Multi-sensor hydrographic lidar operations

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In 2008 hydrographic survey operations were conducted along the west coast of Ireland using two Airborne Lidar Hydrographic (ALH) systems. The Hawk Eye II system (Blom Aerofilms Limited) was used to survey a number of shallow almost land-locked bays and the LADS Mk II system (Tenix LADS Corporation) was used to survey shallow and deep bays and coastal areas. This approach was taken in order to maximize the benefits of each individual system in order to produce a superior product for the customer.

The surveys were conducted under the Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) project which is a joint venture between Geological Survey of Ireland (GSI) and the Marine Institute (MI). The mapping requirements of INFOMAR cover 26 priority bays and 3 coastal areas around the coast of Ireland. This project follows the Irish National Seabed Survey (INSS) which surveyed offshore areas between 1999 and 2005. Previous lidar surveys had also been conducted in Ireland, commencing under the INSS project and continuing under the INFOMAR project in 2006.

The requirement of the survey was to collect bathymetric data from the coastline to a minimum depth of 10 meters. Digital imagery and seabed reflectivity data were also required. Depths were to be reported relative to Malin Head datum. The data was to be used for exploration, fisheries, coastal zone management, coastal engineering and erosion, renewable energy development and investigation of dumping at sea. A second data set relative to Lowest Astronomical Tide (LAT) was also to be provided for charting purposes.

In April the Hawk Eye II system commenced in the vicinity of Sligo, Donegal and Rossaveel. These survey areas were generally constrained, very shallow and significantly impacted by tides and tidal streams. The seaward limits were also exposed to swell. Depths were measured relative to the ellipsoid. Data processing was conducted in proprietary software, the Coastal Survey Studio. TerraMatch software was then used to identify misalignments. Both hydrographic and topographic data was collected. The hydrographic and topographic data was initially cleaned in TerraScan and then converted to CARIS for QC and production of deliverables.

In May the LADS MK II system continued more extensive operations in Galway Bay, along the northeast coast of the Aran Islands and in Tralee Bay. These areas included shallow and deep parts but in general were mostly impacted by swell and variable water clarity through mixing and run off. In addition, operations were also conducted in Lough Foyle, which is very shallow and turbid and lies on the border between Northern Ireland

and Republic of Ireland, and Blacksod Bay, west of Sligo. Depths were measured relative to the instantaneous sea level and reduced to LAT through a tide model. Data processing was conducted in the propriety Ground System (GS). QC Tools, customized software which was developed from Generic Mapping Tool (GMT) and Visualization Tool Kit (VTK), was used to review the data.

Final quality control of the two individual and combined data sets was conducted in CARIS HIPS, Fledermaus and QC Tools. The data sets were integrated into a single CARIS project. An important aspect of the integration of the data was confirmation that the ellipsoid, Malin Head, geoid and LAT datums were correctly related between the two systems.

This paper describes the GSI project, the operations of the two lidar systems, data processing and integration of the separate data sets into a single project.