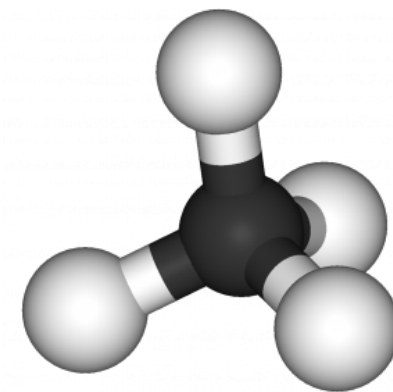




Prepared For:



Market Segments We Serve



How Satelytics Works

1

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

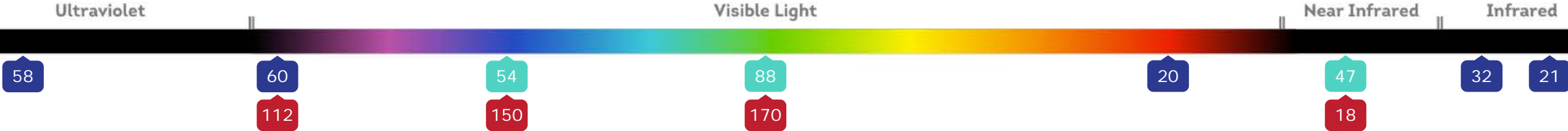


How Satelytics Works

2

Spectra

Visible light and other portions of the electromagnetic spectrum from the sun are reflected off of objects and materials on Earth and into an aerial sensor.






3

Bands

The sensor detects a limited number of bands, or parts of the electromagnetic spectrum, and collates them into data layers that Satelytics can process.

Cameras are sensors that detect the red, green, and blue bands that compose a standard digital image. Multi and hyperspectral images contain many more bands in the nonvisible portions of the spectrum.

Analyzing multiple bands can reveal data values pertaining to the specific phenomena that we're attempting to visualize.

-  Liquid Hydrocarbon
-  Produced Water
-  Building Encroachment

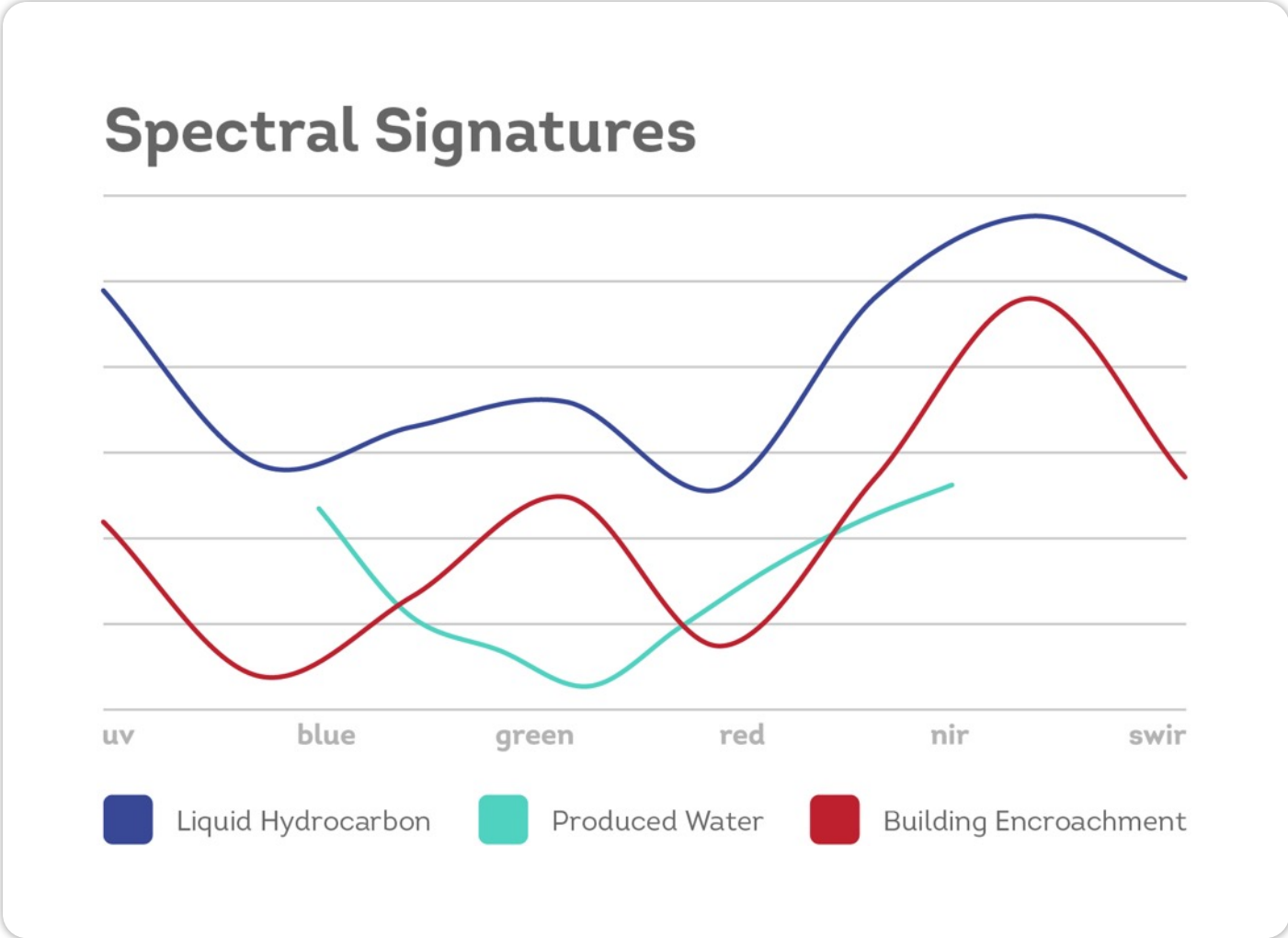
How Satelytics Works

4

Algorithms

Satelytics applies complex, machine learning algorithms to isolate the spectral signatures of objects and phenomena contained in the data, or the pixels, of an image.

Using different bands and computing techniques, our scientists can determine whatever it is we're observing using those spectral signatures.



How Satelytics Works

5

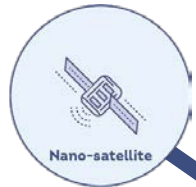
Analytics

Satelytics processes petabytes of data comprising thousands of individual aerial or satellite images and builds a repository of spectral signatures.

We can then use Satelytics to run predictive models or render that data into interactive displays, alerts, and visualizations.



Integration With Other Software Applications on a Number of Platforms



DATA, ANALYSIS, AND ALERTS
STORED ON SATELYTICS CLOUD



Cleared Alerts & Updated Statuses



DATA, MAPS, AND ALERTS

Web Accessible
Alert Dashboards

The image shows three devices displaying the Satelytics interface. A tablet at the top shows a satellite map with a red vertical line. A smartphone in the foreground shows a text message with a warning: "Warning: Potential Hydrocarbon Leak. Active: 33.998333, -118.373758". Another smartphone shows a similar message: "Warning: Right of Way Encroachment. Active: 34.183790, -118.048159". A third smartphone shows a message: "Warning: New Construction near Right of Way. Active: 34.369643, -118.566293". A larger tablet in the background shows a web dashboard with a table of alerts.

Selection	Analysis Result	Workflow Status
<input type="checkbox"/>	Major	Resolved
<input type="checkbox"/>	Major	Resolved
<input type="checkbox"/>	Minor	Resolved
<input type="checkbox"/>	Minor	Resolved
<input type="checkbox"/>	Moderate	Investigation
<input type="checkbox"/>	Major	Resolved

Phone and Mobile
Device Alerts

Methane Leak Detection

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

Aliso Canyon – The facts and figures

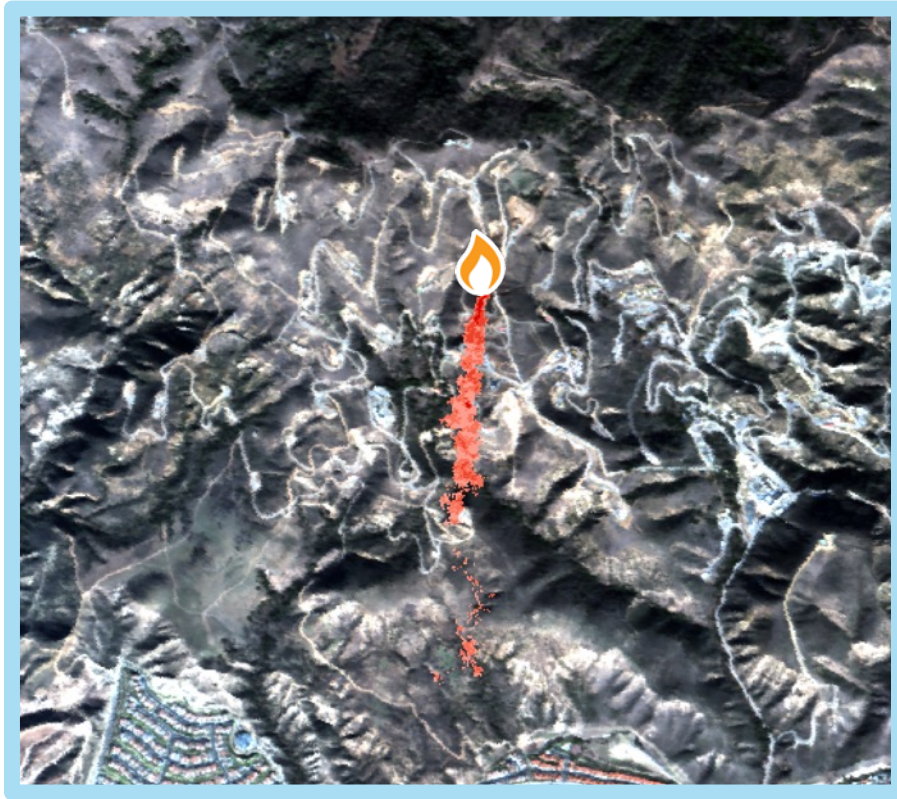
- Discovered October, 2015
- 97,100 tons of methane and 7,300 tons of ethane released into atmosphere
- Worst natural gas leak in U.S. history
- Local residents report numerous health issues
- More than 2,200 families and 2 schools have been temporarily relocated. Over 6,500 families have filed for help
- As many as 1,000 lawsuits filed
- Estimated remediation cost of \$717 million
- \$4 million fine for failure to report
- Untold future regulatory and remediation costs as well as damage to local community, company reputation, and the environment



Aliso Canyon Leak

- **104,400 tons of lost product in largest gas leak in U.S. history**
- **Displaced 2 schools and over 11,000 people**
- **\$721 million to date in direct remediation and regulatory costs**

Aliso Canyon Methane Plume Visualization



January 12, 2016, Isolated on Natural Color

Methane Concentration

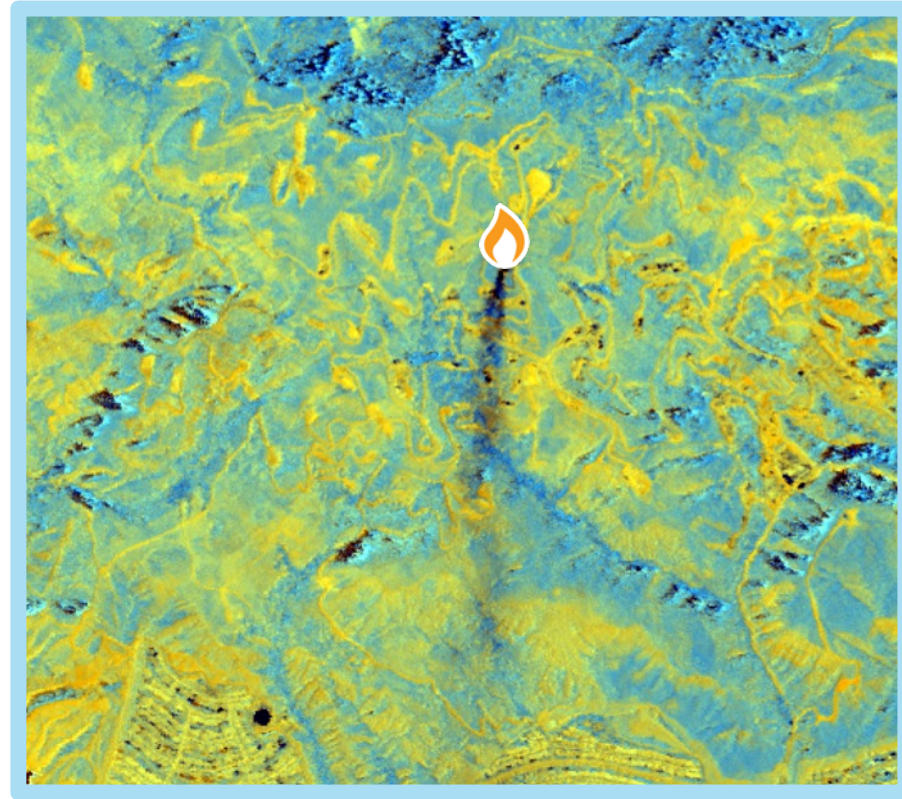


Low

High



Leak Location



January 12, 2016, Pseudo Color

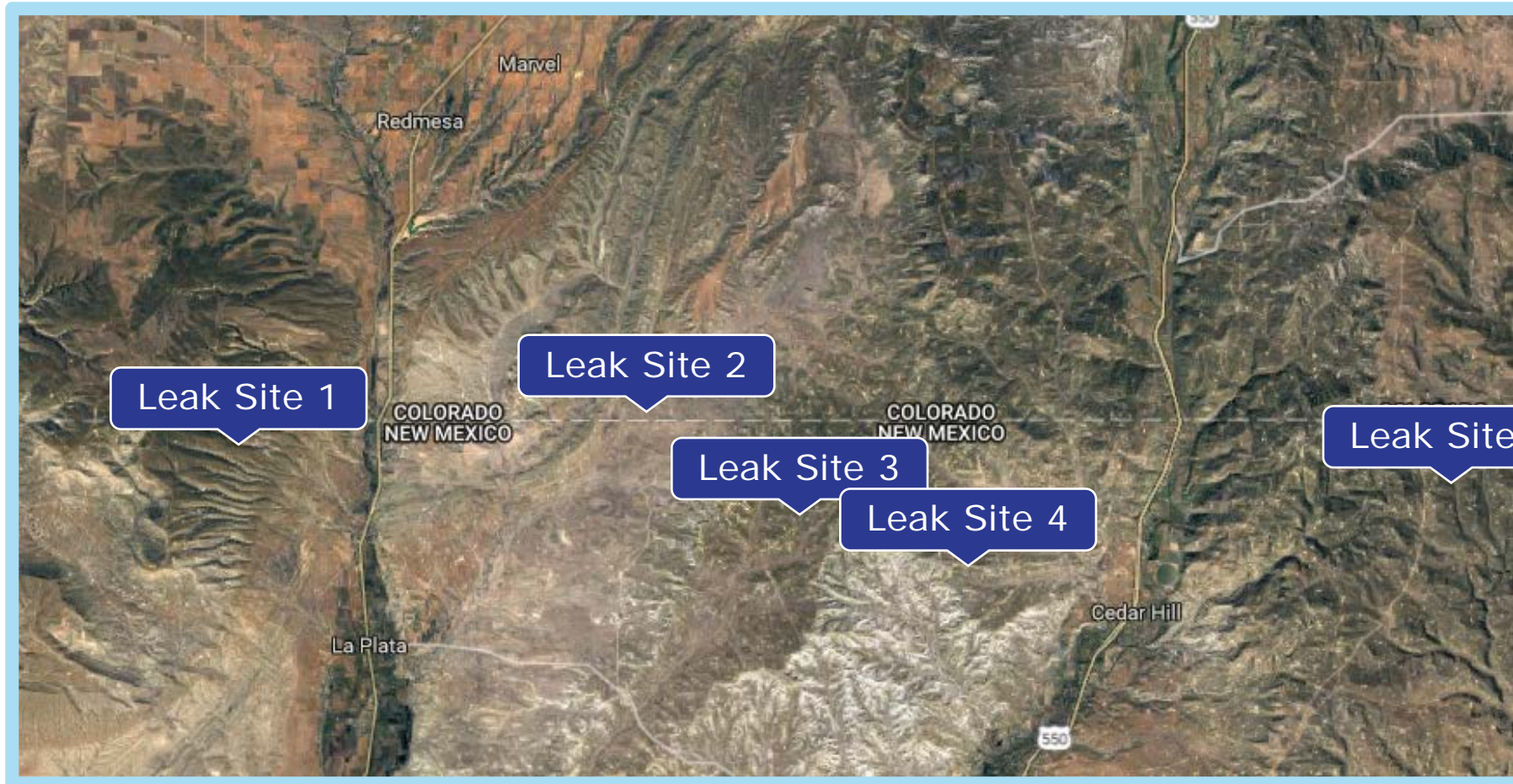
Methane Concentration



Low

High

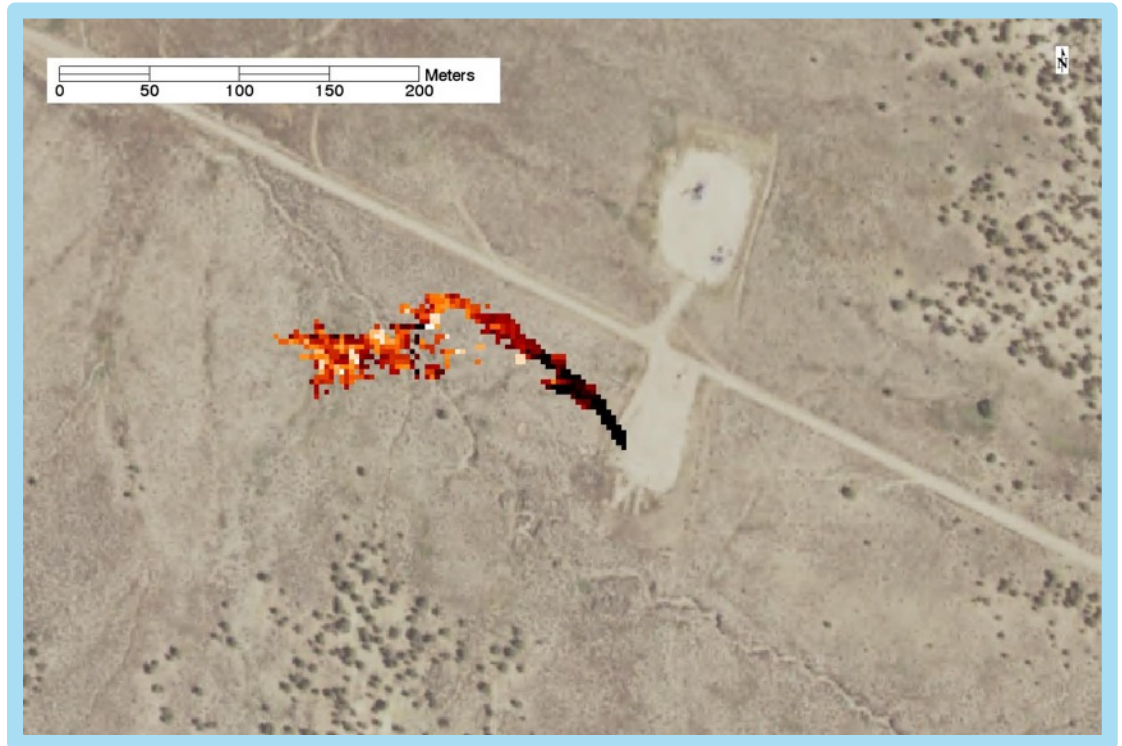
San Juan Basin Region Overview



Leak Site 1



Raw Imagery, 2.8m Resolution



After Analysis, Overlaid on Base Map

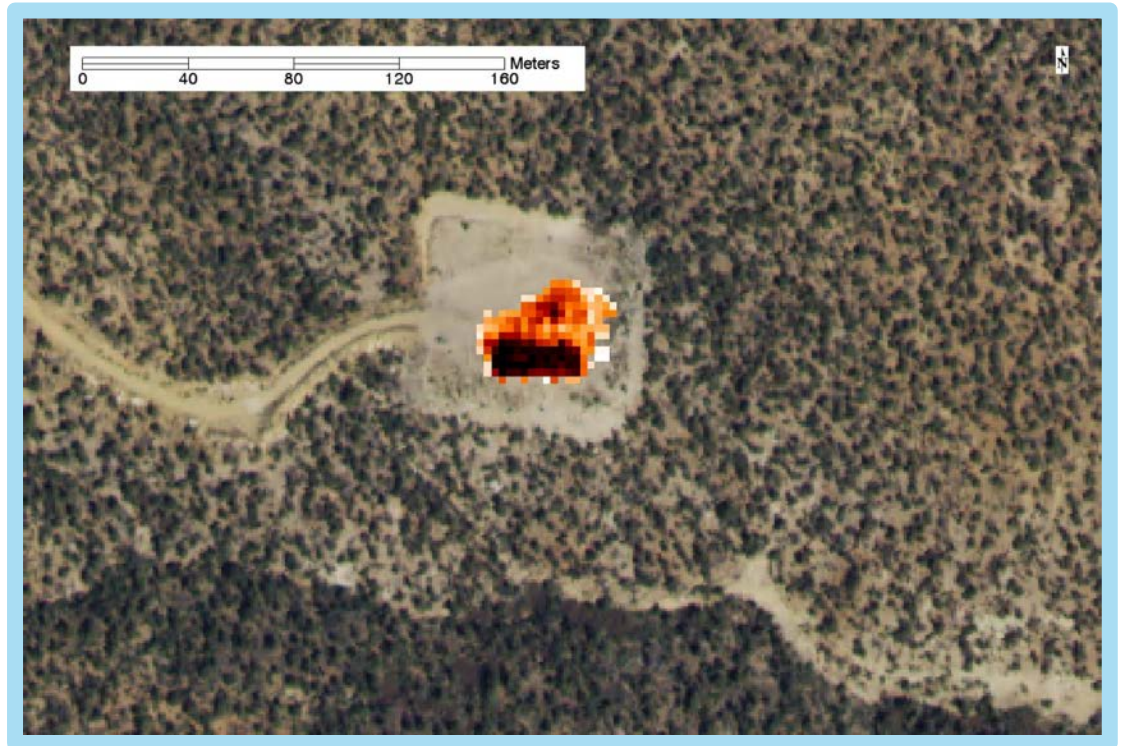
Methane Concentration



Leak Site 2



Raw Imagery, 2.8m Resolution



After Analysis, Overlaid on Base Map

Methane Concentration



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

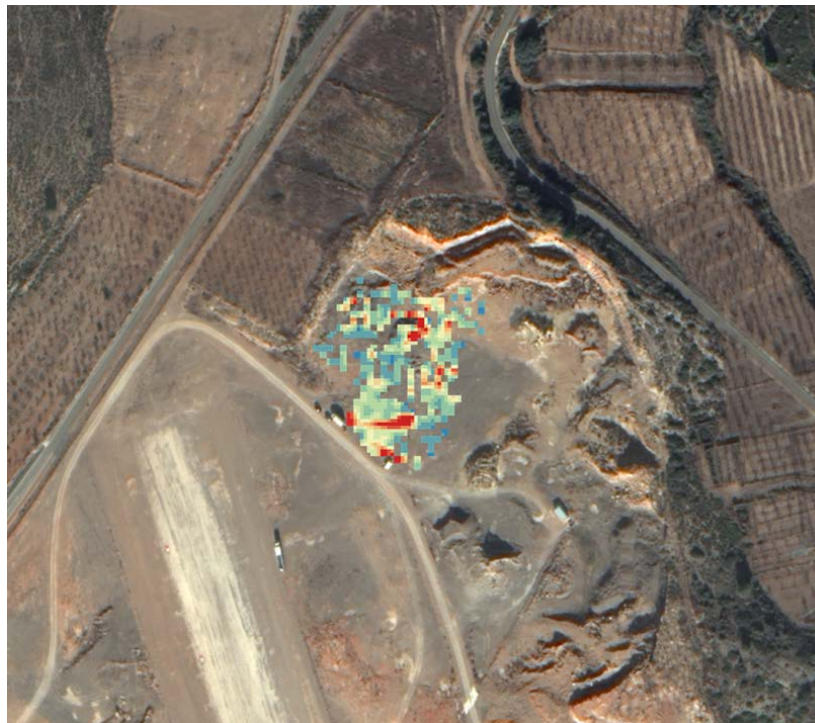
Details Release Rate: 56 kg/hr

Wind Speed: ~2.07 m/s

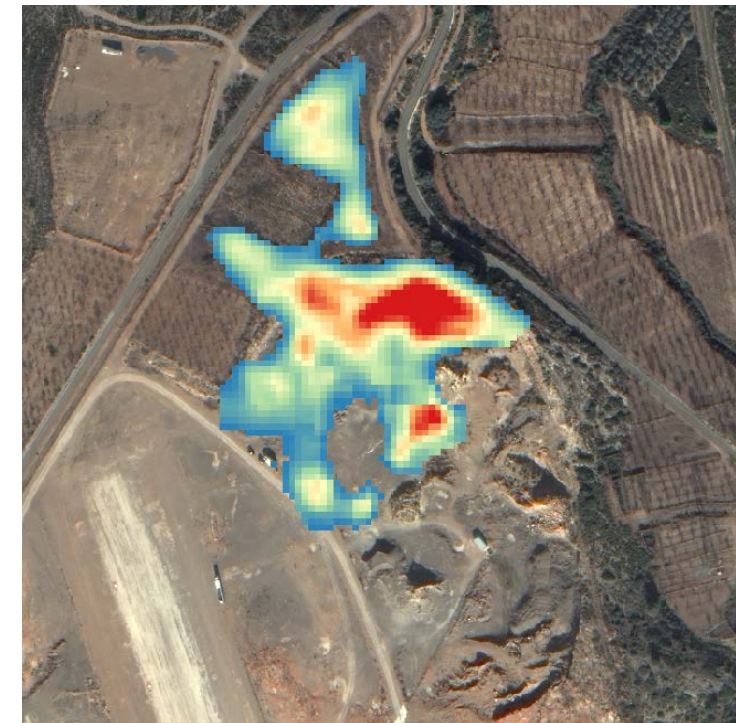
Wind Direction: ~198°



First Release




Improving



Today

Satelytics can perform many tasks at the SAME time for its customers



The image is a composite graphic illustrating the capabilities of Satelytics. On the left, a satellite is shown in space, with a heatmap overlay indicating a gas leak. The heatmap shows a concentration of gas, with colors ranging from blue (low) to red (high). In the center, a software interface displays a data table with columns for 'CONCENTRATION', 'OBSERVATION DATE', 'DETECT VALUE', and 'LOCATION'. The table contains three rows of data. To the right of the table are two maps showing the geographic location of the gas leak, with red markers indicating the specific sites. A blue speech bubble is overlaid on the interface, containing the text: 'Gas Leak Detection and Quantification over land and water. Early adopters BP and Anadarko (OXY)'. The interface also includes various controls like 'Filter', 'Sign In', 'Download', and 'Clear'.

CONCENTRATION	OBSERVATION DATE	DETECT VALUE	LOCATION
188176	2017-01-10 12:40:52-04:30	200.36	23,2719261, -69,02200991
188176	2017-01-10 12:40:52-04:30	133.30	23,2717331, -69,02234850
188176	2017-01-10 12:40:52-04:30	368.30	23,2653286, -69,02201850

Gas Leak Detection and Quantification over land and water. Early adopters BP and Anadarko (OXY)



iPIPE a consortium of oil and gas operators over North Dakota, new Mexico and Texas use satelytics.io to monitor operations weekly

A leak detected early would have cost millions of dollars in remediation. This was identified with costs in the tens of thousands

The screenshot displays the Satelytics web application interface. At the top, the Satelytics logo and navigation menu are visible. The main area features a map of a region with a network of blue and green lines representing pipelines and well pads. A sidebar on the left lists alerts, with three entries for October 17, 2018. An 'Image Comparison' window is open, showing two satellite images of a well pad from September 5, 2018, and September 28, 2018. The comparison shows a red area indicating a change in the well pad. Below the main map, four mobile device screens illustrate different views: 'MapView Online', 'MapView Offline', 'AlertView Screen', and 'PictureView'. The 'AlertView Screen' shows a detailed view of an alert with its location and description. The 'PictureView' shows a scrollable list of images related to the alert.



They even try to trick us...

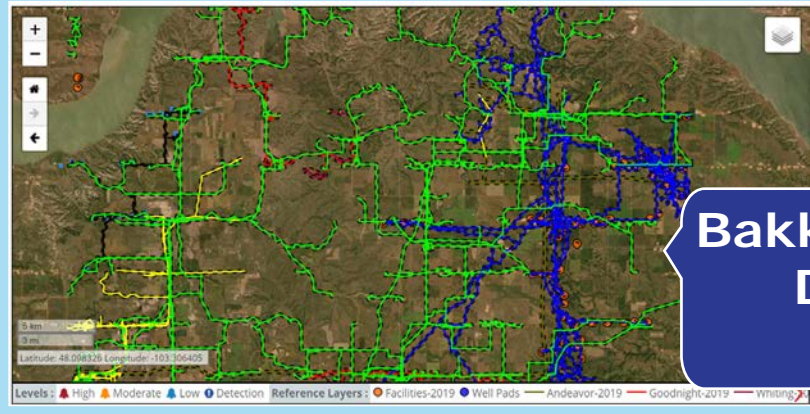
Paddling or kiddie pools filled with liquid hydrocarbon and produced water



iPIPE Members - weekly over Bakken and Permian Basins,



Permian,
Texas and
New Mexico



Bakken, North
Dakota



Gas Leak

Alert Details

Comment Photo

ID: 5188 Date: Jul 8, 2019 Status: Resolved Level: Detection Alert Type: Hydrocarbon

Map Properties Comments Photos

Cancel Alert Synchronized Toggle Marker

July 8, 2019 July 8, 2019

Gas Leak from Permian part of iPIPE

Reference Layers: 300ft Buffer, GeoNight, 2019, DCP, 2019, CINECK, 2019

Gas Leak

Alert Details

ID: 6062 Date: Jul 29, 2019 Status: Resolved Level: Detection Alert Type: Hydrocarbon

Map Properties Comments Photos

Cancel Alert Synchronized Toggle Marker Display Opacity

Jul 21, 2019 Jul 29, 2019

Reference Layers: 300ft Buffer Goodnight-2019 DCP-2019 ONEOK-2019

Gas Leak belonging to DCP Midstream

Gas Leak

Alert Details [+ Comments](#) [+ Photos](#) [X](#)

ID: 5542 Date: Aug 20, 2019 Status: Resolved Level: Detection Alert Type: Hydrocarbon

Map Properties Comments Photos

Center Alert Synchronized Toggle Marker [+ Photos](#) [+ Comments](#)

Aug 11, 2019 Aug 20, 2019

20 m 20 m

Legend: Satelystic Image Timestamp (UTC): 2019-08-11T09:04:42, 0 (Sat) Legend: Satelystic Image Timestamp (UTC): 2019-08-20T17:58:23, 0 (Sat)

Reference Layers: 300ft Buffer Goodnight-2019 DCP-2019 ONEOK-2019

Gas Leak over Permian part of iPIPE

Satelytics Early Detection and Alerts saving Millions of \$'s USD

The screenshot displays the Satelytics web application interface. On the left, a sidebar contains navigation icons. The main content area is titled "Alerts (1)" and shows a detailed view of a "Hydrocarbon" alert detected on June 6, 2019. The alert details include:

- Organization: DCP Midstream
- Status: Active
- Latitude: 32.115917, Longitude: -102.273687
- Created: Jun 5, 2019, Modified: Jun 14, 2019

The "Notes" section contains the following information:

- Comment: DCP leak on the S-2 DT area in waiting for repairs (Updates/Status=Active)
- Jun 14, 2019 12:47PM - Toddie Beams
- Comment: Field Operator going to verify (Updates/Status=Active)
- Jun 12, 2019 1:57PM - Dylan Payne
- Comment: (Updates/Status=Active)
- Jun 10, 2019 1:48PM - Carly Beck

The main map area shows a satellite view of a field with a red circular alert marker. A callout box on the right side of the map contains the following text:

Leak that would have cost \$2 million USD to clean up.

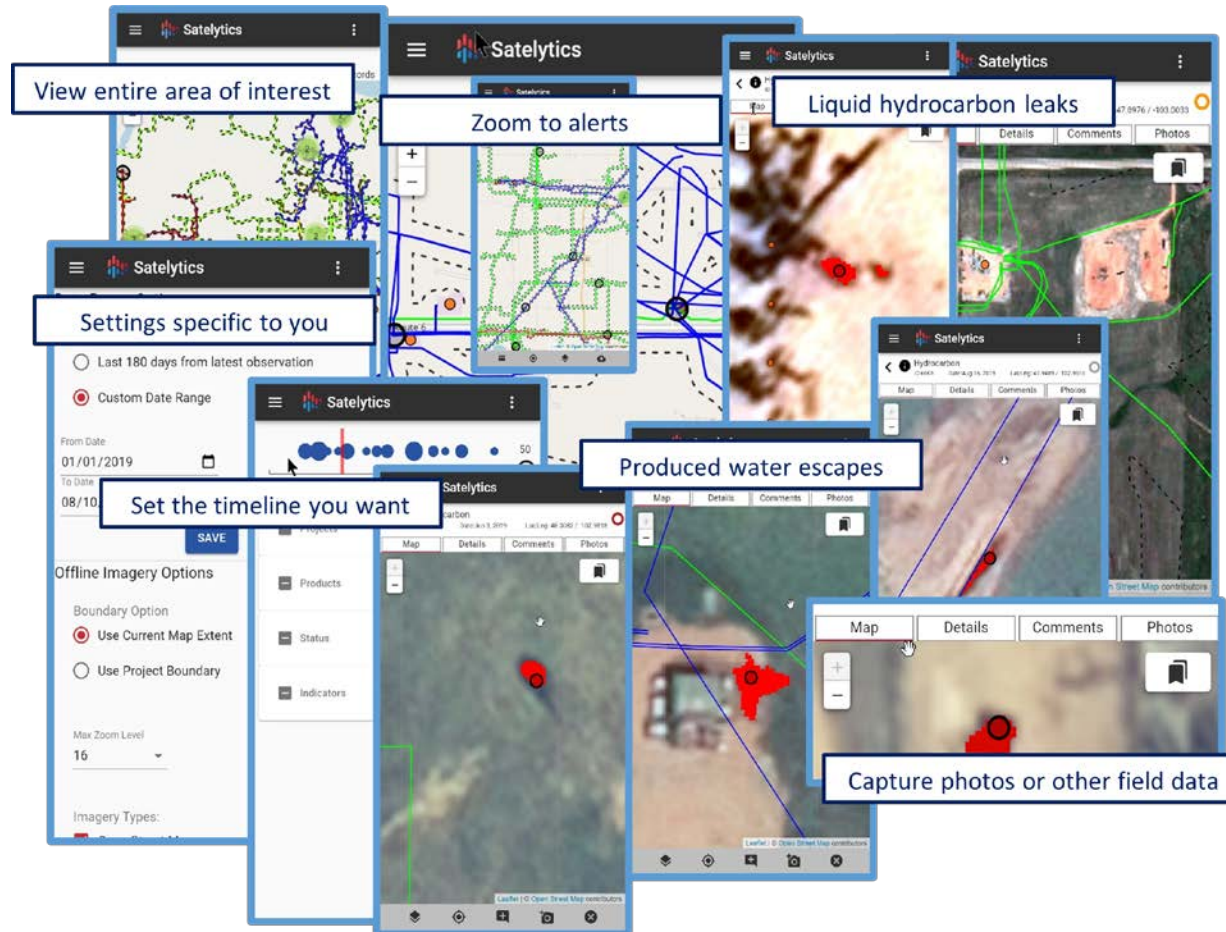
Satelytics detected it early resulting in a cost of less than \$40,000 USD

The interface also includes a search bar, filters, and a legend at the bottom of the map area.

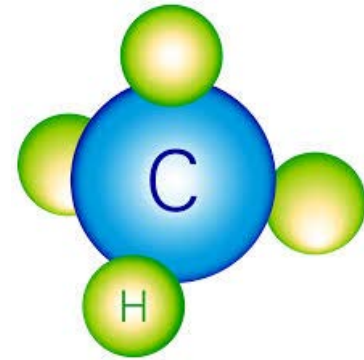
Satelytics – run all the algorithms at the same time for varying business challenges



Satelytics for the “non-connected world”

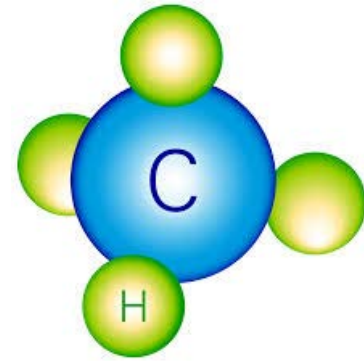


Observations, Market Challenges, Obstacles, and Vision...



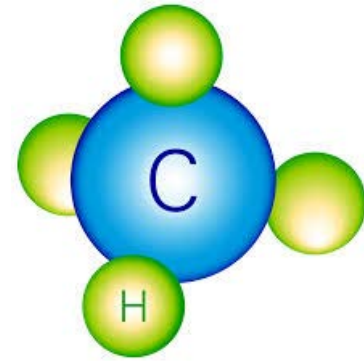
- (i) Methane is one of our toughest challenges 18 months to develop
- (ii) Host of challenges one set of data – economies to the return on investment – theory \$100 divided by 5
- (iii) Prescription versus good practice, innovation, and real results
- (iv) Pathway to regulatory body acceptance – adopt as an equivalency or better
- (v) North Dakota – iPIPE, Lynn Helms Director of DMR and Governor Burgum advocates – even tax credits
- (vi) Federal challenge – AWP alternative work plans – possible?
- (vii) Scale – data delivery probability – conflicting contractual challenges – US Govt versus commercial use
- (viii) Practical reasons dictate – pipeline satellite, facilities could be more flexible
- (ix) Data cost – ingredient up to 86% of project cost

Observations, Market Challenges, Obstacles, and Vision...



- (i) Satellite provider charges three times the cost for SWIR, versus other data
- (ii) IPIPE extension the Permian, data sharing cost principle – refreshing
- (iii) June 2020 three-source data sets trialing – Fixed wing (hyperspectral), Satellite, and Drone – data fusion
- (iv) Bakken Basin weekly monitoring launching in 2020 – objective costs to similar to aerial operations...
- (v) Basin monitoring offering solutions for other challenges, eventually including methane
- (vi) Data source to accommodate the entire need for GHG reduction programs, CO2 and Gas speciation
- (vii) Current providers moving rapid pace – Airbus – HAPS and willingness to load new sensors
- (viii) Stratellites – operating in the stratosphere where different set of rules compared to earth or space
- (ix) Indian Government launching a midwave infrared capable satellite – one example, gas speciation

Observations, Market Challenges, Obstacles, and Vision...



- (i) Early adopters are the necessary visionaries, essential for ground-truthing and beyond
- (ii) Satelytics and BP conducted METEC project to gain industry recognition
- (iii) Resolution coarser than 3.5 pixels per meter square simply does not work... Specificity
- (iv) Bad actors playing both sides of the fence - paints all with the same accusation – “Major emitters”
- (v) Sub pixel analysis – just not scientifically possible
- (vi) 20 million synthetic data sets
- (vii) Critical data that influences quantification - wind, wind velocity, and relative humidity
- (viii) Flow and Flux rates working alongside early adopting customers is the here and now!
- (ix) Flaring – request from some of our current iPIPE participants

Our Customers and Partners



