



Putting your business into motion



MONITORING SYSTEMS



## THE WORLD IN MOTION

Demand for monitoring is on the rise. Around the world, new monitoring projects emerge every day. Aging infrastructure, construction projects, and natural events require improved awareness of motion, providing opportunities for surveyors to expand their services and add new clients.

Monitoring is a critical component in today's project environment. Growth in demand is due to a convergence of several factors:

- **Safety**—A monitoring system can detect motion and alert the project team in real-time. This enables project managers to move people and equipment away from hazardous areas and prevent accidents before they occur.
- **Better decisions**—Understanding the dynamics of structures and work sites leads to improved decision-making. With Trimble monitoring systems, you can deliver comprehensive information about motion-related events and long-term trends.
- **Compliance**—Many regions have local regulations and contract conditions for project safety and management. These regulations often call for monitoring to detect movement. A Trimble monitoring system can help you meet these requirements.



# TRIMBLE SOLUTIONS FOR DEFORMATION MEASUREMENT AND ANALYSIS

## ADD A NEW DIMENSION TO YOUR BUSINESS

On projects around the world, owners and managers demand answers to mission-critical questions—What is moving? How fast? In what direction? Is it accelerating? The answers come from reliable, precise measurements combined with robust data management and analysis.

As a surveyor, your knowledge and experience is the key to meeting the needs of your clients. When you choose Trimble as your monitoring partner, you can build your monitoring business quickly and easily.

### A GROWTH OPPORTUNITY FOR SURVEYORS

- Leverage your existing Trimble surveying systems to create new business in monitoring and deformation measurement.
- Gain confidence and experience on simple monitoring projects, and then move to larger jobs when the opportunities arise.

Success in monitoring comes from flexibility. Each monitoring project has different requirements in locations, conditions, deliverables and performance. With a Trimble monitoring system, you have the tools you need to adapt to a wide variety of project requirements.

## GET YOUR MONITORING SYSTEMS SET UP AND OPERATING QUICKLY AND EFFICIENTLY

- Support planning and decision-making by providing precise data from integrated systems that are tailored for the job.
- Gather measurement data continuously and automatically, even at remote locations.
- Provide your clients with comprehensive information based on rigorous data analysis.



# FLEXIBILITY AND SCALABILITY ARE THE KEYS TO SUCCESS



## Deformation Measurement with Trimble Access Software

Trimble® Access™ software is the fastest way to collect deformation measurements. When you visit the site and set up your Trimble S6 or Trimble S8 Total Station, The Monitoring module for Trimble Access guides you through the process of setup and orientation. Using the stored location of all of your control and monitoring points, it automatically aims and measures to each target. You can define and store standard measurement procedures, ensuring consistent data from one visit to the next.

When the measurements are complete, Trimble Access allows you to inspect the work to make sure you have all the data you need. With Trimble AccessSync™, you can send your data to the office for immediate analysis, while the crew moves on to the next project.



## PUT TRIMBLE'S MONITORING EXPERIENCE TO WORK

Trimble technology is the world leader in measurement, analysis and data management. With years of experience on monitoring projects around the world, Trimble's scalable monitoring systems provide the versatility to adjust to meet a range of project requirements.

### POSTPROCESSED DEFORMATION MEASUREMENT

Many deformation projects are done with measurements taken at intervals of days, weeks or months. With target points and instrument stations in fixed locations, survey teams visit the site to conduct periodic measurements. You can use your Trimble monitoring system for deformation projects, and then put the instruments to work on other surveying jobs. Whenever more deformation measurements are needed, your system is ready in minutes—with control and target locations stored for fast rounds.

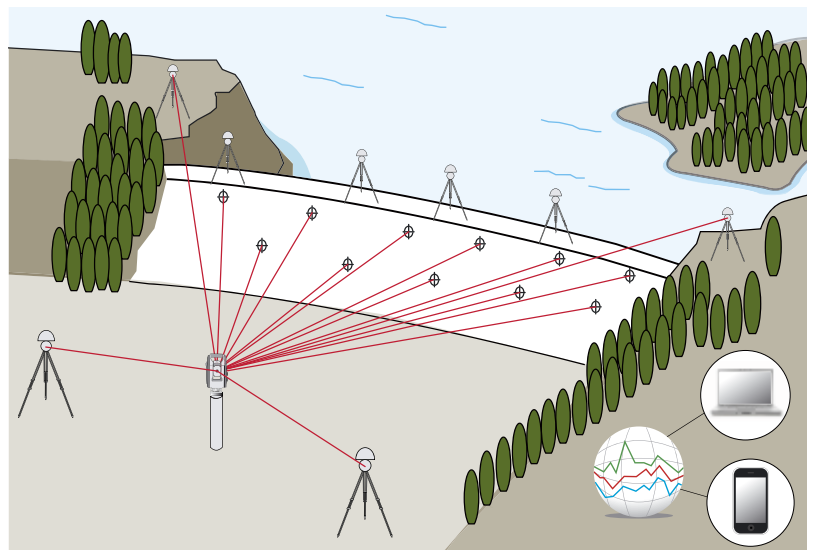
### REAL-TIME AUTOMATED MONITORING

Projects that require constant measurement utilize automated monitoring. With this method, target points are measured

repeatedly, often many times each day. A real-time, continuous approach provides immediate feedback on any motion. You can develop extensive data sets for analysis and trend information. Your Trimble monitoring system manages the work and keeps you informed. As your projects grow, the scalable solution lets you add instruments and measurements whenever needed.

### COMBINING TECHNOLOGIES

Trimble monitoring systems give you the flexibility to combine both GNSS and optical data on a single project. Trimble GNSS provides long-range accuracy and rapid update rates. Trimble Total Stations deliver precise measurements to large numbers of points. You can use Trimble GNSS to monitor individual points, as well as validate the stability of total station control points.



## 1 | Project

### PITT RIVER BRIDGE, VANCOUVER, CANADA

#### Deformation Measurement

During construction of the new Pitt River bridge, traffic flow on adjacent bridges needed to continue. Surveyors used Trimble total stations with Trimble field software to monitor the existing structures while the new bridge was built. Surveyors visited the structures daily for six months, delivering updates to project engineers' desktops.



## 2 | Project

### GREEN POINT STADIUM, CAPE TOWN, SOUTH AFRICA

#### Deformation Measurement

Nearly 70,000 fans will fill the new Green Point Stadium when it hosts the 2010 FIFA World Cup. The crowded construction site and tight requirements to ensure the accuracy of the stadium's structural elements made it an ideal project for the Trimble S8 Total Station and Trimble field software.



#### GNSS Monitoring

The Tolt Dam provides fresh water and flood control in the Seattle region. Trimble GNSS sensors installed on the dam deliver a continuous stream of monitoring information. Trimble real-time monitoring software analyzes the GNSS data to detect movement in the dam or surrounding areas. System operators 50 km away in downtown Seattle review the data and conduct detailed analysis.



#### Automated Monitoring

Construction of a new underground railway in Zürich calls for automated real-time monitoring to protect buildings and structures just a few meters above the tunnels. Surveyors use a network of 45 Trimble S8 Total Stations to collect measurements every 30 minutes. Data from the total stations are analyzed for motion or subsidence, and when necessary the project team is alerted.

## 3 | Project

### TOLT DAM, SEATTLE, USA

## 4 | Project

### DURCHMESSERLINE, ZÜRICH, SWITZERLAND

# BUILD YOUR MONITORING BUSINESS WITH VERSATILE TRIMBLE SYSTEMS



## Monitoring with GNSS



GNSS is the ideal solution for many monitoring applications. When tracking motion across large areas or when the rapid update rates are required, Trimble GNSS may be the answer.

With Trimble's experience in GNSS, you can add new capabilities to your monitoring services. Choose from a wide selection of Trimble GNSS receivers designed for long-term projects. Trimble's complete software suite detects and analyzes motion in projects around the world. You can even tie your Trimble GNSS monitoring system into Trimble VRS™ networks for streamlined access to GNSS corrections.

When you add Trimble GNSS to your monitoring systems, you can deliver added confidence and flexibility to your clients.



## MONITORING OPPORTUNITIES ARE EVERYWHERE

Trimble's scalable system lets you create monitoring solutions that can change and expand with your needs. It's an easy way to start or expand your monitoring business and take advantage of new opportunities.

### GET STARTED WITH DEFORMATION MEASUREMENT

Your existing Trimble surveying system is a powerful monitoring tool. In the field, you can use your Trimble total station and the streamlined monitoring workflow in Trimble Access field software to collect precise, consistent monitoring data. It's ideal for monitoring projects that don't require real-time measurements. Back in the office, import your data into Trimble 4D Control™ software for fast, detailed analysis.

### MAKE THE MOVE TO AUTOMATED MONITORING

Trimble helps you take on projects that demand frequent or continuous measurements. Trimble total stations deliver precise monitoring measurements, with exceptional speed and reliability. Trimble 4D Control software controls the instruments—even in remote locations—and provides advanced real-time measurement, analysis and alerting capabilities.

### ADD GNSS MONITORING IN LARGE AREAS

When monitoring a dam, bridge or large structure, Trimble GNSS receivers produce rapid, accurate measurements across large areas. Rugged Trimble GNSS receivers—controlled by Trimble 4D Control software—are ideal for long-term, high-precision monitoring projects.

### ADVANCED TOOLS FOR DEMANDING PROJECTS

Opencast mines and large excavations present unique monitoring challenges. You can use Trimble GNSS receivers to monitor the rim and exposed areas, while a Trimble S8 Total Station measures to prisms on steep banks and cut slopes. It's all managed by Trimble 4D Control software, created specifically for monitoring applications.

## MEET THE CHALLENGE WITH INTEGRATED MONITORING SYSTEMS

Successful monitoring relies on collecting, analyzing and sharing information. At the hub of your Trimble monitoring system, Trimble 4D Control software comes complete with the components you need to configure a monitoring solution to fit any requirement.

### MEASUREMENT

For postprocessed monitoring, Trimble Access software makes field measurements fast and easy. When your projects require automated measurement, Trimble 4D Control manages your sensors and measurement operations. You can even combine scheduled observations from total stations with continuous data flow from GNSS receivers. The system is adaptable and scalable to handle any size monitoring project.

### ANALYSIS

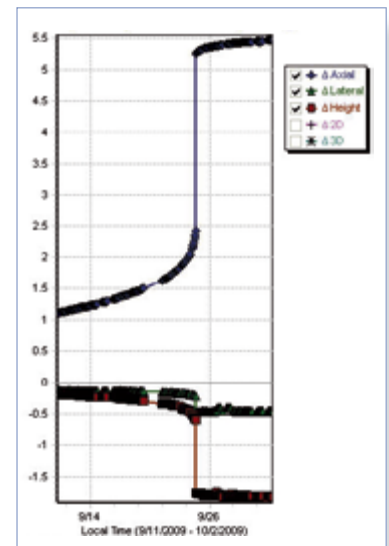
Complex decisions call for detailed information. Trimble 4D Control provides an array of proven, state-of-the-art tools for analysis, detection and alerts for both post-processed measurements and real-time monitoring. Trimble monitoring systems keep you advised with a flow of information in easy-to-use formats.

### SHARING INFORMATION

Many projects require specialized computations and analysis. Utilize Trimble 4D Control to produce detailed reports and charts on your monitoring project. The open-access SQL database makes it easy to share your data with project stakeholders.

### COMMUNICATIONS

Connectivity plays a key role on any monitoring project. Trimble's experience and advanced communications technology helps move data between field and office, and delivers needed information to your clients. Trimble 4D Control allows you to log in and control the system from any location on your network.



### *The Trimble S8 Total Station: Quiet Precision*

*Many projects in urban areas require monitoring, often using total stations attached to nearby buildings. When placed near office or residential spaces, occupants require a low-noise solution.*

*The silent operation of Trimble's advanced total stations allows you to choose the optimal locations and schedules for your monitoring instruments. Trimble's advanced optical solutions, like the Trimble S8 Total Station, include MagDrive servo technology. Virtually silent, the frictionless electromagnetic drive system delivers precision operation and long-term reliability.*



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