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The Geological Heritage of County Wexford

An audit of County Geological Sites in County Wexford 2018

Robert Meehan, Ronan Hennessy, Matthew Parkes and Sarah Gatley



An Chomhairle Oldhreachta
The Heritage Council



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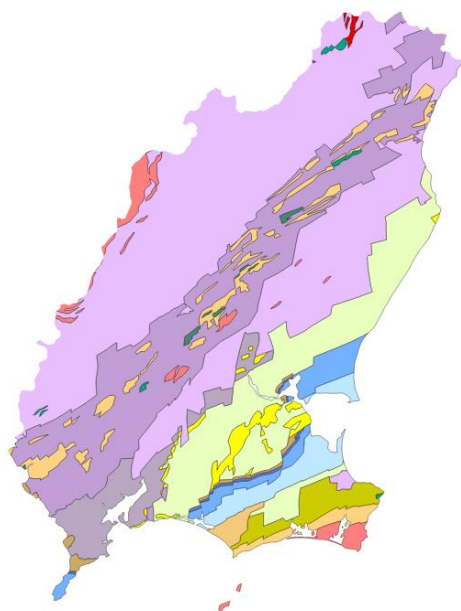
The Geological Heritage of County Wexford

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Section 1 – Main Report

by Robert Meehan, Ronan Hennessy, Matthew Parkes and Sarah Gatley

2018



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Section 2 – Site Reports

IGH 1 Karst

Site Name

Not represented in County Wexford

IGH 2 Precambrian to Devonian Palaeontology

Site Name

Booley Bay

Carrigadaggan

Greenville farmyard

Kiltrea

Loftusacre

Oldtown to Harrylock Bay

Sandeel Bay

IGH 3 Carboniferous to Pliocene Palaeontology

Site name

Hook Head

IGH 4 Cambrian-Silurian

Site name

Baginbun Head

Ballymoney Strand

Cahore Point

Coolishall Quarry

Cullenstown

Kiltrea [see IGH2]

Loftusacre

Petit's Bay

Pollshone Head - Roney Point

Shelmaliere Commons Quarry

IGH 5 Precambrian**Site name**

Greenore Point

Kilmore Quay

St. Helen's Harbour

IGH 6 Mineralogy**Site Name**

Not represented in County Wexford

IGH 7 Quaternary**Site Name**

Blackstairs Mountain

Camaross Pingos

Fethard

Forth Mountain

Loftusacre [see IGH2, IGH4]

Mulmontry Gorge

Saltee Islands

Screen Hills

St. Helen's Glaciomarine Mud

St. Patrick's Bridge

Tincone

IGH 8 Lower Carboniferous**Site Name**

Hook Head [see IGH 3]

IGH 9 Upper Carboniferous and Permian**Site Name**

Not represented in County Wexford

IGH 10 Devonian**Site Name**

Oldtown to Harrylock Bay [see IGH 2]

Sandeel Bay [see IGH 2]

IGH 11 Igneous intrusions**Site Name**

Carnsore Point

Saltee Islands [see IGH7, IGH13]

St. Helen's Harbour [see IGH5]

IGH 12 Mesozoic and Cenozoic**Site Name**

Not represented in County Wexford

IGH 13 Coastal Geomorphology**Site Name**

Ballyteige Bay

Bannow Bay

Cahore Polders and Dunes

Carnsore Point [see IGH11]

Curracloe Beach and The Raven Point

Kilpatrick Sandhills

Lady's Island Lake
Saltee Islands [see IGH7, IGH 11]
St. Patrick's Bridge [see IGH 7]
Tacumshin Lake
Wexford Harbour

IGH 14 Fluvial and lacustrine geomorphology

Site Name

Lady's Island Lake [see IGH 13]
Tacumshin Lake [see IGH 13]

IGH 15 Economic Geology

Site Name

Barrystown Mine
Caim Mine
Graigue Great
Harrylock Bay

IGH 16 Hydrogeology

Site Name

Not represented in County Wexford

Executive Summary

County Wexford is perhaps more widely known than many counties for its geological heritage, and clearly many of the rich heritage and tourist sites have an underlying geological heritage that is the foundation for either cultural heritage interest or for the rich biodiversity of the county. It has some particularly fine but underappreciated geological sites. Wexford County Council's support for this geological heritage audit is critical in raising the profile of geological heritage in County Wexford and for maximising its potential, since some of the sites may be otherwise overlooked, particularly in favour of biodiversity or cultural heritage.

This report documents what are currently understood by the Irish Geological Heritage Programme (IGH) of Geological Survey Ireland (GSI) to be the most important geological sites within County Wexford. It recommends them as County Geological Sites (CGS), for inclusion within the County Development Plan (CDP). The audit provides a more detailed study of sites to replace a provisional listing based on desk study which was adopted in the current 2013-2019 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, some of the sites described in this report are considered to be of national importance as best representative examples of particular geological formations or features. They have been provisionally notified to the National Parks and Wildlife Service (NPWS) by the GSI for designation as Natural Heritage Areas (NHAs) once due survey and consultation with landowners is complete. The NPWS staff have also looked at how the proposed CGS mesh with existing proposed NHAs and how best to integrate them.

Many of the sites fall within existing pNHAs, SACs and SPAs where the ecological interest is actually founded upon the underlying geodiversity. In Wexford, Tacumshin Lake SAC/SPA and Lady's Island Lake SAC/SPA, are important ornithological sites and habitats that are found amid coastal barrier-lagoon systems. Near Carnsore, the Carnsore Point SAC and pNHA are important sites for reef and mudflat habitats, which are directly influenced and controlled by the shallow, nearshore gently sloping bedrock strata. At Hook Head, the entire coast is effectively within SAC or pNHA, but notified for marine biodiversity. Much of this is founded on the Carboniferous limestone beds or the Devonian sandstones so well exposed on the foreshore.

The commission of this audit and adoption of the sites within the CDP ensure that County Wexford 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. In most counties the lead partner in the County Council has been the Heritage Officer. The organisation structure in Wexford is slightly different to most counties. The Planning Department staff have fully embraced this project, and addressed geodiversity within the umbrella of biodiversity and forward planning, and this places County Wexford at the current centre of geological conservation in Ireland.

1. County Wexford in the context of Irish Geological Heritage

This report places County Wexford firmly at the forefront of geological heritage within Ireland, as although more than half of the counties have now commissioned such an audit within the scope of the county-based Heritage Plan, Wexford has adopted a different strategy, embracing geological heritage fully within the County Development Plan (2013-2019) and within its Biodiversity Action Plan (2013-2018).

By providing reliable data, the audit follows what is now a tried and trusted methodology, and will facilitate the strong policy support in Wexford. In the absence of significant resources available at a national level to the relevant bodies for conservation of geological heritage as Natural Heritage Areas (NHA), it represents a very welcome and significant level of progress in defining and safeguarding Ireland's geological heritage. In essence, County Geological Site audits are the only effective national geological conservation at present (see Gatley and Parkes 2016), but only with a level of protection rooted in their adoption into statutory County Development Plans, which include some appropriate policies to protect County Geological Sites and geological NHAs with other designated sites.

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). 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 GSI complements other nature conservation efforts of the last decade, by assessing Ireland's geodiversity. Geodiversity 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 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 the IGH Programme fills a void which has existed 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:

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 the first criterion is to identify the best national representative example of each feature or major sequence, and the second is to identify any unique or exceptional sites. The third criterion, identifying any sites of International importance, is nearly always covered by the other two.

Designation of geological NHAs will be by the GSI's partners in the Programme, the National Parks and Wildlife Service (NPWS). Once designated, any geological NHAs will be subject to normal statutory process within the County Wexford Planning Department and other relevant divisions. **However, compared to many ecological sites, management issues for geological sites are generally fewer and somewhat different in nature. The subsequent section considers these issues.**

From a national perspective, as a result of extensive comparison of similar sites to establish the best among them, there is now a good knowledge of many other sites, which are not the chosen best example, but which 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. All these various important sites are proposed for County Geological Site (CGS) listing in the County Development Plan.

Currently, in 2018, a Master List of candidate CGS and NHA sites is being used in GSI, originally compiled 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, including for example the IGH2 Theme – Precambrian to Devonian Palaeontology. Due to various factors, none have yet been formally designated. In County Wexford, sites such as Carrigadaggan, Greenville, Booley Bay, Sandeel Bay and Oldtown to Harrylock Bay were considered to be of national importance and were put forward as Natural Heritage Areas (NHA) for the IGH2 Precambrian to Devonian Palaeontology Theme. Inclusion of all sites as County Geological Sites (CGS) in County Wexford'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 defined 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, can themselves be significant potential additions to this selection. County Geological Site listing is 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 often undervalued component of our shared natural heritage.

1.1 Wexford County Geological Sites

Site_Name	Designation	IGH Theme Primary	IGH Theme Secondary	IGH Theme Tertiary	Site_Code
Baginbun Head	CGS	IGH4			WX001
Ballymoney Strand	CGS, may be recommended for Geological NHA	IGH4			WX002
Ballyteige Bay	CGS	IGH13			WX003
Bannow Bay	CGS, recommended for Geological NHA	IGH13			WX004
Barrystown Mine	CGS	IGH15			WX005
Blackstairs Mountain	CGS	IGH7			WX006
Booley Bay	CGS, recommended for Geological NHA	IGH2			WX007
Cahore Point	CGS, may be recommended for Geological NHA	IGH4			WX008
Cahore Polders and Dunes	CGS	IGH13			WX009
Caim Mine	CGS	IGH15			WX010
Camaross Pingos	CGS, recommended for Geological NHA	IGH7			WX011
Carnsore Point	CGS	IGH11	IGH13		WX012
Carrigadaggan	CGS; recommended for Geological NHA	IGH2			WX013
Coolishall Quarry	CGS	IGH4			WX014
Cullenstown	CGS	IGH4			WX015
Curracloe Beach and The Raven Point	CGS	IGH13			WX016
Fethard	CGS, recommended for Geological NHA	IGH7			WX017
Forth Mountain	CGS	IGH7			WX018
Graigie Great	CGS, may be recommended for Geological NHA	IGH15			WX019
Greenore Point	CGS	IGH5			WX020
Greenville Farmyard	CGS, recommended for Geological NHA	IGH2			WX021
Harrylock Bay	CGS, may be recommended for Geological NHA	IGH15			WX022
Hook Head	CGS, recommended for Geological NHA	IGH3	IGH8		WX023
Kilmore Quay	CGS, recommended for Geological NHA	IGH5			WX024
Kilpatrick Sandhills	CGS	IGH13			WX025
Kiltrea	CGS, recommended for Geological NHA	IGH2	IGH4		WX026
Lady's Island Lake	CGS, recommended for Geological NHA	IGH13	IGH14		WX027
Loftusacre	CGS	IGH4	IGH2	IGH7	WX028
Mulmontry Gorge	CGS	IGH7			WX029
Oldtown to Harrylock Bay	CGS, recommended for Geological NHA	IGH2	IGH10		WX030
Petit's Bay	CGS	IGH4			WX031
Pollshone Head - Roney Point	CGS, may be recommended for Geological NHA	IGH4			WX032
Saltee Islands	CGS, recommended for Geological NHA	IGH11	IGH13	IGH7	WX033
Sandeel Bay	CGS, recommended for Geological NHA	IGH2	IGH10		WX034
Screen Hills	CGS, recommended for Geological NHA	IGH7			WX035
Shelmaliere Commons Quarry	CGS	IGH4			WX036
St. Helen's Glaciomarine Mud	CGS	IGH7			WX037
St. Helen's Harbour	CGS	IGH5	IGH11		WX038
St. Patrick's Bridge	CGS, recommended for Geological NHA	IGH7	IGH13		WX039
Tacumshin Lake	CGS	IGH13	IGH14		WX040
Tincone	CGS	IGH7			WX041
Wexford Harbour	CGS, recommended for Geological NHA	IGH13			WX042

1.2 Combined, Renamed and Rejected sites

A range of additional sites were assessed in the audit, based on the authors' expert knowledge of Wexford's geology, and especially along the south Wexford coast. It was known, for example, that many of the bays of south Wexford had historically impressive sections in glacial tills with a variety of internal features within them, that had not been adequately considered in the preparation of the IGH Master Site list. Other sites were visited on spec during fieldwork. It should also be noted here that the original creation of the Master Site List was very much a preliminary desk-based study, using expert panels for the 16 different geological themes. Inevitably some sites got overlooked, but these have now been rectified as far as possible. In addition, some of the new sites had been identified in the course of GSI research work in the period since the Master Site List was created and this audit was undertaken.

A range of sites were originally indicated in the IGH Master Site list based on expert panels, and have previously been included in the Wexford CDP; some anomalies survived the development process (in other counties as well as Wexford) to become included in the County Development Plan. Some of these sites have been assessed as unsuitable for County Geological Site status in this audit, and their rejection has been approved by GSI after reviewing the case for each. The combined, renamed and rejected sites are listed below with brief notes as to why they were assessed as unsuitable for inclusion.

Tacumshin Lake and Lady's Island Lake [sites 13, 14, 15 in current CDP]

The duplication of Tacumshin Lake and Lady's Island Lake has been corrected, with each defined as a single site.

Dunmore East [site 3 in current CDP]

This site is in Co. Waterford, and was erroneously listed under Co. Wexford, and is now removed.

Wood Village [site 33 in current CDP]

This site is renamed as Fethard.

Camaross Cross Roads [site 34 in current CDP]

This site is renamed as Camaross Pingos.

Hook to Templetown to link with Baginbun Head [site 5 in current CDP]

This site was unfortunately very ill defined and has been rationalised in this audit. The Hook Head Overview Report clarifies the various sites all over Hook Head.

Broomhill Point [site 36 in current CDP]

The exposures along the northern edge of Broomhill Point, which is on the southern flank of Dollar Bay, had historically impressive exposures showing ice wedge casts and tundra frost polygons. Today, the exposure is poor, however, as there has been much collapse of the soft-sediment sections, and scrub has invaded the majority of this. Owing to this, nothing observed at the site was of sufficient importance to consider it a County Geological Site (see scrub-covered, and collapsed, section in photo below).



Rivers Barrow and Suir

The meandering course of the River Barrow, just before it meets the Suir at Great Island, had been suggested as being potentially important as it had well developed meanders incised into bedrock. However, this is in no way unique, and therefore the site has not been proposed as a County Geological Site.



River Slaney, Bunclody [site 17 in existing CDP]

The River Slaney, just north of Bunclody, had also been suggested as a CGS as it has a discordant river pattern; which is a river course at odds with the regional bedrock geology. Such occurrences are very common in Ireland, however, as many of today's river channels were cut by meltwater during the end of the last Ice Age, as meltwater channels, which often dissect bedrock ridges, creating a common pattern in Ireland.



Lumsdins Bay

The exposures along the edge of Lumsdins Bay had historically impressive exposures showing infilled till cracks, ice wedge casts and tundra frost polygons. Today, the exposure is poor, however, as there has been much collapse of the soft-sediment sections, and scrub and grass have invaded (see photo following). Owing to this, nothing observed at the site was of sufficient importance to consider it a County Geological Site.



Vinegar Hill

Being one of Wexford's most popular tourist attractions, and with knowledge that bedrock cropped out on top of the hill, the locality was visited to examine in detail if the outcrop had any significant element that warranted promotion, geologically. Although the bedrock outcrop is impressive, there is nothing scientifically unique about this, and it is a similar outcrop to those seen in Ordovician rocks throughout north Wexford. Owing to this, the site has not been designated a County Geological Site.



River Slaney, Enniscorthy [site 18 in existing CDP]

The River Slaney at Enniscorthy was included as it was described as 'gorge-like'. However, in the field the river at Enniscorthy comprises a wide floodplain with relatively gentle backslopes on the bounding hills; and there is no gorge feature at the locality. The river in the area has no notable features and therefore it is not included as a County Geological Site.

Milltown [site 8 in existing CDP]

The site at Milltown was included as a representative of the Duncormick Conglomerate Formation of the Old Red Sandstone rocks of Wexford. Most of the data collated on the Duncormick Formation has been derived from borehole data. Milltown was one of four sites where the base of the formation was identified. However, a private dwelling was built on the site post-2005. The formation has been correlated with the succession at Hook Head. Microfossil (palynological) data derived from boreholes indicates that a small part of the formation is late Devonian and the remainder is early Carboniferous.



Cullentragh [site 19 in existing CDP]

This site was added to the Master Site List for the IGH15 Economic Geology theme since mineral exploration here in the very early 1980s identified a uranium prospect, with pitchblende (a uranium oxide) associated with quartz veins. Field investigation and detailed reading of the company reports lodged with the Open File records in the Geological Survey of Ireland indicate that it is probably not worth considering as a County Geological Site. The deposit was one of three prospects investigated in the area, and although two quartz veins with pitchblende were identified, associated with the Blackstairs Granite Pluton, the mineral is not considered as an economic deposit, with very little depth or continuity. A large grid of trenches (up to 3.5m deep) and probes were put into thick glacial tills after some mineralised boulders were found. Today there are no workings and little exposure that could constitute a County Geological Site.



Cummer [site 12 in existing CDP]

Cummer was provisionally listed under two themes for review – IGH6 Mineralogy and IGH 11 Igneous Intrusions. A serpentinite body with minor grains and narrow layers of chromite occurs adjacent to the Wicklow border near Carnew in northwest Wexford. It was drilled by the GSI in the 1980s and again in 2013. The body is approximately 800m long and 80m wide, and is described from borehole cores, but is not considered to be suitable for County Geological Site status.



A view across Cummer Townland looking north to the forestry where the serpentinite body is found.

Duncannon [site 26 in existing CDP]

This was listed in the IGH4 Cambrian – Silurian Theme as a type section for the Duncannon Group, with a sequence of tuffs, volcanoclastic breccias, lahars and lavas. This was largely based on detailed studies done in the 1970s for a PhD. However, assessment for this audit indicates many anthropogenic changes to the site since that time, as well as natural ones. The coastal outcrop just east of the old harbour has been heavily modified by landfill and is fenced off for a business compound. The south facing cliff below the Duncannon Fort has several key sections of the rocks hidden beneath support walls for the Fort, although these are apparently older. The map in a published GSI field guide from 1978 would also imply that the harbour walls have also obscured some of the outcrop. The section south of the new pier and north of the Duncannon Point is inaccessible except at low tide from the strand, but is largely covered by seaweed. The quality of exposures accessible on the strand is really rather poor with many of the reported features being difficult to define, even for a geologist, and certainly not easy to demonstrate to an untrained eye. For the human modifications which have obscured the exposures and an overall lack of demonstrable interest this site is rejected as a CGS.



Left: The tidally covered exposures north of Duncannon Point.

Right: The infilled ground east of the old harbour.

Clonmines

Clonmines has a long history as a Medieval mint for coinage, and was considered as a possible geological heritage site for its mining history. However aside from a possible historic mine shaft exposed at a very low tide in the tidal river beside Clonmines (see photos below), there is very little evidence for any mining in the locality. It is possible that Barrystown Mine on the opposite side of Bannow Bay was actually the source of metals for early operations. With the lack of any identifiable geological heritage component, Clonmines is rejected as a possible County Geological Site.



Monastic ruins at Clonmines.



Wooden structure from mining exposed at a very low tide.



Wooden structure from mining exposed at a very low tide.

1.3 Wexford Council policies regarding geological heritage

The existing County Development Plan (2013-2019) has a listing of sites identified as County Geological Sites, recognising that some are recommended to be NHAs because of their significant geological heritage interest. The two objectives NH01 and NH02 provide the clear statement of intent to protect these CGS and other sites.

It is an objective of the Council:

Objective NH01

To conserve and protect the integrity of sites designated for their habitat/wildlife or geological/geomorphological importance and prohibit development which would damage or threaten the integrity of these sites, including SACs, cSACs, SPAs, NHAs, pNHAs, Nature Reserves, and Refuges for Fauna.

Objective NH02

To recognise the importance of recommended proposed NHAs and County Geological sites identified by the Geological Survey of Ireland and protect the character and integrity of these sites where appropriate.

From Wexford County Development Plan 2013-2019, Volume 1, p355.

The existing site list was based largely on desk based study, for most geological themes, and so it is unsurprising that some sites were not actually suitable, for a range of different reasons, when assessed on the ground. The following sites are rejected from the published site list in the CDP 2013-2109.

- 8 – Milltown
- 12 – Cummer
- 17 – River Slaney, Bunclody
- 18 – River Slaney, Enniscorthy
- 19 – Cullentrath
- 26 – Duncannon
- 36 – Broomhill Point

Built Heritage

It is an objective of the Council:

Objective PS01

To protect the architectural heritage of County Wexford and to include structures considered to be of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest in the Record of Protected Structures.

From Wexford County Development Plan 2013-2019, Volume 1, p382.

Barrystown Mine (WCC1288) and one of Caim Mine's engine house chimneys (WCC1083) are included in the Record of Protected Structures.

2. 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 as SAC and NHA sites. In these areas, the geological heritage enhances and cements the value of these sites for nature conservation, and requires no additional designation of actual land areas, other than citation of the geological interest.

Broadly speaking, there are two types of sites identified by the IGH Programme. The first, and most common, includes small and discrete sites. These may be old quarries, natural exposures on hilly ground, coastal cliff sections, or other natural cuttings into the subsurface, such as stream sections. They typically have a feature or features of specific interest such as fossils or minerals or they are a representative section of a particular stratigraphical sequence of rocks. **The second type of site is a larger area of geomorphological interest, i.e. a landscape that incorporates one or more features that illustrate the processes that formed the landscape.** The Quaternary theme and the Coastal Geomorphology theme often include such sites. In County Wexford, sites such as Wexford Harbour, Screen Hills, Camaross Pingos and St. Patrick's Bridge are considered to be of national importance and are recommended as Natural Heritage Areas (NHA) for the IGH13 Coastal Geomorphology and IGH7 Quaternary Themes.

It is also important from a geological conservation perspective to 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 County Wexford. A lack of awareness in the past, has led to the loss of important geological sites and local character throughout the country. In County Wexford a Landscape Characterisation Assessment was completed and incorporated into the County Development Plan 2007-2013. A simplified version is included in the Draft County Development Plan of 2013-2019, awaiting the completion of a National Landscape Strategy in this area. This provides a tool for the local authority and other agencies to help maintain the character of the County. The Strategic Environmental Assessment within the County Development Plan also provides tools. In addition, the now routine pattern of consultations with GSI, either by the planning department or by consultants carrying out Environmental Impact Assessment, plus strategic environmental assessment (SEA), has greatly improved the situation.

There are large differences in the management requirements for geological sites in comparison to biological sites. Geological features are typically 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 that people are 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 to influence the design so that access to exposures of rock is maintained for the future, or occasionally to prevent a completely inappropriate development through presentation of a strong scientific case.

In many counties, working quarries may have been listed because they are the best representative sections available of specific rock sequences, in areas where exposure is otherwise poor. No restriction is sought on the legitimate operation of these quarries.

However, maintenance of exposure after quarry closure is generally sought in agreement with the operator and planning authority in such a case. At present, working quarries like Coolishall Quarry are now included as County Geological Sites in County Wexford. These issues are briefly explored in a set of Geological Heritage Guidelines for the Extractive Industry, published jointly by the GSI and the Irish Concrete Federation in 2008.

A new quarry may open up a 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 may need occasional maintenance to prevent overgrowth of vegetation obscuring the scientific interest, or may be promoted to the public by means of a viewing platform and information panel.

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 opportunity for general collecting may need to be controlled. County Wexford's sites are mostly not likely to require such an approach, but as the Hook Head area is perhaps one of the best known fossil sites in Ireland, some measures to address issues here are advised. This is explored in a case study approach, later in this report.

Waste dumping

An occasional problem throughout the country, including in County Wexford, 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 areas where rock is exposed, such as in quarries or disused gravel pits, 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. County Wexford was included in a national scheme for Groundwater Protection in 2012, thus ranking the county land surface into vulnerability categories of 'Extreme', 'High', 'Moderate' and 'Low', and helping planners to assess which developments are suitable or not in some areas of County Wexford.

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 to be built**, or in other major infrastructural work, it would be beneficial that **where new rock exposures are created, they be left open and exposed** unless geotechnical safety issues arise (such as where bedding dips are 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 that look the same throughout the country. Leaving rock outcrops exposed where they are intersected along the road, improves the character and interest of the route, by 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 costs. It may also contribute to road safety by providing diversity of surroundings to maintain drivers' attention.

In Wexford, because of the relatively limited construction of major new carriageways, the opportunity for such rock road cuttings has been limited. The improvements on the N11, over recent years in adjacent parts of Wicklow and in places in Wexford, have often not been deep enough to require cuttings. Other roads in the county are less likely to be significantly upgraded but the option should be borne in mind for all future road improvements.

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 of outstanding significance and is used to develop sustainable tourism opportunities.** Initially it was largely a European Geoparks Network (EGN) but since 2004 has expanded worldwide as the Global Geoparks Network (GGN) always supported by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) [see www.globalgeopark.org and www.europeangeoparks.org]. In 2015 Geoparks became full UNESCO designations, and have an equivalence to World Heritage Sites. 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. The Geopark branding therefore helps promote the geological heritage resource so that the community can benefit from it.

In Ireland there are three members of the UNESCO Global Geoparks Network. One is the cross-border Marble Arch Caves Global Geopark in Fermanagh and Cavan [see www.marblearchcaves.net and www.cavancoco.ie/marble-arch-caves-global-geopark]. The Copper Coast Geopark in Waterford also joined the Network in 2001 [see www.coppercoastgeopark.com]. A now well established addition has been the Burren and Cliffs of Moher in County Clare [see www.burrengeopark.ie]. In addition there are aspirant groups exploring the work and infrastructure required for applications in other areas such as Joyce Country in Mayo and Galway, and the Mourne/Cooley/Gullion area. At present, we do not consider the geodiversity in Wexford as likely to meet the criteria for a Geopark application, which have become much more stringent through time. The adoption of the Global Geoparks Network under the umbrella of UNESCO in 2015 further raises the qualification standards as more and more regions seek to become part of the network.

However, if there was one area with suitable geological diversity and significance to be suitable it would be the Hook Head Peninsula. Strong local authority support as well as local ambition would be required to consider the possibility further.

3. A summary of the Geology of County Wexford

1) Concise simple summary of the geology of County Wexford

The rocks of Wexford are very complex in their type and geometry. A complex of igneous and metamorphic rocks, from before 485 million years ago [Ma], dominates the southeastern part of the county, and is represented by the granites around Carnsore Point and the quartzites, gneisses and schists of the area between Kilmore Quay and Rosslare. These are some of the oldest rocks in Ireland. The majority of the county is underlain by rocks from between 485 and 444 million years ago, which are Ordovician age shales, siltstones and greywackes. Granites of Devonian age, from around 400 million years ago, occur in the Blackstairs Mountains. Around 346 million years ago warm tropical seas flooded lower areas and deposited the generally fossiliferous Carboniferous limestone, now found as the bedrock in the lowland zone between Ballyteige Bay and Wexford Harbour. Both this and the Devonian rocks were folded into large scale folds at the end of the Carboniferous Period. Following erosion over several hundred million years, the last two million years have had most impact on the landscape with glaciers eroding the high ground leaving ice-sculpted rock crags across the county, and blanketing much of the lower ground with till. Since the ice age, coastal processes have both eroded the glacial materials, and left complex ecosystems such as that around Tacumshin Lake, the Cahore Polders and Dunes and Lady's Island Lake.

2) More detailed summary of the geology of County Wexford

The Precambrian rocks in Wexford are at least 600 million years old and are now metamorphosed or altered sediments that were first deposited into an ocean and then changed during a later mountain-building event. During the Ordovician period (485-444 million years ago [Ma]) some deeper-water muds were laid down in the Iapetus Ocean that divided Ireland into two parts. The majority of the area of County Wexford is underlain by rocks which date from this time and some contain fossils. As this ocean slowly closed, the continents on either side were subjected to great stress and volcanoes produced lavas and ash during eruptions. During the Silurian period the ocean finally closed. This closure caused another mountain building event to take place causing many of the Ordovician rocks to be faulted and folded.

A new continent was created in the Devonian, around 400 Ma, after the Iapetus Ocean had closed. Large rivers drained from the newly formed mountains and deposited great thicknesses of sand and gravel on the flood plains. In a few places these Devonian rocks can be seen lying on an ancient erosion surface on steeply tilted older rocks. The boundary between them is called an unconformity. These sandstones and conglomerates (pebble beds) occur in a thin band southwest of Wexford Town. At this time also, granite was intruded into the Ordovician rocks, and the cover later eroded off to leave us the Blackstairs Mountains, and granite can be seen cropping out on the mountain summits. By about 359 Ma, at the start of the Carboniferous, sea level was slowly rising and it drowned the flood plains. The limestones deposited in this warm, shallow equatorial sea now form much of the low ground between Wexford Harbour and Ballyteige Bay, as well as Hook Head.

AGE (Million Years Ago)	ERA	PERIOD	EVENTS IN WEXFORD	IF THIS TIMESCALE WAS A DAY LONG ...
2.58	Cenozoic	Quaternary	Several ice ages smothering Wexford, followed in the last 10,000 years by the spread of vegetation, growth of bogs and arrival of humans. Glacier ice deposits till, and meltwater sculpts deep channels and deposits sands and gravels during deglaciation. Dissolution of limestone beneath Quaternary sediments.	The ice ages would begin 38 seconds before midnight
66		Palaeogene	Erosion, especially of limestone.	The Palaeogene period begins at 11.40 pm
145	Mesozoic	Cretaceous	<i>Erosion.</i> <i>No record of rocks of this age in Wexford.</i>	11.15 pm
201		Jurassic	<i>Uplift and erosion.</i> <i>No record of rocks of this age in Wexford.</i>	The age of the dinosaurs, starting at 10.55 pm
252		Triassic	Desert conditions on land. Conglomerates and sandstones deposited between Kilmore Quay and Ballyteige Burrow.	10.42 pm
299	Palaeozoic	Permian	Desert conditions on land. Conglomerates and sandstones deposited between Kilmore Quay and Ballyteige Burrow.	10.30 pm
359		Carboniferous	Land became submerged, limestones with some shales and sandstones deposited in tropical seas across a wide band between Rosslare and Ballyteige Bay and at Hook Head, as well as between Wexford Town and Curracloe. Limestones remaining today are, in the majority, pure and unbedded, with some dolomitisation.	Much of the south Wexford lowland's rocks (mostly limestones, but some sandstones and shales) deposited around 10.10 pm
419		Devonian	Caledonian mountain building. Leinster Batholith Granite intruded, forming Blackstairs Mountains. Sandstones deposited in a narrow band between Johnstown Castle and Duncormick.	'Old Red' Sandstone deposited at 9.52 pm
443		Silurian	Closure of the Iapetus Ocean. Carnsore Granite and Saltees Granite intruded in southernmost Wexford.	Starts at 9.42 pm
485		Ordovician	Slates, siltstones and volcanic rocks form across much of the northern two-thirds of Wexford.	Begins at 9.28 pm
541		Cambrian	Opening of the Iapetus Ocean. Slates, siltstones, mudstones and greywackes formed in a wide band between Cahore Point and Waterford Harbour, north of Hook Head.	Starts at 9.11 pm
2500		Precambrian	Some of Ireland's oldest rocks deposited. Schists, quartzites and gneisses formed between Rosslare and Kilmore Quay.	Beginning 11.00 am
4000	Archaean		<i>Oldest known rocks on Earth.</i>	Beginning 3.00 am
4600			<i>Age of the Earth.</i>	Beginning 1 second after midnight

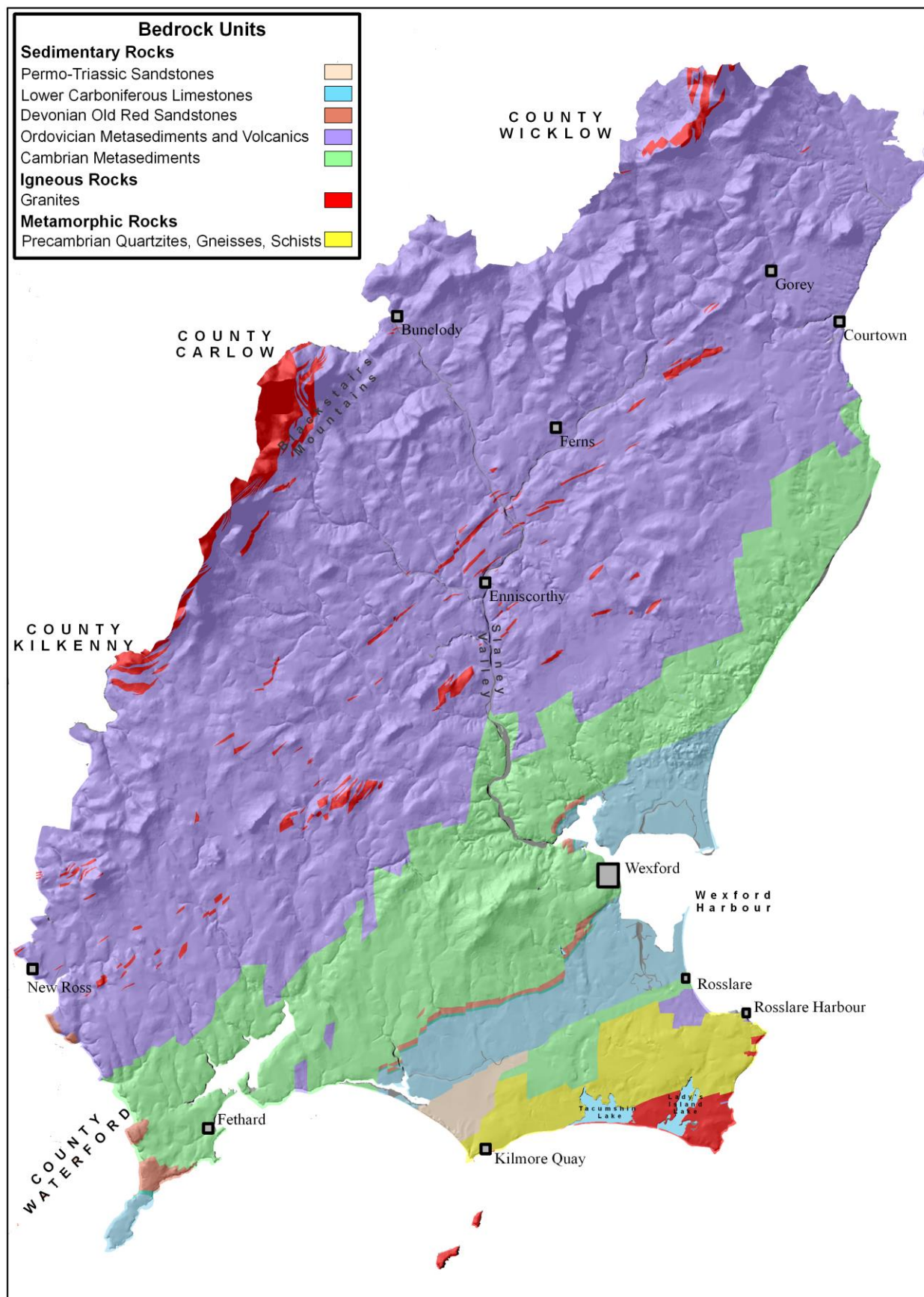
The Geological Timescale and County Wexford

The succeeding 250 million years or so have left little trace in the bedrock of Wexford, excepting some conglomerates and sandstones deposited in the Triassic and Permian Periods between Kilmore Quay and Ballyteige Burrow. At the beginning of the Palaeogene period, around 60 Ma, the limestone exposed across southern Wexford became deeply weathered.

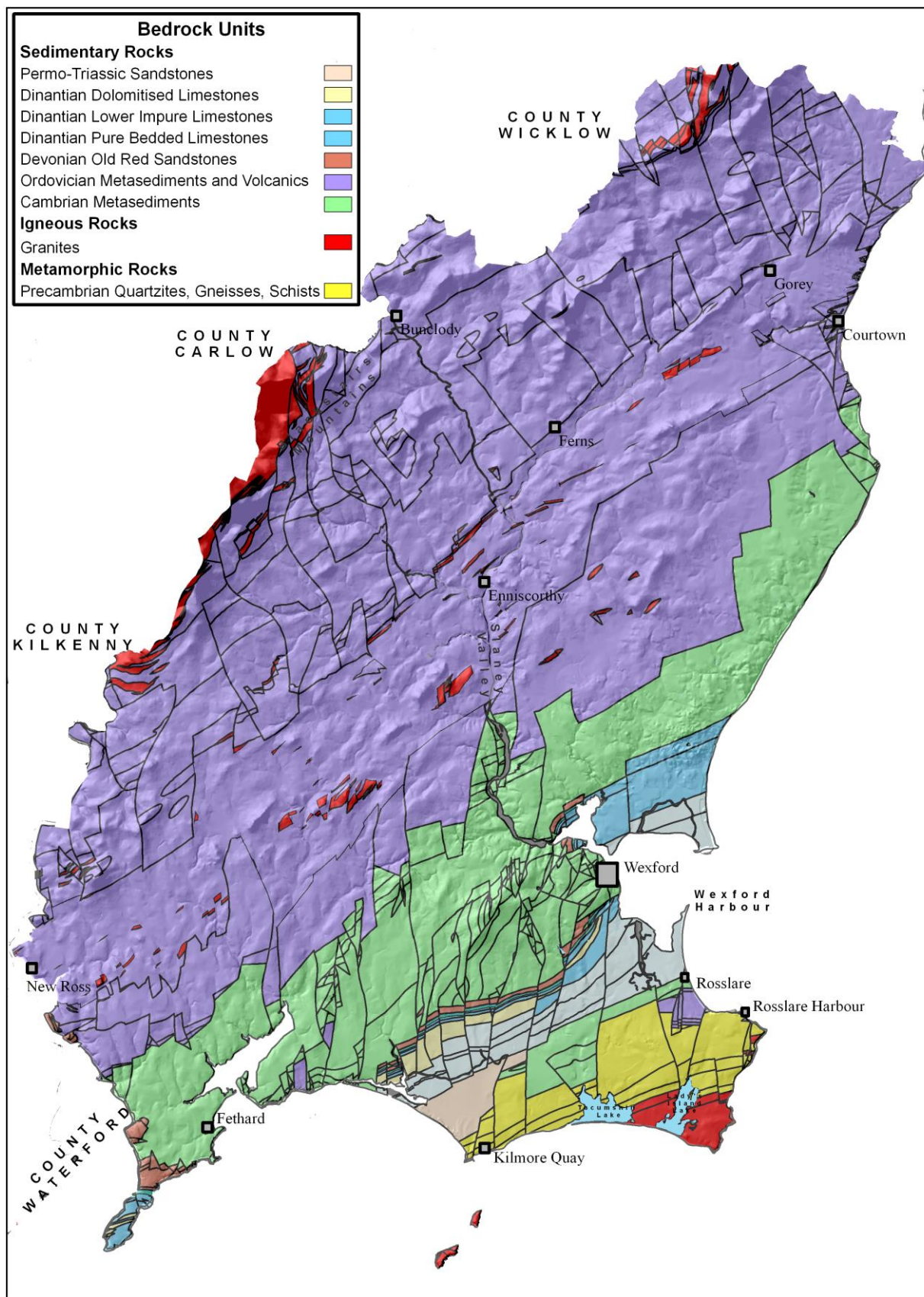
Much of the low ground across Wexford is blanketed with glacial deposits left behind by glaciers from the last Ice Age. Glacial till, or 'boulder clay', forms some of the rapidly eroding coastal cliffs, particularly in the area around Blackwater, and along the south Wexford coast. This means that, conversely, fine exposures into the glacial deposits are seen along the coast, at localities such as Tincone and St. Helen's. The entire county was moulded by ice, with many crags and tails forming the hilly ground around the county, while on the lower ground the subsoils are the remains of the ice sheet deposits. In the major river valleys, when the ice sheets began to melt, wide meltwater rivers were formed, resulting in extensive sands and gravels along the Slaney River. Other sand and gravel deposits that record this meltwater deposition include the Screen Hills, and the erosional power of the meltwater is seen at Mulmontry Gorge.

At the end of the ice age, when the glaciers lay further north in the country than Wexford but the county was still exceptionally cold, unique features such as the pingos at Camaross and the infilled till cracks at Kilmore Quay were formed, by intense freezing and thawing processes.

At the end of glaciation, the land of Ireland rose as relative sea level dropped, owing to a lift in the country afforded by the weight of the ice having been removed when it melted. Raised beaches are common along the Wexford Coast, at Fethard and Cullenstown, and record this process. In the Holocene Period, since glaciation, extensive mudflats have formed at the edge of the modern day beaches throughout the area of Wexford Harbour and Ballyteige Bay. Beaches such as Curracloe Beach, and dune fields such as in the Kilpatrick Sandhills and at Cahore Point, have formed. As well as this, river erosion has occurred along the major rivers in the county, and peat has formed in the Blackstairs Mountains.



A simplified geology map of County Wexford outlining the main geological units.



A detailed geological map of County Wexford.

4. Acknowledgements

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The authors acknowledge permission granted by the Office of Public Works for the reproduction of photographs from the OPW Coastal Oblique Imagery Survey Viewer 2003 online archive.

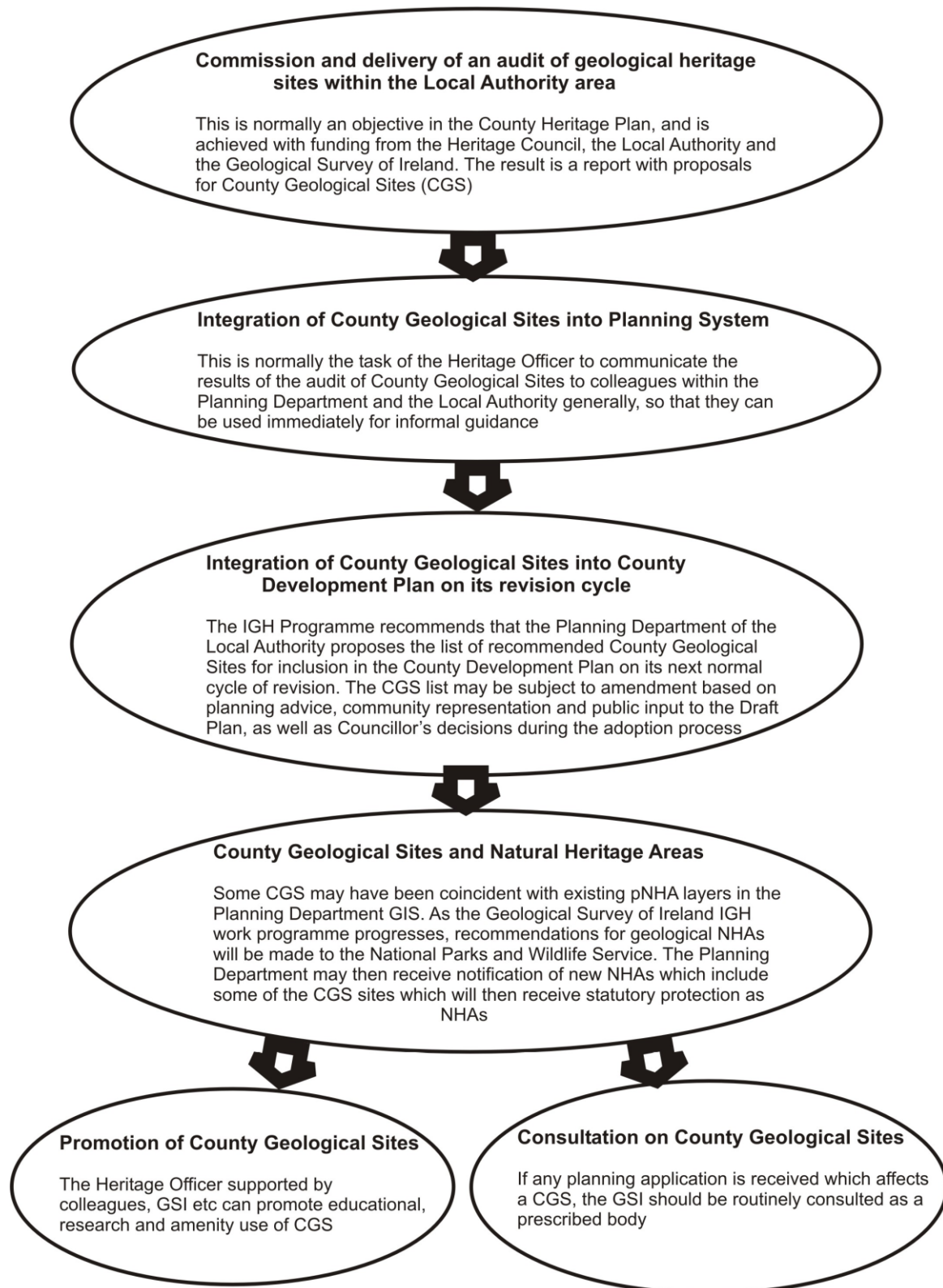
Appendix 1 – Geological heritage audits and the planning process

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 Programme 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: the Planning and Development Act 2000 [e.g. Sections 212 (1)f; Part IV, 6; First Schedule Condition 21], the Planning and Development Regulations 2001, the Wildlife (Amendment) Act 2000 (enabling Natural Heritage Areas) and the Heritage Act 1995. The Planning and Development Act 2000 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 GSI, over the course of numerous county audits since 2004.

County Geological Sites - a step by step guide



Appendix 2 - Bibliography – Geology of County Wexford

Shortlist of Key Geological References

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

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Full Geological references

See below for the full reference list of all papers, books, articles and some unpublished reports etc. relating to the geology and geomorphology of County Wexford that could be traced. Many papers that refer to the Leinster area in general, may or may not be specifically relevant to County Wexford. Similarly there are many papers addressing the geology and wider development of the Wicklow-Wexford-Waterford volcanic belt. Many of these may have no significant detail on the rocks of Wexford itself.

Quaternary References

The references in Appendix 3 all cover the Quaternary, or Ice Age, geology of County Wexford. They are split into references specifically covering sites or features in County Wexford, and a section of national or regional papers which have some data from or on County Wexford included.

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Appendix 3 - Bibliography – County Wexford Quaternary References

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Appendix 4 – 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, Ireland's location on stable tectonic plates mean earthquakes are relatively rare and its recorded human history is not peppered with disastrous landslides, mudflows or other geological catastrophes. There are of course risks of one-off events, and this section briefly looks at the specific record and nature of geological hazards in County Wexford 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, there are periods of sudden activity encompassing major events, and then quiet periods in between. The sites in this audit represent evidence of past geological environments and processes, such as the building of high mountain chains, ice sheets covering the land surface and so on. However, in County Wexford there are few sites representing the active geomorphological or land-forming processes of today.

Landslides and bog flows

The Geological Survey of Ireland has been compiling national data on landslides in the past decade. There are actually no landslide events recorded in Wexford at all. Whilst this does not mean they have not ever occurred, there are none recorded in geological literature or in standard sources.

See <http://www.gsi.ie/Programmes/Quaternary+Geotechnical/Landslides/>

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 Wexford. Many of the 128 recorded events are recurring floods on the River Slaney and other major rivers.

Karstic flooding can occur when underground passages are unable to absorb high rainfall events. However, the relatively limited Carboniferous limestone bedrock in County Wexford is not known to become heavily karstified, like upland limestone areas such as the Burren or the Bricklieves, and so this type of flooding is not significant in County Wexford.

Radon

Radioactive minerals and gases at higher concentrations can be carcinogenic. Radon can seep into homes and workplaces and can be carried in water supplies. A map showing the areas predicted to be at particular risk from radon in Ireland, called High Radon Areas, can be seen on the EPA website at <http://www.epa.ie/radiation/radon/#.VuICbdKLQrg>. The Radiological Protection Institute of Ireland was formerly responsible for this but has been merged with the EPA.

Appendix 5

Data sources on the geology of County Wexford

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 (called GOLDMINE) is now freely available online, into which about half a million documents and maps have been scanned. This means that any user can search on screen for data of relevance to them. **Data is available free of charge.**

Key datasets include:

GOLDMINE (GSI OnLine Document, Maps and Information Explorer).

The GSI online digital archive enables visitors to search the Geological Survey of Ireland online data archive database and download full-size resampled pdfs and/or original high resolution TIFF image files. The data consists of: Scanned Capture of 450,000 pages and maps, including all of GSI principal datasets, (Mineral Exploration Reports-Open File, Geotechnical Reports, boreholes & tests, Historic 6":1 mile and 1":1 mile Geological Maps, GSI Publications, Bulletins, Published and Unpublished Reports, Groundwater Well Hydrographs, Marine Maps, Airborne Geophysical Maps, Mineral Locality Reports and Mine Record Reports and Maps). The database runs on Oracle© and the stored imagery is currently 1.4TB in size.

<https://secure.dcenr.gov.ie/goldmine/index.html>

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. Sheets 19 and 23 cover all of County Wexford.

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 138, 139, 148, 149, 157, 158, 159, 168, 169, 170, 179, 180 and 181 cover County Wexford. 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 GSI's Customer Centre library and scanned on GOLDMINE.

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 (EMD), currently of the Department of Communications, Energy and Natural Resources, 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. Licences relate to numbered prospecting areas, and these are available on a map from EMD. See also www.mineralsireland.ie

MinLocs Data

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

Subsoils Mapping

Since a Groundwater Protection Scheme has been completed by GSI (2012) for the whole country, a modern map of the subsoil types and depths across County Wexford 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. Furthermore, detailed compilation of glacial geology datasets, including a revision published by GSI in late 2014, now provides more data.

Digital mapping of many different datasets is now available via an easy to use public viewer on the GSI website: www.gsi.ie

Tellus Mapping

Tellus is a regional mapping project, combining airborne geophysical and geochemical surveys to provide geoscientific information for the island of Ireland. Since 2007, over 25,000 km² of the island of Ireland has been surveyed through the Tellus surveys which support mineral exploration, environmental management, agriculture and research activity. The Geological Survey of Ireland completed Tellus surveying in approximately 50% of the country by end 2017, with the view to completing the country in subsequent phases. Stream sediment samples originally collected over SE Ireland (including Waterford) in 1986-90, were re-analysed by XRF analysis in 2016 as part of the Tellus geochemical dataset. Tellus data is freely available. For more information see www.tellus.ie/

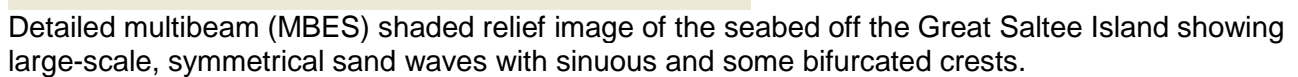
Historic Mine Records

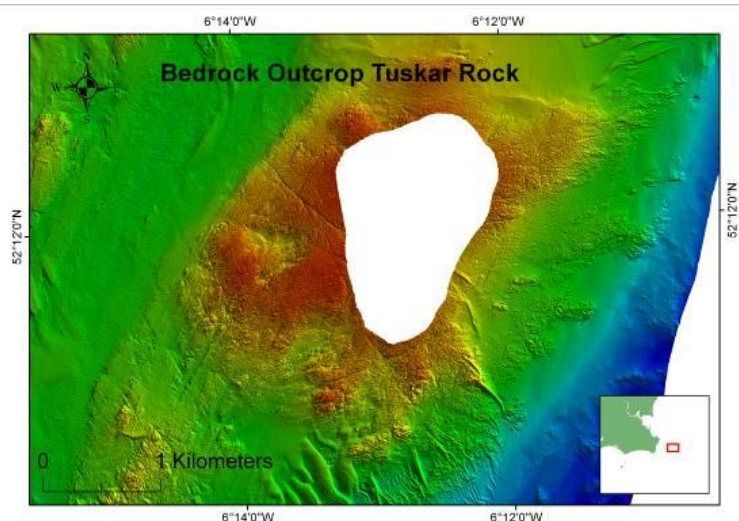
Abandonment plans and varied other material exists for the various mining ventures in the country. In general, these are included in GOLDMINE (see above).

Infomar data

INFOMAR (*INtegrated mapping FOr the sustainable development of Ireland's MARine Resource*) is in the process of mapping inshore areas, identifying 26 priority bays. Survey coverage has been achieved over a large area of the seabed off the Wexford coast. The RV Celtic Voyager mapped the offshore areas. The harbour was mapped by the RV Keary, RV Tonn & RV Geo in 2011 and 2015. Bannow Bay & Kilmore Quay were surveyed in 2015.

Infomar data is freely available for analysis and further processing from the Infomar data via the GSI website at www.gsi.ie and www.infomar.ie





Detailed multibeam (MBES) shaded relief image of the seabed off Tuskar Rock. Widespread faulting is observed in the outcrop.

CHERISH Project

CHERISH (**C**limate, **H**eritage and **E**nvironments of **R**eefs, **I**slands and **H**eadlands) is a 5-year EU funded interdisciplinary Ireland-Wales project between the Geological Survey Ireland, the Royal Commission on the Ancient and Historical Monuments of Wales, the Discovery Programme: Centre for Archaeology and Innovation Ireland, and Aberystwyth University: Department of Geography and Earth Sciences. CHERISH aims to raise awareness and understanding of the past, present and near future impacts of climate change, storminess and extreme weather events on the rich cultural heritage of the Irish and Welsh regional seas and coast.

Irish Project areas include East Wexford and SE Wexford. Aerial surveys across the Wexford coastline in 2017 have provided baseline monitoring, including at Lady's Island monastery and lake. This has been compared with later drone footage following Storm Ophelia, showing the immediate changes in the coastal sand bar. Further information can be found via the GSI website at www.gsi.ie and <http://www.cherishproject.eu/en/>



Lady's Island Lake, County Wexford. Coastal sand bar photographed during baseline aerial survey on 28 September 2017 (left) and with a drone following Storm Ophelia on 18 October 2017.

Appendix 6 - Further sources of information and contacts

Siobhán Power of Geological Survey Ireland can be contacted in relation to any aspect of this report. Deirdre Kearns, Senior Executive Planner in Wexford 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.

Websites 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

<http://www.iqua.ie> - for information, fieldtrips, lectures etc in relation to Ireland's Ice Age history

<http://www.progeo.se/> - for information about ProGEO the European Association for the Conservation of Geological Heritage

SWC Biodiversity and Geodiversity Publications

Hurley, J. 2014 Cutting the Lake at Lady's Island. SWC Promotions, Kilmore, Co. Wexford. 4pp.

Hurley, J. 2014 Ballyteige Burrow. SWC Promotions, Kilmore, Co. Wexford. 4pp.

Hurley, J. 2014 The Saltee Islands. SWC Promotions, Kilmore, Co. Wexford. 4pp.

Hurley, J. 2014 The Keeragh Islands. SWC Promotions, Kilmore, Co. Wexford. 4pp.

Hurley, J. 2014 Hook Head. SWC Promotions, Kilmore, Co. Wexford. 4pp.

Hurley, J. 2015 Tacumshin Lake Part 1 and Part 2: Introduction and the protected areas. SWC Promotions, Kilmore, Co. Wexford. 4pp.

Hurley, J. 2015 Nemestown Shore. SWC Promotions, Kilmore, Co. Wexford. 4pp.

Appendix 7 - Glossary of geological terms

Geological term	Definition
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.
Amphibolite	a metamorphic rock rich in the minerals amphibolite and plagioclase.
Basin	low areas in the Earth's crust, of tectonic origin, in which sediments have accumulated.
Bedrock	a general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.
Bioclast	fragment of a shell or fossil forming part of a sedimentary rock
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.
Breccia	igneous or sedimentary rock comprising of large angular fragments within finer grained material.
Bryozoa	invertebrates belonging to the phylum Bryozoa, ranging from Ordovician to present, often found as frond-like fossils.
Calcite	a pale mineral composed of calcium carbonate, which reacts with dilute hydrochloric acid
Cerussite	a mineral: lead carbonate or white lead ore (PbCO_3) is an important ore of lead.
Chalcopyrite	a mineral: copper iron sulphide, a common ore of copper metal
Channel	a landform consisting of the outline of a path of relatively shallow and narrow body of fluid, most commonly the confine of a river, river delta or strait.
Chert	a sedimentary rock comprising of very fine-grained quartz.
Chironomid	a family of flies, similar in size and form to mosquitoes.
Coelopteran	a family of moths which are sensitive indicators of climatic changes during the last ice age.
Crag and tail	a steep resistant rock mass (crag), with sloping softer sediments (tail) protected from glacial erosion or deposited as glacial debris on the crag's 'downstream' side.
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)
Diamictite/Diamict	lithified, poorly-sorted deposits comprising clasts of various sizes in a mud matrix
Diatom	a major group of algae, among the most common types of phytoplankton.
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
Diorite	coarse-grained igneous rock containing plagioclase feldspar, hornblende and biotite with or without minor quartz
Dolerite	a dark, medium-grained igneous rock. It typically occurs in dykes and sills.
Dune	a hill of sand built by either wind or water flow
Dune slack	lowlying depressions, often wet or water-filled, between sand dunes
Dyke	a sub-vertical sheet-like igneous intrusion, typically in-filling a fracture in the

	earth's crust
Echinoderm	marine organisms with interlocking plates (skeletal) covered by spines
Erratic	a large rock fragment 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.
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
Felsic	refers to igneous rocks that are relatively rich in elements that form feldspar and quartz.
Ferricreted	cemented by iron minerals
Foliation	a finely spaced planar parting caused by compressive deformation of rocks.
Floodplain	a flat or nearly flat land area adjacent to a stream or river that experiences occasional or periodic flooding.
Flute (glacial)	smooth gutter-like channels or furrows made by the abrasive underside of a glacier moving across a rock face.
Fluvial	pertaining to a river or stream.
Gabbro	a dark coarsely crystalline intrusive (plutonic) igneous rock composed mostly of plagioclase feldspar, olivine, pyroxene and amphibole.
Glacial	of or relating to the presence and activities of ice or glaciers.
Glacial striae	markings left on the surface of pebbles / boulders / bedrock by moving ice sheets.
Glaciofluvial	pertaining to the meltwater streams flowing from wasting glacier ice and especially to the deposits and landforms produced by such streams.
Glaciomarine	sediments deposited by glacial meltwater in an marine environment
Gneiss	coarse-grained, banded rock formed during high-grade metamorphism where light-coloured and dark-coloured bands are produced by separation of dark minerals (e.g. biotite, hornblende) and quartzo-feldspathic minerals into parallel bands.
Grading	a sorting effect with the coarsest material at the base of the bed and finest grained material at the top.
Graptolite	extinct organism of the phylum Hemichordata with colonies consisting of one or more fine branches with cups. Ranging from Middle Cambrian to Carboniferous.
Greywacke	an impure sandstone, characterised by poorly-sorted, angular grains in a muddy matrix, that was deposited rapidly by turbidity currents (submarine avalanches).
Haematite (Hematite)	a mineral form of iron oxide, which is the main ore mined as iron.
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.
Inlier	area of older bedrock completely surrounded by younger bedrock.
Interglacial	the time interval between glacial stages, or pertaining to this time.
Intrusive/Intrusion	an igneous rock emplaced within the Earth's crust, not extruded like lava.
Involutions	disturbed and deformed structures in unconsolidated sediments subject to repeated frost action in seasonally-frozen layer

Irish Sea Till	clay-rich till found along the eastern seaboard of Ireland, and occurring as much as 12km inland, which was deposited by an ice stream which occupied the Irish Sea Basin during the last glaciation.
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
Lagoon	shallow water body situated in a coastal environment with access to but separated from the open sea by a barrier.
Laminated	the finest example of stratification or bedding, typically exhibited by shales and fine-grained sandstones.
Lava	magma extruded onto the Earth's surface, or the rock solidified from it.
Limestone	a sedimentary rock consisting chiefly of calcium carbonate (CaCO ₃), primarily in the form of the mineral calcite.
Lithology	the description of rocks on the basis of such characteristics as colour, composition and grain size.
Magma	molten rock that cools to form igneous rocks.
Marram	a very common type of grass that grows in and binds sand dunes.
Meander	a bend in a sinuous watercourse or river which forms when moving water in a stream erodes the outer banks and widens its valley, and the inner part of the river has less energy and deposits fine sediment.
Meltwater	water from melted snow or ice.
Meltwater channel	a channel cut by glacial meltwater, either under, along or in front of an ice margin.
Metagabbro	metamorphosed gabbro.
Metaigneous	metamorphosed igneous rock.
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.
Metasediments	metamorphosed sediments.
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.
Nautiloid	marine cephalopods (molluscs) with an external shell – and are still alive today
Ore	a mineral which is concentrated enough to be exploited by mining
Outcrop	part of a geologic formation or structure that appears at the surface of the Earth.
Phenocryst	a large mineral grain within a finer-grained igneous rock.
Polder	a low-lying tract of land enclosed by dikes that forms an artificial hydrological entity, meaning it has no connection with outside water other than through manually operated devices.
Quartz-siderite	A combination of two minerals, quartz and iron carbonate.
Quartzite	a hard, metamorphosed sandstone, composed mostly of recrystallised quartz grains that are tightly interlocking. Quartzite is formed through heat and pressure usually related to tectonic compression.

Roches moutonnee	a rounded, glacially eroded rock outcrop, usually one of a group, resembling a sheep's back.
Roof pendant	vertically oriented block of country rock, projecting downwards into and enclosed by an igneous intrusion, a remnant of the roof zone of the intrusion
Schist	a metamorphic rock which consists of layers of different minerals and can be split into thin irregular plates, often also termed a mica schist
Shaft	a vertical or inclined hole dug in a mine for access, ventilation, for hauling ore out or for pumping water out.
Shale	A fine-grained sedimentary rock, formed by the compaction and lithification of clay, silt, or mud. It has a finely laminated (composed of layers) structure that gives it a fissility, or tendency to split along bedding planes.
Shear zone	an elongate area or region where rocks have undergone intense deformation
Sphalerite	a mineral: zinc sulphide, a common ore of zinc metal
Spring	the point where an underground stream reaches the surface.
Stratiform	(of a mineral deposit) formed parallel to the bedding planes of the surrounding rock.
Stratigraphy	the study of stratified (layered) sedimentary and volcanic rocks, especially their sequence in time and correlation between localities.
Terrace	terraces are remnants of the former floodplain of a stream or river, formed by the downcutting of a river or stream channel into and the abandonment and lateral erosion of its former floodplain
Till	unconsolidated, unsorted glacial deposits consisting of boulders and cobbles mixed with very finely ground-up rock as sand, silt or clay.
Tor	a large, free-standing rock outcrop that rises abruptly from the surrounding smooth and gentle slopes of a rounded hill summit or ridge crest
Trace fossil	any impression or other preserved sign of activity such as crawling, feeding, scratching, burrowing, walking, resting etc. Ichnofossil
Trilobite	extinct arthropods.
Volcaniclastic	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.
Volcanic Rock	any rock produced from volcanic material, e.g. ash, lava.

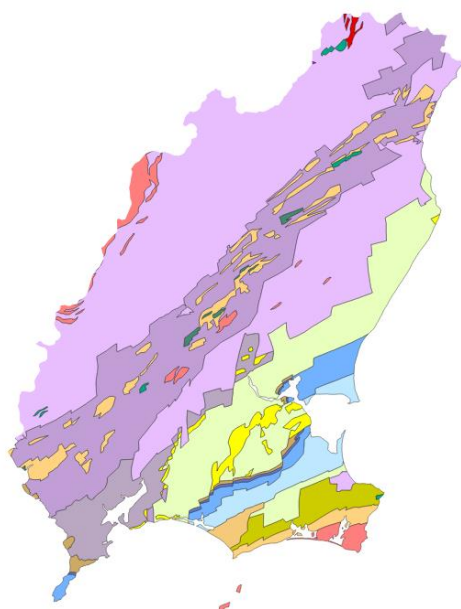
The Geological Heritage of County Wexford

An audit of County Geological Sites in County Wexford

Section 2 – Site Reports

by Robert Meehan, Ronan Hennessy, Matthew Parkes and Sarah Gatley

2018



The County Wexford Geological Heritage Project was supported by



An Chomhairle Oidhreachta
The Heritage Council



This report is a contribution to the
County Wexford Biodiversity Action Plan 2013 – 2018
and Wexford County Development Plan 2013-2019

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 Wexford. 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 Programme in Geological Survey 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 booklet or leaflet for the general public.** Grid references are given for a central point in the site generated from the GIS mapping (a shapefile) of the site boundary. They are only indicative of the location, but the site extent is best shown on the included maps.

Coordinate Projection System – IRENET95 ITM

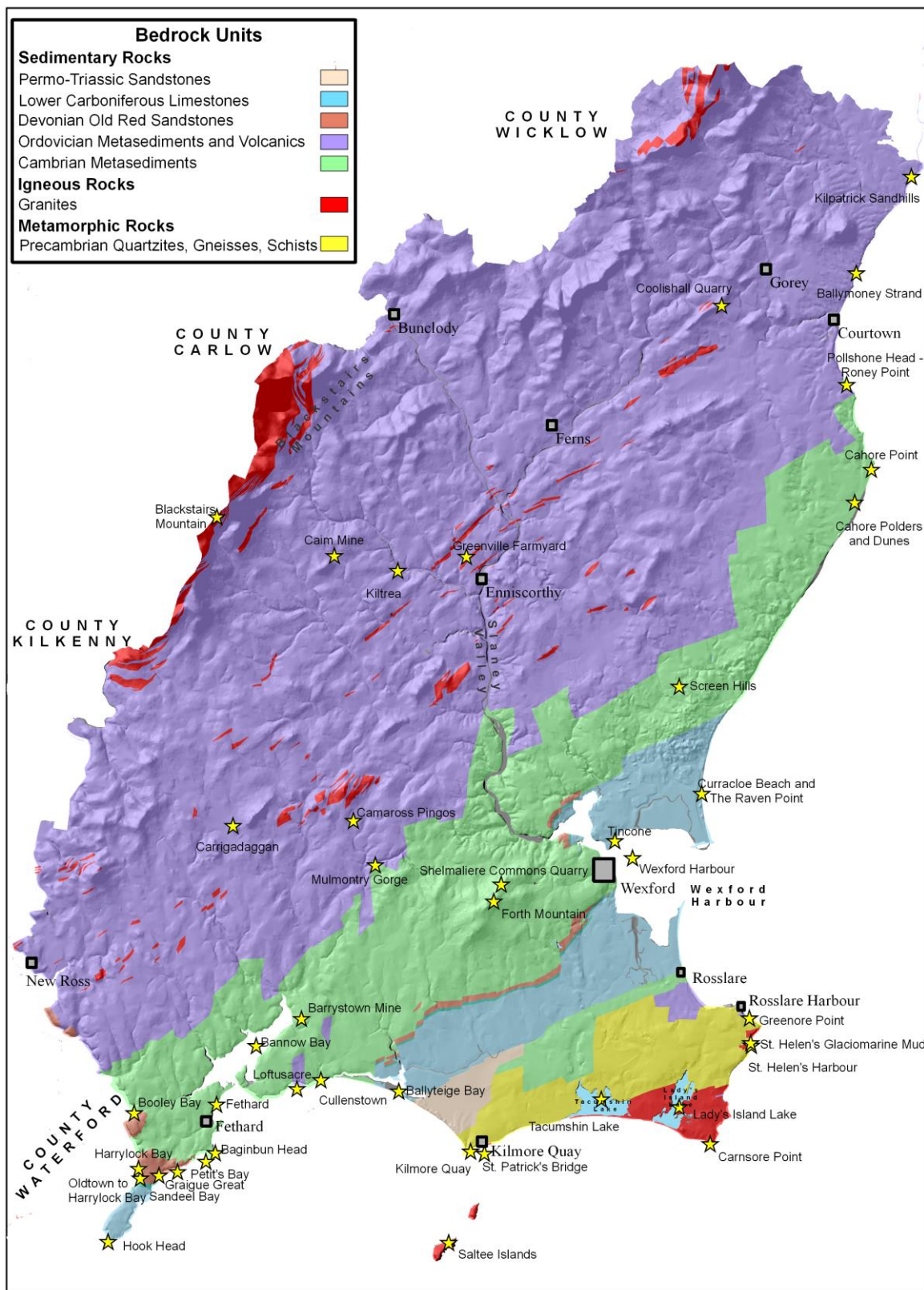
Irish Transverse Mercator (ITM) is the geographic projection co-ordinate system now in use for Ireland, and has been applied to all site localities in the site reports. It is the standard co-ordinate system for OSi maps, including the new Discovery map series, but a coordinate conversion tool is available on the OSi website at:
<http://gnss.osi.ie/converter/converter.asp#results>

A series of maps are provided with an outline of the site boundary. It is important to note that these boundaries have no legal or definitive basis. 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. Boundaries are drawn to include the geological or geomorphological interest of the site, but are extended to the nearest mappable boundary, such as a field boundary, stream, road or edge of forestry. On a few sites, such as in open mountain terrain, it is impractical to find a boundary within a reasonable distance and an arbitrary line may be defined. County Geological Sites are non-statutory instruments and so this is not problematic. If any such site is fully assessed for NHA status, such a boundary may require small revisions.

For sites that have been recommended or which will be recommended 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 these wider areas 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 finalises recommendations with NPWS on the most important sites to be designated. Any

landowner within areas or sites identified in this report with concerns over any aspect of this project is encouraged to contact Sarah Gatley, Head of the Heritage and Planning Programme, in Geological Survey Ireland, Beggars Bush, Haddington Road, Dublin 4. Phone 01-6782837. Email: sarah.gatley@gsi.ie



Simplified Geological Map of County Wexford with site locations indicated.

Section 2 – Site Reports

IGH 1 Karst

Site Name

Not represented in County Wexford

IGH 2 Precambrian to Devonian Palaeontology

Site Name

Booley Bay

Carrigadaggan

Greenville farmyard

Kiltrea

Loftusacre

Oldtown to Harrylock Bay

Sandeel Bay

IGH 3 Carboniferous to Pliocene Palaeontology

Site name

Hook Head

IGH 4 Cambrian-Silurian

Site name

Baginbun Head

Ballymoney Strand

Cahore Point

Coolishall Quarry

Cullenstown

Kiltrea [see IGH2]

Loftusacre

Petit's Bay

Pollshone Head - Roney Point

Shelmaliere Commons Quarry

IGH 5 Precambrian

Site name

Greenore Point

Kilmore Quay

St. Helen's Harbour

IGH 6 Mineralogy

Site Name

Not represented in County Wexford

IGH 7 Quaternary

Site Name

Blackstairs Mountain

Camaross Pingos

Fethard

Forth Mountain

Loftusacre [see IGH2, IGH4]

Mulmontry Gorge

Saltee Islands
Screen Hills
St.Helen's Glaciomarine Mud
St. Patrick's Bridge
Tincone

IGH 8 Lower Carboniferous

Site Name

Hook Head [see IGH 3]

IGH 9 Upper Carboniferous and Permian

Site Name

Not represented in County Wexford

IGH 10 Devonian

Site Name

Oldtown to Harrylock Bay [see IGH 2]
Sandeel Bay [see IGH 2]

IGH 11 Igneous intrusions

Site Name

Carnsore Point
Saltee Islands [see IGH7, IGH13]
St. Helen's Harbour [see IGH5]

IGH 12 Mesozoic and Cenozoic

Site Name

Not represented in County Wexford

IGH 13 Coastal Geomorphology

Site Name

Ballyteige Bay
Bannow Bay
Cahore Polders and Dunes
Carnsore Point [see IGH11]
Curraclloe Beach and The Raven Point
Kilpatrick Sandhills
Lady's Island Lake
Saltee Islands [see IGH7, IGH 11]
St. Patrick's Bridge [see IGH 7]
Tacumshin Lake
Wexford Harbour

IGH 14 Fluvial and lacustrine geomorphology

Site Name

Lady's Island Lake [see IGH 13]
Tacumshin Lake [see IGH 13]

IGH 15 Economic Geology

Site Name

Barrystown Mine

Caim Mine

Graigie Great

Harrylock Bay

IGH 16 Hydrogeology

Site Name

Not represented in County Wexford

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Booley Bay
Other names used for site	
IGH THEME	IGH2 Precambrian to Devonian Palaeontology
TOWNLAND(S)	Booley, Ballinphile
NEAREST TOWN/VILLAGE	Fethard
SIX INCH MAP NUMBER	49
ITM CO-ORDINATES	674925E 605780N
1:50,000 O.S. SHEET NUMBER	76 GSI Bedrock 1:100,000 Sheet No. 23

Outline Site Description

Coastal rock exposures and cliffs.

Geological System/Age and Primary Rock Type

The rocks are of Upper Cambrian age, classed as the Booley Bay Formation, and are thin bedded, repetitive alternations of siltstone and mudstone.

Main Geological or Geomorphological Interest

Booley Bay has rocks with two types of disc shaped fossils that are part of the Ediacaran or Vendian fauna. This association of extinct fossils is known from a number of places around the world and is from the end of the Precambrian period and the start of the Cambrian when the first multicellular organisms with hard shells appear in the fossil record. Independent dating using microfossils, at Booley Bay, suggested this is the youngest such fauna in the world (about 515 million years old from the youngest part of the Cambrian) and the style of preservation suggests these organisms in fact had hard outer walls. The preservation of these fossils is as casts. At Booley Bay, the fine preservation is sufficient to determine fine details of the organisms. It is apparent that these creatures had a rigid outer wall, contrary to earlier views that the Ediacaran biota comprised soft bodied forms, of probable coelenterate affinities. This outer wall and other characteristics throw doubts on the coelenterate nature, and the phyla they belong to is uncertain. However more recent research has argued they are unrelated to the Ediacaran fauna at all.

The site itself is critical in that these fossils must be examined in situ. Although a specimen of *Ediacara booleyi* and two slabs with *Nimbia occlusa* have been lodged in the Geological Survey of Ireland fossil collection, most specimens are impossible to remove without destruction and on no account should collection be attempted. Unfortunately extensive damage has already occurred, indicating whole bed scale removal probably by commercial fossil collectors. Hammering anywhere near the fossils is unnecessary, and all steps to preserve them for the future should be undertaken. Some collecting of fragmentary material on loose blocks along the coastal section has taken place and new localities for the fossils identified by Tony Nicholas formerly of UCC Geology Department. This material has been deposited in the GSI.

Site Importance – County Geological Site; recommended for Geological NHA

The Booley Bay Ediacaran fauna is new and unique in Irish geology, and is of international importance. It is also the subject of ongoing current research into the biological affinities, preservation and other aspects of the fossils, by different teams. Consequently the site is very important and has been recommended to NPWS for geological NHA status.

Management/promotion issues

Most material is irremovable without damage and SHOULD BE LEFT UNTOUCHED BY ALL PERSONS. Some damage was reported in 1999. Examination of the site indicated that half of one main bed with many of the figured specimens has been removed in a manner suggesting commercial fossil collectors. Ideally, a ban on all collecting should be in place, unless it is for rescue purposes, with permit from NPWS only given on advice from GSI.



A panorama view of the cliffs between Booley Bay and Dollar Bay.



Steeply dipping, thin bedded rocks are seen in cross section in the cliff exposures.



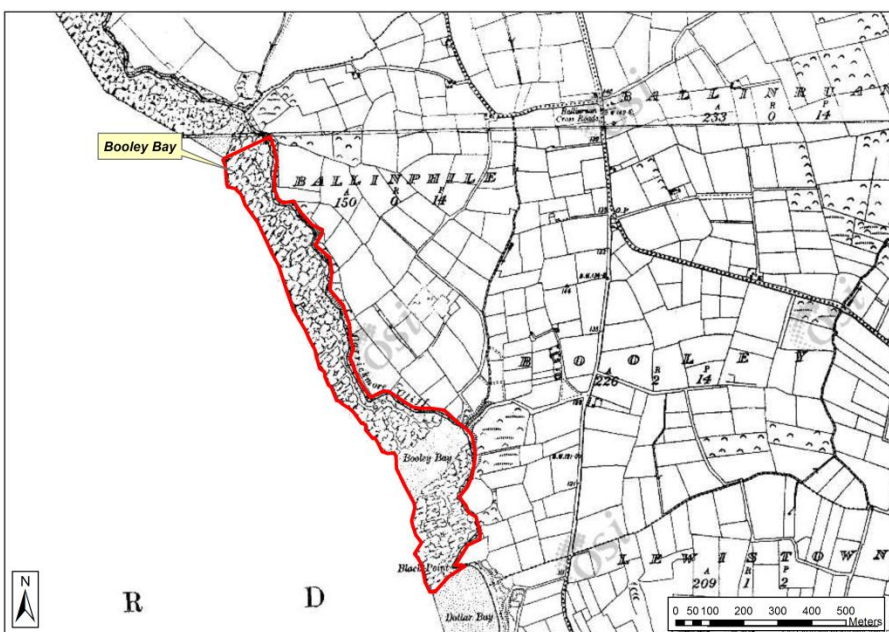
Steeply dipping, thin bedded rocks are seen in plan view in the foreshore exposures.



Panorama view of the cliffs in the north side of Dollar Bay.



Numerous sedimentary structures are seen as well as the rare fossils.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Carrigadaggan
Other names used for site	Carrickadaggan
IGH THEME	IGH2 Precambrian-Devonian Palaeontology
TOWNLAND(S)	Carrigadaggan
NEAREST TOWN/VILLAGE	New Ross
SIX INCH MAP NUMBER	35
ITM CO-ORDINATES	681410E 623820N (Pillar)
1:50,000 O.S. SHEET NUMBER	76
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

Farm hedge bank and field exposures

Geological System/Age and Primary Rock Type

The rocks here are volcanoclastic – sedimentary rocks mostly made up of fragments of volcanic rock and ash from eruptions occurring close by, along with some slates. They are of Ordovician age, from the Sandbian Period (formerly classed as Caradoc).

Main Geological or Geomorphological Interest

This locality has yielded a rich diverse fauna of 22 species of brachiopods, numerous trilobites, a cystoid *Echinosphaerites granulatus* and other invertebrates. They provide good palaeontological evidence for the biostratigraphy of the Duncannon Group in southeast Ireland. It is also the type locality for the cystoid *Echinosphaerites granulatus* M'Coy, 1846.

With its diversity and high numbers of specimens the locality provides a key site for correlation between many of the less fossil-rich Duncannon Group localities. It is also suggestive that volcanism in the Duncannon Group ceased after the Longvillian Stage in southeast Ireland.

Site Importance – County Geological Site; recommended for Geological NHA

This is one of the richest mid Ordovician fossil localities in Ireland, providing museum collections of biostratigraphical and taxonomic importance. Despite the poor exposure, it merits recognition and protection as an NHA, to maintain the option of future study, since rock is very close to the surface and can be reached by shallow excavation.

Management/promotion issues

The site is on private farmland and not suitable for general promotion or casual visitors. Any future excavations or ground works in the vicinity by the landowner could benefit palaeontology by providing fresh material to collect and study.



The loose rocks along the wall, in the ground on both sides provided fossils in the 1980s.



Looking north on the locality.



No fossils were found nearer the monument.



The loose rocks along the wall, in the ground on both sides provided fossils in the 1980s.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Greenville farmyard
Other names used for site	
IGH THEME	IGH2 Precambrian to Devonian Palaeontology
TOWNLAND(S)	Greenville
NEAREST TOWN/VILLAGE	Enniscorthy
SIX INCH MAP NUMBER	20
ITM CO-ORDINATES	696260E 641400N (centre of feature)
1:50,000 O.S. SHEET NUMBER	69
GSi BEDROCK 1:100,000 SHEET NO.	19

Outline Site Description

Disused farmyard and adjacent field.

Geological System/Age and Primary Rock Type

The rocks are slaty mudstones, with some ashy beds, and are of Ordovician age, from the Sandbian Period.

Main Geological or Geomorphological Interest

A disused farmyard in Greenville Townland is important as a representative example of many fossil localities in the rocks running across Co. Wexford and adjoining counties. It is typical of the fossil faunas from mudrocks which were originally deposited in deep water away from the volcanic rocks which characterise the southeast Ireland rock belt which has been defined as the Duncannon Group, and also as the Campile Formation. The fossils are mainly trilobite species, many originally first described and identified from here in the 19th century. Greenville Farmyard is type locality for several trilobite species including the small agnostid *Trinodus agnostiformis* (M'Coy), *Remopleurides platyceps* (M'Coy, 1846) and *Ampyxina hibernica* (Owen and Parkes, 2000).

Site Importance – County Geological Site; recommended for Geological NHA

The long history of importance of this site for biostratigraphical correlation, and the fact that it is type locality for several trilobite species are good justification for designation as a Natural Heritage Area, representative of the deeper water environments and faunas of the Caradoc Duncannon Group.

Management/promotion issues

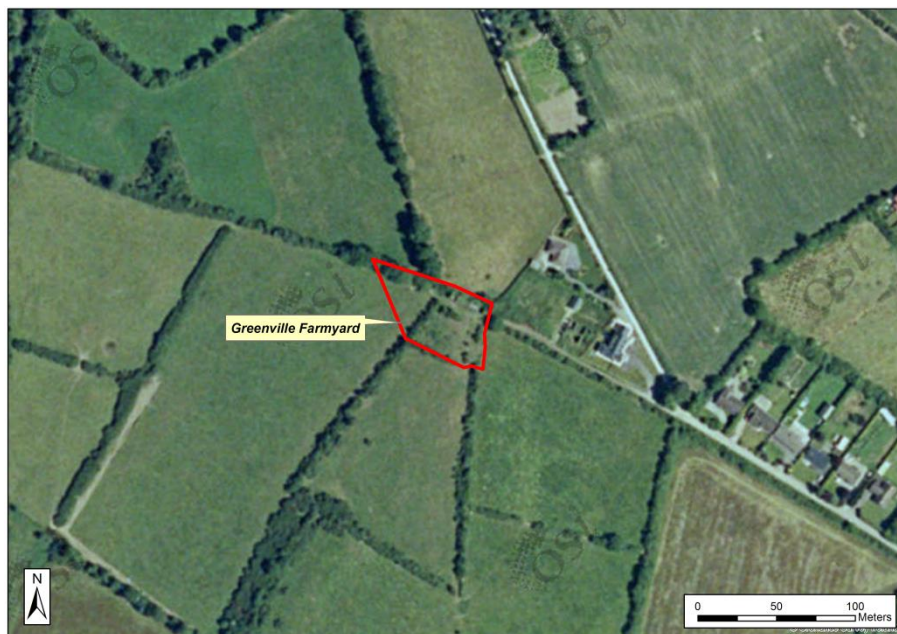
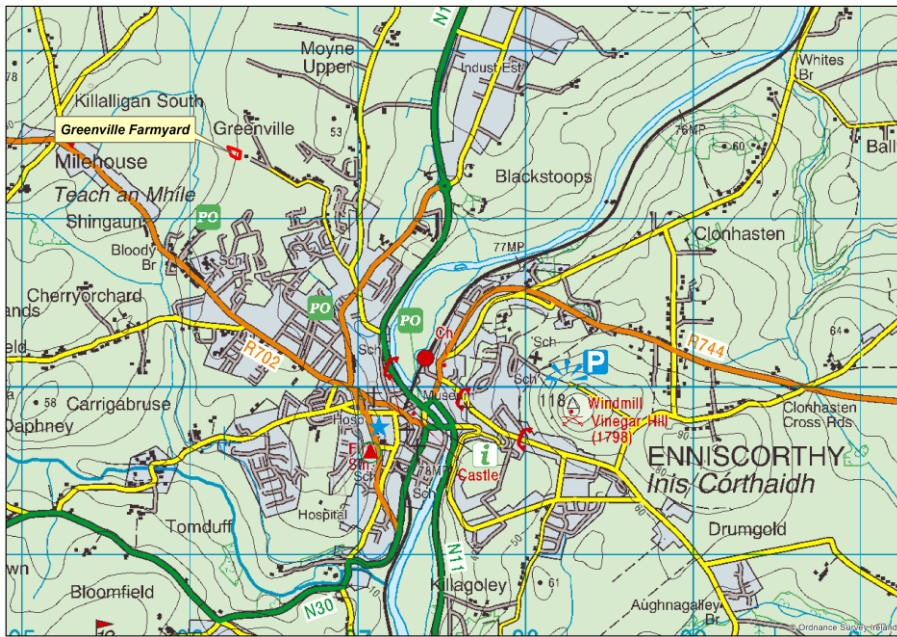
The site itself is very small, but has been shown to cover part of the adjacent field, as a small pit dug in 1999 for fill material by the landowner exposed fossiliferous horizons there too. This has been backfilled with inert material. Any fresh excavation or ground clearance in the immediate area has the potential to provide new fossil material and new information, since two previous collections showed considerable differences in the fossil faunas recovered.



The farmyard at Greenville has rock at the surface, just below the thin soil and grass cover.



The muddy patch is the approximate extent of the now-backfilled pit which yielded much fossil material, just outside the gate at the lower end of the farmyard.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Kiltrea
Other names used for site	
IGH THEME	IGH2 Precambrian to Devonian Palaeontology, IGH4 Cambrian-Silurian
TOWNLAND(S)	Kiltrea
NEAREST TOWN/VILLAGE	Enniscorthy
SIX INCH MAP NUMBER	19
ITM CO-ORDINATES	691868E 640487N
1:50,000 O.S. SHEET NUMBER	68
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

Inactive roadside quarry.

Geological System/Age and Primary Rock Type

The rocks are early Ordovician slates of the Oaklands Formation.

Main Geological or Geomorphological Interest

Small quarries worked intermittently over a long period near Kiltrea House, 6 kilometres west of Enniscorthy, have yielded a sparse collection of graptolites, a crustacean *Caryocaris wrightii* and a diverse assemblage of trace fossils. The rocks are part of the Oaklands Formation, considered to be the youngest part of the Ribband Group in southeast Ireland. Although other localities in the Leinster area have yielded fossils of graptolites and trace fossils, the Kiltrea site is considered as one of the most important, because of the relative richness of the site, and because it has been critical in understanding the biostratigraphy of the Leinster region.

In 1967 the graptolite *Trichograptus fragilis* was identified from Kiltrea, which indicated the rocks were of Llanvirn age (middle Ordovician). This carried significant implications for the timing of deformation events in the Leinster terrane, as the overlying Duncannon Group is unconformable on the Ribband Group. However, a 1996 reappraisal of the specimen as *T. dilaceratus*, correlated it with much better understood graptolite sequences elsewhere. This indicates that the rocks are actually early Arenig in age (lower Ordovician), which makes much better sense in the interpretation of the regional geology of Leinster, and of Irish Ordovician successions.

The older quarries at Kiltrea are now extremely overgrown and virtually inaccessible, but the small intermittently worked quarry has also yielded a *Caryocaris wrightii* tailpiece and with detailed examination would probably provide new graptolite material.

Site Importance – County Geological Site; recommended for Geological NHA

This site has significance in understanding the entire stratigraphy of the Ordovician of Wexford and southeast Ireland.

Management/promotion issues

Actual designation of the site as an NHA would probably increase the recovery of material otherwise lost to landfill, and protect the site against the possibility of use as a dump. Occasional working for fill would provide fresh material to examine for fossils, otherwise vegetation will very quickly further obscure the exposures of rock.



The quarry face at Kiltrea, viewed from the western end.



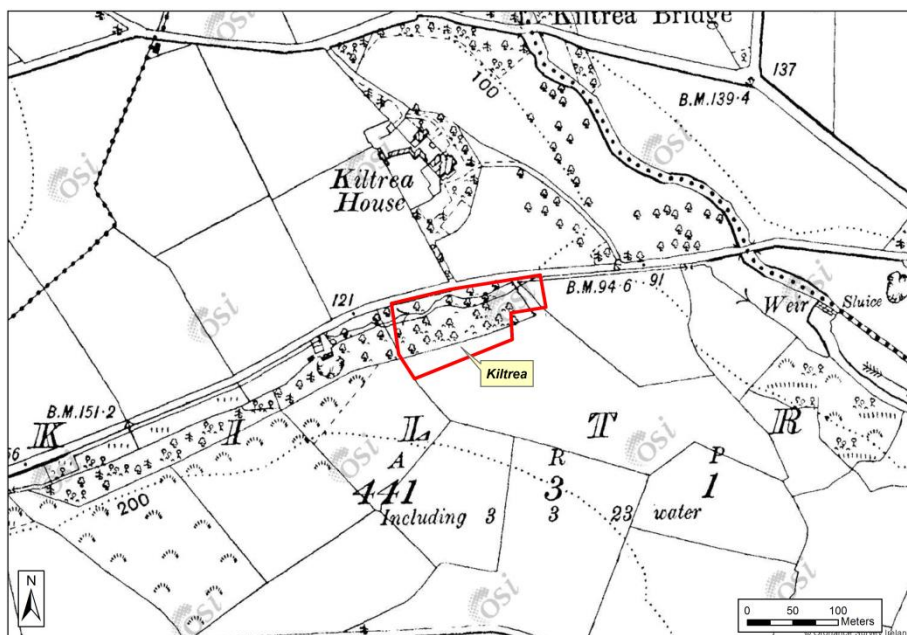
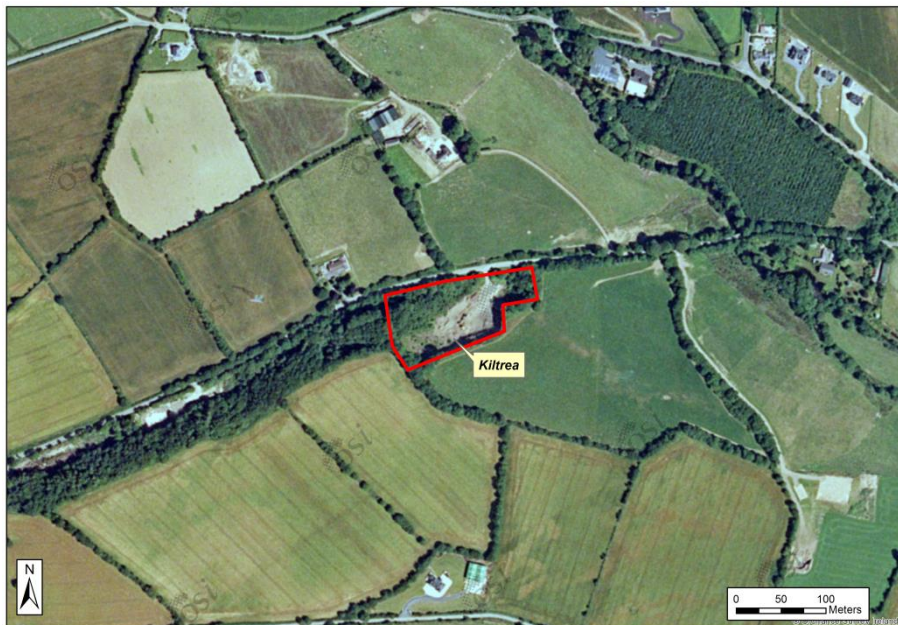
The entrance gate to Kiltrea quarry.



Piles of rock material on the quarry floor.



The view of the quarry at Kiltrea from the eastern end.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Loftusacre
Other names used for site	
IGH THEME	IGH2 Precambrian to Devonian Palaeontology, IGH4 Cambrian-Silurian, IGH7 Quaternary
TOWNLAND(S)	Loftusacre
NEAREST TOWN/VILLAGE	Wellingtonbridge
SIX INCH MAP NUMBER	45, 46
ITM CO-ORDINATES	685440E 607640N
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

Discontinuous rock cliffs at the back of the beach.

Geological System/Age and Primary Rock Type

The rocks here are very mixed sediments of Ordovician (Caradoc) age.

Main Geological or Geomorphological Interest

A mid Caradoc fossil locality in the townland of Loftusacre has yielded a relatively large number (26) of specimens of the fossil echinoderm species *Petraster kinahani* (Baily, 1878), a starfish which is unknown from any other locality. Starfish are also generally very rare within the fossil record, and the only other Irish Ordovician record is of two starfish specimens from Slieveroe in County Wicklow. The material, including the holotype, is in the Geological Survey of Ireland. A limited number of other fossils such as brachiopods and graptolites were found with the starfish and have indicated a Caradoc age, as the starfish record is not biostratigraphically diagnostic.

The site is a small inlier of Caradoc rocks west of Ballymadder Point, near Bannow, County Wexford, and faulted on each side against older Cambrian rocks. Inland exposure is very poor, so little is known of the section except for the coastal exposures. However, it is recorded in 1916 by a Geological Survey of Ireland geologist, W.B. Wright, that the whole townland had been removed by the sea, and the rocks in which the fossils were found are no longer exposed. Examination of the six inch to the mile fieldsheets and even more recent Ordnance Survey editions indicate rock exposures no longer present along the coastal section.

Some sections of the cliff top have unusual structures in the glacial deposits above the bedrock. These are infilled till cracks, caused by a freezing episode. These are rare nationally, only really known from County Wexford. Infilled till cracks are features seen in section which show vertical or near-vertical fractures within till subsoil, which has been filled in by material different to that surrounding it. They are usually several centimetres wide and are commonly over 1m deep from ground surface. The fracture opens owing to contraction of the surrounding ground and does not involve ice heaving within.

Site Importance – County Geological Site

Due to this wholesale removal of the rocks by the sea, and consequent lack of certainty over the exact source of the starfish specimens, this site is not recommended as an NHA, but merits County Geological Site status for its historical value and remaining potential.

Management/promotion issues

Continuing natural erosion will undoubtedly further modify the site. Any serious attempts to prevent coastal erosion will obscure what exposures there are. Continued monitoring and regular searching for fossiliferous horizons for new finds would be desirable.



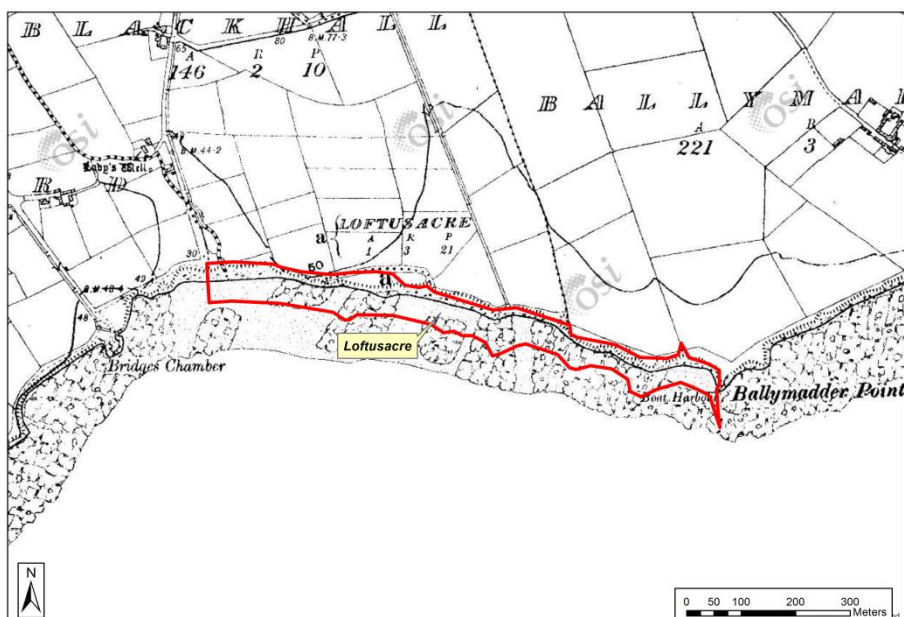
The site viewed from the cliff top at the eastern end.



Some of the beach exposures below the cliff.



Infilled till cracks in the cliff top at Loftusacre.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Oldtown to Harrylock Bay
Other names used for site	
IGH THEME	IGH2 Precambrian to Devonian Palaeontology, IGH10 Devonian
TOWNLAND(S)	Houseland
NEAREST TOWN/VILLAGE	Fethard
SIX INCH MAP NUMBER	49
ITM CO-ORDINATES	675300E 601800N (centre of section)
1:50,000 O.S. SHEET NUMBER	76 GSI Bedrock 1:100,000 Sheet No. 23

Outline Site Description

The site comprises coastal cliffs and foreshore in a section approximately 500m long.

Geological System/Age and Primary Rock Type

The site consists of a 500m long coastal cliff section through the upper part of the Old Red Sandstone Harrylock Formation, of Devonian age.

Main Geological or Geomorphological Interest

This site contains one of the best examples of continental fining upward sequences in Ireland and therefore is of considerable sedimentological interest. In addition, it has a varied representation of late Devonian plants and trace fossil material. Several of the localities along the section are the type localities for Late Famennian (Upper/Late Devonian) megaspore and miospore species. The site has great importance for both geological research and teaching.

The beds are gently dipping and younging southwards and so it is relatively easy to follow the stratigraphical succession as the base of each fining upward cycle is marked by a prominent conglomerate, in a sequence of well-developed fluvial fining upward cycles. Several of the mudstones and siltstones in the finer grained part of these cycles contain important Late Devonian macro plants such as *Archaeopteris hibernica*, cf. *Cyclostigma* and *Barinophyton*; abundant spore floras from which many new species have been described; and finally a number of excellent examples of *Beaconites* type trace fossils. Fuller descriptions of specific features and horizons with fossils exist but are too detailed for this report.

Site Importance – County Geological Site; recommended for Geological NHA

This is an important Devonian palaeontological site of national importance and has been recommended to NPWS for designation as a geological NHA.

Management/promotion issues

It is not possible to access the complete section at high tide, and care should be taken accessing the section at any tide. The site is an almost continuous coastal cliff section starting at a point just south of Shoal Rock in Oldtown Bay, then extending northwards for approximately 500m to where a stream meets the coast at the southern end of Harrylock Bay. Access to the site is from the south. Leave the main road approximately 300m south of the Porters Gate junction and take a small track westwards to Lumsdin's Bay. Proceed northwards along the beach and rocky foreshore to a prominent recess in the cliff just south of Shoal Rock.

It is recommended that this Devonian coastal section is included in any Fossil Collecting Code developed for the Hook. Any attempted collection of fossils or rocks, other than as loose material, should be strongly discouraged and reported to NPWS and/or GSI.



The site seen from the north end (cliff before Harrylock Bay) looking south.



The site seen from the south end (cliff above Shoal Rock) looking north.



One thick sandstone unit at the base of one cycle.



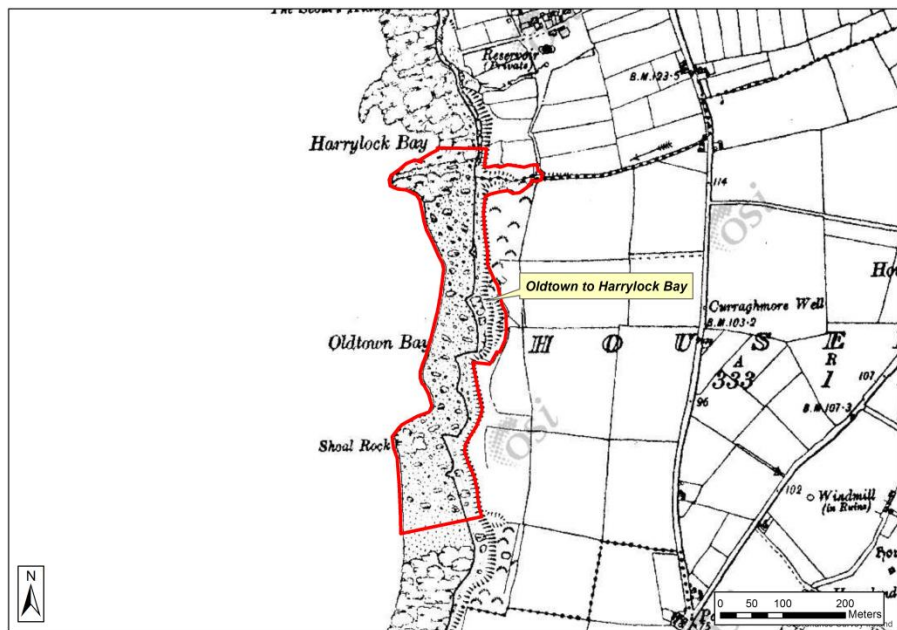
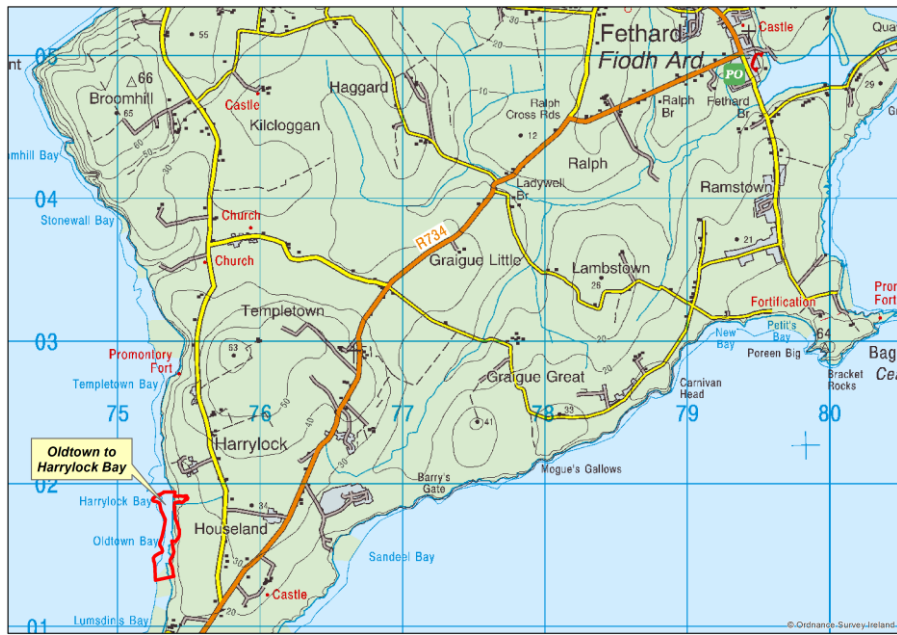
The trace fossil *Beaconites* is locally abundant.



The thick sandstone units at the base of each cycle tend to form ribs of rock into the sea.



The cliffs show numerous recent landslips.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Sandeel Bay
Other names used for site	
IGH THEME	IGH2 Precambrian to Devonian Palaeontology, IGH10 Devonian
TOWNLAND(S)	Houseland
NEAREST TOWN/VILLAGE	Fethard
SIX INCH MAP NUMBER	49, 50
ITM CO-ORDINATES	676460E 601590N
1:50,000 O.S. SHEET NUMBER	76 GSI Bedrock 1:100,000 Sheet No. 23

Outline Site Description

The site is a coastal cliff.

Geological System/Age and Primary Rock Type

The rocks are Devonian in age, and belong to the Harrylock Formation, part of the 'Old Red Sandstone' – sedimentary rocks formed by rivers on an arid continent.

Main Geological or Geomorphological Interest

This coastal cliff site displays interesting sedimentological features from river deposits on a land surface, from the Devonian Period. Unusual and important plant fossils have been found within the sequence. The site exposes a cliff section in the Harrylock Formation with a continental fluvial sequence of fining upward cycles. In this particular section, a superb cycle boundary is exposed. The prominent thick sandstone conglomerate has a pronounced erosive base which downcuts into the underlying fine grained sediments of the underlying (older) cycle. It is in these dark grey siltstones that plant fossils have been found. The plants are preserved as fragmentary permineralised material, and stems of arborescent lycopods and gymnosperms have been described. The site is the type locality for a lycopod described as *Wexfordia hookense*. Siltstones at this horizon have also yielded a diverse miospore assemblage that indicates a late Devonian age.

Immediately adjacent to the end of the track down to the beach on its northern side is a dish shaped excavation with the characteristic scars of millstone excavation.

Site Importance – County Geological Site; recommended for Geological NHA

This site contains one of the best examples of a continental fining upward sequence in Ireland and therefore is of considerable sedimentological interest. In addition, this site is the type locality for the arborescent lycopod *Wexfordia hookense* Matten, 1989.

Management/promotion issues

Public access here is by a track and slipway to the beach and foreshore. The long term issue here is site erosion by the sea, as the cliffs get undercut and collapse in rockfalls where they are competent, or form slides or slumps in the weaker zones. However, such dynamism is a natural part of any coastal site, and erosion may reveal new sections of fossiliferous interest. Care must be taken by any visitor to the beach as access to the beach is partly tidally controlled, and rocky cliffs may be dangerous.

The site is entirely within the Hook Head SAC/NHA 764, a marine SAC. Any attempted collection of fossils or rocks, other than as loose material, should be strongly discouraged and reported to NPWS and/or GSI.



The site viewed from the end of the track to the slipway.



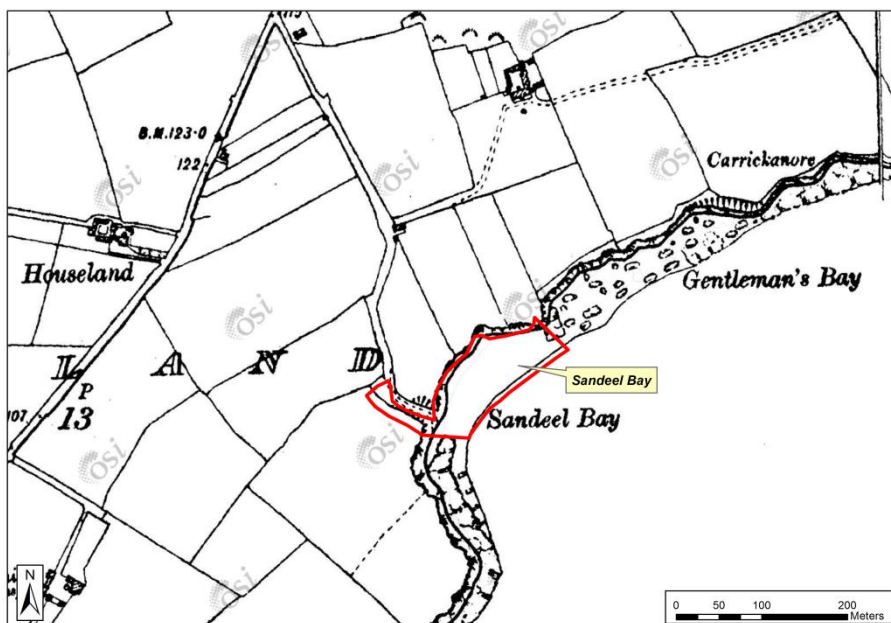
The main erosive sandstone conglomerate unit, downcutting steeply towards the left of the cliff. The beds of grey shales with fossil plant fragments lie at the lower right hand side.



Left: The beds of grey shales with fossil plant fragments lie at the lower right hand side.



Right: The excavation dish of a millstone beside the track and slipway.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Hook Head - Overview		
Other names used for site			
IGH THEME	IGH2 Precambrian to Devonian Palaeontology, IGH4 Cambrian-Silurian, IGH7 Quaternary, IGH8 Lower Carboniferous, IGH10 Devonian, IGH15 Economic Geology		
TOWNLAND(S)	Numerous		
NEAREST TOWN/VILLAGE	Fethard		
SIX INCH MAP NUMBER	49, 50, 54		
ITM CO-ORDINATES	673300E 597350N (below Lighthouse)		
1:50,000 O.S. SHEET NUMBER	76	GSI Bedrock 1:100,000 Sheet No.	23

Outline Site Description

A series of coastal sites on all sides of the Hook Head Peninsula.

Geological System/Age and Primary Rock Type

The Hook Head Peninsula has rocks ranging from Cambrian in age (Booley Bay) to Devonian (Oldtown Bay to Harrylock Bay, Sandeel Bay) and continuously upwards into the Lower Carboniferous (Hook Head).

Main Geological or Geomorphological Interest

The Hook Head Peninsula contains a wealth of geological heritage of national and some international importance within a self-contained, mostly sea-bound area. The largely flat lying agricultural land away from the coast has virtually no exposures of rocks at all, but the coastal exposure is superb nearly all around the peninsula. The same strata can be seen on the west and east coasts since there is a gentle dip southwards of the Devonian and Lower Carboniferous succession which means that as you go southwards you move onto younger and younger beds in the sequence. The succession exhibits an environmental transition from rocks laid down by rivers on a land surface in the Devonian through to Carboniferous rocks of similar nature, then with a rapid transgression of the sea over the area. This is recorded in a variety of marine deposited rocks, mostly limestone at the Hook Head itself. The geology of Hook Head is well known internationally since the fossils from the limestones are very rich and appear in many museum collections, and include many type species, first described from Hook Head.

The quartz conglomerates of the Harrylock Formation were once really important as a source of millstones, and two sites, Harrylock Bay itself and Graigue Great on the east side were both heavily quarried for millstones. These sites are significant in showing how geodiversity relates to economic activity and industrial heritage.

Site Importance – County Geological Site; recommended for Geological NHA

This suite of sites defines the best sections of geology on Hook Head, and some have already been promoted with/notified to NPWS as sites that should be designated as geological NHAs. When additional resources enable further thematic assessment, then other sites are also likely to be recommended for NHA status.

Management/promotion issues

The coast here is already protected as an SAC and pNHA, but only for marine habitats and other aspects, which includes little definition or comprehension of the geology in the original designations. There is much scope for an improved treatment of the geological and palaeontological interests within the existing framework of protection.

There is scope for a local Fossil Collecting Code, founded in a conservation message, as long as the local community are involved and supportive of it. The Audit report includes discussion and ideas for such a project.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Hook Head
Other names used for site	The Hook
IGH THEME	IGH3 Carboniferous to Pliocene Palaeontology IGH8 Lower Carboniferous
TOWNLAND(S)	Churchtown, Slade, Loftus Hall, Portersgate, Houseland
NEAREST TOWN/VILLAGE	Fethard
SIX INCH MAP NUMBER	54
ITM CO-ORDINATES	673300E 597350N (below Lighthouse)
1:50,000 O.S. SHEET NUMBER	76 GSI Bedrock 1:100,000 Sheet No. 23

Outline Site Description

Coastal exposures around the Hook Head Peninsula.

Geological System/Age and Primary Rock Type

The rocks are Lower Carboniferous in age and are mostly limestone formations.

Main Geological or Geomorphological Interest

This succession dips gently southward so the youngest rocks are at the end of the peninsula and going northward is going back in time down the strata. Taking the view of oldest first, from the Devonian rocks at Harrylock Bay, the sequence passes up into non-marine but Carboniferous age rocks of the Oldtown Bay Formation, then into the fully marine Porter's Gate Formation, followed by the Ballymartin Formation and the Ballysteen Formation, both fully marine limestones with numerous fossils in them. There is also a local Bullockpark Bay Member which is oolitic and sometimes dolomitised.

This site is perhaps Ireland's best known fossil site with hundreds of species of fossils found. Many museum collections from here include type specimens – the species were first described on material from Hook Head.

Site Importance – County Geological Site; recommended for Geological NHA

This site is of national and perhaps international importance and should be designated a geological NHA.

Management/promotion issues

As with any coastal site there are risks of getting caught by tides, large waves and storms, and slippery rocks. Caution must be exercised by any visitor to publicly accessible areas to maintain their personal safety.

The coast here is already protected as an SAC and pNHA, but only for marine habitats and other aspects, which includes little definition or comprehension of the geology in the original designations. There is much scope for an improved treatment of the geological and palaeontological interests within the existing framework of protection.

There is scope for a local Fossil Collecting Code, founded in a conservation message, as long as the local community are involved and supportive of it. The Hook Lighthouse Visitor Centre would play a key role in the promotion of such a code. Any attempted collection of fossils or rocks, other than as loose material, should be strongly discouraged and reported to NPWS and/or GSI.



The rocks exposed on the west side of Hook Head around Doornoge Bay.



The cliffs around the Lighthouse can be quite dangerous in bad weather.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Baginbun Head		
Other names used for site			
IGH THEME	IGH4 Cambrian-Silurian		
TOWNLAND(S)	Ramstown		
NEAREST TOWN/VILLAGE	Fethard		
SIX INCH MAP NUMBER	50		
ITM CO-ORDINATES	680030E 603450N (centre of site)		
1:50,000 O.S. SHEET NUMBER	76	GSI Bedrock 1:100,000 Sheet No.	23

Outline Site Description

The site is a section of rocks exposed on the beach at the northern side of Baginbun Head, not the headland itself.

Geological System/Age and Primary Rock Type

The rocks exposed at Baginbun Head are Cambrian in age and are defined as the Booley Bay Formation.

Main Geological or Geomorphological Interest

This site is a representative of the Lower Ordovician Ribband Group rocks which underlie so much of Wexford, with its companion site of Petit's Bay which displays the same rocks on the opposite side of the Baginbun Head promontory. Steeply dipping interbedded siltstones and shales are seen along with conglomerates. There are also folds, and interpreting the structures is a challenging task. As these rocks are very poorly exposed inland, the coastal exposures are critical for our interpretation and understanding of the main areas underlain by them. Baginbun Bay is an accessible place for teaching and illustrating a part of Wexford's geology, and complements Petit's Bay and Booley Bay with variations in the rocks to be seen.

Site Importance – County Geological Site

This site is a good County Geological Site.

Management/promotion issues

The rocks are accessed from the beach which is served by a slipway path from parking space at the cliff top. As with any coastal site, caution regarding the tides or stormy weather should be applied. If desired an explanatory signboard could be erected to explain the geology, probably in the car parking area where other information signs exist already.



The rock exposures in Baginbun Bay are accessible from the beach.



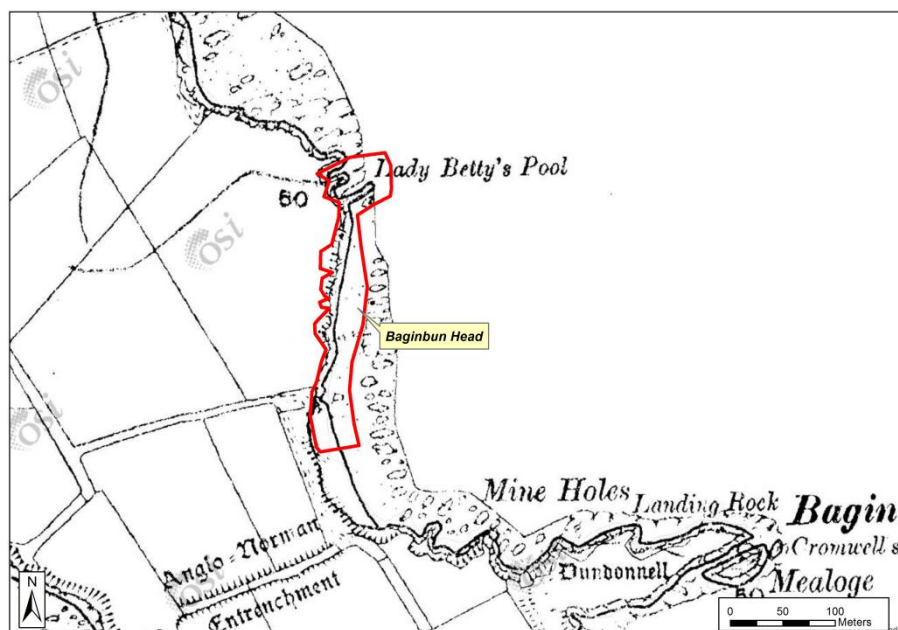
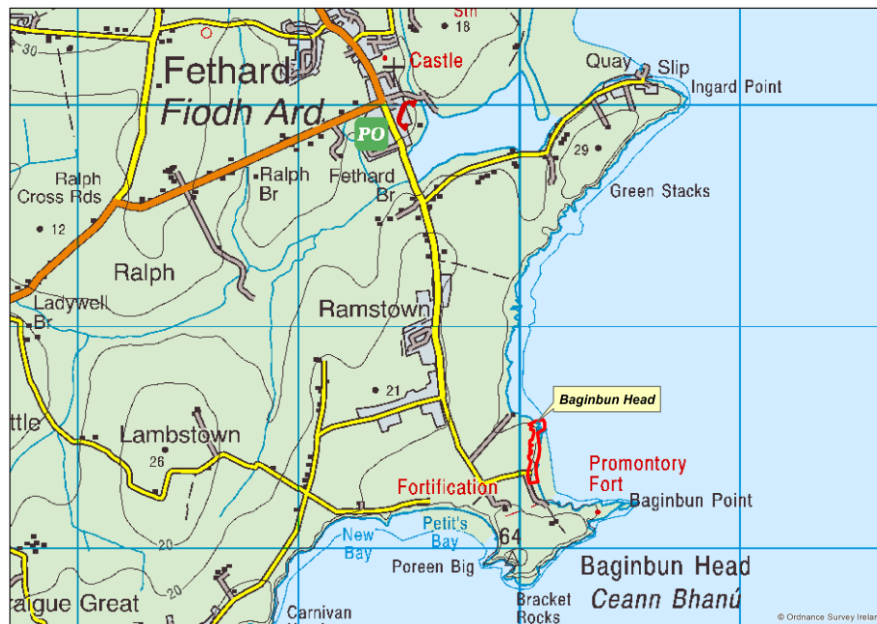
The meaning of the plaque is unknown.



Faults are apparent and easy to see.



The Booley Bay Formation shows much variation in bed thickness of siltstones and shales.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Ballymoney Strand
Other names used for site	
IGH THEME	IGH4 Cambrian-Silurian
TOWNLAND(S)	Kildermot, Ballymoney Lower, Duffcarrick, Seafield
NEAREST TOWN/VILLAGE	Courtown
SIX INCH MAP NUMBER	7, 12
ITM CO-ORDINATES	721300E 659600N (centre of feature)
1:50,000 O.S. SHEET NUMBER	62, 69 GSI Bedrock 1:100,000 Sheet No. 19

Outline Site Description

Approximately 2km of rocky coastal exposures.

Geological System/Age and Primary Rock Type

The rocks exposed here are all Ordovician in age, with both Lower Ordovician and Upper Ordovician strata separated by an unconformity (a time gap not present in the rock record).

Main Geological or Geomorphological Interest

This coastal section of rocks is one of very few places where detailed structural geology and the relationships between different strata in the Ordovician rocks of Wexford can actually be seen in some detail. Lower Ordovician slates of the Ribband Group are exposed with Upper Ordovician rocks of the Duncannon Group lying unconformably on them, with a conglomerate at the base of the younger sequence. Some limited fossil evidence indicates that there is a significant time gap here.

The whole succession is structurally complex with tight folding caused by the Caledonian Orogeny at the end of the Silurian Period, although the older rocks probably suffered additional periods of deformation too. There are many small faults too.

The sequence has the red and buff coloured slates of the Lower Ordovician Riverchapel Formation with the unconformable Duncannon Group above. This starts with the brown and grey Courtown Limestone Formation, which has very little carbonate and is mostly slaty rock. Following this are black slates of the Ballinatrach Formation, which are overlain by volcanic tuffs of the Ballymoney Formation (also classed as the Campile Formation). The interaction of the sea and the unconsolidated glacial sediments has resulted in some small landslips along the section too.

Site Importance – County Geological Site; may be recommended for Geological NHA

This is an important section for understanding the geology of Wexford and is likely to be recommended for NHA status when the Cambrian-Silurian theme is fully assessed.

Management/promotion issues

The sections exposed along the coast north of and south of Ballymoney are largely accessible from the beach, but as with any coastal sections, great care must be taken with the tides. Some headlands require low tide to pass or a degree of scrambling to cross over them. There is a locally produced Coastwatch leaflet guide to the geology of Ballymoney, but there is scope for a more detailed guide (printed or on the web) if funding was made available to do the work required to compile it.



The view looking south from the rocks immediately north of Ballymoney.

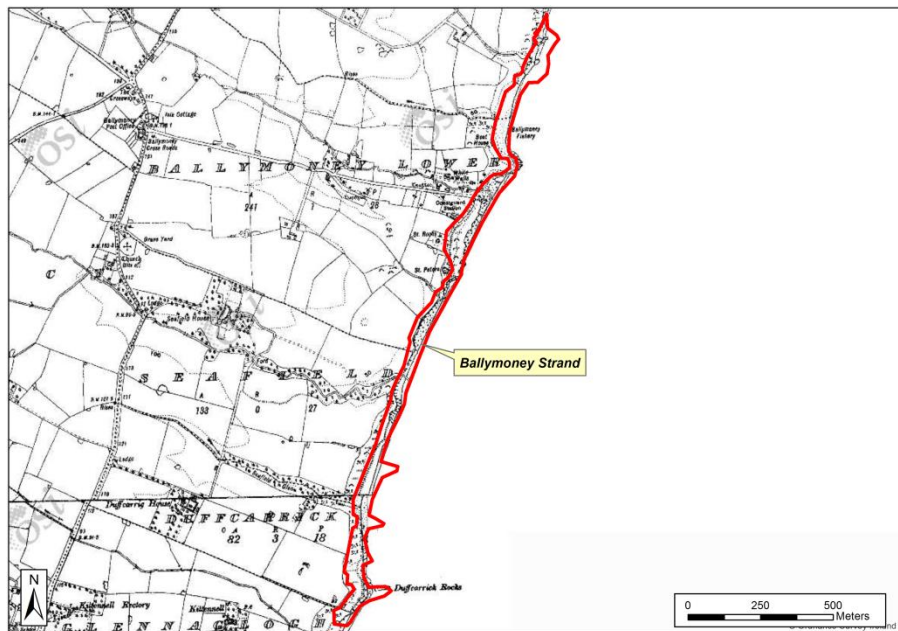
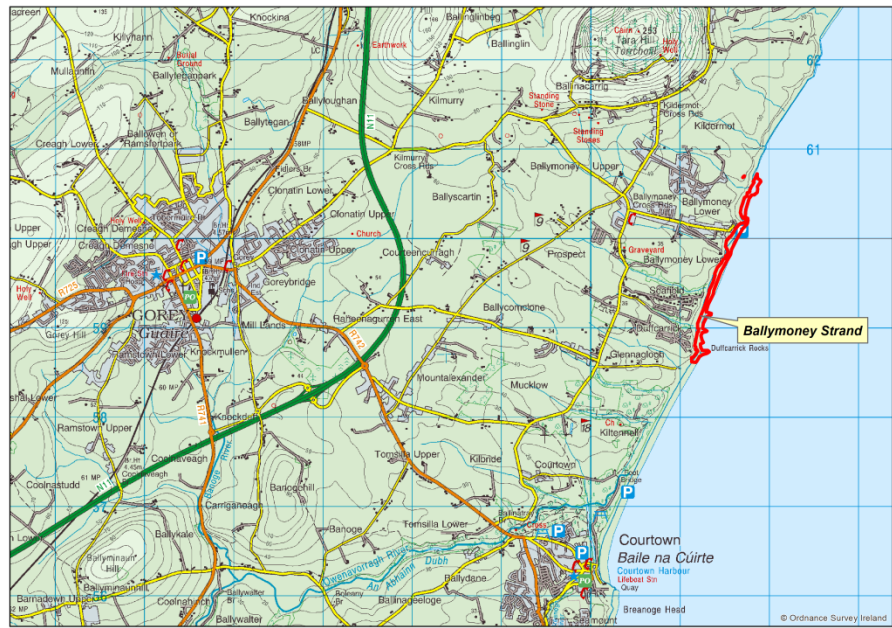


Left: A good exposure illustrating the relationship between bedding, dipping down the right, and the cleavage which is almost vertical.

Right: The northern end of the site, north of Ballymoney, with a fold of Courtown Limestone Formation exposed, and the basal conglomerate exposed.



The Lower Ordovician Riverchapel Formation is well exposed at Seafield.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Cahore Point	
Other names used for site		
IGH THEME	IGH4 Cambrian-Silurian	
TOWNLAND(S)	Cahore	
NEAREST TOWN/VILLAGE	Courtown	
SIX INCH MAP NUMBER	17	
ITM CO-ORDINATES	721150E 651860N	
1:50,000 O.S. SHEET NUMBER	69	GSI Bedrock 1:100,000 Sheet No. 19

Outline Site Description

Approximately one kilometre of coastal section, with near continuous rock exposure.

Geological System/Age and Primary Rock Type

The rocks at Cahore Point are Cambrian, and are mostly quartzites with slates and siltstones.

Main Geological or Geomorphological Interest

This is a good representative section of the Cambrian rocks of the Cahore Group. The Cahore Group is a major element of Wexford's rocks but is poorly exposed inland. It is the equivalent of, or correlated with the Bray Group of County Wicklow. There are thick bedded grey-green to purple greywackes interbedded with slates at the southern end of the section. These are defined as the Cahore House Formation. They are faulted against massive grey-green quartzites of the Cahore Point Formation which make up the Point itself. There is locally an olistostrome – a jumbled mix of quartzite blocks in a slate matrix which results from a localised debris flow.

Site Importance – County Geological Site; may be recommended for Geological NHA

This is a good representative site deserving of County Geological Site status, but may be recommended for NHA when all Cambrian-Silurian sites are assessed in a national overview of the theme.

Management/promotion issues

The coastal nature of the site automatically requires that any visitor pay attention to the tides and their own safety. Access can be made at several points along the section, but a traverse requires low tides and some degree of scrambling on uneven rocks and grassy banks.

Access to the site is from the pier at the northern side of the Point, or from the beach at the southern end. A cliff path allows views down onto the headland too.



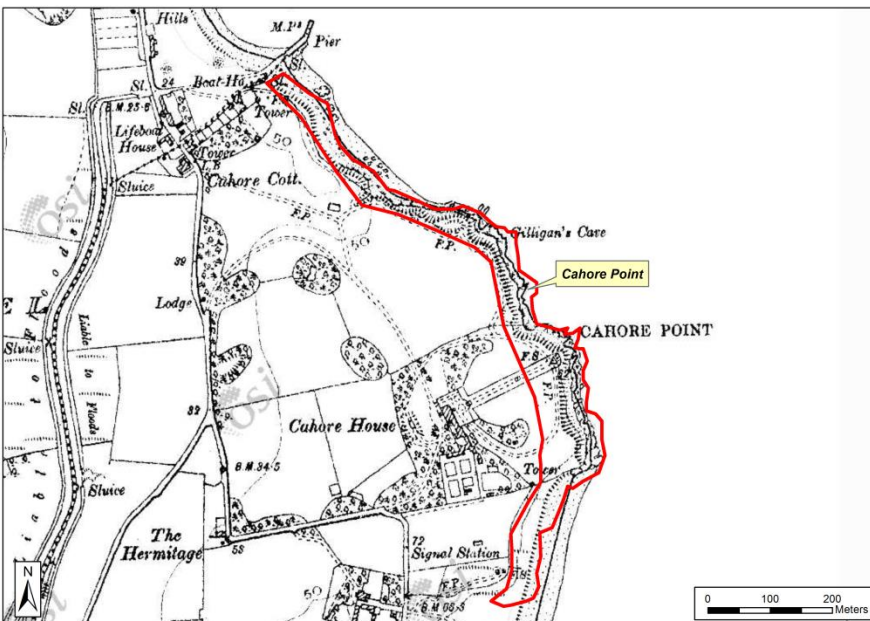
The Cambrian quartzite rocks exposed at Cahore Point.



The northern part of the section with the pier in the distance.



The northern part of the section viewed from the pier.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Coolishall Quarry	
Other names used for site	Casey's Concrete	
IGH THEME	IGH4 Cambrian-Silurian	
TOWNLAND(S)	Coolishal Upper	
NEAREST TOWN/VILLAGE	Gorey	
SIX INCH MAP NUMBER	11	
ITM CO-ORDINATES	712640E 657900N (centre of quarry)	
1:50,000 O.S. SHEET NUMBER	69	GSI Bedrock 1:100,000 Sheet No. 19

Outline Site Description

A large working quarry.

Geological System/Age and Primary Rock Type

The quarry is excavating a large rhyolite body within the Upper Ordovician Duncannon Group rocks.

Main Geological or Geomorphological Interest

This is a good representative site for the large felsic volcanic rock bodies within the Upper Ordovician Duncannon Group. The group as a whole is widely thought to be a volcanic sequence, yet in reality, the majority of the rocks are the associated sedimentary strata. However, although the volcanic units tend to be more resistant to weathering and erosion, and therefore tend to form the small hills through central Wexford, they are still not well exposed, and this quarry provides a significant opportunity to see the large scale relationships and character of these bodies which can be extrusive volcanic strata, within the normal succession of rocks, but they can also be intrusive bodies cutting across and through the succession.

The quarry produces a wide range of products, such as aggregate for farm and forest roads, railway ballast, decorative use, as well as concrete and precast concrete products and blocks.

Site Importance – County Geological Site

This is a good representative site for a significant part of Wexford's geology not well displayed elsewhere.

Management/promotion issues

The inclusion of this quarry as a County Geological Site has absolutely no implications for the normal permitted operation of the quarry. It is hoped that the owner will continue to allow specialist research visits by geological groups by arrangement. It is not suited to general promotion as the quarry is a potentially dangerous working environment and all safety rules must be followed by any geologists visiting with the permission of the operator. The reserves in this quarry suggest a 50 year lifespan, and so any discussion of end-use retention for geological heritage reasons will be the task of a different generation.



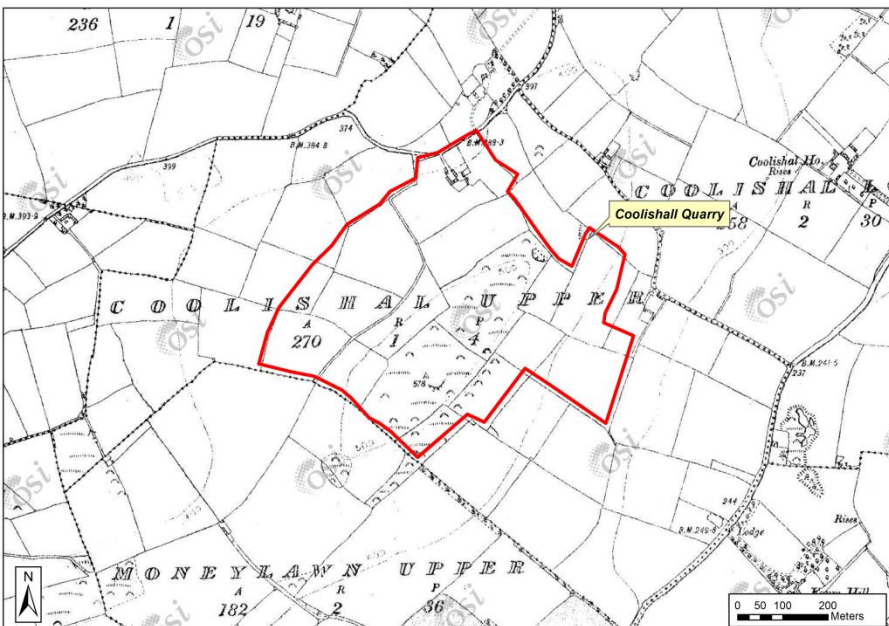
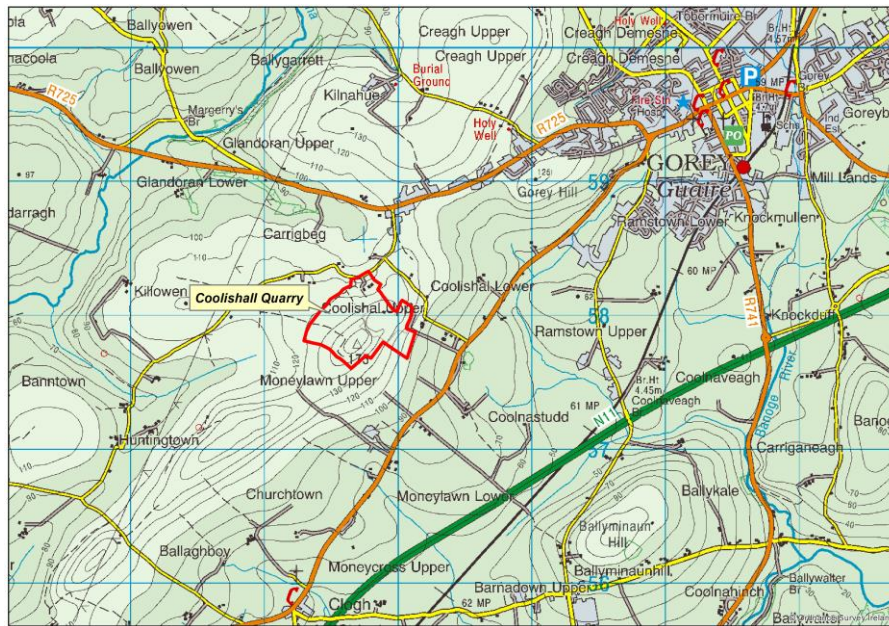
Coolishall Quarry looking east, with the concrete plant at the top of the hill.



Coolishall Quarry, beside a haul road, showing the rich honey colour of the rhyolite rock.



The Coolishall Quarry looking south west.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Cullenstown		
Other names used for site			
IGH THEME	IGH4 Cambrian - Silurian		
TOWNLAND(S)	Ballymadder, Cullenstown		
NEAREST TOWN/VILLAGE	Wellingtonbridge		
SIX INCH MAP NUMBER	45, 46		
ITM CO-ORDINATES	687180E 607895N		
1:50,000 O.S. SHEET NUMBER	77	GSI Bedrock 1:100,000 Sheet No.	12

Outline Site Description

A coastal section some 1200m long with sporadic rock exposures in the cliff and foreshore.

Geological System/Age and Primary Rock Type

The rocks are classed as the Cullenstown Formation, a part of the Cahore Group, and are of Cambrian age. The rocks are greywackes which have been slightly metamorphosed.

Main Geological or Geomorphological Interest

This is a representative site for a part of the Cahore Group Cambrian succession of rocks in Wexford, which are largely invisible inland, but are best seen in coastal sections. In the section between Cullenstown and Forth Mountain, these rocks are much more deformed than is usually the case, and this is because they are caught up in a shear zone. Tectonic activity has been strong in the Wexford-Cullenstown zone with greater deformation of the rocks. At Cullenstown the rocks are strongly cleaved (i.e. slaty) and have kink bands and strong folds.

The strong deformation has been used in the past to argue that the Cullenstown rocks were Precambrian in age, but now, understanding their importance in terms of terranes in southeast Ireland and how they have been assembled by major sideways (strike slip) movements in shear zones and large fault structures has provided a better understanding of the section here.

The more recent deposits above the bedrock are also of considerable interest. A thin raised beach of black cemented sands is seen in a few places. It is overlain by iron cemented (ferricrete) golden coloured sands. Above these are variable layers of unsorted deposits, which were probably deposited by or in the vicinity of ice – rocks, gravel and sands. Overlying these is a glacial till. The iron cement provides a strength that means a vertical cliff forms along much of the section, in contrast to the expectation that what look like unconsolidated sediments will slump and degrade easily.

Site Importance – County Geological Site

This site is a good representative section deserving of CGS recognition.

Management/promotion issues

The rocks are difficult to interpret and to promote in comprehensible ways for the general public, but any revision or replacement or new signboards at the beach car park could include carefully developed geological information. Some of the glacial geology features in the cliffs are potentially more interesting for a general audience, possibly in relation to climate change, sea level change and the dynamics of a coast.



The Cullenstown site viewed from Ballymadder Point, looking east.



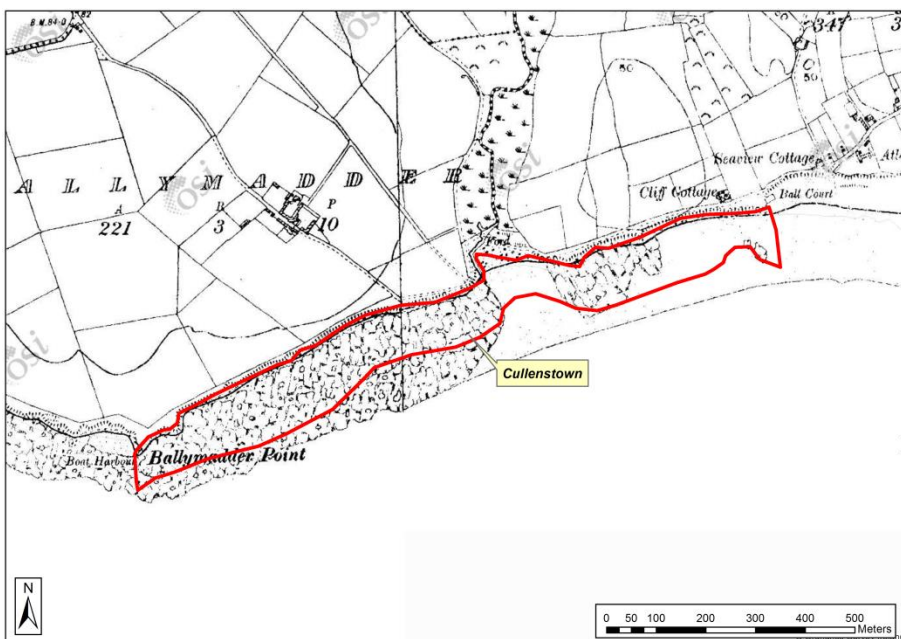
The last phase of deformation of the rocks here is seen as kink bands.



The black raised beach sands and overlying glacial till. Sands are cemented by iron and form vertical cliffs in places.



Exposures of the Cullenstown Formation rocks are seen in patches along the section; this is one of the best developed areas.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Petit's Bay	
Other names used for site		
IGH THEME	IGH4 Cambrian-Silurian	
TOWNLAND(S)	Ramstown	
NEAREST TOWN/VILLAGE	Fethard	
SIX INCH MAP NUMBER	50	
ITM CO-ORDINATES	679700E 603235N (centre of section)	
1:50,000 O.S. SHEET NUMBER	76	GSI Bedrock 1:100,000 Sheet No. 23

Outline Site Description

The site is a section of rocks exposed on the beach at the western side of Baginbun Head, not the headland itself.

Geological System/Age and Primary Rock Type

The rocks exposed at Baginbun Head are Cambrian in age and are defined as the Booley Bay Formation.

Main Geological or Geomorphological Interest

Petit's Bay site is representative of the Lower Ordovician Ribband Group rocks which underlie so much of Wexford, with its companion site of Baginbun Head which displays the same rocks in the bay on the opposite side of the Baginbun Head promontory. Steeply dipping interbedded siltstones and shales are seen but without the conglomerates in Baginbun Head. There are also folds in the rocks, and interpreting the structures is a challenging task. As they are very poorly exposed inland, the coastal sections of Cambrian rocks are critical for our interpretation and understanding of the main areas underlain by them. Petit's Bay is an accessible place for teaching and illustrating a part of Wexford's geology, and complements Baginbun Head and Booley Bay, but with variations in the rocks to be seen.

Site Importance – County Geological Site

This site is a good County Geological Site.

Management/promotion issues

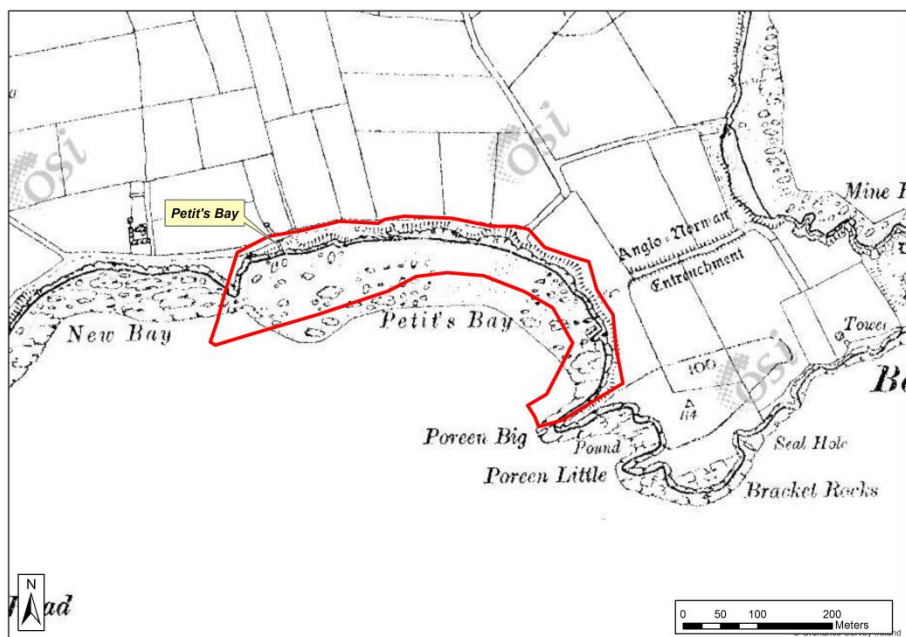
The rocks are accessed from the beach which is served by a slipway path from a parking area at the cliff top. As with any coastal site, caution regarding the tides or stormy weather should be applied. If desired, an explanatory signboard could be erected to explain the geology, probably in the car parking area on the cliff top, where other information signs exist. Good views of the rocks can be obtained from the cliff path at the end of the road on Baginbun Head.



The section on Petit's Bay from the western beach access track. Note the warning sign.



The Petit's Bay site seen from the cliff top path on Baginbun Head at the eastern end.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Pollshone Head – Roney Point		
Other names used for site			
IGH THEME	IGH4 Cambrian-Silurian		
TOWNLAND(S)	Askingarran Lower, Glen		
NEAREST TOWN/VILLAGE	Courtown		
SIX INCH MAP NUMBER	17		
ITM CO-ORDINATES	720660E 652570N (centre of section)		
1:50,000 O.S. SHEET NUMBER	69	GSI Bedrock 1:100,000 Sheet No.	19

Outline Site Description

Approximately 2 km of coastal section, with rocky exposures along most of it.

Geological System/Age and Primary Rock Type

The section exposes Lower Ordovician rocks of the Ribband Group, with some rocks of the Cambrian age Cahore Group included. They are mostly laminated slaty mudstones with siltstone bands, and some quartzites.

Main Geological or Geomorphological Interest

This is a good representative section of Ribband Group slaty rocks that are not well exposed inland, although they underlie very large tracts of the county from the northeast to the southwest. The name 'Ribband' stems from the original description in the 1800's by geologists, of the frequently striped or banded appearance of these laminated mudstones. There is near complete exposure along the section apart from some beach areas. At Pollshone Head the Seamount Formation is seen on the north side, with the Ballyhoge Formation then occurring southward to Roney Point, although north of Salt Rock there are small faulted sections of the Seamount Formation and the Roney Formation. At Roney Point, best accessed from the beach at the southern end, the pale coloured quartzites of the Roney Formation are more resistant to erosion by the sea and form the headland.

The slaty rocks are broadly interpreted as turbidites where storm events or earthquakes cause a slurry of sediment to flow into a basin and settle out. The quartzites represent bigger events that bring shallow water sands down into the basin.

Site Importance – County Geological Site; may be recommended for Geological NHA

This is a good representative site that merits County Geological Site status, and may be recommended for NHA designation when all Cambrian-Silurian sites are assessed in a national overview of the theme.

Management/promotion issues

The coastal nature of the site automatically requires that any visitor pay attention to the tides and their own safety. Access can be made at several points along the section, but a traverse requires low tides and some degree of scrambling on uneven rocks and grassy banks. There is also a slight danger in wet weather of small slides of unconsolidated deposits on top of the rocks exposures, down onto the beach areas.

The public access points at Pollshone Head and at Roney Strand provide the opportunity for signboards, which would be a worthy addition to the site.



The northern part of the section looking from Salt Rock northwards to Pollshone Head.



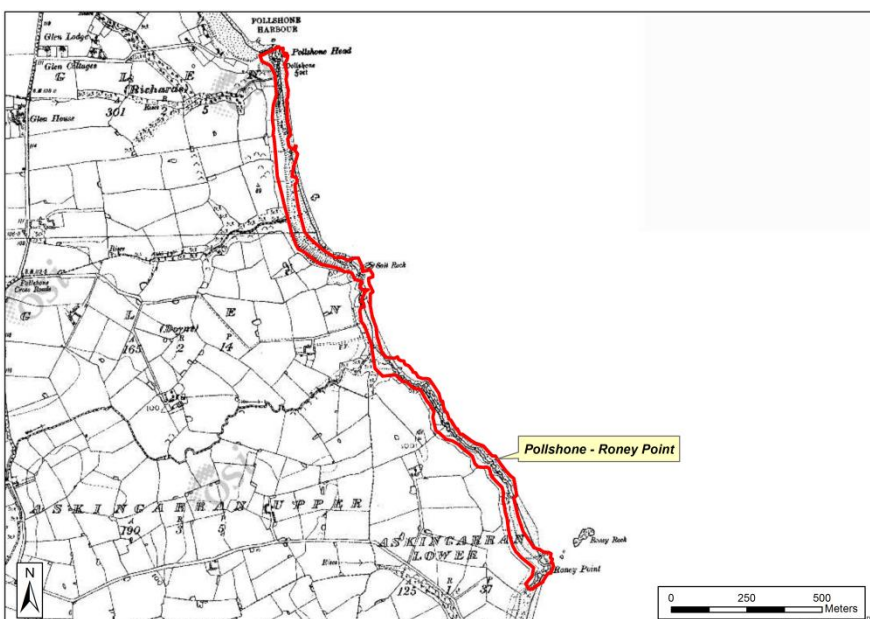
Looking south from Salt Rock to Roney Point in the distance.



The grey slates of the Ballyhoge Formation on Pollshone Head.



Pale coloured quartzites of the Roney Formation at the south end of the site, at the beach access to the headland.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Shelmaliere Commons Quarry
Other names used for site	Carrigfoyle Quarry; Carrickfoyle Quarry Barntown; Windgap Rocks
IGH THEME	IGH4 Cambrian - Silurian
TOWNLAND(S)	Shelmaliere Commons (ED Forth)
NEAREST TOWN/VILLAGE	Wexford
SIX INCH MAP NUMBER	37, 42
ITM CO-ORDINATES	698550E 620390N
1:50,000 O.S. SHEET NUMBER	77
	GSi BEDROCK 1:100,000 SHEET NO. 23

Outline Site Description

A disused quarry on Forth Mountain west of Wexford town. The quarry floor is now flooded.

Geological System/Age and Primary Rock Type

Bedrock comprises Shelmaliere Formation quartzite. The main economic material extracted at the site was quartzite for aggregate.

Main Geological or Geomorphological Interest

There are excellent exposures of quartzite throughout this site, including deposits of quartz-sands sourced from the quarried rock. At the west side of the quarry, a high, thick rockwall/cliff remains. The north face of the rockwall/cliff hosts well-preserved large-scale flute casts, occupying the base of the overturned strata. The foot of this steeply inclined cliff is heavily vegetated. However the flute casts are best viewed from the top of the remaining quarry infrastructure to the immediate east of the rockwall/cliff. The base of the Shelmaliere Formation quartzite, passing down into cleaved metagreywacke rocks (Cullentra Formation), is reported to be visible in a run-off channel at the south end of this wall/cliff.

Site Importance – County Geological Site

This is the type locality for the Cambrian age Shemaliere Formation and is an important County Geological Site. The pink-yellow colour of the quartzite coupled with the surrounding forestry and the view of the low-lying Wexford landscape from this elevated position/location makes this a very unique and visually dramatic site.

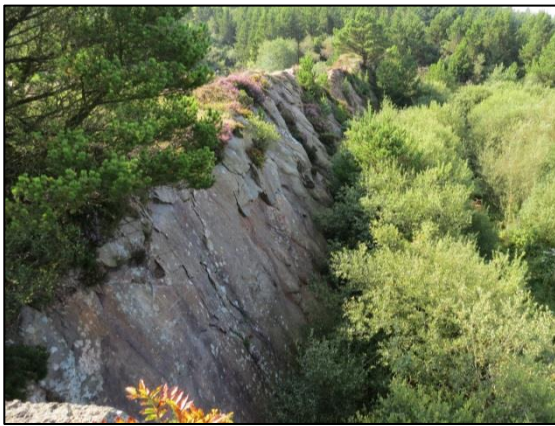
Management/promotion issues

The quarry is referred to as Carrigfoyle Quarry (List of Quarries 1982), most likely due to the proximity of Carrigfoyle Rock (698178E 619850N) to the southwest. It is also known as Barntown Quarry, though Barntown townland is situated a few kilometres northeast of the quarry.

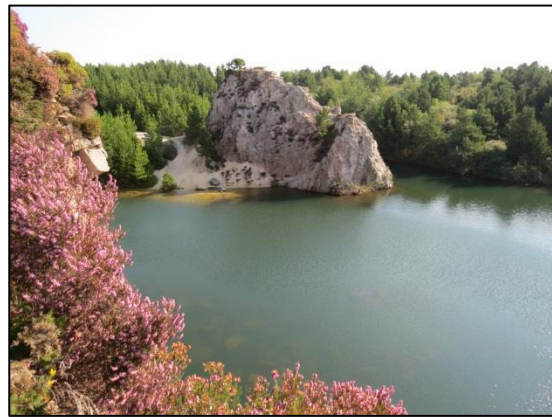
This is a popular site for people to visit. Access to the quarry is via forestry tracks and roads. Foot trails around the perimeter of the quarry can run close to the edge of steep and high quarry faces that overhang the artificial lake. Extreme care should be taken when approaching quarry due to high ledges, loose material and deep water.



View of west end of flooded quarry from top of quarry face.



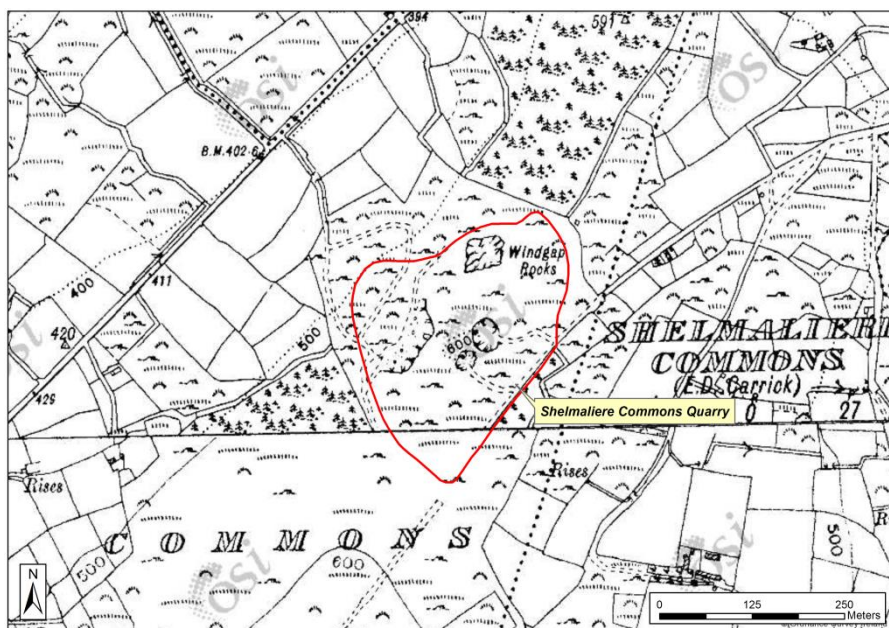
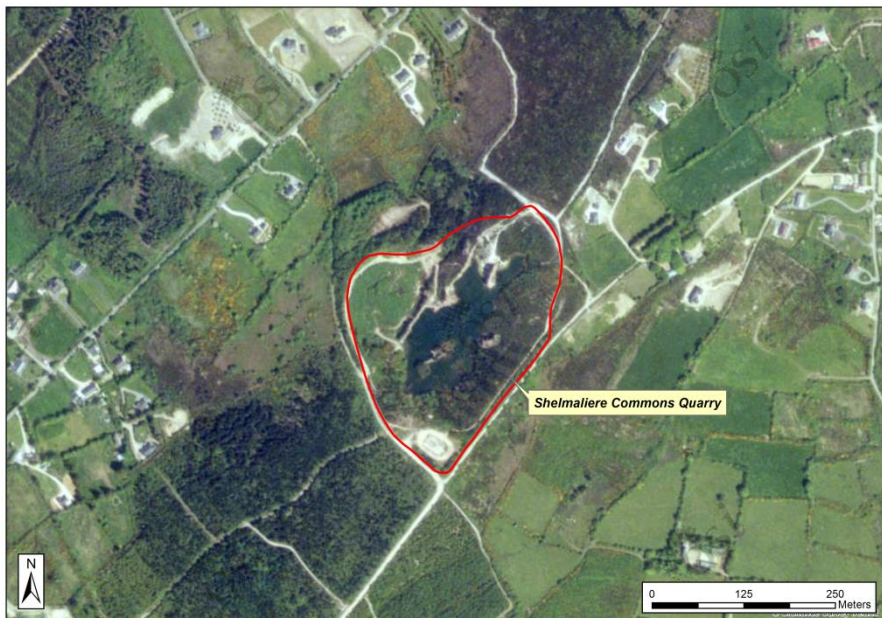
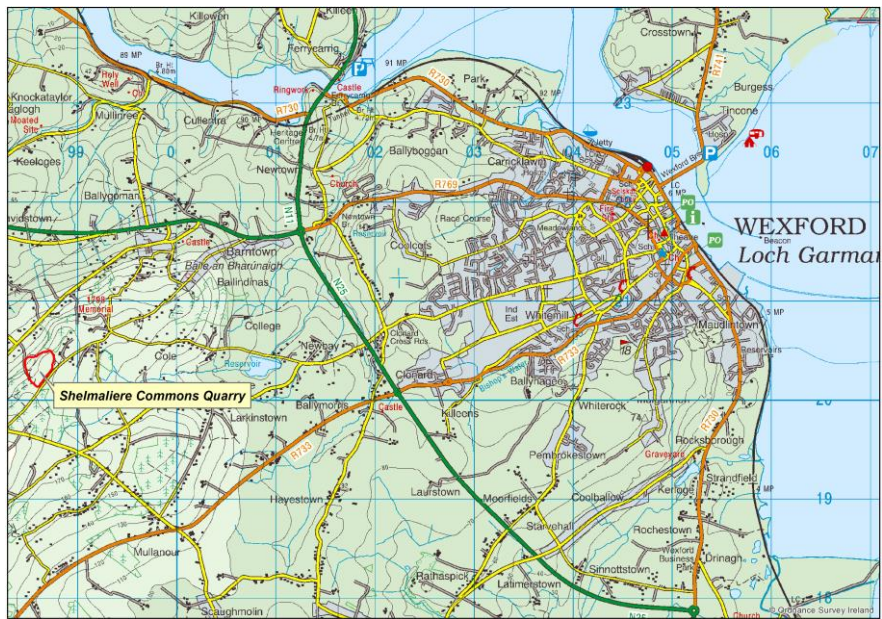
Flute casts on north facing cliff-face.



East side of flooded quarry.



View from Shelmaliere Quarry looking northeast towards Enniscorthy.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Greenore Point
Other names used for site	Carrick Beacon
IGH THEME	IGH11 Igneous Intrusions
TOWNLAND(S)	Bing, Wadingsland, Ballyaddragh
NEAREST TOWN/VILLAGE	Rosslare Harbour
SIX INCH MAP NUMBER	48
ITM CO-ORDINATES	715200E 611240N
1:50,000 O.S. SHEET NUMBER	77
	GS1 BEDROCK 1:100,000 SHEET NO. 23

Outline Site Description

Rocky outcrops in the tidal zone at a prominent headland south of Rosslare Harbour.

Geological System/Age and Primary Rock Type

Precambrian age bedrock comprises fine-grained dark green amphibolites and some schists of the Greenore Point Group (Rosslare Complex).

Main Geological or Geomorphological Interest

The Greenore Point Group comprises a thick sequence of foliated and banded amphibolites. Whilst the rocks do not exhibit any observable evidence of their origin, they are understood to have formed as gabbro, and were metamorphosed and deformed around 620 million years ago. To the south of Greenore Point, some amphibolites occur that were originally formed as diorites.

The age relationship between the Greenore Point Group and the Kilmore Quay Group (also Rosslare Complex), occurring to the south of St. Helen's Harbour and southwest to Kilmore Quay, remains a subject of debate. The Rosslare Complex amphibolites, gneisses and schists of the have been foliated by several episodes of folding and faulting, including deep burial of the complex and gradual uplift over millions of years.

The Greenore Point Group rocks are in faulted contact with a 20m wedge of younger Ordovician metasediments of the Tagoat Group (Milltown Formation and Grahmormack Formation) rocks that occur along the shore at low tide northwest of Greenore Point, and in old quarries south of Rosslare Harbour.

Site Importance – County Geological Site

This is an important County Geological Site because it hosts good exposures of the Greenore Point Group (type locality) amphibolites. The coastal section is located within Carnsore Point SAC (002269). Greenore Point is located in St. Helen's Burrow pNHA (00782).

Management/promotion issues

Access to the shoreline exposures is easy along the beach from Rosslare Harbour or St. Helen's. This is an exposed shoreline, and care should be taken with tides and weather conditions.



Fishing at Greenore Point and Carrick Beacon Rock (marker in distance).



Foliated amphibolite along beach.

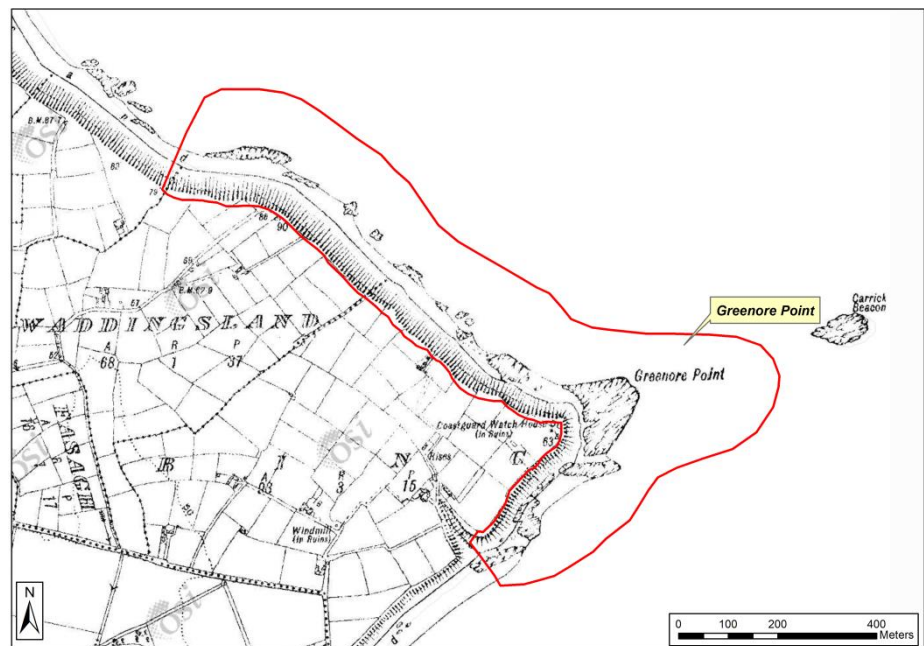
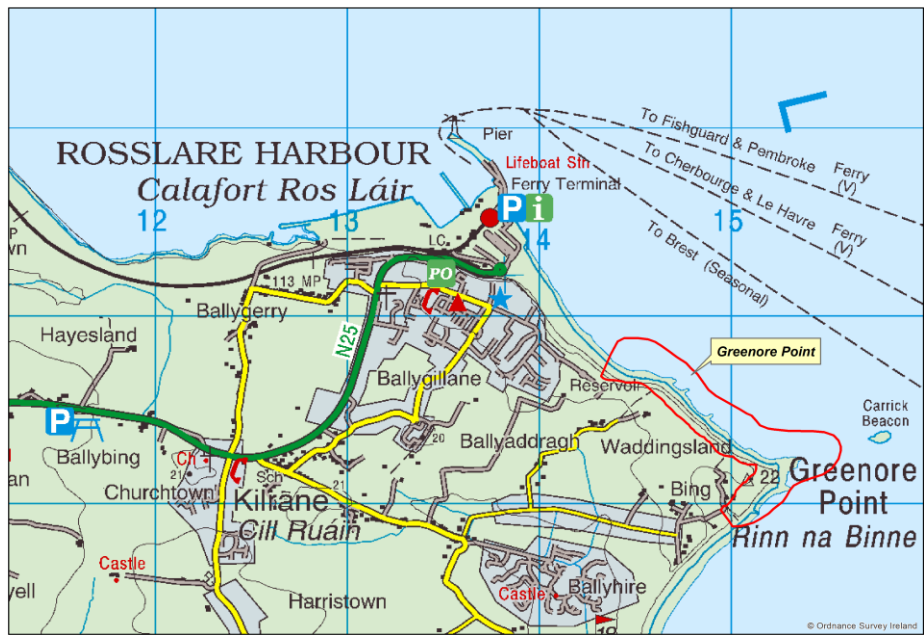


Amphibolite and glacial mud at Greenore Point.



Shoreline bedrock exposures and muddy cliffs at Greenore Point. *

* Image: Office of Public Works Coast of Ireland Aerial Oblique Imagery Survey 2003. Permission to reproduce acknowledged.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Kilmore Quay
Other names used for site	Forlorn Point; Crossfarnoge
IGH THEME	IGH5 Precambrian
TOWNLAND(S)	Crossfarnoge, Nemestown
NEAREST TOWN/VILLAGE	Kilmore Quay
SIX INCH MAP NUMBER	51, 52
ITM CO-ORDINATES	696190E 603130N (Crossfarnoge)
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

Coastal exposures east and west of the harbour at a prominent headland on the south Wexford coast.

Geological System/Age and Primary Rock Type

Precambrian age pale-grey gneiss and schist bedrock, part of the Kilmore Quay Group (Rosslare Complex), cross-cut in places by dark-coloured diorite dykes. Pleistocene raised beach and head deposits occur in cliffs.

Main Geological or Geomorphological Interest

This is the best locality for exposures of the Kilmore Quay Group (the location other is south of St. Helen's near Rosslare Harbour). Bedrock is principally comprised of thin bands of gneiss and dark-grey schist. The rocks were originally sandy and muddy sedimentary rocks, prior to being heavily deformed and metamorphosed during successive episodes of deformation affected these rocks prior to the injection of the dykes. The Rosslare Complex rocks were severely faulted and folded around 480 million years ago, resulting in the Kilmore-Whilkeen Shear Zone that can be traced along the southern margin of the Kilmore Quay Group. The Saltees Granite, seen in contact with the metamorphic rocks at very low tide east of the harbour, was emplaced during this period of deformation. The Rosslare Complex represents the exposed basement of the microcontinent of Avalonia. Avalonia collided with the continent of Laurentia (NW Ireland) between c. 450 and 380 million years ago, with the closure of the Iapetus Ocean during one of the great tectonic episodes to affect Ireland - the Caledonian Orogeny. A precise age for the Rosslare Complex remains a topic of discussion. Radiometric dating of gneiss minerals indicates the rocks over 620 million years ago. The cliffs to the east of the harbour expose a section of the Courtmacsherry Formation raised beach (CFB) that has been documented at numerous sites along the south coast of Ireland. The cliffs expose an upward sequence from bedrock platform, through coarse shingle, head, Irish Sea till, outwash sediments, and inland till. The CFB has been dated at Wood Village, Co. Wexford to about 53,000 years ago.

Site Importance – County Geological Site; recommended for Geological NHA

This important County Geological Site is the type locality for the Kilmore Quay Group, and is important to the understanding of the geological origin of southeast Ireland (Avalonia), and therefore should be recognised as a geological NHA. A significant area of the site is located in the Saltee Islands SAC (000707).

Management/promotion issues

The home of a Coastguard and Lifeboat Station and fishing quay since the 1800s, Kilmore Quay was redeveloped in the 1990s. A popular visitor destination, the erection of a public information sign alongside the coastal path could be a valuable asset in promoting the geological heritage of this and adjacent geo-heritage sites (Ballyteigue Burrow, St. Patrick's Bridge, Saltee Island, Carnsore Granite) and seascapes. A Slí Charman coastal path signboard at the harbour includes some information on the geology of south Wexford. The Kilmore Quay Memorial Garden hosts several inscribed limestone and granite plaques, plinths and sculptures.



Diorite dyke (dark) in gneiss on Forlorn Point. Kilmore Quay Marina in background to east.



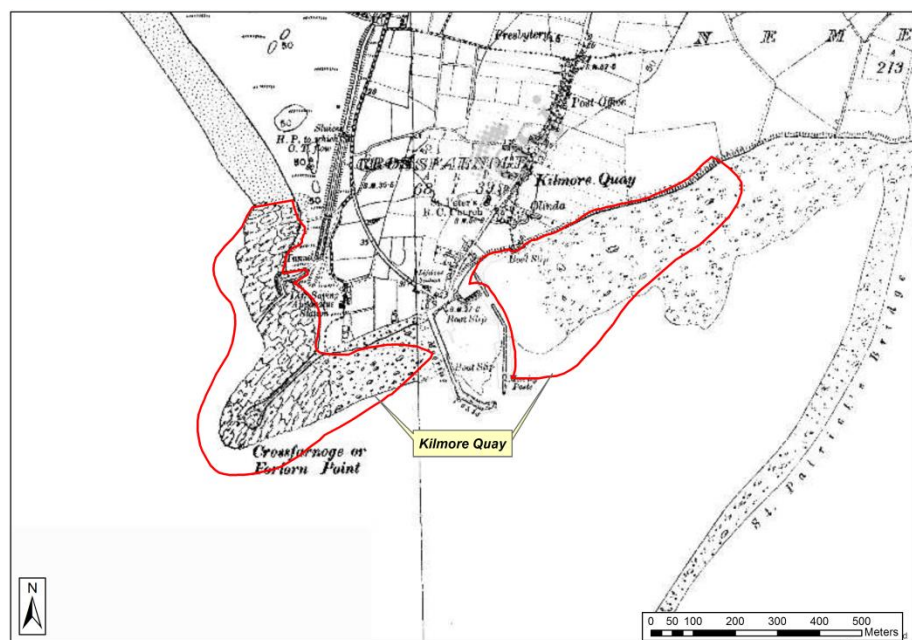
Rust coloured head (sand, soil) overlying raised beach deposits resting on bedrock platform.



Carnsore Granite sign at Kilmore Quay Memorial Garden to those lost at Sea.



Gneiss outcrop on beach at Nemestown, east of the slipway at Olinda looking west.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	St. Helen's Harbour
Other names used for site	
IGH THEME	IGH5 Precambrian
TOWNLAND(S)	St. Helen's, Killillane
NEAREST TOWN/VILLAGE	St. Helen's
SIX INCH MAP NUMBER	48
ITM CO-ORDINATES	714470E 609880N
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

Rocky outcrops along the coastline around the St. Helen's Harbour pier area to the south of St. Helen's Bay Golf Club and holiday village.

Geological System/Age and Primary Rock Type

Precambrian age St. Helen's Gabbro (metamorphosed gabbro), part of the Rosslare Complex.

Main Geological or Geomorphological Interest

Bedrock at St. Helen's Harbour comprises the metamorphosed igneous St. Helen's Gabbro of the Rosslare Complex. The Rosslare Complex consists of some of the oldest rocks in Ireland (certainly the oldest in southeast Ireland) with ages estimated at around 1.7 billion years, before being metamorphosed and deformed around 620 million years ago.

Outcropping along a near-continuous 150m thick section at, and to the north and south of, St. Helen's harbour, the St. Helen's Gabbro rocks occur at the coastal junction (east) of the Greenore Point Group green amphibolites (north) and Kilmore Quay Group gneisses (south).

Unlike the Greenore Point Group amphibolites to the north the St. Helen's Gabbro do not exhibit foliation. It has been suggested that the metagabbros are younger than the amphibolites to the north, and were emplaced as a separate igneous intrusion event around 610 million years ago. This assigns the St. Helen's Gabbros the accolade of representing the only Precambrian igneous intrusion identified in southeast Ireland.

Site Importance – County Geological Site

This is an important County Geological Site as it is the only Precambrian igneous intrusion identified in southeast Ireland. The coastal section is located within Carnsore Point SAC (002269). Greenore Point is located in St. Helen's Burrow pNHA (00782).

Management/promotion issues

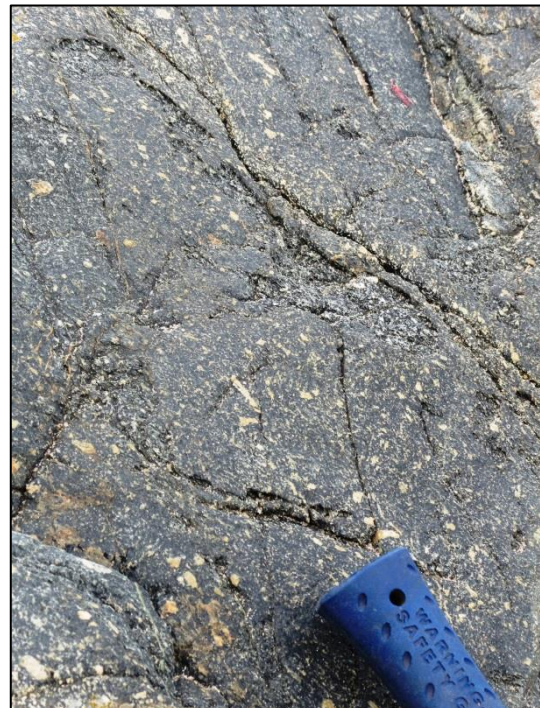
Any development of the harbour area would see the integrity of the site being compromised, as the main outcrops occur immediately north and south of the existing pier. The ease of access to this coastal site renders the site of particular interest to geology interest groups and student groups.



St. Helen's Harbour, looking south.



Metagabbro outcrop on beach just north of St. Helen's harbour.



Light and dark minerals in coarse-grained metagabbro just north of St. Helen's harbour.



Metagabbro on beach just north of St. Helen's harbour, looking north towards Greenore Point in distance.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Blackstairs Mountain
Other names used for site	<i>An Staighre Dubh</i> , Caher Roes Den (site locality),
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Bantry Commons
NEAREST TOWN/VILLAGE	Bunclody
SIX INCH MAP NUMBER	18
ITM CO-ORDINATES	680100E 643930N (main tor features)
1:50,000 O.S. SHEET NUMBER	68
GSI BEDROCK 1:100,000 SHEET NO.	19

Outline Site Description

Blackstairs Mountain is the second highest mountain within the Blackstairs range, rising to a summit at 735m above sea level. The site itself includes a number of tors and surrounding blockfields along the southern should ridge of the mountain.

Geological System/Age and Primary Rock Type

The rock comprising the western side of the mountain, as well as the tor and blockfield features which comprise the site, is Devonian (419-359 Ma) granite. The granite is part of the Leinster Batholith, the plutons that comprises the various granite varieties of south Leinster. Much of the eastern side of the mountain is much older, comprising Ordovician Metasediments.

The form of the mountain was shaped within the Quaternary (Ice Age) Period, with much of the *in situ* weathering of the bedrock having occurred since then, during post-glacial or Holocene times.

Main Geological or Geomorphological Interest

The ridge along the southern shoulder of Blackstair Mountain has a number of well formed 'tors', which are outcrops of granite eroded by wind action since the Ice Age. From a distance, these rocky features resemble man-made structures. However, the granite outcrops are natural, formed by differential weathering of granite bedrock, and mass wasting and removal of the weathered material.

Weathering along horizontal and near-vertical joints has created the characteristic granite tor shape. Some of the tors have formed from roche moutonnee features, themselves moulded and shaped by ice during glaciations.

Surrounding these features, the mountain has been strewn with granite boulders which form an extensive blockfield. This blockfield itself is the result of physical weathering of the granite, and mass movement of the boulders downslope, soon after the ice vacated the locality at the end of the last glaciation. The fact that the outcrops have been ice moulded shows that this portion of the mountain (at an elevation of approx. 550m above sea level) was completely covered by ice during the last glacial maximum.

Site Importance - County Geological Site

The mountain is somewhat unique in the variety of tor forms which lie side by side in a relatively small area. The blockfields are no less impressive.

Management/promotion issues

The mountain ridge is a popular route for hill walkers. An information board along the walking route near the tors, detailing the unusual geology would prove a worthy addition to the site, explaining the formation of the features. The site is already within an SAC and proposed NHA (000770, Blackstairs Mountains) for biodiversity reasons and the unusual geodiversity of the locality should be highlighted in any promotion of this.



View north along the ridge, across a number of the outcropping tors.



Detail of one of the tors, showing differential weathering along fractures in the granite.



View southwards across part of the blockfield.



Outcrop (tor formed from a roche moutonnee) among the blockfield.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Camaross Pingos		
Other names used for site	Camaross Crossroads, Camaross fossil pingos		
IGH THEME	IGH7 Quaternary		
TOWNLAND(S)	Camaross		
NEAREST TOWN/VILLAGE	Adamstown		
SIX INCH MAP NUMBER	36		
ITM CO-ORDINATES	689000E 624900N (centre of features)		
1:50,000 O.S. SHEET NUMBER	77	GSI BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

This site comprises approximately forty pingo remnants, across an area of 26 hectares, located just north of the N25 road at Camaross. This site is a subset of a wider area covering over 6 square kilometres, where over two hundred pingo remnants have been recorded.

Geological System/Age and Primary Rock Type

The pingo locality is underlain principally by bedrock comprising rhyolitic volcanics and grey and brown slates of the Campile Formation, which are volcanic rocks of Ordovician age. . The pingos themselves were formed in the Quaternary Period, at the end of the Ice Age, when ice had vacated the locality but temperatures were still exceptionally cold.

Main Geological or Geomorphological Interest

A pingo, also called a hydrolaccolith, is a mound of earth-covered ice found in the Arctic and subarctic that can reach up to 70m (230 ft) in height and up to 600m (2,000 ft) in diameter. The term originated as the *Inuvialuktun* word for a small hill. The plural form is 'pingos'.

A pingo is a periglacial landform, which is defined as a nonglacial landform or process linked to colder climates. 'Periglacial' suggests an environment located on the margin of past glaciers. However, freeze and thaw cycles influence landscapes outside areas of past glaciation. Therefore, periglacial environments are anywhere that freezing and thawing modify the landscape in a significant manner. They are essentially formed by ground ice which develops during the winter months as temperatures fall.

A series of fossil pingos and related topographic forms, which have a unique hydrology and which seem to be partially fed by springs, are located in Camaross. Some of the pingos are floored by lacustrine clays. Where the water table breaks the surface in the pingos, springs occur. Many of the pingos were once ponds, but were drained in the late nineteenth century.

Site Importance - County Geological Site; recommended for Geological NHA

The site is unique in the number and variety of pingo forms which lie side by side in a relatively small area. The site is of international importance.

Management/promotion issues

Historically, drainage has altered the hydrological regimes of the pingos. Some of this has happened in the late nineteenth century, some in the late twentieth century, and some between 2011 and 2015. Recent drainage has affected the hydrology of some of the pingos, in particular those in the northernmost portion of the locality. It is notable, though, that this drainage has not affected the geomorphology of the features.

Owing to the uniqueness of the site, the importance of the features should be highlighted with promotional literature. It must be noted, however, that the features are on private land.



Rush-dominated, wet grassland in the base of one of the pingos at the south end of the site.



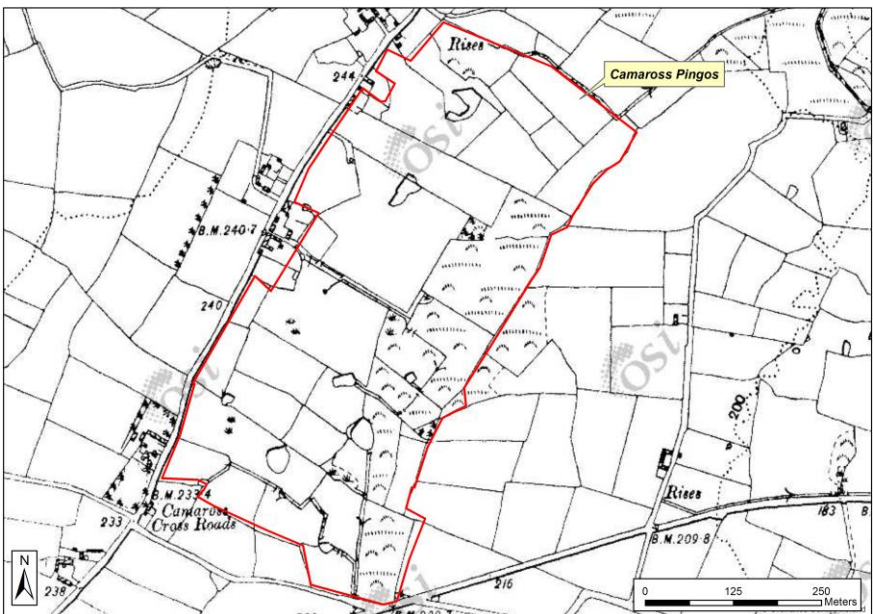
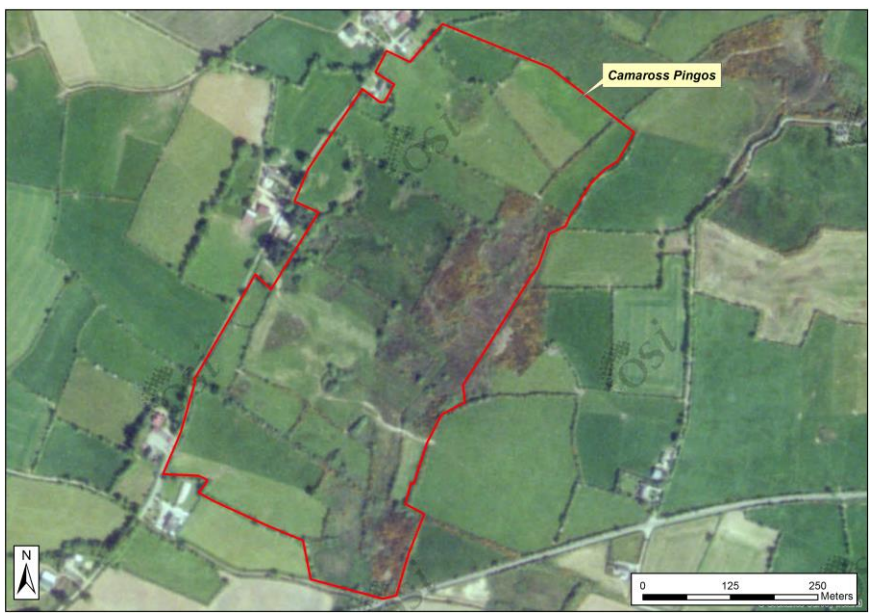
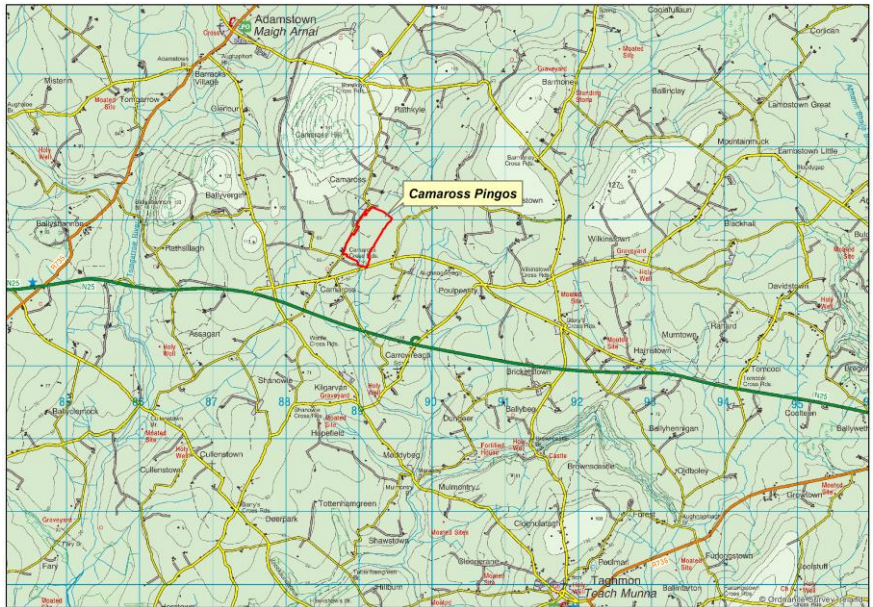
One of the deeper, larger, and more impressive pingos, with wetland within its base, at the northern end of the site.



The most extensive and deepest pingo, at the northern edge of the site.



Pingo with wetland in its base.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Fethard
Other names used for site	Fethard raised beach, Fethard-on-Sea raised beach, Wood Village raised beach
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Grange
NEAREST TOWN/VILLAGE	Fethard
SIX INCH MAP NUMBER	50
ITM CO-ORDINATES	680285E 606360N
1:50,000 O.S. SHEET NUMBER	76 GSI BEDROCK 1:100,000 SHEET NO. 23

Outline Site Description

This site includes a high coastal cliff section that extends for several hundred metres and is c. 6m-10m high over the majority of its extent. The cliff exposes long-studied sediments which have made this a type-site for glacial stratigraphic work in Ireland.

Geological System/Age and Primary Rock Type

The cliff section along the beach at Fethard is comprised of Quaternary Age glacial sediments, which rest unconformably on grey to black mudstones with siltstones of the Booley Bay Formation, which is of Cambrian age.

Main Geological or Geomorphological Interest

The site is located on a lowlying coastal plain, and the base of the section comprises a relatively smooth rock platform, c. 2.5m above sea level. Renowned glacial geologists Anthony Farrington (1966) and Frank Mitchell (1972) suggested that the platform was trimmed by the sea immediately before the last ice advance.

Three sediment units overlie this. The first overlies the rock platform and comprises generally stratified, variably oxidised gravels and moderately to well sorted sands, at altitudes between 2.5m and 3.9m ASL. This is interpreted as part of the Courtmacsherry raised beach, which extends discontinuously along the south coast of Ireland. Above this a geliflucted head deposit is seen, again succeeded by a stony diamicton, which is interpreted as a till forming part of the 'Bannow Formation'. The beach sands were dated using Infra Red Stimulated Luminescence dating to 129,000 years before present, in the late 1990s. This was the first time this raised beach had been definitively dated in Irish Quaternary studies.

The dating of the beach also suggest that the lithostratigraphy developed by Willie Warren of GSI in 1985, which itself suggests that the raised beach is the critical stratigraphic datum to which all other overlying deposits are dated, seems correct. However, the beach cannot represent the peak of sea level during the last interglacial, at least not completely around the Irish coast: it only does this for the site at Fethard. As well as this, the date of the beach casts serious doubt on the interpretation by academics Marshall McCabe and Colm O'Cofaigh (1996) that the Courtmacsherry raised beach belongs to the closing phase of the last glaciation.

Site Importance - County Geological Site; recommended for Geological NHA

This is a particularly impressive exposure into a striking glacial sequence, with several sedimentological characteristics well exposed. The site lies within a proposed NHA (pNHA 000697, Bannow Bay) and SAC for biodiversity reasons and the geological importance of the section, as well as the absolute dating of the raised beach, should be highlighted in promotion of this.

Management/promotion issues

The site is accessible through public beach access, and is therefore easily accessible. The cliffs are prone to slumping, however, and care must be taken when close to the faces. The importance of the site could be highlighted in promotional material for the Bannow Bay NHA.



View of the coastal section at Fethard, along the stretch where the raised beach crops out.



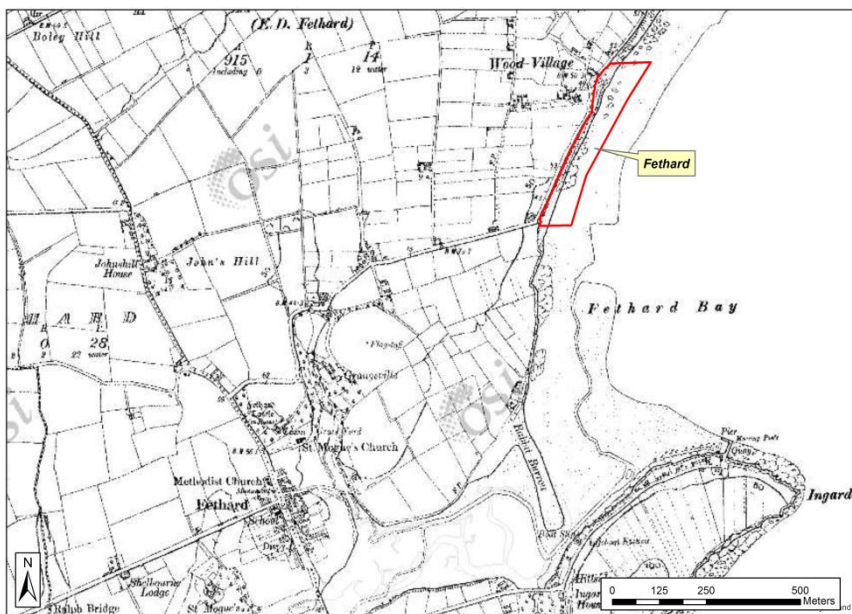
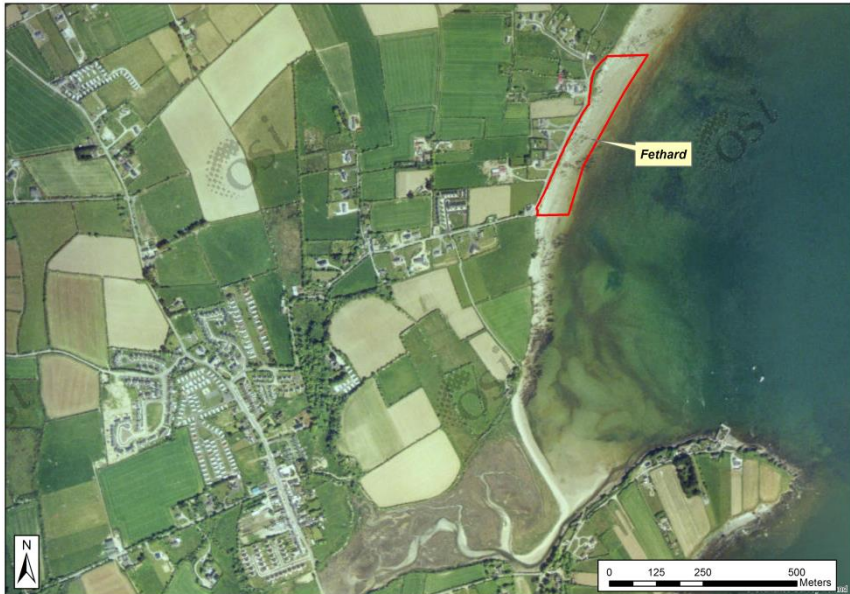
Detail of the cross bedded sands of the raised beach, resting on top of the rock cut platform.



The angular, unsorted, geliflucted material overlying the sorted beach sands.



Ferricreted, bedded sands and gravels within the raised beach profile.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Forth Mountain
Other names used for site	Sliabh Fothart
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Shelmaliere Commons, Bargy Commons, Forth Commons
NEAREST TOWN/VILLAGE	Wexford
SIX INCH MAP NUMBER	42
ITM CO-ORDINATES	697985E 619190N (summit)
1:50,000 O.S. SHEET NUMBER	77
GSI BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A 239m high forest-covered hill capped with prominent rocky tors.

Geological System/Age and Primary Rock Type

Bedrock is Cambrian age quartzite with beds of shale and schist. Periglacial features (tors, ground frost cracks, blockfields) are Quaternary in age, dating from the last Ice Age.

Main Geological or Geomorphological Interest

Forth Mountain is a prominent quartzite hill to the west of Wexford Town. The hill hosts a variety of periglacial features (features formed near glacial areas where perennial freezing and thawing occurs) including tors (isolated, protruding rock outcrops) and blockfields. The main tors on Forth Mountain are (south to north): Carrickatinna Rock, Skeator Rock, Raven Rock, Clorane, Drooping Rock, Carrickadee Rocks, Ravens Rock, Carrickashinna Rock, Carrigfoyle Rock, Windgap Rocks. The lowest tor is at 191m elevation, and highest at 239m. Other periglacial features include involutions and fossil frost (infilled till) cracks (1.4m deep) - both considered to frozen ground phenomena. The lower slopes of the hill are littered with quartzite blocks ranging from boulder size to cobbles. The occurrence of erratics and glacial till, up to 170m elevation, indicates that ice reached at least this height. Silt cappings on stones in the lower soil horizons are also thought to be periglacial. There is also evidence for movement of non-glacial material downslope due to gelifluction (the flow of debris and water-saturated soil that occurs above frozen ground). It has been suggested that the tors are the product of differential weathering rates of shale and quartzite, and not solely due to periglacial conditions. A chronological sequence for the formation of the periglacial features on Forth Mountain was proposed by Culleton (1984).

Site Importance – County Geological Site

This is an important County Geological Site considering the variety of landforms and features associated with periglacial conditions that prevailed in the area during the last glaciation.

Management/promotion issues

Shelmaliere/Forth Mountain is in the majority a Coillte owned and managed area. There are local trails in the area, but advice should be sought locally before embarking on any hiking. The geological heritage and in particular the interesting tor features of Forth Mountain would be an ideal component of any material produced on this area in future. An agreed walking trail could be produced (e.g. Slí na Sláinte route, Healthy Heart route) guiding walkers along a route that allows good views of the tors.



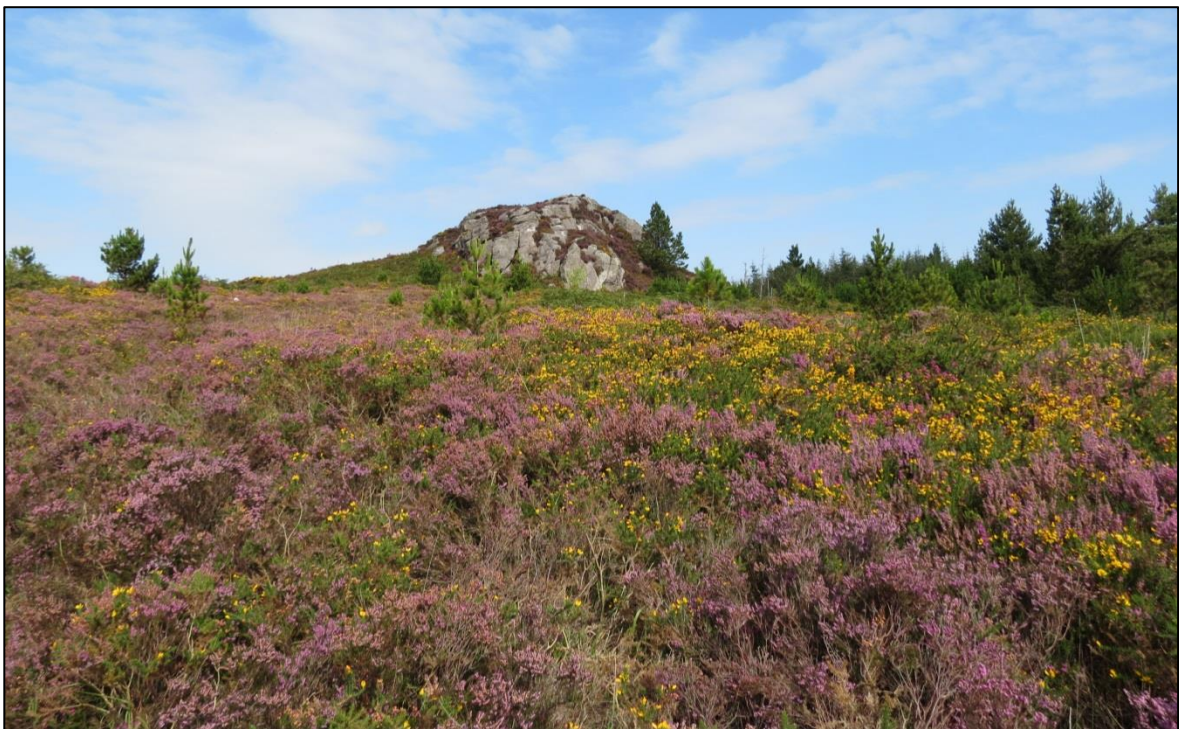
Ravens Rock tor viewed looking north from road near access entrance to Shelmaliere Quarry.



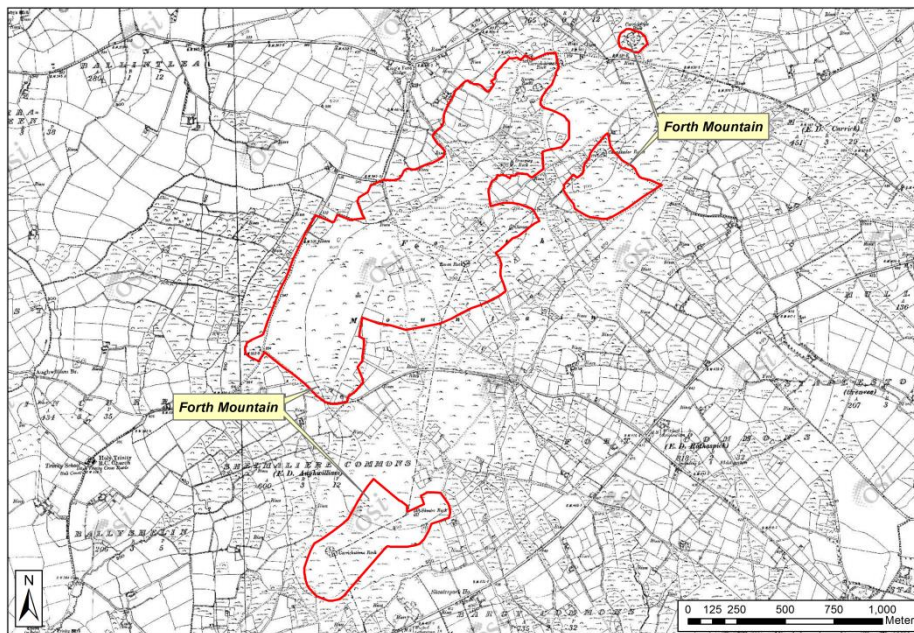
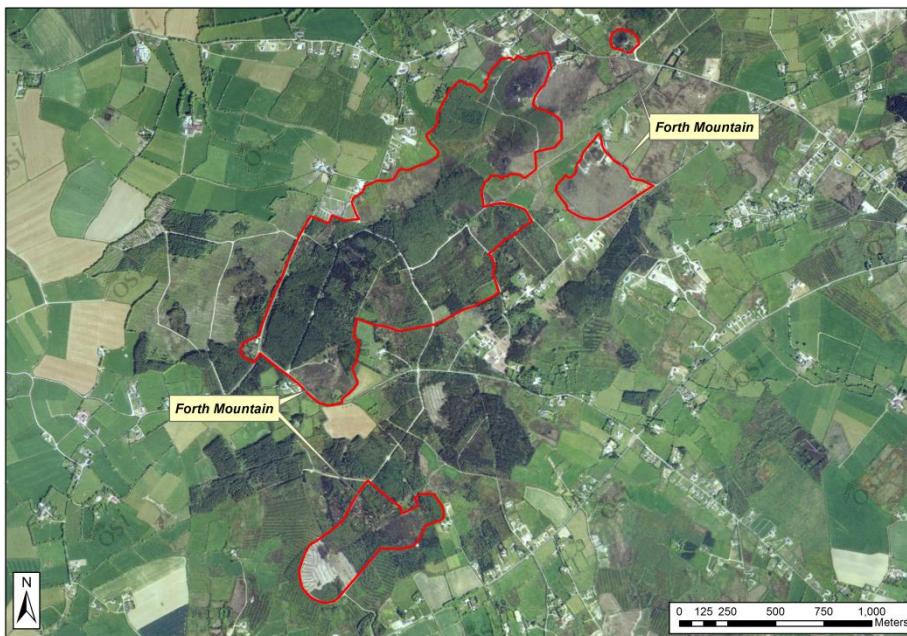
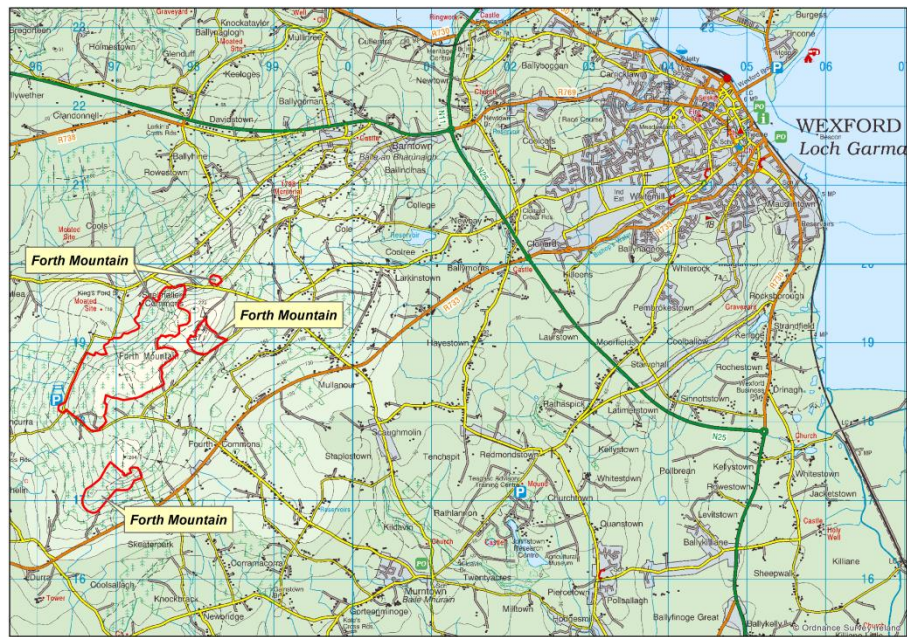
Carrickadee Rock tor with telecoms mast.



Marian Shrine Mass Rock tor and nearby tor.



Carrickatinna Rock at south end of Forth Mountain (near R733 road).



WEXFORD – COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Mulmontry Gorge
Other names used for site	Corock River channel
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Mulmontry, Dungeer, Ballybeg, Cloghulatagh, Bricketstown, Brownscastle, Harristown Big, Harristown Little, Forest, Ballyhennigan, Oldboley
NEAREST TOWN/VILLAGE	Taghmon
SIX INCH MAP NUMBER	36
ITM CO-ORDINATES	692160E 622405N (bend in channel, at Quirk's Ford)
1:50,000 O.S. SHEET NUMBER	77 GSI BEDROCK 1:100,000 SHEET NO. 23

Outline Site Description

Mulmontry Gorge is a deep gorge which has a major change in course halfway along its length; being oriented generally northeast–southwest around Mulmontry, but northwest-southeast around Brownscastle. The deepest portion of the channel extends for a distance of approx. 4.5 kilometres.

Geological System/Age and Primary Rock Type,

The feature is formed in an area of deep glacial sediments which have a 'scalped' appearance. The feature was etched out by meltwater during deglaciation at the end of the last Ice Age, about 12,000 years ago.

The bedrock in the locality is Ordovician and Cambrian Metasediments, which are typically metamorphosed slates, mudstones and schists.

Main Geological or Geomorphological Interest

Mulmontry Gorge is up to 40m deep and has a U-shaped profile, typical of meltwater channels. The base of the channel hosts the Corock River, which is a misfit stream as it lies in a valley much greater in size than it could potentially have eroded.

The channel is considered to have formed completely in the late-glacial period. Initially the channel may have been a subglacial channel, formed under the ice, but later carried surface glacial outwash southwestwards to the Celtic Sea. The channel may have been a previous course of the River Slaney, or may have drained water off the melting Irish Sea glacier which inundated Wexford during the last Ice Age. The channel carried large volumes of subglacial meltwater, and this very high energy meltwater flow formed the channel's unusual depth and size.

Much of the sides of the channel are very steep, and are covered in forestry or scrub along most of their length.

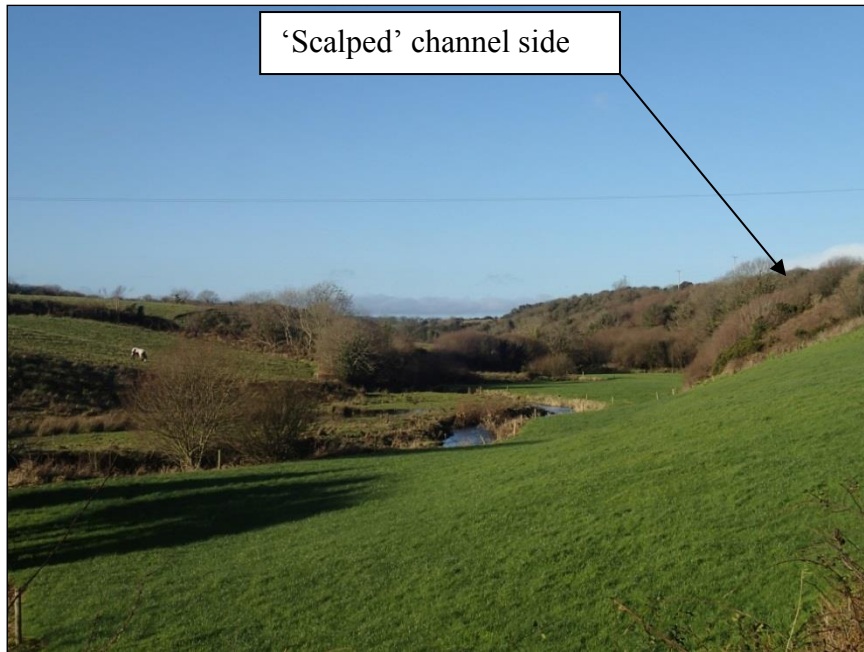
Site Importance – County Geological Site

This is a site with good teaching potential on the process of glacial meltwater erosion, as the feature is accessible and easily viewed from roads.

Management/promotion issues

The roadside location of the channel means that it is fairly accessible. However, there is no parking nearby and it is difficult to stop safely on the roads. Promotion of the feature along these roads is therefore not recommended.

The channel itself and its origins should however be highlighted in any promotion of the geological history or elements of the last Ice Age in the general region.



Mulmontry Gorge, looking northwestwards from Aughnagroagh Bridge.



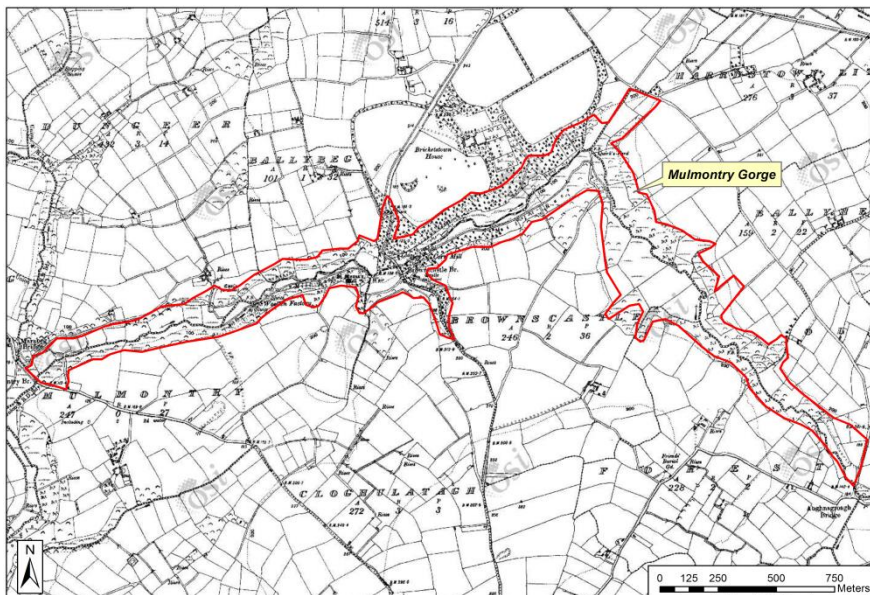
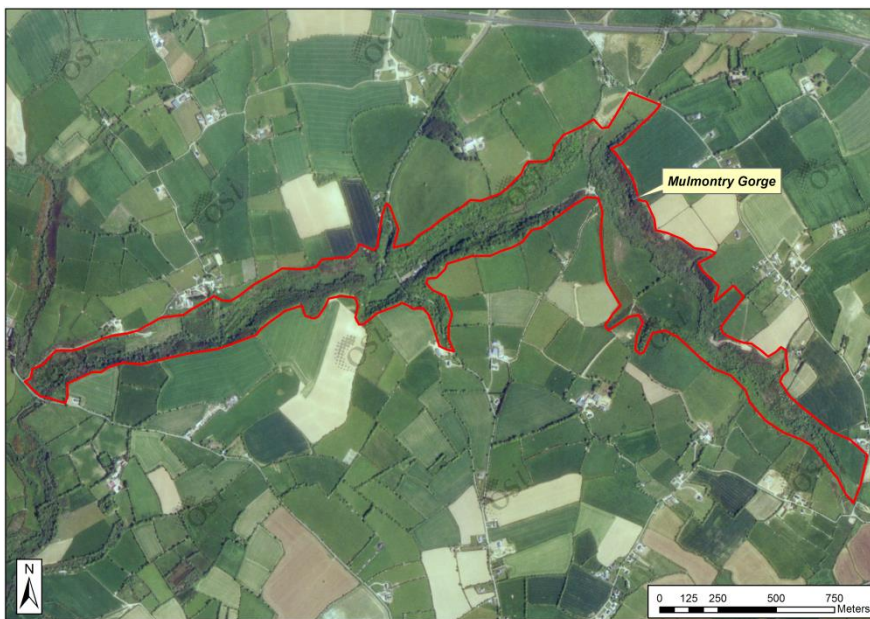
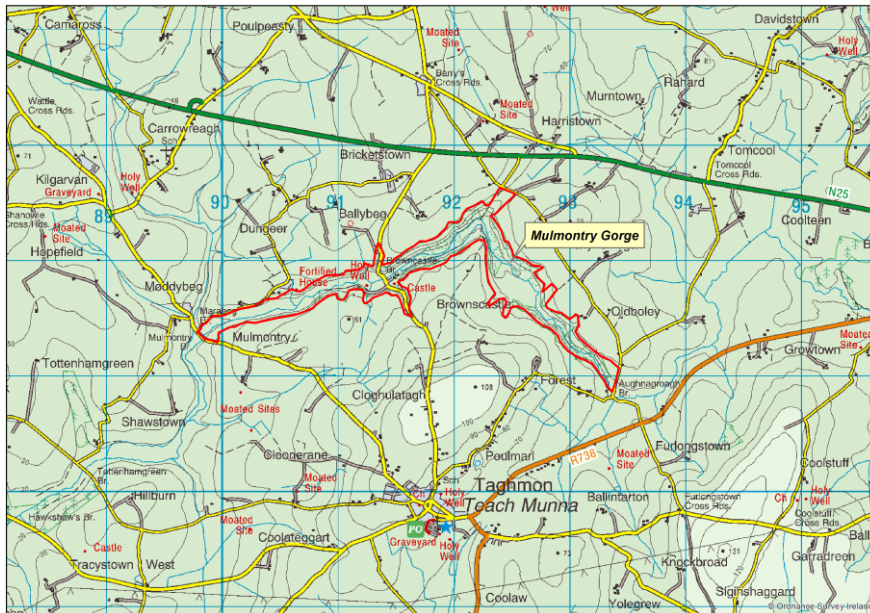
The gorge viewed from the southwest, looking northeastwards from Mulmontry Bridge.



The steep-sided reaches of the gorge at Mulmontry.



View northeast along the gorge, looking into Cloghulatagh Townland.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Saltee Islands
Other names used for site	Great Saltee Island, Little Saltee Island, Saltee Island Great, Saltee Island Little
IGH THEME	IGH11 Igneous Intrusions, IGH13 Coastal Geomorphology, IGH7 Quaternary
TOWNLAND(S)	Saltee Island Great, Saltee Island Little
NEAREST TOWN/VILLAGE	Kilmore Quay
SIX INCH MAP NUMBER	47, 52, 53
ITM CO-ORDINATES	697540E 603420N
1:50,000 O.S. SHEET NUMBER	77 GSI BEDROCK 1:100,000 SHEET NO. 23

Outline Site Description

Two islands situated in St. George's Channel, five kilometres south of Kilmore Quay.

Geological System/Age and Primary Rock Type

The Saltee Islands are formed of granite (specifically granodiorite) that was intruded into the Rosslare Complex about 436 million years ago during the Silurian Period. Dolerite bedrock occurs on Great Saltee Island

Main Geological or Geomorphological Interest

The Saltee Granite is pink-coloured granite that forms the two Saltee Islands. The granites are best exposed in the cliffs on the islands, and also along the outer foreshore at low tide at Kilmore Quay. The hinterland of Great Saltee is covered by limestone-rich clay deposited by glaciers at the end of the last Ice Age.

The Saltee Granite originated as hot molten magma and was emplaced into an actively deforming shear zone that affected the Rosslare Complex around 480 million years ago. The granites are also deformed, and radiometric dating of the granites ascribes a date for this deformation episode during late Ordovician and early Silurian times.

Boulders of Carnsore Granite occur as erratics on the islands, and raised beaches reflect periods of higher sea levels.

Site Importance – County Geological Site; recommended for Geological NHA

This is an important County Geological Site, and should be designated a geological NHA. The Saltee Islands comprise a designated SAC (000707) and SPA (004002).

Management/promotion issues

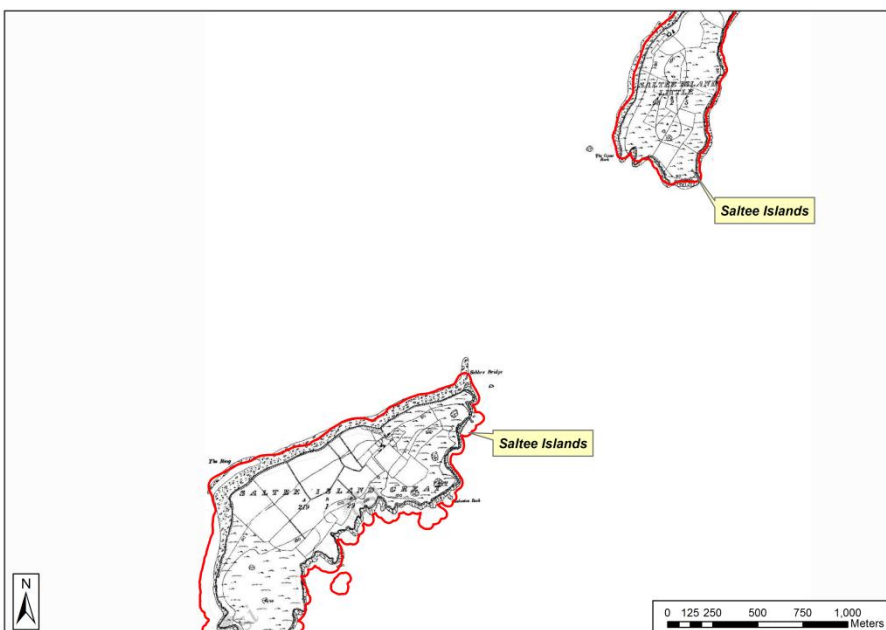
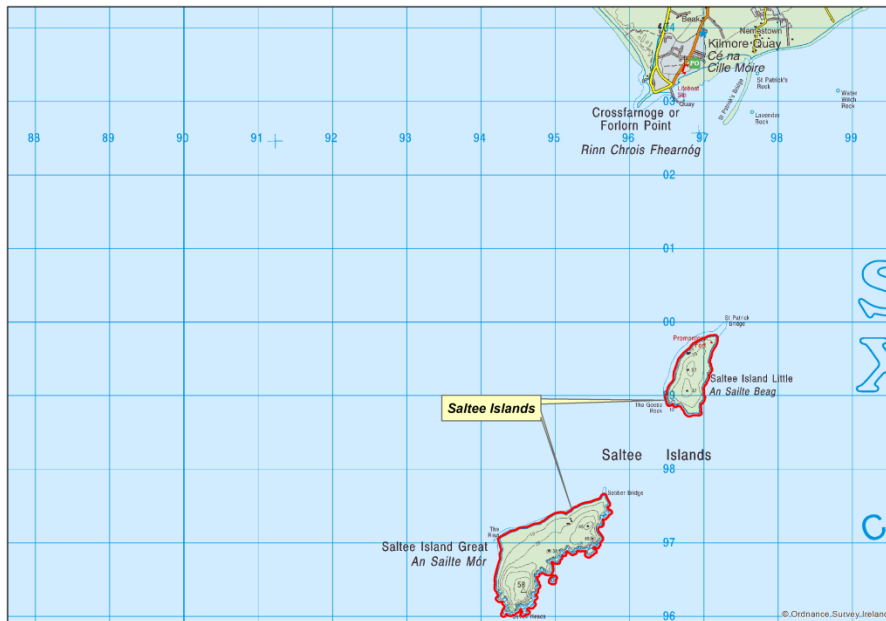
The islands are privately owned. Day visits to Great Saltee are permitted; however, difficult landing conditions restrict visits to Little Saltee. The Saltees Granite occurs low on the shoreline to the east of the harbour at Kilmore Quay. This marks the northern margin of the foliated granite body, where it is in contact with gneiss of the Rosslare Complex.



St. Patrick's Bridge (half-tide) extending southwards towards the Saltee Islands (distance).
St. Patrick's Rock visible on left. Kilmore Quay Harbour visible far right.



Southeastern coast of Great Saltee Island.*



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Screen Hills
Other names used for site	Screen Hills kame-moraine, Screen Hills moraine, the Wexford gravels, the Wexford manure (or manurial) gravels
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Kilmacoe, Ballinesker, Ballaghablake, Ballinacoola, Glenbough, Ballyhowbeg, Ballymore, Ballyheige, Ballylemin, Glebe, Ballinrooaun, Ballinra, Ballyvalloo Upper, Ballyvalloo Lower, Barnariddery Curracloe
NEAREST TOWN/VILLAGE	Curracloe
SIX INCH MAP NUMBER	33
ITM CO-ORDINATES	710325E 629600N (centre of hills)
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	19

Outline Site Description

The Screen Hills area in Wexford is approximately 5 kilometres east-west by 5 kilometres north-south, and is comprised of glaciofluvial and glaciolacustrine sands and gravels which form a hummocky region, approximately 20m-30m above the surrounding land to the west, north and south.

Geological System/Age and Primary Rock Type

The Screen Hills is underlain principally by bedrock comprising Cambrian greywackes and slates in the north, and impure, Lower Carboniferous limestones in the south. The hills themselves were formed in the Quaternary Period, at the end of the Ice Age, when ice was retreating across the locality and producing vast amounts of meltwater.

Main Geological or Geomorphological Interest

The area comprising the Screen Hills consists of a large sand and gravel body, which forms one of the largest sand and gravel aquifers in Ireland. Boreholes into the gravel body have confirmed depths-to-bedrock, predominantly through gravels, of up to 70m thick; these are therefore some of the deepest glacial sediments in the country.

This is an area of rolling kame and kettle-type topography which is often characterised by steep slopes, discontinuous ridges and enclosed depressions. Extensive coastal exposures show a general coarsening-upwards sequence of mud, sand, gravel and diamict, influenced by ice thrusting and gravitational loading, and displaying magnificent glacio-dynamic structures. The pitted nature of the locality is a result of blocks of dead ice melting at the end of the ice age.

The presence of molluscs within the gravels has long been noted in the Quaternary literature, with over 130 individual species found. The sediments themselves have been interpreted by various authors as deposited into a large body of water; either interglacial marine, glaciolacustrine, or glaciomarine.

Site Importance - County Geological Site; recommended for Geological NHA

The site is unique in the number and variety of kame and kettle forms which lie side by side in a relatively small area. The site is of international importance.

Management/promotion issues

This is an excellent site in terms of macro-scale Quaternary glacial geomorphology and should be promoted as unique amongst landscape elements, within both the Wexford County Development Plan, and in Landscape Characterisation. The most prominent kames, in terms of elevation and scale, should be protected.



Extensive sand pit at Ballinrooaun, Castle Ellis, Screen.



The kame and kettle topography of the Screen Hills locality; here viewed from Glebe, near Screen, looking southwest.



Kettle lakes at Ballinrooaun.



Deep, lake-filled kettle hole at Ballyvalloo.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	St. Helen's Glaciomarine Mud		
Other names used for site			
IGH THEME	IGH7 Quaternary		
TOWNLAND(S)	St. Helens Burrow, Bing		
NEAREST TOWN/VILLAGE	Rosslare		
SIX INCH MAP NUMBER	48		
ITM CO-ORDINATES	705522E 606228N (centre of feature)		
1:50,000 O.S. SHEET NUMBER	77	GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A coastal section, comprising low cliffs backing a long gently-curved sandy beach between Greenore Point and St.Helen's.

Geological System/Age and Primary Rock Type

Quaternary (Late Devensian) age glaciomarine muds with shelly material of Arctic marine fauna. The sediments are underlain by Neoproterozoic amphibolite, grey-coloured gneiss (Greenore Point Group) and dark-coloured diorite.

Main Geological or Geomorphological Interest

The coastal section consists of sloping vegetated muddy cliffs (bluffs) made up of massive to laminated muds, with some silty horizons, and an overall absence of coarse-grained material in the cliffs. The layers (diamicts) contain well-preserved shelly cold-water microfauna (*E. clavatum*; *C. lobatalus*). These shell-fish microfauna are commonly found in marine waters in Arctic regions, indicating that Arctic conditions prevailed in south Wexford during the last Ice Age. This all indicates that the muds were deposited by glaciers in a marine environment (i.e. glaciomarine).

Site Importance – County Geological Site

This is an important County Geological Site with mud and silt layers in cliff sections that provide evidence for glaciomarine conditions during the decay cycle of the Irish Sea glacier towards the end of the last Ice Age. The site includes St. Helen's Burrow pNHA (000782) and is situated along the boundary of Carnsore Point SAC (002269).

Management/promotion issues

The site was designated a Coastal Policy Area under the County Development Plan (2007-2013) for its intrinsic natural and special amenity value and limited capacity to absorb development. Coastal erosion is a continual factor affecting this coastline. This site is not deemed of particular public interest, as it resembles much of the Wexford coastline north and south of Rosslare, where muddy cliffs and bluffs are being eroded by the sea.



View of muddy cliffs along beach looking southwest to St. Helen's Golf Club.



Vegetated cliff collapses along the beach between St. Helen's and Greenore Point.



Muddy cliffs below St. Helen's Golf Club.



Mud exposed at foot of cliff overlying amphibolite near Greenore Point.



Marine bivalve shells in cliff muds at Greenore Point.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	St. Patrick's Bridge
Other names used for site	St. Patrick's Rock, Nemestown Shore
IGH THEME	IGH7 Quaternary, IGH13 Coastal Geomorphology
TOWNLAND(S)	Nemestown
NEAREST TOWN/VILLAGE	Kilmore Quay
SIX INCH MAP NUMBER	47, 52, 53
ITM CO-ORDINATES	697540E 603420N
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A long narrow tidal ridge of bouldery gravel extending almost 4 kilometres south from the Nemestown shore towards the Saltee Islands.

Geological System/Age and Primary Rock Type

The moraine ridge landform is comprised of Quaternary Age glacial sediments (mud, sand, gravel, boulders) deposited during the last Ice Age.

Main Geological or Geomorphological Interest

St Patrick's Bridge is an elongate landform which extends out (southwards) from the coast obliquely into the Celtic Sea. Composed of laminated muds with layers of sand, gravel and large pinkish-red granite boulders, the feature has been interpreted as a moraine ridge deposited at the southern margin of a grounded Irish Sea glacier. The 'bridge' probably extended as a sub-aerial land bridge to the Saltee Islands after the last Ice Age, but was drowned, eroded and reworked with rising sea-levels. The landform appears to have altered little since Ordnance Survey maps were first produced in the 1830s and 1840s. The muds and shell fragments in the lowermost sediments (basal diamicts) indicate an Irish Sea origin for the moraine (Irish Sea Till). The diamict is interpreted as a subglacial till. Bouldery accumulations of similar origin are present immediately east of St Patrick's Bridge.

Just east of the 'bridge', and about 250m offshore, a large glacial erratic (Carnsore Granite) known as St. Patrick's Rock, stands proud above the sea-surface. Erratic boulders, occurring in abundance to the east of the 'bridge' are mostly granitic. To the west, erratics are rare, indicating the ice front terminated at the St. Patrick's Bridge. The Sebbur Bridge (rocky moraine) extends northwards from Great Saltee Island.

Site Importance – County Geological Site; recommended for Geological NHA

This important County Geological Site merits designation as a Geological NHA. It is located with the Saltee Islands SAC (000707). The moraine ridge is an important site for Irish Quaternary stratigraphy and helps in the understanding of the origin of the Irish Sea Till and the extent of the last British-Irish Ice Sheet in the Celtic Sea during the Last Glacial Maximum (LGM). Radiocarbon dating (47,175 to 29,305 14^{C} yr BP) of marine shells in the muddy sediments at Kilmore Quay has been used to infer the maximum extent of the British-Irish Ice Sheet during the Last Glacial Maximum (after 20,000 14^{C} yrBP).

Management/promotion issues

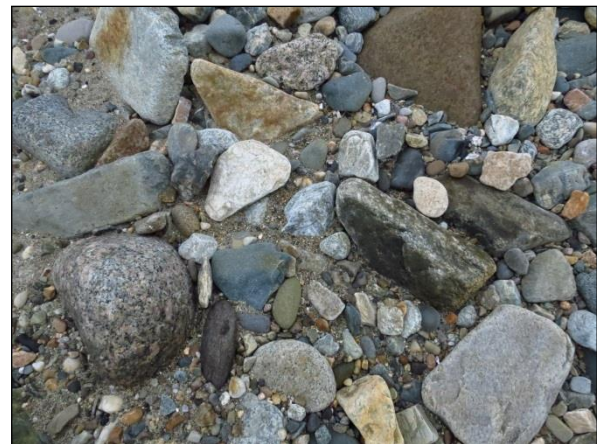
This is an excellent site in terms of macro-scale Quaternary glacial geomorphology. The nearshore part of the site is accessible *via* the beach at Nemestown and is easily visited at low-tide in calm weather conditions. Legend has it the 'bridge' was formed when St. Patrick, chasing the Devil, flung a succession of stones after the fleeing Devil, who was swimming out to sea. The arc-shaped moraine traced the route of the swimmer. The same legend tells of St. Patrick's Rock being flung from Forth Mountain by the holy saint, and is an example of where legend and truth confront: the source being quartzite and the megalith being granite. Nevertheless, these are two examples of geomythology from Irish folklore.



Viewed from Nemestown Shore: St. Patrick's Bridge (half-tide) extending south towards the Saltee Islands (distance). St. Patrick's Rock visible on left. Kilmore Quay Harbour visible far right.



Herring and Great Black-backed gulls on moraine. Little Saltee Island to the south.



Variety of rock types (granite, gneiss, schist, sandstone, limestone) on the beach and moraine.

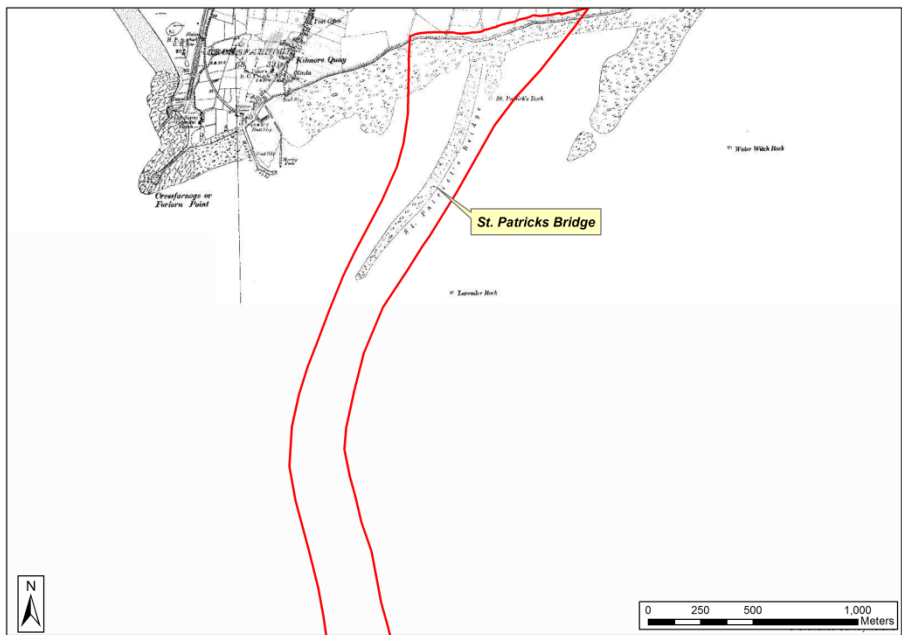
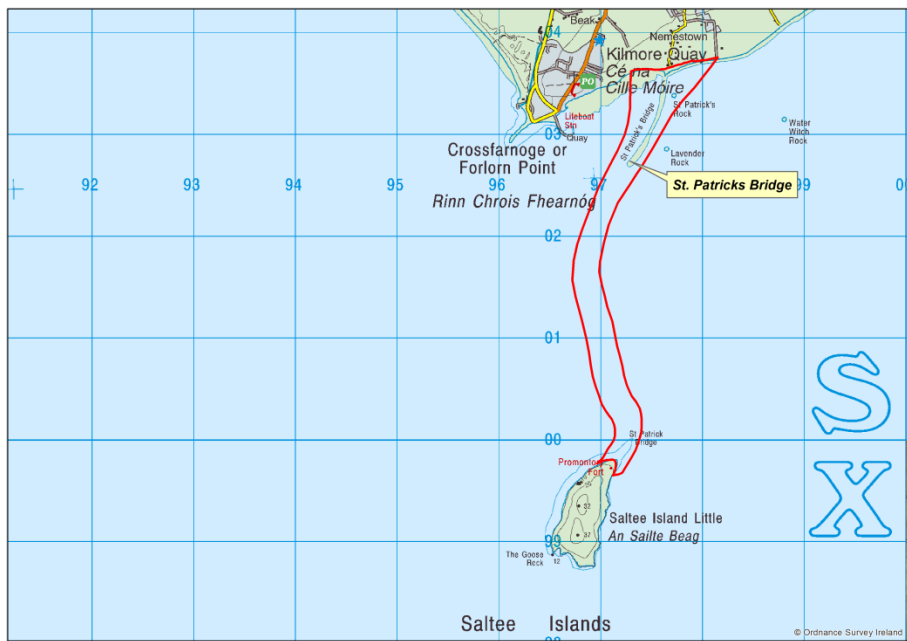


St. Patrick's Bridge viewed from offshore, looking north.*



Shingle beach, St. Patrick's Bridge, Saltee Islands (far left) and Kilmore Quay Harbour visible (far right).

* Image: Office of Public Works Coast of Ireland Aerial Oblique Imagery Survey 2003. Permission to reproduce acknowledged.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Tincone
Other names used for site	Ely House, Ely Lodge
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Tincone, Burgess
NEAREST TOWN/VILLAGE	Wexford
SIX INCH MAP NUMBER	38
ITM CO-ORDINATES	705667E 622800N (centre of section)
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

This site includes a low coastal cliff section that extends for several hundred metres and is c. 1m-3m high over most of its extent.

Geological System/Age and Primary Rock Type

The cliff section at Tincone is comprised of Quaternary Age glacial sediments, deposited during deglaciation at the end of the last Ice Age.

Main Geological or Geomorphological Interest

The cliff exposes sediments that are important to an understanding of deglaciation in this part of Ireland during the end of the last Ice Age.

The exposure contains five main facies, or units, of sediment:

- (1) A brown to light yellowish brown, well stratified, stony and sandy mud which is relatively clast-poor. This facies dominates the section, and clasts therein have the form of dropstones, with associated soft sediment deformations.
- (2) Lenses within the main facies 1, which have no internal stratification whatsoever.
- (3) A massive, pinkish grey to dark greyish brown clay, with elements of vertical fracturing.
- (4) A stony clay with little or no sand within.
- (5) A stratified pinkish grey to dark greyish brown clay, with elements of vertical fracturing.

The main units are facies 1 and facies 3, which are the tills of contrasting colour. The sequence is interpreted to have been deposited as a waterlain till, from ice, into a proglacial lake which occupied Wexford Harbour during deglaciation.

Site Importance – County Geological Site

The section at Tincone is important as its stratigraphy and sedimentology provides information on regional deglaciation and the section shows an excellent example of a laminated till, and of dropstones.

Management/promotion issues

The site is accessible *via* the public beach and is therefore easily visited. Much of the southern portion of the exposure has been damaged within the last twenty years, owing to a combination of building work, reclamation and drainage of land, coastal erosion and installation of coastal defences. The northern portion of the cliffs are also prone to slumping, and care must be taken when close to the faces. The importance of the section could be highlighted in promotional material for the Wexford Harbour proposed NHA, SAC and SPA.



View southwestwards along the exposed section at Tincone.



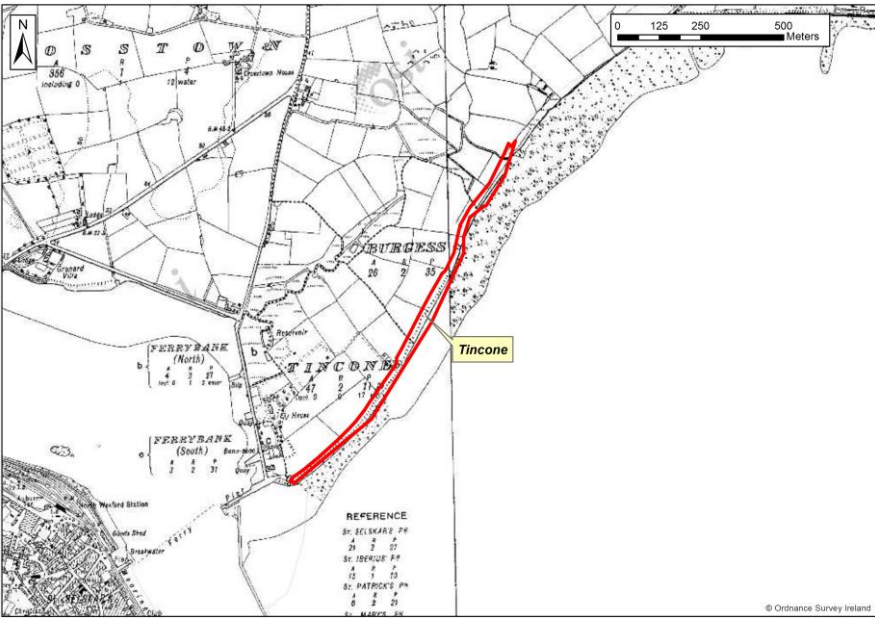
The boundary between two of the main till units in the section; see the colour difference.



A cobble dropstone within the section; see the soft-sediment deformations beneath.



The laminations within the section are clearly seen as horizontal fractures.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Carnsore Point
Other names used for site	Carnsore
IGH THEME	IGH11 Igneous Intrusions
TOWNLAND(S)	Nethertown, St. Vogue's, Churchtown, Carne (Carna)
NEAREST TOWN/VILLAGE	Lady's Island
SIX INCH MAP NUMBER	48
NATIONAL GRID REFERENCE	712150E 603750N
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A low-lying coastal landscape at the most southeastern part of Ireland.

Geological System/Age and Primary Rock Type

Late Caledonian granite emplaced about 430 million years ago during the Silurian Period. The granite is pink coloured and contains large crystals (phenocrysts) of 1-2cm, set in a finer matrix.

Main Geological or Geomorphological Interest

The Carnsore Granite was intruded across a shear zone about 430 million years ago, when shearing along the southern margin of the Rosslare Complex had ceased. The granite is undeformed, unlike the older Saltees Granite which is foliated. The Carnsore Granite is of particular interest in terms of geothermal heat production. The granite exhibits the second highest heat production rate (HPR) of the Irish granites with a HPR value of $6.42 \mu\text{W}/\text{m}^3$. (Mourne Granite has the highest HPR value of $6.83 \mu\text{W}/\text{m}^3$).

The Ordovician Tuskar Group sediments and volcanic rocks (occurring to the west at Tuskar Rock) were completely metamorphosed by the emplacement of the Carnsore Granite during Silurian times.

The site also includes important, mainly subtidal (some intertidal) reef comprising boulders fields and gently sloping bedrock extending offshore, from south of Carnsore Point to Greenore Point. Sections of mudflats and sandflats are exposed at low tide along the eastern coast, northwards from Carnsore Point to Rosslare Harbour. These habitats host a variety of community sub-tidal and intertidal fauna.

Site Importance – County Geological Site

This is an important County Geological Site, as it is the type location for the Carnsore Granite, and is the most southeastern tip of Ireland. (Not visible at the surface, the Carnsore Granite extends west beneath Lady's Lake and east to Tuskar Rock). The site is designated a SAC (Carnsore Point SAC 002269) and is of particular significance for the presence for reefs, mudflats and sandflats, all of which are habitats listed on Annex I of the E.U. Habitats Directive. This site is also partly within Lady's Island Lake pNHA (00704).

Management/promotion issues

Granite exposures occur along the shoreline at Carnsore and Carna. Large granite boulders occur along the southeast shore of Lady's Island Lake. The site is of interest to visiting geology student groups. Any promotion infrastructure (e.g. signboards) would be ideally situated at Lady's Island, as the site itself is exposed, access by foot is via small lanes, and there are no established parking areas nearby.



Granite exposures and wind turbines at Carnsore Point, Ireland's most southeastern point.*

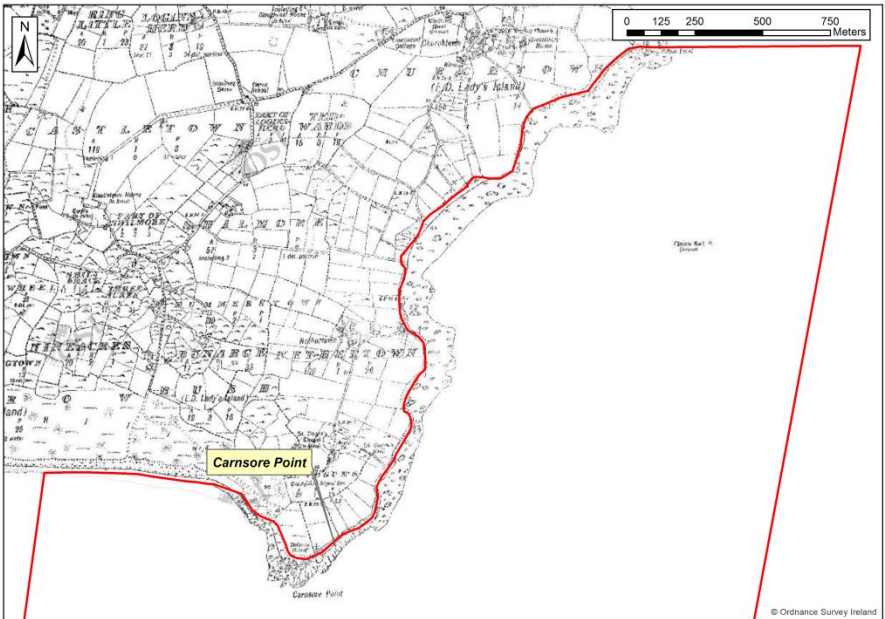


Granite boulders on the southern shore at Lady's Island Lake just west of Carnsore Point.



Granite walls at Carnsore. Wind turbine in background.

* Image: Office of Public Works Coast of Ireland Aerial Oblique Imagery Survey 2003. Permission to reproduce acknowledged.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Ballyteige Bay
Other names used for site	Ballyteige Burrow
IGH THEME	IGH13 Coastal Geomorphology
TOWNLAND(S)	Ballyteige Burrow
NEAREST TOWN/VILLAGE	Wexford
SIX INCH MAP NUMBER	46, 51
ITM CO-ORDINATES	692550E 606580N (centre of barrier spit)
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A long, shingle barrier spit with well-developed sand dunes backing on to Inish and Ballyteige Slob, on the coastline west of Kilmore Quay.

Geological System/Age and Primary Rock Type

A long, dune-capped barrier spit comprising sands, gravels and well-developed vegetated sand dunes, encloses a lagoon backed limestone lowlands. The dunes are Holocene in age, forming 6,000-3,000 years ago, well after the last glaciation. The barrier is underlain by a variety of rock types and ages including Precambrian Rosslare Group gneiss/schist; Permo-Triassic conglomerate/red beds; Carboniferous limestone, and Cambrian greywacke.

Main Geological or Geomorphological Interest

Ballyteige Burrow (townland) hugs the south Wexford coast for a distance of about 9 kilometres northwest from Kilmore Quay. The large dune system comprises dunes of over 20m in height. Embryonic fore-dunes flank the seaward side and fixed dunes extend along the central axis of the burrow. Blowouts and dune slacks in the fixed dunes expose sand and shingle deposits. A variety of well-rounded colourful cobbles can be seen along the beach.

First edition Ordnance Survey maps show the barrier spit at about 9km long, separating Ballyteige Lough from the sea. During mid-1800s works were carried out to reclaim a broad wetland area of the lough (about 660ha). Works included the construction of the Cull Bank (dam) across Ballyteige Lough, the building of Bridgetown Canal, and the construction of drainage networks across the polders. Today, the narrow spit extends over 5 kilometres northwest from the Cull Bank.

Radiocarbon dating of soil material buried under the dunes revealed dates of about 2,000 years before present. This implies that the sand dunes and shingle barrier were migrating landwards at that time. The name 'Burrow' refers to the historical use of the area as a managed rabbit warren since the High Middle Ages, c.1300 AD.

Site Importance – County Geological Site

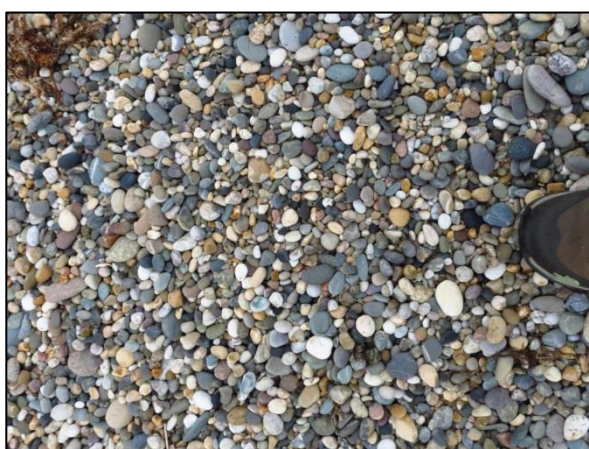
This is a very important County Geological Site considering the coastal geomorphology (beach, barrier spit, dunes, mudflats, saltmarshes), and the recent (<200 years) human-induced changes along the coastline. Ballyteige is recognised as one of the most important shingle-based dune systems in Ireland. This site is renowned for its ecological significance and includes Ballyteige Burrow SAC (000696), SPA (004020) and pNHA (000696).

Management/promotion issues

Access to the site on foot is easily afforded from Kilmore Quay. Established in 1987, the state-owned Ballyteige Burrow Nature Reserve is one of three nature reserves in Co. Wexford. A smaller area of the burrow is managed by Kilmore Quay Community Development Association as an amenity area. Kilmore Quay is a popular visitor destination, and the erection of a public information panel by the coastal path would help to promote the interesting aspects of this and other county geological sites nearby (Kilmore Quay, St. Patricks Bridge, Saltee Islands, Carnsore Granite).



Entrance to Ballyteige Burrow Nature reserve, and fixed dunes, viewed looking northwest.



Rounded cobbles along the beach.



Fore dunes and beach viewed looking southeast to Saltee Islands.



View of fixed dunes back onto the walking track along the rear of Ballyteige Burrow Nature Reserve. Kilmore Quay visible in background.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Bannow Bay
Other names used for site	<i>Cuan Bhanú</i>
IGH THEME	IGH13 Coastal geomorphology
TOWNLAND(S)	Grange, Dengulph, Stonehouse, Gorteens, Saltmills, Tintern, Saintkierans, Taulaght, Clonmines, Ballylannan, Ballyowen, Maudlintown, Barrystown, Kiltra, Newtown, Vernegly, Brandane, Bannow, Bannow Island
NEAREST TOWN/VILLAGE	Wellingtonbridge, Fethard
SIX INCH MAP NUMBER	40, 45, 50
ITM CO-ORDINATES	682400E 689600N (centre of bay)
1:50,000 O.S. SHEET NUMBER	76, 77 GSI BEDROCK 1:100,000 SHEET NO. 23

Outline Site Description

Bannow Bay is a wide coastal embayment, flanked on either side by sand spits and sandy beaches, and incorporating wide expanses of estuarine flats.

Geological System/Age and Primary Rock Type

The feature has been forming in the Holocene Period following the last glaciation, and the bay itself hosts soft mud, silt and sand sediment washed into it during that time. It is likely that the macro-structure of the bay dates back beyond the Quaternary (Ice Age) to the Palaeogene Period.

Main Geological or Geomorphological Interest

The estuary, including the saltmarshes, comprises just over 80% of the site. At low tide up to three-quarters of the substrate is exposed. There are mudflats in the narrow northern part and also in the southwest and southeast. The sediments of the inner estuary associated with the Corock and Owenduff Rivers are generally black anoxic mud, with some fine sand and broken shell.

The main areas of saltmarsh are on the islands at Clonmines, at the mouth of the tributary at Clonmines, at the mouth of the tributary at Taulaght, close to Saint Kieran's House, at the northwest of Big Burrow, at the south-east of Bannow Island and at the west of Rabbit Burrow in Fethard Bay. Very small fragmented linear strips of saltmarsh occur in the upper estuary as far north as the confluence of the Corock and Owenduff Rivers and along the other tributaries.

Also linked with saltmarshes in places are stony beaches and reedbeds. Narrow shingle beaches up to 30m wide occur in places along the edge of the estuary, as well as flanking sand dunes.

Site Importance - County Geological Site; recommended for Geological NHA

The extensive flats and the associated beach, dune and slack features, as well as the surrounding beaches, salt marshes and sand spits, make Bannow Bay a textbook locality for the recognition of coastal depositional features. The bay is already a proposed NHA (pNHA 000697, Bannow Bay), SPA and SAC for biodiversity reasons and the geodiversity of an active sedimentation system should be highlighted in promotion of this.

Management/promotion issues

The location of the features of interest makes them easily accessible, and Bannow Bay is a popular recreational area given the number of fine beaches and bird-watching sites around its perimeter. Information boards at the roadside viewing point at Barrystown are worthy additions to the site, and explain the features associated habitats, flora and fauna. The geological formation of and geomorphological processes taking place within the feature could be highlighted in future on literature produced on the bay.



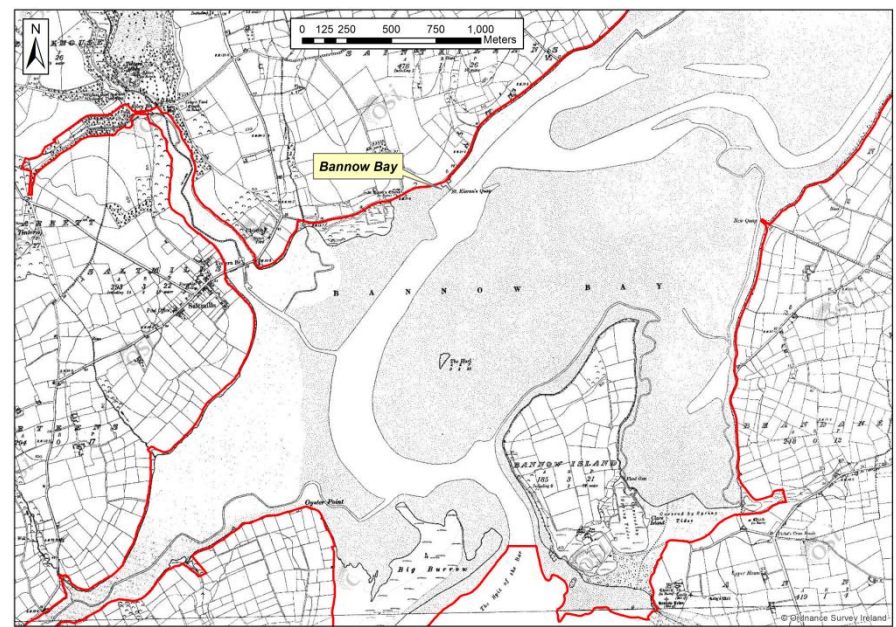
View across the stony beach and mudflats in Barrystown, along the northern edge of the bay.



Fine sandy beach with oyster collectors in the distance, at Kiltra.



View southwest towards Tintern, from Saintkierans Quay.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Cahore Polders and Dunes
Other names used for site	
IGH THEME	IGH13 Coastal geomorphology
TOWNLAND(S)	Cahore, Bog and Warren, Newtown, Oldtown, Templederry, Fodagh, Ballinoulart
NEAREST TOWN/VILLAGE	Cahore
SIX INCH MAP NUMBER	17, 22
ITM CO-ORDINATES	720900E 645030N (centre of features)
1:50,000 O.S. SHEET NUMBER	69
GSI BEDROCK 1:100,000 SHEET NO.	19

Outline Site Description

The Cahore Polders and Dunes are located just south of Cahore Point, 10 kilometres south of Courtown. The site comprises a sand dune system that extends along the coast for over 4 kilometres, backed by areas of polder grassland, wetland and drainage channels.

Geological System/Age and Primary Rock Type

The features have been forming in the Holocene Period following the last glaciation, and the dunes themselves comprises sand sediment continually blown and recycled onto them during that time. The adjacent, reclaimed polders are also Holocene in age.

Main Geological or Geomorphological Interest

A ridge comprising many individual sand dunes forms the eastern boundary of the site. The dunes are highest in the north (up to 18m high) and gradually become lower towards the south. The dunes display a well-developed zonation of fixed dunes grading eastwards to marram-dominated dunes, embryo dunes and, at the northern end of the beach, drift line vegetation.

The dunes grade westwards to polder grassland. This area was formerly a wetland, which has been drained and reclaimed to provide improved grassland for grazing animals. Numerous drainage channels traverse the polders; these are lagoonal in character and contain brackish water. The presence of the brackish water in these channels is the result of inefficiencies in flap valves which have allowed seawater to enter.

Several artificial ponds with more or less fresh water occur near the southern end of the site, in Ballinoulart.

Site Importance - County Geological Site

The site is a textbook locality for the recognition of a dynamic coastal depositional environment. The site is already a proposed NHA (pNHA 000700, Cahore Polders and Dunes), SPA and SAC for biodiversity reasons and the geodiversity of this active sedimentation system should be highlighted in promotion of this.

Management/promotion issues

The location of the features means they are easily accessible, and Ballinoulart beach and the adjacent dunes are popular recreational features. Information boards which explain the features geological formation, and the geomorphological processes taking place within the site, would be worthy additions and this information could also be highlighted in future on literature produced on the polders and dunes.



View southwest from the dune ridge across the polders (flooded, early January 2016).



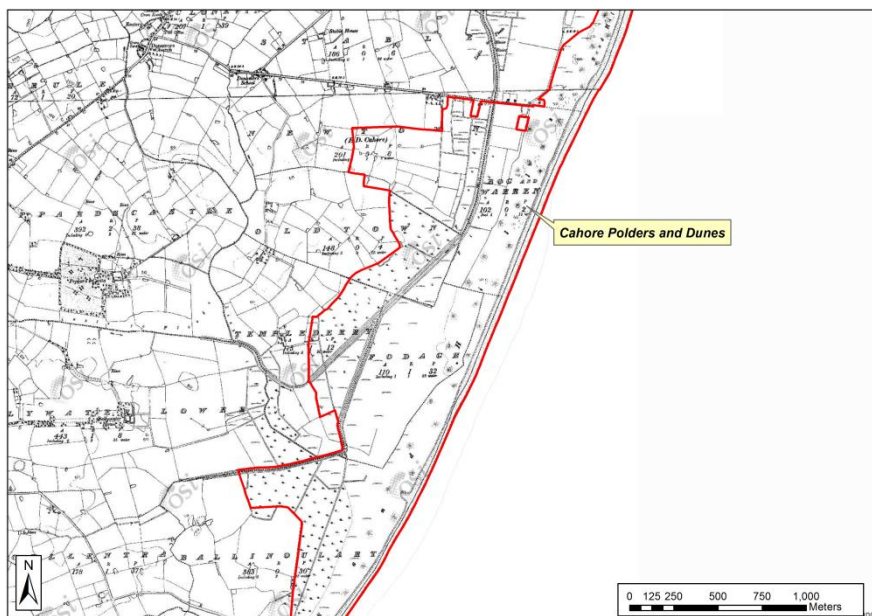
One of the freshwater lakes in Ballinoulart.



One of the brackish ponds in Oldtown.



Some of the highest, fixed dunes at Cahore.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Curraclloe Beach and The Raven Point
Other names used for site	Raven Nature Reserve, The Raven
IGH THEME	IGH13 Coastal geomorphology
TOWNLAND(S)	The Raven, Ballinesker, Ballyaloo Lower, Ballynaclash, Ballyconnigar Lower
NEAREST TOWN/VILLAGE	Curraclloe
SIX INCH MAP NUMBER	33, 38
ITM CO-ORDINATES	711500E 627575N (entrance to beach at White Gap)
1:50,000 O.S. SHEET NUMBER	77 GSI BEDROCK 1:100,000 SHEET NO. 19, 23

Outline Site Description

Curraclloe Beach and the Raven Point comprises the coastal strip running north to Blackwater Head and the dynamic sand dune system of Raven Point itself.

Geological System/Age and Primary Rock Type

The feature has been forming in the Holocene Period following the last glaciation, and the beach itself comprises sand sediment continually washed and recycled onto it during that time. The adjacent sand dunes, though windblown and formed by a different process, are also Holocene in age.

Main Geological or Geomorphological Interest

Curraclloe Beach is the result of wave action by which waves or currents move sand, which makes up the beach, as these particles are held in suspension. Sand may also be moved by saltation (a bouncing movement of large particles). The sand in the beach originated in the sands and gravels deposited in the Screen Hills and Blackwater areas at the end of the last Ice Age, and have been continually eroded, deposited and reworked since then.

The Raven Point is a sand spit, which formed as a result of deposition by longshore drift, which is the movement of sand along the coast by the waves. The spit is formed when the sand material that is being carried by the waves gets deposited due to a loss of the waves energy, because of the estuary emerging in adjacent Wexford Harbour slows it down. As time progresses the deposited material has formed a spit.

The dynamic nature of the system at the Raven Point is best seen at the southern end of the site where sand flats, lagoons, driftlines and small dune slacks develop and are being continuously transformed by the activity of the sea and the wind. Much of the dunes was planted with commercial conifer forest in the 1930s and 1950s, partly as a coastal defence measure to stabilise the dunes and protect the polder of the North East Slob to the west of it. Interestingly, some of the current slack communities are associated with artificial ponds that were originally created as forest fire control reservoirs.

Site Importance - County Geological Site

The beach is a textbook locality for the recognition of a dynamic coastal depositional environment. The beach is already a proposed NHA (pNHA 000712, Wexford Slobs and Harbour), SPA and SAC for biodiversity reasons and the geodiversity of an active sedimentation system should be highlighted in promotion of this.

Management/promotion issues

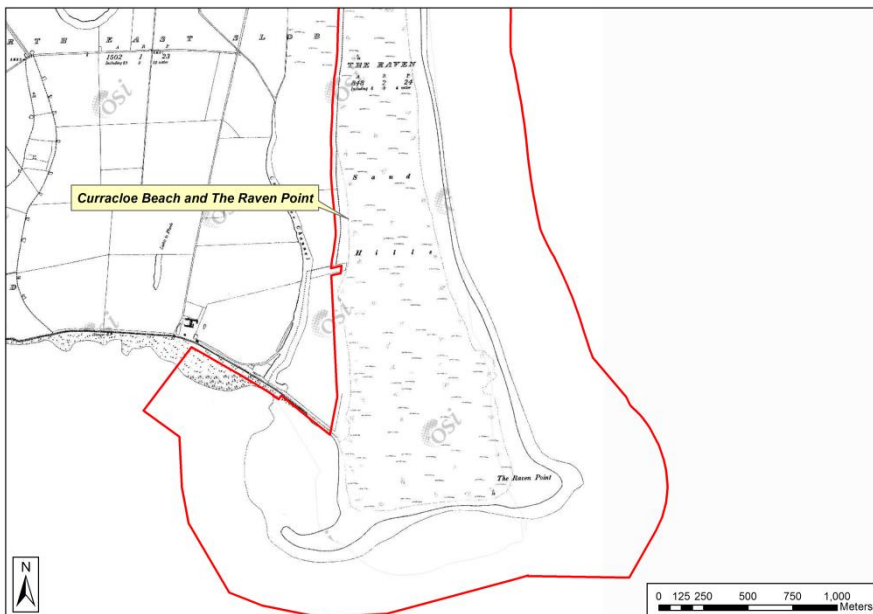
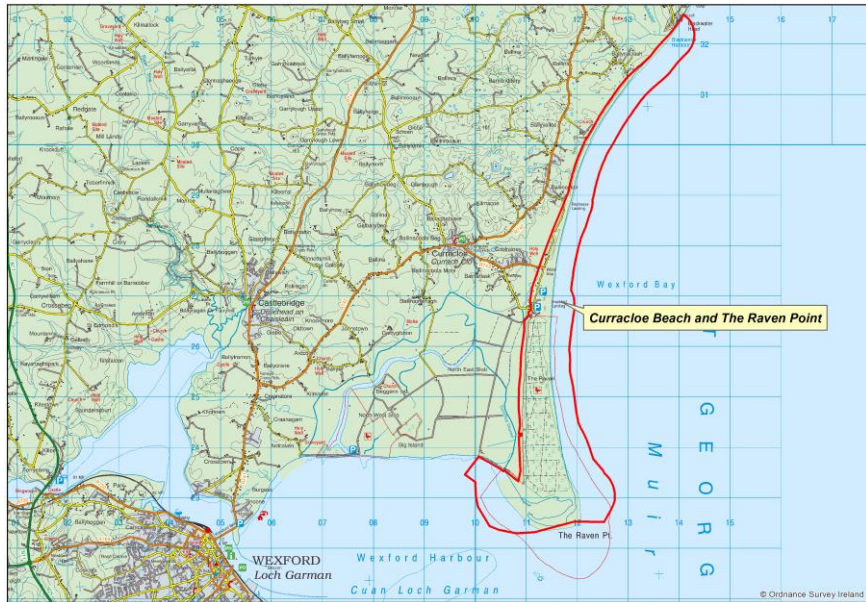
The location of the feature means it is easily accessible, and Curraclloe beach and The Raven Nature Reserve are popular recreational features. Information boards are worthy additions to the site, and explain the features associated habitats, flora and fauna. The geological formation of and geomorphological processes taking place within the site could be highlighted in future on literature produced on the beach and Raven Point.



A view of Curracloe beach, looking south towards The Raven Point.



The sand dunes north of Curracloe, looking north towards Blackwater Head.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Kilpatrick Sandhills
Other names used for site	
IGH THEME	IGH13 Coastal Geomorphology
TOWNLAND(S)	Kilpatrick, Kilmichael
NEAREST TOWN/VILLAGE	Coolgreany
SIX INCH MAP NUMBER	3, 7
ITM CO-ORDINATES	724750E 665700N (centre of sandhills)
1:50,000 O.S. SHEET NUMBER	62 GSI BEDROCK 1:100,000 SHEET NO. 19

Outline Site Description

The Kilpatrick Sandhills comprise a mature sand dune system which extends along 2 kilometres of coastline, approximately 8 kilometres south of Arklow Town.

Geological System/Age and Primary Rock Type

The features have been forming in the Holocene Period following the last glaciation, and the sandhills themselves comprise sand sediment continually blown and recycled onto them during that time.

Main Geological or Geomorphological Interest

The site includes sand dunes in various stages of dune formation, from small fore dunes which are stabilized by marram grass, to mature fixed dunes. Embryonic shifting fore dunes occur mainly along the middle and southern sections of the site.

On the landward side of the dunes, in the middle of the site, there is a low-lying marsh, bounded again at the west by scrubby woodland. Parts of the site are used for grazing cattle, and the grazing is a critical factor in such coastal systems, as the correct grazing pressure maintains species-rich open swards and curtails scrub encroachment. Over-exposure to grazing and amenity usage can cause damage to dune vegetation, however, and exacerbate dune erosion.

At the northern end of the site Kilmichael Point forms a rocky headland, affording fine views along the coastline. Bedrock outcrops occur here where the overlying glacial till has been eroded, exposing cliffs which rise in steps to about 10m above sea level.

Site Importance - County Geological Site

The site is important as a good example of a mature and fairly intact sand dune system which shows the developmental stages of dunes from fore dunes to mature fixed dunes. The site is already a proposed NHA (pNHA 001742, Kilpatrick Sandhills) and SAC for biodiversity reasons and the geodiversity of this active sedimentation system should be highlighted in promotion of this.

Management/promotion issues

The location of the sandhills means they are easily accessible, and Kilpatrick beach and the adjacent dunes are popular recreational features, particularly at the southern end of the site. However, erosion is an issue along this stretch, and the coastline is receding rapidly here.

Information boards which explain the feature's geological formation, and the geomorphological processes taking place within the site, would be worthy additions and this information could also be highlighted in any future literature produced on the sandhills.



View north along the beach, from the central portion of the sandhills.



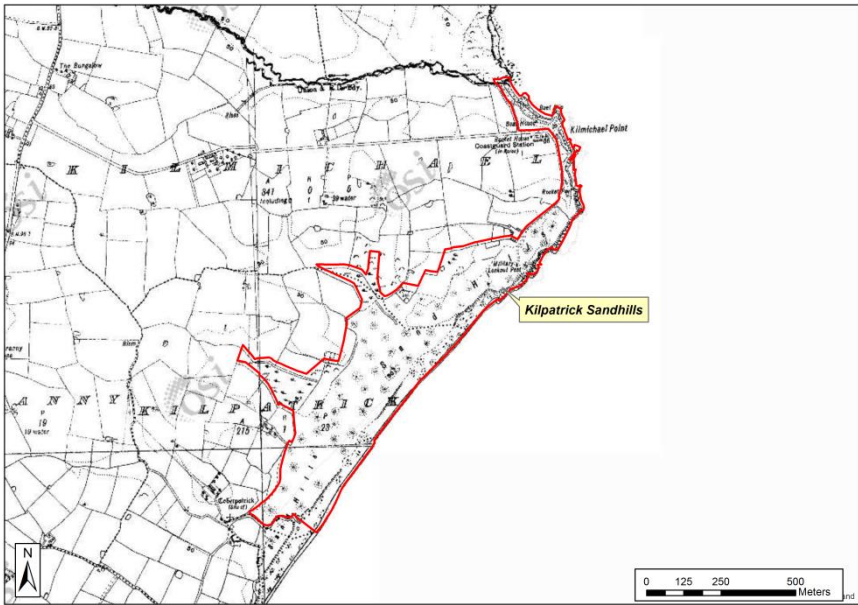
View south across the sandhills, across some of the mature, fixed dunes.



The low-lying marsh to the west of the dunes.



Erosion at the southern end of the site.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Lady's Island Lake
Other names used for site	
IGH THEME	IGH13 Coastal Geomorphology, IGH14 Fluvial and Lacustrine Geomorphology
TOWNLAND(S)	Numerous townlands bordering lake
NEAREST TOWN/VILLAGE	Lady's Island
SIX INCH MAP NUMBER	48, 53
ITM CO-ORDINATES	709800E 606300N (centre of lake)
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A shallow coastal lagoon, separated from the sea by a sandy gravel barrier, situated about 3km west of Carnsore Point at the most southeastern tip of Ireland.

Geological System/Age and Primary Rock Type

The floor of the lagoon varies from mud to sand and gravel, and overlies predominantly Caledonian granite (Carnsore Granite and Saltees Granite), and Precambrian gneisses (Kilmore Quay Group) to a lesser extent in the northern part of the lagoon. Two north-south trending faults follow the long north-south axis of the lagoon, and extend northwards to branch either side of Rosslare.

Main Geological or Geomorphological Interest

Lady's Island Lake is a natural, brackish, percolating lagoon (separated from the sea by a sand and shingle barrier through which seawater seeps or spills over the top), and is the largest of this type of sedimentary lagoon in the country. It is in a relatively natural condition, despite regular breaching of the sand and shingle barrier (often human-induced) which causes wide fluctuations in water-level and salinity. There is no natural outlet to the sea except seepage through the barrier to Coombe beach. The man-made breach in the barrier is known as '*The Cut*'. A shallow waterbody with a maximum depth of 5m in winter (about 1.5m in summer), the lagoon is almost 3.7km long (north-south) and has a maximum width of 1.8km (east-west), and covers a maximum flooded area of about 450ha in winter. Sediments on the floor of the 'lake' vary from mud (north end) to coarse sand and gravel (south end). Analysis of lake sediments indicate that freshwater conditions prevailed from about 4,500 to 1,700 years ago, after which salt water began to wash in. Numerous granite boulders lie along the southeast shore. The barrier is composed of coarse-to-fine gravels underlying small wind-blown (aeolian) sand-dunes. There are two islands in the lagoon: Sgarbheen and Inish. Lady's Island, in the north part of the lagoon, is connected to the mainland by a causeway.

Built in 1862-64, the Gothic revival Church of the Assumption at Lady's Island hosts a variety of stone including Connemara Marble altar fittings, Carlow granite columns, Middleton red 'marble' pillars, Caen stone (Normandy), white Sicilian marble and limestone.

Site Importance – County Geological Site; recommended for Geological NHA

Lady's Island Lake provides a habitat to many species of plants and birds and is a designated SAC (000704) under the EU Habitats Directive. Lady's Island Lake SPA (004009) is one of the most important ornithological sites in the country for breeding, wintering and 'stopping-off' migrating birds. This is a very important County Geological Site because of the direct influence of the geomorphology on ornithology, aquatic fauna and rare plant species. It therefore requires recognition as a geological NHA.

Management/promotion issues

Since the mid-17th century, deliberate breaching of the sand and shingle barrier ('*Cutting the Lake*') has been carried out to relieve flooding around the area. This practice is overseen by the National Parks and Wildlife Service, in association with the Lady's Island Lake Drainage Committee.



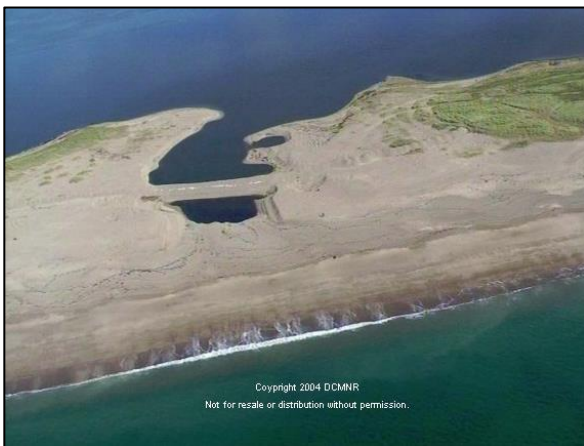
Lady's Island Lake viewed looking south from Lady's Island village.



Granite boulders on the southeast shore.



Viewing point and public information sign at Lady's Island village looking south.



Outlet from Lady's Island Lake to sea through shingle barrier.*



Coombe Beach sand and shingle barrier looking east.

* Image: Office of Public Works Coast of Ireland Aerial Oblique Imagery Survey 2003. Permission to reproduce acknowledged.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Tacumshin Lake
Other names used for site	Tacumshane, <i>Loch Sáile</i>
IGH THEME	IGH13 Coastal Geomorphology, IGH14 Fluvial and Lacustrine Geomorphology
TOWNLAND(S)	Numerous townlands bordering lake
NEAREST TOWN/VILLAGE	Tomhaggard
SIX INCH MAP NUMBER	47, 52, 53
ITM CO-ORDINATES	705522E 606228N (centre of feature)
1:50,000 O.S. SHEET NUMBER	77
GSI BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A shallow tidal lagoon, separated from the sea by a shingle bank and dunes.

Geological System/Age and Primary Rock Type

The waterbody, originally a small bay, now a lagoon, is Holocene in age and formed in post-glacial times. The lagoon overlies Precambrian amphibolites and gneiss bedrock (Rosslare Complex) and Caledonian granites (Saltee Islands Granite and Carnsore Granite).

Main Geological or Geomorphological Interest

Located about 1 kilometre southeast of Tomhaggard, this is a shallow coastal waterbody covering an area of about 3km². The lagoon is separated from the sea by a wedge-shaped sand and shingle barrier that extends eastwards along this gently-curving coast to Carnsore Point. The Irish name for the lake, *Loch Sáile*, accurately alludes to the saline nature of the lake.

Once a shallow bay, the waterbody was gradually cut off from the sea by a sand and shingle spit, formed due to longshore drift and extended westwards across the mouth the bay. The barrier has undergone numerous human-induced changes since about 1840, with the cutting of sluiceways (1860, 1974) and inlets (pre-1925); and the western Mountpill Burrows dunes effectively disappearing. Much of this was carried out to relieve flooding of surrounding farmland and to alleviate winter flooding when inflow from streams is greater than outflow through the seaward drainage pipes.

The sand and shingle barrier along this coastline exhibits evidence of landward (transgressive) migration of the barrier, as is the case near Carnsore where lagoonal clay bed sediments are overlain by overwash sands and gravel.

Site Importance – County Geological Site

This is an important County Geological Site. Tacumshin Lake is a designated SAC (000709) under Annex I of the EU Habitats Directive (sedimentary lagoon, stony banks, embryonic shifting dunes, marram dunes) and an SPA (004092) listed under the EU Birds Directive.

Management/promotion issues

The lake and barrier are in private ownership, and those accessing the site should take this into consideration. Tacumshin Lake SPA is one of the most important ornithological sites in the country. Further drainage system developments may impact the lagoon habitat. In recent times, the lagoon and sand dunes have undergone recreational activity induced damage (horse riding, vehicle driving). The significant influence of the coastal geomorphology on the habitats here, and at Lady's Island Lake, should be included in future ornithological publications on the area.



Tacumshin Lake viewed looking south, seaward.



Barrier at south end of Tacumshin Lake.



Northwest part of Tacumshin Lake viewed from Sigganstown.

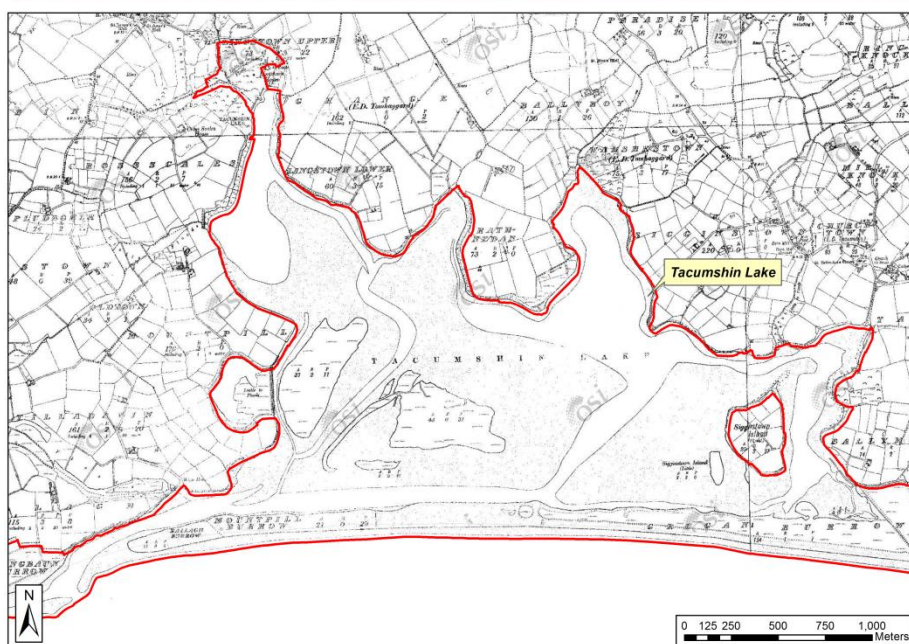


Outlet from Tacumshin Lake to sea through barrier.*



Sand and shingle shoreline between Tacumshin and Lady's Island Lake.

* Image: Office of Public Works Coast of Ireland Aerial Oblique Imagery Survey 2003. Permission to reproduce acknowledged.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Wexford Harbour
Other names used for site	<i>Cuan Loch Garman, The Slobs</i>
IGH THEME	IGH13 Coastal Geomorphology
TOWNLAND(S)	The Raven, North East Slob, Big Island, North West Slob, Ardavan, Burgess, Tincone, Ferrybank South, Townparks, Maudlintown, Rocksborough, Strandfield, Drinagh North, Drinagh South, Bogganstown Lower, Island, Hopeland, Burrow, Warren Lower
NEAREST TOWN/VILLAGE	Wexford
SIX INCH MAP NUMBER	37, 38, 42, 43
ITM CO-ORDINATES	708500E 621100N (centre of harbour)
1:50,000 O.S. SHEET NUMBER	77
GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

Wexford Harbour is a wide coastal embayment, flanked on either side by long sand spits and sandy beaches, and incorporating wide expanses of coastal flats.

Geological System/Age and Primary Rock Type

The feature has been forming in the Holocene Period following the last glaciation, and the bay itself hosts soft mud, silt and sand sediment washed into it during that time. It is likely that the macro-structure of the harbour dates back beyond the Quaternary (Ice Age) to the Palaeogene Period.

Main Geological or Geomorphological Interest

The bay is almost perfectly symmetrical and is bordered on the northwest by the Slaney River Estuary, which feeds freshwater into the harbour. The site is divided between the natural estuarine habitats of Wexford Harbour, the reclaimed polders known as the North and South 'Slobs', and the tidal section of the River Slaney.

Shallow marine water dominates the harbour, but at low tide extensive areas of intertidal flats are exposed. These vary from rippled sands in exposed areas to sandy-muds in the more sheltered areas, especially at Hopeland and the inner estuary to the west of Wexford bridge.

Salt marshes fringe the intertidal flats, especially in the sheltered areas such as Hopeland and towards Castlebridge. The Slobs are two flat areas of farmland, mainly arable and pasture grassland, empoldered behind 19th century seawalls. The lands are drained by a network of channels which flow into two central channels, in parts several hundred metres in width. Water from the channels is pumped into the sea with electric pumps.

Site Importance - County Geological Site; recommended for Geological NHA

The extensive flats and the associated beach, dune and slack features, as well as the surrounding beaches, salt marshes and sand spits, make Wexford Harbour a textbook locality for the recognition of coastal depositional features. The Harbour is already a proposed NHA (pNHA 000712, Wexford Slobs and Harbour), SPA and SAC for biodiversity reasons, and the geodiversity of an active sedimentation system should be highlighted in promotion of this.

Management/promotion issues

The location of the features of interest makes them easily accessible, and Wexford Harbour is a popular recreational area given the number of fine beaches and bird-watching sites around its perimeter. Information boards at the Wexford Wildfowl Reserve are worthy additions to the site, and explain the features' associated habitats, flora and fauna. The geological formation of the features, and geomorphological processes taking place within the harbour, could be highlighted in any future literature produced on the area.



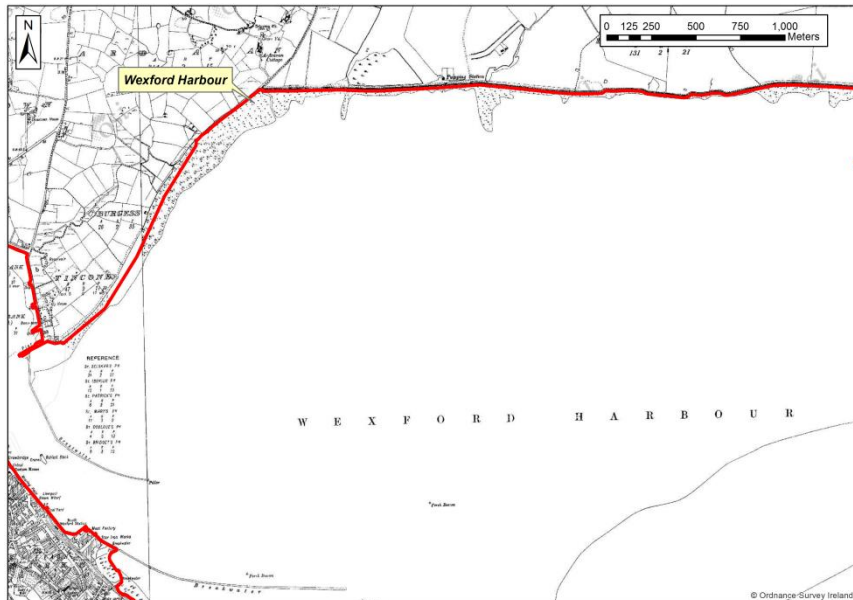
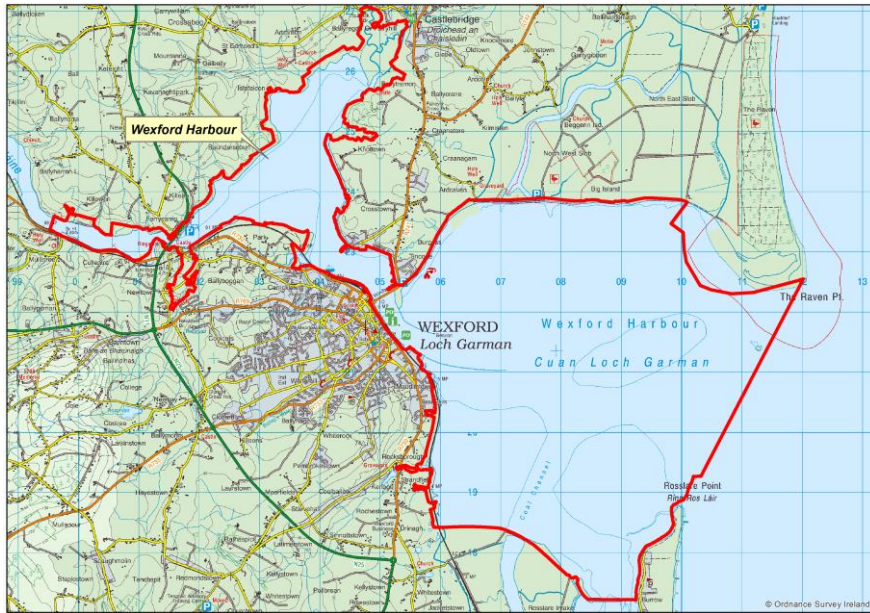
View across the mud, silt and sand flats, on the North West Slob.



Sand beach at the edge of Wexford Harbour, near Ardcavan.



View northeast from Rosslare Burrow across the Coal Channel.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Barrystown Mine
Other names used for site	
IGH THEME	IGH15 Economic Geology
TOWNLAND(S)	Barrystown
NEAREST TOWN/VILLAGE	Wellingtonbridge
SIX INCH MAP NUMBER	46
ITM CO-ORDINATES	685032E 612300N
1:50,000 O.S. SHEET NUMBER	77
GSI BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

A disused steam engine house in the middle of a pasture field.

Geological System/Age and Primary Rock Type

The mineral veins that were once mined here are of unknown age but they are hosted in Cambrian rocks of the Booley Bay Formation. The engine house itself is probably from a period of working in the mid-1800s.

Main Geological or Geomorphological Interest

This historic silver and lead mine was worked over several centuries. There are some reports of intermittent mining from the 8th to the 20th centuries. It is presumed that ore was supplied from here to the mint (for producing coins) at Clonmines across Bannow Bay in the time of King Charles 1, although that working ceased in 1565. Some 445 tonnes of ore is recorded from extraction between 1847 and 1850. Along with many historical mine workings, some re-examination took place during the First World War, and lead veins were proved to the east of the old workings by a Colonel Johnson. Quartz-siderite veins with argentiferous (silver bearing) galena (lead ore) and some sphalerite and chalcopyrite mineral was recorded.

Site Importance – County Geological Site

This is a very modest site, with mostly historical interest, but in view of the rarity of mining heritage in Wexford, it is worth recording as a County Geological Site.

Management/promotion issues

The engine house is in a poor state and will not last very long without some intervention to stabilise it and prevent collapse. Timber lintels in windows, doors and functional openings are all rotted and masonry collapse is taking hold. The extensive ivy is also a problem. No lightning conductor was seen, and if none exists a lightning strike could destroy the chimney. The brick top on the chimney is still in a near complete state.

By comparing historical maps showing the positions of shafts and more recent aerial photographs and other photos (e.g. page 36, Plate 8 of the GSI Map Report for Sheet 23 – South Wexford) it is apparent that much levelling of ground has taken place, eliminating evidence of spoil heaps, locations of shafts and any other mine buildings.



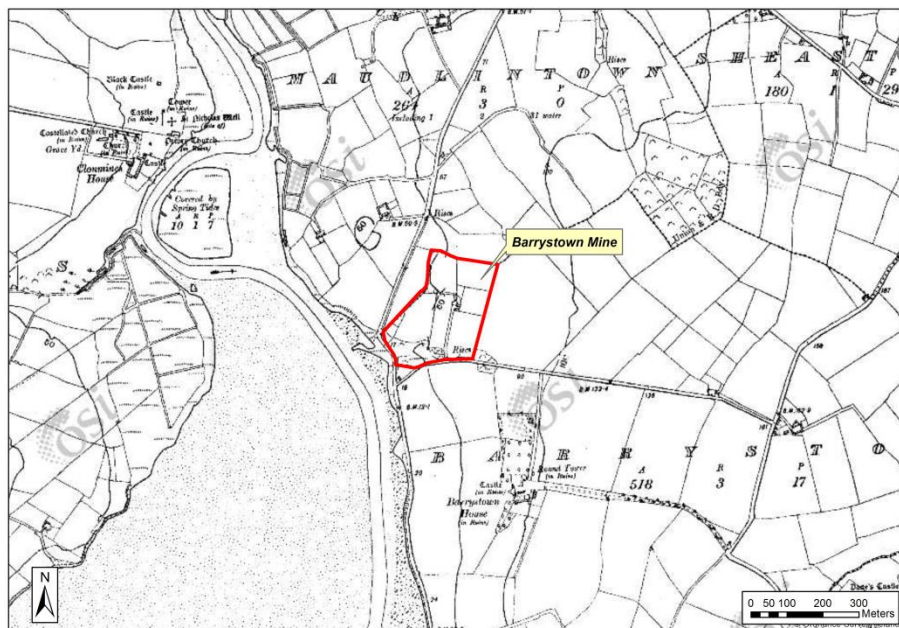
The engine house at Barrystown looking northwest across Bannow Bay.



The brick top of the chimney survives better than many such structures.



Precarious masonry in need of consolidation and conservation work.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Caim Mine		
Other names used for site	Ballyhighland		
IGH THEME	IGH15 Economic Geology		
TOWNLAND(S)	Aughathlappa		
NEAREST TOWN/VILLAGE	Enniscorthy		
SIX INCH MAP NUMBER	19		
ITM CO-ORDINATES	688475E 640942N		
1:50,000 O.S. SHEET NUMBER	68	GSi BEDROCK 1:100,000 SHEET NO.	23

Outline Site Description

Disused mine site.

Geological System/Age and Primary Rock Type

The mineralisation is both in veins and stratiform, so it may be as old as the early Ordovician rocks of the Oaklands Formation in which it is hosted, but it could be younger. The historical mining took place in the early and mid-1800s.

Main Geological or Geomorphological Interest

This historic mine site exploited a quartz vein containing argentiferous (silver bearing) galena with minor sphalerite, chalcopyrite and cerussite. The mine opened around 1815, but was abandoned in the 1820s for a lack of appropriate machinery. The mine was taken over by the Mining Company of Ireland in 1836 and worked until 1845-6. It closed due to a dispute between the landowner and the MCI. Mineral Statistics indicate some 3360 tonnes of galena were extracted during the period 1838-1846.

Two chimneys from steam engines remain on the site, along with a significant spoil heap area. The spoil contains a significant proportion of toxic metals. A joint study by the Geological Survey of Ireland and the Environmental Protection Agency in 2009 measured the contamination and risk. To reduce disturbance from quad bikes the spoil is now fenced off. It was previously extracted on a small scale for local use as sand on gravestones since its toxicity prevented weeds growing on the grave. The full EPA-GSI report is available here: <http://www.epa.ie/pubs/reports/land/mines/#.Vrj6DhwrFMs>

Site Importance – County Geological Site

This is a rare example of historic mining in the county and worth listing as a County Geological Site for that reason. The chimneys are listed in the National Inventory of Architectural Heritage (15701912). <http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=WX®no=15701912>

Management/promotion issues

The area is quite overgrown and the features are not easy to access. The spoil is fenced off completely. There is some rubbish dumping in the woods surrounding the mine site. The site is not suitable for general promotion without a significant investment in safety, access, interpretation and building conservation, if the landowner is identified.



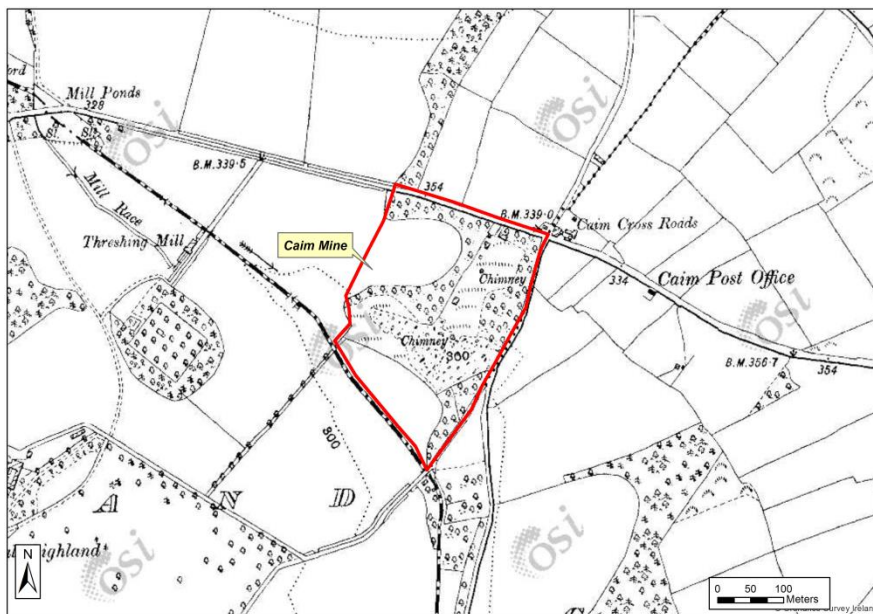
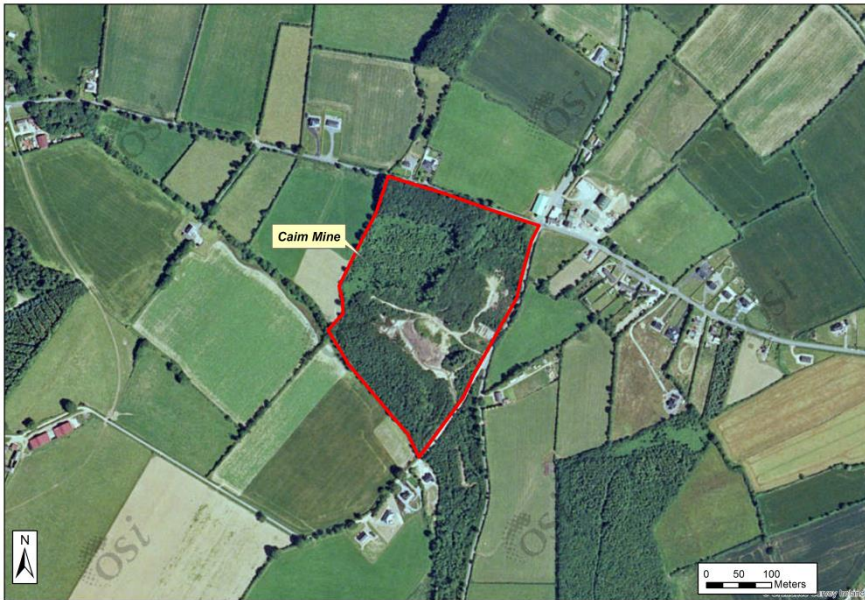
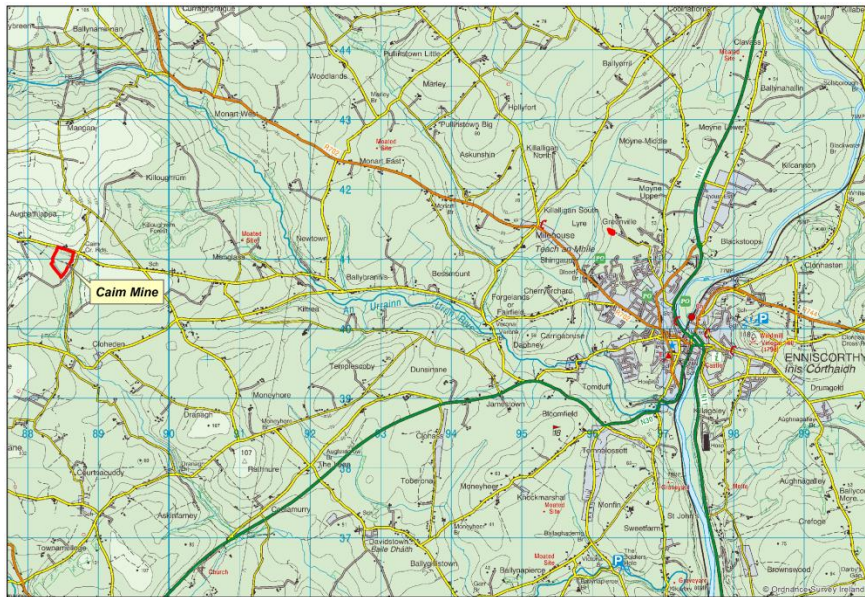
An overview of the site.



The spoil heap at Caim.



One chimney with brick top.



WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Graigue Great	
Other names used for site	Millstone Hole	
IGH THEME	IGH15 Economic Geology	
TOWNLAND(S)	Graigue Great	
NEAREST TOWN/VILLAGE	Fethard	
SIX INCH MAP NUMBER	60	
ITM CO-ORDINATES	677600E 602060N	
1:50,000 O.S. SHEET NUMBER	76	GSI Bedrock 1:100,000 Sheet No. 23

Outline Site Description

A short section of coast just north east of Barry's Gate on a slight headland.

Geological System/Age and Primary Rock Type

The rocks here are Devonian in age, informally called 'the Old Red Sandstone', but classed as the Harrylock Formation. There are thick conglomerate beds and coarse grained red sandstones. The same formation outcrops across the peninsula, and was also quarried at the companion site of Harrylock Bay.

Main Geological or Geomorphological Interest

This site is included as a key source of millstones in historical times. It owes its existence simply to people recognising the value of a very specific lithology. From Medieval times up to early Modern times in Ireland, suitable rock types for millstones in wind and water powered mills would have been highly prized. The quartz conglomerates both here and at Harrylock Bay clearly provided a suitable rock, indicated by the large numbers of circular 'dishes' or scars from where stones were extracted. A circular ring was chiselled out for the outer edge and a small hole in the centre for the axle. Water and wooden wedges could then help split the stone off along a natural bedding plane.

Watercolour paintings by George Victor Du Noyer from the mid 1800's illustrate the site and there are suggestions of cranes in use. However millstones could also have been floated off rocks strapped to boats using the rising tide.

Site Importance – County Geological Site; may be recommended for Geological NHA

This is an important industrial archaeology site which should be protected through recognition as a County Geological Site. When the IGH15 Economic Geology Theme is fully assessed for the best sites on a national basis this site may be one that is recommended for NHA status.

Management/promotion issues

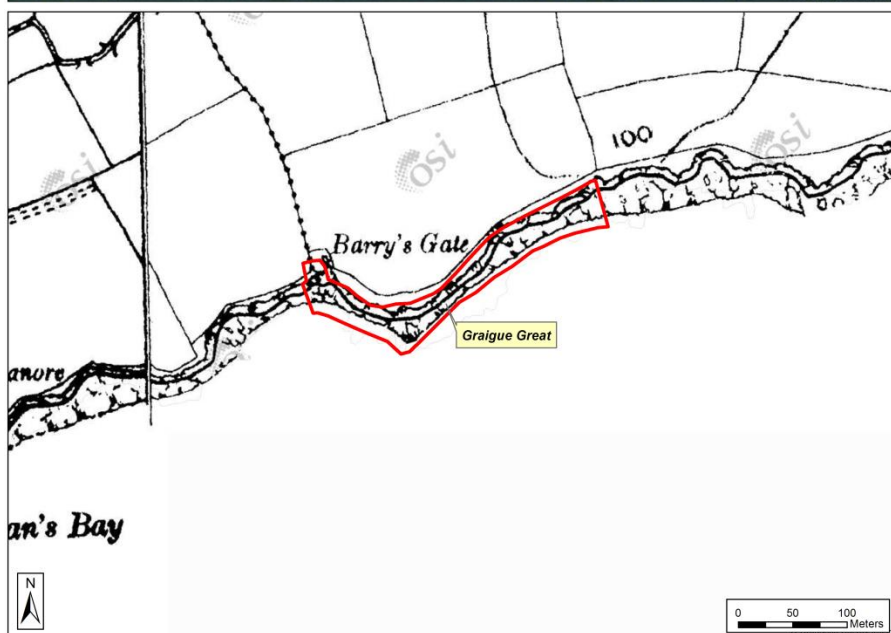
The site could possibly be promoted, obviously depending on suitable access and landowner permission being agreed and organised. However it not easily accessible at all at present and there is no path or track to the site.



There are more than 15 'dishes' where millstones were removed in this view.



A series of multiple 'dishes' where millstones were removed.





Watercolour by George Victor Du Noyer of millstone quarrying at Graigue Great.



Watercolour by George Victor Du Noyer of millstone quarrying at Graigue Great.

WEXFORD - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Harrylock Bay		
Other names used for site	The Scout's Hiding Place		
IGH THEME	IGH15 Economic Geology		
TOWNLAND(S)	Templetown		
NEAREST TOWN/VILLAGE	Fethard		
SIX INCH MAP NUMBER	49		
ITM CO-ORDINATES	675250E 602200N		
1:50,000 O.S. SHEET NUMBER	76	GSI Bedrock 1:100,000 Sheet No.	23

Outline Site Description

A short section of coastal exposures which have been extensively quarried.

Geological System/Age and Primary Rock Type

The rocks here are Devonian in age, informally called 'the Old Red Sandstone', but classed as the Harrylock Formation. There are thick conglomerate beds and coarse grained red sandstones. The same formation outcrops across the peninsula, and was also quarried at the companion site of Graigue Great.

Main Geological or Geomorphological Interest

This site is included as a key source of millstones in historical times. It owes its existence simply to people recognising the value of a very specific lithology. From Medieval times up to early Modern times in Ireland, suitable rock types for millstones in wind and water powered mills would have been highly prized. The quartz conglomerates at Harrylock Bay and at Graigue Great, or Millstone Hole, clearly provided a suitable rock, indicated by the large numbers of circular 'dishes' or scars from where stones were extracted. A circular ring was chiselled out for the outer edge and a small hole in the centre for the axle. Water and wooden wedges could then help split the stone off along a natural bedding plane.

The position of these quarries close to the shore provided an added advantage in that the rocks provided a natural jetty (which was probably improved) but in any case millstones could be strapped to a boat above them at low tide which would then lift off on the rising tide, for transport up the River Suir or along the coast.

Site Importance – County Geological Site; may be recommended for Geological NHA

This is an important industrial archaeology site which should be protected through recognition as a County Geological Site. When the IGH15 Economic Geology Theme is fully assessed for the best sites on a national basis this site may be one that is recommended for NHA status.

Management/promotion issues

The site could possibly be promoted, obviously depending on suitable access and landowner permission being agreed and organised. Access via Lumsdin's Bay along the shore is possible at low tide but is not easy.



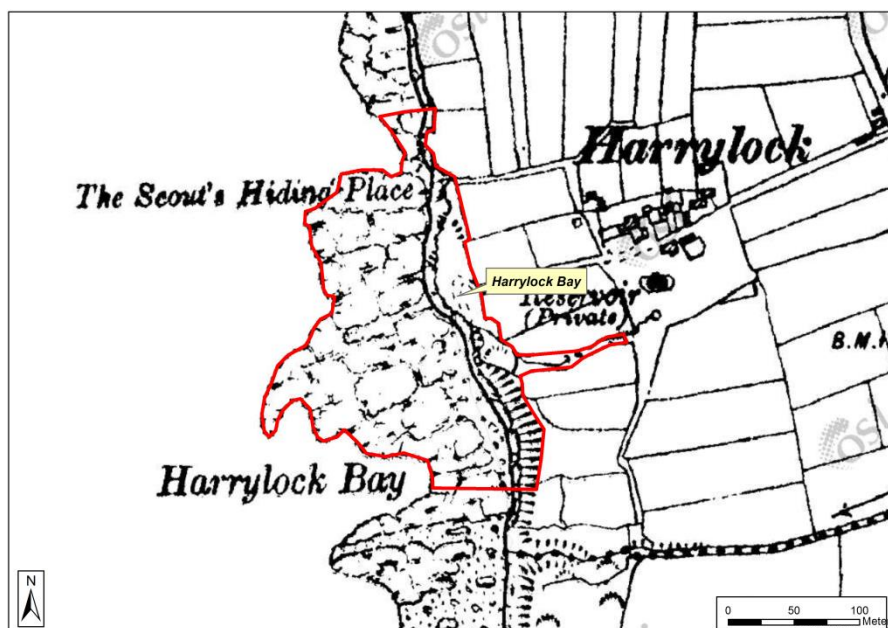
The quarried area viewed from the end of the jetty.

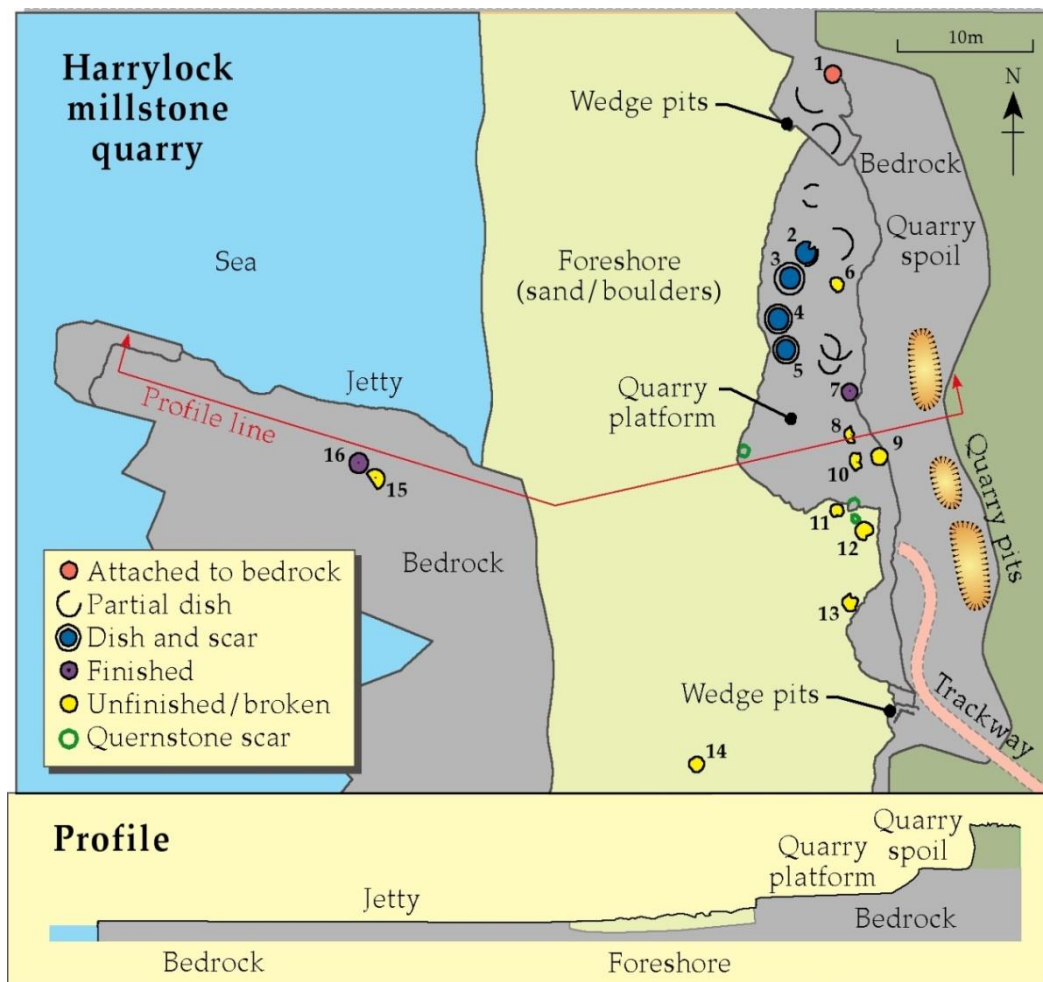


Two abandoned millstones on the jetty.



The quarried bed at Harrylock Bay with 'dishes' evident.





Plan of Harrylock millstone quarry, by courtesy of Dr Niall Colfer, from his PHD thesis on the Millstone quarries of Medieval and early Modern Ireland.



Aerial view of Harrylock millstone quarry, by courtesy of Dr Niall Colfer, from his PHD thesis on the Millstone quarries of Medieval and early Modern Ireland.