



GPS and the Hellenic railway

Vasileios Paslis, Director, METRON SA (pictured)
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SURVEYORS recently played a crucial role in upgrading a 240km rail link from the city of Thessaloniki in Greece's northeastern Thrace region to the Turkish border. Their challenge was to create a three-dimensional land survey for real estate registration and topographic contours along the length of the railway's rugged terrain. Despite difficult conditions, the survey has been efficient, fast and accurate, with help from the capabilities of GPS-based survey systems.

Early in 2004, METRON Consulting Engineers, one of Greece's largest survey engineering firms, surveyed a swath 60m wide along the railway's entire length using the track as a center line. The region's rough landscape made achieving the survey's required accuracy a difficult task indeed. Using total stations was out of the question. From the start of the project, planners realised that setting up and operating total stations would be far too time-consuming and costly for this type of linear work. Instead, they opted for GPS-based survey systems to measure the triangulation network and the required detail points.

A 240km survey in three and a half months

We put seven surveyors to work on the job, choosing a combination of five Z-Max GPS receivers and four Z-Xtreme GPS receivers, all from Thales. The entire 240km project was completed within three and a half months. The receivers both have Z-Tracking, an advanced technology that acquires GPS signals and reads them with high accuracy even in difficult conditions. Even though the region was very mountainous and threatened to multipath the GPS satellite signals, the tracking was able to mitigate many of the problems caused by weak signals, interference and noise.

The survey team used static methods for the triangulation network and RTK for control and detailed points. In static surveys, of course, moving between triangulation points is far more time-consuming than the actual taking of measurements once the receiver is set up. For that reason, the team deployed a total of nine receivers. Using so many receivers effectively reduced the time needed to transfer receivers between sites. Multiple baselines were thus formed. The entire triangulation network, consisting of 140 triangulation points, was

reconnoitered and measured, and pillars were constructed all within 15 days.

Using RTK for control points

In addition to the triangulation points, some 2,000 control points were established and measured using RTK surveying and taking a minimum of 20 epochs. These points were then imported from symbol controllers into survey software and adjusted with the whole network to achieve a unified accuracy.

Detailed points were collected in RTK mode using one Z-Xtreme system as a base station along with eight rover receivers. The receivers were placed in a straight line about 20 paces apart, perpendicular to the track. One coordinator sketched the arrangement as the rovers were collecting the points. When the team reached a train station, they necessarily surveyed in greater detail and, in some cases, when undercover in stations or in dense foliage, a total station was enlisted for part of the work. The total stations and the GPS equipment were able to work together seamlessly. The team established RTK control points in the area and set up and oriented the total station in a short time. The software provided flexible support for a wide range of instruments and data formats, and the total station points were able to be quickly and conveniently collected and logged within the same job as the RTK data from the GPS-based systems.

METRON handles many rural survey projects throughout Greece, and the choice of GPS-based survey equipment systems is boosting productivity on many of our major jobs. Recently completed assignments include a cadastre study of 4.5 million square metres for part of the national highway from Athens to Thessaloniki, real estate registration for 60km of railway in the Messologgi province and 20km of forest road construction.

For further information visit the sites (w) www.metrontopo.gr
(w) www.jgc.gr and (w) www.thalesgroup.com/navigation



Greece's northeastern Thrace region:
A challenging multipath environment.



At work on the railway.



Static survey in high multipath environment.