The Geological Heritage of Roscommon

An audit of County Geological Sites in Roscommon

By Matthew Parkes, Robert Meehan and Sophie Préteseille
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The Roscommon Geological Heritage Project was supported by

An Chomhairle Oidhreachta
The Heritage Council

GSI
Suirbhéireacht Gheolaíochta Éireann
Geological Survey of Ireland

ROSCOMMON
COUNTY COUNCIL

County Roscommon
Heritage Forum
Fóram Oidhreachta
Chontae Ros Comáin

**This report is an action of the
County Roscommon Heritage Plan 2012 – 2016**

For the:
Irish Geological Heritage Programme
Geological Survey of Ireland
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Site name
Not represented in Roscommon

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Report Summary

County Roscommon is a geologically diverse place with many landscapes, areas and sites treasured by both natives and visitors. The bedrock foundation, with hundreds of millions of years in its formation and shaping, and the more recent history of geomorphological processes such as limestone solution and scouring by glaciers, are what has created that underlying geodiversity. Geological understanding and interpretation is best done on the ground at sites where the rocks and landforms are displayed. County Roscommon has a wealth of such natural and human-influenced sites, particularly of karstic and glacial types.

This report documents what are currently understood to be the most important geological sites within Roscommon by the Irish Geological Heritage Programme (IGH) of the Geological Survey of Ireland (GSI). It proposes them as County Geological Sites (CGS), for inclusion within the Roscommon County Development Plan (CDP). The audit provides a reliable study of sites to replace a provisional listing based on desk study which was adopted in a previous CDP.

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, many 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 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. However, many of these sites fall within existing pNHAs and SACs where the ecological interest is founded upon the underlying geodiversity. The commission of this audit and adoption of the sites within the County Development Plan ensure that County Roscommon follows a now established and effective methodology for ensuring that geological heritage is not overlooked in the general absence of allocated resources for progress at national level. It keeps Roscommon at the forefront of geological conservation in Ireland.

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This report is written in non-technical language (with a glossary for unavoidable geological terminology) as a working document for use by the Heritage Officer and the Planning department of Roscommon County Council. It will also be made available via the County Council website for the people of Roscommon. A chapter of the report includes recommendations on how to best present and promote the geological heritage of Roscommon to the people of the county. It will also inform the work of the IGH Programme and be made available through the GSI website.

The preliminary sections, summary geological history and accompanying map, timescale and stratigraphical column particularly may be used as they stand to preface a booklet or as website information in the development of this work, and for information as seen fit by the Heritage Officer. The contents also provide the essential ingredients for a public-oriented booklet on the geological heritage of Roscommon.

Roscommon in the context of Irish Geological Heritage

This report ensures Roscommon is active at the forefront of geological heritage within Ireland, as it is only the ninth county to commission such an audit within the scope of the county-based Heritage Plan. It will hopefully encourage other local authorities to follow what is now a tried and trusted methodology. In the absence of significant political and economic resources available to the relevant bodies for geological heritage conservation as Natural Heritage Areas (NHA) at a national level, it represents a significant level of progress in defining and safeguarding Ireland's geological heritage.

It also 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 Geological Survey of Ireland (GSI) views partnerships with the local authorities, exemplified by this report, as a very important element of its strategy on geological heritage (see Appendix 1).

The Irish Geological Heritage Programme (IGH) in the Geological Survey of Ireland 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 entire spectrum within Irish geology and geomorphology under 16 different themes:

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

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.

Designation of geological NHAs is by the GSI's partners in the Programme, the National Parks and Wildlife Service (NPWS) currently operating within the Department of Arts, Heritage and the Gaeltacht. Once designated any geological NHAs will be subject to normal statutory process within the Roscommon Planning Department and other relevant divisions. **However, management issues for geological sites are generally less, and somewhat different from many ecological designations. The following section considers these issues**.

From a national perspective, as a result of extensive comparison of similar sites to establish which are the best, there is now a good knowledge of many other sites, which are not 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 important sites that are proposed for County Geological Site (CGS) listing in the County Development Plan, along with the clear NHA selections.

Currently, in 2012, a Master List of candidate CGS and NHA sites has been established in GSI with the help of Expert Panels for all the 16 IGH themes. For several themes, the entire process has been largely completed and detailed site reports and boundary surveys have been done along with a Theme Report. Due to various factors, they have not been formally designated yet, although only a very small number of sites (e.g. Moyvannan Mushroom Stones) were considered to be of national importance and to be put forward as Natural Heritage Areas (NHA). Therefore, inclusion of all sites as County Geological Sites (CGS) in Roscommon's planning system will ensure that they are not inadvertently damaged or destroyed through lack of awareness of them outside of the IGH Programme in GSI.

The sites proposed here as County Geological Sites (CGS) have been visited and assessed specifically for this project, and represent our current state of knowledge. It does not exclude other sites being identified later, or directly promoted by the Council itself, or by local communities wishing to draw attention to important sites for amenity or education with an intrinsic geological interest. New excavations, such as major road cuttings or new quarries for example, can themselves be significant and potential additions to this selection.

It was not possible within the scope of this study to identify landowners except in a few sites, but it is emphasised that listing here is not a statutory designation, and carries no specific implications or responsibilities for landowners. It is a primarily a planning tool, designed to record the scientific importance of specific features, and to provide awareness of them in any decision on any proposed development that might affect them. It thus also has an educational role for the wider public in raising awareness of this undervalued component of our shared natural heritage.

Geological conservation issues and site management

Since **geodiversity is the often forgotten foundation for much of the biodiversity** which has been identified for conservation through SAC or NHA designation, it is unsurprising that many of the most important geological sites are actually in 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. The first, which are the most common, are small and discrete sites. They may be old quarries, natural exposures on hilly ground, coastal cliff sections, or other natural cuttings into the subsurface, such as the mushroom stones at Moyvannon and Carrowmurragh, the old clay pits at Lecarrow or the old coal mines at Arigna and Altagowlan. 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 Quaternary theme and the Karst theme include such sites. In Roscommon, the superb eskers are characteristic of the larger sites encompassed under the IGH 7 Quaternary Theme. Large areas of Roscommon's landscape are covered by drumlins or ribbed moraine, which can be problematic, as although unique and impressive, they can be too large to consider as 'sites'.

It is also important from a geological conservation perspective that planners understand 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 Roscommon. A lack of awareness in the past, has led to the loss of important geological sites and local character, throughout the country. In Roscommon a full Landscape Characterisation Assessment was completed in 2008. This provides a tool to help future planning decisions maintain the integrity of the County. However, sites such as Killeglan Karst Landscape exemplify the potential both for new discoveries or recognition of landscape features, and also the potential for their loss despite best planning practices. The bouldery limestone landscape here, which overlies karstified bedrock, is possibly unique in lowland Ireland, and requires detailed study and delineation. It is to be hoped that the windfarm development, recently granted Planning Permission within the boundaries of the Geological Heritage site, will not impact on the integrity of the geomorphological landscape. With some constructive thinking, and engagement by all concerned, the permitted development work may offer opportunity to fully characterise and understand this newly recognised important landscape.

There are large contrasts in the management requirements for geological sites in comparison 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 relevant planning department to be aware of the sites, and more generally, 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.

In other counties, working quarries may have been listed simply because they are the best representative sections available of entire rock sequences, in areas where exposure is otherwise poor. No restriction would be sought on the legitimate operation of these quarries. However, maintenance of exposure after quarry closure would be sought with the operator and planning authority in such a case. At present, several working quarries are now included as County Geological Sites in Roscommon. These issues are briefly explored in a set of Geological Heritage Guidelines for the Extractive Industry, issued jointly by the GSI and the Irish Concrete Federation in 2008.

A new quarry may open a new window into the rocks below and reveal significant or particularly interesting features such as pockets of fossils or minerals, or perhaps a karstic depression or cave. Equally a quarry that has finished working may become more relevant as a geological heritage site at that stage in its life. It would possibly need regular maintenance to prevent overgrowth of vegetation obscuring the scientific interest.

Nationally, specific sites may require restrictions and a typical case might be at an important fossil locality or a rare mineral locality, where a permit system may be required for genuine research, but the general opportunity for collecting may need to be controlled. However, Roscommon's sites are not likely to require such an approach.

Waste dumping

An occasional problem throughout the country, including in County Roscommon, is the dumping of rubbish in the countryside. The dumping of waste is not only unsightly and messy, but when waste materials are dumped in area where rock is exposed, such as quarries or karstic depressions, they may leach into the groundwater table as they degrade. This can cause groundwater pollution and can affect nearby drinking water supplies in wells or springs. Groundwater Protection Schemes (DELG 1999) help to combat pollution risks to groundwater by zoning the entire land surface within counties into different levels of groundwater vulnerability. Such a scheme has been completed for Roscommon County Council by the Geological Survey of Ireland, thus ranking the county land surface into vulnerability categories of 'Extreme', 'High', 'Moderate' and 'Low', and helps planners in assessing which developments are suitable in some areas of Roscommon, and which are not. **Given the very high dependence of County Roscommon on groundwater supplies it is important that education about the threat of dumping is given serious attention**.

New exposures in development

One less obvious area where the Local Authority can play a key role in the promotion and protection of geology is in the case of new roads. **Wherever major new carriageways are built**, such as the bypass around Boyle town and through the Curlews, or in other major infrastructural work, it should be a policy within the Planning Department that **where new rock exposures are created, that they be left open and exposed** unless geotechnical safety issues occur (such as bedding dips prone to rock failure). The grading and grassing over of slopes in cuttings is largely a civil engineering convenience and a mindset which is difficult to change. However, it leads to sterile and uninteresting roads which look the same throughout the country. By leaving rock exposures along the routeway, where they are intersected, it provides an improvement in character and interest, reflecting the geology and landscape of the locality. Sympathetic tree or shrub planting can still be done, but leaving bare rocks, especially where they show interesting features, not only assists the geological profession, but creates new local landmarks to replace those removed in the construction of

the roadway. This can also potentially save money on the construction. The cutting through Devonian volcanic sediments north of Boyle town, on the climb over the Curlews is a good example of such a site, with groundwater seeps and tufa deposits adding to the interest of the rocks.

Geoparks

An extremely interesting development in geological heritage, not just in Europe but internationally, has been the rapid recent growth and adoption of the Geopark concept. A **Geopark is a territory** with a well defined management structure in place (such as Local Authority support), **where the geological heritage is used to develop sustainable tourism opportunities**. Initially it was largely a European Geoparks Network (EGN) but has now expanded worldwide as the Global Geoparks Network (GGN) since 2004 and is fully assisted by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) [see www.globalgeopark.org and www.europeangeoparks.org]. A fundamental theoretical basis of the Geopark is that it is driven from the bottom up – the communities in the Geopark are the drivers of the project and are the main beneficiaries. It therefore provides protection of the geological heritage resource so that the community can benefit from it.

In Ireland there are already three members of the Geoparks Network. One is the Copper Coast Geopark in Waterford [see www.coppercoastgeopark.com]. Another is the cross-border Marble Arch Caves Global Geopark in Fermanagh and Cavan [see**Error! Hyperlink reference not valid.** www.marblearchcaves.net]. A recent addition has been the Burren and Cliffs of Moher in County Clare [see www.burrenconnect.ie/geopark]. In addition there are aspirant groups exploring the work and infrastructure required for applications in other areas such as Joyce's Country in Mayo and Galway, and the Mourne Mountains and Carlingford area. However, Roscommon has no aspirant communities, nor any obvious bedrock areas that have the coherent geological characteristics that would benefit from consideration as potential Geoparks. However, we consider that the Slieve Dart area and Cloonfad Eskers and associated topography are potentially worthy of an east Connaught esker-karst type geopark, including the Garranlahan system and the karstlands in between.

Proposals and ideas for promotion of geological heritage in Roscommon

The clear and significant inclusion of geological heritage in the County Roscommon Heritage Plan 2012-2016 is a most welcome and positive step, for a topic that is often undervalued and poorly known in the wider community. This section examines the existing points in the plan relating to geological heritage and provides specific suggestions of how these may be implemented, supported or enhanced by the audit of geological heritage sites in the county.

Objective 1 Collect and disseminate heritage information –'Notice'. To facilitate the development of a comprehensive heritage database for the county, to make this information available to all.

Action 1.1 Identify gaps in knowledge and facilitate research studies as required to gather data on all aspects of heritage in the county.

Audit Action: This broad action will be partly fulfilled by the geological heritage audit, since geology is poorly understood and undervalued in comparison with many other elements of our heritage. The authors have aimed for a very broad perspective on geological heritage in the audit, including economic and industrial exploitation of Earth resources in Roscommon, and people's interaction with geology over time.

Action 1.4 Carry out an inventory of geological heritage in the county and a literature review of relevant geological research. Publish the findings.

Audit Action: The audit will provide a robust and detailed report and dataset to achieve this objective in the Heritage Plan. However, ongoing review in future years for additional sites will be required. Some vigilance on the ground at sites will be required to ensure they are not damaged. The GSI should be consulted on any planning application that is potentially impacting upon an identified County Geological Site.

Action 1.5 Carry out baseline surveys and data gathering as necessary to inform the Roscommon County Development Plan. For example character assessments of architectural conservation areas, tree survey, habitat mapping, esker survey, turloughs survey, wetlands survey, bogs survey.

Audit Action: The audit will contribute to part of this objective, particularly in respect of turloughs and eskers, both of which are especially richly represented in the county. The audit provides a status report and imagery as of summer 2012 for selected sites, which is a subset of all of the eskers and turloughs in the county.

Action 1.8 Disseminate results of information gathered from heritage research in the county, for example archaeological research.

Audit Action: The audit will be made available to the public as well as to planners and County Council staff. The audit report will be supplemented by exhibition material that can be used as a physical exhibition, and as internet resources, all aiming to disseminate the audit results to a much wider audience. It is to be hoped that resources may be available in subsequent time to produce a 'public-friendly' book on the geological heritage of the county in a similar manner to Sligo, Meath, Fingal and Waterford.

Objective 2 Promote best practice in heritage conservation and management – 'Care'. To promote and advise on best practice standards for heritage conservation and management within the county.

Action 2.1 Seek the provision of a designated county museum service for the county.

Audit Action: Although the audit is not directly relevant to this action, it is to be noted that the contents may contribute to the inclusion of geology within a County Museum if the action is achieved.

Action 2.4 Provide heritage training for community groups. Topics to include amongst others: Best practice in heritage conservation and management; Enhancement of biodiversity; and 'Heritage Audits' – how to identify sites of heritage interest and plan to conserve or enhance sites in your local area.

Audit Action: The authors of this audit report could provide training in geological topics by arrangement with the Heritage Officer.

Action 2.6 Provide heritage training for Roscommon County Council staff and elected members. Topics to include amongst others: Architecture.

Audit Action: The authors of this audit report could provide training in geological topics by arrangement with the Heritage Officer.

Objective 3 To raise awareness of our heritage – 'Enjoy'. To increase knowledge, awareness, understanding and enjoyment of Roscommon's heritage.

Action 3.10 Promote awareness of Roscommon's geological heritage, for example hosting a geology exhibition.

Audit Action: This objective will be fulfilled by the inclusion of draft content for a panel based exhibition (provided as supplementary to tender specifications). Exhibition panels included as part of this audit project can be made available as a handy resource. In addition, the Geoschol 4 page leaflet on the geology of Roscommon, aimed at primary level, can be made available or through a link to it on the Geoschol website (www.geoschol.com).

Other audit benefits:

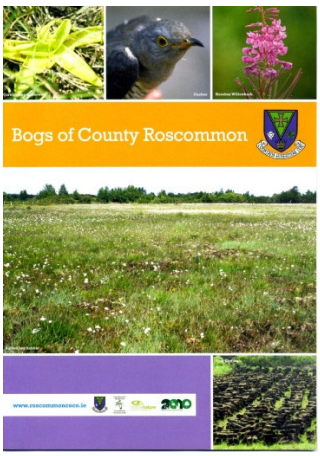
1. Selected geological and speleological titles will be made available digitally to build the heritage data, from the authors' own connections (including Matthew Parkes being Speleological Union of Ireland Librarian) and resources.

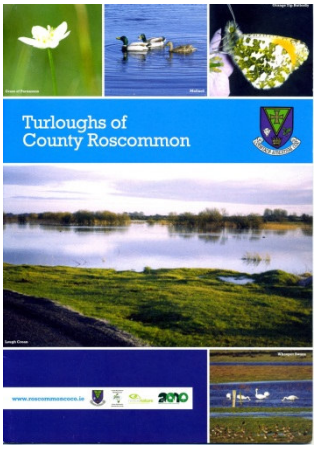
2. The audit could serve as a basis for developing walking and cycling routes, and associated information leaflets and signage if required.

Specific ideas for projects

Leaflets

There are two excellent free leaflets produced by the County Council, one on bogs and one on turloughs. The addition of one on the geology of the county and one on the karst features of Roscommon could be derived easily from this audit. A separate leaflet could easily be produced on 'The Eskers of County Roscommon', 'The Drumlins of County Roscommon' or a combined 'The Glacial landforms of County Roscommon'.

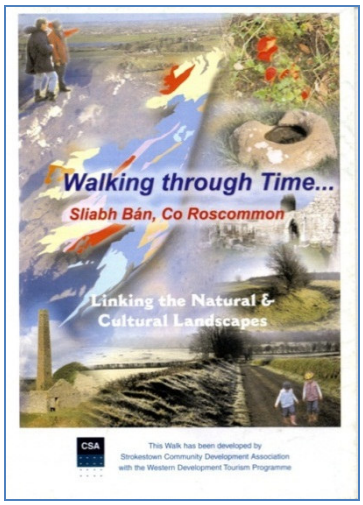




We propose that leaflets on geological topics should be added to this series for free public distribution.

Guides

There are in reality no existing guides to the geology of County Roscommon. There is scope for guides at different levels of detail and accessibility to non-specialists. A wide range of leaflets, booklets, books and other media are all feasible, but the research and production of appropriate text and images is a difficult task to do well without appropriate experience, and adequate time and resources. **It is suggested that with only modest editing and reorganisation the content of this report would comprise a good general guide to the geological heritage of County Roscommon, in similar style to those books and booklets produced in Sligo, Meath, Fingal and Waterford, following audits.**



This guide to Slieve Bawn does briefly describe the geological history of the landscape in which cultural features are explored.

Signboards

Simple explanatory or interpretive signboards may be advisable at key geological heritage locations, but if these are considered, their locations and individual siting should be very selective, since a proliferation of different interest groups may provoke a 'rash' of panels all over the county. The Planning Section should clearly have a controlling input, in conjunction with the Heritage Office. It is most likely that a panel combining various heritage interests at a place is preferred to single interest panels. It is important to consult with potential partners in the planning stage so that duplication does not occur.

The subject of panels, and the integration of text and graphics are a fine art to complete successfully, and the IGH Programme can offer input if signs are planned for key visitor localities. The authors of this report are also able to write, review or provide content on geological heritage for any proposed panels.

Aside from the full public presentation of the Arigna Mining Experience, at present the only geological site known to the authors where some panel signs include an element of geology are at Loughaneane. This turlough area immediately west of Roscommon town has a castle and wildlife interest, and is managed by Roscommon County Council. Signboards about the turlough have a cursory explanation of the geological functioning of turloughs.

Museum exhibitions

As a result of the work to produce this report, the material for a panel based exhibition has been largely compiled. With some extra research covering human dependence on geology and resources, an interesting exhibition can be put together for display in the Roscommon Museum, Council offices or County Library branches. The model followed was that produced for Carlow and for Dun Laoghaire-Rathdown. Images of these can be seen on the geological heritage section of the GSI website [www.gsi.ie].

New media

There are increasing numbers of examples of new methods of promoting Earth Sciences, via mobile phone applications and other electronic media. Self guiding apps on specific sites would be one of these, such as those produced by Ingenious Ireland for Dublin city geology and for other sites. Plans for such products would require some considerable effort to produce and imaginative effort, with the sites being scattered across the county. Linking together turlough sites or eskers would seem the most likely targets for consideration.

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

The group Earth Science Ireland is an all-Ireland group promoting awareness of earth sciences and supporting educational provision in the subject. A main vehicle for the efforts is the twice a year magazine *Earth Science Ireland* and this is distributed free to thousands of individuals, schools, museums, centres and organisations. The editors would welcome more material from the Republic of Ireland and on Roscommon's geological heritage.

Geoschol website [www.geoschol.com]

Geoschol is an educational project, now essentially represented by a website, which was largely aimed at producing educational materials on geology for primary schools. A four page **pdf** summarising the geology and some highlights of Roscommon is already part of the available material. If no material is available to add, then at least working links to

Roscommon County Council website Heritage section, and to other heritage websites should be established.

A summary of the Geology of Roscommon

1) Paragraph summary

The geology of Roscommon is dominated by 330 million years old limestones from the Carboniferous Period. In Slieve Bawn, the Curlew Mountains north of Boyle and northwest of Ballaghderreen there are much older rocks exposed at the surface in small windows through the limestones. The limestones are dominantly well bedded, horizontal layers of a remarkably uniform nature. They were originally deposited in a shallow marine environment when Ireland was largely submerged under a warm tropical sea, and the presence of fossils such as corals reflects this. Only in the north of the county around Lough Allen are there younger rocks, recording a time when the shallow sea was filled with deltas and swamps. In these sandstone and shale rocks there are coal seams formed from ancient forests. The land surface was then emerged for nearly 300 million years and many of these rocks eroded down to their present level. The most significant force to shape the county as we see it today was the Ice Age which ended about 10,000 years ago. Large ice sheets were covering the county and eroded the rocks beneath. As the ice eventually melted away, the meltwaters reorganised the sediments into iconic landforms like eskers, also with large fans of sand and gravel. Since then, the limestone bedrock under the glacial sediments has become markedly dissolved, a process known as karstification. Water solution of the rock formed some caves, and in some larger lakes formed unusual mushroom shaped stones. Roscommon also has a wealth of seasonal lakes called turloughs, where glacially scoured basins fill with groundwater in the winter and dry out in summer as the water table lowers. Geological processes continue to modify the landscape such as with seasonal flooding of the Shannon and Suck River Callows.

2) Simple summary

The geology of Roscommon is absolutely dominated by 330 million years old limestones from the Carboniferous Period. In Slieve Bawn, the Curlew Mountains north of Boyle and northwest of Ballaghderreen there are much older rocks exposed at the surface in small windows through the limestones. These include two inliers (older rocks entirely surrounded by younger rocks) north-east of Strokestown and at Slieve Bawn. These rocks are of Ordovician age and are the remnants of a former ocean floor and the roots of a long since vanished mountain chain. They are related to rocks throughout Longford, Down, and into the Southern Uplands of Scotland, but as they occupy such a small area in Roscommon, their story is best told in detail elsewhere.

Surrounding them are some Devonian age rocks, sandstones and gravels laid down by flash floods in a poorly vegetated environment. Both Ordovician rocks and Devonian rocks are partly preserved because they have been lifted up on one side of the Strokestown Fault, which is a visible geological structure in the county, because the older, more resistant rocks form Slieve Bawn.

The Carboniferous limestones are dominantly well bedded, horizontal layers of a remarkably uniform nature. They were originally deposited in a shallow marine environment when Ireland was largely submerged under a warm tropical sea, and the presence of fossils such as corals reflects this. The uniform nature of these beds both across wide areas and

vertically in thickness makes it difficult to map different geological formations, and they are often simply considered as ‘shelf’ limestones, from an open, shallow sea.

Only in the north of the county around Lough Allen are there younger solid rocks, recording a time when the shallow sea was filled with deltas and swamps. In these sandstone and shale rocks there are coal seams formed from ancient forests. The land surface then emerged for nearly 300 million years and many of these rocks were eroded down to their present level. Only small parts of the country now remain covered by these coalfield rocks, primarily the Castlecomer plateau in Kilkenny, the Arigna district in Leitrim and the northern tip of Roscommon.

The most significant force to shape the form of the county as we see it today was the Ice Age which ended about 10,000 years ago. Large ice sheets covered the county for thousands of years and eroded the rocks beneath. As the ice eventually melted away, the meltwaters reorganised the sediments into iconic landforms like eskers, adjacent to large fans and deltas of sand and gravel. Eskers were formed by sub-glacial rivers, that is, they flowed in tunnels at the base of the ice sheets. Some eskers are small and local within Roscommon, but others form extended networks and cross several counties.

Some Ice Age features define the landscape character of large areas yet are so large they can almost only be seen when using satellite or air photo images. One example is a very fine discrete field of drumlins near Boyle. These whale back elongated ridges of glacial till were left by the ice sheets which covered the county. Even larger ribbed moraines, on a kilometre scale, are present across mid Roscommon, but these need a trained eye to discriminate them from remotely sensed images.

Since the Ice Age, the exposed limestone has developed into what is termed karstified bedrock. Water solution of the rock formed some caves, widespread collapse features and enclosed depressions called dolines. Where some larger, temporary lakes were formed when meltwater was prolific, unusual mushroom shaped stones were created by dissolution of the rock that was submerged. Roscommon also has a wealth of seasonal lakes called turloughs, where glacially scoured basins fill with groundwater in the winter and dry out in summer as the water table lowers. Geological processes continue to modify the landscape today, such as with seasonal flooding of the Shannon and Suck River Callows.

3) Extended summary

Although the geology of Roscommon is absolutely dominated by 330 million years old limestones from the Carboniferous Period, there are much older rocks extending back to nearer 500 million years ago, within the county. In Slieve Bawn, the Curlew Mountains north of Boyle and northwest of Ballaghderreen there are much older rocks exposed at the surface in small windows through the limestones. These include two inliers (older rocks entirely surrounded by younger rocks) north-east of Strokestown and at Slieve Bawn. These rocks are of Ordovician age and are the remnants of a former ocean floor and the roots of a long since vanished mountain chain. They are related to rocks throughout Longford, Down, and into the Southern Uplands of Scotland, but as they occupy such a small area in Roscommon, their story is best told in detail elsewhere.

Surrounding them are some Devonian age rocks, sandstones and gravels laid down by flash floods in a poorly vegetated environment. Both Ordovician rocks and Devonian rocks are partly preserved because they have been lifted up on the east side of a fault, and are now preserved as the more resistant hills known as Slieve Bawn. In the Curlew Mountains north of Boyle and westward through Sligo to Ballaghderreen is a faulted block of the Devonian rocks, uplifted in relation to the limestones either side of the block. The Devonian rocks are mostly sandstones and pebble conglomerates, but include some volcaniclastic rocks; rock material erupted by volcanos but then carried and deposited as sedimentary rocks like the sandstones. The Boyle Road Cutting is a good place to see these rocks.

The Carboniferous limestones are dominantly well bedded, horizontal layers of a remarkably uniform nature. They were originally deposited in a shallow marine environment when Ireland was largely submerged under a warm tropical sea, and the presence of fossils such as corals reflects this. The uniform nature of these beds both across wide areas and vertically in thickness makes it difficult to map different geological formations, and they are often simply considered as 'shelf' limestones, from an open, shallow sea. These limestone rocks are present below the surface of the largest part of Roscommon, but are actually rarely exposed. The veneer of glacial sediments hides them, so the few rock quarries such as Keeloges, Castlemine and Largan are important examples of what the subsurface is actually like.

Only in the north of the county around Lough Allen are there younger solid rocks, recording a time when the shallow sea was filled with deltas and swamps. In these sandstone and shale rocks there are coal seams formed from ancient forests. The land surface then emerged for nearly 300 million years and many of these rocks eroded down to their present level. Only small parts of the country now remain covered by these coalfield rocks, primarily the Castlecomer plateau in Kilkenny, the Arigna district in Leitrim and the northern tip of Roscommon. Two County Geological Sites in Roscommon are representatives of this geology. The Arigna Mining Experience is a superb place to fully appreciate the underground geology of coal deposits and the mining heritage of the district. Altagowlan, which is Roscommon's portion of a wider upland area along the Sligo county boundary, exemplifies the place of coal in the energy supply of human society, now visibly met by windfarm turbines scattered through the old coal mine features.

The most significant force to shape the form of the county as we see it today was the Ice Age which ended about 10,000 years ago. Large ice sheets covered the county for thousands of years and eroded the rocks beneath. As the ice eventually melted away, the meltwaters reorganised the sediments into iconic landforms like eskers, adjacent to large fans and deltas of sand and gravel, such as at Cloonburren Fan, McKeon's Pit and the Cloonagh and Errit Loughs Deltas. The fans and deltas now stand out as high ground with good grass amongst the boggier lake margins.Eskers were formed by sub-glacial rivers, that is, they flowed in tunnels at the base of the ice sheets. Some eskers are small and local within Roscommon, but others form extended networks and cross several counties. The Ballinasloe–Split Hills-Clonmacnoise-Clara Esker System is the most extensive of them, but the Garranlahan Esker is also large and complex. The Castlesampson Esker is smaller but equally valuable as an untouched example of the landform.

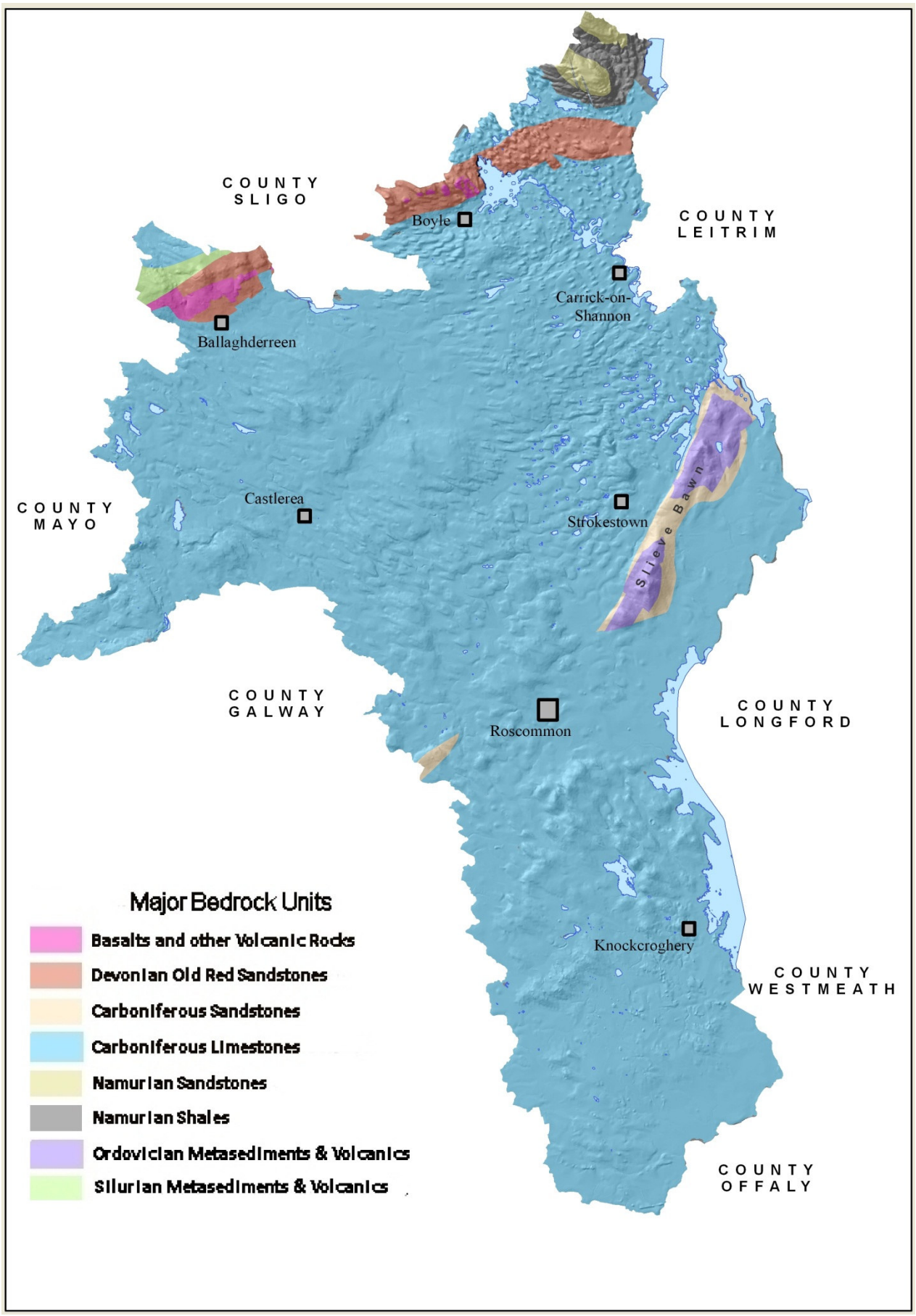
Some Ice Age features define the landscape character of large areas yet are so large they can almost only be seen when using satellite or air photo images. West of Boyle for example is a very fine discrete field of drumlins. These whale back elongated ridges of

glacial till were left by the ice sheets which covered the county. On the ground they form low relief, breaking up any long vistas, but from above or on a map with shaded relief they clearly show the sweeping passage of ice movements. Even larger ribbed moraines, on a kilometre scale, are present across mid Roscommon, but these need a trained eye to discriminate them from remotely sensed images.

Since the Ice Age, the exposed limestone has developed into what is termed karstified bedrock. Water solution of the rock formed some caves, widespread collapse features and enclosed depressions called dolines. Where some larger, temporary lakes were formed when meltwater was prolific, unusual mushroom shaped stones were created by dissolution of the rock that was submerged. Carrowmurragh and Moyvannan Mushroom Stones near the shores of Lough Ree demonstrate it previously once had a far greater extent. Roscommon also has a wealth of seasonal lakes called turloughs, where glacially scoured basins fill with groundwater in the winter and dry out in summer as the water table lowers. Good geological examples of these include Brierfield, Loughnaneane, Mullygollan and Castleplunkett Turloughs. A special kind of turlough exists at Lough Funshinagh which is a disappearing lake. Rather than seasonal fluctuations it occasionally drains entirely as if someone had pulled the plug in the bath. A kind of pseudo karst landscape has been identified around Killeglan west of Athlone. This is a unique site with limestone boulder ridges formed as glacial deposits. Large parts are untouched and represent a pristine landscape of Roscommon before human intervention and land clearance and enclosures.

Geological processes continue to modify the landscape today, such as with seasonal flooding of the Shannon and Suck River Callows. Slow build-up of alluvial sediments and meandering of the river course can change a landscape scene in human lifespans. Collapses of limestone into cavities beneath are more sudden events and occur in some areas, but such holes are often quickly filled in by farmers and landowners. The most active but unseen geological process going on is the movement of groundwater. Since Roscommon has one of the highest percentages of water supply from groundwater, such as from Rockingham Spring, immense care is needed not to pollute the supply from badly maintained septic tanks or farm practices, as limestone areas are very vulnerable to such destruction of a valuable geological resource. Another geological resource, apart from limestone, coal and groundwater, which was formerly exploited, is the clay deposit at Lecarrow. The Knockcroghery clay pipe industry once supplied pipes for smoking tobacco to all of Ireland from this ancient clay preserved in a karstic doline.

AGE (Million Years Ago)	ERA	PERIOD	EVENTS IN ROSCOMMON	IF THIS TIMESCALE WERE A DAY LONG …
2	Cenozoic	Quaternary	Several ice ages smothering Roscommon, followed in the last 10,000 years by the spread of vegetation, growth of bogs and arrival of humans. Deposition of ribbed moraines drumlins and eskers. Dissolution of limestone beneath Quaternary sediments.	The ice ages would begin 38 seconds before midnight
65		Tertiary	Erosion, especially of limestone. Caves, cavities and underground streams developing in mid-Roscommon. Potential deposition of clay at Lecarrow, near Lough Ree.	The Tertiary period begins at 11.40 pm
145	Mezozoic	*Cretaceous*	*Erosion.* *No record of rocks of this age in Roscommon.*	11.15 pm
205		*Jurassic*	*Uplift and erosion.* *No record of rocks of this age in Roscommon.*	The age of the dinosaurs, starting at 10.55 pm
250		*Triassic*	*Desert conditions on land.* *No record of rocks of this age in Roscommon.*	10.42 pm
290	Palaeozoic	*Permian*		10.30 pm
355		Carboniferous	Land became submerged, limestones with some shales and sandstones deposited in tropical seas across much of Roscommon. Limestones remaining today are pure and unbedded in the majority, with smaller areas of muddier limestones at the edges. Shales and sandstones with coal seams deposited in Arigna district.	Much of Roscommon's current rocks (limestone, sandstone and shale) deposited around 10.10 pm
410		Devonian	Caledonian mountain building. Sandstones deposited in the Curlews and north of Ballaghderreen.	'Old Red' Sandstone deposited at 9.52 pm
444		Silurian	Shallow seas, following closure of the Iapetus Ocean. Greywacke and shales deposited at Bohalas in the northwest of the county.	Starts at 9.42 pm
488		Ordovician	Shales, slates, siltstones and volcanic rocks form across the Slieve Bawn ridge.	Begins at 9.28 pm
542		Cambrian	Opening of the Iapetus Ocean. *No record of rocks of this age in Roscommon.*	Starts at 9.11 pm
2500	Proterozoic	*Precambrian*	*Some of Irelands oldest rocks deposited in Mayo and Sligo.*	Beginning 11.00 am
4000	Archaean		*Oldest known rocks on Earth.*	Beginning 3.00 am
4600			*Age of the Earth.*	Beginning 1 second after midnight



A simplified geology map of Roscommon outlining the main geological units.

Geological heritage versus geological hazards

Ireland is generally considered to be a country with very low risk of major geological hazards: there are no active volcanoes, stable tectonic plates mean earthquakes are relatively rare and Ireland's broad human history is not peppered with disastrous landslides, mudflows or other geological hazards. Yet there are of course risks of one-off events, and this section briefly looks at the specific record and nature of geological hazards in Roscommon and the relationship of the County Geological Sites to those hazards.

The difference between human timescales and geological timescales can be difficult to comprehend but for many geological processes they can be suddenly active with major events, and quiet periods in between. Many of the sites in this audit represent evidence of past environments and geological processes, such as tropical coral seas, swampy deltas glacier erosion of the land surface and so on. However, some sites represent the active geomorphological or land-forming processes of today. These sites, generally coastal in many counties, but mainly karstic or rivers in Roscommon, are dynamic environments and can be subject to constant or intermittent change.

Landslides and bog flows
The Geological Survey of Ireland has been compiling national data on landslides in the past decade. Occasional landslides and bog slides are both recorded in Roscommon, in the Arigna area especially.

Flooding
There are two types of flooding which need consideration.

River flooding occurs inland when the rainfall exceeds the capacity of the ground to absorb moisture, and the river channels cannot adequately discharge it to the sea. The OPW website www.floods.ie can be consulted for details of individual flood events in County Roscommon. Some 239 events are recorded across the entire county. Many of these are predictable, seasonal events in the floodplains of the River Shannon and the River Suck. They are vital to the biodiversity of these floodplain areas, known as Callows. Both plant and birdlife is dependent on the wetland habitats along the river banks. As the flooding of the river floodplains is essentially an active geological environment, we have included some representative examples as County Geological Sites.

Karstic flooding can occur when underground passages are unable to absorb high rainfall events. The karst in Roscommon has few caves, yet the abundance of springs, swallow holes and dolines, as well as the karstification seen in some quarries such as Largan Quarry, indicates that the limestone is heavily karstified. In Largan Quarry, as well as the highly weathered epikarst zone nearest the surface, deep expanded joints and fissures are evident, although many have clay rich sediment fills.

There are numerous known turloughs in Roscommon, which are seasonal lakes where the water table intersects the land surface. The Ordnance Survey of Ireland six inch to the mile mapping records many areas as 'liable to flooding' in the karstic landscapes. However, the 1:50,000 Ordnance Survey of Ireland Discovery Series maps are drawn from aerial photographs and are very poor in accurately delimiting such turloughs. These turloughs indicate seasonal variation in the ground water table. The normal pattern is for them to be

lakes in winter and dry grassland in summer, although localised weather/rainfall patterns may mean they are wet in summer too.

Karstic collapse

This is a very real, but localised hazard in parts of Roscommon. In the county there is limestone often only a few metres or less beneath the land surface. The number of known caves in the limestone is very few, but in certain areas such as Mewlaghmore near Castlerea, there are hundreds of karstic features called dolines. These are enclosed depressions with no surface water drainage associated with them. Some form by slow dissolution of the underlying limestone rock, but others can be formed as rapid collapse events.

When they occur, they are often not reported and just filled in by farmers so we have little information on the frequency with which they happen. A record of one such area at Lissananny, north of Castlerea, indicated that collapses frequently occurred but were filled in as rapidly by the landowner. Similarly a verbal communication engaged in with the authors while compiling this report, of a new housing development at Lisacul, included an account of massive collapse openings which were then filled in with rock by the developer before the houses were built.

Groundwater pollution

Whilst not such an obvious hazard as physical collapses, flooding and landslides, the pollution of groundwater supplies carries a serious risk to human health.Roscommon is one of the counties most dependent on groundwater supplies, and therefore the risk is more serious than for most other counties. As the groundwater is largely contained within limestone, it should be noted that karstic springs are especially vulnerable to pollution since the flow is mainly within fissure conduits allowing rapid transmission of pollution from source to water supply. The opportunity for microbial attenuation of pollutants is far less in limestone fissures (as there are no natural barriers to stop pollutants) than it would be in granular deposits, which act as natural filters.

Glossary of geological terms

Geological term	Definition
Adit	a horizontal or only gently inclined mine tunnel dug to access coal or mineral ore, or to drain, ventilate or further develop a mine.
Alluvial Deposit	unconsolidated clay, silt, sand and gravel, deposited by a body of running water.
Alluvium	a term for unconsolidated clay, silt, sand and gravel, deposited by a body of running water.
Aquifer	a water saturated rock unit.
Bead (of an esker)	a segment of an esker.
Bedding Plane	the contact between individual beds of rock.
Bedrock	a general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.
Biostratigraphy	using fossils to define the succession of rocks.
Blanket Bogs	bog covering a large, fairly horizontal area, which depends on high rainfall or high humidity, rather than local water sources for its supply of moisture.
Boulder Clay	unconsolidated, unsorted glacial deposits consisting of boulders and cobbles mixed with very finely ground-up rock or silt. Also known as till.
Brachiopods	a marine invertebrate of the phylum Brachiopoda - a type of shellfish. Ranging from Lower Cambrian to present.
Braided River	a river that consists of a network of small channels separated by small and often temporary islands.
Bryozoa	invertebrates belonging to the phylum Bryozoa, ranging from Ordovician to present, often found as frond-like, net-like or stick-like fossils.
Calcareous	containing significant calcium carbonate.
Calcite	a pale mineral composed of calcium carbonate, which reacts with dilute acid.
Callows	riverside meadows which dry in summer but flood in winter.
Carbonate	a rock (or mineral), most commonly limestone (calcite) and dolomite.
Cave	a natural underground space large enough for a human to enter, which is usually formed in either soluble limestone by karstic processes, or in exposed rock along the coastline, where the sea erodes natural rock fractures.
Chattermarks	crescent shaped marks on a rock surface made at the base of a glacier
Clast	an individual constituent, grain or fragment of a sediment or rock, usually produced by mechanical weathering (disintegration) of a larger rock mass.
Cleavage	a finely spaced, flat plane of breakage caused by compressive deformation of rocks. e.g. the splitting of slate.
Clint	tabular block of limestone in a limestone pavement.
Conglomerate	sedimentary rock comprising of large rounded fragments in a finer matrix.
Crinoid	a variety of sea-urchin, with a long flexible stem, usually anchored to the sea-floor and a body cup with arms which may be branching (a sea lily).
Cross-bedding	layering in sedimentary rocks at an inclined angle to bedding formed by current-ripples.
Crust	the outermost, solid, layer of the Earth.
Delta	a usually triangular alluvial deposit at the mouth of a river, or a similar deposit at the mouth of a tidal inlet, caused by tidal currents.
Dip/dipping	when sedimentary strata are not horizontal they are dipping in a direction and the angle between horizontal and the inclined plane is measured as

	the dip of the strata or beds.
Doline	circular/oval closed depression found in karst terrain.
Dolomite	calcium and magnesium bearing carbonate mineral; also a rock composed of the mineral.
Drumlin	a streamlined mound of glacial drift, rounded or elongated in the direction of the original flow of ice.
Epikarst	the shallow layer, near surface, of highly karstified rock, with many voids included.
Erratic	a rock fragment, often large, that has been transported, usually by ice, and deposited some distance from its source. It therefore generally differs from the underlying bedrock, the name "erratic" referring to the errant location of such boulders. Tracing their source can yield important information about glacial movements.
Esker	a long, narrow ridge of coarse gravel and sand deposited by a stream flowing in or under a decaying glacial ice sheet.
Facies	the character of the rock derived from its original sedimentary environment and process of deposition.
Fan	a usually triangular deposit of sand and gravel deposited by a glacial stream, either under a lake or under air.
Fault	planar fracture in rocks across which there has been some displacement or movement.
Fault Zone	a tabular volume containing many faults and fault rocks (rocks broken up by fault movement).
Fauna	collective term used to group all animal life.
Floodplain	a flat or nearly flat land area adjacent to a stream or river that experiences occasional or periodic flooding.
Flowstone	calcite or other minerals deposited as a surface crust by water flowing over cave or mine walls and floors.
Fluvial	pertaining to a river or stream.
Fold(ing)	flexure in layered rocks caused by compression.
Formation	a formal term for a sequence of related rock types differing significantly from adjacent sequences.
Fossiliferous	rich in fossils.
Fossils	any remains, trace or imprint of a plant or animal that has been preserved in the Earth's crust since some past geological or prehistorical time.
Glacial	of or relating to the presence and activities of ice or glaciers.
Grading	a sorting effect with the coarsest material at the base of the bed and finest grained material at the top.
Greywacke	an impure sandstone, characterised by poorly-sorted, angular grains in a muddy matrix, that was deposited rapidly by turbidity currents (submarine avalanches).
Grike	a solutionally widened vertical fracture separating clints on a limestone pavement.
Gully	a deep valley created by running water eroding sharply into bedrock or subsoil.
Haematite	a mineral form of iron oxide, which is the main ore mined as iron.
Horizon	may refer to a single layer of rock such as a coal seam, an ash layer, or other geological 'event'.
Head	weathered rock fragments accumulated on lower slopes from periglacial freezing and thawing action acting with gravity.
Hummock	a small hill or knoll in the landscape, which may be formed by many different processes.

Ice margin	the edge of an ice sheet or glacier.
Igneous	a rock or mineral that solidified from molten or partially molten material i.e. from a magma.
Interglacial	the time interval between glacial stages, or pertaining to this time.
Joint	a fracture in a rock, which shows no evidence of displacement.
Kame-kettle	an irregularly shaped hill or mound composed of sand, gravel and till that accumulates in a depression on a retreating glacier, and is then deposited on the land surface with further melting of the glacier. Kames are often associated with kettles, and this is referred to as *kame and kettle* topography.
Karst	general term used for landscapes formed by weathering of soluble rocks, usually limestone, by surface water and/or groundwater.
Kettle hole	a shallow, sediment-filled body of water formed by retreating glaciers or draining floodwaters.
Knoll	a small hill or hillock sticking up from generally flat terrain.
Laminated	the finest example of stratification or bedding, typically exhibited by shales and fine-grained sandstones.
Limestone	a sedimentary rock consisting chiefly of calcium carbonate ($CaCO_3$), primarily in the form of the mineral calcite. It is mostly formed by the accumulation of calcareous shells, cemented by calcium carbonate precipitated from solution.
Lithification	the process of rock formation from unconsolidated sediment.
Lithology	the description of rocks on the basis of such characteristics as colour, composition and grain size.
Lodgement	process by which debris is released from the sliding base of a moving glacier/ice sheet and plastered or 'lodged' onto the glacier bed; also describes tills emplaced by this process (i.e. lodgement till).
Maze cave	a cave formed in an extensive grid pattern when slow moving water.
Melt-out	process by which glacial debris is very slowly released from ice that is not sliding or deforming internally; also describes tills emplaced by this process (i.e. melt-out till).
Metamorphic	referring to the process of metamorphism or to the resulting metamorphic rock, transformed by heat and pressure from an originally igneous or sedimentary rock.
Misfit stream	a stream which is too small to have eroded the valley in which it flows, as is often the case with streams now flowing in meltwater channels.
Moraine	any glacially formed accumulation of unconsolidated debris, in glaciated regions, such as during an ice age.
Mudmound	Waulsortian limestone of Carboniferous age is characterised by forming as massive mounds or ridges or sheets of carbonate mud on the seafloor of the time. Mudmound is a general term to describe the varieties of forms.
Mudstone	a very fine grained sedimentary rock, containing quartz and clay minerals. Similar to shale, but not as easily split along the plane of bedding.
Mushroom rock	a mushroom shaped rock, or undercut limestone rock, formed by dissolution of a rock partially submerged in a lake.
Ore	a mineral which is concentrated enough to be exploited by mining.
Orogeny	the creation of a mountain belt as a result of tectonic activity.
Outcrop	part of a geologic formation or structure that appears at the surface of the Earth.
P-form	plastically moulded, smooth-walled, linear depressions which may be straight, curved, or sometimes hairpin-shaped and measure tens of centimetres to metres in width and depth, formed under ice sheets.
Periglacial	very cold but non-glacial climatic conditions.
Phreatic	when a cave passage or void space in limestone rocks is filled with water it

	is said to be phreatic or in the phreas. When later found without water in them such passages have a characteristic cylindrical shape from solution in all directions and are called phreatic tubes.
Phreatic Zone	the area below the water table, where the rock is completely saturated with water.
Plate Tectonics	a theory that states that the crust is divided up into a number of plates, whose pattern of horizontal movement is controlled by the interaction of these plates at their boundaries with one another.
Pyrite	iron sulphide, pale yellow/gold coloured mineral, commonly occurring as cubes and often called 'fool's gold'.
Sandstone	a fine to coarse sedimentary rock, deposited by water or wind, and composed of fragments of sand (quartz grains), cemented together by quartz or other minerals.
Sandur	a plain formed of glacial sediments deposited by meltwater outwash at the terminus of a glacier.
Sedimentary	a rock formed by the deposition of sediment, or pertaining to the process of sedimentation.
Shaft	a vertical hole dug in a mine for access, ventilation, for hauling ore out or for pumping water out.
Shale	a very fine-grained mudstone, containing quartz and clay minerals, that splits easily along the plane of bedding.
Siltstone	is similar to mudstone but with a predominance of silt-sized (slightly coarser) particles.
Sink	another name for a swallow hole, the point where a stream passes underground.
Sluggera	a tube-like collapse of the Earth's surface into an underground cavity, which has formed by the dissolution of limestone.
Slumping	the movement of a mass of unconsolidated sediment or rock layers down a slope, or pertaining to contorted sedimentary bedding features.
Solution pipe	a karstic feature of solution in a vertical narrow chimney or pipe shape.
Spring	the point where an underground stream reaches the surface.
Stratigraphy	the study of stratified (layered) sedimentary and volcanic rocks, especially their sequence in time and correlation between localities.
Sub-aerial	refers to processes occurring above ground level, such as the weathering of rocks.
Subduction	the sinking of one crustal plate beneath the edge of another through the process of plate tectonics.
Subsidence (zone)	the sudden sinking or gradual downward settling of the Earth's surface with little or no horizontal movement.
Swallow hole	the point where a stream passes underground, sinking below the ground surface.
Terrestrial	pertaining to the Earth's dry land.
Till	unconsolidated, unsorted glacial deposits consisting of boulders and cobbles mixed with very finely ground-up rock as sand, silt or clay also known as boulder clay.
Transgression	an incursion of the sea over land area.
Trilobites	extinct arthropods.
Turbidite	deposit of a turbidity current.
Turbidity Current	underwater density current carrying suspended sediment at high speed down a subaqueous slope. The resulting deposit is called a turbidite.
Turlough	a seasonal lake that fills and empties through springs and sinkholes.
Unconformable	a sedimentary rock that is not following in sequence from the one below but has a significant time gap present between them.

Unconformity	a buried erosion surface separating two rock masses or strata of different ages, indicating that sediment deposition was not continuous.
Vadose Zone	the area between the surface and the water table.
Vein quartz	white thin veins of quartz injected in rock fractures during episodes of stress. Also found as durable beach pebbles, once it has been eroded.
Volcanic Rock	any rock produced from volcanic material, e.g. ash, lava.
Volcaniclastic	rock material was derived from a volcanic eruption, but the rock was deposited as a sedimentary rock like a sandstone, as an aggregate of small particles.
Volcanism	the process by which magma and its associated gasses rise into the crust and are extruded onto the Earth's surface and into the atmosphere.
Volcano	a vent in the surface of the Earth through which magma and associated gasses and ash erupt.

Data sources on the geology of County Roscommon

This section is a brief summary of relevant GSI datasets, to assist any enquiry concerning geology and to target possible information easily. The GSI has very many datasets, accumulated since it began mapping Ireland's geology in 1845. A Document Management System (DMS) is freely available to any person at the GSI Customer Centre, into which about half a million documents and maps have been scanned. This means that any user can visit the GSI Customer Centre themselves and search on screen for data of relevance to them. High quality colour and black and white print-outs can be made or data supplied on CD, or via USB keys etc. **Data is available free of charge**. It is planned to make this resource available online but no date is yet set for when this may be achieved.

Key datasets include:

1:100,000 Map Report Series

All historical, modern and other mapping has been compiled into very useful maps and reports that describe the geology of the entire country. Parts of Sheets 7 and 15 include northern and southern Roscommon respectively but the majority of the county is on Sheet 12.

19th century 6 inch to the mile fieldsheets

These provide an important historical and current resource, with very detailed observations of the geology of the entire country.

19th century one inch maps and Memoirs

Information from the detailed 19th century mapping was distilled into one inch to the mile maps, of which parts of Sheets 65, 66, 67, 76, 77, 78, 86, 87, 88, 97, 98, 107 and 108 cover County Roscommon. Each sheet or several sheets were accompanied by a Memoir which described the geology of that area in some detail. These still provide valuable records of observations even though interpretations may have changed with better geological understanding. Memoirs are in the Customer Centre library and scanned on the DMS.

Historical geological mapping is now available via a website: http://www.geologicalmaps.net/irishhistmaps/history.cfm

Open File Data

Each Mineral Prospecting Licence issued by the Exploration and Mining Division of the Department of Communications, Energy and Natural Resources (currently) carries an obligation on the exploration company to lodge records of the work undertaken, for the common good. These records are held by the Geological Survey and are available as Open File Data, once a period of time has expired. They may include geological interpretations, borehole logs, geophysical and geochemical surveys and so on.

MinLocs Data

The MinLocs Database records all known mineral occurrences, however small, from GSI records, such as 19th century fieldsheets and Open File data.

Historic Mine Records

Abandonment plans and varied other material exists for the various coal mining ventures in the county, particularly in the Arigna district.

Subsoils Mapping

Since a Groundwater Protection Scheme has been completed for County Roscommon by GSI, a recently completed map of the subsoil types and depths across Roscommon exists, as well as the previously completed bedrock mapping. This provides a significant resource in general terms as well as for groundwater protection. Customised output is possible. Further more detailed compilation of glacial geology datasets will provide more options in the near future.

Digital mapping of many different datasets is now available via the GSI website: www.gsi.ie

Shortlist of Key Geological References

This reference list includes a few **key** papers, books and articles on the geology and geomorphology of Roscommon that are recommended as access points to Roscommon's fabulous geological heritage.

****

DALY, D., DREW, D.P., DEAKIN, J., PARKES, M. and WRIGHT, J. 2001. *The Karst of Ireland; Limestone Landscapes, Caves and Groundwater Drainage Systems*. Karst Working Group Dublin, 37pp.

GATLEY, S., SOMERVILLE, I., MORRIS, J.H., SLEEMAN, A.G. and EMO, G. 2005. Geology of Galway-Offaly and adjacent parts of Westmeath, Tipperary, Laois, Clare and Roscommon: A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 15, Galway-Offaly. Geological Survey of Ireland. Vii + 90pp.

HOLLAND, C.H. (ed.). 2001. *The Geology of Ireland*. Dunedin Academic Press, Edinburgh.

MacDERMOT, C.V., LONG, C.B. and HARNEY, S.J. 1996. *Geology of Sligo-Leitrim.* Geological Survey of Ireland Bedrock Geology Sheet 7.

MITCHELL, G.F. and RYAN, M., 1997. *Reading the Irish Landscape*. Town House Press, 397 pp.

MORRIS, J.H., SOMERVILLE, I.D. and MacDERMOT, C.V. 2003. *Geology of Longford-Roscommon*. Geological Survey of Ireland Bedrock Geology Sheet 12.

Full Geological references

See Appendix 2 for the full reference list of all papers, books, articles and some unpublished reports etc relating to the geology and geomorphology of Roscommon that could be traced.

Caving References

The references in Appendix 3 relate significantly to caves and caving within the Roscommon area. They may only be brief reports or newsletter items. They are generally available within the Speleological Union of Ireland Library which is housed in the Geological Survey of Ireland and is managed by Matthew Parkes.

Mining heritage references

Appendix 2 includes some references specifically pertaining to the mining heritage of County Roscommon. Assistance with locating these references may be provided by the Mining Heritage Trust of Ireland if required.

Quaternary References

The references in Appendix 4 are all covering the Quaternary, or Ice Age, geology of Roscommon. They are split into the specific ones covering Roscommon sites or features and a section of national or regional papers with some Roscommon data included.

Further sources of information and contacts

Sarah Gatley of the Geological Survey of Ireland, who is the Head of the Geological Heritage and Planning Section, can be contacted in relation to any aspect of this report. Nollaig Feeney, the Heritage Officer of Roscommon County Council is the primary local contact for further information in relation to this report. Other contacts include the Conservation Rangers of the National Parks and Wildlife Service, currently in the Department of Arts, Heritage and the Gaeltacht. The names and phone numbers of current staff may be found in the phone book, or at www.npws.ie.

Web sites of interest

www.gsi.ie - for general geological resources
www.geology.ie – the website of the Irish Geological Association who run fieldtrips and lectures for members, including many amateur enthusiasts
www.earthscienceireland.org - for general geological information of wide interest [this website address is likely to change in 2012/2013. Suggestion search for 'Earth Science Ireland']
http://www.iqua.ie - for information, fieldtrips, lectures etc in relation to Ireland's Ice Age history
http://www.cavingireland.org/ - for information on caves and safe caving
http://www.progeo.se/ - for information about ProGEO the European Association for the Conservation of Geological Heritage

Acknowledgements

The authors would like to gratefully acknowledge the assistance of Nollaig Feeney, Heritage Officer from Roscommon County Council in the development of this project. Funding from the Heritage Council and Roscommon County Council is also acknowledged. We also acknowledge the many members of the IGH Programme Expert Panels who helped define the sites which were considered for County Geological Site status. Sarah Gatley in the Geological Heritage and Planning Section of GSI also provided invaluable support and guidance throughout the project.

Section 2 - Site Reports

Site reports – general points

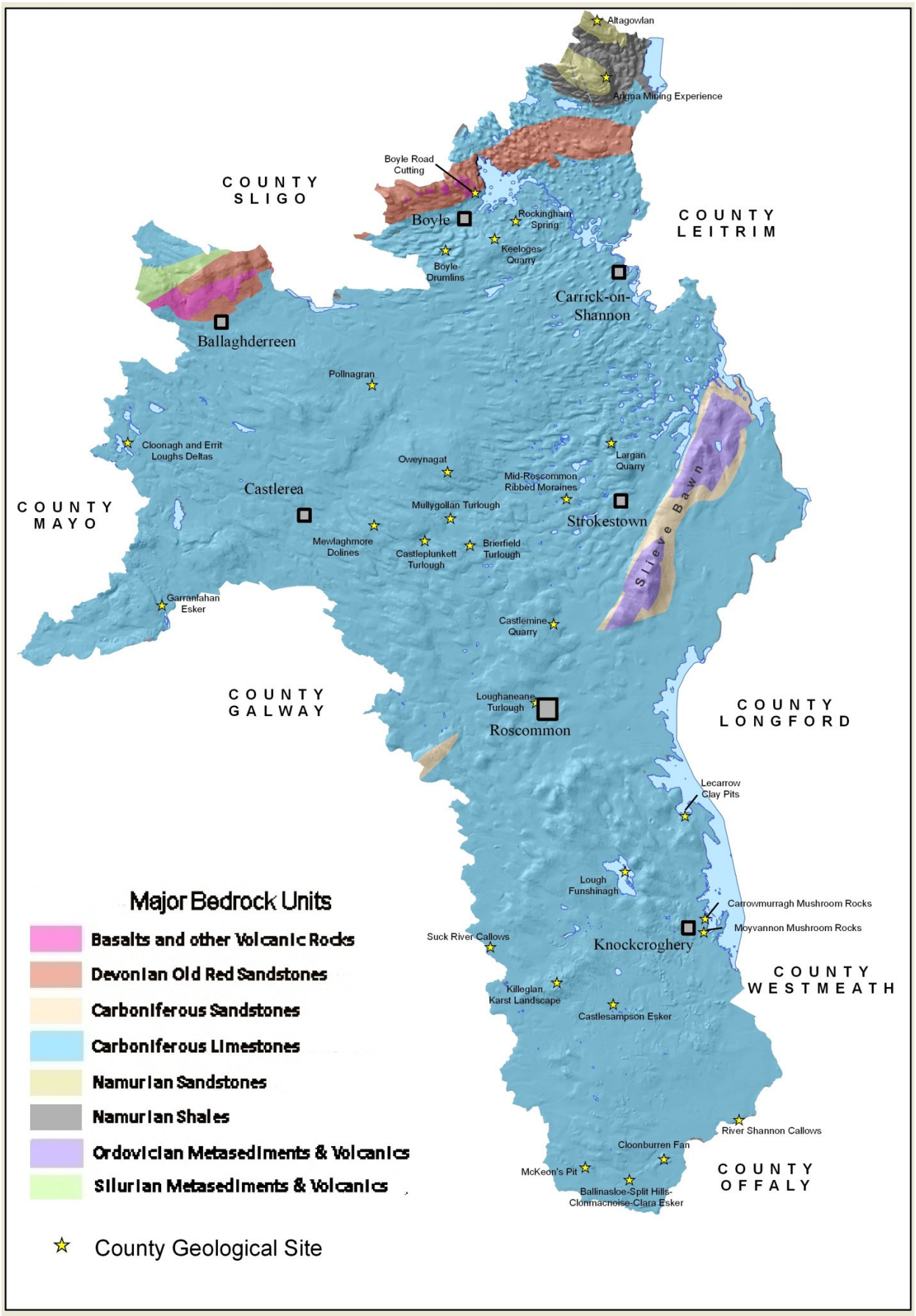
The following site reports are brief non-technical summaries of the proposed County Geological Sites for County Roscommon. These have been specially prepared for this Report in order to make the information accessible to planners and others without geological training. For most sites more detailed reports 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 for a glossy booklet or leaflet for the general public**. Grid references are given normally for a central point in the site, if the site is small, or two extreme points at opposite ends of the site if the site is extensive or linear. They are only indicative of the location, but the site extent is best shown on the included maps.

A series of maps are 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 and boundary 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. Some areas may already be available if they are proposed NHAs (pNHA), under the Wildlife (Amendment) Act 2000. Areas which have been designated as Special Areas of Conservation (SAC) under European Habitats Directives will also have statutory boundaries already determined. The geological interest may be included within the wider area of nature conservation.

In terms of any geological heritage site designation as NHA, due process of site reporting, boundary survey and very importantly, consultation with landowners where they can be readily identified, will take place before GSI makes recommendations to NPWS on the most important sites to be designated. Any landowner within areas or sites identified in this report with concerns over any aspect of this project is encouraged to contact Sarah Gatley, Head of the Heritage and Planning Section, in the Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4. Phone 01-6782837. Email: sarah.gatley@gsi.ie



Simplified Geological Map of Roscommon with site locations indicated.

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Brierfield Turlough**
Other names used for site	
IGH THEME	**IGH1 Karst, IGH7 Quaternary, IGH16 Hydrogeology**
TOWNLAND(S)	**Slevin, Lismurtagh, Ballaghabawbeg, Ballaghabawmore, Tonbaun, Brierfield, Carrowbaun**
NEAREST TOWN	**Tulsk**
SIX INCH MAP NUMBER	**28**
NATIONAL GRID REFERENCE	**181105 277550 (centre of turlough)**
1:50,000 O.S. SHEET NUMBER	**40 1/2 inch Sheet No. 12**

Outline Site Description
Brierfield Turlough is located southeast of the R367 road, about halfway between Castleplunkett and Tulsk. It is in a noticeable basin, bordered by a rock outcrop to the northeast and southwest, and sloping fields underlain by till around the rest of the feature.

Geological System/Age and Primary Rock Type
The turlough has been formed by solution of the karstified Lower Carboniferous limestone which probably occurred in Tertiary times, while its current form is a result of the glaciers of the last Ice Age, which acted during the late Quaternary Period.

Main Geological or Geomorphological Interest
The turlough basin has a 'V' shape extending southwest and northeast. The southwestern arm is peaty and appears flat or slightly domed. The rest of the turlough floor is uneven, the valley in the northwest opening out into a hummocky zone around the swallow holes with shallow channels. A semi-permanent stream enters from the northwest, and water enters from a spring at the southwest. There is additional seepage into the turlough from the peaty areas at the eastern edge.

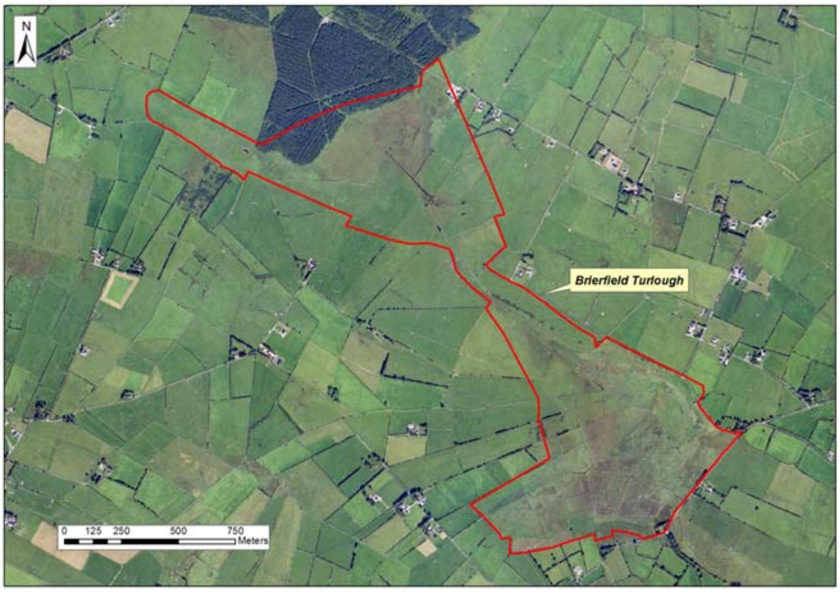
Site Importance – County Geological Site; may be recommended as Geological NHA
Brierfield Turlough was one of twenty-two turlough sites included in a project, funded by the National Parks and Wildlife Service and the Environmental Protection Agency, entitled Assessing the Conservation Status of turloughs. Twelve vegetation communities were mapped in Brierfield Turlough.

Management/promotion issues
The site is already a pNHA (site number 000594), but is an excellent site in terms of karst geomorphology as a well developed swallow hole occurs at the centre of the feature and unusual aspects such as algae paper occur at the base of the feature when freshly drained. The site should be promoted as potentially the best example of a karst turlough in County Roscommon.

The sinkholes of Brierfield Turlough exposed when the turlough was dry in September 2012.

Brierfield Turlough, dry in September 2012.


Brierfield Turlough
Tulsk
Tuilsce
Grange
Ogulla
Balloony
Tonroe
Rathkeiva
Toomona
Lissawaddy
Castleruby
Carrowkeel
Farranawillin
Carrownaskeagh
Crannog
Carrowgarvoy
Ballybeg
Cargin Demesne
Lissacurkia
Ballybroghan
Carrowkell
Corbally
Cloonanart Beg
Ardkeenagh
Slevin
Lismurtagh
Cerns
Manor
Ballaghabawmore
Ballaghabawbeg
Ardeevin
Milltown
Tonbaun
Carrowbaun
Doonleen
Rathmore
Clashaganny
Sheegeeragh
Brierfield
Crannogs
R367
N61
N5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Brierfield Turlough
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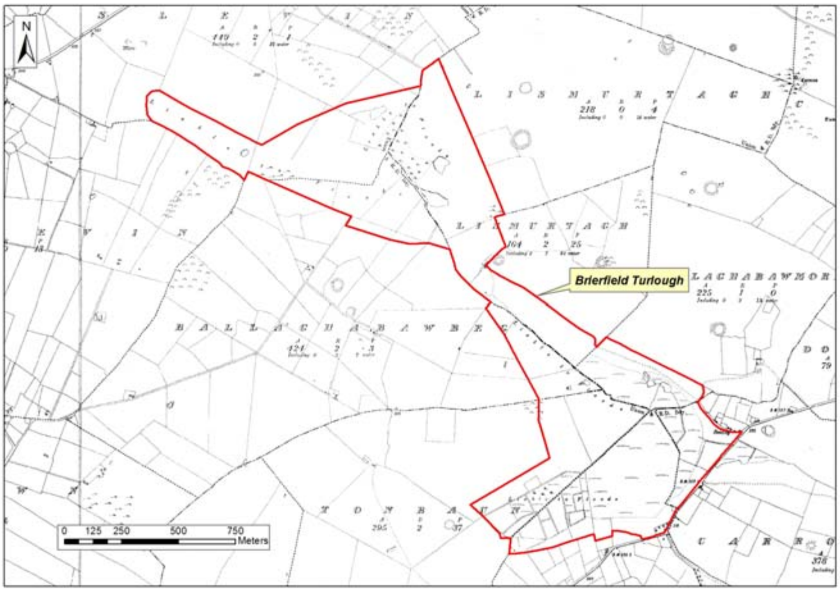
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Brierfield Turlough
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ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Castleplunkett Turlough**
Other names used for site	
IGH THEME	**IGH1 Karst, IGH7 Quaternary, IGH16 Hydrogeology**
TOWNLAND(S)	**Castleplunkett, Ardeevan**
NEAREST TOWN	**Tulsk**
SIX INCH MAP NUMBER	**27**
NATIONAL GRID REFERENCE	**177824 277700 (centre of turlough)**
1:50,000 O.S. SHEET NUMBER	**40 1/2 inch Sheet No. 12**

Outline Site Description
Castleplunkett Turlough is located immediately southeast of the R367 road, at Castleplunkett Village. It is in a noticeable basin, bordered by a rock outcrop to the northeast and sloping fields underlain by till to the south.

Geological System/Age and Primary Rock Type
The turlough has been formed by solution of the karstified Lower Carboniferous limestone which probably occurred in Tertiary times, while its current form is a result of the glaciers of the last Ice Age, which acted during the late Quaternary Period.

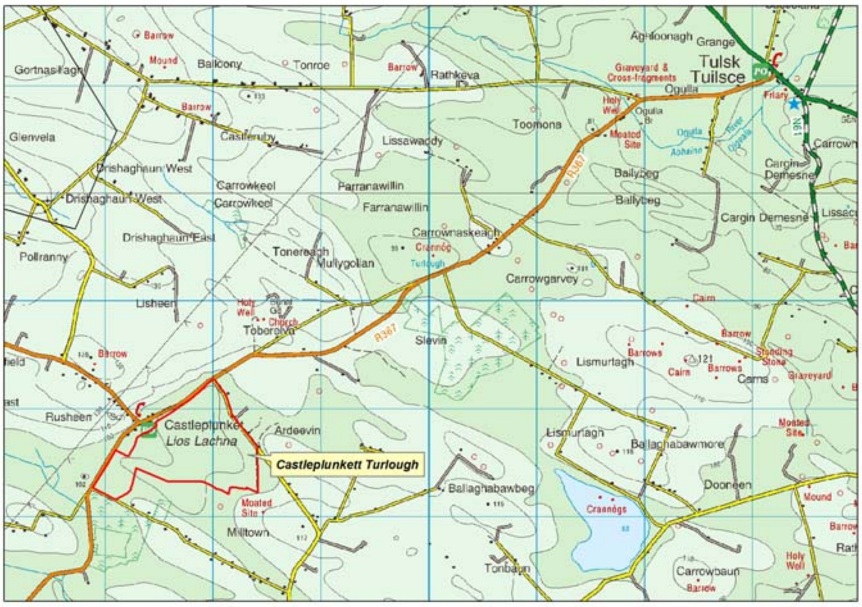
Main Geological or Geomorphological Interest
The turlough is one of the best examples of a turlough feature, which are commonplace in mid-Roscommon. A semi-permanent stream enters from the northeast and flows towards ponds and a swallow hole in peat and rock, which occurs at the centre of the feature. The floor of the turlough retains a high water table, with ditches in summer and there has been a significant peat accumulation. Fen vegetation covers this peat and there is little formation of marl at present. The turlough has a very distinctive appearance in summer due to the presence of the black moss *Cinclidotus* on rocks in the basin floor.

Site Importance – County Geological Site
Castleplunkett is an important turlough because of its semi-natural condition, and its high degree of physical and vegetational diversity. The wetlands support national and wintering bird populations of conservation status.

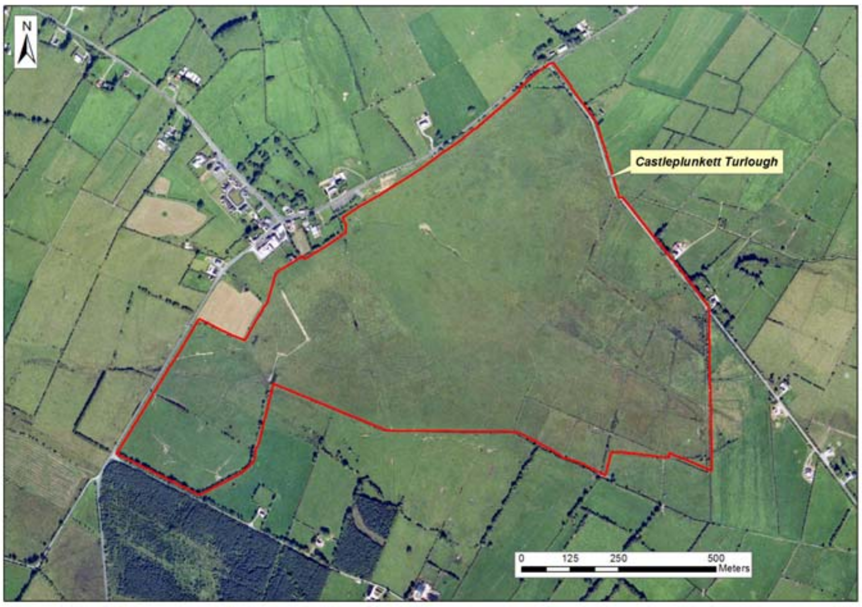
Management/promotion issues
The site has been designated as a proposed NHA (site number 000598). Listing it as a County Geological Site gives recognition to the geological foundation of the biodiversity importance.

A view of Castleplunkett Turlough from the village.

A view of Castleplunkett Turlough from the southeast.



Castleplunkett Turlough
Castleplunket
Lios Lachna
Tulsk
Tuilsce
R367
Gortnaslagh
Ballcony
Tonroe
Rathkeva
Glenvela
Castleruby
Lissawaddy
Toomona
Drishaghaun West
Carrowkeel
Farranawillin
Drishaghaun East
Carrownaskeagh
Pollranny
Tonereagh
Mullygollan
Carrowgarvey
Lisheen
Toborolva
Slevin
Lismurtagh
Rusheen
Ardeevin
Ballaghabawmore
Ballaghabawbeg
Milltown
Dooneen
Tonbaun
Carrowbaun
Ogulla
Bailybeg
Ballybeg
Cargin Demesne
Agaloonagh
Grange
Barrow
Mound
Holy Well
Moated Site
Crannóg
Turlough
Cairn
Barrows
Cairns
Standing Stone
Graveyard
Church
Friary
Crannógs
Graveyard & Cross-fragments



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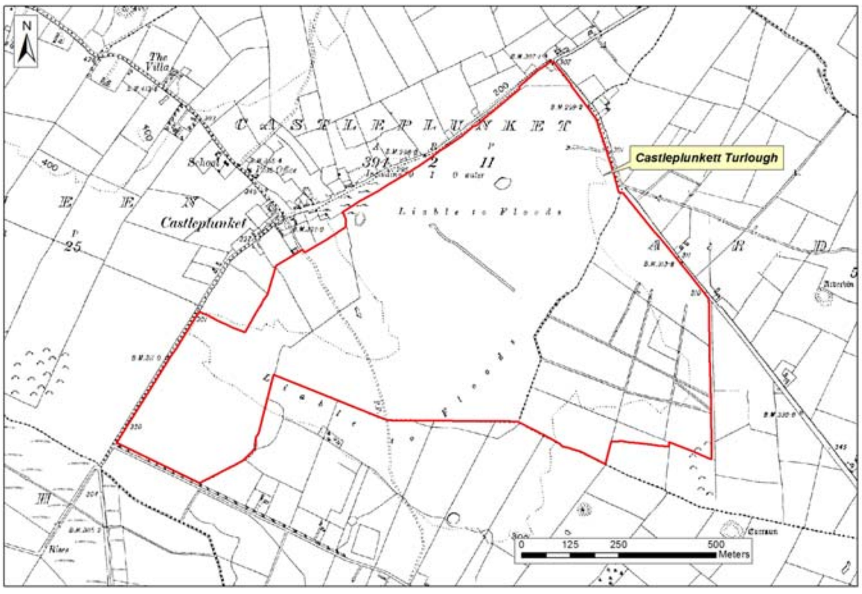

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ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Carrowmurragh Mushroom rocks**
Other names used for site	
IGH THEME	**IGH1 Karst,** **IGH14 Fluvial and Lacustrine Geomorphology**
TOWNLAND(S)	**Carrowmurragh**
NEAREST TOWN	**Athlone**
SIX INCH MAP NUMBER	**49**
NATIONAL GRID REFERENCE	**199758 248115**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 12**

Outline Site Description
The site comprises four different limestone rocks in close proximity, which exhibit a mushroom shape or which show dissolution with marked overhanging lips or shelves.

Geological System/Age and Primary Rock Type
These rocks are of Carboniferous limestone, but the solution is believed to be post-glacial (Holocene) from short lived submergence in temporary lakes or higher-level river floodplains than presently exist.

Main Geological or Geomorphological Interest
Throughout Ireland only around 70 of these mushroom stones are known, in several discrete areas. These stones and the associated cluster at Moyvannan in Cornaseer Townland a kilometre south are indicative of a much higher former level of Lough Ree. This prolonged exposure of the undercut portions of the stone probably took place in the period immediately after glaciation ended when there was both extensive meltwater and many temporary barriers of glacial sediment or remnant ice which dammed back water until new overflow channels and breaches were formed.

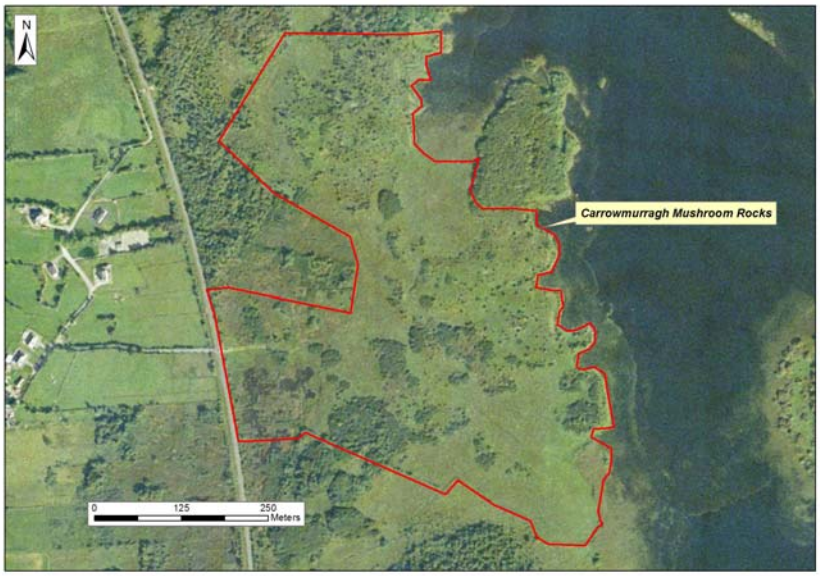
Site Importance – County Geological Site; may be recommended for Geological NHA
These are fine examples of mushroom stones and are of national importance since there are so few on a countrywide basis.

Management/promotion issues
The rocks are inaccessible, very difficult to find and any kind of promotion of them as visitor sites would require some investment as well as landowner agreement and co-operation. It would be desirable to bring them into the public domain and make them accessible, with interpretation. They are also vulnerable to obscurity and damage from the growth of unwanted vegetation like ivy, gorse and brambles. If linked with Moyvannan stones they could make an excellent trail. They are currently within Lough Ree SAC and pNHA (Site Number 000440), and SPA (004064).

Carrowmurragh 1 mushroom stone.

Carrowmurragh 1 mushroom stone viewed from a different angle showing the pedestal and undercut.


Carrowmurragh Mushroom Rocks
Lough Ree
Loch Rí
Bally Bay
Hodson's Bay
Barry Beg
ATHLONE
Baile Átha Luain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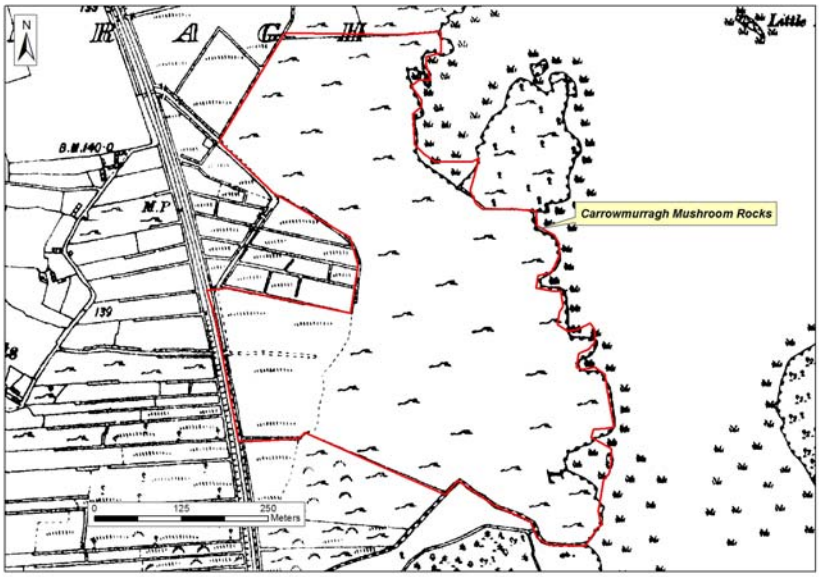
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ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Mullygollan Turlough**
Other names used for site	Carrownaskeagh Turlough
IGH THEME	**IGH1 Karst, IGH7 Quaternary, IGH16 Hydrogeology**
TOWNLAND(S)	**Mullygollan, Carrownaskeagh, Farranawillin, Slevin**
NEAREST TOWN	**Tulsk**
SIX INCH MAP NUMBER	**28**
NATIONAL GRID REFERENCE	**179900 279430 (centre of turlough)**
1:50,000 O.S. SHEET NUMBER	**40 1/2 inch Sheet No. 12**

Outline Site Description
Mullygollan Turlough is located immediately northwest of the R367 road, about halfway between Castleplunkett and Tulsk. It is in a noticeable basin, bordered by a rock outcrop to the north and sloping fields underlain by till to the south.

Geological System/Age and Primary Rock Type
The turlough has been formed by solution of the karstified Lower Carboniferous limestone which probably occurred in Tertiary times, while its current form is a result of the glaciers of the last Ice Age, which acted during the late Quaternary Period.

Main Geological or Geomorphological Interest
The turlough is one of the best examples of a turlough feature, which are commonplace in mid-Roscommon. A semi-permanent stream enters from the west and flows towards ponds and a swallow hole in rock. The floor of the turlough retains a high water table, with ditches in summer and there has been a significant peat accumulation. Fen vegetation covers this peat and there is little formation of marl at present.

Site Importance – County Geological Site
Mullygollan is an important turlough because of its semi-natural condition, and its high degree of physical and vegetational diversity. The occurrence of the scarce Water Sedge (*Carex aquatilis*) and Lesser Water-parsnip (*Berula erecta*), the former in its only known turlough site are of interest. This, coupled with its birdlife, adds to its overall importance ecologically.

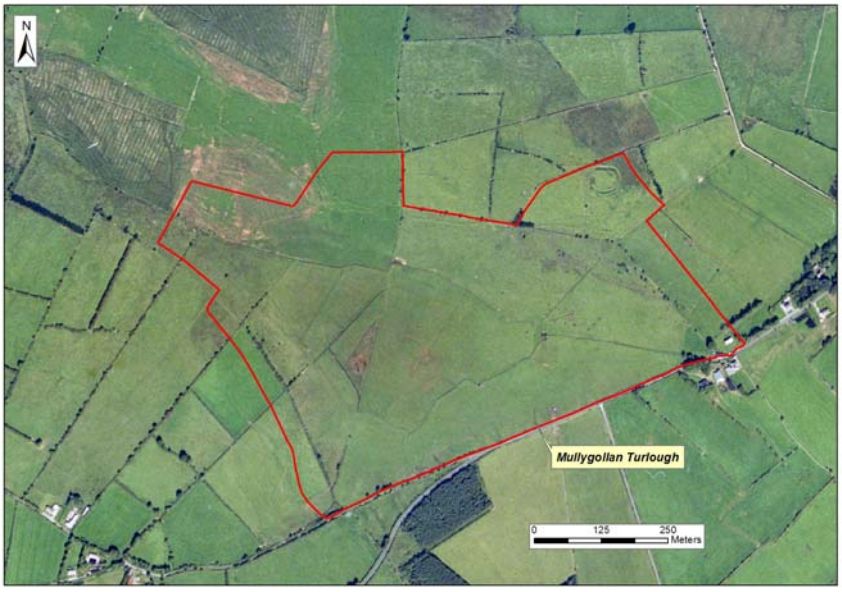
Management/promotion issues
The site has been designated an SAC and is a proposed NHA (Site No. 000612). The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation are designated to afford protection to the most vulnerable of them. Listing Mullygollan Turlough as a County Geological Site gives recognition to the geological foundation of the biodiversity importance.

A panorama view of Mullygollan Turlough from higher ground to the southwest.

A panorama view northwest into the turlough from the R367 road.

A view of the centre of Mullygullan Turlough from the southwest.


Aghloonagh
Grange
Barrow
Rathkeva
Graveyard &
Cross-fragments
Tulsk
Tuilsce
PO
Ogulla
Friary
Holy
Well
Ogulla
Br
Toomona
Moated
Site
Ogulla
Abhainn
River
Oigeala
N61
Lissawaddy
R367
Ballybeg
Cargin
Demesne
Farranawillin
Ballybeg
Farranawillin
Cargin Demesne
Carrowmaskeagh
Crannóg
Turlough
Mullygollan Turlough
Cairn
R367
Slevin
Barrow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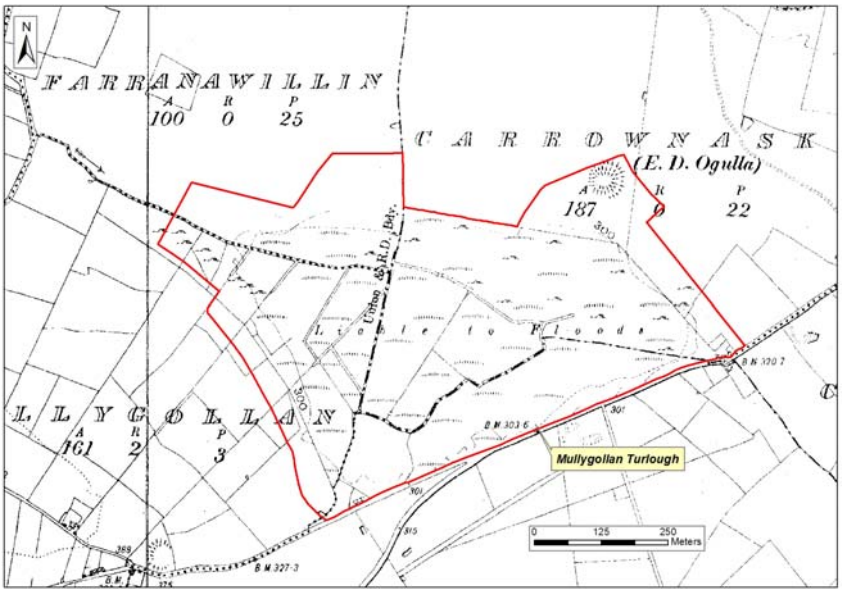
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FARRANAWILLIN
A R P
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(E. D. Ogulla)
A R P
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LLYGOLLAN
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161 2 3
Mullygollan Turlough
0
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250
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Killeglan Karst Landscape**
Other names used for site	
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Milltown, Cuilleenoolagh, Cloonacaltry, Skeavally, Boleyduff, Tobermacloughlin, Lugboy, Breeole, Porteen, Ballyglass**
NEAREST TOWN	**Ballyforan, Taghmaconnell**
SIX INCH MAP NUMBER	**47, 48, 50**
NATIONAL GRID REFERENCE	**188250 243150 (centre of area)**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 12**

Outline Site Description
This site comprises an extensive area of bouldery terrain in southern Roscommon, covering an area of 5 by 2 kilometres, and includes a number of low amplitude, hummocky ridges. Three discrete areas of this topography are defined in close proximity to each other.

Geological System/Age and Primary Rock Type
The landscape is formed on bedrock which is Lower Carboniferous limestone. The majority of the ridge features, as well as the boulders, are Quaternary in age, having been deposited at the base or edge of the ice sheet moving northwest to southeast during the maximum period of the last Ice Age.

Main Geological or Geomorphological Interest
This area is unique in lowland Ireland as it expresses what the entire lowland limestone landscape would have looked like before man modified the countrywide, by reclaiming land and building field boundaries.

The area comprises a number of low, quasi-linear and hummocky ridges, which are 2m-10m in amplitude and often long and sinuous. These seem to be minor ribbed moraines. All of these features have been covered by karstified limestone boulders strewn across the ground. The area looks just like an area of karstified bedrock outcrop in many respects, but little outcrop is seen. The abundance of limestone boulders gives the landscape an unusual and rustic feel. The entire area is dry, with no surface drainage features visible. The majority of the area comprises dry grassland or scrub.

Site Importance – County Geological Site; recommended for Geological NHA
This is the only such area of lowland, boulder-strewn, limestone glacial karst in the country. It is of national importance.

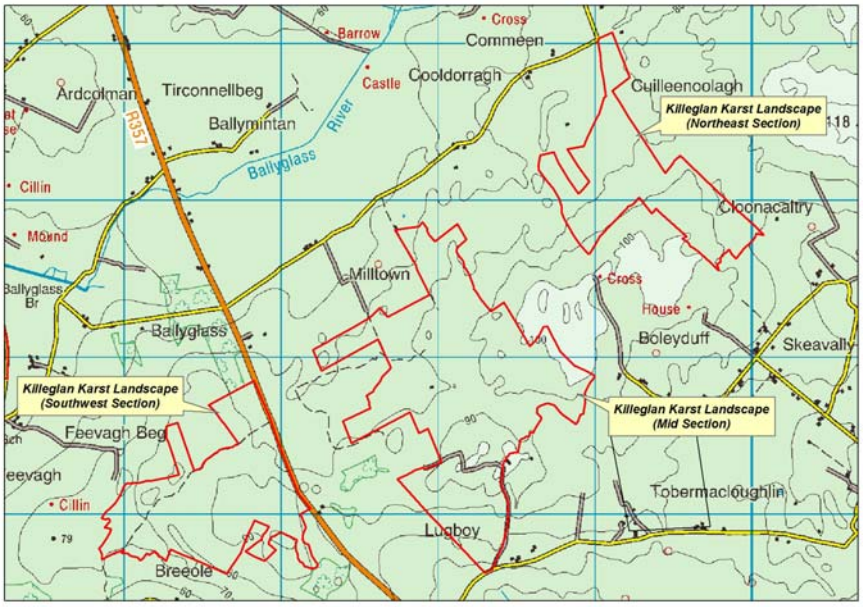
Management/promotion issues
This is an excellent site in terms of macro-scale Quaternary geomorphology. The landscape is noteworthy and should be promoted as unique amongst landscape elements within the Roscommon County Development Plan and in Landscape Characterisation. The site should also be designated as an NHA owing to the uniqueness of the natural landscape character.

The site boundary illustrated here delineates the area displaying this geology in 2004 when the aerial photographs of the locality were taken. As land management practices are constantly changing and may have impacted heavily on this vulnerable landscape, in order to delineate the exact remaining area of interest a detailed field survey is required.

Further research and investigation is required to document and understand the full scientific story. Since a windfarm has been granted planning permission in 2012, it is hoped that scientific opportunity created by ground excavations for this will be used and not wasted.

The pristine landscape of limestone boulders on glacial moraine at Killeglan.

The pristine landscape of limestone boulders on glacial moraine at Killeglan, with karstic weathering imitating limestone bedrock.


Barrow
Cross
Commeen
Castle
Cooldorragh
Ardcolman
Tirconnellbeg
Ballymintan
River
Ballyglass
R357
Cillin
Moand
Cuilleenoolagh
Killeglan Karst Landscape
(Northeast Section)
118
Cloonacaltry
Milltown
Cross
House
Boleyduff
Skeavally
Ballyglass
Br
Killeglan Karst Landscape
(Southwest Section)
Killeglan Karst Landscape
(Mid Section)
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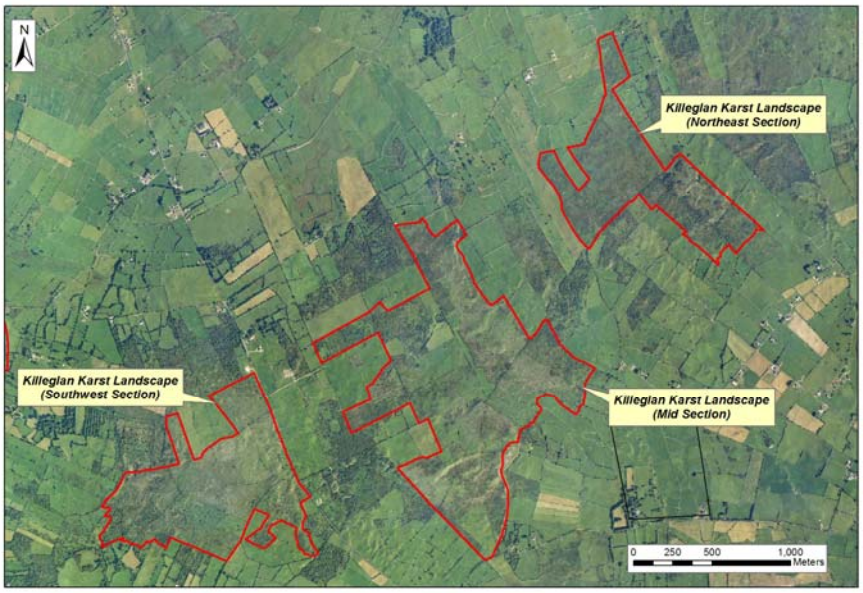
Cillin
Tobermacloughlin
Lugboy
79
Breeole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Killeglan Karst Landscape
(Northeast Section)
Killeglan Karst Landscape
(Southwest Section)
Killeglan Karst Landscape
(Mid Section)
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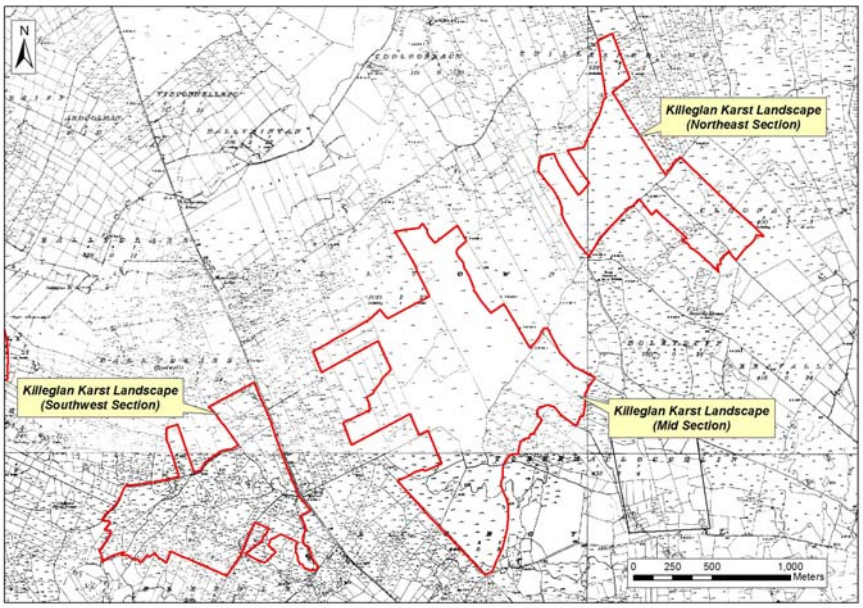
Meters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(Northeast Section)
Killeglan Karst Landscape
(Southwest Section)
Killeglan Karst Landscape
(Mid Section)
0 250 500 1,000
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Lough Funshinagh**
Other names used for site	
IGH THEME	**IGH 1 Karst, IGH7 Quaternary, IGH16 Hydrogeology**
TOWNLAND(S)	**Ballagh, Lahara, Lysterfield, Kildurney, Carrick, Carrickbeg, Inchiroe and Gortfree, Lisfelim**
NEAREST TOWN	**Athlone**
SIX INCH MAP NUMBER	**45**
NATIONAL GRID REFERENCE	**193470 251500**

1:50,000 O.S. SHEET NUMBER **40, 47** **1/2 inch Sheet No.** **12**

Outline Site Description
Lough Funshinagh is a large lake which is known to occasionally disappear rapidly.

Geological System/Age and Primary Rock Type
The lake is in a karstic terrain with Carboniferous limestone bedrock underlying it, although there may be thin clay or marl deposits underlying the lake bed.

Main Geological or Geomorphological Interest
Lough Funshinagh is not a true turlough, but rather it is a disappearing lake. This only happens occasionally, with the last rapid draining taking place in September 1996. It appears that there must be one or more swallow holes in the lake bed which are normally 'plugged' with an impermeable layer, such as clay. If the seal is broken, then the shallow lake may drain, leaving large expanses of dry lakebed. Gradual slumping inward of impermeable material may then reseal the swallow hole and allow the lake to fill gradually again.

Site Importance – County Geological Site; recommended for Geological NHA
The rarity of such disappearing lakes in Ireland means that this site has already been recommended by GSI for designation as a geological Natural Heritage Area by the NPWS.

Management/promotion issues
Access by road to the lake is fairly restricted and could be enhanced if council resources permitted. However, unless the lake has had a disappearing event, it presents no more specific interest to a visitor than any other lake in the county. If the event happens again, it would be very helpful if appropriate geological researchers could be alerted in order to access the site and make observations about processes and locations of importance. Photographs taken during this time, of the lake itself from both the surrounding land and air, would be especially useful.

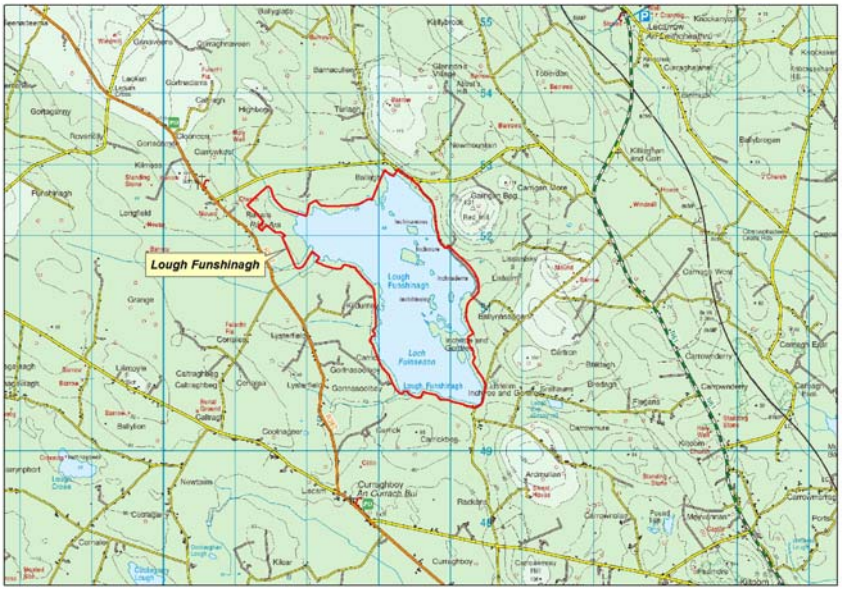
Lough Funshinagh is already a proposed NHA and an SAC (site number 000611).

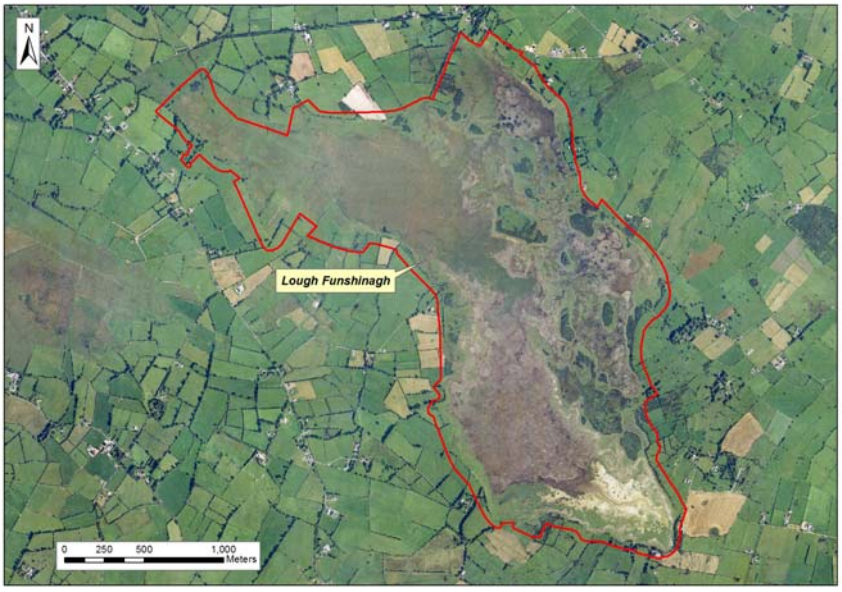
Lough Funshinagh from the roadside at the southern end looking north.

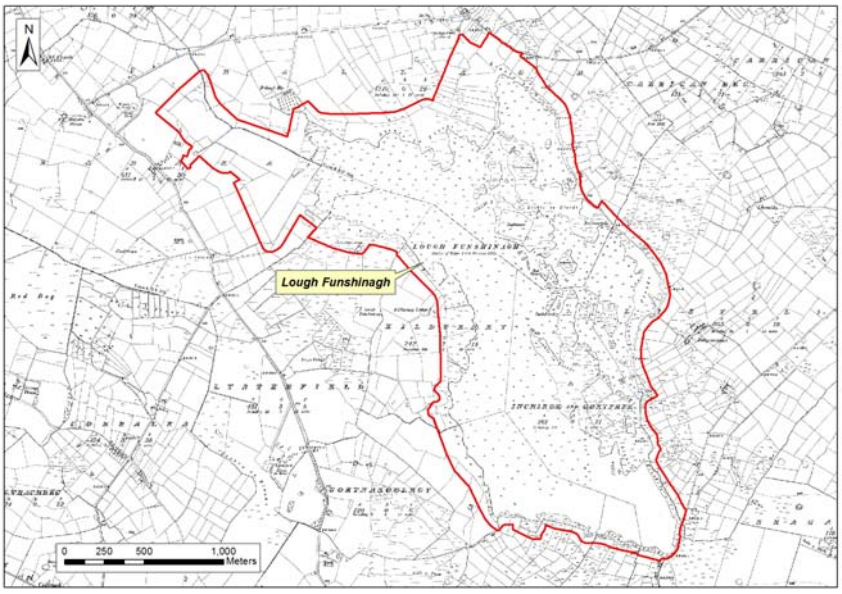
Lough Funshinagh viewed from the southwest side of Red Hill.

Lough Funshinagh, damp (left) and dry with algal paper covering (right) after a draining event in September 1996 (Photos: David Drew).

The main sink at Lough Funshinagh (Photo: David Drew)


Lough Funshinagh


N
Lough Funshinagh
0 250 500 1,000
Meters


N
Lough Funshinagh
0 250 500 1,000
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Loughnaneane Turlough**
Other names used for site	Loughnaneane Park
IGH THEME	**IGH1 Karst, IGH7 Quaternary, IGH16 Hydrogeology**
TOWNLAND(S)	**Loughnaneane, Ballyboughan**
NEAREST TOWN	**Roscommon**
SIX INCH MAP NUMBER	**39**
NATIONAL GRID REFERENCE	**186670 265000 (centre of feature)**
1:50,000 O.S. SHEET NUMBER	**40 1/2 inch Sheet No. 12**

Outline Site Description
This site comprises an expansive turlough adjacent to Roscommon town.

Geological System/Age and Primary Rock Type
The turlough is founded on Carboniferous Limestone bedrock, in a basin eroded largely by ice sheets during the Ice Age (Quaternary).

Main Geological or Geomorphological Interest
The turlough is a karstic basin which is sometimes inundated with water yet at other times is dry grassland, depending on the level of the water table. This turlough shows no obvious large springs to feed it, nor sinks that take water, as many turloughs have, so presumably water flow is via many smaller conduits in the bedrock.

Site Importance – County Geological Site
This turlough is a good example of a geomorphological feature which Roscommon has a large number of, but which are rare in Europe as a whole and largely represented only in Ireland. An arbitrary choice of larger than 10 hectares in size for SAC designation of turloughs means that some smaller ones such as Loughnaneane Turlough of significance are overlooked in nature conservation designations.

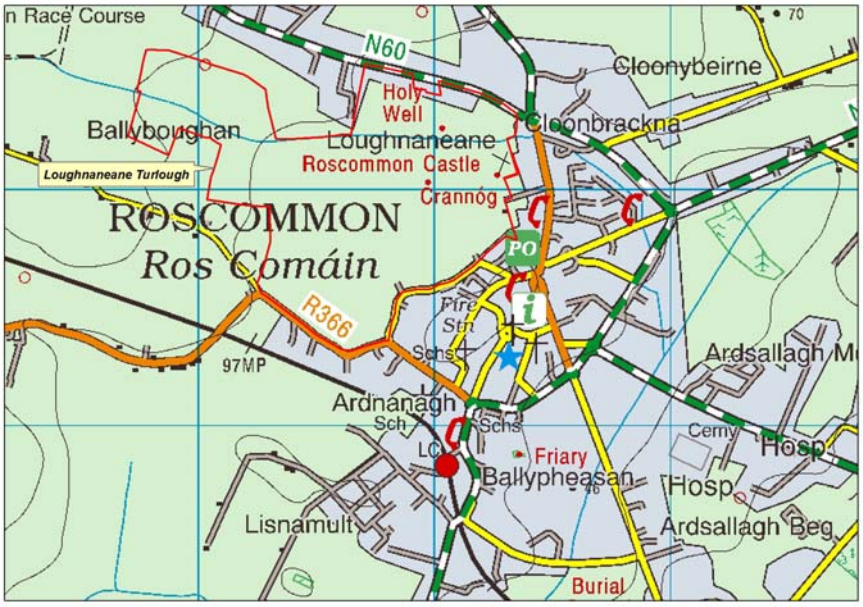
Management/promotion issues
This site has a pride of place in Roscommon town through Loughnaneane Park which is partly within the turlough and which already offers good opportunities for people to visit, view, learn about and enjoy the turlough and its wildlife, as the seasons change and water levels in the turlough also change.

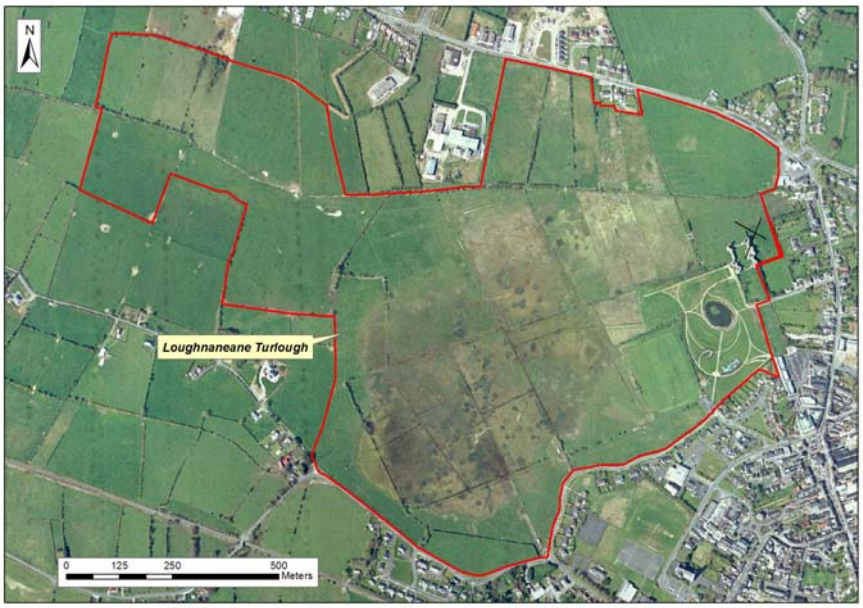
A view over the turlough in summer of 2012, from the road at the southeastern margin.

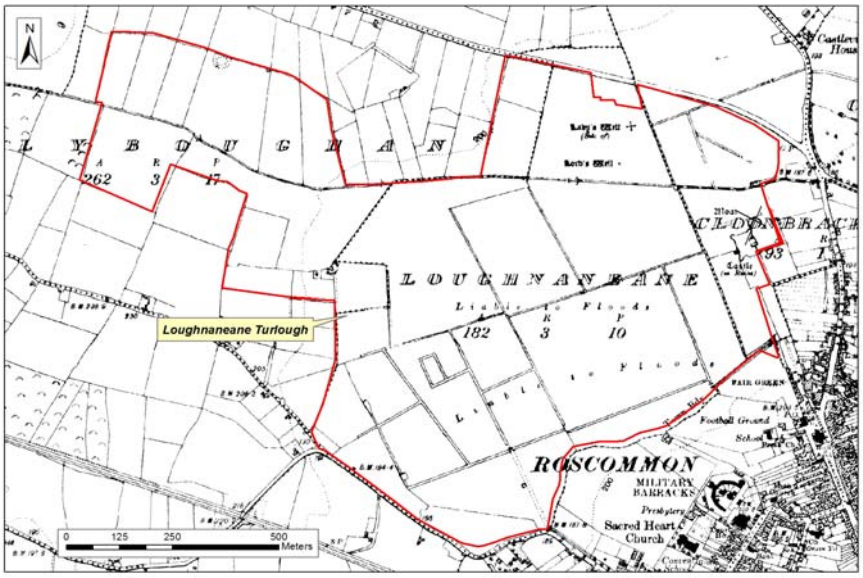
A sign for the park approaching the town.

Horses grazing the drier slopes of the turlough.

A view from Roscommon Castle steps looking over the public park, to the left, and fields sloping down to the centre of the turlough basin, looking west.


n Race Course
N60
Cloonybeirne
Holy Well
Cloonbrackna
Ballyboughan
Loughnaneane
Roscommon Castle
Crannóg
Loughnaneane Turlough
ROSCOMMON
Ros Comáin
PO
R366
Fire Stn
Schs
97MP
Ardsallagh M
Ardnanagh
Sch
Schs
Cemy
Hosp
LC
Friary
Ballypheasan
Hosp
Lisnamult
Ardsallagh Beg
Burial


N
Loughnaneane Turlough
0 125 250 500
Meters


N
Loughnaneane Turlough
LOUGHNANEANE
ROSCOMMON
MILITARY BARRACKS
Sacred Heart Church
0 125 250 500
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Mewlaghmore Dolines**
Other names used for site	
IGH THEME	**IGH1 Karst**
TOWNLAND(S)	**Southpark Demesne, Lissalway, Mewlaghmore, Rathbarna, Knockalegan West**
NEAREST TOWN	**Castlerea**
SIX INCH MAP NUMBER	**27**
NATIONAL GRID REFERENCE	**173360 279100 (centre of features)**
1:50,000 O.S. SHEET NUMBER	**40 1/2 inch Sheet No. 12**

Outline Site Description
The Mewlaghmore Dolines comprise a series of enclosed karstic depressions (or dolines) situated southwest of the R377 road, adjacent to Lissalway Crossroads. They are aligned in a northwest to southeast direction at the base of a shallow valley.

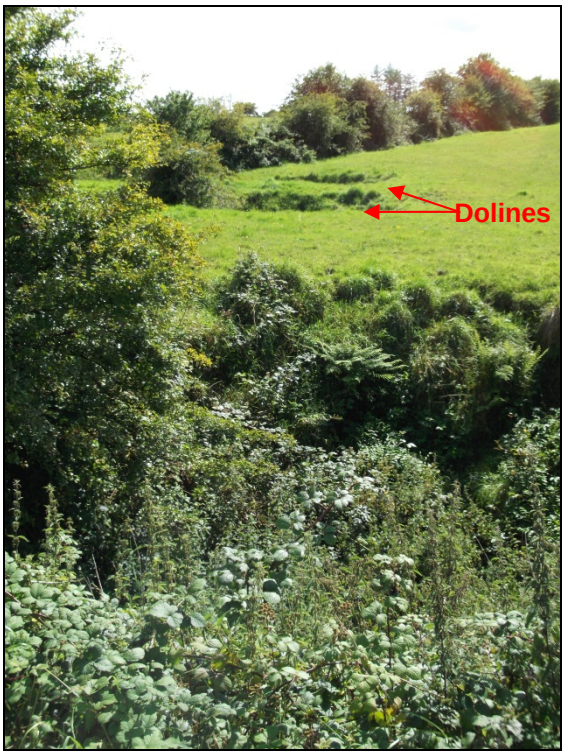
Geological System/Age and Primary Rock Type
The dolines have been formed by solution of the karstified Lower Carboniferous limestone during the late Quaternary Period.

Main Geological or Geomorphological Interest
The Mewlaghmore locality contains a large number of karst features (enclosed depressions and swallow holes) oriented along a linear plane. This is an excellent example of a high density of karst features along a dry valley. The field contains different types and forms of dolines, ranging from shallow, gentle-sided depressions to large, deep collapse dolines with vertical sides. The collapses follow a general line running northwest to southeast, which becomes increasingly more 'valley-like' to the west. Some of the features are dry, some hold ponded water and some are actually becoming swallow holes gradually as water is beginning to sink continually into them.

Site Importance – County Geological Site; recommended for Geological NHA
The field of collapse features is perhaps the finest in the country. It is rare to have such a high concentration of dolines, but the wide range of form within the features makes this locality an even more unique one. The site is proposed as a Geological NHA.

Management/promotion issues
This is an excellent site in terms of karst geomorphology. The site should be considered as potentially the best example of a field of collapse features in the country. The landowner should be identified if possible, to raise awareness of the scientific importance of these features. They are very vulnerable to misguided efforts at drainage or 'land improvement' for agricultural reasons.

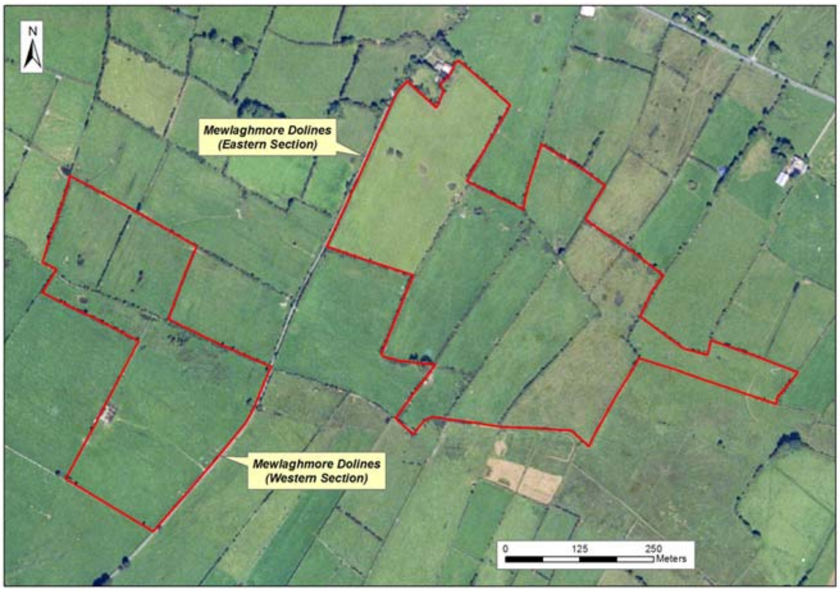
A view over the doline field, with many unseen shallow dolines present beyond the foreground example, with a small pond in it.

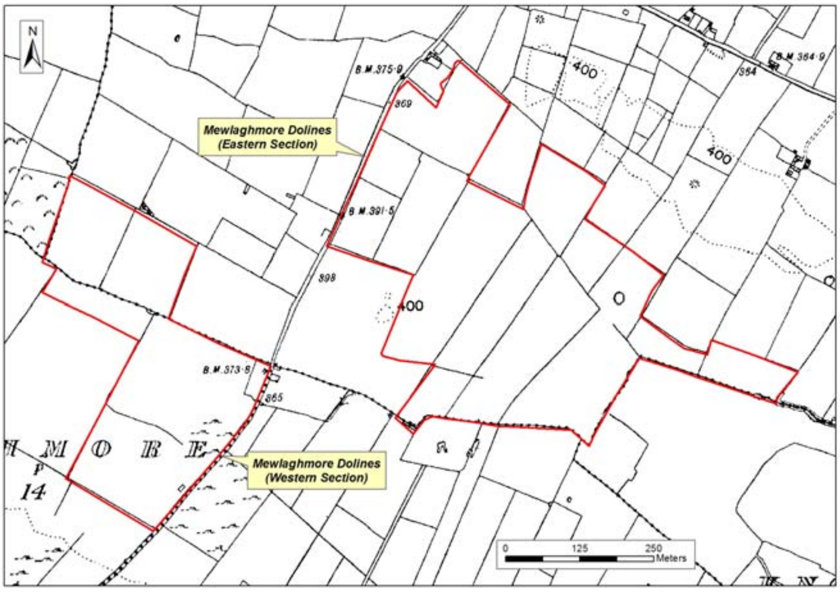


A sinkhole has developed in the foreground doline.

Two dolines: one flooded, one not.


Termon River
Carradooan
Termon More
Ballinphuill
Carradooan
Church
Ardass
Sch
Ballymulrennan
Southpark Demesne
Termon More
Ardass
Ballymulrennan
Termon River
Southpark D
Mewlaghmore Dolines
(Eastern Section)
PO
Rathleg
Southpark Demesne
CASTLEREA
An Caisleán Riabhach
Rampark
R377
Mewlaghmore Dolines
(Western Section)
Knockmurry
Mewlaghmore
Barrows
Carrowgarve
Reservoir
Barrow
Castleteheen
Lisliddy
Carrowmore
Mewlaghadooey
Hill
Holy
Well
Carrowkeel
Carrowkeel


N
Mewlaghmore Dolines
(Eastern Section)
Mewlaghmore Dolines
(Western Section)
0 125 250
Meters


N
B.M.375·9
Mewlaghmore Dolines
(Eastern Section)
400
B.M.391·5
400
B.M.373·8
Mewlaghmore Dolines
(Western Section)
0 125 250
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Moyvannan Mushroom rocks**
Other names used for site	Cornaseer mushroom stones
IGH THEME	**IGH1 Karst,** **IGH14 Fluvial and lacustrine Geomorphology**
TOWNLAND(S)	**Cornaseer**
NEAREST TOWN	**Athlone**
SIX INCH MAP NUMBER	**49**
NATIONAL GRID REFERENCE	**199583 247136**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 12**

Outline Site Description
This site comprises seven different limestone rocks in close proximity which exhibit a mushroom shape or which show dissolution with marked overhanging lips or shelves.

Geological System/Age and Primary Rock Type
These rocks are of Carboniferous limestone, but the solution is believed to be post-glacial (Holocene) from short lived submergence in temporary lakes or higher-level river floodplains than presently exist.

Main Geological or Geomorphological Interest
Throughout Ireland only around 70 of these mushroom stones are known, in several discrete areas. These stones and the associated cluster at Carrowmurragh a kilometre north are indicative of much higher former levels of Lough Ree. This prolonged exposure of the undercut portions of the stone probably took place in the period immediately after glaciation ended when there was both extensive meltwater and many temporary barriers of glacial sediment or remnant ice, which dammed back water until new overflow channels and breaches were formed.

The primary stone at Moyvannan is considered to be the classic form, with a full mushroom shape, and also with three lips on the underside indicating three separate former lake levels.

Site Importance – County Geological Site; recommended for Geological NHA
The primary stone is perhaps the ‘best’ example of a mushroom stone in the country and has been promoted by GSI for designation by NPWS as a geological NHA.

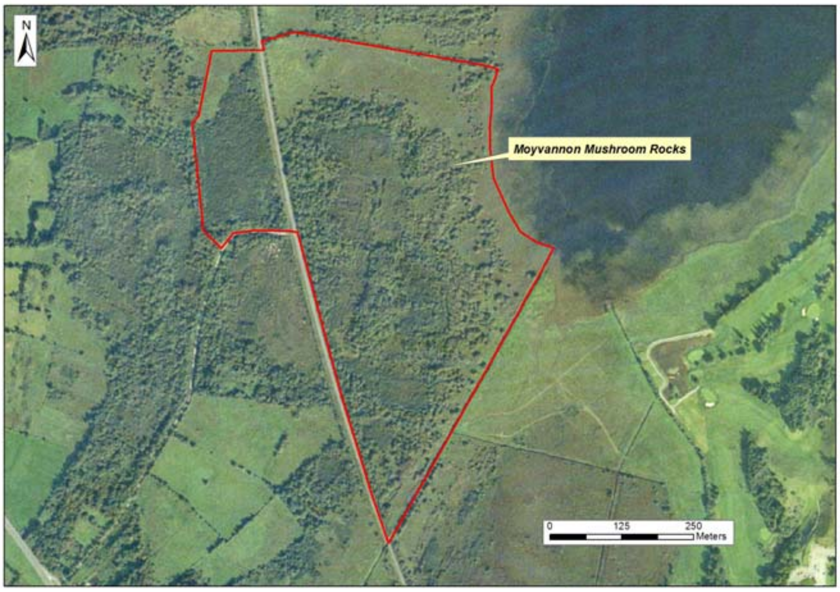
Management/promotion issues
The rocks are inaccessible and any kind of promotion of them as visitor sites would require some investment as well as landowner agreement and co-operation. It would be desirable to bring them into the public domain and make them accessible, with interpretation. They could be linked with the Carrowmurragh stones in some kind of trail. They are also vulnerable to obscurity and damage from the growth of unwanted vegetation like ivy, gorse and brambles. They are currently within Lough Ree SAC and pNHA (Site Number 000440), and SPA (004064).

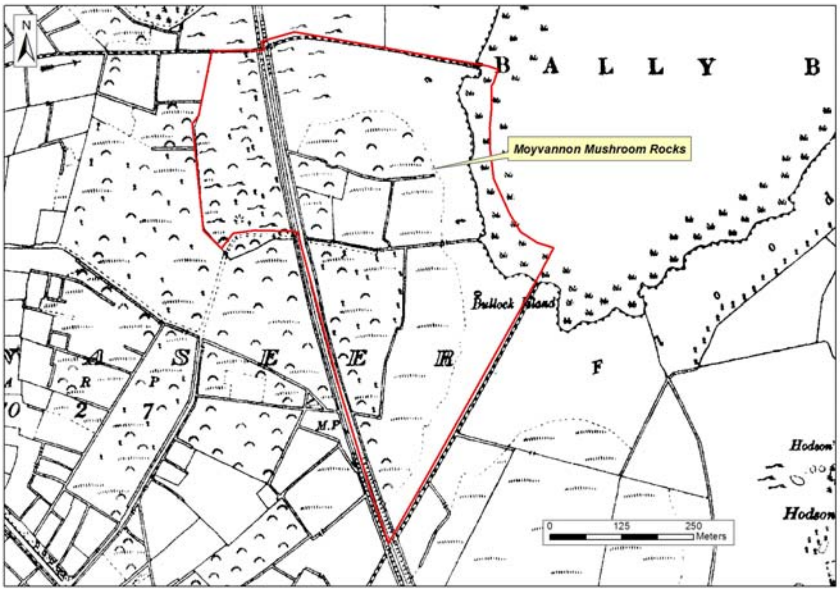
Stylised image of Moyvannan Mushroom rocks from Geological Survey of Ireland Memoir of 1865.

Moyvannan 1 mushroom rock.


Moyvannan 1 mushroom rock viewed from distance showing how vegetation is swallowing up the rock.


Moyvannon Mushroom Rocks
Lough Ree
Loch Rí
ATHLONE
Baile Átha Luain
Kiltoom
Cill Tuama
Comaseer
Ballybay
Hodson's Bay
Barry More
Barry Beg
Corramore
Gortacoosan
Cloghans Glebe
Lisbaun
Feamore
Carrowncloghan
Ballycreggan
Cloongowna
Meehan
Yellow Island
Hodson's Pillar


N
Moyvannon Mushroom Rocks
0
125
250
Meters


N
B A L L Y B
Moyvannon Mushroom Rocks
Bullock Island
F
M.P.
0
125
250
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Oweynagat**
Other names used for site	Uaigh nag Cat, Cave of the Cats, also possibly the Cave of Crúachu
IGH THEME	**IGH1 Karst**
TOWNLAND(S)	**Glenballythomas**
NEAREST TOWN	**Tulsk**
SIX INCH MAP NUMBER	**22**
NATIONAL GRID REFERENCE	**179580 283110**
1:50,000 O.S. SHEET NUMBER	**33 1/2 inch Sheet No. 12**

Outline Site Description
Oweynagat is a linear rift cave entered via a souterrain.

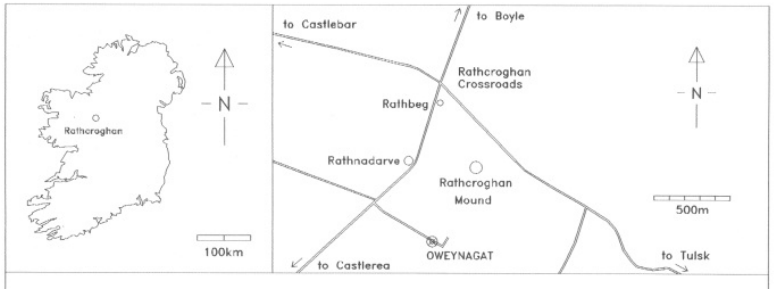
Geological System/Age and Primary Rock Type
The cave is within Carboniferous limestone, but is likely to be post-glacial (Holocene) in age.

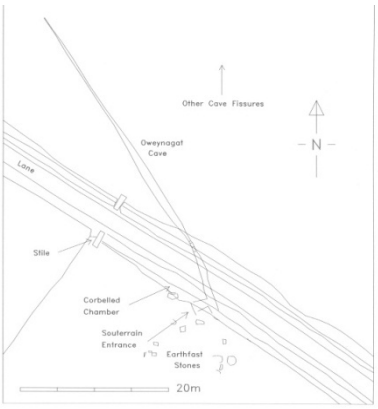
Main Geological or Geomorphological Interest
Aside from its archaeological and folklore interest, as a cave entered via a souterrain, and with an ogham stone built into the entrance roof, the cave is one of very few in County Roscommon and is in an extensive area of karstic terrain, with no other known caves. At Oweynagat there is 37m length of a straight rift passage, with its roof close to surface. Similar unroofed rifts are found within the same field towards the northwest.

A thin veneer of glacial sediment covers most of the limestone terrain in the plateau area west of Tulsk. There may well be other similar caves nearby, masked by sediment cover. The cave has no active stream.

Site Importance – County Geological Site
Although not especially large or otherwise remarkable, the isolated location and rarity of this cave make it important enough to be a County Geological Site. Its place within the rich, undamaged archaeological landscape around Rathcroghan supports the geomorphological interest.

Management/promotion issues
The cave and the souterrain entrance are on private farmland and are not suitable for visiting or promotion other than by permission of the landowner. Although not long or complex, cave environments are both fragile and potentially dangerous and caves should only be visited in the company of experienced cavers. Public access may be available in guided tours on occasion, through the Rathcroghan Visitor Centre in Tulsk (contact 071-9639268 or www.rathcroghan.ie).





Inside the main rift section of the cave.

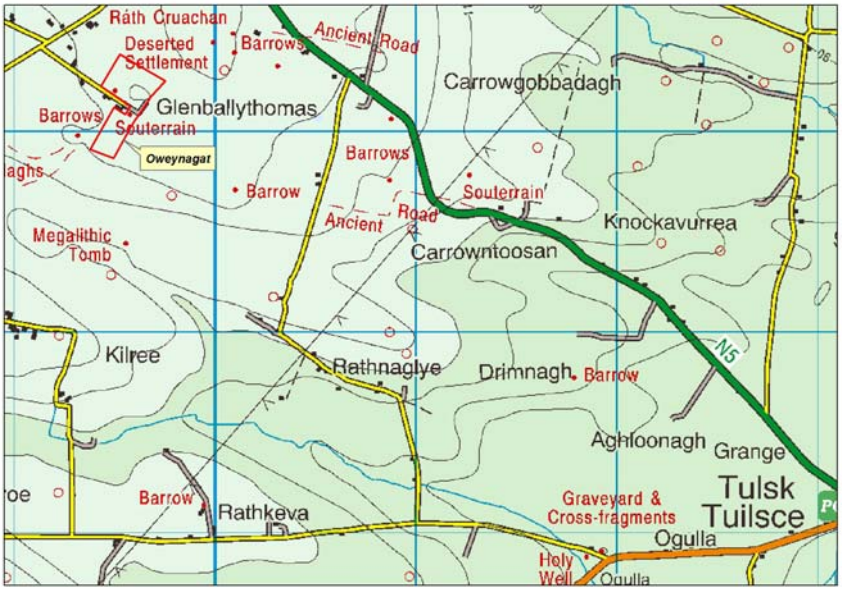
Unroofed cave passage near the cave.

Inside the main cave rift passage.

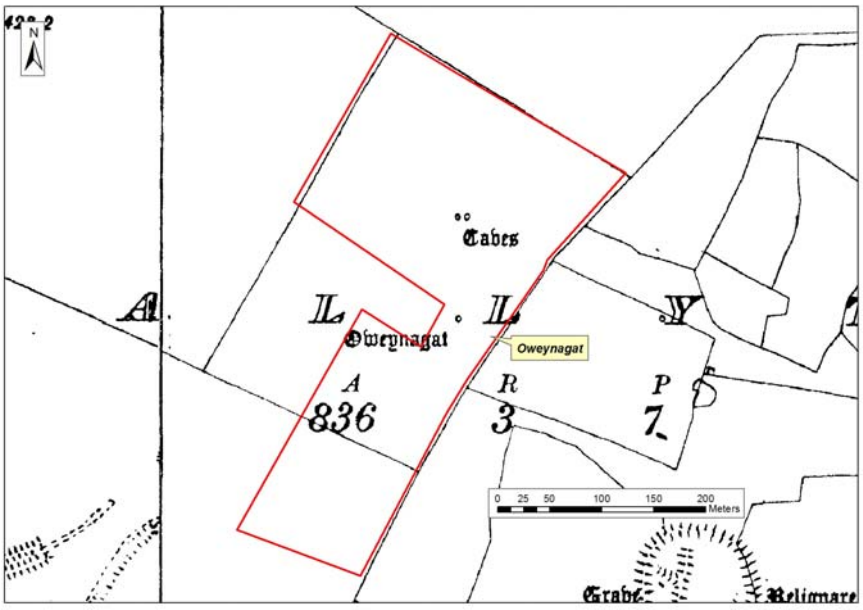
The stepped entrance looking outwards.

Outside the entrance to Oweynagat.

The stepped entrance looking inwards.


Ráth Cruachan
Deserted Settlement
Barrows
Ancient Road
Carrowgobbadagh
Glenballythomas
Barrows
Souterrain
Oweynagat
Barrows
Barrow
Souterrain
Ancient Road
Knockavurrea
Megalithic Tomb
Carrowntoosan
N5
Kilree
Rathnaglye
Drimnagh
Barrow
Aghloonagh
Grange
Barrow
Rathkeva
Graveyard & Cross-fragments
Tulsk
Tuilsce
Ogulla
Holy Well
Ogulla


N
Cave Extent
Oweynagat
0 25 50 100 150 200
Meters


N
Caves
Oweynagat
Oweynagat
A
836
R
3
P
7
0 25 50 100 150 200
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Pollnagran**		
Other names used for site			
IGH THEME	**IGH1 Karst**		
TOWNLAND(S)	**Leggatinty**		
NEAREST TOWN	**Frenchpark**		
SIX INCH MAP NUMBER	**15**		
NATIONAL GRID REFERENCE	**173510 289696**		
1:50,000 O.S. SHEET NUMBER	**33**	**1/2 inch Sheet No.**	**12**

Outline Site Description
Pollnagran is a 750m long, active stream cave.

Geological System/Age and Primary Rock Type
The cave is post-glacial (Holocene) in age.

Main Geological or Geomorphological Interest
This is the only active stream cave in Roscommon, and at 750m long is not insignificant. It was discovered in 2003 by two scientific cavers exploring all known and potential cave sites in Roscommon.

The cave has an entrance in a shallow blind valley where a surface stream disappears underground, although a second stream combines with the first a short distance in. The cave is then a single linear passage trending northeast until it becomes impassable. It follows a single bedding plane down a very shallow dip of 2-3 degrees and is a vadose trench. This means there is water cutting down in a trench, but with air above.

Scalloping of the walls is of small size and indicates fast flowing water. There are zones with roof breakdown, and many deposits of cobbles, sand and silt from reworking of the glacial till on which the surface stream flows before sinking into the limestone. There are also some calcite deposits inside the cave, cementing the fill material as false floors. The cave is near the surface as there are zones of active collapse in the overlying fields.

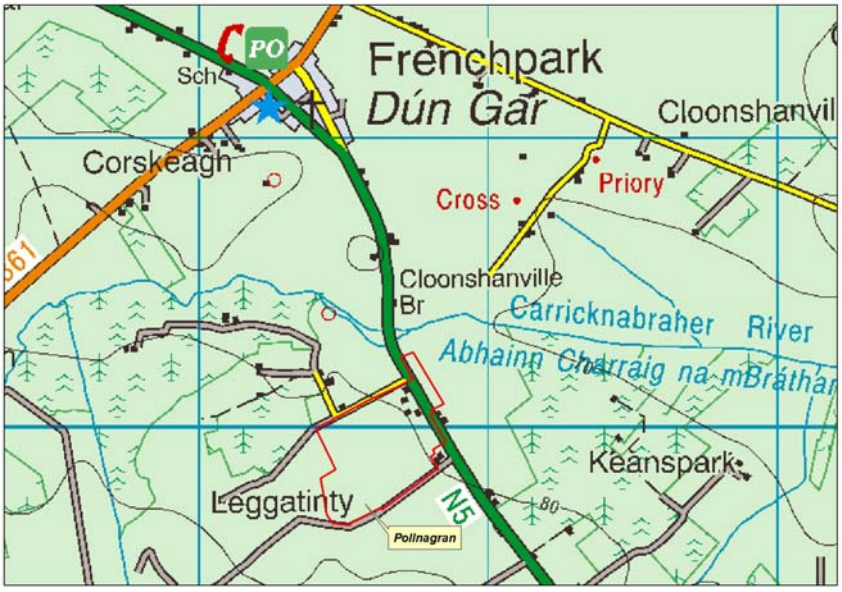
Site Importance – County Geological Site
As a rare active stream cave, this site merits being a County Geological Site, and it is unusual in the context of the widespread karstic terrain in County Roscommon.

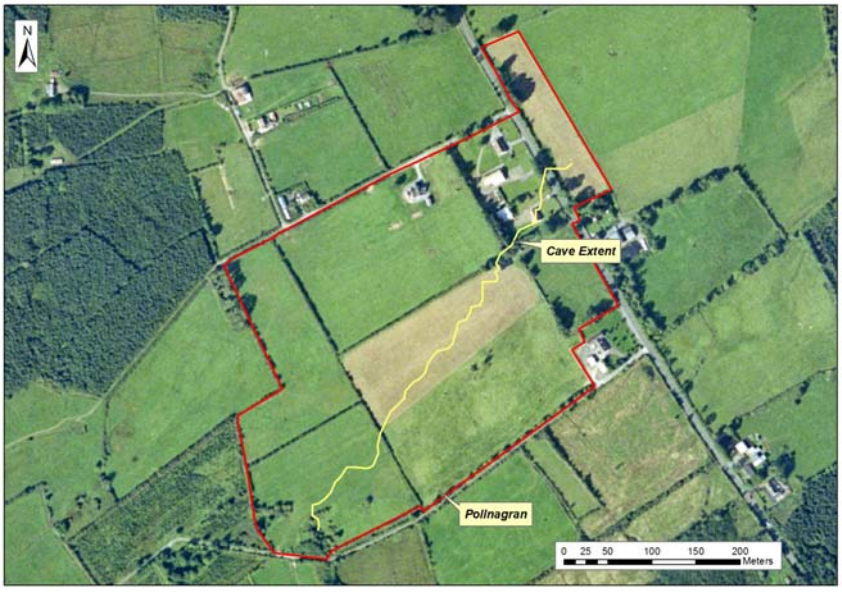
Management/promotion issues
The cave has a very tight entrance providing its own restriction to all but small and determined cavers. It is on private land and is not suitable for promotion.

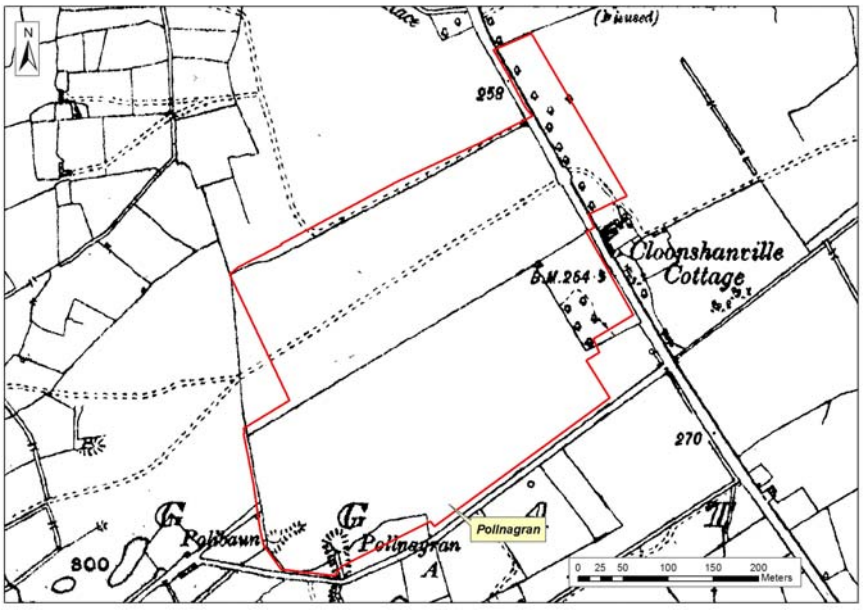
The cave entrance is at the end of the blind valley in the bramble vegetation.

The cave entrance.

The stream that forms the cave.


PO
Sch
Frenchpark
Dún Gar
Cloonshanvil
Corskeagh
Priory
Cross
561
Cloonshanville
Br
Carricknabraher River
Abhainn Charraig na mBráthar
Keanspark
Leggatinty
N5
80
Polinagran


N
Cave Extent
Polinagran
0 25 50 100 150 200
Meters


N
(Disused)
259
Cloonshanville
Cottage
B.M.254·9
270
Polinagran
Polinagran
800
0 25 50 100 150 200
Meters

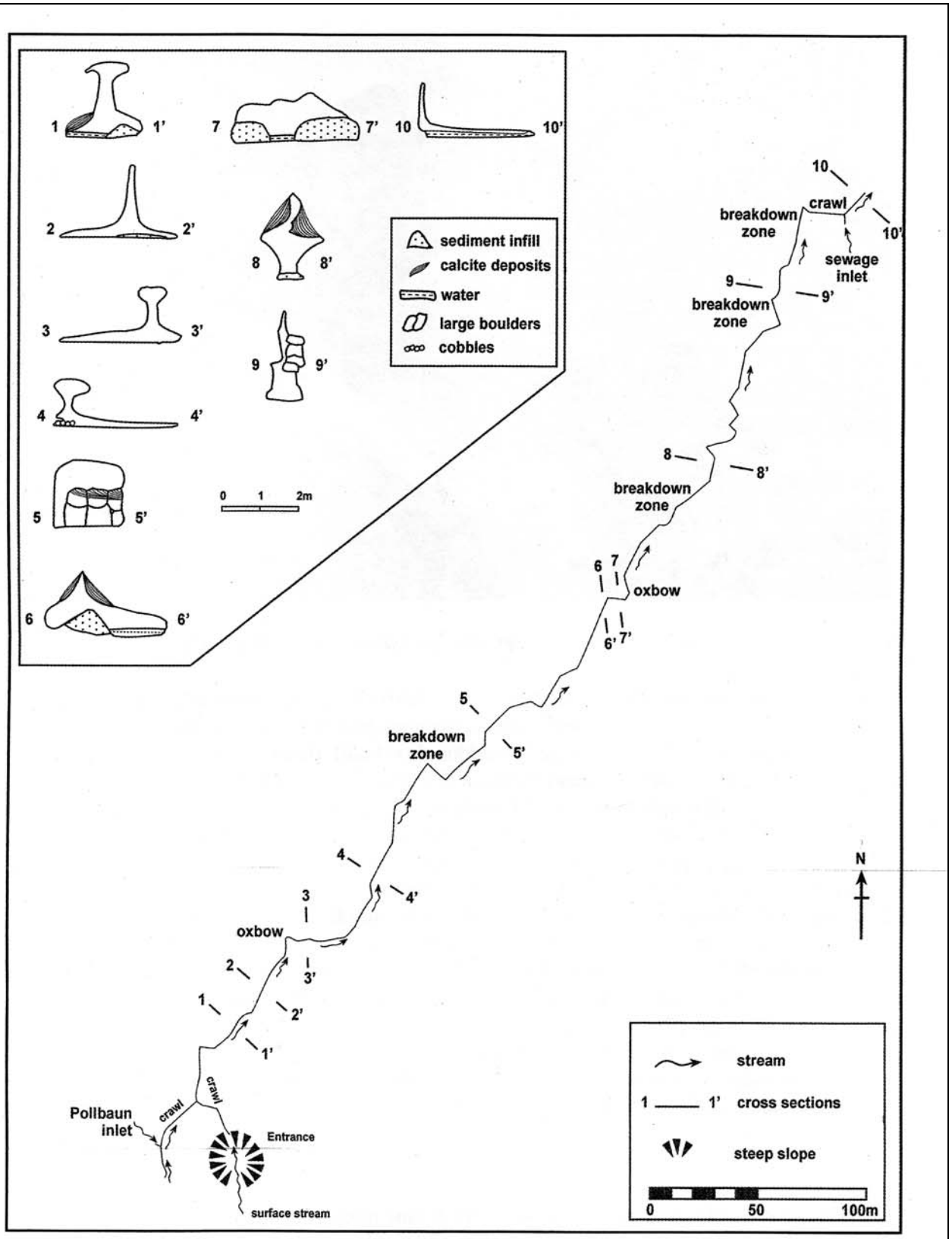


Figure 7. *Plan survey of Pollnagran.*

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Rockingham Spring**
Other names used for site	
IGH THEME	**IGH1 Karst, IGH16 Hydrogeology**
TOWNLAND(S)	**Rockingham Demesne**
NEAREST TOWN	**Boyle**
SIX INCH MAP NUMBER	**6**
NATIONAL GRID REFERENCE	**184970 302880 (spring)**
1:50,000 O.S. SHEET NUMBER	**33 1/2 inch Sheet No. 7**

Outline Site Description
The Rockingham Spring site comprises a disused spring sump and three production boreholes (PW-1, PW-2, PW-3). The spring overflows via two channels to meet the Ballykeevican stream, which then flows to Lough Key. A fourth, augmentation borehole is approximately 300 m north east of the spring, located in the adjacent field.

Geological System/Age and Primary Rock Type
The spring is of karstic origin, formed in pure bedded limestones of the Oakport Formation, which is of Lower Carboniferous age (359-320 million years ago).

Main Geological or Geomorphological Interest
The Oakport Limestone around Rockingham Demesne comprises well bedded, well-jointed, pale, clean, coarse grained rock, with thin shales. The boreholes drilled around the springs indicate fracture zones in the first 20 m. These fractures are likely to act as the major conduits for groundwater flow. The Oakport Limestone has evidence of significant karstification. Epikarst (clints and grikes) has been observed in the uppermost metres of quarry sections around the spring. Furthermore, there is a high density of karst features (dolines, swallow holes, springs and turloughs) located in the Oakport and Lower Ballymore Limestone.

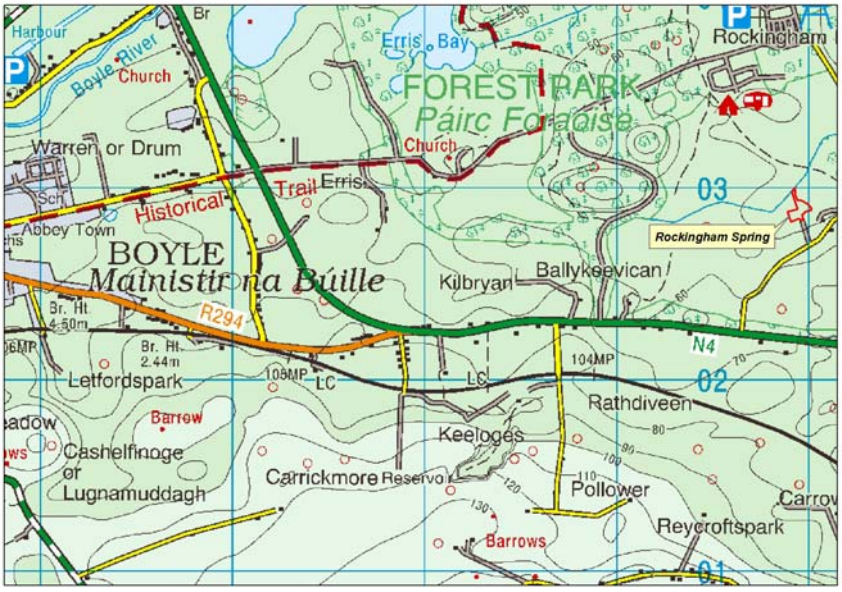
Monitoring of daily abstraction and overflow was undertaken from July 1993 to April 1994. The spring overflows via two channels that meet the Ballykeevican stream. The first channel flows over the weir, via the front of the pond area. The second is a smaller stream flowing from the rear of the pond area. It is likely that the second channel also takes discharge from a fracture zone, which is adjacent to, or part of, that feeding the Rockingham Spring. These data indicate an annual discharge of approximately 5.9M m^3/yr, which suggests a daily discharge of approximately 16,000 m^3/d.

Site Importance – County Geological Site
Rockingham Spring is one of the largest springs in County Roscommon, with a contributing area of approximately 16 km^2. As the site is also a major water supply source it is also one of the most important hydrogeological sites within the county.

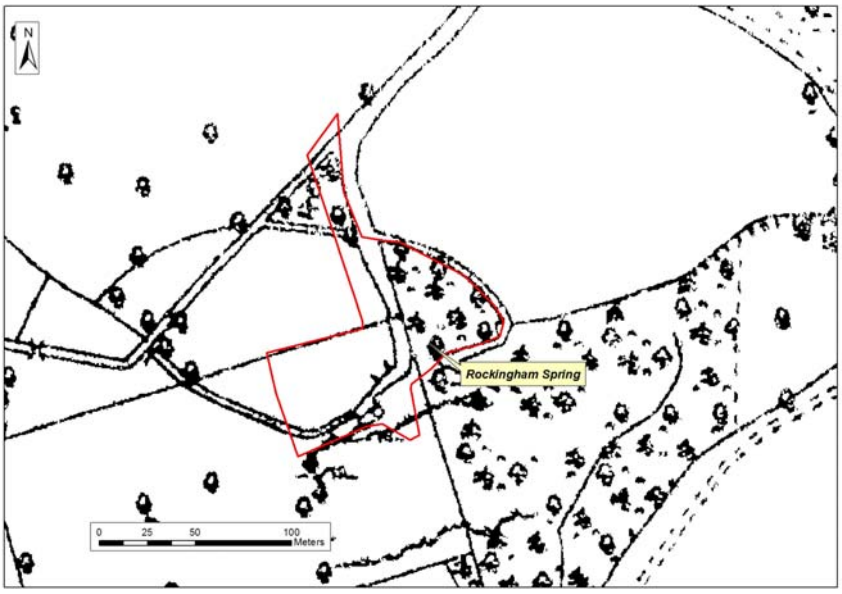
Management/promotion issues
The site is securely fenced off within its own compound, and the boreholes are surrounded by concrete chambers. The spring is now completely covered over. Being a secure water supply vulnerable to contamination the general promotion of the locality is not recommended. General education about the vulnerability of karst groundwater supplies to pollution from septic tanks and agricultural slurry spills and bad spreading practices is highly advisable.

A view of Rockingham Spring with boreholes housed in adjacent buildings.

General view downstream over the spring pool at Rockingham Spring.


Harbour
Br
Boyle River
Church
Erris Bay
FOREST PARK
Páirc Foraoise
Rockingham
Warren or Drum
Church
Trail
Erris
Historical
Abbey Town
BOYLE
Mainistir na Búille
Rockingham Spring
Kilbryan
Ballykeevican
R294
Br. Ht. 4.50m
Br. Ht. 2.44m
N4
104MP
LC
Letfordspark
Barrow
Rathdiveen
Keeloges
Cashelfinoge or Lugnamuddagh
Carrickmore Reservoir
Pollower
Carrow
Reycroftspark
Barrows
01
02
03


N
Rockingham Spring
0 25 50 100
Meters


N
Rockingham Spring
0 25 50 100
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Boyle Drumlins**
Other names used for site	
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Ross, Ardmoyle, Lecarrow, Coolnagranshy, Carrownurlaur, Ballylugnagon, Glebe, Ballytrasna, Kilbryan, Derrybeg, Ardlona, Lisgullaun, Breandrum, Harepark, Ballinphuill, Carrickmore, Rockingham, Derrymaquick, Knockadoo, Ballybaun, Knockadoobrusna, Carrownaun, Lisserdrea, Tinacarra, Lowparks, Greatmeadow, Raththinaun, Ardgallin, Knocknacloy, Aghnagrange, Termon, Letfordspark, Bellspark, Drumanone, Ardsallagh, Copse, Ardcorcoran, Erris, Reask, Emlagh, Mocmoyne, Knocknashee, Ballykeevican, Rathtermon, Lisserlough, Lismerraun, Ardmore, Knockavroe, Grange Beg, Cashelfinoge, Warren, Tawnytaskin**
NEAREST TOWN	**Boyle**
SIX INCH MAP NUMBER	**5, 6, 9, 10**
NATIONAL GRID REFERENCE	**177777 300500 (centre of features)**
1:50,000 O.S. SHEET NUMBER	**32, 33 1/2 inch Sheet No. 7, 12**

Outline Site Description
This field of drumlins forms part of a small, discrete field of these features, south and southwest of Boyle town. It covers an area of 16 by 8 kilometres, and includes approx. 200 drumlin features. A number of the drumlins southwest of the town are superimposed on ribbed moraine features.

Geological System/Age and Primary Rock Type
The drumlins are formed on bedrock which is Lower Carboniferous limestone. The features themselves are Quaternary in age, having been deposited at the base of the ice sheet moving northeast to southwest during the maximum period of the last Ice Age.

Main Geological or Geomorphological Interest
The drumlin field is not only unusual in its small size and ‘discreteness’, but is unusual in that a marked upland area around the Plains of Boyle also contains high, superimposed drumlin features.

The features are generally 500m-1km long and 300m-400m or so wide. They attain a maximum height of about 30m and are usually 20m or so in elevation.

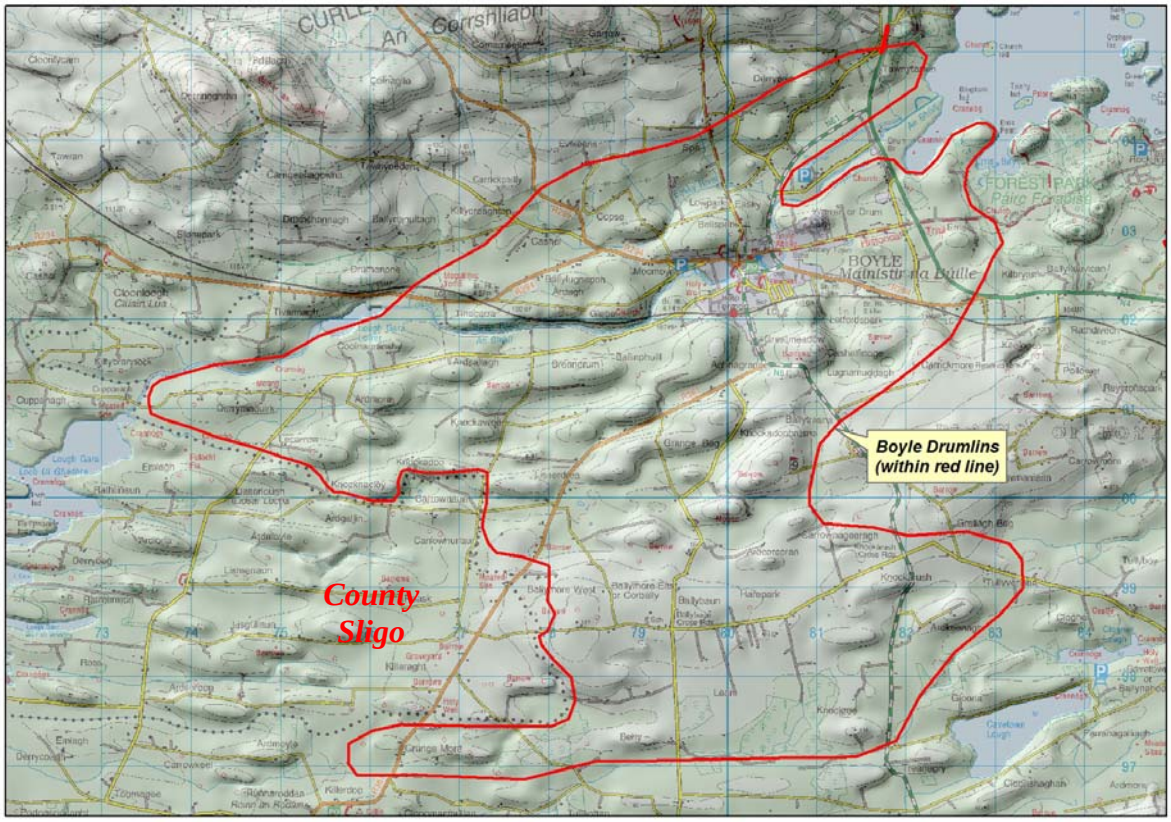
Site Importance – County Geological Site
This is one of the finest fields of discrete drumlins in the country.

Management/promotion issues
This is an excellent site in terms of macro-scale Quaternary subglacial geomorphology. The features as a whole are too large to define as a single site with a specific boundary, as would be required for NHA status. However the landscape itself is particularly noteworthy and should be mentioned as unique in landscape elements within the Roscommon County Development Plan. A colour leaflet on ‘The Drumlins of County Roscommon’ could be produced.

A view of Boyle drumlins, looking north, showing the east-west trend of the drumlins.

A view of Boyle drumlins, looking north, showing the east-west trend of the drumlins.

A view of Boyle drumlins, looking north, showing the east-west trend of the drumlins.


Boyle Drumlins
(within red line)
County
Sligo

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Castlesampson Esker**
Other names used for site	Onagh Esker
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Tobermacloughlin, Onagh, Kilkenny, Castlesampson, Carrowkeeran, Eskerbeg**
NEAREST TOWN	**Athlone, Ballyforan**
SIX INCH MAP NUMBER	**48, 51**
NATIONAL GRID REFERENCE	**192000 241240 (centre of features)**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 15**

Outline Site Description
This esker trends west-northwest to east-southeast in south Roscommon, occurring south of the R363 road between Ballyforan and Athlone.

Geological System/Age and Primary Rock Type
The esker is formed on bedrock which is Lower Carboniferous limestone. The feature itself is Quaternary in age, having been deposited at the base of the ice sheet moving northwest to southeast during early deglaciation after the last Ice Age.

Main Geological or Geomorphological Interest
The Castlesampson esker is an excellent example of a complex, multi-crested esker which is comprised of numerous beads. The esker system comprises ten individual segments, which stretch for a distance of just over six kilometres. The most complex portion of the longest bead (3.5km) has at least four crests. The esker has a very complex, generally sinuous morphology. The feature interfingers with many flanking fans and deltas, with a pronounced kame-kettle topography in places. Many of the kettle holes host lakes.

The esker was probably deposited as a series of fans, which formed at the mouth of a subglacial tunnel as the ice progressively retreated towards the northwest in this area of Roscommon. Several fans, deltas and kames flank the feature.

Site Importance – County Geological Site
The esker is one of Ireland's best examples of the 'long beaded' esker type.

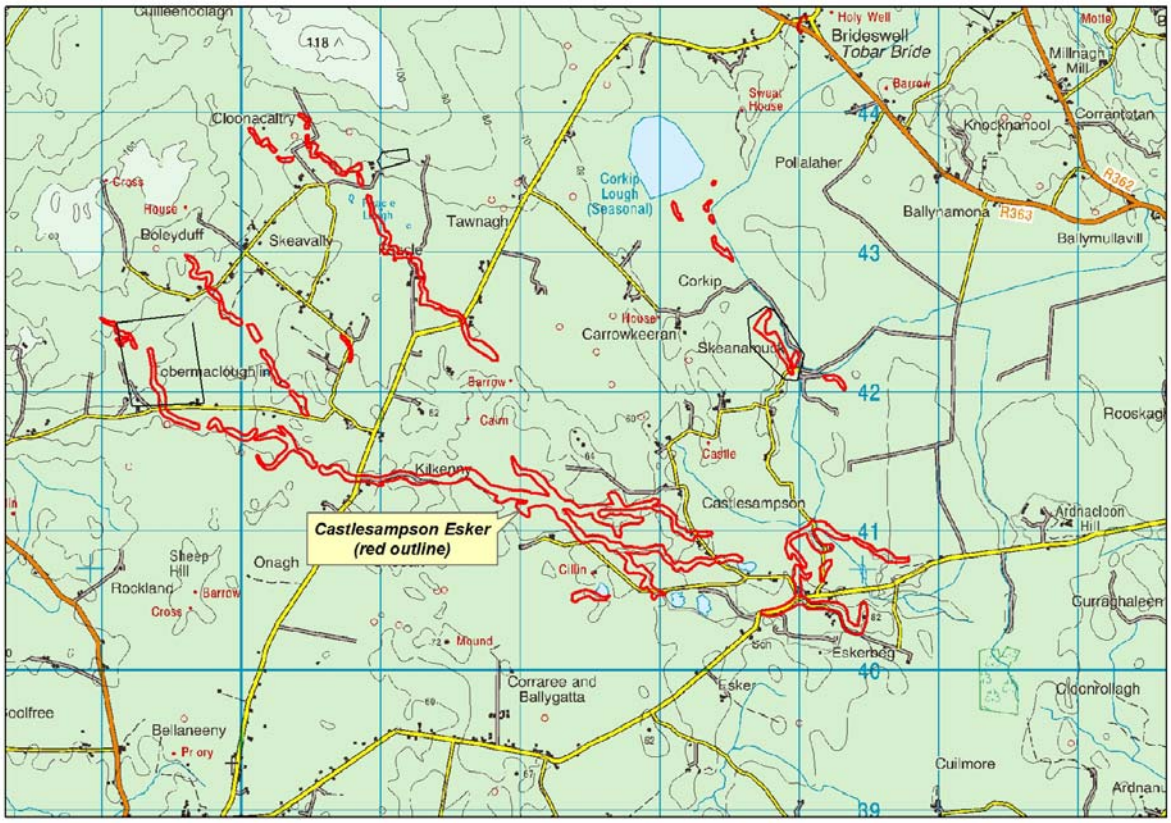
Management/promotion issues
This report gives proper recognition to the geomorphological component of a site that is already conserved for its grassland natural heritage as SAC and proposed NHA (Site Number 001625).

Scrub vegetation on a bead of the Castlesampson esker system.

Reclaimed gravel pit within the Castlesampson esker system.

Bare gravels outcropping on the summit of the Castlesampson esker. See the sinuous nature of the feature as it winds away into the distance.

Two distinct beads of the Castlesampson esker system.


Castlesampson Esker
(red outline)
Brideswell
Tobar Bride
Holy Well
Motte
Millnagh
Mill
Barrow
Knocknanool
Corrantotan
Pollalaher
Corkip
Lough
(Seasonal)
Ballynamona
R362
R363
Ballymullavill
Cloonacaltry
Cross
House
Boleyduff
Skeavally
Tawnagh
Corkip
Carrowkeeran
Skeanahoude
Barrow
Cairn
Castle
Kilkenny
Castlesampson
Ardnacloon
Hill
Sheep
Hill
Onagh
Rockland
Barrow
Cross
Cillin
Curraghaleen
Mound
Eskerbeg
Esker
Corraree and
Ballygatta
Cloonrollagh
Bellaneeny
Priory
Cuilmore
Ardnan
Rooskag
43
42
41
40
39

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Cloonburren Fan**
Other names used for site	The Pilgrims Road, The Eiscir Riada,
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Cornaveagh, Cloonburren**
NEAREST TOWN	**Shannonbridge**
SIX INCH MAP NUMBER	**56**
NATIONAL GRID REFERENCE	**196300 228570 (centre of feature)**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 15**

Outline Site Description
This is a wide, hummocky feature comprised of sand and gravel which partially smothers the Ballinasloe-Split Hill-Clonmacnoise-Clara Esker System at Cloonburren, in southernmost County Roscommon, adjacent to the Shannon River.

Geological System/Age and Primary Rock Type
The fan is formed on bedrock which is Lower Carboniferous limestone. The feature itself is Quaternary in age, having been deposited at the edge of the westward-retreating ice sheet during deglaciation after the last Ice Age.

Main Geological or Geomorphological Interest
The fan feature is a fine example of the type of associated deglacial feature that often forms adjacent to eskers. The ridge may be comprised of several fans, which coalesce to form one large fan-shaped feature at Cloonburren.

The esker is comprised chiefly of limestone clasts which have been derived from the bedrock around the site within the Irish Midlands. These were carried by ice, released into the meltwater conduit on top of or within the ice, and then deposited at the ice margin as the river left the ice and flowed off eastwards subaerially.

An old quarry cut into the southern side of the feature exposes sand and pebble gravel cross-beds, which comprise the internal structure of the feature and record when the sediments were deposited by water flowing off the glacier as it retreated across the area.

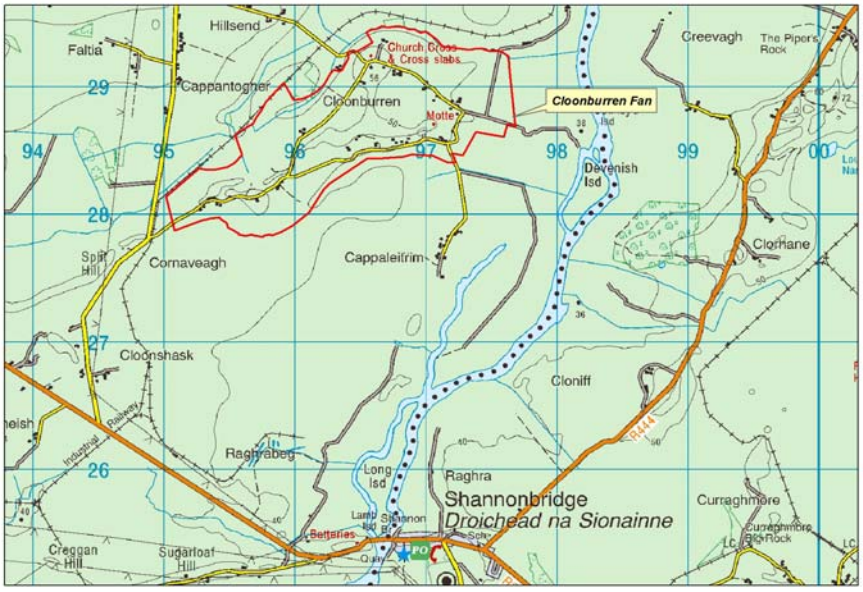
Site Importance – County Geological Site
This fan is an excellent example of a deglacial, ice marginal, meltwater-deposited feature. This is a superb feature and it should be considered for inclusion within the boundary of the Geological NHA of the Ballinasloe-Split Hill-Clonmacnoise-Clara Esker System.

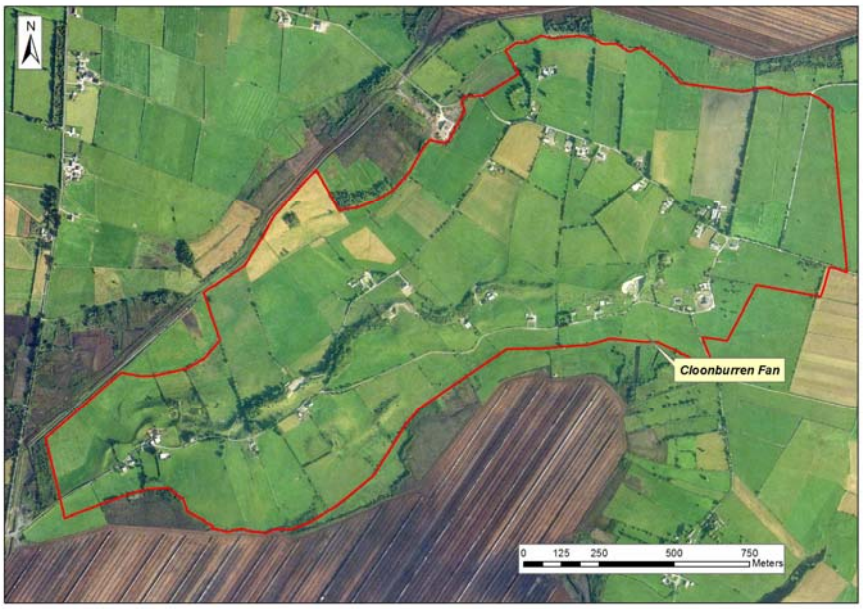
Management/promotion issues
Cloonburren Fan has the one disused quarry noted above which shows the sediments but no new quarrying should be permitted to preserve the integrity of the landforms.

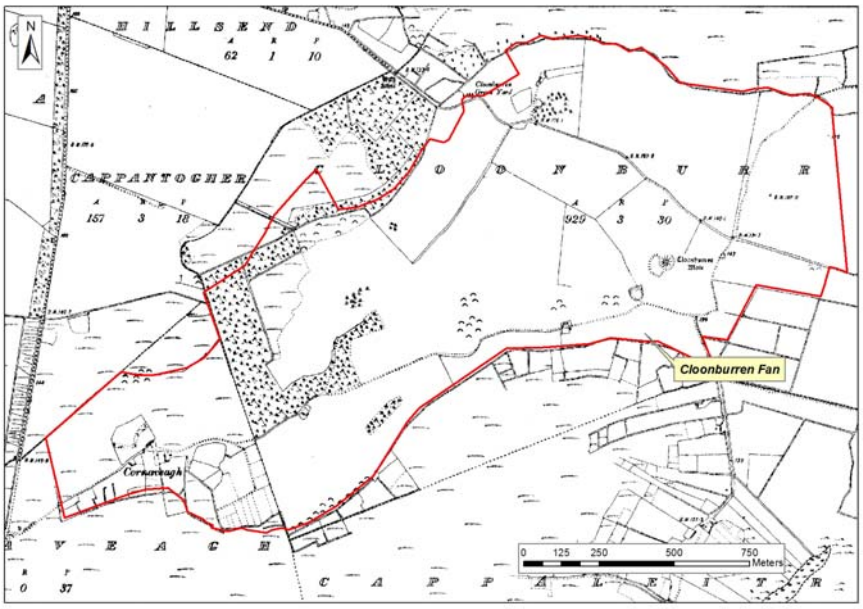
The face of the disused quarry in the south face of Cloonburren Fan.

The southern edge of Cloonburren Fan from the motte at the eastern end of the fan.

Close up detail of the sand and gravel beds in the disused pit.


Hillsend
Faltia
Church, Cross & Cross slabs
Cappantogher
Cloonburren
Motte
Cloonburren Fan
Greevagh
The Piper's Rock
Devenish Isd
Clorhane
Split Hill
Cornaveagh
Cappaleitrim
Cloonshask
Cloniff
Industrial Railway
Raghrabeg
Long Isd
Raghra
Shannonbridge
Droichead na Sionainne
Curraghmore
Creggan Hill
Sugarloaf Hill
Battaries
29
28
27
26
94
95
96
97
98
99
00


N
Cloonburren Fan
0 125 250 500 750
Meters


N
HILLSEND
62 1 10
CAPPANTOGHER
157 3 16
CLOONBURR
92S 3 30
Cloonburren Fan
Cornaveagh
0 125 250 500 750
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Ballinasloe-Split Hills-Clonmacnoise-Clara Esker System**
Other names used for site	Clonmacnoise esker, Split Hills esker, Clara esker, The Pilgrims Road, The Eiscir Riada
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Tulrush, Culliaghmore, Culliaghbeg, Cloonfad, Cornaveagh, Cloonburren**
NEAREST TOWN	**Ballinasloe, Shannonbridge**
SIX INCH MAP NUMBER	**53, 56**
NATIONAL GRID REFERENCE	**193210 227170 (centre of features)**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 15**

Outline Site Description
This is a long, beaded, often high, sinuous esker ridge system that traverses a lateral distance of just under 70 kilometres across the Central Midlands, including counties other than just Roscommon.

Geological System/Age and Primary Rock Type
The esker is formed on bedrock which is Lower Carboniferous limestone. The feature itself is Quaternary in age, having been deposited at the base of the ice sheet moving west to east during early deglaciation after the last Ice Age.

Main Geological or Geomorphological Interest
The esker system is one of the finest examples of a long, wide tunnel-deposited esker in the country. The ridge also has many associated fan, delta, and sandur (a plain formed of glacial sediments deposited by meltwater outwash at the terminus of a glacier) features associated with it. This ridge is one of the three major conduit systems that subglacially drained the melting ice sheet in the Irish Midlands. It crosses Roscommon between the Suck and the Shannon Rivers and follows the R357 road for most of its course. It is generally oriented in an east-west direction and has many small and large pits, both currently in use and disused, cut into it. The feature interfingers with many flanking fans and deltas, with a pronounced kame-kettle topography in places.

The esker is comprised chiefly of limestone clasts which have been derived from the bedrock around the site within the Irish Midlands. These were carried by ice, released into the meltwater conduit at the base of the ice, and rounded in a subglacial river before being left upstanding as the esker when the ice melted.

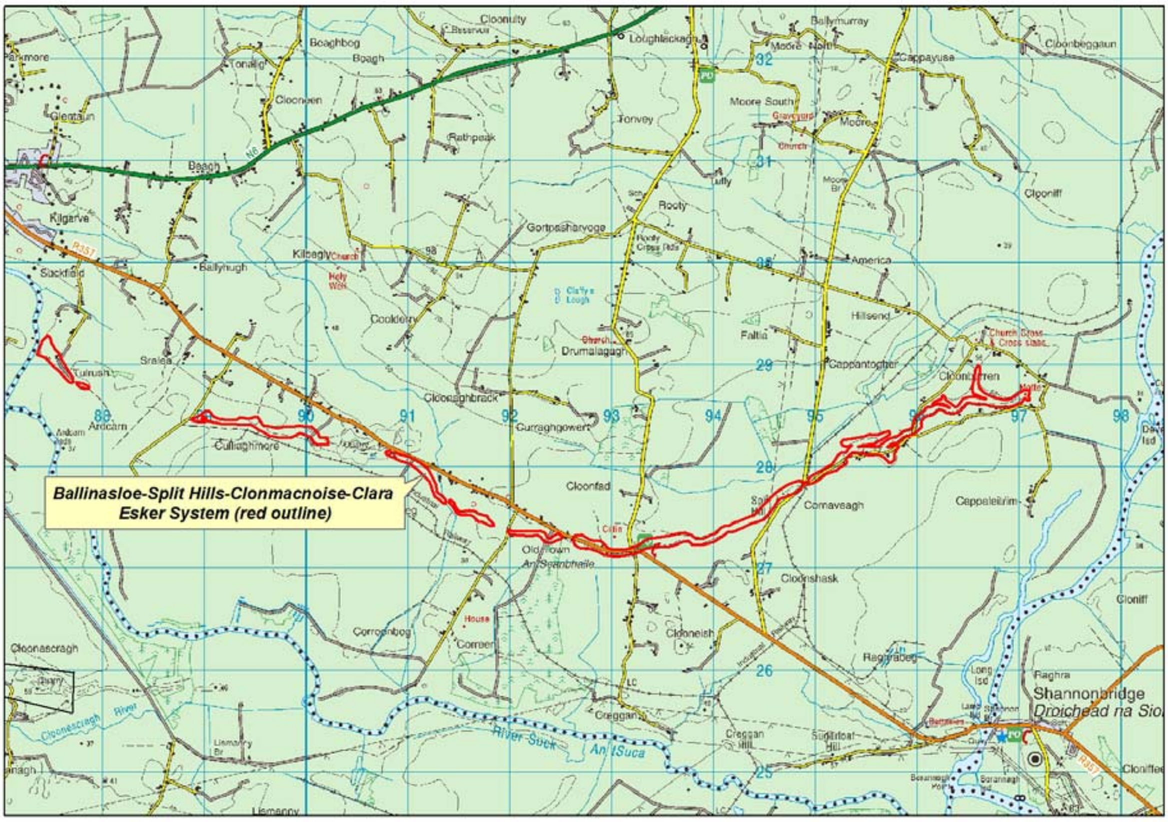
Site Importance – County Geological Site; recommended for Geological NHA
The esker is probably Ireland's best example of a tunnel-deposited esker.

Management/promotion issues
This is a superb feature and should be designated as a geological NHA. It will be put forward by GSI for designation by National Parks and Wildlife Service in the future. Signage along the roadside along the R357 road, especially near the church at Oldtown, might help in the promotion of the feature. A colour leaflet on 'The Eskers of County Roscommon' could also be produced.

One of the esker beads in Cloonburren Townland.
See the steep sides on the ridge.

The esker, poking through bogland and viewed from the west, at Cloonburren.
The long, sinuous nature of the feature is clearly seen.

The esker winding east towards the west, also at Cloonburren.


Ballinasloe-Split Hills-Clonmacnoise-Clara
Esker System (red outline)
Shannonbridge
Cloonulty
Boaghbog
Boagh
Loughteckagh
Ballymurray
Cappayuse
Cloonbeggaun
Moore South
Moore
Cloonkeen
Rathpeak
Tonvey
Rooty
Gortpasharvoge
Kilgarve
Sackfield
Ballyhugh
Cooldeny
America
Hillsend
Faltia
Cappantogher
Cloonburren
Drumalagagh
Sralea
Cloonsighbrack
Curraghgowen
Ardcarn
Cullaghmore
Cloonfad
Cornaveagh
Cappaleitrim
Oldtown
Cloonshask
Cloniff
Cloonascragh
Corrcenbog
Correen
Cloonsheish
Creggan
Creggan Hill
Sugarloaf Hill
Raghra
River Suck
Clooniff

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Erritt and Cloonagh Loughs Deltas**
Other names used for site	
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Errit, Gortaganny, Carrowbehy, Lecarrow, Derreenamackaun, Cloondart, Tully**
NEAREST TOWN	**Ballyhaunis (Mayo), Loughglinn (Roscommon)**
SIX INCH MAP NUMBER	**19**
NATIONAL GRID REFERENCE	**154250 285500 (centre of feature)**
1:50,000 O.S. SHEET NUMBER	**32 1/2 inch Sheet No.**

Outline Site Description
These deltas comprise a number of wide, flat-topped ridges made up of sand and gravel, which stand proud above the surrounding peat bog, in northwesternmost County Roscommon.

Geological System/Age and Primary Rock Type
The deltas are formed on bedrock which is of Lower Carboniferous limestone. The features themselves are Quaternary in age, having been deposited at the edge of the northwestward-retreating ice sheet during deglaciation after the last Ice Age.

Main Geological or Geomorphological Interest
The delta features are fine examples of the type of ice marginal, deglacial features that often form at the edge of glacial lakes. The ridges seem to be comprised of several individual deltas, which coalesce to form one large ice marginal standstill in the locality.

The deltas are chiefly made up of limestone clasts which have been derived from the bedrock around the site within the Irish Midlands. These were carried by ice, released into a meltwater conduit on top of or within the ice, and then deposited subaqueously at the ice margin as the river left the ice and flowed off southeastwards.

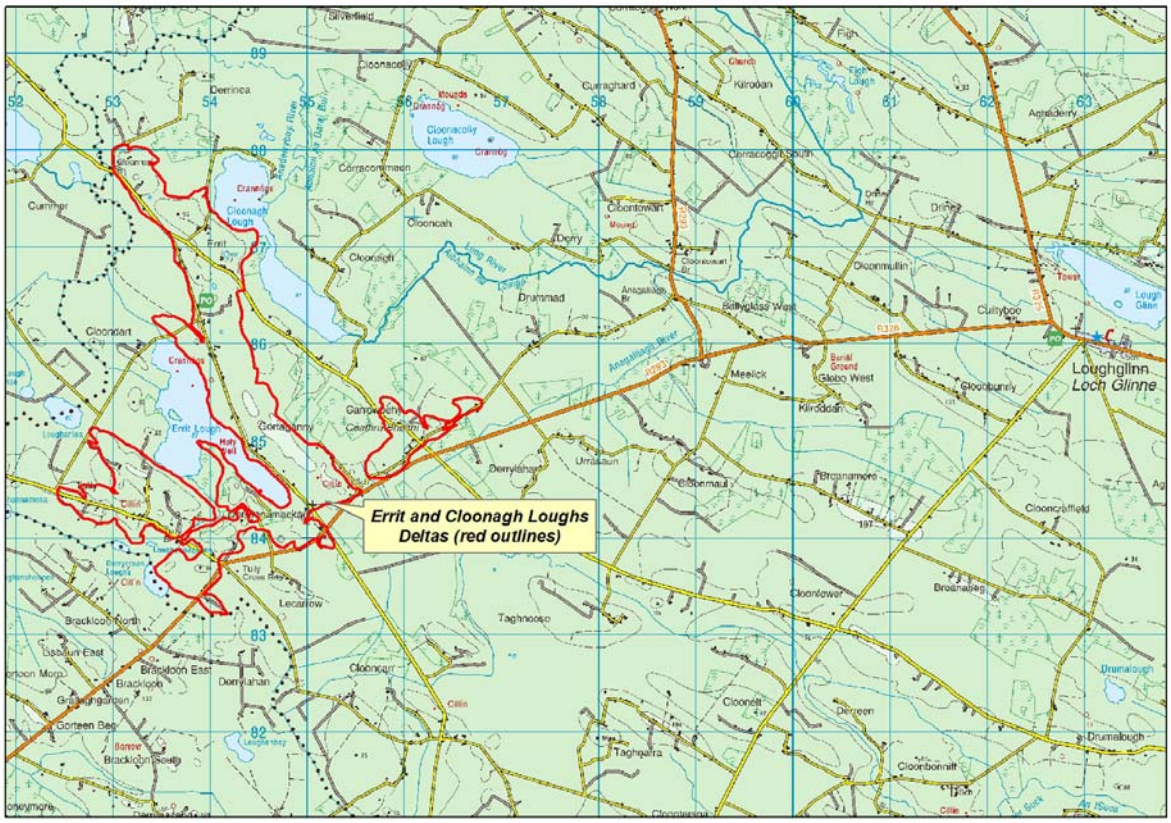
Site Importance – County Geological Site
These deltas are excellent examples of deglacial, ice marginal, meltwater-deposited features.

Management/promotion issues
This system comprises a number of superb features and should be listed as a County Geological Site. A signboard in Gortaganny (which means the ‘sandy field’) where the locals have a strong ‘tidy village’ initiative might help promote the features.

The main delta feature between Cloonagh and Errit Loughs (green fields) from the east.

See the flat-topped nature of the delta ridge, adjacent to Cloonagh Lough.

Bedded sands and gravels which were deposited in a glacial lake, exposed in a gravel pit.


Errit and Cloonagh Loughs
Deltas (red outlines)
Loughglinn
Loch Glinne

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Garranlahan Esker System**
Other names used for site	Cloonfad Esker, Slieve Dart Esker
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Grange, Pollanea Upper, Pollanea Lower, Garraunlahan More, Ballybane Upper, Glenties, Moanvane, Stonepark South, Cloonfineen, Rathleena, Coolcam, Glenmore, Clogher Lower, Milltown, Ballybane, Coosaun, Meelick, Cloonlea, Coolatinny, Clydagh Lower, Cashel, Lisnagroob, Kiltullagh**
NEAREST TOWN	**Cloonfad**
SIX INCH MAP NUMBER	**25, 32**
NATIONAL GRID REFERENCE	**156350 273720 (centre of features)**
1:50,000 O.S. SHEET NUMBER	**39 1/2 inch Sheet No. 11**

Outline Site Description
This is a long, beaded, often high, sinuous esker ridge system that traverses a lateral distance of over 100 kilometres across the west Central Midlands, including the counties of Mayo, Galway and Roscommon.

Geological System/Age and Primary Rock Type
The esker is formed on bedrock which is Lower Carboniferous limestone. The feature itself is Quaternary in age, having been deposited at the base of the ice sheet moving northwest to southeast during early deglaciation after the last Ice Age.

Main Geological or Geomorphological Interest
The esker system is one of the finest examples of a long, wide tunnel-deposited esker in the country. The ridge also has many associated fan, delta, and sandur features associated with it. This ridge is the westernmost of the three major conduit systems that subglacially drained the melting ice sheet in the Irish Midlands. It crosses Roscommon between the N69 at Scregg and the northeastern edge of Slieve Dart, and 'wraps itself' around Slieve Dart. It is generally oriented in a north-south direction and has many small and large pits, both currently in use and disused, cut into it. In interfingering with many flanking fans and deltas, the system has a pronounced kame-kettle topography in places.

The esker is comprised chiefly of limestone clasts which have been derived from the bedrock around the site within the Irish Midlands. These were carried by ice, released into the meltwater conduit at the base of the ice, and rounded in a subglacial river before being left upstanding as the esker when the ice melted.

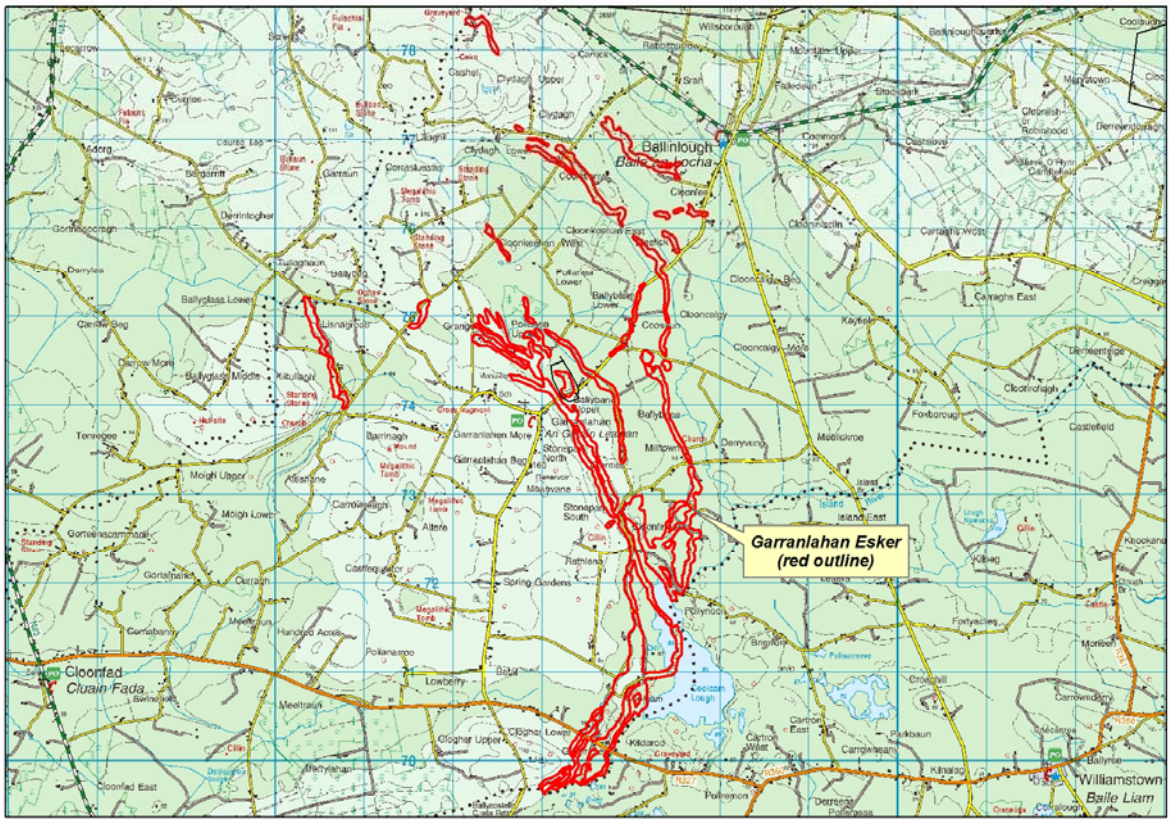
Site Importance – County Geological Site; may be recommended for Geological NHA
The esker is one of Ireland's best examples of a tunnel-deposited esker.

Management/promotion issues
This is a superb feature and should be designated as a geological NHA. Signage along the roadside along the R69 and R327 roads, especially along the Slieve Dart ridge, might help in the promotion of the feature. A colour leaflet on 'The Eskers of County Roscommon' could also be produced.

View along the steep-sided esker towards a disused gravel pit.

A small bead flanking the main esker ridge.

Scrub vegetation and dry grassland on high-sided beads of the Garranlahan Esker.


Garranlahan Esker
(red outline)
Ballinlough
Baile na Locha
Cloonfad
Cluain Fada
Williamstown
Baile Liam

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**McKeon's Pit**		
Other names used for site			
IGH THEME	**IGH7 Quaternary**		
TOWNLAND(S)	**Culliaghmore, Culliaghbeg**		
NEAREST TOWN	**Shannonbridge**		
SIX INCH MAP NUMBER	**56**		
NATIONAL GRID REFERENCE	**190500 228300**		
1:50,000 O.S. SHEET NUMBER	**47**	**1/2 inch Sheet No.**	**15**

Outline Site Description
This is a gravel pit cut into a wide, hummocky feature comprised of sand and gravel which partially smothers the Ballinasloe-Split Hill-Clonmacnoise-Clara Esker System at Culliaghmore and Culliaghbeg, in southernmost County Roscommon.

Geological System/Age and Primary Rock Type
The pit is cut into a series of fan features which is formed on bedrock of Lower Carboniferous limestone. The features themselves are Quaternary in age, having been deposited at the edge of the westward-retreating ice sheet during deglaciation after the last Ice Age.

Main Geological or Geomorphological Interest
The fan feature is a fine example of the type of associated deglacial feature that often forms adjacent to eskers. The pit seems to be comprised of several fans, which coalesce to form one large ridge feature at Culliaghmore and Culliaghbeg.

The esker is comprised chiefly of limestone clasts which have been derived from the bedrock around the site within the Irish Midlands. These were carried by ice, released into the meltwater conduit on top of or within the ice, and then deposited at the ice margin as the river left the ice and flowed off eastwards subaerially.

The gravel pit has been worked down to the top of bedrock and now limestone is being worked and crushed as well as gravel.

Site Importance – County Geological Site
This fan is an excellent example of a deglacial, ice marginal, meltwater-deposited feature. This pit is a nice cutting into a good example of a fan feature.

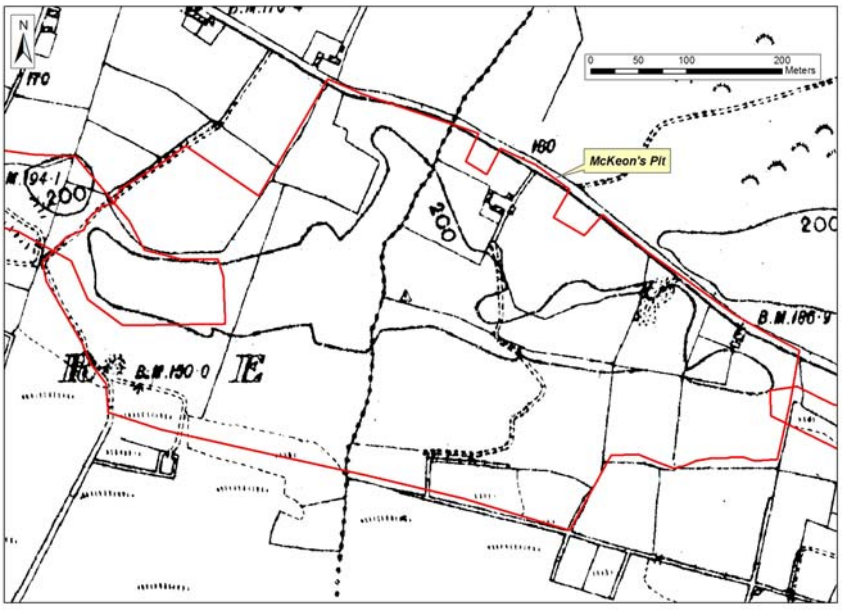
Management/promotion issues
As a working gravel pit and rock quarry, the listing as a County Geological Site has no implications for the normal operation of the quarry, subject to standard permissions and conditions under planning and environmental legislation. It would be desirable to consider retaining representative rock faces for geological purposes during any final closure stages. However, maintaining faces of sand and gravel deposits is unrealistic as they quickly degrade and vegetate. The quarry is not suitable for any general promotion other than by express agreement and permission of the owners and operators, Roadstone Wood.

A view into McKeon's Pit showing flooded workings in bedrock limestone with the thick gravel fan deposit overlying.

The worked out gravel deposit on the southern side of the fan, with thick bog deposits adjacent.


BALLINASLOE
Béal Átha na Sluaighe
McKeon's Pit


N
0 50 100 200
Meters
McKeon's Pit


N
0 50 100 200
Meters
McKeon's Pit
B.M.190·0
B.M.190·9

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Mid Roscommon Ribbed Moraines**
Other names used for site	
IGH THEME	**IGH7 Quaternary**
TOWNLAND(S)	**Too many to list … the field covers over two hundred and thirty individual townlands, across an area of 200 km^2**
NEAREST TOWN	**Strokestown, Elphin, Tulsk**
SIX INCH MAP NUMBER	**16, 17, 22, 23, 28, 29, 36**
NATIONAL GRID REFERENCE	**190000 282000 (centre of features)**
1:50,000 O.S. SHEET NUMBER	**33, 40 1/2 inch Sheet No. 12**

Outline Site Description
This field of ribbed moraine forms part of a small, discrete field of these features, west and northwest of Slieve Bawn. It covers an area of 10 by 20 kilometres, and includes approx. 100 ribbed moraine features.

Geological System/Age and Primary Rock Type
The ribbed moraines are formed on bedrock which is Lower Carboniferous limestone. The features themselves are Quaternary in age, having been deposited at the base of the ice sheet moving northwest to southeast during the maximum period of the last Ice Age.

Main Geological or Geomorphological Interest
These ribbed moraines each contain many superimposed drumlins on their crests, and the area has traditionally been known as the southwesternmost extreme of the 'Drumlin Belt'. The ribbed moraines can only be seen using digital elevation modelling (DEM) and satellite imagery owing to their size.

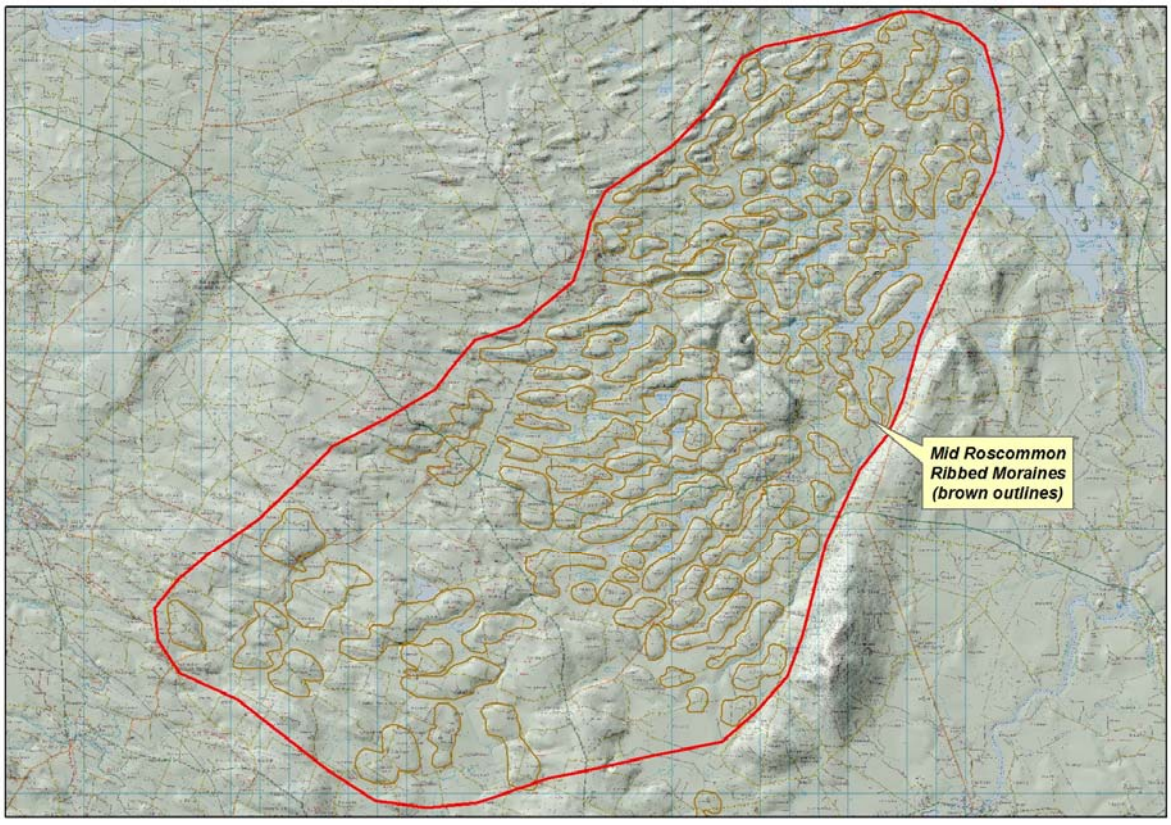
This ribbed moraine field is not only unusual in its small size and 'discreteness' (comparatively for these types of landform), but being interspersed with deep peat means the features are quite striking. It forms the perfect 'ribbed' topography.

The features are generally 6km-8km long and 1km or so wide, with individual superimposed drumlins being c. 1km long and 400m-500m wide. They attain a maximum height of about 35m and are usually 25m or so in elevation.

Site Importance – County Geological Site
This is one of the finest fields of discrete ribbed moraines in the country.

Management/promotion issues
This is an excellent site in terms of macro-scale Quaternary subglacial geomorphology. The features are too large to undertake any conservation efforts on their part, but the landscape itself is noteworthy and should be promoted as unique amongst landscape elements within the Roscommon County Development Plan and in Landscape Characterisation.

A view across some of the mid Roscommon ribbed moraine from Lisduff, east of Elphin, looking north.



ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Boyle Road Cutting**
Other names used for site	
IGH THEME	**IGH10 Devonian**
TOWNLAND(S)	**Tawnytaskin**
NEAREST TOWN	**Boyle**
SIX INCH MAP NUMBER	**6**
NATIONAL GRID REFERENCE	**181763 305142 (centre of section)**
1:50,000 O.S. SHEET NUMBER	**33 1/2 inch Sheet No. 7**

Outline Site Description
A low rock cliff on the west side of the N4 road northeast of Boyle town.

Geological System/Age and Primary Rock Type
The rocks are of Devonian age, and are principally made up of sandstones, which also contain some very hard volcanic sediments.

Main Geological or Geomorphological Interest
Devonian rocks in the Curlew Mountains are principally conglomerates and sandstones but they are poorly exposed. This site provides a good representative section of these Devonian rocks not often exposed elsewhere. Their general characteristics suggest they were deposited in various alluvial environments. In the Boyle road cutting they are classified as the Keadew Formation, but they are already badly weathered, degraded and vegetated in the time since the cutting was made and the road opened in 1999.

One section is accessible and visible because the rock is a local unit of volcaniclastic sediments, termed the Sheegorey Member. Volcaniclastic simply means that the rock material was derived from a volcanic eruption, but the rock was deposited as a sedimentary rock like a sandstone, as an aggregate of small particles. This is a hard, dark grey rock with a purple tinge. It forms well bedded layers which are cut back in a small cliff in the cutting. Localised seeps of lime rich water are forming tufa-like deposits along the cliff. As the rock does not weather and degrade as quickly as the surrounding sandstones it has not become vegetated as much.

Site Importance – County Geological Site
This is a good representative section for the Sheegorey Member of the Keadew Formation, and it is of County Geological Site importance.

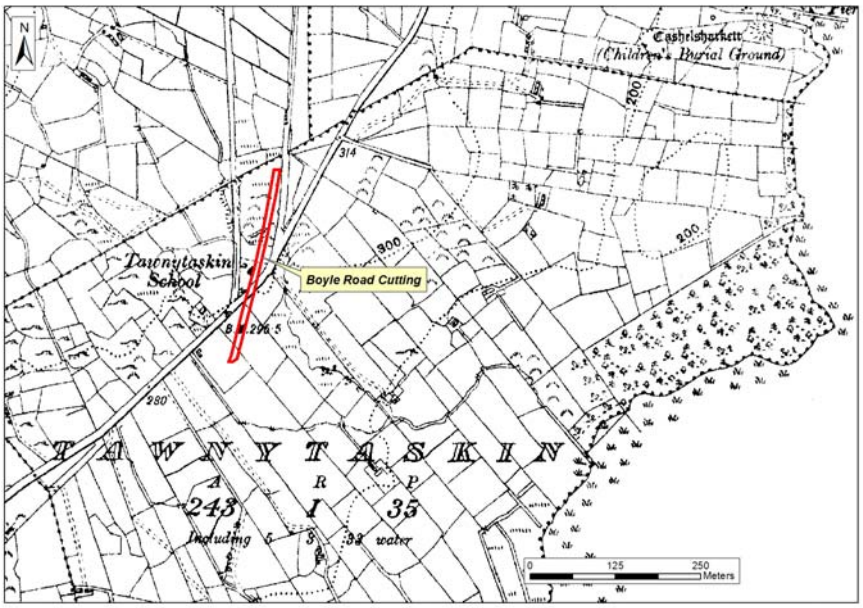
Management/promotion issues
Vegetation is already covering the southern end of the section and some management of this would be required in the long term to maintain an open rock section in the sandstones.

The mid-section of the Boyle Road Cutting showing the wide verge and relatively unvegetated cliff.

The lime rich water seeping from bedding planes in the volcaniclastic rocks has formed a tufa-like deposit over parts of the face.


Boyle Road Cutting
Cillin
Hogs Isd
Church
Church Isd
Tawnytaskin
Derrypark
Bingham Isd
Crannóg
Trinity Isd
Priory
Drummans Isd
An Bhuill
N61
Canal
Erris Point
Spa
Drum Br
Crannógs
Harbour
Boyle River
Church
Erris Bay
FOREST PARK
Páirc Foraoise
Easky River
Lowparks
Easky
Warren or Drum
Church
Bellspark
Boyle Abbey
Historical Trail
Erris
Abbey Town
BOYLE
Mainistir na Búille
PO
Fire Stn
Kilbryan
Ballykeevican
Holy Well
R294


N
Boyle Road Cutting
0
125
250
Meters


N
Cashrisharkett
(Children's Burial Ground)
Tawnytaskin
School
Boyle Road Cutting
TAWNYTASKIN
243
35
0
125
250
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Castlemine Quarry**
Other names used for site	
IGH THEME	**IGH8 Lower Carboniferous**
TOWNLAND(S)	**Cashelmeehan**
NEAREST TOWN	**Roscommon**
SIX INCH MAP NUMBER	**35**
NATIONAL GRID REFERENCE	**187900 271000 (centre of quarry)**
1:50,000 O.S. SHEET NUMBER	**40 1/2 inch Sheet No. 12**

Outline Site Description
Castlemine Quarry is a large working quarry about 6km north of Roscommon town.

Geological System/Age and Primary Rock Type
The quarry is excavated in Carboniferous limestone, which dates from about 330 million years ago. The Geological Survey of Ireland maps the limestone in this locality as undifferentiated but these rocks may belong to the Ballymore Limestone Formation.

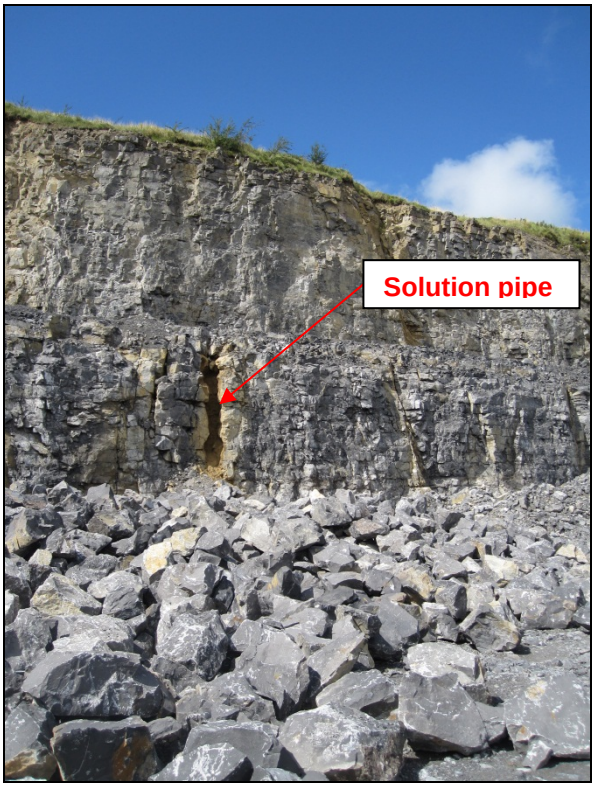
Main Geological or Geomorphological Interest
Over 22m thickness of horizontal limestone beds are seen throughout the quarry, which provides a window into the bedrock which is normally very rarely exposed in County Roscommon. Thick and massive beds are visible across the quarry. Some faces display some karstic solution, with occasional narrow solution pipes and brown calcite stained walls of narrow fissures.

Some beds are very rich in fossils of corals, crinoids, brachiopods and gastropods.

Site Importance – County Geological Site
This is a good representative site displaying the Carboniferous limestone bedrock in central County Roscommon.

Management/promotion issues
As a working quarry, the listing as a County Geological Site has no implications for the normal operation of the quarry, subject to standard permissions and conditions under planning and environmental legislation. It would be desirable to consider retaining representative faces for geological purposes during any final closure stages. The quarry is not suitable for any general promotion other than by express agreement and permission of the owners and operators, Roadstone Wood.

A general view of Castlemine Quarry from the quarry floor.

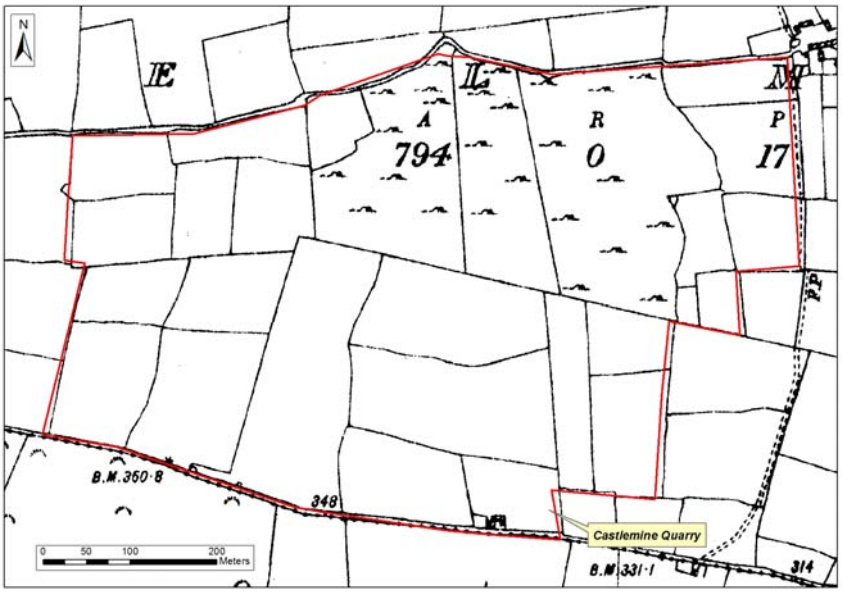


A karstic solution pipe visible in the face.

A calcite stained fissure in the quarry face.


Castlemine Quarry
ROSCOMMON
Ros Comáin


N
Castlemine Quarry
0 50 100 200
Meters


N
A
794
R
0
P
17
B.M.350·8
348
Castlemine Quarry
B.M 331·1
314
0 50 100 200
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Keeloges Quarry**
Other names used for site	
IGH THEME	**IGH8 Lower Carboniferous**
TOWNLAND(S)	**Carrickmore, Keeloges, Rathdiveen**
NEAREST TOWN	**Boyle**
SIX INCH MAP NUMBER	**6**
NATIONAL GRID REFERENCE	**183230 301500 (centre of quarry)**
1:50,000 O.S. SHEET NUMBER	**33 1/2 inch Sheet No. 7**

Outline Site Description
A large, working limestone quarry, about 3km east of Boyle town.

Geological System/Age and Primary Rock Type
The quarry exposes bedrock of the Oakport Limestone Formation and the Ballymore Limestone Formation, both of Carboniferous age, which dates from about 330 million years ago.

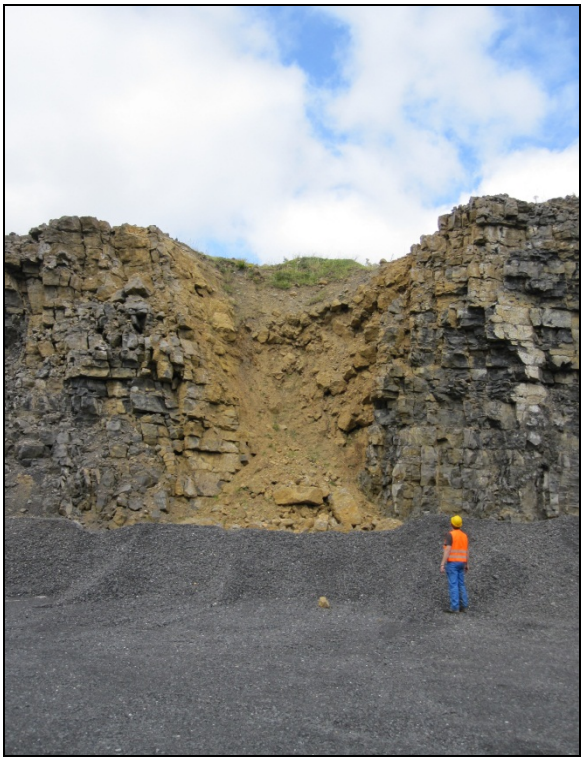
Main Geological or Geomorphological Interest
This quarry provides superb representation and exposure of rock strata that are otherwise rarely exposed at surface and are often described and understood by geologists only from continuous borehole records drilled down into the bedrock. The limestones at Keeloges are very flat bedded. They are fossiliferous with many different types of fossils such as corals, crinoids, trace fossils and microfossils.

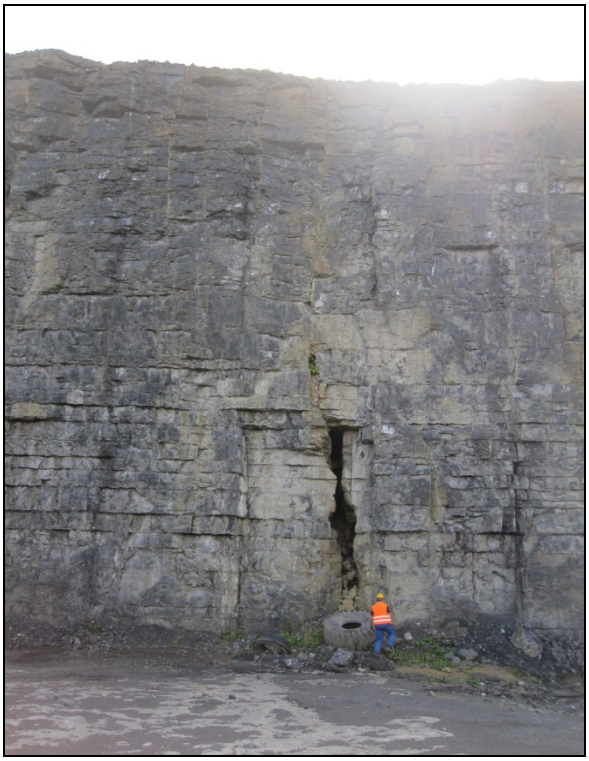
The two limestone formations are divided by a palaeokarstic surface in the quarry where the lower one was briefly exposed and slightly weathered before the overlying limestone was deposited on top of it. The horizontal beds show that this was a short-lived episode. There are features in the quarry showing karstification that has occurred mostly since the Ice Age, where water has dissolved the rock and left narrow voids as fissures, pipes and small caves, as well as at least one solution doline. Here an enclosed depression has been filled with sand and mud, coloured orange by iron minerals.

Site Importance – County Geological Site; may be recommended for Geological NHA
This is an important representative section of rock in the region and is likely to be viewed as having the required national interest for a geological NHA under the IGH8 Lower Carboniferous theme when further work is completed on that theme.

Management/promotion issues
As a working quarry, the listing as a County Geological Site has no implications for the normal operation of the quarry, subject to standard permissions and conditions under planning and environmental legislation. It would be desirable to consider retaining representative faces for geological purposes during any final closure stages. It is not suitable for any general promotion other than by express agreement and permission of the owners and operators, Roadstone Wood.

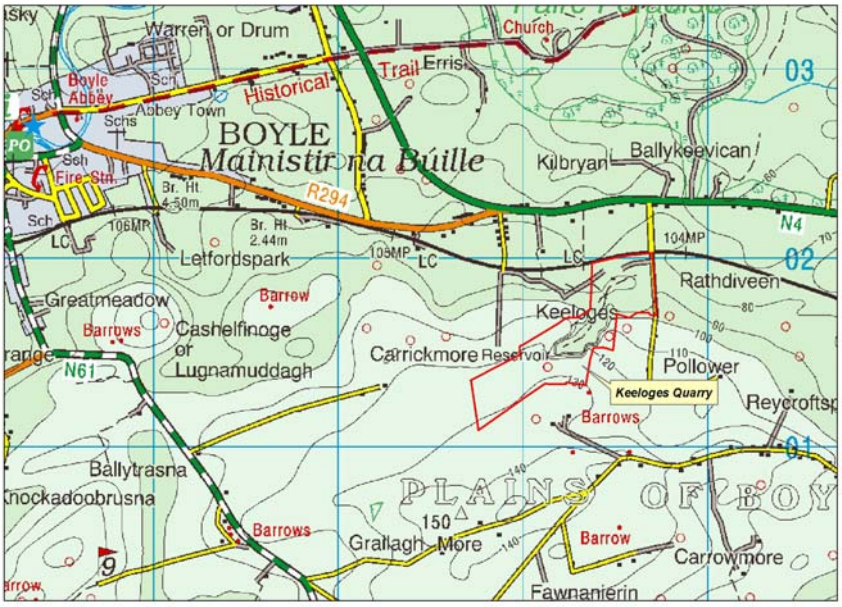
An overview of the south western end of the quarry, looking northeast.

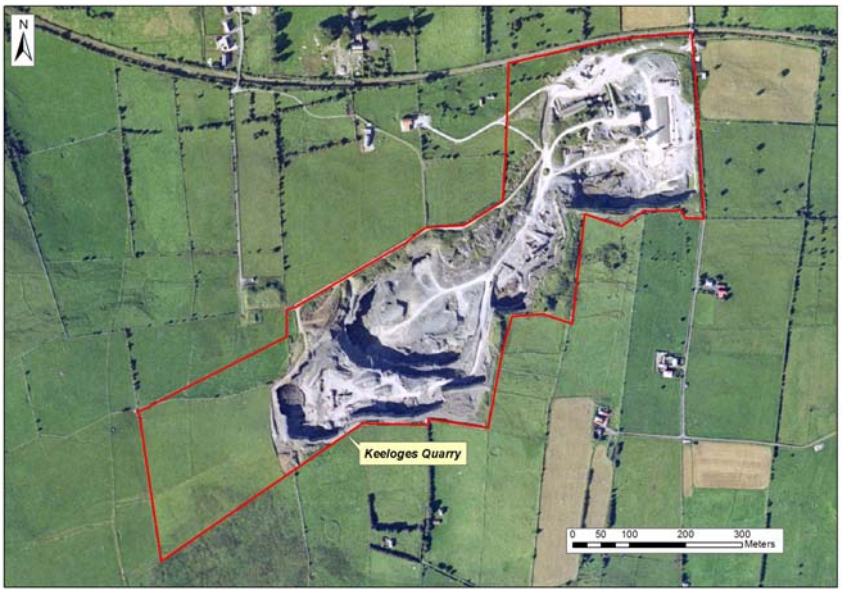


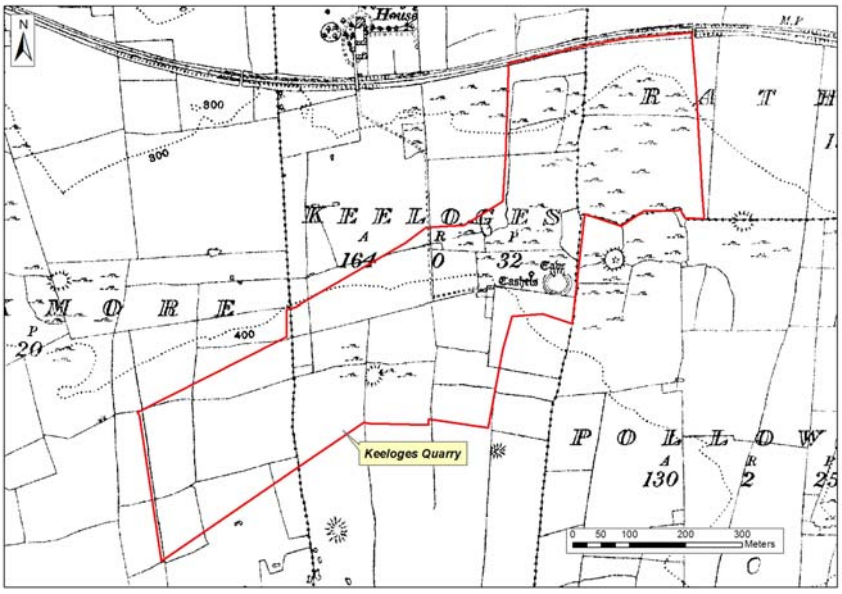


A cross section through an enclosed depression or doline filled with unwanted sediment for the quarry operators (left). A small cave exposed in the quarry face (right).

A bench that has been drilled ready to place explosives in the pattern of holes to blast the rock apart in a highly controlled operation.


Warren or Drum
Church
Trail
Erris
Historical
Boyle Abbey
Abbey Town
BOYLE
Mainistir na Búille
Kilbryan
Ballykeevican
Fire Stn
Br. Ht 4.50m
R294
N4
Br. Ht 2.44m
Letfordspark
Greatmeadow
Barrow
Barrows
Cashelfinoge or Lugnamuddagh
N61
Carrickmore Reservoir
Keeloges
Keeloges Quarry
Pollower
Rathdiveen
Reycroftsp
Ballytrasna
PLAINS OF BOY
Grallagh More
Barrow
Carrowmore
Fawnanierin
03
02
01


N
Keeloges Quarry
0 50 100 200 300
Meters


N
House
800
900
400
KEELOGES
A 164
R 0
P 32
Castle
MORE
P 20
RATH
POLLOW
A 130
R 2
Keeloges Quarry
0 50 100 200 300
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Largan Quarry**		
Other names used for site			
IGH THEME	**IGH8 Lower Carboniferous**		
TOWNLAND(S)	**Largan, Cuilrevagh**		
NEAREST TOWN	**Elphin**		
SIX INCH MAP NUMBER	**23**		
NATIONAL GRID REFERENCE	**192530 285400**		
1:50,000 O.S. SHEET NUMBER	**33**	**1/2 inch Sheet No.**	**12**

Outline Site Description
Largan Quarry is a large working quarry in the northern side of Greywood Hill, north of Strokestown.

Geological System/Age and Primary Rock Type
The quarry is excavated in Carboniferous limestone, which dates from about 330 million years ago. The Geological Survey of Ireland maps the limestone as undifferentiated but these rocks may belong to the Ballymore Limestone Formation.

Main Geological or Geomorphological Interest
Near perfect horizontal limestone beds are seen throughout the quarry, which provides a window into the bedrock which is normally very rarely exposed in County Roscommon. Thick and massive beds are visible across the quarry. Some of the northern faces in particular, but also faces elsewhere in the quarry, display some karstic solution, with pipes and some clay filled cavities, as well as brown calcite stained walls of narrow fissures.

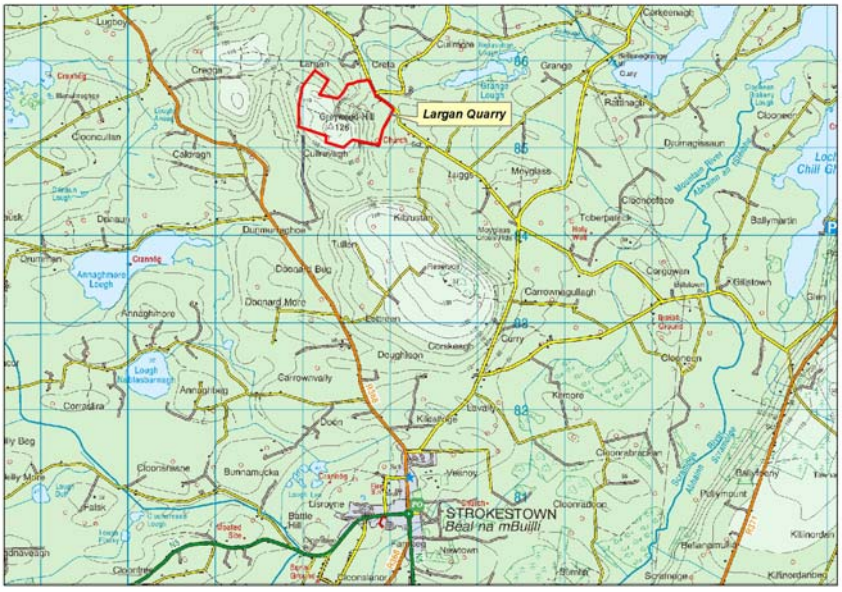
The hill was overtopped by ice sheets during the Ice Age, since there are thick glacial tills in a road cut up to the top of the hill at the south side of the quarry. In addition, freshly exposed rock surfaces (as in the summer of 2012) at the southern end of the quarry show streamlined bedrock forms known as ‘P’ forms, as well as striations and chattermarks.

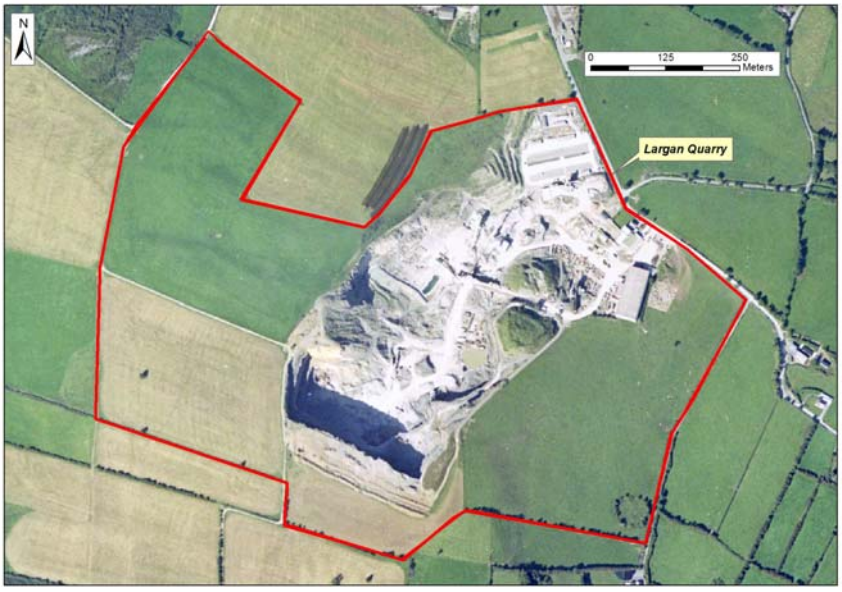
Site Importance – County Geological Site
This is a good representative site displaying Carboniferous limestone bedrock in County Roscommon, with additional features of glacial and karstic interest.

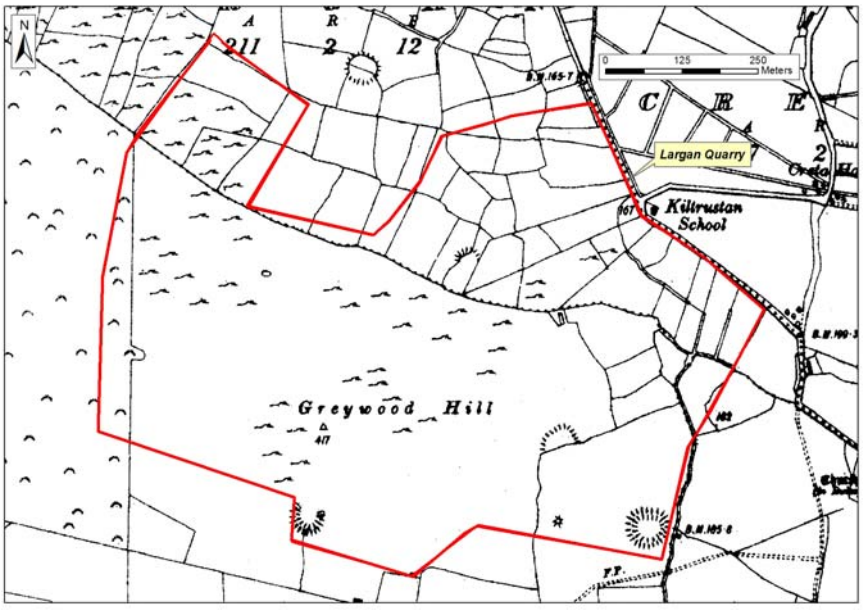
Management/promotion issues
As a working quarry, the listing as a County Geological Site has no implications for the normal operation of the quarry, subject to standard permissions and conditions under planning and environmental legislation. It would be desirable to consider retaining representative faces for geological purposes during any final closure stages. The quarry is not suitable for any general promotion other than by express agreement and permission of the owners and operators, Hanly Brothers Limited.

A view of Largan Quarry, looking southwest from the eastern side.

Glacial striations freshly exposed from beneath glacial till on the hilltop (left).
Rounded edges to limestone beds near the summit are glacial features known as “P”-forms (right).


Largan Quarry
STROKESTOWN
Bealʼna mBuilli


N
0 125 250
Meters
Largan Quarry


N
0 125 250
Meters
Largan Quarry
Kiltrustan School
Greywood Hill

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**River Shannon Callows**
Other names used for site	
IGH THEME	**IGH14 Fluvial and Lacustrine Geomorphology**
TOWNLAND(S)	**Raghrabeg, Cappaleitrim, Cloonburren, Clooniff, Cloonbeggaun, Coolumber, Drumlosh, Curraghnaboll, Cregganabeaka, Callowbeg, Cloonown, Carrickynaghtan, Kilnamanagh, Bunaribba, Doovoge, Bellaugh**
NEAREST TOWN	**Athlone (North), Shannonbridge (South)**
SIX INCH MAP NUMBER	**52, 55, 56**
NATIONAL GRID REFERENCE	**203000 232150 (central portion of callows)**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 15**

Outline Site Description
The Shannon Callows is a long, flat site which includes the Shannon River floodplain, and which extends for approximately 20 km from the town of Athlone to the town of Shannonbridge. The site averages about 0.75 km in width though in places is up to 1.5 km wide.

Geological System/Age and Primary Rock Type
The floodplain is of Holocene (postglacial) age.

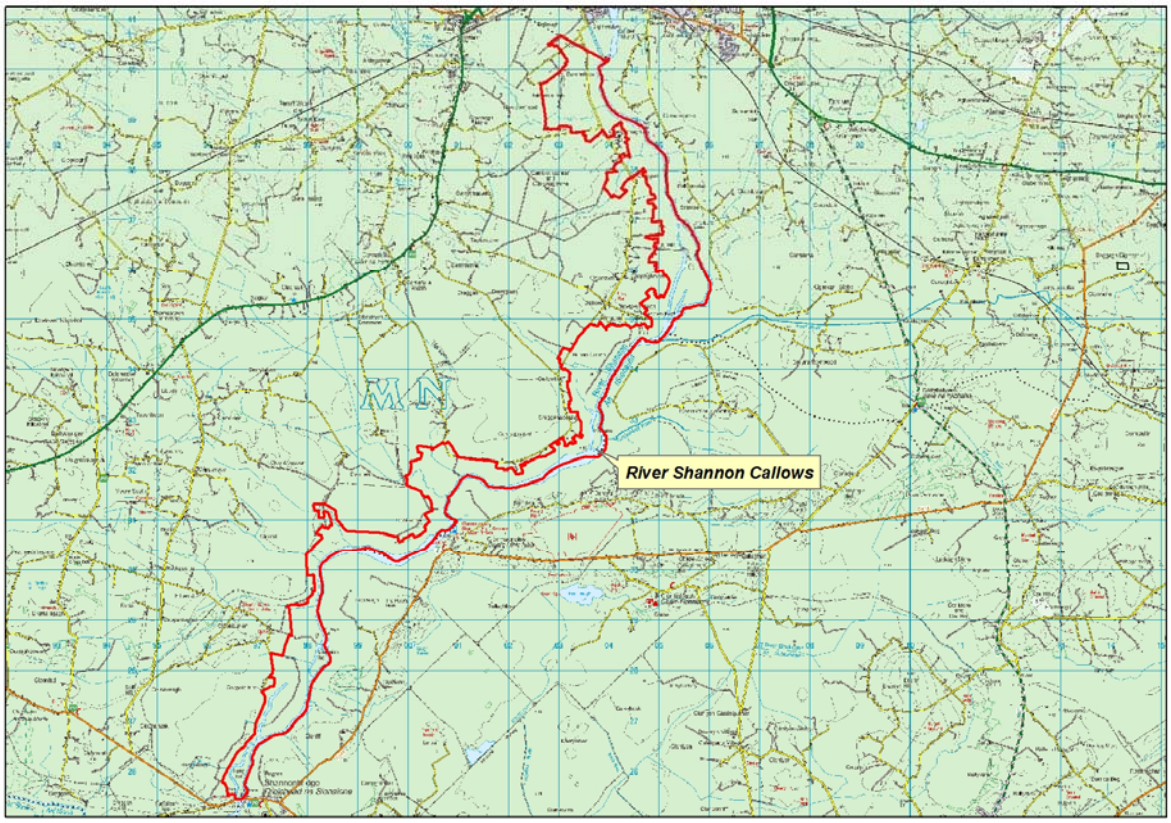
Main Geological or Geomorphological Interest
The site has extensive areas of callow, or seasonally flooded, semi-natural, lowland wet grassland, along both sides of the river. The callows are mainly too soft for intensive farming but are used for hay or silage or for summer grazing. Other habitats of smaller area which occur alongside the river include lowland dry grassland, freshwater marshes, reedbeds and wet woodland. Along most of its length the site is bordered by raised bogs, now mostly exploited for peat, with some hummocks and esker ridges, and knolls of limestone bedrock.

Site Importance – County Geological Site
The Shannon Callows has by far the largest area of lowland semi-natural grassland and associated aquatic habitats in Ireland and one in which there is least disturbance of natural wetland processes, which are ongoing. Botanically, it is extremely diverse. In winter the site is internationally important for the total numbers of birds (regularly exceed 20,000) and for Whooper Swan in particular. It also holds nationally important populations of a further five species.

Management/promotion issues
The site has been designated an SAC and proposed NHA (Site Number 000216) and SPA (Site Number 004096). The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. Listing it as a County Geological Site gives recognition to the geomorphological foundation of the biodiversity importance.

River Shannon Callows near Cloonburren, north of Shannonbridge.

River Shannon Callows near Cloonburren, north of Shannonbridge.


River Shannon Callows

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Suck River Callows**
Other names used for site	
IGH THEME	**IGH14 Fluvial and Lacustrine Geomorphology**
TOWNLAND(S)	**Ballyforan, Cloonagh, Carrowntarriff, Ballyglass, Cartronkilly, Feevagh Beg, Feevagh, Feevagh More, Derrycahill, Porteen and Ballyrevagh West, Breeole West, Cregganycarna, Cloonaddron, Clooncoran, Bellagill, Rooaun Bog and Meadow, Suckfield, Tulrush, Ardcarn, Culliaghmore, Culliaghbeg, Correenbeg, Correen, Creggan, Raghrabeg**
NEAREST TOWN	**Ballyforan (North), Shannonbridge (South)**
SIX INCH MAP NUMBER	**47, 50, 53, 56**
NATIONAL GRID REFERENCE	**184530 236820 (central portion of callows)**
1:50,000 O.S. SHEET NUMBER	**47 1/2 inch Sheet No. 15**

Outline Site Description
The Suck River Callows is a long, flat site which includes the Suck River floodplain, and which extends for approximately 70 km from the village of Castlecoote to the town of Shannonbridge. Only the representative section from Ballyforan to Shannonbridge is reported here, a length of approximately 38 km. The site averages about 0.5 km in width though in places is up to 1.5 km wide.

Geological System/Age and Primary Rock Type
The floodplain is of Holocene (postglacial) age.

Main Geological or Geomorphological Interest
The site has extensive areas of callow, or seasonally flooded, semi-natural, lowland wet grassland, along both sides of the river. The callows are mainly too soft for intensive farming but are used for hay or silage or for summer grazing. Other habitats of smaller area which occur alongside the river include lowland dry grassland, freshwater marshes, reedbeds and wet woodland. Along most of its length the site is bordered by raised bogs, now mostly exploited for peat, with some hummocks and esker ridges, and knolls of limestone bedrock. As with any geomorphological process based site, it must be remembered that these are dynamic environments and the flooding is a natural and unpredictable development.

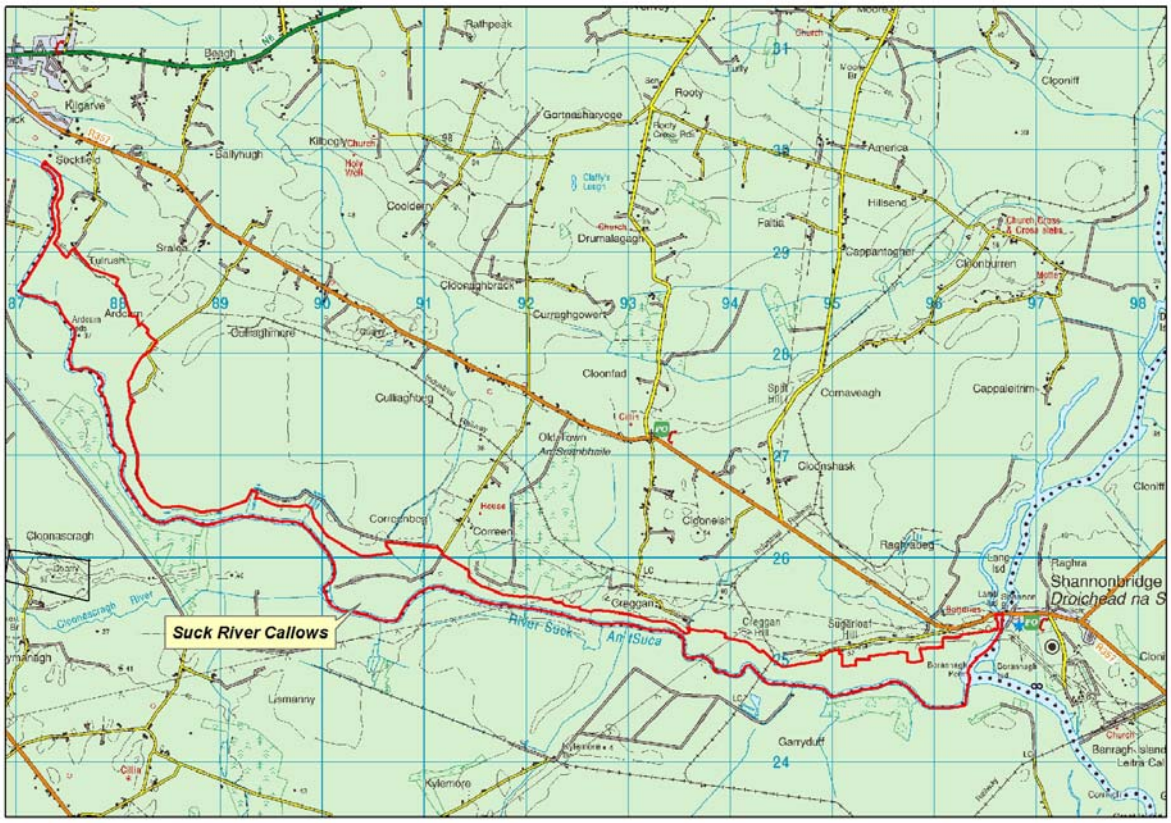
Site Importance – County Geological Site
The Suck River Callows is an extensive area of lowland semi-natural grassland and associated aquatic habitats, despite much drainage works in recent years. This site is of considerable ornithological importance for the Greenland White-fronted Goose population which is of international importance. The Suck River Callows are also known to support nationally important populations of Whooper Swan, Wigeon and Lapwing.

Management/promotion issues
The site has been designated a proposed NHA (Site Number 000222) and SPA (Site No. 04097). The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. Listing it as a County Geological Site gives recognition to the geomorphological foundation of the biodiversity importance. As it is dynamic system, controlling flooding is neither easy nor advisable.

Suck River Callows near Carrowreagh Townland, north of Ballinasloe.

Suck River Callows near Carrowreagh Townland, north of Ballinasloe.

Suck River Callows near Carrowreagh Townland, north of Ballinasloe.


Suck River Callows
River Suck
An tSuca
Shannonbridge
Droichead na S
Ballyhugh
Kilbegly
Gortnashanvoge
Rooty
Cloniff
America
Hillsend
Drumalagagh
Falbe
Cappantogher
Clonburren
Sraleg
Turrush
Ardcarn
Curraghmore
Cloonaghbrack
Curraghgowen
Cloonfad
Culliaghbeg
Comaveagh
Cappaleitrim
Old Town
Cloonshask
Corrcenbeg
Correen
Cloneleish
Cloonascragh
Creggan
Cleggan Hill
Sugarloaf Hill
Raghrabeg
Raghra
Lismanny
Garryduff
Kylemore
Barragh Island
Leitra Cal

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Altagowlan**
Other names used for site	Spion Kop
IGH THEME	**IGH15 Economic Geology**
TOWNLAND(S)	**Altagowlan, Greaghnaglogh**
NEAREST TOWN	**Arigna**
SIX INCH MAP NUMBER	**2**
NATIONAL GRID REFERENCE	**191023 318642 ('T' junction in road within site)**
1:50,000 O.S. SHEET NUMBER	**26 1/2 inch Sheet No. 7**

Outline Site Description
This site comprises old coal workings on open hillside.

Geological System/Age and Primary Rock Type
The coal seams are in Upper Carboniferous rocks of Westphalian age.

Main Geological or Geomorphological Interest
Coal mining has taken place for hundreds of years in north Roscommon, centred on Arigna. A portion of this locality covers the Altagowlan-Greaghnaglogh area, where mining has most recently ceased before 1990, and many of the surface features such as buildings, rail tracks and other infrastructure have either been salvaged, scrapped or fallen into decay. However many ancillary features remain, but the key interest is in the occurrence of coal seams and underground workings.

More recent stone extraction, in part to provide roadways for the erection of a large windfarm, has added fresh geological exposures to the Altagowlan site, providing evidence of the sedimentary environments that the coal seams were formed in.

Site Importance – County Geological Site
Whilst the Arigna Mining Experience portrays so many facets of the coal mining story in the district, Altagowlan provides a complementary untouched representation of the coal mining industry, not otherwise seen in Ireland except in parts of the Castlecomer and Slieveardagh coalfields.

Management/promotion issues
Parts of the full site of interest are in County Leitrim and any future audit of geological heritage sites in that county should include assessment of the adjoining area, which is mostly outside of Roscommon. Safety concerns with underground coal workings are such that no promotion of this site should be undertaken, and only experienced qualified personnel should be used in any more detailed assessments. However, both flooding and collapses that have already occurred have provided closure of most mine adits.

An adit, with adjacent concrete structures.

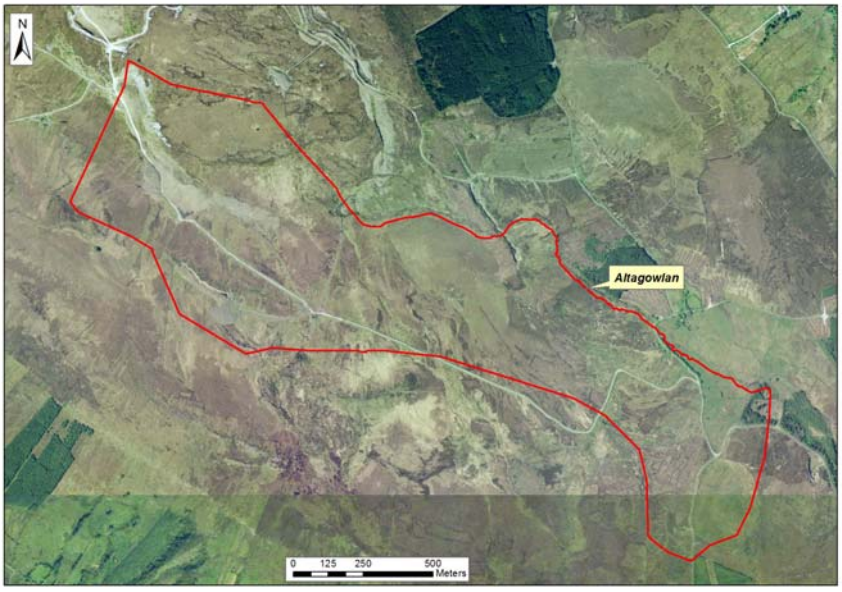
An adit visible in a surface cut.

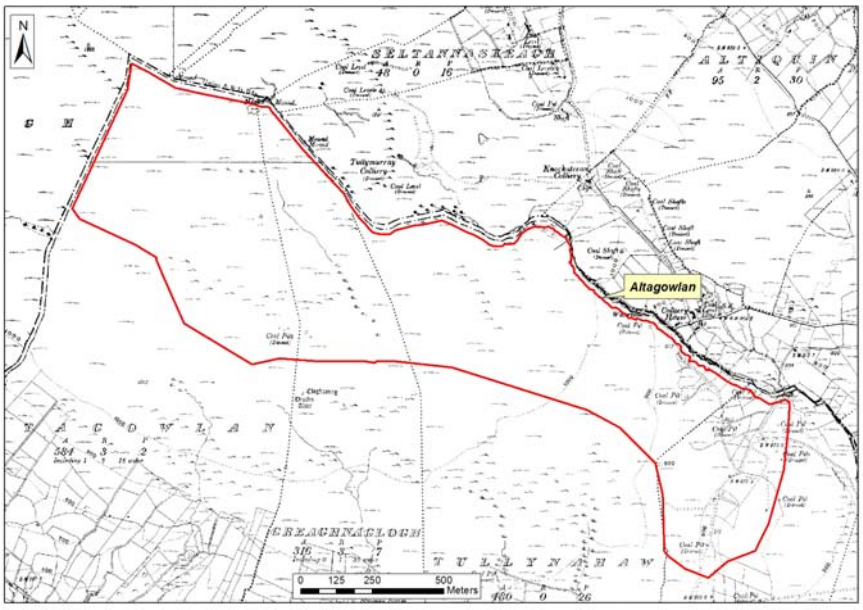
Rusting hutches for carrying coal on rails.

An abandoned adit, now flooded.

A rock quarry for supplying stone for wind turbine roads.


LOUGH ALLEN
Loch Ailiionn
Altagowlan
Drumshanbo
Druim Seanbho


N
Altagowlan
0 125 250 500
Meters


N
Altagowlan
0 125 250 500
Meters

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Arigna Mining Experience**
Other names used for site	Derreenavoggy
IGH THEME	**IGH15 Economic Geology**
TOWNLAND(S)	**Derreenavoggy**
NEAREST TOWN	**Arigna**
SIX INCH MAP NUMBER	**2**
NATIONAL GRID REFERENCE	**192155 314255**
1:50,000 O.S. SHEET NUMBER	**26 1/2 inch Sheet No. 7**

Outline Site Description
Disused coal mine and associated spoil heaps made accessible to the public as a visitor attraction, with full visitor centre and underground tour.

Geological System/Age and Primary Rock Type
The rocks are Upper Carboniferous in age, from the Westphalian Stage, informally known as the Coal Measures. They are a complex of sandstones, siltstones, mudstones and coal horizons formed in a deltaic environment.

Main Geological or Geomorphological Interest
Coal of Carboniferous age forms a main energy source throughout western Europe and America, and has given its name to the time period at around 320 million years ago when it formed. Ireland has several coalfield areas where rocks of this age survive, although they were formerly more widespread, and have been extensively mined. Arigna is one of the two largest deposits, as well as Castlecomer in Kilkenny, and this site very neatly includes nearly all aspects of interest with the rocks and the mines in a well-presented package.

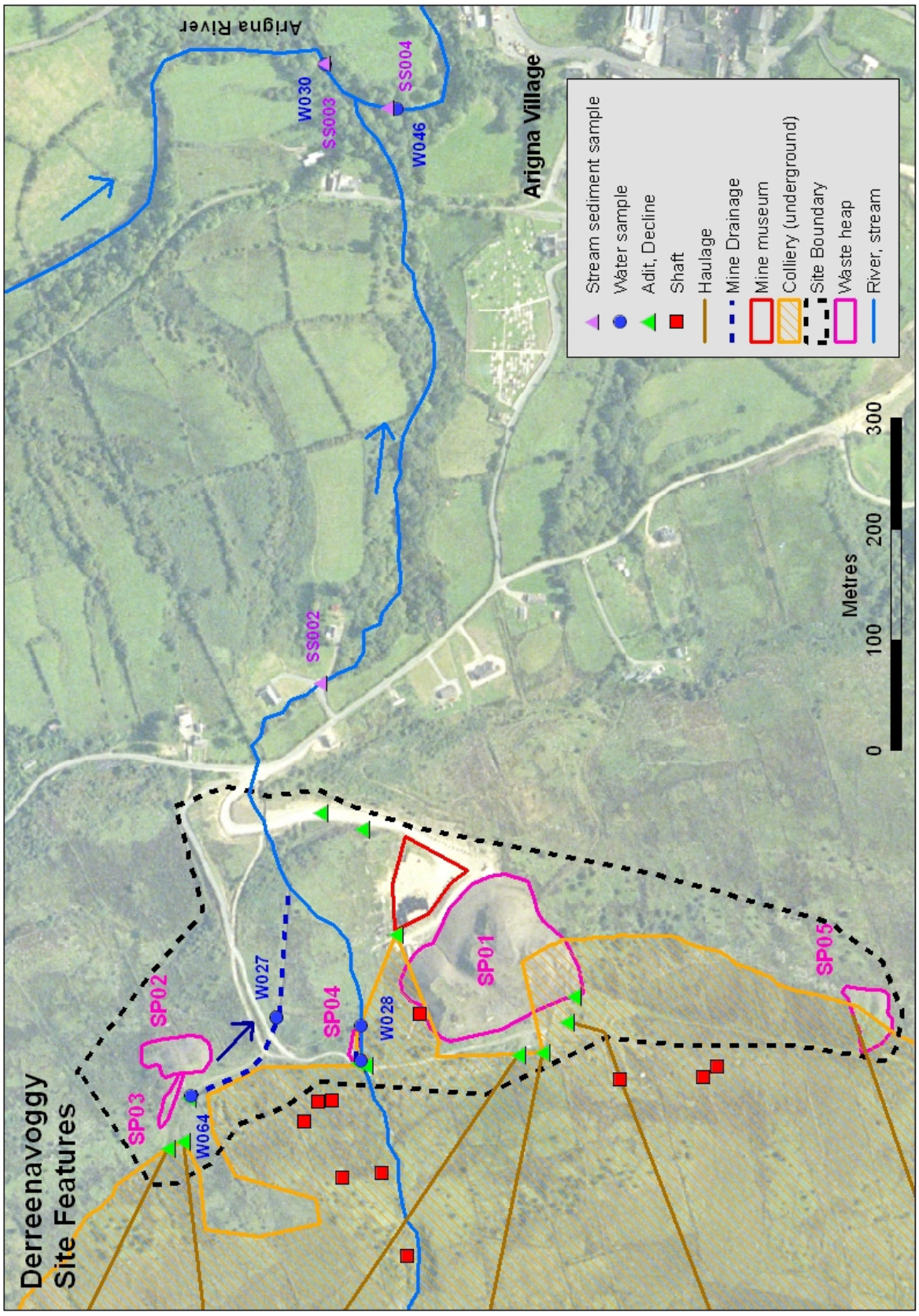
The site has a visitor centre where audio-visual records of coal mining are shown along with physical equipment remains. The highlight is the underground tour in the company of a former miner who demonstrates the geology of the coal deposits and the practical issues involved in extracting it. On accessing the mine, a rock face is preserved under the roof labelled to show the sequence of rock strata. The tour very clearly demonstrates that the coal seams were relatively thin hereabouts, as the miners had to work by hand lying on their sides in a cavity only as thick as the seam. The limits of the site include one of the largest spoil heap areas in the district, demonstrating both the scale of mining that took place until 1990 and the degree of unwanted rock that had to be processed to extract the thin coal seams. Other more minor features of mining interest are included within the site boundary.

Site Importance – County Geological Site
As a preserved and presented site, this is very important in encapsulating the coal mining heritage of the Arigna district, whilst most other sites are significantly degraded since closure of the mines. As a tourist/visitor attraction it is of major importance in Roscommon and deserves to be supported and further enhanced.

Management/promotion issues
The Arigna Mining Experience is run by a limited company and has a range of financial supports as well as visitor income. The support of the County Council will be important into the future, since the level of tourist visitors across the NW region is relatively low, and the Arigna Mining Experience has to work very hard to achieve sustainable visitor numbers.

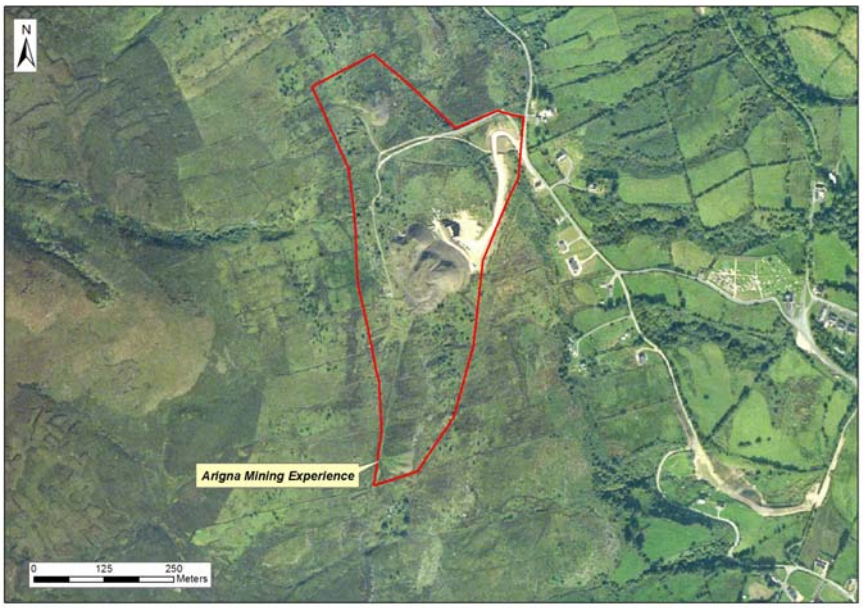
A view of the Arigna Mining Experience visitor centre and car park from the spoil heap above it at Derreenavoggy.

A view of the Arigna Mining Experience visitor centre and car park with the spoil heaps above it at Derreenavoggy.



This map of Derreenavoggy is used with permission, from the EPA-GSI Historic Mine Sites - Inventory and Risk Classification Volume 1, 2009 (see http://www.epa.ie/downloads/pubs/land/mines/).


Arigna Mining Experience
Keadew
Céideadh
Drumshanbo
Druim Seanbhó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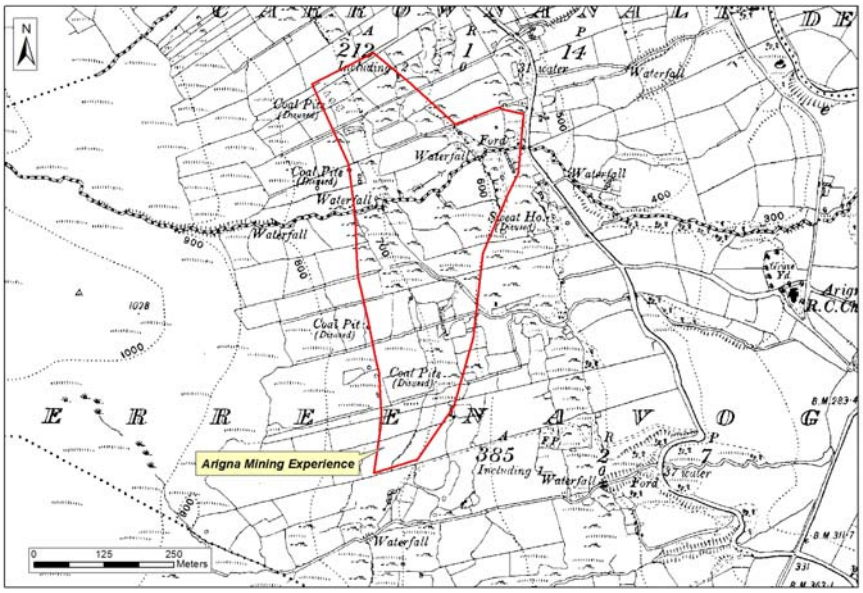
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ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Lecarrow clay pit**
Other names used for site	Blackbrink Bay
IGH THEME	**IGH 12 Mesozoic/Cenozoic, IGH 15 Economic Geology**
TOWNLAND(S)	**Carrownamaddy**
NEAREST TOWN	**Roscommon**
SIX INCH MAP NUMBER	**42**
NATIONAL GRID REFERENCE	**197870 255920**
1:50,000 O.S. SHEET NUMBER	**40 1/2 inch Sheet No. 12**

Outline Site Description
A flooded, overgrown and disused clay pit near the shore of Blackbrink Bay in Lough Ree.

Geological System/Age and Primary Rock Type
The pit seems to be in a karstic solution pipe, of probable Tertiary age (from 2.5-60 million years ago), within Carboniferous age limestone, from about 330 million years ago. The exact age of the clay deposit is unknown but it is likely to be a Tertiary clay deposit rather than a younger, Ice Age (Quaternary) or post glacial (Holocene) deposit that many local brick clay pits are found in.

Main Geological or Geomorphological Interest
This clay deposit is known to be constrained to a narrow solution pipe within Carboniferous limestone, as a pionjar drilling programme in 1979 by the Geological Survey of Ireland found bedrock in close proximity to the old flooded pit. Such Tertiary deposits are rare in Ireland. There may have been some minor secondary deposits as the present landowner described some smaller pits as having been worked. These were possibly trial pits from the 1979 investigation.

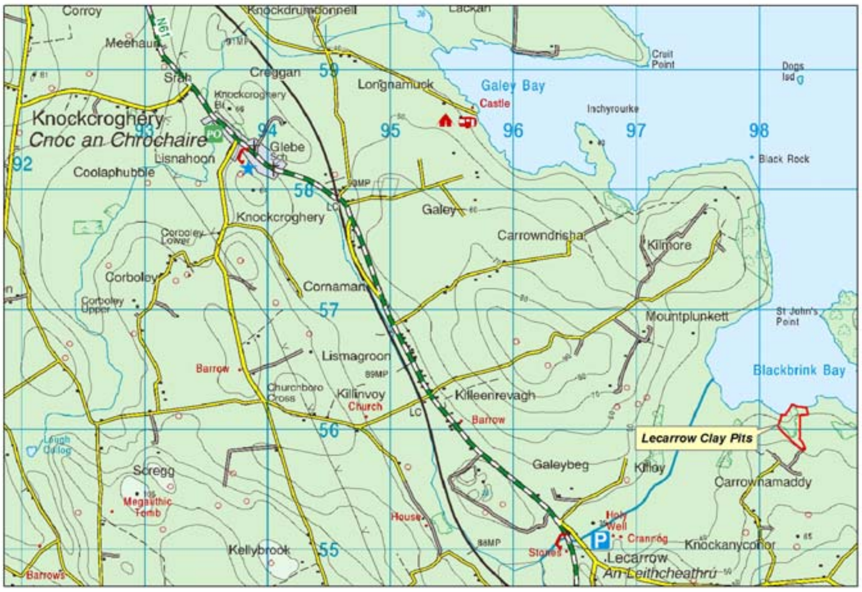
Although it is not certain, and imported clay from Scotland or Wales was probably used at some periods, it seems likely that the clay pipe industry in Ireland, based in Knockcroghery, was founded on using the deposit at Carrownamaddy. An alternative use in pottery in Belleek is also suggested, but the focus of clay pipe making at Knockcroghery presumably resulted from the local supply of suitable clean clay at Lecarrow.

Site Importance – County Geological Site
Despite being effectively inaccessible at present the site merits being considered as a County Geological Site, due to its rarity as a Tertiary clay deposit protected in a karstic solution pipe or doline. The association with the clay pipe industry at Knockcroghery is significant, since it is understood that the clay pipe works supplied pipes to the entire island of Ireland from this one place, rather than there being dispersed production.

Management/promotion issues
The association of the pit with the clay pipe industry at Knockcroghery is not something that can reasonably be promoted at present, and the flooded pit is likely to remain that way unless a major change of use was proposed such as reworking the deposit, which would require the pit to be pumped out. Any other alternative use is difficult to envisage. If older photographs of the pit in use could be sourced, a signboard could be put into the Clay Pipe Museum in Knockcroghery explaining the geological origins and significance of the deposit. The site falls within the area of Lough Ree proposed NHA (Site Number 000440).

The closest point from which the heavily overgrown and flooded pit could be viewed.

The flooded pit is situated within the wooded area of skyline trees close to the shore of Lough Ree.



Corroy
Meehaun
Knockdrumdonnell
Lackan
Srah
Creggan
Longnamuck
Galey Bay
Castle
Crott Point
Dogs Isd
Knockcroghery
Cnoc an Chrochaire
Glebe
Inchyrourke
92
93
94
95
96
97
98
Black Rock
Lisnahoon
Coolaphubble
56
Galey
Knockcroghery
Carrowndrisha
Kilmore
Corboley Lower
Corboley
Cornamart
Corboley Upper
57
Mountplunkett
St John's Point
Lismagroon
Blackbrink Bay
Barrow
Churchboro Cross
Killinvoy
Church
Killeenrevagh
Barrow
Lough Ovlog
56
Lecarrow Clay Pits
Scregg
Galeybeg
Killoy
Carrownamaddy
Megalithic Tomb
House
Holy Well
Crannog
Kellybrook
55
Stones
Knockanyconor
Lecarrow
An Leithcheathrú
Barrows

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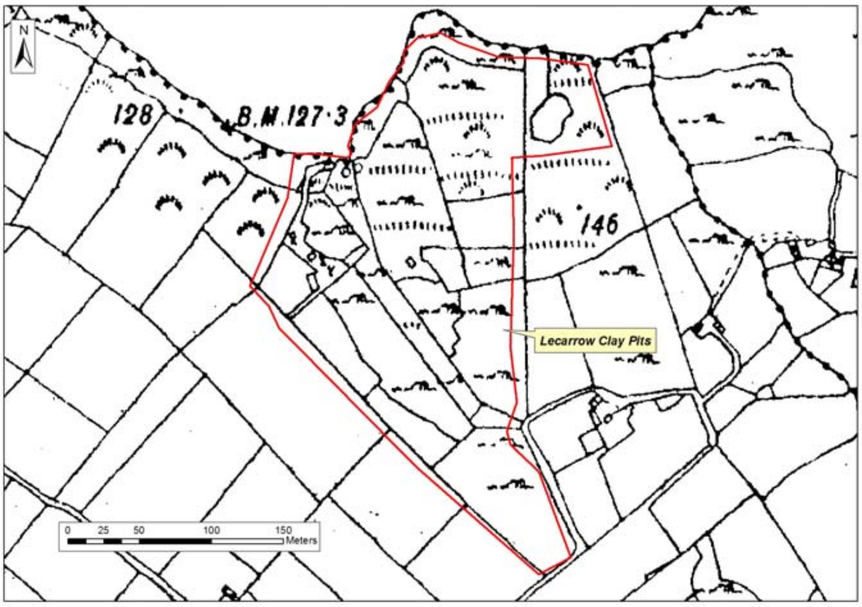
Lecarrow Clay Pits
0 25 50 100 150
Meters



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Lecarrow Clay Pits
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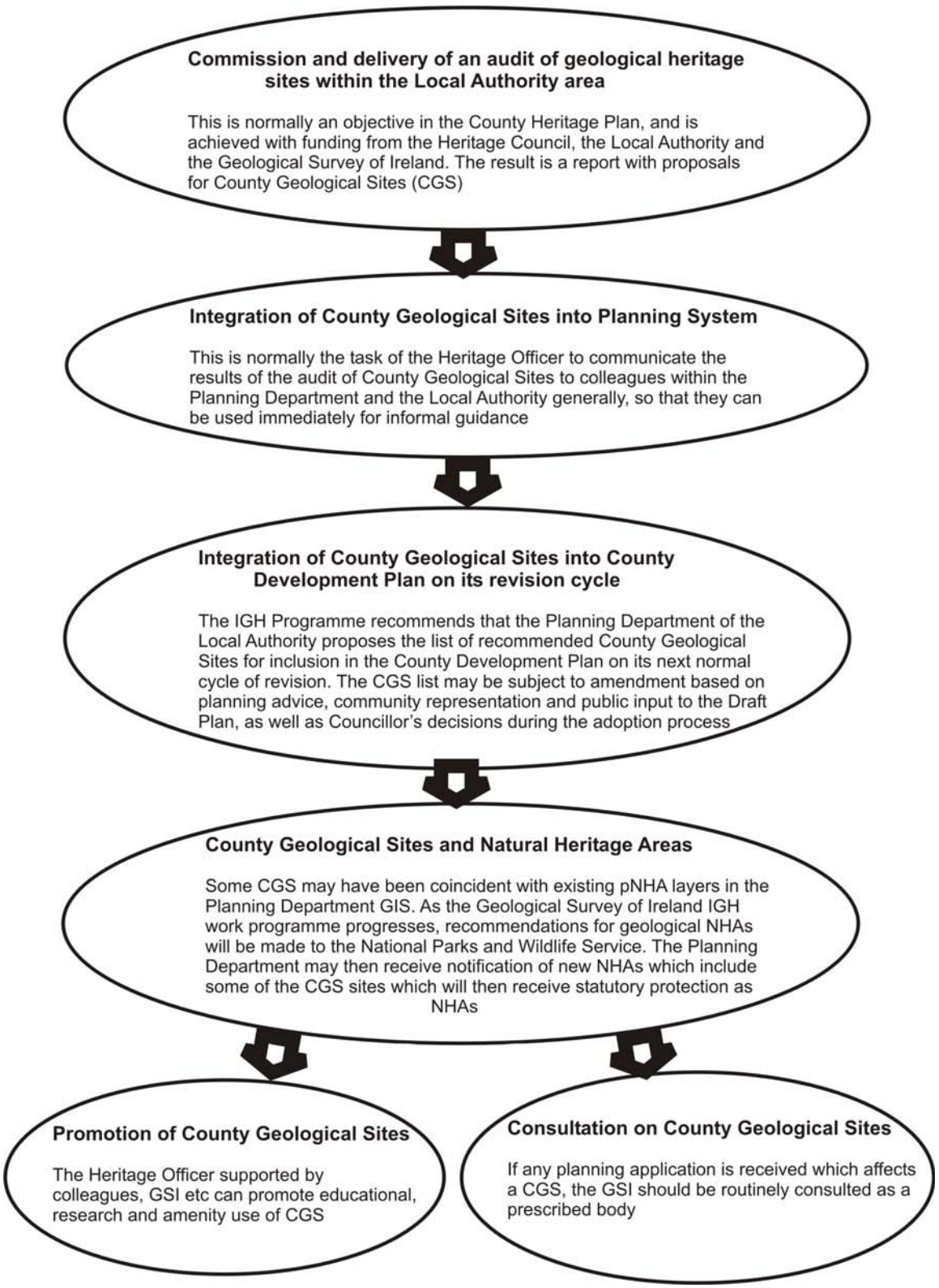
Appendix 1 – Geological heritage audits and the planning process

This appendix contains more detail on the legal framework behind geological heritage audits conducted by County Councils, and the process which operates as a partnership between the Geological Heritage and Planning Section of the GSI and the local authority Heritage Officer.

Geology is now recognised as an intrinsic component of natural heritage in three separate pieces of legislation or regulations, which empower and require various branches of Government, and statutory agencies, to consult and take due regard for conservation of geological heritage features: Planning and Development Act 2000 [e.g. Sections 212 (1)f; Part IV, 6; First Schedule Condition 21], Planning and Development Regulations 2001, Wildlife (Amendment) Act 2000 (enabling Natural Heritage Areas) and the Heritage Act 1995. The Planning and Development Act and the Planning Regulations in particular, place responsibility upon Local Authorities to ensure that geological heritage is protected. Implementation of the Heritage Act 1995, through Heritage Officers and Heritage Plans, and the National Heritage Plan 2002, allow County Geological Sites to be integrated into County Development Plans.

The chart below illustrates the essential process, established by the Irish Geological Heritage Programme in the GSI, over the course of eight other county audits since 2004.

County Geological Sites - a step by step guide



Appendix 2 – Bibliography – Geology of County Roscommon

This bibliography, and those following are quite comprehensive, but are certainly not claimed to be definitive. Any additional references (and preferably a copy of the publication) relating to the geology, geomorphology or hydrogeology of County Roscommon will be welcomed by the Heritage Officer.

References specifically about the caves and karst of Roscommon are included in Appendix 3. The references about the Quaternary (or Ice Age) geology of County Roscommon are included in Appendix 4.

This bibliography includes many books which are national in scope or of great historical importance, and of general value to any geological study in Roscommon. Many of the individual papers listed are perhaps concerned with adjacent or cross-county districts such as the Curlew Mountains, and may have only marginal reference to Roscommon, but geological boundaries do not follow human administration boundaries.

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Appendix 5 – Rejected sites

A range of sites had been previously flagged for consideration in the IGH Master site list, and some were assessed as unsuitable for County Geological Site status in this audit. Similarly a range of additional sites were assessed in the audit, based on the authors' expert knowledge of Roscommon's geology. It was known, for example, that karst features of county importance, rather than of national status, in Roscommon had not been adequately considered in the preparation of the IGH Master site list. Other sites were visited on spec during fieldwork, based on knowledge of Roscommon geology gained from projects undertaken in the years since the original county site list was first supplied to Roscommon's Heritage Officer and/or planning department. The various rejected sites are listed below with brief notes as to why they were assessed as unsuitable for inclusion as County Geological Sites.

Largan Cave
Although this is listed in the GSI's Karst features database, no cave is actually present on the ground. Within the accuracy of the grid reference for the cave there is an area of very wet soil with different vegetation from that expected from dry limestone grassland. It is believed that this may be made-ground filling in a former karstic hole or hollow where a cave may have existed or perhaps a collapse occurred.

The patch of ground where Largan cave is supposed to be, with different soil and vegetation marked.

Lisduff Cave
Although this is listed in the GSI's Karst features database and noted on the Ordnance Survey of Ireland's six inch to the mile maps, no cave is actually present on the ground. The present day ground of grass fields is considerably different from the configuration on the historical maps where there were more walls and buildings in this locality. Whilst the field boundary has small outcrops of limestone rock underneath dense scrub, the cave appears to have been obliterated or buried. It is possible that it was never a natural cave and may have been a souterrain, since they are sometimes mapped as caves on historical OSI maps.

The wooded limestone bank with thick wood debris piled up in the possible site of the cave.

Castlerea Esker

The Castlerea Esker comprises a series of esker beads within an extensive peat bog northwest of Castlerea Town. The esker, though well-defined and intact, is a very low feature as surrounding peatland has enveloped it, and is no more than around 2m-3m high along the entirety of its length. As well as this, the feature is beaded and narrow compared to many of the other eskers in Roscommon.

As the feature is in no way of National Importance, the small size and subdued expression of the feature has merited its exclusion as even a County Geological Site.

Castlerea Esker is the low wooded ridge from which the photo is taken, curving round from left to right (with red highlight).

Moydow Pavement

The Moydow locality is an elevated area of karstified bedrock at or close to the surface, approximately 5 km south of Roscommon Town. During preparation for the field element of the audit, the area was noted as having a potentially extensive area of limestone pavement, from the bare and dry grassland vegetation cover observed in the locality. When visited in the field, the area does comprise some scrub and dry grassland, but there is no rock outcrop of any significance. Thus neither is there any limestone pavement as was initially expected following examination of the aerial photographs.

A view of the high ground at Moydow showing that although there is some bedrock close to surface, there is no significant limestone pavement.

Ballinloughquarter meltwater channel

At Ballinloughquarter just east of Ballinlough Village, a 1.5 km long, sinuous meltwater channel occurs and dissects a ridge. The channel was formed when glacial meltwater spilled from a lake, which was impounded to the north of the ridge during deglaciation in the area. When visited on the ground though, the channel exists and is lengthy, the channel is also wide and relatively shallow and its profile is not clearly seen on the ground. As well as this, much of the locality comprises high hedgerows and forestry, which further subdues the visual impressiveness of the feature. From this, its status as a site is diminished by its wide and shallow morphology, and the difficulty in viewing the profile of the feature clearly from the ground anywhere in the locality.

Ballinloughquarter meltwater channel viewed from the southwest, looking northwest.

Tobereeoge Spring

Tobereeoge Spring is a karstic spring used for water supply, and is located approximately 1.5 km north of Knockcroghery Village. The spring is housed in a pumphouse with an underground concrete chamber, and the water supply compound is secured with security fencing. From this, the spring is not easily accessible and is not clearly seen owing to the engineering of the structure housing it. As there are other water supply springs that can be seen more clearly and which discharge larger volumes of water than Tobereeoge, it has not been recognised as being of County Geological Site status.



Two views of Tobereeoge Spring.

Silver Island Spring

Silver Island Spring is a karstic spring used for water supply, and is located approximately 2 km east of Castlerea Town. The spring is not readily visible and is surrounded by low-lying, wet grassland which subtracts from the impressiveness of the feature. As there are other water supply springs that can be seen more clearly and which discharge larger volumes of water than Silver Island Spring, it has not been recognised as being of County Geological Site status.

Lough Key Forest Park

Although the water levels were high during our fieldwork, we discussed the occurrence of rock exposures with boatmen and staff at the park and are of the view that those that do occur when the water is low are unsubstantial and do not merit inclusion as a County Geological Site. Given the substantial area of the park, there may be some rock exposures present, including within the woodlands. If any attempt at developing the geological interest of the property was considered, it would require detailed study and fieldwork to progress.


The general public access point to the lake.


The rock exposures just below water!

Estersnow Cave

Hickey and Drew (2003) describe this short cave near Cavetown cross roads as having a man-made entrance and being 9m long. It is shorter than this at present, probably due to past dumping of rubbish in the cave. The cave is of no great significance and does not merit being classed as a County Geological Site.



Outside and internal views of Estersnow Cave.

Pollnagollum cave and doline, Frenchpark
This site is very close to the centre of Frenchpark, in a wooded enclosure at the back of a garden. A small stream cave emerges in the side of a 4m deep oval doline. It is effectively a window into the epikarst. The cave stream is polluted by sewage and the water disappears quickly into the rock at the base of the doline. A large pipe that was probably overflow from a septic tank discharges into the doline from the adjacent house but this appears to be redundant, and there may now be proper sewage connections for the house.

Overall, despite the rarity of documented caves in Roscommon, this site does not merit inclusion as a County Geological Site. The pollution of groundwater in a karstic terrain is of some concern and could be investigated further.


Looking into the pothole of Pollnagollum at Frenchpark.

Curlew Mountains road cutting (in Devonian sandstones)
At the very western margin of the county in the bypass north of Boyle there are some sections of Devonian sandstone ("Old Red Sandstone") in the road cut. These were probably very fresh after road construction when they were put forward for inclusion in the IGH site list for the Devonian theme. However they are now poorly exposed due to weathering and degradation of the cutting and due to the encroachment of extensive vegetation cover. There

is no merit in the inclusion of this site as a County Geological Site. One short section on the southern slopes of the Curlews is listed as a County Geological Site (Boyle Road Cutting) since a good exposure of a volcanic rock within the sandstones is reasonably well exposed and accessible in a road cutting.

The GSI IGH record includes mention of a nearby quarry with raindrop pits. This quarry was examined and although there are rock faces exposed, the overall status of the faces is poor. The rock is the same volcanic sediment seen in the Boyle Road Cutting. There is almost no bedrock exposed on the quarry floor, with vegetation and standing water dominating this area. No raindrop impressions were seen. It is reported that such impressions were preserved on fine grained green units, such as thin mudstones or possible ash beds. There are indications of these mudstones as easily weathered broken fragments in a couple of places, but no thin greenish beds. They may have been present and recorded when the quarry was operational and exposures were fresh. However, there is insufficient geological interest remaining to consider this quarry as a County Geological Site. Some pieces of the raindrop prints in a very fine grained greenish rock, that may have been a volcanic ash, are collected and preserved in Trinity College Dublin Geological Museum.

Degraded and overgrown Devonian sandstones in the road cut on the northern side of the Curlews, near the county boundary.

The quarry from which raindrop prints were recovered is not now in satisfactory condition for County Geological Site status.

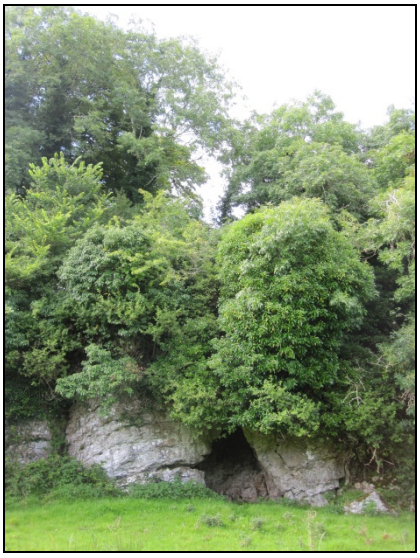
Boyle River

This site was originally listed as showing sections of Boyle Sandstone Formation and Kilbryan Limestone Formation. In fact there are some very minor bankside rock exposures at the minor rapids below Assylin Church graveyard (marked as 'waterfall' on the Ordnance Survey mapping), on the western side of town. There are no outcrops of any significance throughout the town to the northern side of Boyle Abbey, and some of it is channelized by buildings and walls. The exposures near the graveyard are inconsequential beyond allowing an exposure and potential contact between rock types to be drawn on a geological map. River conditions were apparently in high flow, but even so, the exposures in the short rapids would not materially differ from the bankside scraps, in times of low water flow.

Left: The rapids in the Boyle River where there is a small amount of rock exposure.
Right: The rock exposures are no better or larger than this riverbank.

Ballynahoogh or Cavetown Cave

This cave may be the one described in 1969 as Cavetown Cave (Devoy and Gilhuys 1969) but does not fully correspond to the description. The cave is located 5km southeast of Boyle in a limestone hillock just north of the road at NGR 184430 297680, in the townland of Cavetown or Ballynahoogh. The hillock has cliffs of limestone around the base with several arch like rifts which do not extend more than a metre or two. At the east end is a cave which has been surveyed and is a total of 24m long. It is currently very unpleasant due to the decay of a dead animal. Irrespective of this, the cave is of no great significance and does not merit being classed as a County Geological Site.

Left: Matthew Parkes looking into the entrance of Cavetown Cave.
Right: Blind cave in the same escarpment as Cavetown Cave.

Arigna area sites

Coal mining was once widespread across the hills centred on Arigna. Two sites (Arigna Mining Experience and Altagowlan) represent this important industry and its geological component. This area was previously noted in the IGH Master site list as having much potential interest for coal mining heritage under IGH 15, the Economic Geology Theme. For NHA status, the criteria for a site in this theme demanded scientific justification based on the geology of the economic deposit itself and could not include sites solely based on the subsequent mining heritage infrastructure of buildings, water power, pits or adits. As County Geological Sites all facets of the mining heritage could be encompassed in the selection of a site.

The Arigna area was appraised with a view to identifying the best examples of coal and possibly some older iron mining heritage in the district to include both the coal geology and any mining infrastructure. Sadly most areas now exhibit very little of their past with only lumps and bumps in the ground needing serious work to interpret their role, and no classic buildings such as are found in metal mining areas in Wicklow, west Cork, Silvermines and so on.

The public visitor facility, the Arigna Mining Experience (AME) does a superb job of capturing all the interest of the former industry and preserves and presents the underground aspects of coal geology and mining very well. The site boundary encompasses a range of spoil heaps and other minor remains. To represent the underground aspects of coal, the only other site in the region that should probably be considered as a geological NHA is on Bencroy in County Leitrim. Most of the adits in the Arigna coal mines have collapsed or are now made inaccessible for safety reasons.

Other former mines at Aghabehy and Carrownanalt, above the AME and along the flanks of Kilronan Mountain, are now of insufficient interest on the ground to include as County Geological Sites. These have been well documented in the EPA/GSI Historic Mine Site Characterisation Project, which looked at them principally as possible sources of environmental pollution. At Rockhill for example, the decline to the adit survives although the entrance is collapsed. Mine buildings of poor quality concrete also survive but some have been subsumed for farm buildings and the whole area has been disturbed in the course of building roads for access to wind turbines.



Left: The decline at Rockhill with the collapsed adit at the lower end behind the trees.
Right: Former mine buildings now shelter new inhabitants.

Pollawaddy

The cave is located some 7.5km southwest of Ballaghaderreen in the extreme northwest of Co. Roscommon and approximately 1.5km southwest of Lisacul village; NGR M 157317 289238, (50,000 map No. 32); Townland Carrownaknockaun; Altitude 94m O.D; Surveyed length is 45.5m. The entrance is located part way up the southern flank of an 11m high east-west ridge just north of the point at which a small stream sinks. The cave was explored and surveyed in September 2000 by David Drew and Caoimhe Hickey.

The original cave entrance was spacious - some 3m wide and 2m high but the farmer has walled in much of the opening and culverted the stream at the sink and entry is now via an easy squeeze and a 1m drop into a boulder-strewn chamber. Whilst interesting, it does not merit County Geological Site status.

Appendix 6 – Detailed geological map of County Roscommon