

A NEW COORDINATE SYSTEM FOR IRELAND

Michael CORY, Roy MORGAN, Colin BRAY and Iain GREENWAY, Ireland and United Kingdom

Key words: coordinate reference systems, GPS, geodesy.

ABSTRACT

Ordnance Survey Ireland (OSi) and the Ordnance Survey of Northern Ireland (OSNI) are the national mapping organisations responsible for the surveying and mapping of Ireland and Northern Ireland. Amongst their other duties, they are jointly responsible for the development of a geodetic framework on which all of the island's mapping is based, hence for ensuring that mapping on the island "fits together".

Mapping in Ireland, however, as in many places around the world, is based on a different geodetic datum from that used by the GPS. Although transformation formulae and parameters are available between Irish Grid and ETRS89, it is beneficial, particularly for GPS users, to associate a map projection with ETRS89. This maintains the quality and precision of GPS for surveying and mapping purposes, and simplifies GPS positioning on all Ordnance Survey mapping products. Given the growing use of GPS, the time is ripe for the introduction of new map projections for Ireland. This also provides an opportunity to address historic datum anomalies.

The new projections adopted by OSi and OSNI must fulfil several criteria. They are intended to be GPS compatible, and therefore must be associated with ETRS89 and the GRS80 ellipsoid. They must also be orthomorphic or conformal (that is, preserving local shape), and they must minimise mapping distortion throughout Ireland and Northern Ireland. The projections should also be based on formulae that are readily available. Additionally, they must allow compatibility with current mapping to be maintained.

The Transverse Mercator projection has been identified as the most suitable type of map projection for Ireland. Three forms of Transverse Mercator projection have been considered: the current projection, Irish Grid (IG); Universal Transverse Mercator (UTM); and a newly derived projection, Irish Transverse Mercator (ITM).

Any new projections should realise ETRS89 coordinates that are substantially different from the existing corresponding Irish Grid coordinates (thus avoiding confusion). These criteria immediately rule out the possibility of maintaining the current projection parameters. However, both ITM and UTM will provide coordinates that are significantly different to IG.

With regard to scale correction, UTM produces the largest scale correction, of -400ppm or 40cm per km on the central meridian. This becomes significant when plotting measurements of greater than 500m. UTM also provides the largest range of correction (659 ppm). ITM, however, minimises and evenly distributes scale corrections, with a

maximum scale correction of 180ppm on both the central meridian and the extremes of the projection. Positioning the central meridian in the centre of Ireland at 8° west also results in even distribution of convergence and t-T corrections.

The location of the UTM central meridian produces increases of 50' in the convergence calculated along the East Coast. The adoption of either UTM or ITM map projections has no significant effect on area measurements.

The growing numbers of GPS users, most of whom have no interest in issues such as transformations and adjustments, will be best served by a mapping system which is fully compatible with GPS. There are, however, very many existing users of OSi and OSNI mapping. Many of these have associated their own data with the mapping data and therefore have significant databases using IG coordinates. Any proposed change cannot ignore the needs of these users. In addition, whilst the majority of map data users in Ireland will not be concerned about the international compatibility of their work, there are important applications which will benefit significantly from such compatibility. Although UTM, for the reasons described, is not the ideal map projection when considering Ireland in isolation, it is an internationally recognised standard. OSi and OSNI therefore intend to make products and services available in IG, ITM and UTM.

Consultations with the main user groups on the proposals above are currently underway. Wide consultation and education is seen as vital in this very significant change. Particular areas for consultation include the timescale within which users can accommodate changes, the coordinate reference system to be used for small-scale maps, and how product design can be used to assist in the easy identification of the projection being used for any particular map. Other ongoing work by OSi and OSNI includes the implementation of an active GPS network, and realisation of a precise geoid model.

CONTACTS

Michael Cory and Roy Morgan
Ordnance Survey of Northern Ireland
Colby House
Stranmillis Court
Belfast BT9 5BJ
UK
Tel. + 44 2890 255 702
Fax + 44 2890 255 700
Email: mick.cory@doeni.gov.uk; roy.morgan@doeni.gov.uk

Iain Greenway and Colin Bray
Ordnance Survey Ireland
Phoenix Park
Dublin 8
IRELAND
Tel. + 353 1 802 5308
Fax + 353 1 820 4156
Email: igreenway@osi.ie; colin.bray@osi.ie