



Statement on Site condition and conservation work programme

October 2007

Richard Edmonds, Earth Science Manager

Contents

A statement on site condition.....	2
Threats to the Site.....	7
Conclusions.....	14
Appendix 1.....	15

Introduction

Most of the Earth science interests along the coast are extremely robust; large, remote cliff sections and massive active geomorphological features. Contained within these interests, (the cliff sections) are more sensitive 'integrity' or 'finite' features such as fossil rich rock layers. Sensitivity is the key consideration for assessing the state of conservation at any one point in time and is principally determined by the erosion rates acting on the coastline. Hard cliff sections such as the Portland Limestone cliffs in Purbeck erode slowly, so although they are extremely hard, they are potentially sensitive to, for instance, inappropriate fossil collecting. In contrast, the soft clay cliffs of West Dorset erode rapidly and are therefore frequently refreshed, making them robust and less sensitive. In these sites, active collecting, recording and scientific study are essential in order for the interest not to be lost to erosion. Balancing collecting pressure, public access and scientific study is the challenge for management. The concept of sensitivity is fundamental as is the need to establish both practical and effective management solutions where required.

Erosion is the key driver to the conservation of the World Heritage Site. It provides and refreshes the rock sequences in the cliff faces, releases fossils to the beaches and is a subject of interest in its own right through the range of active landforms that fashion the coast. A typical reaction to erosion is that it is '*a terrible thing*'. However, the protection of property and infrastructure through the construction of coastal defences are, without doubt, the greatest single threat to the Site. One of the key messages that must be promoted through World Heritage work, in the widest sense, is the importance of erosion in maintaining an interesting, internationally important and exceptionally beautiful coastline.

Statement on the State of Conservation

The Earth science interests within the Site are primarily protected through the Site of Special Scientific Interest (SSSI) designations which are the responsibility of Natural England (previously English Nature). They monitor the state of conservation through the English Nature Site Information System (ENSIS). ENSIS units typically reflect land ownership and can be assessed for both biological and geological interests. ENSIS looks for threats to the site through a series of questions. Questions relevant to coastal exposures are illustrated in Appendix 1 and define 'favourable' or 'unfavourable' site condition. The World Heritage Management Plan respects natural processes. Therefore, in some cases it is possible for interest features to be obscured by natural processes but still be regarded as in favourable condition.

Summary table for SSSI condition for geological interest:

SSSI	Condition	Notes
Exe Estuary	Favourable	
Budleigh Salterton Cliffs	Favourable	
Otter Estuary	Favourable	
Ladram to Sidmouth	Favourable	
Sidmouth to Beer Coast	Favourable	
Axmouth to Lyme Regis Undercliffs	Favourable	
West Dorset Coast	Favourable	
Chesil and the Fleet	Favourable	
Isle of Portland	Favourable	Many of the inland quarry sites that also make up the SSSI are unfavourable and/or declining
Portland Harbour Shore	Unfavourable	All Earth science units unfavourable
South Dorset Coast	Favourable	
Purbeck Ridge (East)	Favourable	
Studland Cliffs	Favourable	

The detailed monitoring data based on individual ENSIS units and biological/geological interests can be accessed on line at <http://www.english-nature.org.uk>. Follow the 'Special Sites' link to 'Search for SSSI details'.

World Heritage Site monitoring

World Heritage Site monitoring focuses on the Geological Conservation Review (GCR) sites that define the Earth science interest. The GCR is a nation wide audit of the Earth heritage interest within the British Isles and has been undertaken by the Joint Nature Conservation Committee (JNCC). GCR sites represent the best places that record stages in the earth's ancient history, including the fossil record, structures and geomorphological processes. SSSI's cover distinct sections of coast while GCR sites define specific interests that may extend across more than one SSSI. Therefore World Heritage Site monitoring has integrated SSSI monitoring (through ENSIS) while looking at the specific GCR interest. This has created scope to capture more detail, enabling a history to be recorded including information that cannot be measured at any one point in time such as the fossils being found or the geomorphological events taking place. A **unique monitoring database** has been developed by the JNCC with the World Heritage Site Team in order to capture this monitoring data.

The World Heritage Team has established a Science and Conservation Advisory Network (SCAN) made up of scientists with an interest in the Site. This network

started as a result of the very considerable contributions made in order to present the Nomination of the Site to UNESCO. The Network now works as a way to inform scientists about threats and opportunities and to invite comments on the state of conservation and observations that visiting scientists may make. The SCAN has played an important part in canvassing expert opinion when considering coastal defences that may affect the quality of the Site.

61 of the 66 GCR sites are in a 'favourable stable' condition while the remaining 5 are 'declining' or in 'unfavourable' condition, representing 7.5% of the GCR interests. These unfavourable interests represent a very much smaller proportion of the Site in terms of the physical area, (2% of the Site) as many GCR's are quite small in geographical extent. In other words, there are only a number of small, specific problem areas relative to the whole Site. The exception is the Portland Harbour Shore which does represent a considerable problem area. All unfavourable sites were in this condition before designation as a World Heritage Site and many represent a major challenge if they are to be improved.

Unfavourable Geological Conservation Review (GCR) sites are:

CGR number and interest	Description and reason for unfavourable status
GCR 51 Aalenian – Bajocian (Inferior Oolite)	Relates to Burton Cliff Lane outside the Site and which is suffering from vegetation growth.
GCR 636 Albian – Aptian (Lower Greensand)	Punfield Cove , north end of Swanage Bay. Interest obscured by vegetation due to a natural decline in erosion.
GCR 724 Portlandian – Berriasian (Purbeck Beds)	Stratigraphy at Durlston Bay, Swanage due to coastal defences that pre date designation. Defences cover a small proportion of the overall interest and therefore arguably not all unfavourable.
GCR 828 – Oxfordian – Oxford Clay and Corallian Beds	Sandsfoot/Portland Harbour Shore . Decline of coast sections due to construction of the breakwaters together with <i>ad hoc</i> development, coast defence structures and tipping.
GCR 1297 Kimmeridgian	Ringstead Bay due to coastal defences that pre date designation. The interest is largely obscured by recharged beach.
GCR 1298 Kimmeridgian	East Fleet to Smallmouth Sands as GCR 828

There are three discrepancies between EN SSSI monitoring and World Heritage GCR monitoring and these largely reflect the scale of the interest being surveyed. World Heritage GCR monitoring identifies GCR 1297 at Ringstead and GCR 724 at Durlston as unfavourable (both due to coast defence structures constructed before World Heritage Site designation was granted). The English Nature/Natural England assessment for the South Dorset Coast SSSI is favourable as the vast majority of the Site (Weymouth to Swanage) is in very good condition. At Punfield Cove, the GCR interest is inaccessible due to a decline in natural erosion and subsequent growth in vegetation that obscures the geology. The World Heritage Site Management Plan respects natural processes and therefore there is no conflict between a 'favourable' assessment for the SSSI and 'unfavourable' for the GCR interest. The World Heritage Site Management Plan indicates that existing defence schemes at Ringstead and Durlston Bay should not be maintained in the future, allowing the site to revert to an eroding coast in the long term. There is a need to reassess the entire Portland Harbour Shore through a strategic study that could be part of the Shoreline Management Plan programme.

Monitoring has highlighted:

Significant problem areas:

Site	Problem	Action
Durlston Bay	Coast defence – identified before inscription	Through SMP2, coastal groups and WH management Plan
Ringstead Bay	Coast defence – identified before inscription	Through SMP2, coastal groups and WH management Plan
Portland Harbour Shore	Declining through historical construction of Portland Harbour breakwaters (late C1900's) and incremental, <i>ad hoc</i> coastal defences and development along the shore since then.	Need for a strategic study and reassessment of the interests and current value of the sites. Environment Agency considering taking a lead (summer 2007). Funding for a strategic study secured in Autumn 2007.

Minor problem areas: (These do not warrant an 'unfavourable' assessment)

Site	Problem	Action
Peveril Point, Swanage	Derelict WW2 lookout and associated sea wall, concrete rubble on beach	Owners contacted by WH Team and offered assistance in study to identify best action. Building has Dangerous Order notice placed on it. Consultants appointed November 2007 to carry out options appraisal (NE funded).
Osmington Mills	Failed private coast defence scheme introduced alien materials to Site	Dorset Countryside Service in contact with owners to find solution and re instate beach access
Lulworth Cove	Concerns exist about beach lowering on the west side of the cove, exposing building foundations and the old sewage pipeline.	Wessex Water are looking at the pipeline. Lulworth Estate contacted re their intentions.
Bowleaze Cove.	Failing and ineffective coast defence structures that pre date designation.	No current action. To be flagged up in Shoreline Management Plan.
Ferrybridge (The Fleet Shore)	Old and abandoned structures/rubbish on Fleet Shore	Natural England in contact with owners to promote a clear up of the site.
Fleet Shore	Abandoned metal structures from oyster farm reported on beach side of Fleet at Littlesea.	Ilchester Estate informed; have instructed the Oyster Farm to remove the rest of the material.
Freshwater (near Burton Bradstock)	Bund (originally granted with limited permission) and caravan site extension onto beach	Environment Agency has an interest due to beach management for the mouth of the River Bride and is in communication with the owner.
Burton Bradstock	Small amount of rock armour protecting beach house. Date established unknown but pre nomination. Small amounts of rock armour (protecting shed) and gabion baskets (protecting coast path). Established in the late 1990's by Dorset County Council	None.
Pinhay Pumping	Abandoned station and pipes on	Natural England has contacted

Station (West of Lyme Regis)	beach and in undercliff	South West Water to promote clear up of site. August 2007; SW Water has undertaken a clear up of all above ground structures.
Seaton Hole	Gabion structure on edge of Site boundary	None.
Beer	Ongoing cliff instability on the east side of the cove.	Ongoing monitoring by East Devon District Council
Sandy Bay (near Exmouth)	Derelict handrails in beach	Landowner contacted. Fence independently scheduled for removal. Spring 2007; fence removed by the landowners.

There are aspects of the interests for which there is currently little information known such as the palaeontological fossil reptile and fish interests in Durlston Bay or Triassic reptiles in East Devon. This is because the Site covers a large area and it is not always possible to have a presence on the ground to liaise with local collectors. In some areas, centres and museums perform this role reflecting local interest and expertise. However, the cliffs are eroding and fossil material has been observed in the course of monitoring indicating that the GCR are in a favourable condition.

Defence and developmental issues

Defence and developmental issues typically apply to the 'Gateway Towns' that lie outside the Site but their protection may impact directly or indirectly on the Site itself. Within this section are also identified 'recent' (within the last two decades) pre World Heritage designation coast defence schemes within the site.

	Within the WH Site	Outside the WH Site
Coast defence		
		Swanage Bay. Beach replenishment completed 2006. SSSI outside WHS under threat from desire to protect property.
	Durlston Bay. Second landslide below Belle View Road and flats (2000). Response currently under consideration.	Swanage Bay. Beach recharge and groyne replacement (2006). Concerns regarding cliff recession on the north side of Swanage Bay (Pines Hotel).
	Lulworth Cove. Concern over loss of coast path and threat to property.	
		Preston Beach, Weymouth. Ongoing beach management.
	Newton's Cove coast defences. Replacement of failing coast defence structures (2003). Minimal impact on Site.	
	Chesil Cove. Existing coast defence scheme (early 1980's) on and in beach.	
	Freshwater. Ongoing management of mouth of River Bride to avoid flooding.	
	West Bay Ongoing beach management to East Beach. Material taken from Freshwater and returned to West Bay as and when required.	West Bay. Recently completed harbour and coast defence scheme (2004) outside World Heritage Site and minimal impact. East Beach maintenance works.
	Seatown. Existing scheme (1997). WDDC has outline plans to repair the	

	scheme, October 2007. Intend to apply for planning permission to undertake the work this winter.	
	Lyme Regis East Cliff. Potential major scheme under development to stabilise landslide before it reaches the town. Preferred option iput forward in spring 2007 involving 10 metre footprint onto the foreshore and stabilisation of coastal slope. Expression of concern made regarding impact. Preferred option report with the above scheme published September 07.	Lyme Regis. Major ongoing works along sea front. Preferred option for East Cliff presented in May 2007. Option considered to poorly mitigate the environmental designations.
	Beer. Rock groyne and remedial cliff works pre date WH designation.	
	Branscombe. Rock armour to the west of the river pre date WH designation	
	Pennington Point, Sidmouth. Coast defence scheme turned down (2004).	Sidmouth sea front Offshore breakwaters 1995 and Bedford Steps groyne 2000
Inappropriate tourism activity		
	Stonebarrow Cliffs, Charmouth. Repeated warnings to two fossil collectors seen digging in the Flatstone Bed. Letter warning legal action sent in autumn 2006. Further reports in Sept 07. Consideration of legal action by National Trust.	
	Charmouth. Possible increase in 'tourist' digging. Certain increase in expressions of concern. Action required (2006).	Summer warden employed end June to end September 2007, to patrol Charmouth and Lyme beaches and encourage people to stay away from the cliffs. LiDAR survey of the cliffs commissioned from Bournemouth University to run from summer 2007 to spring 2008.
	Tar Rocks, Portland. Recent damage to 5 of 24 ammonites found during a walk over survey of the site. Other specimens may have been damaged at an earlier date.	
Development		
		27a Castle Road, Portland Harbour Shore. Application for three cliff top houses turned down at informal hearing (2005).
		Portland Gas Ltd proposals Portland East Weares. Outside Site but may generate need for coastal defences in future (2006).
		Portland Coastal Strip. Review of Minerals Planning Permissions submission to work pre existing and active minerals permission (2006).
	West Bexington. Proposed reinstatement of beach car park (2006). Work completed December 2007	
	Orcombe Point, Exmouth. Proposal to replace access steps destroyed by bad	

	weather 2005.	
Pollution		
	<p>The Napoli demonstrates the potential for pollution to damage the site. However litter and debris from the cargo does not have a physical impact on the earth science features of the Site. A large and heavy oil slick could well have a serious impact, particularly on the shingle beaches.</p> <p>Concerns have been raised regarding the crushing of pebbles under tracked machinery and possible impacts on beach lowering caused by vehicle movements. These are to be investigated as part of Devon County Council's enquiry into the whole incident.</p>	

Pollution

On the 20th January 2007 the 62,000 tonne container ship MSC Napoli was run aground off the East Devon coast between Branscombe and Sidmouth. The vessel had suffered serious damage at sea and the crew had abandoned ship in extreme weather 40 miles off the Lizard two days before. Salvage tugs were on the scene quickly and Portland Harbour was identified as the best shelter but during the tow, it became apparent that the vessel was in danger of breaking up and sinking in deep water, hence the decision by the Maritime and Coastguard Agency to run it aground.

At the time of writing, 103 of the 2,500 containers had been washed overboard 40 of which were washed onto the shore, mostly along Branscombe beach. An unknown amount of fuel oil had also escaped. The overall impact of this event and the consequent pollution are unclear at this time but the impact on the Earth science interest of the Site is probably minimal. However there are clear impacts for wildlife and littering of the coastline. It is going to take a considerable amount of time to recover the ship and its cargo and while it remains, there is a clear issue of further loss, littering and pollution. Oil, in large volumes, could well represent a threat to the site and particularly the shingle beaches. The clean up operation was initiated within three to four days of the incident occurring and is expected to last several weeks.

Concerns have been raised regarding the crushing of pebbles under tracked machinery and possible impacts on beach lowering caused by vehicle movements. These are to be investigated as part of Devon County Council's enquiry into the whole incident. The Plymouth University Strategic Monitoring Team has been approached to undertake baseline survey work, autumn 2007.

Conservation boundaries

Small areas of the Site lie outside either or both SSSI and GCR interests and are therefore not protected by any legal mechanism. Some GCR sites need updating due to increased knowledge, discoveries and research. Some SSSI's in the medium term will require re-notification due to coastal retreat (SSSI's are legally defined by mapped boundaries).

The areas outside current SSSI designations are:

- Between the Exe Estuary SSSI and Budleigh Salterton Cliffs SSSI (includes part of GCR1506)
- Between the Otter Estuary SSSI and Ladram Bay SSSI
- Between High Peak and Peak Hill (with parts of GCR 814)
- The tip of Portland Bill

The areas outside GCR sites are:

- Straight Point coast (East Devon)
- High Peak to Jacob's Ladder (Sidmouth)
- Just east of Sidmouth to Branscombe
- Northern area of Portland East Weares

The World Heritage monitoring is establishing an extensive **photographic library** including a **unique montage of the coast** from the sea that will provide a baseline against which to observe change, which is particularly useful for the geomorphological GCR interests. Photography only shows what we already know; that the coast is eroding but the record is well worth while and can inform debate on issues such as coastal management and fossil collecting. The World Heritage budget has funded the Dorset Environmental Records Office (DERC) to map the GCR interests in **MapInfo** Geographic Information System. This is a first for GCR interests in the country and will be useful as a trial for the JNCC.

Threats to the Site:

The following is a more detailed look at the threats to the Site, the issues and actions undertaken by the various authorities with responsibility for management.

Threat	Issues	Action being taken
Coast defences	Obscure cliff sections, reduce supply of fossils and interferes with coastal processes. Associated landscape and amenity issues.	Working with coastal engineers/coastal groups on the second generation Shoreline Management Plans. Science and Conservation Advisory Network consulted on coastal issues.
Tipping or landfill	May obscure the interest, introduce alien material to beaches and is unsightly.	Contact landowners and use FACELIFT funding to encourage removal of any tipped material.
Inappropriate fossil collecting	Loss of key scientifically important fossils/ability to undertake research on site.	West Dorset fossil collecting code. Promotion of responsible collecting for entire Site (Natural England/English Nature's national policy).
Inappropriate rock sampling	Unsightly and long lasting scars.	Geologists' Association long running campaign to raise awareness of the issue.
Inappropriate tourism activity	Irresponsible fossil collecting or hammering that reduces the quality of the coast for others. Health and safety concerns also apply here.	Continued development of clear warning signs and information leaflets. Careful promotion of appropriate World Heritage activities along the coast.
Quarrying	A threat to the setting for the Site, Isle of Portland.	AONB protects the landscape in most of the Site. Portland holds complex quarrying issues that relate to extant permissions.

Development within or adjacent to the Site	May lead to increased call for coast defences in the future.	World Heritage taken as a material consideration in an informal planning enquiry
Pollution	With the exception of an extraordinary chemical or nuclear accident oil represents the major pollution threat, particularly to shingle beaches.	Ship to ship transfer in Lyme Bay regulated by agreement with pollution alleviation measures on site at such times.
Climate Change	Complex! Increased erosion could continue to provide good exposures and fossils but may lead to increased calls for coast defences. Foreshore exposures could decline through rising sea levels.	Strategic Monitoring programme and own monitoring will set a baseline to measure change.

Coast defences

The need for coast defences and/or appropriate management of the coast should be identified through the Shoreline Management Plans, now on their second revision (SMP2). The SMP's lie within natural coastal process cells and are developed through Coastal Groups, (principally District Council engineers) in consultation with the public and involving expert consultants. The South Devon and Dorset Coastal Group covers most of the Site; everything west of Durlston Head. The Hurst Spit to Durlston Head Coastal Group covers the rest of the Site. The SMPs will identify specific areas of conflict. These areas include:

- Durlston Bay; the 2000/01 landslide below Belle Vue Road and flats
- Portland Harbour Shore
- East Cliff at Lyme Regis
- Pennington Point, Sidmouth

Other potential problem areas include¹:

- Osmington Mills
- Freshwater
- East Beach, West Bay
- Bowleaze Cove

The majority of funding for coast defences comes from DERFA and must pass several tests, principally cost benefit, technical effectiveness and environmental acceptability. The last application at Pennington Point failed on at least two: environmental and cost benefit. The World Heritage Team and Natural England use the Science and Conservation Advisory Network to gain the latest information about the interests within a site under threat and the likely implications should that coast defence work go ahead. Consultations with the SCAN include: Durlston Bay (the 2000/01 landslide), Portland Harbour Shore (27a Castle Road development), East Cliff, Lyme Regis and Pennington Point, Sidmouth. The contribution from scientists is important in establishing the case to protect the Site and its interests.

A further key issue is that the only action District Councils can take in order to gain funding to address problems associated with coastal erosion is to apply to DEFRA to grant aid coast defence schemes. There is no mechanism to compensate landowners for the loss of property and then allow coastal retreat, unlike in some countries such

¹ This is not an inclusive list

as France. The issue of compensation is fraught with difficulty. Engineers in District and Borough Councils may propose to do nothing, but this may not be a palatable option for elected council members who may experience pressure from landowners at risk. In some cases people may have recently purchased cliff top property in the full knowledge that it may be at risk, in which case, one might say that it was clearly at their own risk. However, in other cases the property may have been with a family for generations and it could be argued that compensation in these cases is more appropriate. This is a complex and ongoing quandary.

The Strategic Monitoring Programme, initially established as the Channel Coast Observatory and now extended around the South West Peninsular, will provide a long term management tool for the coast. Monitoring will be to a common standard that will deliver valuable information that will better inform future management. Data collection includes: aerial photography, LIDAR (air and ground based laser measurements of topography to create 3D models), Beach profiling (including response to storms), tidal gauges and wave rider buoys, all available on line.

The Standing Conference On Problems Associated with the Coastline (SCOPAC) remains an effective association of authorities and agencies with coastal management responsibilities. One major current question lies in the implications of the Marine Bill on the future role of organisations responsible for coastal and flood defence. Currently Local Authorities are responsible for coast protection while the Environment Agency holds a role in flood defence. But under the new Bill this may well change in the near future and is a hot topic on the SCOPAC agenda.

WHS Action: Involvement with the Coastal Groups and the development of the second generation Shoreline Management Plans, the Strategic Monitoring programme and SCOPAC. Continued consultation with the SCAN.

Tipping or landfill

Tipping and landfill are not major problems on the coast but a number of localised exceptions do exist. Sections of Portland Harbour Shore suffer from the dumping of builder's waste. Peveril Point at Swanage has concrete littering the beach, probably from collapsed WW2 defence structures. Osmington Mills has a failed land stability structure that has slipped onto the beach together with concrete, probably also from WW2 structures. Freshwater Caravan Site has a bund extending onto the beach (with previous permissions) but where rubble, wet concrete and rubbish has become incorporated. In addition storms have breached this bund and caused flooding.

WHS Action: Work with landowners, English Nature/Natural England and the Dorset and east Devon Countryside Services to remove alien material where practicable.

Inappropriate fossil collecting

Natural England/English Nature's policy at a national level is Responsible Collecting which allows access but promotes collection and collecting where appropriate and in a fashion that does not damage the site. Responsible collecting is promoted through simple leaflets etc. The core aspects of responsible collecting are not collecting every fossil, leaving large specimens for others to enjoy and showing restraint with regard to hammering.

One challenge lies with the slowly eroding sections of the Site where in situ features are potentially vulnerable. An example are the dinosaur trackways on Worbarrow Tout, within the Army Ranges. A report in August 2006 identified the loss of a

bedding plane containing a number of footprints. Following an investigation, it was agreed that the likely cause of the loss in this instance was natural erosion.

The fossil collecting code of conduct for West Dorset was established due to specific issues in that area; namely the extraordinary richness of fossils, the high quality of preservation, the economic value and subsequent collecting effort and the scientific interest. The key issue here is the high rates of erosion. Without regular and dedicated collecting effort, specimens of key scientific importance would be lost to the sea. However, excessive collecting can make the scientific study of certain interests difficult. The Code seeks to balance the two; requiring collectors not to dig *in situ* and to record specimens of key scientific value. The code is working; to date 127 specimens (excluding two collections of insects) of scientific importance have been recorded.

A number of challenges remain:

- One or two rogue collectors are ignoring the code. The National Trust and/or Charmouth Parish Council intend to catch these people in the act, warn them and take action if they are caught again one has already been warned).
- The code should be extended to other landowners.
- An audit of specimens from the Site (the entire site) would not only be interesting, but could also further inform management. This is by no means an easy task.
- Acquisition of key scientifically important fossils requires support and promotion
- Many collectors wish to see a world class facility to display new finds in West Dorset
- Ill informed 'tourist' digging and hammering continues and generates expressions of concern from the public.

A criticism of the West Dorset fossil collecting code has been made by K Page and G Melendez in a paper presented to the ProGeo conference, September 2005 and in the International Sub-commission on Jurassic Stratigraphy Newsletter 33 July 2006. The paper attempts to develop a comparative analysis of the West Dorset fossil code recording scheme and the fossils recovered from the nearby Charmouth Bypass. The World Heritage Team and natural England disagree with the analysis and conclusions drawn by the authors and have gone to considerable lengths to explain why. This is the subject of ongoing debate.

In order to set the West Dorset fossil code in context, a paper on the management of fossil sites has been jointly written with English Nature (as was) and the Joint Nature Conservation Committee. This develops the concept that fossil sites vary in their sensitivity and therefore management should reflect this. For instance a rapidly eroding coast is different from a working quarry, a disused quarry or a cave deposit and management should vary accordingly. This paper is aimed at a non-geological audience and is available on line at: www.geoconservation.com/EHWH/Docs/fossil. The intention is to publish this as a paper in a peer reviewed journal shortly. Interestingly, Dorset has examples of both extremes within 15 miles of each other; the West Dorset coast with open, managed access and Horn Park Quarry, a disused site rich in fossils and now with a high security fence around it!

Finally, there is a need to continue to carefully promote appropriate World Heritage themes and activities in the right places. The Site should be interpreted broadly and although the fossil interest is widely spread, only Charmouth and Lyme Regis are

appropriate as places to promote collecting (and always with appropriate safety/warning caveats).

WHS Action: Continued maintenance of the West Dorset fossil code with partners, ongoing monitoring of interests site wide, active promotion of responsible collecting and best practice guides, careful promotion of the WHS, publication of management of fossil sites paper and continued engagement in international debate on the management of fossil sites.

Inappropriate tourism activity/excessive tourism pressure

There is a need to continue to monitor the actions of visitors to the Site. The most likely problem will relate to ill informed and inappropriate fossil collecting and/or excessive hammering. A difficult area is that different people have different concepts of damage and acceptable behaviour. An example is tourist fossil collecting around Charmouth and Lyme Regis and digging in the cliffs. Despite positive advice and clear warning signs, visitors continue to dig in the cliffs. Their efforts are most unlikely to have any impacts on overall erosion rates due to the high rates of natural erosion. The greater causes for concern are the health and safety risks associated with being on the cliffs. The local area is clearly provided with warning signs but people choose to ignore sound advice.

World Heritage Site promotion must take into account the sensitivities of sites. The Olympics may offer a case in point though the increased profile may well also offer opportunities to improve the quality of sites, particularly the Portland Harbour Shore, Fleet Shore and older quarries on Portland. Other visitor impacts to the Site are wide and range beyond the Earth science interest and therefore the scope of this paper. These relate to wear and tear on paths and access points, pressures on biological interests and issues relating to traffic and congestion.

WHS Action: Continue to monitor/record letters of complaint and respond to related press coverage. Continue to explore ways to change people's behaviour regarding digging and excessive hammering. Discussions underway with the Strategic Monitoring Programme to include ground based LIDAR. Consider dedicated summer warden post, including Monmouth Beach.

Inappropriate rock sampling

Much of the Site is extremely robust and can cope with the collection of rock samples at current levels. One (historic) issue has been the visual damage brought about by geomagnetic core sampling. This involves extracting core samples using a power drill. Holes are left in hard rocky outcrops and the impacts are aesthetic. The Geologists' Association recognised the problem many years ago and has actively promoted a coring code of conduct amongst scientists and universities. This is not an active problem today while the aesthetic damage must be balanced against the advancement of science achieved by such work.

WHS Action: Awareness of the coring code is already high amongst universities and academics. The Geologists' Association work has been effective.

Quarrying

Quarrying has a limited impact on the Site due to the strong planning controls, particularly within the Dorset and East Devon Areas Of outstanding Natural beauty (AONB's). Portland is the exception as it lies outside the Dorset AONB. There is no

protection for the landscape while extant planning permissions remain active. The World Heritage Management Plan identifies the Review of Minerals Planning (ROMP) as the vehicle to regulate quarrying on the island. The Coastal Strip is a particular concern as The Stone Firms have now submitted their Environmental Statement outlining proposals to work this section of coast from the old Lower Lighthouse to Southwell. They intend to leave a narrow strip between the existing quarried coastline and the new workings so the direct impact on the World Heritage Site interests will be limited. However the permission does overlap with GCR 1643, the Portland raised beach which will suffer an impacted should quarrying proceed. While the proposed quarrying could have the effect of improving the quality of the geological exposures in the area adjacent to the WHS, it would have a significant and potentially damaging impact on the relatively finite resource of the raised beach. Furthermore there must be concern with regard to the quality and setting of the Site which would be damaged by such activity.

In contrast, across the wider landscape, small, appropriately placed quarries are seen as important as sources of local stone and geodiversity. Historically many sites provided local building materials but these have declined due to a number of reasons. The impact today is a loss of geodiversity and choice of local stone in new buildings. This is an issue identified in the Dorset Local Geodiversity Action Plan and will be the subject of continued work, basically identifying local stone character areas and potential new sources of stone. Natural England and English Heritage also recognise the problem and maintain an interest.

WHS Action: Continue to work with Dorset County Council Minerals Planning Authority and the industry and the AONB Teams on wider landscape, quarrying and local stone issues and initiatives.

Development within or adjacent to the Site

Development close to the coast is a key issue for the management of the Site in certain locations. Many of the problems associated with coastal defences or the maintenance of the Coast Path relate to poor planning and development in the last 50 years or less. For instance, the extension to the Lyme Regis Golf Course to the cliff edge above Black Ven, Europe's largest coastal landslide complex, was only granted in 1984 and by 1988 the coast path between Lyme Regis and Charmouth was lost. Today the path, a major asset to the local area, remains closed with huge legal and cost implications if it is ever to be re opened.

The Environment Agency has produced Flood Risk mapping to identify areas where the risk exists and special consideration is required prior to granting planning. Some development sites such as The Mound at West Bay Harbour have generated objections from the Agency as a result of this assessment. However, no similar tool or process exists for land under threat from coastal erosion although such erosion risk maps are currently under development for DEFRA (work by Halcrow).

The application to develop three properties on the cliff top at 27 Castle Road, Weymouth was successfully challenged by Weymouth and Portland Borough Council. At an informal planning enquiry, World Heritage was accepted as a 'material consideration' in the decision to refuse planning permission. This is an important precedent for the future.

The proposed Portland Gas Ltd storage facility below Portland and based on the East Weares Upper Osprey site could represent a threat to the Site due to a possible requirement for coast defence structures in the medium to long term. The principle

of development so close to the coast must be a cause for concern. However, this major project involves other considerations not least of which are the availability of the resource (the extent of the suitable underground geology is limited) and the very considerable safety margin required from centres of population.

WHS Action: Continue to work with District and Borough Council Engineers to promote better awareness of issues. Continue to comment on development plans and individual planning applications that have a direct potential impact on the Site in the longer term.

Pollution

With the exception of an extraordinary nuclear or chemical incident, oil represents the greatest threat to the Earth science interest of the Site. Perhaps of most concern is that a spill of heavy crude could affect the shingle beaches, particularly Chesil. Such an incident would be very difficult to clean up and could change the dynamics of pebble movement with potential catastrophic consequences, including a breach of the beach. Lyme Bay is recognised as a place to undertake ship to ship transfer of oil and deal with emergencies at sea involving large vessels. The ship to ship transfer is regulated through agreement within the 12 mile nautical limit. It is also recognised that such transfer could take place outside the 12 mile limit with no regulation so, though unpopular it is considered better to have the provision than not. This does not confirm Lyme Bay as an appropriate place for such activity.

The Napoli incident as reported in the summary section, illustrates the potential for such a threat. In this case, the littering and associated pollution is far more of a threat to the wildlife and the landscape than the Earth science interest. However, it would be expected that the clean up operation should be to the highest possible standard as appropriate to a site of this quality.

Protection of the setting for the site

The wider setting of the World Heritage Site lies within the protected landscapes of the Dorset and East Devon AONB's. The exception is on Portland where there is no landscape designation and therefore protection. Quarrying is managed through minerals planning and particularly the Review of Minerals Planning Permissions. Issues remain with the Coastal Strip along the East Weares.

WHS Action: As above

Research

Active research is an essential element of a healthy site but funding for research, particularly in the more specialised areas of the Earth sciences, (the core values of the Site), have been in decline for a very long time. This is a very big issue and represents a major piece of work that is the subject of a paper already submitted to the World Heritage Steering Group in the spring of this year.

WHS Action: Follow up, support and implement the Research Strategy already tabled to the WHS Steering Group. Major decision on the role of the Earth science team members

Climate change

Potentially a major issue with both positive and negative implications for the Site. Increased storminess and winter rainfall will increase erosion which will be good for the core interests of the World Heritage Site; stratigraphy, palaeontology and geomorphology. However, it will also increase pressure to defend coastal towns, infrastructure and property. Rising sea levels will lead to a loss of foreshore exposures.

WHS Action: promote research studies into the impact of climate change on the geological interests of the Site

Local Geodiversity Action Plan (LGAP)

The Dorset LGAP aims to promote and raise awareness of the concept of 'geodiversity'. Many of the issues and threats to geodiversity are expressed in this paper. The Government's new guidance in PPG9 offers a major opportunity for the Dorset LGAP as does awareness of the importance of local stone in vernacular building.

WHS Action: Lies outside the role of the WHS but in the past the role has been integrated and therefore consideration should be made when considering the role of Earth science expertise within the WHS Team

Conclusions

The Site is in a favourable condition, similar to the condition when it was included on the World Heritage List by UNESCO in December 2001. Specific management initiatives are working well and new initiatives will greatly enhance knowledge and future management, particularly the Strategic Monitoring Programme for the South West Peninsula. The Shoreline Management Plans remain the key vehicle for identifying sustainable management and future potential conflicts between coastal engineering and the Site. Large and small issues have been identified. The large issues are going to be very difficult to tackle. The small issues are not essential to resolve but are well worth while pursuing.

Key achievements:

The World Heritage Team and its partners have broken new ground in Earth science conservation and management;

- A fossil code for West Dorset
- A paper on the management of palaeontological sites based on their sensitivity
- A unique and integrated monitoring system and database
- Innovative photographic techniques for baseline surveys
- Mapping the GCR's in GIS, a 'first' for JNCC

The tasks for the future:

1. Ongoing monitoring of SSSI's through ENSIS and GCR World Heritage Site team systems.
2. The significant issues identified through the Shoreline Management Plan process
3. The minor issues taken on by various agencies (Natural England, World Heritage Team, Countryside Services, Environment Agency)
4. The ongoing maintenance and development of management initiatives
5. Audit of specimens from the Site in museum/university collections

6. Mapping the interests and maintaining up to date data

The Earth Science Advisor post within the World Heritage Team has been vacant since the spring, partly due to uncertainty about continued support from English Nature/Natural England. This change in staff does provide the opportunity to reassess the priority of the work programme which revolves around five core areas;

1. Monitoring and Management
2. Museums and collections
3. Science and Research
4. LGAP and inland geology/County Geologist
5. Input to interpretation.

Once the World Heritage Team has a better understanding of how Natural England may be able to support our work (as English Nature has in the past), we will be able to identify and if necessary, redefine the roles of the Earth science team members.

Appendix 1

ENSIS key questions relating to coastal SSSI's:

Exposure or feature of interest: 'The features of interest are exposed or can be practically re exposed if required' (defined as a half day of manual labour)

Vegetation: 'Vegetation is not obscuring or damaging the features of interest.'

Tipping or landfill: 'There is no un consented tipping or landfill obscuring or damaging the features of interest.'

Engineering works: 'There are no engineering works ... obscuring or damaging the features of interest.'

Geological specimen collection: 'There is no irresponsible or inappropriate specimen collection.'

Geomorphology: 'There are no artificial developments or modifications.....that effect the evolution of the natural geomorphological system.'

Appendix 2

Is available on request. It is a summary of GCR conditions including comments from surveyors and others about Site condition.