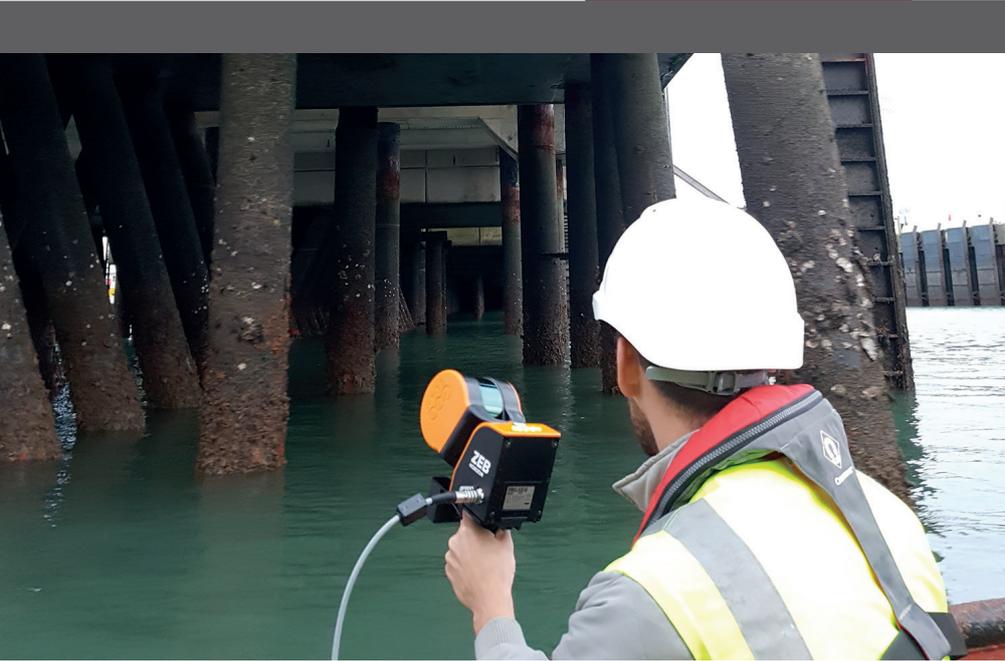


# Case Study

**Customer:**  
Brunel Surveys

**Project:**  
Challenging jetty survey for an International port

**Solution:**  
GeoSLAM ZEB HORIZON and Trimble SX10 Scanning Total Station



## Jetty survey brings unique set of survey challenges

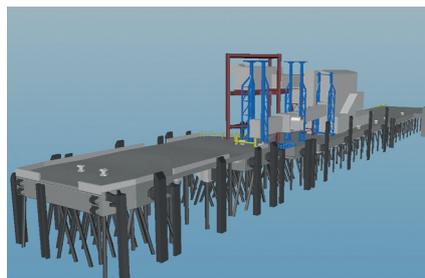
Undertaking a jetty survey for a large international port on the south coast brings its own unique set of challenges. Brunel Surveys' Peter Worthington tackles the access difficulties of a twenty-four hour working port, a swaying boat as a base from which to survey, a tiny tidal window and the need to accurately survey the 200 piles supporting the 170m long deck.

Prior to the planned refurbishment and modernisation of a large international port on the south coast of England, a full topographical survey of the port, its roads and a 170m jetty were required. Contracted to undertake this work was Wiltshire based Brunel Surveys Ltd, a company renowned for the high quality of its drawings, data and 3D models.

The survey work was divided into two sections with the port and roads survey being managed by one Brunel team and the jetty by another. The deliverable for the jetty was specified as 2D/3D drawings plus a 3D model (to 10mm) in an internationally recognisable format, in this case AutoCAD.

With all the survey work due for completion in just 3-4 weeks, careful planning was required to overcome a significant number of challenges unique to the site. As Project

Manager for the jetty aspect of the job, Brunel Senior Land Surveyor Peter Worthington's immediate concern was how to tackle the most problematic aspect of the work, namely surveying the 200 jetty piles to 10mm. Whilst he planned to undertake all the structures and deck work and as many of the piles as possible using the Trimble SX10 Scanning Total Station,



▲ AutoCAD 3D model of the jetty

he knew that there would be twenty or so piles and the underside of the deck (including beams) that would not be visible from any of the scan stations and therefore an alternative method would be required.

### Finding solutions

As a long term KOREC customer, Peter contacted the KOREC team to discuss the options. Whilst research revealed that it was possible to scan underwater, this method was rejected as being hugely expensive and very time consuming due to the number of scans that would be required in the murky water. An alternative solution was to use a KOREC supplied

GeoSLAM ZEB HORIZON handheld scanner. KOREC clarified that it would be possible to use 'Cloud to Cloud' registration to combine the data with that of the SX10 in Trimble's Business Center

software in order to achieve the specified accuracy. The ZEB HORIZON would be operated from a boat that could manoeuvre between the piles and this was felt to be a viable solution, subject to overcoming some challenges particular to the site:

The port was active twenty-four hours a day with large freight and passenger ships docking – this would severely restrict when Peter could gain access to the jetty with the boat.

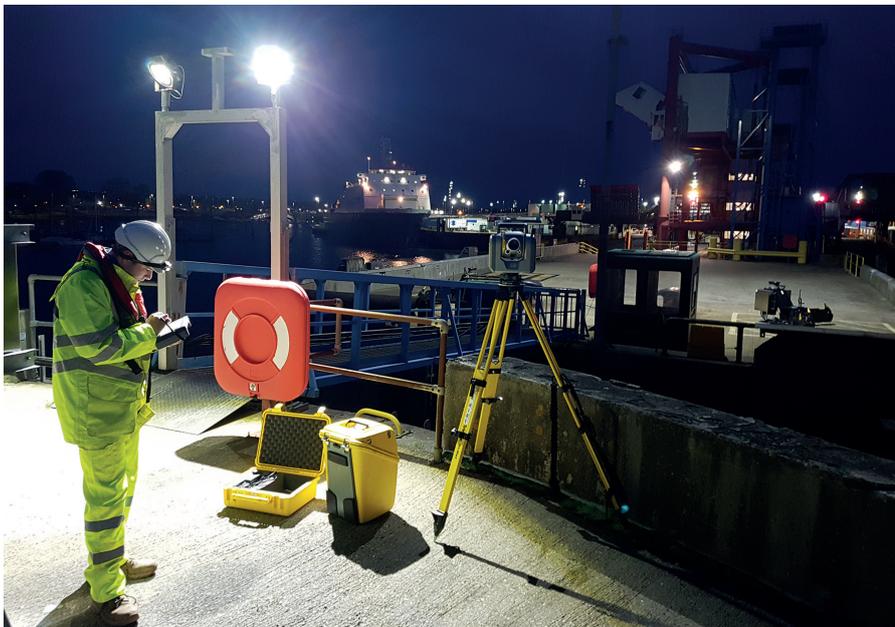
### Project synopsis

**Project:** Jetty survey including 200 piles.

**System:** GeoSLAM ZEB HORIZON used from a boat, Trimble SX10 and Trimble Business Center.

**Challenges:** Surveying piles from a boat, tiny tidal window, working with an ebbing then flooding tide, combining pointclouds.

**Highlights:** Overcoming so many challenges to create a high quality 3D model.



▲ Brunel's Luke Wood scanning the jetty deck with the SX10 set up on a caisson

The tidal window was tiny allowing for just one hour of work (30 minutes whilst the tide was dropping and 30 minutes whilst the tide was rising). At high tide, none of the piles were visible, at low tide, six metres would be visible). As well as the boat swaying in the sea, it was also going down on the ebbing tide and up on the flooding tide.

This one-hour window had to occur when there was no shipping in the area, the weather was good and the locally hired boat and captain were available.

In the 3-4 week period of the project, there was a suitable period of just two possible evenings to undertake the work within the one hour time limit. Peter therefore arranged for a member of the KOREC technical support team to demonstrate in Brunel's office a few days before how to get the best out of the ZEB HORIZON from a boat.

### Using the Trimble SX10

In advance of the forty-eight hour window when the scanning work would be carried out, control for the job was established with Trimble Total Stations and GNSS, with all the grid tied to OS Control.

Peter opted to use the Trimble SX10 because he knew that it would supply the scan accuracy he required and also that its long range would be more than sufficient to measure to the control points 150m away. With restricted time on site, he could also make use of the SX10's polygon feature which would allow him to work selectively by defining the area and density of the scan to speed up the process.

On the evening of day one Peter scanned the surface and top deck of the jetty and at

low tide scanned as many of the piles on one side as he could from a neighbouring jetty. This involved five different set ups to ensure as many of the piles were captured as possible. In some cases set ups were just 3m apart to avoid shadowing in the point cloud.

On the evening of day two he repeated the process on the other side of the jetty and used a nearby caisson from which to survey its top end.

### Using the ZEB HORIZON

Following the consultation with KOREC, a ZEB HORIZON was hired and the KOREC technical support team spent the day with Peter, as agreed, to provide some advice on how best to use the instrument from a moving boat.

A small RIB was chartered and when the tide was at its lowest, the data was captured in four passes made up of three separate surveys of 15 minutes and a final one joining them all together as a validation check. Following good survey practice, Peter also took a few manual measurements with a tape measure.

### Processing the data - combining point clouds

Back at the office, Trimble Business Center processing software and its powerful registration tools were used to combine the SX10 and GeoSLAM data sets. A slice was drawn from the SX10 data for a visual comparison. The ZEB HORIZON data was finely tuned in CAD to match the SX10 data. 2D plans were drawn up and then the highly experienced Brunel team created a 3D model of the jetty which the client was delighted with. Peter concludes,

"With the ZEB HORIZON we were able to substitute a method that would have been in excess of £50k and taken weeks and weeks to complete with a cost-effective alternative that took just one hour."

All information and pictures kindly supplied by Peter Worthington, Senior Land Surveyor, Brunel Surveys.

### About Brunel Surveys

Based just outside of Swindon, Wiltshire, Brunel Surveys operates nationally offering a wide range of land surveying services for clients who include many major companies and authorities. These surveying services range from land and measured building surveys, through 3d laser scanning, volumetric analysis, drainage, underground utility, GPR and CCTV surveys.

[www.brunelsurveys.com](http://www.brunelsurveys.com)



▲ Brunel's Peter Worthington tackles the piles with the ZEB HORIZON scanner

### Key Benefits:

Utilising KOREC's hire fleet to select equipment needed for a particular project

EDM range of the SX10 allowing the Brunel team to resect from control established 150m away

SX10 polygon tool for windowing specific scan regions thereby reducing scan times

ZEB HORIZON providing a fast, easy and cost-effective mobile mapping solution for the pile survey

Ability to combine data sets in Trimble Business Center

## Contact us:

Please do get in touch for further information on any of the products or services mentioned in this case study, a demonstration, support or just a chat about your requirements.

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