



# HIGH-ACCURACY SURVEYING FOR MINISTRY OF DEFENCE

O'MARAH & MORRIS CONSTRUCTION  
ADOPT TOPCON'S GRS-1 RTK NETWORK  
RECEIVER FOR MAJOR DEFENCE  
PROJECT

O'Marah & Morris Construction, a privately owned construction company specializing in highways excavation and full re-instatement works, had a problem to solve. Following the successful award of a major Ministry of Defence (MOD) project from Aspire Defence Limited,

O'Marah & Morris were required to perform excavation work to tight tolerances, and to record as laid coordinates for all work carried out. Working in partnership with Electranet, excavation work was required to provide additional network infrastructure on a number of MOD sites.

"Each excavation needs to be marked-out to an accuracy of better than 500mm prior to work commencing" says Martin Joy, Project Manager. "We are not working in a green field environment, sites such as these are littered with existing underground services and utilities, and we need to ensure excavations are controlled accurately to a pre determined design position. This is critical from both a cost and safety perspective."

Phoenix Surveying Equipment Ltd. was chosen to initially supply a Topcon GMS-2 DGPS handheld GPS receiver with Topcon's TopSURV software on-board. The Topcon GMS-2, linked via Bluetooth to a Topcon BR1 wireless coast guard beacon receiver, was selected for this task for its high accuracy capabilities and easy to use TopSURV software. Users from both O'Marah and Morris and Electranet were trained on-site by Phoenix in the use of the device to enable uploading of coordinate data, setting-out functionality, and to survey data. The collected survey data is then **seamlessly** integrated in to



Topcon's GMS-2 DGPS handheld GPS receiver



Topcon GMS-2 handheld receiver and BR1 coast guard beacon receiver

AutoCAD via a simple export routine. To complete the job, an 'As Fitted' documentation pack is completed and returned to Aspire Defence.

"One of the major reasons for choosing Phoenix and Topcon is the equipment's ability to track both GPS and GLONASS constellations, thereby enabling the devices to work in



the most difficult of environments" continues Martin. "An integrated digital camera provides a method of recording photographs of any excavation work performed, but with the additional benefit that it is geo referenced which makes compiling records so much easier. Finally, the ability to work within the MOD local coordinate system rather than Ordnance Survey grid was a critical requirement when working within the strict MOD guidelines". O'Marah and Morris are provided coordinates from Aspire Defence and these are then imported into TopSURV and "localized" ensuring maximum accuracy when in the field.

Following a successful trial, O'Marah &

Morris eventually decided on the latest Topcon GRS-1 handheld GNSS receiver, which came to market during the trial coinciding neatly with an increased specification for some mapping to be recorded to centimetre level.

The GRS-1 is the world's first fully integrated dual-frequency, dual-constellation, network-enabled RTK rover system. It is an all-in-one handheld GNSS receiver and field controller with internal GSM Modem, high-speed processor, built-in camera, compass and bar code reader. Features also integrated into the new system are SD memory card slot, and wireless connectivity via Wi-Fi and Bluetooth.



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The Topcon BR1 wireless coast guard beacon receiver

Martin says "Having never used surveying solutions before, O'Marah and Morris and Electranet staff were amazed how easy the Topcon GRS-1 is to use. The TopSURV software allows staff to easily set-out or survey data to a variety of accuracies. It is a great step-forward to be able to use the GRS-1 in handheld mode to achieve 30-50cm or RTK pole-mounted mode to achieve 10-20mm. The RTK mode is imperative when surveying the levels of pit excavations".

Although the GRS-1 is capable of receiving DGPS corrections via Beacon or SBAS sources, Phoenix Surveying equipment recommended the use of TopNet, Topcon's new dedicated GNSS network correction service. Regardless of brand, this service is available to all subscribers using a GNSS receiver unit and a mobile data connection. It allows users to carry out their usual surveying activities without the need for a local GNSS base station, as network corrections are supplied to the rover using a low cost GPRS connection via the internal data enabled SIM card.

Working as a partner with Ordnance Survey, Topcon take data from the recently upgraded nationwide CORS (Continuously Operating Reference Stations) network of receivers.

Once corrected within TopNet, data is passed to subscribers via an industry standard data transportation technique called NTRIP (Network Transport of RTCM data by Internet



Topcon's revolutionary new GRS-1 in handheld GNSS mode

Protocol), a method whereby data corrections are transmitted using a standard internet based communication device. This could be a direct broadband cable or wireless connection, but typically for mobile users, a data-enabled mobile connection is used to transmit the corrections from the NTRIP server to the mobile device via a GPRS (General Packet Radio Service) connection.

The GRS-1 uses the latest Windows Mobile™ operating system to run a variety of applications including TopSURV, Topcon's popular engineering and surveying software and ESRI's ArcPad mobile software. Extensions are available for ESRI Arcpad that provides full access to the GPS/RTK capabilities of the GRS-1, and as standard, the GRS-1 is supplied with Windows Mobile Office incorporating MS Word, Excel, One Note and PowerPoint.

Also, making use of the wireless capabilities, the mobile phone SIM enables a mobile-office on the GRS-1

with the ability to access internet web pages and send and receive emails. Transferring contact and address information from

Outlook is simple so you may never need to download collected data again, simply email it back to the office.

Martin concludes, "The Topcon GRS-1 represents a cost effective solution that will provide a solid return of investment in less than 12 months. We have been convinced by its ease of use and accuracy in the field, but savings have also been noticed in the office. Now there is no need to translate conventional tape measurements and hand written notes to a drawing, as everything is handled electronically. Leigh Harris, the Phoenix mapping representative states "The Topcon GRS-1 has set a new standard in mobile data capture. It is imperative to be able to offer customers a device that is both a mapping and survey grade solution. The ability to collect data in the field and wirelessly send it to the office reduces travelling time and costs significantly. This is allowing customers to immediately see the financial benefits and efficiency gains that are achievable". Leigh continues, "It is fascinating to start to understand the variety of applications and uses that the new GRS-1 provides. Phoenix is starting to receive enquiries from non-typical mapping and survey customers as the market place react to this exciting technology".

Article by Joseph Cox, Marketing & Ecommerce Manager, Phoenix Surveying and Safety Equipment, e-mail: [jcox@phoenixse.com](mailto:jcox@phoenixse.com), visit [www.phoenixse.com](http://www.phoenixse.com) for more details.



Topcon's GRS-1 with the TopSURV survey software)