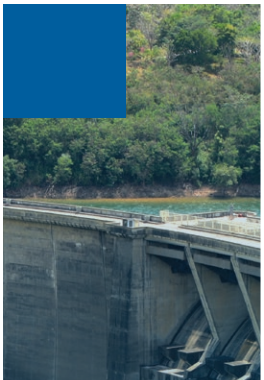
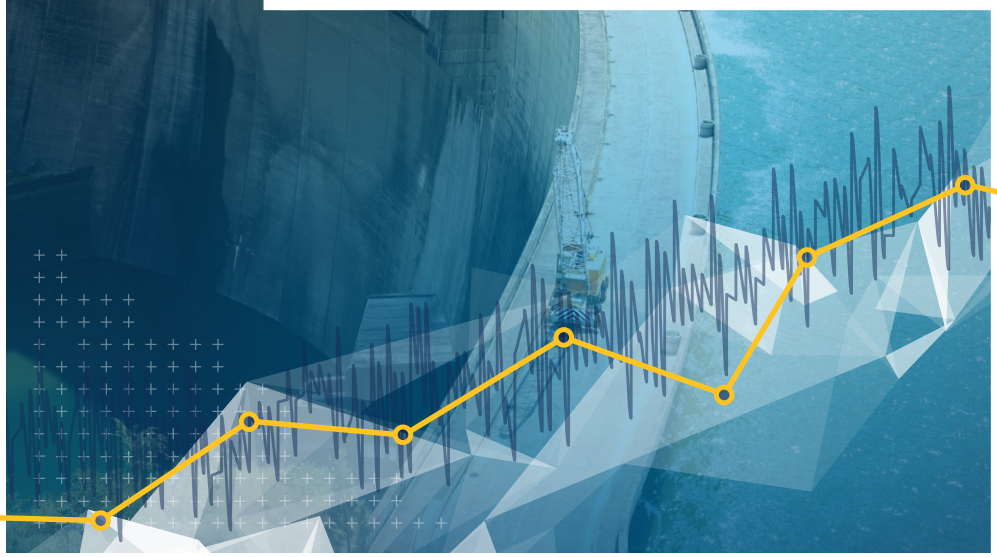
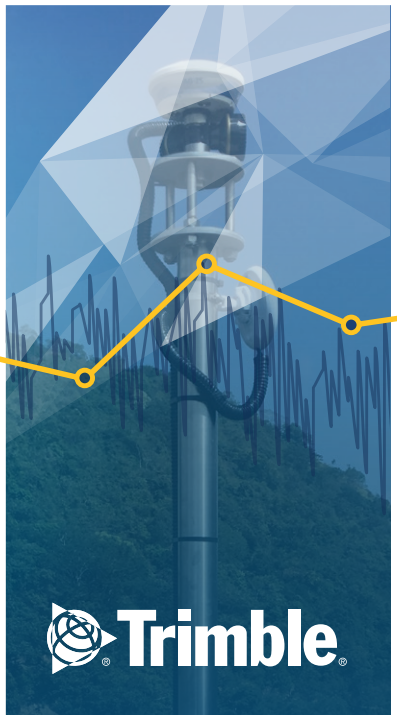
Trimble Monitoring

AUTOMATED MOVEMENT
DETECTION WITH CONFIDENCE







AUTOMATED MOVEMENT DETECTION TO SUPPORT INFORMED DECISIONS ABOUT INFRASTRUCTURE WITH CONFIDENCE FOR SURVEYING AND CONSTRUCTION PROFESSIONALS.

Automated Movement Detection with Confidence

Results You Can Rely On

Rely on Trimble® products for automated remote monitoring to increase safety onsite and have total confidence in your results.

- Transportation Infrastructure
- Buildings and Structures
- Dams and Mining
- Landslides and Natural Hazards

Trimble Monitoring connects geospatial professionals, construction managers, and mining and dam operators to crucial assets, providing up-to-the-minute data on condition and movement of structures or land.

Trimble taps into more than 40 years of experience in the fields of robotics and automation to offer highly effective monitoring solutions.

Trimble Monitoring Advantages

Complete Solution

Total stations, GNSS, optical instruments, geotechnical sensors and analytical software work together to support movement analysis and visualization for any project needs.

Automation and Safety

Increase efficiency through automation, resulting in fewer site visits while increasing safety via real-time reporting and alarming.

Flexibility

Scalable solutions meet a range of project requirements from simple to complex installations:

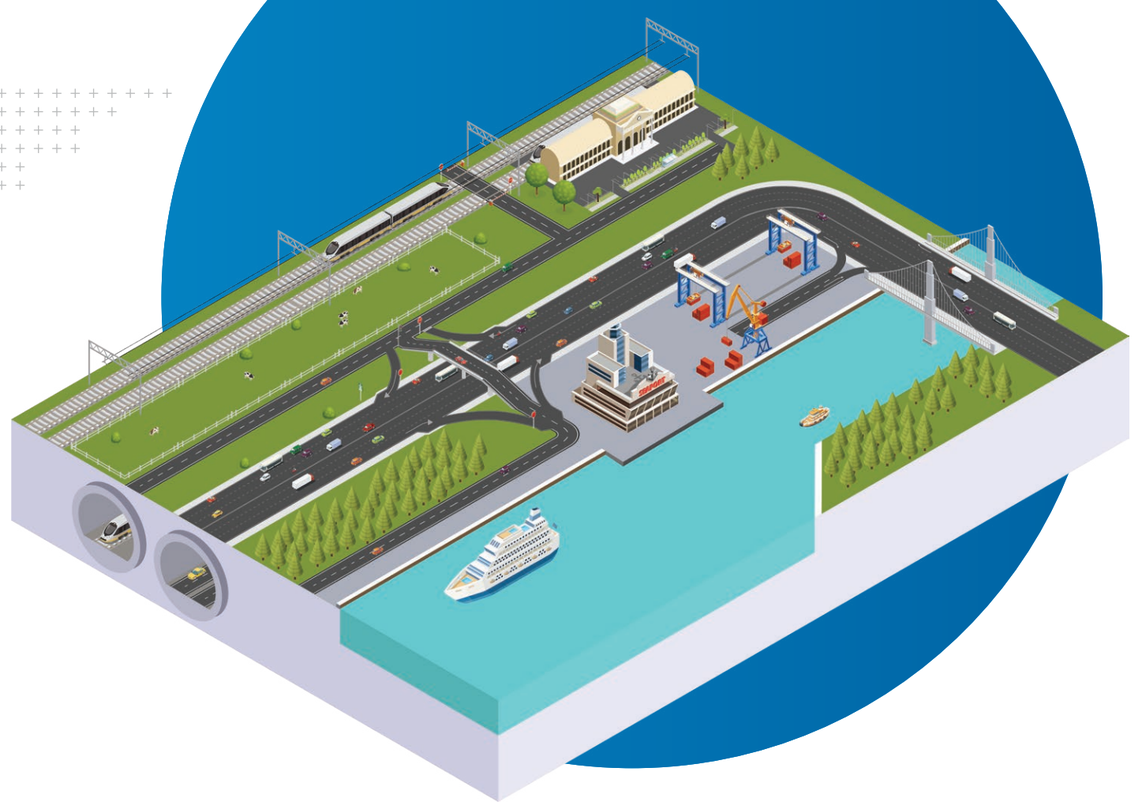
- Campaign (periodic) monitoring
- Real-time operations at pre-scheduled intervals

Durable, Resilient Equipment

Trimble total stations powered by MagDrive™ technology offer the best sealed drive solution in the industry to withstand very harsh environmental conditions, such as heavy rain, wind and ice.

Software that Understands Surveyors

Trimble 4D Control™ (T4D) software is an industry leading platform for automated movement detection. With its history rooted in other Trimble surveying software packages like Trimble Survey Controller™ and Geomatics Office™, T4D is designed to address the monitoring needs of surveyors and construction professionals. Combine Trimble's precision GNSS and total stations with any external geotechnical sensors to create a complete monitoring solution for any project.



Transportation Infrastructure

Whether it is a highway, metro line, bridge, or a tunnel, the safety of the public and workforce during construction is paramount. An automated monitoring system is crucial for detecting movements to make educated decisions before an issue occurs.

Key Benefits

- Ensure uninterrupted traffic and public transit by providing warning alarms when movement is detected
- Alarm nearby stakeholders and communities of infrastructure subsidence and movement for informed decision making
- Long and short term analysis of structural behavior to determine structure stability

Italian Railway Monitoring

Misura Engineering Company, working with Spektra Italy, deployed a Trimble Monitoring system to continually measure railway track position during a track replacement and construction operation. T4D Control software and an S-series total station provided continuous operation for the project length to establish how much twist and subsidence occurred in the track during the process to alert stakeholders if there was a safety concern.

Christchurch Northern Corridor Monitoring

International Earth Sciences was tasked with monitoring the construction of the Christchurch Northern Motorway. After historic earthquakes in 2011, the area was susceptible to aftershocks and liquefaction. A challenge with this project was consolidating the data from over 2000 geotechnical sensors in one platform.

T4D control was deployed to provide stakeholders with awareness and notification of significant movements by incorporating all geotechnical and geodetic sensor data with complex analysis and reporting.

Gasworks Tunnel in London

The Central Rail Link Alliance worked with Amey Consulting to monitor 19th century infrastructure during tunnel construction to ensure public safety and construction accuracy.

The cost-effective system provided accurate measurements to detect and verify that movement was within safe engineering tolerances, providing asset owner reassurance for the structural integrity of the tunnel.

Buildings and Structures

Activities associated with construction projects can cause ground movements, vibrations and shocks that affect buildings within the zone of influence of the excavation. Trimble solutions provide 24/7 monitoring for buildings and other large structures to keep your sites, and the people on them, safe.

Key Benefits

- Performance of buildings subject to influence of adjacent or underground construction monitoring
- Analyze integrity and stability of a building after significant events
- Monitor lateral movement, heaving, and settlement resulting from activities such as tunneling, excavation, and pilling

Brisbane Skytower

Because of it's proximity to Brisbane International Airport, the Skytower's construction crane could only operate with strict conditions, including continual monitoring of the crane's height. UPG worked with Hutchinson Builders to deploy a real-time monitoring system using T4D Control and Trimble GNSS receivers to alert stakeholders of crane movement and ensure that it did not exceed height restrictions.

Monitoring the Royal Clarence Hotel in Exeter

The Royal Clarence Hotel in Exeter was devastated during a fire in 2016. An effort was undertaken to restore much of the structure for historic and architectural importance. During the construction, it was vital to monitor retained areas to ensure safety of workers on site.

With the help of KOREC, Sumo Services deployed T4D Control software and the S-series total station on site to monitoring the site for movement 24/7. The system proved itself on several occasions by detecting unsafe movement and allowing the construction team to make decisions before continuing, ensuring safety of all onsite.

Infrastructure Monitoring in the Northern Territory

Earl James and Associates was tasked with monitoring subsidence of several critical concrete structures in Australia's Northern Territory. This project required the monitoring to be performed around-the-clock and in all weather conditions. UPG deployed a Trimble monitoring system using T4D Control to process, manage, and report on the data while measuring 70 prisms deployed across the site with an S-series total station.

Despite harsh environmental conditions, the system was able to continue operating with no down times and the total station can be repurposed once the project is completed to be used on a future project.

Dams and Mining

For mining sites and energy infrastructure, it is important to detect movement, the rate of movement and the rate of increase of the movement in order to identify potential failure modes. Monitoring provides the information needed to support a safe working environment and efficient mining operations while mitigating the associated risk.

Key Benefits

- Early detection of potential failure of reservoirs, tailings dams, and stock piles to drastically impact safety and economic activity downstream
- Determine movement over seasonal variations in dam structure and mine surface relative to environment factors
- Monitoring high walls, excavated faces, and potential unstable slopes to determine hazardous situations

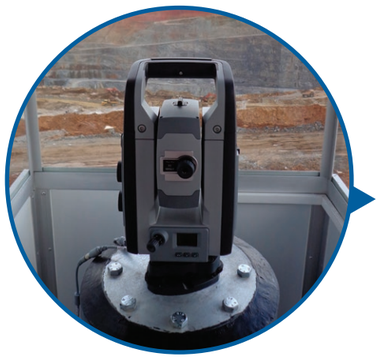
Steenbras Dam in Cape Town

The Steenbras Dam near Cape Town, South Africa, is an important resource to the local community. Monitoring the stability and integrity of the dam is crucial as a water and power resource as well as to protect downstream communities.

T4D Control was selected to monitor the dam for it's ability to create complex alarming conditions and integrate data from optical, GNSS, and geotechnical sensors. The system has continued to operate since it's installation in 2012.

Comprehensive Monitoring of Victoria Dam

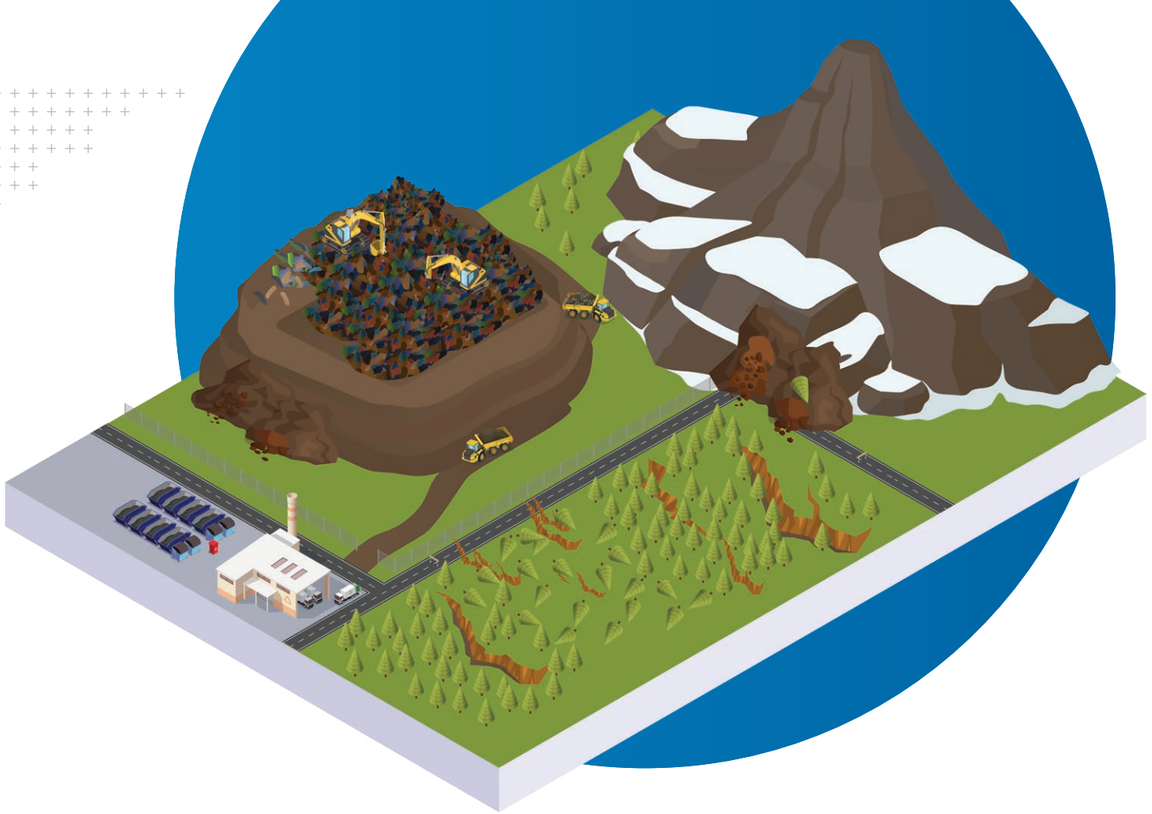
The Victoria Dam is the tallest dam in Sri Lanka and is vital to local agriculture and hydroelectrical power provision. Due to the age of the dam (over 25 years), the Mahawell Authority upgraded their monitoring system to continuously monitor and analyze the structural integrity. T4D Control software along with Trimble GNSS and S-series total stations were deployed to provide continuous geodetic measurements of the dam structure. T4D also provides integration of various geotechnical sensors and complex alarming conditions to alert stakeholders whenever movement outside of tolerance is detected.



Frontier Mine

The Frontier Mine in the Democractic Republic of Congo required monitoring of the mine surface for critical movements during blasting operations. Trimble real-time monitoring was deployed using T4D Control and S-series total stations to provide reliable and continuous monitoring of the mine surface to alert stakeholders of significant movement resulting from mine operations.

TRANSFORMING THE WAY THE WORLD WORKS



Landslides and Natural Hazards

Natural hazards such as landslides, volcanoes and floodplains are often located in remote areas, making it difficult and time consuming to properly monitor the status. With an automated monitoring system, the durable equipment can be set up once and relied on to transmit updates to the office for analysis and reporting.

Key Benefits

- Early detection of landslide and natural hazard risks to alarm public and improve safety
- Examine movement trends along natural features such as slopes and glaciers to predict long term effects and anticipate issues before they happen
- Provide early warning system for nearby communities when high levels of movement are detected

Kostanjek Landslide Monitoring

Activated by mining activities in 1963, the Kostanjek landslide is the largest in the Republic of Croatia. Located in the hilly capital city of Zagreb, it is a reactivated, deep-seated, large translational landslide with an area of about a square kilometer. High precision and frequency measurements were required to estimate and predict future landslide movement

Trimble NetR9® TI-M GNSS reference receivers and Trimble 4D Control software were deployed to monitor the slope, making use of T4D's multiple GNSS processing options. Daily monitoring of movement with high precision enables measurements of small displacements, which is particularly important for the analysis of slow moving landslides.

Denali Slope Subsidence Monitoring

The US National Parks Service deployed a real-time monitoring system after a landslide occurred during the spring season blocking traffic on a popular road.

A Trimble real-time monitoring system was deployed with T4D Control and an S-series total station to detect any future movements in the slope to alarm stakeholders of movement. This assists the decision making process to ensure the visitors using the road are safe and that access is maintained. One primary challenge on this project was the remote location and harsh climate. Trimble hardware is proven in tough climates to handle long periods of exposure between maintenance cycles.

Landslide in Åkerneset

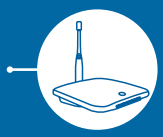
The Åkerneset area contains many large, steep mountain slopes that have potential to cause tsunamis from landslides affecting nearby communities. Cautus Geo was employed to monitor a large mountain landslide in the Åkerneset area of Norway. This involved deploying T4D Control, a Trimble S-series total station, GNSS, and a variety of geotechnical sensors. This system continues to keep a close eye on the steep fjord landscape to alarm stakeholders when movement is detected and make informed decisions.

Solution Components

Trimble 4D Control Software

Trimble's 4D Control real-time monitoring software provides movement analysis and visualization so you can easily manage one or multiple monitoring sites. It is the core of a monitoring project because it controls the measurements from optical, GNSS, and geotechnical sensors, manages and analyzes the data and alerts, delivering the data you need to make timely decisions.

Settop M1 Communication Box

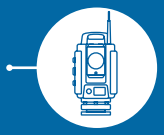


The Settop M1 total station controller allows you to stay connected and transfer data continuously to the office. In case of power outages or interruptions, the Settop M1 ensures the data is safely stored on a local disk.

Trimble Access Monitoring Field Software

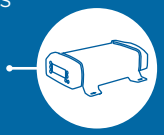
The Trimble Access™ Monitoring field software provides streamlined workflows to set up, monitor and report on deformation surveys. Improve efficiency by saving measurements for subsequent visits and review reports of displacement above specified tolerances in the field. Import the JobXML file into Trimble office software such as Trimble Business Center™ or Trimble 4D Control for further processing in the office.

Trimble Total Stations



Designed to handle demanding jobs and difficult environments, Trimble Total Stations withstand harsh conditions often found in monitoring situations. Built on proven Trimble MagDrive technology, Trimble S-series total stations are the most durable optical instruments in the market, providing silent operation that won't disturb residents or businesses. The S5, S7 and S9 models are ideal solutions for engineering and monitoring applications that depend on fast, accurate measurements.

Trimble NetR9 Ti-M GNSS Receiver



The Trimble NetR9 Ti-M GNSS receiver provides continuous high precision measurements and rapid updates to monitor over long distances. Compact and rugged, the Trimble NetR9 Ti-M is capable of tracking most modern GNSS signals.

TBC Monitoring Office Software

Trimble Business Center provides field to finish workflows with confidence for survey and construction professionals. The TBC Monitoring module enables surveyors to process, manage, and report on manual monitoring projects using survey data from GNSS, total station, level, and scanning sensors. Visualize displacements in 3D and in comprehensive reports to provide clients with a complete picture of movement across the project.

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