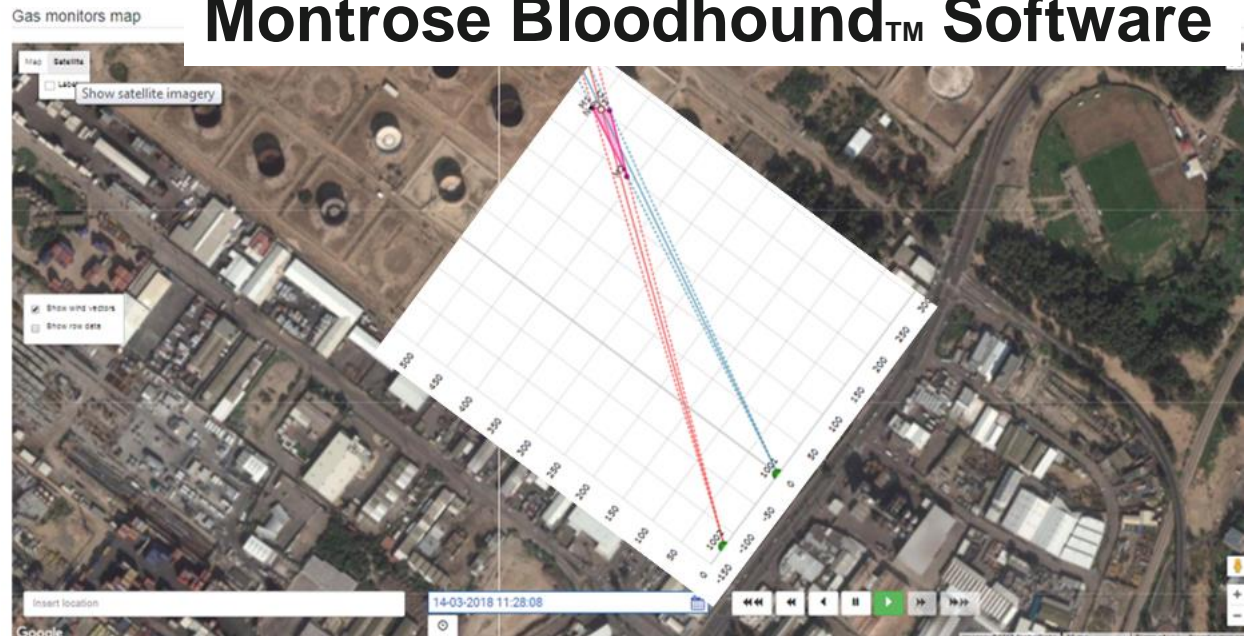
Next to a small lake by the Montrose office.



# Triangulation Software's and Leak Pin-Pointing – (Orthogonal)



## Montrose Bloodhound™ Software

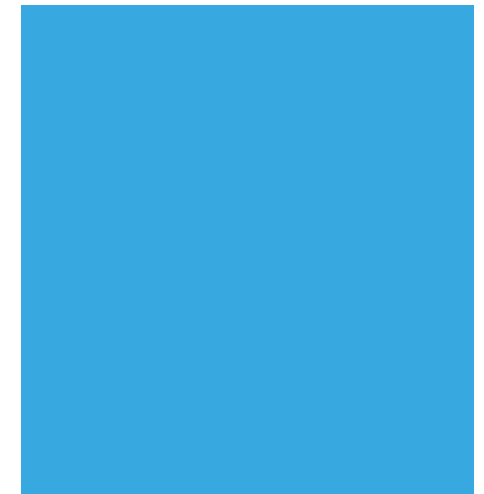




# MACRO Technologies

## Drone Detection

- Utilize open path laser detection with drone to map concentration in ppm
- Drone detection can help prioritize areas or sites with higher emission levels with surprising accuracy
- Can combine with aerial photos to map emission points on detailed maps



# Drone Surveys



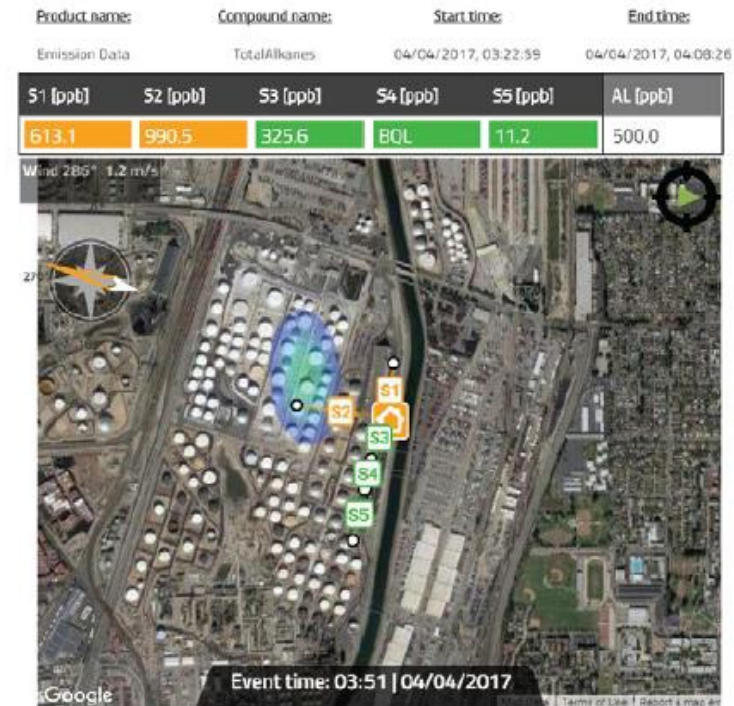
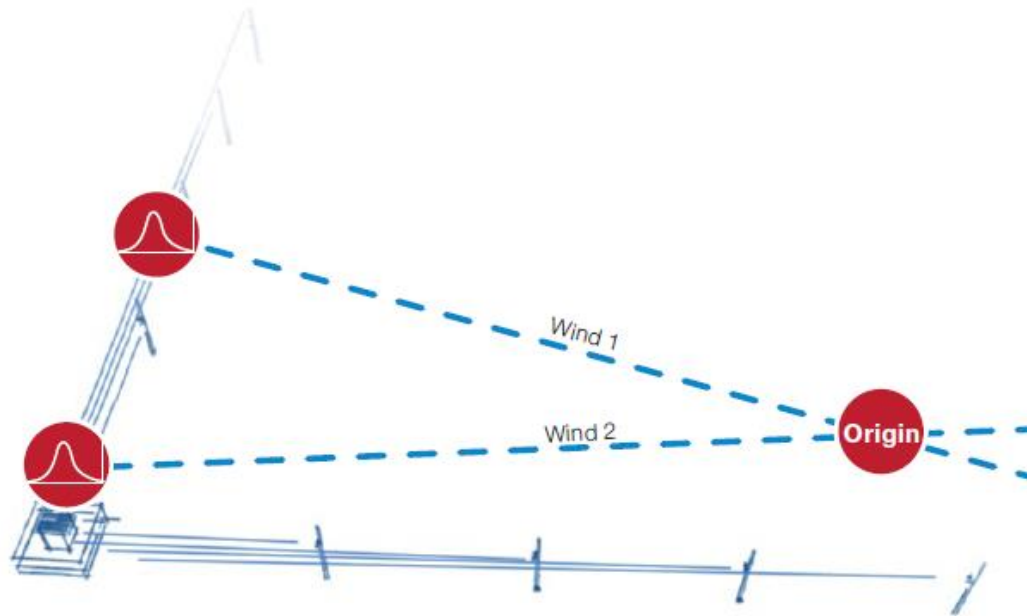
# Drone Surveys

- Drone surveys are time efficient and cover ground faster than foot-based surveys
  - Present real potential to reduce necessary site time.
    - Facility example:
      - Drone survey time: 14:01
      - Foot survey time: 5 hours
- Drone surveys shown to effectively narrow focus on emission areas.
  - Localities identified as problem areas by drone coincided with independent OGI survey
  - Drones improved leak detection in real world scenario
- Deliverables:
  - Semi-Quantitative Measurement of Facility Methane Emissions
  - Methane Gas plume Strike Points with GPS Location and ppm\*m Reading
  - Visual overview of entire facility with highlighted Emission source areas



# Sensor Arrays and Triangulation

- Low cost VOC/methane sensor array with triangulation
- 24/7 coverage of site
- Earliest detection of new large leak sources
- Differentiate between intentional and unintentional emissions
- Creates a early detection reactionary program vs. random scheduled surveys
- Ideal for large sites but can also work for multiple small installations



# Sensor Monitoring Services

Partnered with Several Companies to evaluate different technologies:



Sensit's  
SPOD



Thelco's  
FLM 8500



Ambilab's  
Ambi VOC



Lunar Outpost's  
Canary-S



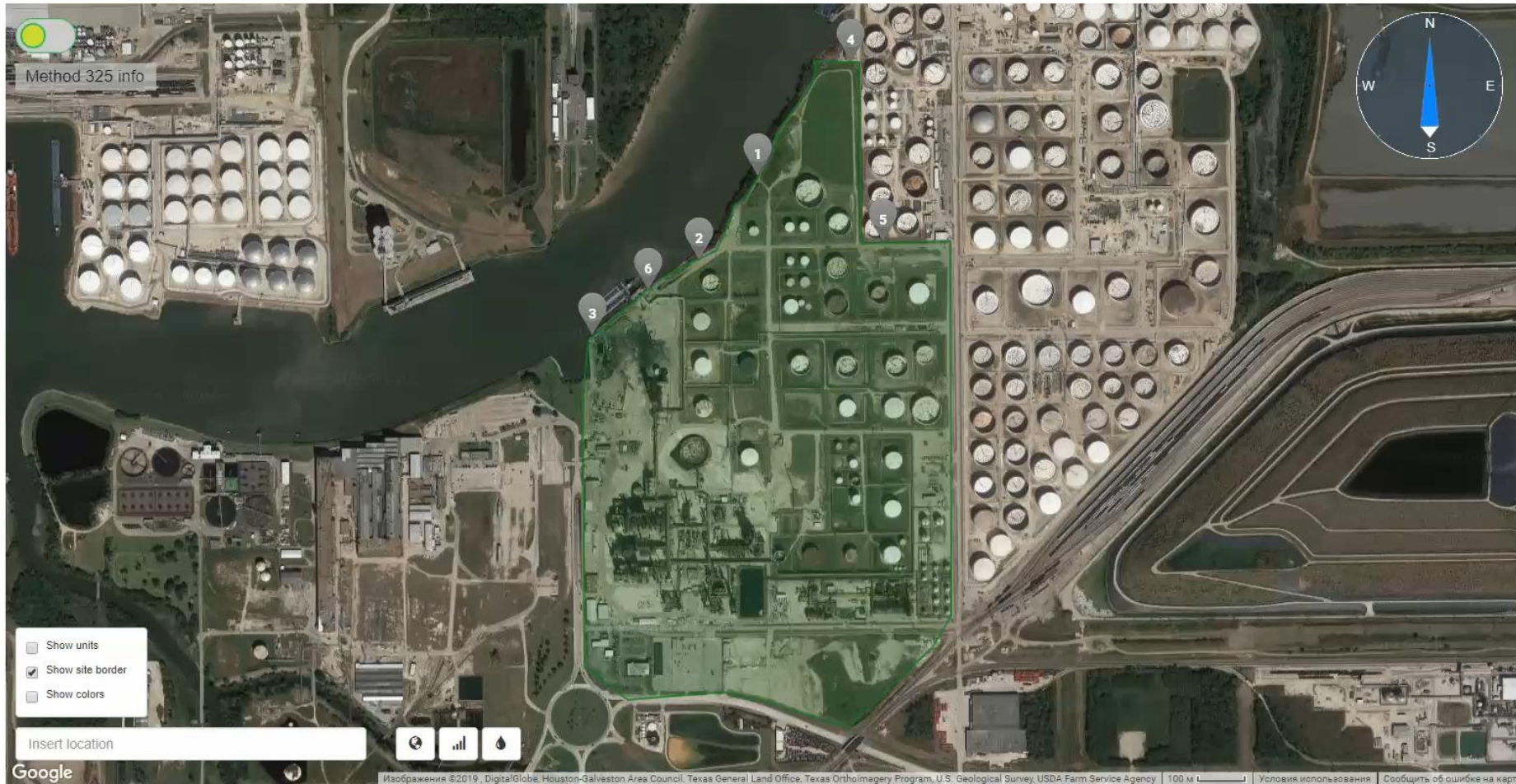
Clarity's  
Node

**CH4 TDL Axteris Integration with Triangulation Platform and Solar Arrays**



# 24/7 Emission Coverage

Pasadena Refining System, Inc.

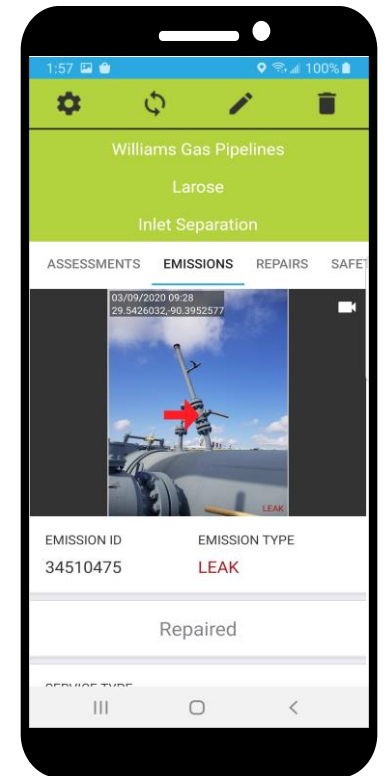
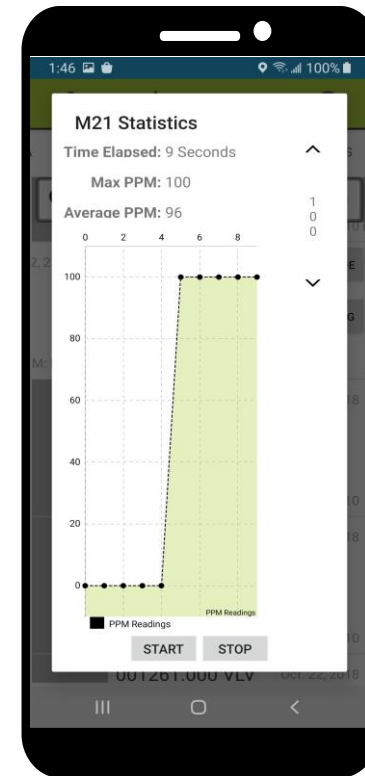
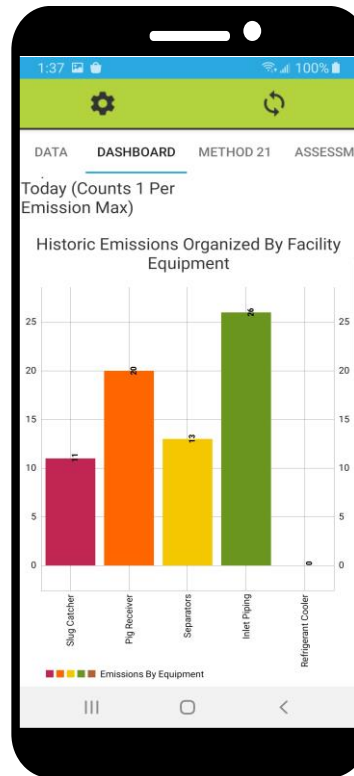


# Fence-line for LDAR

- 24/7 Monitoring converts scheduled LDAR surveys with reactive LDAR responses
- Detection level must be sufficient but not equivalent
- Accurate Quantification and effective triangulation is key
- Most effective tech for true emission reduction – finding the largest leaks faster will drastically reduce total emission volumes
- Regulators are listening

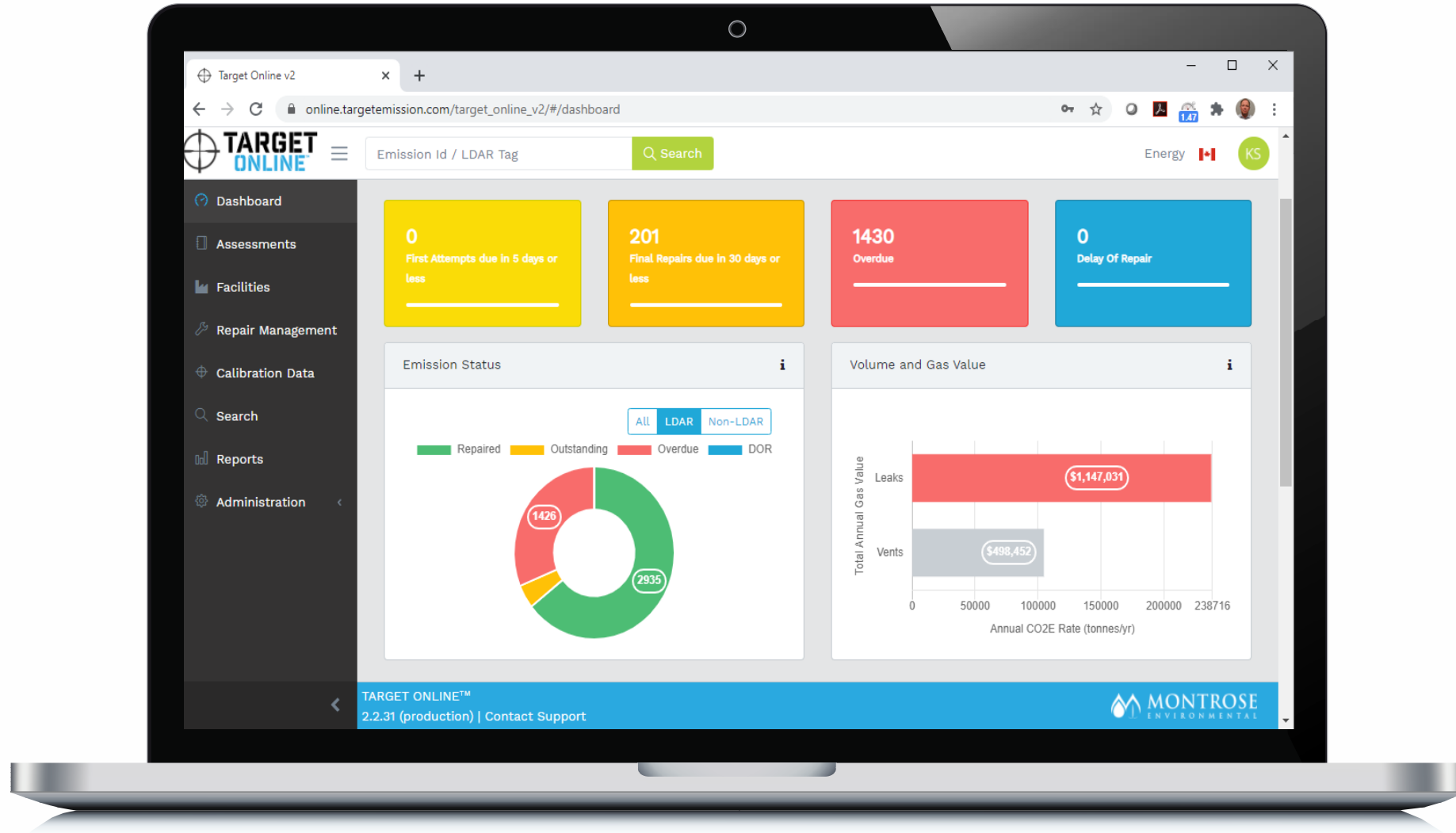


# Field Data Management

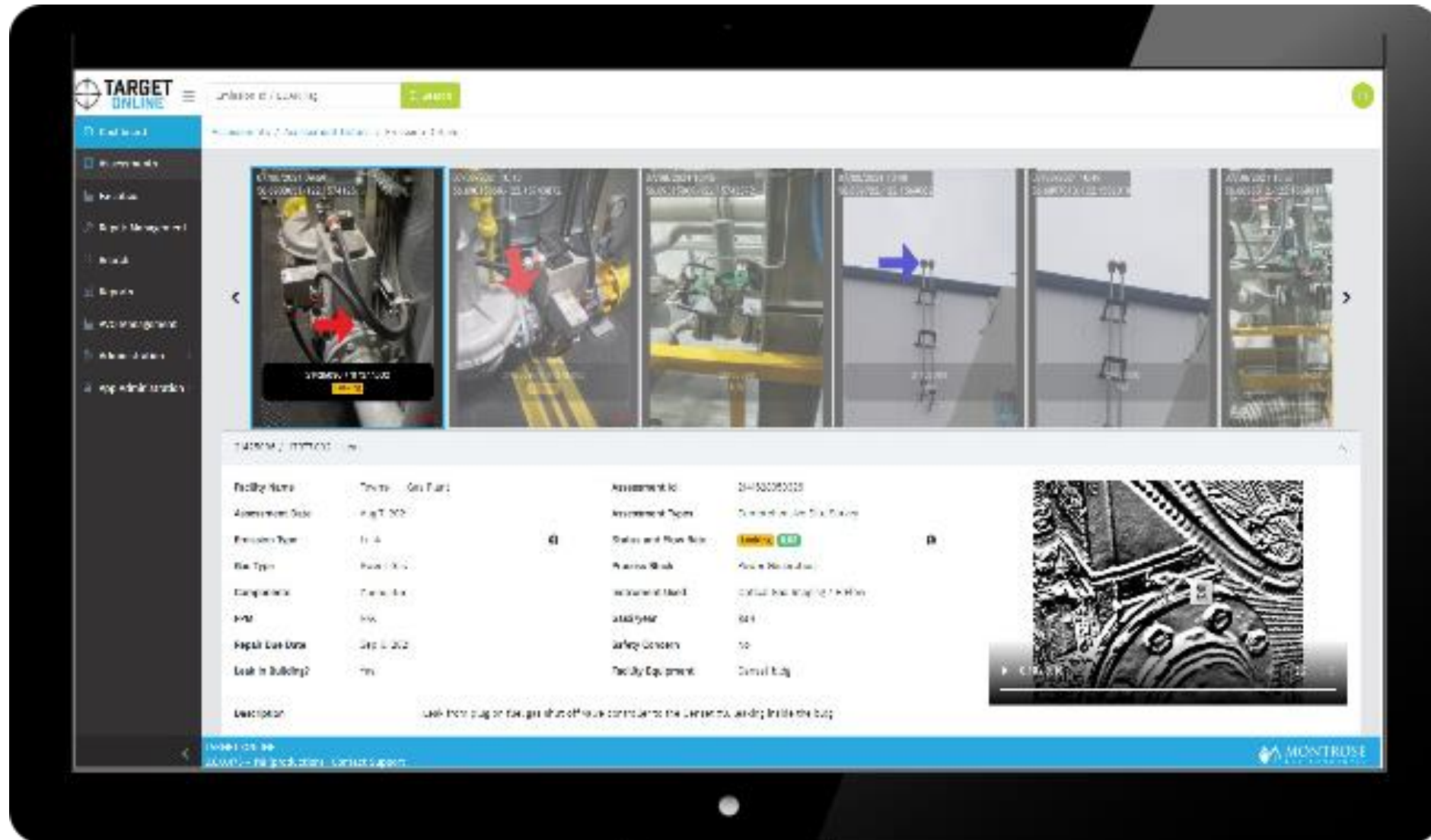




# Program Management

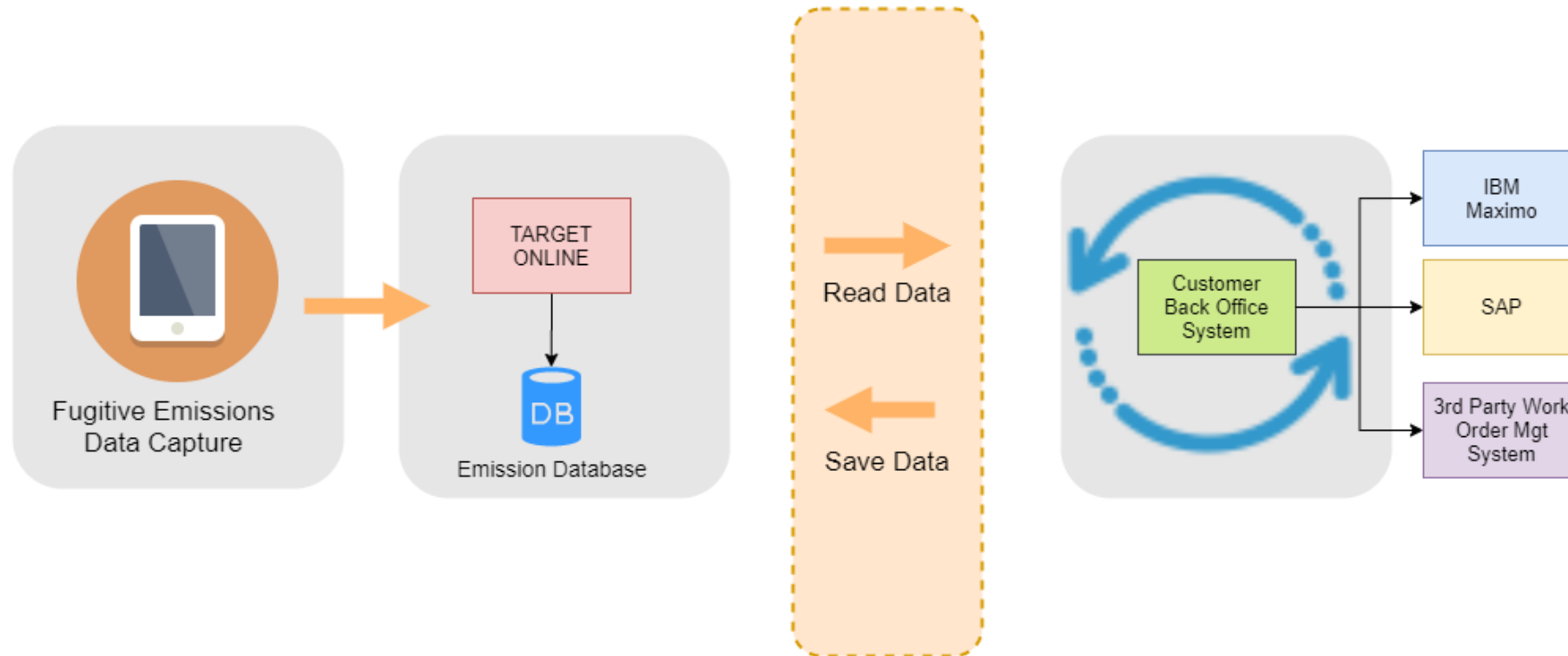


# Leak/Repair Communication Cycle



# Program Communication

## TARGET Cloud Services API



# ALT FEMP SELECTION

- ALT FEMPs can be intimidating
- Technology selection will require analysis of facility types/locations
- Usually, a custom combination of technologies will be needed
- As of today, no one alternative technology will replace MICRO/MACRO combination
- Effective data management system is crucial
- Tech that finds the largest leaks faster will drastically reduce total emission volumes
- Accurate quantification and acceptable lower detection limit is key



# Thank You.

## Questions?



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