

An audit of Geological Sites in County Kilkenny (Phase 2)

Addendum to Clarke *et al.* (2007), *The Geological Heritage of Kilkenny*.

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This project is an action of the Kilkenny Heritage Plan

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IGH 8 Lower Carboniferous

Site Name

Dunbell M9 Cutting
Bennettsbridge M9 Cutting
Danesfort M9 Cutting
King's River M9 Cutting
Barrettstown Quarry

IGH 10 Devonian

Site Name

Hugginstown M9 Cutting
Earlsrath M9 Cutting

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Report Summary

This report, prepared for Irish Geological Heritage Programme of the Geological Survey of Ireland and for the Heritage Office of Kilkenny County Council, addresses the GSI's proposed inclusion of some new sites in the Irish Geological Heritage listing of County Geological Sites in County Kilkenny, and their addition to the listing of County Geological Sites in the Kilkenny County Development Plan 2014-2020. It should be read in conjunction with Clarke, Parkes and Gatley (2007). The sites in question are significant cuttings into bedrock along the route of the M9 motorway (and an adjacent disused quarry), which were not in existence during the course of the audit of Kilkenny geological heritage sites conducted in 2007.

Each cutting is individually described and reported upon in the standard format for County Geological Site reports established by the Geological Survey of Ireland, in conjunction with numerous local authorities which have completed geological heritage audits. It is concluded that all six cuttings examined should all be added to the Kilkenny County Geological Site list. In addition, a disused quarry which lies close to the M9 motorway route which was assessed should also be included.

Some generic suggestions in relation to the promotion and management of these sites are also discussed. Full provision of digital shapefiles of these additional sites accompanies this report so that the sites can be integrated into the GIS system within the planning and heritage sections of Kilkenny County Council.

The fieldwork for this report was completed in May 2012, with draft reports completed in July. The final report was completed in November after receipt of feedback.

New exposures in development

Following many years of promoting the idea from the Irish Geological Heritage Programme, it is pleasing to record that wherever major new carriageways have been built in recent years in major infrastructural road works across the country, such as along the M9 in County Kilkenny, any newly created rock exposures have often been left open and exposed.

By leaving rock exposures where they are intersected along roadsides, it provides a landscape feature and interest along the route, reflecting the geology and landscape of the locality. Sympathetic tree or shrub planting can still be done, but leaving bare rocks, especially where they show interesting features, not only assists the geological profession, but creates new local landmarks to replace those removed in the construction of the roadway.

Regional stratigraphy

The significant lack of bedrock exposures in south Kilkenny has meant that geological interpretations and published maps for the area have been somewhat speculative. The new cuttings referred to in this report have the potential to add significantly to our broad understanding of Carboniferous geology in the southeast. These new cuttings greatly supplement the few quarries that were selected in the 2007 audit, because at that time they were the only representative sections available.

The published Geological Survey of Ireland (GSI) maps for the specific area of these road cuttings are highly interpretative and not very reliable in the detail of the different formations. As far as we can ascertain from consulting geological colleagues, these sections have not been examined by any academic or governmental geologists specialising in Carboniferous geology or stratigraphy, either during construction or since.

The definition of Carboniferous limestone bedrock formations in this district is poorly understood. There is very little detailed research published on the area, with the Geological Survey of Ireland's 1:100,000 map sheet 19 (Tietzsch-Tyler and Sleeman 1994a) being the only significant compilation. Various detailed biostratigraphical studies such as Cózar and Somerville (2005), Nagy *et al.* (2005), Gallagher (1996) all focus on adjacent areas but skirt around the south Kilkenny limestone area. The recent revised Correlation Chart for Carboniferous rocks (Somerville *et al.* 2011) also only mentions the area with little detail.

Dunbell, Danesfort and King's River cuttings are both within the Butlersgrove Formation, whilst Bennettsbridge Cutting lies within the Ballyadams Formation, which is slightly younger and lies on top of the Butlersgrove Formation. Barrettstown Quarry lies within the Ballysteen Limestone Formation. In the case of all the cuttings, the observed geology fits broadly into the informal definitions of the GSI Sheet 19 map and report, but serves to illustrate the geodiversity in this poorly studied area, and to draw attention to the scientific value of the new sections.

We conclude by summarising that the limestone rocks were deposited in various different environments (or sedimentary facies) within an open marine shallow sea that existed across much of Ireland in the Lower Carboniferous Period. Some of the features seen are primary sedimentary features, but others such as the white calcite blobs in Dunbell M9 Cutting and King's River M9 Cutting are secondary features caused by replacement of original evaporite minerals such as gypsum or anhydrite. Other features such as the numerous palaeokarstic surfaces in between beds of limestone in the Bennettsbridge M9 Cutting are of uncertain timing, but probably occurred at the same time as beds were forming, or when the process called diagenesis took place, converting wet sediments into hard rocks.

Most of Ireland's Midlands are covered by limestone deposited during this time, mostly classed as Viséan, stratigraphically. However, specialist work on samples to identify zonal fossils would be required to assign the specific rocks in the Kilkenny road cuttings to the different Stages into which the Period is subdivided. In other well studied areas this is not a problem, but data in south Kilkenny are currently quite poor.

(Part of) Carboniferous Period	(part of) Dinantian Subsystem	(part of) Viséan Series	Ballyadams Formation
			Butlersgrove Formation
			Ballysteen Limestone Formation

The stratigraphical relationship of the relevant Carboniferous Limestone formations is summarised here, with the left hand columns being the subdivisions of the Carboniferous Period (or System). Internationally agreed terminology now differs from these columns but at a local and national level, these are entrenched in maps and literature on the area. In standard stratigraphical fashion the succession of rock formations is portrayed with the oldest at the base, and youngest at the top.

The older Devonian rocks represented in Hugginstown and Earlsrath Cuttings are from two separate formations. Although the Kiltorcan Formation was included in two sites in the 2007 Audit, these were selected primarily for the palaeontological interest, so the Hugginstown Cutting provides a complementary scientific representation of this stratigraphy at a county level. The somewhat older Carrigmaclea Formation seen in Earlsrath Cutting was not previously included in any County Geological Site and provides new representation of these terrestrial sediments accumulated by rivers on a weathering older landscape over 360 million years ago.

Ideas for promotion of geological heritage in relation to new road cuttings in Kilkenny

It may be difficult to do any promotion of these cuttings since they are on a motorway and there is little scope for safe viewing on site, other than for passengers passing by in cars at high speeds. However, some suggestions which could be followed up, if appropriate, are briefly discussed below.

Guides

The option of a brief printed guide to the 'Rocks of the M9 in Kilkenny' or similar could be considered. The authors could work with the Heritage Officer in producing such a leaflet type of guide if requested, based on distilling the content of the audit of these sites, with additional explanatory drawings or illustrations. A sheet of A4 size folded into a DL size is suggested as sufficient.

Signboards

Signboards can be a useful way of disseminating information to road users about sites of geological interest along a route. It is an interpretive option that the GSI strongly recommends. The GSI will liaise with the National Roads Authority (NRA) and Kilkenny County Council to explore the possibility of providing signage about geological features and cuttings along national routes, in the context of road safety constraints. It is proposed to write an article on the scientific importance of these new cuttings and to explore the issue of 'name' signs on important cuttings, for the NRA publication *Seanda*.

New media

There are increasing numbers of examples of new methods of promoting earth sciences, via smart phone applications and other electronic media. Self guiding 'apps' on specific sites is one of these, such as those produced by Ingenious Ireland for Dublin city geology and for other sites. Advertising such an 'app' which gave explanatory data about the geological interest of the cuttings would probably need to be done via other routes (radio/newspapers/magazines etc.) rather than having a sign on the motorway.

Earth Science Ireland Group and magazine [www.earthscienceireland.org]

The group Earth Science Ireland is an all-Ireland group promoting awareness of earth sciences and supporting educational provision in the subject. A main vehicle for this is the twice-annually magazine *Earth Science Ireland*, distributed free to thousands of individuals, schools, museums, centres and organisations.

Subject to agreement of the Heritage Officer for Kilkenny it is proposed to write a brief, well-illustrated article on these cuttings and their proposed addition to the CGS list for Kilkenny. The article would continue to be available online and could be supplied as a **pdf** to the Heritage Officer for local longer-term use, without the rest of the magazine. Multiple copies of the magazine could also be made available.

Geoschol website [www.geoschol.com]

Geoschol is an educational project, now essentially represented by a website, which was largely aimed at producing educational materials on geology for primary schools, but which also has general interest resources. It is proposed here that any guide, article or other promotional material from this audit is made available to a wider public through the Geoschol website. A four page **pdf** summarising the geology and some highlights of Kilkenny is already part of the available material.

(http://www.geoschol.com/counties/KILKENNY_GEOLOGY.pdf)

Geological References

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- WATERS, C.N. et al. 2011. *A Revised Correlation of Carboniferous Rocks in the British Isles*, Special Report 26, The Geological Society, London.

Glossary

For simple definition of any unfamiliar geological terms in this report, the reader is referred to the glossary in the 2007 Audit (Clarke, Parkes and Gatley). This is available on the GSI website:

<http://www.gsi.ie/Programmes/Heritage+and+Planning/County+Geological+Sites+Audits/Kilkenny.htm>

Site reports – general points

The following site reports are brief non-technical summaries of the newly proposed County Geological Sites for County Kilkenny. These have been specially prepared for this report in order to make the information accessible to planners and others without geological training. For most sites more detailed reports and information files are held in the IGH Section in the Geological Survey of Ireland. These are available for consultation if required. Further sites may become relevant as IGH Programme work develops.

Each site report has primary location information, a mention of the main rock types and their age, and a short description of the key aspects of scientific interest. A section outlining any particular management or other issues specific to the site is included, along with some photographs exemplifying the site. **A CD accompanying this report will include further pictures of most sites at higher resolution, should they be required for a glossy booklet or leaflet for the general public.** Grid references are given normally for a central point in the site if the site is small, or two extreme points at opposite ends of the site if the site is extensive or linear. They are only indicative of the location, but the site extent is best shown on the included maps and in GIS shapefiles.

No detailed individual site maps are provided with an outline of the site boundary, since the 2005 Ordnance Survey of Ireland air photo and mapping data available in GSI does not include the M9 Motorway. Immediately 2010 data becomes available these site boundaries will be compiled and presented to the Heritage Officer. At present the GIS shapefiles are based on accurate GPS measurements taken in the field at key locations.

For sites that have been proposed or will be proposed for NHA designation detailed site boundary maps will become available to the Local Authority, through NPWS as the designation process is undertaken. Some areas may already be available if they are proposed NHAs (pNHA), under the Wildlife (Amendment) Act 2000. Areas which have been designated as Special Areas of Conservation (SAC) under European Habitats Directives will also have statutory boundaries already determined. The geological interest may be included within the wider area of nature conservation.

In terms of any geological heritage site designation as NHA, due process of site reporting, boundary survey and very importantly, consultation with landowners where they can be readily identified, will take place before GSI makes recommendations to NPWS on the most important sites to be designated. Any landowner within areas or sites identified in this report with concerns over any aspect of this project is encouraged to contact Sarah Gatley, Head of the Heritage and Planning Programme, in the Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4.

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