



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

# East Dunbartonshire Geodiversity Audit

## Volume 1 - Site Assessments and Maps

Geology and Landscape Scotland Programme

Open Report OR/09.019









BRITISH GEOLOGICAL SURVEY

GEOLOGY AND LANDSCAPE SCOTLAND PROGRAMME

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*Front cover*

Central image: View south-east towards Bishopbriggs from an escarpment of Craigmaddie Muir Sandstone close to the Auld Wives' Lifts.  
Above image: Mineral growth and striations on a fault plane, Blairskaith Quarry.  
Lower image: Glaciofluvial cobbles and pebbles of various lithologies, Inchbelle Quarry.  
Right image: Fossils from the Lower Limestone Formation at Blairskaith Quarry.  
Left image: Columnar jointing in a basaltic volcanic plug at Craingangawn Quarry.

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# East Dunbartonshire Geodiversity Audit

## Volume 1 - Site Assessments and Maps

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# Foreword

Constant development pressure on Scotland's land and resources demands a greater awareness and understanding of the dynamics of our natural world in order to deliver a sustainable environment for the future, particularly with climate change now a reality. Geodiversity is an important environmental asset but is one of the least recognised and appreciated. It links people, places, rocks, soils, landforms, landscape and ecosystems, and the past through the present to the future.

In East Dunbartonshire, nationally and internationally important geological sites have been assessed and are protected by statutory measures, but these form only a limited part of the area's geodiversity. East Dunbartonshire Council is dedicated to furthering the cause of geodiversity by protecting geological, geomorphological and landscape features. To this end, the British Geological Survey (BGS) were commissioned to audit and assess East Dunbartonshire's geodiversity. This report produced by BGS is a systematic inventory and evaluation of the area's potential Local Geodiversity Sites and provides a foundation for developing a Local Geodiversity Action Plan for East Dunbartonshire.

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## Summary

This report describes a geodiversity audit of East Dunbartonshire commissioned by East Dunbartonshire Council (EDC), funded by Scottish Natural Heritage (SNH) and EDC, and carried out by the British Geological Survey (BGS).

The audit began with a review of the available geodiversity documentation for East Dunbartonshire including BGS field maps, databases, digital aerial photography and publications, SNH SSSI and GCR documentation, and site information from the Strathclyde RIGS Group. An initial list of 59 sites with potential for geodiversity value was compiled from this information.

A total of 36 sites from the initial list were visited and audited, most during March and April 2009. Information was recorded on the GeoDiversitY scoring system, developed by BGS. In this system, geological scientific merit, education value, community site value, cultural/heritage/economic importance, access, site fragility, potential are assessed. The GeoDiversitY system was accessed via digital data entry forms on the BGS SIGMA Mobile system running on a ruggedized field notebook PC.

Of the 36 sites visited, 34 are recommended as Local Geodiversity Sites. These sites have a good geographical spread across East Dunbartonshire, encompassing both urban and rural areas. Together they show typical geological strata, structure and features of all the geological units present immediately beneath the surface of East Dunbartonshire and are representative examples of the Carboniferous sequence which underlies much of Central Scotland.

The sites, chosen primarily for their geology, have revealed numerous links to the character of the landscape, historical structures, ecology, and the economic and cultural history of the area.

Many of these sites could be enhanced to encourage visitors and students to learn more about the geology beneath their feet and how the geology, as the foundation of our landscape, has influenced the form and nature of what lies at the surface; from the inter-drumlin depressions which have created a wetland habitat to the ironstones and fireclays which were exploited as raw materials for the heavy industry which flourished around Glasgow, resulting in the development of large conurbations.

This report will assist in future planning, development and conservation issues within East Dunbartonshire and form the basis of a Local Geodiversity Action Plan (LGAP).

# 1 Introduction

The British Geological Survey (BGS) was commissioned by East Dunbartonshire Council (EDC) to carry out a review of sites of geological and geomorphological significance within the local authority area. The study has taken the form of a geodiversity audit to assist in future planning, development and conservation issues.

This work was undertaken during Spring 2009 and combined a desk-top review of published literature and records with new information collected from field visits carried out during March and April 2009. This report describes, illustrates and scores 36 sites in East Dunbartonshire of which 34 are recommended as Local Geodiversity Sites and together represent the geological diversity of the area.

In addition to this report the study has produced a GIS database containing key spatial and attribute information relating to each site, which has been provided to EDC.

## 1.1 BACKGROUND

In its recent Local Plan, EDC identified a number of strategic aims for all services. One of these is enhancement of the quality of life and protection of the local environment. More specifically, the Council is dedicated to furthering the cause of geodiversity by protecting landscape features, in particular those geological features that are designated as Local Geodiversity Sites (formerly termed Regionally Important Geological and Geomorphological Sites or RIGS) and those protected in East Dunbartonshire's Greenspace Strategy.

Nationally designated sites such as SSSIs protect only a limited part of the area's geodiversity. With the aid of Scottish Natural Heritage (SNH), EDC wish to evaluate their Local Nature Conservation Sites (LNCS). These are non-statutory sites selected for their local geodiversity (LGS) or biodiversity and ecological importance (LBS or formerly SINCS). EDC also wish to explore the potential for enhancing the quality and quantity of their geological sites, particularly those of educational value. A survey of these sites will assist EDC with writing Local Plan 2 and form the basis of a Local Geodiversity Action Plan (LGAP).

## 1.2 AIMS AND OBJECTIVES

The principal aim of the study is to identify a network of key sites across East Dunbartonshire, supported by formal assessment, which represent the diverse geology and geomorphology of the area.

To achieve these aims, the objectives of the study are as follows:

1. Undertake a review of existing sites of geological/geomorphological significance.
2. Identify additional sites to ensure as full a representation as practical of the geology and geomorphology in the area with a good geographical spread.
3. Recommend site boundaries and where appropriate make suggestions for the future management of the site, following assessment of the current site condition.
4. Establish the geodiversity value for each site, based on a series of criteria including scientific, educational, cultural and community merits.
5. Use assessment criteria suitable for repeatable, consistent valuation of the sites.

6. Provide information that will enable the integration of geology with the area's landscape, biodiversity, cultural and economic heritage.
7. Identify key geological sites which may be appropriate for conservation and/or enhancement with respect to education and public enjoyment.

### **1.3 METHODOLOGY**

Three key stages:

1. Inception and desktop study (review of published literature and BGS archive records; identification of potential sites from various sources). See Table 2 for list of potential sites.
2. Field-based study (assessment of potential sites to identify key representative localities; documentation/recording of principal features of geological/geomorphological significance).
3. Analysis, recommendations and reporting.

### **1.4 STRUCTURE OF THE REPORT**

Following the background and introduction to the study in chapter 1, chapter 2 describes the geology present in East Dunbartonshire, summarising the underlying bedrock (solid) geology and the overlying Quaternary (superficial) deposits. This information is based on the published geological maps of the area; BGS map sheets 30E (Glasgow) and 31W (Airdrie). Chapter 3 describes how the local geodiversity sites were selected and evaluated, the methodology for collection of the field data, and information on the scoring system used.

Chapter 4 provides detailed site assessments for each of the 35 individual sites visited, and forms the main part of the report. The information is presented as a set of pro-forma sheets containing information including:

- Location and general information
- Location Map
- Summary Description
- Access and Safety
- Culture, Heritage and Economic
- GeoScientific Merit
- Current Site Value
- GeoDiversity Value

Chapter 5 summarises information about the sites in two tables: Table 7 brings together the scores given for GeoScientific Merit, Community Value, Education Value and Cultural/Heritage/Economic Value for each site. Added together these give a total score upon which an ultimate Geodiversity Value is based. Table 8 highlights which geological units and features are visible at each site.

The appendices include a representative collection of photographs with descriptive captions illustrating and explaining the main geological features present at each site (Appendix 1). Other appendices contain typical descriptions of the different geological rock units which underlie East Dunbartonshire (Appendix 2); the SIGMA (System for Integrated Geoscience MApping) Mobile system used to digitally record data in the field (Appendix 3).

## **1.5 WHAT IS GEODIVERSITY?**

Geodiversity has many definitions, but essentially describes the variety of rocks, minerals and fossils, landforms and landscapes, active geological processes and soils and subsoils (Quaternary deposits) of an area. It links people, places, rocks, soils, landforms, landscape and ecosystems, and the past through the present to the future.

All these elements interlink and together determine not only the character of our natural environment and where the range of local wildlife habitats have formed, but have influenced, for example, where mineral workings have taken place and the history of settlement in the area. Geology, as the foundations of our landscape, influences and links much of an area's local 'character'.

## **1.6 WHY CONSERVE GEOLOGICAL FEATURES**

Considering the impact of geology on our local landscapes and heritage, few geological and landscape features in Scotland have any protection other than those designated as SSSIs. Geodiversity is an important environmental asset but is one of the least recognised and appreciated.

The geodiversity of an area is vulnerable to a wide range of threats, quarries can be infilled, natural overgrowing by vegetation can completely obscure an exposure, features within an urban environment may be built over.

The general public, Local Authorities, industries and schools have for many years been made aware of the importance of conserving archaeological and wildlife sites for future generations; it equally important that geodiversity sites are understood, protected and explained to others.

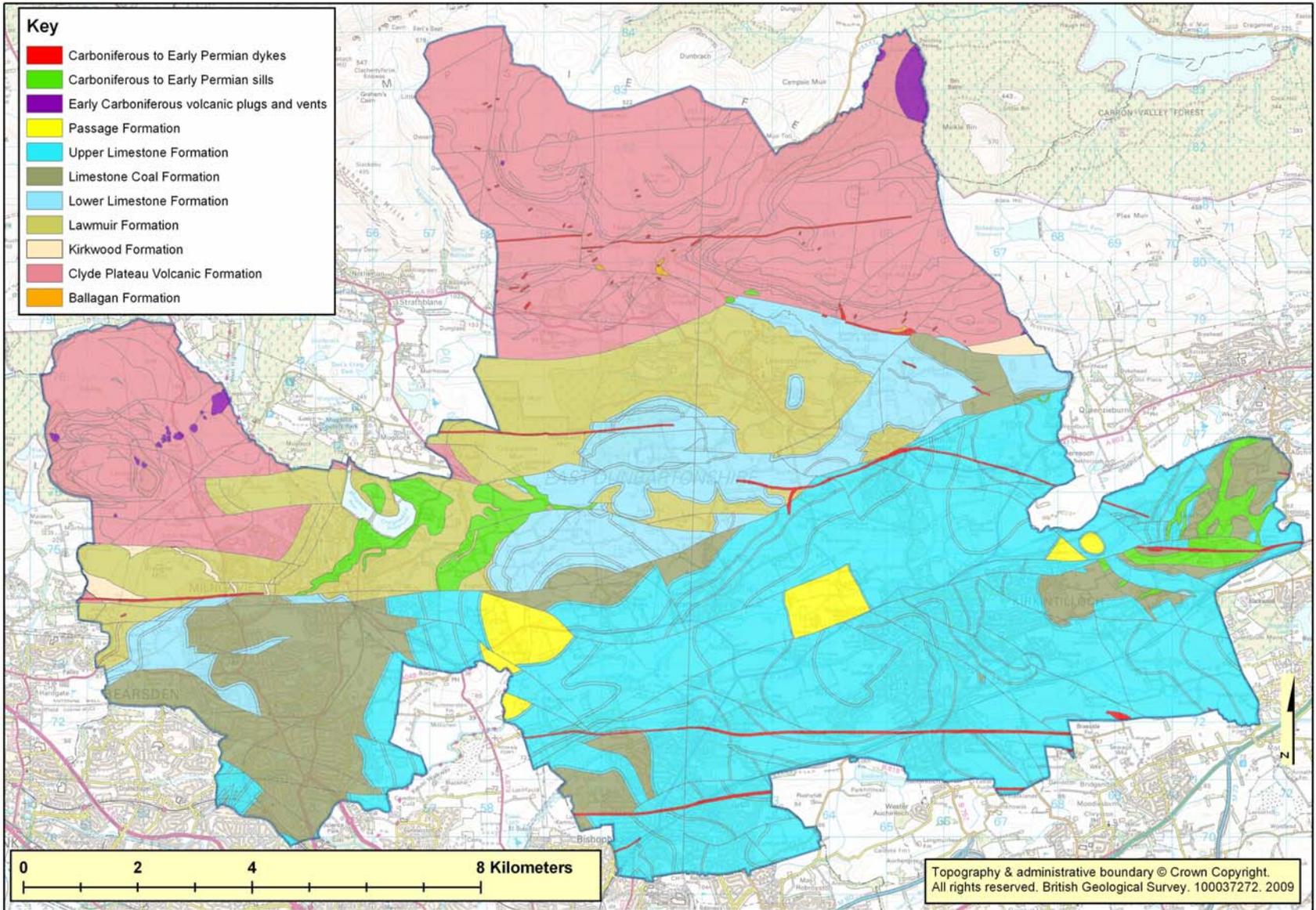
## 2 East Dunbartonshire's Geological Heritage

### 2.1 THE INFLUENCE OF GEODIVERSITY IN THE LANDSCAPE

The diverse and attractive landscape and rich biodiversity of the East Dunbartonshire Council area is very much a product of the underlying geology and geological processes that have acted upon it. The Campsie Fells are made up of volcanic rocks belonging to the Clyde Plateau Volcanic Formation. These igneous rocks are as a rule hard wearing and resistant to erosion, so that when our present-day landscape was being sculpted during the last ice-age they resisted erosion resulting in high ground. Conversely, the Kelvin Valley is largely underlain by relatively soft sedimentary rocks from the Clackmannan Group, which were preferentially eroded by the ice and now form low ground which is used by the River Kelvin. Glacial and subsequent river processes have acted to form the valleys and meanders of the River Kelvin and Glazert Water, and rolling countryside or urban settings with rocky hills (e.g. Bar Hill), drumlin hills and lochs in hollows.

### 2.2 BEDROCK GEOLOGY

The East Dunbartonshire Council area has a diverse and attractive landscape with a rich biodiversity: the Campsie Fells, the picturesque steep slopes of the Campsie escarpment, The rocks that underpin the East Dunbartonshire Council area are all of Carboniferous age (310–350 million years old) belonging to the Inverclyde, Strathclyde, and Clackmannan groups (Map 1 and Table 1). Most of the formations (eight) in these groups of mainly sedimentary rocks occur in East Dunbartonshire, of which the youngest, the Passage Formation is not seen anywhere at surface. Extrusive igneous rocks (Clyde Plateau Volcanic Formation), lava flows and volcanic ashes occur forming the Campsie Fells and the Kilpatrick Hills. Intrusive igneous rocks, mainly in the form of sheets (sills) occur but locally dykes and volcanic neck (plug) intrusions are also found. There are two main types of sheets, the alkali-microgabbro (teschenitic) sills and the Quartz-microgabbro of the Midland Valley Sill complex (this also occurs as dykes). The former are generally almost contemporaneous in age with the sedimentary rocks they intrude, but the latter is significantly younger than other Carboniferous rocks occurring in East Dunbartonshire (300 million years old). Further geological details about the sedimentary formations and igneous rocks are to be found in Appendix 2.



Map 1: Geological map of East Dunbartonshire.

Classification of the Carboniferous strata in the Midland Valley of Scotland											
Subsystem	Series	Stage	Lithostratigraphical Units					Groups	Old Classifications		
			Formations								
			Central Coalfield	Ayrshire	Fife	West Lothian	East Lothian				
Silesian	Westphalian	C	Bolsoviaian	Upper Coal Measures					Coal Measures	UPPER (BARREN) COAL MEASURES	
		B	Duckmantian	Middle Coal Measures						MIDDLE COAL MEASURES	PRODUCTIVE COAL MEASURES
		A	Langsettian	Lower Coal Measures						LOWER COAL MEASURES	
	Namurian	Chokerian-Yeadonian	Passage Formation					Clackmannan Group	PASSAGE GROUP		
		Arnsbergian	Upper Limestone Formation						UPPER LIMESTONE GROUP		
		Pendleian	Limestone Coal Formation						LIMESTONE COAL GROUP		
			Lower Limestone Formation						LOWER LIMESTONE GROUP		
Dinantian	Viséan	Brigantian	Lawmuir Formation	Pathhead Formation	West Lothian Oil-Shale Formation	Aberlady Formation	Bathgate Group	UPPER OIL-SHALE GROUP			
		Asbian	Kirkwood Formation	Sandy Craig Formation							
			Holkerian to Arundian	Clyde Plateau Volcanic Formation						Pittenweem Formation	Gullane Formation
					Anstruther Formation	Arthur's Seat Volcanic Formation		Garleton Hills Volcanic Formation			
		Chadian	Fife Ness Formation	Ballagan Formation		Inverclyde Group		CEMENTSTONE GROUP			
		Tournaisian	Clyde Sandstone Formation							Ballagan Formation	
	Courseyan		Ballagan Formation					Inverclyde Group	UPPER OLD RED SANDSTONE (part)		
	Kinnesswood Formation										

Note: The Laggan Cottage Mudstone Formation of north Arran and the Birgidale Formation of south Bute at the base of the Strathclyde Group are not shown. Nor are the Bathgate hills, Kinghorn and Salsburgh Volcanic formations of the Bathgate Group.

**Table 1: Classification of the Carboniferous strata in the Midland Valley of Scotland.**

### **2.3 QUATERNARY GEOLOGY**

The detailed physical shaping of the current landscape owes much to the work of ice sheets and the cycles of glaciation and deglaciation over the last two million years. The effects range from erosion of the bedrock by ice armoured with rock fragments into crag and tail (e.g. Bar Hill) landforms, deep sediment filled bedrock depressions (down to 60 m below O. D.) scoured out by the ice and/or by meltwaters flowing under pressure under the ice, to small rock features like roche moutonnee and glacial striae.

Ice sheets and glaciers also laid down sediments that now largely bury the bedrock. The chief and most widespread deposit is glacial till (formerly known as boulder clay) that is laid down at the base of the ice and consists of a mix of boulders, cobbles and stones in a plentiful matrix of clay, silt and sand. It is this material (Wilderness Till Formation) that is subsequently sculpted by the ice sheet into drumlin landforms (basket of eggs topography) that characterise much of this area and the rest of the Glasgow conurbation.

Glacial meltwaters laid down sand and gravel (Broomhouse Sand and Gravel Formation) in the form of mounds (where melting ice decayed in the sediment), deltas and terraced spreads and such landforms are present in and around the Kelvin and Glazert valleys. Such sand and gravel deposits (Cadder Sand and Gravel Formation) also occur buried under glacial till (Wilderness Till Formation) in the Kelvin valley and date from before the last main ice age. The bones of woolly rhinoceros have been found in these sediments in the Cadder area and date to about 30 000 years ago just prior to the last major ice age.

Lake deposits and river alluvium have been laid down since the last ice left the area about 14 000 years ago. Some lakes have completely silted up whilst others form attractive areas of open water and wetlands and with peat present locally (e.g. Bardowie Loch). On the relatively steep slopes of the Campsie Fells, there are vegetated and unvegetated areas of scree (talus) associated with ancient and active rockfall and landslide. A wide range of soils have formed including gleys in wetter parts and podsol on the better draining sandier materials.

### **2.4 GEOLOGICAL RESOURCES AND THE BUILT HERITAGE**

The mineral resources of East Dunbartonshire have a long history of exploitation. Bulk minerals extracted have included the two types of microgabbro sill (and dykes) and lavas for hard rock aggregate (roadstone and concrete), sand and gravel and the quartz-conglomerate on Douglas Muir (high specification aggregate). Mudstones have been quarried for the manufacture of bricks with colliery spoil also similarly used. Mining and opencast extraction has taken place over 100's of years particularly for coal, limestone and ironstone. In particular, the Hurlet Limestone, Alum Shale and Hurlet Coal formed the basis for an industry which included the Campsie Alum Works at Lennoxton. Over the centuries sandstone quarries provided raw materials for buildings including both blocks and flagstones. The Roman Bath House at Bearsden has a few flagstones showing beautiful ripplemarks. The very limited outcrops of limestone and the associated waste in quarries for lime manufacture provide little oases for lime-loving flora. Heather thrives on the restored areas of rock in the quartz-rich workings of Douglas Muir.

## 3 Evaluating East Dunbartonshire's Geodiversity

### 3.1 AUDIT SITE SELECTION CRITERIA

The project began with a review of the available documentation and datasets that could potentially provide information on geodiversity sites in East Dunbartonshire. These sources included:

- Strathclyde RIGS Group list of potential geodiversity sites and relevant site forms
- SSSI and GCR documentation (SNH)
- BGS 1:10 000 standards and field maps
- BGS BritPits database of Mines and Quarries
- BGS Glasgow Memoir (Clough et al., 1925 and Hall et al., 1998)
- BGS Economic Geology of the Central Coalfield Memoir, Area 1 (Robertson, 1937)
- Geological Excursions around Glasgow and Girvan (Lawson, 1992)

Information from these sources was entered into a spreadsheet, giving a total of 59 potential sites (Table 2). The site locations were then exported to a GIS for analysis. Duplications and overlaps were identified and the list narrowed to 35 priority sites for field checking and auditing using expertise from several BGS staff. The selection was made to ensure a comprehensive geological and good geographical spread within the East Dunbartonshire area. During the course of fieldwork it proved impracticable to visit five of these priority sites and five other, more accessible, localities were visited. The five priority sites that were not visited are identified in table 2 for potential further investigation.

### 3.2 GEODIVERSITY AUDITING

Field auditing was carried out in March and April 2009. As far as possible landowners were contacted prior to visiting or accessing sites, but ownership was not established for every site visited.

### 3.3 PROJECT GIS

A project GIS (in ESRI ArcGIS) was established to display the location of geodiversity information and examine spatial relationships between geodiversity and other environmental considerations. A wide range of digital data was acquired and the datasets translated to a suitable format for display in ArcGIS. The GIS was also used to produce figures and maps for this report. Output from the field auditing database (see 3.4 below) was exported and appended as attribute data in the ArcGIS shape files. All shape files handed over to East Dunbartonshire Council have ISO 19115 Standard metadata information attached.

<b>Table 2</b>								
<b>No</b>	<b>Site</b>		<b>Easting</b>	<b>Northing</b>	<b>Source of Information</b>	<b>Priority to visit</b>	<b>Notes</b>	<b>Geodiversity Site No.</b>
1	Finglen	NS	5930	8150	BGS map/memoir	P	Might merit further investigation	
2	Craigangawn Quarry area	NS	5250	7695	BGS map/memoir	P		EDC 26
3	Mugdock Reservoir (Barrachan)	NS	5600	7600	BGS map/memoir	P		EDC 27
4	Mugdock disused quarry	NS	2755	3805	BGS map/memoir	P		EDC 11
5	Blairskaith quarries (infilled?) & outcrops	NS	5935	7570	BGS map/memoir	P		EDC 13 EDC 25
6	Craigmaddie Muir and Auld Wives Lift	NS	5820	7665	BGS map/memoir	P		EDC 14
7	Pattie's Bught disused quarry	NS	2950	3895	BGS map/memoir	P		EDC 17
8	Douglas Muir Quarry area	NS	5260	7460	BGS map/memoir	P		EDC 23
9	Bearsden Cromarty Crescent area burn	NS	5475	7340	BGS map/memoir	P		EDC 9
10	Linn of Baldernock	NS	2875	3740	BGS map/memoir	P		EDC 28
11	Smithyhills	NS	2905	3735	BGS map/memoir		Not priority site	
12	Lennox Park, Milngavie	NS	2770	3710	BGS map/memoir		Not priority site	
13	Bardowie Loch	NS	5800	7350	BGS map/memoir	P		EDC 6
14	Buchley (Wilderness) former gravel pits	NS	5965	7245	BGS map/memoir	P		EDC 31
15	Clachan of Campsie	NS	6125	7995	BGS map/memoir	P		EDC 19
16	Waterhead Farm (council boundary)	NS	6460	8320	BGS map/memoir		Not priority site	
17	Bin Burn (council boundary)	NS	6565	8275	BGS map/memoir	P	Might merit further investigation	
18	Lennoxtown Forest	NS	6105	7755	BGS map/memoir	P	Might merit further investigation	
19	Lennoxtown Crow Road	NS	6245	7935	BGS map/memoir	P		EDC 18
20	Burnel Rannie-Balgrochan burn area	NS	6310	7895	BGS map/memoir	P	Might merit further investigation	

Table 2 (continued)								
No	Sites		Easting	Northing	Source of Information	Priority to visit	Notes	Geodiversity Site No.
21	Maiden Castle Motte & Bailey	NS	6420	7840	BGS map/memoir	P	Might merit further investigation	
22	Barraston Farm, Glenwynd, Glenwhapple area	NS	6055	7582	BGS map/memoir	P		EDC 12 EDC 35
23	Finniescroft Wood	NS	3115	3895	BGS map/memoir	P		EDC 16
24	Burniebrae Farm, Cowies Glen	NS	6580	7730	BGS map/memoir	P		EDC 20
25	Shields and Spouthead farms	NS	6575	7845	BGS map/memoir	P		EDC 21
26	Spouthead Burn	NS	3265	3940	BGS map/memoir	P		EDC 22
27	Hungryside Bridge, Crofthead gravel pits	NS	3105	3640	BGS map/memoir		Not priority site	
28	Mid Boghead quarry	NS	3200	3597	BGS map/memoir		Not priority site	
29	Bothlin Bank, Lenzie	NS	6740	7180	BGS map/memoir	P		EDC 4
30	Huntershill Sandstone Quarry, Crowhill Road	NS	6065	6955	BGS map/memoir		Not priority site	
31	Bar Hill Roman Fort area	NS	3545	3805	BGS map/memoir	P		EDC 2
32	Twechar Quarry	NS	3505	3782	BGS map/memoir	P		EDC 1
33	Board Craigs, Twechar	NS	3500	3745	BGS map/memoir			EDC 3
34	Gallow Hill, Glazert Water	NS	3200	3840	BGS map/memoir	P		EDC 15
35	Inchbelle landfill, gravel pit	NS	3320	3780	BGS map/memoir			EDC 29
36	Bishopbriggs No 2 Gravel Pit	NS	3125	3675	BGS map/memoir			EDC 33
37	Cawder Golf Course (gravel pit)	NS	3060	3600	BGS map/memoir			EDC 32
38	Low Moss	NS	3150	3635	BGS map/memoir	P		EDC 5
39	Lennoxton	NS	628	796	Strathclyde RIGS		Matched with BGS site	
40	Bearsden to Balmore (SW point)	NS	554	706	Strathclyde RIGS	P		EDC 7

Table 2 (continued)								
No	Sites		Easting	Northing	Source of Information	Priority to visit	Notes	Geodiversity Site No.
41	East end of Lennoxtown	NS	640	770	Strathclyde RIGS		Matched with BGS site	
42	Bearsden, Kilmardinny	NS	549	729	Strathclyde RIGS	P		EDC 8
43	St Germain's	NS	544	714	Strathclyde RIGS		Not priority site	
44	Lennoxtown	NS	622	795	Strathclyde RIGS		Matched with BGS site	
45	Loch Ardingning	NS	564	779	Strathclyde RIGS		Outside EDC	
46	Douglas Muir Quarry	NS	515	745	Strathclyde RIGS		Matched with BGS site	
47	Auld Wives' Lifts, Craigmaddie Muir	NS	583	764	Strathclyde RIGS		Matched with BGS site	
48	Campsie Glen	NS	611	797	Strathclyde RIGS		Matched with BGS site	
49	Linn of Baldernock	NS	591	758	Strathclyde RIGS		Matched with BGS site	
50	Lennoxtown	NS	634	789	Strathclyde RIGS		Not priority site	
51	Lennoxtown	NS	550	800	Strathclyde RIGS		?Outside EDC	
52	Milngavie waterworks	NS	557	762	Strathclyde RIGS		Matched with BGS site	
53	Barr Hill, Tewchar	NS	709	759	Strathclyde RIGS		Matched with BGS site	
54	Blairskaith quarry	NS	595	752	Strathclyde RIGS		Matched with BGS site	
55	Blairskaith quarry	NS	592	758	Strathclyde RIGS		Not priority site	
56	Barraston quarry	NS	604	758	Strathclyde RIGS		Matched with BGS site	
57	Craigen Glen	NS	622	755	Strathclyde RIGS			EDC 30
58	Manse Burn (SSSI)	NS	529	733	SNH	P		EDC 10
59	Bearsden Roman Baths	NS	546	721	HS			EDC 24

**Table 2: Initial list of potential geodiversity sites compiled from a variety of sources (see 3.1).**

### 3.4 BGS GEODIVERSITY DATABASE –INTRODUCTION

Data from field auditing were logged on BGS SIGMA Mobile ruggedized field notebook PCs. SIGMA Mobile allows collection of digital data/information in the field, including digitising geodiversity site boundaries. One of its main strengths is the facility to bring practically any digital dataset to the field including DiGMapGB (BGS digital geological map data), historic Ordnance Survey maps, scanned geological field maps, Intermap NEXTMap digital terrain/surface models etc. The system also has an inbuilt GPS. SIGMA Mobile uses a combination of customised ESRI ArcGIS, MS Access and InfiNotes. Data was entered on data entry forms on the MS Access-based BGS GeoDiversitY database. This was designed for rapid and objective geodiversity data collection in the field, either on a hard copy form, or direct input via PC. The database was set up and tested during BGS geodiversity projects in the North Pennines, County Durham, West Lothian and Greater London. Site data is entered into a number of screen-sized entry forms. For examples of data entry forms running on a MIDAS iX104 Notebook PC see Appendix 3. Some of the options available in these data entry forms are listed in Table 3 below.

<b>BGS GeoDiversitY database fields</b>		
Geodiversity audit name	Date of audit	Surveyor name
Site number	Site name	Assessment status
Access details	Site ownership details	NGR (from GPS)
Geodiversity value	Brief site review	Overall geodiversity value score
<b>Site Type: Feature</b>	<b>Site Type: Current use</b>	<b>Geoscientific Merit: Rarity</b>
<b>Geoscientific Merit: Quality</b>	<b>Geoscientific Merit: Reference</b>	Geoscientific Merit: Notes
Geoscientific Merit: Further information	Geoscientific Merit: Lithostratigraphy codes	Other designations
Other scientific merit	Other	<b>Current site value: Community</b>
<b>Current site value: Education</b>	<b>Historical, archaeological &amp; literary associations</b>	<b>Aesthetic landscape</b>
<b>Earth science history</b>	<b>Economic geology</b>	CHE Notes
<b>Site fragility</b>	<b>Site potential use</b>	Fragility & potential use notes

**Table 3: Options available in the BGS GeoDiversitY database**

### 3.4.1 Site Type and Stratigraphy and Rock Types

Selection criteria for geodiversity site type are listed in below.

<b>Site Type: Feature</b>		
CODE	DESCRIPTION	TRANSLATION
N_SECTION	NATURAL SECTION	Natural outcrop of one or more geological features forming a linear exposure (river section, cliff face, shoreline etc)
N_EXPOSURE	NATURAL EXPOSURE	Natural outcrop of geological feature
N_LANDFORM	NATURAL LANDFORM	Constructional or erosion geomorphological feature (valley, crevasse, dune, all Quaternary features etc)
N_VIEW	NATURAL VIEW	Collection of geological features forming a landscape overview interpretation
A_MINWORKS	ARTIFICIAL MINE WORKINGS	Feature produced by minerals/coal workings (adit, spoil, hush etc)
A_QRYWORKS	ARTIFICIAL QUARRY WORKS	Feature produced by stone/aggregate workings (quarry, pit, waste dumps etc)
A_SECTION	ARTIFICIAL SECTION	Section exposure created artificially by work to construct a road/track/path etc
A_EXCAV	ARTIFICIAL EXCAVATION	Artificially created exposure (excavation - not related to any of the above)
-	NOT APPLICABLE	Not Applicable
N_SAMPLE	Natural geological sample not in situ	Natural geological sample not in situ
A_SAMPLE	Manmade Artefact	Manmade Artefact
<b>Site Type: Current Use</b>		
CODE	DESCRIPTION	TRANSLATION
IN_USE	IN CURRENT USE	Feature still used for primary purpose (working quarry etc) as defined by the FEATURE criteria
DISUSED	DISUSED	Feature no longer used for primary purpose and has no other current use
OPEN_CNTRY	OPEN COUNTRY	Feature on publicly accessible natural countryside with no unique use (mountains national park land etc)
PVTE_CNTRY	PRIVATE COUNTRY	Feature is on privately owned, natural countryside with limited/no public access (Estate land etc)
AGRIC_LAND	AGRICULTURAL LAND	Feature is used/forms part of land used for agricultural purposes (farm fields and grazing areas etc)
DOMESTIC	DOMESTIC LAND	Feature falls within the limits of private lands associated with dwellings (gardens, stately home grounds etc)
URBAN	URBAN	Feature is on publicly accessible lands (but not recreational lands) within the urban limits (allotments, road verges etc)
RECREATION	RECREATIONAL LAND	feature is on land specifically designed or modified for recreational uses (parks, picnic areas, dog dens! etc)
MILITARY	MILITARY LAND	Feature is on MOD land or land used for military purposes
INDUSTRIAL	INDUSTRIAL LAND	feature is on land used for industrial purposes (including waste land forming part of/owned by an industrial complex)
DISPOSAL	DISPOSAL USE	Feature is used or is on land used for waste disposal (quarries now used for land-fill etc)
-	NOT APPLICABLE	Not Applicable

**Table 4: BGS GeoDiversity database – selection criteria for Site Type**

**Stratigraphy and Rock Types:** The ‘Age’ (chronostratigraphy), ‘Formation’ (lithostratigraphy) and rock type (lithology) of the exposures present are given. Ideally, representative sections of the main formations present in the East Dunbartonshire area should be represented in the selected sites.

### 3.5 BGS GEODIVERSITY DATABASE – ASSESSMENT OF SITE VALUE

In the BGS GeoDiversitY database, Culture, Heritage & Economic importance, GeoScientific Merit, Current Site Value (education and community value) are given numeric score. Access, site fragility, potential use and other site details are entered via tick-box, drop-down menu or in free text fields.

#### 3.5.1 Access and Safety

Access is an important consideration, particularly in areas of urban populations where opportunities to experience the natural world are limited. Road access and parking, Safety of access, Safety of exposure, Current condition, Current conflicting activities, Restricting conditions and Nature of exposure criteria are descriptive and for general guidance only. Field leaders and teachers should prepare a separate risk assessment where required.

#### 3.5.2 Cultural, Heritage and Economic importance

These criteria are taken from the UKRIGS system and include any known links and important associations with the literary, cultural, aesthetic and historical aspects of geodiversity, or if geological materials have been exploited commercially in the past. The rating scale used is 0 to 10, with 10 reflecting important associations providing excellent opportunities for raising public awareness. The criteria used are:

**Historic, archaeological & literary associations:** May have cultural and heritage associations with literary or historical events and people relevant to Earth science.

**Aesthetic landscape:** May be an attractive/aesthetic landscape relevant to Earth science, promoting public awareness and appreciation of Earth science and may even be an National Scenic Area or National Park. For example, natural features such as mountain, upland, glen, strath, coast; man-made features such as urban, derelict, reclaimed,

**History of Earth science:** May be a significant site in the history of Earth science, for example where scientific concepts were first demonstrated by famous geologists.

**Economic geology:** May have economic associations with the past and present extraction and use of geological resources as raw materials, their subsequent processing, or the reclamation and later use of the site. Examples may include:

- past/present extraction of coal, sand and gravel, building stone, metallic ores
- processing plants such as furnaces which are likely also to be sites of importance for industrial archaeology
- land reclamation projects where the geological aspects are significant

#### 3.5.3 Geoscientific Merit

Geoscientific criteria are the key intrinsic attributes of a site or feature and the main reasons to justify conserving a site, even if it has restricted or no current access. A single site is unlikely to score highly on every criterion. Rarity, quality and literature/collections scores are combined into a single score in Volume 1 site assessments. Where rating scores fall between the values listed, intermediate ratings are indicated, for example a rarity or quality rating of 9 may reflect European or northern hemisphere significance. Similarly, a rarity or quality rating of 5 and 7 may reflect a western Midland Valley and Scotland-wide significance. Ranking criteria are given in Table 5 below:

<b>GEOSCIENTIFIC MERIT</b>		
<b>RARITY</b>	<b>Rating</b>	
<p>The abundance or significance of the feature of the site in the global context.</p> <p><i>Is the rarity such that the feature is one of only a few in the world, in the UK or in the regional area or is it one of many examples and only of reference or educational significance (because it is on the doorstep)?</i></p> <p><b>Regional</b> refers to the Midland Valley of Scotland (between the Southern Uplands and Highland Boundary faults)</p> <p><b>Local</b> refers to East Dunbartonshire Council area</p>	10	World
	8	UK
	6	Regional
	4	Local (LGAP)
	2	Educational / Reference
	0	Not Present / Relevant
<b>QUALITY</b>	<b>Rating</b>	
<p>The extent to which a feature is typical or demonstrates 'text-book' features.</p> <p><i>World class specimen or poor example?</i></p> <p><b>Regional</b> refers to the Midland Valley of Scotland (between the Southern Uplands and Highland Boundary faults)</p> <p><b>Local</b> refers to East Dunbartonshire Council area</p>	10	World class
	8	UK
	6	Regional
	4	Local (LGAP)
	2	Educational / Reference
	0	Not Present / Relevant
<b>LITERATURE / COLLECTIONS</b>	<b>Rating</b>	
<p>The detail of written literature or material collections relating to the feature.</p>	10	Detailed Studies
	8	Interpretations
	6	Descriptions
	4	Collected Material
	2	Referenced
	0	No Data

**Table 5: BGS GeoDiversitY database – Geoscientific Merit**

### 3.5.4 Current Site Value

Ranking criteria for these attributes are given in Table 6 below:

<b>EDUCATIONAL VALUE</b>	<b>Rating</b>	
<p>The value of the site feature for educational fieldwork (including school, degree and adult education courses). Including 'relief sites' that may relieve pressure on other popular sites.</p> <p><i>Is it visited by UK-wide groups or local schools only?</i></p> <p><b>Regional</b> refers to Central Scotland</p> <p><b>Local</b> refers to East Dunbartonshire Council area</p>	10	UK Educational
	8	Regional
	6	Local area schools
	4	Local (walking distance) groups
	2	Little value
	0	No value
<b>COMMUNITY VALUE</b>	<b>Rating</b>	
<p>The value of the site to local people as a local amenity including historical or cultural associations outside the geological significance. 'Local' is defined as within walking or 10 min drive distance.</p> <p><i>Is the feature of the site used daily as common ground or rarely visited by the local community?</i></p>	10	Daily local use
	8	Weekly use
	6	Monthly use
	4	Yearly use
	2	Infrequent use
	0	No local use

**Table 6: BGS GeoDiversitY database – Current Site Value**

### 3.5.5 Fragility

The following attributes are available for selection:

1. Geohazard (e.g. landslip risk)
2. weathering/erosion
3. natural overgrowth
4. sample/fossil collecting
5. dumping
6. likelihood of development.

### 3.5.6 Potential use

The following attributes are available for selection:

1. Research
2. Higher/further education
3. school education
4. on-site interpretation
5. on-site geotrail
6. incorporated
7. multidisciplinary

### 3.5.7 Geodiversity Value

Geodiversity Value can be considered as an assessment of the importance of the site to the local area or network. Key sites in the area may represent unique or outstanding features or exceptional preservation and should be designated as Local Geodiversity Sites and protected for their specific scientific value. Such sites may have been considered for designation as SSSIs, but not fully met the requirements. Most sites of high specific scientific value will also have high assessed ratings for education and science and for cultural, heritage and economic aspects, but there may be exceptions. High-rating examples would include sites of the only exposure of a key formation or feature, e.g. an unconformity, a basal conglomerate, a marine band, an ash band, a dyke, a highly fossiliferous bed, or other feature listed under Geoscientific Merit. Lower ratings are given to sites with locally more common or less well preserved features.

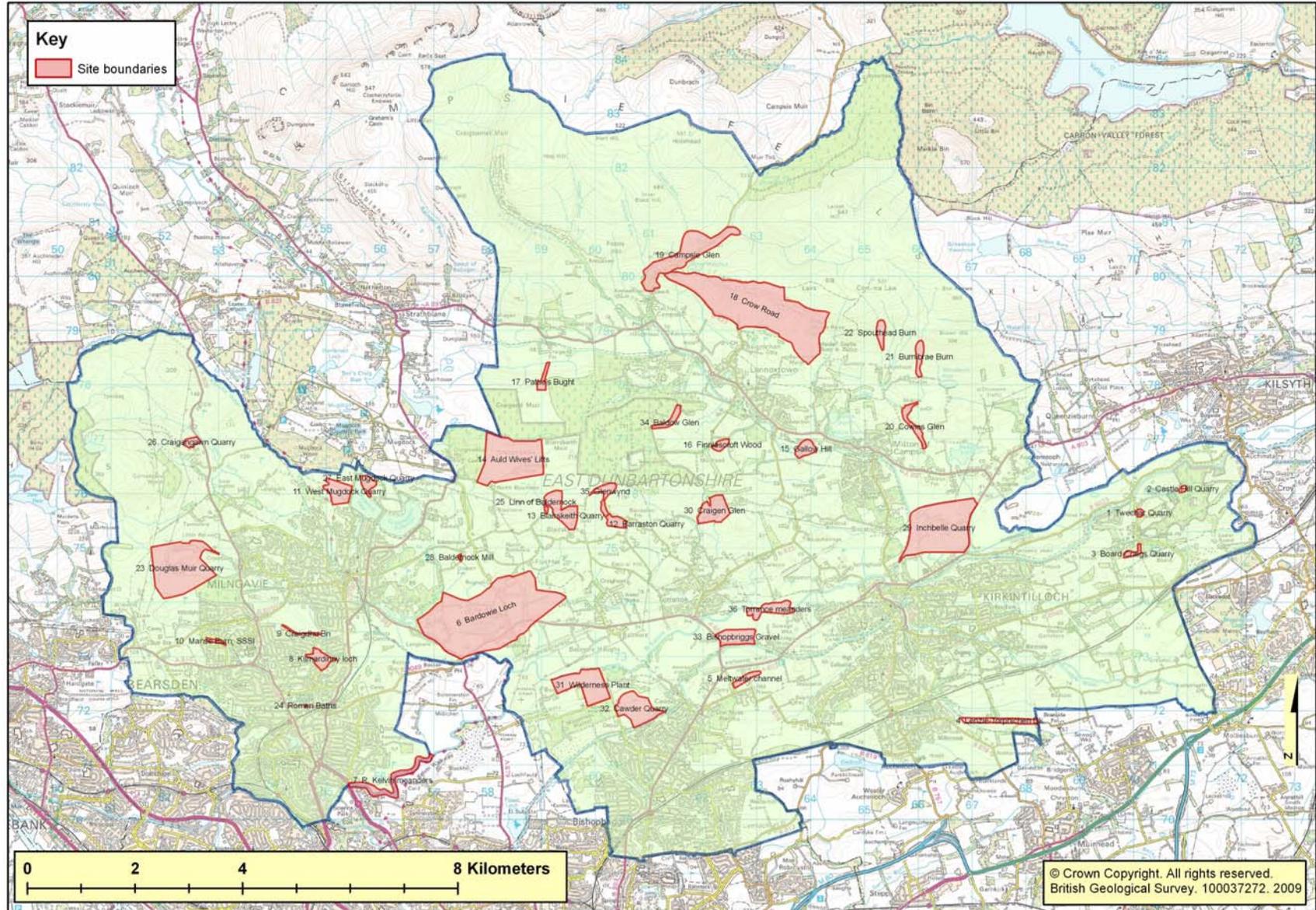
Geodiversity Value can be considered as an assessment of the importance of the site to the local network. The assessment of the value of the geology and geomorphology for education and science is separate.

Geodiversity Value is scored between 0 and 10 and is based on the sum of all the scores given for the various criteria described above. Although this may appear to be a rather subjective assessment it allows a grading of the different sites visited and takes into consideration an overview of other sites in the vicinity. Suggested scoring guides are:

0 – no specific scientific interest

5 – some specific scientific interest, the average for similar sites in the vicinity

10 – key site, showing unique or outstanding features, the best site in the vicinity



Map 2: Location of sites visited

## 4 Site Assessments

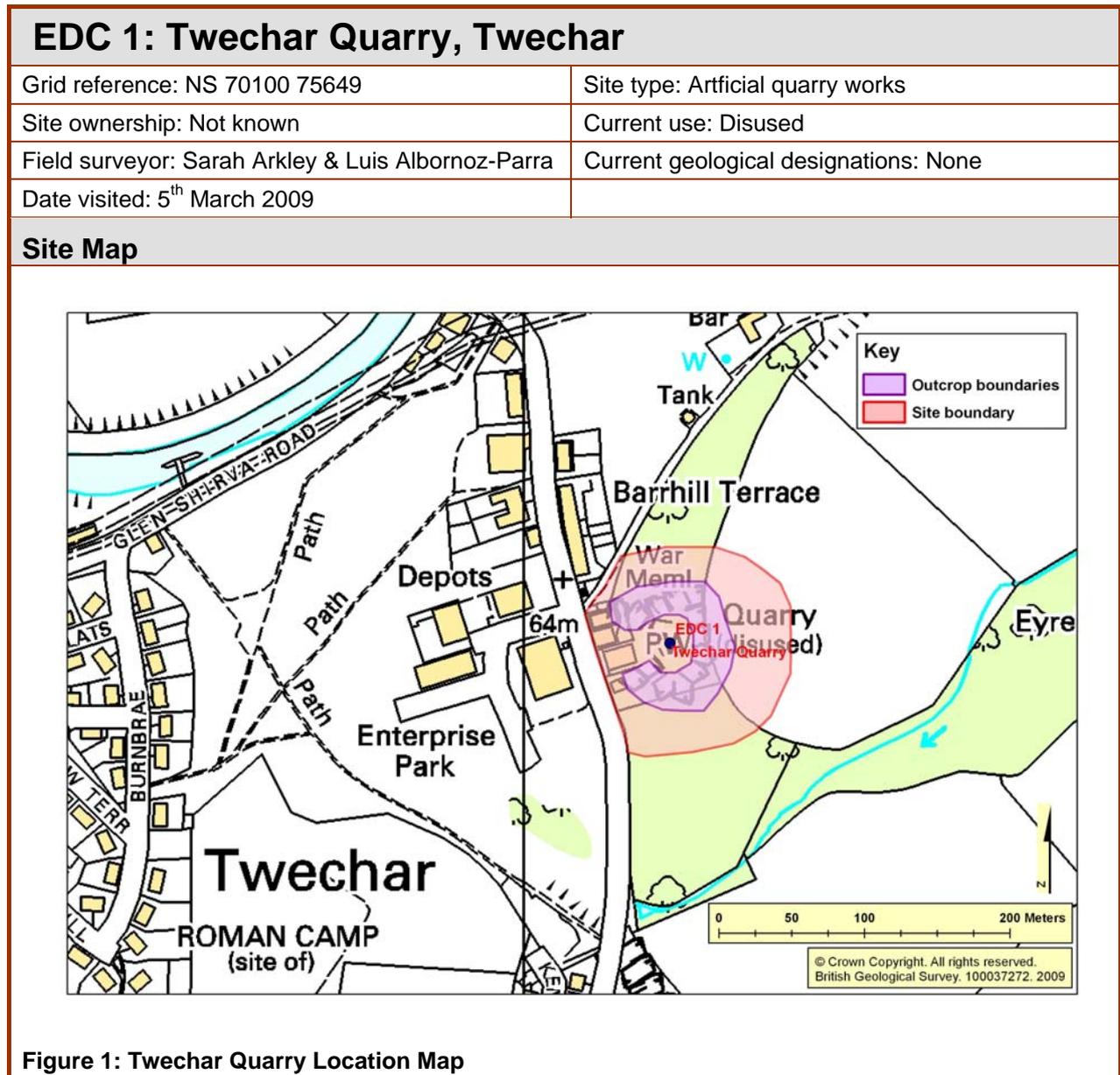


Figure 1: Twechar Quarry Location Map

### Summary Description

Disused quartz-microgabbro quarry, formerly used for roadstone. Recorded as an 'old quarry' in (Robertson, 1937).

This quartz-microgabbro intrusion is part of the Midland Valley Sill Complex intruded here into the lower part of the Upper Limestone Formation sedimentary rocks (between the Lyoncross Limestone and Index Limestone). The radiometric age of the sill complex is thought to be between 290–295 Ma (de Souza, 1979) and to reach a maximum thickness of 90 m around Cumbernauld (Forsyth et al., 1996)

Approximately 15 m high faces remain. At the north end of the quarry the top of the sill is exposed  $\frac{2}{3}$  of the way up the face; the conformable nature of the contact between the fine-grained chilled margin of the sill is and the bedded baked sandstone above can be clearly identified. Close inspection of the contact and overlying sediments is possible at the side of the quarry but the ground is quite steep, clearance of vegetation and a few simple steps would greatly improve access to this key section.

Other features visible at the site include quartz and calcite veining within the top part of the sill, coarser and more 'patchy' looking microgabbro within the main body of the sill. Columnar jointing, perpendicular to the cooling surface, is fairly well developed and slickenslides can be observed on some fault planes indicating the direction of movement.

Generally microgabbro from near the top or base of a sill is finer grained and more brittle than material from the middle of thick sills. This material was often worked into setts.

### EDC 1: Stratigraphy and Rock Types

Age: Upper Carboniferous	Formation: Midland Valley Sill-Complex
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Rock type: Quartz-microgabbro
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Age: Upper Carboniferous	Formation: Upper Limestone Formation
--------------------------	--------------------------------------

Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type
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### Assessment of Site Value

#### Access and Safety

Aspect	Description
Road access and parking	Site is 50 m from a road, car parking at the local tavern adjacent to the site.
Safety of access	Rough uneven ground on floor of quarry, boggy in places.
Safety of exposure	Some quarry faces are high and potentially loose material should be removed.
Permission to visit	Permission given by the tavern owner.
Current condition	Good; moss and ivy growing in places on the quarry faces but generally they are well exposed. A few young trees within the quarry itself may in time obscure views. Minor amounts of household/garden rubbish in places.
Current conflicting activities	None
Restricting conditions	None known
Nature of exposure	Vertical quarry faces

#### Culture, Heritage & Economic

Aspect	Description	Rating
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Old quarry at the edge of the village of Twechar, revealing the underlying geology	2
History of Earth Sciences	None known	0
Economic geology	Former road-metal quarry	3

<b>EDC 1: GeoScientific Merit</b>				
<b>GeoScientific Merit</b>	<b>Rarity</b>	<b>Quality</b>	<b>Literature/ Collections</b>	<b>1st</b>
Litho Stratigraphy	4	3	2	<input type="checkbox"/>
Sedimentology	2	2	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	6	6	2	<input checked="" type="checkbox"/>
Structural Geology	3	4	2	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	1	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				41
<b>Current Site Value</b>				
<b>Community</b>	Pub adjacent to the quarry is visited on a regular basis			10
<b>Education</b>	A rare locality where the features typical of the top part of a sill and the contact with the deposits it has intruded can be observed.			6
<b>Fragility and potential use of the site</b>				
<b>Fragility</b>	Geohazard, Natural Overgrowth, Development. Pub has recently closed and land is potentially subject to redevelopment.			
<b>Potential use</b>	School, On-site Interpretation			

<b>Geodiversity value</b>	
Although there are numerous disused quarries in East Dunbartonshire within the Midland Valley quartz-dolerite sills and dykes, Twechar quarry is one of the few to expose the top or base of an intrusion. The nature of the contact between the igneous intrusion and the baked sedimentary rocks it intruded can be examined in the quarry and typical field characteristics observed.	<b>6</b>

## EDC 2: Castle Hill Quarry, Twechar

Grid reference: NS 70890 76083	Site type: Artificial quarry works
Site ownership: Not known	Current use: Recreational land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 5 <sup>th</sup> March 2009	

### Site Map

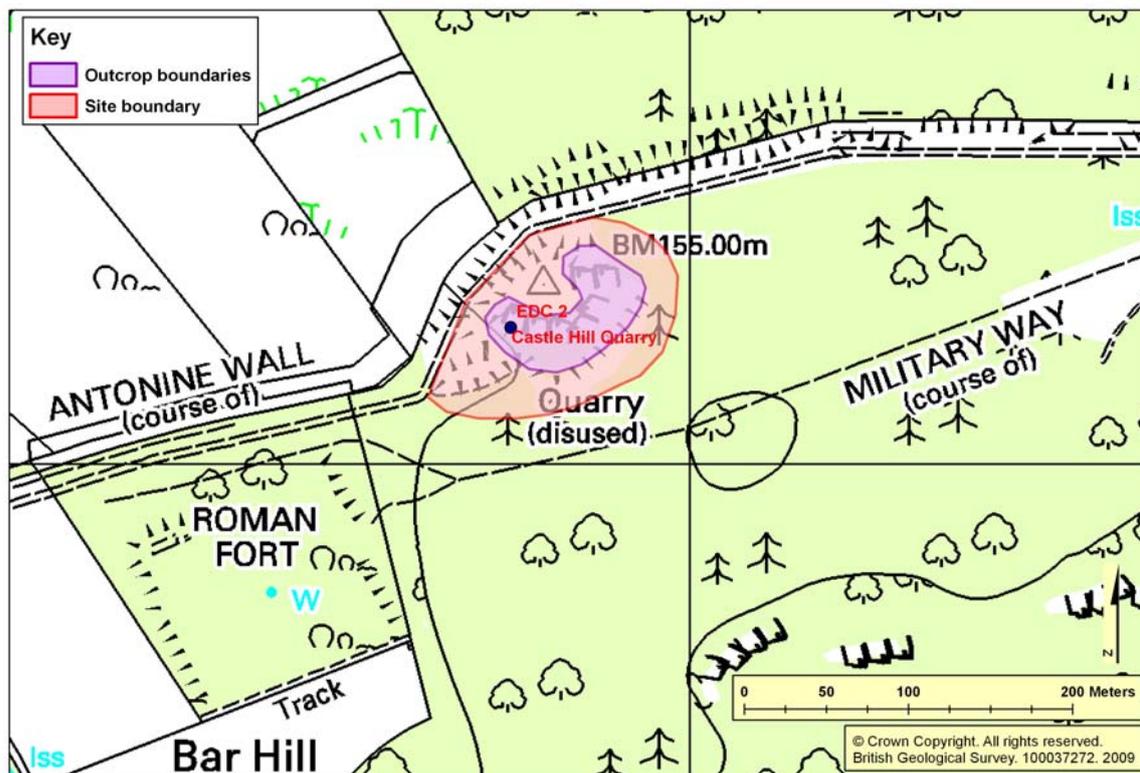


Figure 2: Castle Hill Quarry Location Map

### Summary Description

Disused quartz-dolerite quarry, formerly used for roadstone. Recorded as an 'old quarry' in Robertson, 1937.

This Quartz-microgabbro intrusion is part of the Midland Valley Sill Complex intruding into the upper part of the Limestone Coal Formation sedimentary rocks (below the Meiklehill Main Coal).

Approximately 10m high faces can be seen through the sill. The massive, coarse-grained nature of the rock would suggest the quarry was positioned in the middle part of the sill, the height of the faces give some indication to the great thickness of the intrusion. Some jointing exists, with good examples of spheroidal weathering displayed.

The site is of particular importance due to its historical connections. The quarry is located adjacent to the remains of the Antonine Wall, built by the Romans and there was an Iron-Age hill fort on top of Castle Hill (now partly removed by the quarry).

Interpretation boards already exist on the 'Bar Hill Roman Fort', 'Bar Hill Roman Baths' and 'Castle Hill', produced by Historic Scotland, where the foundations remain. Unfortunately, there is no mention of the underlying geology on the boards, although it was probably the high ground formed by the resistant nature of the sill which attracted the Roman engineers to this superb strategic location overlooking the Kelvin valley and to build a defensive wall here - in a similar way that Hadrian built his wall on the Whin

Sill farther south. Any new leaflets/literature on the wall should include some information on the underlying geology.

Excellent views from the trig point immediately north of quarry, E and W along the Kelvin valley and northwards to the Kilsyth Hills. Probably the reason for positioning a Roman Fort here. This could be another potential site for an interpretation board to explain the geological landscape. Differential resistance to erosion of the different rock types is clearly reflected in the nature of the topography. Almost all the features of prominent relief are due to the presence of intrusive or extrusive igneous rocks.

From a Quaternary perspective, the microgabbro outcrops forming the high ground of Bar Hill and Croy Hill (to the east) show the typical asymmetrical shape of a 'crag and tail'. Moulded by the passage of ice, both of these hills display steep slopes to the WSW (the crag) and gentle slopes to the ESE (the tail), indicating ice flow in an easterly direction.

## EDC 2: Stratigraphy and Rock Types

Age: Upper Carboniferous      Formation: Midland Valley Sill-Complex

Rock type: Quartz-microgabbro

## Assessment of Site Value

### Access and Safety

Aspect	Description
Road access and parking	Parking in Twechar village, walk eastwards 1-1.5km up a well signposted farm track, then over rough ground to the quarry at Castle Hill
Safety of access	Wooded around quarry faces and area to the south, some steepish ground at the base of the quarry faces, accessible with care.
Safety of exposure	Little potential for any blocks to become dislodged due to widely-spaced jointing, but full assessment would need to be made.
Permission to visit	No permission to visit was sought, located adjacent to archaeological remains open to the public.
Current condition	Quarry faces are quite mossy, obscuring details of the microgabbro, also some impressive biological weathering in places with tree roots growing within joints. Old iron fencing along the eastern end could be removed.
Current conflicting activities	None
Restricting conditions	None known
Nature of exposure	Sub-vertical quarry faces

### Culture, Heritage & Economic

Aspect	Description	Rating
Historic, archaeological & literary associations	Located on the Antonine Wall: adjacent to Bar Hill Roman Fort, Bar Hill Roman Baths and Castle Hill Iron-Age Hill Fort.	9
Aesthetic landscape	Intrusion forms high ground which allows good views to N and E across the Kelvin Valley towards the Kilsyth Hills.	5
History of Earth Sciences	None known	0
Economic geology	Former road metal quarry	2

EDC 2: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	4	5	2	<input checked="" type="checkbox"/>
Structural Geology	2	2	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	3	4	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				22
Current Site Value				
<b>Community</b>	Antonine Wall and associated archaeology attracts many visitors to pass by, though very few probably look at the quarry faces on the 'backside' of the hill.		10	
<b>Education</b>	The quarry exposes typical features associated with the middle part of a thick sill, good spheroidal weathering and examples of biological weathering.		4	
Fragility and potential use of the site				
<b>Fragility</b>	Geohazard			
<b>Potential use</b>	School, On-site Interpretation, Multidisciplinary			

Geodiversity value	
The main value of this site is the historical associations. The quartz-microgabbro sill has formed high ground which has been used by the Romans to build a major defensive wall, 63km long, across Scotland. There are also great views from the top along the Kelvin valley and towards the Kilsyth Hills where the relationship between the landscape and the underlying geology can be explored.	<b>5</b>

## EDC 3: Board Craigs Quarry, Twechar

Grid reference: NS 70009 74903	Site type: Artificial quarry works
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 5 <sup>th</sup> March 2009	

### Site Map

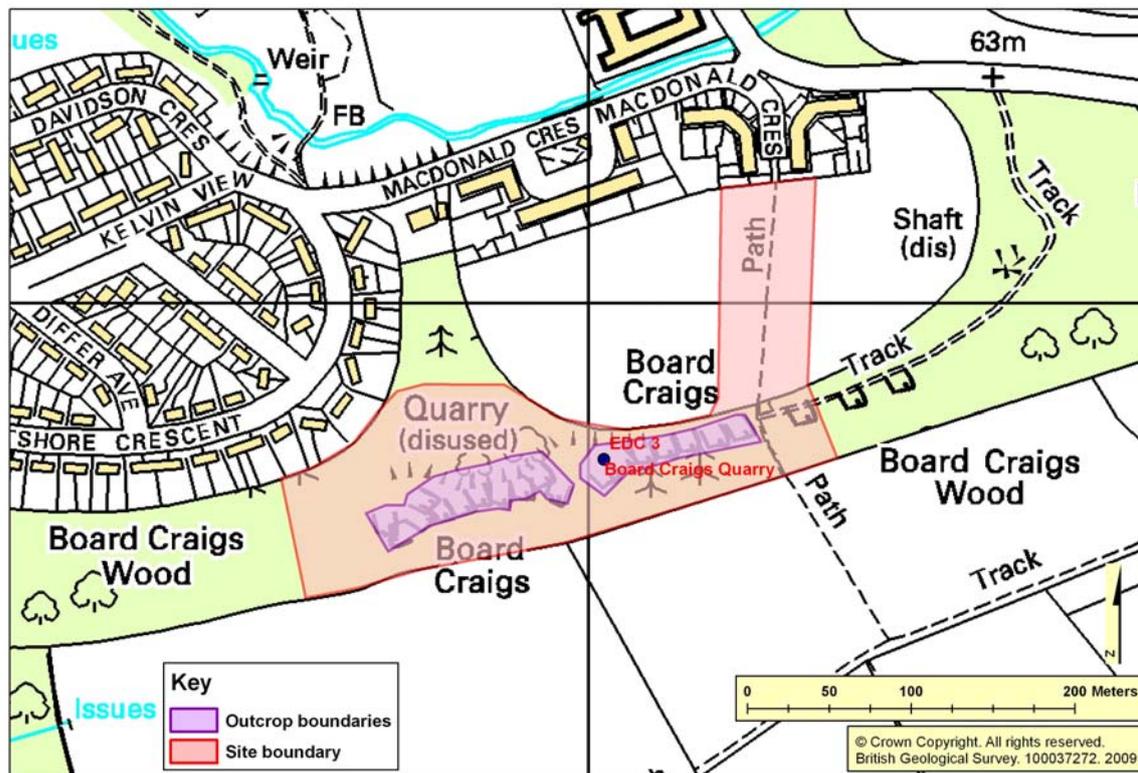


Figure 3: Board Craigs Quarry Location Map

### Summary Description

Disused quartz-microgabbro quarry, formerly used for roadstone. Recorded as an 'old quarry' in Robertson, 1937 and on the 1922/23 Ordnance Survey map.

This intrusion is part of the Midland Valley Sill Complex intruding into the upper part of the Limestone Coal Formation (above the Meiklehill Main Coal).

Approximately 10m high cliff faces are exposed along an escarpment through the quartz-microgabbro sill. The medium/coarse-grained nature of the rock would suggest the quarry was positioned in the middle part of the sill, the height of the faces give some indication to the thickness of the intrusion. No evidence of top or base of the sill seen. The exposures vary in their quality along the escarpment, but some areas display good sub-vertical columnar jointing and rusty coloured weathering, typical of a basic igneous intrusion with its high Fe/Mg mineral content. There are also good examples of spheroidal and biological weathering here.

Great views from the site northwards across the Kelvin valley to the Kilsyth Hills and Campsie Fells.

<b>EDC 3: Stratigraphy and Rock Types</b>	
Age: Upper Carboniferous	Formation: Midland Valley Sill-Complex
Rock type: Quartz-microgabbro	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Street parking is available in the housing estate at the southern edge of Twechar village, opposite the school. Footpath from here heads uphill across grassy farmland to wooded area where the exposures are. Need to cross old barbed wire fence to access woodland. Few minutes walk.	
Safety of access	Gently sloping ground in fairly open mature woodland, access is fine with a little care.	
Safety of exposure	Quarry faces should be checked for any loose material which may fall.	
Permission to visit	No permission sought	
Current condition	Good; moss and ivy growing in places on the quarry faces but generally they are well exposed. Some good biological weathering where tree roots are growing in the joints of the microgabbro. Minor amounts of household/garden rubbish in places, generally clean.	
Current conflicting activities	None	
Restricting conditions	None known	
Nature of exposure	Vertical quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Farmland at the edge of the village of Twechar. Good views over the village to the Kilsyth Hills	2
History of Earth Sciences	None known	0
Economic geology	Former road metal quarry	2

EDC 3: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	5	4	2	<input type="checkbox"/>
Structural Geology	2	2	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	4	3	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				22
Current Site Value				
<b>Community</b>	Dog walkers and local residents are likely to visit the fields adjacent to the site, located immediately behind a residential estate.			8
<b>Education</b>	The quarry exposes typical features associated with the middle part of a thick sill, and some examples of spheroidal and biological weathering.			4
Fragility and potential use of the site				
<b>Fragility</b>	Geohazard			
<b>Potential use</b>	School			
Geodiversity value				
Geologically this site displays a good section through the middle part of a thick quartz-microgabbro intrusion, combined with being used as a local resource and the great view to the Campsie Fells				<b>3</b>

## EDC 4: Lenzie–Torphichen Dyke, Lenzie

Grid reference: NS 66889 71831	Site type: Natural exposure
Site ownership: Not known	Current use: Private Country
Field surveyor: Sarah Arkley & Luis Alborno-Parra	Current geological designations: None
Date visited: 5 <sup>th</sup> March 2009	

### Site Map

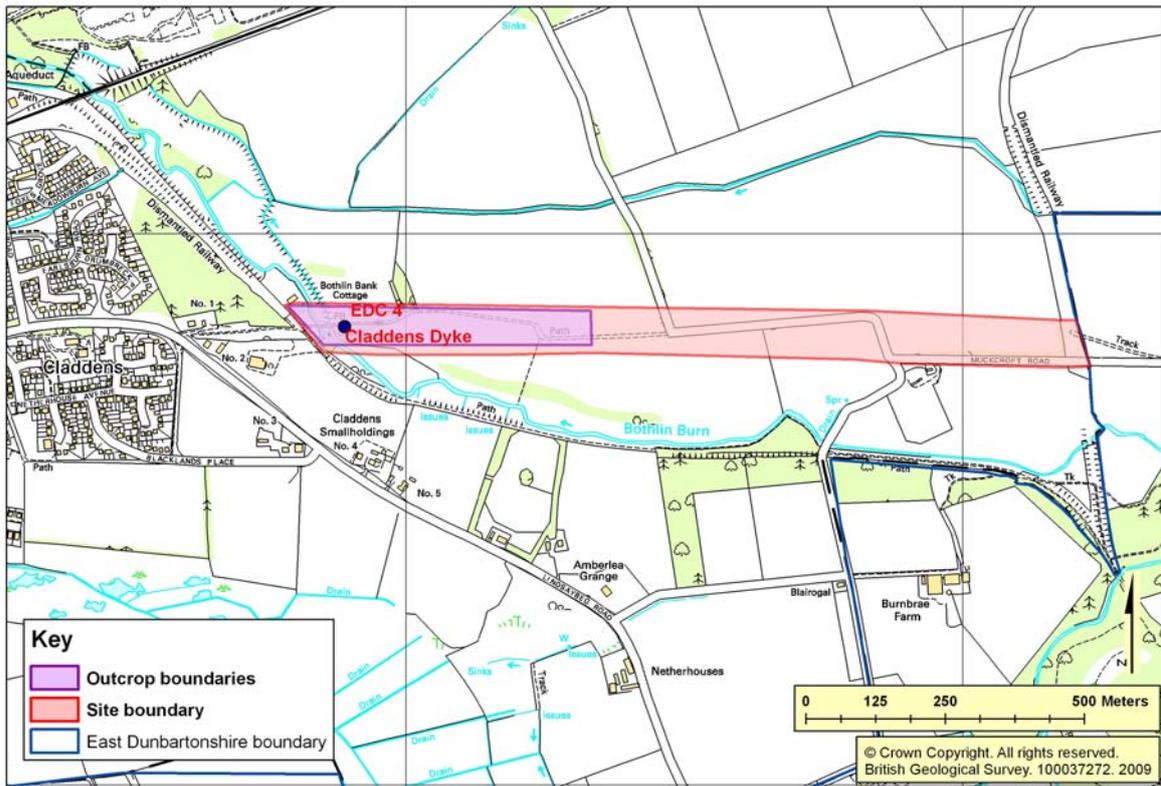


Figure 4: Lenzie–Torphichen Dyke Location Map

### Summary Description

The topographic expression and composition of the Lenzie–Torphichen Dyke can be explored at this site at Claddens on the east side of Lenzie. This and the nearby Claddens Dyke to the south are significant E–W trending, quartz-microgabbro, sub-vertical sheet-like intrusions which traverse across East Dunbartonshire. The dykes cut through the Carboniferous sedimentary rocks of the Midland Valley.

They, with a few other quartz-microgabbro dykes stretch east-west 10's km with little interruption across East Dunbartonshire. The dykes are commonly 20–30 m thick, although have been recorded up to 45 m (Forsyth et al, 1996). The dykes are generally regarded as feeders to the sills (such as those exposed in EDC1, EDC2 and EDC3) and as such their age is assumed to be same (290–295 Ma).

Some have been quarried but generally the much thicker sills were exploited as a resource.

Good site to show how geology influences the shape of the landscape – resistant nature of the microgabbro dyke forms a long, narrow, wall-like ridge.

The high ground, formed by the resistant nature of the microgabbro, appears to have influenced the course of the river at this point and the nature of the channel. Also forms a distinctive ridge farther east (1.25 km) which has been used to build the road on. Exposure of the dyke materials are limited, lake below south side but to west of river there are outcrops either side of road which could be cleaned up

('old quarry' recorded here on 1922/23 OS map). Weir positioned where dyke crosses river - humans following natural barrier. Info in Robertson, 1937, p101 and Clough, 1911, p158. If any leaflets were to be written on the StrathKelvin Railway Path, could include some info on this site.

#### EDC 4: Stratigraphy and Rock Types

Age: Upper Carboniferous      Formation: Lenzie–Torphichen Dyke

Rock type: Quartz-microgabbro

#### Assessment of Site Value

##### Access and Safety

Aspect	Description
Road access and parking	Parking probably best within the housing estates in the south-western part of Kirkintilloch, either walk eastwards along the road (B757) to the site or join the course of the old railway line ('StrathKelvin Railway Path') and find the site from the north.
Safety of access	Construction work is currently taking places in the western part of the site. South of the site, part of the land is flooded and has very boggy areas, otherwise rough open country.
Safety of exposure	Small natural exposures are well-jointed but there is little risk of material falling. Man-made exposures are sub-vertical and recent, these should be checked for any loose material higher up the faces and cleaned up for access to fresh sections.
Permission to visit	No permission sought
Current condition	Good
Current conflicting activities	Construction work in the western part of the site
Restricting conditions	None
Nature of exposure	Natural and man-made outcrops along

##### Culture, Heritage & Economic

Aspect	Description	Rating
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Mainly farmland. Dyke forms prominent ridge over several km's	3
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 4: GeoScientific Merit																																					
<table border="1"> <thead> <tr> <th>GeoScientific Merit</th> <th>Rarity</th> <th>Quality</th> <th>Literature/ Collections</th> <th>1st</th> </tr> </thead> <tbody> <tr> <td>Litho Stratigraphy</td> <td>0</td> <td>0</td> <td>0</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Sedimentology</td> <td>0</td> <td>0</td> <td>0</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Igneous/Mineral/ Metamorphic Geology</td> <td>6</td> <td>5</td> <td>2</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Structural Geology</td> <td>2</td> <td>2</td> <td>0</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Palaeontology</td> <td>0</td> <td>0</td> <td>0</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Geomorphology</td> <td>5</td> <td>5</td> <td>2</td> <td><input type="checkbox"/></td> </tr> </tbody> </table>			GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st	Litho Stratigraphy	0	0	0	<input type="checkbox"/>	Sedimentology	0	0	0	<input type="checkbox"/>	Igneous/Mineral/ Metamorphic Geology	6	5	2	<input checked="" type="checkbox"/>	Structural Geology	2	2	0	<input type="checkbox"/>	Palaeontology	0	0	0	<input type="checkbox"/>	Geomorphology	5	5	2	<input type="checkbox"/>
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Palaeontology	0	0	0	<input type="checkbox"/>																																	
Geomorphology	5	5	2	<input type="checkbox"/>																																	
<b>Total geoscientific merit score</b>			29																																		
Current Site Value																																					
<b>Community</b>	On the other side of the river to the StrathKelvin Railway Path which seems popular with locals. Footbridge at site.	9																																			
<b>Education</b>	The dyke is a good example of how a rock which is more resistant to weathering and erosion than the surrounding material forms a positive feature on our landscape; reading the landscape.	6																																			
Fragility and potential use of the site																																					
<b>Fragility</b>	Development. Construction work ongoing in the western part of the site.																																				
<b>Potential use</b>	School, On-site Interpretation, Geotrail																																				
Geodiversity value																																					
Of the several east-west trending dykes which traverse across East Dunbartonshire this site best reveals the composition and the influence of such igneous intrusions on the present day landscape.		4																																			

## EDC 5: Meltwater Channel, Cadder

Grid reference: NS 62787 72625	Site type: Natural landform
Site ownership: Not known	Current use: Agricultural land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 5 <sup>th</sup> March 2009	

### Site Map

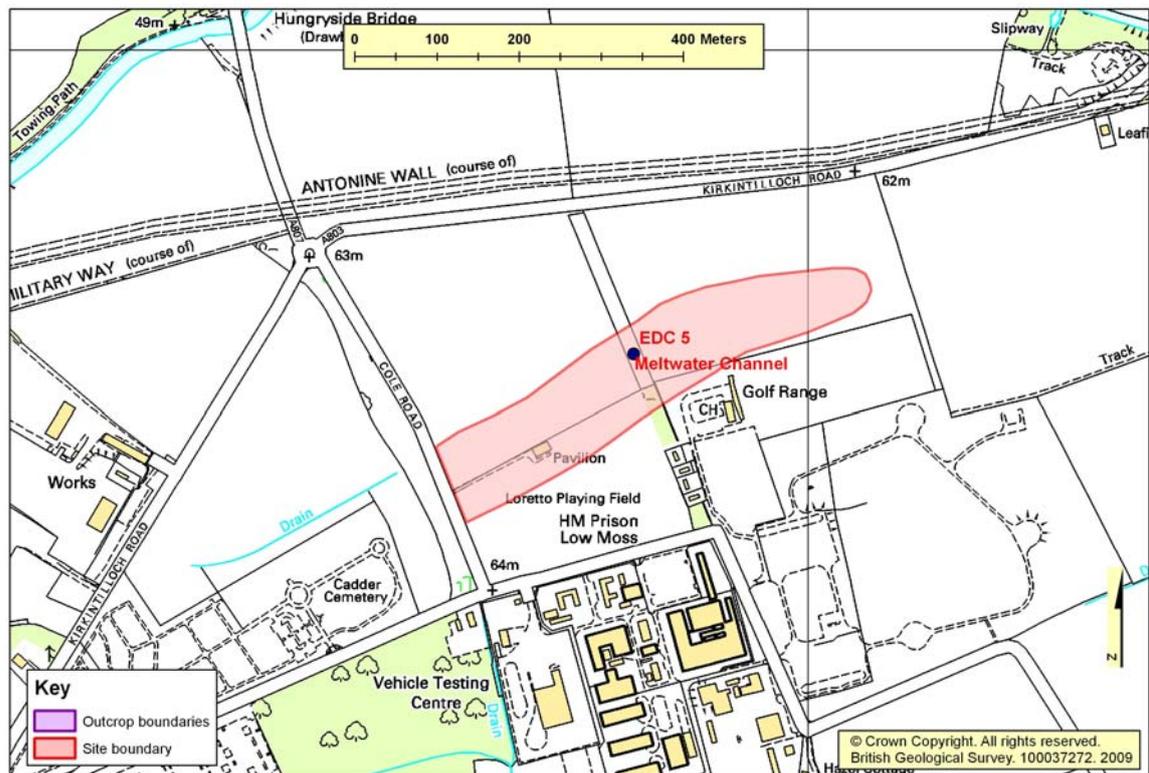


Figure 5: Glacial Meltwater Channel Location Map

### Summary Description

Glacial meltwater channel, orientated ENE–WSW. Channel carved out by meltwater from a retreating glacier. 'U'-shaped, linear depression in agricultural farmland, approx 10 m deep, 50 m across and > 1 km long. Interpreted as a glacial meltwater channel cut into glacial till. Formed as the ice retreated back to the north and west and meltwater shed off the front of the glaciers. Southern margin of the pre-glacial channel of the Kelvin passes near here, confirmed by boreholes.

<b>EDC 5: Stratigraphy and Rock Types</b>	
Age: Pleistocene	Formation: Wilderness Till Formation
Rock type: Glacial deposits: diamicton	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Either park in a layby 700 m ENE of the site by Leafield Cottage or may be able to park in the golf range located 100 m SE of the site.	
Safety of access	Located within agricultural fields but a tree belt dissecting the channel at right angles allows good access into the channel	
Safety of exposure	Undulating fields, muddy feet would probably be the worst that could happen	
Permission to visit	No permission sought	
Current condition	Good, best channel definition seen when crops are very young or fields are ploughed.	
Current conflicting activities	Ploughing will over time 'smooth out' the channel	
Restricting conditions	Time of year; crop height	
Nature of exposure	Natural landform	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Mainly farmland. Distinctive landform	2
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 5: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	4	5	2	<input checked="" type="checkbox"/>
<b>Total geoscientific merit score</b>				11
Current Site Value				
<b>Community</b>	Farmer is probably the only person to go into the fields where the channel lies, but there is a golf range to the south of the field and a main road (with footpath) to the north			5
<b>Education</b>	Good example of a linear meltwater channel, extending over 100's of metres, with other glacial features and sediments nearby a glacial story could be developed.			5
Fragility and potential use of the site				
<b>Fragility</b>	None			
<b>Potential use</b>	School			

Geodiversity value	
Meltwater channels record the retreat of the last glaciers following a period of glaciation. They illustrate the youngest event in the geological history of the area. Although there are many examples across Scotland, this type of landform is relatively rare in East Dunbartonshire and this site displays one of the best examples. Its geodiversity value is enhanced on account of its relative rarity in East Dunbartonshire.	<b>3</b>

## EDC 6: Bardowie Loch, Bardowie

Grid reference: NS 57893 73591	Site type: Natural landform
Site ownership: Not known	Current use: Recreational land
Field surveyor: Sarah Arkley & Luis Alborno-Parra	Current geological designations: None
Date visited: 5 <sup>th</sup> March 2009	

### Site Map

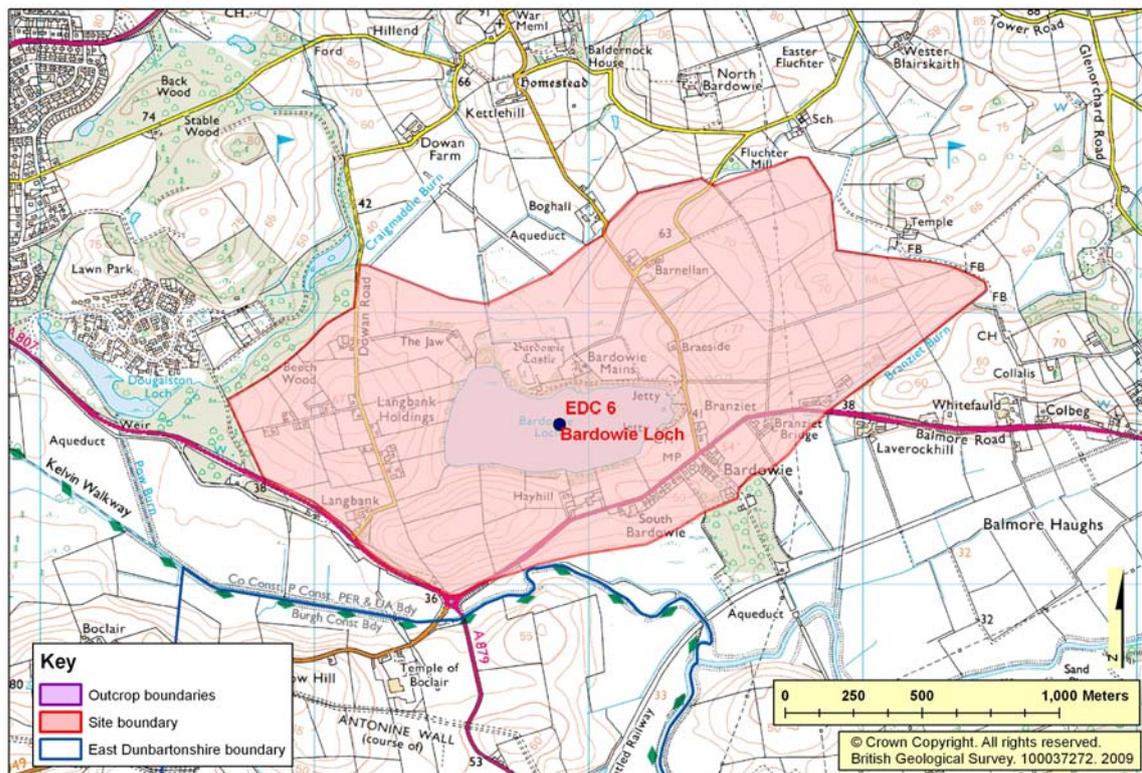


Figure 6: Bardowie Loch Location Map

### Summary Description

Inter-drumlin hollow and adjacent drumlins.

During the Quaternary, the area was covered by ice sheets on several occasions which moulded the topography and laid down extensive glacial deposits. Much of the low ground in East Dunbartonshire is covered by glacial till, some of which has been moulded into elongate ridges parallel to the direction of ice flow (drumlins). On retreat of the ice, meltwater poured from the glaciers over the new glacial topography, hollows between some of the drumlins were flooded and formed lochs. Bardowie Loch is thought to have formed in this way, its dimensions are approximately 815 m x 350 m.

The size and depth of the loch has likely allowed a continuous sequence of fine-grained sediment to accumulate on the loch floor, along with organic matter and animal remains. A core through this sequence, and detailed analysis of the sediments and animal/plant remains could provide an unbroken record of environmental change since the formation of the loch. The site is unspoilt and clean. There are currently no public footpaths around the loch, but the loch is used regularly by a local sailing club. The glacial topography and meltwater flooding has created an excellent wetland habitat for wildlife. Northern margin of the pre-glacial channel of the Kelvin passes beneath here (evidence from boreholes).

<b>EDC 6: Stratigraphy and Rock Types</b>	
Age: Pleistocene	Formation: Wilderness Till Formation
Rock type: Glacial deposits: diamicton	
Age: Quaternary	Formation: Kelvin Formation
Rock type: Lacustrine deposits: clay, silt and sand	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Appears to be surrounded by private land. A lay-by large enough for a few cars exists opposite the sailing club, but the only discovered access is along a 'private road' which exists along the north side of the loch. Views of the loch can be made from the public road to the south of the loch.	
Safety of access	Access along the 'private road' is good, take care at the waters edge.	
Safety of exposure	Wet feet if you get too close to the water's edge	
Permission to visit	No permission sought	
Current condition	Good	
Current conflicting activities	None	
Restricting conditions	No footpaths around the loch shore	
Nature of exposure	Natural landform	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Reasonably sized loch surrounded by rolling hills, mainly farmland.	4
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC6: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	4	6	2	<input checked="" type="checkbox"/>
<b>Total geoscientific merit score</b>				12
Current Site Value				
<b>Community</b>	Sailing club at the eastern end of the loch		9	
<b>Education</b>	Good example of an inter-drumlin hollow and surrounding drumlins. A thick and continuous sequence of sediments has probably accumulated on the loch floor which could reveal, with research, information about how the local environment has developed since the loch's formation when the ice retreated.		5	
Fragility and potential use of the site				
<b>Fragility</b>	None			
<b>Potential use</b>	School, On-site Interpretation, Multidisciplinary			

Geodiversity value	
Although neither lochs nor drumlins are rare features in the area, Bardowie Loch is a very good example of a flooded inter-drumlin hollow. However the main value of the site lies below the water, where the likely presence a continuous sequence of sediment on the loch floor could provide an important insight into how the local environment has changed from the last glaciation to the present day .Its geodiversity value is enhanced as it is a good example of a flooded inter-drumlin hollow and its potential for future research	<b>3</b>

## EDC 7: River Kelvin Meanders, Bearsden

Grid reference: NS 56262 70469	Site type: Natural landform
Site ownership: Not known	Current use: Recreational land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 6 <sup>th</sup> March 2009	

### Site Map

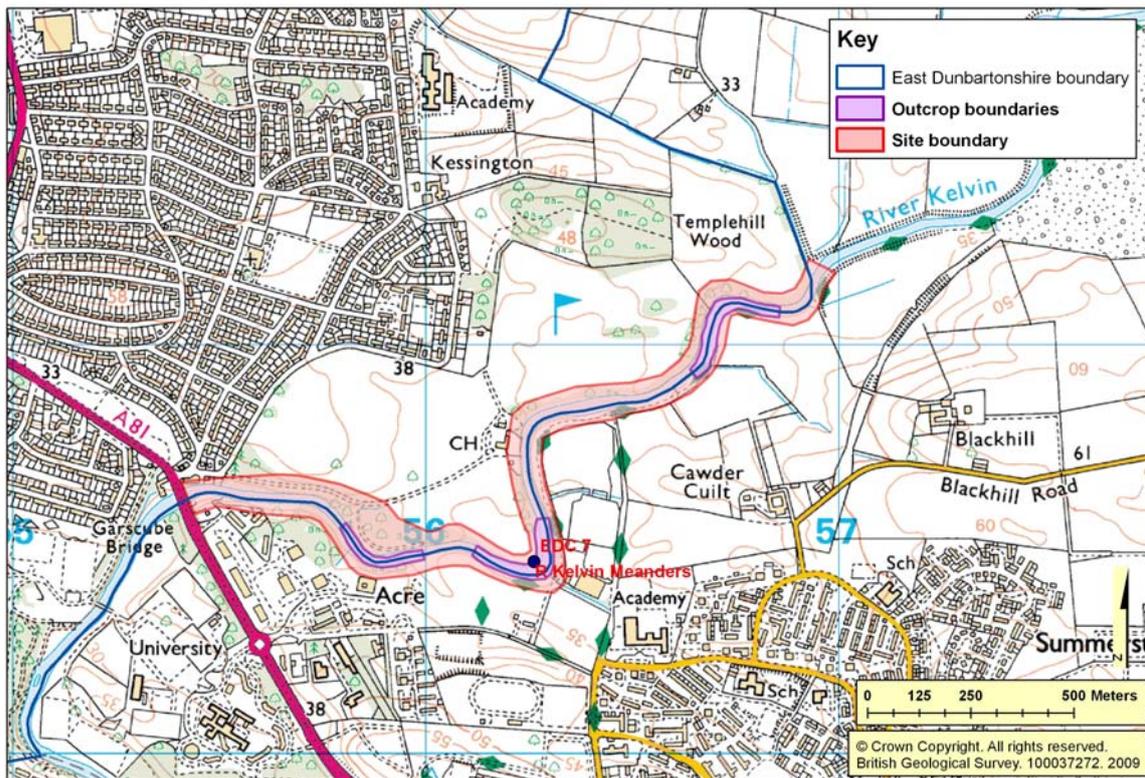


Figure 7: River Kelvin Meanders Location Map

### Summary Description

Typical river features seen along a meandering stretch of the River Kelvin on the edge of Bearsden.

This site is one of the best places to observe lower course river features in East Dunbartonshire. The meanders display good examples of river-cliffs and point-bars. The erosive banks found on the outside of the meander are up to 2–2.5 m high, cutting into bedrock in places. The depositional point-bar, made up of soft fine-grained sediment, forms on the inside of the meander.

Towards the northeastern corner of the site a mid-channel bar can also be seen. Located on a meander, the bar creates an eddy flow, where water between the bar and the river bank flows upstream.

<b>EDC 7: Stratigraphy and Rock Types</b>	
Age: Pleistocene	Formation: Wilderness Till Formation
Rock type: Glacial deposits: diamicton	
Age: Holocene	Formation: Kelvin Formation
Rock type: Alluvium deposits: clay, silt, sand and gravel	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking is possible north of the meanders at Killermont Golf Club (ask for permission) access to views along the river is possible along the edge of the golf course. The 'Kelvin Walkway' runs along part of the meandering rivers course south of the river	
Safety of access	Generally open woodland or shrub along the river banks, easy walking	
Safety of exposure	Be careful of steep or overhanging river banks	
Permission to visit	Killermont Golf Club for the area north of the river	
Current condition	Good	
Current conflicting activities	Stabilisation of the river banks would obscure any natural sections or landforms	
Restricting conditions	None	
Nature of exposure	Natural landforms	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Unspoilt river course, partly wooded at the edge of Glasgow City	3
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 7: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	2	2	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	3	4	0	<input checked="" type="checkbox"/>
<b>Total geoscientific merit score</b>				11
Current Site Value				
<b>Community</b>	Popular golf course to the north of the river and public footpath south of the river means people are frequently walking along the site			10
<b>Education</b>	Reasonable examples of meanders, displaying classic river cliffs and point bars. 'Cut-off' meanders can be seen further upstream in the River Kelvin between Torrance and Kirkintilloch (Torrance Meanders, EDC 36)			4
Fragility and potential use of the site				
<b>Fragility</b>	Erosion			
<b>Potential use</b>	School, Multidisciplinary			

Geodiversity value	
<p>This site displays characteristic erosional and depositional river features found in the lower course of a mature river. Although common across Central Scotland, examples of good sized meanders are relatively rare in East Dunbartonshire. The main value of the site is to use these fluvial deposits and landforms which are actively forming today and representative of river landforms forming across Scotland to help us understand the structures and sediments observed in fossil river deposits from the Carboniferous which underlie extensive areas of the Midland Valley. As Charles Lyell summarised in the 1830's "The present is the key to the past". In the absence of locally active glaciers or volcanoes, rivers are a good example to illustrate the important geological principle of uniformitarianism, explaining that the same natural processes that operate now, have always operated in the past, and at the same rates. Its geodiversity value is enhanced on account of its relative rarity in East Dunbartonshire.</p>	<b>3</b>

## EDC 8: Kilmardinny Loch, Bearsden

Grid reference: NS 54917 72934	Site type: Natural landform
Site ownership: Not known	Current use: Recreational land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 6 <sup>th</sup> March 2009	

### Site Map

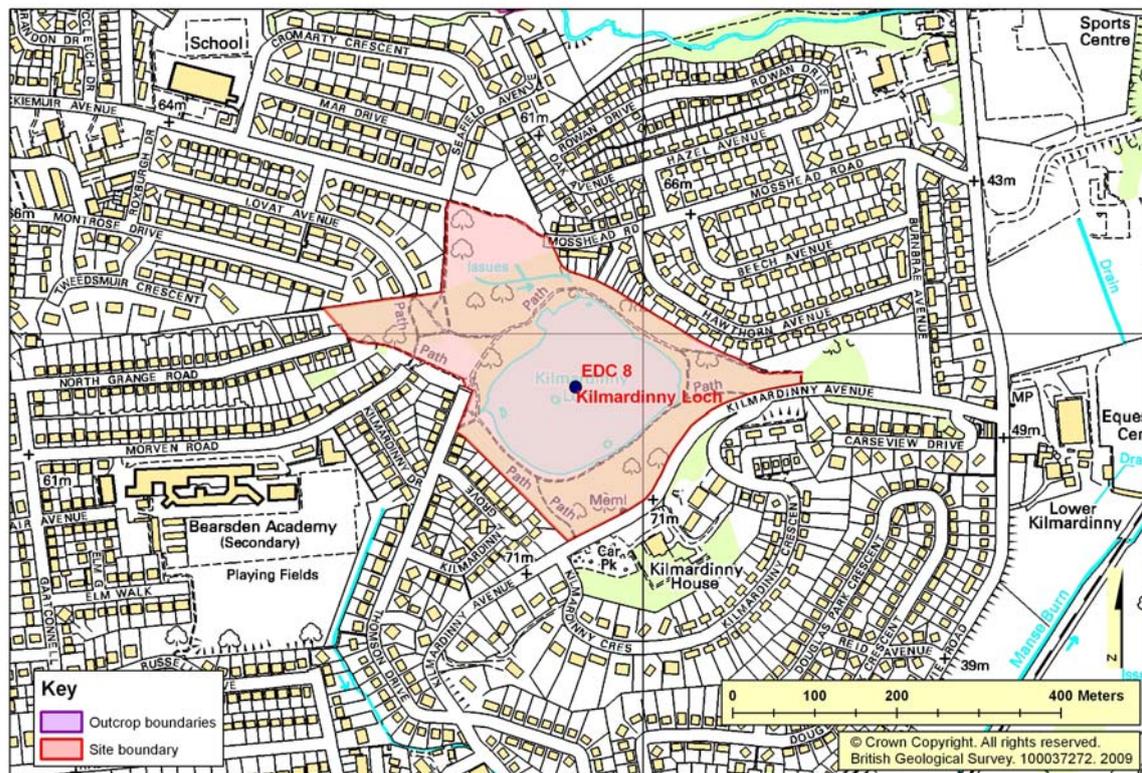


Figure 8: Kilmardinny Loch Location Map

### Summary Description

Small inter-drumlin loch in urban environment.

During the Quaternary, the area was covered by ice sheets on several occasions which moulded the topography and laid down extensive glacial deposits. Much of the low ground in East Dunbartonshire is covered by glacial till, some of which has been moulded into elongate ridges parallel to the direction of ice flow (drumlins). On retreat of the ice, meltwater poured from the glaciers over the new glacial topography, hollows between some of the drumlins were flooded and formed lochs. Kilmardinny Loch is thought to have formed in this way; its dimensions are approximately 250 m x 200 m.

The glacial topography and the subsequent flooding of this inter-drumlin area have created an excellent wetland habitat for a variety of birds & animal species. The margins of the loch also support a variety of wetland flora. A wildlife oasis with a built-up environment which is enjoyed by local residents. The site illustrates how the shape of the landscape influences the way man and wildlife can use the area. Despite being located beneath a flight path for Glasgow Airport and very much within the urban environment, the site is rather unspoilt and reasonably well looked after. There are many public footpaths around the loch which are well used by locals. No information about the site was observed, but not sure if any kind of interpretation board would survive here. Cadder Sand and Gravel Formation has been mapped adjacent to the loch but no exposures were seen - may be a possibility for creating an exposure.

<b>EDC 8: Stratigraphy and Rock Types</b>	
Age: Pleistocene	Formation: Wilderness Till Formation
Rock type: Glacial deposits: diamicton	
Age: Quaternary	Formation: Kelvin Formation
Rock type: Lacustrine deposits: clay, silt and sand	
Age: Pleistocene	Formation: Cadder Sand and Gravel Formation
Rock type: Gravel, sand and silt	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Small parking area at the east end of the loch, but street parking in the surrounding residential areas should be possible in a number of places.	
Safety of access	Wooded area surrounds the loch, good footpaths into the site and a flat path goes all the way round.	
Safety of exposure	Could get your wellingtons stuck if heading into the wetland areas at the edge of the loch	
Permission to visit	No permission sought	
Current condition	Okay, minor household/garden rubbish	
Current conflicting activities	None	
Restricting conditions	None	
Nature of exposure	Natural landform	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Valuable open space with urban environment	3
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 8: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	4	4	2	<input checked="" type="checkbox"/>
<b>Total geoscientific merit score</b>				10
Current Site Value				
<b>Community</b>	Public park surrounded by housing estates, local residents frequent the site, feeding birds, dog-walking, etc.			10
<b>Education</b>	Small inter-drumlin loch, if an exposure of sand and gravel could be found/created this would add significantly to the value of the site. Thick sequence of sediments may also exist beneath the loch			5
Fragility and potential use of the site				
<b>Fragility</b>	None			
<b>Potential use</b>	School, On-site Interpretation, Multidisciplinary			

Geodiversity value	
Although neither lochs nor drumlins are rare features in the area, Kilmardinny Loch is a good example of a flooded inter-drumlin hollow. However, the main value of the site is that the fact that it is located within the urban environment and could be used as an example of the glacial features and deposits created in the area during the last glaciation and developed to inform residents about their local geological history. Its geodiversity value is enhanced on account of its accessible location.	<b>3</b>

## EDC 9: Craighdu Burn, Bearsden

Grid reference: NS 54838 73404	Site type: Natural exposure
Site ownership: Not known	Current use: Urban
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 6 <sup>th</sup> March 2009	

### Site Map

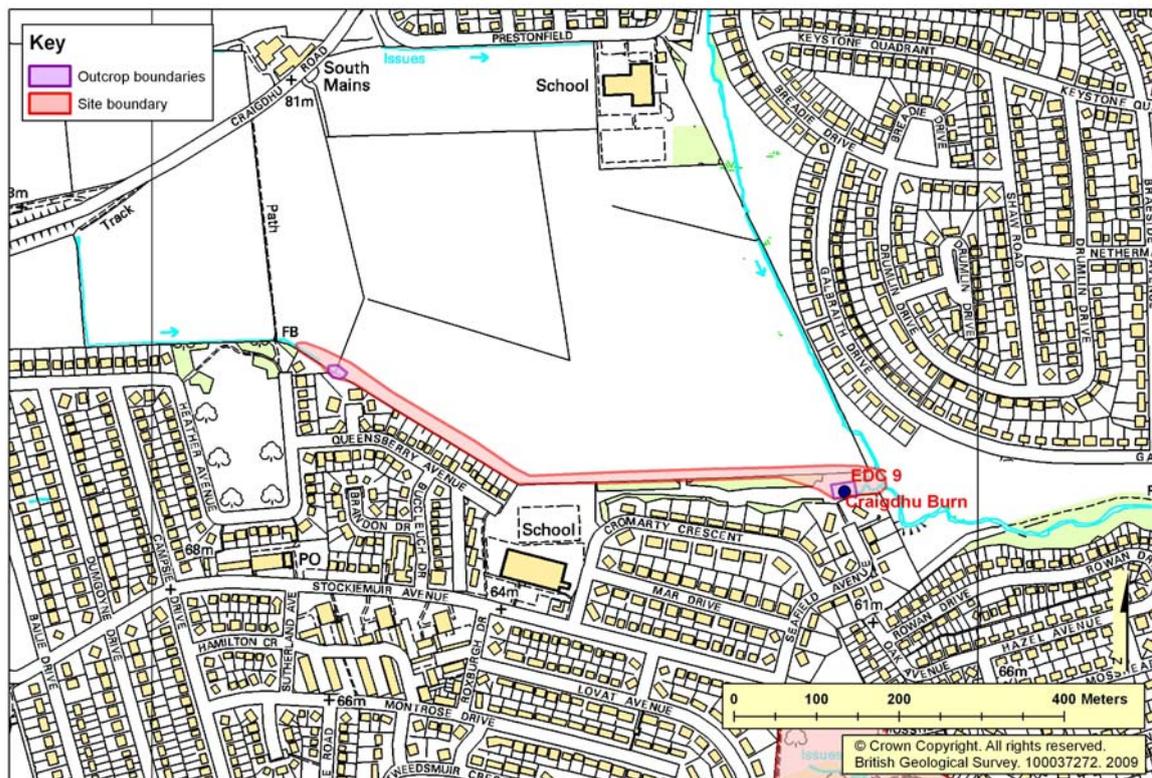


Figure 9: Craighdu Burn Location Map

### Summary Description

Geological exposures along a tributary of the Craighdu Burn no longer exist. The burn is now piped underground and exposures have been covered.

The geological map records exposures through the sedimentary strata of the Limestone Coal Formation which contained fossils of the brachiopod '*Lingula*' (a marine shell). But no exposures of bedrock are now visible. Where the burn is flowing on the surface to E and W of the recorded exposures, it cuts through glacial till, no bedrock was found.

A second recorded bedrock exposure (on the geological map) describes a 10" coal seam, possibly the Kilsyth Coking Coal, about 60m SE (downstream) of the confluence with the Craighdu Burn. However, the riverbank where the section is thought to exist is very degraded and vegetated.

Farther west of the recorded exposures, a small burns joins the tributary, the water is very iron-rich and forms deposits on pebbles in the base of the burn - ?mine water.

<b>EDC 9: Stratigraphy and Rock Types</b>	
Age: Upper Carboniferous	Formation: Limestone Coal Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Street parking in the housing estate to the south of the site	
Safety of access	Public footpath along course of the burn, housing to the south of the burn, farmland to the north. Dense shrubs along course of burn	
Safety of exposure	Beware of thorny shrubs if looking for any remaining outcrops	
Permission to visit	No permission sought	
Current condition	No geology sections exist anymore – burn is now piped underground	
Current conflicting activities	'Improved' water course management	
Restricting conditions	Concrete pipe and soil	
Nature of exposure	Stream sections were previously recorded	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Located along boundary between housing estate and farmland	2
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 9: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				0
Current Site Value				
<b>Community</b>	Frequent use by local residents.			10
<b>Education</b>	Site was chosen for it's exposure of fossil shells – these should still exist under there.			2
Fragility and potential use of the site				
<b>Fragility</b>	None			
<b>Potential use</b>	None			
Geodiversity value				
Unfortunately the exposures displaying Carboniferous fossils for which this site was chosen are no longer visible. But this site has been included as an example of what could happen to a number of other good sites displaying East Dunbartonshire's rich geodiversity if there is not appropriate protection in place.				<b>0</b>

## EDC 10: Manse Burn, Bearsden

Grid reference: NS 52951 73295	Site type: Natural section
Site ownership: Not known	Current use: Recreational land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: SSSI
Date visited: 6 <sup>th</sup> March 2009	

### Site Map

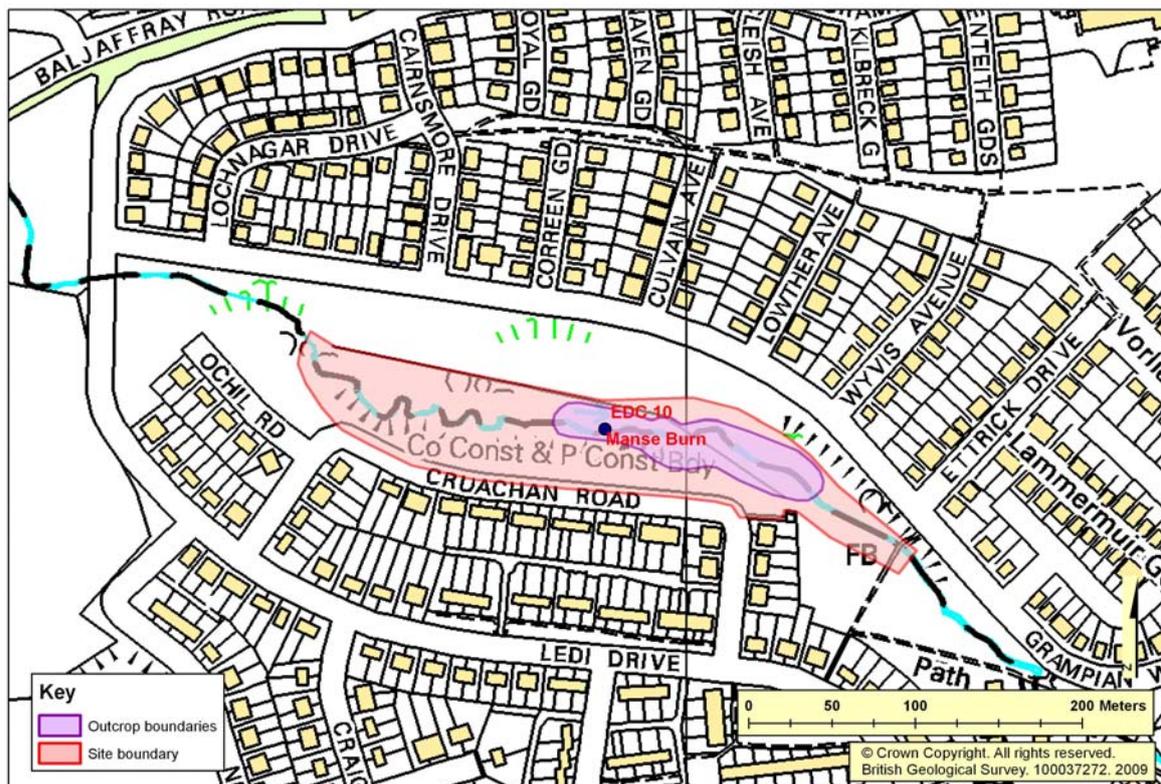


Figure 10: Manse Burn Location Map

### Summary Description

Manse Burn, SSSI. Carboniferous fossil sharks found in 1980's with 14 species of fish. Carboniferous black shale outcrops found in stream bed and banks. Bedrock exposures up to 1.5 m high in stream banks. Top of Lower Limestone Formation, Top Hosie Limestone and base of Limestone Coal Formation are exposed along the burn.

Small rivulet flowing out of bank (?at rockhead), very iron-rich, coating bank sediments in bright orange - ?mine waters. Site is interesting/important scientifically but not very impressive for public. Being a SSSI, public passing by and trying their luck at fossil picking should not be encouraged. Manager of Douglas Muir quarry informed BGS that local residents are hoping to pull together some information for the public after someone turned up at Milngavie Railway Station with a rifle asking where he had to go to shoot the sharks! Tarmac is supporting the 'Shark Project'. Exposure of the Wilderness Till Formation at the western end of the burn.

<b>EDC 10: Stratigraphy and Rock Types</b>	
Age: Upper Carboniferous	Formation: Limestone Coal Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Top Hosie Limestone, Lower Limestone Formation
Rock type: Limestone	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Ample street parking in the housing estate surrounding the site	
Safety of access	Burns runs through an area of open ground in the estate, small informal footpath runs alongside the burn allowing access, although frequently crosses the burn. Wooded along the burn. A higher path exists along the edge of the woodland above the burn	
Safety of exposure	Low outcrops within the burn or in the banks. Some of the dipping strata underwater is slippery	
Permission to visit	No permission sought possibly Council property	
Current condition	A few small exposures in the stream are kept fresh by flowing water, bank side exposures could become overgrown with shrub very easily	
Current conflicting activities	Although protected, fossil collecting does appear to be happening on a large scale	
Restricting conditions	None	
Nature of exposure	Natural stream exposures	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Valuable open space with urban environment	2
History of Earth Sciences	None known	0
Economic geology	Non recorded	0

EDC 10: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	6	6	6	<input type="checkbox"/>
Sedimentology	6	6	6	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	3	3	2	<input type="checkbox"/>
Palaeontology	9	9	10	<input checked="" type="checkbox"/>
Geomorphology	1	1	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				74
Current Site Value				
<b>Community</b>	Frequent use by local residents			9
<b>Education</b>	One of the best Carboniferous fish sites in the world. Most of the recovered material is now in a collection at the Hunterian Museum, Glasgow. We believe there is currently a 'Shark Project' underway, initiated by local residents to inform the public of the importance of the site.			10
Fragility and potential use of the site				
<b>Fragility</b>	Erosion, Natural Overgrowth, Over-collecting, Dumping, Development			
<b>Potential use</b>	Research, Higher/Further Education, School, On-site Interpretation, Multidisciplinary			

Geodiversity value	
The significance of this site has already been recognised in designating it a SSSI. The site is of major international importance for its Carboniferous age fossils. Fossil fish of this age (approximately 330 Ma) are rare throughout the world, the Bearsden sharks have exceptional preservation and eleven new bony fish species have been found here. The quality and variety of the Carboniferous assemblage found at this site is unrivalled worldwide. However the site's value for geoconservation is currently lessened by dumping, litter, erosion, over-collecting and natural overgrowth	<b>8</b>

## EDC 11: West Mugdock Quarry, Mugdock Country Park

Grid reference: NS 55127 76027	Site type: Artificial quarry works
Site ownership: Not known	Current use: Recreational land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 6 <sup>th</sup> March 2009	

### Site Map

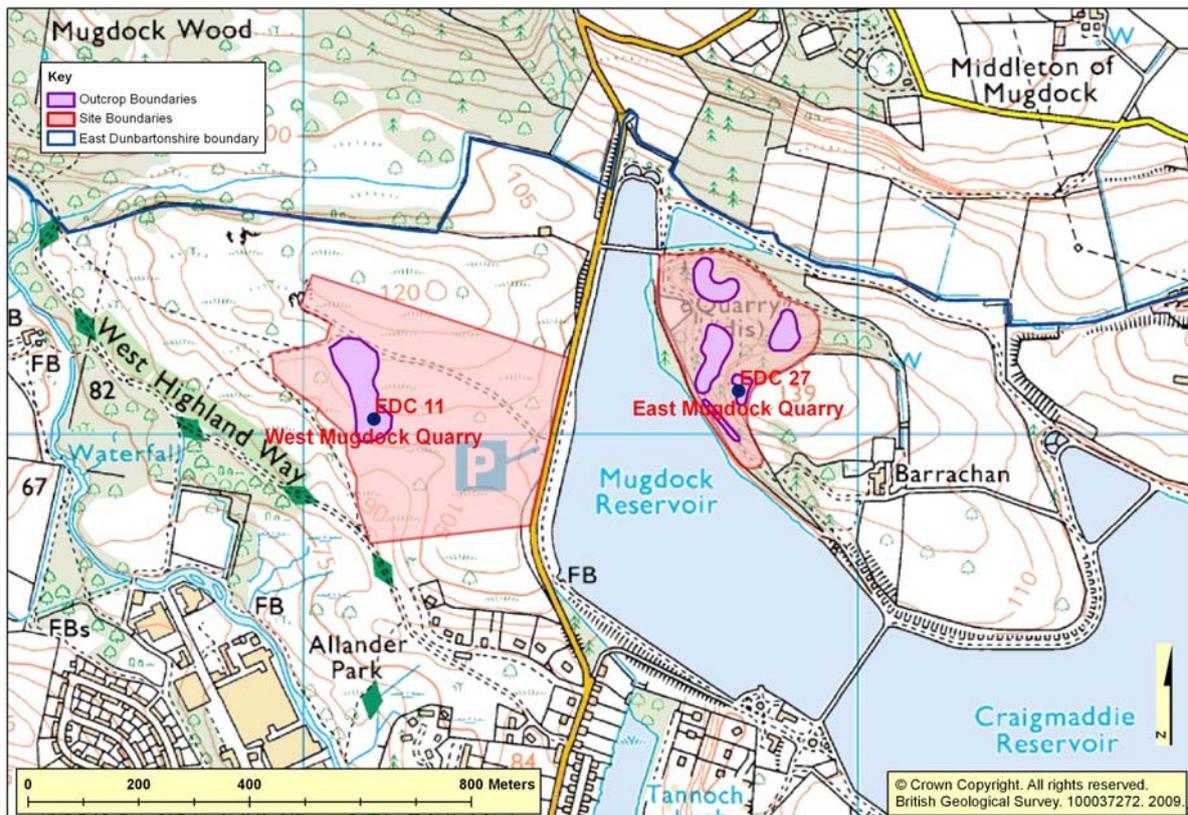


Figure 11: West Mugdock Quarry Location Map

### Summary Description

One of a series of disused sandstone quarries across Drumclog Moor, formerly used for ?building stone. Recorded as an 'old quarry' on the 1922/23 Ordnance Survey map.

The sandstone beds are part of the Douglas Muir Quartz-Conglomerate Member from the basal part of the Lawmuir Formation. This unit is extensively quarried at Douglas Muir Quarry (EDC 23)

Approximately 3–4 m high cliff faces remain, mostly covered in moss and ferns. Thick-bedded (up to 1.5 m), massive sandstone units can be seen. The sandstone has a pinkish colour, is typically coarse-grained, gritty and pebbly, with occasional scattered white & pink quartz pebbles, up to 1.5 cm in diameter, which are generally angular to sub-rounded. Joints through the sandstone are well spaced out, approximately 2–3 m apart. No evidence of any tool marks.

Although only a portion of Mugdock Country Park is within East Dunbartonshire, there is lots of potential here for introducing geology to those that visit. Craigmaddie Visitor Centre is the main information point for the park, although they didn't know anything specifically about the quarry they do have some leaflets which touch on the local geology, which could be developed further. The park also produces some education packs where information on the local geology could be included. Additionally a display of local rocks, how they have influenced the landscape, created wildlife habitats and what they have been used for, e.g. building stones, could be developed. Existing information board near Drumclog car park about the Milngavie Reservoirs are very good, but don't mention anything about the geology.

<b>EDC 11: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Douglas Muir Quartz-Conglomerate Member, Lawmuir Formation
Rock type: Conglomerate	
Age: Quaternary	Formation: Clippens Peat Formation
Rock type: Peat	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Good access from Drumclog Moor car park at NW end of Mugdock reservoir. 400 m walk along a good track to the north end of the quarry.	
Safety of access	All within Mugdock Country Park. Well looked after. Quarried area is easily accessible within open woodland; small path goes through the quarried area.	
Safety of exposure	Quarry faces appear stable and are only a few metres high	
Permission to visit	Public access to Mugdock Country Park	
Current condition	Quarry faces are mostly covered in moss and ferns	
Current conflicting activities	None	
Restricting conditions	None	
Nature of exposure	Vertical quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Part of Drumclog moor, heather moor with scrubby woodland	3
History of Earth Sciences	None known	0
Economic geology	Former sandstone quarry, stone was probably used locally for dry-stone walls or possibly as a local building stone.	3

EDC 11: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	4	4	2	<input checked="" type="checkbox"/>
Sedimentology	4	4	4	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				24
Current Site Value				
<b>Community</b>	Popular country Park north of Glasgow City			9
<b>Education</b>	Typical example of a local sandstone quarry, it's location within the country park should be capitalised on			4
Fragility and potential use of the site				
<b>Fragility</b>	None			
<b>Potential use</b>	School, On-site Interpretation, Geotrail, Multidisciplinary			

Geodiversity value	
<p>This site is a typical example of the small sandstone quarries which are scattered across East Dunbartonshire, and most likely used for material to build the dry-stone walls which criss-cross the countryside. However, the main value of the site is its location within Mugdock Country Park and the opportunity this opens up for informing large number of visitors about their local geology in general; how it influences the shape of our landscape, creates wildlife habitats, and contains raw materials which attracted people to settle in the area and industries to develop nearby.</p>	<b>4</b>

## EDC 12: Barraston Quarry, Barraston Farm

Grid reference: NS 60440 75444	Site type: Artificial quarry works
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 9 <sup>th</sup> March 2009	

### Site Map

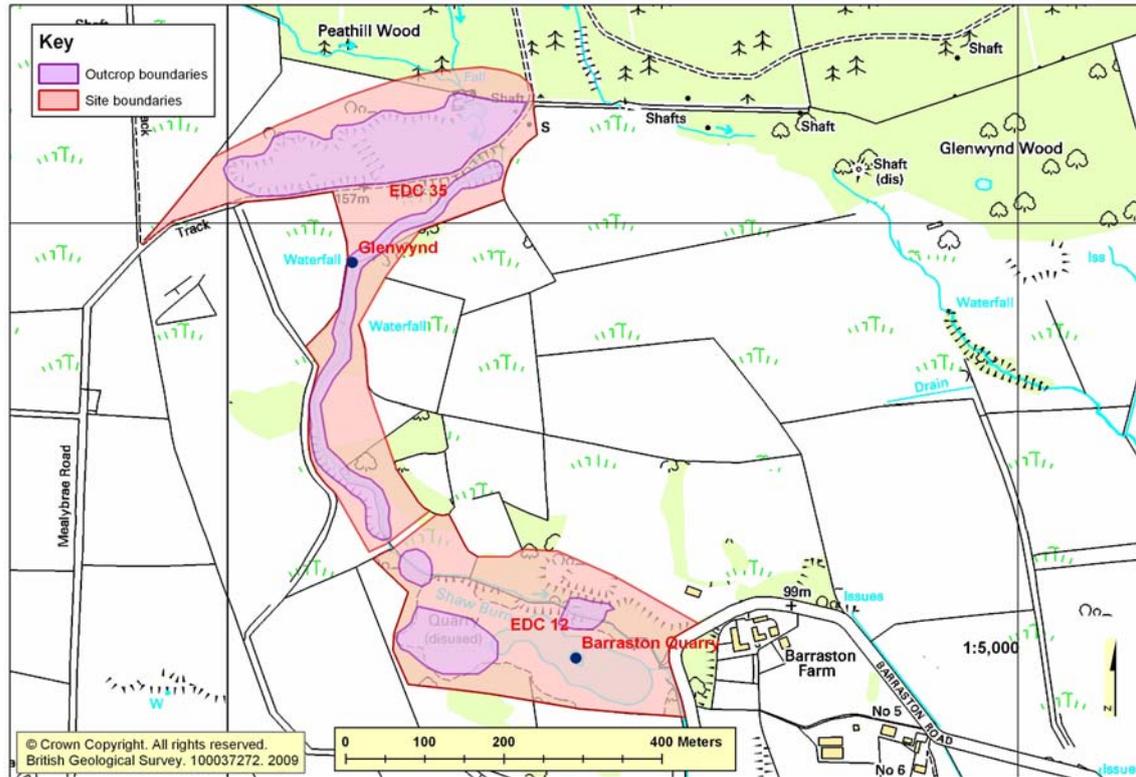


Figure 12: Barraston Quarry Location Map

### Summary Description

Disused mudstone quarry, formerly used for the manufacture of bricks.

The mudstone beds are part of the Lower Limestone Formation, located between the Hurllet Limestone and Blackhall Limestone.

The quarry is degraded, overgrown and largely flooded. Small friable outcrops through black mudstones containing ironstone bands are seen to the north and west of the quarry. Burnt mudstone waste piles exist to the north. Extensive searching for outcrops of the limestone drew a blank, Robertson, 1937 mentioned outcrops now "much obscured". Few blocks of blue-grey limestone with crinoid fragments found lying around (?Blackhall Limestone).

The mudstones in the lower part of the Lower Limestone Formation are generally barren or only yield ostracods, fish debris or *Curvirimula* (Hall et al, 1998). However specimens of gastropods and bivalves are recorded from here (Strathclyde RIGS designation form). Clayband ironstones on the other hand are abundant in this part of the sequence, north of the Clyde these were known as the Campsie Clayband Ironstones and were worked at Barraston (Robertson, 1937).

Flooded quarry provides wetland habitat which currently has a population of great crested newts (Strathclyde RIGS designation form).

<b>EDC 12: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Blackhall Limestone, Lower Limestone Formation
Rock type: Limestone	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Small layby at entrance to quarried area off tarmac country road. Quarry itself is largely flooded	
Safety of access	Around flooded area the quarry is pretty densely wooded, mainly with very spikey hawthorn. Muddy and uneven ground makes walking very difficult to relatively poor outcrops.	
Safety of exposure	Degraded quarry faces appear stable, low ground is very wet	
Permission to visit	No permission sought	
Current condition	Many of the quarry faces are well degraded	
Current conflicting activities	None	
Restricting conditions	Difficult access	
Nature of exposure	Quarry and stream sections	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Old quarry, part flooded and densely wooded.	2
History of Earth Sciences	None known	0
Economic geology	Mudstone for brick manufacture	3

EDC 12: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	4	4	2	<input checked="" type="checkbox"/>
Sedimentology	4	4	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	1	1	2	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				24
Current Site Value				
<b>Community</b>	Worn footpath from the layby to the loch suggests people do visit			6
<b>Education</b>	Mudstone was worked extensively here. Typical example of a disused quarry; displaying features such as disturbed ground, waste material, small sections through the worked material, flooding, no restoration. Site could be compared with an active quarry where operators now have to restore the worked area to how it appeared previously. Difficult access devalues this site			3
Fragility and potential use of the site				
<b>Fragility</b>	Erosion, Natural Overgrowth, Development			
<b>Potential use</b>	School, Multidisciplinary			
Geodiversity value				
There are few places in East Dunbartonshire where such a large volume of mudstone has been removed/processed as seen at this site. Although the remaining quarry faces are much degraded and access is poor to this site, valuable information about our industrial past can be gained from this locality. However, the main value of this site is how a disused quarry left to nature can over time create a valuable habitat for wildlife.				4

## EDC 13: Blairskaith Quarry, Blairskaith

Grid reference: NS 59491 75606	Site type: Artificial quarry workings
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 9 <sup>th</sup> March 2009	

### Site Map

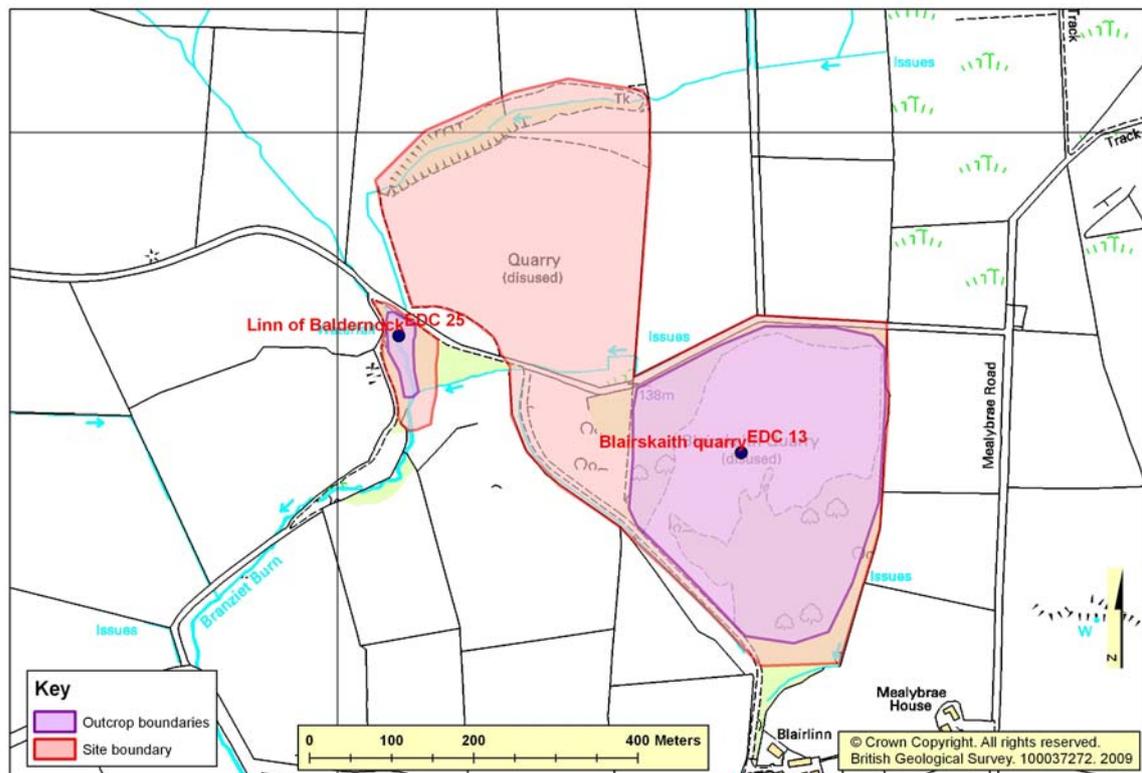


Figure 13: Blairskaith Quarry Location Map

### Summary Description

Disused mudstone quarry, formerly used for manufacture of bricks .

The mudstone beds are part of the Lower Limestone Formation, located above and below the Blackhall Limestone.

The quarry contains a number of sections mainly exposing black fissile mudstones with some dolostone beds. Fallen blocks display a fantastic variety of fossils and sedimentary structures. This is a great site for groups to see a whole selection of geological features found in sedimentary rocks within a safe environment. Fossils include fish material (scales, coprolites), plant debris (*Stigmaria*, *Ulodendron*) and a variety of other fossils including crinoids, nautiloids and brachiopods. Sedimentary structures include septarian nodules and desiccation cracks.

The mudstones in the lower part of the Lower Limestone Formation are generally barren or only yield ostracods, fish debris or *Curvirimula* (Hall et al, 1998). Clayband ironstones are on the other hand are abundant in this part of the sequence, north of the Clyde these were known as the Campsie Clayband Ironstones and were worked at Blairskaith (Hall et al., 1998).

Excellent site.

<b>EDC 13: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Blackhall Limestone, Lower Limestone Formation
Rock type: Limestone	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking probably best south of the quarry near Easter Blairskaithe Farm, alternatively there is a rough track to the north of the quarry which could be used.	
Safety of access	Good access. Large quarry with undulating terrain, partly wooded,	
Safety of exposure	Quarry faces appear fairly stable, plenty of interesting material available away from the faces too.	
Permission to visit	No permission sought	
Current condition	Some of the faces are fairly degraded.	
Current conflicting activities	Former quarries could be targeted for landfill.	
Restricting conditions	None	
Nature of exposure	Degraded quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Open ground, with wooded areas	3
History of Earth Sciences	None known	0
Economic geology	Quarried for mudstone	5

EDC 13: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	6	6	4	<input checked="" type="checkbox"/>
Sedimentology	5	5	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	2	2	0	<input type="checkbox"/>
Palaeontology	6	6	2	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				44
Current Site Value				
<b>Community</b>	As a suggested site in the 'Glasgow Geological Society Excursion Guide', interested geologists will already be aware of and visit this site.		6	
<b>Education</b>	Excellent variety of rock types, sedimentary structures and fossils can be observed here, with the added bonus of the nearby mine at Linn of Baldernock and associated karst features.		8	
Fragility and potential use of the site				
<b>Fragility</b>	Erosion, Natural Overgrowth, Over-collecting, Development (Potential for landfill)			
<b>Potential use</b>	Research, Higher/Further Education, School, On-site Interpretation, Geotrail, Multidisciplinary			

Geodiversity value	
The main value of this site is the diverse range of sedimentary rock types, fossils and structures which can be observed here. Visitors of any age and geological expertise will find something of interest here, the exposures are safe, specimens are numerous and varied, and the site has good access. An excellent site.	<b>7</b>

## EDC 14: Auld Wives' Lifts, Craigmaddie Muir

Grid reference: NS 58233 76427	Site type: Natural exposure
Site ownership: Not known	Current use: Private country
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 9 <sup>th</sup> March 2009	

### Site Map

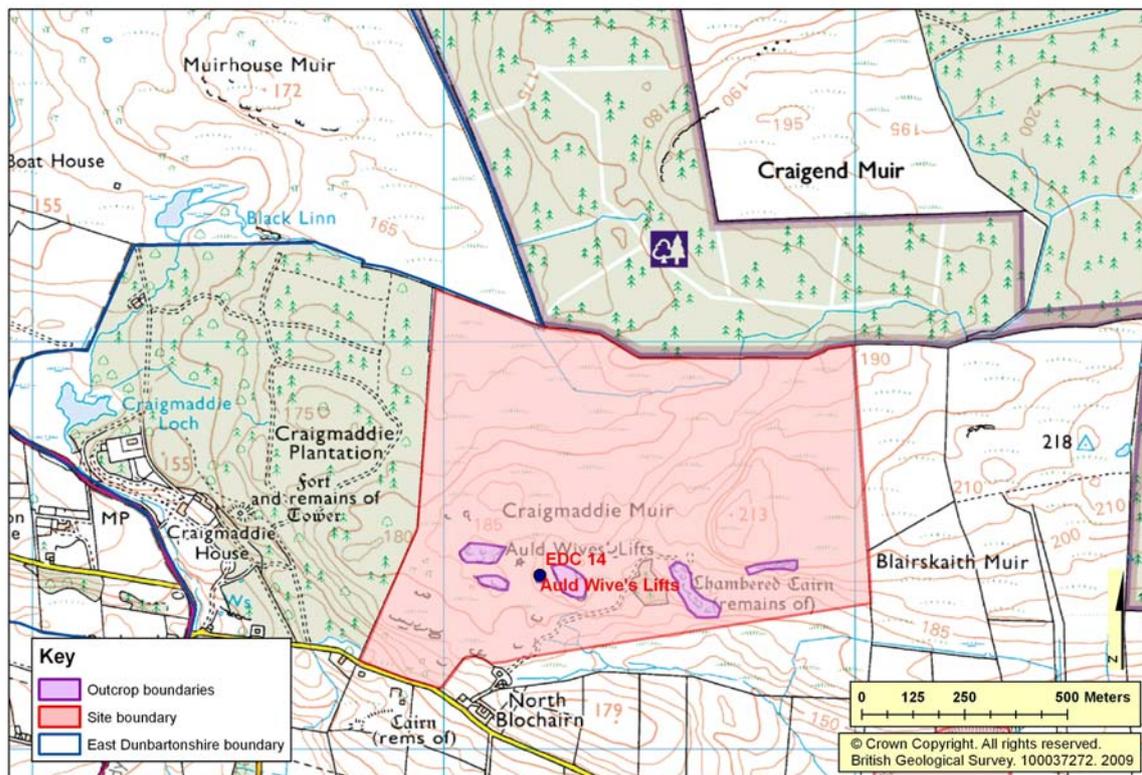


Figure 14: Auld Wives' Lifts Location Map

### Summary Description

Disused sandstone quarries, formerly used for millstones and for the construction of local dry-stone walls.

The sandstones are from a unit often referred to as the Craigmaddie Muir Sandstone within the lower part of the Lawmuir Formation. Where conglomerates are found interbedded with the sandstones the rocks have been placed within the underlying Douglas Muir Quartz-Conglomerate Member of the Lawmuir Formation.

Craigmaddie Muir is the type area for the Craigmaddie Muir Sandstone, displaying white, cross-bedded sandstones, 170–180m thick, with pebbly bands in places (Hall et al., 1998). The site contains a number of escarpments; some natural and some resulting from quarrying which show sedimentary features, including good examples of cross- and contorted convolute-bedding

The site is enhanced by a number of archaeological features including chambered tombs, cairns and cup-and-ring marks which have been recorded on Craigmaddie Muir, although these were not explored. The sandstone is also thought to have been used for making millstones and may be the origin for the millstone displayed in the wall near North Blochairn and the one outside Baldernock Mill.

The Auld Wives' Lift on Craigmaddie Muir is the main feature of the site, formed of three massive sandstone blocks, two forming the base and one perched on the top. There are a number of both natural

and man-made theories as how the structure formed, which range from it representing glacially perched boulders, to a sandstone tor, to the local legend of three old women from Campsie, Strathblane and Baldernock, who having challenged each other as to who was the strongest, carried, in their aprons, the three stones and laid them in position. Whatever its origins, the stones have since been carved by man with names, dates, initials and faces, dating back at least two centuries.

The site also displays a number of Quaternary geological features, including an excellent example of a large ice-moulded drumlin, located to the SE of site & ice-carved striations (orientated approx ESE–WNW) on some smoothed sandstone surfaces. The views from here across to Glasgow are fantastic.

On the wildlife side Craigmaddie Muir forms an upland habitat.

### EDC 14: Stratigraphy and Rock Types

Age: Pleistocene	Formation: Wilderness Till Formation
Rock type: Glacial deposits: diamicton	
Age: Lower Carboniferous	Formation: Douglas Muir Quartz-Conglomerate Member, Lawmuir Formation
Rock type: Conglomerate	
Age: Lower Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type	

### Assessment of Site Value

#### Access and Safety

Aspect	Description
Road access and parking	Parking on verge of single track road by houses, space for 2–3 cars max. Private access, sign at gate to ask for permission to use track up to the moor from the house.
Safety of access	Good farm track takes you up onto the moor, then walking is over rough moorland, around the Auld Wives' Lifts the ground is very boggy, wellingtons would be recommended
Safety of exposure	All quarry faces appear stable
Permission to visit	Permission given by farmer at the start of the track
Current condition	Good clean faces exposed
Current conflicting activities	None
Restricting conditions	None, although exposed if weather is poor
Nature of exposure	Natural and Man-made exposures

#### Culture, Heritage & Economic

Aspect	Description	Rating
Historic, archaeological & literary associations	Chambered cairn recorded nearby on the map, graffiti on the sandstone blocks date back centuries	5
Aesthetic landscape	Open moorland with great view across to the Campsie Fells to the north and towards Glasgow to the south.	5
History of Earth Sciences	None known	0
Economic geology	Former sandstone quarries, stone was probably used locally for millstones and construction of dry-stone walls.	3

EDC 14: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	6	2	<input checked="" type="checkbox"/>
Sedimentology	5	5	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	4	5	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				34
Current Site Value				
<b>Community</b>	The Auld Wives' Lifts is a feature of local curiosity			7
<b>Education</b>	Variety of features here makes it a site, Bedrock, Quaternary and archaeological			5
Fragility and potential use of the site				
<b>Fragility</b>	None			
<b>Potential use</b>	Higher/Further Education, School, On-site Interpretation, Multidisciplinary			
Geodiversity value				
An excellent site displaying a variety of sedimentary and glacial features. However, the main value of this site probably lies with its associations with local industry (millstone quarrying), archaeology (chambered tombs) and folklore (Auld Wives Lifts).				<b>6</b>

## EDC 15: Gallow Hill, Milton of Campsie

Grid reference: NS 63841 76704	Site type: Natural landform
Site ownership: Not known	Current use: Agricultural land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 10 <sup>th</sup> March 2009	

### Site Map

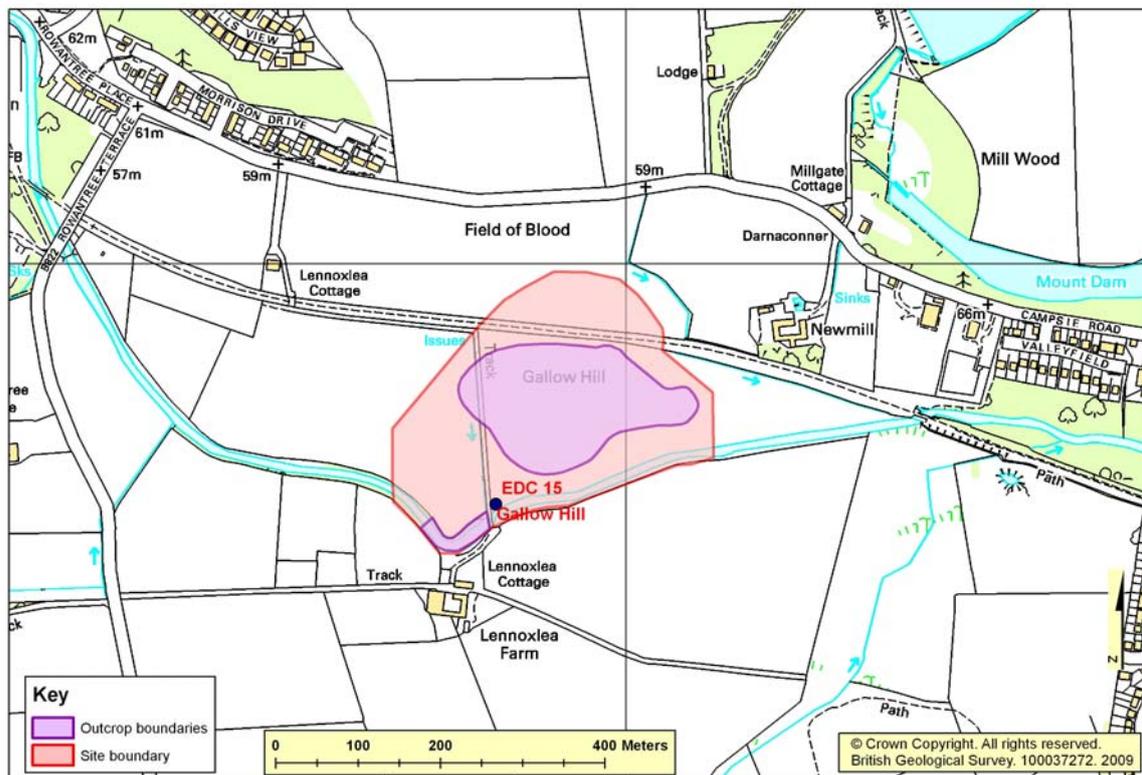


Figure 15: Gallow Hill Location Map

### Summary Description

Gallow Hill is a mound of sand and gravel, surrounded by the flood plain of the Glazert Water, the present river course includes a meander within the site.

The ice-contact sand and gravel deposits, from the last glaciation, have been assigned to the Broomhouse Sand and Gravel Formation. The alluvium of the Glazert Water could be assigned to either the Kelvin Formation or Law Formation.

The sand and gravel mound forming Gallow Hill is thought to have ice-contact, glaciofluvial origins due to its 'moundy' nature. However the RIGS site list records the site as 'terminal moraine'. The mound is approximately 300 m x 150 m and up to 10 m high, no exposures of the deposits were found.

The Glazert Water flows immediately to the south of Gallow Hill and its wide flat floodplain surrounds the mound, suggesting that in times of flood the mound would become an island. The resulting fertile land is currently used for grazing livestock. A 'point bar', located on the inside of the river meander, is composed of cobbles, indicating a fairly high energy flow. There is a 'river cliff' at the other side on the outside of the meander. Cobbles on the point bar show imbrication, there are lithologies of various origins, most are subrounded and range from 3–20 cm in diameter, although the largest can reach 75 cm.

However, this sand and gravel mound also has a darker side to it; historical references refer to an event in 1639 when Lord Kilsyth hanged one of his servants here, and is presumably where Gallow Hill acquired its name.

<b>EDC 15: Stratigraphy and Rock Types</b>	
Age: Holocene	Formation: Kelvin Formation or Law Formation
Rock type: Alluvial deposits: clay, silt, sand and gravel	
Age: Quaternary	Formation: Broomhouse Sand and Gravel Formation
Rock type: Glaciofluvial deposits: sand and gravel	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Restricted parking space N of hill on main road with possibly more spaces at Lennoxlea Farm, south of Hill but then access will involve a longer walk as bridge does not exist any more between farm and site. Both rough and good tracks surrounding area. Minor rubbish along river banks.	
Safety of access	Public footpaths, farm tracks and farmland	
Safety of exposure	Care should be taken at river edge	
Permission to visit	No permission sought	
Current condition	Good, best definition seen when crops are very young or fields are ploughed, currently grassed.	
Current conflicting activities	Ploughing will over time 'smooth out' the feature	
Restricting conditions	Time of year – crop height	
Nature of exposure	Natural landform	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None know (?origin of the name)	0
Aesthetic landscape	Farmland, good views to the Kilsyth Hills to the north	3
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 15: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	2	1	0	<input type="checkbox"/>
Sedimentology	2	3	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	4	4	0	<input checked="" type="checkbox"/>
<b>Total geoscientific merit score</b>				16
Current Site Value				
<b>Community</b>	Public track along the dismantled railway to the north of site, gets regular use by dog-walkers, joggers, etc.			10
<b>Education</b>	Not very impressive site but displays features important to the local post-glacial history			3
Fragility and potential use of the site				
<b>Fragility</b>	Development. Potential resource of sand and gravel.			
<b>Potential use</b>	School			

Geodiversity value	
The site displays 'hummocky' ground, composed of sand and gravel deposits, and formed in an ice-contact environment during the last glaciation. The site is further enhanced by the modern river features produced by the Glazert Water adjacent to Gallow Hill.	<b>3</b>

## EDC 16: Fanniescroft Wood, Lennoxton

Grid reference: NS 62328 76845	Site type: Natural section
Site ownership: Not known	Current use: Private country
Field surveyor: Sarah Arkley & Luis Alborno-Parra	Current geological designations: None
Date visited: 13 <sup>th</sup> March 2009	

### Site Map

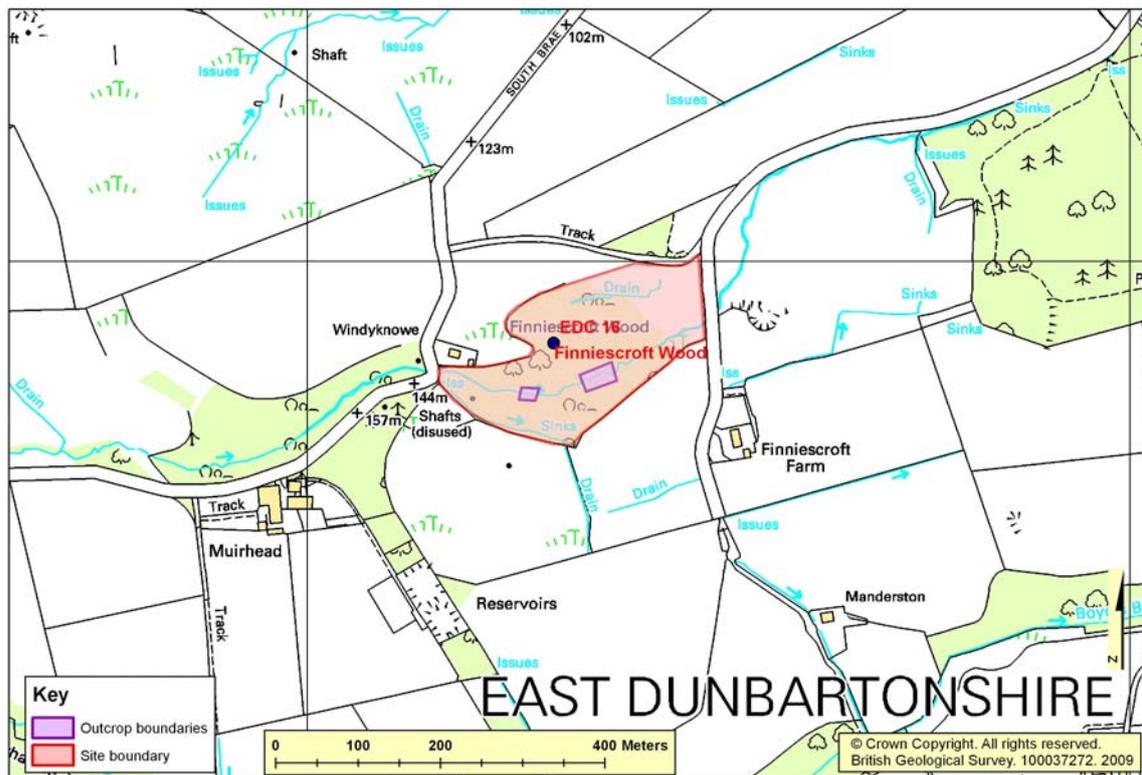


Figure 16: Fanniescroft Wood Location Map

### Summary Description

Disused limestone quarry.

The Hurler Limestone marks the base of the Lower Limestone Formation. Immediately underlying the Hurler Limestone is the Alum Shale and Hurler Coal

The Hurler Seam (including both the limestone and coal) is one of the most important datum lines within the Carboniferous sequence, as it was the lowest workable seam which could be recognised over wide areas of western Scotland. (Hinxman, 1920). The limestone is generally 3 to 4 ft thick north of the Clyde, dark grey in colour and largely composed of encrinital debris, the coal is usually soft, contains pyrite and is of poor quality, a thin layer of 'alum shale' separates the two. (Robertson, 1937)

The alum shale at one time supplied material for a considerable alum industry nearby. The coal was only valuable for burning the lime on the spot. The lime however, was of good quality and extensively worked.

The Hurler Limestone is visible in small stream exposures, containing crinoid debris.

<b>EDC 16: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Hurllet Limestone, Lower Limestone Formation
Rock type: Limestone	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking is possible for one or two cars at both the SW and NE end of the wood,	
Safety of access	Within the wood access is over rough uneven ground	
Safety of exposure	Some steep ground is very wet and slippery. Also when viewing outcrops within the stream care should be taken on slippery rocks	
Permission to visit	No permission sought	
Current condition	Small outcrops kept clean by flowing water	
Current conflicting activities	None	
Restricting conditions	None	
Nature of exposure	Stream exposure	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	Adjacent to Campsie Alum Works	3
Aesthetic landscape	Wooded area	2
History of Earth Sciences	None known	0
Economic geology	Workings in Hurllet Limestone, Alum Shale and coal	3

EDC 16: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	5	2	<input checked="" type="checkbox"/>
Sedimentology	4	4	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	3	4	2	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				31
Current Site Value				
<b>Community</b>	Few people would venture into the woods which cover the site of the old quarry, however there is a signed footpath which runs just north of the woods			5
<b>Education</b>	Importance of this site is due to the presence of the Hurllet Limestone which was quarried extensively in the area, but the outcrops are not that impressive from an educational point of view, although gain value due to their proximity to the former Campsie Alum Works, SE of Lennoxton			4
Fragility and potential use of the site				
<b>Fragility</b>	Erosion, Natural Overgrowth			
<b>Potential use</b>	School			
Geodiversity value				
The main value of this site is the presence of the Hurllet Limestone, this unit was extensively worked across the Central Scotland and surviving exposures are rare.				5

## EDC 17: Pattie's Bughths, Craigend Muir

Grid reference: NS 59004 77966	Site type: Artificial quarry works
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 10 <sup>th</sup> March 2009	

### Site Map

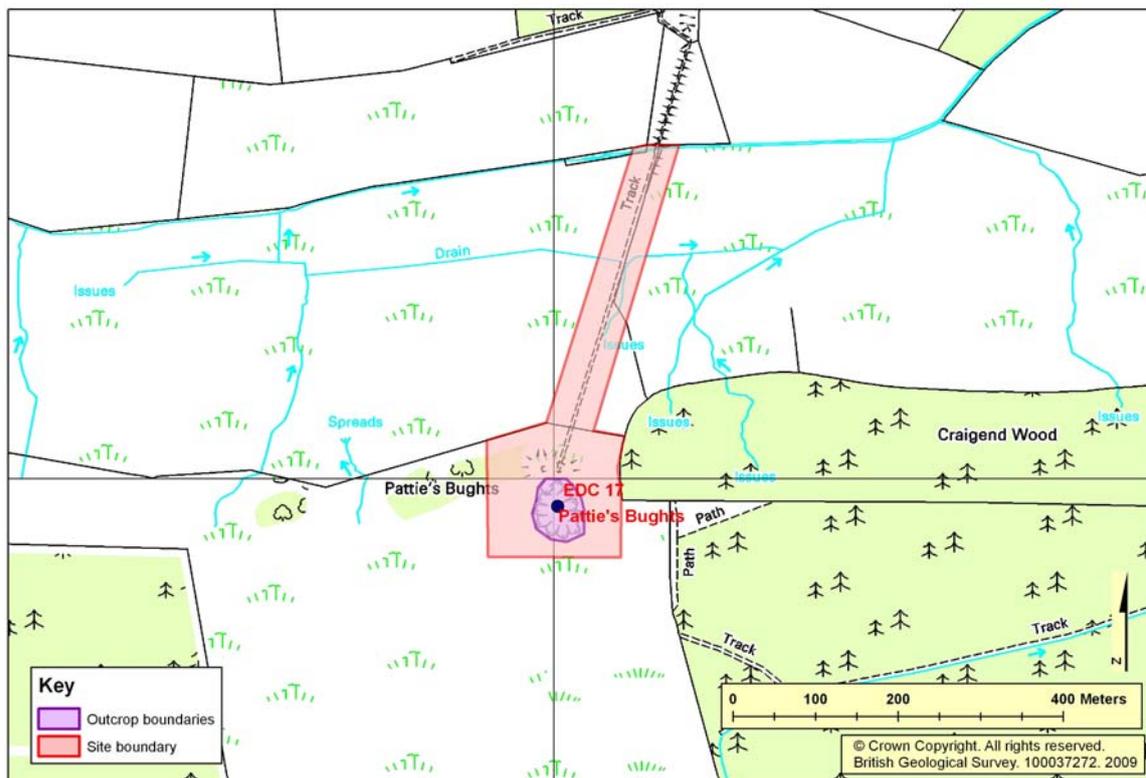


Figure 17: Pattie's Bughths Location Map

### Summary Description

Disused sandstone quarry, formerly used for ?building stone.

The sandstone beds are part of the Craigmaddie Muir Sandstone in the lower part of the Lawmuir Formation.

A number of relatively fresh quarry faces remain, revealing the nature and structure of the sandstone beds. 6 m high quarry faces expose thick-bedded, mostly massive medium- to coarse-grained sandstone. One bed is at least 4m high. The sandstone is quartz-rich, buff coloured with limonite banding when altered.

A number of fallen blocks on the floor of the quarry contain plant material. There are some excellent examples of both *Stigmaria* and *Lepidodendron*, representing branches/roots between 5-8 cm thick and a branching *Stigmaria* specimen which is approximately 45 cm long.

Evidence of the way the sandstone was extracted, selected and transported is gleaned from the vertical cylindrical drill marks in the face, the large waste heaps near the mouth of the quarry, the trackway leading up to the quarry, and the remains of walls and buildings. There are great views to the north towards the Campsie Fells.

Little information can be found regarding when this quarry was worked, but a local resident believes

material was used for the construction of Blane Valley Railway Line, immediately north of farm; the stone may well have been used to build the railway bridges. The Victorians built railway c.1861, so it could be suggested that the quarry was active at that time. The railway is now disused and a new tarmac track has been laid down as a local footpath and cycle track. A previous owner of the quarry who still lives near the site informed us that he was approached in the past about reopening the quarry and a resource assessment was carried out.

### EDC 17: Stratigraphy and Rock Types

Age: Lower Carboniferous      Formation: Lawmuir Formation

Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type

### Assessment of Site Value

#### Access and Safety

Aspect	Description
Road access and parking	
Safety of access	The walk up the old tramway is pretty wet and wellingtons would be recommended
Safety of exposure	Quarry faces appear stable, best fossils are found in discarded blocks in the middle of the quarry
Permission to visit	Permission given by the residents of Craigend Farm
Current condition	Good
Current conflicting activities	None
Restricting conditions	None, although exposed if weather is poor
Nature of exposure	Quarry faces and railway bridge

#### Culture, Heritage & Economic

Aspect	Description	Rating
Historic, archaeological & literary associations	None known	3
Aesthetic landscape	Open moorland with great views across to the Campsie Fells to the north and the Dun Glas, a conspicuous volcanic neck	3
History of Earth Sciences	None known	0
Economic geology	Former sandstone quarry used for railway construction	3

EDC 17: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	4	4	2	<input type="checkbox"/>
Sedimentology	3	3	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	5	5	2	<input checked="" type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				30
Current Site Value				
<b>Community</b>	Few people probably walk up to the old quarry but the dismantled railway line has been recently tarmaced and seems a popular route with walkers and cyclists			5
<b>Education</b>	Good plant fossils, great view and a nice link with the railway line makes this an interesting site			5
Fragility and potential use of the site				
<b>Fragility</b>	Over-collecting			
<b>Potential use</b>	Higher/Further Education, School, On-site Interpretation, Geotrail, Multidisciplinary			
Geodiversity value				
This site displays some excellent specimens of plant material. However, the main value of the site is the fact that it retains many features of quarrying which are normally lost; you can see evidence for the way quarrymen extracted the stone, worked the stone, transported the stone and then you can look at the railway bridges along the Blane Valley Railway Line to see the final product and application of the stone.				<b>5</b>

## EDC 18: Crow Road, Lennoxtown

Grid reference: NS 62309 79297	Site type: Natural exposures / Natural landforms
Site ownership: Not known	Current use: Open country
Field surveyor: Sarah Arkley & Luis Alborno-Parra	Current geological designations: None
Date visited: 10 <sup>th</sup> March 2009	

### Site Map

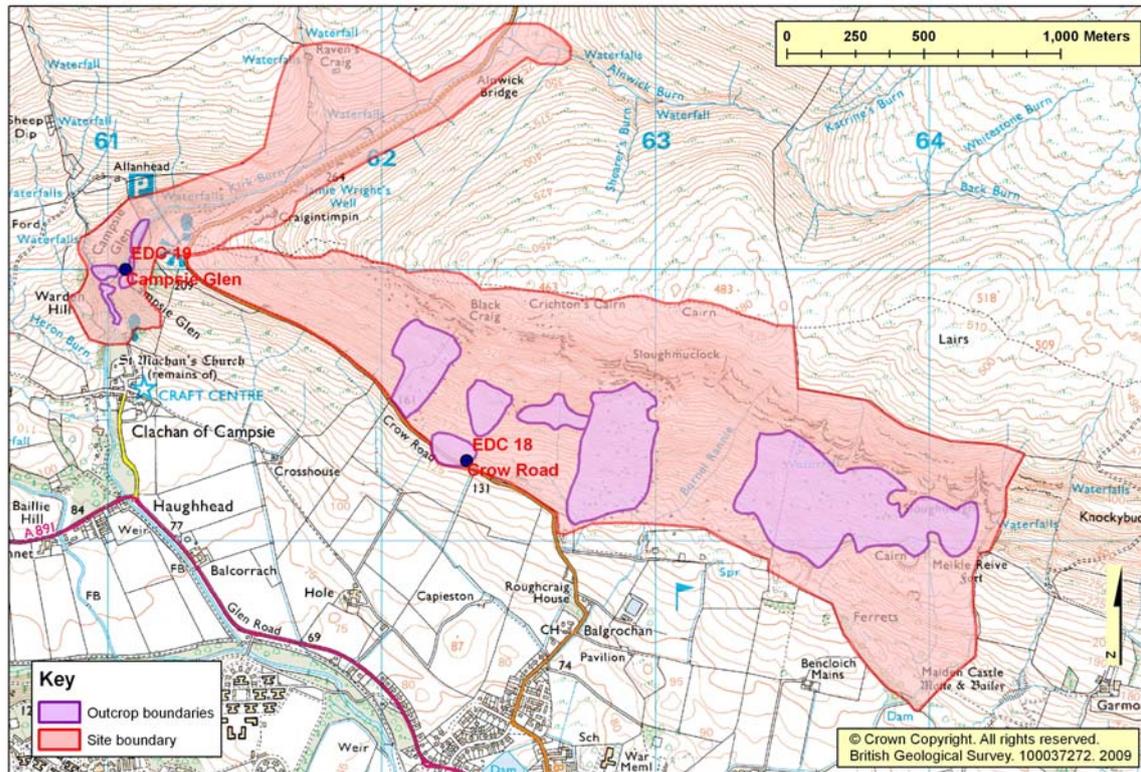


Figure 18: Crow Road Location Map

### Summary Description

Two main features are visible at this site; these are the large landslips lying on the southern slopes of the Campsie Fells and outcrops of the famous Lennoxtown essexite.

The outcrops of essexite have been interpreted as two small volcanic plug-like intrusions. The northern plug intrudes through the Clyde Plateau Volcanic Formation and the southern plug straddles a fault which has Clyde Plateau Volcanic Formation on the NW side and sedimentary rocks belonging to the Lower Limestone Formation on the SE side. Geophysical evidence indicates that the margins of both of the igneous bodies are steep (Forsyth, 1996). Biotite crystals from the Lennoxtown essexite have been dated radiometrically at 270Ma (de Souza, 1979) suggesting an early or mid-Permian age.

Half a dozen small hillside outcrops (a few m wide) of the rare Essexite (nepheline monzogabbro) can be examined. The exposures are well-jointed with sub-vertical joints between 3 and 8 cm apart, trending approximately E–W. Weathered, the rock has a pale grey colour with large black phenocrysts of augite, which stand proud of the surface. The sizes of the phenocrysts are generally between 3–8 mm in diameter but were seen up to 16 mm. The shape of the phenocrysts is usually subhedral to square/rectangular euhedral, and the groundmass is medium-grained, with a crystal size of approximately 1mm.

The unique nature and point source of the essexite intrusion, has enabled geologists to use the rock as

a 'tracer' for ice flow direction. Erratic boulders of essexite found across Central Scotland can be sourced back to this single locality and a transport direction derived.

The sub-horizontal lava flows exposed across the steep southern slopes of the Campsie Fells display excellent trap featuring of the Clyde Plateau Volcanic Formation.

Along the steep south-facing slopes of the Campsie Fells a chain of landslips exists NE and NW of this location.

Good view towards the SE across Lennoxton.

**EDC 18: Stratigraphy and Rock Types**

Age: Quaternary	Formation: Not applicable
Rock type: Landslide deposit: boulders, cobbles and pebbles	
Age: Carboniferous to Early Permian	Formation: Lennoxton Boss, Western Midland Valley Westphalian To Early Permian Sills
Rock type: Nepheline-monzogabbro	

**Assessment of Site Value**

**Access and Safety**

Aspect	Description
Road access and parking	Space for two cars on roadside, no gate to get over barbed wire fence.
Safety of access	Open hillside, boots recommended to walk over rough ground.
Safety of exposure	No evidence of any recent movement.
Permission to visit	No permission sought
Current condition	Good
Current conflicting activities	None
Restricting conditions	None
Nature of exposure	Small hillside exposures of essexite and large vegetated landslip.

**Culture, Heritage & Economic**

Aspect	Description	Rating
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Edge of the Campsie Fells, great views southwards especially towards Lennoxton	4
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 18: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	4	4	2	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	6	6	6	<input checked="" type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	5	5	2	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				40
Current Site Value				
Community				10
Education				6
Fragility and potential use of the site				
Fragility	Geohazard, Erosion			
Potential use	Higher/Further Education, School, On-site Interpretation, Geotrail, Multidisciplinary			

Geodiversity value	
An excellent site displaying a variety of geological and geomorphological features. The main value of this site is the rare outcrops of essexite, and how, due to their distinctive appearance, they have been used to determine ice-flow patterns of a much younger geological event.	<b>7</b>

## EDC 19: Campsie Glen, Clachan of Campsie

Grid reference: NS 61063 80000	Site type: Natural section
Site ownership: Not known	Current use: Recreational land
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 10 <sup>th</sup> March 2009	

### Site Map

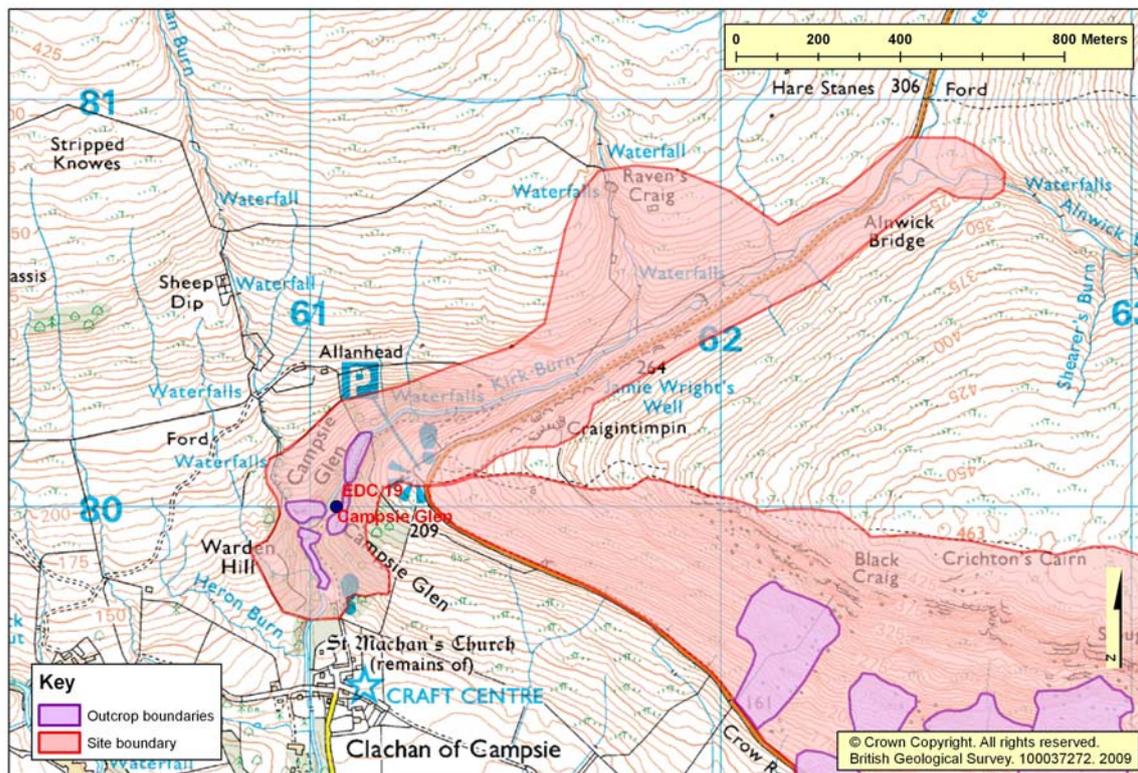


Figure 19: Campsie Glen Location Map

### Summary Description

Large number of sedimentary, igneous and structural features including: Ballagan Formation (Inverclyde Group) mudstones and siltstones with thin interbeds and nodules of dolostone (cementstone); a number of narrow cross cutting dykes mostly of early Carboniferous age but also the Campsie Dyke of late Carboniferous to Permian age; at least three lava flows at the base of the Clyde Plateau Volcanic Formation. The lavas are underlain by red mudstones with a volcanic ash bed; faulting; and pot holes in the river bed at the knick point in the gorge

Comprehensive descriptions of the various geological features can be found both in the field guide of the Glasgow and Girvan area produced by the Glasgow Geological Society and in the pamphlet produced by the Strathclyde RIGS Group.

<b>EDC 19: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Clyde Plateau Volcanic Formation
Rock type: Tuff and agglomerate	
Age: Lower Carboniferous	Formation: Clyde Plateau Volcanic Formation
Rock type: Microporphyrritic basalt	
Age: Lower Carboniferous	Formation: Ballagan Formation
Rock type: Argillaceous rock, dolostone and sandstone	
Age: Late Carboniferous	Formation: Central Scotland Late Carboniferous Tholeiitic Dyke Swarm
Rock type: Olivine-microgabbro and olivine-basalt	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Good parking at Clachan of Campsie, space for about 20 cars, plus public bus service to Clachan of Campsie. Public footpath heads up the glen from here with information board at the edge of the village.	
Safety of access	Best exposures are in the river banks, care must be taken along the river. Footpaths exist up most of the glen although they are of variety of states.	
Safety of exposure	Higher up the glen, the steep sides of the valley are loose and unstable, and recent falls are evident. Warning signs have been erected to make people aware of the danger.	
Permission to visit	No permission sought	
Current condition	River exposures are kept clean by flowing water,	
Current conflicting activities	None	
Restricting conditions	Danger of rockfall in the upper parts of the glen	
Nature of exposure	River sections and exposures on valley sides	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	Bleach pools from former industry	3
Aesthetic landscape	Amazing steep-sided valley, mostly wooded	5
History of Earth Sciences	In the late 1800's, this site was popular with many early geologists from the Geological Society of Glasgow.	2
Economic geology	None recorded	0

EDC 19: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	6	8	<input checked="" type="checkbox"/>
Sedimentology	5	6	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	5	5	2	<input type="checkbox"/>
Structural Geology	5	4	2	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	2	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				59
Current Site Value				
Community				10
Education				6
Fragility and potential use of the site				
Fragility	Geohazard, Erosion			
Potential use	Research, Higher/Further Education, School, On-site Interpretation, Geotrail, Multidisciplinary			
Geodiversity value				
Excellent site, the main value of which lies in the wide variety of geological features displayed up the Glen. Access to the site and lower parts of the glen is very good and already popular with visitors and geologists. There are ample opportunities to enhance existing information with some geology.				8

## EDC 20: Cowies Glen, Milton of Campsie

Grid reference: NS 65948 77206	Site type: Natural section
Site ownership: Not known	Current use: Private country
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 13 <sup>th</sup> March 2009	

### Site Map

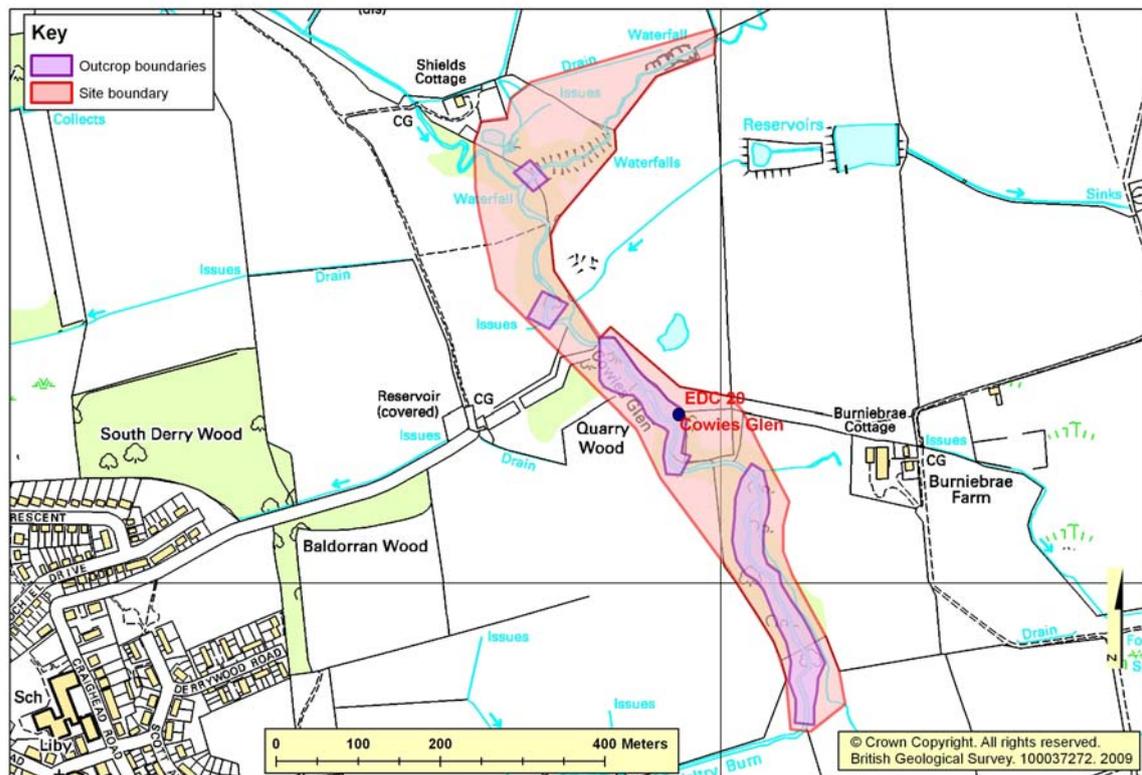


Figure 20: Cowies Glen Location Map

### Summary Description

Stream sections up the Waltry Burn expose a variety of sedimentary rock types, features and tectonic structures.

The burn cuts through strata belong to the Lower Limestone Formation and the Upper Limestone Formation.

Exposures of limestone, coal, mudstone and sandstone can all be observed. Natural coal exposures in Central Scotland are rare due to their economic value as a raw material. The limestone beds often display scattered crinoidal fragments and some sandstone units show good examples of fossilised current ripples. A small sandstone quarry exists part way up the site, presumably for local use. An excellent section through a fault is exposed part way up the site, with different rock units either side and ochre stained waters draining from the plane of the fault.

Small exposures of glacial till (Wilderness Till Formation) are present in the banks of the burn in the lower part of the site, characteristically displaying scattered boulders within a fine-grained, over-consolidated matrix.

Geomorphological features have been formed by the river, particularly good examples include the potholes part way up the site

Access at the top of the site is barred by 'keep out' signs.

<b>EDC 20: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Upper Carboniferous	Formation: Upper Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking for one car is possible by the covered reservoir to the west of the site.	
Safety of access	The Glen is largely wooded and access up Waltry Burn to view exposures requires frequent crossing of the burn, wellingtons recommended. Accessible with care. Access up Burniebrae Burn, which joins Waltry Burn SE of Shields Cottage, is not welcome (warning signs).	
Safety of exposure	Care should be taken when crossing the burn with slippery rocks in the water and some sections are quite high and may contain loose blocks above head height.	
Permission to visit	No permission sought	
Current condition	Most burn sections kept clean by flowing water	
Current conflicting activities	None	
Restricting conditions	None	
Nature of exposure	Natural exposures in the burn and valley sides	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Wooded valley	2
History of Earth Sciences	None known	0
Economic geology	Former small sandstone quarry, coal seam observed in stream section	2

EDC 20: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	5	2	<input type="checkbox"/>
Sedimentology	5	5	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	5	5	2	<input type="checkbox"/>
Palaeontology	4	4	2	<input type="checkbox"/>
Geomorphology	3	3	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				52
Current Site Value				
Community				2
Education				5
Fragility and potential use of the site				
Fragility	Erosion			
Potential use	Higher/Further Education, School, Multidisciplinary			

Geodiversity value	
The main value of this site is the variety of sedimentary rocks and structures visible up the glen. The exposures of Upper Limestone Formation are particularly useful in representing this part of the Carboniferous succession. Some of these geological features are of a high quality or rarely exposed in East Dunbartonshire. However the site's value for geoconservation is currently lessened by unfriendly access	<b>6</b>

## EDC 21: Burniebrae Burn, Shields Farm

Grid reference: NS 66024 78690	Site type: Natural section
Site ownership: Not known	Current use: Open country
Field surveyor: Sarah Arkley & Luis Alborno-Parra	Current geological designations: None
Date visited: 13 <sup>th</sup> March 2009	

### Site Map

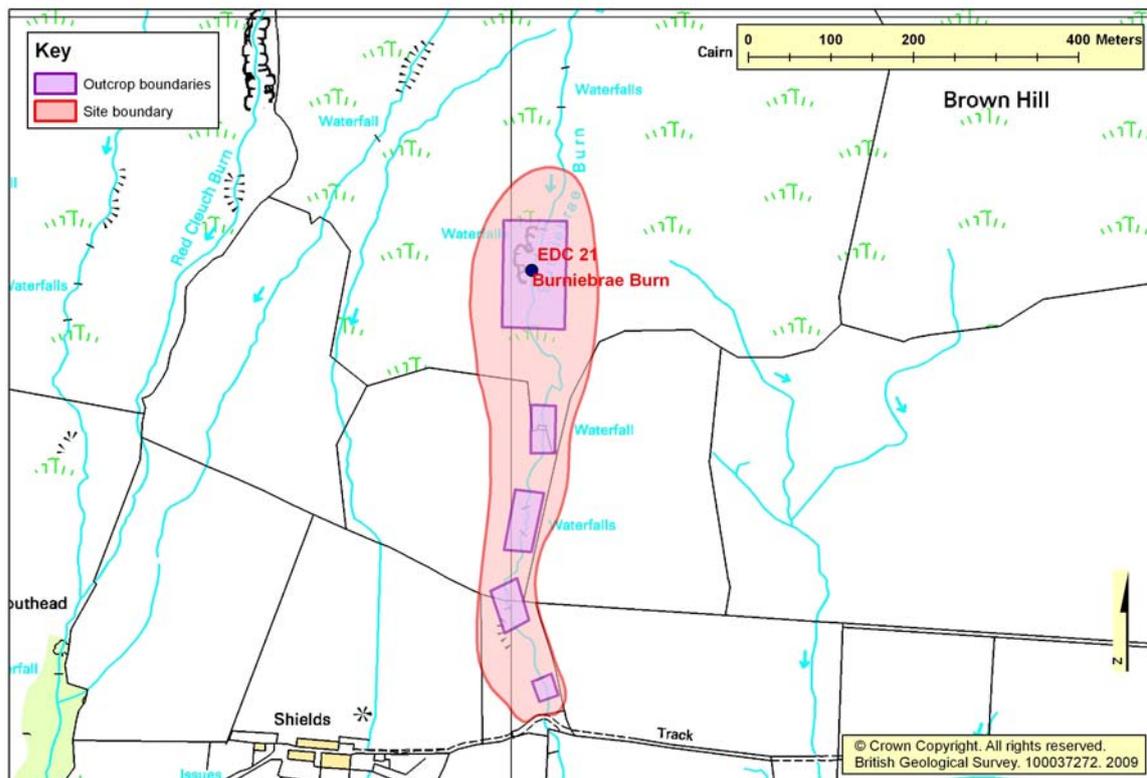


Figure 21: Burniebrae Burn Location Map

### Summary Description

Stream sections up the Burniebrae Burn expose a variety of sedimentary and igneous rock types, features and tectonic structures.

The lower part of the site exposes Limestone Coal Formation and the Lower Limestone Formation strata. The upper part of the site exposes the faulted contact of the sedimentary rocks with lavas of the Clyde Plateau Volcanic Formation which make up the high ground of the Campsie Fells.

The Top Hosie Limestone crops out in the burn at the southern end of the site and a section through the overlying dark mudstones is exposed in the bank sides.

A series of waterfalls along the burn expose excellent sections through sedimentary cycles of the Limestone Coal Formation, typically displaying dark-coloured mudstones at the base, passing upwards into siltstones, with a thick unit of sandstone at the top forming the lip of the waterfall. The repeated sedimentary cycles in the geological sequence has created an equal number of waterfalls as the burn flows down over the sequence.

Towards the northern end of the site, the Campsie Fault, trending ESE-WNW, cuts across the burn. The fault brings the sedimentary rocks described above into contact with the lava flows belonging to the much older Clyde Plateau Volcanic Formation. The composition and nature of these two rock types is very different and expressed by the presence of a large waterfall, the sedimentary rocks have been preferentially eroded by ice and water.

<b>EDC 21: Stratigraphy and Rock Types</b>	
Age: Upper Carboniferous	Formation: Limestone Coal Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Top Hosie Limestone, Lower Limestone Formation
Rock type: Limestone	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Clyde Plateau Volcanic Formation
Rock type: Tuff and agglomerate	
Age: Lower Carboniferous	Formation: Clyde Plateau Volcanic Formation
Rock type: Microporphyrritic basalt	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parked at Shields Farm, space for a few cars with farmers permission	
Safety of access	Track goes eastwards through Shields Farm and crosses Burniebrae Burn. Access is possible along the burn itself in most places, waterfalls can be by-passed by grassy slopes either side. Open hillside either side of the burn allows good access.	
Safety of exposure	Care should be taken near the waterfalls and if the ground is wet the grassy slopes can be quite slippery.	
Permission to visit	Permission granted by farmer at Shields Farm	
Current condition	Good	
Current conflicting activities	None	
Restricting conditions	None, bit exposed in poor weather	
Nature of exposure	Stream and bank side exposures	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Nice open country on the edge of the Campsie Fells, nice stream section with numerous good waterfalls and views southwards	5
History of Earth Sciences	None known	0
Economic geology	None recorded	0

<b>EDC 21: GeoScientific Merit</b>				
<b>GeoScientific Merit</b>	<b>Rarity</b>	<b>Quality</b>	<b>Literature/ Collections</b>	<b>1st</b>
Litho Stratigraphy	5	6	2	<input checked="" type="checkbox"/>
Sedimentology	5	5	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	4	4	2	<input type="checkbox"/>
Structural Geology	5	5	2	<input type="checkbox"/>
Palaeontology	3	3	0	<input type="checkbox"/>
Geomorphology	2	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				55
<b>Current Site Value</b>				
Community				4
Education				5
<b>Fragility and potential use of the site</b>				
Fragility	None			
Potential use	Higher/Further Education, School, Geotrail, Multidisciplinary			

<b>Geodiversity value</b>	
The main value of this site is the high quality and number of sections exposed up the burn, through a variety of sedimentary and igneous rocks, and the well-exposed nature of the Campsie Fault. In particular, the exposures of the Limestone Coal Formation are important in the East Dunbartonshire context.	<b>8</b>

## EDC 22: Spouthead Burn, Spouthead Farm

Grid reference: NS 65323 78773	Site type: Natural section
Site ownership: Not known	Current use: Open country
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 13 <sup>th</sup> March 2009	

### Site Map

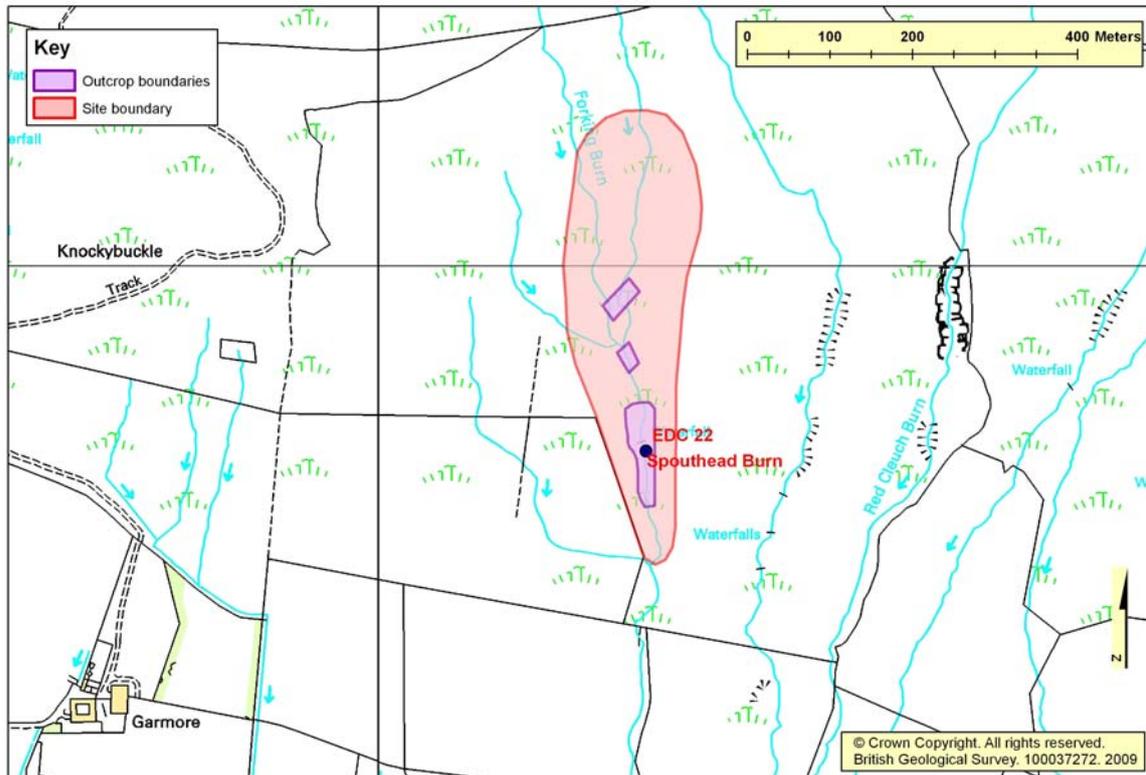


Figure 22: Spouthead Burn Location Map

### Summary Description

Stream sections up the Spouthead Burn expose a variety of sedimentary and igneous rock types, features and tectonic structures.

The lower part of the site exposes strata belonging to the Lower Limestone Formation. Part way up the site a felsite intrusion forms a waterfall above which lies some strata belong to the Ballagan Formation. The upper part of the site exposes basaltic lava flows of the Clyde Plateau Volcanic Formation which make up the high ground of the Campsie Fells.

On a clear day there are great views across the valley.

<b>EDC 22: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Late Carboniferous	Formation: Central Scotland Late Carboniferous Tholeiitic Dyke Swarm
Rock type: Olivine-microgabbro and olivine-basalt	
Age: Lower Carboniferous	Formation: Ballagan Formation
Rock type: Argillaceous rock, dolostone and sandstone	
Age: Carboniferous -Early Permian	Formation: Midland Valley Carboniferous To Early Permian Alkaline Basic Dyke Suite
Rock type: Felsite	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking at Spouthead Farm with permission from the farmer. Space for a few cars.	
Safety of access	Head behind the farm and across open fields. Open country above the farm makes for good access, mainly along side the burn	
Safety of exposure	Care should be taken near the waterfall over the felsite intrusion	
Permission to visit	Permission given by farmer at Spouthead Farm	
Current condition	Okay, some of the outcrops in the burn are small	
Current conflicting activities	None	
Restricting conditions	None, but fairly exposed in poor weather	
Nature of exposure	Stream and bank side exposures	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Open country, stream section with some waterfalls and views southwards	3
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 22: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	4	4	2	<input type="checkbox"/>
Sedimentology	2	2	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	5	4	2	<input checked="" type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
Total geoscientific merit score				25
Current Site Value				
Community				3
Education				4
Fragility and potential use of the site				
Fragility	Erosion			
Potential use	School			

Geodiversity value	
The main value of this site is the presence of the felsite intrusion and the cementstone beds belonging to the Ballagan Formation.	<b>4</b>

## EDC 23: Douglas Muir Quarry, Milngavie

Grid reference: NS 52246 74838	Site type: Artificial quarry works
Site ownership: Mains Estate. Tarmac lease the site from Mains Estate	Current use: In current use
Field surveyor: Mike Browne & Hugh Barron	Current geological designations: None
Date visited: 19 <sup>th</sup> March 2009	

### Site Map

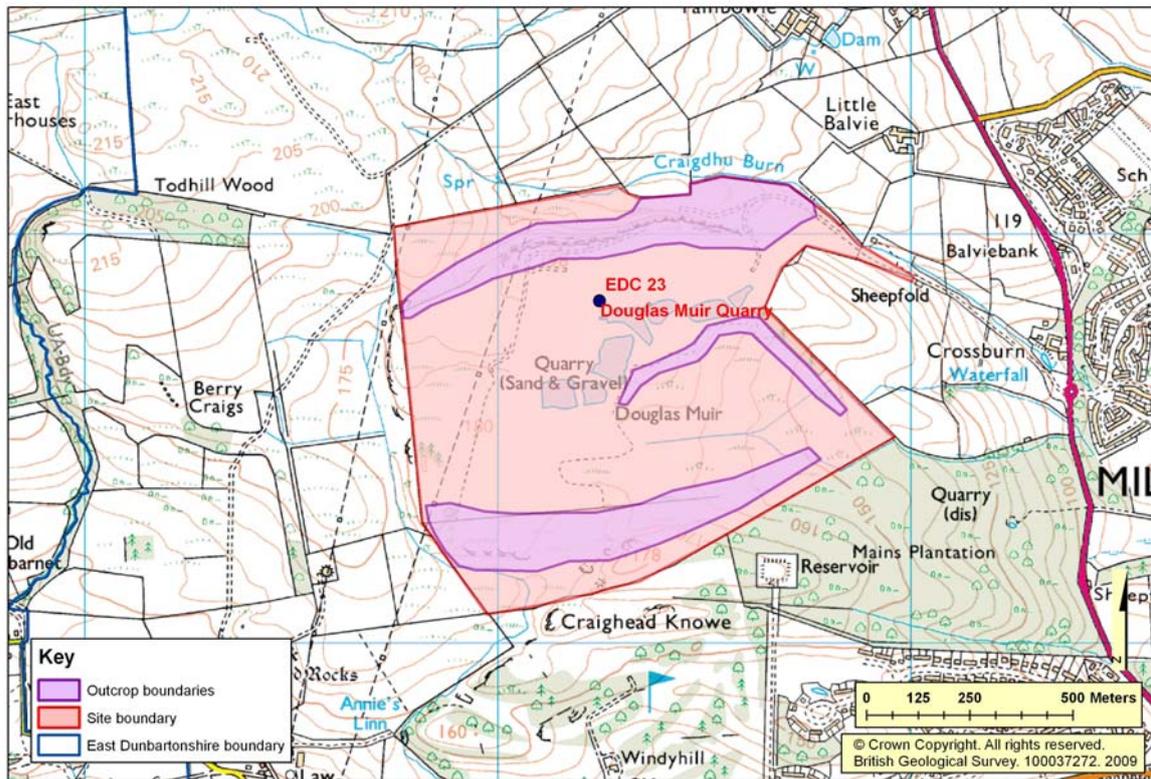


Figure 23: Douglas Muir Quarry Location Map

### Summary Description

The Douglas Muir Quartz-Conglomerate Member (DMQ) of the Lawmuir Formation (Strathclyde Group) consists mainly of hard, white conglomerates with subordinate pebbly sandstones with a few lenses of (purplish-grey)/grey mudstone up to 30 cm thick. Trough cross-bedding is present in sets from 0.2 m to 1.0 m thick. Many of the units are upward fining in grain size. The clasts and pebbles are almost exclusively of white and pink vein quartz and well-rounded, averaging 2 cm but up to 10 cm in diameter (, but some blocks of sandstone up to 15 cm across are also present). Palaeocurrent directions indicate transport of the original sediments towards the south-south-west. Channel bases of at least 20 m lateral extent are currently visible. Note the older working faces are weathered to a strong darkish yellow brown colour. The fresh conglomerate has a slightly yellow tinge. The sandstones are pale grey (i.e. off-white).

The base of the Douglas Muir Quartz Conglomerate is not seen on the site but elsewhere it rests apparently unconformably on volcanoclastic sediments of the Kirkwood Formation. The top boundary is transitional, by upward passage by interbedding from conglomerate to white and pale grey sandstones of the Craigmaddie Muir Sandstones of the Lawmuir Formation. Note this transition seems to be happening laterally southwards (and with thinning?) within the current quarry with less conglomerate and more mudstone lenses preserved.

Thickness is said to be 15 m at the type locality at Douglas Muir Quarry, and up to 70 m maximum elsewhere. Good examples of petrified fossil trees seen (not in situ). Possible glacial striae seen.

<b>EDC 23: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Douglas Muir Quartz-Conglomerate Member, Lawmuir Formation
Rock type: Conglomerate	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	On entry call into the site office	
Safety of access	As this is a working quarry, prior requests for a visit (to the quarry manager) would be essential and all visitors should follow the required site health and safety regulations. For safety, visitors may need to be accompanied by quarry personnel during visits. Plenty of parking is available next to the site office. Be aware of quarry vehicles at all times and wear all appropriate PPE.	
Safety of exposure	Working faces should not be approached as they are generally unstable	
Permission to visit	Permission given from the site office (Tarmac)	
Current condition	Good clean quarry faces	
Current conflicting activities	Working quarry	
Restricting conditions	As these are working faces it is currently not known what exposures will remain when quarrying ceases.	
Nature of exposure	Sub vertical quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Quarry reveals good sections through the underlying geology	2
History of Earth Sciences	None known	0
Economic geology	Active crushed rock quarry – high specification material	5

EDC 23: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	6	6	2	<input checked="" type="checkbox"/>
Sedimentology	5	6	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	4	4	2	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				37
Current Site Value				
Community				2
Education				6
Fragility and potential use of the site				
<b>Fragility</b>	Development. Value of the site depends on the development of conservation sections once working has finished. Restoration mixes wetlands/lakes with partly heather covered bare bedrock and false screes against remaining quarry faces. Paths will cross the area so interpretation with a leaflet and info board is possible.			
<b>Potential use</b>	Higher/Further Education, School, On-site Interpretation, Geotrail, Multidisciplinary			

Geodiversity value	
This site provides the best exposures and is the type locality for the Douglas Muir Conglomerate Member. The current operators (Tarmac Ltd) are additionally willing to discuss leaving key areas of some quarry faces accessible following extraction for the purpose of geoconservation, so future visitors may access and learn from the site. One such face would be the one facing south–west above the silt lagoon in the eastern part of the quarry. This face displays excellent channel features. This site’s geodiversity value would be enhanced if the current or any other operator leaves conservation sections after cessation of working.	<b>6</b>

## EDC 24: Roman Baths, Bearsden

Grid reference: NS 54616 72089	Site type: Manmade artifact
Site ownership: Not known (Historic Scotland?)	Current use: Urban
Field surveyor: Mike Browne & Hugh Barron	Current geological designations: None
Date visited: 19 <sup>th</sup> March 2009	

### Site Map

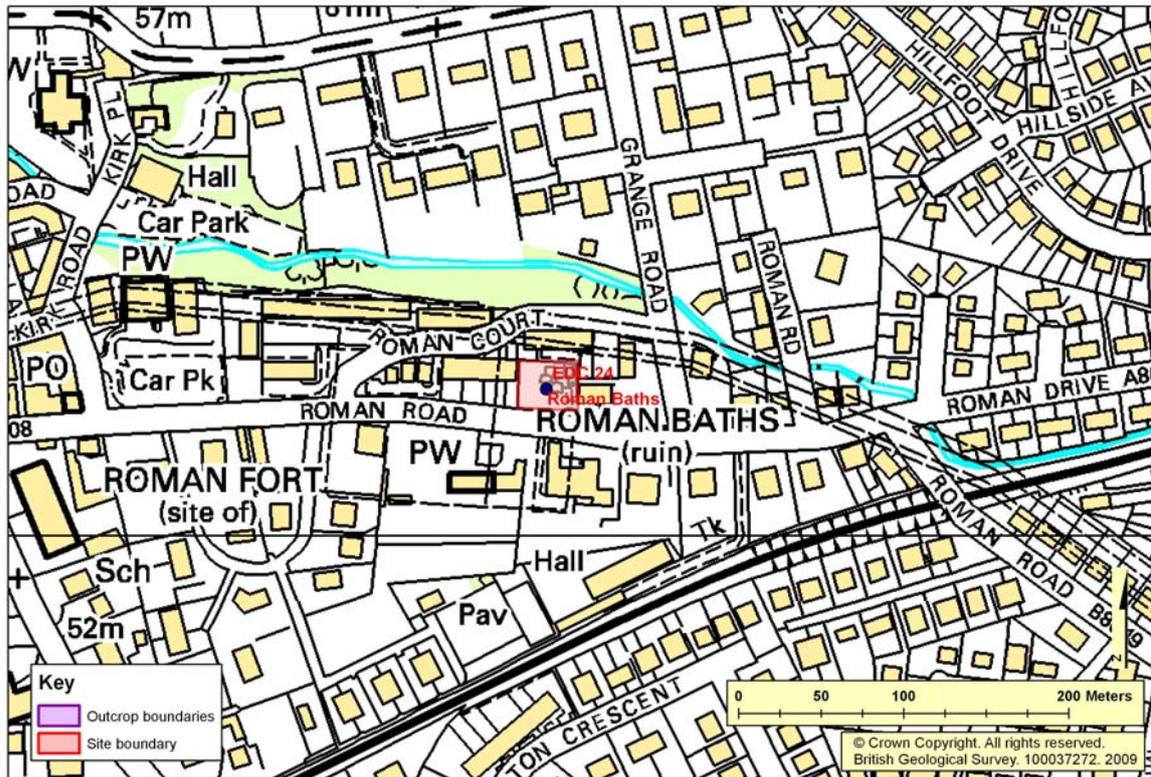


Figure 24: Roman Baths Location Map

### Summary Description

The remains of the Bearsden Roman Bath House are located a little to the east of the Bearsden Fort, which is thought to be one of those built along the Antonine Wall to house the troops. Demolition of Victorian mansions and an archaeological dig in 1973 revealed most of the ground plan of the fort. The baths are reputed to be one of the best preserved examples of a bath house in Scotland. The site is cared for by Historic Scotland.

An information board illustrates how the Bath House would have appeared when in use and puts the building into a regional context, but there is no mention of the materials used to construct the building.

The buildings appear to have been built from local Carboniferous blonde sandstone. The original flagstones are of a similar sandstone, some of which display excellent fossilised ripples.

<b>EDC 24: Stratigraphy and Rock Types</b>	
Age: Carboniferous	Formation: Not known
Rock type: Sandstone	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Car Parking some 250 m distance west of site	
Safety of access	Road traffic main hazard	
Safety of exposure	Low risk of tripping and falling over	
Permission to visit	Open access	
Current condition	good	
Current conflicting activities	none	
Restricting conditions	none	
Nature of exposure	Cultural built heritage	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	Roman Baths	9
Aesthetic landscape	Urban environment	2
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 24: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	2	3	0	<input checked="" type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				5
Current Site Value				
Community				9
Education				5
Fragility and potential use of the site				
Fragility	None			
Potential use	Higher/Further Education, School, On-site Interpretation, Multidisciplinary			

Geodiversity value	
<p>This site clearly displays Bearsden’s long-standing link between geology and the built environment. Romans appeared to have used the local sandstone for construction of the baths. The site additionally displays how the nature of the stone has determined how and where it is used; thicker-bedded stone, which produced blocks which were used for the construction of walls, whereas thinner-bedded stone was carefully extracted in sheets and used as slabs on the floor. Chisel marks still visible on original stones . Its geodiversity value is enhanced on account of its link with archaeology (Scheduled Ancient Monument) and accessible location.</p>	<b>6</b>

## EDC 25: Linn of Baldernock, Blairskaith

Grid reference: NS 59074 75749	Site type: Artificial mine workings
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Luis Albornoz-Parra	Current geological designations: None
Date visited: 9 <sup>th</sup> March 2009	

### Site Map

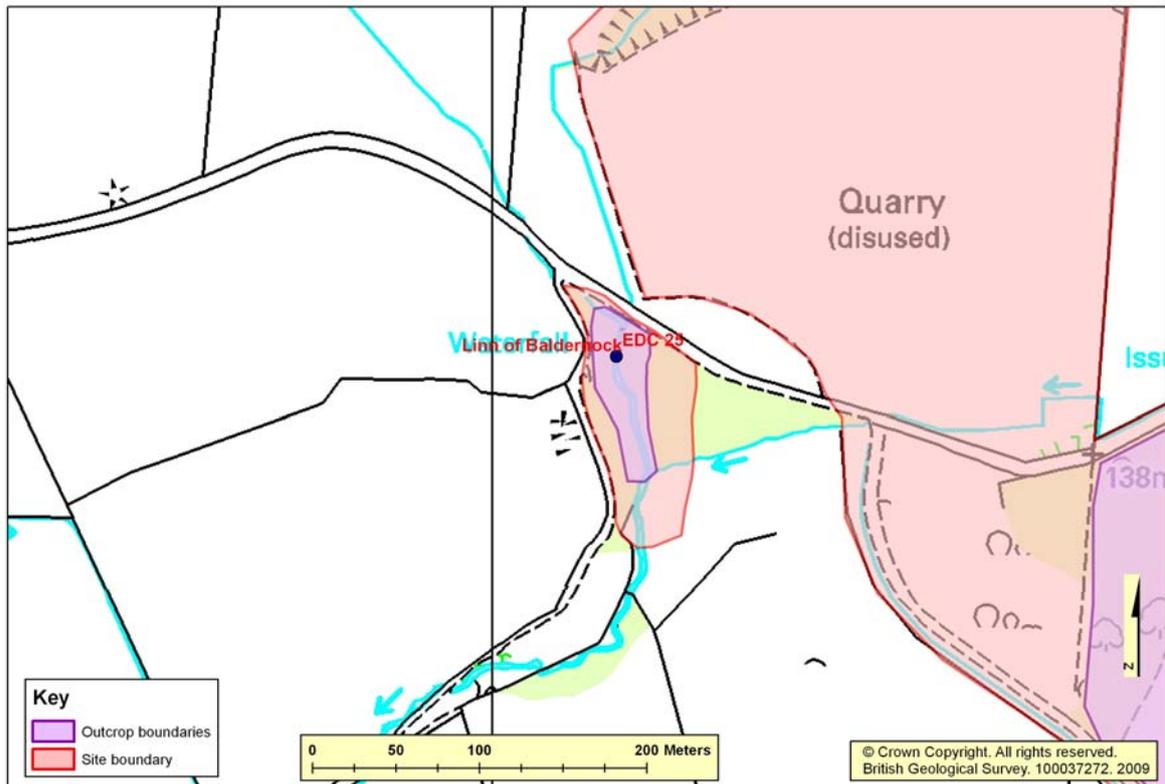


Figure 25: Linn of Baldernock Location Map

### Summary Description

A large number of sedimentary and igneous features occur; with stoop and room workings in a thin limestone which exhibit a number of different cave 'formations' such as stalactites.

Comprehensive descriptions of the various geological features can be found in the field guide of the Glasgow and Girvan area produced by the Glasgow Geological Society. Main features are the non-marine Baldernock Limestone in the Lawmuir Formation, the overlying Milngavie Sill (alkali-microgabbro) intruding the Hurler Coal and strata belonging to the Lower Limestone Formation

Access into the stoop and room workings are possible with care but should be discouraged from a health and safety perspective. Inside the cave – immature stalagmites, stalactites, flowstones and cave pearls can be seen, but it should be noted that many of these speleothem features are delicate and have taken a long time to form.

Interesting wildlife habitat created in a 'cave' environment.

<b>EDC 25: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type	
Age: Lower Carboniferous	Formation: Baldernock Limestone, Lawmuir Formation
Rock type: Limestone	
Age: Carboniferous-Early Permian	Formation: Milngavie Sills
Rock type: Basalt and microgabbro	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking is possible along a rough track off the tarmac road to the north of the waterfall. Limestone mine is best accessed from the road immediately west of the site, walk upstream to the waterfall.	
Safety of access	Wooded area around the stream section, small informal path to the waterfall. Entering any mines should be discouraged from a Health & Safety point of view.	
Safety of exposure	Banks of the valley are quite steep in places and can be wet, care should be taken	
Permission to visit	No permission sought, weekend picnic spot with open access	
Current condition	Good	
Current conflicting activities	Karst features (stalagmites, stalactites, cave pearls, etc.) within the mine form very slowly and are very delicate, care should be take in promoting these features of the mine.	
Restricting conditions	None	
Nature of exposure	Natural stream section with stoop and room workings behind the waterfall	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Wooded stream section	3
History of Earth Sciences	None known	0
Economic geology	Mined for limestone	5

<b>EDC 25: GeoScientific Merit</b>				
<b>GeoScientific Merit</b>	<b>Rarity</b>	<b>Quality</b>	<b>Literature/ Collections</b>	<b>1st</b>
<b>Litho Stratigraphy</b>	5	5	2	<input checked="" type="checkbox"/>
<b>Sedimentology</b>	4	4	2	<input type="checkbox"/>
<b>Igneous/Mineral/ Metamorphic Geology</b>	5	5	2	<input type="checkbox"/>
<b>Structural Geology</b>	0	0	0	<input type="checkbox"/>
<b>Palaeontology</b>	4	4	2	<input type="checkbox"/>
<b>Geomorphology</b>	2	2	2	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				50
<b>Current Site Value</b>				
<b>Community</b>	As a suggested site in the 'Glasgow Geological Society Excursion Guide', interested geologists will already be aware of and visit this site.			6
<b>Education</b>	Excellent example of stoop and room workings in the Baldernock Limestone and associated karst features within the mine.			8
<b>Fragility and potential use of the site</b>				
<b>Fragility</b>	Geohazard, Over collecting			
<b>Potential use</b>	Higher/Further Education, School, On-site Interpretation, Geotrail, Multidisciplinary			

<b>Geodiversity value</b>	
An excellent site, displaying a variety of geodiversity features, including a good geological section through an igneous intrusion, a variety of sedimentary rocks, an excellent (and accessible) example of stoop and rooms workings, and on top of that some superb speleothem 'formations' within the old workings which must be some of the best in Scotland.	<b>8</b>

## EDC 26: Craigangawn Quarry

Grid reference: NS 52440 76916	Site type: Artificial quarry works
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Mike Browne	Current geological designations: None
Date visited: 2 <sup>nd</sup> April 2009	

### Site Map

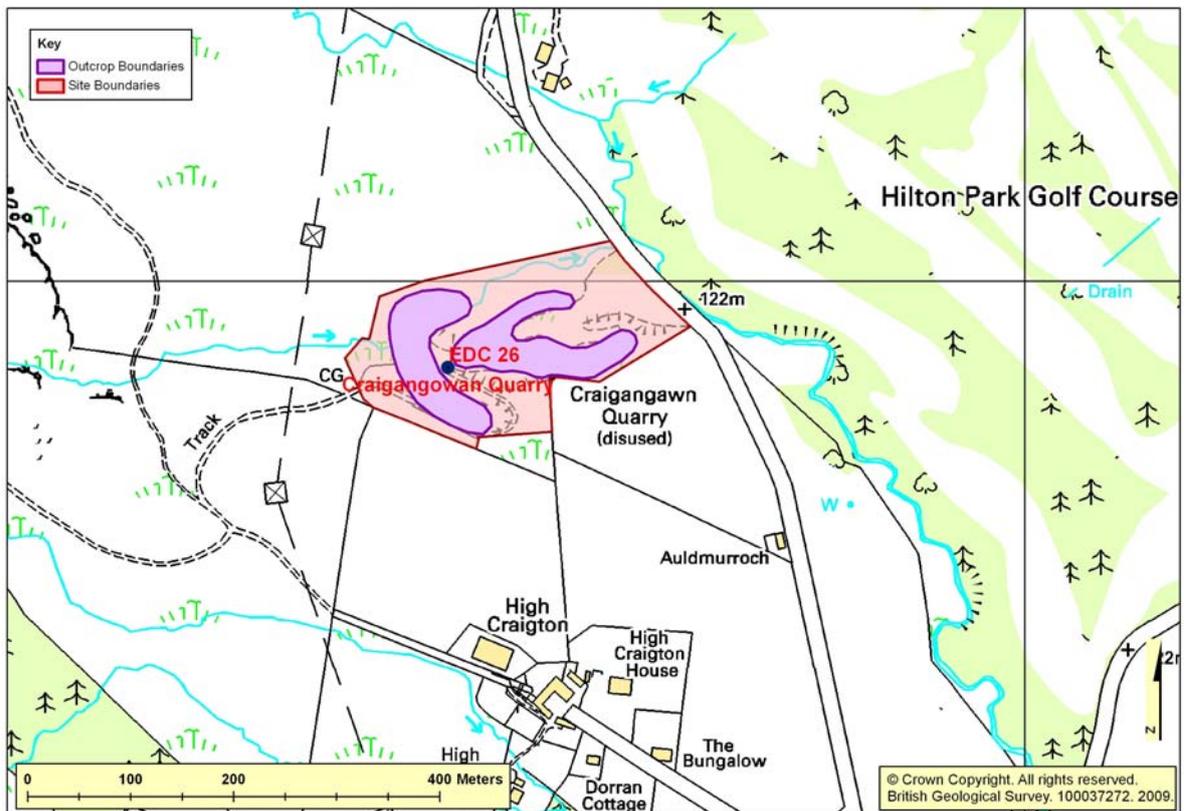


Figure 26: Craigangawn Quarry Location Map

### Summary Description

Disused igneous and agglomerate quarry, formerly used for roadstone. Located towards the eastern end of the Kilpatrick Hills

Lower Carboniferous volcanic vent. Many of the volcanic vents in the Kilpatrick Hills and Campsie Fells are demonstrably sources of the local Clyde Plateau Volcanic Formation lavas (Hall, 1998). The vent exposed in the old quarry face at Craigangawn Quarry displays an upward-opening funnel geometry, the vent is filled with coarse agglomerate and cuts through deposits of fine ash, all of which are visible.

Adjacent outcrops display excellent examples of columnar jointing in basaltic intrusions.

The site has good access and the floor of the quarry is largely grassed. However, care should be taken close to the main quarry face exposing the vent as loose material falls on a regular basis.

Good views of lava trap topography can be seen from here on the Kilpatrick Hills and on a clear day the Campsie Fells.

<b>EDC 26: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Clyde Plateau Volcanic Formation
Rock type: Tuff and agglomerate	
Age: Lower Carboniferous	Formation: Southern Scotland Dinantian Plugs and Vents Suite
Rock type: Agglomerate	
Age: Lower Carboniferous	Formation: Southern Scotland Dinantian Plugs and Vents Suite
Rock type: Plagioclase-olivine-clinopyroxene-macrophyric basalt	
Age: Lower Carboniferous	Formation: Southern Scotland Dinantian Plugs and Vents Suite
Rock type: Plagioclase-macrophyric basaltic rock	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking for 1 car in a small layby on the road to the northeast of the quarry. Cross a barbed wire fence to enter the disused quarry	
Safety of access	Quarry floor is grassy, wet in places but faces are generally very accessible, a few trees in front of the main face which obscure the view a bit	
Safety of exposure	As with all quarries, assess each face before approaching. The main face particularly is weathering continuously and small pieces of material fall regularly down the face.	
Permission to visit	No permission sought although shepherd passed by with a wave.	
Current condition	Good	
Current conflicting activities	None	
Restricting conditions	None known	
Nature of exposure	Sub vertical quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Pleasant with good view across to the Campsie Fells	3
History of Earth Sciences	None known	0
Economic geology	Worked for aggregate, disused for at least 30 years	3

<b>EDC 26: GeoScientific Merit</b>				
<b>GeoScientific Merit</b>	<b>Rarity</b>	<b>Quality</b>	<b>Literature/ Collections</b>	<b>1st</b>
Litho Stratigraphy	4	4	2	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	5	6	6	<input checked="" type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	2	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				31
<b>Current Site Value</b>				
<b>Community</b>				5
<b>Education</b>				7
<b>Fragility and potential use of the site</b>				
<b>Fragility</b>	Weathering/Erosion			
<b>Potential use</b>	Research, Higher/Further Education, School, Multidisciplinary			

<b>Geodiversity value</b>	
This site displays excellent sections through a number of igneous intrusions, revealing not only their composition, but also their structure and geometry. Most importantly it exposes sections in one of the few volcanic vents in East Dunbartonshire. The quality of these exposures would be difficult to match regionally.	<b>6</b>

## EDC 27: East Mugdock Quarry, by Mugdock Reservoir

Grid reference: NS 55786 76079	Site type: Artificial quarry works
Site ownership: Not known	Current use: Recreation
Field surveyor: Sarah Arkley & Mike Browne	Current geological designations: None
Date visited: 2 <sup>nd</sup> April 2009	

### Site Map

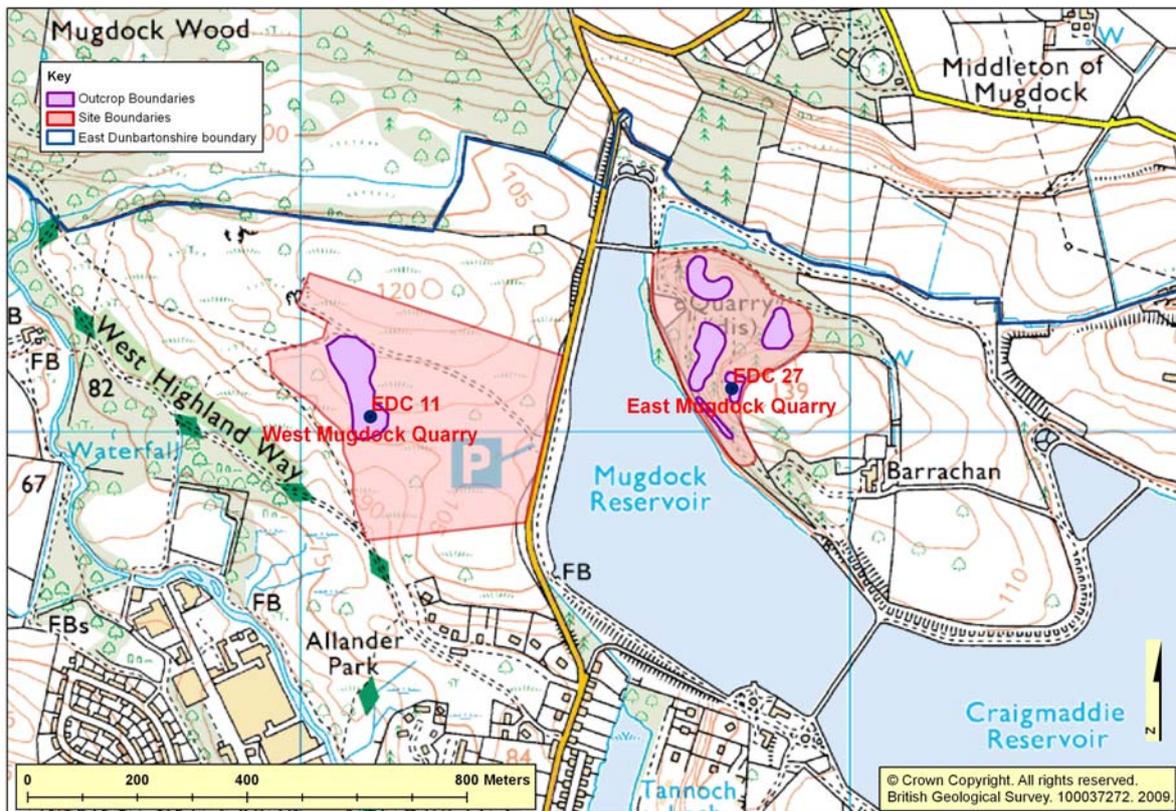


Figure 27: East Mugdock Quarry Location Map

### Summary Description

Disused sandstone and microgabbro quarry, may have been formerly used for building stone and roadstone.

The intrusion is part of the Milngavie Sills complex intruding here into sandstones belonging to the Lawmuir Formation.

There are several quarries in the vicinity, although most are only in sandstone, just the one displays the intrusion. This quarry reveals sandstone in the lower part (approx 6 m) and the microgabbro sill in the upper part (approx 4 m). The sandstone is fairly massive, medium-grained and pale-coloured. The microgabbro, in contrast, is dark-coloured and displays good sub-vertical columnar jointing.

A path over-looking the reservoir, to the south of the quarry, has been improved by man. The hillside adjacent to the path has been beautifully chiselled, the tool-marks left by quarrymen are still very clear. The exposure through sandstone here displays a good example of contorted (convolute) cross bedding.

<b>EDC 27: Stratigraphy and Rock Types</b>	
Age: Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type.	
Age: Carboniferous to Early Permian	Formation: Milngavie Sills, Western Midland Valley Westphalian to Early Permian Sills
Rock type: Basalt and microgabbro	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking is available for a couple of cars at the northeastern tip of the reservoir in a layby or a large number of cars can be parked at Drumclog Moor car park, at the edge of Mugdock Country Park.	
Safety of access	Care should be taken along the road, then a footbridge leads from the road across the reservoir to a network of paths through woods on the eastern side of Mugdock Reservoir	
Safety of exposure	Care should be taken as in all quarries and an assessment made of each face before approaching. The quarry which displays the overlying sill has a bench half way up which can be easily accessed but care should be taken not to step back!	
Permission to visit	No permission sought as part of public park	
Current condition	Two of the four quarries are almost completely overgrown. The other two are in good condition although some of the sandstone faces are a pretty mossy obscuring any structures.	
Current conflicting activities	None	
Restricting conditions	None known	
Nature of exposure	Sub vertical quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Pleasant with scarp features	5
History of Earth Sciences	None known	0
Economic geology	Former sandstone and microgabbro quarry used in the walls and buildings around the reservoir and possibly for the reservoir itself.	3

EDC 27: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	4	3	2	<input type="checkbox"/>
Sedimentology	3	3	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	4	5	4	<input checked="" type="checkbox"/>
Structural Geology	1	2	0	<input type="checkbox"/>
Palaeontology	2	2	2	<input type="checkbox"/>
Geomorphology	2	4	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				45
Current Site Value				
Community				10
Education				6
Fragility and potential use of the site				
Fragility	Geohazard, Natural Overgrowing			
Potential use	Research, Higher/Further Education, School, On-site Interpretation, On-site Geotrail, Multidisciplinary			

Geodiversity value	
The main value of this site is the number of different features it exposes. Not only of the rocks and their structures but tool-marks of this quality are rare in East Dunbartonshire, and the sandstone was likely used for constructing local buildings connected with the reservoir.	<b>7</b>

## EDC 28: Baldernock Mill, Baldernock

Grid reference: NS 57491 74862	Site type: Natural section
Site ownership: Not known but appears to be in a private garden	Current use: Private Country
Field surveyor: Sarah Arkley & Mike Browne	Current geological designations: None
Date visited: 2 <sup>nd</sup> April 2009	

### Site Map

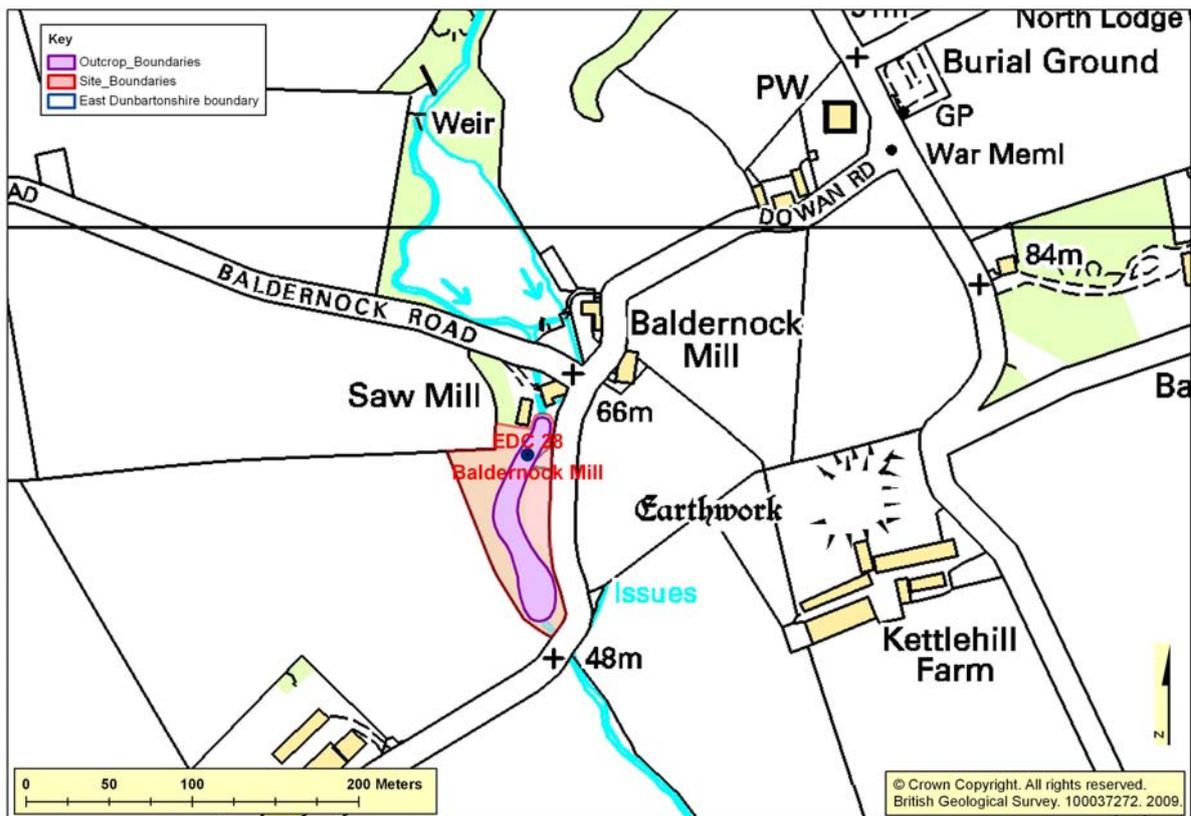


Figure 28: Baldernock Mill Location Map

### Summary Description

Stream section immediately south of Baldernock Mill exposing sedimentary rocks belonging to the Lawmuir Formation with a small intrusion.

Section in the easterly bank of the burn displays a limestone at the base overlain by dark mudstones which are intruded by a sill. The thin intrusion is seen to 'step' or change levels part way along the section, a feature known as transgression.

Baldernock Mill has a long history and the millstone outside may well be from Craigmaddie Muir (EDC\_14), where they were reputedly made.

Craigenglen Beds (marine band) exposed here – Glasgow memoir p29.

<b>EDC 28: Stratigraphy and Rock Types</b>	
Age: Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type.	
Age: Carboniferous to Early Permian	Formation: Milngavie Sills, Western Midland Valley Westphalian to Early Permian Sills
Rock type: Basalt and microgabbro	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking is available off the road adjacent to the burial ground in Baldernock opposite the church. Walk down the quiet single-track Dowan Road to reach Baldernock Mill.	
Safety of access	Care should be taken in the stream with slippery rocks	
Safety of exposure	Section appears stable	
Permission to visit	No permission sought but appears to be within a private garden	
Current condition	Good, lower part of the section is kept clean by flowing water	
Current conflicting activities	None known	
Restricting conditions	Main section is in private grounds belonging to the Mill, part of the garden	
Nature of exposure	Cliff section in the valley side	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	16 <sup>th</sup> Century Mill with working overshot wheel and millstone outside on display	5
Aesthetic landscape		2
History of Earth Sciences	None known	0
Economic geology	None recorded	0

EDC 28: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	4	2	<input type="checkbox"/>
Sedimentology	4	4	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	5	5	2	<input checked="" type="checkbox"/>
Structural Geology	2	2	0	<input type="checkbox"/>
Palaeontology	4	3	0	<input type="checkbox"/>
Geomorphology	1	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				45
Current Site Value				
Community				6
Education				6
Fragility and potential use of the site				
Fragility	None			
Potential use	Research, Higher/Further Education, School, Multidisciplinary			
Geodiversity value				
The main value of this site is the presence of a transgressing sill, a feature rarely so well exposed. The mill adjacent to the site is a good historical/cultural link.				7

## EDC 29: Inchbelle Quarry, Kirkintilloch

Grid reference: NS 66172 75159	Site type: Artificial quarry works
Site ownership: Tarmac Limited	Current use: In current use
Field surveyor: Sarah Arkley & Mike Browne	Current geological designations: None
Date visited: 2 <sup>nd</sup> April 2009	

### Site Map

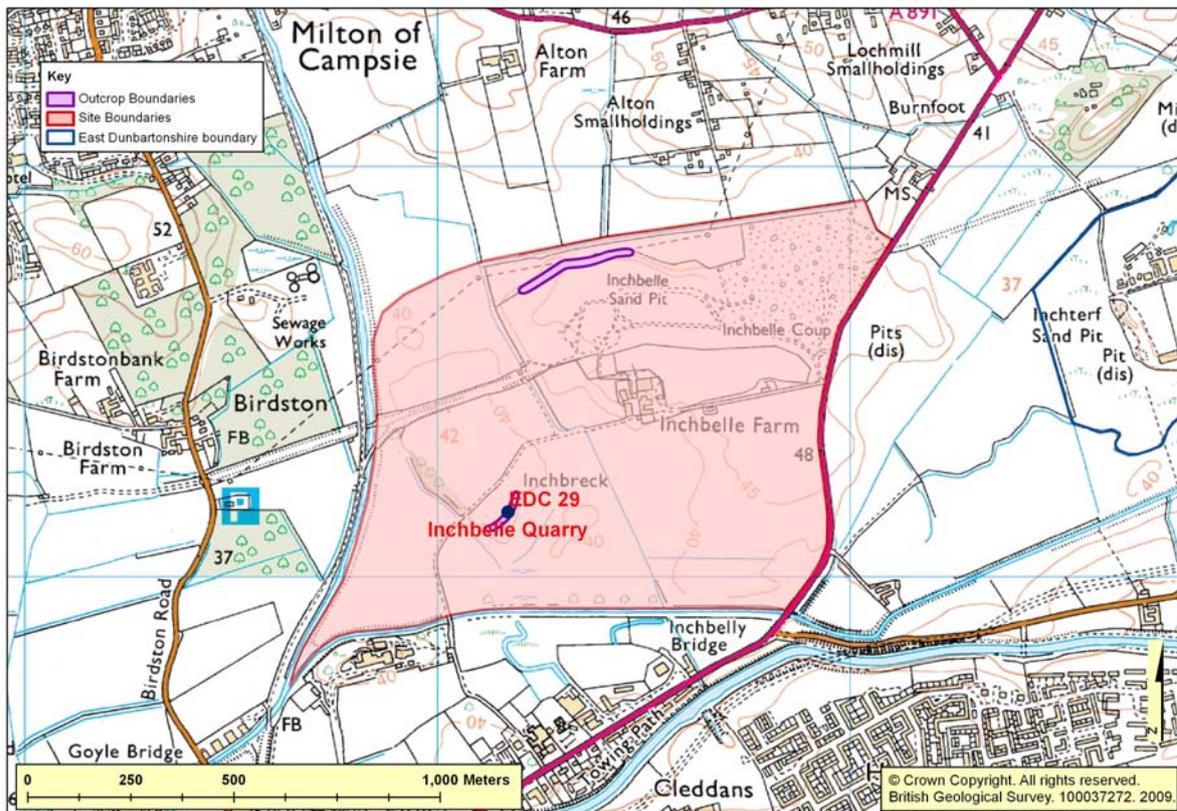


Figure 29: Inchbelle Quarry Location Map

### Summary Description

Active sand and gravel quarry. Areas previously worked are now used for landfill.

Thin unit, few m thick. Typically loose rounded gravel at surface underlain by laminated sand. The contact between the two units can be observed in some low faces along the northern edge of the quarry, although these are rapidly being lost under landfill.

Good views across to the hills

Tarmac have plans to expand to the east, it would be good if a representative face could remain exposed for future generations to observe.

<b>EDC 29: Stratigraphy and Rock Types</b>	
Age: Quaternary	Formation: Broomhouse Sand and Gravel Formation
Rock type: Gravel, sand and silt	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	On entry call into the site office. Approach site from the west for the sand and gravel quarry (the eastern entrance is for the landfill site).	
Safety of access	As this is a working quarry, prior warning of a visit (to the quarry manager) would be advisable and all visitors should follow the required site health and safety regulations. Plenty of parking is available next to the site office. Be aware of quarry vehicles at all times and wear all appropriate PPE.	
Safety of exposure	Working faces are generally low (less than 2 m high). Areas of uncompacted wet sediment exist adjacent to some areas of landfill.	
Permission to visit	Permission given from the site office (Tarmac)	
Current condition	Low, poor quality exposures	
Current conflicting activities	Working quarry	
Restricting conditions	As these are working faces, which are being landfilled following extraction, it is currently unknown what exposures will ultimately remain.	
Nature of exposure	Low degraded quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Nice valley, views to Kilsyth Hills	3
History of Earth Sciences	None known	0
Economic geology	Sand and gravel quarry, low quality aggregate	3

<b>EDC 29: GeoScientific Merit</b>				
<b>GeoScientific Merit</b>	<b>Rarity</b>	<b>Quality</b>	<b>Literature/ Collections</b>	<b>1st</b>
Litho Stratigraphy	6	3	0	<input checked="" type="checkbox"/>
Sedimentology	4	4	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	4	4	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				25
<b>Current Site Value</b>				
<b>Community</b>				0
<b>Education</b>				4
<b>Fragility and potential use of the site</b>				
<b>Fragility</b>	None			
<b>Potential use</b>	None			

<b>Geodiversity value</b>	
The sand and gravel deposits exposed in this site are an important part of East Dunbartonshire's glacial history. Many similar quarries existed in the past but almost all are now degraded and overgrown.	<b>4</b>

## EDC 30: Craigen Glen, Balgrochan

Grid reference: NS 62143 75714	Site type: Natural section
Site ownership: Not known	Current use: Open country
Field surveyor: Sarah Arkley & Mike Browne	Current geological designations: None
Date visited: 6 <sup>th</sup> April 2009	

### Site Map

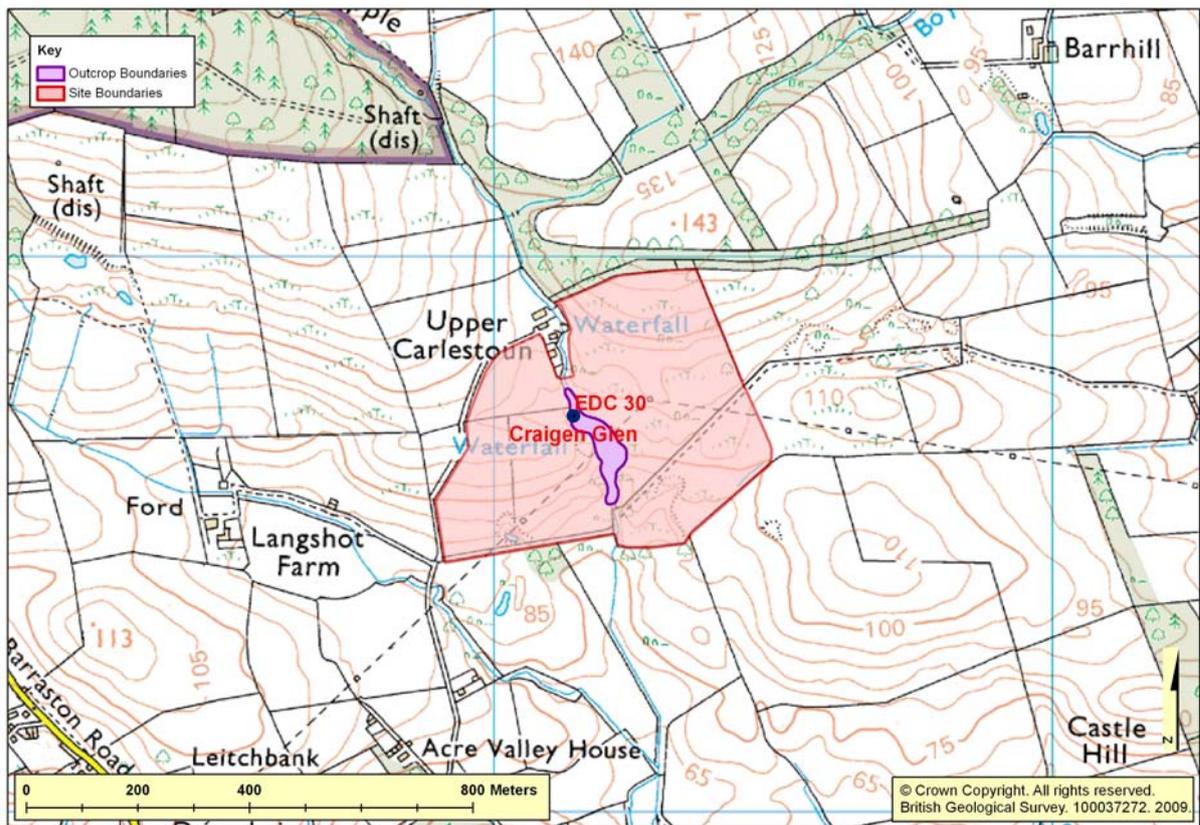


Figure 30: Craigen Glen Location Map

### Summary Description

Stream section through sedimentary strata belonging to the Lower Limestone Formation and Lawmuir Formation.

Lower part of site displays evidence of former workings; disturbed landscape, burnt mudstone bings, etc.

Exposures up the burn are generally on the bank sides, which vary in accessibility and quality. Possible adit was seen approximately half way up the site on the eastern bank beneath a thick sandstone bed.

The Craigen Glen Beds, found in the upper part of the Lawmuir Formation, form a marine band within laminated mudstones which are noted for their fossils of brachiopods, molluscs, large productoids and corals (Hall, 1998)

<b>EDC 30: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking for one car at the crossroad of tracks southwest of the site. A footpath is signed from here to the burn and styles exist over fences. At the burn the path disappears and you need to find your way up a wooded stream	
Safety of access	Access to the lower part of the glen where there is evidence of old workings is good. Access to the upper part is more difficult with lots of new barbed wire fences in the way.	
Safety of exposure	Care should be taken on slimy rocks in the stream, especially on the smooth rock platform below the waterfall.	
Permission to visit	No permission sought	
Current condition	Okay, bit overgrown in places	
Current conflicting activities	None	
Restricting conditions	Barbed wire fences	
Nature of exposure	Stream section, exposures are seen with in the burn and bank sides	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape	Pleasant	3
History of Earth Sciences	Members of the Glasgow Geological Society visited here early in the history of the society on their first field excursion.	3
Economic geology	Some workings, waste piles remain	2

EDC 30: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	6	5	2	<input checked="" type="checkbox"/>
Sedimentology	3	3	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	1	2	0	<input type="checkbox"/>
Palaeontology	1	2	0	<input type="checkbox"/>
Geomorphology	1	1	0	<input type="checkbox"/>
Total geoscientific merit score				27
Current Site Value				
Community				9
Education				5
Fragility and potential use of the site				
Fragility	Natural overgrowing			
Potential use	Research, Higher/Further Education, School, Multidisciplinary			
Geodiversity value				
This site displays a number of sedimentary features and industrial remains and is one of only a few localities where the marine band (Craigenglen Beds) is exposed. Historically the site was first visited by Glasgow Geological Society in 1858 and was famous then for its fossils of marine shells.				5

## EDC 31: Wilderness Plantation

Grid reference: NS 59604 72548	Site type: Artificial quarry works
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Mike Browne	Current geological designations: None
Date visited: 6 <sup>th</sup> April 2009	

### Site Map

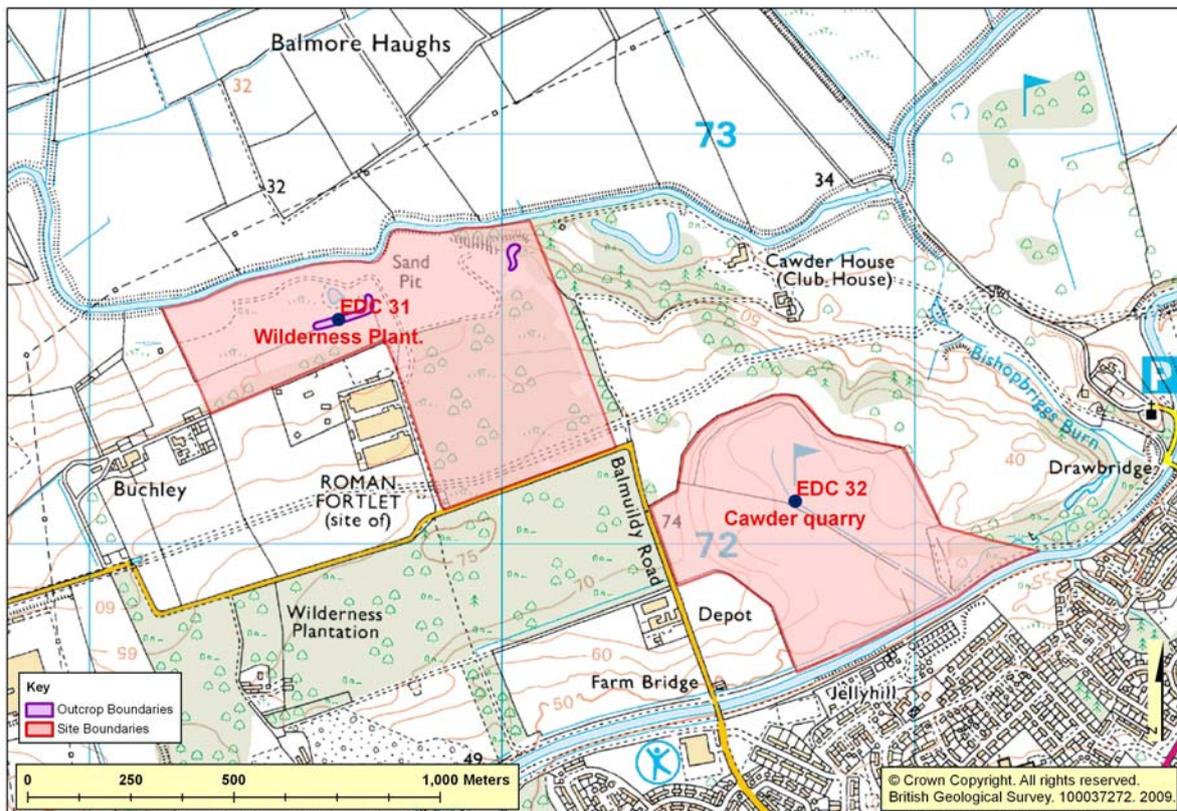


Figure 31: Wilderness Plantation Location Map

### Summary Description

Disused sand and gravel quarry and completed landfill site.

Type locality of the Wilderness Till Formation, overlying older sand and gravel deposits of the Cadder Sand and Gravel Formation from which a radiocarbon dated (27 550 years Before Present) woolly rhinoceros humerus bone was found in 1963 close to Balmuily Road.

After some searching the type exposure was relocated, although largely degraded and overgrown, the critical contact with the underlying sand and gravels is now obscured but can be re-exposed.

Exposures of till found at the top of the degraded face are hard reddish brown, generally fine-grained with scattered boulders and other smaller clasts. There are no sedimentary structures in the till, but a fabric (glaciotectonic) is observed.

Samples of the underlying sands are visible towards the edge of the face where rabbits have exploited them for burrows.

<b>EDC 31: Stratigraphy and Rock Types</b>	
Age: Quaternary	Formation: Wilderness Till Formation
Rock type: Glacial deposits: diamicton	
Age: Quaternary	Formation: Cadder Sand and Gravel Formation
Rock type: Sand and Gravel	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking possible for a few cars by the side of the bonded warehouses south of the site	
Safety of access	A track heads northwards towards the River Kelvin from where the sections can be accessed.	
Safety of exposure	Exposures are only visible in the upper quarter of the face; the rest has been covered by fallen material and forms a steep slippery slope. The area at the base of the sections is very wet and smells, it is likely a contaminated site, a deep green pool sits at the bottom of part of the section.	
Permission to visit	No permission sought	
Current condition	Possible contaminated site	
Current conflicting activities	None known	
Restricting conditions	Smell	
Nature of exposure	Degraded quarry face	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations		0
Aesthetic landscape	Landscaped landfill site, view across the Kelvin valley	2
History of Earth Sciences	None known	0
Economic geology	Site was worked for sand and gravel for decades	5

EDC 31: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	6	6	2	<input checked="" type="checkbox"/>
Sedimentology	5	4	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	1	2	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	2	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				32
Current Site Value				
Community				5
Education				6
Fragility and potential use of the site				
<b>Fragility</b>	Weathering/Erosion, Natural overgrowing, Dumping			
<b>Potential use</b>	Research, Higher/Further Education, School			

Geodiversity value	
This site is the type locality for the Wilderness Till Formation, a glacial deposit which stretches across much of Central Scotland. Glaciotectonic structures at and around the contact between the till and the underlying sand and gravel worthy of re-excavation and academic research. As a site with a dated woolly rhinoceros bone it is also important in the understanding of Quaternary ice age events in central Scotland.	<b>6</b>

## EDC 32: Cawder Quarry, Cadder

Grid reference: NS 60711 72106	Site type: Artificial quarry works
Site ownership: Not known	Current use: Disused
Field surveyor: Sarah Arkley & Mike Browne	Current geological designations: None
Date visited: 6 <sup>th</sup> April 2009	

### Site Map

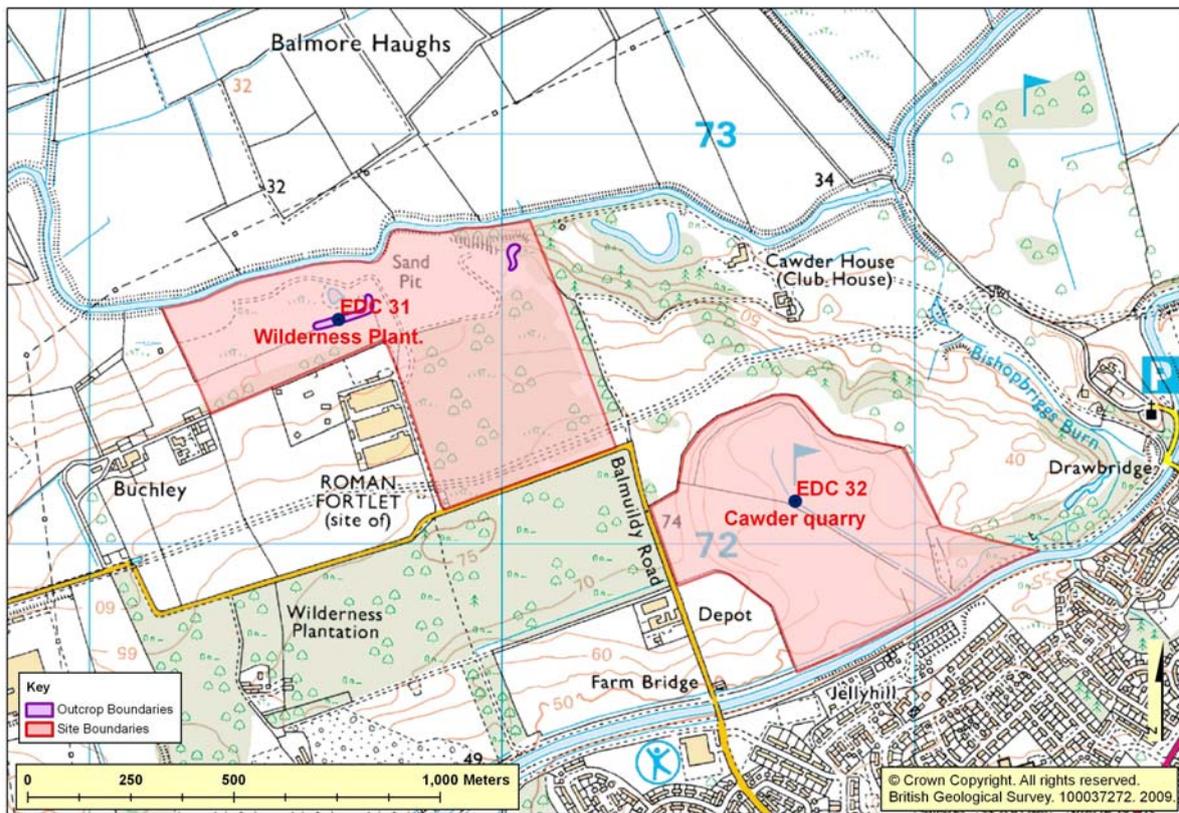


Figure 32: Cawder Quarry Location Map

### Summary Description

Disused sand and gravel quarry.

No sections were found. Once an important quarry the faces are now degraded and overgrown, so that no exposures remain.

<b>EDC 32: Stratigraphy and Rock Types</b>	
Age: Quaternary	Formation: Wilderness Till Formation
Rock type: Glacial deposits: diamicton	
Age: Quaternary	Formation: Cadder Sand and Gravel Formation
Rock type: Sand and Gravel	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking is possible along Balmuilty Road, to the west of the site	
Safety of access	Walk across field from the road to the site	
Safety of exposure	Not relevant	
Permission to visit	Viewed from track opposite the council depot on Balmuilty Road	
Current condition	Appears very overgrown	
Current conflicting activities	None known	
Restricting conditions	Faces are so degraded that the site is of little value in its current condition	
Nature of exposure	Degraded quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape		1
History of Earth Sciences	None known	0
Economic geology	Working in 1970's for sand and gravel under till	5

EDC 32: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	0	2	<input checked="" type="checkbox"/>
Sedimentology	2	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	0	0	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				9
Current Site Value				
Community				10
Education				2
Fragility and potential use of the site				
Fragility	Natural overgrowing, Development			
Potential use	Research, Higher/Further Education			
Geodiversity value				
Former large sand and gravel quarry. All faces now degraded and overgrown. No exposures remain.				2

## EDC 33: Bishopbriggs No2 Gravel Pit, Torrance

Grid reference: NS 54616 72089	Site type: Artificial quarry works
Site ownership: Not known	Current use: Agricultural Land
Field surveyor: Sarah Arkley Mike Browne	Current geological designations: None
Date visited: 6 <sup>th</sup> April 2009	

### Site Map

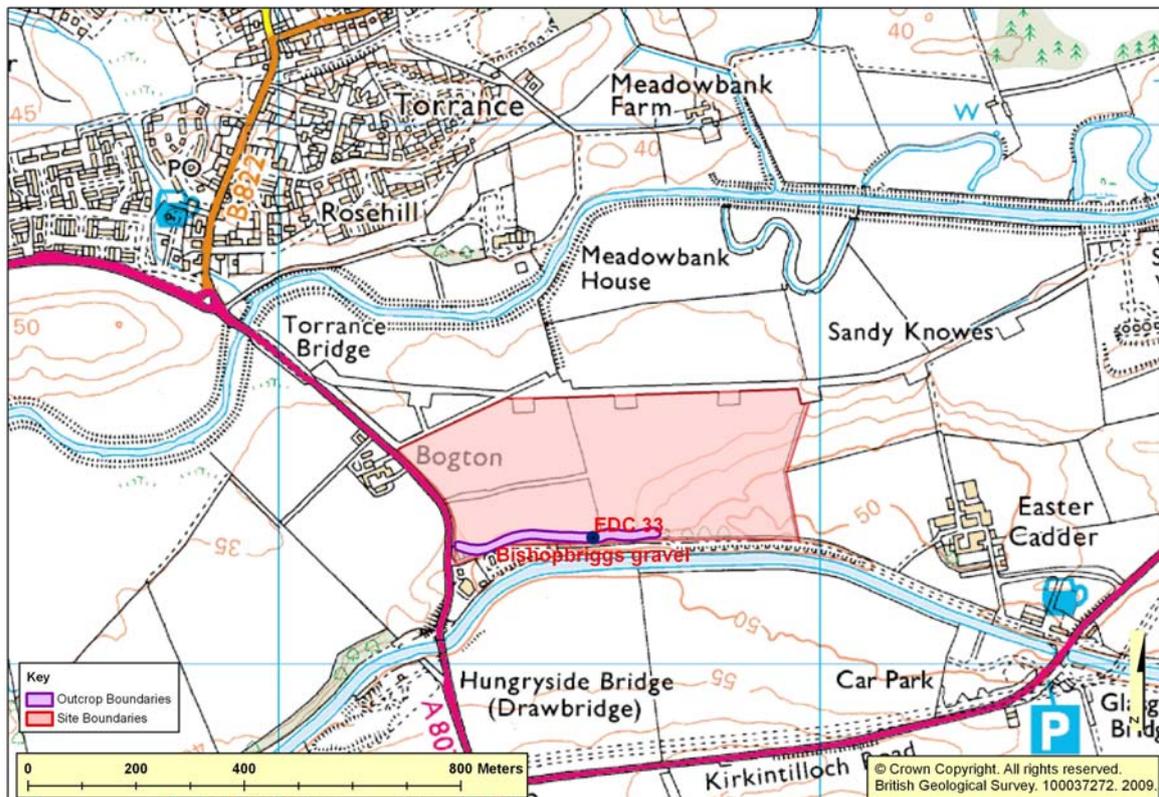


Figure 33: Bishopbriggs No2 Gravel Pit Location Map

### Summary Description

Disused sand and gravel quarry.

No sections were found. Once a reasonably sized quarry, the faces are now degraded and overgrown, so that no exposures remain.

Large-scale trough cross-bedding was formerly recorded at the site, in 12 m sections, indicating the transport direction of the material was in an easterly direction

Note on BGS fieldslip at southwestern edge of worked ground: "Rhino locality, (1925) see Rolfe S.J.G. 2, 253–58." This refers to Rolfe, 1966. Woolly rhinoceros from the Scottish Pleistocene. Scottish Journal of Geology, 3, p253–258. Various woolly rhinoceros bones have been found in the Bishopbriggs area of the Kelvin valley. Collagen from the humerus bone yielded a radiocarbon date of 27 550 years B.P. which has greatly increased our understanding of Quaternary deposits in the Kelvin valley.

<b>EDC 33: Stratigraphy and Rock Types</b>	
Age: Quaternary	Ross Sand and Gravel Formation
Rock type: Sand and Gravel	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Small car park at Torrance Bridge.	
Safety of access	Walking along the roadside footpath past Bogton House to the site	
Safety of exposure	Not known	
Permission to visit	Viewed from roadside	
Current condition	Appears very overgrown	
Current conflicting activities	None known	
Restricting conditions	Faces are so degraded that the site has little value in its current condition	
Nature of exposure	Degraded quarry faces	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape		2
History of Earth Sciences	None known	0
Economic geology	Former sand and gravel quarry, stopped in ?late 60's	3

EDC 33: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	6	0	8	<input checked="" type="checkbox"/>
Sedimentology	5	0	2	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	6	0	8	<input type="checkbox"/>
Geomorphology	4	4	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				43
Current Site Value				
Community				5
Education				2
Fragility and potential use of the site				
Fragility	Natural overgrowing			
Potential use	Higher/Further Education			

Geodiversity value	
Former sand and gravel quarry where woolly rhinoceros bone was found. All faces now degraded and overgrown. No exposures remain. Locality mainly of historical importance because of bone find, but current site geodiversity value lessened by the lack of visible quarry faces and overgrown nature of the site.	<b>5</b>

## EDC 34: Baldow Glen, Lennoxtown

Grid reference: NS 61526, 77489	Site type: Natural section
Site ownership: Not known (Managed by Forestry Commission)	Current use: Private Country (Forestry)
Field surveyor: Mike Browne	Current geological designations: None
Date visited: 14 <sup>th</sup> April 2009	

### Site Map

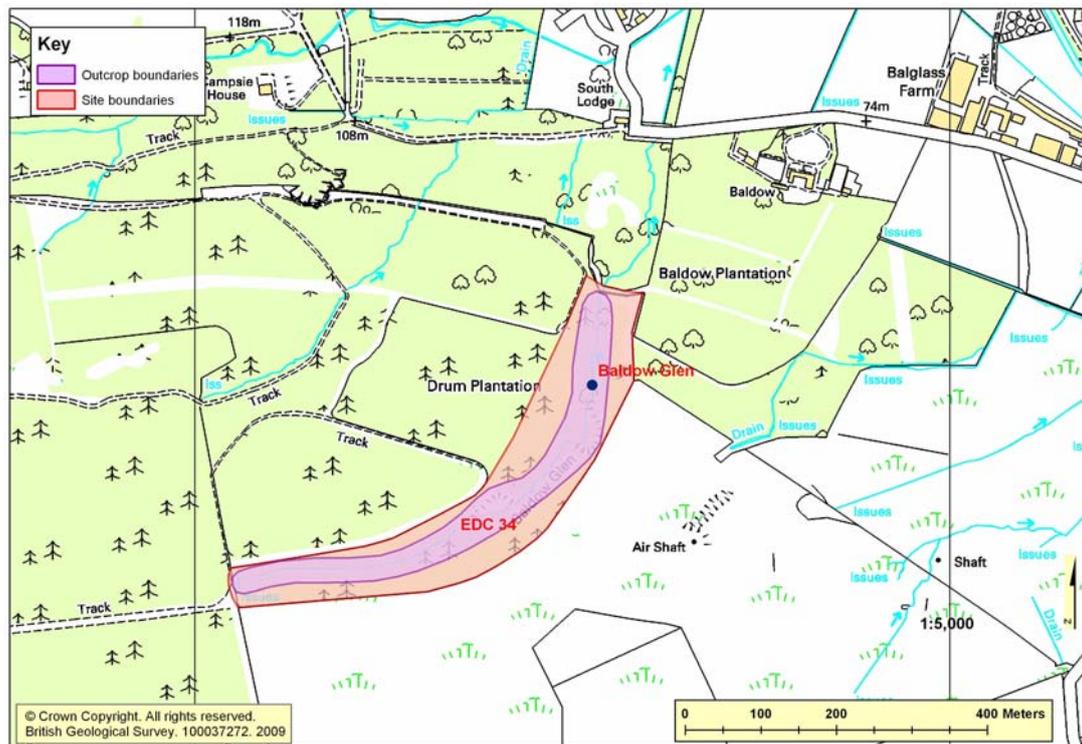


Figure 34: Glen Baldow Location Map

### Summary Description

Wooded glen with steep banks revealing exposures mainly of beds of mudstone belonging to the Lower Limestone Formation (and top of the Lawmuir Formation). The Hurllet Limestone seems to have been quarried out (with compacted waste visible) but the underlying Hurllet Coal is exposed showing good cleat (joints).

Thin beds of ironstone and nodules of ironstone occur along with exposure of the Blackhall Limestone which here is crinoidal.

<b>EDC 34: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type	
Age: Lower Carboniferous	Formation: Blackhall Limestone, Lower Limestone Formation
Rock type: Limestone	
Age: Lower Carboniferous	Formation: Hurlet Limestone, Alum Shale and Hurlet Coal
Rock type: Limestone, mudstone and coal	
Age: Lower Carboniferous	Formation: Baldernock Limestone, Lawmuir Formation
Rock type: Limestone	
Age: Lower Carboniferous	Formation: Balgrochan Beds, Lawmuir Formation
Rock type: Mudstone (marine band)	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking possible near Newlands Farm to the SW, walking along forest tracks to the site	
Safety of access	Walking on forest tracks, then off-path and up to 15 m deep valley. Beware of felling	
Safety of exposure	Low risk of rock fall, possible slips on steep valley sides and deep boggy patches.	
Permission to visit	None sought	
Current condition	Okay	
Current conflicting activities	Forest felling,	
Restricting conditions	None known	
Nature of exposure	Stream section	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	None known	0
Aesthetic landscape		2
History of Earth Sciences	None known	0
Economic geology	Coal and limestone workings	4

<b>EDC 34: GeoScientific Merit</b>				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	5	4	<input checked="" type="checkbox"/>
Sedimentology	4	4	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	3	4	0	<input type="checkbox"/>
Palaeontology	4	4	4	<input type="checkbox"/>
Geomorphology	2	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				45
<b>Current Site Value</b>				
<b>Community</b>				8
<b>Education</b>	Relevant to anyone interested in coal, mudstone and ironstone as minerals			3
<b>Fragility and potential use of the site</b>				
<b>Fragility</b>	Weathering and erosion only			
<b>Potential use</b>	Guided walk			
<b>Geodiversity value</b>				
Access is a limiting factor (from informal bike trail) but ok for looking at lithologies described under education				<b>6</b>

## EDC 35: Glenwynd

Grid reference: NS 60158, 75949	Site type: Artificial quarry works / natural section
Site ownership: Not known	Current use: Agricultural land
Field surveyor: Mike Browne	Current geological designations: None
Date visited: 14 <sup>th</sup> April 2009	

### Site Map

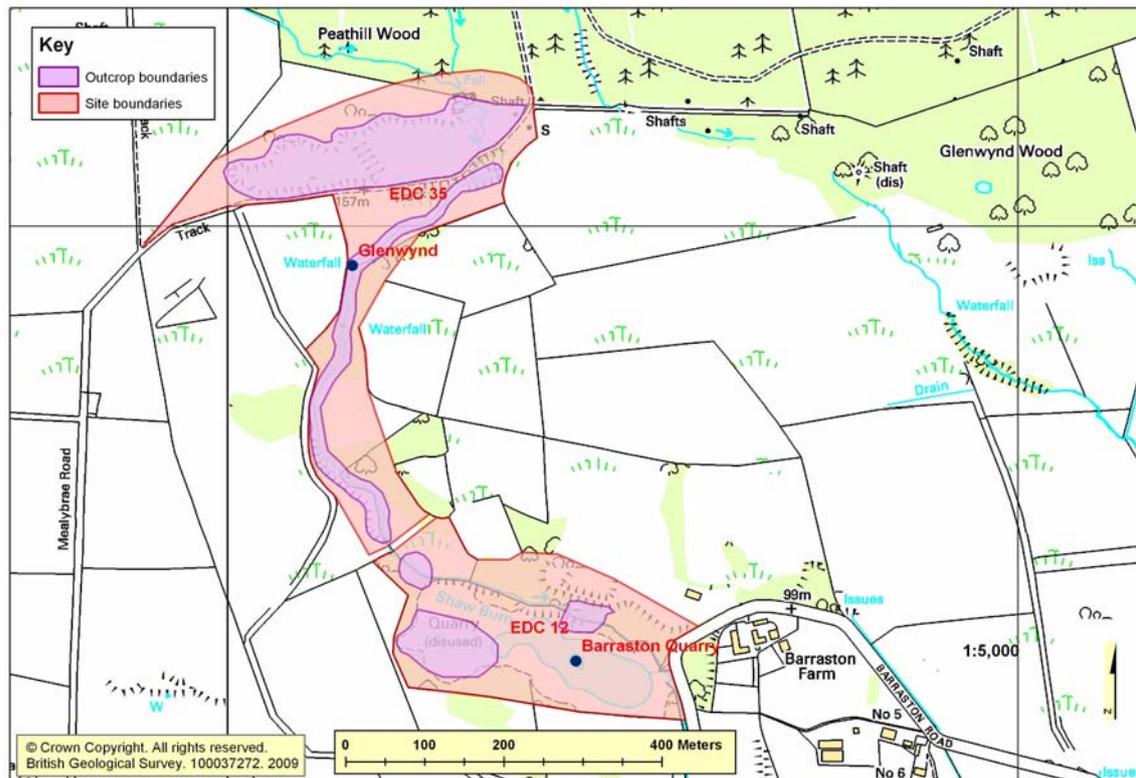


Figure 35: Glenwynd Location Map

### Summary Description

Discontinuous stream sections; also old mineworkings including quarry waste from excavation of Hurler Limestone, Alum Shale and Hurler Coal. Mine shafts/adits locally.

Baldernock Limestone and Balgrochan Beds (marine band, including crinoidal limestone) exposed.

Views of surrounding landscapes across the Kelvin valley.

<b>EDC 35: Stratigraphy and Rock Types</b>	
Age: Lower Carboniferous	Formation: Lower Limestone Formation
Rock type: Sedimentary Rock Cycles of the Clackmannan Group Type	
Age: Lower Carboniferous	Formation: Lawmuir Formation
Rock type: Sedimentary Rock Cycles of the Strathclyde Group Type	
Age: Lower Carboniferous	Formation: Baldernock Limestone, Lawmuir Formation
Rock type: Limestone	
Age: Lower Carboniferous	Formation: Balgrochan Beds, Lawmuir Formation
Rock type: Mudstone (marine band)	
Age: Lower Carboniferous	Formation: Hurllet Limestone, Alum Shale and Hurllet Coal
Rock type: Limestone, mudstone and coal	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	Parking possible for approx 10 cars with new car park to NW of Newland farm	
Safety of access	Forest tracks or open fields	
Safety of exposure	Exposed in poor weather, presence of old shafts and adits	
Permission to visit	No permission sought	
Current condition	Reasonable small exposures	
Current conflicting activities	Livestock	
Restricting conditions	None known	
Nature of exposure	Stream sections, degraded quarry workings no sections visible.	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations		0
Aesthetic landscape		3
History of Earth Sciences		0
Economic geology		5

EDC 35: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	5	5	2	<input checked="" type="checkbox"/>
Sedimentology	4	4	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	4	4	4	<input type="checkbox"/>
Geomorphology	2	2	0	<input type="checkbox"/>
<b>Total geoscientific merit score</b>				36
Current Site Value				
Community				9
Education				2
Fragility and potential use of the site				
Fragility	Weathering and natural erosion			
Potential use	Guided walk			

Geodiversity value	
Good for links between the bedrock geology and the former exploitation of their minerals. At least one shaft and one adit location can be seen with little risk, if sensible.	<b>5</b>

## EDC 36: Torrance Meanders (River Kelvin)

Grid reference: NS 63212, 73905	Site type: Natural landform
Site ownership: Not known	Current use: Agricultural land
Field surveyor: Strathclyde RIGS Group	Current geological designations: None
Date visited: October 2009	

### Site Map

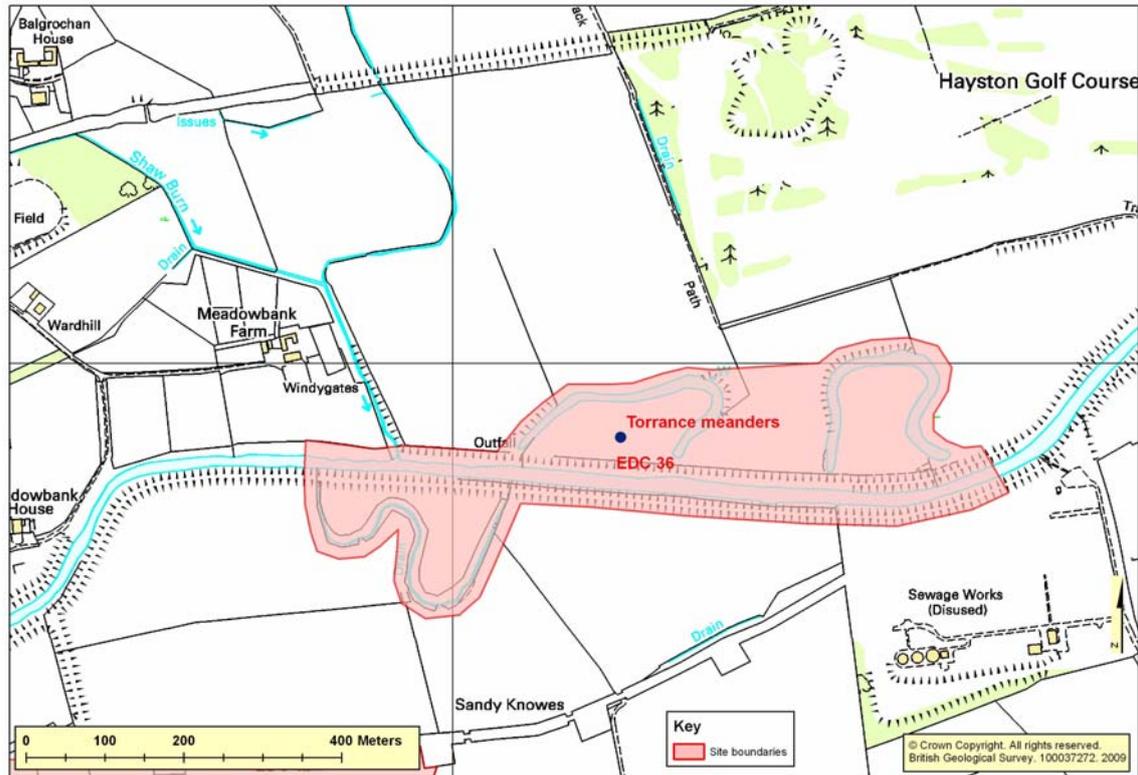


Figure 36: Remnant Meanders of the River Kelvin Location Map

### Summary Description

Inactive river channel remnants, interrupting arable fields and partially infilled with aquatic vegetation. They form three meanders (two with complex form) that are separated by the artificially straightened, deepened and leveed channel of the Kelvin, which is approximately 200 years old. The two meanders on the northern side have outer banks incised into a glacial terrace.

Viewed together, the meanders allow reconstruction of a 1.6km reach of the naturally meandering Kelvin. Although they have the appearance of oxbows, they appear not to result from natural meander cutoff and so are genetically not oxbows.

<b>EDC 36: Stratigraphy and Rock Types</b>	
Age: Holocene	Formation: Alluvium
Rock type: Clay, silt, sand and gravel	

<b>Assessment of Site Value</b>		
<b>Access and Safety</b>		
<b>Aspect</b>	<b>Description</b>	
Road access and parking	For the two northern meanders, best access is path along S side of Hayston Golf Club – park ca.1km away either at clubhouse with permission, or in Hayston and then cross footbridge over Kelvin. Alternative is to park in Torrance and walk disused railway path.  Access to southern meander more awkward – park at Bogton ca.800m away?	
Safety of access	Easy crossing arable fields to viewpoints over the meanders.	
Safety of exposure	Wholly safe to overview, though the meanders themselves are flooded.	
Permission to visit	Required with regard to possible damage to crops.	
Current condition	Only the overall channel planforms, and their (degraded) steep outer banks, survive.	
Current conflicting activities	Scrub growth partly obscures the steep channel banks in places.	
Restricting conditions	Site divided by River Kelvin into two halves, with no nearby bridge.	
Nature of exposure	Natural landforms.	
<b>Culture, Heritage &amp; Economic</b>		
<b>Aspect</b>	<b>Description</b>	<b>Rating</b>
Historic, archaeological & literary associations	<i>(not researched yet)</i> Important glimpse into landscape before river was straightened and floodplain 'tamed'; links to farming history and era of large-scale land engineering / Improvement.	6
Aesthetic landscape	Surprising & intriguing natural features in otherwise 'tamed' landscape – but only really striking in aerial views.	4
History of Earth Sciences	None known	0
Economic geology	History of water resource control?	1

EDC 36: GeoScientific Merit				
GeoScientific Merit	Rarity	Quality	Literature/ Collections	1st
Litho Stratigraphy	0	0	0	<input type="checkbox"/>
Sedimentology	0	0	0	<input type="checkbox"/>
Igneous/Mineral/ Metamorphic Geology	0	0	0	<input type="checkbox"/>
Structural Geology	0	0	0	<input type="checkbox"/>
Palaeontology	0	0	0	<input type="checkbox"/>
Geomorphology	5	4	2	<input checked="" type="checkbox"/>
<b>Total geoscientific merit score</b>				11
Current Site Value				
<b>Community</b>	Little visited and unassuming, but northern part very close to Core Path linking settlements, and to popular golf course.		3	
<b>Education</b>	Virtually unique opportunity to illuminate the 'natural' Kelvin, and contrast with the artificial channel. Also demonstrates meander confinement by glacialuvial terraces. Potential somewhat limited by lack of preserved/visible landform detail.		5	
Fragility and potential use of the site				
<b>Fragility</b>	Natural Overgrowth, Agricultural Dumping / infilling?			
<b>Potential use</b>	School, Multi-disciplinary (already a bio LNCS)			

Geodiversity value	
<p>Most comparable rivers in the Central Belt have been straightened or artificially confined. Although many do have similar remnant meanders, this is certainly the best example in East Dunbartonshire. (Broomhill 'Oxbow' in Kirkintilloch is more degraded, and bisected by the upraised EDC office site; a remnant meander at Cadder is also degraded and incorporated into a golf course development.)</p> <p>Whereas the River Kelvin Meanders (Bearsden) site demonstrates active processes, this Torrance Meanders site is quite distinct as it is an inactive relict of a lost river regime. The geodiversity value of this site is enhanced by its rarity and particular potential for helping local people understand changing land-use on the floodplain.</p>	<b>3</b>

N.B. Some context provided by Tipping R. et al (2008). The chronology and long term dynamics of a low energy river system: the Kelvin Valley, central Scotland. *Earth Surface Processes & Landforms* 33 p910-922

## 5 East Dunbartonshire's Geodiversity Site Results

In total 36 sites were visited and assessed. Of these, 34 are recommended as Local Geodiversity Sites. These sites have a good geographical spread across East Dunbartonshire, encompassing both urban and rural areas. Together they show typical geological strata, structure and features of all the geological units present immediately beneath the surface of East Dunbartonshire.

Although all the rocks seen at outcrop in East Dunbartonshire are Carboniferous in age, together the sites expose much of the Carboniferous sequence which underlies Central Scotland.

The sites, chosen primarily for their geology, have revealed numerous links to the character of the landscape, historical structures, ecology, and the economic and cultural history of the area.

Many of these sites could be enhanced to encourage visitors and students to learn more about the geology beneath their feet and how the geology, as the foundations of our landscape, has influenced the form and nature of what lies at the surface; from the inter-drumlin depressions which have created a wetland habitat to the ironstones and fireclays which were exploited as raw materials for the heavy industry which flourished around Glasgow, resulting in the development of large conurbations.

Scored out of 10, the 34 sites assigned geodiversity values of between 3 and 8 are recommended for designation as Local Geodiversity Sites.

See Tale 7

<b>Table 7: Geological Scores For The Geodiversity Sites</b>	<b>Locality</b>	<b>Geoscientific Merit</b>	<b>Community Value</b>	<b>Education Value</b>	<b>Culture, Heritage &amp; Economic Value</b>	<b>Total Score</b>	<b>Geodiversity Value</b>	<b>Local Geodiversity Site</b>
Twechar Quarry	EDC 1	41	10	6	5	62	6	Yes
Castle Hill Quarry	EDC 2	22	10	4	16	52	5	Yes
Board Craig Quarry	EDC 3	22	8	4	4	38	3	Yes
Lenzie–Torphichen Dyke	EDC 4	29	9	6	3	47	4	Yes
Meltwater Channel	EDC 5	11	5	5	2	23	3	Yes
Bardowie Loch	EDC 6	12	9	5	4	30	3	Yes
R Kelvin Meanders	EDC 7	11	10	4	3	28	3	Yes
Kilmardinny Loch	EDC 8	10	10	5	3	28	3	Yes
Craigdhu Burn	EDC 9	0	10	2	2	14	0	No
Manse Burn SSSI	EDC 10	74	9	10	2	95	8	Yes
West Mugdock Quarry	EDC 11	24	9	4	6	43	4	Yes
Barraston Quarry	EDC 12	24	6	3	5	38	4	Yes
Blairskaith Quarry	EDC 13	46	6	8	8	68	7	Yes
Auld Wives' Lifts	EDC 14	34	7	5	13	59	6	Yes
Gallow Hill	EDC 15	16	10	3	3	32	3	Yes
Finniescroft Wood	EDC 16	31	5	4	8	48	5	Yes
Pattie's Bught	EDC 17	30	5	5	9	49	5	Yes

<b>Table 7: Geological Scores For The Geodiversity Sites</b>	<b>Locality</b>	<b>Geoscientific Merit</b>	<b>Community Value</b>	<b>Education Value</b>	<b>Culture, Heritage &amp; Economic Value</b>	<b>Total Score</b>	<b>Geodiversity Value</b>	<b>Local Geodiversity Site</b>
Crow Road	EDC 18	40	10	6	4	60	7	Yes
Campsie Glen	EDC 19	59	10	6	10	85	8	Yes
Cowies Glen	EDC 20	52	2	5	4	63	6	Yes
Burniebrae Burn	EDC 21	55	4	5	5	69	7	Yes
Spouthead Burn	EDC 22	25	3	4	3	35	4	Yes
Douglas Muir Quarry	EDC 23	37	2	6	7	52	6	Yes
Roman Baths	EDC 24	5	9	5	11	30	6	Yes
Linn of Baldernock	EDC 25	50	6	8	8	72	8	Yes
Craigangawn Quarry	EDC 26	31	5	7	6	49	6	Yes
East Mugdock Quarry	EDC 27	45	10	6	8	69	7	Yes
Baldernock Mill	EDC 28	45	6	6	7	64	6	Yes
Inchbelle Quarry	EDC 29	25	0	4	6	35	4	Yes
Craigen Glen	EDC 30	27	9	5	8	49	5	Yes
Wilderness Plantation	EDC 31	32	5	6	7	50	6	Yes
Cawder Quarry	EDC 32	9	10	2	6	27	2	No
Bishopbriggs No2 Gravel Pit	EDC 33	43	5	2	5	55	5	Yes
Baldow Glen	EDC 34	45	8	3	6	62	6	Yes
Glenwynd	EDC 35	36	9	2	8	55	5	Yes
Torrance Meanders	EDC 36	11	3	5	11	30	3	Yes

**Table 7: Geological scores for the Geodiversity Sites.**

Table 8: Geological Features Visible at Geodiversity Sites	Locality	Ballagan Formati	Clyde Plateau	Kirkwood	Lawmuir	Lower Limestone	Limestone Coal	Upper Limestone	Passage	Early Carboniferous	Carboniferous to	Carboniferous to	Geological	Fossils and	Geomorphology	Quaternary	Economic	Built
		Formationn	Volcanic	Formation	Formation	Formation	Formation	Formation	Formation	Formation	Volcanic Plugs and	Early Permian Sills	Early Permian Dykes	Structures	Palaeontology	Deposits/Feature	Heritage	Heritage
Twechar Quarry	EDC 1							●			●		●				●	
Castle Hill Quarry	EDC 2										●				●		●	●
Board Craig Quarry	EDC 3										●						●	
Lenzie–Torphichen Dyke	EDC 4											●			●			
Meltwater Channel	EDC 5														●	●		
Bardowie Loch	EDC 6														●	●		
R Kelvin Meanders	EDC 7														●	●		
Kilmardinny Loch	EDC 8														●	●		
Craighdu Burn	EDC 9																	
Manse Burn SSSI	EDC 10						●							●		●		
West Mugdock Quarry	EDC 11				●											●	●	
Barraston Quarry	EDC 12					●											●	
Blairskaith Quarry	EDC 13					●							●	●			●	
Auld Wives' Lifts	EDC 14				●										●	●	●	●
Gallow Hill	EDC 15														●	●		
Finniescroft Wood	EDC 16					●								●			●	
Pattie's Bught	EDC 17				●									●			●	●
Crow Road	EDC 18		●								●				●	●		
Campsie Glen	EDC 19	●	●									●	●		●	●		
Cowies Glen	EDC 20					●		●					●	●		●	●	

<b>Table 8: Geological Features Visible at Geodiversity Sites</b>		<b>Ballagan Formatiønn</b>	<b>Clyde Plateau Volcanic Formation</b>	<b>Kirkwood Formation</b>	<b>Lawmuir Formation</b>	<b>Lower Limestone Formation</b>	<b>Limestone Coal Formation</b>	<b>Upper Limestone Formation</b>	<b>Passage Formation</b>	<b>Early Carboniferous Volcanic Plugs and Vents</b>	<b>Carboniferous to Early Permian Sills</b>	<b>Carboniferous to Early Permian Dykes</b>	<b>Geological Structures</b>	<b>Fossils and Palaeontology</b>	<b>Geomorphology</b>	<b>Quaternary Deposits/Feature</b>	<b>Economic Heritage</b>	<b>Built Heritage</b>
Burniebrae Burn	EDC 21		●			●	●						●	●	●			
Spouthead Burn	EDC 22	●				●						●			●			
Douglas Muir Quarry	EDC 23				●									●			●	
Roman Baths	EDC 24																	●
Linn of Baldernock	EDC 25				●						●			●	●		●	
Craigangawn Quarry	EDC 26		●							●					●		●	
East Mugdock Quarry	EDC 27				●						●		●	●	●		●	●
Baldernock Mill	EDC 28				●						●		●	●	●			●
Inchbelle Quarry	EDC 29														●	●	●	
Craigen Glen	EDC 30				●	●							●	●	●	●	●	
Wilderness Plantation	EDC 31														●	●	●	
Cawder Quarry	EDC 32															●	●	
Bishopbriggs No2 Gravel Pit	EDC 33													●	●	●	●	
Baldow Glen	EDC 34					●							●	●	●	●	●	
Glenwynd	EDC 35				●	●								●	●	●	●	
Torrance Meanders	EDC 36														●	●		

Table 8: Geological features at the Geodiversity Sites.

# Glossary

<b>Agglomerate</b>	A coarse-grained rock made up of material ejected during a volcanic eruption.
<b>Allochthonous</b>	Pertaining to materials, particularly rock masses, that formed somewhere other than their present location, and were transported by fault movements, large-scale gravity sliding, or similar processes. Autochthonous material, in contrast, formed in its present location. Landslides can result in large masses of allochthonous rock, which typically can be distinguished from autochthonous rocks on the basis of their difference in composition. Faults and folds can also separate allochthons from autochthons.
<b>Alluvial</b>	Environments, actions and products of rivers or streams.
<b>Amygdale</b>	Vesicles and cavities in lavas which are infilled with minerals.
<b>Anticline</b>	A structural term describing an arch-shaped fold in rock in which the rock layers are upwardly convex. The oldest rock layers form the core of the fold, and outward from the core progressively younger rocks occur.
<b>Basalt</b>	A fine-grained, dark-coloured igneous rock composed of iron and magnesium rich minerals.
<b>Bedding</b>	A feature of sedimentary rocks, in which planar or near-planar surfaces known as bedding planes indicate successive depositional surfaces formed as the sediments were laid down.
<b>Bedrock</b>	A term used to describe unweathered rock below soil or superficial deposits. Can also be exposed at the surface.
<b>Biological weathering</b>	Biological processes and changes that contribute to the breakdown of rocks, for example tree roots or animal burrows.
<b>Bioturbation</b>	The disruption of depositional sedimentary structures by organisms e.g. activities such as burrowing.
<b>Bivalve</b>	Class of molluscs with paired oval or elongated shell valves joined by a hinge (e.g. mussels).
<b>Brachiopods</b>	A phylum of solitary marine shelled invertebrates, the shell is made up of two unequal valves.
<b>Braided river</b>	A river consisting of a number of small channels separated by bars
<b>Bryozoa</b>	Tiny colonial animals superficially similar to coral. They date back to the Ordovician, 480 million years ago, to present day. Mainly living in a marine environment, they cover rocky surfaces like moss.
<b>Calcite</b>	Calcium Carbonate [ $\text{CaCO}_3$ ] a widely distributed mineral and a common constituent of sedimentary rocks, limestone in particular. Also occurs as stalactites and stalagmites and is often the primary constituent of marine shells.
<b>Calcareous</b>	Containing calcium carbonate.
<b>Calcrete</b>	Conglomerate consisting of surficial sand and gravel cemented into a hard mass by calcium carbonate precipitated from solution and redeposited through the agency of infiltrating waters, or deposited by the escape of carbon dioxide from vadose water.
<b>Caledonides</b>	The mountain belt formed during the Caledonian Orogeny
<b>Caledonian</b>	Refers to a major mountain-building (orogeny) event related to the closure of the Iapetus Ocean and the convergence of the Laurentia, Baltica and Avalonia crustal blocks during the Ordovician, Silurian and early Devonian. It affected

eastern North America, Scotland, Ireland, Scotland, Scandinavia and Greenland.

<b>Carboniferous</b>	A geological period [359–299 Ma] of the Palaeozoic Era preceded by the Devonian and followed by the Permian.
<b>Cementstone</b>	A name used to describe a limestone, usually containing clays, that is, or was, used to make cement.
<b>Chronostratigraphy</b>	The branch of stratigraphy linked to the concept of time. Chronostratigraphical units are defined as bodies of rock that formed during a specific interval of geologic time. Chronostratigraphical units are thus special rock bodies that are conceptual, as well as being material.
<b>Clast</b>	Particle of broken down rock, eroded and deposited in a new setting.
<b>Columnar jointing</b>	A type of jointing which looks like columns. Found in igneous rocks and results from the internal contraction during cooling of lava, as seen in the vertical columns of the Giant's Causeway, N. Ireland.
<b>Conglomerate</b>	A coarse-grained clastic sedimentary rock, a significant proportion of which is composed of rounded or subrounded pebbles and boulders.
<b>Coprolite</b>	Fossilised excreta
<b>Country rock</b>	A general term used to describe any rock which has been penetrated by an igneous intrusion.
<b>Crinoid</b>	A sea dwelling creature (class Crinodea) which has survived since Ordovician times. They are known as sea-lilies and have three sections, the stem, the calyx and feather-like arms by which they collect food. Their abundance in the Palaeozoic era has meant that their remains have formed large thicknesses of limestone due to their calcareous skeletons.
<b>Cross-bedding</b>	Sets of strata which are inclined to the general stratification of the beds. They dip in the direction of fluid flow at the time when the beds were laid down.
<b>Desiccation cracks</b>	Polygonal cracks formed in a sediment as it dries out in a terrestrial environment, also known as shrinkage cracks
<b>Devensian</b>	The last glacial stage in Britain, lasting from around 70 000 BP (Before Present) to about 10,000 BP.
<b>Devonian</b>	A geological period [416–359 Ma] of the Palaeozoic Era preceded by the Silurian and followed by the Carboniferous.
<b>Dolomitic limestone</b>	A limestone containing a high concentration of the mineral dolomite
<b>Drumlin</b>	A low, rounded hill of glacial till, which was moulded by glaciers passing over it. Drumlins are elongate in the direction of ice flow.
<b>Dyke</b>	A sheet-like body of intrusive igneous rock emplaced along a vertical or near vertical fracture, normally discordant to the structure in the country rocks..
<b>Earth heritage</b>	The geological and landscape heritage of an area. Used mostly in the context of geoconservation.
<b>Earth science</b>	Science related to planet Earth. Also known as geoscience. Includes disciplines such as economic geology, geochemistry, geomagnetism, geomorphology, geophysics, glaciology, hydrogeology, mineralogy, palaeontology, petroleum geology, petrology, stratigraphy, structural geology, engineering geology, sedimentology, seismology.
<b>Echinoid</b>	Sea urchins (class Echinoidea) are found in oceans all over the world. Their shell or "test", is globular in shape and covered with spines. The size of an adult test is typically from 3 to 10 cm. The earliest known echinoids are found in the rock of the late part of the Ordovician period, and they have survived to the present day.

<b>Essexite</b>	A variety of gabbro, an igneous rock, notable for its prominent augite phenocrysts.
<b>Eustatic</b>	World-wide changes in sea-level caused either by tectonic movement or growth or melting of glacial ice-sheets (glacioeustatic).
<b>Extrusive</b>	Describes igneous rocks that have been extruded onto the Earth's surface, rather than being intruded beneath the surface (intrusive).
<b>Fault</b>	A fracture in the Earth's crust across which the rocks have been displaced relative to each other.
<b>Fault plane</b>	A vertical or dipping surface of a fault.
<b>Felsite</b>	A general term used to denote pale-coloured, fine-grained igneous rocks.
<b>Fireclay</b>	A fine-grained sedimentary rock. It often contains fossil plant roots, commonly occurring beneath a coal seam. A fossil soil.
<b>Fluvial</b>	Referring to a river environment.
<b>Fold</b>	A bend in planar structures such as rock strata or bedding planes.
<b>Fold axis</b>	A line which lies parallel to the hinge line and marks the intersection of the axial plane with the hinge zone
<b>Formation</b>	The fundamental unit used in lithostratigraphy. Specific features distinguish one formation from another. Formations may be subdivided into members and several formations may constitute a group.
<b>Freestone</b>	Any fine-grained sandstone or limestone that can be sawn easily.
<b>Gastropod</b>	Molluscs belonging to the class Gastropoda, usually with coiled shells.
<b>Geomorphology</b>	The study of landforms and the processes that forms them
<b>Glaciofluvial</b>	Refers to sediments deposited by flowing glacial meltwater.
<b>Glaciolacustrine</b>	Refers to deposits and landforms derived from materials brought by glacial meltwaters into lake environments.
<b>Glaciotectonic</b>	Refers to structures (normally folds and faults) in subglacial and proglacial sediment and bedrock disrupted by ice flow.
<b>Hercynian</b>	A period of mountain building (orogeny) in Europe throughout the late Palaeozoic, synonymous with the Variscan Orogeny.
<b>Holocene</b>	The youngest epoch of the Quaternary Sub-Era. Covers the last 11 800 years. The concept of the Holocene ending at the end of the 18th Century is gaining ground, with the following Epoch termed the Anthropocene.
<b>Igneous rocks</b>	A rock that has formed from the cooling of magma (molten rock).
<b>Intrusion</b>	A body of igneous rock which has been injected as magma into existing hard rocks (country-rock). On cooling the magma is called an igneous intrusion.
<b>Joints</b>	A fracture, or potential fracture, in a rock adjacent to which there has been no displacement.
<b>Lacustrine</b>	Refers to a lake environment.
<b>Limestone</b>	Sedimentary rock composed mainly of calcium carbonate.
<b>Lithology</b>	The character of a rock expressed in terms of its mineral composition, structure, grain size and arrangement of its constituents.
<b>Lithostratigraphy</b>	The branch of stratigraphy concerned with the description of rock units in terms of their lithological features and spatial relationships
<b>Ma</b>	Abbreviation for megannum (or more correctly, megannus) meaning million years

<b>Magma</b>	Molten rock.
<b>Marl</b>	A sedimentary rock, a calcareous (lime-rich) mudstone, or clay-rich chalk.
<b>Massive</b>	A term used to describe a thick rock unit without any stratification, jointing or fracturing.
<b>Mass-movement</b>	The down slope movement of earth material due to the force of gravity.
<b>Meltwater</b>	Water produced by melting of snow or ice.
<b>Mountain building</b>	The complex series of geological processes which create mountains.
<b>Moraine</b>	Accumulations of material which have been transported and deposited by ice.
<b>Orogeny</b>	A period of mountain building by tectonic activity.
<b>Ostracod</b>	Small aquatic crustacean dating back to Cambrian times, [class : Ostracoda]. Ostracods vary in size from 0.2mm to 30mm and have a bivalve-like protective shell. They are very important in correlating palaeoenvironments due to their worldwide occurrence.
<b>Palaeogene</b>	The lowest period belonging to the Cenozoic Era [65.5–23 Ma].
<b>Paleocene</b>	The lowest epoch of the Palaeogene period, [65.5–55.8 Ma]
<b>Palaeozoic</b>	The lowest era of the Phanerozoic Eon. It is preceded by the Proterozoic and is followed by the Mesozoic, [542–251Ma].
<b>Periglacial</b>	Conditions, processes and landforms associated with cold, nonglacial environments.
<b>Permian</b>	A geological period [299–251 Ma] of the Palaeozoic Era preceded by the Carboniferous and followed by the Triassic.
<b>Phenocryst</b>	Large crystals, usually of near perfect shape, which occur in a finer-grained groundmass in igneous rocks.
<b>Pleistocene</b>	A geological epoch [1.8Ma–11.5 ka] preceded by the Pliocene and followed by the Holocene. Part of the Cenozoic Era and Quaternary Sub-Era.
<b>Pliocene</b>	A geological epoch [5.3 – 1.8 Ma] preceded by the Miocene and followed by the Pleistocene. Part of the Cenozoic Era.
<b>Point bar</b>	An accumulation of material (usually sand and/or gravel formed on the inside of a river meander.
<b>Porphyritic</b>	The term applied to igneous rocks which contain isolated crystals, or phenocrysts, larger than those forming the main body of the rock.
<b>Proterozoic</b>	The Late eon [2500–542 Ma] of the Precambrian followed by the Achaean.
<b>Pyroclastic</b>	Describes rocks that form directly by explosive ejection from a volcano.
<b>Quartz</b>	The mineral form of silicon dioxide (SiO <sub>2</sub> ). The most abundant and widespread of all minerals, it generally appears transparent or white and is hard enough to scratch glass.
<b>Quartz-microgabbro</b>	Medium grained basic igneous rock containing minor quartz.
<b>Quaternary</b>	A geological sub-era [1.8 Ma to present day] of the Cenozoic Era, following the Neogene
<b>River-cliff</b>	A steep face in rock or unconsolidated deposits, located on the outside bend of a meander. Formed by continual undercutting of the face.
<b>Ripple marks</b>	Small scale ridges and troughs formed by the flow of water or wind over unconsolidated sandy or silty sediment. The fossilised equivalent of ripples found today on beaches and river sands.

<b>Seat earth</b>	A sedimentary rock underlying a coal seam representing an old soil that supported the vegetation from which the coal has formed.
<b>Sedimentary rock</b>	A rock formed in one of three main ways: by the deposition of the weathered remains of other rocks (clastic sedimentary rock); by the deposition of the results of biogenic activity; and by precipitation from solution. Four basic processes are involved in the formation of a clastic sedimentary rock: weathering (erosion), transportation, deposition and compaction.
<b>Silcrete</b>	A conglomerate consisting of surficial sand and gravel which has been cemented into a hard mass by silica.
<b>Sill</b>	A tabular igneous intrusion with concordant contacts with the surrounding country rocks
<b>Slickenslides</b>	A polished rock surface, usually displaying linear grooves and ridges. Found on fault planes and caused by the movement of adjacent blocks of rock.
<b>Solifluction</b>	Solifluction is a slow downslope flow of water-saturated fragmental material or soil. It is promoted by the existence of permafrost which traps snow and ice melt within the surface layer making it more fluid.
<b>Spheroidal weathering</b>	A type of chemical weathering where jointed blocks of rock are slowly rounded by the removal of their outer shells. Often known as onion-skin weathering and typically seen in igneous rocks.
<b>Strata</b>	Rocks that form layers or beds.
<b>Stratigraphy</b>	The definition and description of the stratified rocks of the Earth's crust.
<b>Syncline</b>	A structural term describing a basin- or trough-shaped fold in rock in which rock layers are downwardly concave. The youngest rock layers form the core of the fold and outward from the core progressively older rocks occur.
<b>Terrane</b>	A fault-bounded body of rock of regional extent, characterized by a geological history different from that of contiguous terranes. A terrane is generally considered to be a discrete allochthonous fragment of oceanic or continental material added to a craton at an active margin by accretion.
<b>Terrigenous</b>	Derived from the erosion of rocks on land.
<b>Throw</b>	The amount of displacement on a fault.
<b>Thrust</b>	The movement of one crustal surface over another.
<b>Tufa</b>	A porous or cellular deposit of calcium carbonate deposited from lime-rich water.
<b>Tuff</b>	A rock formed of consolidated volcanic ash and fine-grained material ejected during a volcanic eruption. Finer grained than agglomerate.
<b>Unconformable</b>	A term generally applied to younger strata that do not conform in position or that do not have the same dip and strike as those of the immediately underlying rocks. Also applies to the contact between unconformable rocks.
<b>Unconformity</b>	A surface of contact between two groups of unconformable strata. Represents a break in the geological record where a combination of erosion and lack of deposition was taking place.
<b>Vein</b>	A fracture in the rock infilled with secondary minerals, often quartz or calcite.
<b>Vesicles</b>	Small spherical or elliptical cavities in an igneous rock which represent bubbles of gas which existed in the hot magma. Before the gas could escape, the magma cooled and hardened, 'trapping' the gas bubbles in the rock.

## References

British Geological Survey holds most of the references listed below, and copies may be obtained via the library service subject to copyright legislation (contact libuser@bgs.ac.uk for details). The library catalogue is available at: <http://geolib.bgs.ac.uk>.

CLOUGH, C T, and seven others. 1911. The geology of the Glasgow district. *Memoir of the Geological Survey, Scotland*.

DE SOUZA, H A F. 1979. The geochronology of Scottish Carboniferous volcanism. Unpublished PhD thesis, University of Edinburgh.

FORSYTH, I H, HALL, I H S, and MCMILLAN, A A. 1996. Geology of the Airdrie district. *Memoir of the British Geological Survey, Sheet 31W (Scotland)*.

HALL, I H S, FORSYTH, I H, and BROWNE, M A E. 1998. Geology of the Glasgow district. *Memoir of the British Geological Survey, Sheet 30E (Scotland)*.

HINXMAN, L W, ANDERSON, E M, and CARRUTHERS, R G. 1920. The economic geology of the Central Coalfield of Scotland, Area IV. Paisley, Barrhead and Renfrew. *Memoir of the Geological Survey, Scotland*.

LAWSON, J D AND WEEDON, D S. 1992. *Geological Excursions around Glasgow and Girvan*. Geological Society of Glasgow., 496pp.

PROSSER, C, MURPHY, M, and LARWOOD, J. 2006. *Geological conservation: a guide to good practice*. (Peterborough: English Nature.)

ROBERTSON, T, and HALDANE, D. 1937. The economic geology of the Central Coalfield of Scotland, Area I. Kilsyth and Kirkintilloch. *Memoir of the Geological Survey of Great Britain*.

ROLFE, W D I. 1966. Woolly rhinoceros from the Scottish Pleistocene. *Scottish Journal of Geology*, Vol. 2, 253–258.

STACE, H, and LARWOOD, J G. 2006. *Natural Foundations: geodiversity for people, places and nature*. (Peterborough: English Nature.)