ANNEX 1

SUMMARY CHARTS FOR GEOLOGICAL/GEOMORPHOLOGICAL FEATURES AND ISSUES IN UPLAND, LOWLAND AND MARITIME NATURAL AREAS.

NATURAL AREA - Uplands	2	3	7	9	12	58	61	63	73	76	77	78	80	83	84	85	88	89	Total
Geological significance:																			
Outstanding		●	●	●						●	●			●				●	7
Considerable	●						●	●								●			4
Notable					●												●		2
Some						●			●			●	●		●				5
No. of (P)SSSIs	18	26	42	28	8	3	15	14	1	31	13	0	5	28	2	14	4	70	322
No. of GCR sites	20	36	52	34	8	3	14	19	1	38	34	0	6	41	6	27	5	95	439
No. of GCR networks	8	11	13	11	2	2	6	8	1	15	6	0	4	11	3	10	3	18	51
International / National type sites		●		●						●	●						●		5
Key Issues:																			
Need to safeguard/enhance existing resource	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	18
Under-promotion of heritage/landscape/archaeology links	●	●			●		●		●	●	●	●			●	●	●	●	12
Mineral extraction, restoration, landfill, development	●	●			●	●							●	●			●		7
Interruption to natural fluvial processes	●	●	●	●				●								●		●	7
Poor quality/lack/deterioration of exposures				●	●				●	●		●	●						6
Under-promotion of educational/scientific value				●			●								●	●	●	●	6
Threats to caves/karst features		●	●											●		●		●	4
Loss/misuse/overuse of palaeontological resource				●						●	●			●					4
Require conservation sections in (dis)used quarries					●												●	●	3
Threats to mines/mine dumps	●	●																	2
Threats to soil/gravel profiles, geomorphological features						●	●												2
Inadequate management of type sections				●							●								2
Little recording of new (temporary/permanent) sites										●	●								2
Construction of coastal defence works				●															1
Threats to limestone pavements			●																1
Misuse/overuse of mineralogical resource														●					1

NATURAL AREA - Lowlands (1)	1	4	5	6	8	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Geological significance:																												
Outstanding					●									●											●		●	●
Considerable	●		●			●		●	●				●						●			●						
Notable				●			●								●		●	●						●		●		
Some		●								●	●	●				●				●	●		●					
No. of (P)SSSIs	7	4	16	7	13	6	6	14	12	0	4	2	12	12	9	0	8	2	15	1	2	16	1	6	27	1	21	23
No. of GCR sites	11	5	19	7	18	13	6	15	12	0	4	2	14	21	10	0	9	4	14	1	2	16	1	6	35	2	23	24
No. of GCR networks	6	3	6	6	8	8	2	3	4	0	3	1	6	6	2	0	3	4	6	1	1	7	1	3	9	1	4	4
International / National type sites	●		●		●	●		●	●					●				●							●			●
Key Issues:																												
Need to safeguard/enhance existing resource	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Little recording of new (temporary/permanent) sites	●	●	●	●	●	●		●	●			●										●	●		●			
Poor quality/deterioration of exposures										●			●		●	●	●	●	●		●						●	●
Interruption to natural coastal processes	●	●	●	●	●	●	●																		●		●	
Loss/misuse/overuse of palaeontological resource								●			●			●			●											●
Under-promotion of educational/scientific value	●	●	●	●	●	●		●	●	●		●												●	●			
Construction of coastal defence works	●	●	●	●	●	●	●											●								●	●	
Mineral extraction, restoration, landfill, development							●				●		●	●	●				●	●	●	●	●		●			●
Under-promotion of heritage/landscapes/archaeology link																								●	●	●		
Require conservation sections in (dis)used quarries	●		●		●	●		●	●			●										●						
Interruption to natural fluvial processes		●																		●								●
Threats to soil/gravel profiles, geomorphological features														●										●				
Inadequate management of type sections								●										●										
Threats to caves/karst features																												
Lack of statutory protection/incomplete GCR coverage																			●									
Interruption to hydrological levels/systems																						●	●					
Threats to mines/mine dumps																												
Loss/misuse/overuse of mineralogical resource																												
Inadequate management of urban geological SSSIs																												

NATURAL AREA - Lowlands (2)	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	59	60	62	64	65	66	67
Geological significance:																															
Outstanding		●				●										●				●	●			●	●		●			●	
Considerable	●		●		●			●	●	●	●	●	●		●		●					●	●			●		●			
Notable				●			●											●	●												
Some														●															●		●
No. of (P)SSSIs	14	22	12	6	14	17	4	13	5	16	18	6	14	1	8	14	4	8	6	7	39	10	13	22	44	13	28	1	4	25	2
No. of GCR sites	14	24	12	6	18	28	10	20	4	21	28	12	15	1	19	33	21	10	9	42	62	14	15	29	63	18	36	5	4	38	4
No. of GCR networks	4	9	7	4	7	10	7	10	2	7	7	8	5	1	9	14	8	7	5	16	18	9	8	9	8	6	9	4	1	11	1
International / National type sites	●					●	●		●		●	●			●	●	●			●	●	●		●		●		●		●	
Key Issues:																															
Need to safeguard/enhance existing resource	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Little recording of new (temporary/permanent) sites		●					●		●	●	●			●	●	●					●								●	●	
Poor quality/deterioration of exposures	●		●					●				●	●				●	●	●			●	●	●					●	●	●
Interruption to natural coastal processes							●	●	●		●	●			●	●	●		●	●	●		●		●	●	●	●			
Loss/misuse/overuse of palaeontological resource			●		●	●				●						●				●	●	●	●	●				●	●	●	
Under-promotion of educational/scientific value		●			●	●	●		●	●	●				●	●				●	●										
Construction of coastal defence works								●				●			●	●	●		●	●	●		●			●	●	●			
Mineral extraction, restoration, landfill, development	●		●	●				●				●	●							●			●	●							
Under-promotion of heritage/landscape/archaeology link					●	●							●	●			●		●						●	●	●			●	
Require conservation sections in (dis)used quarries										●	●														●	●	●				
Interruption to natural fluvial processes																							●							●	
Threats to soil/gravel profiles, geomorphological features				●	●	●																								●	●
Inadequate management of type sections																															
Threats to caves/karst features				●														●						●							
Lack of statutory protection/incomplete GCR coverage										●	●											●									
Interruption to hydrological levels/systems																															
Threats to mines/mine dumps																								●	●						
Loss/misuse/overuse of mineralogical resource																								●						●	
Inadequate management of urban geological SSSIs					●	●																									

NATURAL AREA - Lowlands (3)	68	69	70	71	72	74	75	79	81	82	86	87	90	91	92	TOTAL
Geological significance:																
Outstanding	●	●	●				●									18
Considerable					●			●				●	●			27
Notable				●						●	●			●		14
Some						●			●						●	15
No. of (P)SSSIs	26	48	28	5	16	3	26	14	1	2	8	10	8	6	2	860
No. of GCR sites	34	66	32	7	21	5	39	14	1	3	8	11	8	7	2	1187
No. of GCR networks	14	16	16	6	8	5	13	9	1	2	4	5	2	6	2	83
International / National type sites		●					●						●			29
Key Issues:																
Need to safeguard/enhance existing resource	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	74
Little recording of new (temporary/permanent) sites	●					●	●	●		●			●			39
Poor quality/deterioration of exposures				●					●		●	●		●		29
Interruption to natural coastal processes	●										●				●	28
Loss/misuse/overuse of palaeontological resource	●	●	●		●	●	●	●								25
Under-promotion of educational/scientific value		●								●						25
Construction of coastal defence works	●										●					24
Mineral extraction, restoration, landfill, development									●		●	●				24
Under-promotion of heritage/landscape/archaeology link		●			●		●	●						●	●	19
Require conservation sections in (dis)used quarries			●				●	●		●			●			18
Interruption to natural fluvial processes					●	●				●						8
Threats to soil/gravel profile, geomorphological features																7
Inadequate management of type sections							●	●				●				5
Threats to caves/karst features										●						4
Lack of statutory protection/incomplete GCR coverage																4
Interruption to hydrological levels/systems															●	3
Threats to mines/mine dumps										●						3
Loss/misuse/overuse of mineralogical resource																2
Inadequate management of urban geological SSSIs																2

NATURAL AREA - Maritime	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	TOTAL
Geological significance:																									
Outstanding			●			●	●					●	●	●	●	●		●							9
Considerable								●	●		●						●		●						5
Notable	●	●		●	●					●										●	●				7
Some																						●	●	●	3
No. of (P)SSSIs	7	6	12	5	2	6	8	7	10	1	3	9	21	5	17	36	11	32	2	5	4	2	3	1	215
No. of GCR sites	11	9	32	5	3	11	12	9	18	7	10	26	64	36	83	44	13	68	7	13	4	2	6	1	494
No. of GCR networks	7	6	15	3	2	4	4	4	9	7	8	15	16	13	27	6	2	11	5	12	4	2	4	1	58
International / National type sites	●	●	●	●		●	●	●		●	●	●	●	●	●	●		●	●	●					17
Key Issues:																									
Need to safeguard/enhance sites integrity	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	24
Need to safeguard/enhance natural processes	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	24
Rise in sea-level	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	24
Risk of flooding		●		●	●		●	●	●	●		●	●		●		●		●	●	●	●			15
Mineral extraction, exploitation, dredging	●	●		●	●							●			●	●		●	●				●	●	11
Under-promotion of educational/scientific value	●	●	●		●					●	●	●	●												8
Loss/mis-/overuse of palaeontological resource			●						●				●	●	●				●	●					7
Damaging recreational activities	●							●				●	●	●											5
Threat of landfill																						●			1
Managed retreat								●																	1
Military exercises															●										1

ANNEX 2

EXPLANATORY NOTES FOR KEY MANAGEMENT ISSUES IN MARITIME NATURAL AREAS

EXPLANATORY NOTES FOR KEY MANAGEMENT ISSUES IN THE MARITIME NATURAL AREA'S

INTRODUCTION

Eleven key themes were identified as recurring management issues in the Maritime Natural Area's. These notes explain the reasoning behind the inclusion/exclusion of a particular management issue, as a key priority, in a Maritime Natural Area [MNA]. It could be argued that in every MNA, any one of the management issues could be addressed, eg. Managed retreat could be considered as an option in every MNA, or damaging recreational activities could be considered to be an issue anywhere along the coast, that the public has access. However, this would not have distinguished between priority management issues and less important issues for each individual MNA. The table serves to simplify and highlight the main issues and areas of concern drawn from the Earth science MNA profiles. An 'issues' inclusion, in terms of management priority for an individual MNA, is based upon an operations/activities/natural factor's high potential to cause damage to an Earth science sites scientific integrity or significantly contributes to its destruction.

A significance scale rating from 1 to 10 gives an indication of the most commonly arising management issues in the MNA's, with regard to it's geology/geomorphology. [(1) refers to the most highly significant issues with regards to it's occurrence within the MNA's, while (10) refers to the issues with the least significance]. It is important to emphasise that this significance rating is purely based on the number of MNA's that should adopt a particular management issue and therefore become a priority over all the MNA's and not, the issues significance within an individual MNA. (ie. simply because the management issue rates a significance value of (1) does not mean that this is the highest priority within the actual MNA).

- **MAINTAIN AND ENHANCE NATURAL PROCESSES:** The natural forces of wind, waves and tides along a coastline have produced a variety of coastal landscapes, many of which are internationally or nationally important for their habitats and natural features. The conservation of these sites might be dependant upon maintaining natural coastal processes and it should be recognised that interruptions to such processes may have consequential effects. By protecting a coastline that is being eroded by marine processes, it reduces the input of sediment into the cell, thereby having a potential 'knock-on effect' down drift. [SIGNIFICANCE RATING: 1]

- **MAINTAIN AND ENHANCE INTEGRITY OF EXISTING EXPOSURES**: This is a key management issue in all Maritime Natural Areas that contain Earth science sites and concerns maintaining geological profiles and geomorphological features. Natural processes are a key component in maintaining the integrity of these sites. For example coastal defence works will protect the backshore from erosional processes that may have been working upon it. This stabilisation results in vegetative growth and obscures the exposure. [SIGNIFICANCE RATING: 1]

- **MINERAL EXPLOITATION:** mineral exploitation encompasses: offshore dredging, onshore mineral extraction, aggregate extraction, quarrying and spoil tipping in the inter-tidal area. Mineral exploitation becomes a priority management issue where it is: threatening the integrity of existing exposures, where the material is relic in nature, if it is altering the hydrodynamics in the nearshore zone which may effect littoral and marine processes. Quarrying and dredging also has the potential to release heavy metals, that have previously been stored in the sediment, into the marine environment. Another issue is a declining coal industry, which in coastal areas particularly near the scottish border, may have previously been an important sediment input through spoil tipping in the intertidal zone. With soft engineering techniques becoming increasingly popular as an alternative to hard defences, dredging and extraction of offshore banks to supply beach replenishment schemes, is becoming more popular and is therefore becoming a key management issue within the coastal zone. [SIGNIFICANCE RATING: 3]

- **FOSSIL COLLECTING:** A fossil is the 'remains or traces' of a plant or animal which has been buried by natural processes and then permanently preserved" [GCR series.1. 1995]. Palaeontology is the study of fossils. Fossils can be used to construct a detailed history of life on earth, to explain the rate and pattern of evolution, and the ancient environments and ecosystems. Fossil collecting becomes a priority management issue when a site notable for it's fossils is threatened by irresponsible collection or over-collection; posing a threat to the scientific integrity of the (P)SSSI. [SIGNIFICANCE RATING: 5]

- **PROMOTION OF EDUCATIONAL VALUE OF THE RESOURCE:** This is a priority issue within a Maritime Natural Area if it is thought the integrity of the GCR site is threatened by the public and would greatly benefit from public awareness concerning site sensitivity, ie. the introduction of interpretive media will educate people on conservation issues encouraging them to act in a responsible manner. This is particularly important in sensitive sites that are easily accessible, notable fossil sites, and dune systems or important educational grounds. [SIGNIFICANCE RATING: 4]

- **SEA-LEVEL RISE:** Sea-level rise is expected to result in accelerated erosion of beaches and cliffs, flooding of low-lying coasts and a loss of salt marshes and mudflats. A likely consequence or perceived threat is the construction of more extensive coastal defence. A potential threat therefore exists regarding some coastal geological and geomorphological (P)SSSI's and raises a management issue of how to protect them. However most (P)SSSI's rely on natural processes to maintain their integrity and as a result of increased coastal defence elsewhere, their properties and significance are likely to change anyway. Nevertheless Sea-level rise remains a management issue. [SIGNIFICANCE RATING: 1]

- **LANDFILL SITE:** Landfill sites become a major issue in the coastal zone, primarily for the marine pollution implications through leakage and run-off. However a landfill site would require stabilisation of the shoreline and therefore reduce the value of a site for its geomorphological and sedimentological interest as well. It is not advisable to

construct waste disposal sites in low-lying coastal areas which are likely to come under increasing pressure from rising sea-levels and accelerated marine erosion. PPG20 states that coastal planning seeks to resist development which does not specifically require a coastal location. Any proposal for a landfill site in a Maritime Natural area therefore becomes a priority management issue. [SIGNIFICANCE RATING: 8]

- **FLOOD RISK:** Flood risk, ie. those areas with a high probability of suffering from inundation eg. low-lying, exposed, unprotected or inadequately protected land. In these areas proposals for some form of flood/coastal defence or improvement scheme is likely to be on the agenda particularly where property or high value agricultural land is at risk. Flood risk in a MNA becomes a priority management issue when a GCR site is threatened by a proposed scheme through altering natural processes (marine and littoral) or obscuring an exposure. [SIGNIFICANCE RATING: 2]

- **DAMAGING RECREATIONAL ACTIVITIES:** Any MNA containing Earth science sites which are heavily used by the public and are particularly sensitive to interference should include 'preventing potentially damaging recreational activities' as a key management issue eg. trampling on dune systems augments blowouts. If the present levels of damage are low but the threat is perceived to be acute enough to adopt the precautionary principle then the issue of recreational activities is included as a priority management issue. Potentially damaging recreational activities include vehicular use in the MNA as well as human interference eg. bicycles, 4-WD etc. [SIGNIFICANCE RATING: 6]

- **MANAGED RETREAT**: Involves setting back the line of actively maintained defence to a new line inland of the original. The rationale behind this idea is based on "a combination of flood defence requirements and habitat re-creation to replace lost intertidal habitats". [Burd, 1995]. It is a key management issue in areas which are suffering from the symptoms of coastal squeeze (ie. the low water mark is raised through rising sea-levels while the high water mark is fixed by the presence of hard sea defences, thus reducing the width of the inter-tidal zone with significant loss of habitats). Enhanced flood defence is achieved by creating an inter-tidal profile which serves to dissipate wave energy in the most efficient and responsive way. The most suitable areas for managed retreat are those which were originally saltmarsh before being enclosed by sea walls for agricultural purposes. The adoption of this management technique in the MNA's depends on the success of a number of 'experiments' such as Tollesbury and Northey island, hence it's limited inclusion as a priority issue. [SIGNIFICANCE RATING: 8]

- **MILITARY EXERCISES:** In the past the coastline of Britain has seen considerable military activity eg. the Dooms Day Landing's at Slapton Sands, south Devon, and many relics of the past still exist to serve as reminders. While not a major issue in many areas, it becomes a key management concern when military exercises threaten sensitive sites and natural features along the coast. [SIGNIFICANCE RATING: 8]

ANNEX 3

EIT CONTACT OFFICERS FOR EARTH HERITAGE ISSUES
(BY NATURAL AREA)

EIT geologists:

TM - Tom Moat
AK - Andy King
KP - Kevin Page
JL - Jonathan Larwood
NP - Natalie Perkins

LIST OF EARTH SCIENCE LEAD CONTACTS FOR NATURAL AREAS		
	(updated 01 February 1996)	
Number	**NATURAL AREA**	**Contact**
1	Northumberland Coastal Plain	TM
2	Border Uplands	TM
3	North Pennines	TM
4	Northumbrian Coal Measures	JL
5	Durham Magnesian Limestone	JL
6	Lower Tees	JL
7	Yorkshire Dales	KP
8	The Vales of Yorkshire	JL
9	North York Moors	KP
10	Yorkshire Wolds	JL
11	Plain of Holderness	KP
12	Southern Pennines	KP
13	Coal Measures	KP
14	Southern Magnesian Limestone	JL
15	Humberhead Levels	JL
16	Coversands	KP
17	Sherwood Forest	JL
18	Trent Valley and Levels	AK
19	Charnwood Forest	TM
20	Lincolnshire Limestone	KP
21	Lincolnshire Clay Vales	KP
22	Lincolnshire Wolds	KP
23	Lincolnshire Marsh and Coast	KP
24	Middle England	KP
25	Northamptonshire Uplands	KP
26	Bedfordshire Greensand	KP
27	Fenland	NP
28	East Anglian Southern Chalk	NP
29	Breckland	NP
30	North Norfolk	NP
31	Broadland	NP
32	Suffolk Coast and Heaths	NP
33	East Anglian Plain	NP
34	Chilterns	NP
35	Oxford Clay Vales	KP
36	Oxford Heights	KP
37	Wessex Downs	NP
38	London Basin	NP
39	Thames Marshes	NP
40	North Kent Plain	JL
41	North Downs	NP
42	Romney Marsh	JL
43	Low Weald	JL
44	High Weald	JL
45	South Downs	NP
46	Greensand	KP
47	Hampshire Chalk	NP
48	South Coast Plain	JL
49	Isle of Wight	JL
50	New Forest	KP
51	South Wessex Downs	NP
52	Dorset Heaths	KP
53	Isles of Portland and Purbeck	KP
54	Wessex Vales	JL
55	Blackdowns	AK
56	Devon Redland	KP

57	South Devon	KP
58	Bodmin Moor	NP
59	Cornish Killas and Granite	TM
60	The Lizard	TM
61	Dartmoor	NP
62	Culm Measures	TM
63	Exmoor and the Quantocks	AK
64	Vale of Taunton	AK
65	Mid Somerset Hills	AK
66	Mendips	AK
67	Somerset Levels and Moors	NP
68	Avon Ridges and Valleys	AK
69	Greater Cotswolds	KP
70	Severn Valley	AK
71	Malvern Hills and Teme Valley	TM
72	Dean Plateau and Wye Valley	AK
73	Black Mountains and Golden Valley	AK
74	Hereford Plain	AK
75	Midlands Plateau	JL
76	Shropshire Hills	AK
77	Central Marches	AK
78	Oswestry Uplands	JL
79	Mosses and Meres	JL
80	Staffordshire Uplands	JL
81	Upper Trent Valley	JL
82	The Derwent Valley	JL
83	White Peak	KP
84	South West Peak	KP
85	Dark Peak	KP
86	Urban Mersey Basin	KP
87	Lancashire Plain and Valleys	KP
88	Forest of Bowland	KP
89	Cumbrian Fells and Dales	TM
90	Eden Valley	AK
91	West Cumbria Coastal Plain	TM
92	Solway Basin	NP
M1	Eastern Scottish Border to North Bank of Tyne	JL
M2	North Bank of Tyne to Saltburn	JL
M3	Saltburn to Bridlington	JL
M4	Bridlington to Skegness	KP
M5	Skegness to Old Hunstanton	NP
M6	Old Hunstanton to Sheringham	NP
M7	Sheringham to Lowestoft	NP
M8	Lowestoft to Languard Point	NP
M9	Languard Point to Whitstable	NP
M10	Whitstable to North Foreland	JL
M11	North Foreland to Folkestone	JL
M12	Folkestone to Selsey Bill	JL
M13	Selsey Bill to Studland Cliffs	JL
M14	Studland Cliffs to Portland Bill	KP
M15	Portland Bill to Start Point (Lyme Bay)	AK
M16	Start Point to Land's End	TM
M17	Scilly Isles	NP
M18	Land's End to Minehead	TM
M19	Minehead to Brean Down	AK
M20	Brean Down to Southern Welsh Border	NP
M21	Northern Welsh Border to Rossall Point, Fleetwood	KP
M22	Rossall Point, Fleetwood to Walney Island (mid point)	KP
M23	Walney Island (mid point) to Maryport	TM
M24	Maryport to Western Scottish Border	NP