



GROUND-BREAKING NEWS

GROWTH ACROSS MARKETS

AND GEOGRAPHIES



As leaders in real-time, geotechnical monitoring of slopes and walls in both open-cut and underground mines, we at GroundProbe have been working in the global mining industry for over 17 years.

Over time, we have developed an expert understanding of these environments and their infrastructure - like tailings dams - and the unique challenges they present.

Recent tailings dam disasters have fuelled rising concerns over the safe management of mine tailings and waste material.

In response, there has been a global shift by governments, investors, industry organisations and mining companies towards implementing greater transparency with regard to the governance and management of tailings dams.

Mining companies are also quickly recognising that real-time monitoring of tailings dams to detect movement early plays a substantial role in mitigating the risk of catastrophic failures.

GroundProbe is proud to now have our industry-leading slope monitoring systems, as well as our world-class Geotechnical Support Services, providing real-time tailings dam monitoring and support to over 15 sites around the world.

Brian Gillespie
Chief Executive Officer



*Retiro do Sapecado Mine:
Tailings Dam Failure in 2014 - GroundProbe Provided Post-Failure Dam Monitoring*

The Importance of Tailings Dam Monitoring

INDUSTRY NEWS

Collapses in mines, tunnels and tailings dam can be disruptive, destructive and at worst, fatal.

Tailings dam failures can be considerably devastating; often having catastrophic physical, social, economic and environmental impacts.

With the assistance of slope stability monitoring, mine personnel can act quickly by detecting movement early and forecasting potential failures; making deformation monitoring an integral component of proper tailings dam management and stewardship.

History shows that slope stability monitoring is one of the essential forms of monitoring required for tailings dam monitoring.

Tailings dam monitoring can reduce the risk of catastrophic failures by detecting movement early and tracking changing dam slope conditions for signs of subsidence caused by piping, or large positive deformation.

Whilst the initial design, construction and ongoing management of a dam is essential to its robustness and longevity, using slope stability monitoring as a means to observe the changing nature of a dam over time is essential to ensuring maximum safety.

GroundProbe's Tailings Dam Experience

INNOVATIONS

In the last few years GroundProbe is proud to have been brought in to help monitor tailings dams at several high-profile mine sites across Brazil which have experienced significant tailings failures, including monitoring after the Samarco Mineração S.A collapse that occurred in 2015, through the rebuilding of the facilities.

Despite not being on-site before or during the collapses, GroundProbe systems were brought in to monitor the continued stability of the dams moving forward for maximum safety.

GroundProbe provided Samarco Mineração S.A with two safety-critical, mobile radar systems (SSR-XT) and three long-range, fixed-deployment radar systems (SSR-SARx) to monitor their Santarém, Sela, Tulipa and Germano dams following the collapse.



*Samarco Mineração S.A:
Tailings Dam Failure in 2015*

GroundProbe radars and lasers are now monitoring a number of tailings dams around the world in a precautionary capacity, as sites commonly do for their open cut slopes.

Some tailings dams have been deemed high risk with assumed instability, so monitoring regimes have since been put in place to detect and measure the movement and predict if and when a failure is likely to occur.



(Left to Right) Chris Bijsterveld - GroundProbe Business Manager for North America and Brazil, Antonio Rocha - GroundProbe Group Business Development, Brian Gillespie - GroundProbe CEO



*Mar Azul Mine:
GroundProbe CEO Brian Gillespie Inspects a SSR-SARx Monitoring a Tailings Dam*

Other sites have deployed monitoring systems because of a hypothetical risk to the dam. The hypothetical risk or hazard consequence classification does not take into account the actual stability of the dam, but rather the risk of harm should the dam collapse. Dams are classified according to: the potential loss of life; environmental, cultural and social impacts; as well as infrastructure and economic losses.

Currently, GroundProbe have deployed tailored monitoring solutions to tailings dams on three continents across 15 mine sites located throughout Brazil, Australia, Chile and South Africa.

Nearly half of our tailored solutions have also included 24/7 world-class support provided by our GSS team through our GSS-Remote, GSS-Local, or GSS-Reporting services.

The GSS team are able to provide customers with dedicated 24-hour remote monitoring solution for mine sites anywhere around the globe.

The remote monitoring team, all fully-qualified Geotechnical Engineers with extensive radar knowledge and experience, operate 24/7 from a central, remotely-located office.



Providing real-time support, the team monitor live radar data and respond to alarms and movement, remaining in close phone and online contact with site-based staff.

Risk-Control

Solutions

INNOVATIONS

Each tailings dam is unique and so is the consequence of a dam failure.

The size and volume of the dam, the type of material it holds, its method of construction and consequence classification, as well as the site’s geography and climate, should all be considered when determining the level of slope stability monitoring required.

As a result, there is no one technology or system that is ideal for monitoring all tailings dams.

Instead, a tailored monitoring strategy is the most effective means of providing maximum safety.

GroundProbe believes the level of risk control required and the site’s specific monitoring needs should correspondingly determine the monitoring solution provided.

Whether post-failure or as a precautionary measure, GroundProbe deploys tailored monitoring regimes which often incorporate both radar and laser technologies, with sites also commonly employing our Geotechnical Support Services (GSS) remote or local monitoring services.

RADAR				LiDAR		InSAR
						
SSR-XT	SSR-FX	SSR-SARx	SSR-Omni	GMS-Dual	GMS-Prism	InSAR Service
3D Real Aperture Radar	2D Real Aperture Radar	2D Synthetic Aperture Radar	2D Real Aperture Radar	Prism and Prismless EDM	Prism EDM	Interferometric Synthetic Aperture Radar
Tactical, targeted monitoring Highly accurate safety-critical monitoring of high-risk areas	Strategic, broad-area monitoring Detects hotspots of movement over vast areas	Long-range, high-resolution monitoring Monitors over long distances	Full-coverage, high-resolution monitoring Monitors 360° over long distances	Long-term, background monitoring Monitors physical and virtual prisms	Long-term, background monitoring Monitors physical prisms	Broad area, long-term, background monitoring Mine-wide, satellite-based radar
Precision: 0.1mm				Precision: ±2mm + 2ppm		Precision: ~2mm
Time Between Scans: ~2 minutes – adjustable				Time Between Scans: ~5-10 minutes		Time Between Scans: ~11 days
SSR-Viewer: All GroundProbe monitoring solutions use				the same visualisation, analysis and alarming software		
Geotechnical Support Services (GSS): World-class global support network that assists our customers				with effective risk management through a fully-qualified team of over 25 Geotechnical Engineers		

Prism and Prismless Monitoring

CASE STUDY

Providing total monitoring flexibility, GroundProbe's GMS-Dual (Geotech Monitoring Station) can monitor using both prism points - which are paired with physical prisms installed on the pit wall - and virtual points - which are virtual prisms that can be placed digitally on the wall in GroundProbe's patented SSR-Viewer software.

At Filminera Resources Corporation's Masbate Gold Project, an open-cut gold mine in the Philippines, the loss of a significant number of physical prisms due to vandalism had compromised the site's ability to detect and measure deformation, thereby reducing the on-site geotechnical team's confidence to effectively manage risk.

As a result, the GMS-Dual was deployed to the site - which is currently undergoing an active production stage - to provide long-term, broad-area, background monitoring.

“The GMS-Dual was selected due to its unique prismless monitoring functionality whereby users are able to detect deformation across the slope by placing virtual points anywhere on the wall within SSR-Viewer, our geotechnical monitoring and analysis software.”

Fernanda Carrea, Product Manager, GroundProbe.

“The GMS-Dual is then able to reflect its laser signal directly off the rock, corresponding to the exact location and placement of the virtual points in SSR-Viewer, allowing it to detect hotspots of movement across the area of interest,” said Ms Carrea.

Virtual points can also be utilised when monitoring areas that are difficult, dangerous or even impossible to physically reach, consequently inhibiting the installation of physical prisms.

In addition, as many virtual points as needed can be placed in as many locations as required, allowing the GMS-Dual to detect deformation across vast areas and at long-range.

The GMS-Dual was easily deployed in just minutes and positioned looking down to one of the mine's main pits, where hundreds of virtual points were digitally placed on the slope.

“Within days of monitoring, the GMS-Dual provided extensive practical data on the overall stability of the pit,” said Prastowo Harymurty, GroundProbe's Technical Specialist who deployed the system.

“It also proved its competency in detecting and tracking both positive and negative deformation trends across each of the different types of points; Prism Points, Pixel Points and Precision Points.”



The GMS-Dual monitored continuously and without interruption, successfully detecting sub-millimetre movement, reflecting its high accuracy and precision.

“The data gathered enabled the on-site geotechnical team to identify areas with differentiated geotechnical behaviours and deformation trends; for example, some zones featured no significant movement while others either presented noticeable linear or regressive deformation trends,” said Mr Harymurty.

Blasting activity in the lower benches of the pit were also monitored using virtual points to provide geotechnical peace of mind.

Using SSR-Viewer's intuitive visualisation tools, the geotechnical team could pinpoint hotspots of movement across the pit, represented visually through a colour gradient heatmap which was draped over the top of a photographic representation of the area.

The geotechnical team were also able to perform a velocity analysis and even conduct remote inspections of the areas of interest in real-time using the GMS-Dual's built-in telescopic camera.

Additionally, the system's ability to monitor both prism and virtual prism points allowed the geotechnical team to monitor the remaining prisms installed on the pit walls,

providing three-dimensional displacement data of these points in real-time.

“Thanks to the GMS-Dual and its prismless monitoring, we have been able to counteract the lack of continuous, real-time slope monitoring caused by the unauthorized removal and vandalism of physical prisms by intruders.”

Peter Alip, Chief Geotechnical Geologist, Masbate Gold Project.

“Moving forward, our geotechnical team is excited to incorporate the system into our permanent on-site monitoring processes and procedures thanks to its easy setup, user-friendliness and smart data capture,” said Mr Alip.

“We are eager to continue using the GMS-Dual for effective slope stability in order to detect hazards early, make confident decisions and manage risk, without having to rely solely on physical prisms.”

GroundProbe extends Business in the Americas with the Opening of their Second 24/7 Monitoring Centre

INNOVATIONS

GroundProbe has launched a dedicated monitoring centre in Santiago, Chile to provide 24/7 real-time radar and laser monitoring services for tailings dams and mines throughout North and South America.

Monitoring real-time slope stability data and reacting to alarms to ensure the maximum safety of people and communities, the high-tech centres connect remote sites with industry experts in three languages. Crewed by 45 specialised geotechnical engineers, the centres provide 24/7 expertise to over 30 customers globally.

GroundProbe is widely accepted as the global leader in real-time technologies used to detect instabilities and predict when mine and dam collapses will occur.

From a launch event in Santiago, GroundProbe CEO Brian Gillespie said the new centre marked an important step for GroundProbe's future growth, especially for South and North America.

“We’ve witnessed a boom in Brazil for continuous, real-time monitoring of tailings dams, with a huge increase in demand for our remote, 24/7 geotechnical expertise,” Mr Gillespie said.

“We saw it as an absolute necessity to bolster our offering and extend our support services from Asia Pacific to the Americas.



(Left to Right) Brian Gillespie - GroundProbe CEO, Robert Fergusson - Australian Ambassador to Chile, Germán Johow - GroundProbe Business Manager for South America, and David Noon - GroundProbe COO



“Placing the centre in Santiago and ensuring its tri-lingual capabilities allows us to do just that.”

For many years now, GroundProbe have been providing 24/7 assistance to our customers from our Asia-Pacific monitoring centre.

The addition of a second location, operating in Spanish, Portuguese and English sees GroundProbe remain at the forefront of our industry.

“Our Santiago remote monitoring centre is operational from day one, with our teams already monitoring many tailings dams, a massive hydro-electric dam and even a landslide on a national highway in Colombia,” said David Noon, COO of GroundProbe.

“Not only is it essential to our customers that our team are native Spanish and Portuguese speakers, but having a centre in Latin America shows our level of commitment to the region and to creating jobs in the local communities we serve,” he said.

To mark the launch, GroundProbe and Orica hosted a celebratory event with key customers, industry heavyweights and stakeholders.

GroundProbe's monitoring centres are home to our Geotechnical Support Services (GSS) team. GroundProbe is the only vendor in the industry to have a dedicated team of geotechnical support engineers.

The second monitoring centre in Santiago will provide the same leading services to our customers, including: GSS-Remote, our 24-hour remote monitoring solution; GSS-Training, our specialised SSR and laser training service; and GSS-Reporting, our customised analysis and reporting service. All services are provided by highly experienced, fully-qualified Geotechnical Engineers.

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