geoimage

Satellite Imagery and Geospatial Solutions

Applied Spatial Intelligence

Mine site taken with SPOT 7.

CONTENTS

About Geoimage 04

Premium Service Bundle 05

Exploring the Benefits of Geoimage 06

Our Services and Solutions 08

Monitoring and Compliance 09

InSAR 10

SWIR 11

Digital Elevation Models (DEMs) 12

Image Processing 13

*ground*WATCH 14

A Glimpse at the Future of Earth Observation 15

Satellites and Sensors 18

DIRECT CONTACTS

MARK COVINGTON
General Manager
0403 017 505
MarkC@geoimage.com.au

SIMON GREIG
Sales Manager
0449 722 386
simon@geoimage.com.au

ABOUT GEOIMAGE

For over 35 years, our extensive experience in serving various industries such as mining, exploration, oil and gas, government, and environment has enabled us to establish strong and trusted relationships with our clients and partners.

At Geoimage, we take pride in offering insightful service, shared knowledge, and aligned goals that contribute to our client's success. Our team's expertise and innovative problem-solving have been the key drivers of our success. We are continuously committed to providing new and innovative spatial technology solutions that offer powerful insights, exceptional value, and improved outcomes for our clients.

EXTENSIVE INDUSTRY EXPERTISE

We have extensive industry expertise across mining, agriculture, infrastructure, and environmental management allowing tailored solutions for each industry.

ADVANCED ANALYTICS CAPABILITIES

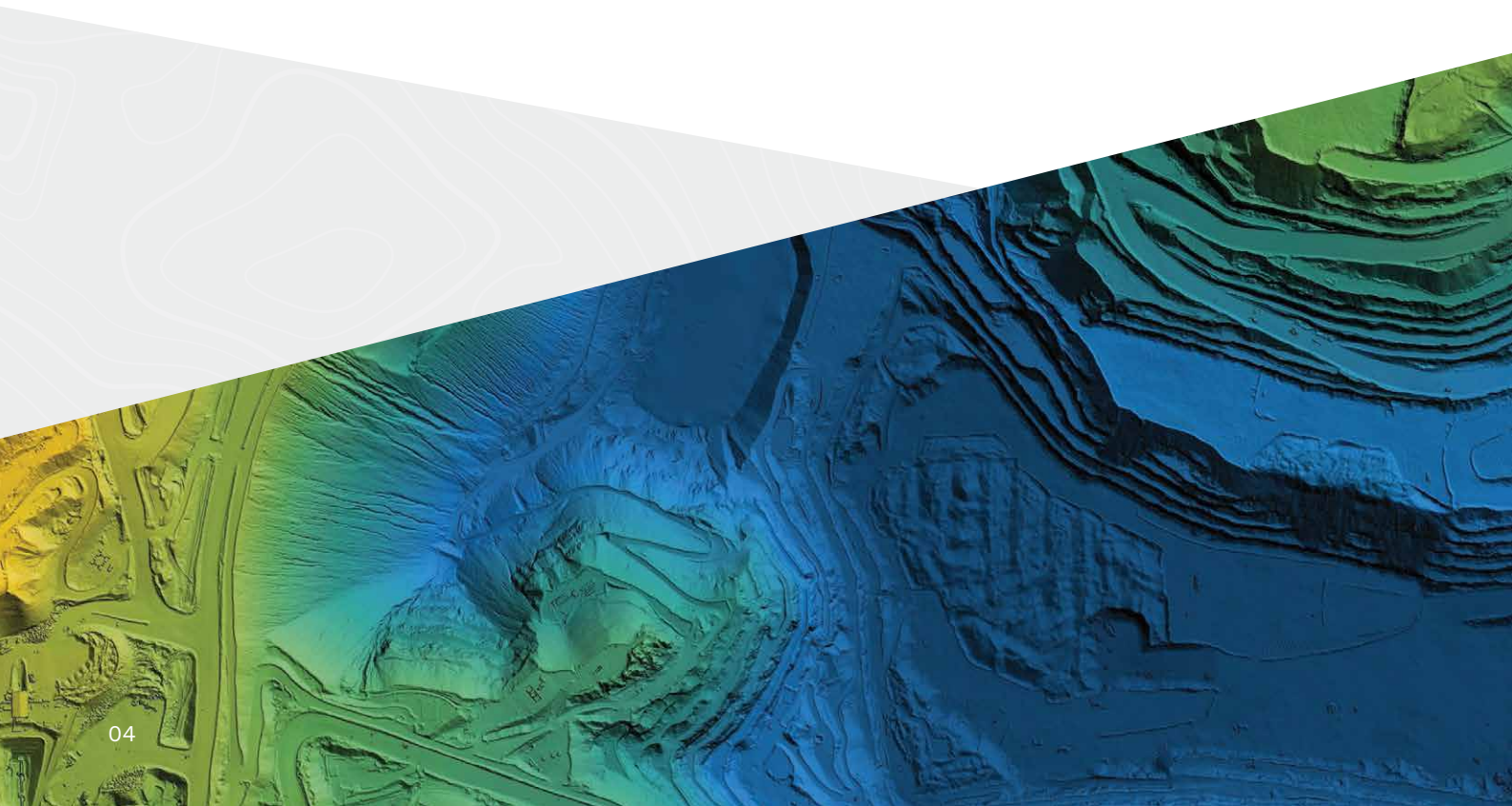
Our advanced analytics capabilities use AI and machine learning to extract insights from satellite imagery and geospatial data.

ADVANCED IMAGE PROCESSING CAPABILITIES

Our cutting-edge image processing techniques, coupled with proprietary algorithms and advanced methods, enable us to provide more accurate and timely data than our competitors.

STRONG PARTNERSHIPS WITH LEADING PROVIDERS

Partnerships with top providers give Geoimage access to diverse data sources and comprehensive solutions.



PREMIUM SERVICE BUNDLE

The Premium Service Bundle (PSB) offers a convenient and straightforward method for accessing satellite imagery and geospatial solutions on-demand, eliminating the need for multiple purchase orders and quote requests. This exclusive package from Geoimage comes in two tiers, namely Premium and Premium Plus, with increasing benefits for each tier level.

Geoimage can tailor a customised PSB to accommodate your specific needs if either of the two existing options are unsuitable. Our committed sales team is available to discuss this option with you.

SAVE TIME AND STREAMLINE YOUR ORDERING PROCEDURE

PRIORITISED CAPTURE AND DATA PROCESSING DELIVERABLES

HIGH-VOLUME GEOSPATIAL USERS RECEIVE COMPETITIVE RATES

EXPLORE OUR VARIETY OF OPTIONS TO DETERMINE THE PLAN THAT IS MOST SUITABLE FOR YOUR NEEDS

PREMIUM*

COMMITMENT OF UP TO

$100,000

PERIODIC BILLING BASED ON YOUR REQUIREMENTS

Everything you get in Premium

- ✓ Up to 10% pricing discount
- ✓ $10,000 deferral of budget
- ✓ Premium priority tasking
- ✓ Premium priority data processing
- ✓ Monthly progress reports
- ✓ Access to Account Manager
- ✓ Access to Technical POC
- ✓ Custom deliverables in multiple formats
- ✓ Data hosting

PREMIUM PLUS*

COMMITMENT OF UP TO

$500,000

PERIODIC BILLING BASED ON YOUR REQUIREMENTS

Everything you get in Premium Plus

- ✓ Up to 15% pricing discount
- ✓ $50,000 deferral of budget
- ✓ Above premium priority tasking
- ✓ Above premium priority data processing
- ✓ Monthly one-to-one updates
- ✓ Dedicated Account Manager
- ✓ Dedicated Technical POC
- ✓ Custom deliverables in multiple formats
- ✓ Data hosting

CUSTOM SOLUTION*

COMMIT WHAT YOU WANT

$CUSTOM

PERIODIC BILLING BASED ON YOUR REQUIREMENTS

Customise a solution to suit your needs

- ✓ Custom pricing discount
- ✓ Custom deferral of budget
- ✓ Custom priority tasking
- ✓ Custom priority data processing
- ✓ Monthly one-to-one updates
- ✓ Emergency response data
- ✓ Negotiable Account Manager
- ✓ Negotiable Technical POC
- ✓ Negotiable Custom deliverable
- ✓ Data hosting
- ✓ 24/7 hotline access
- + **Much more**

* Terms and Conditions apply. Please contact our sales team to find out more.

EXPLORING THE BENEFITS OF GEOIMAGE

LAND DISTURBANCE CALCULATION

Calculate land disturbance to measure your mining progress, construction progress, adhere to regulatory requirements, and implement sustainable land use practices.

Geoimage can provide high-resolution satellite imagery that can pinpoint the extent of land disturbance caused by mining activities, which can be used to create detailed maps and models of the disturbed land area.

Additionally, Geoimage can generate Digital Elevation Models (DEMs) (see page 12 for more information on DEMs) that provide valuable information about the terrain and topography of the disturbed land.

By analysing satellite imagery from various time periods using change detection techniques, Geoimage can calculate the rate and magnitude of land disturbance caused by mining operations. This assists companies in monitoring and managing their land use practices more efficiently.

STOCKPILE VOLUMETRICS

Accurately measure and manage your stockpiles to optimise your operations and reduce costs.

Geoimage can provide high-resolution satellite imagery to accurately identify and measure stockpile volumes. Using this imagery, Geoimage can create 3D models of stockpiles that provide accurate information on their shape and size.

Geoimage can employ advanced software to calculate stockpile volumes quickly and accurately. This software can also detect and quantify any changes in stockpile volumes over time, enabling companies to monitor their operations and make informed decisions.

Geoimage can also perform regular surveys of stockpiles to provide up-to-date information on their volume and status. This assists companies in managing their resources and inventory more effectively.

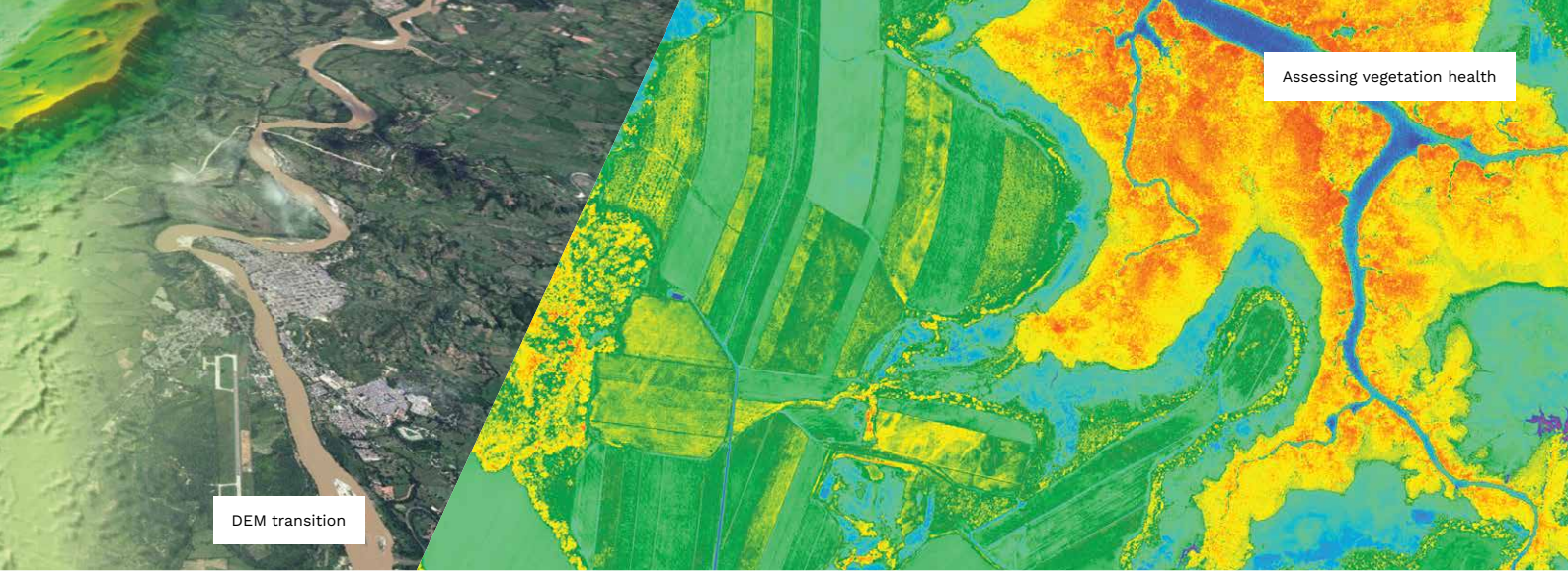
TAILINGS DAMS MONITORING

Monitor the stability and safety of your tailing dams ensuring the safety of communities and the environment.

Geoimage can provide high-resolution satellite imagery to track any changes in the tailings dam's structure, such as subsidence, cracks, or deformations, which may impact the dam's stability.

By performing spectral analysis (see page 11 for more information on SWIR) on satellite imagery, Geoimage can also detect and monitor changes in vegetation, water flow, and land use surrounding the dam. This analysis can provide insight into potential risks and hazards to the dam's stability, such as flooding or erosion.

Geoimage can provide monitoring solutions for tailings dams utilising satellite imagery and other remote sensing technologies. Monitoring uses change detection algorithms to identify changes occurring over time and the changes can be displayed within your GIS.



GENERAL MONITORING

Geoimage can assist with any general monitoring by providing a range of geospatial solutions and technologies. This includes high-resolution satellite imagery, spectral analysis, digital elevation models, change detection techniques, and monitoring using remote sensing technologies. By leveraging these tools, companies can monitor and manage their operations more effectively, identify potential risks and hazards, and make informed decisions to protect the environment and ensure the safety of nearby communities.

Geoimage can provide customised solutions to meet the specific monitoring needs of mining companies, helping you achieve your goals efficiently and cost-effectively.

ASSET CONDITION MONITORING

Maintain and optimise your equipment and infrastructure by monitoring the condition of your assets.

Geoimage can provide high-resolution satellite imagery to identify and monitor changes in the condition of mining assets such as equipment, facilities, and infrastructure. This allows companies to detect potential issues early and implement preventive maintenance measures, reducing downtime and increasing efficiency.

Using advanced remote sensing techniques, Geoimage can analyse satellite imagery to provide detailed information on asset conditions, before and after natural events such as cyclones, flood events and bush fires.

REHABILITATION ASSESSMENT

Evaluate the progress and effectiveness of rehabilitation efforts using accurate and detailed information.

Geoimage can provide high-resolution satellite imagery to assess the vegetation cover and ground conditions of rehabilitated areas. This information can be used to determine the success of rehabilitation efforts and identify areas that may require further attention.

Geoimage can perform spectral analysis on satellite imagery to provide information on soil quality, moisture content, and other important factors that influence the success of rehabilitation efforts.

Let Geoimage map the distribution of native and invasive species to ensure you remain compliant with environmental commitments.

OUR SERVICES AND SOLUTIONS

MONITORING AS A SERVICE

Employ satellite imagery for change monitoring and to maintain an audit trail for compliance purposes. Our main service component is change detection, which enables the detection and tracking of modifications over time, offering valuable insights for decision-making and risk management.

Our services encompass analysis and visualisation of physical changes in the landscape and environment. The results can be provided in various standard GIS formats, streamed to your GIS or analysed via our secure web-based application, *ground*WATCH.

WHAT IS MONITORING AS A SERVICE?

Satellite imagery provides a bird's eye view of large areas and can reveal detailed information about the landscape, such as changes in vegetation cover, ground disturbances, and mining activities.

BENEFITS TO THE MINING INDUSTRY

EARLY DETECTION OF CHANGES

Satellite imagery helps mining companies detect and track changes in mining sites or surrounding areas, like vegetation encroachment or water body changes. This allows for early detection of potential issues and prompt mitigation actions.

ENVIRONMENTAL PROTECTION

Satellite imagery can monitor environmental impact, including deforestation, soil erosion, and pollution, to ensure compliance with environmental regulations.

INCREASED SAFETY

Satellite imagery can detect potential safety hazards, like unstable slopes, in mining operations and ensure compliance with safety regulations.

IMPROVED OPERATIONAL EFFICIENCY

Satellite imagery allows mining companies to optimise production processes by detecting changes like higher ore concentrations or impacts on mining activities.

COST SAVINGS

Satellite imagery can help mining companies reduce costs by minimising the need for expensive ground surveys and the risk of fines for non-compliance with regulations.

BETTER STAKEHOLDER ENGAGEMENT

A bird's eye view of a mining lease provides an easy to comprehend perspective and can enable effective communication with a range of stakeholders, whether those stakeholders are senior management, contractors, or community groups.

InSAR

Geoimage provides mining and exploration industries with high-resolution satellite imagery, InSAR data processing, and solutions for environmental monitoring, mineral deposit identification, and resource management. Geoimage assists companies comply with regulations related to ground stability, environmental protection, and community engagement. InSAR solutions offer critical information on ground movement, helping clients improve safety, minimise environmental impact, optimise resource management, and meet regulatory requirements.

WHAT IS InSAR?

InSAR (Interferometric Synthetic Aperture Radar) is a remote sensing technique that employs radar imagery to detect changes in ground surfaces over time. This method is particularly beneficial for monitoring ground deformation.

BENEFITS TO THE MINING INDUSTRY

MONITORING GROUND STABILITY

InSAR can detect ground movements and subsidence caused by mining activities, helping to ensure safe and stable mining operations.

IMPROVED SAFETY

One of the advantages of InSAR is that it does not require any personnel or equipment to be present on-site for measurements, as it relies entirely on satellite technology. Therefore, InSAR is regarded as the safest option for monitoring mine sites.

COST-EFFECTIVE

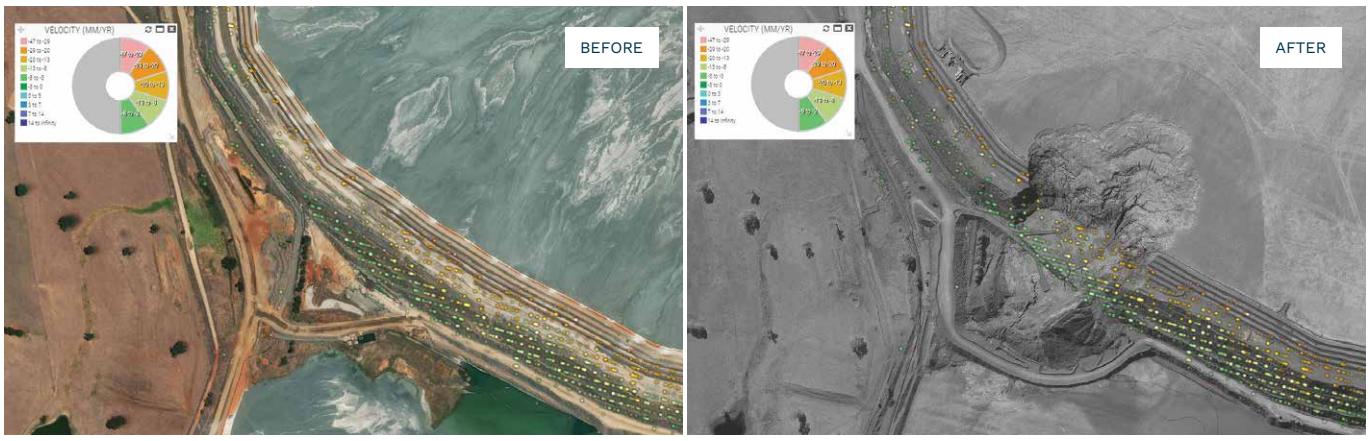
Due to their broad coverage capability, satellite scenes can capture hundreds of km² in a single image, making InSAR (Interferometric Synthetic Aperture Radar) a cost-effective approach for monitoring surface movement over large areas.

CONSTANT MONITORING

The data required for InSAR can be obtained at constant intervals, typically every few days, enabling ground movements to be monitored continuously and decisions to be made promptly.

REGULATORY COMPLIANCE

InSAR can assist mining companies in meeting regulatory requirements related to ground stability, environmental protection, and community engagement.



Surface movement monitoring using InSAR.

SWIR

Geoimage uses Short-Wave Infrared (SWIR) technology to extract insights from satellite imagery, enabling clients to make informed decisions. Spectral analysis techniques identify and quantify surface features such as vegetation species and clay mineralogy products.

WHAT IS SWIR?

SWIR is a part of the electromagnetic spectrum between the visible and mid-infrared ranges, commonly used in remote sensing. SWIR penetrates atmospheric haze and detects variations in moisture, and chemical composition, making it useful in mining, exploration, and more to detect and identify features invisible to the human eye or other imaging technologies.

BENEFITS TO THE MINING INDUSTRY

DETECTION OF ALTERATION ZONES

SWIR can detect alteration zones caused by mineralisation, which can be a useful tool for inferring the type and extent of mineralisation.

MAPPING OF GEOLOGY

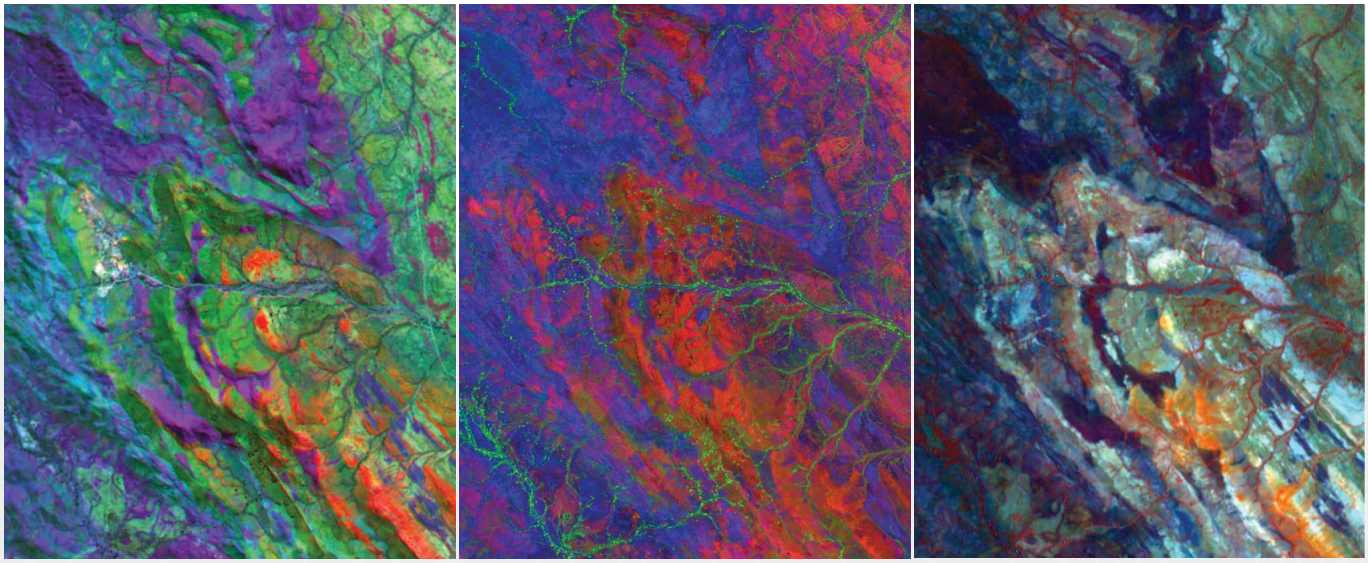
SWIR can map lithological units based on their mineral composition, which can be useful for understanding the geology of an area and the potential for mineralisation.

COST-EFFECTIVE

Satellite scenes have the ability to cover vast areas of land, often hundreds of km², in a single image, which makes SWIR a cost-effective approach for green fields exploration.

ENVIRONMENTAL MONITORING

SWIR can be used to monitor environmental impacts, such as acid water leakage drainage or vegetation stress, to support mitigation and remediation efforts.



Using WorldView 3 SWIR to detect different mineral compositions.

DIGITAL ELEVATION MODELS (DEMs)

Geoimage provides two options for Digital Elevation Models (DEM) - Digital Surface Model (DSM) and Digital Terrain Model (DTM). DSM includes all ground features like buildings and trees, making it useful for 3D modelling and urban planning. On the other hand, DTM represents the bare Earth surface without features, useful for topographic mapping and geospatial analysis. Geoimage has an experienced team that can produce high-quality DEMs based on project requirements, using data sources like Stereo, Tri-stereo, and photogrammetry data.

WHAT ARE DIGITAL ELEVATION MODELS (DEMs)?

Digital Elevation Models (DEMs) are crucial for geospatial analysis as they describe the 3D surface and enable orthorectification of imagery. There are two types of DEMs - Digital Surface Model (DSM) and Digital Terrain Model (DTM), which have distinct differences affecting their usefulness for applications. DSM includes all cultural features like buildings and vegetation, while DTM represents only the bare ground surface. DEMs can be created from different data sources and classified by their grid or spatial resolution, affecting their inherent vertical accuracy. DSMs are useful for landscape and city modeling, while DTMs are necessary for flood or drainage modeling, land-use studies, geological applications, and other purposes.

BENEFITS TO THE MINING INDUSTRY

PLANNING AND DESIGN

DEMs can provide detailed information about the topography of mining sites, allowing engineers and planners to design optimal extraction and mining plans. This includes identifying potential hazards, such as unstable slopes or areas prone to landslides, and determining the best routes for access roads and haulage.

ENVIRONMENTAL IMPACT ASSESSMENT

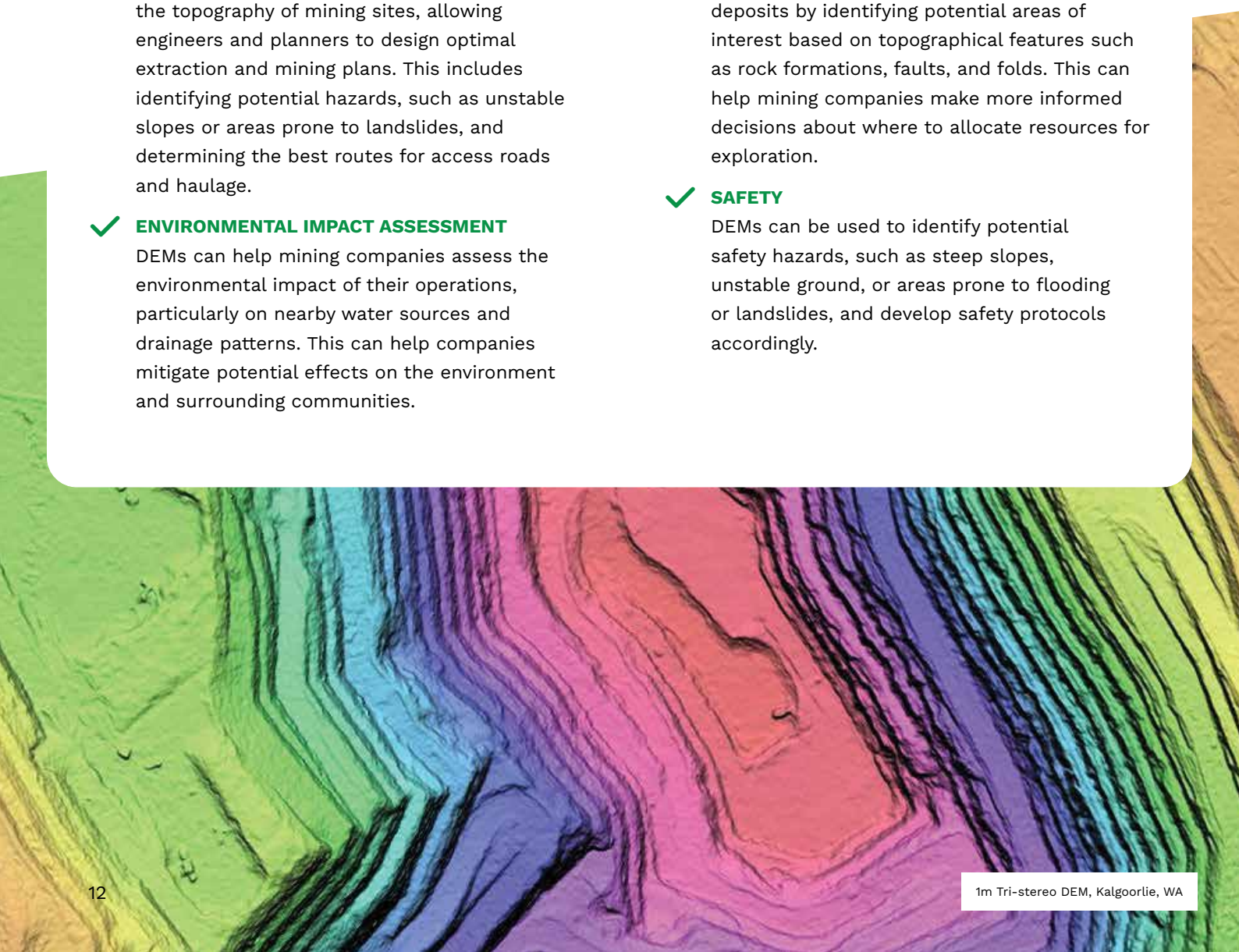
DEMs can help mining companies assess the environmental impact of their operations, particularly on nearby water sources and drainage patterns. This can help companies mitigate potential effects on the environment and surrounding communities.

EXPLORATION

DEMs can aid in the exploration of mineral deposits by identifying potential areas of interest based on topographical features such as rock formations, faults, and folds. This can help mining companies make more informed decisions about where to allocate resources for exploration.

SAFETY

DEMs can be used to identify potential safety hazards, such as steep slopes, unstable ground, or areas prone to flooding or landslides, and develop safety protocols accordingly.



1m Tri-stereo DEM, Kalgoorlie, WA

IMAGE PROCESSING

To align raw satellite imagery with real-world map projections and coordinate systems, most types of imagery require some form of geometric correction or rectification. Geoimage's processing team offers a variety of services to correct and improve raw satellite imagery to meet this requirement.

ORTHORECTIFICATION

Orthorectification is a form of geometric rectification that enhances the horizontal positional accuracy of satellite imagery by warping it to align with accurate ground control. This technique is most effective when the area is mostly flat and the imagery has been acquired from a near-vertical or nadir viewpoint.

PAN-SHARPENING

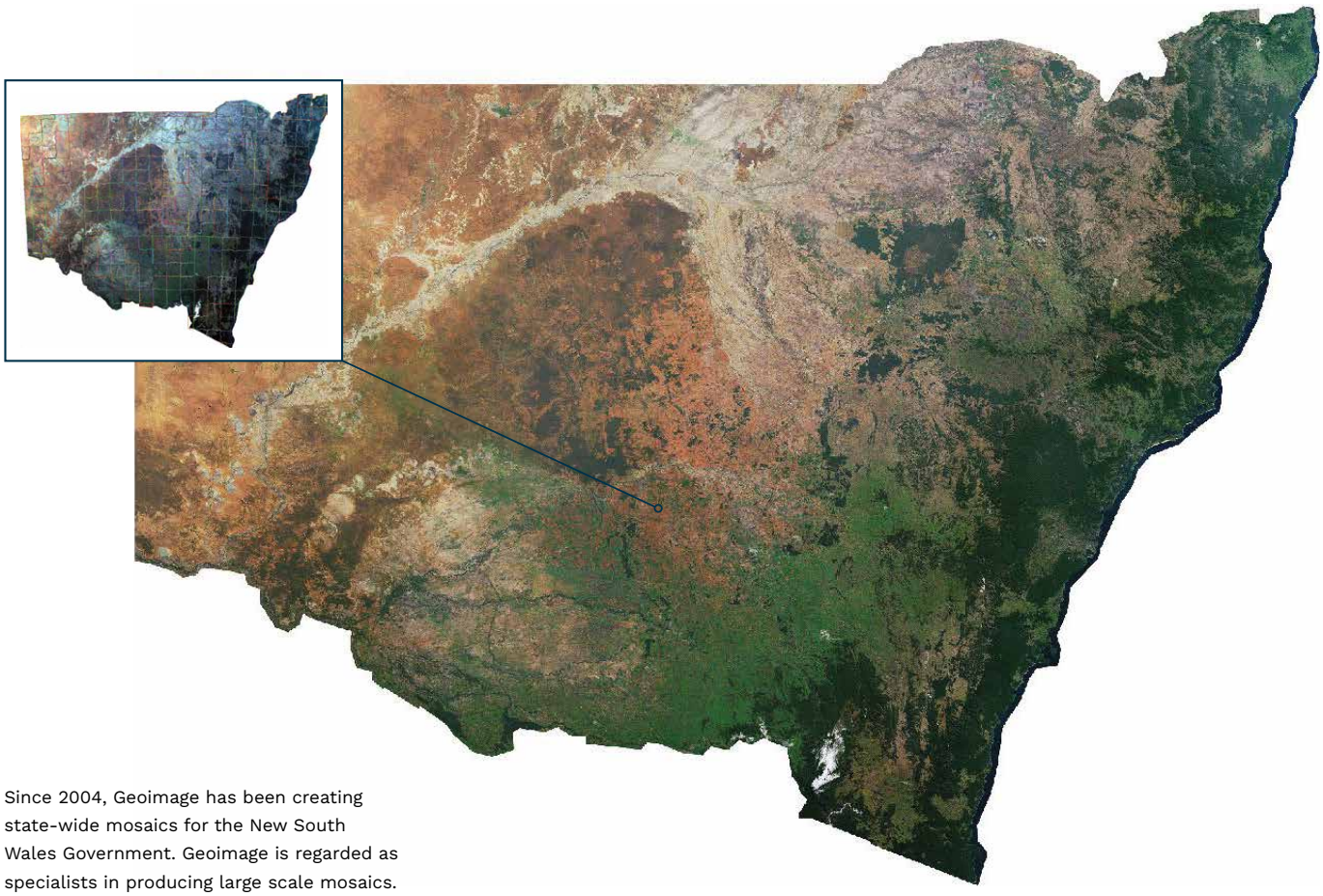
Geoimage combines high-resolution panchromatic and lower-resolution multispectral data to create a colour image that highlights the superior detail of the pan band. This produces a more appropriate colour image for various applications, such as vegetation mapping or as a background for vector data. The higher spatial resolution provides a more detailed view of the world.

MOSAICKING

Mosaicking stitches together multiple satellite images to create a larger composite image, useful for creating large-scale maps and visualisations. It is beneficial in monitoring large areas where changes in vegetation cover can be tracked over time.

HAZE REMOVAL

Haze and smoke in satellite images can obscure views due to air pollution, cloud cover, and other factors. To mitigate the issue of haze in colour imagery, Geoimage has developed in-house techniques.



Since 2004, Geoimage has been creating state-wide mosaics for the New South Wales Government. Geoimage is regarded as specialists in producing large scale mosaics.

*ground*WATCH

*ground*WATCH by Geoimage is a web-based visualisation dashboard that operates securely on an enterprise GIS platform. Its intuitive interface makes it easy for users to monitor changes by interacting with data. The dashboard also features customisable interactive filters and user controls to meet the specific needs of each project.

HOW DOES *ground*WATCH WORK?

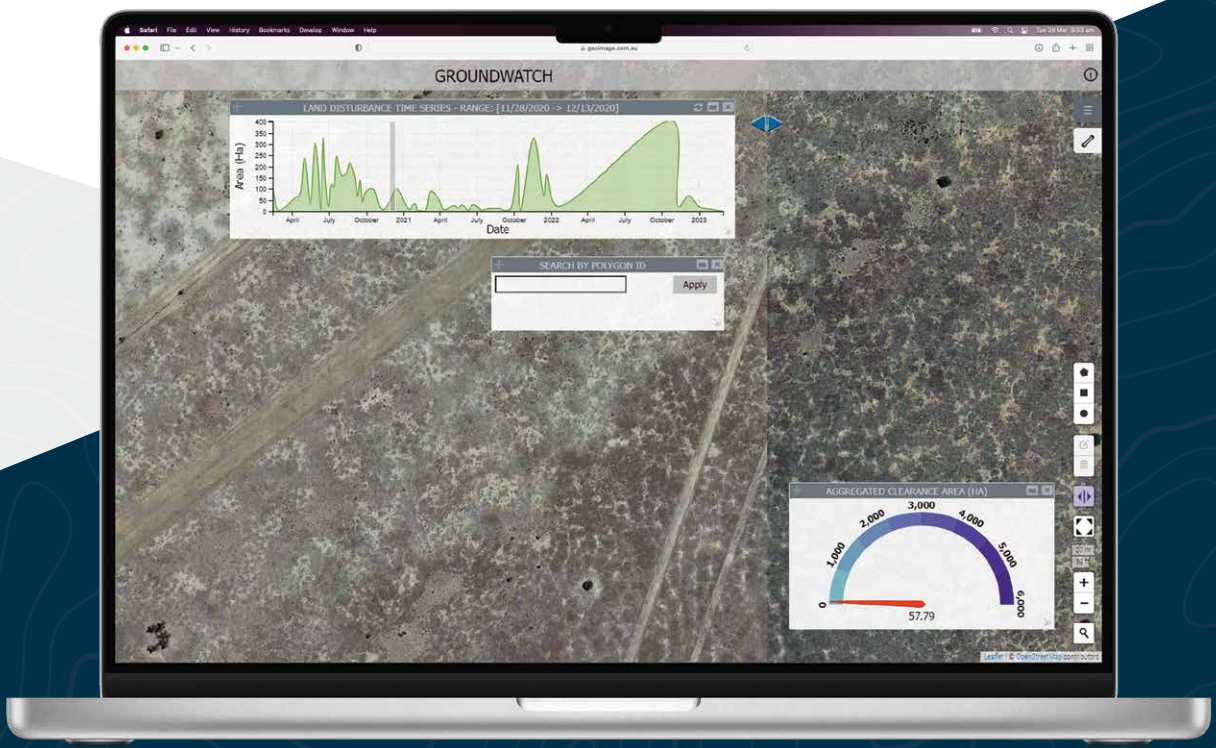
Geoimage ingests spatial imagery in various formats into the dashboard, which is processed and analysed by in-house algorithms and proprietary software systems. The data is presented in interactive charts and graphs alongside the corresponding imagery. Dynamic updates are made to all associated graphs, charts, and imagery whenever the user applies spatial or non-spatial filters.

WHY CHOOSE *ground*WATCH FOR YOUR NEXT PROJECT?

*ground*WATCH is a flexible platform that helps asset owners and managers improve project governance and control. It offers measurable ways to enhance outcomes, with custom dashboards that meet specific needs. The system is useful across industries and use cases, and can be integrated with InSAR. *ground*WATCH is particularly valuable for monitoring remote and regional assets and projects, covering large areas without limitations.

BENEFITS TO THE MINING INDUSTRY

- ✓ High-resolution optical imagery captured every two weeks and delivered within two working days of image capture.
- ✓ Uses both raster and vector data.
- ✓ Intuitive user interface that is easy to use and requires no knowledge of GIS.
- ✓ Displays change polygons over areas of interest.
- ✓ Interactive charts and graphs that filter and visually present information.
- ✓ Timeline functionality for interactive display of changes over time.
- ✓ Hosted on secure servers within Australia.



A GLIMPSE AT THE FUTURE OF EARTH OBSERVATION

VENDOR UPDATES

WORLDVIEW LEGION

Maxar is planning to deploy its latest Earth imaging constellation, WorldView Legion, with six satellites expected to be operational by the end of 2023. These satellites will provide high-resolution imaging capabilities of up to 30cm with multiple revisits per day. This unprecedented increase in capacity will be a game changer for all use cases that require very-high resolution imagery.

SYNSPECTIVE

Synspective intends to launch 30 small satellites with SAR sensors, capable of capturing high-quality data even in unfavorable weather conditions. The satellites will have a ground resolution of 1-3m and a swath width ranging from 10-30km. This constellation will provide global coverage with a revisit time of fewer than four hours.

XPLORE

Xplore plans to launch its initial Xcraft small satellite in the fourth quarter of 2023. These satellites will offer excellent hyperspectral imaging data with up to 400 bands available in groups of 32. The data will be captured at resolutions of 2 and 5 metres.

PIXXEL

Pixxel intends to launch six VNIR (5m resolution) satellites with daily global access by the fourth quarter of 2023. Additionally, they plan to launch twelve VNIR and six SWIR (5m resolution) satellites that will have daily revisits between the fourth quarter of 2024 and the first quarter of 2025. All of Pixxel's satellites will be able to capture 300 spectral bands. New providers of hyperspectral sensors will bring significant price reductions to the market and herald a new era in the use of hyperspectral for exploration and environmental use cases.

INTRA DAILY CAPTURE

Certain satellites are capable of capturing images of a specific location multiple times throughout the day. The frequency and resolution of these images can vary depending on the design of the satellite. Notable examples of satellites with high-frequency capture capabilities include the Pléiades Neo constellation and the WorldView Legion constellation.

BENEFITS OF DAILY CAPTURE

- ✓ **Timely data collection:** With the ability to capture images daily, satellites can provide timely data and information about a particular area or location. More frequent captures can help mitigate the effects of missing critical captures due to cloud cover.
- ✓ **Improved accuracy:** Multiple image captures allow for more accurate data collection and analysis. This is particularly important for applications such as mapping, where even slight changes in terrain or features can have significant impacts on accuracy.
- ✓ **Enhanced monitoring capabilities:** With the ability to capture images daily, satellites can be used for ongoing monitoring of natural and man-made assets, disaster management, and surveillance.
- ✓ **Increased flexibility:** With the option of daily captures you can be more confident of capturing your AOI on a specific date, essential for use cases that are time critical.

COST OF DATA DECREASING

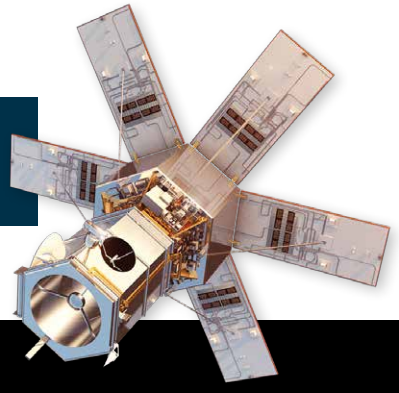
Satellite imagery data costs are decreasing due to various factors such as technological advancements, increased competition, and economies of scale.

Advances in satellite imaging have improved the resolution, accuracy, and speed of data acquisition, allowing for more data to be collected at lower costs.

Innovations in data processing and storage have also made it more efficient to distribute and analyse large amounts of satellite data.

The rise in competition among satellite imaging companies has led to more options for data types and pricing models, driving down costs.

Stay informed about the most recent advancements in the geospatial industry by visiting **www.geoimage.com.au**.

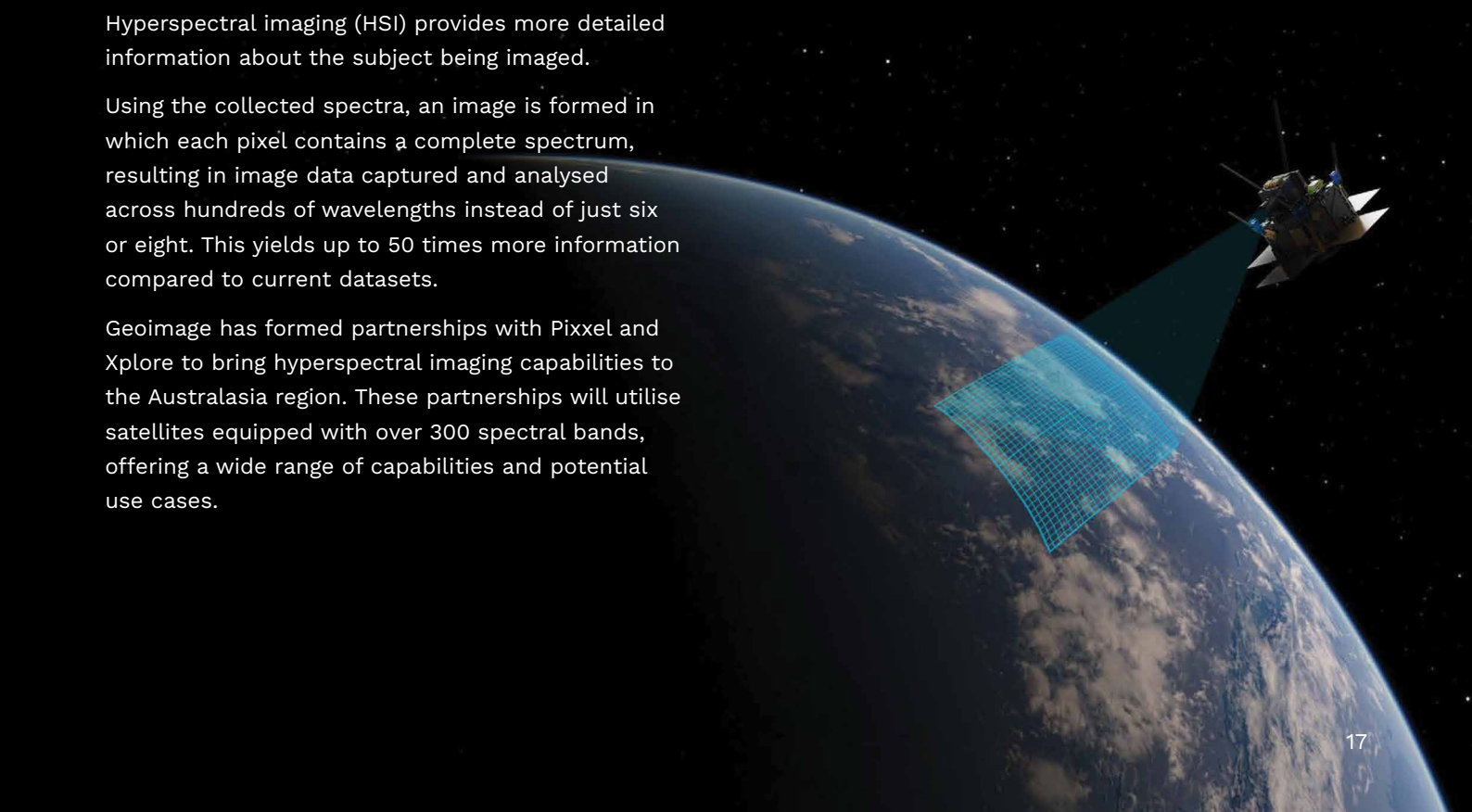


HYPERSPECTRAL: THE NEXT BIG THING

Hyperspectral imaging (HSI) provides more detailed information about the subject being imaged.

Using the collected spectra, an image is formed in which each pixel contains a complete spectrum, resulting in image data captured and analysed across hundreds of wavelengths instead of just six or eight. This yields up to 50 times more information compared to current datasets.

Geoimage has formed partnerships with Pixxel and Xplore to bring hyperspectral imaging capabilities to the Australasia region. These partnerships will utilise satellites equipped with over 300 spectral bands, offering a wide range of capabilities and potential use cases.



SATELLITES AND SENSORS

Geoimage utilises its partnerships with leading satellite imagery providers such as Maxar, Airbus, and RESTEC, among others, to acquire and employ the most advanced and cutting-edge satellites and sensors. As an independent reseller, Geoimage guarantees that clients receive the optimal satellite solution tailored to their specific use case.

Australasia's only **DIAMOND** partner of Airbus.

Australasia's first and only **GOLD** partner of Maxar.

GEOIMAGE ARE LICENCED RESELLERS FOR THE FOLLOWING PROVIDERS

AIRBUS MAXAR RESTEC pixxel Synspective

VERY HIGH-RESOLUTION

Satellite	No. satellites	Panchromatic resolution	Multispectral resolution	Bands available	Swath width at nadir	Stereo/ Tri-stereo
Pléiades Neo	2	30cm	1.2m	6	14km	Yes
WorldView-3	1	31cm	1.24m	• 8 multispectral bands at 1.24m • 8 SWIR bands at 3.7m • 12 CAVIS bands at 30m	13.1km	Yes
WorldView-2	1	50cm	2.0m	4 or 8	16.4km	Yes
WorldView-1	1	50cm	N/A	4	17.6km	Yes
GeoEye-1	1	50cm	2.0m	4	15.2km	Yes
Pléiades	2	50cm	2.0m	4	20km	Yes

HIGH-RESOLUTION

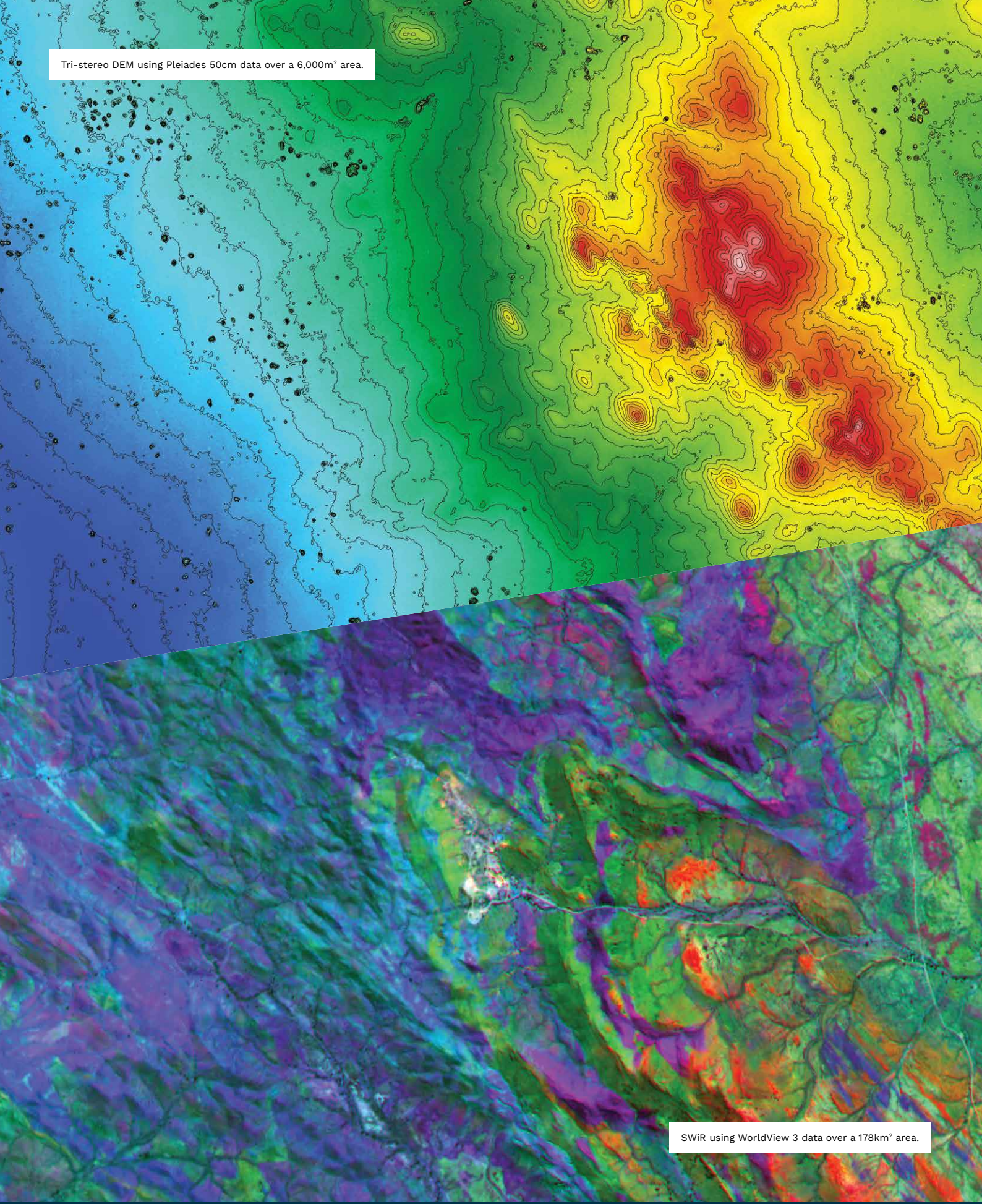
Satellite	No. satellites	Panchromatic resolution	Multispectral resolution	Bands available	Swath width at nadir	Stereo/ Tri-stereo
SPOT 6 and 7	2	1.5m	6.0m	4	60km	Yes
RapidEye	1	N/A	5.0m	5	77km	No
ALOS-1	1	2.5m	10m	4	70km	Yes

MEDIUM-RESOLUTION

Satellite	No. satellites	Panchromatic resolution	Multispectral resolution	Bands available	Swath width at nadir	Stereo/ Tri-stereo
Sentinel	2	N/A	10m	• 4 bands at 10m • 6 bands at 20m • 3 bands at 60m	290km	No
ASTER (Terra)	1	N/A	15m	14	60km	Yes
Landsat	2	15m	30m	8	185km	No

RADAR

Satellite	Band	Polarisation	Ground resolution	Scene coverage	Repeat cycle
Radarsat-2	C	HH/HV/VH/VV	1-100m	8-500km	3 days
Radarsat-1	C	HH	1-100m	18-500km	24 days
Sentinel 1A/1B	C	HH/HV/VH/VV	5m	80-400km	12 days
TerraSAR-X and TanDEM-X	X	HH/HV/VH/VV	1-18.5m	10-100km	2-11 days
ALOS-2	L	HH/HV/VH/VV	3-100m	50-490km	14 days



Tri-stereo DEM using Pleiades 50cm data over a 6,000m² area.

SWiR using WorldView 3 data over a 178km² area.

geoimage

BRISBANE OFFICE
59 Anderson Street
Fortitude Valley, QLD 4006

+61 7 3319 4990
sales@geoimage.com.au
www.geoimage.com.au

Applied Spatial Intelligence