



The Reality Capture Playbook

Mining Edition

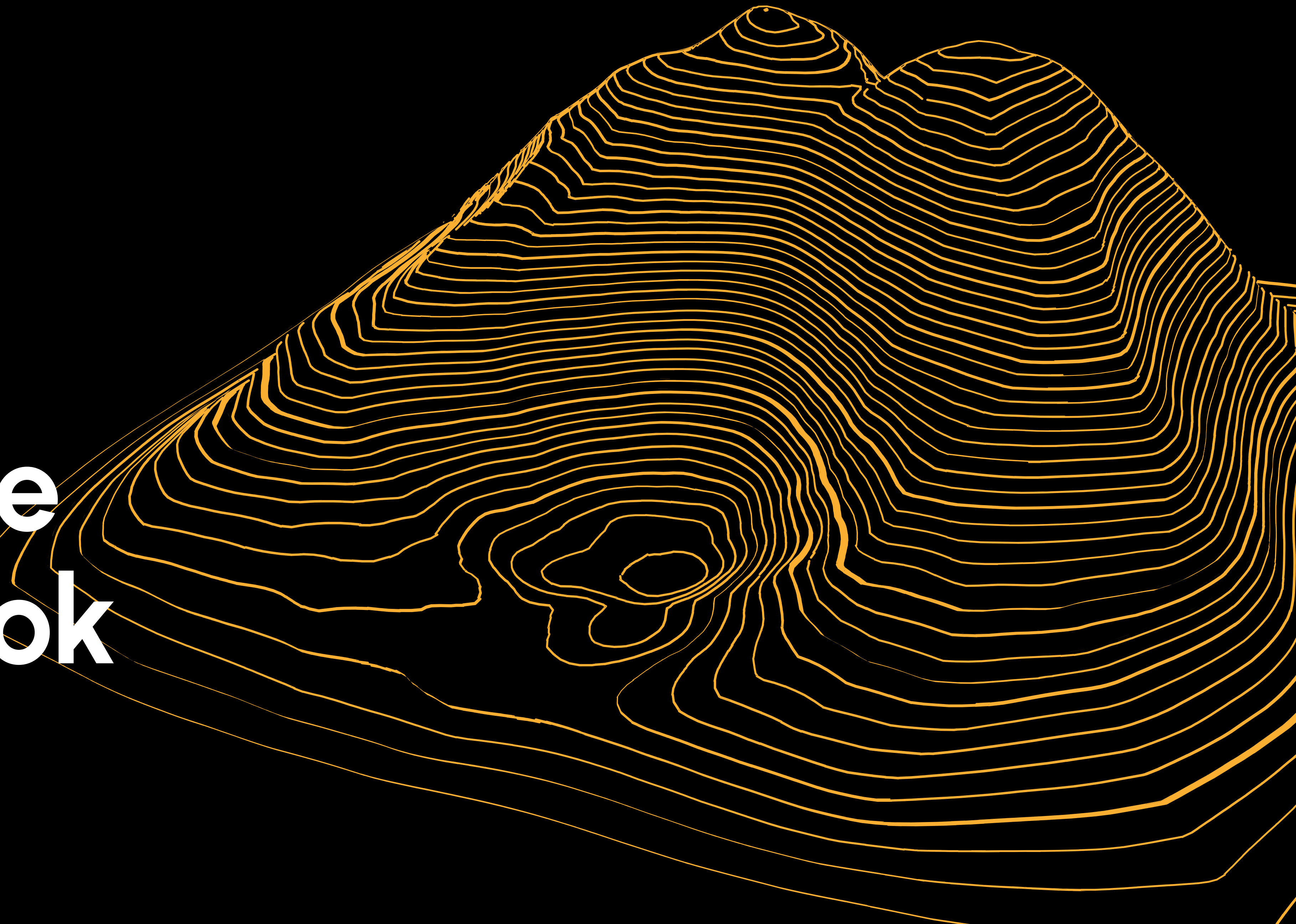




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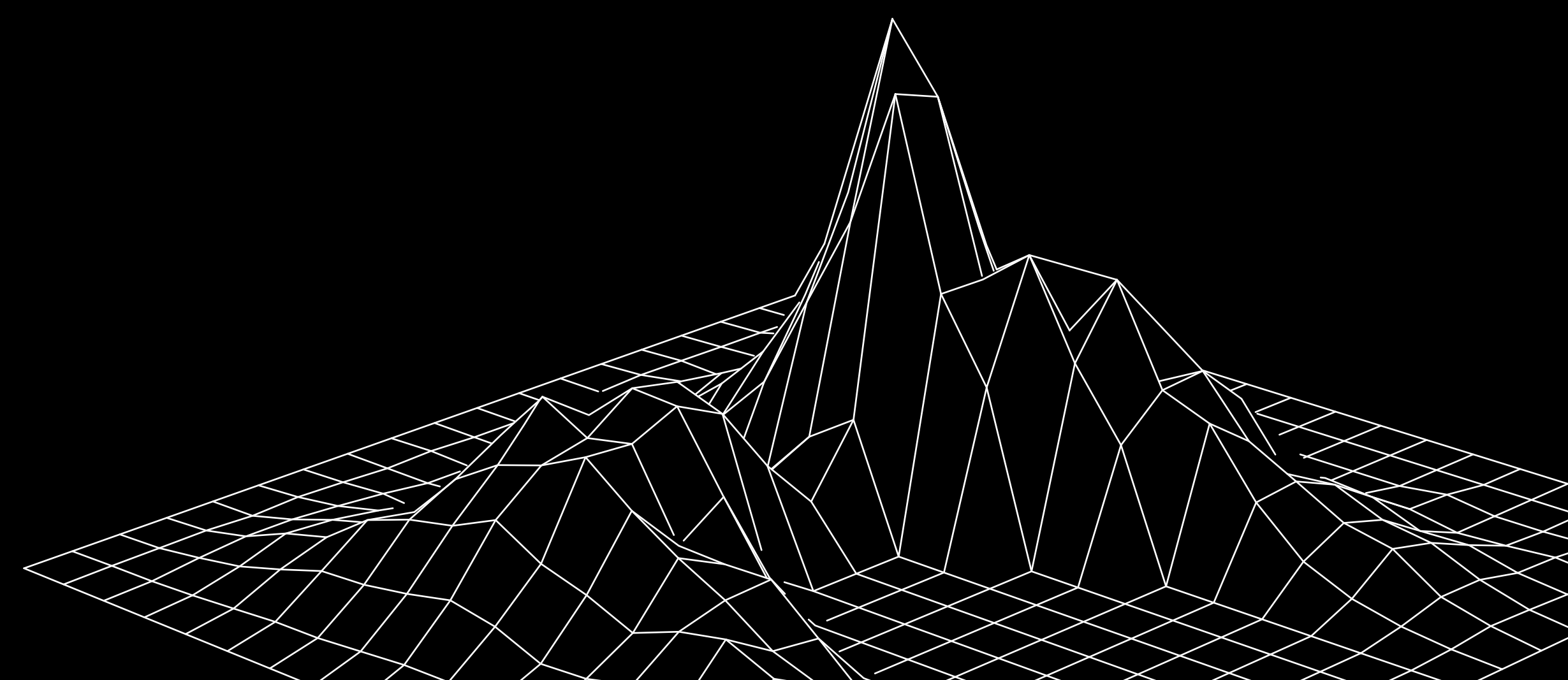
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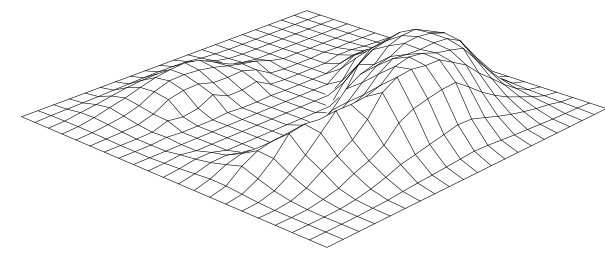
- Environmental monitoring and rehabilitation
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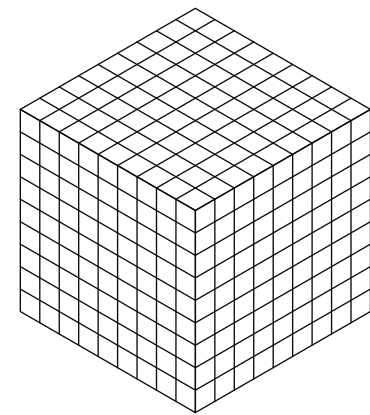


Phases of the mine lifecycle

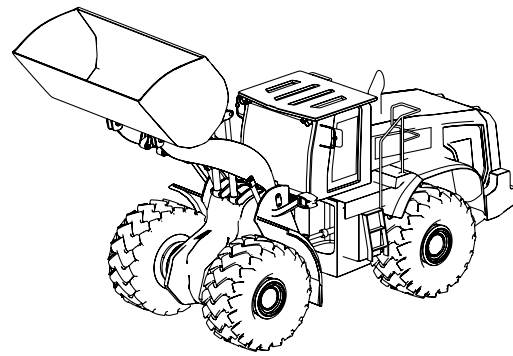
Maximize efficiency and increase safety for the life of the mine.



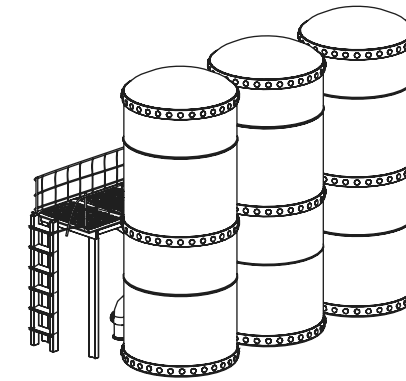
Explore



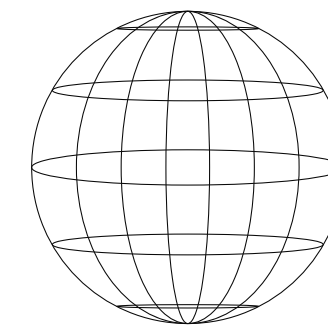
Study



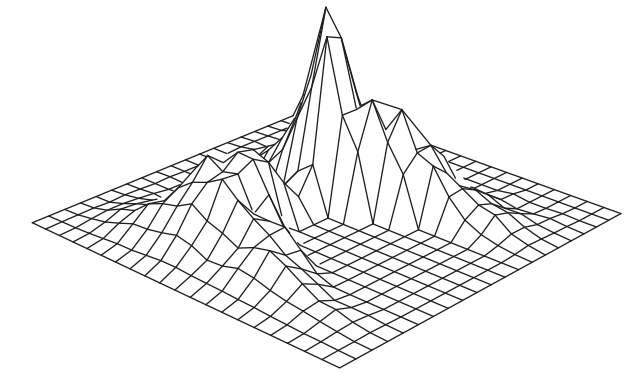
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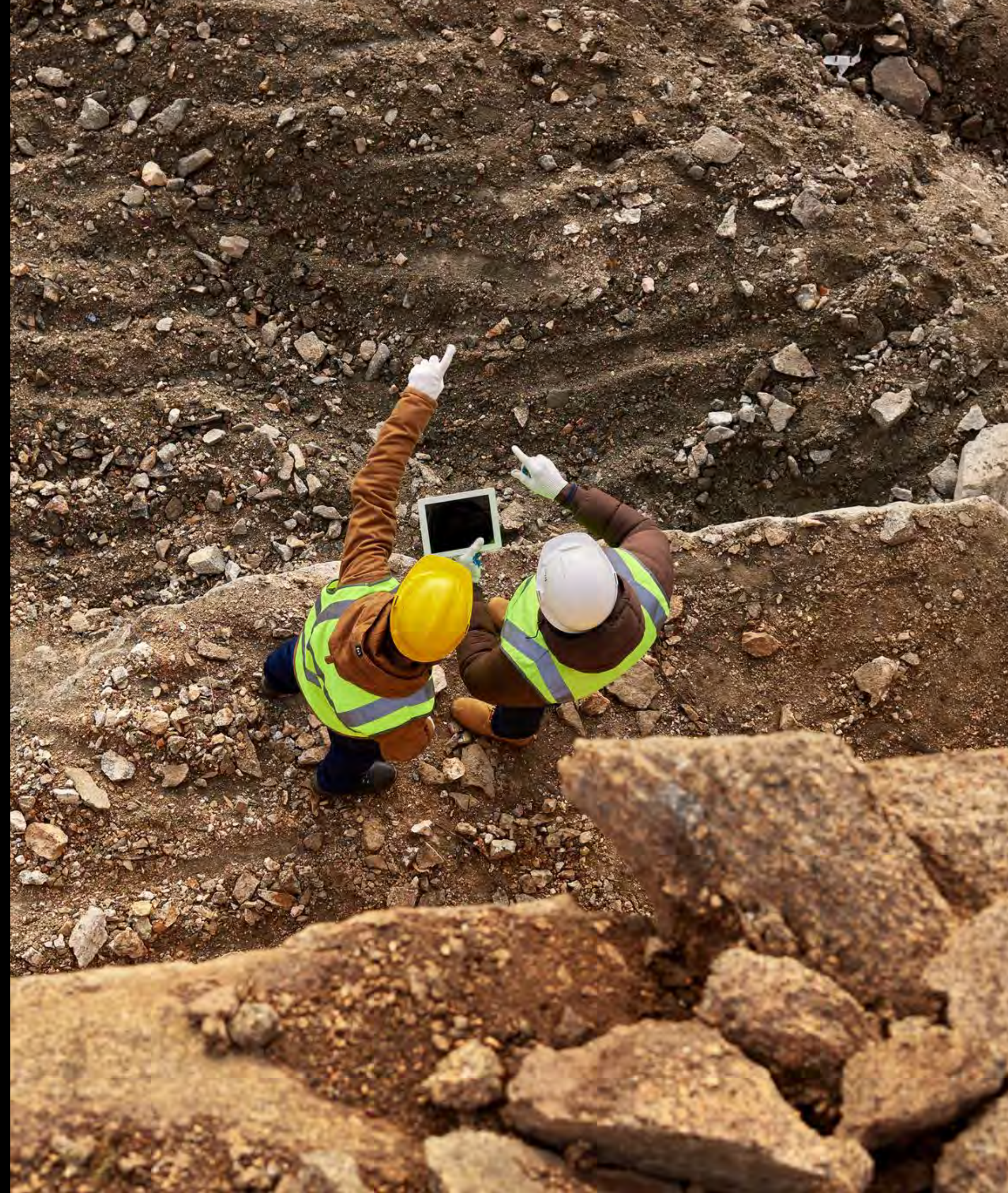


Reality capture and analysis in mining

Reality capture technologies like drones, 360 cameras, and robots enhance mining operations by improving safety, management, and exploration. Complementing traditional methods, they provide precise, real-time data, enabling better decisions and optimized operations.

Solving with reality capture

- Drones excel at capturing current, high-resolution terrain models in targeted locations.
- Detailed drone 3D models are used across technical teams, collaborating with external parties, updating management and providing actionable insights.
- Visit and inspect sites remotely through 360 capture throughout building interiors augmented with 2D and 360 photos.
- Analyze, annotate, report and share your findings easily across teams and to those that need to make informed decisions.

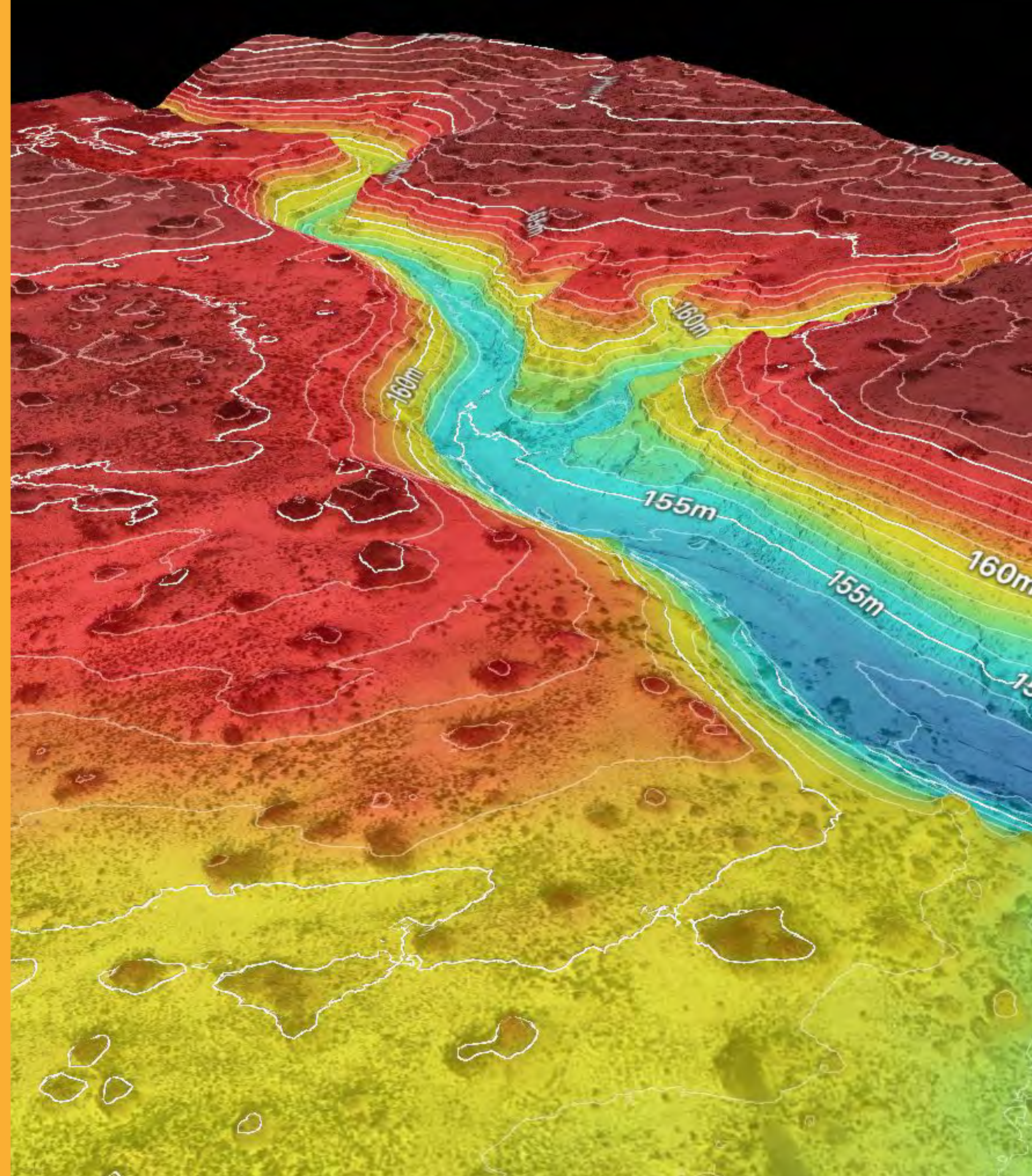


Explore

During mine exploration there are a number of sensor types and acquisition methods used to identify the most likely regions of economic deposits. While satellites and manned aircraft can cover vast areas, drones are used to gather greater detail in smaller areas.

Solving with reality capture

- Exploration teams receive detailed maps for planning access routes and drill pad locations in challenging terrain.
- Geologists use the greater detail to model exposed rock faces and mapping outcrops.
- Cultural heritage teams can support Traditional Owners of the land to show dangerous terrain and visualize steep or inaccessible locations.





Planning

The problem

Inadequate awareness and tracking during planning, exploration drilling coordination and site access leads to delays, increased costs, and environmental impact.

The solution

Drones offer a cost-effective method for collecting detailed map data in hard-to-access areas. DroneDeploy produces high-resolution 3D models to map geological features essential for assessing mineral potential and planning extraction, with inspection tools enabling precise visual and quantitative comparisons.

The value

- Upload tenement boundaries, property lines, and areas of cultural and environmental importance.
- Focus on key areas with targeted flight planning, terrain following, and vertical mapping for enhanced resolution.
- Document activities and ground disturbances progressively to streamline compliance reporting.
- Capture the rehabilitated condition of drill pads visually and spatially for environmental compliance.

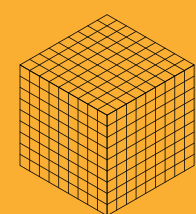


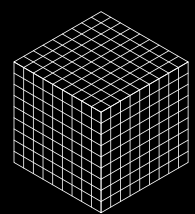
Study

Mining feasibility studies are both costly and time-consuming, yet they are crucial for informed decision-making. Securing land-clearing permission is a significant process, with stringent regulatory requirements, especially in culturally sensitive areas.

Solving with reality capture

- Quickly get up-to-date data to understand culturally significant sites.
- Partner with traditional owners to perform on-the-ground surveys, guided by drone data to accurately target key areas.
- Drone-captured reality data provides virtual access to remote or hard-to-reach locations, enabling efficient, respectful planning.





Geotechnical survey

The problem

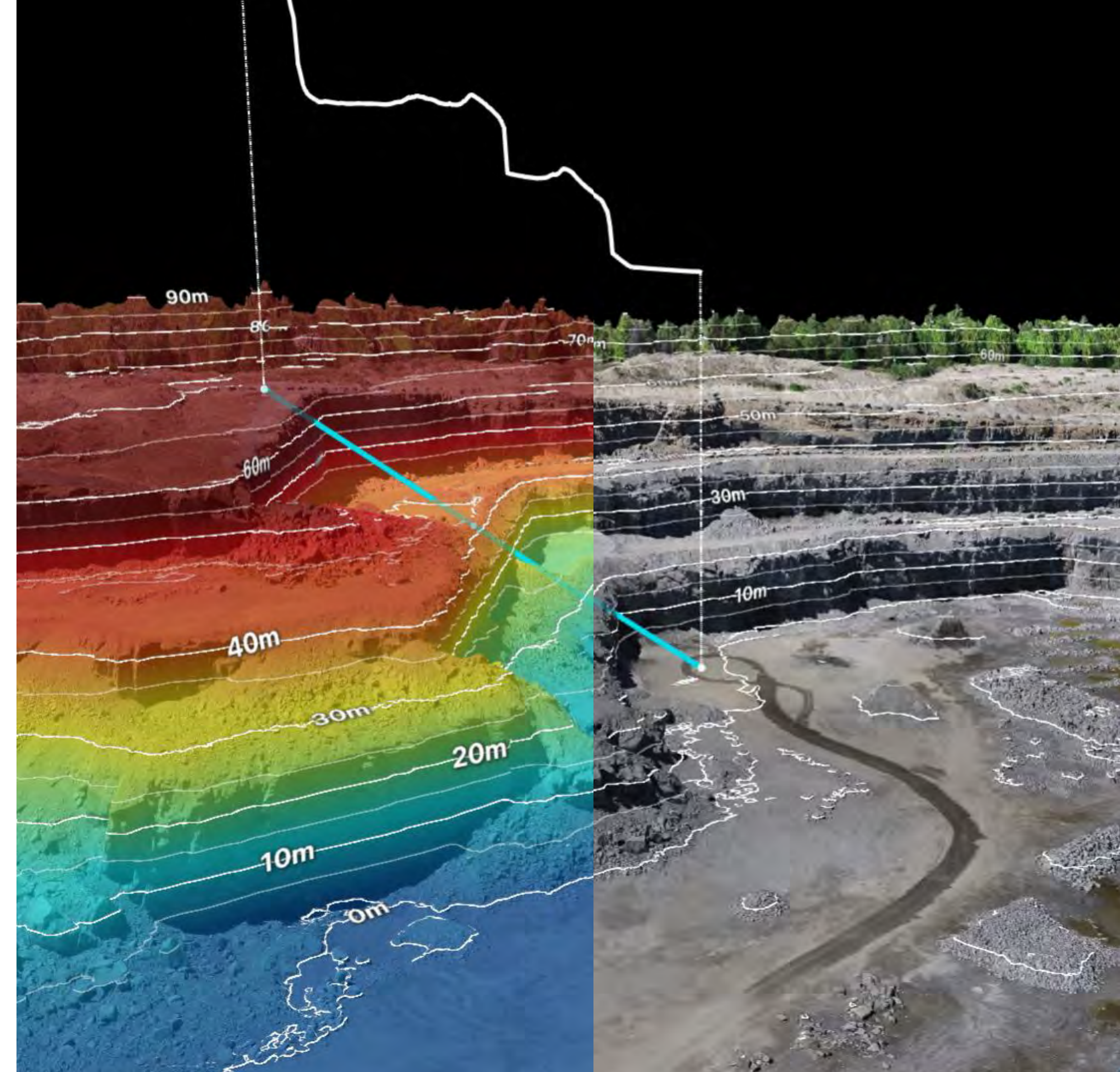
Understanding the geological structure and geotechnical hazards of a mine site is crucial throughout its lifespan. Extraction plans must adapt to geologists' and engineers' findings to enhance efficiency and prevent rock falls. These decisions require timely, high-resolution imagery and 3D modeling of the relevant areas.

The solution

Drones offer a cost-effective method for collecting data in remote areas. DroneDeploy produces high-resolution 3D models to map geological features essential for assessing mineral potential, geothermal hazards and planning extraction, with inspection tools enabling precise visual and quantitative comparisons.

The value

- Identify geotechnical hazards and implement safety controls.
- Geo-referenced 3D models enable a virtual field experience, allowing information to be collected without exposure to high risk areas.



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.

Extract

Mining operations are challenging and can have areas of risk with rapidly changing conditions. Multi-disciplinary teams struggle to share data and gain a complete, up-to-date picture of the mine site.

Solving with reality capture

- Frequent, automated drone flights give you current conditions on site.
- Accessible and shareable data reduces rework and delays.
- Create a digital record of mine progress.
- ROM stockpile monitoring.
- A variety of exports allows for specialist workflows in other platforms including mine-to-design, haul road analysis and pre/post blast assessment.



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Extract

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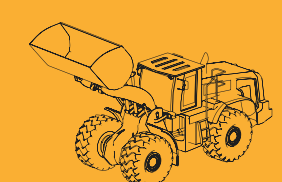
Explore

Extract

Process

Transport

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Compare to design

The problem

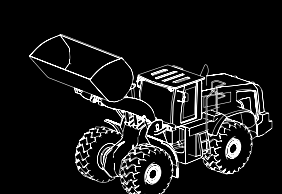
Tracking in-pit material movement and calculating pre- and post-blast swell factors are essential for efficient extraction. Ensuring compliance with the design, such as bench height and face position, and monitoring dump compliance are crucial for maintaining productivity and safety.

The solution

Importing 3D design surfaces enables measurement and visualization of changes in volume and deviations from mine design. DroneDeploy's cut/fill visuals highlight and quantify change and deviation with a high degree of accuracy.

The value

- Increased efficiency in haulage, stockpile management and processing plant downtime.
- Reduced geotechnical risk associated with dump failure and resultant damage and downtime.
- Reduced rework costs to meet rehabilitation design while avoiding environmental penalties or fines.





High accuracy mine surveys

The problem

Data capture on a mine site can be fast-paced, ad hoc and dynamic. High accuracy is always desired but not always achievable in the timeframe available.

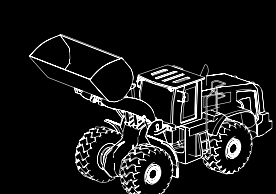
The solution

Easily create a highly accurate deliverables like a Map, Digital Terrain Model (DTM) and Point Cloud with DroneDeploy. Simplified workflows for high-accuracy mapping include:

- Upload your own RTK or PPK local base data.
- Combine DroneDeploy PPK with Ground Control Points (GCP).
- Automated GCP recognition.
- Checkpoints for map accuracy verification.

The value

- Save time during field capture.
- Faster time to insight.
- Consistent, high accuracy data you can trust.





Highwall mapping

The problem

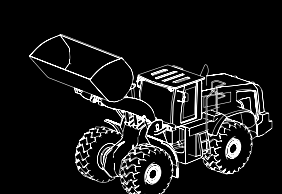
Geological and geotechnical insights require high-quality information to predict and model layers and coal seams as well as faults and hazards. Comparing accurate highwall models to design for conformance checks is required for maintaining safe mining operations.

The solution

Drones are cost effective for data capture and DroneDeploy can automate their flight and process their imagery to create high-resolution 3D models for seam mapping, structural fault mapping and highwall conformance checks.

The value

- Use 3D annotations to mark out faults for safe and efficient mining progress.
- Identify marker bands and layers to verify and track progress.
- Export point clouds to specialized mining software for deeper analysis.





System integration

The problem

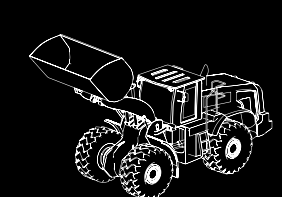
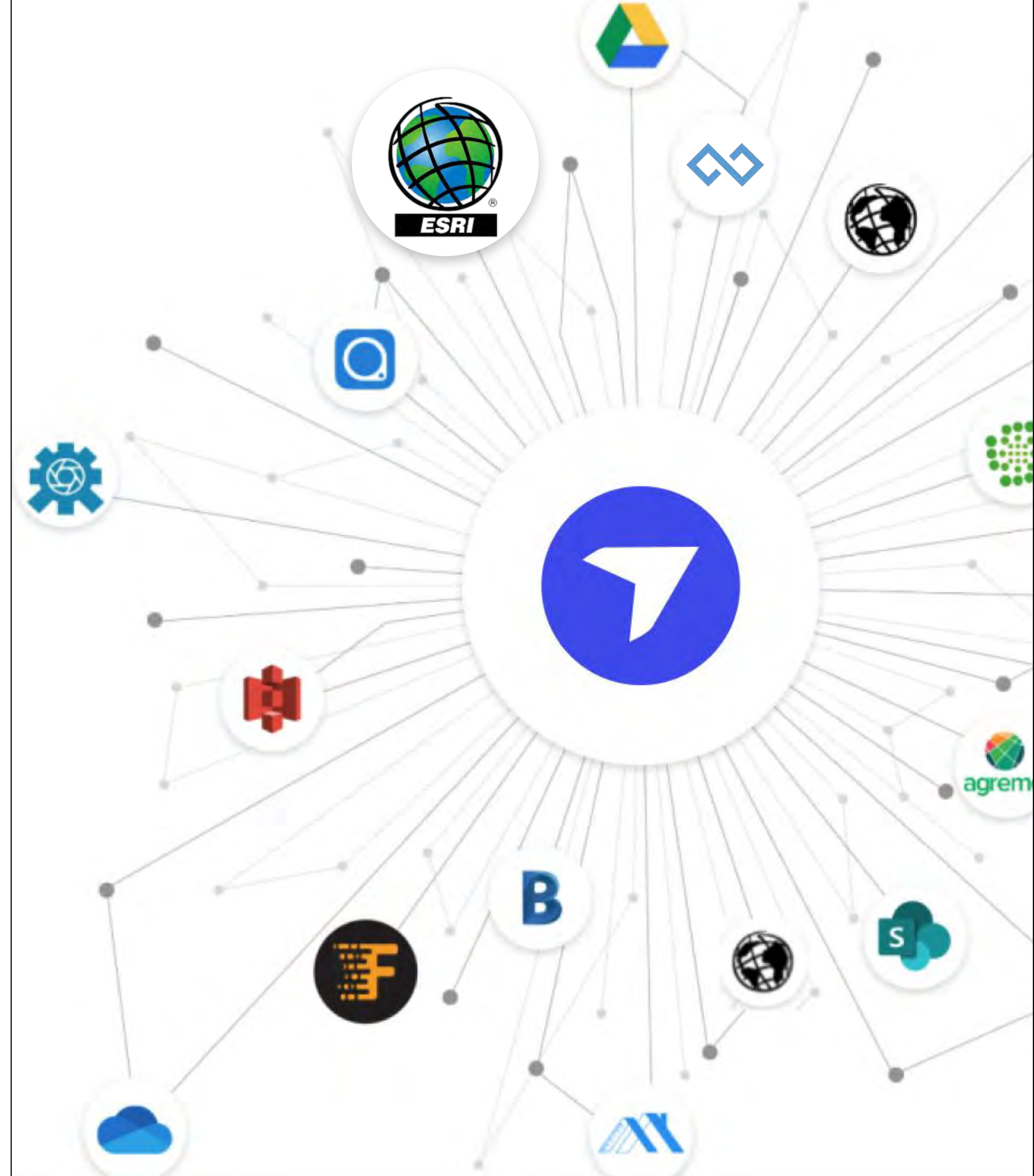
Mining operations cover vast areas, and with multiple sites, the geographical footprint becomes immense. Despite this scale, mining professionals need seamless integration of drone data with existing technology to improve efficiency, decision-making, and spatial awareness.

The solution

Export data to ERP systems or surface the latest maps in GIS platforms like Esri, eliminating manual uploads and ensuring all users have immediate access to the most recent data.

The value

- Augment the GIS intelligence you're already using.
- Reduce bottlenecks and data silos with seamless and automatic streaming to Esri and other tools.
- Avoid retraining and rebuilding processes.





Process

Performing regular asset inspections and monitoring stockpiles and tailings dams can be time consuming, expensive and carries risk. You need a single source of truth.

Solving with reality capture

- Easily and efficiently monitor stock piles and tailings dams.
- Perform thermal inspections to reduce downtime of conveyor idlers.
- Improve safety by automating inspections of conveyor belts and wash plants.
- Track annotations and comments across multiple sites and assets.





Stockpile monitoring

The problem

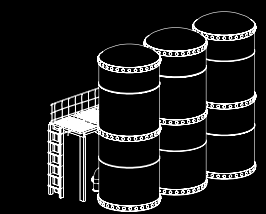
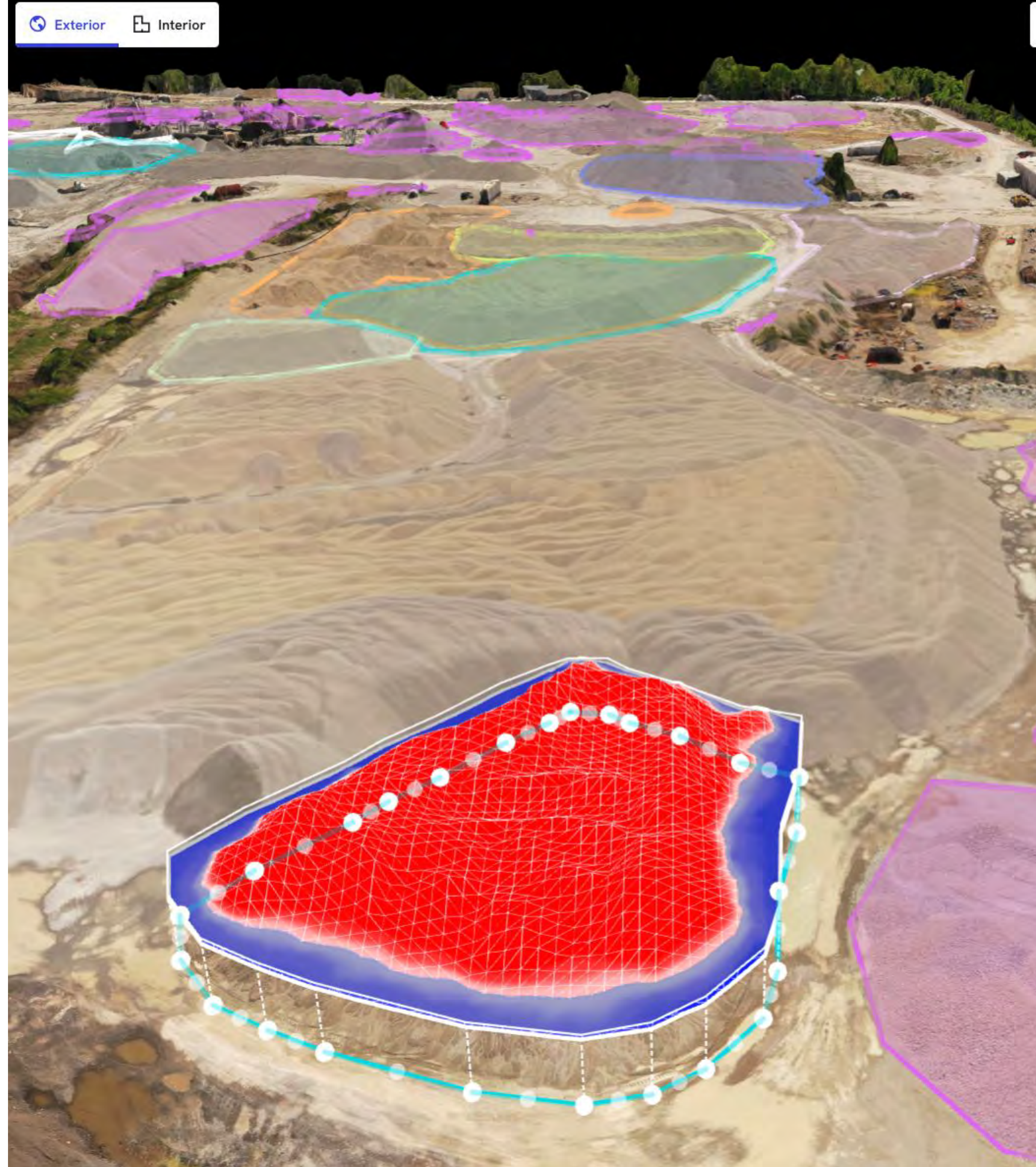
Measuring stockpiles can be risky, time-consuming, and expensive. Accurate data is needed to manage inventory, but sending survey teams into the field for hours to clamber across stockpiles is inefficient and a safety concern.

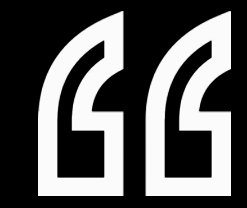
The solution

Regular, automated drone surveys allow for more effective stockpile management which will maximize processing efficiency, minimize waste, and ensure sustainable mining operations.

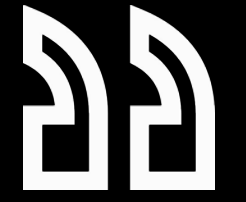
The value

- Fast, automated capture through drones reduces exposure to heavy vehicle operations on the ROM pad.
- AI identifies volumes and compares to design surfaces reducing analysis time.
- Machine learning removes overhanging conveyors and equipment for accurate measurements.
- Quickly and easily measure the total amount and types of stockpile materials and automatically generate sharable PDF reports that include types and value of the materials.

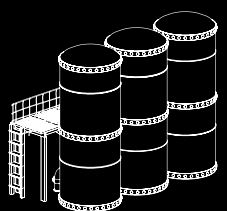




On a recent project we were able to **survey 19 gravel stockpiles in just four hours** – a task that **would have taken 10-12 hours** with two **surveyors**



Kelsey Martin, President of Martin Remote Sensing





DroneDeploy AI

The problem

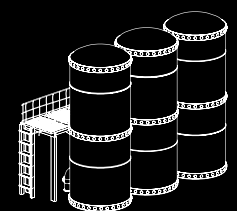
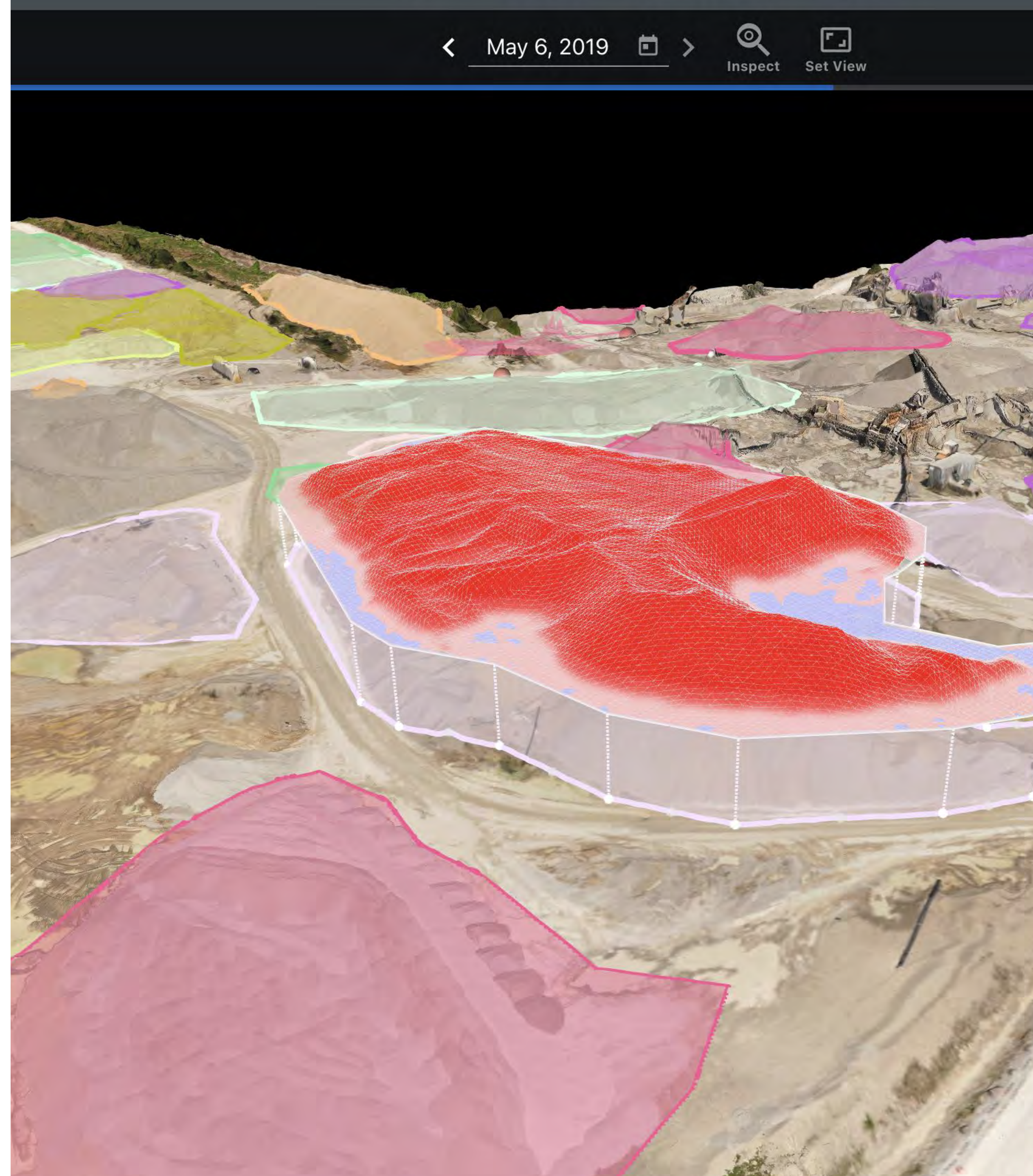
Mining companies face inefficiencies in stockpile management and delayed hazard detection, leading to costly logistics and safety risks. DroneDeploy AI automates monitoring and provides real-time insights to streamline operations and enhance safety.

The solution

DroneDeploy's AI tools boost efficiency and safety in mining by automating stockpile management and hazard detection. Available for maps, models, and 360 imagery, these tools empower teams to optimize operations and reduce downtime with greater safety oversight.

The value

- DroneDeploy's AI streamlines stockpile monitoring, enabling accurate inventory tracking, optimized blend planning, and efficient material transport logistics.
- Safety AI detects hazards in near real-time, enabling proactive on-site safety management.
- AI safety tools log incidents and near misses, providing reports to analyze trends and enhance safety protocols.





Tailings dam monitoring

The problem

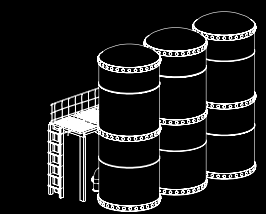
Inadequate tailings dam management poses environmental, safety, and regulatory risks, including dam failures, water contamination, and non-compliance with standards. A robust management system is needed to ensure safe, responsible tailings disposal while minimizing environmental impact.

The solution

Automated drone capture provides accurate 3D models of tailings dams, identifying issues like wall slumps and cracks. High-resolution imagery highlights hazards to dam integrity, ensuring timely intervention and safety for nearby operations and communities.

The value

- Collect accurate and timely dam condition data that provides context and visualization for collaboration and better decision-making.
- Integration with other monitoring tools provides improved environmental compliance to meet regulatory requirements.
- Data-driven decisions for maintenance and planning reduce cost and increase efficiency.





Asset inspection

The problem

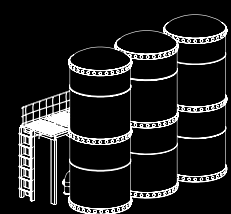
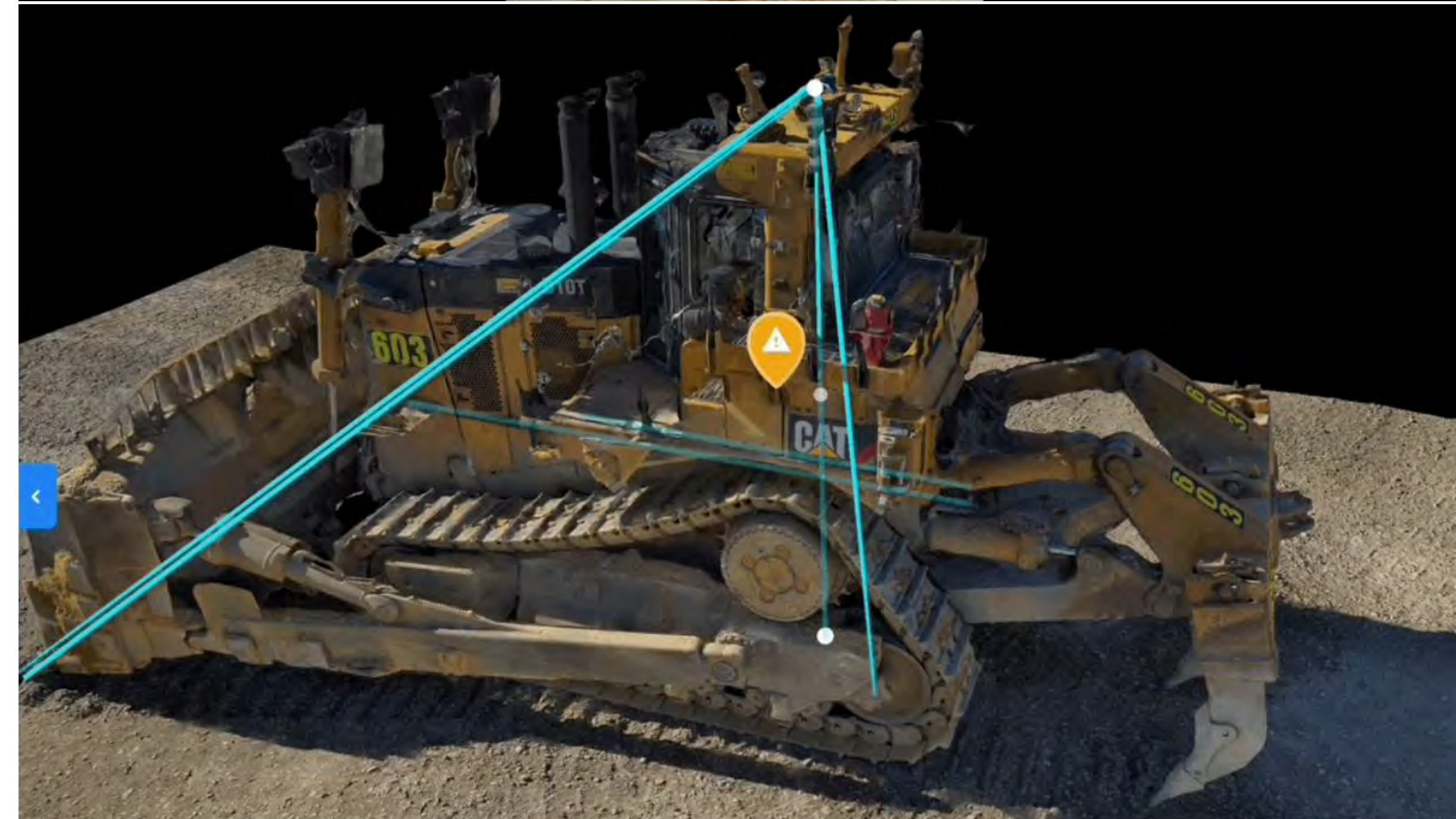
Assets like wash plants and heavy equipment need to be regularly inspected for safety and maintenance reasons. Manually inspecting assets is often costly and time consuming and can involve working at hazardous heights.

The solution

Use DroneDeploy to Implement proactive maintenance scheduling to help prevent unexpected shutdowns and optimizes operational efficiency. Even routine, scheduled maintenance becomes more efficient, generating substantial savings across critical assets, including conveyor belts and smelters.

The value

- Increase safety by keeping humans away from areas of risk.
- Reduce downtime and maintenance costs.
- Improve communication and documentation.
- Reduce the cost of regular inspections.
- Improve efficiency between teams.



Aerial + ground remote inspections

The problem

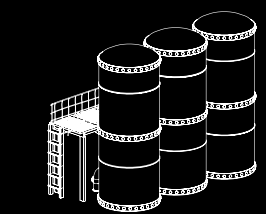
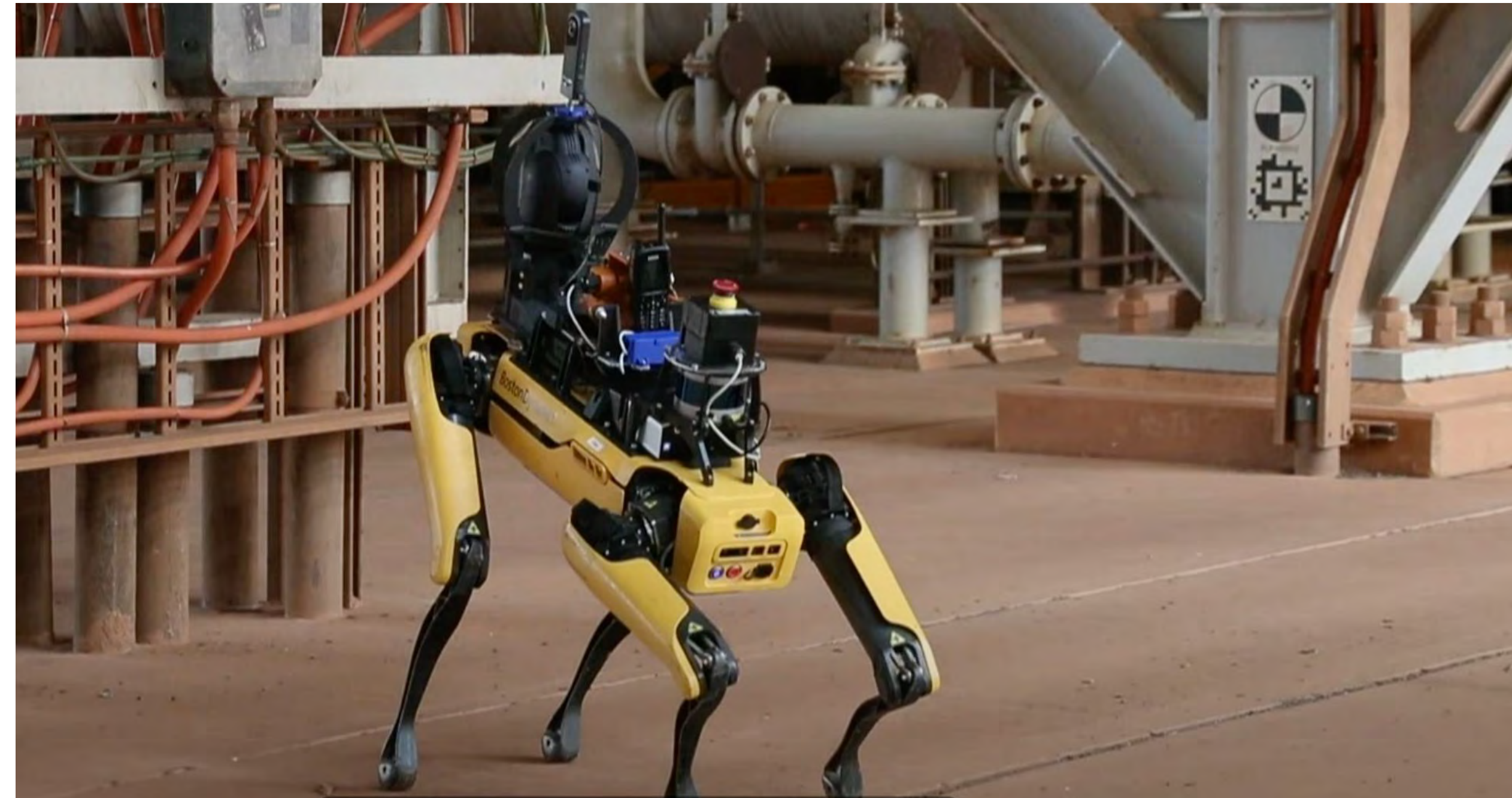
Manual inspections are time-consuming, prone to human error, and can put workers in hazardous situations. Mines are often hard to access, and site visits lead to high travel costs.

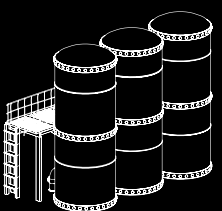
The solution

Robots with PTZ cameras and thermal sensors can automatically inspect mine assets and perform 360° virtual walkthroughs of facilities like wash plants. Docked drones can be remotely triggered to inspect vents, conveyor belts, and infrastructure, as well as measure inventory. All media is automatically uploaded and processed in DroneDeploy for seamless visualization, analysis, and reporting.

The value

- Remotely detect leaks or abnormal gauge readings.
- Automate equipment inspections (wash plants and heavy equipment).
- Managers can monitor multiple sites remotely.





Thermal inspections

The problem

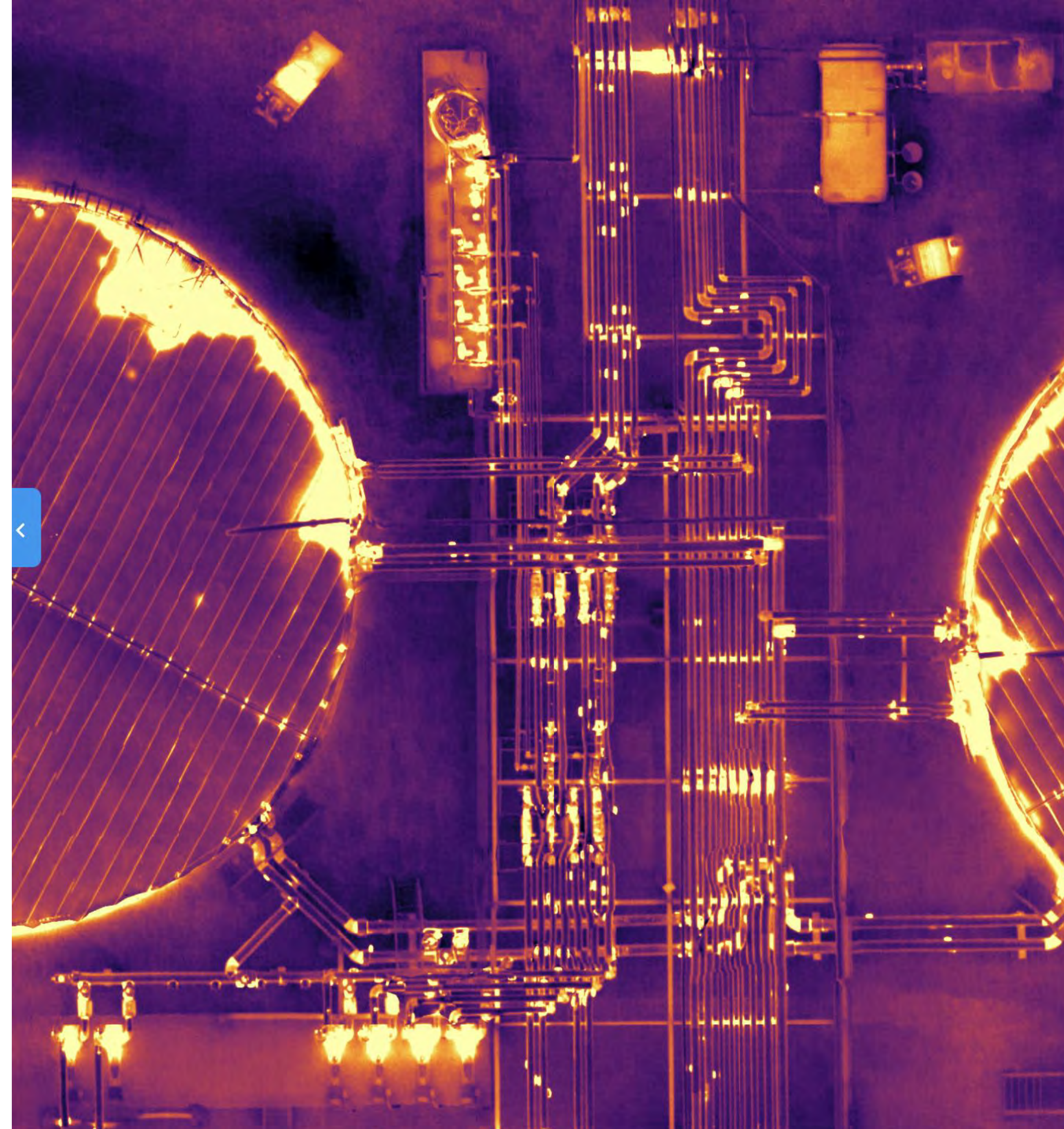
Repairs of high pressure equipment, steam generators and boilers are often reactive due to late detection of issues. Equipment failures can interrupt operations and lead to costly repairs.

The solution

With DroneDeploy, you can automate thermal and radiometric inspections through mapping and photo reports captured with drones or robots to reduce risk. Launch proactive visual and thermal inspections from both the air and ground to 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.





Aerial inspections in hazardous areas

The problem

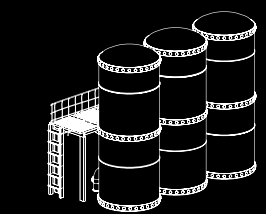
Accessing some areas on a mine site can present significant risks to the people entering these areas. Safety is paramount and the mining industry. Mining teams need ways to isolate hazards when they're impossible to eliminate.

The solution

Drone inspections eliminate the need for people to enter dangerous areas like deteriorating structures, hazardous material tanks, or tall heights. For exteriors, drones reduce the need for roped access or platforms, while indoors, they enter confined spaces, removing the need for venting, cooling, or internal scaffolding in large tanks.

The value

- Remove inspection teams from high-risk areas.
- Reduce requirement for rope access and confined space entry.
- Monitor deteriorating assets to determine removal schedule.
- Reduce cost of manual inspection.



Transport

Efficient, safe, and timely movement of mined materials is critical. Mine operators need detailed, up-to-date information on track conditions and potential obstructions to optimize efficiency and avoid costly delays or accidents.

Solving with reality capture

- Efficient management of the transport corridor including erosion control, geotechnical risks and vegetation encroachment.
- Manage asset renewal including site planning for track replacements and bridge inspection.
- Measure and manage ballast stockpile volumes.
- Provide situational awareness during disaster recovery management including derailments and natural disasters.
- Plan and maintain rail infrastructure with accurate maps and models for better decision-making and resource allocation.





Track inspection

The problem

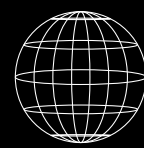
Rail track inspection is labor-intensive, time-consuming, and hazardous. Manual inspections can miss subtle issues like minor track misalignments or early signs of wear and tear. Additionally, the vast distances and challenging environments make consistent and thorough inspections difficult.

The solution

Drones can quickly and safely cover extensive track lengths, capturing real-time, accurate assessments of track conditions, proactively identifying potential issues, enhancing safety and efficiency, and reducing time and cost.

The value

- Reduced risk of accidents and injuries to personnel.
- Early detection of issues such as misalignments, cracks, and wear.
- Reduced time required for thorough inspections.
- Less costly repairs and downtime.
- Better maintenance planning and resource allocation.

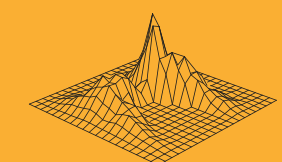


Close

Improving sustainability is a priority for all mines in meeting the commitments of their operation and showing leadership within the industry. In order to most efficiently return a mined area to a graded and rehabilitated state, reality capture can assist in quantify and documenting these efforts.

Solving with reality capture

- Track the reclamation progress with reality capture and annotation tools.
- Monitor wildlife biodiversity, mating, and population with thermal drones.
- Measure and monitor site re-vegetation success and invasive species with map comparisons and plant health filters.
- Effectively monitor and document progress against stringent, government-mandated KPIs.
- Minimize the cost of reconciliation inspection and reporting.





Environmental monitoring and rehabilitation

The problem

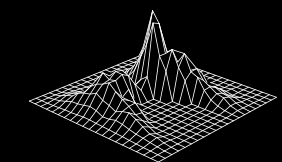
Environmental monitoring is crucial throughout the mine life cycle, especially during rehabilitation, to meet regulatory requirements. Inefficient, time-consuming assessments can lead to environmental and safety concerns.

The solution

Drone mapping and AI tools offer a cost-effective solution for accurate mine site assessment and rehabilitation planning. DroneDeploy provides reports on vegetation coverage, identifies plant stress, and uses gap/coverage analysis and AI counting to minimize environmental impact and ensure regulatory compliance.

The value

- Reduce trips to remote locations.
- Improve progress tracking to design grade over entire reclamation area.
- Provide detailed insight to teams and agencies.
- Reduce overall time to generate reports.





Site clean up and remediation

The problem

Mine site structures and processing facilities, often spanning areas like small suburbs, present challenges when they need to be demolished and removed. Safety risks from deteriorating tall structures and hazardous materials like asbestos require careful planning. Additionally, large quantities of waste and contaminants must be tracked, measured, and safely removed.

The solution

Drone capture generates 3D models of the site and its structures, providing measurable asset models, high-resolution inspection imagery, and context. Specialists can remotely access these datasets for better planning and estimation. As demolition progresses, drone data helps track and plan removal quantities accurately.

The value

- Improved communication for cross-team planning.
- Reduce trips to remote locations.
- Accurately order trucks and ships required for removal.
- Provide detailed and shareable oversight of progress.





More questions? Get in touch!



[Click Here](#)

Special thanks for contributions to this playbook

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