



The Reality Capture Playbook

Oil & Gas Edition

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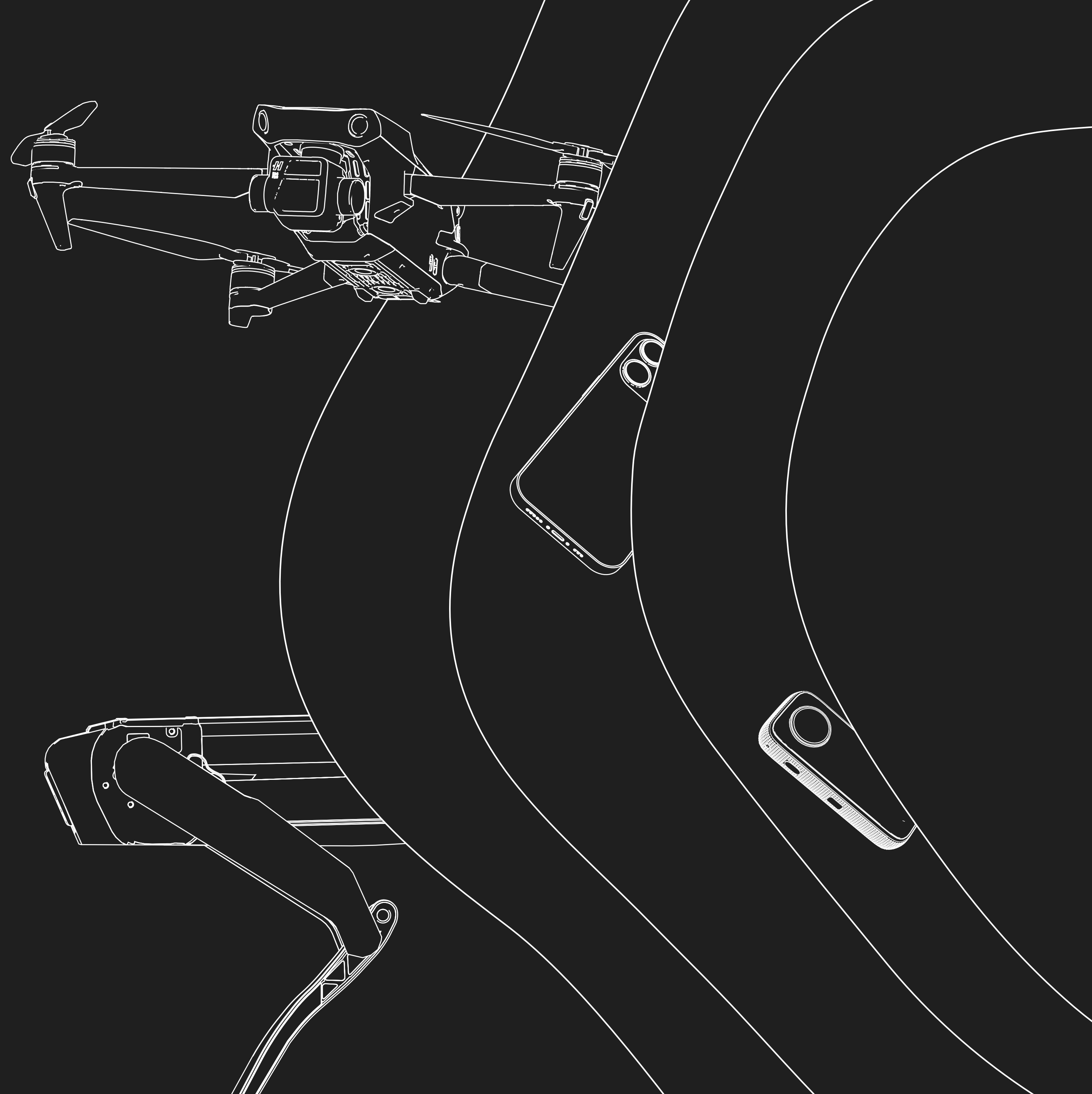
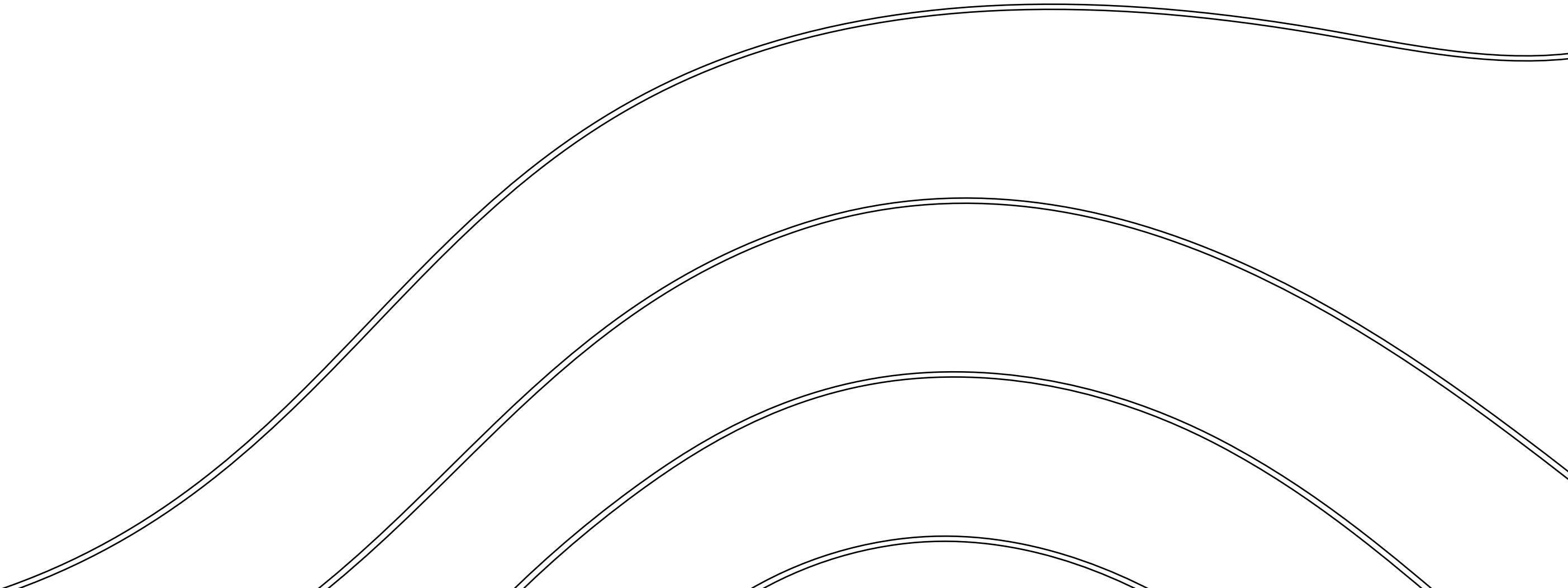




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What is reality capture?

Reality capture is the process of digitally documenting your facilities and assets and creating 2D or 3D representations of them. This enables you to:

- Keep employees out of hazardous environments
- Reduce the cost of surveying, inspections and construction
- Improve visibility of remote sites
- Monitor and document asset health
- Enable predictive maintenance and reduce downtime
- Minimize risk and improve regulatory compliance

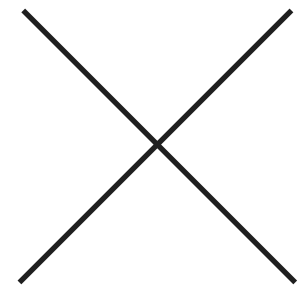
Reality capture can be achieved using mobile devices, 360 cameras, drones and even ground robots. This data can be uploaded to DroneDeploy to extract intelligent insights including measurements, thermal data, detailed reports and more.

Our vision of reality capture

We strive to make your workflows:

- **Unified:** All of your images, data and insights in one platform.
- **Automated:** Drones and robots capture data automatically.
- **Intelligent:** Your data is transformed into valuable insights with AI.





How to use this playbook

Overview

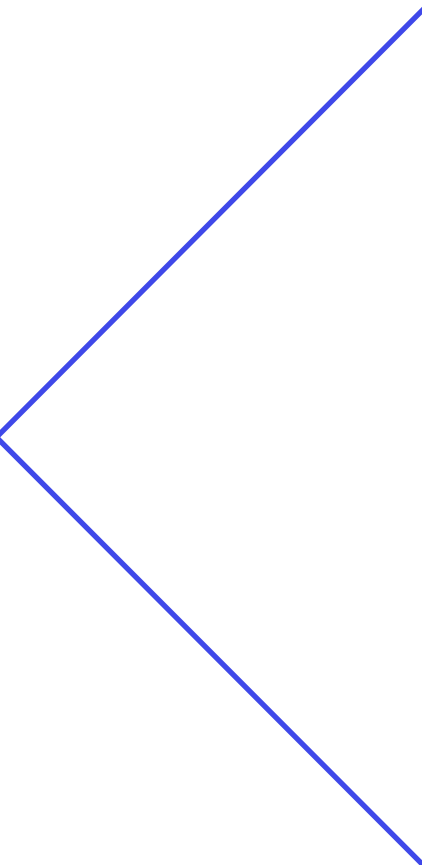
DroneDeploy is a comprehensive reality capture platform that allows you to capture physical environments from every angle with a drone, robot, 360 camera or smartphone, creating up-to-date digital replicas of your sites and assets.

This Playbook will walk you through reality capture approaches throughout the oil and gas lifecycle, and provide inspiration with unique workflows and use cases that have been used by our customers.

Reality capture solutions across your asset lifecycle

In this section, you'll learn how DroneDeploy can be used to gain visibility and inform operations at every stage of the oil and gas lifecycle – from exploration, planning, construction, operations and maintenance through to asset succession planning, conservation and reclamation.

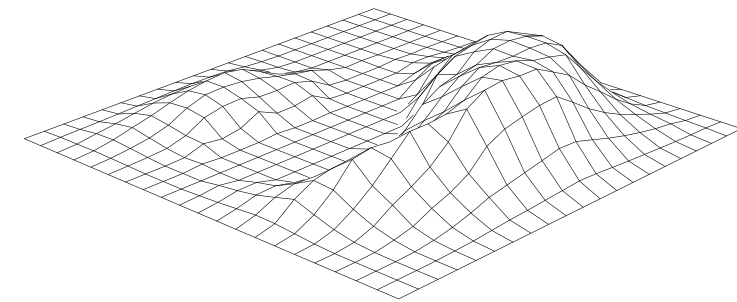
Through accurate and automated reality capture, you'll gain full visibility into your sites and assets – saving significant time and costs, improving worker safety and minimizing operational downtime.



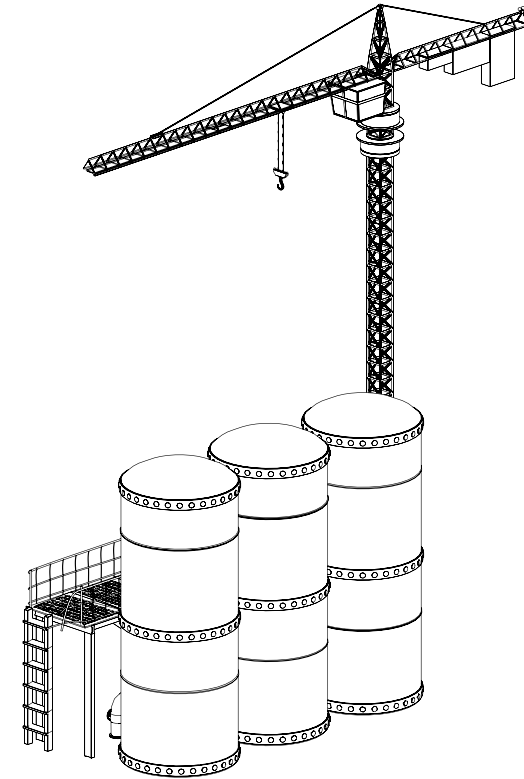


Phases of the asset lifecycle

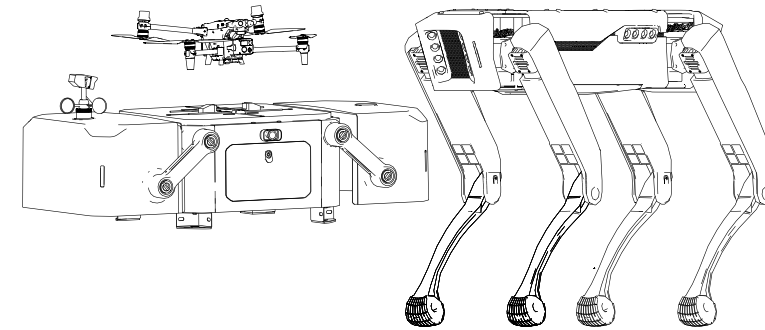
Maximize efficiency across the oil and gas value chain.



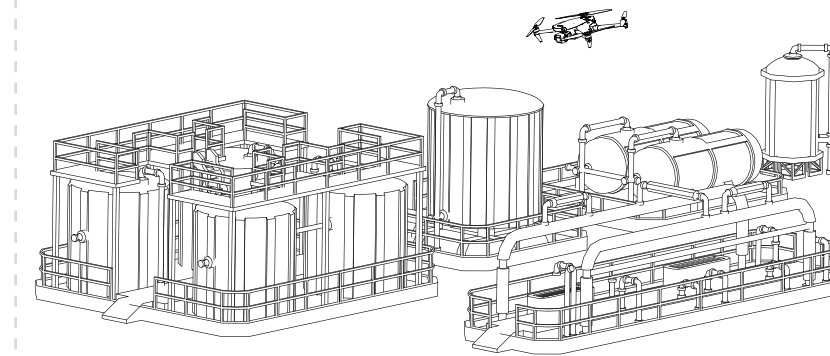
**Exploration
and planning**



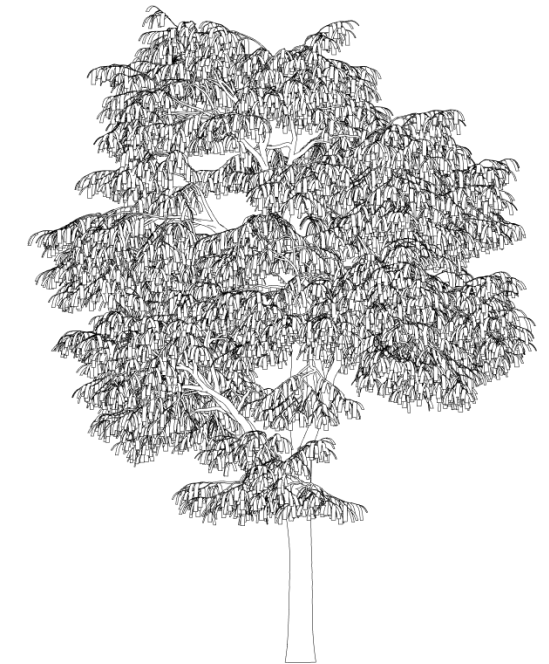
**Permitting
and construction**



**Operations
and maintenance**



**Asset succession
planning**



**Conservation
and reclamation**



Full visibility across your asset lifecycle

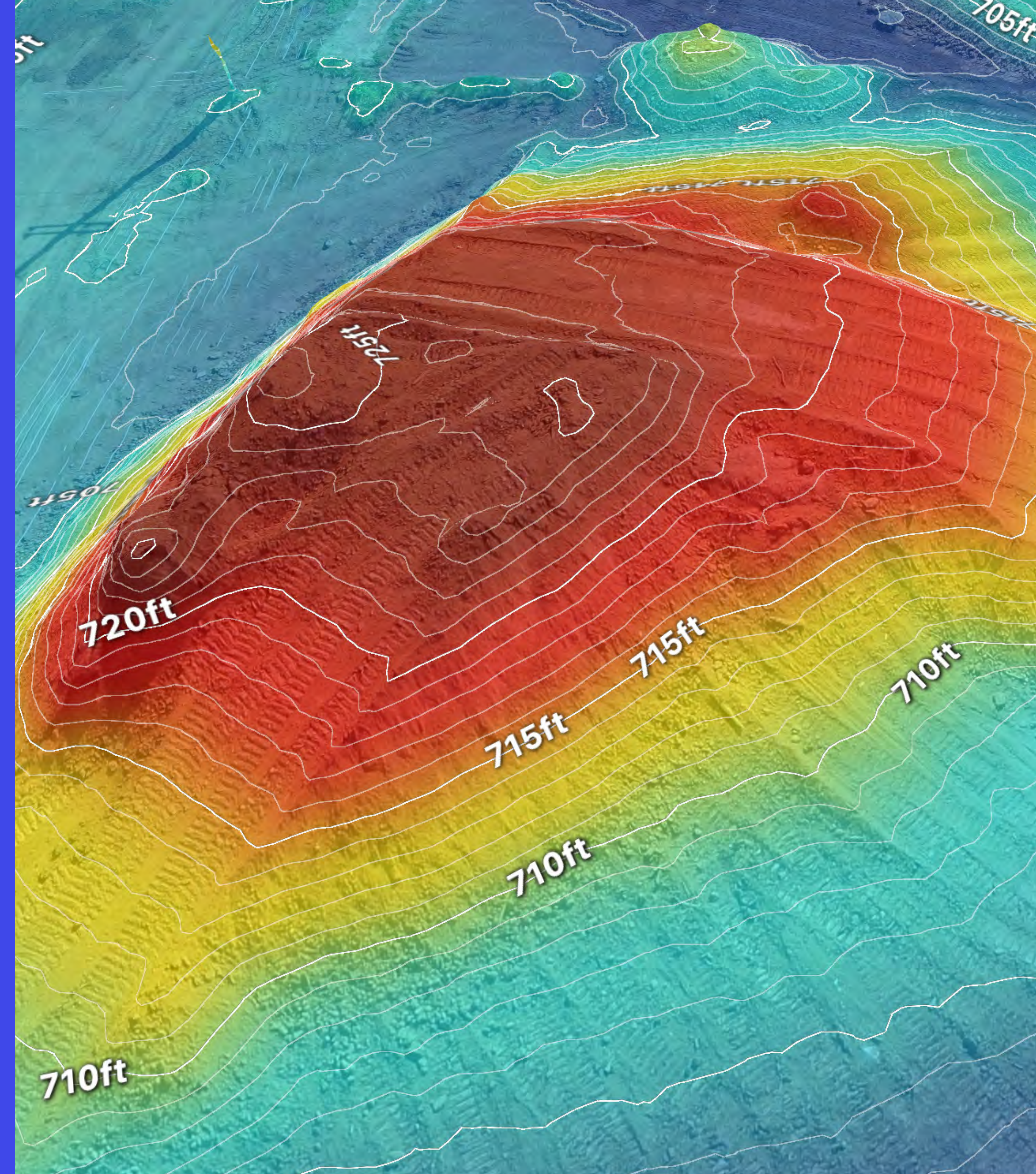


Exploration and planning

During this phase, you need to obtain high-quality and accurate maps of large areas. You must also ensure effective communication between a wide variety of teams and departments, often in multiple locations.

Solving with reality capture

- Create high-quality maps and elevation models
- Export and use for location CAD models
- Collect all facility data in one place
- Use high-res 3D photogrammetry engine for accurate geological modeling and civil designs





High-accuracy mapping

The problem

It's crucial that you obtain high accuracy maps of large areas, whether planning for construction or performing site maintenance. However, traditional methods of surveying are costly and time-consuming.

The solution

DroneDeploy offers high-accuracy mapping using ground control points (GCPs), real-time kinematic positioning (RTK) and post processed kinematic (PPK) options. Once captured, send TIFF and CAD exports to design software.

Automate site fly overs using DroneDeploy's flight planning software. Launch repeatable flight plans over time to get a full picture of site conditions and speed up the entire surveying process.

The value

- High accuracy maps completed in days, not weeks
- Reduce number of people on site and improve safety
- Cut training and management overheads
- Direct cost reduction on third party surveying





Initial site measurements

The problem

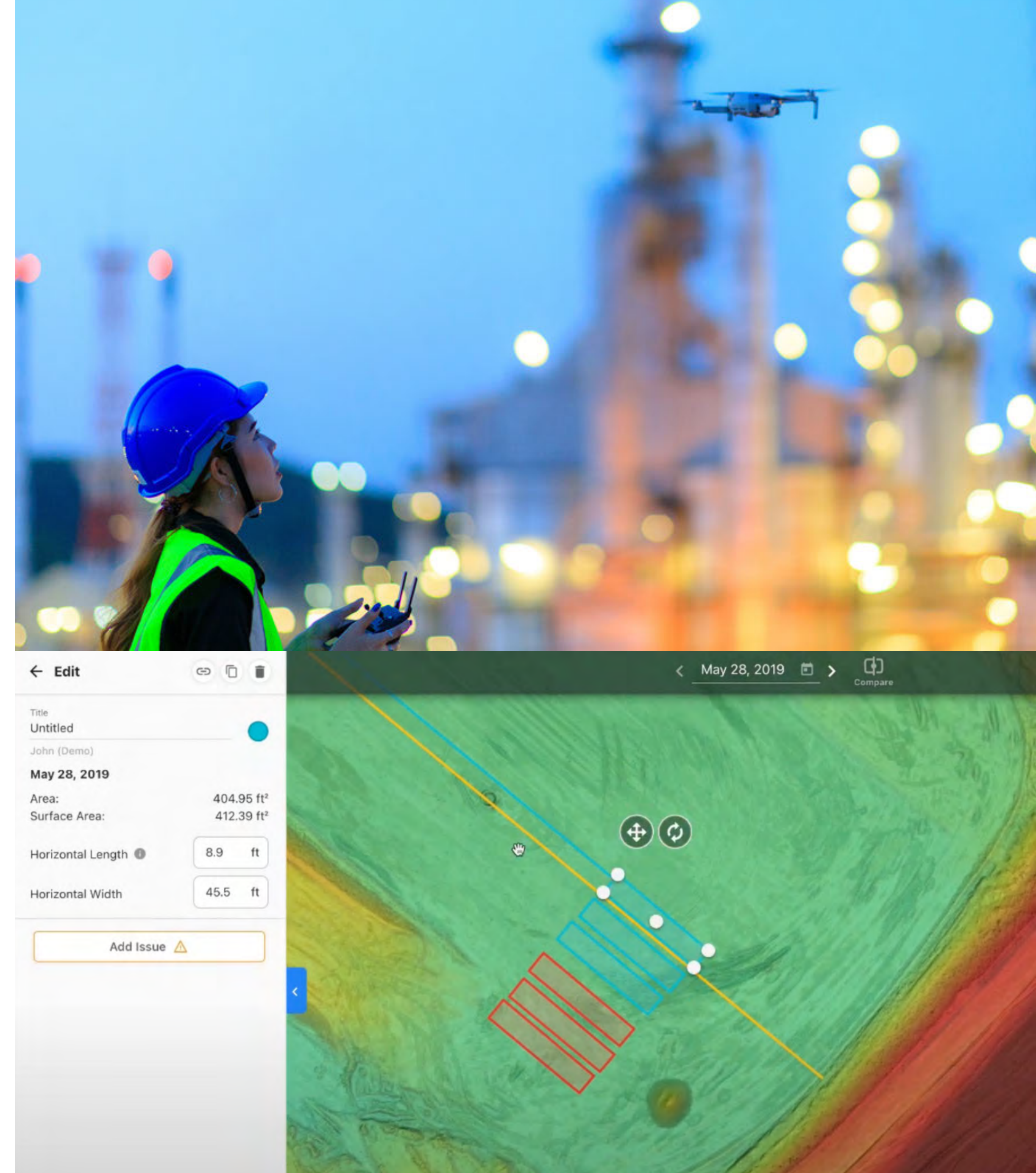
Traditional ground-based measurements performed by workers are time consuming, difficult to repeat and cover large areas that are challenging to map accurately. Additionally, measurements are often taken in hazardous environments, putting workers at risk.

The solution

With DroneDeploy, you can use drones to autonomously capture data on on oil and gas leases, wellsite pads and other locations from the air. Once data is collected and uploaded to DroneDeploy, you can automatically calculate elevation and volumetric data. These accurate measurements can be used for development plans.

The value

- Expedite time to begin work (days vs. weeks)
- Reduce the cost of manual measurements
- Make your measurement process repeatable
- Improve operational safety





Geological data from outcrops

The problem

Geological exploration requires high-quality information to predict where rocks and fluids are in the subsurface. Having accurate geological models is extremely important for the whole site development.

The solution

Drones are a cost-effective way of collecting data in difficult-to-reach areas. DroneDeploy creates high-res 3D models so you can correlate bedding and fault data and create synthetic virtual logs validated by real outcrops.

The value

- Outcrop models act as an important data reference when questions and new techniques arise
- Synthetic digital logs provide analogous data to compare with well-log patterns in subsurface
- Structurally oriented 3D models enable a virtual field experience with fewer logistical and safety challenges



3D modeling formation outcrops in DroneDeploy

DroneDeploy's photogrammetry engine lets you create high resolution 3D models of formation outcrops. Use 3D viewer and 3D annotation tools to outline deposition layers and describe faults to incorporate into your geological modeling.



Permitting and construction

Surveying land for O&G development takes significant time and effort. The old way of construction tracking and project management is more complicated than it needs to be, and site visits can be costly.

Solving with reality capture

- Expedite the permitting process with consolidated reporting
- Minimize site visits with remote operations
- Use automation to streamline processes
- Reduce rework and non-productive time
- Improve communication between teams
- Avoid going over time and budget





Logistics planning

The problem

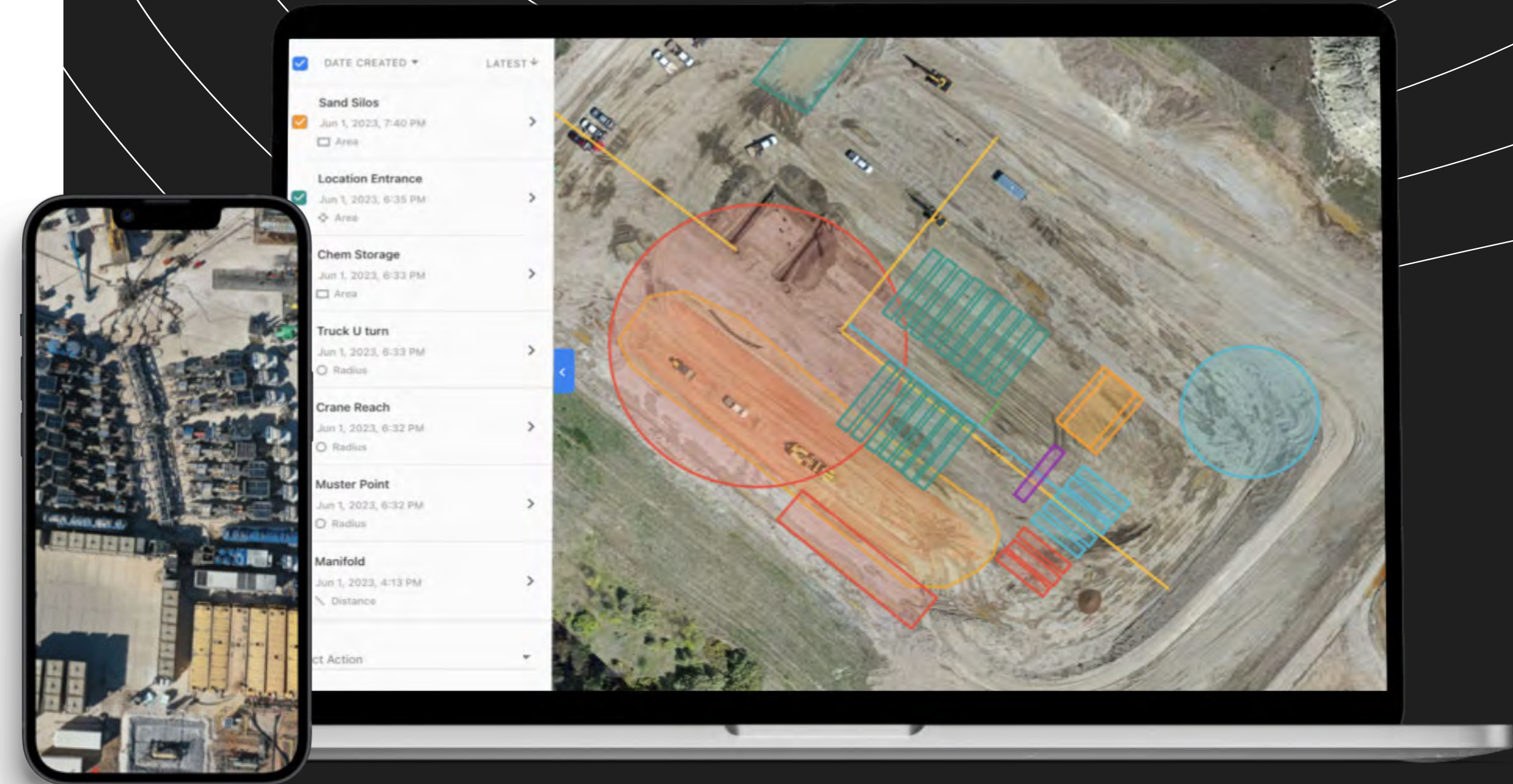
Serious issues can arise if location planning is inadequate for drilling, side tracking, work overs, equipment installation and retrofitting. Costly rework may be required to rectify issues.

The solution

Use DroneDeploy's automated drone flights to create highly-detailed maps of your site in days versus weeks. Then use these maps to record measurements and annotations, create equipment layouts, measure equipment placing and plan for safety areas – managing all your logistical planning in one platform.

The value

- Avoid critical errors in wellsite execution planning
- Reduce rework and speed up completion cycles
- Eliminate unnecessary trips to your site
- Improve site safety through increased site visibility
- Full documentation for easier compliance audits



Use Case

Creating planning layouts

Use annotation tools to create layouts for completions or more permanent operations.

- With predefined dimensions, rotation, and the ability to copy and paste annotations, you can create a site layout seamlessly
- Leverage annotation colors and titles to convey information across teams
- Ensure effective placement of equipment to improve logistics workflows

This can all be completed within DroneDeploy, without the need for any CAD software.

[Try it live in-app](#)



Sample use cases

Stockpile planning

What is it?

Use DroneDeploy to take accurate measurements, helping you plan berm volume and placements and create space for spill and leakage protection.

The value

- Quickly plan berm space and placements
- Reduce human error in measurements
- Refer to a single source of truth
- Ensure berm fits original designs

Marking locations

What is it?

Use DroneDeploy's annotation tools to mark locations and develop accurate plans for construction. Plan ahead for safety areas at your facility.

The value

- Ensures locations are accurate
- All teams work off the same digital plans
- Helps your facility meet pre-build regulations



Stockpile AI in DroneDeploy

DroneDeploy's Stockpile AI helps you find and measure the stockpile volumes on your map and copy volume measurement annotations from one map to another to track stockpile change and inventory.





Volume measurement

The problem

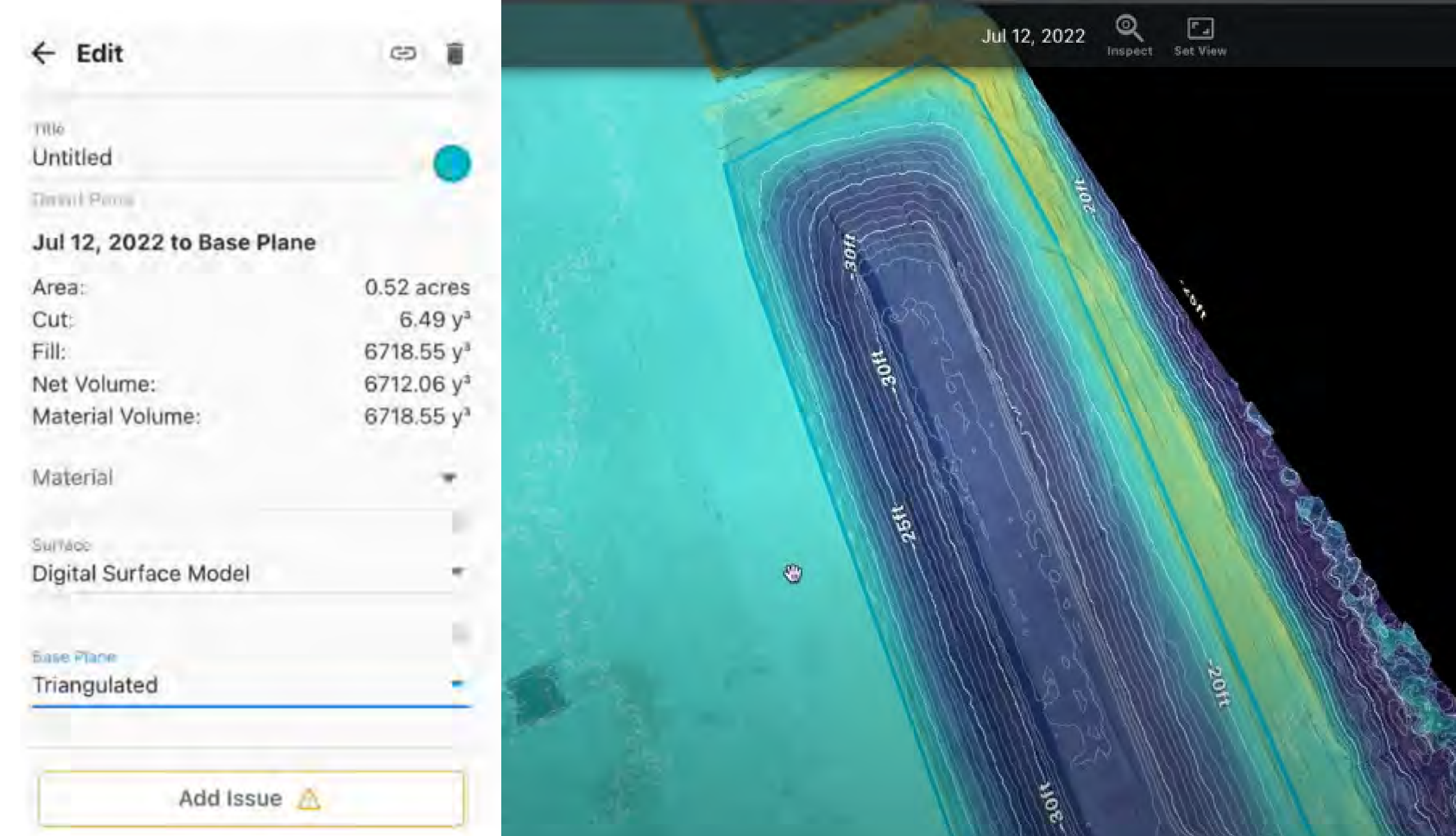
Getting accurate volume measurements is costly and time consuming when using manual methods. Traditional methods can also pose safety risks to team members.

The solution

With DroneDeploy, you can quickly perform accurate earthworks measurements – including volume measurements for removal, pit volumes for landfill and volumetric stockpile analysis. This data can all be captured in hours instead of weeks.

The value

- Replace third-party surveyors
- Survey land in hours rather than weeks
- Reduce the amount of people needed on site
- All of your stockpile reporting in one place

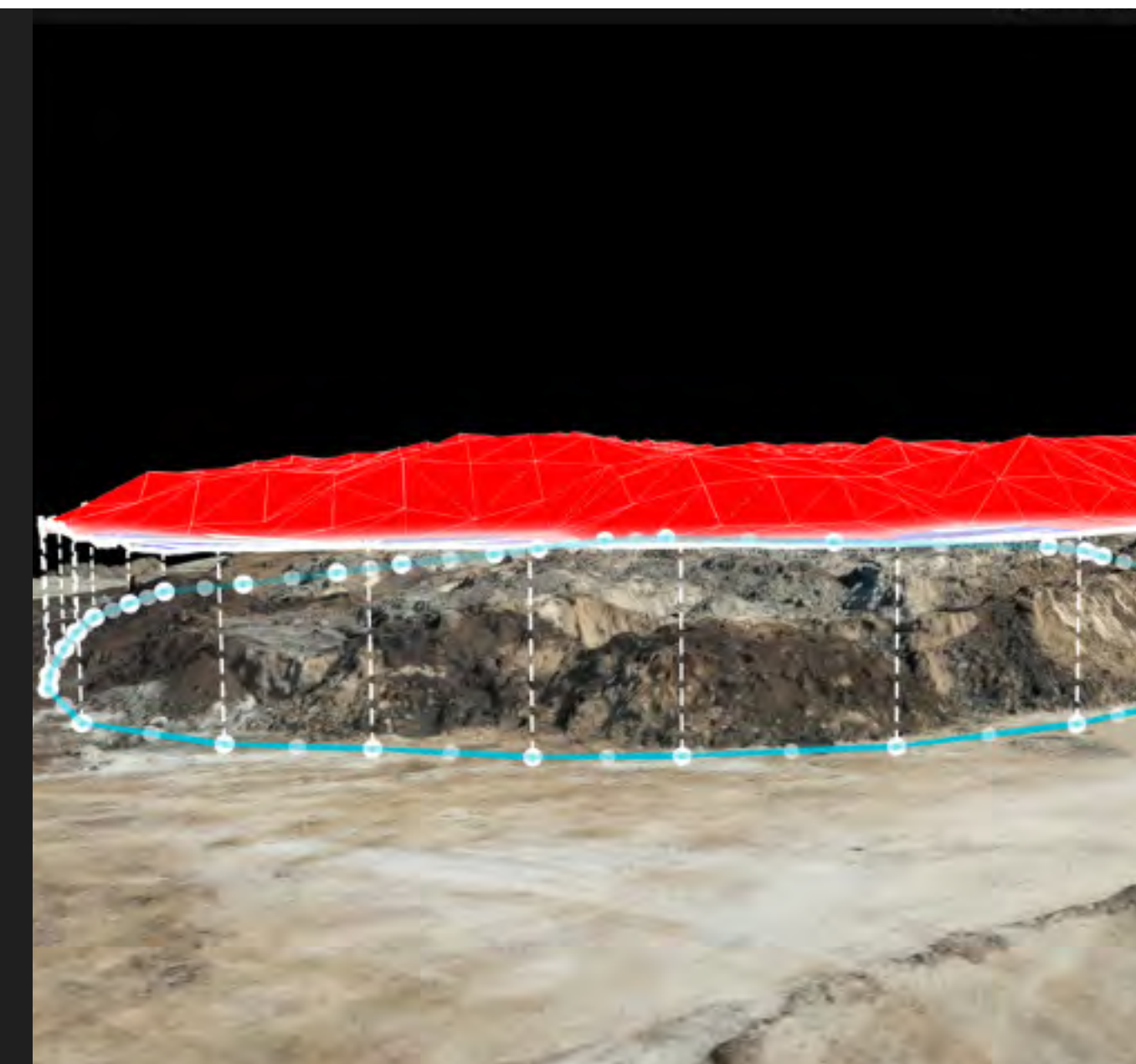


Use case

Measuring material for removal

In DroneDeploy, you can measure stockpile volumes fast using drone flights, without the need of a third-party surveyor.

Generate accurate stockpile reports quickly and capture essential metrics such as material density and cost.





“

Traditional surveys take weeks to complete and only provide linear point data. With DroneDeploy's photogrammetry mapping, we get elevation data to create plans for equipment placements and pump sizes for fluid pump selection. This data is very accurate and creates quick turnaround times for design proposals, allowing us to make faster decisions.

”

Maurillo Espinoza, UAS Program Manager | California Resources Corporation



Operations and maintenance

Facility inspections are time-consuming, challenging and often dangerous. Data stays siloed, making it hard to get a complete picture of your facility's assets for efficient O&M.

Solving with reality capture

- Automate maintenance inspections
- Reduce rework and non-productive time
- Improve safety by automating inspections
- Track annotations and comments across multiple functions
- Use AI and machine learning to create predictive maintenance workflows
- Bring data into multiple platforms, including GIS and asset management systems
- Build intelligent, predictive processes
- Create a digital trail of the work performed





Remote operations

The problem

Facilities may be spread across hundreds or thousands of locations in remote areas, making them hard to manage at once. Poor documentation causes teams to work on outdated info, leading to mistakes and rework.

The solution

With DroneDeploy, you can instantly view your facilities from anywhere using drones and robots. Robots can be left on-site to perform on-demand inspections and investigate issues. Automated drone flights and drone in a box solutions can be used to document hard to reach areas. Maintain a responsive, up-to-date 3D representation of oil and gas facilities without setting foot on-site.

The value

- Reduce trips to remote facilities
- Catch mistakes early to avoid costly repairs
- Reduce the need for workers in hazardous areas
- Improve documentation of facilities





HSE training

The problem

Onsite HSE training is valuable but can have inconsistencies, high expenditures and put employees and contractors in potentially hazardous environments.

The solution

DroneDeploy allows you to combine aerial, ground and other data from a variety of assets to create virtual replicas of sites. As a result, your team can train on interactive and accurate models, reducing safety risks.

The value

- Significantly reduce training expenses
- Employees and contractors can participate in remote training from different locations and time zones
- Train large numbers of workers simultaneously and scale safety education efforts
- Remote training is more consistent and standardized
- Avoid putting trainees in risky environments





Piping and instrumentation diagram (P&ID) verification

The problem

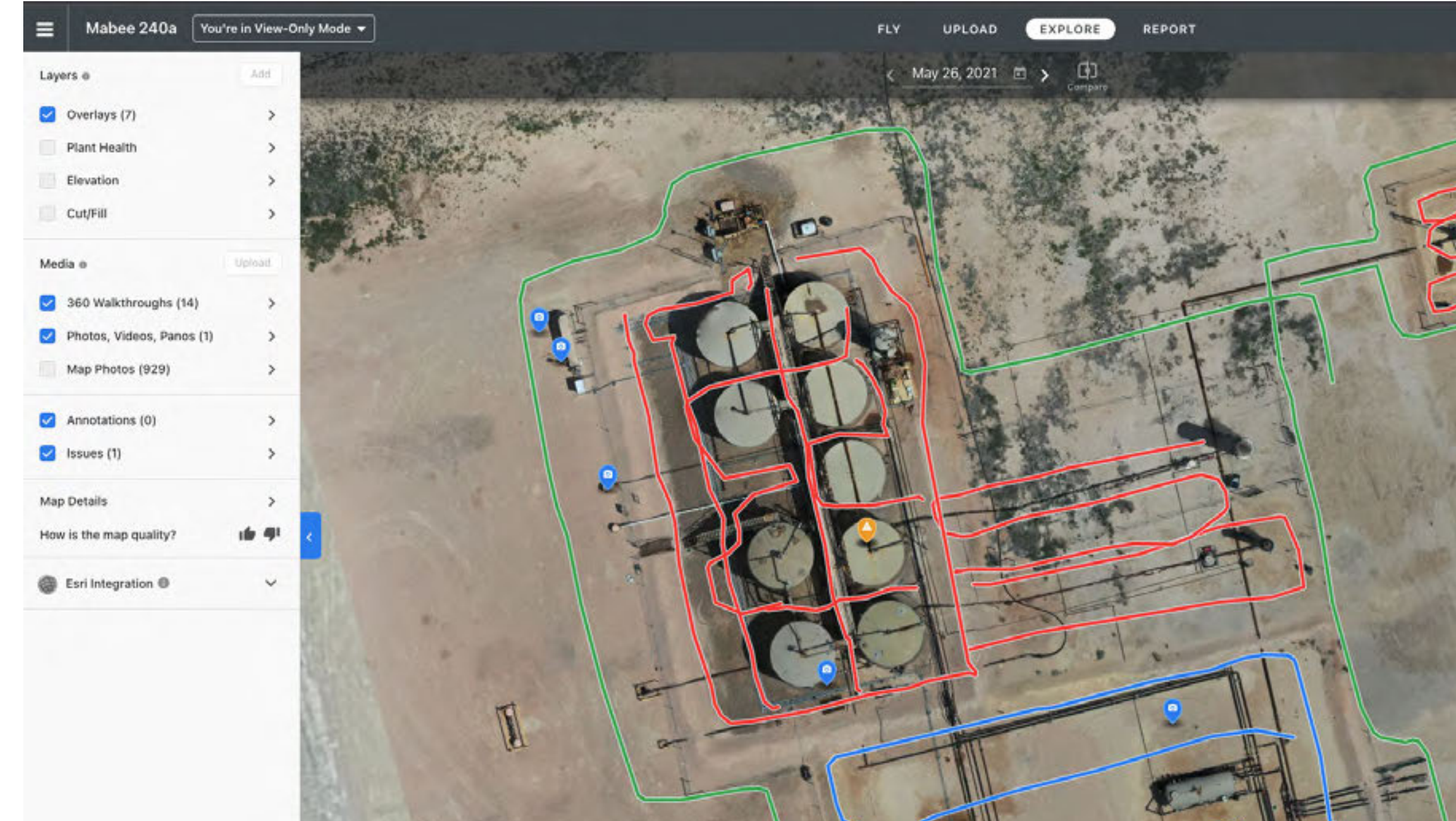
Physical piping, flanges, valves and P&IDs are often outdated or do not match the schematics. This confusion may lead to inadequate planning, extended maintenance times, rework and miscommunication.

The solution

Use DroneDeploy to create detailed maps and 360 walkthroughs for a visual representation of the P&ID without being at the field. This allows you to remotely verify P&ID accuracy, valve types and redline accuracy – helping operations relate the actual view to schematics.

The value

- Resolve issues when P&ID schematics are incorrect
- Use walkthroughs to close the loop in process hazard assessments instead of manual verification
- Catch inconsistencies and reduce risk of rework



“Having up to date imagery of a facility with walkthroughs has helped when as-built questions arise on our P&IDs and GIS. By being able to visit “virtually” we have saved drive time returning in person.”

John Julius, TechOps Coordinator | California Resources Corporation (CRC)





“

We deploy remote robots in O&G facilities, collect the data and push it to our cloud system or customer system to create dynamic digital twins of facilities.

Nasser Ghorbani, New Product Development Lead | SLB



Equipment and thermal inspections

The problem

Repairs of high pressure equipment, steam generators and boilers are often reactive due to late detection of issues. Equipment failures can interrupt operations and lead to costly repairs.

The solution

With DroneDeploy, you can automate thermal and radiometric inspections through mapping and photo reports captured with drones or robots. This allows you to launch proactive visual and thermal inspections from both the air and ground, so you can detect anomalies before pinholes, engine overheating or tank buildup escalates.

The value

- Plan and schedule proactive maintenance, before higher cost breakdown repairs occur
- Pinpoint problems and shorten maintenance cycles
- Perform more regular thermal and visual inspections
- Reduce equipment failures and production losses
- Reduce non-productive time
- Improve worker safety



Remote robotic inspections

The problem

Walking a facility to perform manual inspections is tedious and time-consuming, and can put workers in hazardous situations. Manual inspections are also prone to human error. Remote facilities can be difficult to access and site visits incur significant travel costs.

The solution

With DroneDeploy, you can send robots to walk your facility on a regular basis. Equip robots with customized payloads, including PTZ cameras and thermal sensors. Plan entirely automated robot missions and schedule these to repeat at fixed times, or send robots on ad-hoc remote inspections. Use robots to capture gauge readings or create 360 virtual walkthroughs of facilities.

The value

- Detect leaks or abnormal gauge readings
- Perform repeatable inspections of your site
- Confirm IoT or SCADA sensor readings onsite before sending out expensive personnel
- Reduce cost of manually inspecting sites
- Minimize the risk of human error
- Engineers can monitor multiple sites remotely





Sample use case

Asset-centric missions

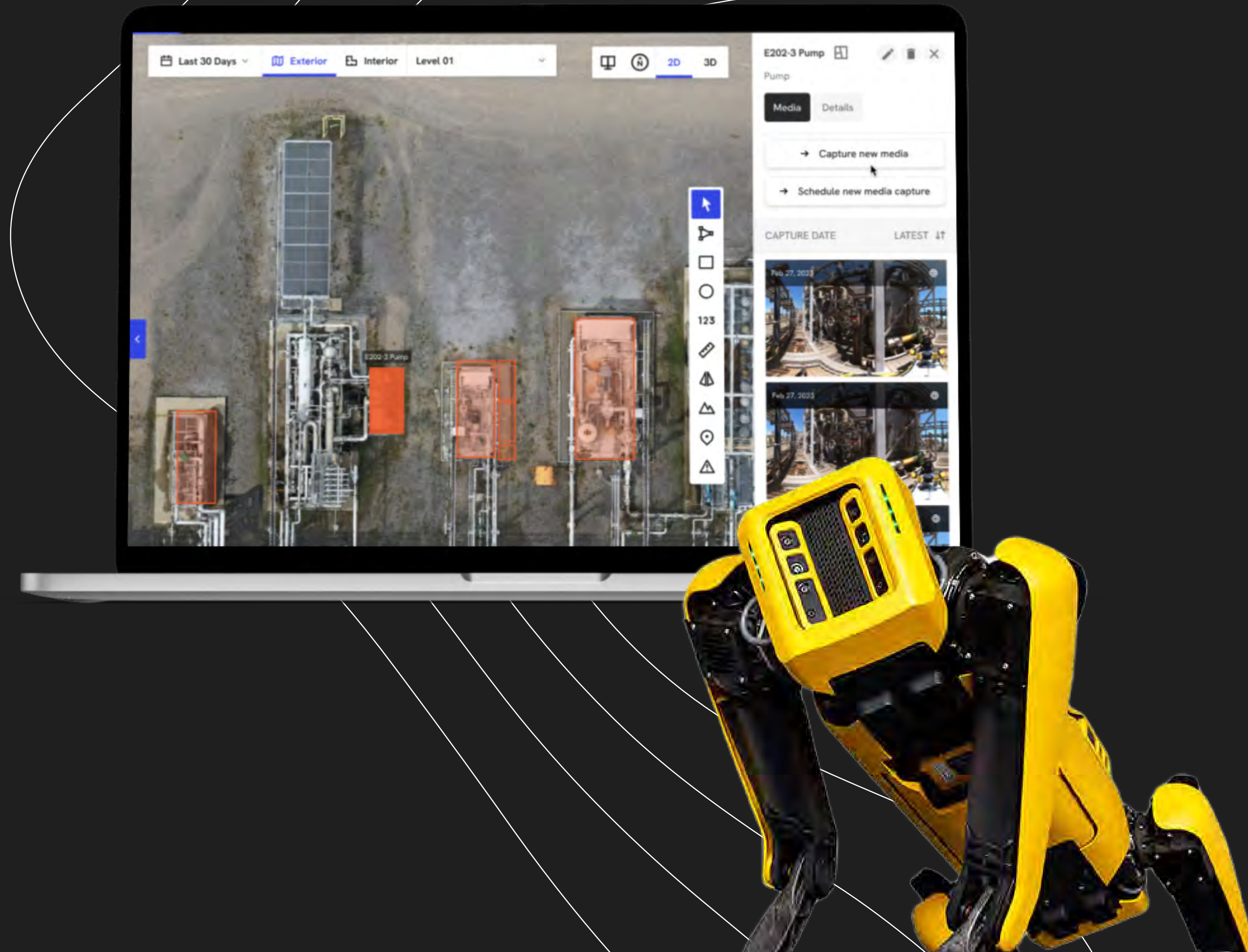
Asset-centric missions let you import a list of assets into DroneDeploy and automatically generate a robot mission, using the optimal route to inspect the assets.

What is it?

With DroneDeploy Automation, you can generate autonomous robot missions based on assets and points of interest using our powerful flow engine. DroneDeploy automatically generates a dynamic mission to efficiently inspect these assets, even across large sites.

The value

Inspecting thousands of assets across a large, remotely located facility requires high cost employees working long hours in hazardous conditions. By using robots for regular operator rounds, you can keep workers safe and out of hazardous areas. The robots carry multiple payloads and capture high value data with better accuracy and consistency.





Emissions monitoring

The problem

Oil and gas facilities are already hazardous areas, and gas leaks may not be detected by personnel on-site until the situation has become serious.

The solution

DroneDeploy lets you deploy autonomous ground robots and aerial drones to your facility, equipped with sensors that capture detailed thermal data. This data can be pulled into DroneDeploy to create geolocated heatmaps on top of your high-res drone imagery. Drones and robots with gas sensors can also be used to pinpoint exactly where a leak is located. Before sending in teams for repairs, robots can identify and assess the situation so they can be prepared.

The value

- Find small leaks before they become larger issues
- Automate your reporting on gas levels
- Adhere to compliance and regulatory requirements
- Keep your teams out of hazardous areas

Learn more about
methane detection:

[Play video](#)



Up-to-date digital twins

The problem

Many leading energy companies are using 2D digital replicas of sites; but these are often outdated and lack the benefits of 3D visualization.

The solution

Bring 3D mapping to your facility's digital twin with DroneDeploy. Our platform combines drone data from the air and LiDAR or 360 photos from the ground to create a full virtual replica of your site. Robots can walk your entire site autonomously, helping ensure your digital twins are up to date. You can also remotely monitor sites via your digital twin by using AI/ML to read analogue gauges and identify thermal anomalies in DroneDeploy.

The value

- Create high-res models with 3D photogrammetry
- Update your digital twins with live data captured and calculated by autonomous robots
- Remotely access your site and assets on a regular and repeatable basis

**Learn more about
building digital twins**

[Play video](#)





DJI Dock integration

The problem

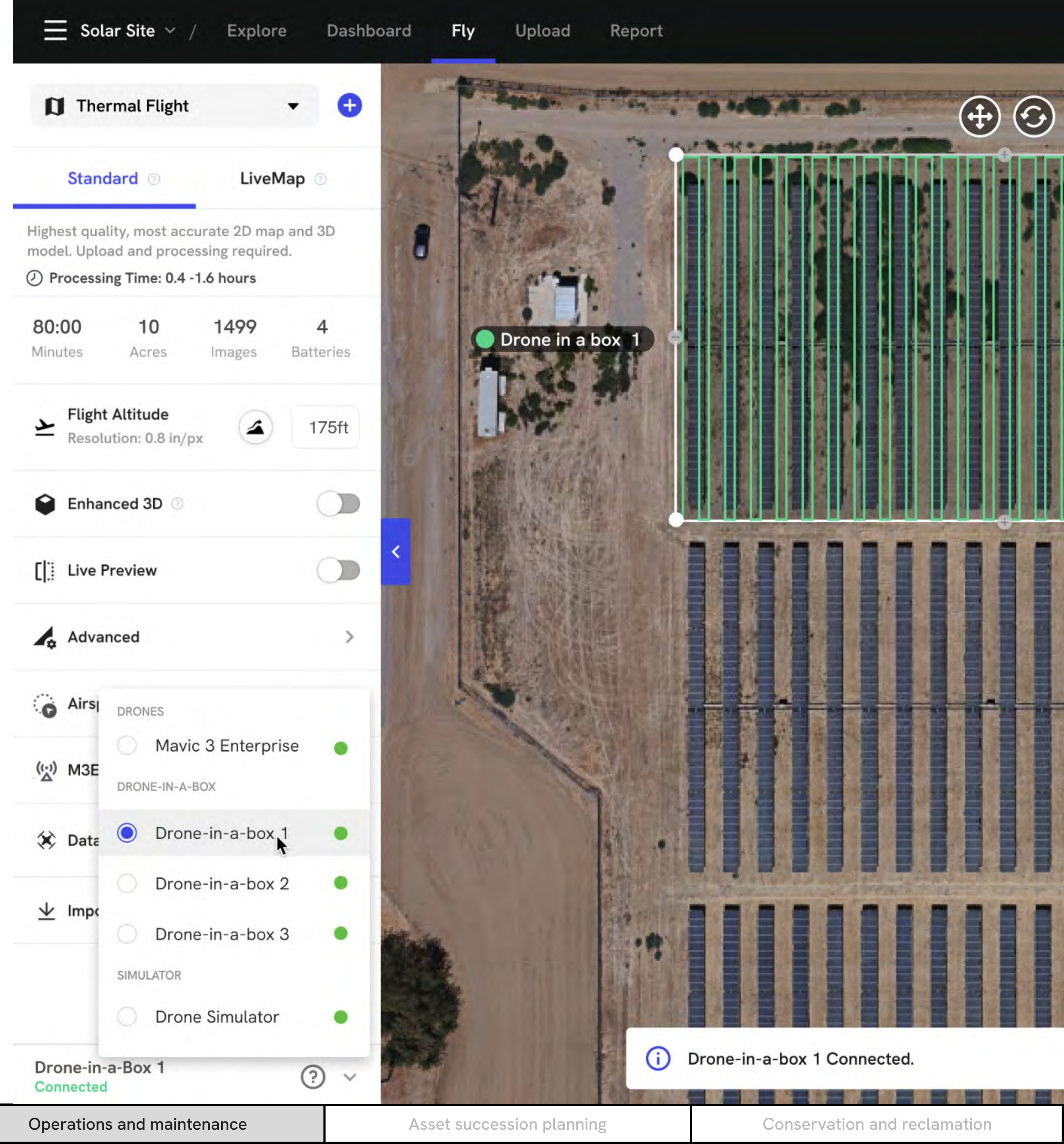
Many oil and gas facilities are moving towards unmanned operations to improve safety and efficiency, which requires new ways of performing routine inspections.

The solution

With DroneDeploy, you'll soon be able to remotely plan and trigger DJI Dock flights right from the interface. Once launched, all media captured will be automatically uploaded and processed in your DroneDeploy project for visualization, analysis and reporting.

The value

- Improve preventative maintenance by automating flights and capturing data more regularly
- Remove workers from hazardous environments
- Avoid costly scaffolding and people working at heights
- Automate equipment inspections (flares, wells, tanks, compressors, separators, etc) with RGB and thermal
- Detect methane emissions with TDLAS and OGI sensors





Seamless system integration

The problem

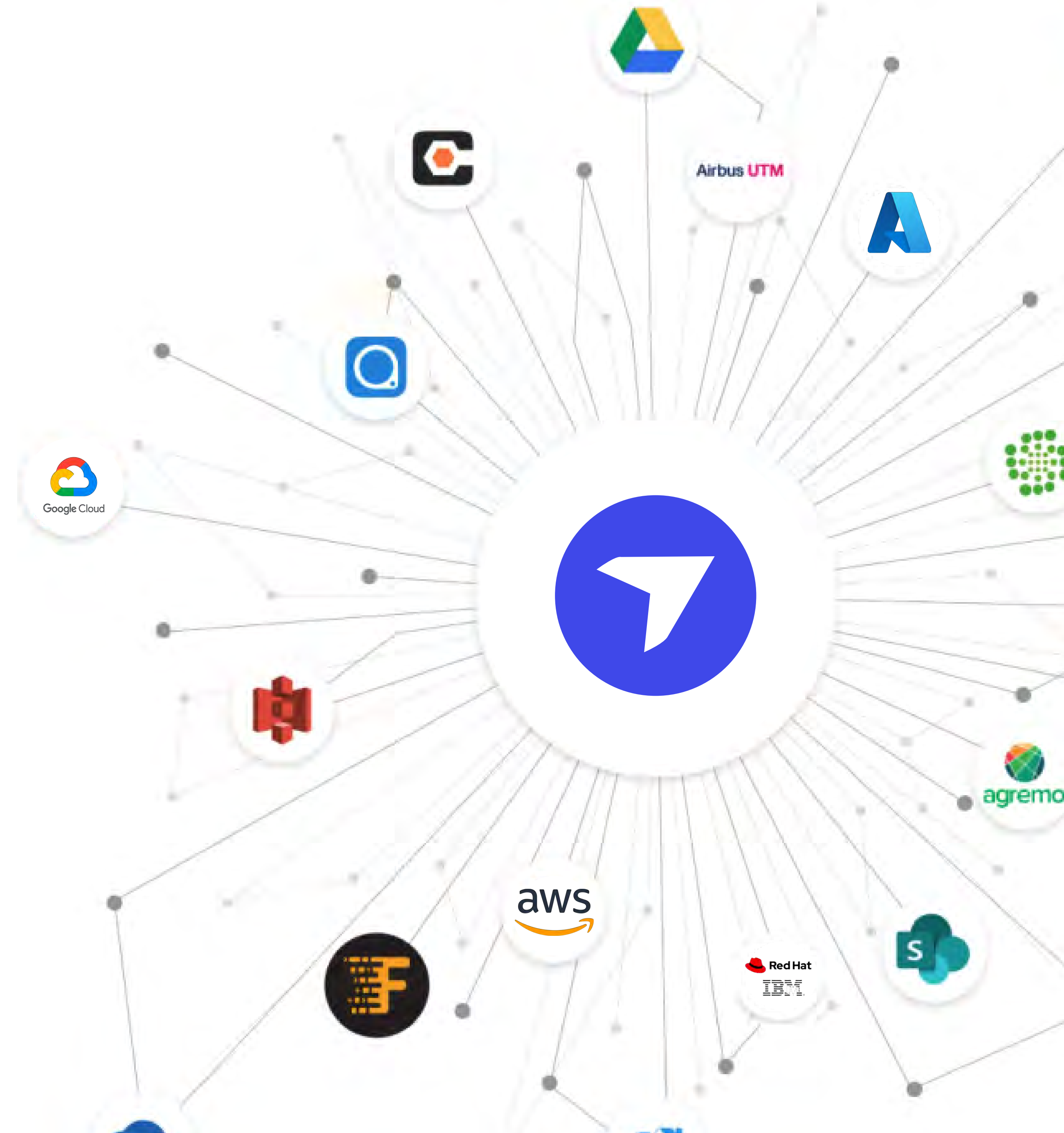
You have your own in-house or bespoke asset management system as a central source of truth. Any new platform needs to be integrated into your existing system and workflows.

The solution

DroneDeploy integrates seamlessly with any asset management system via APIs. For example, the media, metadata and asset IDs captured from a robotics walkthrough can be easily pushed to your existing workflows or systems.

The value

- Our unified platform slots seamlessly into current operations and workflows
- Create a central place for all of your data
- Minimize IT maintenance efforts and cost
- Make the most of your existing software investments
- Avoid retraining staff on entirely new systems





Esri ArcGIS integration

The problem

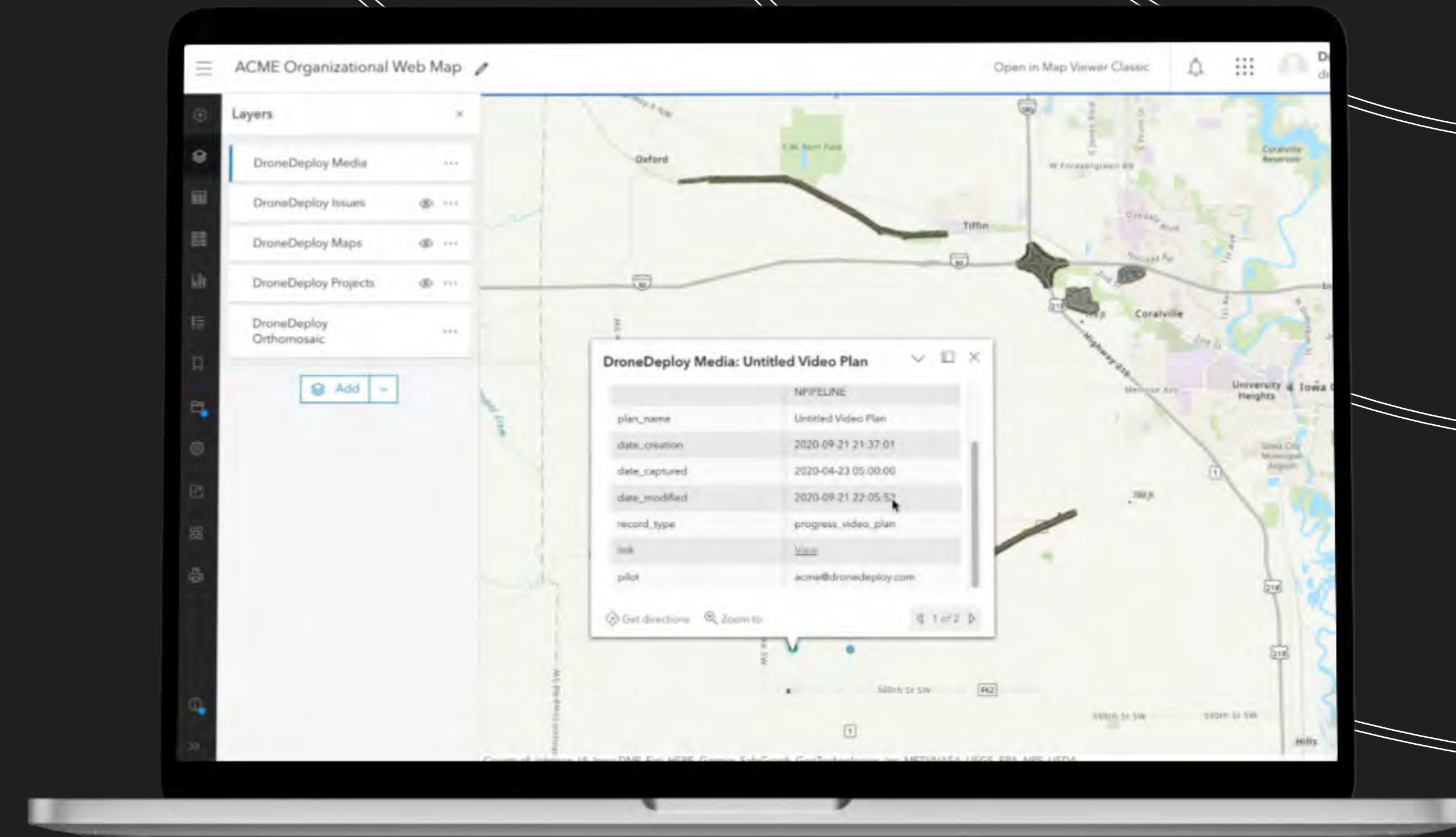
Many energy companies rely on Esri with geographically widespread assets. Keeping all asset data spatially referenced and interconnected is a key operational goal.

The solution

DroneDeploy offers a range of integrations with oil and gas software solutions including Esri, so you can maximize the value of your data. Other integrations include Data Lake and AMS. Harness your data across multiple platforms.

The value

- Harness the intelligence you're already using
- Push scheduling data seamlessly into existing systems
- Avoid having to retrain and rebuild processes



“ We use Esri ArcGIS as a ground source of truth for our geospatial assets. With DroneDeploy WMTS and WFS services all our drone imagery is automatically synced up to ArcGIS and always up to date. ”

Danny Allen, Geospatial Supervisor | ConocoPhillips.



Use case spotlight

Inspecting nuclear cooling towers

The problem

Inspecting a 600-foot concrete tower is dangerous, time-consuming and costly for ground teams.

The solution

DroneDeploy lets you capture the entire 600-foot concrete structure without putting teams at risk. The aerial data captured can be used to create a detailed 3D map of the tower, complete with native resolution.

The outcome

- Reduce time and cost of data collection
- Avoid the need for expensive scaffolding
- Cut inspection reporting from weeks to just 3-7 days
- Cut the average \$500K per inspection to a fraction of the cost
- Distribute reports to stakeholders within hours





Use case spotlight

Inspecting tanks

The problem

Teams need an efficient way to inspect and document tanks, and understand where they exist geospatially.

The solution

With DroneDeploy, you can create high-res 2D/3D models of your tanks and locations, enabling safe remote inspections. All data from asset imagery in DroneDeploy can be seamlessly integrated into downstream systems.

The outcome

- Quickly assess tank conditions without extensive scaffolding or rope access
- Significantly reduce chance of accidents and injuries
- Save labor costs due to fewer boots on the ground
- More regular inspections = early detection of issues
- Drastically reduce the time to finish tank inspections

[Try it live in-app](#)





Asset succession planning

Every asset reaches a point where it needs to be upgraded. You need a single source of truth for these changes. Accurate tracking is crucial for reducing cost and time to launch.

Solving with reality capture

- Easily adopt pads and processing facilities through the stages of asset succession (e.g. retrofitting processing equipment as associated with increased water cut, need for additional pumping equipment and produced water storage or re-injection)
- Use virtual twins to view asset history
- Get as-built 3D models
- Accurately measure and retrofit equipment
- Plan for any additional equipment required
- Document sites for operational transitions





Midstream facility modeling

The problem

Facilities are evolving and changing all the time and it is often costly and time consuming to stay up to date with these changes. Checking changes can expose your facility to human error and extra downtime.

The solution

Use DroneDeploy to create digital models of midstream facilities and track changes. Perform regular flights and walkthroughs to maintain updated aerial and ground maps of sites. Mark and track assets for upgrades and retrofits. Manage teams through annotations on your 3D facility models.

The value

- Reduce management and maintenance costs
- Improve communication and documentation
- Reduce the cost of regular inspections
- Improve efficiency between teams





Customer success spotlight

Keeping methane in the pipe at scale

The challenge

According to McKinsey, about 57% of the oil and gas industry's carbon footprint comes from methane emissions. Fortunately, 75% of those emissions can be eliminated with a preventative approach and the use of technology. With hundreds of facilities, California Resources Corporation (CRC) was spending significant time and resources creating visual documentation of its equipment to reduce unnecessary methane emissions – it needed a better way.

Success

Starting in 2018, the CRC began using drone mapping to transform aerial data into virtual 2D maps and 3D models of pad locations, pipelines, processing equipment and pumping stations, saving the company hundreds of thousands of dollars in time and labor costs over previous methods.

The drone operations team now can import scan data into DroneDeploy by adding the methane visualization layer to existing maps, which allows them to quickly identify and monitor unexpected leaks. If a probable leak is detected, sometimes it can be fixed right away.

Issues such as loose connections, an open bypass valve, or an unlit pilot at a flare stack can be the cause of the leak. More complex issues, such as a leaking compressor seal or faulty leaking valve, typically require a maintenance request. By taking this workflow to the sky and to the cloud, CRC has simplified its emissions monitoring process, ensuring that methane stays in the pipe.

57%

of the industry's carbon footprint come from methane emissions

75%

of all methane emissions can be avoided

[Read more in JPT](#)



Injection wells and water facilities

The problem

Geographically remote locations are time-consuming and expensive to visit. As a result, access to information may be outdated or limited.

The solution

Perform remote on-the-ground inspections with DroneDeploy's walkthrough feature, giving you a 360 perspective of your site. Through the platform you can create one shared dashboard to access all your asset information from anywhere in the world.

The value

- Get real-time data for operational meetings
- Reduce the need for off-cycle maintenance
- Reduce non-productive time
- Improve safety with reduced travel
- Immediate knowledge of operational footprint





Reclamation and conservation

Improving sustainability is a critical priority for the oil and gas industry. If you can't track it, you won't understand the impact of your assets. But third party services are expensive and don't show the full picture.

Solving with reality capture

- Track the reclamation progress with reality capture and annotation tools
- Measure site re-vegetation
- Document the carbon footprint of sites
- Minimize the cost of reconciliation inspection and reporting





Revegetation calculation and plant health

The problem

Vegetation coverage may need to be calculated for pipelines, ROW, well sites or remediation areas. These measurements are often done manually, but this is time-consuming, costly and prone to human error.

The solution

DroneDeploy can be used to capture an area and provide a report detailing current vegetation coverage, as well as measurements and vegetation encroachment risks.

The value

- Reduce trips to remote locations
- Increase accuracy by calculating entire asset area, rather than multiple hoop sections
- Provide detailed insight to teams and agencies
- Reduce overall time to generate reports



Vegetation gap overlay model example





Natural habitat analysis

The problem

Understanding the vegetation and habitat conditions of right of way (ROW), well sites and pipeline locations is difficult as they are often in remote locations. It's hard to track change over time for large areas.

The solution

Use DroneDeploy to gain instant insight into the condition of ROWs, shorelines and pad remediations. This can be achieved via our RGB inspection, elevation and thermal models, vegetation models and cut/fill analysis tools.

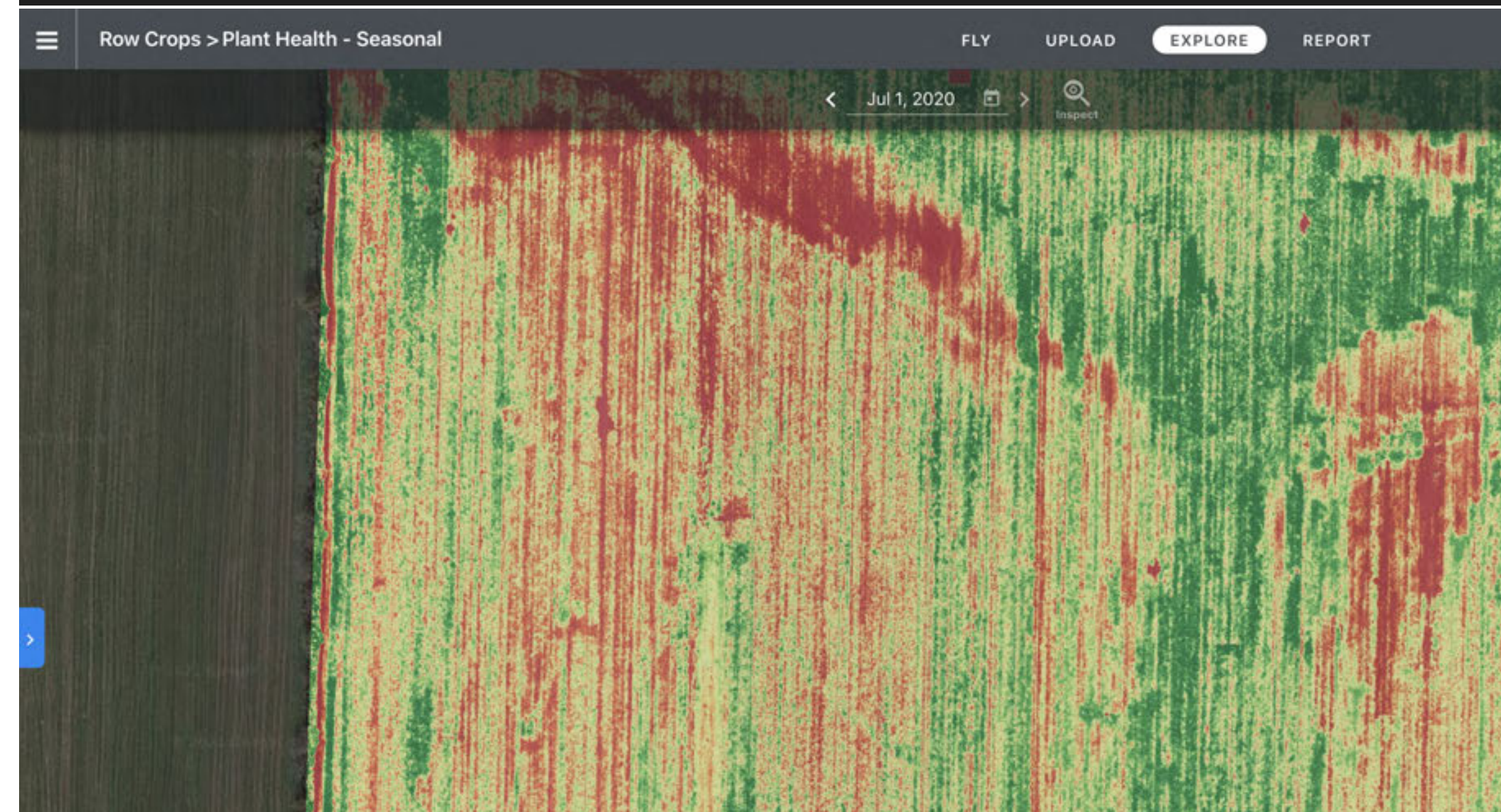
The value

- Create detailed reports on the entire asset portfolio
- Save significant time and costs on habitat analysis
- Track habitat impact over time
- Reduce your overall operational footprint



Using drones to monitor environmental impact

DroneDeploy lets you use drones for more comprehensive monitoring and planning to avoid environmental impact.





Stormwater measurements

The problem

Accumulation of water on site can create safety hazards and potential accidents. Excess water can erode soil, damage roads and compromise the structural integrity of facilities and equipment.

The solution

With DroneDeploy, you can easily document existing site conditions. Create drainage modeling and track progress over time of retention pond development. 3D models provide accurate measurements for berm spill containment for your SPCC (Spill Prevention, Control and Countermeasure) plans.

The value

- Prevent contaminants from entering nearby water
- Reduce soil erosion that can impact water quality downstream
- Mitigate the accumulation of water, reducing the risk of accidents and equipment damage



Create high resolution maps and elevation profiles

Use DroneDeploy's volume annotation tool to perform containment calculations, and use our EDGE annotations in 3D Export geotiff and 3D DXF for CAD analysis of flooding zones.



Steamflood injection thermal mapping

The problem

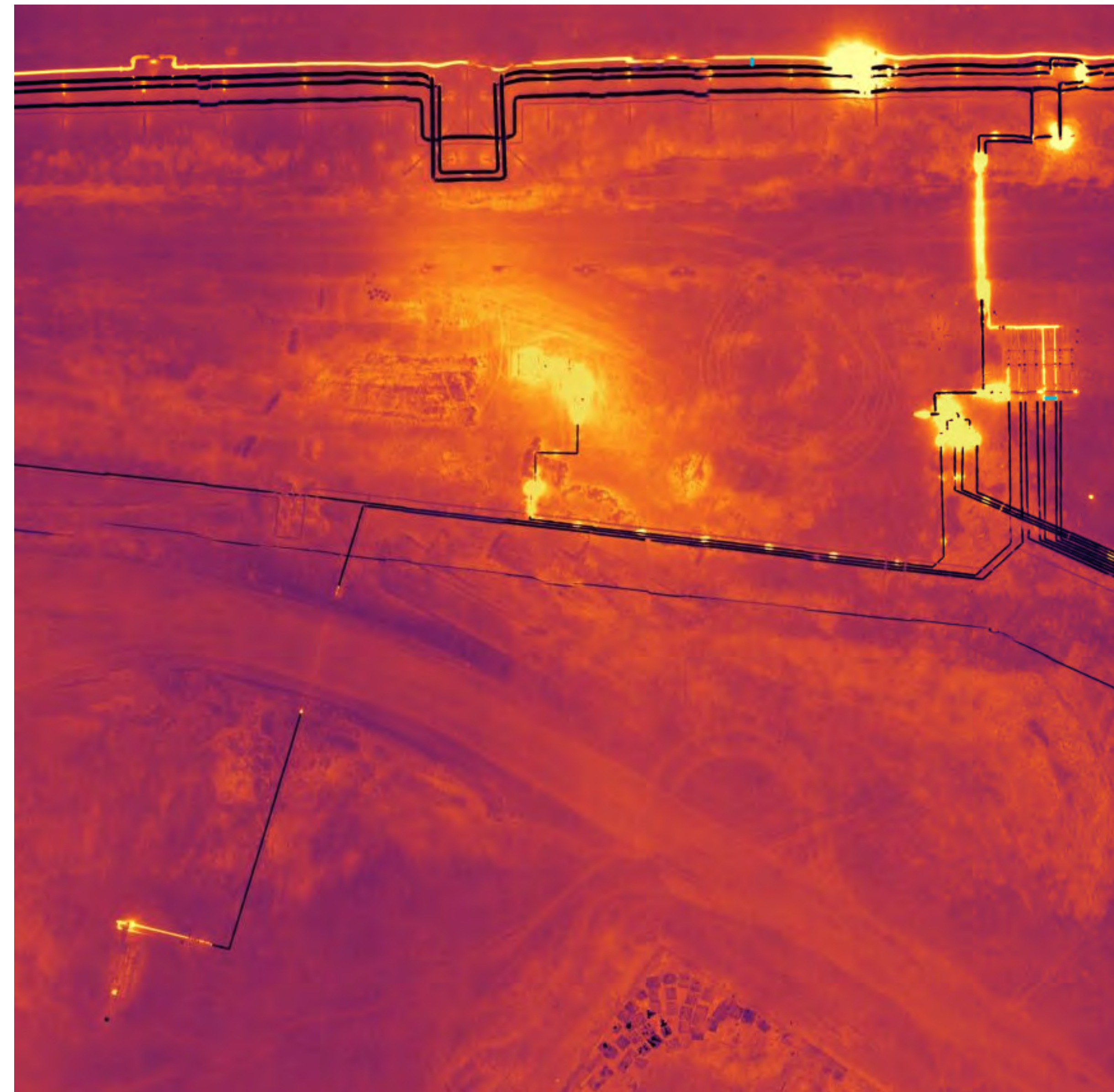
Fields with shallow steam injection wells may have steam breakthroughs on the ground and equipment. These breakthroughs are not visible with regular RGB mapping techniques.

The solution

Use DroneDeploy to launch thermal and radiometric mapping of large areas and gain an instant audit of steam injection infrastructure. Use these maps to detect thermal anomalies and take a proactive approach to prevent steam breakthroughs and equipment failure.

The value

- Mitigate harmful environmental impacts
- Reduce analysis turnaround time for field steam injection profile optimization
- Improve steam flood pattern and overall field production
- Catch equipment overheating and leaking issues before the consequences become serious



Thermal data processing in DroneDeploy

With DroneDeploy thermal data processing it's easy to keep consistent track records of temperature anomalies and changes over time. Some tools you'll find in the platform include: thermal mapping area annotations and issue markups.



Leak detection

The problem

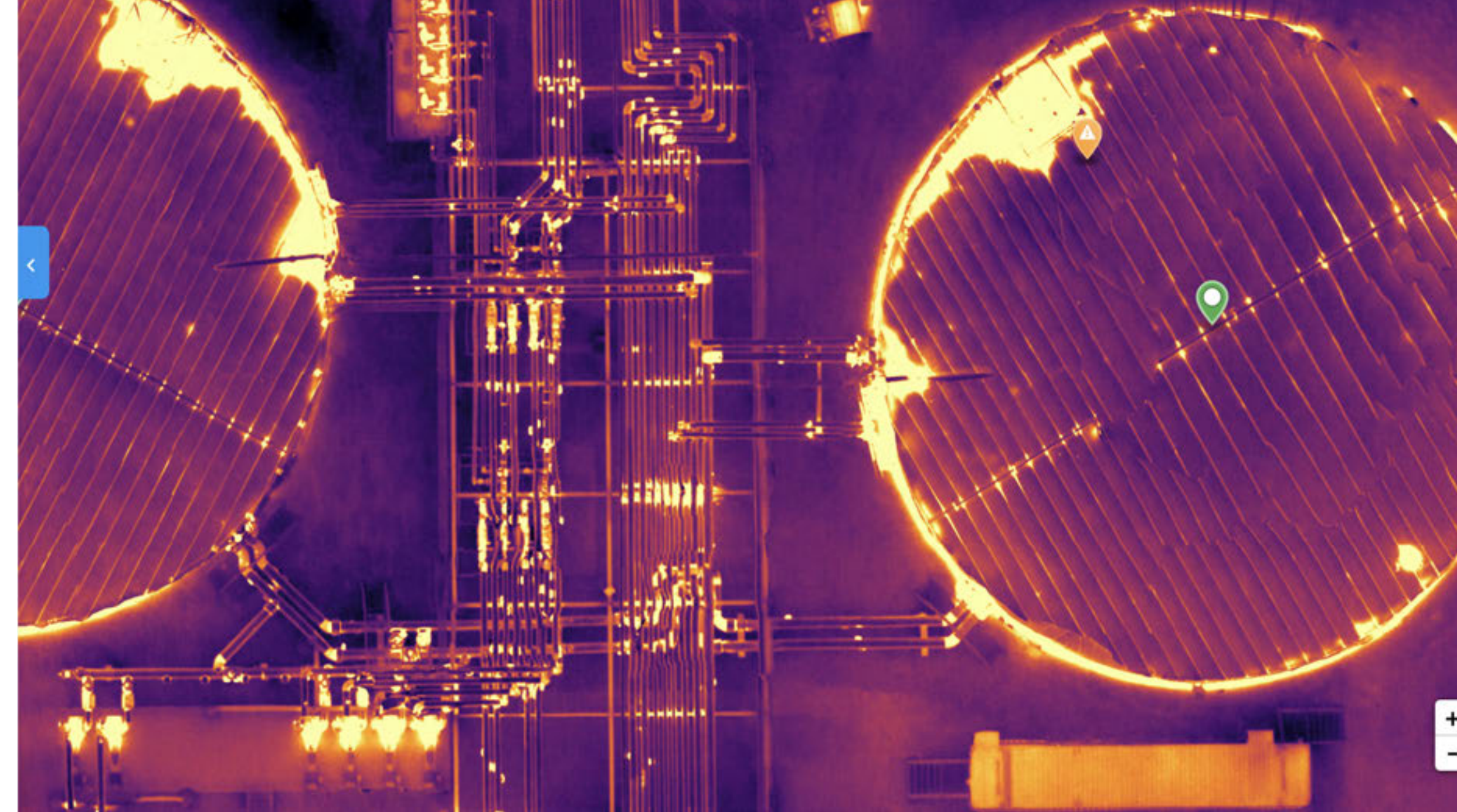
When a spill occurs, you want to catch it and stop it as soon as possible. Conducting audits to report acreage, or helping transition assets after an oil and gas merger can also be costly and time consuming.

The solution

Vegetation indexing in DroneDeploy helps you identify possible leaks along ROWs/equipment boundaries. With automated linear mapping, you can capture large areas around your site in less time.

The value

- Save significant time on data collection
- Identify risks before the problem escalates
- Mitigate safety risks and remove people from dangerous situations



Using DroneDeploy to monitor infrastructure and detect leaks early

Use our RGB drone mapping and video tools for visual analysis, thermal mapping and Optical Gas Imaging for infrared thermal and spectroscopy detection and our 360 Walkthroughs for on-the-ground checks and documentation.



More questions? Get in touch!



[Click Here](#)

Special thanks for contributions to this playbook



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