



Prepared For:

How Satelytics Works

Data Acquisition

Satelytics takes in multi and hyperspectral data from a variety of third party sources including enterprise satellite data providers using conventional and nano-satellite arrays, plane or drone aerial imagery, and fixed or persistent camera platforms.



Satellites



Nano-satellites



Aircraft



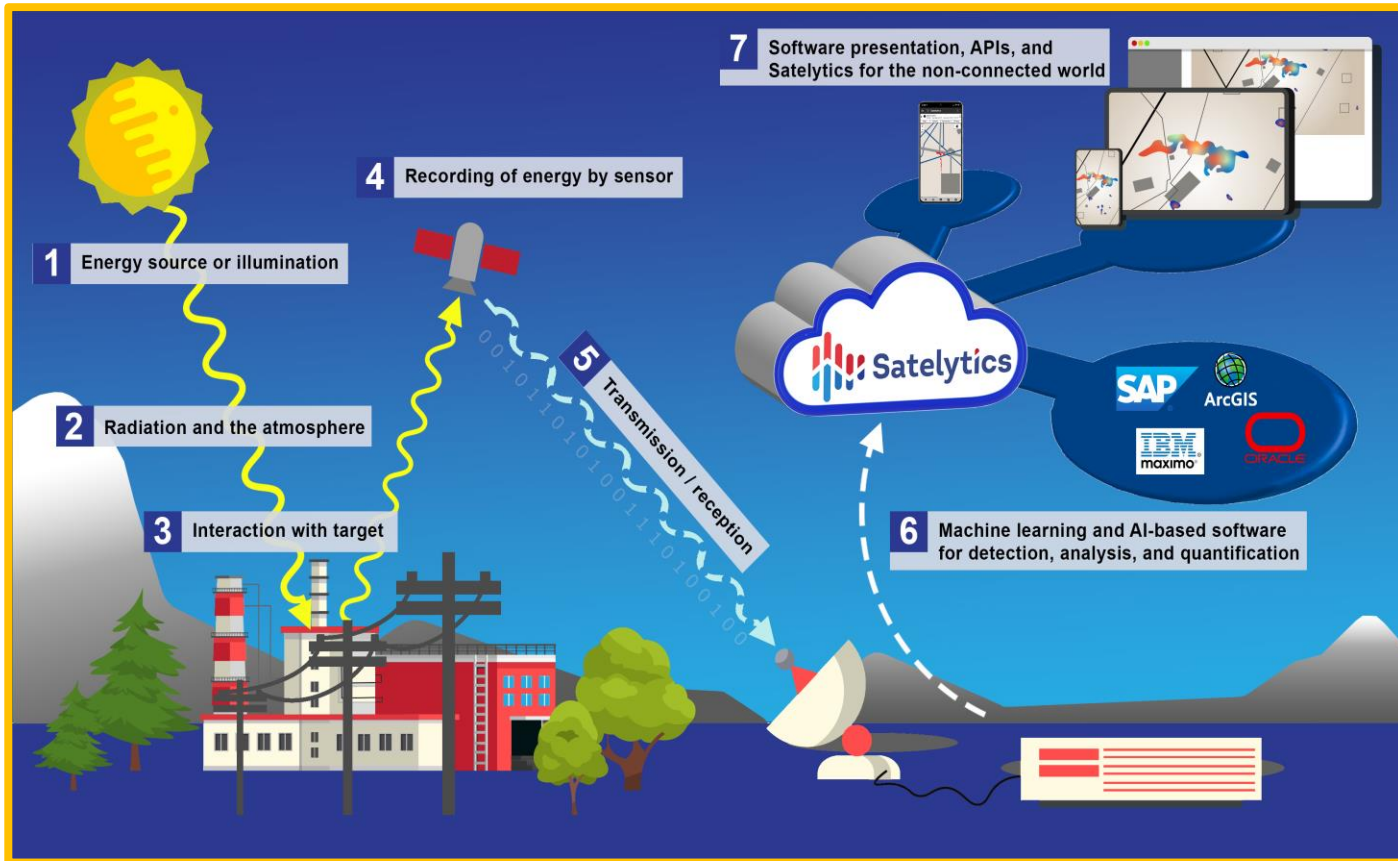
Drone/UAV



Fixed/Persistent Platform

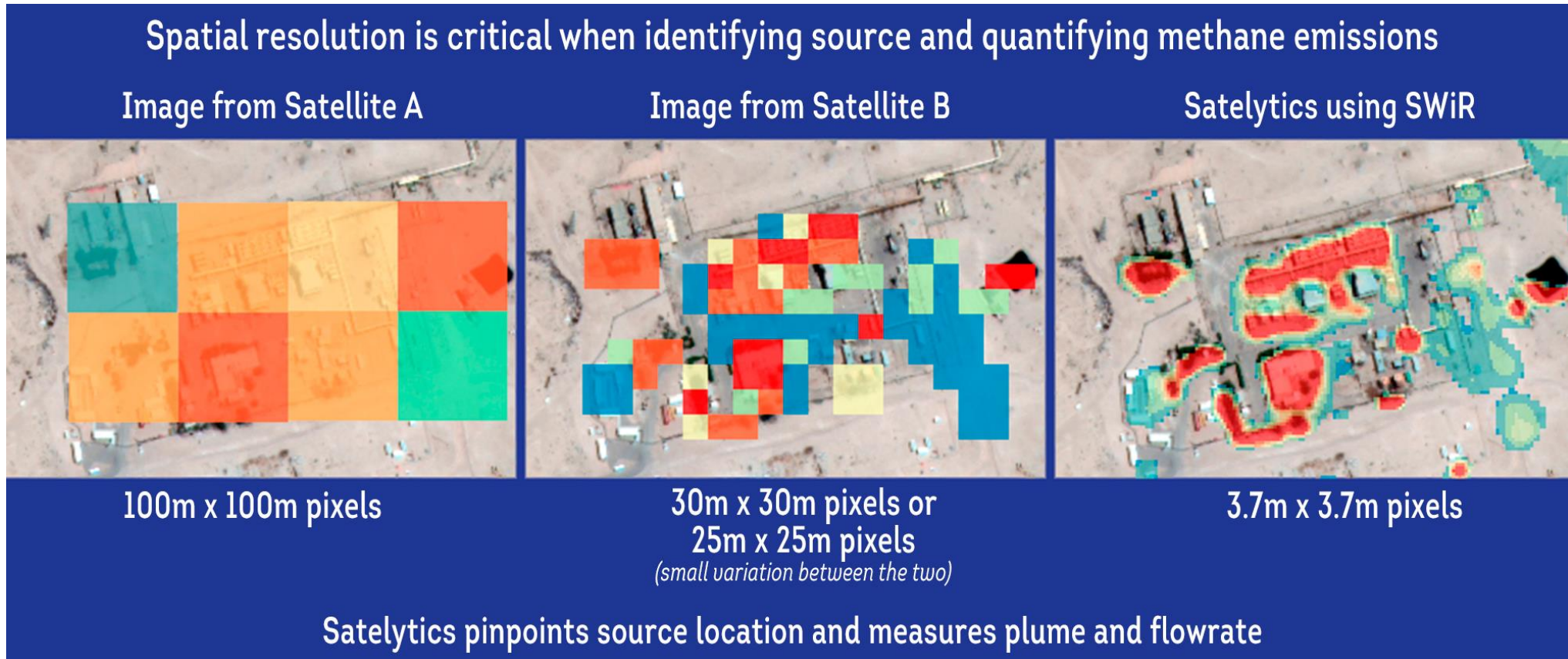


How Our Solution Works



- 1) **Energy Source or Illumination** - sunlight illuminates the target.
- 2) **Radiation and the Atmosphere** - atmospheric distortion of the reflected energy is accounted for in the analysis.
- 3) **Interaction with the Target** - energy reflects off the target and is distorted in the reflection.
- 4) **Recording of Energy by the Sensor** - a sensor records the reflected electromagnetic radiation.
- 5) **Transmission, Reception, and Processing** - energy recorded by the sensor is transmitted, then received and processed at a ground station.
- 6) **Software Detects, Analyzes, and Quantifies** - the data is analyzed using artificial intelligence-based software — algorithms designed to extract and quantify measurements of the target.
- 7) **Presentation of Analytics** – Data and imagery is presented in a customer-defined form to allow decision-making and immediate action.
- 8) **Device Platform** – Data, analytics, and imagery are accessible on smartphones, tablets, and browsers. Alerts are also delivered by text message.

Alerts with Specificity, Location, and Measurement, Not Directionless Data



- For methane: 3.7-m by 3.7-m pixels enable source identification at the component level
- For all other measurements, 30-cm to 46-cm resolution yields specificity to help you get the earliest possible notification of trouble.



GEOSPATIAL ANALYSIS

Physical Analysis

- ✓ Change Detection
- ✓ Encroachment Analysis
- ✓ Land Use Identification
- ✓ Land Movement Analysis
- ✓ Population Identification
- ✓ Bathymetry
- ✓ Relative Sediment
- ✓ Turbidity
- ✓ Total Suspended Solids
- ✓ Surface Water Temperature
- ✓ Theft Detection
- ✓ Digital Terrain Model
- ✓ Digital Surface Model

Chemical Analysis

- ✓ Liquid Hydrocarbon Leak Detection
- ✓ Produced Water Leak Detection
- ✓ Methane Leak Detection (on land)
- ✓ Methane Leak Detection (over water)
- ✓ Acid Mine Drainage
- ✓ Phosphorus
- ✓ Arsenic
- ✓ Barium
- ✓ Calcium
- ✓ Chloride
- ✓ Copper
- ✓ Iron
- ✓ Manganese
- ✓ Molybdenum
- ✓ PFAS
- ✓ Nitrogen
- ✓ pH

Biological Analysis

- ✓ Vegetation Management
- ✓ Chlorophyll-a
- ✓ Phycocyanin
- ✓ Submerged Aquatic Vegetation
- ✓ Tree Density
- ✓ Tree Height
- ✓ Tree Speciation
- ✓ Tree Health (growing season)
- ✓ Tree Health (life cycle)

Run one or ALL algorithms at the same time....

Produced Water Leak

Liquid Hydrocarbon Leak

Subaquatic Vegetation - Hydrilla

Vegetation Growth/Decline

Tree Height

Constituent	Observation Date	Data Value	Location
Tree Height	2017-10-19 10:00:00 -04:00	27.39	(43.36911742, -88.31353024)
Tree Height	2017-10-19 10:00:00 -04:00	36.99	(43.36912424, -88.31347659)
Tree Height	2017-10-19 10:00:00 -04:00	33.49	(43.36913496, -88.31349977)
Tree Height	2017-10-19 10:00:00 -04:00	31.34	(43.36918761, -88.31342161)
Tree Height	2017-10-19 10:00:00 -04:00	26.88	(43.36916518, -88.31341624)
Tree Height	2017-10-19 10:00:00 -04:00	13.41	(43.36922368, -88.31323519)
Tree Height	2017-10-19 10:00:00 -04:00	15.92	(43.36922953, -88.31320032)
Tree Height	2017-10-19 10:00:00 -04:00	20.48	(43.36923051, -88.31314668)
Tree Height	2017-10-19 10:00:00 -04:00	19.56	(43.36923879, -88.31303318)

Geohazard - Slips and Slides

Change Detection - Structures

Work Verification

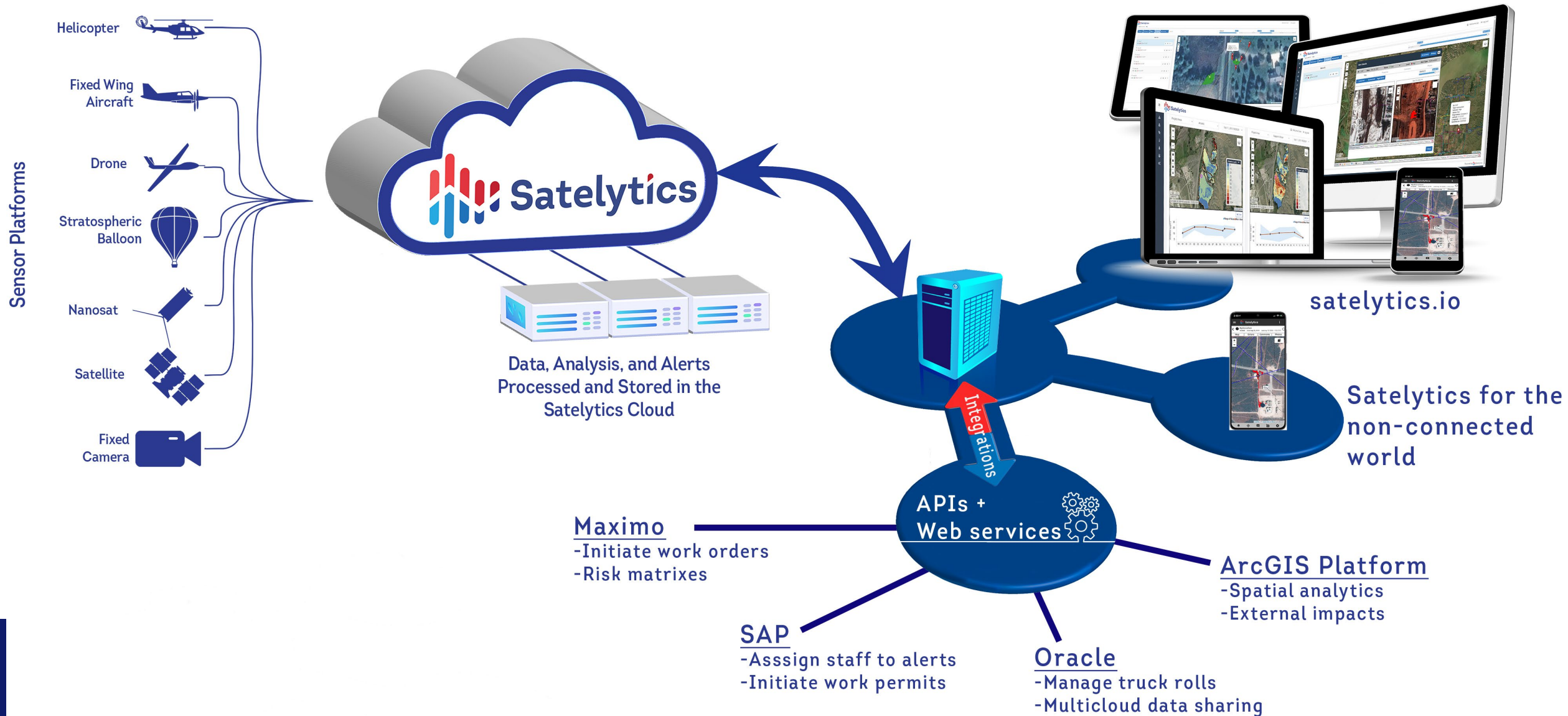
Strike Threat Potential

Side-by-Side Comparison

Tree Height, Density, Health

Wildfire Risk Assessment

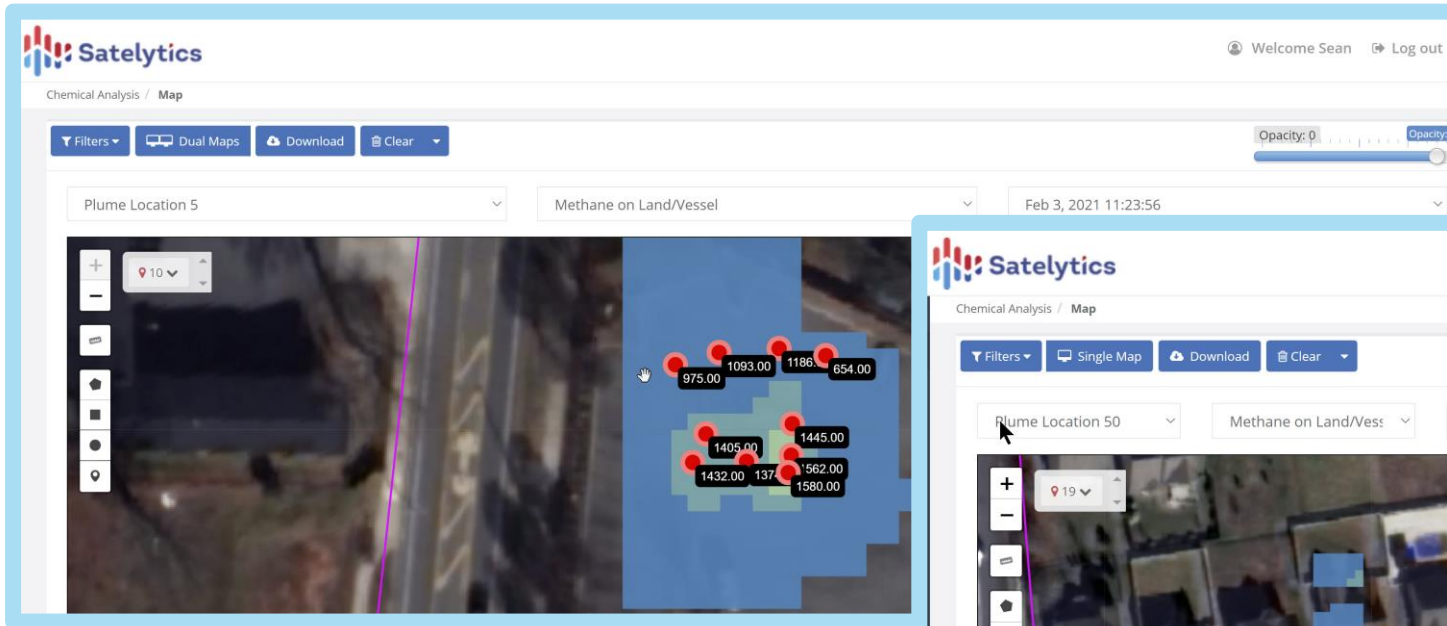
Integration With Other Software Applications on a Number of Platforms



Methane Leak Detection

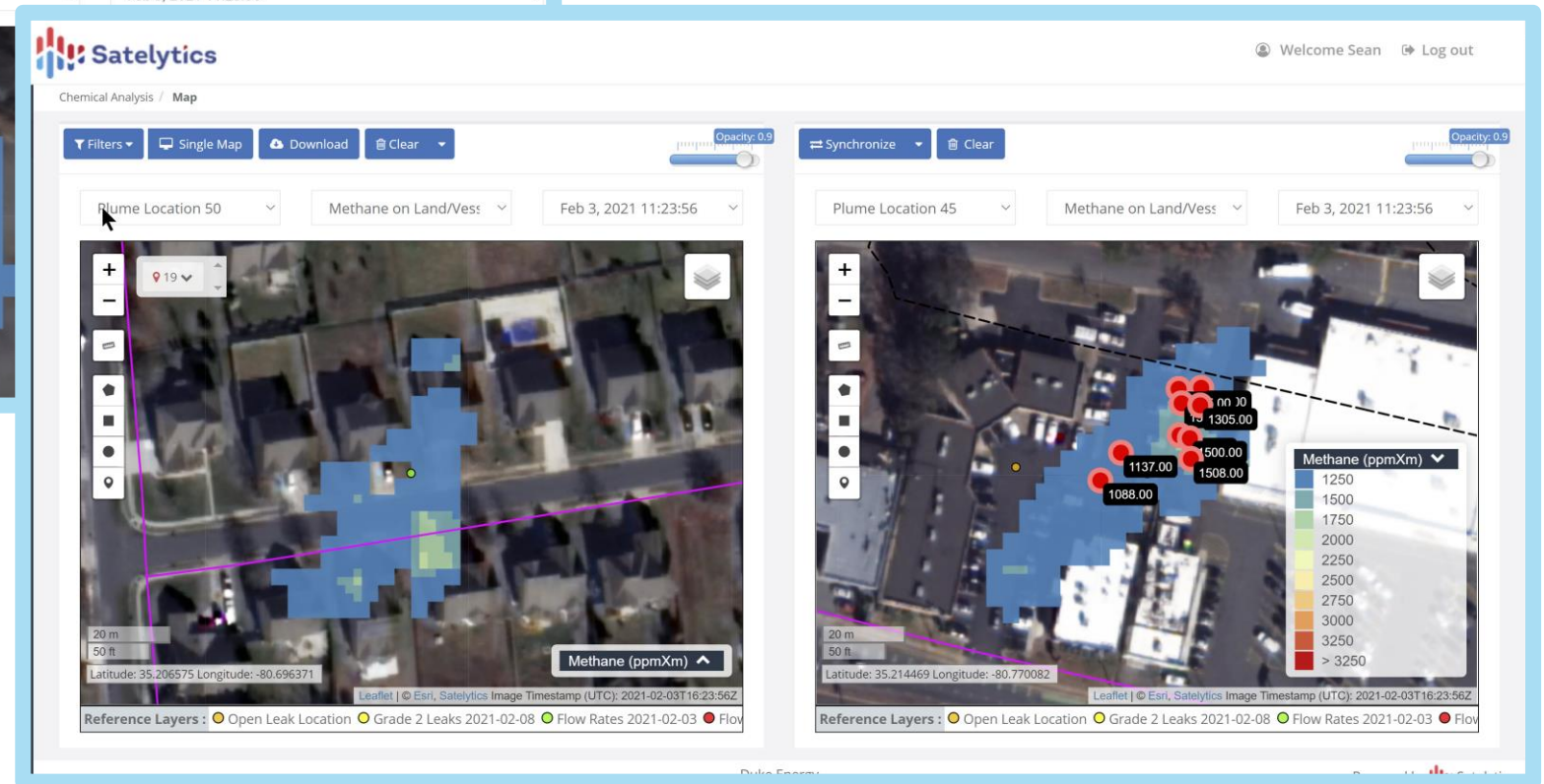
Gas leak detection during the Aliso Canyon gas leak near Porter Ranch, Los Angeles using satellite data.

Urban domain methane measured in parts per million and flow rates in kg/hour

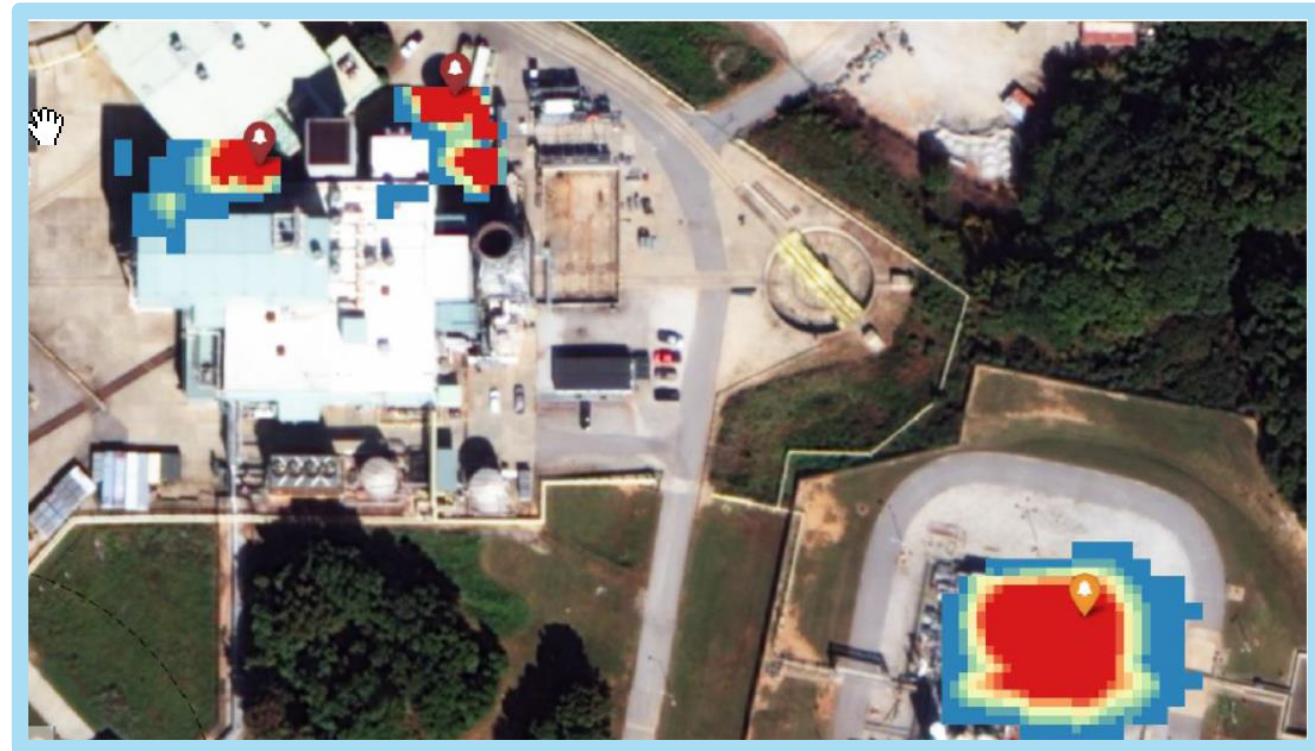
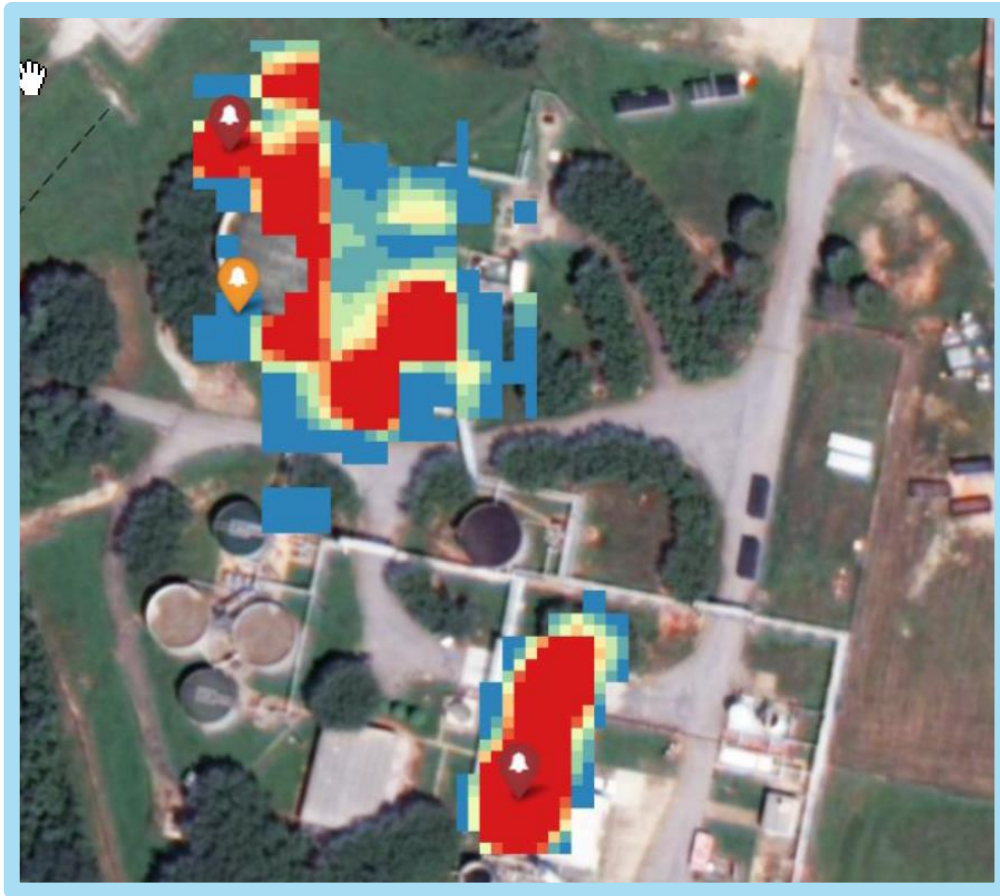


Measuring both plume and flow rates using Satelytics' algorithms

Satelytics.io allows for dual screens to show multi dates or multi locations

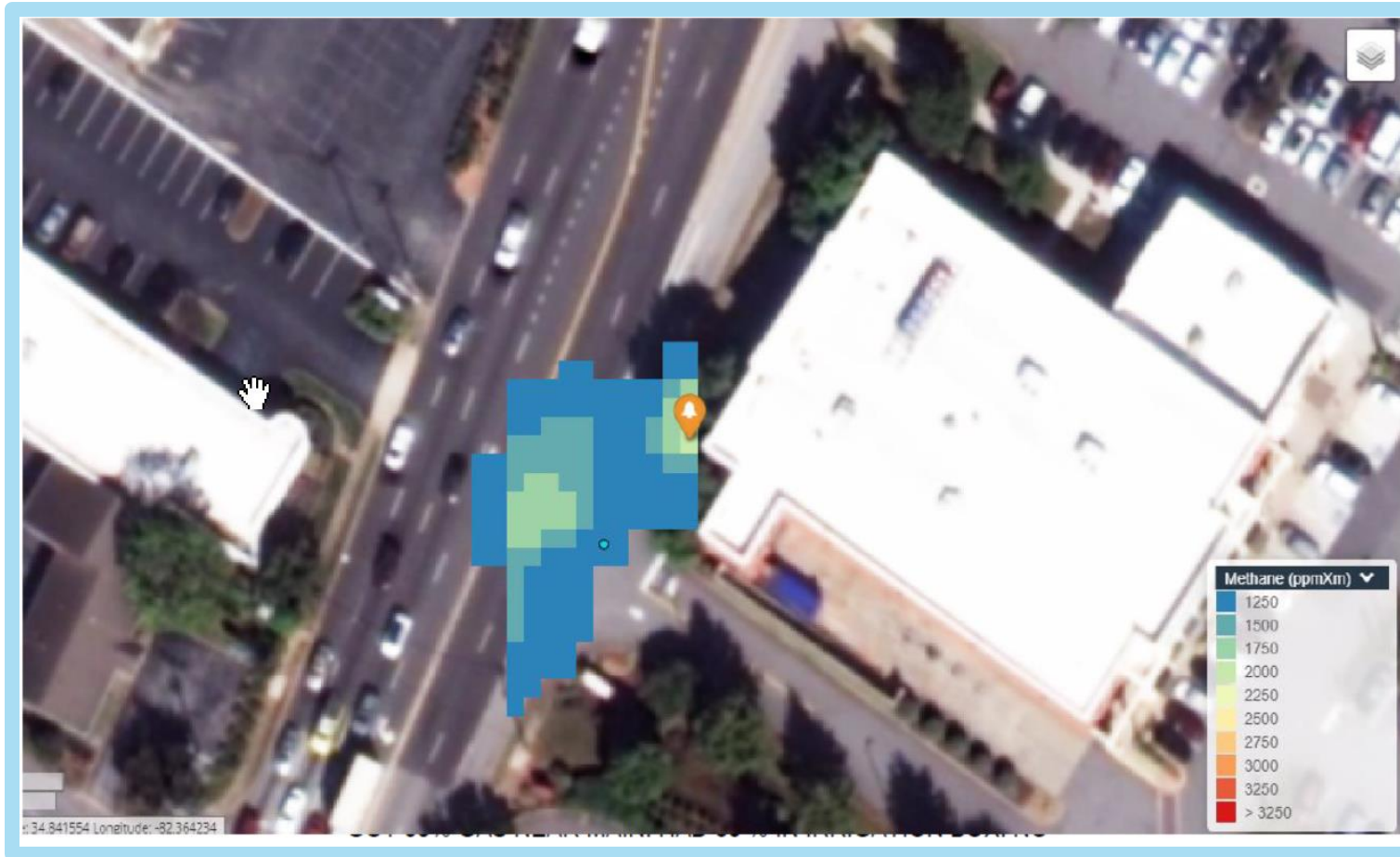


Data Stewardship – Addressing Upstream and Downstream Leaks



Leaks were “unknown” to the customer before using Satelytics.io

Urban domain methane measured in parts per million and flow rates in kg/hour

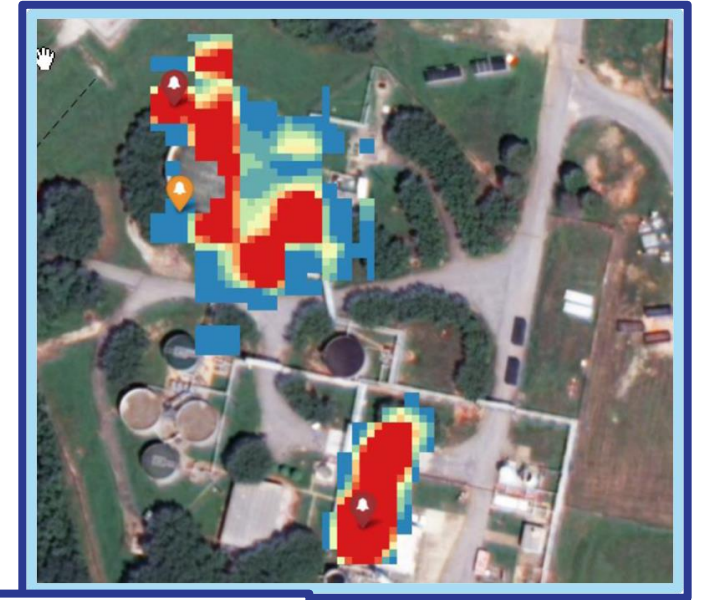


**Measuring both plume and flow rates using Satelytics' algorithms
– source of leak marked with alert symbols chosen by customer**



The meter has a small leak 200 ppmXm seen in image to the right below the insulated union

Methane leaks monitoring both plume and flowrate. Could also be liquid leaks.



Alert Details

ID: 6018 Date: Jul 28, 2019 Status: Resolved Level: Detection Alert Type: Hydrocarbon

Map Properties Audit Photos

Choose File No file chosen Comment... Save

Satelytics

Leak Detection / Map

Visibility: 0 Visibility: 0 Jul 8, 2019 Oct 8, 2019

Alerts (1)

- Hydrocarbon 6018 Jul 28, 2019

5 m 30 ft

Latitude: 48.076259 Longitude: -102.893784

Legend: High Moderate Low Detection Reference Layers Facilities Hess-2019 ONEOK-2019 Casio-2019 Androsco Enbridge Buffer 300 ft Equior Goodright

Current Results – Algorithm Accuracies

Location (Date)	wind speed (m/s)	Flow Rate (kg/hr)	Actual (kg/hr)	ERROR (%)
METEC (3/4/2020)	1.84	12.39	13.12	5.56
VIVER (12/7/2017)	2.07	59.02	56	-5.39

VIVER Comparison – Original Capture - December 7, 2017

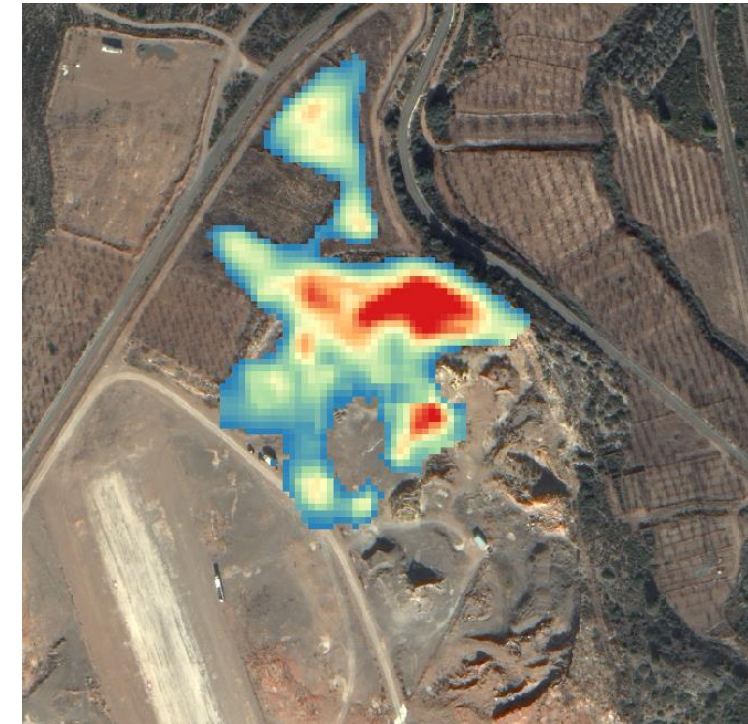
Details Release Rate: 56 kg/hr Wind Speed: ~ 2.07 m/s Wind Direction: $\sim 198^\circ$



First Release



Improving



Today



For more information: see our demonstration at: <https://vimeo.com/601148619>

Questions, comments, and suggestions please share with...

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