

**EPA STRIVE Programme 2007-2013**

## **ISIS SISCore Data Model**

**(2007-S-CD-1-S1)**

### **ISIS Final Technical Report 15**

Prepared for the Environmental Protection Agency  
by  
Teagasc and Cranfield University

**Authors:**

*Hallett, S.H. and Carvalho, J.*

**ENVIRONMENTAL PROTECTION AGENCY**

An Ghníomhaireacht um Chaomhnú Comhshaoil  
PO Box 3000, Johnstown Castle, Co.Wexford, Ireland

Telephone: +353 53 916 0600 Fax: +353 53 916 0699

Email: [info@epa.ie](mailto:info@epa.ie) Website: [www.epa.ie](http://www.epa.ie)

## **ACKNOWLEDGEMENTS**

This report is published as part of the Science, Technology, Research and Innovation for the Environment (STRIVE) Programme 2007-2013. The programme is financed by the Irish Government under the National Development Plan 2007-2013. It is administered on behalf of the Department of the Environment, Heritage and Local Government by the Environmental Protection Agency which has the statutory function of co-ordinating and promoting environmental research.

This project involved many staff and students based at Teagasc Johnstown Castle, Teagasc Athenry, Cranfield University and University College Dublin. Many thanks go to all the staff, PhD students, placement students and FAS placements who contributed to this project. We also wish to thank the Steering Committee, Dr Alice Wemaere (EPA), Ms Niamh Connolly (EPA), Dr Mark Gibson (Teagasc), Prof Peter Loveland, Dr Erika Micheli and Dr Arwyn Jones.

## **DISCLAIMER**

Although every effort has been made to ensure the accuracy of the material contained in this publication, complete accuracy cannot be guaranteed. Neither the Environmental Protection Agency nor the author(s) accept any responsibility whatsoever for loss or damage occasioned or claimed to have been occasioned, in part or in full, as a consequence of any person acting, or refraining from acting, as a result of a matter contained in this publication. All or part of this publication may be reproduced without further permission, provided the source is acknowledged.

The EPA STRIVE Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

**EPA STRIVE PROGRAMME 2007-2013**

Published by the Environmental Protection Agency, Ireland

## **Details of Project Partners**

### **Teagasc - Environment, Soils and Land-use Centre,**

Johnstown Castle, Wexford, County Wexford, Ireland.

Tel.: +353 (0)53 9171200

E-mail: rachel.creamer@teagasc.ie

### **Teagasc – Spatial Analysis Group, Rural Economy and Development Programme.**

Ashtown, Dublin 15, Ireland.

Tel.: +353 (0)1 8059953

E-mail: reamonn.fealy@teagasc.ie

### **Cranfield University - National Soil Resources Institute**

Cranfield Campus, Cranfield, Bedfordshire, MK43 0AL, UK

Tel.: +44 (0)1234 750111

Email: t.mayr@cranfield.ac.uk

### **University College Dublin**

School of Biosystems Engineering, Agriculture and Food Science,

Belfield, Dublin 4, Ireland.

Tel.: +353 (0)1 7162808

Email: nick.holden@ucd.ie

## Executive Summary

The Irish Soil Information System (ISIS) project was established in 2008, following a comprehensive inventory of Irish soil data compiled by Daly and Fealy (2007) which highlighted that soil data coverage of Ireland was incomplete in both detail and extent. The ISIS project is funded under the Environmental Protection Agency STRIVE Research Programme 2007-2013 and co-funded by Teagasc. It was led by Teagasc with the participation of researchers from Cranfield University (UK) and University College Dublin. The overall objective of the ISIS project was to conduct a programme of structured research into the national distribution of soil types and construct a soil map, at 1:250,000 scale, which will identify and describe the soils according to a harmonised national legend. This map is now available in digital format and forms the basis of a new soil information system for Ireland (<http://isis.teagasc.ie>).

The ISIS project has utilised existing data and maps from the previous National Soil Survey (NSS) conducted by An Foras Talúntais (forerunner organisation to Teagasc). The NSS produced: mapping at 1:126,720 scale for 44% of the country; a General Soil Map of Ireland and a National Peatland map, both at 1:575,000 scale and other miscellaneous large scale mapping of experimental farms. In addition, more recent map products have been included such as the Indicative Soil and Subsoil mapping (Fealy and Green, 2009) with national coverage using GIS and remote sensing techniques.

Comparison of soil information at European scale has led to the requirement for the harmonisation and coordination of soil data across Europe, and, in light of the demands for soil protection on a regional basis within member states there is a growing need to support policy with a harmonised soil information system. The European Soil Bureau Network (ESBN) Technical Working Group dealing with Soil Monitoring and Harmonisation recommended a soil map of Europe at a scale of 1:250,000 as an economically feasible intermediate scale that can identify specific problems at regional scale (Montanarella and Jones, 1999).

The ISIS project adopted a combined methodology of utilising novel predicted mapping techniques in tandem with traditional soil survey applications. This unique combination at a national scale has resulted in the development of a new national soil map for Ireland. Building upon the detailed work carried out by the An Foras Talúntais (AFT) survey (known as *Terra Cognita*), the ISIS project generated soil-landscape models at a generalised scale of 1:250,000 for the counties of Carlow, Clare, Kildare, Laois, Leitrim, Limerick, Meath, Offaly, Tipperary South, Waterford, Westmeath, Wexford, West Cork, West Mayo and West Donegal. These soil-landscape models (also referred to as soilscape) were used as the baseline data for statistical models (random forests, Bayesian belief networks and neural networks) to predict soil map units in counties where there was no map available (referred to as *Terra Incognita*). To validate the methodology, this work was supported by a 2.5 year field survey, in which 11,000 locations were evaluated for soil type, using an auger bore survey approach. These data were used to check the predicted soil mapping units (associations) for counties: Cavan, Dublin, East Cork, East Donegal, East Mayo, Galway, Kerry, Kilkenny, Louth, Monaghan, Roscommon, Sligo, Tipperary South and Wicklow, where a detailed soil

survey map was not available. Where new soil information was generated, due to previously unknown combinations of soil-landscape units, profile pits were selected at representative locations across the country. These 225 pits were described and sampled in detail and were used to generate a new soil classification system for the country. The final product is a unique combination of new and traditional methodologies and soils data from both the AFT and the ISIS project. The final, soil association map of Ireland consists of 58 associations (excluding areas of alluvium, peat, urban, rock or marsh) that are made up from 213 soil series. Associated representative profile information is available in the online soil information system.

A key component of the ISIS project has been the development of a soil and land information system and associated public web site. This system has been designed to hold the complete set of information deriving both from the ISIS field programme and modelling activity, as well as the previously existing legacy soils information available for Ireland. Drawing on this information system, the web site is designed to hold and disseminate this information online both in cartographic and tabular form to stakeholders. Prior to this development, there has been no harmonised computerised system in place to hold and manipulate national Irish soils data. The information system therefore addresses the pressing need and requirement for a publicly-accessible, integrated IT framework based upon contemporary informatics standards to serve the many and varied stakeholders having an interest in soils information in Ireland.

