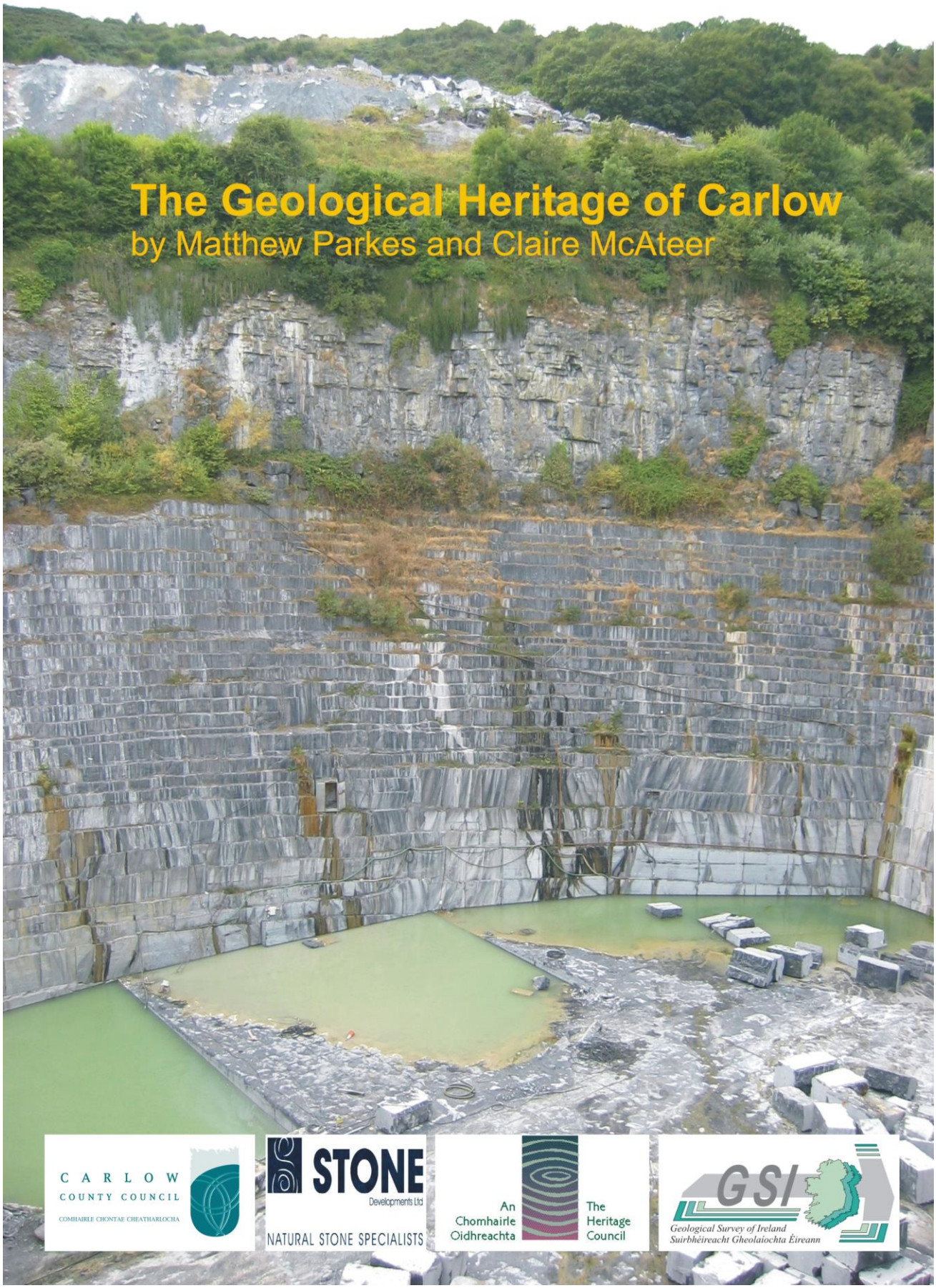
The Geological Heritage of Carlow

by Matthew Parkes and Claire McAteer



CARLOW COUNTY COUNCIL
COMHAIRLE CHONTAE CHEATHARLOCHA

STONE Developments Ltd
NATURAL STONE SPECIALISTS

An Chomhairle Oidhreachta
The Heritage Council

GSI
Geological Survey of Ireland
Suirbhéireacht Gheolaíochta Éireann

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Irish Geological Heritage Programme
Geological Survey of Ireland
Beggars Bush
Haddington Road
Dublin 4

Tel: 01-6782837
sarah.gatley@gsi.ie

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This report is an action of the County Carlow Heritage Plan 2003 - 2007

Contents

Report Summary

This report is a result of a collaborative project between the Heritage Office of Carlow County Council, the County Carlow Heritage Forum and the Geological Survey of Ireland, with the benefit of funding from the Heritage Council and some additional sponsorship from Stone Developments Ltd, based in Old Leighlin. It aims to contribute to several actions within the Heritage Plan, by providing a baseline report on various aspects of geological and geomorphological heritage of the county.

It documents what are currently understood to be the most important geological sites within Carlow, and proposes them as County Geological Sites (CGS), for inclusion within the Carlow County Development Plan, when it is next revised. County Geological Sites do not receive statutory protection like Natural Heritage Areas (NHA) but receive an effective protection from their inclusion in the planning system. However, some of the sites described in this report are considered to be of national importance as best representative examples of particular geological formations or features. They either have been, or will be, formally proposed by the Geological Survey of Ireland, for designation as NHAs by the National Parks and Wildlife Service after due survey and consultation with landowners.

The report also documents a wide variety of geological data sources providing information about Carlow. It has a simple geological history of the county, with maps, charts and a glossary that make the information accessible to those who have not had any formal geological training. This material and others generated for a public exhibition held in the Council offices in 2003 may be reused for educational and promotional purposes within the county. The geological collections held by the county are also identified as part of the project.

The commission of this report, and adoption of the sites within the County Development Plan places Carlow at the forefront of geological conservation in Ireland, where the local authorities have a vital role to play at County level. By effective action through Heritage and Planning Offices, with community based support, they will ensure that geological heritage is properly addressed as a foundation to other components of our national heritage.

Carlow in the context of Irish Geological Heritage

This report places Carlow in the very forefront of geological heritage within Ireland, as it is only the second county to commission such a project within the scope of the Heritage Plan. It represents a significant commitment on the part of the Local Authority to fulfil its obligations to incorporate geology into the spectrum of responsibilities under the Heritage Act 1995, the Planning and Development Act 2000, Planning and Development Regulations 2001, and the Wildlife (Amendment) Act, 2000 and the National Heritage Plan (2002).

The Irish Geological Heritage Programme (IGH) in the Geological Survey of Ireland (GSI) complements other nature conservation efforts of the last decade, by assessing Ireland's geodiversity, which is the foundation of the biodiversity addressed under European Directives on habitats and species by the designations of Special Areas of Conservation (SAC) and more recently on a national scale by the introduction of Natural Heritage Areas (NHA) as the national nature conservation method. As a targeted conservation measure to protect the very best of Irish geology and geomorphology it fills a void which has been there since the abandonment of the Areas of Scientific Interest scheme, listed by An Foras Forbartha in 1981.

The IGH Programme does this by identifying and selecting the most important geological sites nationally for designation as NHAs. It looks at the whole of Irish geology and geomorphology under 16 different themes. A fundamental approach is that only the minimum number of sites necessary to demonstrate the particular geological theme is selected. This means that our first criterion is to identify the **best National representative example** of each feature or major sequence, and secondly any unique or exceptional sites. The third criterion, of any sites of International importance, is nearly always covered by the other two.

IGH THEMES

1. Karst
2. Precambrian to Devonian Palaeontology
3. Carboniferous to Pliocene Palaeontology
4. Cambrian-Silurian
5. Precambrian
6. Mineralogy
7. Quaternary
8. Lower Carboniferous
9. Upper Carboniferous and Permian
10. Devonian
11. Igneous intrusions
12. Mesozoic and Cenozoic
13. Coastal geomorphology
14. Fluvial and lacustrine geomorphology
15. Economic geology
16. Hydrogeology

Designation of geological NHAs is by the partners in the Programme, the National Parks and Wildlife Service (NPWS – formerly a part of Dúchas) in the Department of

Environment, Heritage and Local Government. Once designated, any geological NHAs will be subject to normal statutory process within the Carlow Planning Department and other relevant divisions.

As a result of extensive comparison of similar sites to establish which is the best, we have a good picture of many other sites, which may not be the chosen best example, but may still be of national importance. Others may be of more local importance or of particular value as educational sites or as a public amenity. It is these various other sites that are proposed for CGS listing in the revised County Development Plan.

At the time of writing this report, candidate sites have been established by Expert Panels for all the 16 themes, and for most themes the indicative site lists have been finalised. For three themes, the entire process has been completed and detailed site reports and boundary surveys have been done along with a Theme Report.

The sites proposed here as CGS have been visited and assessed specifically for this project, and represent our current state of knowledge. Although there are some areas that may merit inclusion, the state of work done by the Expert Panel for some themes is not sufficiently advanced to be clear on the importance of some sites for this report. Such sites are primarily landscapes exhibiting Quaternary or glacial features. However, we are reasonably confident that the scientifically most important sites in Carlow have been identified in this report. Other sites may of course be proposed in the future, driven by local knowledge and interest, or by new discoveries and developments in the science of geology.

Geological conservation issues and site management

Since geodiversity is the often forgotten foundation for much of the biodiversity which has been selected for conservation through SAC or NHA designation it is unsurprising that nationally, many of the most important geological sites are actually the same areas. In these areas, the geological case enhances and cements the value of these sites for nature conservation, but requires no additional designation of actual land areas.

There tend to be two broad types of site identified by the IGH Programme. Most geological sites tend to be small and discrete. They may be old or active quarries, natural exposures on hilly ground, coastal cliff sections, or other natural exposures. In Carlow, there are very few natural exposures, so most of the sites are quarries, which provide a window into the underlying geology. They usually have a specific interest such as fossils, minerals or are a representative section of a particular stratigraphical sequence of rocks. The other type of site tends to be larger areas that represent a geomorphological interest – landscapes that illustrate processes which formed them. The Coastal Geomorphology theme, the Quaternary theme and the Karst theme include such sites. In Carlow, the Ballymoon Esker is the example of these larger sites.

It is also important from a geological conservation perspective that planners are aware of the landscape importance of geomorphological features which may not in themselves warrant any formal site designation, but which are an integral part of the character of Carlow. A lack of awareness in the past, has led to the loss of important geological sites, throughout the country.

There are big contrasts in the management requirements for geological sites in contrast to biological sites. Most geology is actually quite robust and generally few restrictions are required in order to protect the scientific interest. In some cases, paradoxically, the geological interest may even be served better by a development exposing more rock. The important thing is for the sites to be known about in the planning department, and more generally, so that consultation can take place if some development is proposed for a site. In this way, geologists may get the opportunity to learn more about a site or area by recording and sample collection of temporary exposures, or influence the design so that access to exposures of rock is maintained for the future, or prevent completely inappropriate developments through a strong scientific case.

It is the case in Carlow, that working quarries such as Stone Development's Bannagagole Quarry may in the future be designated as geological NHAs simply because they are the best or only representative sections available of entire sequences. Absolutely no restriction would be sought on the legitimate operation of these quarries. However, maintenance of some rock sections after quarry closure would perhaps be planned with the operator and planning authority in such a case.

A case study from Carlow indicates some issues arising in relation to some geological heritage – competing interests in the case of sand and gravel resources.

Case Study – Sand and gravel extraction – Ballymoon Esker, Bagenalstown
What are important Quaternary landforms to the geomorphologist, capable of telling the story of how the landscape formed and of the many changes and processes it has undergone during the Ice Ages, are also important sand and gravel resources to others. The development requirement for aggregates has grown drastically in recent years and almost any feature may be under pressure of extraction. Carlow has perhaps only the one esker, but this good example at Bagenalstown, exemplifies the issues involved.

The site exemplifies the conflicting interests of such Quaternary sites across the country. It is important that at least the very best landforms are protected as examples for scientific research and for education, yet they are rapidly disappearing, without even being documented and mapped. Since sand and gravel are low value, high volume materials that are costly to transport, demand exists everywhere, so no features are safe.

Eskers are long, sometimes winding or beaded ridges of sand and gravel which were deposited from rivers flowing in tunnels underneath ice sheets or glaciers. Their name, used internationally for such glacial landforms, is derived from the Irish word for them: ‘eiscir’. They can vary significantly in size and shape, but usually have a roughly triangular cross section. If ‘sliced open’ in a gravel pit for example the intermixed layers of sand and gravel are exposed. Their shape and sediment distribution are due to the dynamics of the water contained in the ice under pressure and the late stages when the meltwater channel ceases to operate.

Geomorphologically, the Ballymoon esker workings have gone quite deep and now expose the contact between granite bedrock and overlying glacial deposits. They exhibit sections of calcrete, where circulating groundwater rich in lime has precipitated calcite as a natural cement, forming a concrete like deposit at the base of the esker.

Ballymoon esker, north east of Bagenalstown is a proposed NHA (000797) primarily for its rare plants: Basil Thyme and Green-winged Orchid (only known in 4 and 7 sites respectively) and others. The site synopsis also cites the geomorphological interest of the esker which is well separated from the larger esker systems of the midlands. However in the early 1990s when the site was selected as a pNHA sand and gravel working was noted at several sites and only the northernmost section of the esker was intact.

This remains the situation with Kilcarrig Quarries working sand and gravel from several pits along the esker. If the esker is to be fully redesignated as an NHA under the Wildlife (Amendment) Act 2000, a full survey will need to be done to establish the distribution and status of the rare plant community of the calcareous grassland on the esker. The permissions and status of the gravel working by Kilcarrig Quarries Ltd will need to be examined. The site requires a detailed geomorphological assessment to establish whether it has any exceptional features. Investigation of these internal features is of course only possible where quarrying has exposed them, illustrating one of the paradoxes of geomorphological and geological conservation.

In short, Ballymoon Esker exemplifies the many conflicting interests and issues that arise with geomorphological landscape features which also comprise an economically useful resource. ***It would make a very good case study for Carlow schools to use, examining demand and needs for aggregate resources, and what is also available locally, and the nature conservation value of the esker, along with the geomorphological importance, and the local sense of place.***

Geological History of the Carlow area

This is a non-technical summary written to be accessible for any reader, but occasionally some geological terms are unavoidable. A Glossary of these terms (in blue print) is provided at the end of the report.

The scenic landscapes in the Carlow area formed over hundreds of millions of years by various geological processes, each one leaving its mark in the rock record. Careful examination of the rocks in the region can help unravel the mysteries surrounding their formation and thus shed light on the evolution of the Carlow terrain. However, there are few natural exposures in Carlow, and it is in the quarries and pits that windows can be found exposing the bedrock. Even on the hilly terrain of the Blackstairs (see below) underlain by granite, natural outcrops are rare.

Rocks can be divided into three main groups, sedimentary, igneous and metamorphic. All three groups are exposed in Carlow. Sedimentary rocks are laid down as soft material such as sand or mud and then hardened by compaction and lithification into sandstones, siltstones, mudstones and limestones. Fossils, often preserved in these rocks, can give us an idea as to how the rock formed and what the climate and environment were like at that time. Igneous rocks crystallise from magma originating deep beneath the Earth's surface and may be extrusive (i.e. lava flows at the Earth's surface) or intrusive (emplaced within the Earth's crust, below the surface). Metamorphic rocks are sedimentary or igneous rocks that have been altered by changes in temperature and/or pressure. New minerals grow in response to these changes and their composition depends on the composition of the original rock.

At any one locality there is usually more than one rock type, or lithology and they are generally inter-layered. Ranges of lithologies over a small area are largely consistent and sequences of rock often share common characteristics allowing them to be

grouped together as packages or geological units. The most important of these 'units' is the formation, which is defined as a sequence of related rock types differing significantly from adjacent sequences.

The oldest rocks in the Carlow area are of Lower Ordovician age and belong to the Ribband Group (Figure 1). They are exposed in the east of the county, northeast of the Blackstairs Mountains (Figure 2 summary geological map). Of this Group, only the oldest formation, the Maulin Formation, is exposed in Carlow. Originally deposited as mudstones on the floor of the Iapetus Ocean, these rocks are dominantly dark blue-grey in colour. The Iapetus Ocean separated the NW half of Ireland from the SE half from Cambrian to Silurian times. The Kilcarry Member of the Maulin Formation records the first evidence of volcanic activity in the Carlow area. Characterised by andesitic lavas and tuffs this formation formed as the Iapetus Ocean began to close through a process called subduction (where one lithospheric plate sinks beneath another). As it sank, the subducted oceanfloor began to melt generating magma that was injected into the rocks above.

According to concepts of plate tectonics the Lithosphere (crust and upper mantle) is divided into a number of rigid plates, which collide, separate and slide by each other as they move. Where plates separate (e.g. the Mid Atlantic Ridge) new plates are created and where they collide (e.g. the Himalayas) plates are destroyed. Movements along plate boundaries can result in mountains being built, volcanoes, earthquakes and the formation of deep-sea trenches. In the case of Iapetus two landmasses (one including NW Ireland, the other SW Ireland) on either side of the ocean began moving towards each other during Ordovician times. In order to facilitate this one lithospheric plate sank below the other.

Whilst upper Ordovician rocks crop out in the Wexford area, no such rocks are exposed at the surface in the Carlow area. The lower Ordovician Ribband Group was affected by two major phases of deformation. The first, the Monian Orogeny (a Lower Ordovician mountain-building event affecting southeast Ireland and Anglesey) occurred shortly after deposition. The second phase, the Caledonian Orogeny took place during the Silurian, marking the final closure of the Iapetus Ocean.

Over half of Carlow is formed of granite (See figure 2 and figure 3). The Blackstairs Granite and the Tullow Granite, both exposed in Carlow form part of the Leinster Granite. Extending from the Carlow-Wexford area northeast to Dublin Bay, the Leinster Granite is the largest body of granite in Ireland and Britain. It was emplaced, or intruded, into the Lower Palaeozoic rocks towards the end of the Caledonian Orogeny, during early Devonian times (around 400 million years ago). The intrusion of the granite cooked and metamorphosed the surrounding country rock as it was emplaced, altering the mudstones of the Maulin Formation to micaceous phyllites and schists adjacent to the granite. The Kilcarry Member volcanics were also metamorphosed to amphibolites

AGE (Million Years)	ERA	PERIOD		Events Relating to the Carlow Area
1.6	Cenozoic	Quaternary		A series of ice ages followed by spread of vegetation, growth of bogs and the arrival of man.
65		Tertiary		Erosion. Opening of the North Atlantic ocean. Volcanoes in NE Ireland.
135	Mesozoic	Cretaceous		Erosion. Probable incursion of the sea. Chalk deposition preserved today in northern Ireland.
205		Jurassic		Uplift and erosion. Sediments deposited in offshore sea basins.
250		Triassic		Erosion and deposition under desert conditions.
290	Palaeozoic	Upper	Permian	
355			Carboniferous	Land progressively submerged. Coastal plain and nearshore deposits followed by limestone deposition in shallow tropical seas. Subsequent building out of the land, deltaic sands and muds deposited often under swampy conditions. Variscan mountain building event (affecting southwest Ireland) towards the end of the Carboniferous.
410			Devonian	Continued mountain building, rapid erosion and deposition under semi-desert conditions. Intrusion of granites and metamorphism during early Devonian.
438		Lower	Silurian	Closure of Iapetus Ocean, continental collision and Caledonian mountain building.
510			Ordovician	Deep-sea mudstone deposition on the floor of the Iapetus Ocean. Volcanism along the southeast margin of Iapetus as the ocean contracts. Monian Orogeny during the Lower Ordovician (affecting southeast Ireland and Anglesey).
544			Cambrian	Opening of the Iapetus Ocean between northwest and southeast Ireland.
2500	Pre-cambrian	Proterozoic		Oldest rocks in Ireland.
4000		Archaean		Oldest known rocks on Earth.
Formation of the Solar System approximately 4600 million years ago				

Figure 1. Geological Time Scale

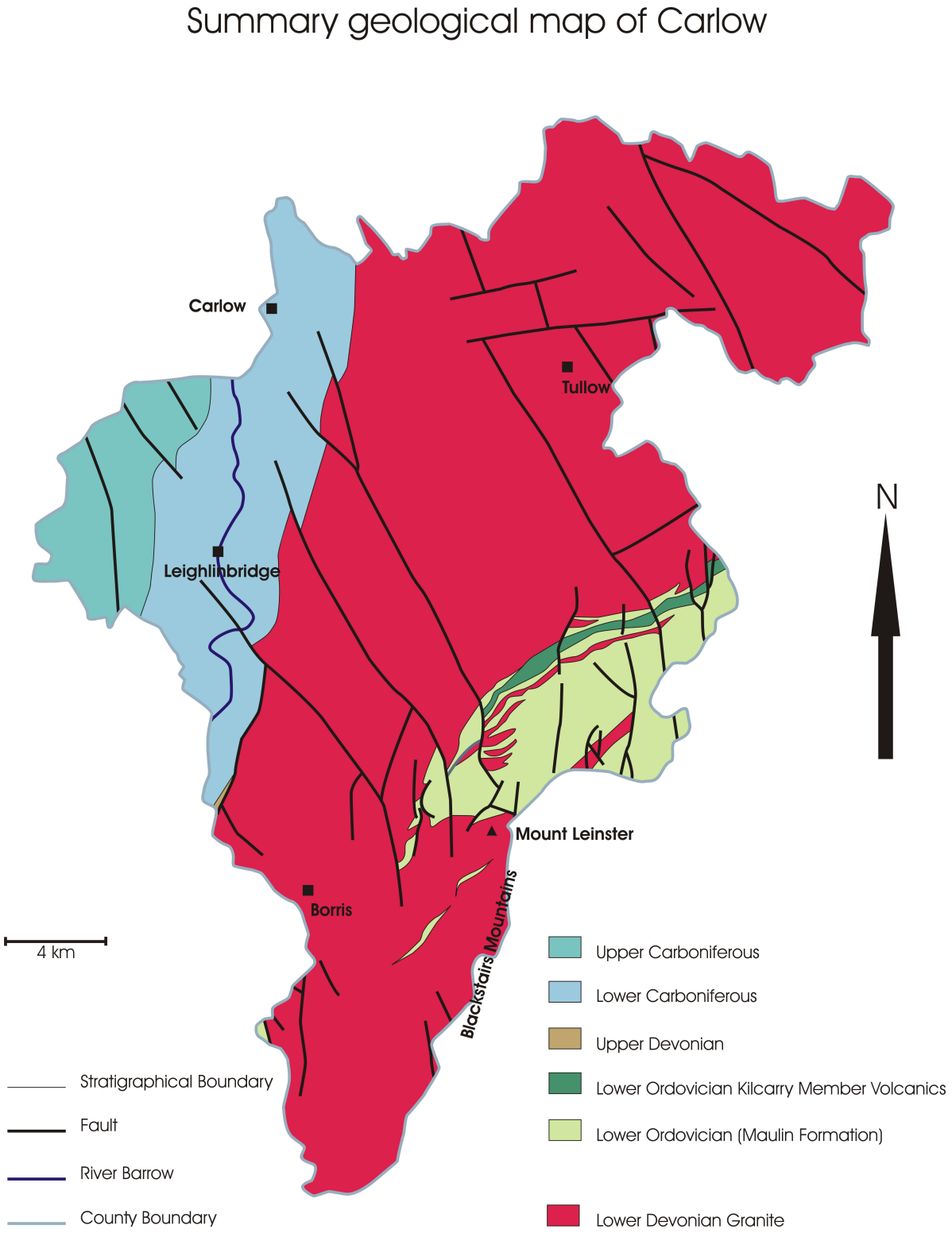


Figure 2. Summary geology map of Carlow.

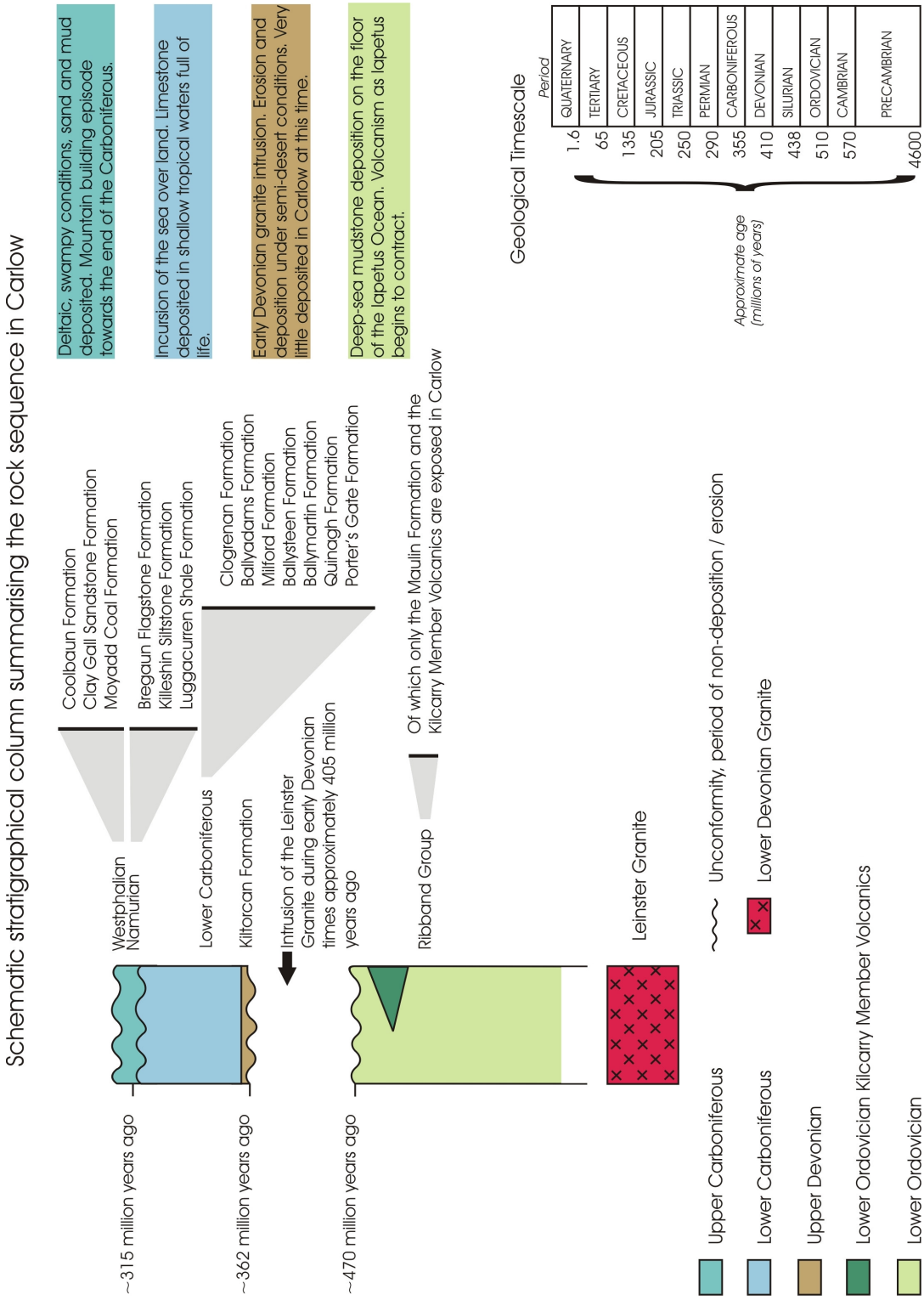


Figure 3. A schematic stratigraphical column summarising the rock sequence in Carlow.

and chlorite schists due to their close proximity to the granite. This type of metamorphism is known as contact metamorphism. Both the Tullow and Blackstairs plutons are mostly composed of granite but also include some granodiorite.

The emplacement of the granite was roughly synchronous (at the same time) with a phase of shearing responsible for the East Carlow Deformation Zone (McArdle and Kennedy 1985). This zone can be traced from Graiguenamanagh to Wicklow. Earlier folds were tightened during this event and new mineral alignments and foliations developed within the rocks. The timing of the crustal movements responsible for the East Carlow Deformation can be determined with some accuracy. Because the movement affected the margins of the granite and was accompanied by contact metamorphism it can be inferred that movement took place during and immediately after granite emplacement.

Another feature of the Leinster Granite is the presence of vein-like aplites and pegmatites. Aplite veins developed when residual granitic magma was squeezed through cracks and fractures that formed as the granite cooled. Pegmatites are very coarse-grained igneous rocks of granitic composition. They usually occur in association with intrusive igneous rocks, most commonly felsic intrusions (e.g. granite). Of particular interest in the Carlow region is the occurrence of lithium-rich pegmatites containing an unusual mineral called spodumene. The most important occurrence is at Aclare.

The closure of the Iapetus Ocean saw the amalgamation of two landmasses to form the Old Red Sandstone Continent (or Laurussia), during the Devonian. Ireland's position within this landmass, which covered most of northwest Europe, had a latitude and as such, climate, similar to that of the Sahara desert today. Marine processes were not a major factor as most of the land lay above sea level. Instead terrestrial processes, such as wind and fluvial systems dominated. The Old Red Sandstone Continent remained throughout the Devonian from about 410 to 360 million years ago. In the Carlow area the only evidence for this period is found on the Kilkenny/Carlow border, southeast of Goresbridge. Here a thin, northeast-southwest trending sliver of transitional Upper Devonian/Lower Carboniferous rocks can be found. Known as the Kiltorcan Formation these rocks are characterised by red and green mudstones capped by distinctive yellow sandstones. The rocks are rich in plant fossils in localised places outside the county. The lack of Lower Devonian deposits suggests that at that time Carlow was a site of erosion rather than deposition.

During the early Carboniferous, sea level began to rise and the shoreline moved northwards from Cork flooding the land as it passed. The sea lapped up against the emergent granite high ground and laid down sediment in the Barrow Valley (Aldwell 1975). At this time Ireland experienced a tropical climate much like that of the Bahamas today making it the ideal setting for limestone deposition. This early Carboniferous transition to a marine depositional environment is recorded in the shallow water Porter's Gate Formation, consisting of grey calcareous sandstone, shales and thin limestones. Fossils found within this formation, including brachiopods,

bivalves, crinoids and corals, provide valuable information on the age of the formation and the depositional environment. The Porter's Gate Formation passes northwards into the Quinagh Formation. Although not very well exposed at the surface a GSI borehole at Quinagh allowed for detailed analysis of this formation. The Formation is characterised by alternating thin beds of mudstone, siltstone and very fine-grained sandstone. The Quinagh Formation rests unconformably over the Leinster Granite with no sign of any intervening Devonian deposits. This suggests a period of non-deposition and implies that the granite was in fact above sea level at this time. Further evidence to support this comes in the form of weathered granite clasts found throughout the Quinagh Formation and in overlying limestone formations (Tietzsch-Tyler *et al.* 1994a).

Marine conditions continued with the slightly deeper-water, lower energy deposition of the Ballymartin Formation consisting of interbedded grey muddy limetones and calcareous mudstones. The overlying Ballysteen Formation records a gradual deepening over time from clean, shallow-water limestones to more fine-grained, muddy, deeper-water limestones. Oolitic limestones are also found throughout this formation implying temporary shallowing of the sea to higher energy settings where wave and tidal action could form well-rounded oolites. Much of the Ballysteen Limestone has been dolomitized. Dolomitization occurs when magnesium rich fluids pass through the rocks altering calcite (present in limestone) to dolomite. Earth movements sometime after the deposition of the limestones resulted in the development of faults which acted as conduits for Mg-rich fluid to travel through. The Ballysteen Formation is well exposed in the quarry at Ballyellin.

Fine-grained, grey, muddy limestones with occasional bands of black calcareous mudstone characterise the succeeding Butlersgrove Formation. Intermittent limestone beds rich in fossil brachiopods and corals are also common and are used as 'Kilkenny Black Marble' in the building trade when polished. The Milford Formation, encountered by a GSI borehole at Milford is believed to represent the lateral equivalent of the Butlersgrove Formation. Peloidal, calc-arenitic limestones are dominant in this formation. Minor mudstones, micrites, oncolites and stromatolites are also found. The lower part of the Milford Formation is completely dolomitised. Shallow-sea, crinoidal packestones and wackestones define the later Ballyadams Formation and Clogrenan Formations (exposed at Clogrenan Quarry). Irregular clay horizons within the Ballyadams Formation indicates periodic shallowing of the sea to such an extent that at times the seafloor was exposed above sea level. The Carboniferous limestones between the Ballysteen and Ballyadams Formations are very poorly exposed in Carlow, and as such drillhole data has proved invaluable to understand how they formed.

Upper Carboniferous rocks (Namurian and Westphalian) occur in northwest Carlow and form part of the Castlecomer Coalfield spanning Counties Carlow, Kilkenny and Laois. Lower Namurian deposits are absent in the Carlow area reflecting a period of non-deposition. The Namurian succession here begins with the black/dark grey shales of the Luggacurren Shale Formation. Marine fossils occur at many horizons

throughout this formation and there is a distinct lack of sand and silt. These rocks were deposited in deep, quiet waters. The succeeding formations, the Killeshin Siltstone Formation and the Bregaun Flagstone Formation, reflect the filling of the basin by a southwards advancing deltaic system similar to the modern day Mississippi. The delta was fed by sediment from a large landmass that stretched from southeast Ireland to the English Midlands (Tietzsch-Tyler 1995).

The overlying Westphalian succession consists of many regression cycles each one displaying sequences of marine mudstones shallowing upwards into deltaic siltstones and swampy, vegetation-rich deposits. These swampy horizons, full of plant material were later transformed into coal. The Westphalian succession in Carlow consists of the Moyadd Coal Formation, the Clay Gall Sandstone Formation and the Coolbaun Formation, in ascending order.

Towards the end of the Carboniferous the rocks were gently folded by a phase of mountain building known as the Variscan Orogeny, but which mostly affected rocks further to the south. The uplift and tilting of the saucer shaped Castlecomer Plateau occurred at this time, visible from much of the county, even though most of it is in Kilkenny and Laois.

For much of the following 300 million years Ireland was mostly a land area dominated by erosion rather than sedimentation. Eroded sediment was carried offshore and deposited in ocean basins. During Cretaceous times, approximately 135 million years ago, it is believed that most of Ireland was covered by a chalk sea, remnants of which can be see today in northern Ireland. Following this marine incursion Ireland became emergent again. An interesting site at Ballyellin quarry may provide evidence of Tertiary deposition. A conical solution pipe, discovered in the Carboniferous limestone at this locality was found to contain micaceous clay deposits. These clays, eroded from the Mount Leinster granite some time during the last 60 million years, were protected by the pipe as other evidence of Tertiary deposition was destroyed elsewhere by glaciers during the Ice Age (Mitchell 1980). However, the general relief of the county with river lowlands in the west, even on the granite areas, and residual granite hills in the east, was probably largely established before the Quaternary, or Ice Age time.

Excluding the mountainous areas in Carlow geologically recent sediments have covered much of the rest of the older geology here. These deposits accumulated over the last 1.6 million years, during the Quaternary period, as Ireland's climate oscillated between arctic and temperate conditions. Most are products of the Ice age and were

deposited either from large sheets of ice that extended across the land or by meltwater released towards the end of the glaciation.

Evidence from other areas suggests that Ireland was affected by at least two separate glaciations. Most of the surface features seen in Carlow relate to the last glaciation, the Midlandian, which ended approximately 10,000 years ago. Earlier glacial and interglacial deposits were either buried by the Midlandian deposits or removed by the ice. As the ice moved over the ground loose debris was incorporated into it producing an abrasive base to the ice sheet, sculpting the landscape as it went. The debris was deposited directly by the ice as till or by melt waters as gravel and sand. Towards the end of the last glaciation rivers, which developed beneath and within the melting ice sheets deposited sand and gravel in the form of striking, often bead-like ridges, or eskers like that seen at Bagenalstown.

Following the last glaciation geological processes have continued in the Carlow area with rivers and streams eroding the landscape and depositing alluvium in the valleys. Peat bogs developed during the post-glacial period but with the exception of the Blackstairs and the area between Carlow town and Castlcomer very few remain today. The veneer of glacial sands and gravels, and till covering much of the lowland granite areas in the middle of the county have contributed to rich soils which make good farmland. In some areas such as around Ballyloughan Castle, stony and sandy soils form heathlands with rock boulders close to surface.

A spectacular and more recent event occurred in Carlow in November 1999 when a meteorite plummeted to Earth from outer space. Samples of the meteorite were recovered at Leighlinbridge. The meteorite has been classified as an ordinary chondrite and is thought to have originated in the inner asteroid belt. Analyses of the specimens indicate that the meteorite exploded before it hit the ground suggesting that the debris may well have extended beyond the Leighlinbridge area. To date 4 specimens of the meteorite have been recovered totalling 271g in weight.

Further information on this meteorite may be found at:
http://fernlea.tripod.com/leighlin.html

GLOSSARY

Amphibolite	a metamorphic rock rich in the minerals amphibolite and plagioclase.
Andesite	a volcanic rock of intermediate composition (between rhyolite and basalt).
Aplite	a fine to medium-grained igneous rock found as veins within coarser-grained plutonic igneous rocks.
Calcareous	containing significant calcium carbonate.
Chondrite	a stony meteorite containing chondrules.
Chondrule	small globular mass of pyroxene, olivine and sometimes glass.
Clast	an individual constituent, grain or fragment of a sediment or rock, usually produced by mechanical weathering (disintegration) of a larger rock mass
Extrusive	an igneous body emplaced at the Earth's surface as lava.
Felsic	containing at least one of the light coloured minerals feldspar, leucite, nepheline or silica.
Foliation	a finely spaced planar parting caused by compressive deformation of rocks.
Formation	a sequence of related rock types differing significantly from adjacent sequences.
Granite	a coarsely crystalline intrusive igneous rock composed mostly of quartz and feldspar.
Granodiorite	an igneous rock similar to granite but containing more of the mineral plagioclase and also more iron and magnesium-bearing minerals.
Intrusive	an igneous rock emplaced within the Earth's crust, not extruded like lava.
Lithification	the process of rock formation from unconsolidated sediment.
Metamorphic aureole	zone of country rock, surrounding an igneous intrusion which has undergone metamorphism due to the heat of the intruding magma.
Metasediments	metamorphosed sediments.
Metavolcanics	metamorphosed volcanics.
Micaceous	mica-rich.
Micrite	limestone made up of a very fine-grained, muddy calcite.
Oncolite	a spheroidal algal mass generally greater than 2mm and commonly found in shallow water.
Ooids	spheres of calcite 1-3mm in diameter, which form in high-energy water.
Orogeny	the creation of a mountain belt by tectonic activity.
Oolite	a limestone made up of ooids.
Packestone	a limestone in which coarse grains form a self-supporting frame-work.
Pegmatite	a very coarse-grained igneous rock of granitic composition.
Pelite	a metamorphosed mudstone.
Peloidal limestone	limestone comprising of ellipsoidal particles of calcite mud.
Phyllite	a foliated pelite.
Pluton	an igneous intrusion formed at sufficient depths to allow for the growth of large crystals.
Plutonic	originating at great depth.
Regression	a recession of the sea from a land area.
Schist	a metamorphic rock exhibiting a foliation defined by the preferred alignment of tabular minerals.
Stromatolites	an algal deposit usually found in shallow water.
Till	unconsolidated, unsorted glacial deposits consisting of boulders and cobbles mixed with very finely ground-up rock or silt.
Tuff	rock formed from volcanic ash usually composed of silt-sized to sand-sized particles.
Wackestone	limestone in which coarse grains float in a calcareous mud matrix.

Data sources on the geology of County Carlow

This section summarises the main sources of information available through the GSI and others on the geology of Carlow, although many of the actual data sets are included in appendices here.

Geological maps

Since Ireland was first mapped geologically, from the earliest development of the science, Carlow has featured. Herries Davies (1983) has documented the early history of geological mapping by Sir Richard Griifith of the Valuation Survey and many others and is recommended for further detail. The Geological Survey of Ireland , established in 1846, began an official mapping programme. Carlow was one of several counties first produced on County Index maps, before the one inch to one mile series was established as the published base map. Geological mapping was done on six inches to the mile fieldsheets. Both six and one inch sets are available for consultation in GSI's Customer Centre, as well as other archival maps by appointment.

The 19th century mapping and numerous other GSI and external mapping was used in the compilation of GSI's 1:100,000 series which represent the current state of the art general purpose geological maps for the country. Sheet 19 covers Carlow (and parts of Wexford) and is available for purchase from GSI (currently €25 including map and explanatory booklet). It can also be purchased digitally. A seamless national 1:100,000 series map is also available digitally in a GIS, which allows tailored selections to be made.

GSI Document Management System

Around half a million geological documents have been scanned in the GSI, and loaded into a document management system allowing easy searching, on screen viewing and digital output for customers visiting the Customer Centre. Appendix 1 is an illustrative summary of the titles of all documents relating to Carlow. However, new data is continually being added and additional indexes of other material also included. Included in the DMS are the one inch and six inch fieldsheets described above. The Open File mineral exploration reports and records are also included.

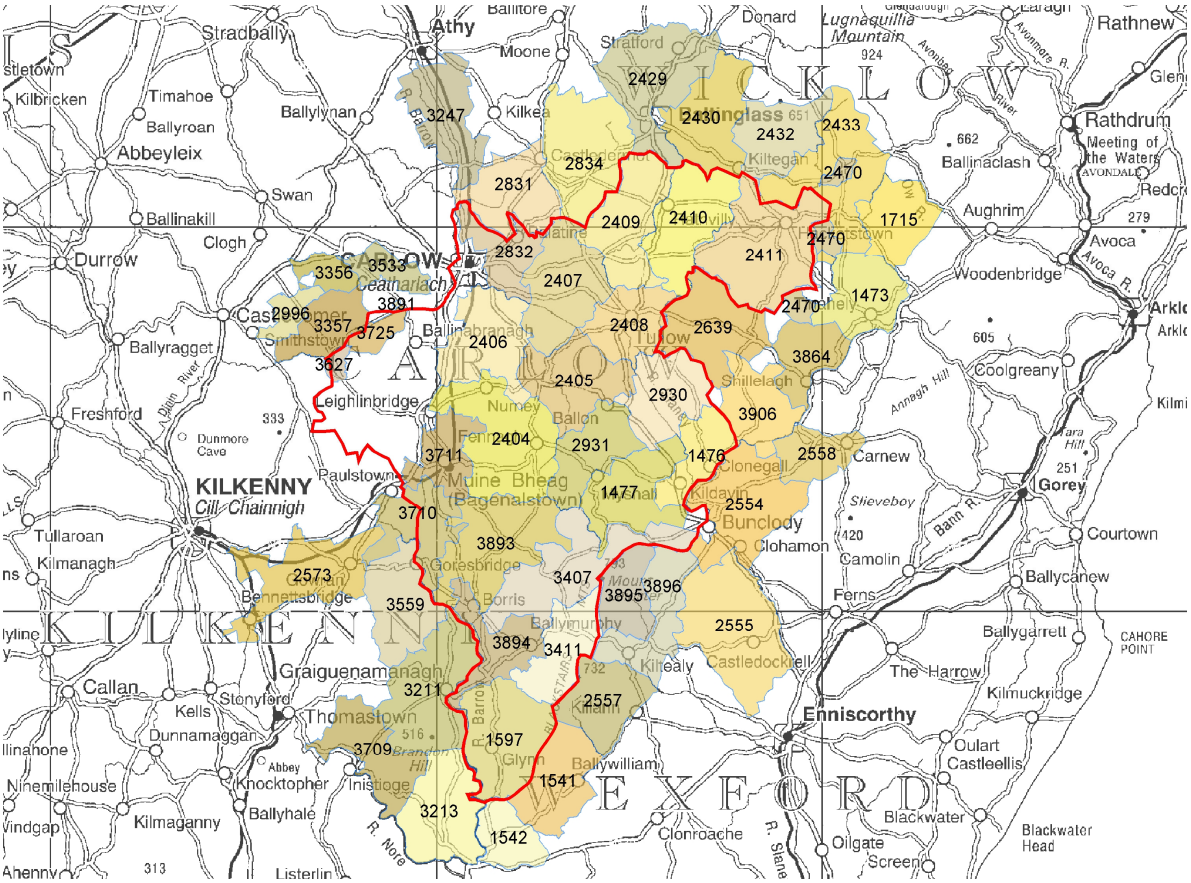
Open File exploration data

For a scheduled list of many minerals of economic importance (excluding rock materials such as aggregates) a licence is required from the government in order to mine or extract the mineral. An exploration licence is also required to search for these minerals. Presently these regulatory matters are administered by the Exploration and Mining Division of the Department of Communications, Marine and Natural Resources.

As part of the licence conditions reports on the exploration work carried out must be submitted and surrendered with licences. These records are normally classed as Open File data, so that the country benefits from such effort, and future exploratory

work is able to make use of earlier study. They may include bedrock and subsoil mapping, geophysical studies, geochemical studies, assay results, and other material.

The country is divided up into exploration licence areas given a unique Prospecting Licence (or PL) number, often following townland boundaries, and those for Carlow are shown on the map below.



Geological papers and books

The GSI Library holds many books and journals with varied geological information, some of which are specifically pertaining to Carlow. The bibliography following this section highlights the main specific references identified in this project. Obviously Carlow will be mentioned in many general works on the Irish landscape, and this list is not claimed to be definitive, but should include all the most specific papers.

Directories

The GSI produces a Quarry Directory (in paper or CD format, now in its third edition) which provides the most recent information on working quarries and their products, output and contacts etc.

Bibliography

ALDWELL, C.R. 1975. The Geological History of Carlow. *Lecture to the Old Carlow Society*. GSI Unpublished manuscript.

BRITISH MINING CONSULTANTS LTD. 1982. Report on Irish Coal. *Unpublished report to the Geological Survey of Ireland*, **1 & 2**.

BRÜCK, P.M., COLTHURST, J.R.J., FEELY, M., GARDINER, P.R.R., PENNEY, S.R., REEVES, T.J., SHANNON, P.M., SMITH, D.G. & VANGUESTAINE, M. 1979. South-East Ireland: Lower Palaeozoic Stratigraphy and depositional history. In: A.L. Harris, C.H. Holland and B.E. Leake (eds.) The Caledonides of the British Isles – reviewed. *Geological Society of London Special Publication*, **8**, 533-544.

BRÜCK, P.M., GARDINER, P.R.R., MAX, M.D. & STILLMAN, C.J. with contributions from BALL, D.M., COLTHURST, J.R.J., PENNEY, S.R., REEVES, T.J. & SCHIENER, E.J. 1978. field guide to the Caledonian and Pre-Caledonian rocks of south-east Ireland. *Geological survey of Ireland Guide Series*, 87pp.

CLAYTON, G., HAUGHEY, N. SEVASTOPULO, G.D. & BURNETT, R. 1989. Thermal maturation levels in the Devonian and Carboniferous rocks in Ireland. *Geological Survey of Ireland*, 36pp. and map.

DALY, D. AND MISSTEAR, B.D.R., 1976, A preliminary hydrogeological survey of the Castlecomer Plateau, S.E. Ireland. Unpublished M.Sc. thesis, University of Birmingham.

EAGAR, R.M.C. 1964. The succession and correlation of the coal measures of south eastern Ireland. *C.R. 5me. Cong. Int. Strat. Geol. Carb.*, Paris 1963, 359-374.

EAGAR, R.M.C. 1975. Neure Arbeiten uber das Westfal in Irland. *Zbl. Geol. Palaont.* **1**, 291-308.

GALLAGHER, V. 1989a. Geological and isotope studies of microtonalite-hosted W-Sn mineralisation in SE Ireland. *Mineral. Deposita.* **24**, 19-28.

HARDMAN, E.T. 1881. Explanatory Memoir of the Geology of the Leinster Coalfields, to accompany parts of sheet 127, 128, 136, 137, 145, 146, 147, 155, 156 and 166 of the Maps of the Geological Survey of Ireland, with Palaeontological notes by W.H. Baily. *Memoirs of the Geological Survey of Ireland*, 95pp.

HAUGHEY, N. McARDLE, P. 1990. Vitirnite reflectance data from a preliminary study on selected Irish coal seams. *Geological Survey of Ireland Bulletin*, **4**, 201-209.

HIGGS, K.1986. The Stratigraphy of the Namurian Rocks of the Leinster Coalfield. *Geological Survey of Ireland Bulletin*, **3**, 257-276.

HOWES, M.J., BOLAND, M.A., FLEGG, A.M. & MACKENNA, K. 1988. Quarry directory of active quarries and pits in Ireland. *Geological Survey of Ireland Rep. Ser.* RS 8/33.

IXER , R.A., McARDLE, P. & STANLEY, G.J. 1990. Primary gold mineralisation within metamorphosed iron ores, southeast Ireland. *Geological Survey of Ireland Bulletin*, **4**, 221-226.

JUKES, J.B., KINAHAN, G.H.K., BAILY, W.H. & DU NOYER, G.V. 1859. Explanation of Sheet 137 (Formerly Quarter Sheet 40 N.E.) of the Maps of the Geological Survey of Ireland. *Memoirs of the Geological Survey of Ireland*, 54pp.

JUKES, J.B. 1861. Explanations to accompany Sheets 147 and 157 of the Maps of the Geological Survey of Ireland, illustrating parts of the Counties Kilkenny, Carlow and Wexford, with Palaeontological Notes by W.H. Baily. *Memoirs of the Geological Survey of Ireland*, 59pp.

JACKSON, J.S. 1955. The Carboniferous rocks of the Kingscourt Inlier. Unpubl. Ph.D. Thesis, University of Dublin.

KINAHAN, G.H. 1889. Economic Geology of Ireland. *J.R. Geol. Soc. Ir.*, **8**.

LUECKE, W. 1981. Lithium pegmatites in the Leinster Granite (southeast Ireland*). Chem. Geol.* **34**, 195-233.

MAGUIRE, P. 1958. The Petrology of the Granitic and Metamorphic Rocks of the Blackstairs Mountain, Unpublished B.Sc. thesis, University of Dublin.

MAX, M.D., BARBER, A.J. & MARTINEZ, J. 1990. Terrane assemblage of the Leinster Massif, SE Ireland, during the Lower Palaeozoic. *Journal of the Geological Society of London*, **147**, 1035-1050.

McARDLE, P. 1981. The country rocks flanking the Leinster Granite between Aughrim and Ballymurphy. *Geological Survey of Ireland Bulletin*, **3**, 85-95.

MCARDLE, P., 1984, A Study of the Geological Setting of Mineralisation associated with the margin of the Tullow Lowlands Unit of the Leinster Granite. Unpublished Ph.D. thesis, National University of Ireland, University College Dublin.

McARDLE, P. & KENNAN, P.S. 1987. The distribution, genesis and potential of tungsten, lithium and associated metal deposits on the SE margin of the Leinster Granite. *Geological Survey of Ireland Bulletin*, **4**, 27-40.

McARDLE, P. & KENNEDY, M.J. 1985. The East Carlow Deformation Zone and its regional implications. *Geological Survey of Ireland Bulletin*, **3**, 237-255

MCARDLE, P., GARDINER, P.R.R., FEELY, M. & COLTHURST, J.R.J. 1987a. A possible western extension of the East Carlow Deformation Zone: a preliminary note. *Geological Survey of Ireland Bulletin*, **4**, 63-66.

McARDLE, P. & O'CONNOR, P.J. 1987b. The distribution, geochemistry and origin of appinites and lamprophyres associated with the East Carlow Deformation Zone of SE Ireland. *Geological Survey of Ireland Bulletin*, **4**, 77-88.

McARDLE, P., WILLIAMS, F.M., DOYLE, E.M., KENNAN, P.S., MOORE-LEWY, G., GALLAGHER, V. & O'CONNOR, P.J. 1989. The metallogenic relationships of mineralisation along the southeast margin of the Leinster Granite. *Geological Survey of Ireland Rep. Ser.* RS 86/2. 57pp.

M'Coy, F. 1844. *A synopsis of the characteristics of the Carboniferous Limestone fossils of Ireland*. Dublin University Press. 207pp.

MISSTEAR, B.D.R., DALY, E.P., DALY, D. & LLOYD, J.W. 1980. The groundwater resources of the Castlecomer Plateau. *Geological Survey of Ireland Rep. Ser*. RS80/3.

MITCHELL, G.F. 1980. The search for Tertiary Ireland. *Journal of Earth Sciences Royal Dublin Society* **3** (No.1), 13-33.

NAYLOR, D. 1992. The post-Variscan history of Ireland., Parnell, J. (ed.), Basins on the Atlantic Seaboard: Petroleum Geology, Sedimentology and Basin Evolution., Geol. Soc. Lond. Spec. Publ., No. 62, pp 255-275.

NEVILL, W.E. 1956. The Millstone Grit and Lower Coal Measures of the Leinster Coalfield, with an appendix on the non-marine fauna by R.M.C. Eagar. *Proceedings of the Royal Irish Academy*, **58**, Section B, 1-16.

O'CONNOR, P.J. 1970. The Geology of the John's Hill Granite and Environs, Co. Carlow. Unpublished B.Sc. thesis, National University of Ireland, University College Dublin.

O'CONNOR, P.J. 1986. Uranium mineralization in the Irish Caledonides. In: ANDREW, C.J., CROWE, R.W.A., FINLAY, S., PENNELL, W.M. & PYNE, J.F. (eds) *Geology and the Genesis of Mineral Deposits in Ireland*. Irish Association for Economic Geology. Dublin, 157-176.

O'CONNOR, P.J., GALLAGHER, V. & KENNAN, P.S. 1991. Genesis of lithium pegmatites from the Leinster Granite margin, southeast Ireland: geochemical constraints. *Geological Journal*, **26**, 295-305.

O'CONNOR, P.J. &REIMANN, C. 1993. Multielement regional geochemical reconnaissance as an aid to target selection in Irish Caledonian terrains. *Journal of Geochemical Exploration*, **47**, 63-87.

O'MEARA, M. 1964. Leinster Coalfield, 1959-63 drilling report. *Geological Survey of Ireland Unpublished Report*. 169pp.

PHILCOX, M.E.1994. Summary of the Succession in GSI Borehole 91-25 (Milford, Co. Carlow). *Geological Survey of Ireland Unpublished Report*.11pp.

PHILLIPS, W.E.A. & HOLLAND, C.H. 1981. Late Caledonian deformation. In: HOLLAND, C.H. (ed.) *A Geology of Ireland*. Scottish Academic Press, 107-120.

RYBACK, G & MORETON, S. 1993. Microminerals from Ireland. Part 3: The East (Leinster, Cavan and Monaghan), with a post-script on Western Ireland*. UK J. Mines and Minerals* **12**, 36-41.

STEIGER, R. 1977. Prospecting for lithium and tungsten in Ireland. In*: Prospecting in Areas of Glaciated Terrain*, pp.14-24. Institution of Mining and Metallurgy, London.

STEIGER, R. & BOWDEN, A. 1982. Tungsten mineralization in southeast Leinster, Ireland. In: BROWN, A.G. (ed.) *Mineral Exploration in Ireland: progress and development 1971-81*. Irish Association for Economic Geology. Dublin, 108-114.

STEIGER, R. & von KNORRING, O. 1974. A lithium pegmatite belt in Ireland. *J. Earth Sci., Leeds* **8**, 433-43.

STILLMAN, C.J. & FRANCIS, E.H. 1979. Caledonide volcanism in Britain and Ireland. In: HARRIS, A.L., HOLLAND, C.H. & LEAKE, B.E. (eds.) *The Caledonides of the British Isles – reviewed*. Geological Society of London special Publication, **8**, 557-578.

SWEETMAN, T.M. 1988. The Geology of the Blackstairs Unit of the Leinster Granite. *Irish Journal of Earth Sciences*, **9**, 39-59.

TIETZSCH-TYLER, D. 1989. The Lower Palaeozoic geology of S.E. Ireland – a re-evaluation. *Annual Review Irish Association for Economic Geology*, 112-119.

TIETZSCH-TYLER, D. 1995. Building stones of St. Canice's Cathedral, Kilkenny: An Introduction to the Rocks of the Kilkenny Region. *Pamphlet, Geological Survey of Ireland and Bord Fáilte*.

TIETZSCH-TYLER, D., SLEEMAN, A.G., McCONNELL, B.J., DALY, E.P., FLEGG, A.M., O'CONNOR, P.J., PHILCOX, M.E. & WARREN, W.P. 1994a. *Geology of Carlow-Wexford, a geological description to accompany the Bedrock Geology 1:100,000 Map Series, Sheet 19, Carlow-Wexford*. Geological Survey of Ireland.

TIETZSCH-TYLER, D., SLEEMAN, A.G., BOLAND, M.A., DALY, E.P., FLEGG, A.M., O'CONNOR, P.J. & WARREN, W.P. 1994b. *Geology of South Wexford: A geological description of South Wexford and adjoining parts of Waterford, Kilkenny and Carlow to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 23, South Wexford*. Geological Survey of Ireland.

WHITWORTH, M.P. 1992. Petrogenetic implications of garnets associated with lithium pegmatites from SE Ireland. *Mineralogical Magazine* **56**, 75-83.

Further sources of information

The GSI now has the expertise, knowledge and experience to be able to assist Local Authorities in all matters relating to geological heritage, including incorporation into Development and Heritage Plans. A document outlining generic issues for all local authorities is available on request. For further information or advice please contact:
Sarah Gatley [01-678 2837: sarah.gatley@gsi.ie]

or visit the IGH section of the GSI web site at:
http://www.gsi.ie/Programmes/Heritage

GSI publishes a very wide range of maps, reports and products on various aspects of geology, some of which will include information relevant to specific interests, even if they are not specifically about Carlow. For information about such paper products, visit the GSI website at: **www.gsi.ie**

ES2k

In September 2003, the organization Earth Science 2000 (ES2k) evolved into an all Ireland organization with the express aims of:

- promoting public awareness of Earth Science issues affecting the quality of life, quality of the environment and the sustainable and responsible development of the geological resources in Ireland;
- promoting education and life-long learning in the Earth Sciences;
- to act as a coordinating body for and a significant voice of the Earth Sciences in Ireland.

This organization publishes a colour magazine which is distributed free, thanks to a number of sponsors. It is very accessible for a general audience, well illustrated and is recommended for distribution to schools and public libraries in Carlow.

It is recommended that the Heritage Office orders a bulk number of the magazine for wider distribution in the county through established structures.

See http://www.habitas.org.uk/es2k/index.html

Site Reports – General Points

The following site reports are brief non-technical summaries of the proposed County Geological Sites for Carlow. 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 one or two low resolution photographs exemplifying the site. A CD accompanying this report will include further pictures of most sites at higher resolution, should they be required. Grid references are given normally for a central point in the site, or two extreme points at opposite ends of the site.

A map may be provided with an outline of the site boundary. It is important to note that no legal or definitive basis should be based on these boundaries. They are indicative only of the limits of exposure or of geological interest, and not based on detailed field surveys, which were outside the scope of this contract.

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.

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 at the Irish Geological Heritage Programme, in the Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4.
Phone 01-6782837. Email: sarah.gatley@gsi.ie

CARLOW - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Aclare**		
Other names used for site			
TOWNLAND(S)	Aclare		
NEAREST TOWN	Myshall		
SIX INCH MAP NUMBER	17		
NATIONAL GRID REFERENCE	284700 160000, = S 847 600		
1:50,000 O.S. SHEET NUMBER	61,68	**1/2 inch Sheet No.**	19

Outline Site Description
A number of fields with surface boulders at their margins, overlying the proven deposit below ground.

Geological System/Age and Primary Rock Type
The pegmatites are associated with the intrusion of the Leinster Granite approximately 400 million years ago.

Main Geological or Geomorphological Interest
Extensive drilling at Aclare House has revealed the presence of the largest lithium-bearing pegmatite deposit in the Leinster region. Pegmatites are very coarse-grained igneous rocks of granitic composition. They usually occur in association with intrusive igneous rocks, most commonly felsic intrusions (e.g. granite). Most economically important pegmatites, although in close proximity to intrusions, actually occur in the surrounding metamorphic aureole. Aclare, for example, lies approximately 1km from the granite contact. The main lithium-bearing mineral present is spodumene, a white mineral up to 0.3m in length at this locality. Other accessory minerals include Bertrandite, Cassiterite, Columbite-Tantalite, uranium-bearing Microlite, lithian Muscovite and Phosphosiderite. There is still some controversy as to the formation of the Li-pegmatites in this area. The pegmatite at Aclare is one of a series of Li-bearing pegmatites flanking the Leinster Granite between Borris and Shillelagh. Despite numerous boulders there are no natural outcrops of these spodumene pegmatites. Drilling has proved an invaluable source of information. The lithium deposits only occur in the Lower Ordovician metasediments and metavolcanics of the Ribband Group and within the East Carlow Deformation Zone. Whilst the development of the lithium deposits is associated with the intrusion of the Leinster Granite it is not clear to what extent. Some researchers believe that the lithium-enriched pegmatites formed from later stage lithium-enriched magma associated with the emplacement of the granite. Others attribute the enrichment to the melting of surrounding lithium-rich sediments. Movement of the East Carlow Deformation Zone also played an important part in their formation. Whatever the origin it seems as though the geology of the Carlow area was just right to accommodate the lithium pegmatites.

Other significant bedrock spodumene pegmatites occurrences in Carlow are known from Orchard, Coolasnaghta and Seskinnamadra.

Site Importance
The site is of National importance and is likely to be proposed for NHA designation under the IGH6 Mineralogy theme, and the IGH15 Economic Geology theme of the GSI's IGH Programme.

Management/promotion issues
Although the deposit has been extensively explored, and is of uneconomic extent for mining purposes, it still provides a geological topic of debate, concerning the origin and emplacement of the pegmatites. Although there are numerous boulders around the field margins showing pegmatites, there is little to show a non specialist. This and the fact that the site is on private farmland indicates it is not suitable for significant promotion.

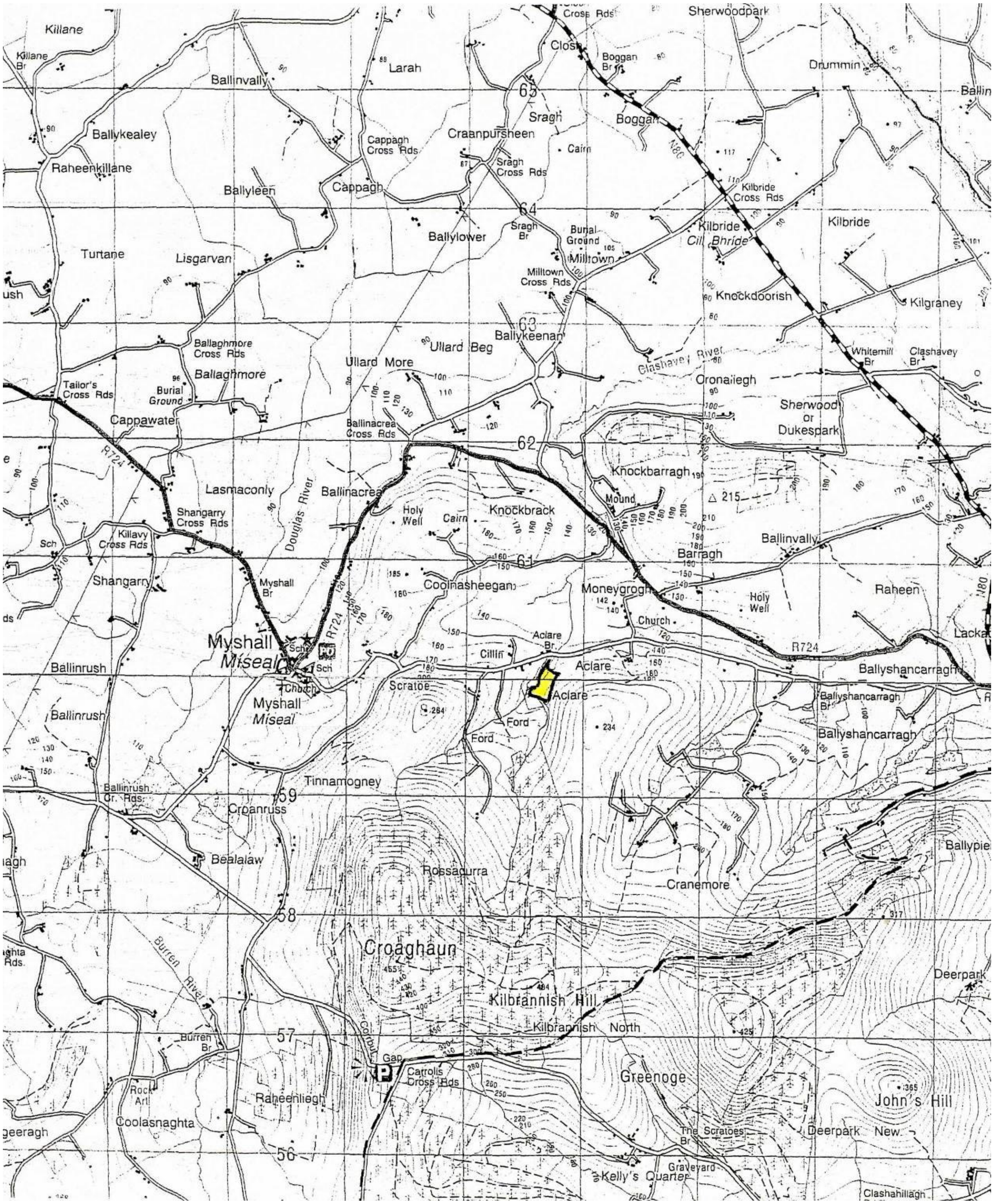
A view over the site, the two main fields in the middle distance.

A typical collection of boulders at the edge of the fields.

A close up of a pegmatite boulder showing the very large crystals of feldspar.

A spodumene sample (the purple mineral), actually from one of the other main localities in the district.

ACLARE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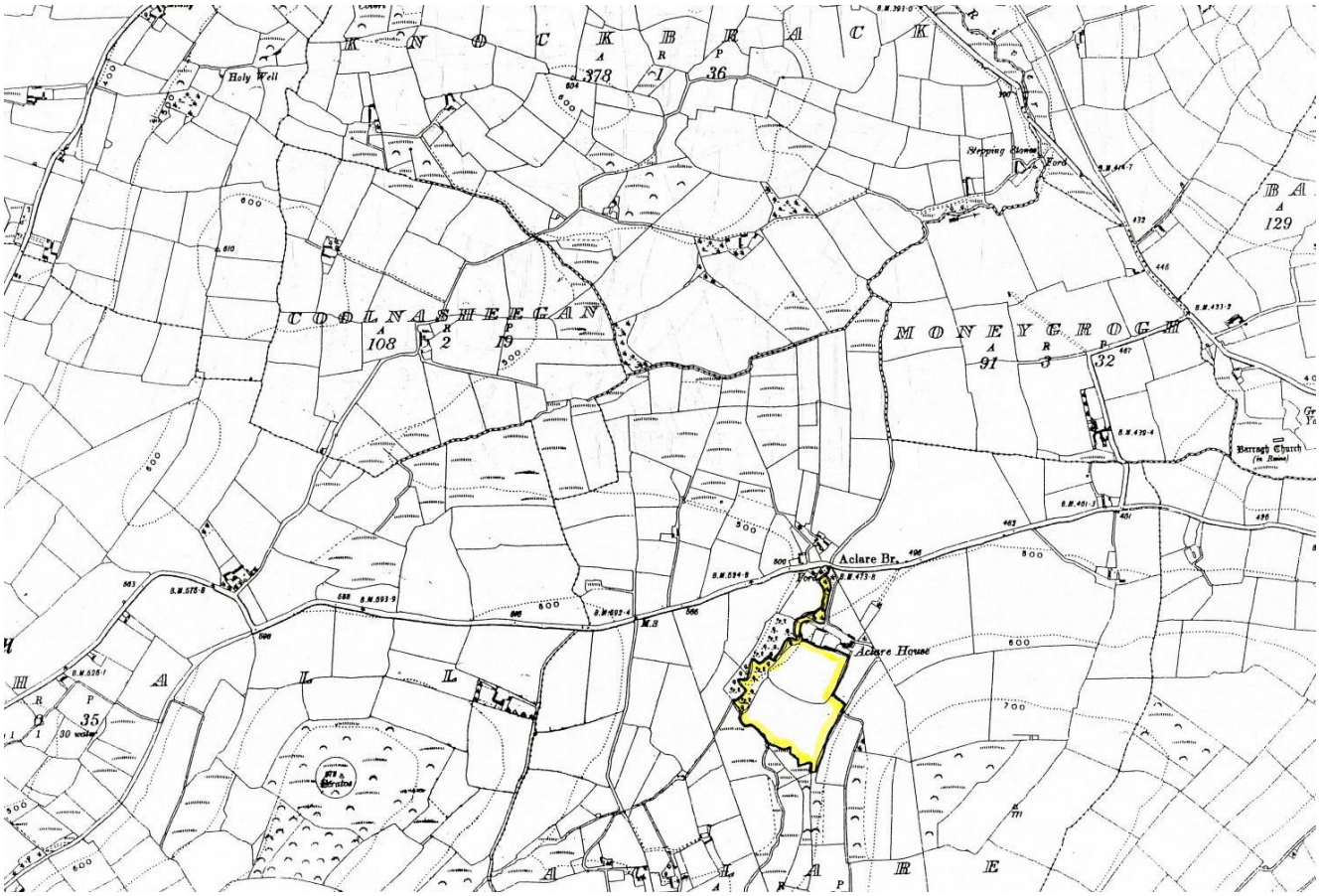
Sherwoodpark
Drummin
Larah
Ballinvally
Ballykealey
Raheenkillane
Cappagh Cross Rds
Craanpursheen
Sragh
Boggan
Sragh Cross Rds
Cappagh
Ballyleen
Kilbride Cross Rds
Kilbride
Cill Bhríde
Ballylower
Burial Ground
Milltown
Turtane
Lisgarvan
Milltown Cross Rds
Knockdoorish
Kilgraney
Ballykeenan
Ullard Beg
Ballaghmore Cross Rds
Ballaghmore
Ullard More
Clashavey River
Oronailegh
Whitemill Br
Clashavey Br
Tailor's Cross Rds
Burial Ground
Cappawater
Sherwood or Dukespark
Ballinacrea Cross Rds
R724
Knockbarragh
Lasmaconly
Ballinacrea
Douglas River
Mound
Holy Well
Knockbrack
Shangarry Cross Rds
Killavy Cross Rds
Ballinvally
Barragh
Shangarry
Myshall Br
Coolnasheegan
Moneygrogh
Raheen
Holy Well
Church
Myshall
Miseal
Aclare Br
Cillín
Aclare
Ballinrush
Ballyshancarragh
Scratoe
Ballyshancarragh Br
Ballinrush
Myshall
Miseal
Ford
Tinnamogney
Ballinrush Cr. Rds
Croanruss
Bealalaw
Rossacurra
Cranemore
Croaghaun
Burren River
Kilbrannish Hill
Kilbrannish North
Deerpark
Burren Br
Gap
Carrolls Cross Rds
Greenoge
Rock Art
Raheenliegh
John's Hill
Coolasnaghta
The Scratoes Br
Deerpark New
Graveyard
Kelly's Quarter
Clashahillagh

ACLARE


Holy Well
Stepping Stones
Ford
COOLNASHEEGAN
MONEYGROGH
Barragh Church
(in Ruins)
Aclare Br.
Ford
Aclare House
Graveyard

CARLOW - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Ballyellin Quarry**
Other names used for site	Ballyellen Limestone Flour Works
TOWNLAND(S)	Ballyellin, Tomdarragh
NEAREST TOWN	Goresbridge
SIX INCH MAP NUMBER	19
NATIONAL GRID REFERENCE	268800 154700 = S 6880 5470
1:50,000 O.S. SHEET NUMBER	68 **1/2 inch Sheet No.** 19

Outline Site Description
A large working quarry.

Geological System/Age and Primary Rock Type
Carboniferous Limestone includes a 15m solution pipe 15m+ deep, with clays and round quartz gravel probably derived from Tertiary weathering of the Leinster Granite.

Main Geological or Geomorphological Interest
A conical pipe 15m in diameter was unexpectedly discovered, in Carboniferous Limestone at Ballyellin quarry. The pipe, found below 8m of glacial till, extends for 15m width at the surface and is thought to continue to a greater depth. Below a 2m cap of quartzose sand and gravel, micaceous clays were found infilling the pipe. These clays originated from the Mount Leinster Granite, less than a mile east of the location and were transported to their current site via a stream possibly some time during the Tertiary (Mitchell 1980). The pipe was able to protect the granitic debris that was stripped by glaciers everywhere else in the area during the Ice age. The contact between the limestone and the pipe displayed heavy iron and manganese staining, a probable affect of weathering.

In an area where much of the Carboniferous geology is covered by quaternary deposits, Ballyellin Quarry also provides a unique exposure of the Ballysteen Formation.

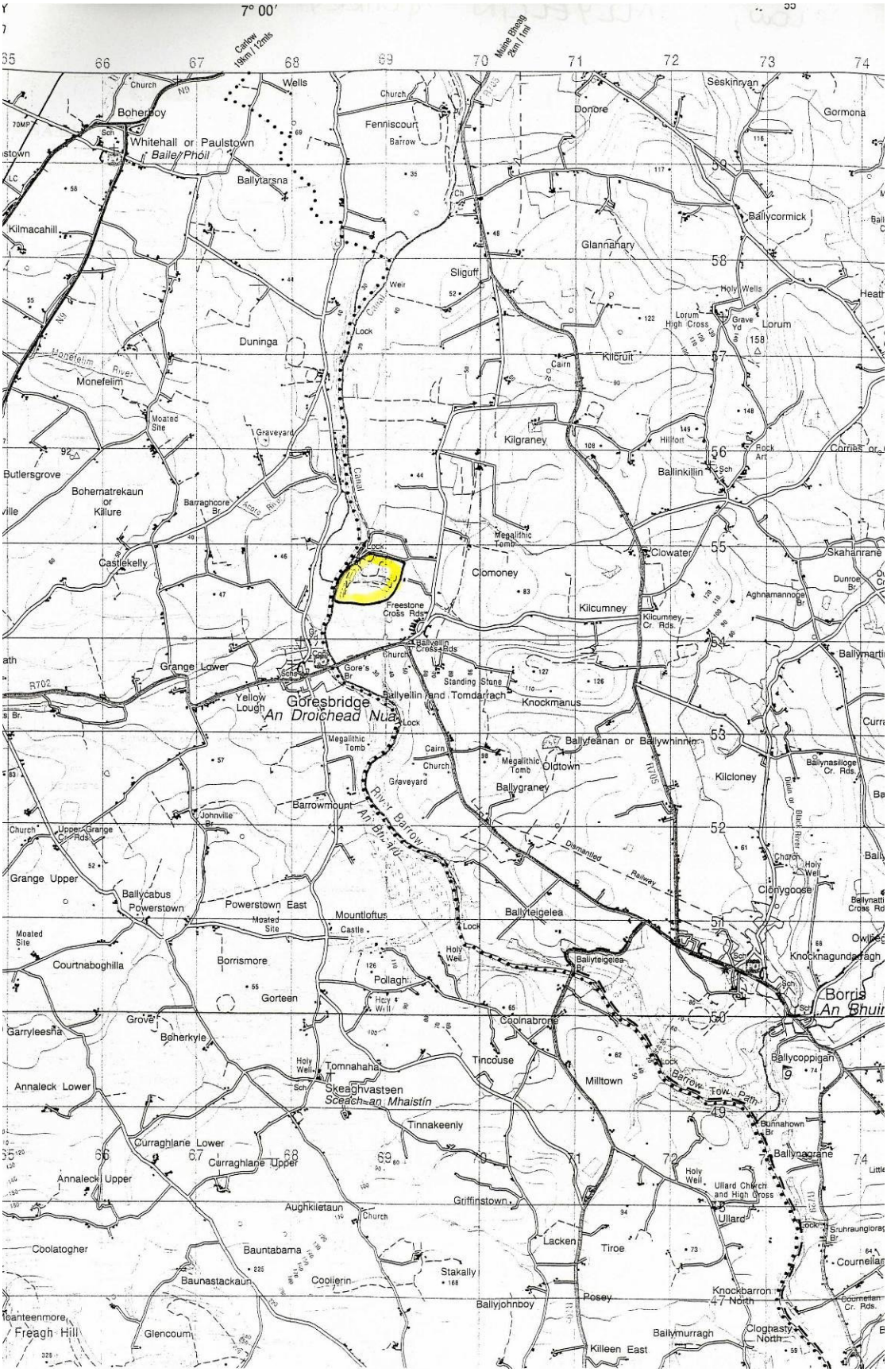
Site Importance
The site is of possible National importance and may be proposed for NHA designation under the IGH 12 Mesozoic and Cenozoic theme of the GSI's IGH Programme when it completes its work.

Management/promotion issues
The site is a large working quarries, mainly producing limestone flour for agricultural use. No management issues arise, except if the quarry were to close; then maintaining access for geologists would be desirable. As a working quarry it is not suitable for promotion to general visitors, other than at the instigation of the operators.
Contact: Michael Tobin, Glenstone Quarries, Goresbridge, Co Kilkenny 059-9775177

A view of the pipe from distance.

A close up view of the pipe infill.

BALLYELLIN QUARRY



CARLOW - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Ballymoon Esker, Bagenalstown**
Other names used for site	
TOWNLAND(S)	Curraghacruit, Ballymoon
NEAREST TOWN	Bagenalstown
SIX INCH MAP NUMBER	16
NATIONAL GRID REFERENCE	272000 162000 = S 72 62
1:50,000 O.S. SHEET NUMBER	61 **1/2 inch Sheet No.** 19

Outline Site Description
An esker ridge of glacial sands and gravels.

Geological System/Age and Primary Rock Type
Long ridge of water-sorted glacial sand and gravel.

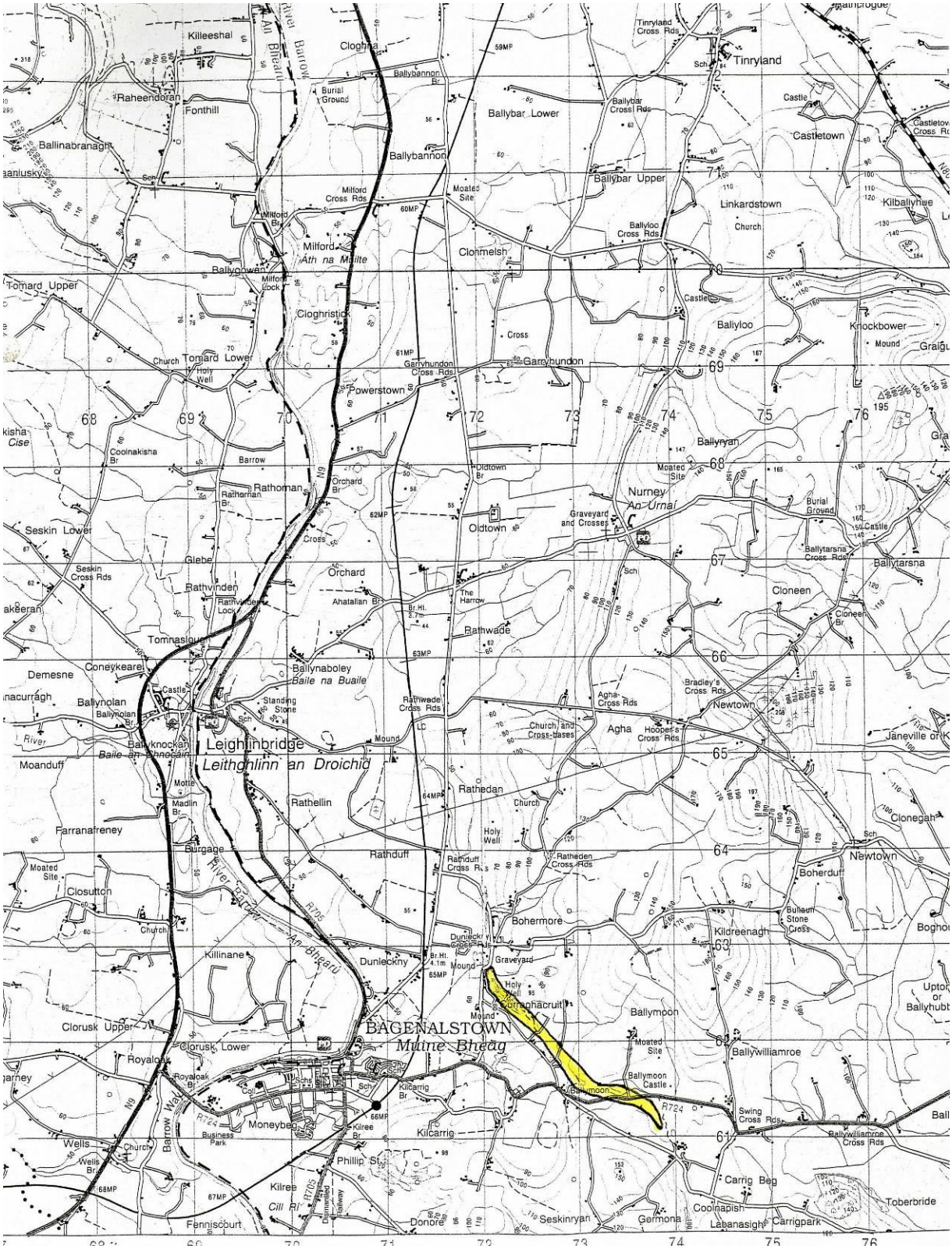
Main Geological or Geomorphological Interest
Rivers, which developed beneath and within melting ice sheets towards the end of the last glaciation deposited sand and gravel in the form of striking, often bead-like ridges or eskers like that exposed east of Bagenalstown. The northern section of this esker is intact, with a woodland community, but much of the rest has calcareous grassland with rare plants. The several pits which are active expose many internal sections of the sediments. In one pit, deeper workings have reached the granite bedrock.

Site Importance
The site is of National importance and may be proposed for NHA designation under the IGH 7 Quaternary theme of the GSI's IGH Programme. It is already a proposed NHA for its biological interest, despite the working pits, and the existing site boundary is applicable to the geomorphological interest.

Management/promotion issues
Extensive further quarrying of this feature for sand and gravel poses a threat to the long-term integrity of the site. The site offers considerable opportunity for educational case study approaches to raise awareness of the competing interests involved in such sites.

Top left: the intact northern section of the esker.
Top right: a view along the esker from middle to north.
Left: deeper workings have removed gravel to granite bedrock.

BALLYMOON ESKER, BAGENALSTOWN



CARLOW - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Bannagagole Quarry**		
Other names used for site	Baunleath Quarry, Old Leighlin Quarry		
TOWNLAND(S)	Bannagagole		
NEAREST TOWN	Oldleighlin		
SIX INCH MAP NUMBER	15		
NATIONAL GRID REFERENCE	266000 164000	= S 66 64	
1:50,000 O.S. SHEET NUMBER	61	**1/2 inch Sheet No.**	19

Outline Site Description
Very large and deep working quarry

Geological System/Age and Primary Rock Type
Carboniferous limestone of the Ballyadams Formation, from the Viséan Series of the Lower Carboniferous.

Main Geological or Geomorphological Interest
Limestones of the Ballyadams Formation are found in the Bannagagole quarry. Some of the beds are marketed as Kilkenny Black Marble when cut and polished. As well as being an important provider of material for buildings and monuments the Bannagagole quarry hosts many interesting fossils. The quarry is the recorded locality for a variety of solitary corals such as *Dibunophyllum* and colonial rugose corals such as *Lithostrotion*. More importantly a single specimen of *Lonsdaleia* (a phaceloid, colonial rugose coral) *Lonsdalaeia floriformis floriformis* is recorded "…the second record of this form from a known locality in Ireland..." (Jackson 1955). The quarry is also a type locality for M'Coy's brachiopod species *Brachythyris planicostata*, with the syntype specimen in the Griffith Collection of the Natural History Museum.

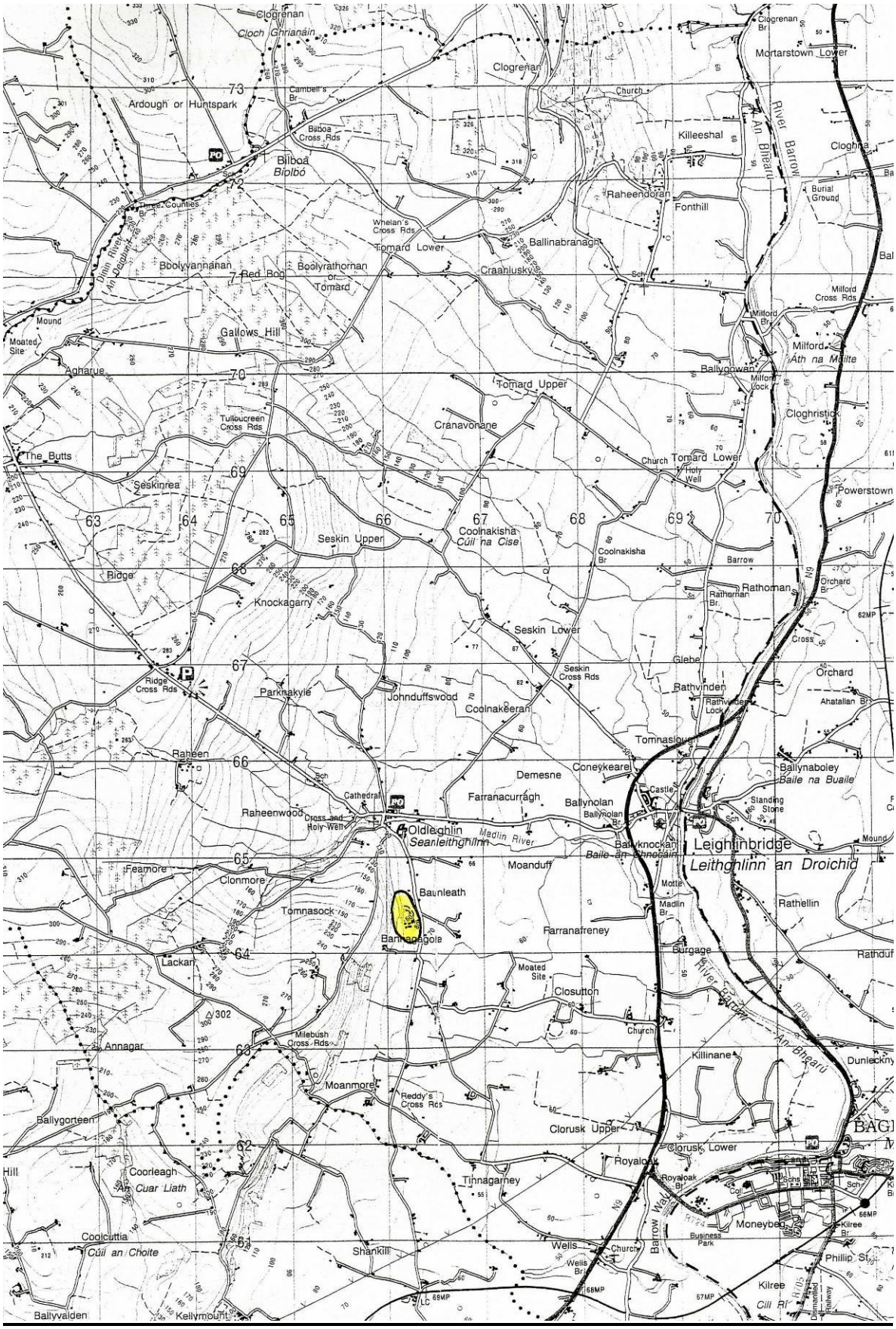
Site Importance
The site is of National importance and is likely to be proposed for NHA designation under the IGH 3 Carboniferous - Pliocene Palaeontology theme and the IGH8 Lower Carboniferous theme of the GSI's IGH Programme.

Management/promotion issues
The site is one of Stone Developments Ltd, largest working quarries, exporting limestone for building and monumental work to Ireland and Europe. No management issues arise, except if the quarry were to close; then maintaining access for geologists would be desirable. As a working quarry it is not suitable for promotion to general visitors other than at the instigation of the operators, although the showrooms and outdoor samples etc are available for anyone to visit.
Contact: Philip Meaney, Stone Developments Ltd, Baunleath Quarry, Old Leighlin, Carlow 059-9721227, also see www.stonedevelopments.ie

Limestone is sawn out in massive blocks for use as cladding slabs.

The westerly dip of the limestone beds is apparent in this view of the quarry.

Bannagagole Quarry



CARLOW - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Clogrenan Quarry**
Other names used for site	Clogrennane Lime Ltd, Irish Sugar Company Quarry
TOWNLAND(S)	Raheendoran, Clogrenan,
NEAREST TOWN	Carlow
SIX INCH MAP NUMBER	7
NATIONAL GRID REFERENCE	268810 172040 = S 6881 7204
1:50,000 O.S. SHEET NUMBER	61 **1/2 inch Sheet No.** 19

Outline Site Description
A large and deep working quarry

Geological System/Age and Primary Rock Type
Carboniferous limestone; the youngest formation in the region, with an unconformity between it and the younger shales overlying the limestone.

Main Geological or Geomorphological Interest
This active quarry exposes the Lower Carboniferous Ballyadams Formation at the base of the section and passes upwards into the Clogrenan Formation. It is the type locality for the Clogrenan Formation (i.e. the location that best represents the formation). Thickly bedded wackestones and crinoid-rich calcarenites of the Ballyadams Formation are exposed at the base of the section. Irregular clay horizons are also found. These indicate periods of soil formation as the area was uplifted above sea level. An important stratigraphical boundary, the Asbian/Brigantian boundary is exposed in the middle part of the quarry. The base of the Clogrenan Formation coincides with this major boundary. The Clogrenan Formation is conspicuous due to its absence of clay horizons and the presence of nodular chert at its base. This lack of impurities makes the limestone very attractive for chemical uses. One clay section on the northern edge requires study but may include some Tertiary karstification.

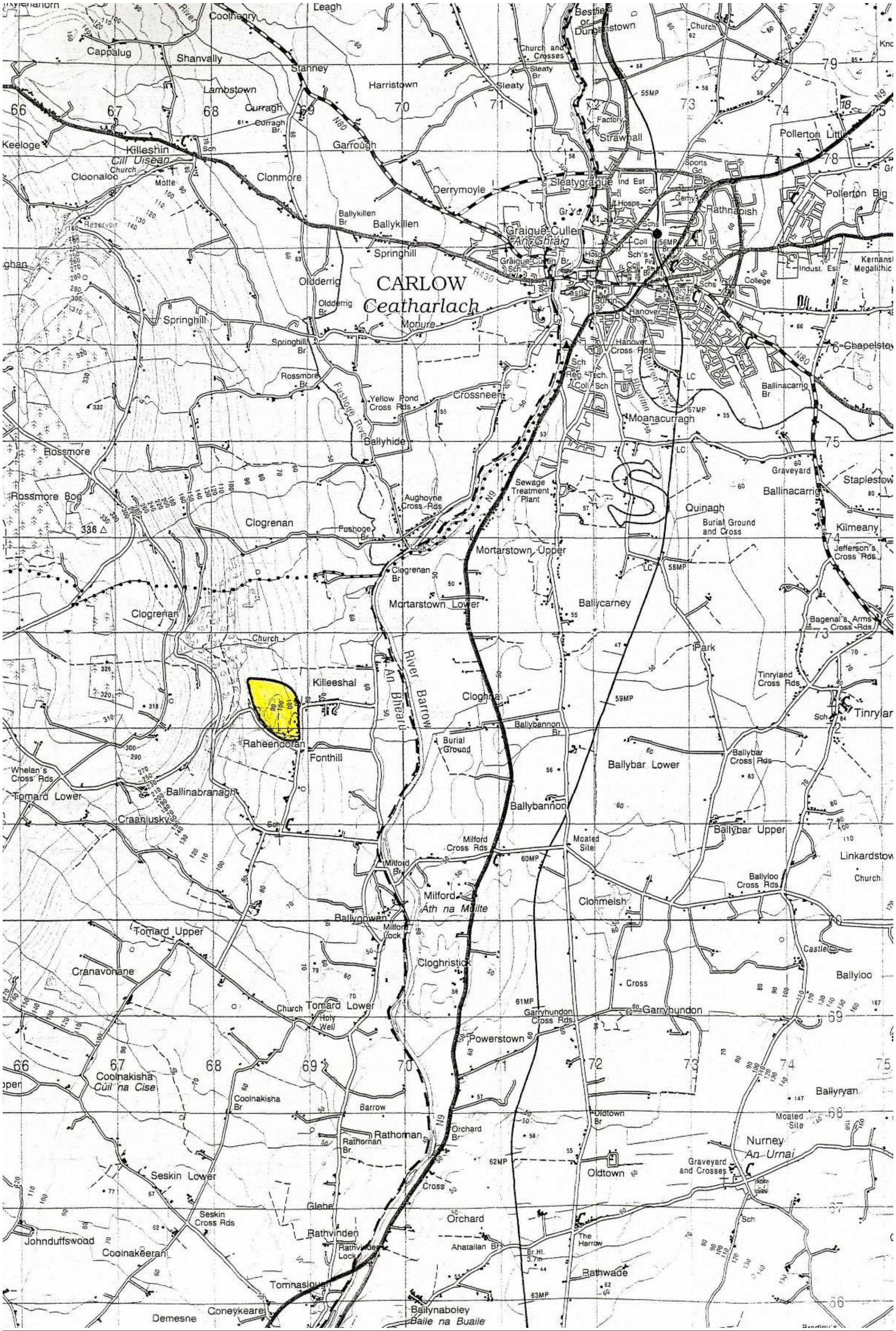
Site Importance
The site is of National importance and is likely to be proposed for NHA designation under the IGH 8 Lower Carboniferous theme of the GSI's IGH Programme.

Management/promotion issues
The site is a large working quarry, producing lime for chemical uses, and some limestone for aggregates and other uses. No management issues arise, except if the quarry were to close; then maintaining access for geologists would be desirable. As a working quarry it is not suitable for promotion to general visitors other than at the instigation of the operators.
Contact: Leo Grogan, Managing Director, Clogrennane Lime Ltd, Clogrennane, Carlow.
Telephone 059-9131811

A general view of the quarry.

The lime kilns and quarry plant.

Clogrenan Quarry



CARLOW - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Morrisey's Quarry**
Other names used for site	Clonmelsh Quarry
TOWNLAND(S)	Clonmelsh
NEAREST TOWN	Carlow, Leighlinbridge
SIX INCH MAP NUMBER	12
NATIONAL GRID REFERENCE	272151 170414 = S 72151 70414
1:50,000 O.S. SHEET NUMBER	61 **1/2 inch Sheet No.** 19

Outline Site Description
A large working quarry with extensive overburden of glacial till.

Geological System/Age and Primary Rock Type
Carboniferous Limestone

Main Geological or Geomorphological Interest
Lower Carboniferous limestones of the Ballysteen Formation are well exposed at this quarry.

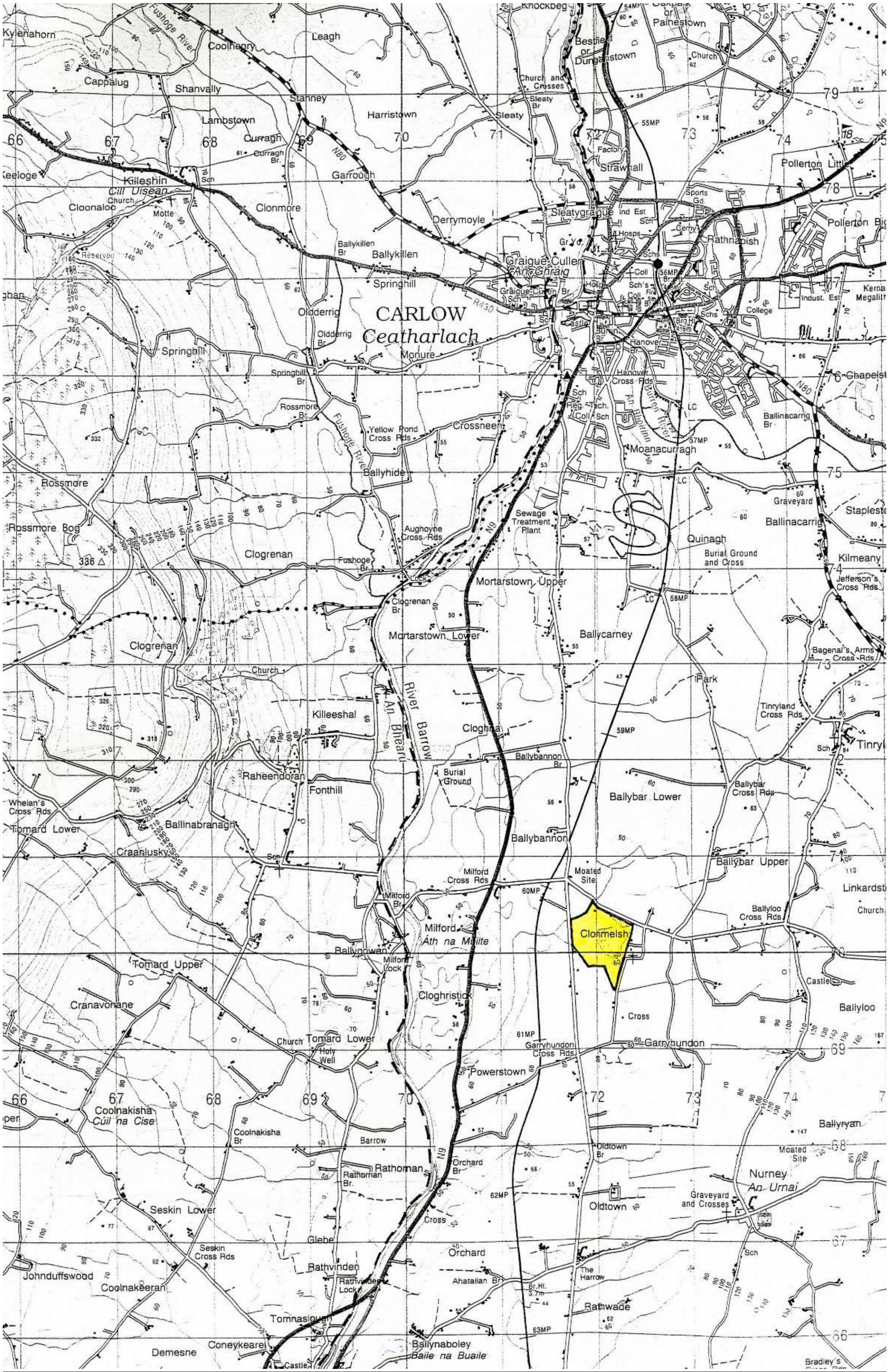
Site Importance
The site is of County Geological Site importance and may be proposed for NHA designation under the IGH 8 Lower Carboniferous of the GSI's IGH Programme.

Management/promotion issues
The site is a large working quarry, producing limestone for aggregates, ready mix concrete and bituminous road dressings. No management issues arise, except if the quarry were to close; then maintaining access for geologists would be desirable. As a working quarry it is not suitable for promotion to general visitors other than at the instigation of the operators.
Contact: Quarry Manager, Aidan Doyle, Clonmelsh Quarry, Milford, Carlow 059-9146142

A panoramic view of the quarry.

The depth of overburden is shown on this image

Morrisey's Quarry



Title	E = EXPLORATION DATA
The Geological History of Carlow, Lecture by C.R. Aldwell to Old Carlow Society, 20 March 1975.	
19 Booklet. Geology of Carlow-Wexford: A geological description, to accompany bedrock geology 1:100,000 scale map, Sheet 19, Carlow - Wexford.	
6" Carlow 6.1 -- quartered field sheet with original observations.	
6" Carlow 7.3 -- quartered field sheet with original observations.	
A possible western extension of the East Carlow Deformation Zone: a preliminary note.	
Aclare Spodumene boulder distribution PL 1477 (Scale 25" : 1 mile) O.S. Sheets Carlow 15 - 16.	E
Aclare Spodumene boulder distribution PL 1477 (Scale 25" : 1 mile), O.S. Sheets Carlow 15 - 17.	E
Airborne spectrometer survey + isomagnetic map of PL 2605 Cos. Carlow + Kilkenny (Scale 1:21,120) Fig. 2605/D.	E
Airborne spectrometer survey + isomagnetic map of PL's 1536-1537, 1596-1597, 1713, 2293, 2605, 2649 and 2650 Cos. Carlow + Kilkenny (Scale 1:21,120) Fig F - sheet 1 of 2.	E
Airborne spectrometer survey + isomagnetic map of PL's 1596-1597, 1713-1714, 2052, 2293, 2605 and 2650 Cos. Carlow + Kilkenny (Scale 1:21,120) Fig G - sheet 2 of 2.	E
Airborne spectrometer survey of AY-c area (PL's 1536-7, 1596-7, 1713, 2293, 2605, 2650 - Counties Carlow and Kilkenny (Scale 3" : 1 mile) (Fig. 5).	E
Airborne spectrometer survey of AY-c area (PL's 1596-7, 1713-4, 2052, 2605, 2650 - Counties Carlow and Kilkenny (Scale 3" : 1 mile) (Fig. 6).	E
Airborne spectrometer survey of the AY-c area Co. Carlow and Kilkenny Scale 1:21,120 Fig. 3.	E
Alpha cup survey - statistical treatment, PLs 2403-4 25" Carlow 16/15 and 19/3 (Area C3).	E
Alpha cup survey location map of the Goresbridge area, PL 2952 6" Carlow 19.	E
Alpha cup survey of the Fennagh area PLs 2405-7 (Scale 1:2500), 25" Carlow 16-4, 17-1	E
Alpha cup survey of the Goresbridge area, PL 2952 25" Carlow 19/10.	E
Alpha cup survey of the Goresbridge area, PL 2952 25" Carlow 19/13.	E
Alpha cup survey of the Goresbridge area, PL 2952 25" Carlow 19/5.	E
Alpha cup survey of the Goresbridge area, PL 2952 25" Carlow 19/9.	E
Analytical report No. 85/1 Geochemical reconnaissance of the Quinagh borehole, Co. Carlow using energy dispersive XRF procedures.	
Annual report and synthesis PLs 2403-12 and 2420-36 Cos. Carlow, Dublin and Wicklow dated March 1979 (114 sheets).	E
Annual report on PL 1474 and PL 1477 in Co Carlow for the year ending March 30th, 1991 (3 pages).	E
Annual report on PL 1536-1542 Cos Carlow + Wexford dated October 25th 1985 (17 pages).	E
Annual report on PL 1538 in Cos Carlow + Wexford dated October 25th 1977 (8 pages).	E
Annual report on PL's 1473 - 1477 in Co's Wicklow and Carlow for the year ending March 29th, 1978, (8 pages).	E
Annual report on PL's 1473 - 1477 in Co's Wicklow, Wexford and Carlow for the year ending March 29, 1977 (9 pages).	E
Annual report on PL's 1473 - 1478 Co's Wicklow, Carlow and Wexford for the year ending March 29th, 1973 (19 pages).	E
Annual report on PL's 1475 + 1476 Co's. Carlow + Wicklow for the year ending March 30th, 1990.	E
Annual report on PL's 1475 and 1476 Co's Wicklow + Carlow for the year ending March 29th 1977 (3 pages).	E
Annual report on PL's 1536, 1537 + 1539 (Co's Carlow and Wexford) for year ending 25/10/76 (7 pages).	E
Annual report on PL's 1536, 1537 + 1539 Counties Carlow + Wexford year ending 25/10/77 (8 pages)	E
Annual report on PL's 1536, 1537, 1539 - 42 (Co's Carlow, Kilkenny + Wexford) for the year ending 26/10/74 (7 pages).	E
Annual report on PL's 1536, 1537, 1539 - 42, 1596 - 9 + 1717 - 18 (Co's Carlow, Kilkenny and Wexford) for the year ending 30/11/73 (4 pages).	E
Annual Report on PLs 1536-1539 Cos Carlow + Wexford dated October 25th 1976 (6 pages)	E
Annual report on PLs 1536-1542 Cos Carlow + Wexford for year ending October 26th 1974 (8 pages).	E

Basal till pionjar sampling + geophysical synthesis map of the Kilcunmey area (NW extension) PL 2403 25" Carlow 19/9 and 13.	E
Basal till pionjar sampling and geophysical synthesis map of the Corries Bridge area PL 2403 25" Carlow 19/7 and 11.	E
Basal till pionjar sampling and geophysical synthesis map of the Dunroe area PL 2403 25" Carlow 19/5 and 16.	E
Basal till pionjar sampling and geophysical synthesis map of the Tower Hill area PL 2403 25" Carlow 19/15.	E
Carlow 220KV Power Station (66779)	
Carlow 220KV Power Station (66780)	
Carlow 220KV Power Station (66781)	
Carlow 220KV Power Station (66782)	
Carlow 220KV Power Station (66783)	
Carlow 220KV Power Station	
CARLOW	E
Carlow bogs (PLs 2404-6, 2951-2 and 2931) Preliminary assessment survey.	E
Carlow PL Map	E
Carlow Regional Technical College Phase II (84056)	
Carlow Regional Technical College Phase II (84057)	
Carlow Regional Technical College Phase II (84058)	
Carlow Regional Technical College Phase II	
Carlow Shopping Centre (86176)	
Carlow Shopping Centre (86177)	
Carlow Shopping Centre (86178)	
Carlow Shopping Centre (86179)	
Carlow Shopping Centre (86180)	
Carlow Shopping Centre (86181)	
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Carlow Shopping Centre (86187)	
Carlow Shopping Centre (86188)	
Carlow Shopping Centre (86189)	
Carlow Shopping Centre (86190)	
Carlow Shopping Centre (86191)	
Carlow Shopping Centre	
Chargeability survey of PL 1597 (Knockeen quarry - 25" Carlow 24/6) Fig. 1.	E
Cobra sampling on PL 1597 (AY a Knockeen south area, Co. Carlow) (Scale 1:2500) (Cu, Pb, Zn) Enclosure 6.	E
Cobra sampling on PL 1597 (Knockeen quarry area - 25" Carlow 24/6) (Cu, Pb, Zn) Fig. 4.	E
Compilation map of minerex alpha cup, VLF + VLF-R surveys of the Bagenalstown area, PL 2951 25" Carlow 16/10.	E
Compilation map of PL 2403 6" Carlow 19.	E
Compilation map of PL 2403 6" Carlow 22.	E
Compilation map of PLs 2403-4 6" Carlow 16.	E
Compilation map of PLs 2404-5 6" Carlow 17.	E
Compilation map of PLs 2404-5 and 2407-8 6" Carlow 13.	E
Compilation map of PLs 2404-7 6" Carlow 12.	E
Compilation map of PLs 2405 and 2407-9 6" Carlow 8.	E
Compilation map of PLs 2406-7 6" Carlow 7.	E
Compilation map of PLs 2407, 2409 and 2410 6" Carlow 3.	E
Compilation map of PLs 2408-12 6" Carlow 9 and Wicklow 37.	E
Compilation map of PLs 2409-11 6" Carlow 4 and Wicklow 32.	E
Compilation map of the Bagenalstown area, PL 2951 25" Carlow 16/9 and 10.	E
Compilation map of the Bagenalstown prospect PL 2951 25" Carlow 16/9 and 10.	E

Compilation map of the Corries Bridge area, PL 2403 25" Carlow 19/7 and 11 (includes overburden thickness).	E
Compilation map of the Corries Bridge area, PL 2403 25" Carlow 19/7 and 11.	E
Compilation map of the Corries Bridge prospect PL 2403 25" Carlow 19/7 +11 (includes overburden thickness).	E
Compilation map of the Dunroe prospect PL 2403 25" Carlow 19/11, 12, 15 and 16.	E
Compilation map of the Goresbridge prospect PL 2952 6" Carlow 19.	E
Compilation map of the Kilcumney area, PL 2403 25" Carlow 19/9, 10, 13 and 14.	E
Compilation map of the Tower Hill area, PL 2403 25" Carlow 19/15.	E
Compilation map PL 1476 (Scale 1" : 880ft). Carlow 18	E
Compilation map Tinahely area, O.S. Carlow 18. PL 1476 (Scale 6" : 1 mile).	E
Compilation map, Aclare, Tinahely PL's 1476 and 1477 (Scale 6" : 1 mile), O.S. Sheet Carlow 18.	E
Coolasnaghta Au stream geochemistry PL 3407 (Scale 1:25,000) Carlow 20.	E
Deep overburden geochemistry Li Kiledmond area PL 3407 (Scale 1:100) Carlow 22 and 23.	E
Deep overburden geochemistry results Li PL's 3407, 3411 and 3412 Carlow 9 - 13 and Wexford 8, 9 and 13.	E
Deep overburden geochemistry results Li PL's 3407, 3411 and 3412 Carlow 9 - 13 and Wexford 8, 9 and 13.	E
Deep overburden geochemistry results Li PL's 3407, 3411 and 3412 Carlow 9 - 13 and Wexford 8, 9 and 13.	E
Deep overburden geochemistry results Li PL's 3407, 3411 and 3412 Carlow 9 - 13 and Wexford 8, 9 and 13.	E
Deep sampling on PL 1537 (25" Carlow 22/11) Fig. 1537/E.	E
Deep sampling on PL's 1477 and 1538 (Aclare area - 6" Carlow 20) (Cu, Pb, Zn) Fig. 1538/D.	E
Detail geochemical survey of PL 1596 (Knockeen area - Aclare AY-a 6" Carlow 24 (Cu, Pb, Zn) Enclosure 4.	E
Detail geochemical survey of PL 1597 (AY a Coolyhme area - Co. Carlow 24) (Scale 1:2500) (Cu, Pb, Zn) Enclosure 5.	E
Detailed geology + previous exploration on PLs 2404, 2951 + 2952 Goresbridge area 6" Carlow 15, 16, 19. Kilkenny 16, 21 + 25 Plate 3	E
Detailed geology of PLs 2404, 2951 + 1952 Nurney area 6" Carlow 12 Plate 2	E
Detailed magnetics survey, Kilcarry Bridge, PL 1476, Scale 6" : 1 mile, O.S. Sheet Carlow 18.	E
Detailed radem survey Aclare PL 1477 (Scale 25" : 1 mile), O.S. Sheets Carlow 17 - 15.	E
Detailed soil sampling on PL's 1537 + 1538 (Aclare AY-a area 6" Carlow 22) (Cu, Pb, Zn) Figs 1537/G and 1538/E.	E
Diamond drilling (location of hole 32) PL 1477 (Scale 1" : 200'), O.S. Sheets Carlow 17/15.	E
Diamond drilling Cross section, Holes 1476/1 + 2, Monaughrim Td., Scale 1" : 20 ft, PL 1476, O.S. Carlow 18/2.	E
Diamond drilling cross-section Holes 1476/1 and 2, Monaughrim, PL 1476. O.S. Carlow 18/2 (Scale 1" : 20ft.)	E
Drill location map of the Goresbridge area, PL 2952 6" Carlow 19.	E
Drill location map of the Nurney area, PL 2404 25" Carlow 12/11.	E
Drillhole location map of Dunroe prospect PL 2403 25" Carlow 19/11.	E
Electromagnetic map (part 2) of the AY-c area, Counties Carlow and Kilkenny (Scale 1:21,120) Fig. 4.	E
Electromagnetic map (part) of the AY-c area, Counties Carlow and Kilkenny (Scale 1:21,120) Fig. 2.	E
Electromagnetic map of PL 2605 Cos Carlow + Kilkenny (Scale 1:21,120) Fig 2605/C.	E
Electromagnetic map of the AY-c area (PL's 1536-7, 1596-97, 1713, 2293, 2605, 2650 - Counties Carlow and Kilkenny (Scale 3" : 1 mile) (Fig. 3).	E
Electromagnetic map of the AY-c area (PL's 1596-7, 1713-14, 2052, 2293, 2650 - Counties Carlow and Kilkenny (Scale 3" : 1 mile) (Fig. 4).	E
EM map of PL's 1536-1537, 1713, 2293, 2605, 2649 + 2650 Cos. Carlow + Kilkenny (Scale 1:21,120) Fig. B - Sheet 1 of 2.	E
EM map of PL's 1536-1537, 1713-1714, 2052, 2293, 2605 + 2650 Cos. Carlow + Kilkenny (Scale 1:21,120) Fig C - sheet 2 of 2.	E

EM RES profile lines and deep sampling results on PLs 1537 + 1598 (Lacken area, Carlow 24) Fig. 1598/E	E
Field notes, data and sample points Carlow area (23 pages).	
Fig. 3 - An outline geology of Carlow - Wexford, Line of section from Fig. 2 also shown.	
Fig. 3 - An outline of the geology of Carlow - Wexford (1 page).	
Geochemical anomaly map of PL 2403 - 6" Carlow 22.	E
Geochemical anomaly map of PLs 2403 6" Carlow 20.	E
Geochemical anomaly map of PLs 2403 and 2952 6" Carlow 19.	E
Geochemical anomaly map of PLs 2403-4 and 2951-2 6" Carlow 16.	E
Geochemical anomaly map of PLs 2404 and 2931 6" Carlow 17.	E
Geochemical anomaly map of PLs 2404-6 and 2951 6" Carlow 12.	E
Geochemical anomaly map of PLs 2405-6 and 2407-9 - 6" Carlow 8.	E
Geochemical anomaly map of PLs 2408-12 6" Carlow 19 and Wicklow 37.	E
Geochemical anomaly map of PLs 2410-1, 2430 and 2432 6" Carlow 1a, 4 and Wicklow 32.	E
Geochemical anomaly map of PLs 2411 and 2433 - 6" Carlow 10 and Wicklow 38.	E
Geochemical anomaly map of PLs 2411 and 2433 - 6" Carlow 5 and Wicklow 33.	E
Geochemical anomaly map of PLs 2411 and 2433 - 6" Carlow 5 and Wicklow 33.	E
Geochemical anomaly map of PLs 2412 and 2930 6" Carlow 9 and Wicklow 42.	E
Geochemical anomaly of PLs 2405, 2407-8 and 2930-1 - 6" Carlow 13.	E
Geochemical anomaly of PLs 2407, 2409 and 2410 - 6" Carlow 3.	E
Geochemical plan of PLs 514 + 515 Cos Carlow + Kilkenny (6":1 mile) (Cu, Pb, Zn)	E
Geochemical survey of PL 1596 (6" Carlow 23 - AY (a)) (Cu, Pb, Zn).	E
Geochemical survey of PL's 1717 and 1718 (Co. Carlow) Scale 1" : 1 mile (Cu, Pb, Zn, Mo, As, Ni) 2 pages key to map and map).	E
Geological + geochemical (THM) plan of PLs 514 + 515 Cos Carlow + Kilkenny (6":1 mile)	E
Geological compilation map with the main structural elements of the east Carlow deformation zone (scale 1:50 000)	E
Geological map of PL 1537 (6" Carlow 22).	E
Geological map of PL 1537 (6" Carlow 24).	E
Geological map of PL 2403 - 6" Carlow 22.	E
Geological map of PLs 2403 6" Carlow 20.	E
Geological map of PLs 2403 and 2952 6" Carlow 19.	E
Geological map of PLs 2403-4 and 2951-2 6" Carlow 16.	E
Geological map of PLs 2404 and 2931 6" Carlow 17.	E
Geological map of PLs 2404, 2951 + 2952 Goresbridge Cos Carlow + Kilkenny (1" OS sheets 137 + 147) Plate 1.	E
Geological map of PLs 2404-6 and 2951 6" Carlow 12.	E
Geological map of PLs 2405 and 2407-9 - 6" Carlow 8.	E
Geological map of PLs 2405, 2407-8 and 2930-1 - 6" Carlow 13.	E
Geological map of PLs 2407, 2409 and 2410 - 6" Carlow 3.	E
Geological map of PLs 2410-1, 2430 and 2432 6" Carlow 1a, 4 and Wicklow 32.	E
Geological map of PLs 2411 and 2433 - 6" Carlow 10 and Wicklow 38.	E
Geological map of PLs 2412 and 2930 6" Carlow 14 and Wicklow 42.	E
Geological survey of PL 1597 (6" Carlow 24) - S.	E
Geological survey of PL 1598 (6" Carlow 22) - T.	E
Geological survey of PL 1598 (6" Carlow 23) - U.	E
Geology compilation of PL 3407 (Scale 1:25,000) Carlow 19 - 23.	E
Geology of Carlow-Wexford: A geological description, to accompany bedrock geology 1:100,000 scale map, Sheet 19, Carlow - Wexford.	
Geology of South Wexford: a geological description of South Wexford and adjoining parts of Waterford, Kilkenny and Carlow to accompany the Bedrock Geology 1:100,000 scale map series, Sheet 23, South Wexford.	
Geology of the Tomduff andalusite prospect PL's 3407, 3411 and 3412 (Scale 1:25,000) Carlow 19-23 and Wexford 8, 9 and 13.	E
Geology with radiometrics and drainage PL 2403 6" Carlow 19.	E
Geology with radiometrics and drainage PL 2403 6" Carlow 22.	E
Geology with radiometrics and drainage PLs 2403-4 6" Carlow 16.	E

Geology with radiometrics and drainage PLs 2404-5 6" Carlow 17.	E
Geology with radiometrics and drainage PLs 2404-5 and 2407-8 6" Carlow 13.	E
Geology with radiometrics and drainage PLs 2404-7 6" Carlow 12.	E
Geology with radiometrics and drainage PLs 2405 and 2407-9 6" Carlow 8.	E
Geology with radiometrics and drainage PLs 2406-7 6" Carlow 7.	E
Geology with radiometrics and drainage PLs 2407, 2409 and 2410 6" Carlow 3.	E
Geology with radiometrics and drainage PLs 2408-12 6" Carlow 9 and Wicklow 37.	E
Geology with radiometrics and drainage PLs 2409-11 6" Carlow 4 and Wicklow 32.	E
Gold exploration (1987) compilation map recce panning and follow-up rock sampling PL 1476 (Scale 6" : 1 mile).Carlow 17	E
Gold exploration (1987) compilation map recce panning and follow-up rock sampling PL 1476 (Scale 6" : 1 mile).Carlow 18	E
Ground magnetic survey of Kiledmond plus geological interpretation PL 3407 (Scale 1:15,625) Carlow 19 - 23.	E
Interim report on PL's3407, 3411 and 3412 in Co's Carlow + Wexford for the one year period September 10th, 1989 (4 pages).	E
Interpretation report on the Airborne EM survey of PL's 1536-1537, 1596-1597, 2052, 2293, 2605, 2649 and 2650 Cos. Carlow + Kilkenny dated June 1978 (84 pages).	E
Isomagnetic contour map of PL's 1536-1537, 1596-1597, 1713, 2293, 2605, 2649 + 2650 Cos. Carlow and Kilkenny (Scale 1:21,120) Fig D - sheet 1 of 2 (Base map with PL boundaries).	E
Isomagnetic contour map of PL's 1596-1597, 1713-1714, 2052, 2293, 2605 + 2650 Cos. Carlow and Kilkenny (Scale 1:21,120) Fig E - sheet 2 of 2 (Base map with PL boundaries).	E
Isomagnetic contour map of the AY-c area (PL's 1536 -7, 1596 -7, 1713, 2293, 2605, 2650 - Counties Carlow and Kilkenny (Scale 3" : 1 mile) (Fig. 1).	E
Isomagnetic contour map of the AY-c area (PL's 1596 -7, 1713 -4, 2052, 2605, 2650 - Counties Carlow and Kilkenny (Scale 3" : 1 mile) (Fig. 2).	E
Kilcarry Bridge cobra sampling PL 1475 (Scale 6" : 1 mile) OS Carlow 18	E
Kilcarry Bridge deep sampling, (portable drilling), PL 1476, Scale 6" : 1 mile, O.S. Sheet Carlow 18.	E
Kilcarry Bridge deep sampling, PL 1476, Scale 6" : 1 mile, O.S. Sheet Carlow 18.	E
Kilcullen - Carlow Road Improvement - Bolton Hill (68062)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68063)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68064)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68065)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68066)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68067)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68068)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68069)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68070)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68071)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68072)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68073)	
Kilcullen - Carlow Road Improvement - Bolton Hill (68074)	
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Kilcullen - Carlow Road Improvement - Bolton Hill (68076)	
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Annual report and synthesis PLs 2403-12 and 2420-36 Cos. Carlow, Dublin and Wicklow dated March 1979 (114 sheets).
Annual report on PL 1474 and PL 1477 in Co Carlow for the year ending March 30th, 1991 (3 pages).
Annual report on PL 1536-1542 Cos Carlow + Wexford dated October 25th 1985 (17 pages).
Annual report on PL 1538 in Cos Carlow + Wexford dated October 25th 1977 (8 pages).
Annual report on PL's 1473 - 1477 in Co's Wicklow and Carlow for the year ending March 29th, 1978, (8 pages).
Annual report on PL's 1473 - 1477 in Co's Wicklow, Wexford and Carlow for the year ending March 29, 1977 (9 pages).
Annual report on PL's 1473 - 1478 Co's Wicklow, Carlow and Wexford for the year ending March 29th, 1973 (19 pages).
Annual report on PL's 1475 + 1476 Co's. Carlow + Wicklow for the year ending March 30th, 1990.
Annual report on PL's 1475 and 1476 Co's Wicklow + Carlow for the year ending March 29th 1977 (3 pages).
Annual report on PL's 1536, 1537 + 1539 (Co's Carlow and Wexford) for year ending 25/10/76 (7 pages).
Annual report on PL's 1536, 1537 + 1539 Counties Carlow + Wexford year ending 25/10/77 (8 pages)
Annual report on PL's 1536, 1537, 1539 - 42 (Co's Carlow, Kilkenny + Wexford) for the year ending 26/10/74 (7 pages).
Annual report on PL's 1536, 1537, 1539 - 42, 1596 - 9 + 1717 - 18 (Co's Carlow, Kilkenny and Wexford) for the year ending 30/11/73 (4 pages).
Annual Report on PLs 1536-1539 Cos Carlow + Wexford dated October 25th 1976 (6 pages)
Annual report on PLs 1536-1542 Cos Carlow + Wexford for year ending October 26th 1974 (8 pages).
Basal till pionjar sampling + geophysical synthesis map of the Kilcunmey area (NW extension) PL 2403 25" Carlow 19/9 and 13.
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Ground magnetic survey of Kiledmond plus geological interpretation PL 3407 (Scale 1:15,625) Carlow 19 - 23.
Interim report on PL's3407, 3411 and 3412 in Co's Carlow + Wexford for the one year period September 10th, 1989 (4 pages).
Interpretation report on the Airborne EM survey of PL's 1536-1537, 1596-1597, 2052, 2293, 2605, 2649 and 2650 Cos. Carlow + Kilkenny dated June 1978 (84 pages).
Isomagnetic contour map of PL's 1536-1537, 1596-1597, 1713, 2293, 2605, 2649 + 2650 Cos. Carlow and Kilkenny (Scale 1:21,120) Fig D - sheet 1 of 2 (Base map with PL boundaries).
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Overburden sampling (portable drill), Li, Cs results, Monaughrim Td., PL's 1475 + 1476, O.S. Sheet Carlow 18 + Wicklow 46.
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Reconnaissance geochemical survey of PL's 1537 + 1598 (Ballymurphy area AY a) 6" Carlow 22 + 24 (Cu, Pb, Zn) Enclosure 3.
Reconnaissance geochemical survey of PL's 1537, 1597 + 1598 (6" Carlow 24) (Cu, Pb, Zn).
Reconnaissance geochemical survey of PL's 1537, 1597 + 1598 - area AYa (Aclare - AYa - 6" Carlow 24) (Cu, Pb, Zn).
Reconnaissance geochemical survey of PL's 1537, 1597 and 1598 (Ballymurphy area (AYa) - Co. Carlow 22 and 24 (Cu, Pb, Zn) Fig. 5.
Reconnaissance geochemical survey of PL's 1538 + 1598 (AY Killedmond area - 6" Carlow 23) (Cu, Pb, Zn) Enclosure 7.
Reconnaissance stream geochemical survey of PL's 1537 and 1538 (Aclare AY-a area, Co. Carlow) (Scale 3": 1 mile) (Cu, Pb, Zn) Fig. 1537/D and 1538/B.
Reconnaissance stream geochemical survey of PL's 1537, 1597 + 1598 (Aclare AY-a area, Co. Carlow) (Scale 3": 1 mile) (Cu, Pb, Zn) Fig. 1537/B.
Reconnaissance stream sampling, (Cu, Pb, Zn), Tinahely and Aclare area, PL 1476, Scale 3" : 1 mile, O.S. Sheets Carlow 17 + 18.
Reconnaissance stream sediment survey of PL's 1538 - 9 and 1598 (Aclare area - Counties Carlow and Wexford) (Scale 3" : 1 mile) (Cu, Pb, Zn) Fig.s 1538/G and 1539/B.
Renewal report on PL's 1474 - 1477 + 1538 Co's Wicklow + Carlow for the 1984 - 1985 period, (11 pages).
Renewal report on PL's 1474 - 1477 in Co's Wicklow + Carlow for the year ending March 1986, (6 pages).
Renewal report on PL's 1474 - 1477 in Co's Wicklow and Carlow for the year ending March 30th, 1989, (12 pages).
Renewal report on PL's 1475 and 1476 Co. Wicklow + Carlow for the year ending March 29th 1973 (2 pages).
Renewal report on PL's 1475 and 1476 in Co's Wicklow + Carlow for the year ending March 29th 1974 (2 pages).
Renewal report on PL's 3407, 3411 and 3412 in Co's Carlow + Wexford for the two year period ending September 18th, 1990 (23 pages).
Report on PL's 1473 - 1476 and 1715 - 1717 Co's Wicklow, Carlow and Wexford for the one year period ending February 1972 (6 pages).
Report on PL's 1473 - 1477 Co's Wicklow and Carlow for the year ending March 29th, 1980 (13 pages)
Report on PL's 1473 - 1477 in Co's Wicklow + Carlow for the year ending March 29th, 1979 (10 pages)
Report on PL's 1473 - 1477 in Co's Wicklow, Wexford and Carlow for the year ended March 29th, 1976 (10 pages).
Report on PL's 1473 - 1478 and 1715 - 1716 Co's Wicklow, Wexford and Carlow for the year ending March 29th, 1974 (6 pages).
Report on PL's 1473 - 1478 Co's Wicklow, Carlow and Wexford for the year ending March 29th, 1971 (1 page).
Report on PL's 1475 + 1476, Co's Wicklow and Carlow, for the year ending March 29th 1979, (4 pages)

Report on PL's 1475 and 1476 Co's Wicklow + Carlow for the year ending March 29th 1975 (3 pages).
Report on PL's 1475 and 1476 Co's Wicklow and Carlow, for the year ending March 29th 1980, (4 pages).
Report on PL's 1536 - 1539 (Counties Carlow, Kilkenny + Wexford) for the year ending 25/10/79 (8 pages).
Report on PL's 1536 - 1539 in counties Carlow, Kilkenny and Wexford for the year ending 25/10/78 .
Report on PL's 1536 - 1542, 1596 - 1599 + 1717 - 8 (Co's callow, Carlow + Wexford) for year ending 30/11/72 (22 pages).
Report on PL's 1536 - 37 and 1539 - 1542, Co's Kilkenny, Carlow + Wexford for the year ending 26/10/71 (21 pages).
Report on PL's 1596 - 1599 in Co's Carlow, Kilkenny and Wexford for the year ending 2/1/78.
Report on PL's 1717 and 1718 (Co. Carlow) dated February 1972 (3 pages).
Report on PL's1536 - 39 in Co's Kilkenny, Carlow + Wexford for the year ending 25/10/80 (14 pages).
Report on PL's1596 - 98 in Co's Carlow and Kilkenny for the year ending 2/1/80 (11 pages).
Report on PLs 1596-1598 in Counties Kilkenny and Carlow for the year ending 2/1/81 (8 pages)
Report on the geology of PLs 2404, 2951 + 2952 Goresbridge, Cos Carlow + Kilkenny dated Nov. 1982 (33 pages)
Simplified geology map of PL's 3407, 3411 and 3412 (Scale 1/2" : 1 mile) Carlow 19, 20, 21, 22, 23, 24, 25 Wexford 8, 9, 13.
Stream panned concentrates (Tin). PL 1475 (Scale 3" = 1 mile). O.S. Carlow 17, 18, 19, 20, + 21. Wexford 8 + 9
Stream panning survey PL 1477 nd1538, Au (Scale 6" : 1 mile), O.S. Sheet Carlow 20.
Stream panning survey PL's 1476, 1477,1538 and 1539, Au, (Scale 3" : 1 mile), O.S. Sheets Carlow 17, 18, 19, 20 + 21, Wexford 8 + 9.
Stream panning survey PL's 1537, 1538, 1597 + 1598 Au (Scale 3" : 1 mile), O.S. Sheets Carlow 22, 23, 24, 25 + 26.
Summary of work since issue up to October 1979 (PL's 1536 - 39) Counties Kilkenny, Carlow + Wexford.
Summary report on PL's 1536 - 37 and 1539 - 1542, Co's Kilkenny, Carlow + Wexford for the year ending 26/10/71 (1 page).
Supplementary report on PL's 1473 - 1477 Co's Wicklow + Carlow for the year ended March 29th,1979
Supplementary report on U exploration on PL's 1537 - 39 and 1598 in counties Carlow, Kilkenny + Wexford.
Surface geology map PL 1476 Carlow Map 18(Scale 6" : 1 mile).
Surrender report on PL's 3407, 3411 and 3412 in Co's Carlow + Wexford for the year period October 12th, 1990 to June 5th, 1991 (12 pages).
Synthetic map of area C1-3 PL's 2403-4 6" Carlow 16 and 19.
Technical report on PL's 2403-12 and 2420-36 Co's Carlow, Dublin and Wicklow for the period Jan to Sept. 1977 (19 sheets).
Technical report on PL's 2403-12 and 2420-36 Co's Carlow, Dublin and Wicklow for the period Oct to Dec. 1977 (19 sheets).
Tomduff andalusite prospect PL 3407 Geology, trench location map, trench cross-section. Different scales Carlow 22 and 23.
Tomduff Hill andalusite prospect PL 3407 Trench location map (Scale 6" : 1 mile) Carlow 19 - 23.
Trench logs PL 3407 Tomduff Carlow 22 and 23 (7 pages).
U stream geochemical survey of PL's 1537, 1597 and 1598 (Aclare AY-a area, Co. Carlow) (Scale 3" : 1 mile) Fig. 1537/C.
VLF profile lines and deep sampling on PLs 1537 and 1598 (Ballymurphy area Carlow 22) (Cu, Pb, Zn) Fig. 1598/D
VLF resistivity contours Kilcumney grid Co. Carlow PL 2403 (Scale 1:1000).
Work report on Carlow date 11/10/77 (2 pages).
Work report on PL 1473 - Wicklow, Carlow and Wexford year ending 29/3/74 (2 pages).
Work report on PL 1473 - Wicklow, Carlow and Wexford year ending 29/3/75 (2 pages).
Work report on PL 1473 - Wicklow, Carlow and Wexford year ending 29/3/76 (3 pages).

REPORT ID	PROJECT_TITLE	PROJECT_ADDRESS	INVESTIGATION_DATE
1282	Leighlinbridge	Co Carlow	24/06/1977
1287	R.N. Gillespie Ltd.	Kennedy Avenue, Carlow, Co. Carlow	10/07/1990
1289	St. Marys Christian Brothers School (CBS)	Carlow, Co. Carlow	15/10/1985
1291	Seven Oaks Hotel	Carlow, Co. Carlow	07/02/1990
1293	Haddens Commercial premises	Tullow Street, Carlow, Co. Carlow	30/11/1984
1295	Braun Ireland Ltd.	Dublin Road, Carlow, Co. Carlow	12/06/1985
1297	Proposed Community Workshop	Dublin Road, Carlow, Co. Carlow	17/12/1982
1299	Amalgamated Fruit Ltd	Industrial Estate, Carlow, Co. Carlow	14/05/1991
1301	Belmont Hotel	Carlow, Co Carlow	23/10/1990
1303	Indusrial Development Authority (IDA) Site	Dublin Road, Carlow, Co. Carlow	08/08/1973
1305	Brophy Agricultural Services	Tullow, Co. Carlow	24/04/1990
1307	Carlow 220KV Electricity Station	Rathoe, Co. Carlow	25/01/1994
1534	Proposed Cork-Dublin gas pipeline (Preliminary site investigation report)	Lough Carrig Lodge, Co. Cork- Brownsbarn, Co. Dublin	22/04/1981
1749	Apartment Development	The Quay, Carlow, Co. Carlow	15/11/1994
1752	Quinnsworth Supermarket	Carlow, Co. Carlow	28/07/1994
2110	Proposed New Marina	Belturbet, Co. Cavan	01/04/1993

Box No.	Specimen number	Old identification	Owner status	Condition F=Fair G=Good P=Poor	New identification	Comments	Suggestion as to value: Not worth keeping = NWK
90	02/224	Petrified wood	?	F	Petrified wood	Probably purchased from abroad	
90	02/225	1 small rock	?	F	Carboniferous Limestone with fragment of brachiopod		NWK?
90	02/226	1 grey slate 9.5" x 7"	?	F	Slate	Could be from Ireland, but may be from North Wales or elsewhere	
101	02/205	1 Rock 8" x 5.5"	?	F	Carboniferous limestone with partly silicified colonial coral, *Siphonodendron*?		
101	02/206	1 Rock 6" x 3.5"	?	F	Carboniferous limestone with brachiopods and some corals	slight pyrite decay in small patches	
101	02/207	1 Rock 5.5" x 3.5"	?	F	galena and subsidiary sphalerite ore sample	possibly from Tara Mines or Lisheen or Galmoy mines if acquired recently	
99	83/124	1 Large Stone	D see comments	F	Carboniferous Limestone with colonial coral	Very nice specimen. Has sticker: on loan from Oliver Scully, Killeshin	
99	02/202	1 Stone 6.5" x 5"	?	F	Carboniferous Limestone cobble with many brachiopods in cross section and some coral fragments		
99	02/203	1 Stone 4" x 3"	?	F	Carboniferous Limestone with colonial coral	Very nice specimen.	
99	02/204	1 Stone 5" x 4"	?	F	Carboniferous Limestone with colonial coral	Like 02/202 but not quite as good	
87	02/184	Fossil in Split Stone Grey	?	**P**	Grey shale with some indeterminate plant fossil fragments	Suffering serious pyrite decay	**Best disposed of.**
87	02/185	Fossil in Split Stone Grey	?	F	Coal with much plant debris	ridges on one side are the work of the excavator not a fossil feature	
87	02/186	Fossil in Split Stone Grey	?	**P**	Dark grey shale with oily colour staining from weathering	Suffering serious pyrite decay	**Best disposed of.**
87	02/187	Fossil in Split Stone Grey	?	**P**	Dark grey shale with oily colour staining from weathering	Suffering serious pyrite decay	**Best disposed of.**

87	02/188	Fossil Black	?	F	Coal		
297	87/123	1 Pair Horn Protectors Lead Used to prevent Hornbutting in young cattle	D	G	Yes!	Not geological. Move to appropriate collection	
297	02/2458	1 Rock Black in Colour 6" x 6"	?	F	Flint nodule	May be from Northern Ireland Chalk, but not well rounded as in a beach or river pebble. Could be from a glacial drift deposit.	
297	02/2459	1 Multi Colour Rock 6" x 5" x 3"	?	F	Granite	pale coloured with a rusty stain, equigranular, medium grained	
92	02/238	1 Piece of Rock White	?	F	Pegmatite: large crystals of quartz and feldspar with few micas	May be from Aclare or other similar Carlow pegmatite localities	
92	02/239	1 Piece of Rock Black	?	F	Limestone with only a few brachiopod fragments		NWK?
92	02/240	1 Piece of Rock Mixed Colours	?	F	Granite, grey, rich in biotite		
81	87/127/1	Fossil in Split Stone	D	F			retained for ID
81	87/127/2	Fossil in Split Stone	D	F			retained for ID
81	87/127/3	Fossil in Split Stone	D	F			retained for ID
81	87/127/4	Fossil in Split Stone	D	F			retained for ID
81	02/234	Fossil in Split Stone	D	F	Carboniferous limestone with indeterminate brachiopods		
81	02/229	Fossil in Split Stone	D	F	Rounded Carboniferous Limestone pebble with gastropod or nautiloid in cross section		
81	02/232	Fossil in Split Stone	D	F	Ammonite in a split limestone pebble	May be an erratic pebble from glacial deposits derived from Northern Ireland if found in Carlow.	
81	02/231	Fossil in Split Stone	D	F	*Euomphalus pentangulatus*	A very common marine gastropod in Carboniferous limestone Also called *Straparollus pentangulatus*	
81	02/233	Fossil in Split Stone	D	F			

81	02/228	Fossil in Split Stone	D	F	Cut pebble exposing a coiled nautiloid with body chamber filled with calcite crystals.		
81	02/230	Fossil in Split Stone	D	F	Ammonite internal mould with majority of shell dissolved away.	May be from Northern Ireland?	
81	02/227	Fossil in Split Stone	D	F	*Gryphaea arcuata*	A common Jurassic bivalve of oyster type, also called Devil's toenail	Probably not from Carlow, or even from Ireland at all, though it may have come from NI and there is one enigmatic published record of such fossils having been found in Carlow. If genuine it would represent a residual onshore Jurassic deposit and be important.
81	02/176			F	*Euomphalus pentangulatus*	A very common marine gastropod in Carboniferous limestone Also called *Straparollus pentangulatus*	
81	02/178	Fossil in Split Stone	D	F	*Euomphalus pentangulatus*	A very common marine gastropod in Carboniferous limestone Also called *Straparollus pentangulatus*	
81	02/179	Fossil in Split Stone	D	F	*Gryphaea arcuata*	A common Jurassic bivalve of oyster type, also called Devil's toenail	
81	02/180	Fossil in Split Stone	D	F	*Euomphalus pentangulatus*	A very common marine gastropod in Carboniferous limestone Also called *Straparollus pentangulatus*	
81	02/181	Fossil in Split Stone	D	F	Brachiopod shell, complete in Carboniferous Limestone		
81	02/182	Fossil in Split Stone	D	F	No visible fossil. Small ironstone nodule	Probably from Carboniferous shales	
81	02/183	Fossil in Split Stone	D	F	Terebratulid brachiopod in Carboniferous limestone?		

293	02/2431 A	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Stone sample resembling a book.	Possibly 'Cork Red Marble'	
293	02/2431 B	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Solitary rugose coral fragment.	Possibly *Caninia*. Partly silicified.	
293	02/2431 C	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	G	Echinoderm	Probably Cretaceous. Perhaps from Northern Ireland Chalk. Possibly *Conulus*.	
293	02/2431 D	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Coiled Carboniferous Nautiloid.	Genus and species indeterminate.	
293	02/2431 E	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Marble weight		
293	02/2431 F	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Patterned tile.	Possibly archaeological.	
293	02/2431 G	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Core sample of quartz vein with small galena crystals.		
293	02/2431 H	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Bored limestone	Modern borings by bivalves.	
293	02/2431 I	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Petrified wood??		
293	02/2431 J	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Marble	Same rock type as E.	
293	02/2431 K	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Solitary Rugose coral.	In Carboniferous limestone. Genus and species indeterminate.	

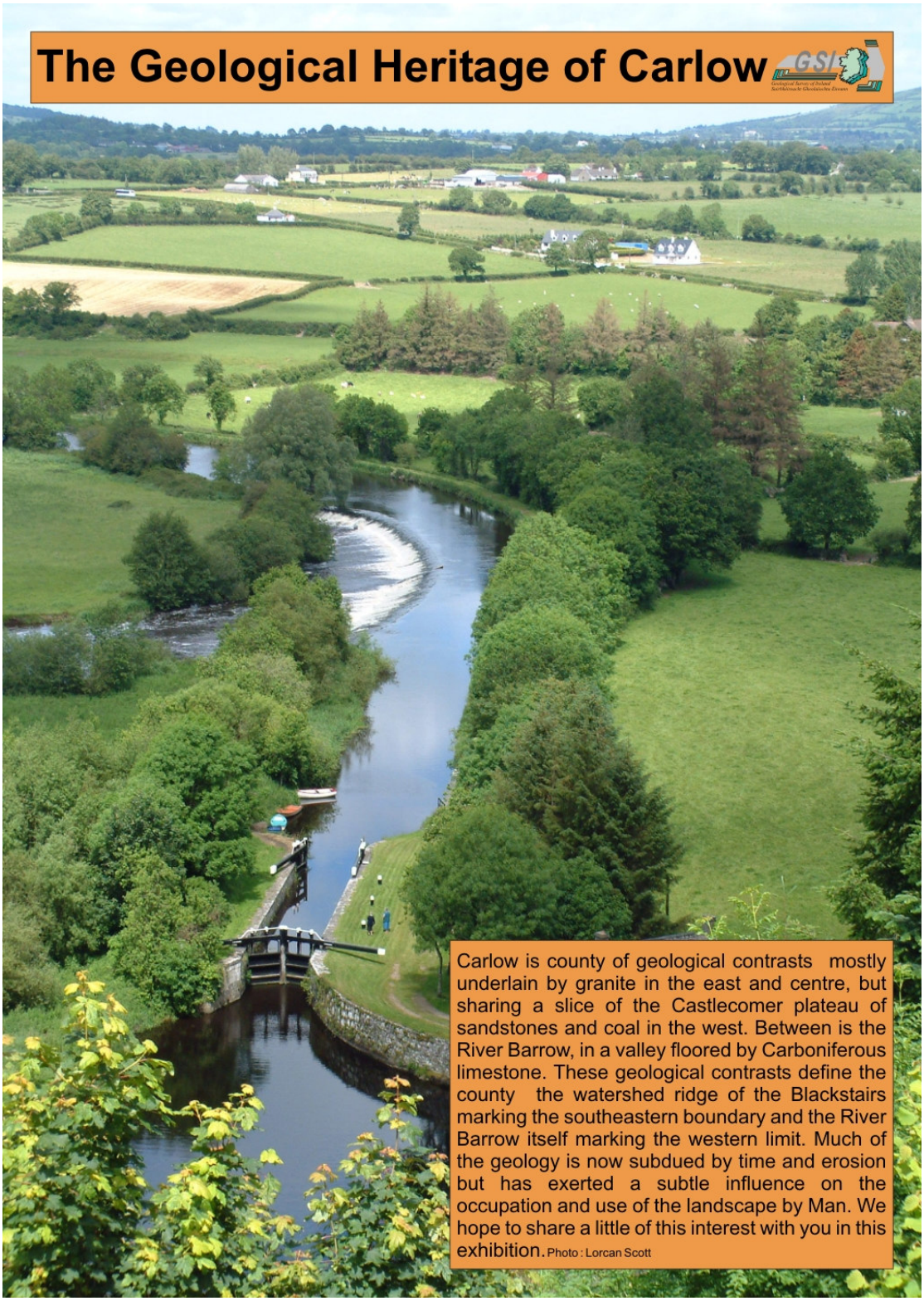
293	02/2431 L	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D		Sawn slab of ?marble	Could be a Jurassic banded marble deposit from Southern England	
293	02/2431 M	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Core of granite	Very micaceous (rich in the mica mineral biotite) with a metamorphic fabric indicating that the rock has been deformed.	
293	02/2431 N	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Brass handle	Not geological. Move to appropriate collection	NWK?
293	02/2431 O	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Polished 'marble' sample	From Cork but not 'Cork Red Marble', probably Carboniferous limestone, perhaps from Little Island.	
293	02/2431 P	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Sample of gypsum	Easily scratched. May be from a teaching set.	
293	02/2431 Q	Part of Jackson Collection, pieces of marble, granite, tiles, crystals, fossils & brass.	D	F	Quartz crystal		
126	02/557	Fossil	?	F	Siltstone	not calcareous, no fossils	NWK?
126	02/558	Fossil	?	F	Siltstone	not calcareous, no fossils	NWK?
126	02/559	Fossil	?	P	Dark grey shale with plant? fossil fragments	Suffering from pyrite decay and will disintegrate eventually	?NWK as fossils are poor.
126	02/560	Fossil	?	F	Carboniferous limestone	No fossil	NWK?
126	02/561	Fossil	?	P	Carboniferous limestone	No fossil except a few crinoid ossicles. Minor pyrite decay	NWK?
126	02/562	Fossil	?	P	Carboniferous limestone with poor brachiopod shell fragment	Some pyrite decay	NWK?
126	02/563	Fossil	?	F	Carboniferous limestone	no fossil	NWK?
126	02/564	Fossil	?	P	Carboniferous limestone	no fossil	NWK?
126	02/565	Fossil	?	F	sandstone	not calcareous, no fossil, some sulphur residue from pyrite decay	NWK?
126	02/566	Fossil	?	F	granite	no fossil	NWK?

240	83/62	*1 Stone approx 37' long???*	D	G	limestone with crinoid stem section in cross section		
240	02/2028	1 Stone 4" x 2.5"	?	F	indeterminate fine grained grey rock, not limestone	probably igneous, or hornfels Would need thin section cut to identify properly	
240	02/2029	1 Fossil Round	?	F	indeterminate nodule	calcareous	
240	02/2030	1 Stone 4" x 3"	?	F	limestone	no fossil	NWK?
240	02/2031	1 Flat Stone 4" x 2.5"	?	F	archaeological tool?	scraper shape	
240	02/2032	1 Fossil 3" x 1.5"	?	F	*Euomphalus pentangulatus*	A very common marine gastropod in Carboniferous limestone Also called *Straparollus pentangulatus*	
240	02/2033	1 Fossil 1.5" x 1.5"	?	F	*Euomphalus pentangulatus*	A very common marine gastropod in Carboniferous limestone Also called *Straparollus pentangulatus*	
240	02/2034	2 Fossil 1.5" x 1.5"	?	F	spiriferid brachiopod	Carboniferous limestone	
240	02/2035	1 Slate Flat 2" x 3"	?	F	slate with glacial striae?	could also be modern scratches	
240	02/2036	1 Fossil	?	F	spiriferid brachiopod	Carboniferous limestone	
240	02/2037	1 Rock 2" x 3"	?	F	silicified coral in Carboniferous limestone		
240	02/2038	1 Fossil	?	F	*Euomphalus pentangulatus*	A very common marine gastropod in Carboniferous limestone Also called *Straparollus pentangulatus*	
240	02/2039	1 Rock Small	?	F	?spiriferid brachiopod		
240	02/2040	1 Rock 2" x 1"	?	F	spiriferid brachiopod	Carboniferous limestone	
240	02/2041	1 Rock 1.5" x 1.5"	?	F	brachiopod	spiriferid group	
240	02/2042	1 Fossil 2" x 1"	?	F	spiriferid brachiopod	Carboniferous limestone	
240	02/2043	1 Rock 1.5" x 1"	?	F	pink calcite	unusual	
240	02/2044	1 Rock 5" x 4"	?	F	sandstone (or decalcified calcareous sandstone) with spiriferid brachiopods	Carboniferous	
240	02/2045	1 Rock 5" x 5"	?	F	Carboniferous limestone with one brachiopod fragment		NWK?
240	02/2046	1 Rock 6" x 4.5"	?	F	?? Not limestone		NWK?
240	02/2047	1 Rock 5" x 4"	?	F	sandstone	no fossil	

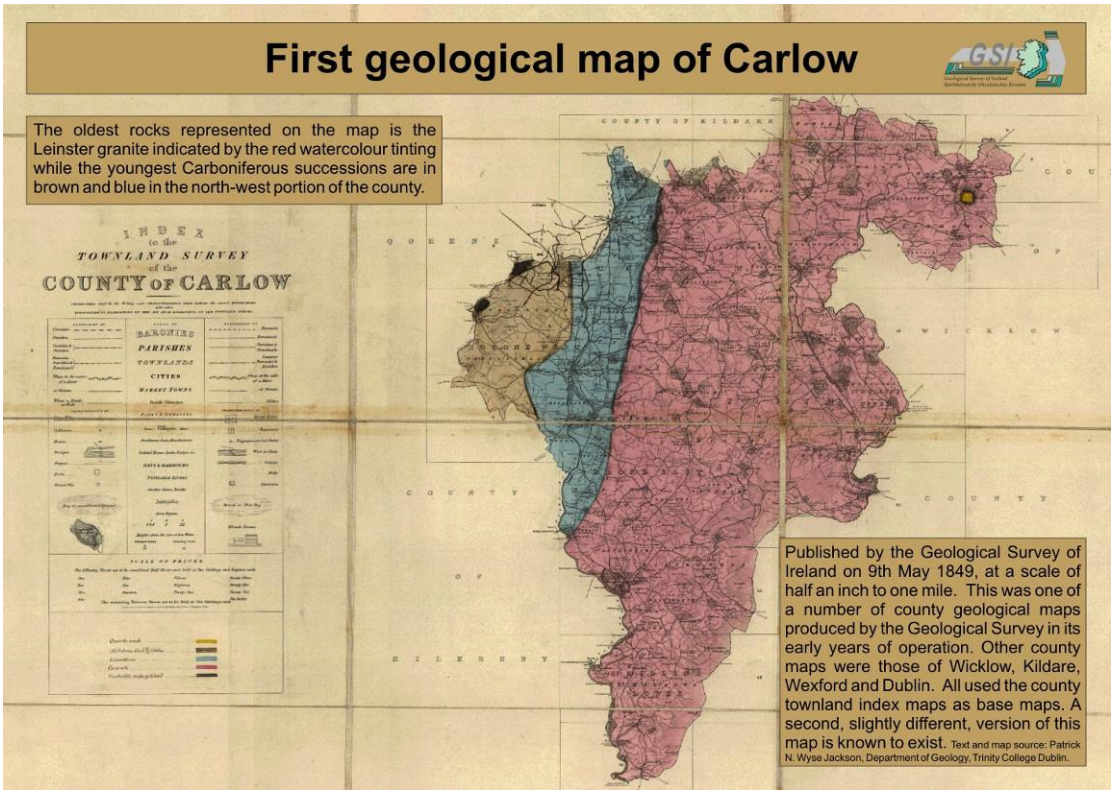
240	02/2048	1 Rock 6" x 3"	?	F	limestone, but probably not Carboniferous in age		NWK?
88	02/214	1 Crystal of Quartz	?	F	Modern coral or recent fossilised coral.	Not from Ireland. More abraded and pebble-like than 02/219	
88	02/219	1 Crystal of Quartz	?	F	Modern coral or recent fossilised coral.	Not from Ireland.	
88	02/212	Seam of Mica in Granite	?	F	Fine-grained granite	No 'seam' of mica present.	
88	02/213	Seam of Mica in Granite	?	F	Fine-grained granite	Piece from 02/212?	
88	02/217	Seam of Mica in Granite	?	F	Granite		
88	02/223	Crystal of Quartz	?	F	Quartz		
88	02/218	Crystal of Quartz	?	F	feldspar and micas	from a pegmatite	
88	02/222	Crystal of Quartz	?	F	Quartz		
88	02/216	Crystal of Quartz	?	F	Quartz		
88	02/220	Crystal of Quartz	?	F	Calcite		
88	02/215	Crystal of Quartz	?	F	Modern or Recent coral	has been rolled around and abraded as a pebble	
88	02/221	Crystal of Quartz	?	F	Modern coral or recent fossilised coral.	Probably from a foreign holiday, not from Ireland	
171	83/94	Petrified Wood	D	F	Petrified Wood	Probably not from Ireland.	
171	83/93/6	Piece of Rock White	D	F	Fibrous Gypsum	Possibly from Kingscourt, Cavan area.	
171	83/77	Axehead	D	F	Axehead made from sandstone	Probably a 'roughout' which was abandoned when a split showed in the cutting edge.	
171	83/73	1 Stone Grey with white Design	D	F	Typical limestone beach pebble with calcite veins.		
171	83/79	Rock in 2 pieces from the Penrhyn Quarry N Wales	D	F	cracked open' nodule with pyrite and chalcopyrite veins internally		
171	83/93/9	1 Piece of Rock Orange/Yellow Jackson	D	F	Quartz with purple fluorite or amethyst vein.	Probably worked as a jewellery piece but was abandoned when it split on drilling a hole.	
171	83/93/8	White Delph Flower Broken Jackson	D	F	yes!		

171	80/79	1 Piece of Slate	D	F	Slate	Typical North Wales roofing slate.	
171	02/1330	1 Rock 7" x 2.5"	D	F	Coarse-grained schist	Possibly a spearhead 'roughout'.	
171	83/109/10	1 Small Stone with	D	F	Schist	Used as a weight for spinning or fishing.	
171	02/1331	1 Rock 3" x 1.5"	?	F	Laminated limestone pebble	Unusually shaped due to varying resistance to erosion in different bands.	
171	02/1332	1 Rock 4" x 7"	?	F	Psammite (banded schist)	Metamorphosed sandstone.	
171	02/1333	1 Rock 3.5" x 1.5"	?	F	Carboniferous Gastropod	Quite worn so unidentifiable.	
171	02/1334	1 Round Rock	?	F	Core of Quartz mineralisation.		
171	02/1335	1 Stone in Half Shell	?	F	Ironstone nodule with soft corestone.	Unusual soft centre.	
171	02/1336	1 Fossil	?	F	Pebble of coral fragment.	Notes with sample	
96	82/18	Fossilised "squid" in limestone block Inscribed. "Gift of Ned Byrne" side Back "Bawnleath Quarry 1981 70 Million Years Old APP" rox in pencil.	D	G	orthoconic nautiloid, possibly *Rayonnoceras*	Probably from the Ballyadams Formation, therefore around 340 million years old. Apparent rapid tapering of the cone is false due to the angle of the cut section not being paralle to the length.	Good display specimen

The Geological Heritage of Carlow



Carlow is county of geological contrasts mostly underlain by granite in the east and centre, but sharing a slice of the Castlecomer plateau of sandstones and coal in the west. Between is the River Barrow, in a valley floored by Carboniferous limestone. These geological contrasts define the county the watershed ridge of the Blackstairs marking the southeastern boundary and the River Barrow itself marking the western limit. Much of the geology is now subdued by time and erosion but has exerted a subtle influence on the occupation and use of the landscape by Man. We hope to share a little of this interest with you in this exhibition. Photo : Lorcan Scott


First geological map of Carlow
GSI
The oldest rocks represented on the map is the Leinster granite indicated by the red watercolour tinting while the youngest Carboniferous successions are in brown and blue in the north-west portion of the county.
INDEX
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COUNTY of CARLOW
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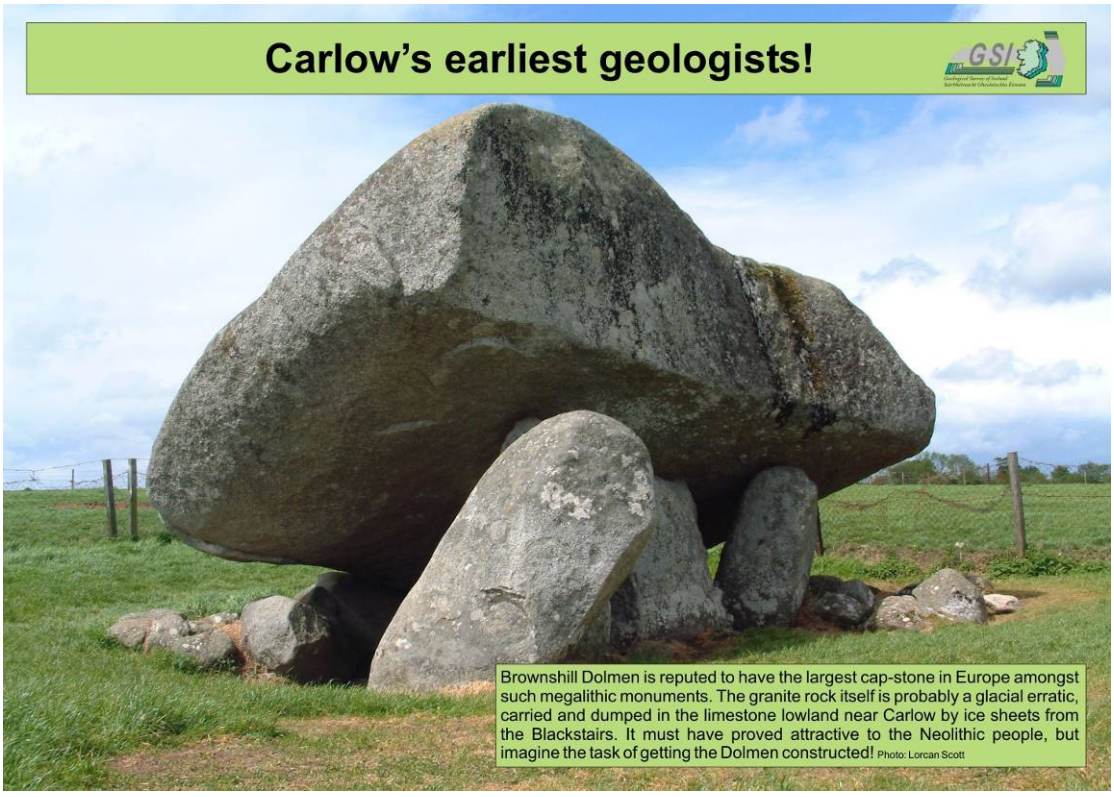
COUNTY
KILKENNY
Published by the Geological Survey of Ireland on 9th May 1849, at a scale of half an inch to one mile. This was one of a number of county geological maps produced by the Geological Survey in its early years of operation. Other county maps were those of Wicklow, Kildare, Wexford and Dublin. All used the county townland index maps as base maps. A second, slightly different, version of this map is known to exist. Text and map source: Patrick N. Wyse Jackson, Department of Geology, Trinity College Dublin.


Carlow's earliest geologists!
GSI
Brownshill Dolmen is reputed to have the largest cap-stone in Europe amongst such megalithic monuments. The granite rock itself is probably a glacial erratic, carried and dumped in the limestone lowland near Carlow by ice sheets from the Blackstairs. It must have proved attractive to the Neolithic people, but imagine the task of getting the Dolmen constructed! Photo: Lorcan Scott

Samuel Haughton (1821-1897)

Samuel Haughton (1821-1897) was a remarkable man who had interests in many fields: geology, mathematics, medicine, biology, physics, and education. It is therefore not surprising that he is today often described as being a "Victorian polymath".

He was born in Carlow to Quaker parents but was brought up an Anglican. He entered Trinity College at the age of sixteen and remained there for the rest of his life. He was a highly talented student and he obtained a Fellowship at the unusual and very young age of 24. Like many Fellows at this time he then became ordained. Haughton's early work was in the fields of mathematics and geology and he was appointed as Professor of Geology in 1851. His geological work included research on granites, Carboniferous fossils, and meteorites. He calculated the age of the Earth and arrived at a date of 2,000 million years; however he felt this to be too high and so he revised this figure a few years later to 200 million years [today the Earth is known to be 4,500 million years old].

He later studied medicine and carried out much work on animal muscles and mechanics. He calculated the length of drop in hanging, which would cause instant death - up until this time many of those condemned simply suffered slow strangulation.

He was President of the Royal Irish Academy and is commemorated by the Haughton House at Dublin Zoo. He is buried at Killeshin, County Carlow.

Text: Patrick N. Wyse Jackson

John Tyndall (1820-1893)

John Tyndall (1820-1893) rose from humble origins to become a highly influential scientist and educator. Born at Leighlinbridge, County Carlow, he received his early education locally before becoming a surveyor in Ireland and later in England. He then obtained a position as a teacher at a school in Hampshire which contained a good laboratory. This whetted his appetite for experimental science and so he moved to Marburg in Germany where he studied chemistry under Robert Bunsen.

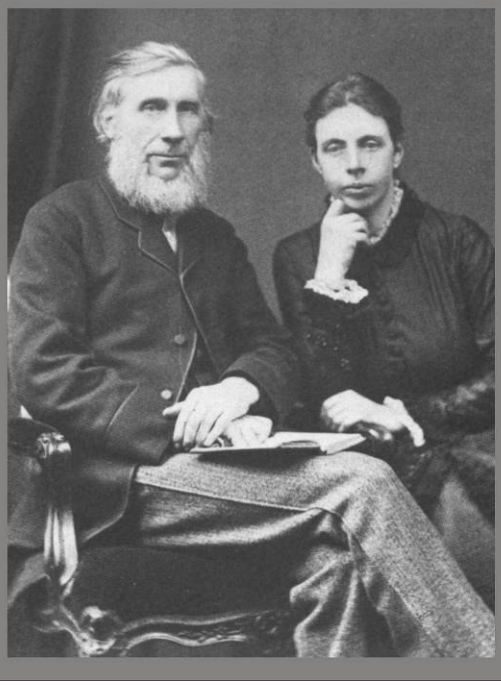
On his return to England he was unable to obtain a university position, but in 1853 was appointed to the Royal Institution in London where he was a frequent and popular lecturer.

He was interested in the interaction between light and gas, and was able to explain satisfactorily why the sky is blue - this he showed was due to the different wavelengths of light being dispersed by molecules in the atmosphere. He measured the pollution in London for the first time and devised a method of sterilisation of food called Tyndallisation where food is heated several times rather than once as in the process of Pasteurisation.

For recreation he spent a great deal of time in the Alps where he was a noted mountaineer. After his marriage in 1876 he built a small house in the region where he continued to carry out research on among many subjects, solar radiation and glaciers.

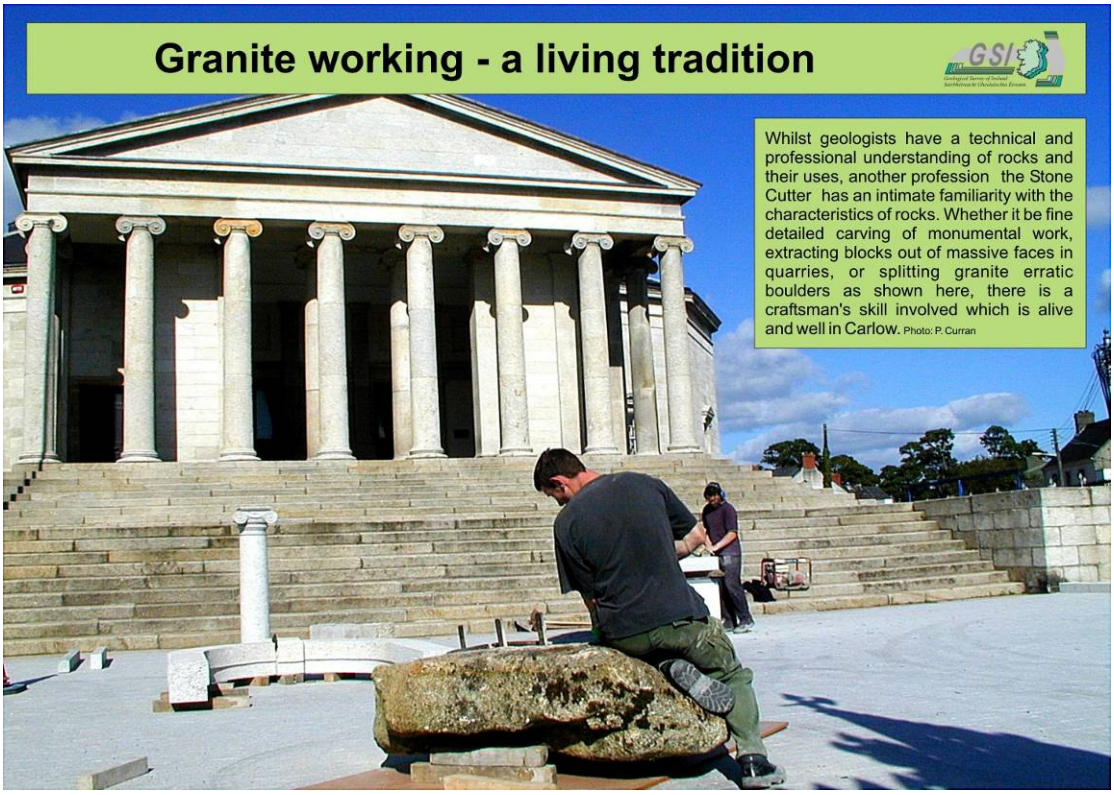
Tyndall died in 1893 when his young wife accidentally gave him a large dose of sleeping draught rather than indigestion remedy that he had requested. He remarked to her "You have killed your John" and he died later that night. He was buried in London and a commemorative stone was erected close to his alpine home in 1911.

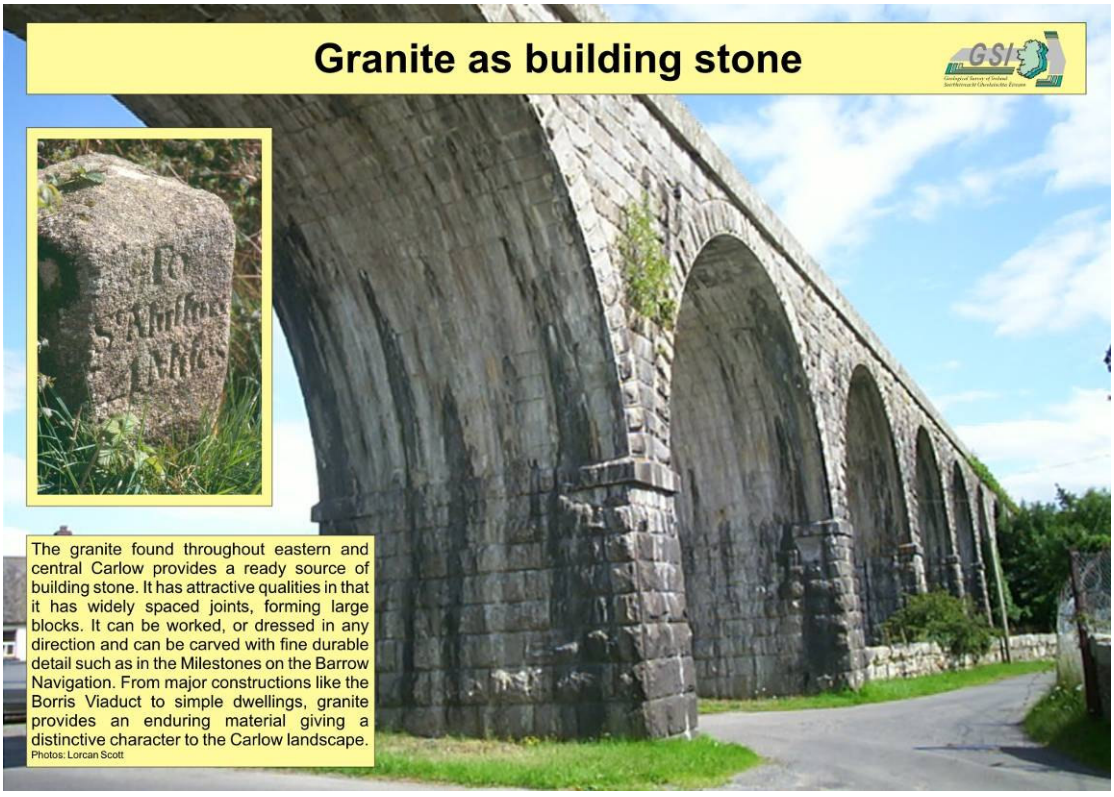
Photo: John and Louisa Tyndall, Text: Patrick N. Wyse Jackson



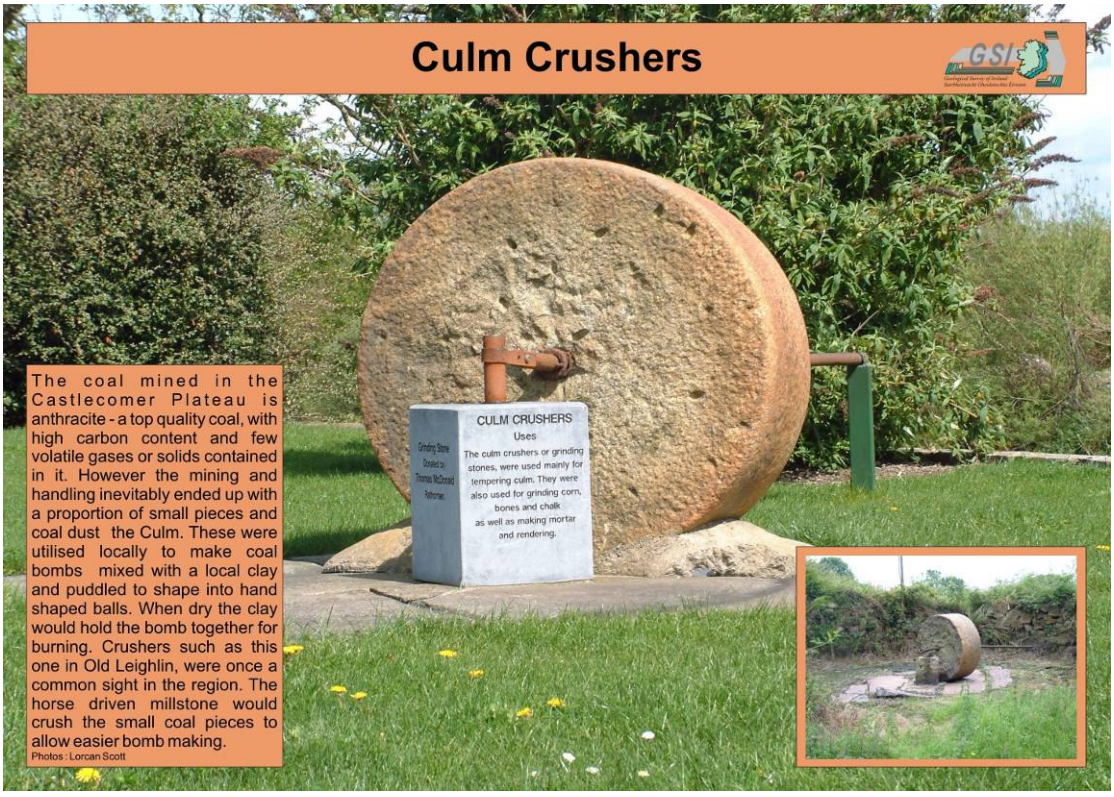
Carlow's past life

The sedimentary rocks are the record of the environments in which they formed. The shells and bones of the animals and the remains of the plants sometimes preserved as fossils are part of that evidence. Carlow's limestone formations are no exception and in places are richly fossiliferous. Around 330 million years ago the limestone was forming in a tropical sea, when Ireland was near the equator. Animals such as this massive orthoconic (a straight cone shaped) nautiloid were swimming around in the sea. Its modern relatives are the squid and cuttlefish. Other Carlow fossils from the limestone may be displayed here. Photo : Sophie Preteseille

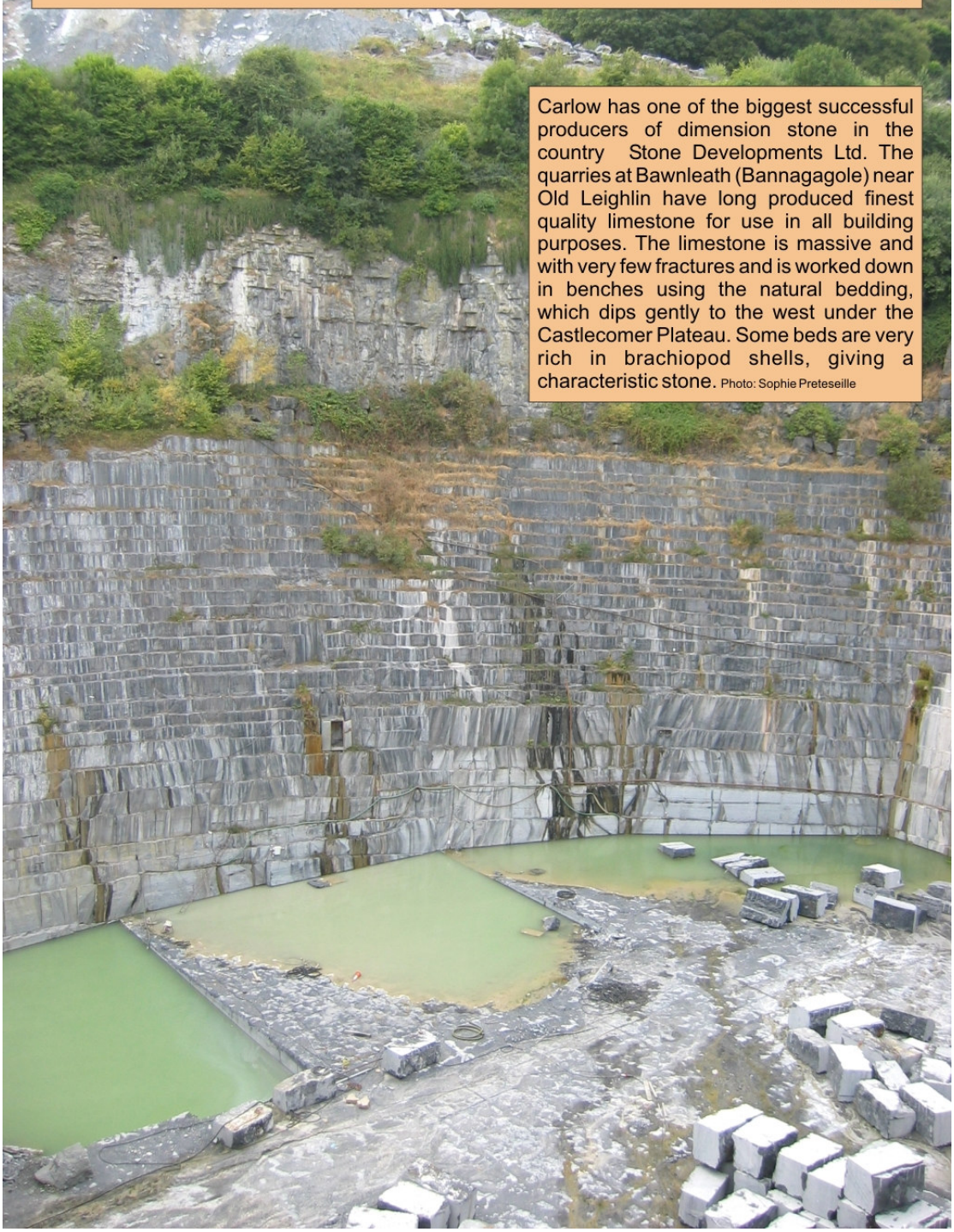

Granite working - a living tradition
GSI
Whilst geologists have a technical and professional understanding of rocks and their uses, another profession the Stone Cutter has an intimate familiarity with the characteristics of rocks. Whether it be fine detailed carving of monumental work, extracting blocks out of massive faces in quarries, or splitting granite erratic boulders as shown here, there is a craftsman's skill involved which is alive and well in Carlow. Photo: P. Curran


Granite as building stone
GSI
The granite found throughout eastern and central Carlow provides a ready source of building stone. It has attractive qualities in that it has widely spaced joints, forming large blocks. It can be worked, or dressed in any direction and can be carved with fine durable detail such as in the Milestones on the Barrow Navigation. From major constructions like the Borris Viaduct to simple dwellings, granite provides an enduring material giving a distinctive character to the Carlow landscape.
Photos: Lorcan Scott

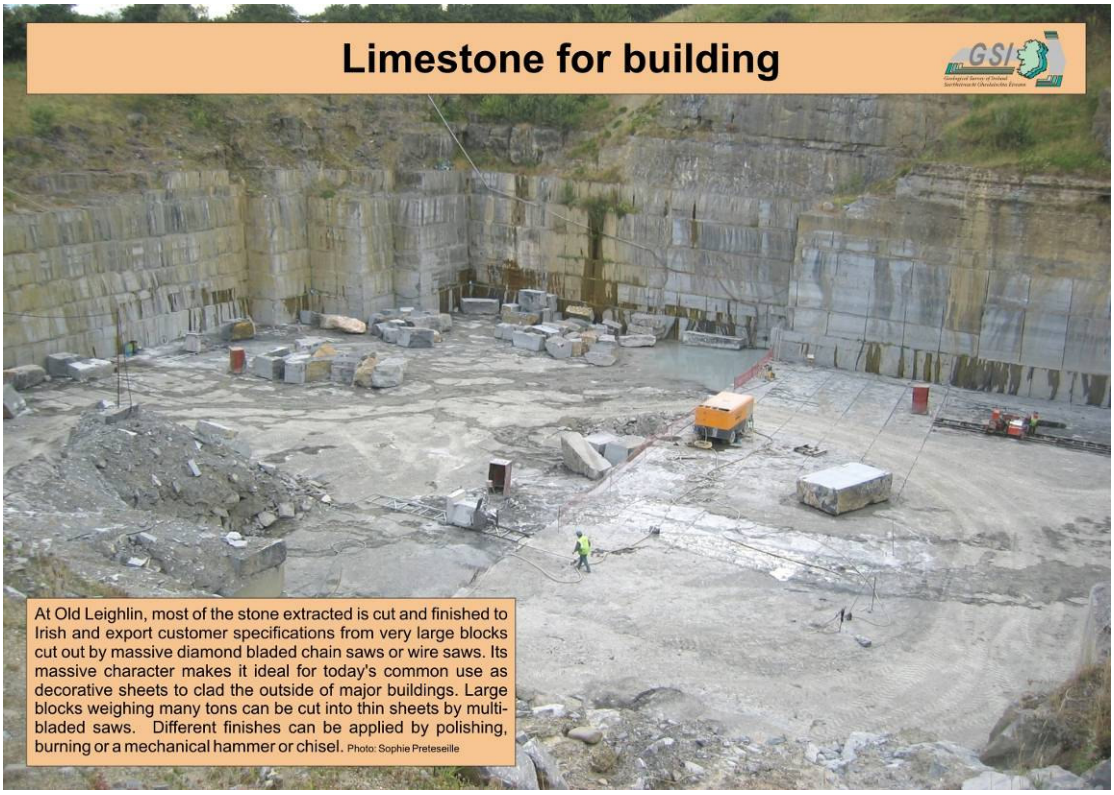

The Carlow Fence
A distinctive feature of Carlow is the decorative fence made of granite pieces, crudely worked to shape and assembled together like this example from Oakpark House. These are probably unique to Carlow. If you know of other examples, please contact the Heritage Officer. Photo: Lorcan Scott

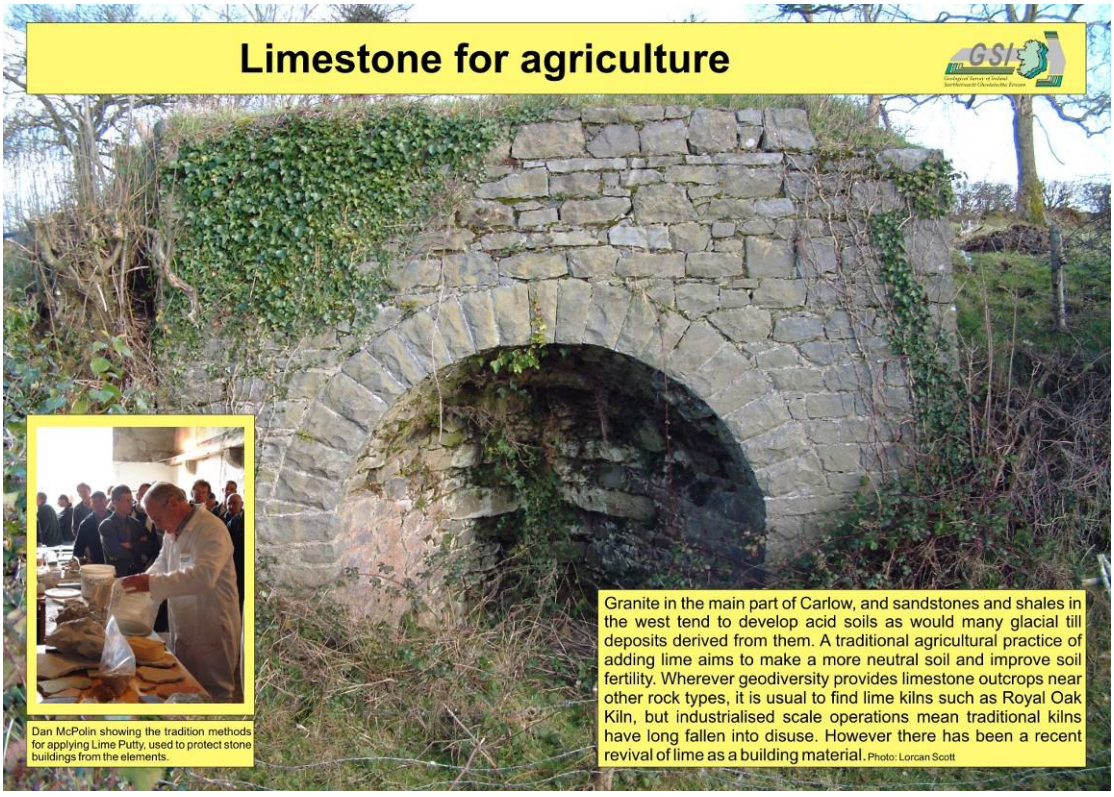

Culm Crushers
The coal mined in the Castlecomer Plateau is anthracite - a top quality coal, with high carbon content and few volatile gases or solids contained in it. However the mining and handling inevitably ended up with a proportion of small pieces and coal dust the Culm. These were utilised locally to make coal bombs mixed with a local clay and puddled to shape into hand shaped balls. When dry the clay would hold the bomb together for burning. Crushers such as this one in Old Leighlin, were once a common sight in the region. The horse driven millstone would crush the small coal pieces to allow easier bomb making.
Photos : Lorcan Scott
CULM CRUSHERS
Uses
The culm crushers or grinding stones, were used mainly for tempering culm. They were also used for grinding corn, bones and chalk as well as making mortar and rendering.

Limestone for building

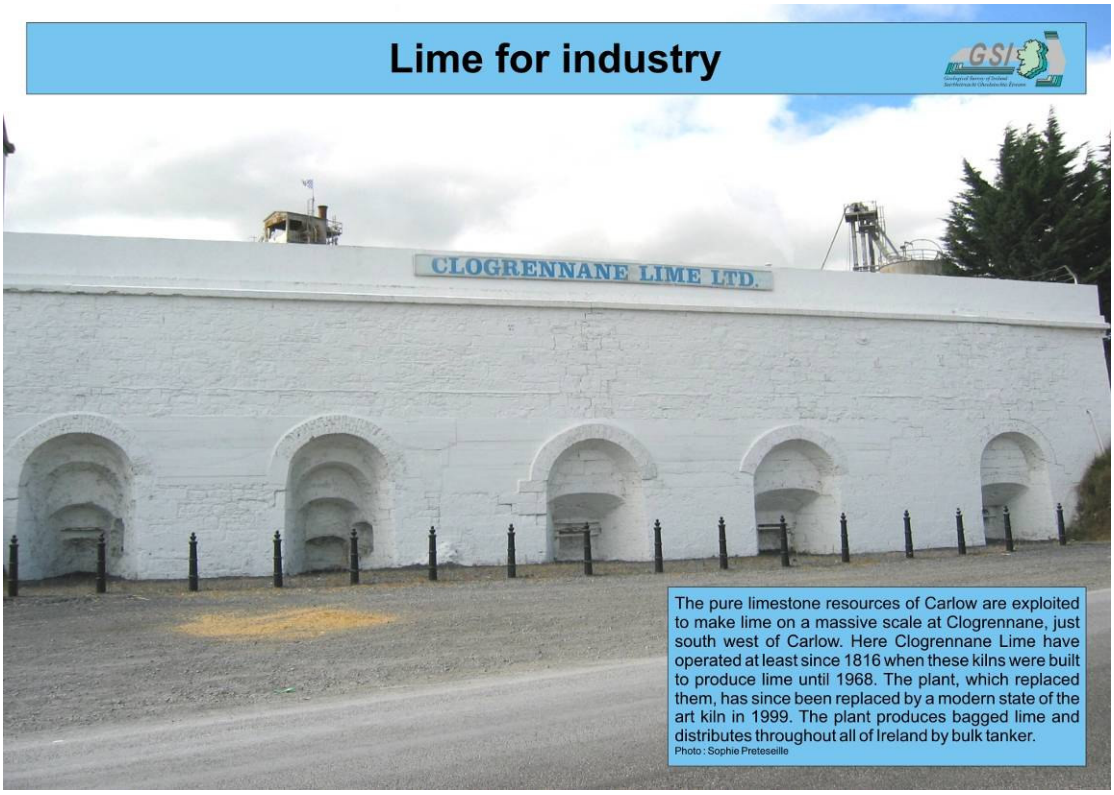


Carlow has one of the biggest successful producers of dimension stone in the country Stone Developments Ltd. The quarries at Bawnleath (Bannagagole) near Old Leighlin have long produced finest quality limestone for use in all building purposes. The limestone is massive and with very few fractures and is worked down in benches using the natural bedding, which dips gently to the west under the Castlecomer Plateau. Some beds are very rich in brachiopod shells, giving a characteristic stone. Photo: Sophie Preteseille


Limestone for building
GSI
At Old Leighlin, most of the stone extracted is cut and finished to Irish and export customer specifications from very large blocks cut out by massive diamond bladed chain saws or wire saws. Its massive character makes it ideal for today's common use as decorative sheets to clad the outside of major buildings. Large blocks weighing many tons can be cut into thin sheets by multi-bladed saws. Different finishes can be applied by polishing, burning or a mechanical hammer or chisel. Photo: Sophie Preteseille

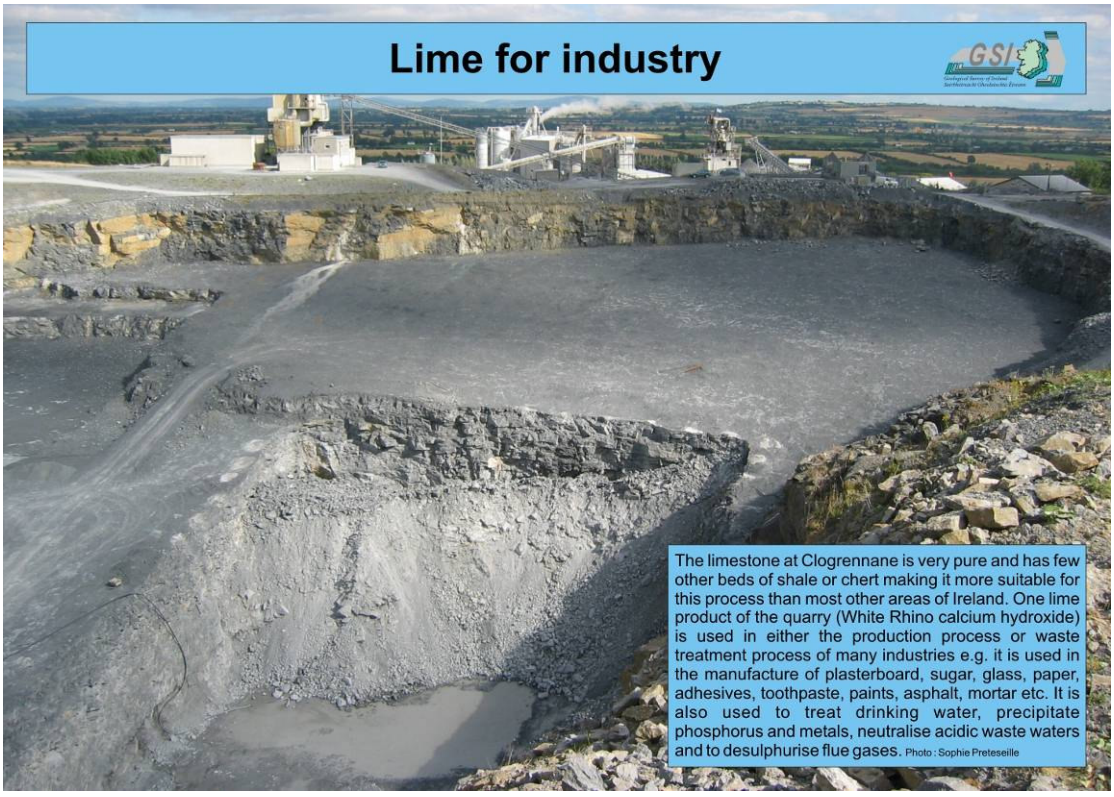

Limestone for agriculture
GSI
Dan McPolin showing the tradition methods for applying Lime Putty, used to protect stone buildings from the elements.
Granite in the main part of Carlow, and sandstones and shales in the west tend to develop acid soils as would many glacial till deposits derived from them. A traditional agricultural practice of adding lime aims to make a more neutral soil and improve soil fertility. Wherever geodiversity provides limestone outcrops near other rock types, it is usual to find lime kilns such as Royal Oak Kiln, but industrialised scale operations mean traditional kilns have long fallen into disuse. However there has been a recent revival of lime as a building material. Photo: Lorcan Scott

Lime for industry



The pure limestone resources of Carlow are exploited to make lime on a massive scale at Clogrennane, just south west of Carlow. Here Clogrennane Lime have operated at least since 1816 when these kilns were built to produce lime until 1968. The plant, which replaced them, has since been replaced by a modern state of the art kiln in 1999. The plant produces bagged lime and distributes throughout all of Ireland by bulk tanker.
Photo : Sophie Preteseille

Lime for industry

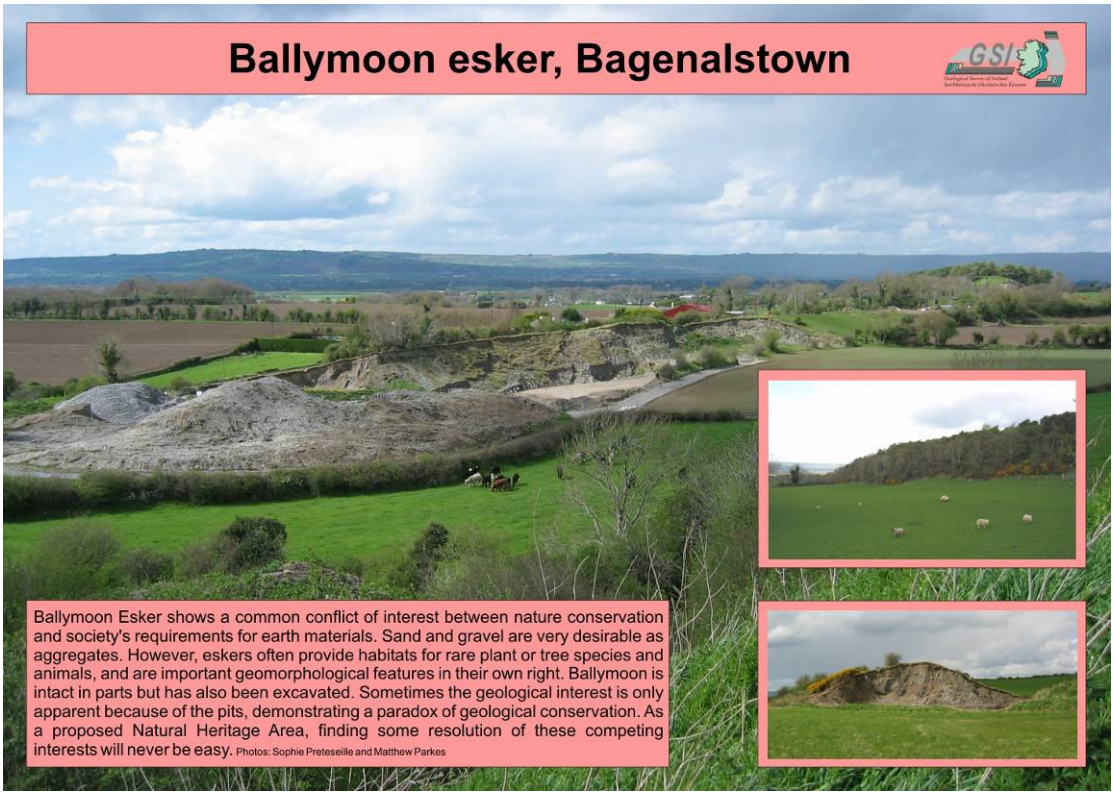


The limestone at Clogrennane is very pure and has few other beds of shale or chert making it more suitable for this process than most other areas of Ireland. One lime product of the quarry (White Rhino calcium hydroxide) is used in either the production process or waste treatment process of many industries e.g. it is used in the manufacture of plasterboard, sugar, glass, paper, adhesives, toothpaste, paints, asphalt, mortar etc. It is also used to treat drinking water, precipitate phosphorus and metals, neutralise acidic waste waters and to desulphurise flue gases. Photo : Sophie Preteseille

Rocks are resources

Morrissey's Quarry, at Clonmelsh near Carlow town demonstrates just how important rocks are to our everyday lives. Limestone is blasted and crushed in the quarry for a variety of purposes, mostly in construction. Its aggregates are used for road construction, rail ballast, ready-mix concrete, blocks, tarmac, agricultural lime and other purposes. The quarry is also a good place to see the gentle westerly dip of the Ballysteen Limestone Formation beds under the Castlecomer plateau, and the depth of overburden - glacial deposits at the land surface. Photo: Matthew Parkes

Ballymoon esker, Bagenalstown



Ballymoon Esker shows a common conflict of interest between nature conservation and society's requirements for earth materials. Sand and gravel are very desirable as aggregates. However, eskers often provide habitats for rare plant or tree species and animals, and are important geomorphological features in their own right. Ballymoon is intact in parts but has also been excavated. Sometimes the geological interest is only apparent because of the pits, demonstrating a paradox of geological conservation. As a proposed Natural Heritage Area, finding some resolution of these competing interests will never be easy. Photos: Sophie Preteseille and Matthew Parkes

Eskers

This example shows the immediate pressure on important geomorphological features and landscapes as sand and gravel aggregate resources. Finding the right balance between meeting development needs and maintaining a network of sites for conservation is difficult and the County Geological Site protection through the planning system must be effective in maintaining local examples of geomorphological features, such as Bagenalstown esker. Some eskers are protected as natural woodland habitats but here the sand martins burrows are a new wildlife interest.
Photo: Matthew Parkes

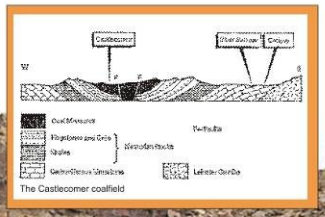
Ballyellin Quarry

Before the Ice Age, when sheets of ice scoured the land surface, the present day land area was largely exposed and being eroded for many millions of years. Evidence of the Tertiary and older periods of geological time back to the Jurassic is a rarity. Occasionally, depressions in the Carboniferous limestone landsurface were filled by Tertiary sediments, which then escaped the drastic resculpting of the landscape by glaciers. Ballyellin Quarry has such a depression: a pipe about 15m wide with clays and gravels from the weathering of the nearby Leinster Granite. Such deposits are geologically important, but constitute a problem for the quarry operators. Photos : Sophie Preteseille

Aclare

Within the area of a few fields at Aclare, east of Myshall, there is a scatter of surface boulders of an interesting rock type with unusual minerals. The boulders are all resistant white quartz, feldspar and some other minerals, comprising a pegmatite. Pegmatites form during late stages of the cooling of a granite mass, and are very coarse grained equivalents of the granite, but they may have a concentration of particular elements in them producing strange minerals. At Aclare and a few adjacent areas the element lithium is involved, with minerals such as spodumene occurring. The deposit below surface has been drilled and is not considered to be economic i.e. in big enough amounts to be worth the cost of mining. Photos: Sophie Preteseille

The Coal Measures



The Castlecomer Plateau is actually a saucer shaped structure with the youngest rocks occurring in the middle and the rim upturned. The youngest rocks are the "Coal Measures". These are rocks that formed in a swampy environment on top of a massive delta which built out into the shallow seas which existed earlier in the Carboniferous period. The Coal itself is formed from dead plant material. From Sir Richard Griffiths' Irish Coalfield Surveys in the early 1800's, geologists have analysed the past environments and the present day structure, including small faults which disturb the coal seams, to determine where best to mine during the centuries of exploitation.
Photo: Matthew Parkes, Diagram: *Geology and Scenery in Ireland*, J.B. Whittow

Keeping Mining Heritage Alive

Mining was once the heart of communities in the Castlecomer Plateau. The geological heritage is intimately interwoven with the cultural heritage of people who lived and worked in association with the coal mines. There are small-scale operations still going today, both underground and open-cast (mostly in County Kilkenny), but the Castlecomer Colliery Mining Heritage Group are working to preserve and present this heritage. The photo shows Willie Joe Mealy keeping alive the tradition of making coal bombs "dancing the culm", when they hosted the Mining Heritage Trust of Ireland AGM in 2002. Photo: Matthew Parkes

CARLOW - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Kilcarry Mine**		
Other names used for site			
TOWNLAND(S)	Craan		
NEAREST TOWN	Kildavin		
SIX INCH MAP NUMBER			
NATIONAL GRID REFERENCE	289300 162900		
1:50,000 O.S. SHEET NUMBER	61	**1/2 inch Sheet No.**	19

Outline Site Description
A disused mine or mine trial adit.

Geological System/Age and Primary Rock Type
The mine adit is within schists of the Maulin Formation (Ordovician) adjacent to the contact with the Tullow Pluton of the Leinster Granite. Age and type of mineralisation is not clear.

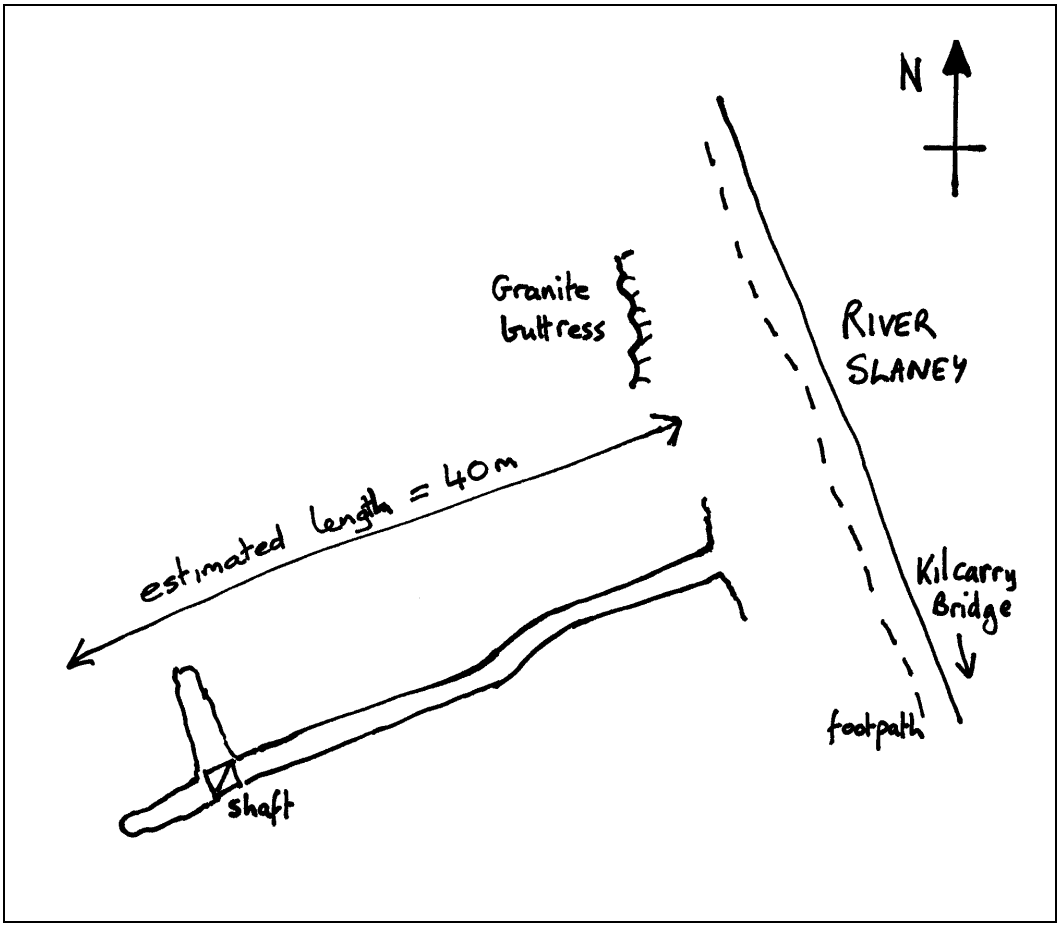
Main Geological or Geomorphological Interest
The mine adit goes in perpendicular to the river bank for approximately 35m, where there is a flooded shaft, although it looks as if it is only a metre or two deep. There is about 5m of adit beyond the shaft and a 5m drive to the right at the shaft. The fragmentary drill holes in the roof look very smooth and as if they have been drilled with a mechanical drill, suggesting it is a more modern adit, rather than an 18th century or early 19th century work with hand drilled effort. There are some quartz vein remnants in the slightly wider adit mouth, but no obvious signs of other mineralisation. It is only speculative as to what was mined, if anything, and it could have been simply an exploratory trial, rather than a productive mine. No extant records have been identified in the GSI mine records, nor any mention of this adit on 19th century geological fieldsheets, again suggesting it postdates 1890 or so. It is only about 10m from the nearest granite outcrop, so is probably associated with mineralisation associated with intrusion of the granite. The 19th century fieldsheet suggests that it is within a schist and granite intermingled outcrop.

Site Importance
The site is of some local and historical interest, but is not important.

Management/promotion issues
As it is short and unspectacular this mine is not really suitable for promotion. Also the land ownership and access situation along the riverbank to access it may be an issue as it is on private farmland.

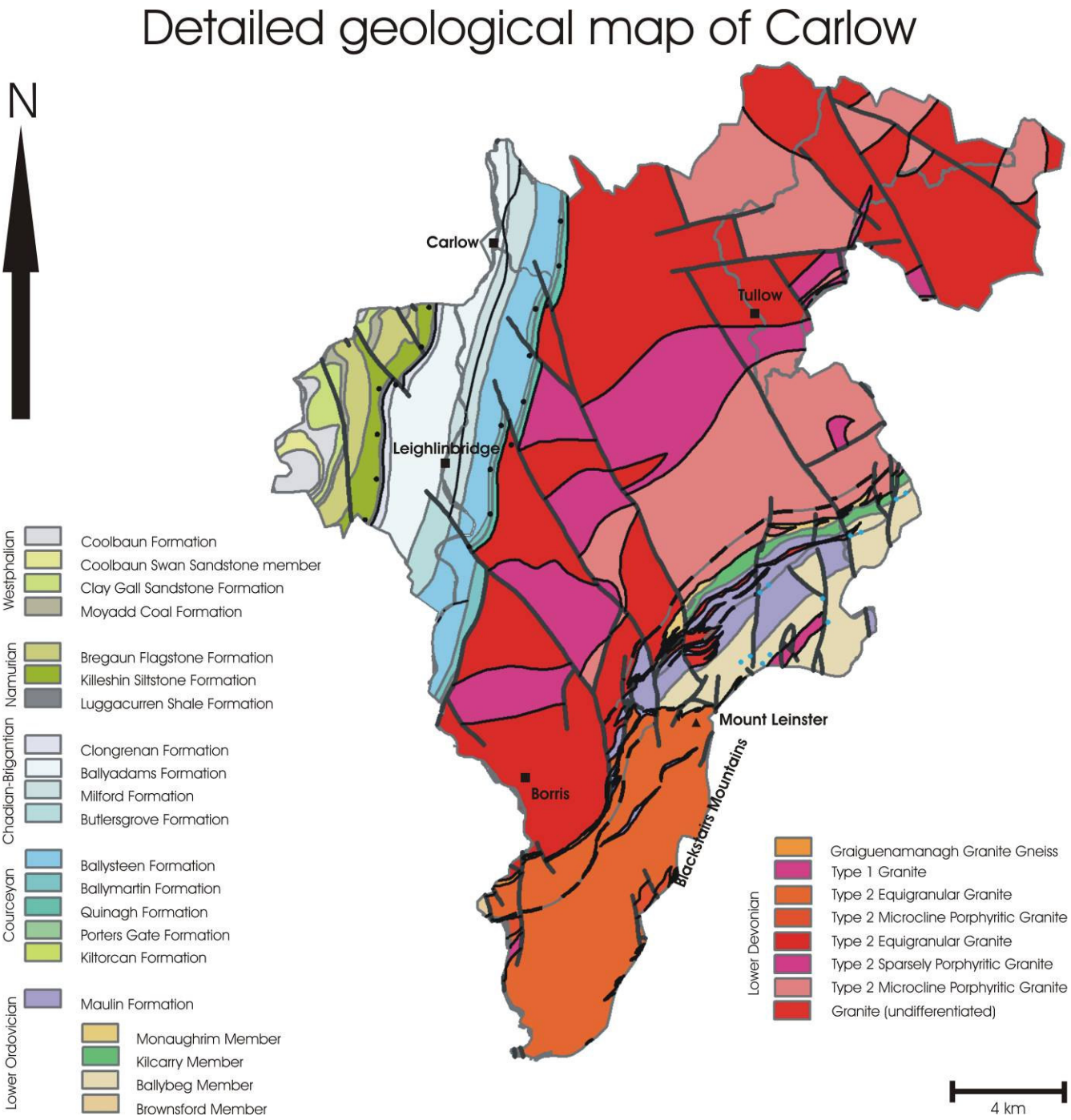
Far left: the nearest granite buttress by the mine.
Left: view into the mine adit from the entrance. White helmet of person returning is visible top centre.

Enlarged extract of GSI 6 inch to the mile 19th century fieldsheet, showing probable mine location within the granite outcrop (coloured pinky red), where granite and schists (coloured purple) are intermixed.



Sketch survey of mine working.

Appendix 7


Detailed geological map of Carlow
N
Carlow
Tullow
Leighlinbridge
Mount Leinster
Borris
Blackstairs Mountains
Westphalian
Coolbaun Formation
Coolbaun Swan Sandstone member
Clay Gall Sandstone Formation
Moyadd Coal Formation
Namurian
Bregaun Flagstone Formation
Killeshin Siltstone Formation
Luggacurren Shale Formation
Chadian-Brigantian
Clongrenan Formation
Ballyadams Formation
Milford Formation
Butlersgrove Formation
Courceyan
Ballysteen Formation
Ballymartin Formation
Quinagh Formation
Porters Gate Formation
Kiltorcan Formation
Lower Ordovician
Maulin Formation
Monaughrim Member
Kilcarry Member
Ballybeg Member
Brownsford Member
Lower Devonian
Graiguenamanagh Granite Gneiss
Type 1 Granite
Type 2 Equigranular Granite
Type 2 Microcline Porphyritic Granite
Type 2 Equigranular Granite
Type 2 Sparsely Porphyritic Granite
Type 2 Microcline Porphyritic Granite
Granite (undifferentiated)
4 km