

5A. VISUAL IMPACT

5A.1 In this Chapter the visual impact of the development is considered in relation to the amended proposals [1.2], as described in COR/111 and summarised above [2B.9-18]. In the light of my legal conclusions on the nature of the project and its indirect effects [3A.19-24], the Chapter also touches on the effects of the RCF, RCM & PRZ boreholes [2B.6] and some possible effects of the DWR if it were constructed on this site. The site and surroundings are described in COR/112 & also summarised above [2B.1-8]. The preceding Chapters 2C, 4A & 4B have analysed the development plan & other policies which bear on this topic and the other planning merits.

5A.2 As to the DWR, the initial outline design in the late 1980s was for a railhead & a disposal location including support buildings & 4 shafts, with headworks 35-50 m high [SPD/1/1, p.3]. The first site-specific design for Sellafield was for waste receipt at a new marshalling yard next to Sellafield Works, and then overground & underground rail links broadly on the line of the current Service Corridor A [2B.3] to a surface site of about 40 ha [idem, pp.3-4]. This would have been in the southernmost part of the PRZ, between Sides Lane and the B5344 [2B.2 & 7], corresponding with the location simulated in the Nirex 95 post-closure performance assessment [COR/522, Vol.3, Fig.6.1]. There would have been 4 shafts, each with a 65 m high winding tower; a new access to the A595(T); and about 60 ha of landscaping to reduce visual impact. But a review identified objections relating to visual intrusion, proximity of operations to Gosforth, impact of & severance caused by the link, doubts about the trunk road access, lighting, & aesthetic design [COR/206].

5A.3 By 1991 there were 2 design options to deal with these problems. The preferred one was for virtually all buildings to be next to the Works, with twin drifts down to the DWR, and 2 ventilation shafts rising into buildings about 15 m high in a landscaped surface site of 4 ha accessed by road from Sellafield [SPD/1/1, pp.4 & 6]. The back-up option would also be much better than the initial design, but would not have the operational simplicity of the preferred option [idem, p.9], and has now been set aside by Nirex. It was for tunnels to be bored about 50 m below ground from the Works to a surface site of about 12 ha, again with the 2 ventilation shafts but also an 8.5 m diameter shaft for waste delivery, with partially buried headworks to keep superficial height down to 15 m [idem, p.9]. In 1993, the preferred design was re-examined to ensure that the RCF would be compatible with the DWR [SPD/1/5, p.49]: and it was announced that much more design development had taken place, with a special design team recently appointed [idem].

5A.4 The RCF/RCM/PRZ boreholes development currently in operation on the PRZ [COR/101, Fig.3.1.1] has altered the appeal site's landform and appearance and is clearly visible [idem, para.3.10.2]. The then County Planning Officer expressed the view that the short term visual impact of the boreholes development on the countryside would be greater than that of any subsequent RCF or DWR [COR/201, p.246]. The developments are of up to 3 years duration from the time of commencement, plus a maximum of 4 years' post-drilling testing, and are subject to landscaping and restoration conditions [idem, pp.217 & 229]. However, some of the boreholes have yet to be drilled; and the sites of 4 of the boreholes would be incorporated into the RCF Platform, whilst the sites of 2 others would be retained as part of the Surface Site [COR/112, para.6.13].

5A.5 The methodology of Cumbria's 1992 Assessment of County Landscapes [COR/304] in support of the Structure Plan was based on the Countryside Commission's 1987 guidelines. The Assessment included the appeal site within the Main Coastal Strip of North Copeland, extending inland from Sellafield, and comprising a lower and less distinctive coastal landscape than the Coastal Cliffs & Hills to the north-west [idem, p.32, para.3.5 & Plan P246/2-0002, Sheet 5]. The Sellafield complex and associated developments are found to detract from many views. Attractive blocks of deciduous woodland to some extent mitigate the general impression of a rather intensively managed bland landscape, comprising predominantly flat or undulating agricultural land divided into large rectangular fields with shelter belts or hedges. The Strip does not project the distinctive character which would justify landscape designation.

5A.6 The Landscape Assessment in the ES [COR/101, Ca.10] was preceded by a Visual Assessment in the "Sellafield Baseline Information Report" 1990 [COR/701, Ca.5]. The methodology of the latter was based on a combination of the Countryside Commission approach and the Visual Resources techniques of the US Bureau of Land Management. Its findings were helpfully summarised in 1993 by Nirex Report 375 [COR/702], which also set out principles for mitigation in the landscape design of both an RCF and DWR on the appeal site [idem, Appendix 1].

5A.7 According to the Baseline Report [COR/701, p.112, Map 20], the PRZ falls within its Landscape Character Zone 16 (Lingbank/Longlands), which straddles the A595(T) between the Calder Valley and Gosforth [NRX/2/3, Fig.4.1]. The scenic quality of the Zone, & most of the 46 others in the study area, is assessed as containing a combination of some outstanding features and some that are fairly common to the region [COR/701, paras.5.3.15 & 5.4.2 & Map 24]. The human sensitivity level to changes in the landscape of the Zone, and its potential visibility in its surroundings, is rated as medium [idem, paras.5.4.5-12 & Maps 25-6], again like most other zones.

5A.8 The final stage of the Baseline Report's assessment technique is to assign its zones to one of 5 Management Classes [idem, p.111, Table 5.3.1]. These categorise the acceptable degrees of change which are warranted by the basic landscape elements of the zone, placing the most disturbed landscapes in Class 5 and the best conserved ones in Class 1. Zone 16 was initially placed in Class 4 by the standard methodology [idem, Table 5.4.1 & Map 27], but modification of the original, largely quantitative method, by adding all available judgemental information, led to a revision [idem, Map 28].

5A.9 The portion of the Zone which is in the National Park was upgraded to Class 2 [idem, para.5.5.7], whilst most of the rest & of the PRZ was upgraded to Class 3 [idem, para.5.5.9] because it is adjacent to the Park and includes the attractive Lingbank Plantation [COR/101, Fig.3.5.1 & COR/112, para.6.6]. The consequence was that the site is in an area classed as intrinsically not outstanding yet important in terms of its context [COR/701, p.120, Class 3], which could support some change & development, but changes in form, line, colour & texture of a development should remain subordinate to the existing landscape [idem, para.5.6.3]. The strip of Zone 16 to the south-west of the PRZ remains in Class 4 because it is less attractive & visible, and overlooks the Sellafield Works.

5A.10 The Landscape Quality section of the ES [COR/101, paras.3.10.54-5] emphasises that the average scenic quality of Longlands Farm & Lingbank Plantation is of slightly greater landscape value than that of areas to the south & west. This is said to be because of its attractive topographic features, the visual variety & structure provided by the woodland blocks, and the screening of views of Sellafield by some of those blocks. The situation of the area adjacent to the National Park is noted as an additional factor.

5A.11 The ES sets out Nirex's assessment of the RCF development as at the time of the application. The main differences in visual terms between the amended application now being considered [NRX/2/3, Fig.5.2] and the development which was the subject of the ES are due to the views of MAFF on planting trees on temporary soil mounds, and to the extra depth of excavation and resultant spoil [2B.14] which is a contingency for less promising geology at the 650 m bOD horizon [2B.13]. Additional matters of detail have also been negotiated during the inquiry and are addressed further in Chapter 7A. These relate to the colours of the external elevations of the headgear and buildings [COR/113, s.2]; security fencing & lighting [2B.11 & NRX/1/5]; and landscape planting & management [NRX/11/18 & COR/113, s.8]. Re-routing of the electricity supply is also proposed [COR/113, Condition 4 & Drg. No.008008D].

5A.12 The extent of potential visibility of the RCF is illustrated by Visual Envelope Maps (VEMs) in the ES and in other documents submitted by Nirex and Cumbria, but they are generally based upon topography and so are only indicative. None of the VEMs account for hedgerows, trees or walls and buildings. Nirex's VEMs in the ES [COR/101, Figs.3.10.20-27] and in NRX/2/3 [idem, Fig.6.2] use the highest structures at the Sellafield Works (piles and stacks) for reference and also take account of the screening effect of large blocks of woodland. Cumbria's VEMs relate either to a height in the middle of the 4 cooling towers at Sellafield [CCC/2/1, Fig.4a] or to the southern pair of towers [CCC/3/1, Figs.3-3b]. They do not take account of the higher piles & stacks at the Sellafield Works (some 30 m or so higher than the towers), so reducing Cumbria's VEM coverage of Sellafield in relation to the RCF.

5A.13 It is agreed that the proposals would cause some visual intrusion [COR/101, para.3.10.3]. Changes would be made in the landscape within the appeal site related to landform, vegetation cover and built structures [idem, paras.3.10.101-5]. The extensive earthworks associated with the creation of the Platform Site and bunds would affect topography, as would the excavated spoil through creation of a new landform. Some 15 trees and some 450 m of hedgerow and scrub within the valley would be removed; and hard-standings, buildings, cranes, shafts and access roads would be introduced into the landscape of the Surface Site.

5A.14 The development would be potentially visible to residents & the public from points in a wide arc around the site, including roads & other public rights of way both in the National Park and on the coast [idem, Tables 3.10.1-5 & Figs.3.10.19-38]. Significant developments & modern structures, especially the Sellafield Works [NRX/2/3, Fig.4.2], share some of the fields of view. The network of rights of way near the PRZ according to the 1989 Definitive Map is shown on Fig.3.12.1 of the ES. The shaft headgear buildings are estimated to be potentially visible from about half of the land area within 1.5 km of the centre of the Platform Site and less than a quarter of the land area from 1.5 to 5 km

[COR/101, para.3.10.6]. Photomontages in the ES indicate some of the anticipated impact [idem, Figs.3.10.7-18, viewpoint plan Fig.3.10.19, but NB Figs.3.10.12-3 are not from a realistic public viewpoint]. Nirex's subsequent analysis of the ES's assessment indicates that there would be a range of slight to substantial visual effects on a variety of properties [NRX/2/3, Table & Fig.6.1].

5A.15 However, because the topography falls away from the A595(T) to the platform site and towards the coast [see sections in COR/101, Figs.3.10.2-5 & map Fig.3.10.34], the appeal site is not very visible from the A595(T). When travelling south or north on this road, the site appears briefly on approaching the site access; and while passing the access the Sellafield Works is also in view. Otherwise along this road, the site is only visible from a limited number of viewpoints for short distances. In addition, the retention of Longlands Farmhouse would help to screen views of the development itself generally from the east.

5A.16 The freeze drilling rigs (25 m), if they are required [2B.12], and the tower crane (35 m) are assessed to contrast strongly, due to their scale and appearance, with their surroundings for the relatively short period they are needed [idem, para.3.10.66]. The lower longer-term buildings would also stand out because of their simple geometric shape, larger scale and the texture of the cladding materials used [idem, para.3.10.67, but see COR/113, s.2]. Lighting would contrast the Platform Site with its unlit surroundings except when seen with an illuminated area behind (eg the Sellafield Works) [COR/101, para.3.10.69]. The landscaping proposals illustrated in the ES [idem, Figs.2.11-16], and since revised [NRX/2/3, Fig.5.2] are designed to screen & integrate the development and improve its setting's landscape character & visual amenity. RCF/RCM/PRZ Borehole planting has already commenced.

5A.17 Notwithstanding its location immediately on the other side of the A595(T) from the appeal site, the setting of Sally Hill (listed Grade II) is assessed to be unaffected because the topography [COR/101, Fig.3.10.2] would result in only the top of the tower crane, if anything, being visible over hedges [idem, Table 3.10.6]. Other listed buildings would also be unaffected. Whilst there would be inter-visibility with the Scheduled Ancient Monument at Seascale Stone Circle to the south-west [idem, Fig.3.11.1], the Monument is regarded as too distant at 2.7 km for its setting to be affected. No party to the inquiry has demurred from these judgements.

5A.18 The conclusion in the ES concerning landscape quality in relation to the National Park is that the development would affect the Park, due to the visibility mainly of the shaft headgear from within the Park, and its appearance in views from the Park [idem, paras.3.10.88-91]. But, whilst the impact on the landscape in which the development itself would lie is assessed as significant albeit temporary, the impact on the Park is assessed as small. The overall effects of the development on landscape amenity are consequently considered to be minor due to the limited effect on the Park and the average value of the area directly affected.

5A.19 **Nirex** claims that the form and siting of the RCF would be appropriate to the function which it is intended to fulfil. Its proposals have located and designed the development to minimise visual intrusion by cut & fill; by minimising structure height; by optimising

screening by the landform; by sympathetic shaping of spoil and by the subdued use of lighting [idem, paras.3.10.4 & 10]. The texture and colour of its cladding would also help the headgear to blend into the background.

5A.20 Furthermore, open headgear as advocated by Copeland would be technically possible, if thought preferable despite the proposals being designed in accordance with modern mining practice. Fencing has been reduced by 20% in response to comments by Gosforth & Cllr Gray [NRX/1/5, Fig.2]. Minimal light spillage would be assured by the proposed low level of operational lighting of 20-50 lux needed to illuminate the Surface Site for vehicles and pedestrians. Temporary lighting would be shielded from Sides Bungalow by trees on the boundary of its curtilage and intervening topography and vegetation during the period between dusk and 1900 hours for the 12 months it would be needed. Cumbria accepts that the proposed detailed schemes are the best that could be achieved in the circumstances, including the details of the design of the structures [NRX/11/12 & 14].

5A.21 The phased landscaping proposals [NRX/2/3, Fig.5.2] would provide screening around the development, and facilitate its integration with the existing landscape and surrounding vegetation structure. Most of the small valley in the PRZ would be retained throughout the development. The landscape character and visual amenity of the local area would be improved through the creation of some 4.85 ha of new indigenous broadleaved woodlands and the strengthening of hedgerows. Mitigation of potential effects on local fauna and provision of habitats for flora and fauna would also be achieved (see Chapter 5E). The visual effects of the development would be reduced as planting matures. Following restoration, the long term effects of the development on the landscape would be insignificant [COR/101, para.3.10.9], with the spoil heap taking the locally familiar shape of a drumlin (ovoid hillock formed by glaciation).

5A.22 Nirex claims that no party suggests an alternative to the appeal site for the proposed investigation of the BVG at Sellafield. Mr Spendlove's alternative proposals for the RCF shafts and surface works within the site would have significant practical and scientific disadvantages. He has in the first place confused the 15 m height of the permanent ventilation shaft headgear in the preferred DWR design option with the height of its temporary construction headgear, which would be in the same 25-30 m range as the RCF's. Then his alternative shafts would not be squarely within the volume of rock which has been preliminarily characterised in COR/524, and which would be monitored by the already approved boreholes. Furthermore, his preferred location would entail construction through up to 22 m of unconsolidated ground.

5A.23 His alternative locations & platform heights could well result in a greater impact upon the surroundings than the appeal proposals, in Nirex's view. In particular, Mr Spendlove does not appear to have taken into account the visual impact of his own artificial slopes, such as the red rock-bolted sandstones; nor the points that, if the RCF proceeds beyond Phase 1, his scheme would cause a long delay and produce more spoil than the present proposals. Cumbria, in contrast, accepts the chosen level of the platform site as striking the best balance between utilising the local topography to assist in screening the development and mitigating the local environmental disruption caused by cut & fill.

5A.24 Thus Nirex considers that the RCF could be accommodated by the landscape without significant adverse effect. It would not directly impinge on the Lake District National Park, and no party has specified any alleged detriment to the present character, appearance, qualities or distinctive features of the Park. The landscape quality of the area immediately surrounding the RCF is not high. It does not lie within any designated landscape area, nor does it merit "County Landscape" status. It is within the very wide area over which the Sellafield Works exerts a strong visual influence, as Cumbria accepts [NRX/2/3, Fig.6.2 & CCC/2/1, Fig.5a]. There are other modern man-made structures, in addition to settlements, in this area [NRX/2/3, Fig.4.2]. On the other hand, there would be sufficient separation between the RCF and the Sellafield Works to avoid a cumulative impact.

5A.25 Cumbria also concedes that the land within the National Park just east of the A595(T) in the vicinity of the PRZ is broadly similar in character to the land to the west of the road. That stretch of the Park is not identified as an area which the Park authority feels it is particularly important to conserve under the provisions of the Wildlife & Countryside Act 1981 [COR/309, Fig.2]; neither does it, taken in isolation, exhibit all the special characteristics which lead to National Park designation. Cumbria also accepts that the really distinct change in the character of the local countryside is where the undulating farm & estate lands give way to moorland and fell near Hurlbarrow [NRX/2/3, Fig.4.1].

5A.26 The immediate context of the activities on the appeal site would be a landscape of merely average value. Also they would be obscured from most public viewpoints in the National Park, and from travellers along the A595(T) - the main transport corridor - except at the site entrance. Although the spoil disposal area would be seen from the inside of the bend in the Newton Manor drive [2B.7-8], the drive is a private road [NRX/11/8, para.2.1], and the activities are unlikely to have an adverse impact if they are not seen from any public vantage point. Nirex considers that, although the earthworks of the boreholes in and around the Platform Site give rise to some visual intrusion depending on the stage of development and proximity of view, this impact is not significant in the context of the character of the existing landscape. Yet the former County Planning Officer foresaw the RCF/RCM/PRZ borehole development as being more obtrusive than the RCF in the short term.

5A.27 The RCF would not be seen from many local viewpoints, and it must be borne in mind that Nirex's VEMs constitute a worst case analysis. The tallest RCF structure, the tower crane, would only be on site for 11 months and the others for less than 12 years. Visual impact of the RCF would normally be limited to that caused by the top of the shaft headgear and the hopper, because of the visual containment by the topography, Farm buildings and the Boreholes screen planting. Should it be concluded that there would be some residual intrusion notwithstanding the landscaping and restoration schemes, which have now been agreed with Cumbria [COR/113, Conditions 28a-b & 29 & NRX/11/18], Nirex considers that such effects could be further ameliorated by additional design work.

5A.28 Cumbria concedes that a number of views of the RCF from the coastal strip, and at close range in the National Park, would be contained and intermittent. The viewpoints within a radius of 2 km of the site which Cumbria feels are important extend to only 30% of a circle. Only the upper part of the RCF structures would be visible from the National Park and Cumbria admits that this part of the Park is not frequented by large numbers of people. Furthermore, Cumbria also accepts that walkers in the National Park would usually see the

RCF together with the Sellafield Works. Nirex submits that the predominance of Sellafield in the visual context for the RCF is demonstrated by its VEMs [NRX/2/3, Fig.6.2] and by the more detailed analysis of fields of view from viewpoints identified in the ES [NRX/2/1]. It regards Cumbria's use of a field of view of only 50° as unrealistically blinkered.

5A.29 The limited extent of views is illustrated by Cumbria's own photomontages CCC/2/2, Figs.S1-S3 (near Moss Wood, near Tarn How & near Hurlbarrow Farm - superseding idem, Figs.4c-e) even though these photomontages still suffer from some technical shortcomings [NRX/2/2]. In the first (S1) the view would be limited to the South Shaft headgear, a small proportion of the North Shaft headgear and a glimpse of the hopper. The lower buildings would not be seen. The second view (S2) would be limited to one shaft, the top of the winder house and the hopper, with the lower buildings and conveyor unseen. The third view (S3) would show only the shafts and hopper merging with the background. The lack of rigour in Cumbria's analysis is exemplified by its reliance upon ES photomontages 3.10.12-13 from Sides Lane, which are not taken from normal eye level where the high hedges would obscure views.

5A.30 The only views of the National Park which would include the RCF would be from the south-west. They would be limited to the tops of the taller structures and screened from many viewpoints. Some views, such as that from Brownbank [COR/101, Fig.3.10.11], would have a background not confined to the National Park. The only settlement affected would be the village of Seascale, along its eastern edge [idem, Fig.3.10.7]. Although the view of the Park from parts of Seascale Golf Course & the public footpath alongside it would also be affected, the effect would be ameliorated to some degree by the distances involved [idem, Fig.3.10.14]; and their visual amenity would not be harmed given the wider landscape setting of the Golf Course.

5A.31 It is generally accepted by the other parties that the development would not adversely affect the visual setting of Sally Hill or any other heritage site. Although Mr Balogh refers to the proposed Hadrian's Wall Military Zone [BLG/1/10], English Heritage does not positively recommend in its Draft Management Plan that any of the Cumbrian coast between Maryport & Ravenglass be defined as part of the Zone [idem, para.5.4.1 & coloured green on NRX/11/10]. This is because there are only sporadic Roman sites along this stretch of coastline [BLG/1/10, para.5.3.6, last bullet point]. Some land down this coast is tentatively identified [coloured orange on the map] as possibly part of a wider Zone which would include visual settings, but even then the nearest part of this to the RCF would be as far away as Seascale Stone Circle, which as an individual feature is agreed to be too distant from the RCF to be affected.

5A.32 Nirex consequently denies that the adverse impact of the RCF development upon the countryside surrounding the appeal site or, bearing in mind the Kirkby Moor appeal decision [4A.15-16], the character of the National Park, would be significant. There would be no long term diminution in the quality of the landscape but an enhancement as a result of this scheme. Visually intrusive effects and localised physical change would be either temporary or would in the long term be offset by the beneficial effects of new woodlands and enriched vegetation cover in and around the appeal site.

5A.33 **Cumbria** regards the visual impact of the RCF as being demonstrably harmful to both local viewpoints and those in the adjacent National Park. A similar view was also taken on the applications for the RCF/RCM/PRZ Boreholes, and they were granted permissions of a very temporary nature only because it was accepted at that stage that there was still important information to be obtained, and in the light of appeal decisions for Boreholes 8, 8a, 9 and 9a [COR/201, pp.248-9 & 343-375]. The basic points remain that the countryside is to be protected for its own sake as a matter of national policy, and the natural beauty of the National Park needs to be preserved & enhanced and its enjoyment promoted in conformity with statute.

5A.34 The RCF would be an incongruous new industrial development set in open countryside, some of which is of high quality as found by Nirex's own Baseline Report [5A.9], and within which Nirex concedes there would be some significant visual effects [NRX/2/3, Table 6.1]. The local topography and the landscaping measures would have only limited screening effects. The RCF may be regarded as temporary but would be preceded by obvious construction activity such as a tall tower crane and periods of intense lighting. It would last for some 15 to 20 years as a discrete project including boreholes & restoration, and this would be a relatively long time. The construction lighting, at 300 lux on 20 m columns and switched on up to 1900 hours on weekdays for a construction period of up to 2 years, could even be powerful enough to be intrusive to Sides Lane Bungalow.

5A.35 Taking views from properties as indicators, within 1.7 km of the RCF there would be a range of slight & moderate impacts, and in some places substantial ones [idem, Table 6.1 again]. The RCF would be seen against the skyline from some viewpoints. For example from the Seven Acres Caravan Site & Brownbank [COR/101, Figs.3.10.10-11]; from near Moss Wood, near Tarn How & near Hurlbarrow Farm and on the bridleway near the Seven Acres Caravan Site [CCC/2/2, Figs.S1-S3 & 4f]; from the Red Admiral before tree screening obscures the open view [COR/101, Figs.3.10.8-9]; and from Sides Lane [idem, Fig.3.10.13] even with an allowance for a lower, and more realistic, height of eye.

5A.36 Other viewpoints show the RCF against the Fells in the National Park, notably from the outskirts of Seascale [idem, Figs.3.10.7 & 14]. The significant visual presence of the Sellafield Works would not make the RCF more acceptable in such a context. The RCF would be perceived from Seascale as an independent industrial development with the Park as its backdrop; and would also be seen separately from Sellafield at points to the north in the Park, such as at Ponsonby [idem, Fig.3.10.17]. When viewed from the Park in the same scene as the Sellafield Works, as at High Boonwood [CCC/3/1, Fig.3a, viewpoint 1], the RCF would be regarded as an extension of the Sellafield development, thereby exacerbating the impact, not alleviating it.

5A.37 The RCF would be an alien development [CCC/2/1, Fig.3a] visible over a wide area [idem, Fig.4a] and intruding into the important "buffer zone" between Sellafield and the National Park. The local area is popular with visitors wishing to see the many sites of interest. Recreational users of the National Park would observe the significant impact of the RCF during walks in what is designated as a "Quieter Area" in the Deposit Local Plan [COR/309, para.2.10 & CCC/3/1, Fig.2]. Walkers would stop occasionally to look about, especially on hills. Footpaths, bridleways and lanes are a feature of the area to the north-east of the appeal site, and users would observe the adverse impact of the development just as do

the occupiers of various dwellings in the locality [eg NRX/2/3, Table 6.1 Nos.38 (Ponsonby Old Hall), 39 (Sella View), 40 (Gibb Hill), 41 (Gibb Hill Farm) & COR/101, Fig.3.10.17].

5A.38 A typical circular walk starting at Gosforth [CCC/3/1, Fig.3a, viewpoints 1 to 11 and photomontages CCC/2/1, Figs. 4f & 4h] illustrates the frequent and clear views of the RCF which would be potentially visible. Motorists would also see the development [eg CCC/3/1, Fig.3a, viewpoints 3 & 4]. Not only would the RCF be prominent from the Park and elsewhere, but it would also lack affinity with the predominantly rural scene. This would be emphasised by the tall structures, spoil dumping and substantial lighting characteristic of industrial and mining operations. Cumbria, joined by Copeland, FOLD, the Ramblers Association [WR/RAM/1] and other objectors, emphasise the importance of the fringes of the National Park to its character and enjoyment, notwithstanding the different approach in the Kirby Moor appeal decision.

5A.39 The substantial degree of intrusion can be estimated in relation to the drilling rig of similar height to the RCF (about 30 m) on the site as seen from north of Hurlbarrow Farm [CCC/3/4 - taken near location 6 on CCC/3/1, Fig.3a] and again at In Fell [CCC/3/5 - taken at location 9 on CCC/3/1, Fig.3a]. This can be verified during the accompanied site inspection, when a crane is located on the South Shaft site & raised to the same height as that proposed for the RCF headgear.

5A.40 Potential visibility of the RCF in the National Park extends beyond 8 km [CCC/3/1, Fig.3], and in some areas where Sellafield's cooling towers are not visible [idem, Fig.3b]. This is so even allowing for woodland cover not included in the visual envelope modelling [eg Seven Acres Caravan Site - CCC/2/1, Fig.4f]. The visual impact would be mitigated by distance and by haze, mist or rain, but better visibility normally coincides with greater use of the National Park for recreation. Photomontage CCC/2/1, Fig 4g, for example, demonstrates a clearer distant view than COR/101, Fig.13.10.18. The widespread impact on the National Park would clearly be contrary to the policies already considered, and constitute demonstrable harm to an interest of internationally acknowledged importance. The overall visual effects are the principal ingredient of the environmental harm which would be caused by the RCF, in Cumbria's judgement.

5A.41 Copeland emphasises the differing visual impacts from the separate phases of the RCF development namely, about 4 years for construction, 6 years operational, and 2½ years restoration. Nirex accepts that overall these would be wholly different in scale to any previous borehole. During the construction phase the tower crane (some 35 m high) would be on site for about 11 months, and potentially visible over 56% of the locality between 1 km and 5 km of the site. Construction headgear between 25 m and 30 m high would be on site for about 39 months. Nirex concedes that a major alteration would be made to the shape of the landscape of the valley form. The tree and hedgerow loss there [5A.13] should be set off against Nirex's proposal to plant new woodland.

5A.42 The operational headgear buildings (29.2 m high) & winder houses could be in place for some 9 years. They would have a substantial extent of potential visibility [5A.14] both outside & inside the National Park, in countryside which is overwhelmingly rural in character & sensitive to visually harmful development. The significant and wide-ranging adverse

impact upon local views and upon local visual amenity would be contrary to national policy as well as Structure Plan & emerging Local Plan policies. Although Nirex has claimed that the RCF proposals would not cause any visual obstruction, it does now concede that the roadside planting to screen the associated borehole development will block the open view south-westwards from the Red Admiral Hotel [COR/101, Figs.3.10.8-9]. That is one of the public viewpoints within the National Park nearest to the development. On the other hand, as Nirex further concedes, the existing woodland and topography are a natural barrier between Sellafield Works and the Surface Site, with the consequences that the Works do not detract from the landscape quality of the Site and would be visually separate from the RCF.

5A.43 As for the external appearance of the RCF structures, the detailed design proposals agreed with Cumbria [NRX/11/12] are still unsatisfactory so far as Copeland is concerned, and do not accord with LP policies. The most visible parts of the operational buildings, with flat roofs and clad with plastic coated profiled metal sheets, would not reflect local vernacular trends in form & construction, contrary to Nirex's own design principles for permanent buildings on the appeal site [COR/702, Appendix 1, 7th bullet point]. The RCF would look like a substantial alien development, failing to fulfil Nirex's own desire to achieve the maximum degree of harmony within the landscape.

5A.44 Gosforth, adopting the evidence of Mr Spendlove (see below), and supported by Councillor D W T Gray in his own right, is of the view that the proposals exceed what is strictly necessary for the RCF and considers that they incorporate requirements for development of the DWR. Car parking and office space are cases in point. The impact of both the RCF and DWR should be considered at this stage.

5A.45 Experience with the borehole developments has shown local people the harmful effects of lighting. Boreholes were introduced into a rural agricultural area where little or no light pollution existed in contrast to the glare at the distant and distinguishable Sellafield Works. Lighting from the proposals would add to the present intrusive effects, especially if switched on throughout the night. The borehole development on the PRZ has also led to the recently constructed access from the A595(T) giving an industrial air to the site entrance, in contrast to the countryside setting which the appeal site shares with Gosforth village. The village is regarded as a "gateway" to some of the most beautiful western valleys of the Lake District.

5A.46 Gosforth & Cllr Gray believe that the mitigation measures would only have a limited effect from surrounding viewpoints, including the well used network of rights of way between Gosforth and Seascale. The headgear would be very prominent locally, emphasised by the industrial box-like design of buildings and structures and the tall illuminated security fencing, which would contrast with the rural character of their surroundings. The potential impact of the fencing and proliferation of obtrusive signs can be gauged from existing nuclear industry installations in the locality [GRY/1/2]. The proposals do not compare favourably with the sympathetic environmental approach taken in Sweden for the Äspö project [GRY/1/4].

5A.47 The extensive levelled platform (4 ha) would require considerable excavation and seems excessive. Gosforth's witnesses and Mrs Lowery can personally testify that Newton Manor drive has been used as a public right of way without challenge for several decades, and the extensive spoil disposal area would be visible from this. In the absence of the

internal transport link to Sellafield envisaged by the preferred DWR design option [5A.3], the A595(T) access to the site would attract additional activity near Gosforth and the National Park instead of towards the Sellafield Works. Gosforth regards it as important that details should be the subject of any formal planning approval. Although the proposals are said to be temporary, the term is lengthy for such a degree of harm, especially considering the time for the site to be fully restored to agricultural use.

5A.48 The Shop Stewards, on the other hand, support Nirex, and particularly on the visual impact issues. Although the proposed structures would have some visual effect at close quarters, they would be insignificant from within the National Park. There has been a dramatic increase in visitors to North Copeland over the last 15 years, especially to the Sellafield Visitors Centre [NRX/2/3, Fig.4.2] and on the Coast-to-Coast Walk from St Bees to Ravenscar. The visual impact of the RCF must be assessed against the large numbers of projects permitted at the Sellafield Works during the same period [CBC/1/1], by contrast with which the RCF would pale into insignificance. If there is concern about the visibility of developments on the coastal strip from the higher ground in the National Park, the permitted opencast coal workings over a 10-13 km stretch between Keekle & Workington have had a far greater local impact before restoration.

5A.49 Seascale Parish Council also supports the RCF proposals, but on scientific grounds, whereas it considers that visual intrusion would be inevitable. The RCF structures would impinge on presently undisturbed views of the Lakeland Fells from Seascale; and from this aspect the long-term landscaping measures would actually hide pleasant features from view rather than screen unattractive ones.

5A.50 FOLD, also supported by the Ramblers Association (Lake District Area) and the Council for National Parks, and representing the CPRE and YHA, do not see a special environmental designation of the PRZ as a prerequisite for a cogent case of objection on grounds of landscape impact. They point out that the landscape is continuous and varied rather than a patchwork of specially designated areas. Quantitative landscape assessment, as advocated by Nirex, is misleading; and structures like overhead power lines, although detracting, do not undermine the value of the PRZ setting.

5A.51 They see the proposals as being an entirely separate development in the landscape from the Sellafield Works, even though connected by such power lines; and the existence of the Works does not justify any further disfigurement. On the contrary, because of the high value of the general landscape to visitors and residents using public rights of way for recreation, especially in the National Park, there is a greater sensitivity to significant development of the sort proposed. Once the eye is caught by such a development, it is difficult to prevent the eye straying to it at every opportunity and to escape the perception of a less attractive scene.

5A.52 The scale and nature of the proposals, described by Nirex as similar to a modern industrial design typical of coalfields, would be extremely damaging. Security fencing, lighting and additional activity would add to the intrusion despite Nirex's efforts at reduction. Nirex concedes that the cumulative effect of the programme of temporary

boreholes has been significant in the landscape, and yet these proposals would be much worse. FOLD are not convinced that the significant changes to the landform and landscape character through the proposed earthworks cannot be reduced by exploration of other siting options.

5A.53 In addition, there has been no environmental assessment of the effects of quarrying the limestone for backfill. Neither has there been an objective appraisal of the transitionally unprepossessing appearance of the new planting whilst it is sheathed in plastic tubes, nor of the permanent change in character of the local landscape. Furthermore, the submitted restoration scheme is based on the premise that the RCF would be unsuccessful from the scientific point of view. Nirex actually claims to consider success to be the more likely outcome, in which case the next development stage would probably not be restoration but transition to the surface site of the DWR [5A.3]. Yet no assessment of the visual & other effects of this has been submitted.

5A.54 Mr N R Spendlove, supported by Gosforth, South Lakeland District Council [WR/SLC/1], Blawith & Subberthwaite Parish Council [WR/BSP/1] & 2 other parish councils in South Lakeland, proposes that only one shaft needs to be sunk to achieve the data for the first decision point on whether to proceed to a DWR or abandon this PRZ. Alternative locations for the RCF shafts and alternative schemes for the surface works would be feasible and less intrusive in the landscape. Extending the Platform Site into the valley to the west [SPD/1/7, Fig.4.1, item 8 & Fig.4.4] would allow the operational headgears installed after construction to be no more than 15 m above ground level instead of 29.2 m. They could also be more sensitively clad [idem, Figs.4.6 & 4.8].

5A.55 The single shaft would suffice for what would effectively be Phase 1 of the RCF scientific programme [2B.15]. This proposition leads directly to the realisation that the superstructure in the present proposals would be grossly excessive for the scenario in which the decision to abandon the PRZ is taken during Phase 1. Ample office & research accommodation to support this Phase could be provided in Longlands Farmhouse & at Nirex's Cumbrian headquarters, which are only 4.8 km south-east away down the A595(T) at Greengarth, just before the village of Holmrook [NRX/2/3, Fig.4.1]. The upper floor of the proposed office block [COR/102B/008022C] would not then be required. The 1,120 m² car park of 324 spaces is also seen to be largely unnecessary, and does not need to be provided on the Platform Site in any event.

5A.56 Also, operational headgears, heap-stead buildings, main extractor fan ducts and fan house, and the North Shaft disposal hopper and conveyor would never be built if the site were to be found unsuitable during the single shaft sinking stage. Whilst there would be a delay & some extra cost before sinking the second shaft if it were decided in due course to proceed with Phases 2 & 3, the risk of considerably extending the period of environmental damage by going on to use the redundant RCF structures for generic research or DWR purposes without a full re-appraisal would be avoided.

5A.57 Mr Spendlove suggests 3 options for minimising impact during the sinking of the first (South) shaft [idem, Figs.4.2-4.7]. Option 1, creating a new platform at 68 m aOD, would cut into the existing drilling platform to sink the South Shaft at the RCF3 Borehole position [idem, Figs.4.2-4]. This option would obscure the development from all but 2 of the

dwellings otherwise affected in Nirex's survey [NRX/2/3, Fig.6.1]. Soil stripping and total rock and spoil excavation would be greatly reduced from about 5 ha to about 0.8 ha and from about 86,000 m³ to about 50,000 m³ respectively. The valley to the west would be used for an access road instead of being filled to a depth of about 14 m in the Nirex proposals.

5A.58 Option 2 would achieve sunken access to Borehole RCF3 by excavation from the south-west but without cutting away the whole shaft platform, and by siting the winder house on it, resulting in about 25,000 m³ of spoil [idem, Figs.4.5-6]. Option 3 would re-site the South Shaft some 130 m to the south-west, where minimal excavation would be required to construct a shaft platform at low level [idem, Fig.4.7]. Contrary to Nirex's criticism, it would only be Option 3 which did not sink into the volume of rock which Nirex has been readying itself to characterise. All 3 of the options could comply with basic safety requirements. If it were decided to sink a second shaft, there would no particular benefit in its being only 50 m away from the first, as Nirex currently proposes; and indeed Mr Spendlove sees more benefits in a greater separation distance.

5A.59 FOE Cumbria and other parties, plus many written representations [eg WR/O/32, WR/P/126, WR/FOE/18] also maintain a visual impact objection. Mrs M S K Higham particularly emphasises the unique inter-relationship of the landscape of the Fells with the coastal region, and the views of the Isle of Man beyond. Mr S Balogh draws attention to the need to take account of the impact on the setting of the Hadrian's Wall Military Zone set out in the Draft Management Plan [BLG/1/10], including long distance views towards the Wall or associated fortifications down the coast [idem, para.5.2.2]. Mr J Fitzsimons MEP points out the value of the scenic beauty of the Lake District National Park to international tourism.

5A.7
2B.4
2B.2
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5A.45
5A.60 My conclusions on the visual impact of the development stem from an initial judgement that the landscape character of the PRZ is fairly reflected by the assessment in the Sellafield Baseline Information Report. The PRZ, and particularly the Surface Site, are located in an area of relatively uncluttered open countryside adjacent to the designated National Park. There is a continuum in the relatively open landscape across the A595(T), as the Baseline Report observes. But this means to me that there is an inter-dependence between managing the landscape of the PRZ and enhancing the beauty & promoting the enjoyment of the Park. It does not mean that this fringe of the Park is less important than usual. I also accept that the location is additionally sensitive because it is close to Gosforth village which forms a focal point for visitors gaining access to the western Lake District.

5A.5
5A.9
2B.4
5A.61 The County Council's Assessment of County Landscapes was designed to serve a different purpose from the Baseline Report and ES, namely to select specially distinctive areas for designation outside the National Park. The omission of the PRZ from such designation as a result of that Assessment's broad-brush approach does not detract from the conclusions of the Baseline Report's & ES's more localised & detailed analyses, in my view. The setting of the PRZ is important because the PRZ is of a scenic character similar to that of the contiguous edge of a designated landscape of at least national importance. The site itself also contains topographic features which are attractive in their own right, notably the woodland and the small & secluded valley.

5A.48 5A.62 As some parties have pointed out, there is also a much broader perspective, in the
5A.59 sweep of the view down from the fells, across the fairly narrow coastal strip, and out to sea.
Although I accept that there are much larger developments in this general scene, especially
5A.9 the opencast coal zone and the Sellafield Works, the former is well to the north, and the latter
5A.10 is visually distinct from the PRZ at the local level, as the Baseline Report & ES themselves
3A.19 note. On the other hand, the RCF development would not be so small-scale as to be trivial
5A.21 in comparison. This is particularly so in the context of the RCF/RCM/PRZ Borehole
developments being part of the same project, and of the contingent provision for the RCF to
be followed by the DWR.

5A.12 5A.63 In examining the impact of the present proposals, the VEMs submitted by Nirex and
Cumbria give useful indications of the extent of potential visibility of the RCF structures in
5A.34-5 relation to the Sellafield Works, bearing in mind the differences in the way the VEMs have
5A.14 been processed. Nirex accepts that a number of residents spread around the locality would
5A.28 see the RCF; and it is clear that, potentially, the RCF would be intermittently visible over
5A.14 a very wide area, but not to the same extent as the Sellafield Works. The relationship of the
rights-of-way network to properties is such that the general public would obviously experience
similar visual effects. In short, the RCF would not obtrusively pervade its environs, but it
would frequently be disconcertingly noticeable, in my judgement.

5A.39 5A.64 My site inspections, some of them with the benefit of a crane on the spot of the
proposed South Shaft, broadly confirmed that the VEMS fairly indicate in their different ways
the extremes of visibility, both existing & potential. My general observations on views from
the higher ground, a couple of kilometres or more away from the appeal site, are that the first
inclination is to look out to sea, especially on a clear day: that, if it is visible, the eye is then
drawn by the Sellafield Works: but that, even where the appeal site & the Works are
virtually aligned in the field of view, it is almost always clear that their locations are well
5A.24 separated. Consequently I have concluded that the upper structures of the RCF would be
5A.18 intermittently seen from some distance away in the National Park as distinct, modern
5A.20 protrusions beside the Park's fringe.

5A.30 5A.65 Looking at the site basically from the opposite direction, near the coast at Seascale to
5A.36 the south-west, there would in my view be a similar perception, save that the structures
would be seen against the impressive background of the lower, western fells which are mainly
in the National Park. This would be the scene from the extensive amenity space of the
Seascale Golf Course and the well-used public footpath beside it. Although the Sellafield
Works is close by there, it lies just west of north, and the viewer really needs to turn away
from the prospect of the fells to take in the Works. There are similar, albeit discontinuous,
5A.35 impressions on the B5344 from Seascale towards Gosforth, until the RCF would become a
COR/101, skyline feature, in which form it would be seen on Footpath 409011 from Moss Wood to
Fig.3.12.1 Fleming Hall. However, the path is obviously little used; and then vegetation largely
5A.29 obscures views of the Surface Site from Byway 409309 along Sides Lane itself.

5A.26 5A.66 I also agree with Nirex that there would be relatively few views of the development
5A.15 from the A595(T). However, there would be enough for some travellers from the south-east
to appreciate that they were approaching some modern development in the countryside before
2B.7 Sellafield, in my judgement. Also the Surface Site's access from the road is an obvious
5A.45 works entrance. To my mind the engineering works have left their mark there, and their

5A.35 incongruity has already harmed the character of the countryside flanking both sides of the
5A.42 trunk road. The planting opposite the Red Admiral Hotel is also obscuring a view seawards
from this point on the edge of the National Park where people naturally tend to congregate.
It is not a justification that the access & planting have been provided in association with the
borehole developments, since I have concluded that those developments are part of the same
project as the present proposals, and indeed the access & planting are relied on to serve &
screen these proposals.

5A.13 5A.67 Moreover, the proposals would certainly cause visual harm to their immediate setting,
5A.18 as the ES concluded. Nirex has made little attempt to design in keeping with the local
5A.20 vernacular tradition, relying rather on modern mining designs employed in other parts of the
5A.16 country. This criticism applies to the buildings as well as the more prominent headworks, and
5A.45-6 the consequence is that they would look palpably out of place, in my view. There would be
5A.20 some inevitably adverse impact too from the lighting & the fencing.

5A.41 5A.68 Mr Spendlove's objection, adopted by Gosforth, is a reminder that the issue over the
5A.57-8 interesting little valley is not whether it would be harmed, but what would be the feasible
minimum extent of its harm. My broad conclusions on his alternatives are that they would
have less visual impact than Phase 1 of the submitted project, but that if the enterprise
proceeded to Phases 2 & 3, the implications of his approach would be more costly, time-
5A.23 consuming & productive of spoil. Nirex's resistance to his step-by-step attitude does
5A.20 emphasises the importance it attaches to the later, DWR design stages of the underground
operations, in contrast to its lack of a direct riposte to his criticism of the sizes of the
5A.55 temporary offices & car park. Whilst the relative seclusion of the buildings and their
5A.26 curtilage from public view would mitigate their visual impact, I consider that it does not
remove the basic objection that they would do visible harm to a rather pleasant piece of
countryside.

5A.26 5A.69 Similar remarks apply to the spoil disposal area, which would be on a pasture close
2B.14 to an attractive wood, and visible from a drive which the public use even though it is not on
5A.47 the Definitive Map, in some conflict with SP 60 [2C.16]. Although it may be that the
5A.21 additional planting proposed would add in due course to the wooded air of the northern part
5A.53 of the PRZ, it might well contribute to the raw appearance of the development in the interim,
and I do not accept that this rural spot is otherwise in need of visual enhancement. I also
5A.52 share FOLD's scepticism that the quality of the permanently modified landform would be as
good as that of the existing one. In short, I consider that the RCF development & activities
would fail to remain subordinate to the existing landscape of the Surface Site & its immediate
5A.9 surroundings, contrary to the Baseline Report's requirements for Management Class 3.

5A.29 5A.70 Nevertheless this kind of ground-level impact would not be apparent at a distance, and
so the strength of the longer-range effects must be gauged in the light of the extent of
visibility discussed above, the uninteresting appearance of the structures that would be visible,
and Nirex's warranted criticisms of Cumbria's original photomontages. On the accompanied
inspection, the viewpoint at Hooker Crag on Muncaster Fell [location 6 on CCC/3/1, Fig.3b
& see Fig.2], about 8 km south-east of the Platform Site, was taken as representative of the
2C.42 delineated features on the National Park's Conservation Map in that general direction from
5A.40 the site. I have formed the impression that at such distances the RCF could be difficult to

discern and would not be dominant, although it would add an increment to the other developments seen on a clear day in the open countryside.

5A.71 The delineated moor & heath at Ponsonby Fell & Swainson Knott to the north-east of the appeal site would be closer at about 3.5-4 km; and, judging by the view from the footpath near the Farmery [location 8 on idem, Fig.3a] at the south-western tip of the delineated part of Swainson Knott, the headgear of the RCF should be readily discernible.

2C.42 5A.72 Coming to views at the 1-3 km range from within the National Park, the RCF's upper structures would be seen from publicly accessible points in the deposited Local Plan's designated Quieter Areas above Hurlbarrow [idem, locations 6 & 7] and on Bleng Fell [idem, location 4]. Whilst the latter would be a view against the background of the Sellafield Works, from the former in particular the RCF would be sufficiently distinct & prominent to materially detract from the landscape on its own account, in my judgement, even though seen against the coastal villages or the sea. There would also be a number of intermittent but clear & closer views around Ponsonby & Boonwood [idem, locations 1-3 & 9-11] from the National Park countryside similar to the PRZ, but placed by the Baseline Report in Management Class 2, where changes in any of the basic landscape elements should not be evident in the characteristic landscape. I consider that the RCF would also be intrusive in the landscape from these locations.

5A.25
5A.9
COR/701,
p.120

5A.35 5A.73 A final location worthy of note is the bridleway leading north-eastwards off the A595(T) towards Gallows Hill on the low ridge beside the Seven Acres Caravan Site, and about 3 km south-east of the Platform Site [location 1 on CCC/3/1, Fig.3b]. This land is in the National Park and is placed by the Baseline Report in Management Class 2. The main structures of the RCF would be plainly seen on the skyline, whilst there are only intermittent views of the Sellafield Works further west.

COR/701,
Map 28

4A.44 5A.60 5A.67 2C.5 5A.72-3 5A.28 5A.74 In relating these conclusions to the relevant policies, the strategic framework SP Policies 1-10 are not of course intended to be directly applicable to a specific application, even for major development. Nevertheless, I note in the context of the first part of Policy 2 that the site's setting is of some landscape sensitivity & importance, containing some attractive features; and yet that the development would not remain subordinate to the landscape, but cause visual harm to its setting & look out of place. As to Policy 5, the development would visibly impinge to some extent on some nearby land within the National Park which has attributes similar to the site & its immediate surroundings, and on other landscape within the Park the quiet enjoyment of which the emerging local plan seeks to promote.

2C.8 5A.70 5A.71 5A.37 5A.75 SP Policy 11 is concerned with managing the environment, and so is directly applicable to an individual development. The land in the Park to the south of the site which is identified on the Section 3 Conservation Map is too far away for its character to be affected, in my judgement. The land identified on the Map which is to the north-east of the site is closer, and I consider that the sight of the RCF could have a marginal effect on its character. More importantly, the RCF would visually intrude into some parts of the National Park to its east which are being identified by the emerging development plan for special protection of their quiet enjoyment. There would be similar intrusion into a stretch of

undeveloped open countryside in the Park, to the protection & enhancement of which particular regard is to be paid.

5A.67
5A.65
5A.76 The identified moor & heath, the quieter areas on the slopes, and the open countryside closer to the boundary are all characteristics & qualities of that part of the National Park which is near the site; and in my judgement the RCF's effects on them would harm the character of the Park. The harm would be accentuated by the failure to meet high standards of design. Moreover, the development would also be seen as a distinct, modern protrusion in views of the rising ground of the Park from towards the coast to the south-west. To my eyes, this would harm the appearance of the Park from this direction.

4A.55
4A.54
1.3
5A.77 Consequently I consider that both the character & appearance of the Park would be harmed by the RCF. Even if Policy 11 is to be strictly construed as not to bite on a development site outside the Park, the provisions of it & Policies 2 & 5, plus the Conservation Map & the deposit Local Plan, indubitably spell out the features which constitute the local nature of this interest of acknowledged international importance. This interest does not abruptly become of no consequence just beyond its mapped boundary. The policies do not include any exception for temporary development. In making the judgements based on these factors that the character & appearance of the Park would be harmed, I have taken into account existing intrusions into the landscape, notably the Sellafield Works. Therefore the development would not accord with the combined provisions of SP Policies 2, 5 & 11, and the 2nd Reason for Refusal has been sustained.

2C.9
4A.56
5A.23
5A.68
5A.22
5A.78 It is SP Policy 13 which relates to undesignated landscapes such as that of the development site itself. I have already concluded that the site is in the undeveloped open countryside, and that, since the development is not required to meet local infrastructure needs, a departure from the Policy is involved. But Policies 11 & 13 both require development also to be sited to minimise environmental impacts and meet high standards of design. Although the Platform level has been set to minimise the headgear's intrusion in the vertical plane, the Platform has still been placed in the horizontal plane where it would inevitably damage the pleasant small valley. This is not a visual compromise, but in order that Nirex may most readily characterise the particular volume of rock within the PRZ which it presently favours as a DWR location.

5A.21
4A.19
4B.6
1.3
5A.79 Again, whilst I agree with the consensus that the proposed landscaping is to a high standard, Nirex seeks to defend the external design of the structures on grounds of expediency only. The Policies do not recognise such grounds as an exception. The development would therefore be contrary to Policy 13 on all counts, and so the 1st Reason for Refusal has also been made out.

2C.12
4A.57
5A.68
5A.55
4B.26
1.3
5A.80 Nirex has similar difficulties in complying with SP Policy 25. It claims that it is impossible to fully achieve the enhancement aim of the first part. But, after allowing for that, there remain the points that the development would cause visible harm to a rather pleasant piece of countryside; introduce significant office & car parking development into a rural area; and fail to reflect local vernacular trends in structural form & construction. This last deficiency cannot legally be remedied by omitting a major part of the design, nor mitigated enough in practice by a revised colour scheme. Once more, there is no exception for temporary development in the Policy, and the 3rd Reason for Refusal has been sustained.

5A.17 5A.81 On the other hand, I concur with the judgements that the settings of Sally Hill & the
Seascale Stone Circle, and other Listed Buildings & Ancient Monuments, would not be
2C.12 affected, thereby complying with SP Policy 26 & Mid Copeland Local Plan Policies 6J & R.
2C.20-1 Although the Stone Circle is close to one of the viewpoints from which I consider that the
5A.76 appearance of the National Park would be harmed, the latter is because the backdrop of the
Park would be close in the scene to the offending development, whereas the RCF would be
at the limits of the Stone Circle's visual setting. For even stronger reasons, I do not accept
5A.31 that the Draft Hadrian's Wall Military Zone would be affected. The designation that might
5A.39 run down the coast from Maryport to Ravenglass would itself be a setting; and to implicitly
BLG/11/10 argue for the existence of a setting for a possible setting is extremely tenuous, in my view.

2C.21 5A.82 Also it seems to me that the landscaping measures would just comply with the other
relevant Mid Copeland Local Plan Policy - 6Q. Nevertheless the breaches of particular
4A.43 development plan policies set out above have to be brought forward to the overall framework
2C.14 of Policy 54. These breaches suggest that there are already emerging cases that the stipulated
criteria are not met in all respects. In relation to criteria (ii) & (iii), it would have been
practicable to cause less visual harm & to reduce the adverse visual impact even more, by
carrying out a smaller development in the first place and by preparing a better external design
of the structures. Nirex is unwilling to take these steps because of the cost & time penalties
involved, in my judgement. In relation to criterion (iv), the Lake District feature of
4A.48 conservation importance would be harmed, and so the value of the benefits of the RCF has
to be shown to outweigh the value of the interest affected.

5A.5-10 5A.83 On this last point, I would rate the harm to the National Park as on a moderate scale,
to reflect the development's location outside the Park, and the middling scenic beauty of the
landscape affected. But it would still seem to me to amount to harm to the wider
environment which has to be taken round to the general balancing exercise of criterion (i),
together with the breaches of Policies 13 & 25. The relevant policies of the emerging
4B.21 development plan also have to be considered. Despite agreed compliance with LP ENV 11
5A.42 & 13, the overall impact of the development in relation to the landscape is not acceptable to
2C.27 Copeland, for the reasons already given, and that is a conflict with criterion ENV 33.4. The
2C.30 utilitarian & rootless type of external design conflicts with the principles of DEV 3.

5A.26 5A.84 This tension with the visual requirements of the statutory & emerging development
plan is, if anything, exacerbated by consideration of the effects of related developments, in
my view. Nirex has, to my mind, put forward completely the wrong approach towards the
RCF/RCM/PRZ Boreholes. Instead of seeking to compare their impact unfavourably with
that of the appeal development, it should have acknowledged that they are part of the same
project the overall effects of which have to be taken into account. Although I disagree with
5A.4 the implication that their visual effects are worse than those of the present proposals, their
5A.45 various platforms in particular have badly broken up the natural landform for the time being;
and their illuminated rigs can be intrusive. These 2 elements lengthen the potentially
deleterious effects of the RCF project.

5A.2 5A.85 The first site-specific DWR design for the PRZ indicated that an RCF could be the
forerunner of a repository development with a fairly massive visual impact. The proximity
6B.89 of this to Gosforth is difficult to reconcile with the site search eliminator of entire local
authority districts above a population density threshold. However, it seems that the impact

5A.3 problems of such a concept were recognised, and largely eliminated in the re-design. Assuming that the now preferred design option were located on the Platform Site after completion of the RCF, it seems to me that the reduction in respective scales would be significant enough so as not to permanently harm the character & appearance of the nearby National Park. I also note that the permanent buildings would reflect local vernacular trends.

5A.43
4B.7
5A.3
SPD/1/1,
p.6
3A.1
5A.86 Nevertheless it also appears that the development on the PRZ would be a permanently inappropriate one in the open countryside. There are in addition 2 important matters outstanding. The first one is a paradox over the internal road link between the development and the Sellafield Works, for Cumbria & Nirex have agreed for the purposes of the RCF that such a link would have an unacceptably adverse visual impact, whereas it is part of the DWR design concept. The second matter is that, whereas the preferred DWR design option includes spoil disposal by conveyor up a drift & thence off-site by rail, Nirex is reserving its position on the use of the RCF shafts for construction access. If that construction access were to include the disposal of considerable volumes of spoil, the visual & other impacts of the DWR at Longlands Farm might be significantly greater than I have assumed above.

SPD/1/1
5A.87 Whatever the position about spoil disposal at Longlands Farm, the preferred design option would of course entail a large extension of the south-eastern part of the Sellafield Works.

5B. SOCIO-ECONOMIC IMPACT

5B.1 The Department of the Environment's 1989 Guide to Environmental Assessment Procedures does not specify socio-economic impact in its Appendix 4 checklist as a matter to be considered for inclusion in an environmental statement. However, the Lee & Colley 1992 quality review approach advises that a statement should estimate the significance that the projected impacts will have for society, in the form of both the affected community & society in general [SUT/1/2, p.46, paras.2.5 & 2.5.1]: and the Morris & Therivel 1995 minimum requirements & best established practice approach sets out as Criterion 5 the socio-economic characteristics of the development [SUT/1/1, 3rd page].

5B.2 Nirex has included a Chapter on Socio-Economics in its ES [COR/101, p.71], and no challenge to this inclusion has been brought to my attention. The 11th Preamble to Directive 85/337/EEC states that the effects of a project on the environment must be assessed in order, amongst things, to take account of concerns to protect human health, & to contribute by means of a better environment to the quality of life. The Directive & the UK Regulations list the factors that might be affected as including human beings, the inter-action between human beings & natural resources, & material assets. It seems to me that the socio-economic impact of a development project must be regarded as at least likely to have some indirect effects on such aspects of the environment.

5B.3 Even if socio-economic impact should not be treated as part of the effects of the project on the environment, I regard socio-economic factors as capable of being material planning considerations in any event.

5B.4 Nirex's discussion document [COR/203] initiating its 1987-8 DWR consultative exercise [6B.22-3] stated that several hundred jobs would be created during the DWR constructional period, and then an operational workforce of about 100 would be required [idem, p.14, para.4.1.1]. One of the main findings of the consultants' report on the consultation responses [COR/204] concerned socio-economics. The executive summary stated that potential detrimental local economic impact & blight through social stigma associated with the public perception of radioactive waste disposal were key concerns, especially in areas dependent on tourism, agriculture & fishing.

5B.5 After the decision was taken in July 1991 to concentrate further investigations at Sellafield [2A.10], Nirex published a booklet outlining both the site search [Ca.6B] and continuing research & development work [COR/205]. Section 5 on "Facilities Required" [idem, p.12] estimated that there would be up to 3,000 construction jobs and then 350-400 permanent operating staff, for what was in effect the first site-specific Sellafield DWR design [5A.2]. Section 8 on "The Next Steps" [idem, p.24] commented that there was little doubt that any development of the size of the construction & operation of the DWR would have a substantial impact on the local community. Nirex was committed to discussing ways in which it could be a good & conscientious neighbour. It wanted to bring as many benefits as it could to the local community and, at the same time, keep disturbance & inconvenience to a minimum.

5B.6 Since 1990 senior Nirex staff have periodically reported to the Sellafield Local Liaison Committee, which is chaired by a senior County Councillor & was established about 40 years ago as a consultative body on BNFL & UKAEA local operations. The formal Nirex Liaison Group was set up in 1991 at officer level & consists of representatives of Nirex, Cumbria, Copeland & the National Park authority [CCC/1/2]. It is Nirex's proposal that, if permission is granted for the RCF, a Joint Consultation Committee with local authority members should be set up [NRX/12/2, pp.36-8]. Nirex & Gosforth have already set up both a Local Liaison Group and a Technical Consultative Group. As a good neighbour, Nirex has contributed to the community of Gosforth by assisting with extensions to the school playground & church, and with the upkeep of the car park, public hall & playing field. Nirex also maintains a local educational sponsorship programme which in 1994-5 sponsored 3 university students in earth sciences.

5B.7 The ES establishes an economic baseline in terms of the use of the Surface Site and the key characteristics of the West Cumbrian economy. It concludes on the latter [COR/101, p.74, para.3.3.31] that the area's future economic prospects remain inextricably linked to the local nuclear industry in both its operation & future construction projects. Local employment prospects are not promising, with the possible exception of the tourism industry. The effects then assessed are on agricultural businesses, employment, housing & public services, tourism, and perceptions of the local area. The conclusions [idem, pp.79 & 80, paras.3.3.69 & 78-81] are that there would be no significant effect on agricultural activity or the viability of farm holdings (there no longer being any agricultural tenure of Longlands Farm): that the employment effects would be unambiguously positive, albeit small-scale in relation to previous construction projects in West Cumbria: that any adverse effect on housing & public services or tourism would be unlikely: and that, assuming that appropriate measures are taken to explain the nature of the development, any significant effect on local economic behaviour would be unlikely.

5B.8 The tourism assessment refers to a 1992 study carried out by consultants for the Cumbria Tourist Board [COR/408], & to a 1994 literature review of blight & nuclear facilities by Nirex's consultants [updated version COR/409]. The perceptions assessment relies largely on a 1993 report by Nirex's consultants on 2 surveys - a local survey of businesses & agencies in the vicinity of Sellafield, & a survey of development agencies in other parts of the country with major nuclear facilities [COR/402]. This survey report is an integral part of the evaluation of the social & economic impacts of the proposed DWR project [idem, para.1.1]. The ES comments that any local concerns arising from Nirex's investigation programme appear to relate to its effect in bringing development closer to residential properties & particularly Gosforth village. Further activities at Longlands Farm may reinforce these concerns, although the study findings suggest that the proposals are unlikely to have a significant effect on economic behaviour.

5B.9 Cumbria in turn has a 1993 consultants' study report on public perception & the nuclear industry in West Cumbria, based mainly on an expert review of socio-economic data and observations of focus groups [COR/401]. It has also arranged for opinion polls on the proposed Sellafield DWR in 3 waves - September 1991, November 1992 [COR/412], & November 1994 [COR/411]. Copeland received an 8% response to a written questionnaire which it circulated in 1991 [COR/403]. It has also conducted a 1992 professional opinion survey of local residents [COR/404]. There have been 2 further 1995 surveys to prepare for

the LP Inquiry - one of residents, with a wider remit of the socio-economic impact of BNFL's local activities as well as awareness of the RCF proposals [COR/407], and the other of businesses in the UK seeking industrial capacity & which have considered West Cumbria but have not so far decided to invest there [COR/410].

5B.10 Another group of consultants has carried out research for The West Cumbria Development Fund on the perceptions of individuals within groups of West Cumbria as a destination for leisure travel & inward investment. There are 2 versions of their report, published 7 months apart [COR/405 & 406]; and, with the agreement of Nirex & myself, FOE Cumbria have corresponded with the authors concerning the differences between the versions [COR/406A]. The same research group designed for the CBI a 1995 telephone survey by a leading market research company of 1,000 of the directors of the top 3,000 UK companies by turnover [NRX/10/10].

5B.11 **Nirex** has revised its ES estimate of RCF direct labour requirements [COR/101, p.71, paras.3.3.3-4] for the period 1996-2008 to about 1,260 person years, made up of 540 contractors' labour, 315 management/operations staff, & about 405 scientific staff. There would be an annual average of 97, with a peak requirement of 185 person years in 1999. Using the same multiplier for indirect & induced employment as the ES of 1.34 brings the total person years of employment provided by the RCF to 1,690. The area would benefit from more employment for local people, additional expenditure by in-migrants, and more contracts & work for local firms.

5B.12 Whilst Copeland & Gosforth suggest that the construction of Encapsulated Product & other Stores at Sellafield Works [CBC/1/1, Items 49 & 51] would provide equivalent employment & other benefits to the RCF, those stores would be additional to the DWR and not a substitute for it. There is no other query of Nirex's calculation of a positive employment effect for West Cumbria. Nirex's Model Code of Employee Relations for its contractors provides that their manpower should include, where reasonable & practicable, local personnel with relevant skills & experience or who can be suitably trained: and employment opportunities should be advertised locally. A steering group led by the Chair of the West Cumbria Development Agency has been set up to guide Nirex on local recruitment.

5B.13 There is no dispute over the capacity of local housing, education & health provision to meet the limited demands of people moving to the area as a result of the additional employment. Although there are suggestions that the advent of another nuclear facility would reduce residential property values, a supplementary study around Sellafield by Nirex's consultants [NRX/10/7, Section 3] concludes that any blighting effect in the immediate area must be highly localised and that any other blighting effect seems to be offset by the employment benefit associated with the facility [idem, p.18, para.4.3].

5B.14 Also in 1994 Cumbrian male wage rates were the highest in the Northern Region [NRX/10/1-3], and Nirex contends that high wage levels at Sellafield contributed significantly to this. The relatively stable & highly paid employment provides sustained spending power & hence substantial additional benefits to the community. Although construction employment at Sellafield has been run down severely in the last few years, and the local authorities

emphasise the predicted falls in general Sellafield employment over the period to 2010, the nuclear industry will remain the dominant local employer and every additional job should be all the more welcome against a background of declining opportunities.

5B.15 The statutory development plan for these parts of Copeland recognises the central role of the Sellafield Works in the local economy [eg COR/305, pp.5 & 7-9, paras.2.1-2 & 2.9-10, and NRX/10/5, p.6, para.2.1.4 (mis-printed as 2.2.4)]. Moreover, there has been inward investment related to the nuclear industry. Whilst the local authorities dwell on the lack of non-nuclear investment at the regional strategic employment site of The Westlakes Science & Technology Park on the south-eastern outskirts of Whitehaven [COR/306, p.72], the point is that the Park exists due to the presence of the nuclear industry. No other industry has induced a beneficial stimulus of this sort in Cumbria, and Copeland concedes the Park to be very important to the local economy in the long term.

5B.16 There is no substantive evidence that the RCF itself would influence people's perceptions and thereby have a detrimental effect on inward investment. The fact that BNFL has made contributions to local infrastructure & other provision in connection with its major developments at Sellafield [COR/401, Annex C] is not evidence of such effects; and Copeland admits that BNFL has consistently declined to incorporate such contributions in a planning agreement. Copeland's 1991 & 1992 surveys related to a DWR and not the RCF, and in any event found less than 50% of respondents completely opposed to a DWR [COR/403, Note 7] and 50% giving some support [COR/404, p.32, Section 8.3] respectively. As for Copeland's 1995 surveys, the business survey is basically unreliable due to its poor response rate & unsoundly small sample [COR/410, p.2]; whereas the residents survey is sensibly representative, and shows that 54% of respondents were unconcerned about an RCF at Longlands Farm [COR/407, p.vii]. This survey & Cumbria's 3rd wave poll [COR/411] show, in Nirex's view, a clear majority of residents favouring the RCF and a clear balance of opinion in support of the nuclear industry.

5B.17 Copeland is being very selective with the contents of Nirex's 1993 survey report [COR/402], despite accepting the surveys' methodologies. Any blight associated with the DWR can only occur if there is an adverse impact on the economy resulting from changes in people's behaviour & decisions, in turn resulting from perceptions of risk, image & stigma associated with nuclear facilities [idem, para.1.2]. As stated in para.3.18 of PPG23, perceptions of risk should not be material unless their land-use consequences can be clearly demonstrated. The few potential recruits to one company mentioned in the report [COR/402, para.3.15] who gave proximity to Sellafield as a reason for declining job offers also cited remoteness and poor career prospects & social facilities as other grounds for turning down the offers. The 2 economic development agencies which considered that the nuclear presence deterred companies & workers from moving into the area were actually the Economic Development Units of Copeland & its neighbouring district, Allerdale [idem, Table 4.2 & para.4.16]. They did not provide any evidence to support this assertion.

5B.18 Reliance cannot be placed, either, on the reported claim by the West Cumbria Development Agency to be aware of 2 cases where the proximity of Sellafield had been the deciding factor in companies choosing not to locate in West Cumbria [idem, para.4.38]. The Agency cannot now substantiate this claim [NRX/10/13]. The vacation of the Rowntree Mackintosh factory on the eastern edge of Egremont now referred to by the Agency was of

course a case of re-location away from West Cumbria, not of failing to move to the area. Nirex's consultants have spoken twice to the manager of this factory, who insists that the relocation was due to group rationalisation and not the presence of Sellafield. There is a similar account in the consultants' report of another company's explanation for moving away [COR/402, paras.3.23-4].

5B.19 There is no documentary corroboration of claims by Copeland about the closure of a sea-food processor and the deterrence of a brewery, of claims by FOE Cumbria about the closure of a dairy and effects on markets for fish, nor of a claim by Mr Catlin about the closure of a local school. On the other hand, Copeland's own Economic Development Unit is reported as seeing Sellafield as a positive factor in terms of its scientific expertise & the associated opportunities for technology transfer [idem, para.4.14]. It is also important to note, in Nirex's view, that its consultants' report concluded that the experience of other areas with nuclear facilities does not suggest that the nuclear presence has had any major impact on inward investment decisions [mis-printed as "discussions", idem, para.7.12]. Other factors, particularly location & accessibility, appear to be much more influential.

5B.20 Nirex considers that Copeland is being similarly selective with the information in the research reports for The West Cumbria Development Fund [COR/405 & 406]. The company decision makers questioned for the survey had chosen not to move to West Cumbria: there was no survey of companies which chose to move. Although Copeland considers the information presented in the interim version of the report as more favourable to its case, the perceived disadvantages that would be experienced by operating in West Cumbria were dominated by accessibility problems [COR/405, p.12 & Table 6 and NRX/10/12, Minute 2)]. In reality, there is no material difference of substance between the 2 versions of the report: and the final version concludes that Sellafield is not a significant deterrent to inward investment [COR/406, p.7]. This is corroborated by Nirex's own supplementary study on foreign direct investment [NRX/10/7, p.18] and by the CBI telephone survey [NRX/10/10, p.8].

5B.21 The report for the Development Fund actually envisages that Sellafield could be turned into a significant asset [COR/406, p.7]. So far as leisure travel is concerned, the vast majority of persons are no less likely to visit because of the presence of BNFL [idem, bottom of p.11]. Indeed 6% of respondents were more likely to visit to see the Sellafield Visitors Centre [idem, end of Section 2.2.2].

5B.22 The Äspö Hard Rock Laboratory in Sweden has been visited by Nirex's socio-economic consultant because the laboratory is similar to the RCF apart from being a generic research facility, and is also near a nuclear power station which is the country's location for the interim storage of spent fuel. The impact of the power station has been positive & significant in terms of providing highly paid & skilled employment, improving the local infrastructure, and enhancing educational standards, which is being taken forward by the Laboratory as a centre of excellence. Similar effects have been noted at Dounreay by the Scottish Office's Chief Reporter [NRX/10/8]. A recent paper [NRX/10/11] again confirms the same sorts of impacts by all 4 Swedish nuclear power plants, including positive visitor attraction & lack of effect on property values.

5B.23 Although Copeland relies on passages in the RWMAC/ACSNI Study Group's Report on Site Selection & Public Health Protection [GOV/409] commending consideration of compensation payments where net detriment arises, Nirex has seen no evidence that the RCF would have a net detrimental impact on the local economy. Perceptions are not always translated into behaviour, and Nirex's empirical evidence [5B.7 & 11-14] shows that on balance the impact of the RCF would be positive. There is no evidence that a non-nuclear but equally stable employer would provide a similar number of jobs if the RCF were turned down. Nor are there indications of any actual adverse impact by the presence of Sellafield on tourism. Indeed, English Tourist Board research suggests that holiday-takers do not think of adverse publicity for Sellafield or nuclear incidents in making holiday decisions [NRX/10/9].

5B.24 The argument that West Cumbria is too dependent on a dominant nuclear industry was rightly rejected in the Windscale Inquiry Report, in Nirex's view [NRX/10/4, p.76, para.14.24ii]. Consequently, it is clear to Nirex that the RCF would bring significant net economic benefits to the area, without imposing a strain on the social infrastructure. Whilst there may be some perceptions that the DWR as another nuclear facility would cause some harm, there is no reason to believe that this would translate into anything more than slight or fleeting blighting effects.

5B.25 These net benefits must be taken into account in the balancing exercise under SP Policy 54 [4A.6], whereas the development would conform with the emerging LP Policies ENV 33.4 [2C.27], DEV 4 & IMP 1 [4B.5]. There would be no adverse long-term effects on the Borough's social & economic resources, and so no need for a planning obligation to address such effects.

5B.26 The planning obligations suggested by Copeland are unnecessary, irrelevant & unreasonable. The liaison arrangements could not be appropriately included [GOV/138, para.9(a)]. There would be no need for the Nirex head office to be in West Cumbria for the RCF to go ahead; and indeed it would be premature to move before the location of the DWR is finally settled. The concentration of training & research in the local area would not be amenable to control by a legal agreement, and would be better discussed by the steering group [5B.13]. Copeland cannot relate the provision of social housing or community facilities to the RCF, because it concedes that the RCF would not add to the demand for social housing nor cause a deterioration in community facilities.

5B.27 **Cumbria** does not demur from Nirex's assessment of the impact on local housing, education & health provision, and notes the employment predictions. It does point out, however, that its opinion polls [COR/411 & 412] indicate mixed views about the nuclear industry generally and the RCF. There appear to be a substantial number of people in the County who have concerns of various kinds & to varying degrees about the Nirex proposals [see executive summary at rear of COR/411].

5B.28 As a result of its commissioned research into public perception, Cumbria takes issue strongly with the view that local support constitutes unequivocal approval of the nuclear industry based on a better understanding than average of its operations & processes. The background & qualitative research undertaken by its consultants [COR/401] has made it

appreciate that there is a general ambivalence towards the industry, reinforced by a "dependency syndrome", which makes many local people suppress their real feelings of concern. There is extensive local ignorance of Sellafield; and the acceptance of it and the accompanying risks is founded more on a fatalism about its dominant economic role & the lack of any realistic alternatives than on knowledge [idem, pp.2-3].

5B.29 Nevertheless Cumbria has noted Nirex's perceptions assessment report [COR/402]. It accepts that a direct connection between local people's feelings and social well-being & economic development has not been clearly demonstrated. Although overall it recognises concerns that further nuclear-related development may adversely affect external perceptions of Cumbria, it concludes that the harmful social & economic impacts do not amount to a individual reason for objection.

5B.30 Copeland is also concerned about the concept of local support. The report on the 1987-8 consultative process quoted in effect [COR/204, top of p.12] from the Council Leader's press statement welcoming BNFL's intention to initiate local discussions on radioactive waste disposal & management issues [NRX/12/1, p.4]. The report did not refer to the comment made later in the press statement that, whilst investment at Sellafield assists the local economy, the overriding issues are the health & safety of the local community and pollution of the environment. Nor did it recount Copeland's official response to the consultation [NRX/12/2, p.1], even though the consultants have confirmed receipt [NRX/12/9] of the response, which specifically commented at item 3 that local support is secondary to finding the "best" site. The response also commented at item 5 that the benefits to accrue to the local community should be assessed for the inquiry into the preferred site; and that such benefits should include the availability of resources for achieving social & economic objectives, and resolving problems arising from the location of such a controversial facility.

5B.31 The consultants did report to Nirex that impact & blight through stigma & perception were key concerns in areas especially dependent upon tourism, agriculture & fishing. Nirex itself refers to the Cumbria Tourist Board 1992 estimates [COR/408] of about 6,190 jobs directly dependent on tourism in West Cumbria (Copeland & Allerdale districts), and the 1991 Census of Population estimate of some 3,200 residents being employed in agriculture, forestry & fisheries. These compare with the 1991 Census of Employment data of about 5,600 workers in the construction industry and the BNFL 1991 Sellafield direct workforce of 7,550.

5B.32 There were 3,831 registered unemployed in the Whitehaven Travel To Work Area in April 1995, representing 12.5 % of the economically active excluding the self-employed, compared with 9.0% in Cumbria, 10.2% in the North West Region & 9.8% in Great Britain. BNFL itself projects that its total Sellafield workforce will have reduced to about 4,750 by the year 2010. This would be just over 14% of the Borough's predicted workforce, compared with the present 30%. Although Nirex has made much at this inquiry of the nuclear industry's funding of diversification, for example by establishing The Westlakes Science & Technology Park, Gosforth has demonstrated that employment there is still related to the nuclear industry. Furthermore the Challenge Fund bid to finance the extension to the Park, in which Nirex's consultants were involved, has failed.

5B.33 The benefit of the annual average of 97 jobs provided by the RCF has to be gauged in this context. The proportion of these to be filled by local recruits is largely speculative - Nirex's latest percentage ranges of local recruits vary between 5-20% for scientific work and 50-80% for site establishment. It is then a matter for further speculation as to how many of these local recruits would be transfers within the nuclear industry or even within Nirex. The gross socio-economic benefits are thus marginal at best. In Copeland's view they should be compared, as Gosforth has urged, with the 170 jobs over an average construction period of 3½ years for each Encapsulated Product Store at Sellafield, which have been planned on the basis of a worst case scenario assuming abandonment of the DWR project.

5B.34 Copeland points out that Nirex seems to be arguing that the adverse impact from the RCF would be outweighed by the general benefits from the nuclear industry. But the general, albeit declining, benefits will continue to be provided regardless of the RCF, and so cannot be put into the balance. Also Nirex is drawing a false distinction between perceptions and material impact. In the cases of deterrent effects upon tourism & inward investment, perceptions constitute the mechanism through which the impact is caused. In incinerator appeals such as decision ref. APP/F4410/A/89/126733 of 11 November 1991 [CBC/1/12], the perceived risk of socio-economic effects has been taken into account [idem, para.9].

5B.35 It is Copeland's contention that the grant of permission for the RCF would create or enhance negative perceptions of the area, so as to be likely to deter inward investment & tourism. Nirex itself emphasises the public controversy aroused at all 4 of the sites it was investigating for a shallow waste repository in 1986. Yet one of them was in an area already familiar with the nuclear industry. Nirex undertook to help those in the immediate vicinities of the sites who were unable to sell their homes [GOV/202, para.91]. In the subsequent 1987-8 site search for a DWR, Nirex & its present consultants eliminated all local authority districts with a population density of more than 5 persons per ha [6B.11], partly in the light of public perception of the acceptability of a DWR nearby, so it has told this inquiry. There was obviously little doubt at the time that the implementation of Nirex's plans would have a detrimental effect on local economies, and yet those plans were merely to explore some sites.

5B.36 Nirex has refused to identify most of the 12 sites examined by the MADA exercise because it would raise public alarm [3B.27]. It could not conceivably be irresponsible to raise such alarm, as Nirex claims, unless the alarm would in turn create an adverse impact. The MADA team itself identified an Attribute 26 described as Economic Blight [NRX/18/6, Table 1], and measured it by proximity to susceptible activities. It transpires that those activities included tourism, recreation, agriculture & food processing, all of which are significant within Copeland. On the other hand, the team failed to formulate an Attribute measured by degree of prejudice to future prospects of inward investment.

5B.37 Many local people have adverse perceptions of a DWR. The responses to Copeland's 1991 questionnaire showed over 60% significantly concerned or worried about the safety of people living close by [COR/403]. The 1993 opinion poll revealed that 63% of respondents were concerned about the safety of those living or working nearby [COR/404, p.19]. Although these relate to a DWR, so does Nirex's own research work, and this is because the connection between the RCF and the DWR is obvious. In any event, unlike Nirex, Copeland & Cumbria have also recently surveyed attitudes towards the RCF; and 46% of respondents

in Copeland's residents survey are concerned or very concerned about the RCF proposal, with about half of those people concerned about health or safety matters [COR/407, p.vii].

5B.38 Copeland considers that there is ample evidence to confirm the proposition that adverse perceptions are translated into social & economic decisions concerning land use. Copeland has first hand experience as an employer of potential recruits turning down jobs because of the presence of Sellafield. Its Development & Services Director has personally been told by a representative of Rowntree Mackintosh that one of the reasons for the closure of the Egremont factory, with the loss of 80 jobs, was customers' negative perceptions of confectionery produced near Sellafield. The owner of a Whitehaven sea-food company has told him that the business recently moved, with more than 100 jobs, out of the area partly because of its negative image. He is also aware of a major brewery which eventually decided not to build an hotel with 35-40 full-time job equivalents due to the presence of Sellafield.

5B.39 The survey reports actually relied on by Nirex reveal similar instances, in Copeland's view. The fact remains that the West Cumbria Development Agency originally told Nirex's own consultants that the proximity of Sellafield was the decisive factor in 2 companies choosing not to move to the area [COR/402, p.28, para.4.38]. The interim report for The West Cumbria Development Fund clearly showed that 4 out of 14 corporate respondents perceived the nuclear complex at Sellafield to be a disadvantage to operating in West Cumbria, and 3 more did so when prompted [COR/405, Table 6]. The telephone survey for the CBI indicates that, when prompted, 19% of 1,000 corporate respondents perceived the nuclear complex at Sellafield to be a disadvantage [NRX/10/10, p.7 & Table 9].

5B.40 This is consistent with overseas experience, in Copeland's judgement. Nirex's own updated literature review finds that surveys based on intended behaviour indicate that risk perceptions of nuclear waste repositories could have severe blighting effects on every investigated area of economic activity [COR/409, executive summary, para.5]. Also evidence based on actual behaviour suggests that there are blighting effects associated with nuclear facilities, with the consultants relying on positive economic effects to outweigh these [idem, para.6].

5B.41 Nirex has emphasised at first that the flow of inward investment to West Cumbria is weak. This is indeed correct, with a large number of companies closing down plants or re-locating elsewhere in the early 1990s, and no entirely new major international investment [COR/402, p.21, paras.4.8-10]. It has been such conditions which have led to the 1989 declaration of EU Objective 2 status and the 1993 grant of UK Intermediate Area status. But Nirex has eventually conceded that this is a point which strengthens Copeland's arguments. For the fragile investment position means that merely a modest adverse impact could have very significant effects.

5B.42 Again contrary to Nirex's initial insistence, there is a similar vulnerability to impact on tourism, in Copeland's view. In 1987, 15% of respondents to the English Tourist Board's survey stated that they would not want to holiday in Cumbria because of pollution, by which nearly all of them meant ionising radiation [NRX/10/9]. In 1993, the Cumbria Tourist Board told Nirex's consultants that the proposed DWR at Sellafield would be likely to have a negative impact on tourism [COR/402, p.32, para.4.65].

5B.43 The final version of the report for The West Cumbria Development Fund showed that the presence of BNFL at Sellafield makes it less likely for 20% of 1,024 respondents to visit West Cumbria for a day or holiday trip [COR/406, Table 12]. For some reason the 6% who are more likely to visit the Sellafield Visitor Centre are emphasised instead [idem, p.11], glossing over the net adverse reaction of 14%, and the curious feature of the Visitor Centre for a tourist attraction that entrance is free. Once more the overseas evidence confirms that a nuclear facility would have an adverse impact on the attractiveness of an area to visitors [COR/409, para.3.29].

5B.44 Copeland submits that this amply demonstrated deterrent effect upon inward investment & tourism of a Sellafield DWR would begin as soon as permission is granted for the RCF. The decision would be seen as concluding that the location has sufficient promise [4A.9] as a DWR site to justify an investigation of up to 13 years [2B.9] & expenditure of about £540M [3A.2]. This would be regarded as a very high level of commitment to a DWR here. There is accordingly a substantial socio-economic objection to the RCF proposals, because they would prejudice the use & enjoyment of some of the Borough's social & economic resources, contrary to emerging LP Policy DEV 4.

5B.45 Nirex has not offered any planning obligation to try to meet this objection, in accordance with LP Policy IMP 1 & hence criterion ENV 33.5. This failure to offer mitigation & compensation is contrary to the practice of BNFL [COR/401, Annex C] when granted permission for major projects, and of other countries, and to the recommendation of the RWMAC/ACSNI Study Group [GOV/409, para.6.14]. Copeland is consequently indicating obligations which could be offered, but by way of example only, albeit with broad orders of cost so that judgements can be made whether the suggested measures would be reasonably commensurate.

5B.46 The head office of Nirex is at Harwell, where 173 of its employees plus 23 secondees & consultants are based. There are only 19 employees plus about 100 contractors' staff at the Cumbrian offices in Greengarth Hall, Holmrook [5A.55]. The head office should be moved to Whitehaven where suitable offices are available, and at no net cost, but with the advantages of being closer to local suppliers and obtaining a better understanding of local issues.

5B.47 Nirex should invest about £10M over 5 years in the expansion of The Westlakes Science & Technology Park, to facilitate the local advancement of detailed research & analysis associated with the RCF. It should also commit itself to local training, recruitment and supplies & services, budgeting to spend about £500,000 on training. BNFL's contributions to the West Cumbria Development Fund to help diversify the local economy are due to end in 1997. Nirex could take over the main funding responsibility for the duration of the RCF, index-linked & amounting to a minimum contribution of £11M over 10 years. This might help to finance wider transport infrastructure improvements, such as sustaining the West Cumbrian railway line and providing a local airstrip.

5B.48 Thirty social housing units within 16 km of the site could be funded at a cost of about £2.5M over 5 years, to mitigate against loss of population due to adverse impact. A million pounds could be paid over 5 years for improvements to village halls & similar community facilities which are in a poor state of repair due to lack of public investment. Finally, as

discussed in Chapter 5C, the local road network is in need of improvement, at an estimated cost of £10.5M over 5 years.

5B.49 **Gosforth** points out that there are collectively many hundreds of person years of experience of working in the nuclear industry in its parish. For example, 2 of its witnesses are experienced engineers in the nuclear industry & former managers at BNFL. Such local expertise is actually the basis of the Technical Consultative Group [5B.6]. Whilst the formal liaison arrangements are welcome, they were instituted by Gosforth, and it is Gosforth which has taken the initiative to put them on a formal footing [GPC/2]. Nirex's lack of complete openness in the earlier years [WR/GPC/4], and its tardiness in entering into real dialogues with experienced scientists on matters of genuine concern [eg WR/GPC/2], have caused great anxiety.

5B.50 This is partly because another aspect of the parish's socio-economic profile is that less than half of its economically active residents work in the nuclear industry. The Nirex proposals have already had an adverse social impact, as the local community has split over what its response should be. The agreed view of the Parish Council, without wishing to become embroiled in the legal arguments [Ca.3A], is that it is in the general social & economic interest for all the important implications of the DWR to be dealt with now.

5B.51 BNFL did not purchase the Newton Manor Estate including the PRZ in order to expand the Sellafield complex, but merely in pursuance of its 40 year-old policy to buy up land coming onto the market within the Sellafield safeguarding zone [see notation on COR/306 Proposals Map]. The appropriate use of Longlands Farm is agriculture, and Nirex can only say that the agricultural holding would not be affected because the tenancy was terminated in order that it could go ahead with its proposals. Gosforth also doubts whether the re-introduction of agriculture after closure of the RCF would be viable, particularly because of the additional planting in the landscaping scheme.

5B.52 As has already been shown [5A], the RCF would be a conspicuous development in the countryside near to this National Park gateway settlement, which is also a local service centre & commuter village. The RCF would itself be a major mining development 400 m from a centre for scenic tourism, which would be bound to suffer as a result. The RCF's physical presence would also be a constant reminder of the proposed DWR. A much more objective & equitable way to proceed would be to operate a smaller underground laboratory over a longer timescale, whilst similar short-term employment benefits are obtained from the construction of the interim stores already approved for Sellafield [5B.33].

5B.53 Some local businesses have declined recently and jobs have been lost. Gosforth cannot prove that this has been due to the potential DWR, but equally Nirex cannot prove that it has not. Additional business from RCF & DWR construction workers for Gosforth's shops, eating places & accommodation could be a mixed blessing, for past experience with Sellafield construction contracts suggests that the workers temporarily crowd out & cut across the long-term tourist trade, which has difficulty in recovering afterwards. The specialist workers themselves would come from all parts, and not especially the local community.

5B.54 Local people are acutely aware of the stigma attached to being near Sellafield, especially when there has been a well publicised scare. Nirex concedes that there can be a blighting effect on property prices in the immediate locality after such incidents [COR/402, p.36, para.5.17]. Its other residential property value review [NRX/10/7] is unreliable because it used the records of just one building society [idem, para.3.5] and was unable, due to the postcodes, to concentrate on property immediately around Sellafield [idem, para.3.7-11 & Map 3.1]. Nirex also accepted in 1986 that its investigations at Fulbeck affected property prices; and seemingly it had a scheme to compensate home-owners in the vicinity of all 4 investigation sites [GPC/6A, pp.S4-10].

5B.55 Gosforth has in fact been under the impression that it is Government policy to acknowledge that Nirex's investigations cause blight - it believes that this is why Nirex has not been compelled to divulge the locations of the alternative sites [3B.27], and why a site deemed to have some local support has been preferred over others offering more promising geology [6B.30]. As the RWMAC/ACSNI Study Group [GOV/409] has pointed out, this acknowledgement of blight is certainly the policy of most other leading nuclear countries, which have accepted the need to compensate the host community.

5B.56 Gosforth points to some obvious ways in which the local community could be helped. The RCF would add to the risks of local emergencies, and some of the best emergency services in the vicinity are stationed at Sellafield Works, yet no direct access between the RCF and the Works is proposed. Nirex must also be required to contribute to improvements to the transport infrastructure - rail & air as well as road. It would not be enough to try to influence economic diversification by providing new industrial premises, because experience to date is that they are actually taken over by nuclear-related businesses. The most striking example of this is the Westlakes regional strategic site, where Gosforth has discovered that less than 3% of the employment provided is with employers who moved in from outside Cumbria [GPC/13, Fig.S4], and that most of the employment is nuclear-related in any event [see CFE/1/3]. This dependency on the nuclear industry, coupled with apprehension about blight, features in a number of the written representations.

5B.57 According to Gosforth, a principal public concern in the Parish is the anticipated drop in residential property values. The Parish Council is already struggling to maintain local services due to its complete dependence on precepting domestic taxpayers since the introduction of the uniform business rate. It is unsatisfactory to have to rely on occasional, voluntary contributions from major businesses like Nirex acting in its good neighbour role. A trust fund should be set up for the potential host community, as in France at Soulaines-Dhuys [GPC/6, pp.10-1]. The RWMAC/ACSNI Study Group commented [GOV/409, para.6.12], that this issue of compensation should be brought into the open, and Gosforth has consequently ensured that it has been aired in relation to the current proposals.

5B.58 The Shop Stewards support the RCF for social & economic reasons. They represent about 4,800 industrial workers at BNFL, and on their behalf have researched, & consulted on, the best way forward for the DWR project for the last 7 years. The paramount factor is safety, for their members & families and the rest of the people of West Cumbria. Some of the environmental groups opposing the DWR project must be following a hidden agenda, because they have been inconsistent in opposing both the surface storage of spent fuels and

the underground disposal of waste, and in opposing both the transport of waste to Sellafield for processing and the retention of waste at Sellafield after processing.

5B.59 In contrast, the Shop Stewards have responded to genuine concerns, such as the opposition of the Irish & Manx Governments to a deep under-sea repository. But radioactive wastes will continue to be created, and to need storage, treatment & disposal, and the Stewards' members will carry out the bulk of this work, which is centred on Sellafield. The deep underground repository on land is now the best practicable option, so long as retrievability of the emplaced waste is ensured. Longlands Farm is the presently favoured site, but everyone agrees that it still has to be proved that the geology is suitable. The RCF would be an essential part of that proving programme, and so must go ahead.

5B.60 The Stewards' support is not due mainly to the jobs which the RCF would provide, since their number would be small compared with the job losses at Sellafield & elsewhere, albeit well-paid long-term jobs with their greater economic multiplier effect are now at a premium. Satisfactory assurances have now been received from Nirex about a training programme for local people, and its Model Code for contract employers is also welcome. Whilst the Stewards do agree that the infrastructure in West Cumbria is chronically poor, it is not Nirex's responsibility to put this right, but the Government's. The construction of the DWR should supply some arguments & leverage for obtaining improvements, but that stage will not be reached unless the RCF is first allowed to go ahead.

5B.61 The Construction Workers also support the RCF, but for more direct economic reasons. Following the completion of the previous major building contracts at Sellafield, this Region now has the highest unemployment rate of construction workers in the UK, and one of the highest in the EU. Serious problems of poverty are appearing amongst this sector of the workforce which has done so much to help create the modern nuclear industry. The RCF project would bring very welcome re-employment to some, but there are 2,000 long-term construction jobs at stake in the provision of the DWR itself. The vast majority of Cumbrians know that the area's future rests with the nuclear industry, which has an excellent safety record, and they support the RCF. Minorities with greatly exaggerated fears about safety & property values should not be allowed to block this crucial opportunity to prove the suitability of the preferred site.

5B.62 There are also written representations in support of the RCF from local people for social & economic reasons. For example, M J Darvell [WR/D/99] claims that the case of the Parish Council is not properly representative of the village, because the Council does not behave in a truly consultative & open manner itself. Nirex would probably have provided more benefits for the village as a good neighbour, if it had not been criticised as acting out of base motives. The main tourist attraction in West Cumbria is the nuclear industry, and one of the main problems for both tourism & industry is poor communications. The RCF could well attract more tourists to the visitor centre [2B.3], plus businesses to service both the RCF & its workforce. Incoming workers & their families would also increase demand for house purchase, thereby sustaining the market & values.

5B.63 The Rt Hon Dr J Cunningham, MP for the constituency which includes the site, offers his qualified support for the RCF development. He has had the opportunity to study

the social & economic profile of the area in depth over many years, and is familiar with developments in the nuclear industry in his constituency and elsewhere in the UK & abroad. BNFL is a world leader, and Sellafield is to remain a large nuclear site of global significance. In his judgement, no practicable alternative has been put forward to spent fuel & waste re-processing & underground disposal. Continually expanding surface storage is not a credible long-term option, because of the safety & environmental management problems of coping with the massive sprawl of the Sellafield complex that would be entailed.

5B.64 The Sellafield area above all has to address the future of the nuclear industry squarely, and not try to shuffle off the problems. He considers that, on the scientific & technical side, Nirex is proceeding prudently, absorbing the lessons of best international practice & research. There is a reasonable case for exploring this site, subject to transparency & proper peer review, and on the understandings that the grant of permission for the RCF would not represent a commitment to the DWR nor rule out the options of monitoring & retrievability in any subsequent DWR.

5B.65 He considers that the largest economic problems faced by the Borough are long-term unemployment, over-dependence on BNFL, & large scale dereliction. There is no need for Nirex to exacerbate these problems, and indeed it has an opportunity to help alleviate them. For these reasons, he also supports the case put forward by Copeland for Nirex to enter into a planning agreement before receiving permission for the RCF. Following the precedents set by BNFL, the agreement should cover, amongst other things, the provision of training; guarantees of local recruitment & of supply contracts; and investment in the A595(T). These commitments should not await a decision to go ahead with the DWR, for they would merely be reasonable recompense to the Borough for already taking the strain of this national project. Moreover, in liaison with the local economic development agencies, Nirex should be dealing throughout the RCF development period with the local authorities' concerns about the property market, tourism & other economic impacts.

5B.66 Mr Dale Campbell-Savours, MP for the adjoining constituency, supported by Mr Tony Cunningham MEP [WR/C/180], believes that this RCF inquiry is the critical one for the future of the DWR project at Longlands Farm. This may be his only opportunity to influence the RCF & DWR inquiry decisions, for there may not be a Parliamentary debate on them. This DWR project is misconceived because it would irreparably harm the image of West Cumbria which local bodies & representatives have worked together for decades to defend. Although the negative image of Sellafield & Cumbria is unwarranted, it has been an uphill struggle to counteract it, and the DWR project would undermine this work, and make it very difficult to attract non-nuclear industry to West Cumbria.

5B.67 He is confident of this from his considerable personal experience. People who doubt the gravity of the concerns caused by Nirex's investigations should have seen the extraordinary lobbying in the House of Commons in 1986 by Government Ministers whose constituencies were affected then by the shallow repository site search, but who could not officially oppose the investigations. He thoroughly endorses the 1993 public perceptions report prepared for Cumbria [COR/401], especially the references to the dependency syndrome and fatalism. Personnel managers in West Cumbria are well aware of the difficulties of recruiting key personnel because of the negative image of Sellafield. The

general situation about closures is not as represented in Nirex's evidence. It is not the case that rumours circulate of closures occurring due to the negative image, and that they are then scotched when the managers responsible are contacted. What really happens is that managers publicly declare that the closure or re-location was due to some other reason, but tell people like him confidentially that it was indeed because of the image.

5B.68 Although the operations of BNFL are critically important to the future of the County, the future of Sellafield does not depend on the DWR being built in Cumbria. Another location would be found because nobody could afford to write off the billions of pounds invested in Sellafield. On the other hand, the future prospects of West Cumbria for social & economic development would be damaged by the reinforcement of the perception that the area can be regarded as a depository for everyone's radioactive waste. Government Ministers & other eminent figures have already floated suggestions that the DWR's functions could be expanded to take submarine reactor compartments or greater volumes of waste "substituted" under THORP's overseas re-processing contracts. This growing threat to the image & future diversity of Cumbria should be pre-empted by refusing permission for the RCF.

5B.69 The Irish Government points out that Nirex has paid no attention to the social & economic impact of the DWR project on the people of Ireland, notwithstanding the long history of concern expressed about the effects of operations at Sellafield on the eastern seaboard of that country. Similarly, the Isle of Man Government [WR/IOM/1] is firmly of the view that there is the potential for a detrimental effect on the Island's economy due to public perception of environmental harm, whether real or imaginary. This could damage tourism, fishing or inward investment. Nirex is trying to exploit the dependence of West Cumbria on the nuclear industry whilst overlooking both the potential harm to the Island and the benefits obtained from nuclear power by other parts of the UK with no involvement in the radioactive waste disposal problems. Patricia McKenna MEP considers that it is in any event fallacious to assume that a local population would support a DWR just because it supports other types of nuclear facility.

5B.70 FOE Cumbria similarly regard Nirex as confusing support with financial dependence. Nirex is misconstruing survey & poll information as showing little resistance to the presence of nuclear facilities, and glossing over some of the most crucial findings. For example, Cumbria's polling has found that about half of Cumbrian residents think that the nuclear industry is doing a bad job in disposing of its waste, and that Nirex specifically is not doing the best possible job [COR/411, executive summary at rear, 2nd bullet point]. Listening to Nirex's case, it is difficult to credit that there is now a 9% majority of the residents of Cumbria in favour of the County Council opposing Nirex's development [idem, last bullet point]. Moreover, Nirex has not dwelt on the findings of its own 1994 survey of attitudes towards the storage/disposal of radioactive waste [CFE/1/1]. Only 34% of residents aware of Nirex's proposals consider that the RCF should be built [idem, last bullet point, 1st page]. The survey puts this low level of support down to "misconceptions", but 32% still oppose the RCF when the misconceptions are dispelled [idem, top of 2nd page].

5B.71 The alleged misconceptions are that the RCF would be more than an underground research facility, but Nirex now concedes that parts of the RCF could become parts of the DWR development. Also the various survey reports contain plentiful evidence of blight which is inconsistent with Nirex's conclusions. Even 30% of the residents of Copeland who

work in the nuclear industry are concerned about the RCF project [COR/407, p.xv, Graph for Q.13a]. Of 12 local firms interviewed by Nirex's consultants, a majority actually expressed concerns in various ways [COR/402, eg paras.3.39 & 3.42-4]. All the development agencies interviewed were concerned about reinforcement of the area's negative image [idem, paras.4.44-53].

5B.72 There were some similar findings in the interim version of the research report produced for The West Cumbria Development Fund [COR/405] which are not apparent in the final version [COR/406]; and FOE Cumbria are still not satisfied with the consultants' explanation [COR/406A], especially bearing in mind that the consultants do other work in association with the nuclear industry [CFE/1/3, penultimate page, central item]. Much of the focus for such inter-relationships seems to be The Westlakes Park. EU funds intended to promote diversification are actually being devoted there to activities associated with the nuclear industry [CFE/1/4].

5B.73 Moreover, people familiar with West Cumbria are well aware of the industry's blighting effect. Tourism expenditure & tourist-related employment are lowest in Copeland of all Cumbrian districts [COR/408, Table 1]: as at 1992, Copeland had the most adverse past turnover trends [idem, p.64, Table 5.2]. Recruitment letters sent out by the West Cumbria Health Authority have been known to try to reassure people about radiation levels. Fish cannot be sold in the North East if they are disclosed to have been landed in West Cumbria. A local dairy moved to the South of Scotland when it discovered that its rivals were informing customers that its milk might be tainted by radiation. A school's exchange scheme with another in Germany was ended by German parents anxious about the health of their children when visiting West Cumbria. There can be little doubt that the nuclear industry already has a damaging effect on the economic well-being of the area, and that the RCF & DWR would increase this effect, a view shared by eg WRs/NTR/1, NCH/1, & S/235-6.

5B.74 CORE regard the Construction Workers' view on the nuclear industry's safety record as untenable. The industry & its regulators now accept with hindsight that former safety standards for both workers & public were too low. There are several current controversies about the long-term health effects of radiation on workers, their families & residents, which all contribute to the negative image: & see eg WRs/A/81, B/244, D/69 & 104, & O/32.

5B.75 Moreover the supporting workers & others are misunderstanding the real nature & extravagance of the DWR venture. Its location at Sellafield was effectively determined when the decision was made to go ahead with THORP. The current cost estimates [NRX/12/16, 1st column in each sub-table] are far too low, with a more realistic estimate by conventional accounting methods of more than £5 billions capitalization by the time the DWR is open for emplacement, comprising around £2 billions direct costs & the remainder interest & inflation [idem]. The latest design concept [5A.3] would be far too large for the present inventory [6A.4]; and the only way in which it could become an economic proposition would be to take in both ILW from elsewhere at open market prices and HLW.

5B.76 SCC submit that the RCF cannot possibly be justified on the grounds of benefits to the nuclear industry, its employees or recipients of Nirex's largesse. The potential hazards to future generations resulting from the project's attenuated timescale & premature commitment to an unsuitable location would be far more important than these benefits.

5B.77 **Mr J R Catlin** worked in the nuclear industry for 30 years, finally as Head of Engineering R & D at BNFL, and is now a local farmer. He wishes the industry future success but not at the expense of the well-being of local people. In his view, it is clearly untrue that West Cumbria has felt few ill effects from the nuclear industry, which has thrown an alien shroud over the area. For example, a well publicised incident led to the closure of a thriving school at Seascale, and seriously affected others in the area. Local farmers like himself are acutely aware of a negative image of West Cumbria. This would inevitably be exacerbated by the decision to locate here the largest DWR in the world, with particularly severe effects on farming & tourism. When combined in the long term with the Government's intended entombment of Sellafield (in contrast to the clearance of nuclear power station sites), the effects would be devastating.

5B.78 **Patricia England** is a voluntary community project co-ordinator, with experience of living within 2.5 km of 4 nuclear reactors at Heysham. She considers that Nirex's real view of the benefits of the current project is that it would avoid further costs which would be incurred by Nirex & its shareholders in spending more time & resources on investigating other locations with more scientific promise. Risk is primarily a matter of perception by involved parties. Nirex needs to address the psychological pressures which inevitably accompany the potential risk of living with a static hazard, by establishing a working relationship with the impacted communities which so manages the nuclear technology as to improve their quality of life.

5B.79 **Councillor D W T Gray**, the Borough Ward Councillor for Gosforth, follows this up by referring to the policies of Canada [GRY/1/5], France, Spain, Switzerland [GRY/1/3] & the USA to compensate local communities in advance for the stigma of receiving controversial development. The RCF as a site confirmation exercise is not a laboratory as generally understood internationally, despite being described as such when announced in 1991 [GRY/1/6, 2nd doc.]. Consequently the DWR project is already at the stage where the first level of compensation would be paid according to good international practice [GRY/1/7]. It is demeaning, & accentuates the stigma, to be told that it is not the UK practice to pay compensation. Also, public concern about the ambiguities of the highly technical aspects of the case for the development is heightened by the proponents not being local people, and thus being perceived as lacking a personal commitment to the area. Nirex (as opposed to BNFL) has not yet even set up the local subsidiary company promised in 1991 [GRY/1/6, 1st doc.].

5B.80 **Mrs Anne Lowery** & her family have occupied Newton Manor Lodge near the northern tip of the PRZ [2B.7] since 1986, and bought it from BNFL in 1989. BNFL drove a hard bargain and gave no inkling of plans to develop a DWR immediately behind their home. Nirex has paid no attention in any of its preparations to the effects of its project on her family and the 2 other independent families who live around the edges of the PRZ (Robinsons at Newton Manor Cottage & Steels at Low Lingbank - for details of the BNFL domestic properties within the PRZ see GRY/1/7, pp.42-3). No concern has been displayed over their legitimate anxieties over the RCF development about eg explosives storage, noise & traffic and potential blight. Nirex has actually paid more attention to the off-site effects on badgers & toads [Ca.5E] than human beings.

5B.81 **Ms J M Skinner** is a modern historian by profession who lives at Lancaster, and therefore close to Heysham & Springfields. Historians are more aware than most that the

history of the nuclear industry is very short, and includes a catalogue of errors, including mistakes still being made by BNFL & Nirex about the properties of plutonium. If the RCF were to go ahead, the people of West Cumbria & environs would be subjected to long-term psychological trauma because a development entailing significant potential risk would be imposed on them. The RCF would not provide much local work, but reinforce the dependency culture and undermine property values & tourism. In connection with the latter, a street survey in Blackpool on 16 September 1995 revealed, amongst other things, that 63.5% of the sample of 138 would visit Cumbria less frequently if the DWR were built at Sellafield.

5B.11 5B.82 My conclusions on the socio-economic impact can start with an uncontroversial
5B.12 point. There would be some employment benefits from carrying out the RCF development,
5B.32 including indirect & induced employment and other consequential additions to economic
5B.60 activity. However, only an average of just under 100 direct jobs is predicted, and a
5B.33 significant number of those would not be for local people, notwithstanding special
5B.52-3 arrangements for recruitment & training. Such benefits would be relatively modest in the
context of West Cumbria's overall employment trends. By way of comparison only, they
would seemingly be less than those from the series of interim radioactive waste stores to be
built at Sellafield. But I do believe that the fairly small numbers involved in the RCF could
bring some more business to Gosforth village as the local service centre without competing
detrimentally with the tourist trade.

5B.5 5B.83 This balance might well not hold for Gosforth if the construction & operation of the
5B.61 DWR were to follow on from the RCF as Nirex hopes. The employment & related benefits
3A.12 of the DWR for the wider area would nevertheless be on a significantly higher scale. Even
5B.75 though Nirex has not sought to re-calculate the DWR benefits, as opposed to the DWR costs,
for this inquiry, my view is that those benefits should be taken into account because they
would be contingent, indirect effects of the RCF. However, I also consider that the RCF
application stage is an appropriate juncture at which to review the dependency of the West
Cumbrian economy on the nuclear industry.

5B.14 5B.84 Nirex is arguing on the one hand that the nuclear industry sustains that economy and
5B.24 will remain the dominant employer, and on the other hand that the economy is not too
NRX/10/4, dependent on the industry. But the Windscale (THORP) Inquiry Inspector's conclusion in
p.76 the passage cited by Nirex was not, in my view, that BNFL's dominance would remain
satisfactory. Rather it was that there was no evidence that less dominant yet equally stable
employers would provide a similar number of permanent jobs if THORP was refused
permission. He expressly stated that there might have been force in the over-dependency
argument if there were such evidence.

5B.31 5B.85 The local economic situation is still similar in some respects to that in 1978 considered
5B.41 at the Windscale Inquiry. The nuclear-related project under consideration would bring some
employment benefits but they would only amount to some alleviation of the unemployment
problem. There is no evidence of large-scale provision of new jobs by other stable
employers. There is still a worryingly high dependency on the nuclear industry. On the
other hand, it does seem to be clear now that other employers are continuing to close down
or re-locate despite the development of THORP. There has also been the 1993 appraisal for

5B.28 Cumbria of public perception & the nuclear industry. I agree with its authors that this sheds
COR/401, new light on the situation, largely because focus groups can give a perspective to people's
pp.1-2 deep feelings different from that of opinion polls.

5B.65 5B.86 The appraisal identifies a sense of dependency which is founded substantially on a
5B.68 fatalism about the nuclear industry's dominant economic role & the lack of alternatives. I
5B.63 am also very impressed by the shared belief of the 2 experienced & committed local MPs that
5B.66 West Cumbria is over-dependent on the nuclear industry. The fact that their overall
2A.10 approaches towards the RCF project differ actually strengthens for me the importance which
they attach to this point. I consider that it is now palpably obvious that the West Cumbrian
economy is too dependent on the nuclear industry. It follows that any event which
significantly consolidates the nuclear industry further would be an economic detriment in this
sense. The establishment of the DWR at Sellafield would be such an event, particularly
because the ultimately crucial factor in concentrating solely on the appeal site has been its
proximity to the existing Sellafield Works.

5B.16 5B.87 In other words, the nuclear industry has chosen to establish the DWR at Sellafield,
if it can, because it does wish to bring radioactive waste management & disposal activities
together here, yet this would not be in the interests of the long-term economic health of West
Cumbria, in my judgement. I do appreciate from the evidence put to the inquiry that many
people in the area support the industry in its aim, but I am driven to the conclusion that if
they persist in this they run a real risk of their long term prosperity being subordinated to the
demands of a single industry. That would be the logical consequence of sustained over-
dependence. This adverse effect has to be set off against the employment & related benefits
of the DWR.

5B.17 5B.88 Whilst it might be thought that this line of reasoning has moved some way from
assessing the effects of the RCF, the fact is that Nirex itself has led evidence about the impact
of the nuclear industry and of individual nuclear facilities. This is an implicit contradiction
of its legal submissions that the RCF must be kept separate from the DWR [3A.11-15], and
reinforces my conclusions that they are connected as matters of fact & law [3A.18-24].

5B.17 5B.89 Another basic difficulty with Nirex's case on this topic is its considerable reliance on
its definition of blight. Whilst I would not necessarily quarrel with the definition as such,
the implication that the definition covers all the relevant circumstances of potential impact on
people and their property is incorrect, in my view. For I am firmly of the opinion that a
5B.34 genuine apprehension affecting the quality of life can be a material planning consideration,
albeit that I am aware of current litigation in the Court of Appeal concerning the similar issue
of fear of crime. To adopt the words in one of Nirex's reports, a person who perceives the
risk associated with the DWR to be high may experience less enjoyment from occupation of
their property [COR/409, p.3, para.1.10]. In the case of a resident, this would be an injury
to residential amenity, and a land-use consequence of a perception of risk.

5B.90 So long as there is some substance to it, a resident's apprehension of risk does not
have to be scientifically or statistically accurate before it can be material. It is of course
necessary to distinguish such situations from sheer prejudice or simple opposition, but the
basic question is not whether financial or other loss would be experienced but instead whether
amenities & worthwhile existing uses would be affected, albeit financial loss could be strong

evidence of disamenity. Good neighbourliness & fairness are also amongst the yardsticks against which development proposals can be measured (PPG1, para.40).

5B.8-10 5B.91 The evidence to the inquiry on this pertinent point of public perception is
CFE/1/1 unfortunately a striking example of voluminous but fragmented representations, in my
CORJ/411 judgement. For example, Nirex Cumbria & Copeland commissioned separate opinion polls
CORJ/407 which included perceptions of the RCF, whereas I believe that more meaningful information
5B.16 could have been obtained by pooling resources in a single, independent & penetrating
5B.71-2 survey. The various surveys into impact on tourism & other businesses also suffer from a
number of difficulties, including both sample sizes and inferences drawn by the surveyors,
often capped by selective quotations by parties to the inquiry.

5B.30 5B.92 However, the simple basic test in the case of residents, of a genuine public perception
5B.35-6 leading to an injury to amenity, enables my conclusions to start from earlier principles. It
5B.55 is clear from the criteria used by Nirex in its site selection exercise, and from its public
5B.5 statements about that exercise, that Nirex then accepted that its quest for a site for a
6B.46 radioactive waste repository would arouse considerable public apprehension at any location
which it started to evaluate. Nirex has not withdrawn its vindications of those criteria, and
yet it tends to deny that the phenomenon would occur significantly at this, its favoured
location. In my view, it needs to bring forward a very cogent explanation for such an
apparent inconsistency.

5B.16 5B.93 Looking at the burden of both the systematic & anecdotal evidence submitted on this
5B.37 point, my judgement is that there is generally a lower incidence of apprehension in West
5B.67 Cumbria than the overall site selection approach seemed to predicate. This may well be due
5B.70 to what Nirex described as a measure of support and Cumbria & others describe as the
dependency syndrome, but it ought nevertheless to be taken as the genuine level, in my
view. Although appreciation of dependency illuminates social understanding, it carries weight
in the economic arguments rather than the social ones. On the other hand, I am equally clear
that the degree of apprehension is substantial & significant, and that it is considerable even
amongst people associated with the nuclear industry. Since land-use planning is not
concerned with simple volumes of opposition or support, the fact that the apprehensive people
may be in a minority goes only to the relative weight to be attached to their fears, in my
view, once it is clear that the minority is not insignificant. In this case, there is evidence that
a moderate number of residents would have their amenity affected. In some ways, the
5B.80 reaction of the occupants of Newton Manor Lodge to the perceived lack of neighbourliness
typifies this effect.

CFE/1/1 5B.94 Primarily from scrutinising the responses to particular opinion poll questions about the
CORJ/411 RCF, it seems to me that the apprehensions about the RCF are normally indirect
CORJ/407 apprehensions about the DWR. Despite noting the distinctions between prompted &
unprompted questions, and between questions coupling the RCF & DWR and others dealing
with them separately, I infer that the underlying fears are mainly about health & safety in
relation to radioactive waste. However, I have already concluded that such indirect effects
should be taken into account at this stage [3A.21-3]. Also, whilst I agree with Nirex that an
5B.40 appreciable degree of difference can be seen between the intended behaviour of residents
faced with the prospect of the project and their less negative actual behaviour after the event,

the present situation is of course still at the heightened negativity stage of anticipating the main part of the project.

5B.8-10 5B.95 Turning to the impact on tourism & other businesses, I consider the bulk of the evidence to be either generalised or based on unreliably small samples. Moreover, I am unsure about the realism of distinguishing between poor communications, remoteness, and deterrence by the nuclear industry, as separate factors discouraging trips to, or investment in, 5B.19-20 West Cumbria. There is virtual unanimity that transport communications with the remainder NRX/10/10 of the UK are poor, and to my mind that must be a powerful contributor to the sense of remoteness. However, the wartime location of the nuclear complex and its subsequent NRX/10/4, civilian growth were surely due in large part to the relative remoteness of the location. para.2.24 Hence to my mind the factors of poor communications/remoteness and nuclear presence feed off & reinforce each other.

NRX/10/10 5B.96 My overall impression of the uneven survey evidence about what are mainly external perceptions of West Cumbria is that they are fairly similar in some ways to internal perceptions. Many outsiders seem hardly to think about West Cumbria at all, apparently 5B.23 because of its relative remoteness. When prompted or focused upon, a significant number 5B.39 refer to some negative image of the nuclear industry, but it can by no means be pinned down 5B.73 as an overwhelming liability to the area. On the other hand, the clear views of the Manx & 5B.69 Irish Governments from across the Irish Sea, of the negative perceptions associated with the industry and their likely accentuation by the DWR, are persuasive arguments of some adverse 5B.15 effect on tourism & other businesses, including fishing. Also I believe that reflecting on what 5B.41 businesses have done, as distinct from what they say they have been doing, suggests quite 5B.31 strongly to me that there is a special deterrent factor at work. The position of agriculture is 5B.77 more problematic, but it is also quite possible that West Cumbria is at a disadvantage in the current EU re-structuring of this industry.

4A.50-2 5B.97 In short on this topic, there would be modest employment & related benefits from the RCF, and much more significant ones from the DWR if it went ahead; but, particularly in case of the latter, these benefits have to be balanced against the detriment to the area's prosperity in being indefinitely subordinated to the demands of a single industry. Moreover, there would be a social detriment, in that the amenity of a significant number of local residents would be injured by genuine apprehensions about the project, mainly relating to health & safety. Similarly, there could be noteworthy effects on tourism, fisheries & inward investment in business, plus possibly agriculture. These various benefits & detriments should be carried forward to the final balancing exercise under SP Policy 54(i), but in the meantime there would seem to be some deleterious long term effects on the Borough's economic resources, contrary to emerging LP Policy DEV 4 [2C.28].

5B.26 5B.98 Since Nirex has not offered any condition or obligation to meet or mitigate significant socio-economic objections, it would be inappropriate for me to comment in detail on the suggestions of other parties. There is also the point that emerging LP Policy IMP 1 applies to costs or effects arising directly from the development concerned, whereas I have found that most of the effects would be indirect ones. Nevertheless it seems to me that potential obligations must at least be briefly considered as mitigation measures, although the transportation suggestions are postponed to the next Chapter.

5B.96 5B.99 Local confidence in the RCF venture's integration into the West Cumbrian economy
could have been improved, in my judgement, by the setting up of the promised local
5B.79 subsidiary, and perhaps seeking to incorporate it jointly with Copeland. The most realistic
5B.15 way to help the economy to diversify must be, to my mind, to continue to encourage
5B.47 currently nuclear-related businesses to adapt their expertise laterally into non-nuclear
5B.72 applications, notwithstanding the views of some of the other parties. There could have been
a commitment by now for such a joint venture to do this in a phased manner, geared to the
progressive success of the RCF/DWR project. The informal practice of subsidising public
5B.6 services & facilities in the Parish might also have been formalised into a trust fund with a
5B.57 regular income; and with objects which include the support of services & facilities utilised
by workers at the venture & their relatives & associates, and the relief of residents of
properties certified to be blighted by the venture. Measures such as these could in my
judgement have considerably mitigated the social & economic effects of the RCF.

5C. TRAFFIC IMPACT

5C.1 The preferred conceptual DWR design publicised in December 1991 [COR/206] was prepared as a result of the local community raising, amongst others, the issue of the routing of transport links to the DWR headworks area, both during construction and during the operational phase [idem, p.3]. Considerable support had been expressed for the view that DWR entry & exit should be via a point on or close to the existing Sellafield Works, rather than from the east. This last point was amplified in the more detailed progress report [SPD/1/1] as meaning a new link from the A595 [idem, p.4, top of r/h column]. The consequentially preferred design concentrated on construction & operational access to the PRZ from Sellafield. It included 2 ventilation/emergency access shafts above the vaults within a surface site of about 4 ha [idem, p.6], with little need following construction for above-ground access. As no manned operations would be involved, appropriate road access could be provided from the Sellafield direction. This concept was still being publicised by Nirex in 1994 [SPD/1/5, p.47].

5C.2 At the Nirex Liaison Group on 7 January 1992 it was confirmed that road & workforce access would be via the Sellafield Works [CCC/1/2, p.132, para.3]. However, by April-May 1992 an access from the A595 to the ventilation shaft area was being discussed [idem, p.103], together with an informal Cumbria scheme for the improvement of the road between Gosforth and Calder Bridge to a 7.3 m wide carriageway plus metre strips [idem, pp.104 & 108]. At a meeting on 12 June, pedestrian traffic along the road was discussed, at Copeland's instigation [idem, p.99]. On 23 November, the Department of Transport, in discussing the RCF & its Boreholes, stated its general preference not to have a new development's access directly onto a trunk road for safety reasons, but acknowledged that the A595 is not a typical trunk road, and that the use of Sides Lane would be reduced & the existing farm access closed [idem, p.80].

5C.3 In the event, the Department did not object, and the present access to the appeal site [2B.7] was permitted & constructed in 1993 as part of the RCF/RCM Boreholes development [COR/201, p.229]. Copeland, supported by Gosforth, recommended that permission should not be granted until a requirement was met to improve substantially the stretch of the A595(T) between Calder Bridge and Gosforth [idem, p.237, para.2.a) & p.238]. Nirex had confirmed that, looking ahead, it would be ready to give sympathetic consideration to a significant contribution to the costs of a cost-effective package of improvements to this stretch of road [idem, p.278]. This package & its timing would be for the Department of Transport to consider, in consultation with the local authorities & communities. But Nirex did not accept that its operations at Longlands Farm would add unacceptably to the traffic using this stretch [idem, p.277, para.2(iii)]: and the County Planning Officer advised the Planning Sub Committee that Copeland's suggestion went beyond Structure Plan policy and the advice in Circular 16/91; could be misconstrued as looking for an unrelated community benefit; and had an unrealistic timescale [idem, p.249].

5C.4 A former County Councillor, also supported by Gosforth, suggested alternative access arrangements [idem, p.285, item 13]. This concept [idem, p.293] was for a Sellafield Works by-pass along the eastern edge of the Works, linking the C4013 in the north to the U4465 in the south [2B.2], and with a spur eastwards to Longlands Farm, to link the Farm with the

Works and the railhead. Although the Planning Officer reported this suggestion also to the Sub Committee, he made no specific written comment on it, as opposed to Copeland's suggestion.

5C.5 However, Condition 5 of the RCF/RCM Boreholes permission requires that upon completion of that development [5A.4], the access shall be restored to provide an agricultural access to serve Longlands Farm only [idem, p.229]. The present application describes the access as an existing one which would be unaltered, to become the access point to the Surface Site [COR/102, pp.2 & 37]. The latest restoration scheme includes the retention of the first length of the access from the trunk road as the access to Longlands Farm [COR/113, Scheme H, Section 5.1, last para. & drawing no.008046A]. Therefore the amended RCF proposals include in effect the permanent retention of the present temporary access point.

5C.6 The ES contains an assessment of traffic effects as at the time of the planning application [COR/101, Ca.4]. The HGV flow estimates allow for the removal of 15,000 t of excavated BVG [2B.14] for off-site testing [idem, para.3.4.43 & Table 3.4.8]. The RCF/RCM/PRZ Boreholes traffic [2B.6] has also been taken into account [idem, paras.3.4.46-7]. The conclusions are that, although the increases in traffic would be material in terms of PPG 13, Annex B, para.4, there would be no significant effects on the A595(T) or other roads, on road safety, or on the use of the trunk road by pedestrians & cyclists [idem, paras.3.4.69-75].

5C.7 However, there have been a number of changes in the RCF proposals since preparation of the ES which have affected the traffic analysis. The amendments to the design, construction methods (adding some necessity for abnormal loads), programme and timetable, and consequential changes to the fluctuations in the size & nature of the workforce, have required fresh calculations [NRX/9/14, Tables 5.1-5 & 6.1]. The option to dig the shafts as far down as 935 m bOD [2B.12] has also been taken into account (the "Variant Case"). There is now also a programme to bore 4 Saline Interface Boreholes - BHs 15-18 - between the trunk road and the coast [NRX/14/12, Table 6.3], which would generate some traffic [NRX/9/14, Table 5.6]. The opportunity has been taken to utilise more recent traffic flow & accident data.

5C.8 **Nirex** has concluded that the use of rail in the development of the RCF would not be viable. It would be difficult to engineer a spur from the Cumbrian Coast Line near the Sellafield Works across the intervening topography to the PRZ. Also, with the excavated spoil remaining on site, there would be a variable mix of material flows, with a peak of short duration [NRX/9/14, Table 5.3]. Thus there would be no conflict with SP Policies 9 [2C.6] & 70 [2C.17] and LP Policy TSP 13 [2C.32]. Also there would be environmental, operational & logistical problems in constructing a new road access to Longlands Farm from Sellafield [idem, Table 7.1, Sheet 1].

5C.9 Moreover, such a road access is not needed, in Nirex's judgement, because the practical capacity of the A595(T) [2B.2] would be more than adequate to cater for the traffic likely to be generated by the development. The traffic would not necessitate the improvement of the length of the trunk road between Gosforth and the Nursery Road junction north-west of Calder Bridge [idem, Fig.4.1] sought by Copeland, namely to a 7.3 m wide carriageway

plus footway & cycleway. As Copeland concedes, the trunk road's recorded injury accident record [idem, Table 4.5 & Figs.4.14 & 15] does not warrant such an improvement. There is no objection to the RCF proposals by the Highways Agency as the trunk road highway authority or by Cumbria as local highway authority [idem, Table 7.1, Sheet 2], nor by the police.

5C.10 A realistic assessment of the practical link capacity of the A595(T) between Gosforth and Nursery Road based on the Department of Transport's Standard TD 20/85 [GOV/117] is approximately 12,000 vehicles per day (vpd). This assessment starts with the Standard's figure of a 13,000 Annual Average Daily Traffic (AADT) flow capacity for a new road link of this type, and then allows a reduction for poor alignment, variable width & limited junction design. Copeland seems to accept this assessment, and certainly has not put forward an alternative figure.

5C.11 Nirex has combined the predicted RCF traffic with the predicted traffic generated by the RCF/RCM/PRZ Boreholes, and also allowed for the effects of the BHs 15-18 traffic on the local network. The overall traffic generated by the Longlands Farm developments would be, on monthly maxima, of the order of 550 vpd 2-way for the first 4 years and 300 vpd thereafter, usually with relatively low HGV flows & proportions [NRX/9/14, Fig.5.2]. It has assumed a split of the generated traffic of 100% HGVs & 80% LGVs & cars to the north-west of the site entrance and 20% LGVs & cars to the south-east. Also it has taken the estimated generation in the busiest month of the year and added it to the highest monthly flow on the road (July). These are all worst-case assumptions, and have been multiplied by the National Road Traffic Forecast's (NRTF) low growth rate.

5C.12 The low rate is another conservative assumption in this case, for the flows on the road have actually been declining in recent years [idem, Table 4.1], probably related to the reduction in employment at the Sellafield Works [idem, Table 4.2]. Putting all the assumptions together as a worst case scenario, total flows on the road would not reach its assessed capacity during the life of the RCF [idem, Fig.6.1]. Even with NRTF high growth the assessed capacity would not be reached [NRX/9/13A]. The total project-generated flow would be of the same order as the recent reductions in flow at Calder Bridge & south of Gosforth; and would be within the growth range predicted by the NRTF over the period of the development. Representations of objection on traffic grounds [idem, Table 7.2] have taken little cognisance of this point or of the fact that the development would be temporary.

5C.13 Although Copeland claims that the capacity would be exceeded by the year 2009, the basis for this claim is a faulty 1994 AADT figure for the trunk road south of Calder Bridge traffic signals [idem, Fig.4.9]. The faulty figure of 8,900 is a conversion by Cumbria of an agreed 12 hour flow by a general county-wide factor rather than the more accurate site-specific factor derived from Nirex's observations [NRX/9/13, Section 5], which suggests a no-change-from-1993 figure of 8,300. Even then, a base figure of 8,900 would result in a flow of less than 12,000 on the NRTF low growth rate. Moreover, the stretch of road where the counts are taken has a higher practical capacity than the rural stretches further south-east [idem, para.6.3].

5C.14 Turning to junction capacity on the route north-westwards from the site, Nirex's OSCADY analysis of the Calder Bridge junction with the C4013 coming up north-eastwards

from the Sellafield Works [NRX/9/14, Figs.4.1 & 4.3] shows that the junction has the capacity, if necessary by automatic adjustment of the signals, to accommodate the flow generated by the appeal development in the peak years. Moving on to the next major junction at the Blackbeck Roundabout [idem, Fig.4.2], the peak hour there [idem, Fig.4.8] is 0700 to 0800 hours. After the RCF Phase 1 construction works, the RCF traffic is predicted to add only about 30 cars to the flow there in the peak hour. Nirex considers this addition to be insignificant, but if there is concern, Nirex could undertake to ensure that the RCF shift patterns do not coincide with those of BNFL.

5C.15 So far as the safety of the junction at the site entrance is concerned, the junction provides facilities to current design & safety standards [idem, Figs.4.4 & 4.5]. The major road has been re-aligned through the junction; there is good visibility for turning traffic; and a south-east-bound right-turn lane has been provided. A PICADY analysis shows that the junction has ample capacity, with the right-turn lane able to accommodate the highly improbable event of a queue of 3 HGVs. There is also capacity for waiting off the road at the approach to the security gate. If the access point were nevertheless blocked by an accident or incident, there would be emergency access via Sides Lane [2B.7].

5C.16 The incidence of pedestrian & cyclist traffic on the A595(T) is low [NRX/9/14, Table 4.4], with the emerging dedicated cycle routes being aligned more to the south-west around the Sellafield Works [idem, Fig.4.13]. The relatively small increase in traffic from the appeal development would have an insignificant effect on pedestrian & cycle use of the trunk road. Trunk roads are not designed for pedestrian usage. Nor is there evidence of suppressed demand, or to show that the appeal development would give rise to such an additional demand from the site to Calder Bridge as to justify refusal in the absence of highway improvements for pedestrians & cyclists. On the Surface Site itself, facilities for cyclists would be provided as warranted by demand.

5C.17 Hence the needs of pedestrians & cyclists would be taken into account in compliance with LP Policy TSP 7 [2C.31]. Moreover, the development would have overall a satisfactory standard of access to the A595(T), which in turn would be an appropriate standard of road, in conformity with LP TSP 5 & 6 and SP 36 [2C.13]. This sufficiency of the transport infrastructure of course means that no improvements can be required at Nirex's expense under SP 36 or LP IMP 1 [2C.29]. The traffic generation must obviously be acceptable under the key LP Policy ENV 33.4 [2C.27 & 4B.4].

5C.18 Hence, despite the eminence & number of those submitting that Nirex must offer a planning obligation for improvements to the A595(T) [eg 5B.63-80], there is no case for doing so. This is not surprising because there is no scheme for the improvement of this length of the trunk road in the development plan [2C.17 & 32]. Copeland in particular has effectively acknowledged the weakness of its arguments by confirming that it is not asking for the imposition of a condition that the development shall not begin until road improvements have been carried out.

5C.19 **Cumbria** acknowledges that the RCF project would be of insufficient size to make a rail link practicable. It confirms its opposition to a service road from Sellafield because of the adverse visual impact. There is sufficient highway capacity to cope with the proposed

development. It would be desirable to arrange the RCF working shifts so as not to exacerbate peak hour conditions at the Calder Bridge & Blackbeck junctions, but the overall level of traffic anticipated would be acceptable. Nevertheless, the periods of heaviest HGV use in connection with the development would affect the amenities of the area due to the poor alignments & variable widths of the trunk road. If permission is granted, Nirex should draw up a code of good practice for HGV drivers to minimise congestion & environmental impact. On the other hand, pedestrian & cycling use of the trunk road is low, and the effect of the additional traffic would not be so significant as to necessitate road widening or the provision of footways.

5C.20 **Copeland** points out that, although the traffic figures have been revised, Nirex concedes that the combined RCF & BHs' development-generated traffic would for the first 5 years represent an increase of about 7% over the A595(T) traffic in the vicinity of the appeal site, and so would be material in terms of PPG 13. Copeland's approach towards restricting development alongside the trunk road until essential improvements have been carried out accords with paras.6.3-6 of the PPG. The strategic role of trunk roads is to carry long distance traffic. The addition of significant local traffic movements prejudices this role. Also direct access onto primary routes is to be avoided as far as practicable; and it may be appropriate to require major road improvements if the type of road warrants it.

5C.21 This national policy background obviously makes the RCF project's traffic volumes significant for the purposes of LP TSP 6. When the project's traffic reaches a peak after the first year, nearly a quarter of it would be HGVs [NRX/9/14, Table 5.7]. This would be the largest development project served by the entire length of the trunk road from Egremont to Millom. Copeland does not accept a 13 year development period as temporary, a description which it would confine to durations of no more than 3 years or so. Yet the A595(T) is not an appropriate standard of road within the meaning of the LP Policy.

5C.22 The physical character of the length of the trunk road south-eastwards from the Nursery Road junction (north-west of which it has been improved) to Gosforth is not generally in dispute. It is sinuous & undulating, often with a carriageway considerably less than 7.3 m wide, and also often with no or only one footway and narrow verges. The stretch from Calder Bridge to Gosforth has characteristic alignments; carriageway widths almost always less than 7.3 m, and as narrow as 5.6 m just south of the hamlet of New Mill; and generally narrow verges or edge strips, with just one short stretch of footway at New Mill. Nirex accepts that the TD 20/85 Standard is for a main carriageway width of at least 7.3 m, plus 1 m strips on either side, making a total carriageway width of 9.3 m. Plainly this length of the trunk road is seriously sub-standard.

5C.23 The practical link capacity estimated by Nirex must have several limitations. The A595(T) is in reality an all-purpose road, so that flows are sometimes slowed by a range of vehicles, from agricultural ones to pedal cycles. Flows are also held up by passage through the village of Calder Bridge, where the frontages are built up & slow speeds are needed to avoid hazards; and by the Calder Bridge traffic lights & Blackbeck Roundabout themselves. Then Nirex is under-estimating the AADT also. There must be very little difference between the flows past the appeal site and those at the count point in Calder Bridge. Yet the 1994 base figure for Calder Bridge should be taken as 8,900, since Nirex concedes that the easing

of traffic conditions is only a temporary phenomenon. Then the counts south of Gosforth show that the peak month is shifting from July [5C.6] to August [NRX/9/14, Table 4.1]. This necessitates an uprating, at the 1994 difference between the months of about 16%, of the 8,900 to a peak flow of about 10,325 vpd.

5C.24 Projecting this peak flow at the NRTF low growth rate, the practical capacity estimated by Nirex would be exceeded by the year 2003, and at the high growth rate by the year 2000. Even if there were some flexibility in the capacity estimate, by the last year of the development the estimate would be exceeded by 1,000 to 3,000 vpd. This is a clear case of the road which constitutes the main transport infrastructure for the area not being up to an appropriate standard, and in need of improvement. The RCF's traffic would make a significant contribution to the excess, a view shared by Dr M Burns [WR/B/176]. In the absence of any improvement scheme or undertaking by Nirex to improve the road, there are substantial traffic reasons for refusal due to the conflict with LP TSP 6, IMP 1 & ENV 33.4.

5C.25 Gosforth considers that Nirex is failing to deal with issues raised in previous years which must now be resolved. These include the nature of the link between Sellafield Works and the PRZ. The preferred DWR design option includes an access road from Sellafield notwithstanding current visual objections, and yet Nirex has confirmed that it has not contemplated building it now, even as an emergency access. Further thought must be given to this question, because it is not being appreciated that there is no alternative to the A595(T) as a public road between Calder Bridge and Gosforth. The theoretical detour via public roads is about 210 km (130 miles) long through the Lake District. The realistic detour is along BNFL's private roads.

5C.26 Nirex can make extravagant provision at the RCF site for very large car parks [COR/102B/008009B] & other facilities, but is unwilling to commit itself to help sustain vital local air services; guarantee the retention of a railhead at Sellafield; and either link the site by road to Sellafield's infrastructure or contribute towards improving the seriously sub-standard trunk road. The Highways Agency is taking a similarly negative approach on the last point, despite agreeing that there are narrow bends & some hidden entrances, with no provision for pedestrians [GPC/6, pp.5-6]. The Agency does suggest that the Parish Council could negotiate for a strip of land for a footpath outside the highway boundary, but the appeal site frontage does not extend to Gosforth, and a single footway would be better on the north-eastern side of the carriageway, to serve the Red Admiral Hotel, Boonwood & Sally Hill.

5C.27 Gosforth is aware of regular pedestrian & cyclist use of this stretch of road, but usage is low due to the hazards & intimidation of going along an unlit, winding & narrow trunk route, as the Inspector will have appreciated on his inspection. A previous letter from the Department of Transport did specifically acknowledge the poor standard of the road [GPC/6A, p.S15] & the hazards to pedestrians [idem, p.S16], but it claimed that there was no evidence of demand. The actual experience at Holmrook, the next village to the south-east down the trunk road [5A.55], is that when an extra length of footway is provided beside the road, pedestrian flows increase several-fold.

5C.28 The Department also claimed in March 1993 that the accident rate over the majority of the length of the road between Calder Bridge and Gosforth was slightly less than the

national average of 0.39 personal injury accidents per million vehicle kilometres (PIA/mvkm) for this type of road [idem, p.S15]. But Nirex has acknowledged that the proper average for comparison is the 0.28 PIA/mvkm rate for all Class A roads in non-built up areas in 1993 [GOV/119, p.99, Table 4.15]. Although Nirex rightly says that national rates are declining, the average rate for the Calder Bridge - Gosforth length for 1991-3 of 0.34 was not only above the national average of 0.28, but also an increase on its own 1990-2 average of 0.31 [NRX/9/14, Fig.4.14]. Furthermore, Nirex admits that 2 of the 1992 accidents involved cyclists [idem, Fig.4.15, Sheet 4]. Those 2 were actually on a short section next to the village which the Department did concede had a higher rate, but Gosforth has heard nothing of the study which Cumbria was to undertake into that in 1993 [GPC/6A, p.S15].

5C.29 Mrs Anne Lowery corroborates Gosforth's evidence on injury accidents. Her neighbours have given her details of 5 serious accidents on the trunk road in the vicinity of Newton Manor Lodge between 1987 and 1991. Most of them appear to have been partly attributable to the poor visibility along the trunk road to the south-east from the mouth of Newton Manor Drive [WR/LOW/1, last page]. One involved injury to a cyclist.

5C.30 Seascale Parish Council [WR/SPC/1] generally supports Gosforth on the questions of rail use and the blockage of the trunk road between Calder Bridge and Gosforth. In the case of the latter, although it believes that the shortest detour is only about 130 km (80 miles), it emphasises that the emergency evacuation plans for the Sellafield Works assume that the A595(T) would remain open. It is also concerned about the ghost island at the existing access point, which does not seem to have the capacity for HGV turning movements claimed by Nirex, and appears prone to damage-only accidents.

5C.31 FOE Cumbria do not align themselves with any other party on this topic. Improvements to the trunk road as requested by Copeland & Gosforth would be likely to result both in more traffic on the road and in more major development projects. The physical improvements to the road itself would harm the character of the National Park as the road ran alongside it. The additional traffic would also disturb the quiet enjoyment of the Park and other environmentally significant areas such as the Duddon Estuary, where in turn the pressure would increase for an environmentally damaging road improvement, despite the requirement of SP Policy 63 [2C.17] for rigorous environmental assessment.

5C.32 I conclude firstly that traffic impact is a striking example of the importance of assessing the environmental effects of a project at the first opportunity. In this case, I welcome Nirex's inclusion of the effects of the Boreholes traffic in the assessment, but I sympathise with the frustration of Copeland & Gosforth in failing to achieve resolution of the principle of road access to the DWR project at the first (Boreholes) application stage. The position appears to be that the original concept of a DWR south of Sides Lane was rejected partly because it would have entailed a new road access to the A595(T). The revised concept as published consequently provides for access to the PRZ to be mainly from Sellafield, even in the case of surface access to the shaft compound after construction. Yet it also seems that as early as in 1992 proposals to revert to an A595 access were being informally discussed.

5C.3 5C.33 The present access to the Boreholes development appears to be the logical consequence
5A.4 of that discussion. Currently it has a temporary permission with about 4 years left before
5C.5 expiry, but approving the amended RCF proposals would include granting permission for its
5C.2 indefinite retention. The implication of the 1992 discussions is that this is intended to be the
3A.1 access to the DWR ventilation shafts area also if the RCF is successful. Even though the
5C.21 RCF shafts might themselves be transformed into the DWR ventilation shafts, there is also
a possibility that they would be used as a secondary DWR construction access. In these
circumstances, it is, in my view, not before time to settle the principle of the projects' road
access to the A595(T); and it should no longer be treated as a purely temporary access.

5C.8 5C.34 This is all the more so because the situation on rail use is clear to me. I accept that,
5A.2 in rail traffic terms, the RCF would be far too fragmented a project to be viable. On the
SPD/1/1 other hand, the DWR's main excavation and emplacement operations would be prime
candidates for utilising rail, and are being treated as such. That use should give a much
needed boost to the Cumbrian Coast Line, and hence benefit the local economy, all in accord
with SP Policies 9 & 70 and LP Policy TSP 13.

5C.1-2 5C.35 Concentrating, therefore, on the road access, PPG 13 should first be considered since
a trunk road is involved. The guidance in the PPG is, of course, to be applied to individual
planning applications and appeals as well as in development plan preparation [para.2.11].
According to the guidance, as Copeland has pointed out, generally all trunk roads should be
reserved as corridors for movement and associated development should be resisted.
Specifically, the A595(T) is part of a key long distance route identified by Policy SP 63-2
[2C.17]. Also the history of the DWR project does suggest that Nirex is seeking to associate
the DWR development with the trunk road notwithstanding sustained local opposition.

5C.19 5C.36 Moreover, the A595(T) is of course a primary route, onto which direct access should
5C.8 be avoided as far as practicable. The informal evolution of the DWR design concept, in
withdrawing from a direct trunk road access and then proposing it again, does imply a
5C.1 judgement that access to a secondary road via Sellafield is not feasible. Cumbria has
2B.3 mentioned visual objections, and Nirex now seems to have several kinds of objection.
COR/101 Nevertheless, the published design concept, prepared after much consideration, includes an
5A.2 access road from the PRZ to Sellafield. Also service corridors have been subjected to a
general environmental assessment for the purposes of the RCF application. The cut & fill
to accommodate a road through the topography should be considerably less, in my judgement,
than for the rejected surface rail link. In the absence of a detailed, public environmental &
economic assessment of a road link between the PRZ and Sellafield, I decline to conclude that
such a link would not be feasible.

5C.37 Consequently it seems to me that there is, on the face of it, a national policy objection
to retaining the access from the PRZ onto the A595(T). Nevertheless, the question of
whether there are other particular circumstances concerning this access which are sufficiently
exceptional to warrant a departure from the policy remains to be considered. These can be
examined in terms of the 3 issues - of the physical capacity of the main road; its suitability
for pedestrians & cyclists; and its overall safety.

5C.12 5C.38 On the first point, I support Nirex's view that the carriageway would in practice have
the physical capacity to carry the RCF project's vehicular traffic. It seems to me that

5C.24 Copeland's contrary view about the length from Calder Bridge to Gosforth does not fully
5C.11 appreciate that Nirex's statistics are a worst-case scenario; that taking the highest month's
5C.23 flows is a particularly pessimistic approach; and that the traffic patterns south of Gosforth
are plainly different from those north of Gosforth. As to traffic patterns to the north-west
5C.14 of Calder Bridge, I do not accept that slight additions to peak hour congestion at junctions
could constitute a significant problem. Consequently, the vehicular capacity issue tends to
5C.33 favour allowing an exception so far as the RCF project's traffic is concerned: but this might
be followed by DWR secondary construction traffic, which would prolong the inappropriate
usage.

5C.15 5C.39 On the second issue, the layout of the new Longlands Farm access provides good
visibility around its junction for all traffic, including pedestrians & cyclists. Also, the
projects' traffic is likely to travel more slowly than through traffic on the approaches to the
access, creating fewer speed-related risks for slower users of the highway. I would also
expect one of the main desire lines for pedestrian & cycle traffic to & from the site itself to
5B.52 be in the direction of Gosforth as the local service centre, and Nirex has the option of Sides
2B.7 Lane as a basis for that route in preference to the main road.

5C.25 5C.40 However, the trunk road is the only public road from Gosforth towards the north-
5C.30 west. Although there is a roughly parallel footpath route through Middle Boonwood further
east [see COR/101, Fig.3.12.1], I have found this on my site inspection to be muddy, &
5C.27 difficult to follow even in broad daylight. Walking instead along the narrow stretches of the
trunk road carriageway between banks certainly induces apprehension; and I readily accept
2B.2 Gosforth's argument that a number of potential pedestrian trips between the village, New
5C.28 Mills hamlet and Calder Bridge must be suppressed. The unsuitability of the conditions for
5C.29 cyclists is even plainer, in my view, for they have figured too highly in accidents. Thus,
5C.16 although I do not consider that the projects' traffic would add disproportionately to the risks
for pedestrians & cyclists, the provision of safer conditions for them as encouraged by
para.4.12 of the PPG must have a high priority if any spare trunk road capacity is to be
utilised for local trips.

5C.30 5C.41 Turning to the general safety aspects, it is unfortunately commonplace to experience
damage-only accidents even at a modern junction. On the other hand, any junction increases
the risks of accidents & obstructions to some extent; and this stretch of road is a vital link
5C.25 for the local community. I am also rather concerned to avoid complacency about the recent
5C.9 accident record, which is somewhat above the average and against the trend for this type of
5C.28 road. It seems to me that there have been clusters of accidents at either end of the appeal
5C.29 site's frontage, mainly related to other local junctions. No detailed analysis of these apparent
hazards has been supplied.

5C.42 I have concluded on these issues that the unavoidable local community use and the
safety record of this stretch of all-purpose trunk road militate against the exceptional retention
of the direct access to the road, notwithstanding its apparent physical capacity to
accommodate more local & freight vehicular trips. It is in this sense that the proposals do
not accord with SP Policy 36 [2C.13], in that the proposals do not include the infrastructure
to connect the project to an appropriate secondary road; nor with LP TSP 6, in that the
A595(T) is an inappropriate standard of road because of its existing functions as well as its

character. This unacceptable overall impact in relation to traffic generation would also be in conflict with LP ENV 33.4.

5C.16 5C.43 Consideration of the issue of suitability for pedestrians & cyclists also draws attention
COR/102B to the virtually complete failure to observe the principles of PPG 13 in designing the layout
5C.26 of the RCF. There is no planned provision for cyclists, nor any that I can see for
pedestrians, whilst there has been no response to the criticism of the excessive provision of
car parking. All this would be contrary to LP TSP 7 [4B.21], in my view, and hence LP
DEV 3.6 too [2C.30].

5C.18 5C.44 No planning condition nor obligation has been offered to meet these objections, thus
adding conflict with SP 54(ii) & (iii) & potentially with LP IMP 1. Nevertheless I do not
agree with many of the other parties [Ca.5B] that the situation could be different if an
5C.2 undertaking were given to improve the whole length of the carriageway of the A595(T) from
5C.38 Gosforth to Calder Bridge or beyond. There is no approved scheme for such an
5C.40 improvement; and I consider that there is, for the time being, an insufficient capacity
5C.41 argument to justify one, as distinct from a segregated footway/cycleway & specific safety
measures. There is also the point made by FOE Cumbria that there could well be a strong
5C.31 environmental case against substantial road works on this length in particular or down this
corridor in general. Thus I regard the prospects of linking the RCF/DWR projects to large-
scale improvements of the trunk road corridor as rather remote.

5D. NOISE & VIBRATION EFFECTS

5D.1 The ES assesses the potential noise & vibration effects of the RCF development in some detail [COR/101, Ca.9], and concludes that they would not be significant. The existing levels in noise sensitive areas around the Surface Site are found to be typical of an essentially rural area, with HGVs on the trunk road, farm machinery & wind effects in vegetation the major sources [idem, para.3.9.2]. The RCF design incorporates standard noise control techniques, and any residual noise effects would be minimised [idem, para.3.9.3] by good operational practice & compliance with BS 5228 [NRX/3/2]. There would be periods when noise levels at the few closest properties would exceed existing levels [COR/101, para.3.9.4], but even the noisiest activities would produce levels well below the limits conventionally set for them [idem, para.3.9.1]. Vibration levels are unlikely to have any discernible effect [idem, para.3.9.5].

5D.2 The ES does not assess the noise & vibration effects of the RCF/RCM/PRZ Boreholes development, nor of operations in the ventilation shaft area of the preferred DWR design. However, the Boreholes permissions contain noise control conditions, including a prohibition on site construction & removal works at night, and imposing night-time drilling & testing noise level limits of 40 dB L_{Aeq} for the PRZ BHs [COR/201, p.226, Conditions 22 & 23] and 43 for the RCF/RCM ones [idem, p.232] (for meanings of dB and L_{Aeq} , see 5D.5).

5D.3 Nirex has carried out vibration & repeat noise level measurements in June 1995, after preparation & submission of the ES [see NRX/3/8, Table 6.2 for complete set of noise measurements & idem, Fig.6.1 for noise measurement locations]. The other parties accept Nirex's noise measurements, the averages & ranges of which are summarised in NRX/3/8, Table 6.1. Nirex's overlaid graph of vibration limits for residential areas [idem, Fig.5.1] is also accepted.

5D.4 **Nirex** points out that its average baseline noise levels are actually towards the lower end of the range currently experienced, because the surveys were concentrated into periods when the wind speeds were generally below the average for the area. The use of predicted maximum levels in the ES makes those assessments a worst-case analysis [COR/101, para.3.9.37]. Cumbria concedes that any adverse noise effect is capable of being dealt with by way of planning conditions: and Copeland is really concerned only with some predicted night-time noise levels.

5D.5 Although Copeland is contesting both the general night-time noise limit and the acceptability of predicted noise from concrete batching operations, its approach is not warranted by either absolute standards or the "exceedance" principle as utilised in BS 4142 [GOV/902, p.7, para.8.2] (ie that site-attributable noise exceeding existing background noise levels by more than 10 "A-weighted" decibels (dB(A)) is likely to give rise to complaints). On neither of these bases can Copeland show that the amenities of people living or working in the noise sensitive properties would be affected by noise levels at the night-time limit agreed between Nirex & Cumbria, namely a free field (ie away from a facade) value of 42 dB(A) equivalent continuous sound level over an hour ($L_{Aeq,1 hr}$). This would already be a more stringent limit than for the RCF/RCM Bhs.

5D.6 In Nirex's judgement, the basic absolute standard is the World Health Organisation's (WHO's) expert group's recommendation of a bedroom noise limit of 35 dB L_{Aeq} [GOV/122, p.15, S.1.1.3.3 & p.19, S.1.1.4]. Copeland generally accepts that the WHO's group's recommendations are appropriate guidance. Copeland also urges that the guidance in MPG 11 on setting noise limit values be applied to the construction phase of the RCF; and yet para.34 of the MPG recommends the very night-time nominal limit agreed by Cumbria, which is effectively the external free field equivalent of the WHO's group's bedroom noise limit. There is no justification to be found in the WHO's group's recommendations or MPG 11 for Copeland's contention that the longer RCF development period necessitates a lower limit than for the Boreholes.

5D.7 Copeland is in some difficulty in relying on the exceedance principle, in Nirex's view, because that is only to be found in BS 4142, and yet Copeland otherwise regards the BS as inapplicable in the circumstances of this case because it deals with mixed urban areas and assesses the likelihood of complaints rather than disturbance. But the fundamental point is that the exceedance principle only applies above a certain threshold, as exemplified by the BS itself in stating that its method is not applicable in situations where the background noise level is very low ie below 30 dB(A) [idem]. The average night-time background levels for the 2 sets of properties most likely to be affected, Sides Bungalow & the dwellings at Boonwood Garden Centre [NRX/3/8, Table 6.1, Locations C & E] are respectively 27 & 29 dB(A) for more than 90% of the measurement period (L_{A90}). Therefore the exceedance principle cannot be applied.

5D.8 Nirex also considers that a prohibition on night-time working cannot be justified, especially for the concrete batching plant required to line the shafts. Initial calculations of a typical sound power level for such plants of 106 dB(A) [NRX/3/8, Table 7.1] are out of date: the modern figure is 92 dB(A) [back calculated from results in NRX/3/3]. Reducing the predicted noise levels from concrete batching at the receiver locations [NRX/3/8, Table 7.2], by this difference of 14 dB(A) to a range of 7-17 dB(A) [NRX/3/4], shows that there could not conceivably be a problem from the concrete batching plant alone, even if 5 Db(A) were added back for the intermittent nature of the noise.

5D.9 Nor would it be necessary, in Nirex's judgement, to prohibit the night-time operation of the hoppers or the carriage of concrete from plant to shaft by truck. The sound power level of loading a concrete mixing lorry is 108 dB(A), and of loading a hopper is 102 dB(A) [again back calculated from NRX/3/3]. The higher figure would make the predicted levels at Locations C & E 33 dB(A), still 9 dB(A) below the equivalent of the WHO's group's standard. None of the predictions allow for special noise attenuation measures, in any event.

5D.10 In response to Mrs Lowery [NRX/3/7], noise levels were not measured at New Mill because they were measured instead at High Lingbank [NRX/3/8, Fig.6.1, Location D], which would be nearer the development but is further away from the trunk road's traffic noise. Since the effects predicted at High Lingbank were minor [idem, Tables 7.2 & 7.3], there was no need to measure levels at New Mill. The north-western outskirts of Gosforth were surveyed because they were thought to be less affected by traffic noise, but in the event the effects were found to be minor there too. Mrs Lowery is understandably concerned about the sensitivity of her son to sudden loud noises, but the loudest predicted noises from the

RCF development would be at least 30 dB(A) less than the noises already experienced by the occupants of Newton Manor Lodge from road traffic.

5D.11 Nirex has also obtained information on baseline vibration conditions in June 1995 at Newton Manor and outside the front of the Red Admiral Hotel. The measured levels at the latter from trial blasts and a passing truck can be compared with the BS 6472 curves [NRX/3/8, Fig.5.1]. The background level is typically a peak particle velocity of 0.0005 mm/sec, and the truck & highest test charge levels typically 0.001 mm/sec, an order of magnitude below Curve 1 of the British Standard [GOV/903, p.11, Fig.5]. The predicted vibration levels at the Hotel from blasting out parts of the Platform Site are below the 2.8 mm/sec acceptable night-time level, and in fact near-surface blasting would be confined to the daytime. The requisite controls by planning conditions have been agreed by Cumbria & Copeland.

5D.12 Cumbria has considered the noise & vibration effects in the context of SP Policy 21 [2C.11] & LP Policy 29 [2C.39]. It understands the operational reasons for activities such as shaft sinking, gallery construction, monitoring & experimentation being carried on 24 hours a day, 7 days a week. However the normal practice in construction & quarrying is to confine noisy surface activities such as site establishment and earth, spoil & soil movements to daytime hours in the working week: and Nirex concedes that it would not need longer working hours for these activities. The potential noise controls have been approached by Cumbria on this basis [CCC/1/25].

5D.13 Nirex has agreed that the general day-time noise limit should be 50 dB $L_{Aeq,1hr}$ instead of the 55 limit recommended by para.34 of the MPG, because of the operation of the exceedance principle as set out in para.37 of the same. Whilst Cumbria is willing to settle for this limit, it should be appreciated that it entails one instance of exceedance. The average background level for Location C, Sides Bungalow, is 34 dB L_{A90} [NRX/3/8, Table 6.1]. Yet the predicted noise levels at it for most of 2007 & 2008 would be 46 dB $L_{Aeq,1hr}$ [idem, Table & Fig.7.3]. The noisy activity in question would be restoration, which would include intermittent concrete-breaking, and so under BS 4142 methodology the level should be corrected by adding another 5 dB [GOV/902, p.6, para.7.2]. This corrected difference of 17 dB would lead to a marked deterioration in the noise environment of Sides Lane for very much longer than the typical period of 8 weeks given in para.61 of the MPG.

5D.14 As to night-time working, Cumbria appreciates that noise levels of 42 dB $L_{Aeq,1hr}$ would be clearly audible in occasional periods of still air, and that para.39 of the MPG suggests local discussions on whether this is a reasonable night-time limit in quieter rural areas. But on balance the recommended limit is appropriate in this case. Cumbria also agrees with Nirex that there would be a minimal change in road traffic noise [NRX/3/8, Tables 7.4-5]: and that the predicted vibration effects would be acceptable in the light of BS 6742.

5D.15 Copeland points out that, although Nirex has referred to the Noise Exposure Categories in PPG 24, these are for new dwellings, and Nirex concedes that the appropriate guidance for the construction stages of the RCF is MPG 11. For its part, Copeland relies

firstly on para.39 of the MPG, and its expert witness is indeed a local Environmental Health Officer. Its aim is to avoid any disturbance of residents, by loss of sleep or otherwise.

5D.16 Nirex's 1995 repeat noise survey [NRX/3/8, Table 6.1] has revealed a wider range of background levels than in the ES [COR/101, Table 3.9.1]. Whilst the tops of the ranges for Location G, N-W Gosforth, have increased, the night-time average & bottom of the range have been reduced to 30 & 21 dB L_{A90} respectively. Nirex attributes these drops to occasional periods of still air, and Copeland contends that such intervals have been typically occurring in recent summers, after the end of the 1987-90 wind-speed data period in the ES [COR/101, Tables 3.8.2-3]. With such background levels, any night-time limit should be 35 dB L_{Aeq} .

5D.17 There are also problems with Nirex's predicted levels, in Copeland's view. The predictions have switched [see CBC/2/1] from maximum levels in the ES [idem, Table 3.9.3] to typical levels in the evidence to the inquiry [NRX/3/4 & /8, Table 7.2]. It is the maximum levels which must comply with limits [CBC/2/2], and not merely typical ones. The latter are sometimes based upon unproven assumptions, such as that the concrete batching plant would not operate at the same time as the hopper or a truck delivering concrete from the plant to the shafts. Nirex also concedes that it would be appropriate to use the BS 4142 methodology to add 5 dB for distinct notes, impulses or irregularities, but that it has not done this in its calculations.

5D.18 Hence this correction of 5 dB should be added in the case of concrete batching. Also another 2 dB should be added for the power sound level of loading a lorry exceeding the original power sound level for a batching plant. This could mean that, in the cases of Locations C & E, the maximum predicted levels L_{Aeq} would exceed the lowest background levels L_{A90} by 22 & 20 dBs respectively. Although Nirex claims that such low background levels mean that examining the excess is the wrong approach, the aggregate predicted concrete batching noise levels at the 2 locations are now 43 & 44 dB $L_{Aeq,thr}$. On warm, still nights, with wide open windows giving an attenuation of only 5 dB(A) [NRX/3/8, Table 4.3], these noise levels would exceed the WHO's group's bedroom limit of 35.

5D.19 Copeland has concentrated on the concrete batching activities because it is absolutely clear that Nirex would wish to undertake these throughout the night. However, the problem of principle is wider than that. Many of the predicted maximum noise levels from site establishment & fore-shaft excavation are above the night-time limit of 42 dB L_{Aeq} agreed between Nirex & Cumbria [CBC/2/1]. Moreover, even Nirex's typical site establishment predictions for Locations C & E, for example, are above the agreed limit at 43-48 & 44-51 dB L_{Aeq} respectively [NRX/3/8, Table 7.2], and well above the adjusted average backgrounds of 27 & 29 dB L_{A90} [idem, Table 6.1].

5D.20 However, Nirex's response to concerns expressed on this score is still to claim that such activities would be conducted during normal daytime working hours. It is not possible to reconcile this claim and Nirex's own predictions with its reluctance to accept a condition to confine such activities to daytime hours. To rely on a noise limit which the developer predicts would not always be met would create obvious enforcement problems. Although Nirex refers to the history of noise controls on its other boreholes [NRX/3/8, Table 5.3], some of the permissions, including those for the RCF/RCM/PRZ BHs, do not allow site construction at night; and some, including the PRZ BHs, have more stringent night-time

limits than proposed now. A key distinction is that the BH permissions are for much shorter developments, and even then there have been occasional problems in complying with the noise limits or in relation to unforeseen noise from eg mechanical breakdowns [CBC/2/3 & 5].

5D.21 Given Nirex's unwillingness to cease operations at night, or even to accept a prohibition on the RCF's noisiest activities at night, or even to accept a night-time noise limit on those activities below 40 dB L_{Aeq} free field, in Copeland's judgement there is no alternative but to refuse permission. For the public would be exposed to a noise nuisance, contrary to SP 21; and the predicted noise would not be reduced to acceptable levels by controls on operating hours or working methods, contrary to LP ENV 29. This aspect of the RCF's environmental impact would thereby also be unacceptable under LP ENV 33.4.

5D.22 Gosforth emphasises that the background noise levels are as low as Nirex's expert witness has ever experienced. More stringent noise controls than those agreed by Nirex & Cumbria would be required to protect the Parish's tranquillity. No night-time noise level should be higher than the background, and the daytime noise limit should be reduced to 45 dB L_{Aeq} , since there is an average background as low as 34 dB L_{A90} [NRX/3/8, Table 6.1, Location C]. This could be achieved by reducing the scale of the development as already suggested [5A.44], and by improved acoustic design.

5D.23 With regard to blasting, Gosforth points out that the key effect is not noise, as Nirex's PR office has suggested in statements to the local press, but vibration. The test charges were designed to be imperceptible to people off the site, but local experience of a seismographic survey indicates that even small charges can be felt some distance away. A less theoretical and more people-oriented form of control of the actual rock-blasting charges than that currently proposed is required.

5D.24 Mrs Anne Lowery considers that Nirex should have assessed the noise impact on the hamlet of New Mill. This comprises dwellings which are not owned by BNFL, unlike some of those surveyed. It is also nearer the proposed surface works than Gosforth village, and would suffer more from the increased traffic noise. Moreover, the increase in the traffic noise should have been assessed for the peak hours. Finally, she is most concerned about the effect of additional sudden, loud noises on the health of her adult son, who lives with her. He has cerebral palsy, and suffers from spasms in reaction to such noises.

5D.25 My conclusions on noise begin with my experience that it is customary to give the average of a range of background noise measurements as a typical background level, albeit with an elementary distinction between day and night and perhaps also the identification of evening & dawn periods. Of course, as in this case, the average can change with more information. On the other hand, taking the measurements when wind speeds are low is also standard practice, and so not a particular conservatism. Moreover, given the ways in which predicted levels from a complex development like this are gradually built up into L_{Aeq} s by following BS 5228 or similar methodologies, I have reservations about expressing the predictions in terms of typical levels, rather than merely in a range to cover any variables or uncertainties if requisite. Certainly, in my view, any reference to predicted L_{Aeq} noise levels

for purposes of setting or checking limit values should be to the upper ends of any ranges, so as to avoid limits being confused with norms.

5D.6 5D.26 I agree with the main parties that the above-ground & near-surface aspects of the RCF
5D.12 development would share many common features with surface mineral workings, and so that
5D.15 most of the advice in MPG 11 is appropriate. On the other hand, I also agree with Nirex that
5D.8 for scientific, safety & operational reasons, underground working at the RCF would have to
be continuous, together with at least some secondary surface activity. Therefore I consider
it unrealistic to suggest a ban on all activities at night, whilst appreciating that disturbance
arising from essential night-time activities could itself constitute an objection to the
development proposals, particularly when experienced within the National Park.

5D.7 5D.27 The agreed aim is to set absolute daytime & night-time limit values. It is plain from
5D.22 Nirex's own evidence that the setting of Longlands Farm is one of the country's quieter rural
areas: and arguably it is an exceptionally quiet rural area, despite the trunk road. Therefore,
under the advice implicit in para.38 of the MPG, the setting is a candidate for a daytime limit
of 45 dB L_{Aeq} , as sought by Gosforth. Leaving the limit at 50 would not make conditions
5D.13 always easy for any occupants of Sides Bungalow, as Cumbria has pointed out. However,
5D.4 the Environmental Health Officer has acquiesced to this figure; and the range of average
background levels at the 7 chosen noise sensitive locations [NRX/3/8, Table 6.1, A-G] rises
from the 34 at Sides Bungalow to up as high as 43 dB L_{A90} . I also take into account that the
Bungalow is owned by BNFL [GRY/1/7, p.42, reverse side], and so I accept the 50 figure.

5D.13 5D.28 This daytime limit of 50 is nevertheless 5 dB L_{Aeq} below the normal one recommended
by para.34 of the MPG, due to the application in this quiet rural area of the "exceedance"
principle, which is of course to be found in para.37 of the MPG as well as in BS 4142. That
point leads on to the question of whether the night-time limit should nevertheless be set at its
recommended normal value of 42 dB $L_{Aeq,1hr}$, or at something lower, in pursuance of para.39
NRX/3/8 of the MPG. The background noise levels at night are significantly lower than during the
day, albeit strikingly so only in the village. It seems to me that the clear policy of para.34
of the MPG is to make a distinct difference at night, and I can see no reason why that should
5D.2 not be reflected in this case by following the setting of the daytime limit down to something
lower than normal, as has been done with some of the Borehole works on the site.

5D.6 5D.29 However I do agree with Nirex that the sticking point in lowering the value must be
GOV/122, the WHO's group's recommended bedroom limit. That recommendation is actually for a
p.15 level of less than 35 dB L_{Aeq} , which I take strictly to be a limit of 34. However the
5D.18 measurement would take place outdoors, and even a wide open bedroom window in summer
typically attenuates noise by 5 dB(A). Although inevitably somewhat arbitrary, it seems to
me that the limit for still, warm nights should be 39 dB $L_{Aeq,1hr}$. In pressing for an even lower
limit, Copeland & Gosforth are to my mind seeking to avoid disturbance to some human
activity other than sleep, but they have not produced evidence that any common human
activity or condition is more sensitive to noise disturbance than sleep.

5D.19 5D.30 There is also the unusual issue that Nirex is predicting some noise levels from site
5D.20 establishment & fore-shaft excavation which would exceed the night-time limit it has agreed
with Cumbria, let alone the lower limit which I believe to be appropriate. Nirex's position
is that it does not intend to carry out these noisy activities at night, and would be prevented

5D.5 from doing so by the need to comply with the noise limit. However, it seems to me that such a position tends to confuse activities merely requiring constraint in order to secure good practice with activities which should be forestalled altogether. Consequently, my conclusion is that both kinds of condition are necessary. In a similar vein, Nirex appears to have overlooked the clear national policy set out in para.33 of the MPG to treat Saturday afternoons, Sundays & public holidays as periods of rest from surface mineral workings unless local variations can be agreed.

5D.21 5D.31 However, such matters do not amount in themselves to conflicts with the development plan, in my judgement, because Nirex has not refused outright to accept the requisite amendments to the proposed controls. The specific point about the concrete batching process is a slightly different one, because that would be an industrial process ancillary to the basic excavation of the mine. It does seem that Copeland's probing has revealed a weakness, in that it appears the use of a hopper or lorry as part of the process at night could conceivably cause noise difficulties. But I was even more persuaded by the detailed evidence on this point that now the matter has been drawn to Nirex's attention, it would be practicable to cope with it even within the lower limit which I prefer.

5D.24 5D.32 Whilst I have much sympathy for the general predicament of Mrs Lowery & her family in grappling with these proposals, I am satisfied that the noise survey has treated their home fairly. The key points are that their dwelling already experiences considerably more traffic noise than some of the other dwellings; that there would be little change to that traffic noise as a result of the Nirex proposals; and that High Lingbank is in a quieter setting but closer to the development site than their home, and was surveyed.

5D.24 5D.33 Similarly I understand the feelings of Gosforth in complaining about the extreme technicalities of predicting vibration effects, but I consider that those effects have been well evaluated in accordance with the standard which provides guidance on human response to building vibration, and incidentally should preclude even cosmetic damage to the buildings themselves.

NRX/3/8,
Fig.5.1

5E. OTHER ENVIRONMENTAL EFFECTS

5E.1 The ES [COR/101] has chapters on flora & fauna [5], land [6], water [7], air [8], cultural heritage [11], and recreation [12]. The chapters are generally in the same order as lists & checklists drawn up for environmental assessment purposes, and this Chapter of my report follows the ES's sequence of topics, noting differences in terminology where appropriate. Items are specifically mentioned only if they have been of some concern to a party or to myself. I agree with the general conclusion of the ES that, in relation to the unmentioned items, any effects of the RCF development would be insignificant. But there is no assessment of effects from the DWR, on the marine environment [3C.23] or elsewhere.

5E.2 Nirex emphasises that its assessment & evidence on Nature Conservation ("flora & fauna" in the ES, "ecology" in Nirex's evidence) has been challenged only by Gosforth, which really has merely been seeking reassurance on minor points. There is no designated nature conservation or similar site [2C.19] in the PRZ or Services Corridors [NRX/4/1 & 11/6]. Gosforth is concerned about the possibility of trapping animals within the security fence, which it claims has happened at Sellafeld Works; but the secured part of the PRZ would be very much smaller than the extent of the Works, and would be periodically surveyed by ecologists as part of the badger monitoring. Nirex is aware of complaints of fly infestation at the Drigg Disposal Site, but this seems to result from rotting vegetation, which is ecologically valuable.

5E.3 The landscaping & restoration proposals, particularly the woodland & hedgerow planting [2B.18] coupled with the woodland management agreement [NRX/11/18], would in due course enhance the nature conservation value of the area, in Nirex's view. They would provide more extensive & varied habitats for a good number of flora & fauna, including badgers.

5E.4 The Lingbank badger clan is healthy, and Nirex recounts that the clan has expanded back into its Bluebell Wood sub-sett on the appeal site since the 2 badger surveys were carried out for the ES [NRX/4/2, p.9, Map 3], despite the RCF/RCM Boreholes development. This is in contrast to surrounding clans, 2-4 of which seem to have been exterminated by recent human persecution [idem, p.10]. With signs of use 3-6 times greater than any other field [idem, p.8], the proposed spoil disposal area [2B.14] is the main foraging ground of the Lingbank clan [idem, p.4, Map 1], in search of the earthworms [idem, p.11] which comprise about 90% of their diet. But there would be specific mitigation measures to ensure that adequate foraging areas would be maintained to sustain the clan, & thus the badger population over a wider area [idem, p.10]. Steps would also be taken to counter disturbance by site traffic, blasting & lighting.

5E.5 The requisite badger tunnels across internal roads would be provided as the fencing & roads were constructed [COR/113, Scheme E]. The disposal field would be managed so that there would always be a minimum aggregate of 8 ha of grass sward kept cut to no higher than 100 mm. This would include a continuous grassland route around the field. To conserve the earthworm population in the stripped soil, a system of stripping & replacement with the least amount of handling & storage would be utilised. The situation would be

monitored; and, if requisite, spoil disposal procedures would be modified and alternative foraging areas identified & their use encouraged [idem, Scheme F]. Cumbria & Copeland have agreed that such measures would be adequate: and English Nature's consultation response was that the impact on the badgers is unlikely to be significant [COR/107, p.104, para.2)].

5E.6 With regard to off-site effects, there is a heronry near Newton Manor and the birds take eels, trout & stickleback which are present in Newmill Beck. However, herons are exceptionally tolerant of noise & disturbance, and there would be special precautions to prevent significant changes in the quality of the Beck water. Foul water from the Platform Site would be removed via the separate drainage system [2B.9], whilst surface water would go through the settlement tank and be discharged through the new drain into the Beck strictly in accordance with the terms of the consent already granted by the NRA under the Water Resources Act 1991 [COR/114, 1st item].

5E.7 In Nirex's judgement, these precautions would also protect the natterjack toad habitat 2 km down the Beck [2C.19]. The possibilities of a flood, or of a pollution incident affecting the toads directly or indirectly through the invertebrate food chain, would be greatly reduced by these measures. Also the core of their habitat is a group of special breeding ponds especially provided off the Beck, which can be isolated by sluices. There would be automatic & continuous monitoring of the quantity & quality of water flows from the site, including water quality and flora & fauna in the Beck itself, coupled with arrangements to co-ordinate any discharges with the operation of the pond sluices [CCC/1/27]. Again, English Nature is satisfied that there would be no significant impact provided the measures are implemented [COR/107, pp.103-5]; and Cumbria & Copeland are content with the proposals. In the very unlikely event of an incident harming the toads, the juveniles might well suffer whilst sufficient adults survive to maintain the colony.

5E.8 Nirex considers that there would be no significant effect on Agriculture in the long term. There is no MAFF objection [COR/107, pp.97-8], and the reservations expressed in the Ministry's consultation response have been met [NRX/7/5, pp.5-6]. A compromise has also now been reached on the question of planting on soil mounds [5A.11]. Despite the overall development period of 13 years, the maximum loss of land from agricultural production would be just under 25 ha of predominantly Grade 3b land for no more than 12 years. Any disruption of land in the Services Corridors would be for a maximum of 6 months. Gosforth's anxieties are over-stated, in Nirex's view, because only 4.6 ha would be lost permanently to landscape planting: and the Longlands Farmstead could be converted back to farming use if required.

5E.9 Turning to Water Resources, and looking first at surface water run-off, Nirex points out that, although the culverts on the line of the rill [2B.4] do restrict the volumes of flow, this natural system is able to drain its small catchment effectively [NRX/1/3, bottom of 1st page]. The natural course of the rill would be piped under the Platform Site [idem, 2nd page], and this & the cut-off drains would carry the catchment's surface water to the settlement pond [2B.9]. There would be stormwater storage on the Platform Site itself, and the overall surface water design would be to a standard in excess of a 1 in 50 year storm return period - a very conservative provision for a temporary development, and in contrast to the EA's discharge consent criterion of a 1 in 2 year minimum. The other criteria which

have been set by the EA are a maximum discharge to the Beck of 600 l/s: suspended solids to be less than 50 mg/l; and no visible oils or grease [COR/101, p.27, para.2.42]. If by any chance, an extreme event led to an overflow, this would be over the southern lip of the Platform, achieving a great dilution of any sediments washed down.

5E.10 Subsequent to South Shaft fore-shaft excavation, underground water from the RCF would be discharged into the on-site sewerage system [2B.9], because it would be saline to varying degrees and sometimes include process water & suspended solids. The ingress of water into the excavations would be controlled by probe drilling, lining & grouting; and total inflow including process water is now estimated to average about 2.1 l/s long term, but pumping capacity would be 7.5 l/s subject to EA authorisation. The concerns of Gosforth about drawdown in the sandstone aquifer are unfounded, since there would be little or no effect on near-surface levels or flows of groundwater during shaft sinking or in the subsequent operation of the RCF. Effects are predicted to be undetectable more than 200 m away from the shafts. The development would draw its own water supply from the mains.

5E.11 Although concerns have been expressed about Air Quality, Nirex points out that there has been no evidence of problems with dust from the Borehole sites, and none are predicted from the RCF development. Indeed, Nirex's expert witness has not been challenged on his predictions, with Copeland merely discussing the wording of the appropriate condition, and Cumbria content to rely on that condition. This lack of challenge should be borne in mind when considering Cumbria's repetitive point about the cumulative effects on rural character of dust together with traffic, noise & vibration.

5E.12 Even without dust control measures on the site, the predicted maximum increase in dust deposition rates, based on a systematic analysis of materials & movement [NRX/6/2, Table 6.1] and the application of emission factors for each operation [idem, Table 6.2] to produce emission rates for 4 modelled activities [idem, Table 6.3], is less than 10% of the generally accepted 200 mg/m²/day nuisance threshold at the closest dwelling [idem, Figs.6.1-4]. This maximum increase would be the rate during the Platform Site earthworks [idem, Fig.6.2]. According to the US EPA Fugitive Dust Model, which effectively gives conservative predictions for the local topography since it assumes that the terrain is flat, the deposition rate at Newton Manor & Boonwood Garden Centre cottages would be about 16 mg/m²/day for 3 months. In contrast, the baseline survey [idem, Table 4.1] revealed background variations of as much as 100 mg/m²/day.

5E.13 Archaeology is the only aspect of the local Cultural Heritage which to Nirex's knowledge has been queried, apart from the possible setting of the Military Zone [5A.31], and even that query does not come from the statutory consultees or the local authorities. Within the context of a preliminary desk study & field inspection carried out for the DWR project [NRX/8/1 & 2], both the PRZ & the Services Corridors have been surveyed [NRX/8/3, 6 & 8] and an archaeological evaluation produced [NRX/8/10, Fig.8.1]. Site preparation for Boreholes RCF1-4 has also been monitored [NRX/8/5].

5E.14 The overall position is that only 1 out of the 18 sites of real or potential archaeological interest (not importance) identified within or close to the appeal site [NRX/8/10, Fig.3.1] would be adversely affected by the RCF development. That would be Site 15, which comprises vestigial remains about 5 m wide of rig & furrow on the ridge of the spoil disposal

field. The remains themselves are of very minor importance, but may be an indicator of more interesting remains beneath, which could nevertheless be investigated when the development went ahead, under the terms of a standard planning condition.

5E.15 Mr Forwood nevertheless challenges Nirex's evaluation in relation to Sites 12-14, the Gretigate Stone Circles. Gretigate is said to be the old name for Sides Lane, and the Circles are in a small cleft running north-westwards from the Lane up behind Sides Bungalow [see original 1961 presentation appended to WR/F/89]. Nirex has made a very careful investigation of the Circles [NRX/8/4 & 7], and concluded that Circles B & C (Sites 12 & 13) within the appeal site are more likely to be the results of stone clearance from adjacent fields [NRX/8/7, p.11, para.4.2.2] than the originally supposed Bronze Age monuments (Cumbria SMR 1292) [idem, p.4, paras.1.1.1-2.2]; and that the original discoverer's interpretation cannot be supported [idem, para.4.2.1].

5E.16 These conclusions have been accepted by the County Archaeologist for inclusion in the newsletter of the Regional group of the Council for British Archaeology [NRX/8/9]. Although Mr Forwood criticises in particular a failure to carry out a detailed investigation of Circle A [NRX/8/10, Fig.3.1, Site 14], this is outside the appeal site, and nothing that is known about it conflicts with the conclusions on Circles B & C [WR/NRX/2(8)]. There is no sign of Circle A visible on the surface: and, although Mr Forwood postulates that there may be underground evidence of stones in the field as at the Seascale Stone Circle ("Grey Croft"), this is not what the original presentation suggested. Furthermore the development in question is strictly landscape planting authorised under the RCF/RCM/PRZ Boreholes permissions [NRX/2/3, Fig.5.3, marked "1995"].

5E.17 As to Public Rights of Way and Recreation, Services Corridor A crosses the bridleways from Calder Town End to Fleming Hall & Ponsonby Tarn [COR/101, Fig.3.12.1, No.421010] and reaches the one from Calder Farm to Ladywood [idem, no.421016]. But the electricity route to the RCF would now probably not use this Corridor [2B.11], and even if it did, disruption to the rights of way would be for no more than 4 months. The provision of underground services along Corridor B would involve digging trenches across the Calder Town End to Fleming Hall bridleway [idem, No.409019 on this stretch] and the Calder Farm to Seascales byway [idem, also No.421016], but the disruption to them would be much shorter than the total 7 month construction period.

5E.18 Whilst the use of Longlands Farm by the Cumbria Riding Club for local events has been affected by the RCF/RCM/PRZ Boreholes development, and would be affected further by the RCF development, the lease of an alternative field beside the A595(T) has been offered to the Club [NRX/11/7]. A local syndicate shoots over Longlands Farm 2 or 3 times a year, and would lose the shooting at the Farm for the duration of the RCF development; but it would retain most of its shoot, across Newton Manor and Calder, Fleming & Seascale Halls' lands.

5E.19 A final point concerns the siting of the Explosives Store [COR/102B/008026/B], which would be located to the north-west of the Platform Site [idem, 008007/B]. This is the optimum stretch of the PRZ for storing the explosives away from dwellings & other sensitive premises. Whilst Mrs Lowery has expressed anxiety about it, it would be about 430 m away from her house, twice the minimum distance prescribed by the Stores for Explosives Order

1951 [GOV/802]. The dwellings at High Lingbank & Sally Hill would be closer than Newton Manor Lodge, although well over the minimum distance. A licence for the store itself would still have to be obtained from the local authority [COR/114, last item].

5E.20 Cumbria & Copeland note that the development of the Surface Site would lead to a loss of an area used by badgers for foraging, but also that English Nature & the Cumbria Wildlife Trust have not objected. Nor have the 2 Nature Conservation organisations objected in relation to the proposed Newmill Beck SSSI & its population of natterjack toads. Although English Nature has expressed caution about the consequences of possible pollution & flooding incidents, a Memorandum of Understanding has now been drawn up between English Nature, the NRA & Nirex to settle the matter [CCC/1/27]. There would thus be no conflict with SP 17 [2C.10] or LP ENV 1-5 & 23 [2C.35 & 38].

5E.21 Similarly, they accept Nirex's assessment of the impact on Agriculture, now that a compromise has been reached with MAFF on planting on mounds. Again, there need be no conflict with SP 22 & 24 [2C.11] or LP SVC 1 & 5 [2C.34] & ENV 15 [2C.37] on Water Resources, so long as Nirex is willing to agree to the requisite conditions. Their position is similar on Air Quality in relation to SP 21 [2C.11] & LP ENV 26 [2C.39]. Similarly, on Archaeology, in the absence of an objection by the County Archaeologist and given Nirex's willingness to accept an archaeological investigation condition, the proposals accord with SP 26 [2C.12], Mid Copeland Local Plan Policy 6R [2C.21], & LP ENV 51 & 52 [2C.41]. With regard to the Rights of Way in the Services Corridors, it is appreciated that Gosforth & the Ramblers Association have indicated some anxiety, but alternative routes on which they would be consulted would have to be provided, and then the bridleways & byway restored to their former condition. Hence there would be no conflict with LP ENV 14 [2C.37].

5E.22 Gosforth, in relation to Nature Conservation, is concerned for the well-being of the wild animals in its Parish. It has knowledge of animals becoming trapped by the security fences at both Sellafield & Drigg, with potential ecological problems from in-breeding, disease, & other aspects of animal behaviour, including fly infestation. It also gives a reminder on Agriculture that, prior to the grant of permissions for the RCF/RCM/PRZ Boreholes, Longlands was a working farm supporting 2 generations of a farming family. It would be preferable to utilise stripped soil temporarily on surrounding fields rather than risk deterioration in storage. Nearly 5 ha of land would be permanently lost to agriculture, adding to the factors which would militate against the resumption of a viable holding here.

5E.23 As to Water Resources, in Gosforth's judgement, Nirex has not shown satisfactorily how it would cope with the speedy run-off from the Platform Site in the event of an exceptional storm, and the consequent risks in the Beck downstream. It seemingly has not reached agreement with the EA on control of the ingress of underground water. There would be risks both of pollution of that water and of derogation (emphasised by FOE) to the many private water supplies in the locality, plus loss of pressure in the mains from over-use by Nirex. More stringent controls to protect Air Quality than are proposed would be required, because the dust generation would not be inhibited by vegetation as on farmland. Gosforth also wishes to be consulted on all detailed proposals which would affect Rights of Way (as

does the Ramblers Association) & Recreation, as even temporary local modifications to these can have consequential effects which outsiders would not appreciate.

5E.24 Mrs Anne Lowery believes the siting of the explosives store to be too close for comfort, notwithstanding the fact that the stand-off distance would comply with the law. The carriage of explosives to & fro would be a worry, as well as their storage. The blasting would be a constant reminder of their presence. The fear of sudden noises would inhibit her son [5D.24] from going for his walks, diminishing his quality of life even further.

5E.25 Mr Martin Forwood [WR/F/89] believes that Nirex is basically missing the point about the Gretigate Stone Circles. They are officially recorded as a Monument, and were visited by an eminent archaeologist as they were originally being surveyed in 1960. Not every archaeologist who has visited them doubts their authenticity, and, if authentic, Circle A would form one of the largest stone circles in Britain. Since they appear to be a group, the best practice would have been to investigate the largest one thoroughly before writing the group off as not authentic. As it is, there is a distinct possibility that the development would be extended in due course over Circle A without the authenticity of the group having been established one way or the other.

5E.5
5E.4
5E.26 My conclusions on Nature Conservation are on the basis that the presence of a protected species is a material consideration if the development would be likely to cause harm to the species or its habitat [PPG 9, para.47]. It is quite clear to me that the spoil disposal operations would harm the habitat of the Lingbank badger clan, for the operations would take place over most of the clan's principal feeding ground. It is particularly important to sustain this clan, since it seems to be the only one in the locality to have survived human persecution. I note that the badger survey recommendations included encouragement of extended foraging into 2 potential alternative areas before operations start; and a search for alternative soil storage locations [NRX/4/2, pp.16-7].

5E.27 In my view, these recommendations did not go far enough. The best solution would have been to identify another spoil disposal site altogether: and a better mitigation measure would be a commitment to the establishment of proven foraging areas before spoil disposal commences. There must be a serious risk, in my judgement, of the sheer amount of activity on the foraging ground severely disturbing the clan, notwithstanding that badgers are largely nocturnal. Even more importantly, the piecemeal stripping of their feeding area could gradually remove the bulk of their food supply, if Nirex's experimental measures to conserve the earthworms fail to work.

5E.28 Notwithstanding the views of the authorities & consultees, I consider that this part of the RCF development would constitute a serious interference with the core habitat of a protected species, and that the untried mitigation measures fall well short of ensuring that the harm would be kept down to a tolerable level. Although I doubt whether the feeding ground of a single clan can be an important nature conservation interest in terms of SP 17, it is obviously a site supporting a protected species within the meaning of LP ENV 5. There would also be an adverse impact by a waste disposal operation, contrary to SP 60 & LP ENV 23, reinforcing the landscape objection [5A.69]. This environmental harm should be carried forward into the final appraisals under the key policies SP 54 & LP ENV 33.

- 5E.20 5E.29 It has been appreciated that there would be some risk to the Annex IV protected toads & their potential SSSI habitat downstream. This habitat must be regarded as of national significance, in my view, and so brings into play SP 17 & LP ENV 2, as well as LP SVC 1 & 5. The consensus is that there would be sufficient protection of the toads & their breeding ponds from pollution & sudden surges, by the liaison & monitoring arrangements agreed by English Nature & the NRA to help implement Nirex's compliance with the terms of its water discharge consent. Although I would normally consider that it is appropriate & necessary to make the requisite precautions the subject of planning conditions, rather than rely on the enforcement powers of the EA, I accept that these particular arrangements would be adequate. Moreover, I do consider that the other points made about nature conservation are very minor.
- 5E.22 5E.30 On the other hand, I agree with Gosforth's point on Agriculture that the RCF project has resulted in the indefinite loss of an agricultural unit. This reinforces the conclusion about the inappropriateness of the development in this setting [4A.56]. As to Water Resources, I am satisfied with the drainage arrangements, as it is only with abnormal incidents that my preceding paragraph is concerned. Also I agree that a derogation of other water abstractions would be highly unlikely: and I do not accept that the water utility would offer a mains supply if it felt this would prejudice existing customers. However, there is another technical point to resolve on the control of the ingress of underground water. But I entirely accept
- 5E.9-10 5E.12 Nirex's case on Air Quality.
- 5E.13 5E.31 Similarly, Nirex has carried out some impressive work on Archaeology. I note that this started out as part of the DWR project, and that on this topic the effects of the Boreholes have also been taken into account. Yet Mr Forwood has a good underlying point about the Gretigate Stone Circles. They are officially recorded as a monument; and, according to PPG 16, the preservation of important remains & their setting should be considered regardless of Scheduling. Nonetheless the very careful evaluation by Nirex has persuaded me that it is very probable that Circles B & C are not archaeological remains at all, and were wrongly judged to be such due to initial over-enthusiasm. The putative Circle A, although adjacent, has a rather different setting and could be of a somewhat different nature. Although the indications are strongly that this too is not an artefact, it would be wrong to investigate it invasively unless threatened by development, in case it does constitute archaeological remains. In my view, Nirex has carried out the requisite degree of evaluation of it at this stage.
- 5E.15 5E.16
- 5E.17 5E.18 5E.19 5E.32 I consider that the actual disruption of Rights of Way would be very minor. On Recreation, I am pleased that another venue has been offered to the Riding Club, because this is yet another example of the development's disturbance of rural activities, as is indeed the loss of some shooting, albeit in a smaller way. As to the Explosives Store, whilst I once more understand Mrs Lowery's feelings, this is a topic definitely for control under other legislation, albeit a reminder of the failure of the ES to deal with risks of accidents [3B.48].

6A. BASIC REPOSITORY LOCATIONAL CRITERIA

6A.1 The legal, political and regulatory frameworks which set the requirements for the suitable location of a DWR for ILW and LLW are outlined in Chapter 2A above. The fundamental requirement in finding a suitable location for a DWR is to provide a PCSR and PCSA which will satisfy the regulators that the risks would be acceptable.

6A.2 In order to meet the regulatory requirements for deep disposal, Nirex has evolved the concept of a multi-barrier containment system for a DWR. This system is explained in Chapter 6C but, in brief, it would comprise a natural barrier provided by excavation of vaults at depth in a stable geological setting; an engineered physical barrier constituted by packaging the waste in steel or concrete containers; and an engineered chemical barrier comprising cement-based vault backfill. It is mainly the radioactivity from the emplaced waste to be released through the chemical barrier, predicted by Nirex to be 0.01% of the total, and transported away from the DWR through the natural geological barrier, mostly by groundwater flow, which could cause long-term risks to health [COR/501, para. 6.3.1].

6A.3 Thus, the main determining factors in meeting the 10^{-6} risk target, or those required to achieve the necessary degree of safety with optimisation using best practicable means, are geological, hydrogeological, chemical and radiological. The engineered barriers are broadly generic in character. It is common ground that the work involved in research and development of a DWR is at the leading edge of science. This Chapter deals with the geological, hydrogeological and radiological criteria leaving aside other factors for later Chapters. Guidelines for these matters derive from International, EU and national sources.

6A.4 The waste inventory is described in COR/522, Vol.3, Tables 6.1 and 6.2. It is extracted at NRX/15/43, Table 5.1. Of particular note are the inclusion of long lived radionuclides such as ^{36}Cl (16.6 TBq), ^{129}I (0.919 TBq) and ^{238}U (35.8 TBq), having half lives in millions of years of 0.301, 15.7 and 4,468 respectively. The estimated radioactive decay of the disposal inventory with time is displayed at NRX/15/43, Fig. 5.1. A summary of projected radioactive waste arisings in the UK (1991) is at NRX/15/40 but should be treated with some caution due to subsequent modifications including, for example, more efficient forms of packaging, so reducing waste volume. The updated planning requirements to 2060 for the DWR are in a range of 200,000 m^3 to 275,000 m^3 , including 15,000 m^3 of LLW.

6A.5 The thermal evolution of the DWR is described at COR/528, and summarised at idem, p.7-8 Box B. The main sources of heat in the DWR are the exothermic cement hydration reaction and energy deposited in the system from the decay of radioactive isotopes. The DWR will experience a significant rise in temperature after closure to about 80 °C with a heat output of some 400 kW. Although the main radionuclide heat input will have ceased within the first 300 years, decay heating will continue (with overall heat output of more than 10 kW for more than 10,000 years) due to the longer lived actinides, which undergo energetic α decay. Heating could affect the performance of the cement vault backfill, metal corrosion, chemical degradation of organic wastes and microbial populations.

6A.6 In responding to consultation on the draft regulatory guidance [HMP/1/1] Nirex suggests that ILW "should include wastes with a radioactive content which exceeds either of

the upper limits for LLW but of a lower radioactivity and heat output than high level wastes. ILW's encompass a large range of different forms including the metal cladding of nuclear reactor fuel, reactor components, chemical processing residues and filters". LLW should be "wastes with a radioactive content which does not exceed 4×10^9 Bq/t of α radioactivity or 1.2×10^{10} Bq/t of β/γ radioactivity other than very low level wastes" [NRX/12/17, p.4].

6A.7 International Guidelines and regulations of relevance are reviewed in Cm 2919 Chapter 2 [GOV/208]. Para. 10 states that the principles of radioactive waste management set out by the IAEA [GOV/504] have been fully reflected in the White Paper's policies.

6A.8 Early IAEA attention was focused on HLW and other long-lived wastes [GOV/501]. In 1983, guidelines advised that the hydrogeological characteristics of the geological environment should tend to restrict groundwater flow within the DWR and, on a wider scale, that the hydrogeological characteristics of the host rock and the groundwater regime of the surrounding geological environment should favour waste isolation [GOV/501, GOV/502]. The geological medium should have a lithology and depth appropriate for the categories and quantities of waste to be disposed of, it should be geodynamically stable including avoiding potentially destabilising structural features [GOV/502]. The suitability of the host rock will depend upon individual circumstances related to the specific site rather than the general properties of the host rock type [COR/501, p.9]. Rock characterisation should therefore facilitate the effective prediction of DWR performance [GOV/501, para. 6a].

6A.9 The IAEA document, 'Safety Series No.99 - Safety Principles and Technical Criteria for the Underground Disposal of High Level Radioactive Wastes' 1989 [GOV/503] is principally concerned with HLW and is in the process of review of disposal of all radioactive waste as part of the RADWASS programme.

6A.10 The latest IAEA guidance on identification and selection of sites for deep geological disposal of radioactive wastes is to be found in GOV/507 of 1994. Its status is presently advisory [para. 2A.2 above], but it is not confined to HLW applying also to α bearing wastes in solid and packaged forms [GOV/507, para.109]. The advice suggests principles based on best practice upon which the most appropriate detailed standards, criteria and specifications can be established for the physical characteristics and waste type and performance requirements of the country concerned [GOV/507, para. 108]. Only general guidelines can be identified owing to the predominance of factors and processes which may be highly site specific and interactive [idem, para. 401]. The system of natural and engineered barriers has to be considered as a whole. Flexibility in the disposal system is important and the possibility to compensate for uncertainties in the performance of one component by placing more reliance on another should be retained [idem, para. 402].

6A.11 The key locational principles are set out as site selection guidelines at GOV/507 paragraphs 404 et seq. to achieve "adequate isolation of radionuclides from the accessible environment for desired periods of time" [idem, para. 301]. The guidelines are not meant to be complete, neither should they be applied in isolation but used in an integrated fashion for an overall optimisation of site selection [idem, para. 403]. In summary, the DWR locational criteria are:

- a. a geological setting to inhibit the movement of radionuclides from the (DWR) to the environment during the time periods of concern [idem, para. 404];
- b. sufficient distance from geological discontinuities that could provide a rapid pathway for radionuclide transport: uniform rock formations in comparatively simple geological settings and formations with few major structural features or potential transport pathways are preferred [idem, para. 405];
- c. favourable mechanical properties of the host rock to ensure long term stability and so safe construction, operation and closure of the DWR and resistance to gas transport [idem, para. 406];
- d. absence of unacceptable susceptibility to future geodynamic phenomena and consequent radionuclide release [idem, paras. 408-409];
- e. restricted groundwater flow but sufficient dilution capacity [idem, paras. 412-413];
- f. physicochemical and geochemical characteristics of the geological and hydrogeological environments that tend to limit the release of radionuclides from the DWR [idem, para. 416];
- g. minimisation of the risk of human intrusion [idem, para. 420];
- h. acceptable radiation exposures to the public from transportation of the waste [idem, para. 429].

6A.12 IAEA radiation safety standards [GOV/505] are also in the course of revision in the light of the recommendations of ICRP 60 [GOV/506]. The general principles, based on IAEA's latest safety standard [GOV/510], are set out in Cm 2919 [GOV/208, para. 46] where they are stated to be embodied in the reformulation of national policy. The IAEA RADWASS Safety Fundamentals document (1995) proposes that radioactive waste should be managed in such a way that predicted impacts on the health of future generations will not be greater than relative levels of impact that are acceptable today [GOV/504]. This principle was endorsed by the OECD's Nuclear Energy Agency (NEA) Radioactive Waste Management Committee in 1995 [FOE/1/4, pp. 7-9] and nationally in Cm 2919 [GOV/208, para. 81]. The NEA added that, in their view, geological disposal should ensure that residual radioactive substances reaching the biosphere should be at concentrations that are insignificant compared, for example, with the natural background levels of radioactivity [FOE/1/4, p. 16].

6A.13 **EU Guidelines.** The ICRP recommend the principles of justification, optimisation and the establishment of individual dose and risk limits [GOV/208, para. 55] The ICRP's recommended changes in the methodology used to calculate doses are subject to negotiation as part of the Euratom Basic Safety Standards Directive.

6A.14 Although the present legal dose limit is that members of the public should not be exposed to a dose of more than 5 mSv/y from all man-made sources of radioactivity other than from medical exposure, in 1990, ICRP 60 recommended instead a dose limit of 1 mSv/y

except in special circumstances. This is likely to be reflected in the revised Euratom Basic Safety Standards Directive and then implemented in UK law [GOV/208, para. 63].

6A.15 Euradwaste Series No.6 [NRX/14/2] reflects IAEA advice on DWR location [NRX/12/15]. Particular importance is placed upon the natural barriers formed by the host rock and surrounding geological formations for α bearing wastes containing isotopes with an extremely long radioactive half-life. The criteria are [NRX/14/2, Section III.1]:

a. Stability. The site shall present a high degree of stability; tectonic movement should not be expected to occur (or to induce significant phenomena) before e.g. 10,000 years, evaluated at regional levels and forecasted from present trends and historical evidence. More generally, the site should be deemed to be stable as long as necessary according to the safety assessment. Seismicity should be low, levels depending upon the waste option and the site, but below level 7 of the Richter scale (or intensity IX-X in the modified Mercalli scale). It should be, say, some tens of km from geothermal anomalies or volcanic evidences.

b. Hydrogeology. Low groundwater flow and/or appropriate dilution capabilities are essential requirements together with appropriate characteristics of the underground waters. The hydrogeology of the formation and the hydrology of the site shall be such as to ensure negligible radiological consequences, if any, on the site and at regional level both in the case of the normal and of altered evolution scenarios. Preference should be given to formations having high homogeneity and continuity and more generally showing simple patterns.

c. The chemical and geochemical properties of the host rock should favour the retention of the radioelement when released from the DWR.

d. The mechanical behaviour of the rock should allow safe operation of the DWR and ensure that an appropriate sealing of the various DWR areas and shafts can be achieved.

e. Thermal guidelines mainly concern HLW, however DWR temperature, the physical properties of the rock, and the geological setting should ensure that the confinement properties of the formation are not impaired and undue heating of the overlying sediments and waters does not take place.

e. The appropriate dimensions of the host rock will depend upon the option, the waste to be disposed of, the DWR capacity and the geological settings. The formation should have sufficient depth and be large enough to provide an efficient isolation of the DWR from the biosphere. The depth of the DWR should be great enough to take into account such phenomena as erosion of the ground surface layers notably for sedimentary formations. The site and its geological setting should be selected so that perturbations due to the excavation of the DWR should not impair its performance.

f. Presence of Natural Resources. The formation should be located far enough from either ore deposits or minerals scarce enough to be considered as a possible object of

future exploitation. More generally, preference should be given to a formation and a site for which the risk of human intrusion is deemed to be small.

The guidance advises satisfying a combination of its criteria prior to an overall safety assessment on the whole system, to finally show if the radiological protection standards are met.

6A.16 EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances [GOV/132] has been implemented by the NRA's Policies and Practices for the Protection of Groundwater [GOV/131] and Pollution Prevention Guidelines [GOV/133].

6A.17 National Guidelines include advice from the Institute of Geological Sciences (now BGS) in 1976 that hydrogeological conditions for deep disposal of HLW should be simple and determinable [COR/615]. Broad geological disposal options appropriate to different classes of radioactive wastes were considered in the 1982 White Paper on Radioactive Waste Management [GOV/203] as in the National Strategy [GOV/301]. The 1986 DOE comparative assessment of disposal and storage options for LLW and ILW [GOV/303] concluded that the BPEO for most ILW was disposal deep underground or offshore.

6A.18 In 1993, as a result of ICRP 60, the NRPB recommended acceptance of the reduced dose limit to an individual of 1 mSv/y. This has been accepted by the Government [GOV/208, para. 65]. To account for multiple exposure sources a target of 0.5 mSv/y from any one nuclear site has been established and authorisations assume maintenance of the discharge limit for the radionuclides specified. A dose constraint of 0.3 mSv/y has also been set to assist in the optimisation of new facilities [idem, para. 68]. This broadly translates into a dose of 0.03 mSv/y for an individual over his or her lifetime for an annual risk of death of 10^{-6} [idem, para. 73]. However, the Government has decided to err on the side of caution and set a threshold of 0.02 mSv/y [idem, para. 73]. Thus, since 1989, the dose for an individual has been modified from 0.1 mSv/y, (incorporating an element for uncertainty - GOV/302, para. 3.8) to 0.02 mSv/y in order to maintain the 10^{-6} level of risk of death. In the case of post-closure safety for a DWR, the Government has made the 10^{-6} /y risk target one of developing either a fatal cancer or a serious hereditary defect [cf GOV/302, para. 3.7 & GOV/208, para. 78].

6A.19 The draft replacement regulatory Guidance, although not laying down geological criteria nationally for deep disposal, suggests that the geological barrier of any DWR must operate to ensure that,

"Radioactive wastes shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today" [HMP/1/1, para. 5.5]

6A.20 In the period after control is withdrawn from the DWR,

"the assessed radiological risk to a representative member of the critical group should be consistent with a risk target of 10^{-6} /y." [idem, para. 6.7]

Nirex considers the requirement to be ambiguous as it could be construed as including past discharges from the Sellafield site or elsewhere in the risk calculations [NRX/12/17, para. 6.4]. The guidance goes on to say that where the Inspectorates are satisfied that good engineering and good science have been adopted by the operator and the estimated risk is below the target, no further reductions in risk will be sought. However, if the estimated risk is above the target, the Inspectorates will need to be satisfied not only that an appropriate level of safety is assured, but also that any further improvements in safety could be achieved only at disproportionate cost. No indication is given of what is meant by an appropriate level of safety.

6A.21 The degree of isolation required of the waste depends on the concentrations and radioactive half lives of the radionuclides present in the wastes, among other factors. The timescale is for the developer to justify [GOV/208, para. 81 & HMP/1/1, paras. 5.6 & 6.13]. At the inquiry the period of 10⁸ years was used for risk predictions [NRX/15/43, Fig. 5.1]. During this period population and climate changes and other naturally occurring processes such as glaciation would take place [COR/522, Vol. 3 Section 6.3]. However, as Cm 2919 points out at paras. 80-81, there are likely to be limitations on the degree of quantified prediction which can be made and qualitative factors will need to be relied upon in very long timescales [see also HMP/1/1, para. 8.23 & NRPB comments at GOV/409, paras. 3.31-32]. The draft regulatory guidance refers to reliance upon "multiple and complementary lines of reasoning" to support assessment [HMP/1/1, para. 9.5]. Cumbria is concerned about the means of accounting for low probability high-consequence events in the use of risk targets for the post institutional phases of the DWR [CCC/1/26, para. 3.1 bullet pt. 6 & 3.12].

6A.22 In relation to environmental radioactivity,

"It shall be shown to be unlikely that radionuclides released from the disposal facility would lead at any time to significant increases in the levels of radioactivity in the accessible environment."

This assessment takes account of the comparative radiotoxicity of different radionuclides and of the ambient variations of levels of radioactivity in local environmental media [HMP/1/1, para. 6.19]. Nirex suggests that the levels of radioactivity should be those overall in recognition of the fact that the levels of those radionuclides not naturally present in the surrounding environment could be significantly increased due to their presence in the DWR waste inventory [NRX/12/17, para. 6.9].

6A.23 Radiation exposure of the UK population was reviewed by the NRPB in 1993 [GOV/416]. It concluded, based upon 1991 data, that the annual effective dose equivalent to the general public from all sources of ionising radiation is 2,600 μ Sv (2.6 mSv) on average and the collective effective dose equivalent is some 150,000 man Sv [idem, Table 35 & Fig.13]. About a half of the collective dose is due to radon (100 μ Sv/y to 100,000 μ Sv/y, with scattered higher values - average 1,300 μ Sv/y) and the predominance (2210 μ Sv/y - 127,000 man Sv) originates from all natural sources including cosmic rays (200 μ Sv to 300 μ Sv - average 260 μ Sv/y), gamma rays (100 μ Sv to 1000 μ Sv - average 350 μ Sv/y), food and drink (100 μ Sv to 1000 μ Sv - average 300 μ Sv/y). Artificial sources include medical exposure (average 370 μ Sv/y), consumer products (up to 100 μ Sv), fallout (5 μ Sv), occupational exposure (average 1.5 mSv/y) and discharges to the environment (average 0.4

μSv). The report expresses concern about exposure to radon in some locations [idem, para.9(b)] but concludes favourably that fallout doses are quite low, the Chernobyl increment having virtually disappeared, and that doses from nuclear discharges and radioactive consumer products are trivial.

6A.24 Cumbria has just under the average exposure of 2210 μSv for annual doses from natural radiation in England [idem, Fig.7]. However, the report also shows that discharges from Sellafield into the marine environment are widespread in their effects [idem, Table 13]. These effects arise from both fish consumption and external radiation. The locations of the nuclear installations monitored is at idem, Fig.11. Exposure of infants from the consumption of milk in 1991 shows Sellafield to have the greatest maximum annual dose of 28 μSv with Dounreay at 16 μSv .

6A.25 In 1995, the NRPB suggested that there is no lower threshold for health risk from radiation exposure although it recognised that there is a practical limit to the lowest doses at which excess risks have been detected in epidemiological studies [GNP/1/3]. It found that its studies in the case of exposure to low linear energy transfer are consistent with a linear trend in cancer risks at low doses without any threshold.

6A.26 In March 1995, the RWMAC/ACSNI Study Group Report 1995 [GOV/409] was published. Its conclusions were not all accepted in Cm 2919 [GOV/208, para. 8.6]. In summary its principal findings related to locational factors included:

- a. The health and safety of today's and future generations is the prime consideration in the selection process.
- b. The approach to safety, the terminology used and the standards set should be those of the Tolerability of Risk (TOR) applied to nuclear plant but more consideration needs to be given to the intolerable or unacceptable risk level for a DWR in the light of the public's regard for a risk of $10^{-6}/\text{y}$ as the maximum acceptable figure.
- c. For the finally selected site(s) the associated risk criteria must be demonstrably satisfied over a period of 10,000 years after making appropriate allowance for uncertainties in current understanding and future performance. Beyond this time arguments must be presented to demonstrate that safety will not be reduced.
- d. The various stages of the open site selection process must ensure that sites for further consideration satisfy the "acceptable risk" level of the TOR criteria. The contribution expected from the engineered barriers to the safety case should be stated at the outset.
- e. The development and use of derived equivalent criteria which are based directly on known geological and hydrogeological site characteristics. These would involve groundwater return indices (GRI) together with disqualifying factors.

6A.27 Although the Study Group favoured a more quantitative approach to site performance than hitherto, the usefulness of the GRIs is challenged by BGS [NRX/14/5]. Notably they

draw attention to the considerable uncertainty as to the geological formations present at depths typical of those considered for deep disposal of radioactive wastes; the lack of available reliable hydrogeological data for deep formations in the UK and the large uncertainties associated with inferring values for parameters where data are lacking [idem, para. 3.3i]. The RWMAC/ACSNI Study Group's comments on the acceptability and tolerability of risk levels were the subject of submission of minority views [GOV/208, para. 76, GOV/409, pp.79 et seq.].

6A.28 It is common ground between the main parties that the geological barrier should achieve four goals. Firstly, it must ensure that there are low flows of groundwater through the DWR so that the physical and chemical barriers can operate to retain short-lived and most long-lived radioactivity. Secondly, it must ensure substantial dilution, or other retardation, of those radionuclides that are released from the vaults in order to limit concentrations reaching the surface to meet regulatory requirements. Thirdly, it must ensure that gas does not reach the surface in concentrations that would pose a flammability hazard or lead to concentrations of radionuclides in gas which would pose an unacceptable risk. Fourthly, pathways for return of radionuclides should not be created by natural disruptive events, inadvertent human intrusion or by RCF construction. PERA [COR/501] in effect sets out the 1st, 2nd & 4th of these characteristics at Chapter 3. It is also accepted that nuclear radiation, even in small doses, can have harmful effects [e.g. GNP/1/3].

6A.29 Nirex points out that, following the withdrawal from Billingham in 1985, it sought advice from BGS on potentially suitable generic geological environments. BGS identified the following characteristics [COR/614]:

- a. predictable groundwater flow paths, preferably long and resulting in progressive mixing with older, deeper waters or leading to discharge at sea;
- b. very slow local and regional groundwater movements in an area with low hydraulic gradients;
- c. ease of construction to allow for repository design;
- d. meeting the many accepted caveats regarding seismicity, depth, etc.

6A.30 This contrasts with the approach in the 1976 report from the Institute of Geological Sciences [COR/615] which put great emphasis on the properties of the host rock itself rather than defining what are considered to be suitable large scale hydrogeological environments. Nirex draws attention to the need to differentiate between the significantly different storage requirements for HLW, with its heat generation, and ILW.

6A.31 In 1987, "The Way Forward" [COR/203] explained Nirex's approach to deep disposal, identifying 5 potentially suitable generic hydrogeological environments [COR/614]. These were:

- a. hard rocks in low relief terrain;

- b. small islands;
- c. seaward dipping and offshore sediments;
- d. inland basins of mixed sedimentary rocks; and
- e. low permeability basement rocks under sedimentary cover (BUSC).

Environments a. to c. were initially identified as the preferred group with their hydrogeological structures seen as simple and more predictable. But after a re-evaluation the BUSC environment was examined along with the other 3 [COR/501, p.43, para.6.4.1].

6A.32 Nirex claims that selection of a DWR site cannot rely upon generic characteristics but must be based upon a safety assessment of the complete system. The Sellafield PRZ exhibits the essential characteristics of the BUSC environment mentioned in PERA [COR/501, para. 6.3.3(d)] because groundwater flow is dominantly occurring in the sedimentary cover and there is little anticipated connection to the underlying older hard basement rocks which are of low intrinsic permeability. The Bredehoeft and Maini paper (CCC/4/1) cited by Cumbria does not provide the authoritative definition of this generic geological term, since there are other interpretations such as that in PERA; but in any event the essential characteristics of the Sellafield PRZ conform to the definition in the paper.

6A.33 It believes the paper gives examples of a coastal site broadly analogous to Sellafield and of an inland BUSC site as described by PERA [CCC/4/1, Figs.3 & 5]. Nirex does not regard these sites as showing the cover rocks as shales with a downward hydraulic gradient isolating groundwater beneath, because in both examples permeable sandstone aquifers are a component of the cover sequence [CCC/4/1, p.295, para.4], and basement rocks crop out on land in both [idem, Fig.3 and CCC/4/11, Fig.2b (Sellafield Variant)].

6A.34 In relation to geological complexity, the nature of the rock structure will determine the location of the DWR in any rock mass [NRX/14/2, p.5]. DWR depth is limited by increasingly high temperatures and rock stresses [NRX/14/2, p.6]. Nirex submits forcefully that complexity of a site is not a disqualifier although it may add to the difficulties of characterisation. It is the capability to predict hydrogeological behaviour, and so support a reliable probabilistic safety assessment, which is essential at any potential DWR location, in its view. The IAEA guidelines [GOV/507, para.401-402] are merely general advice on geological environments, and Nirex has no fixed view on an appropriate environment in this case.

6A.35 But it does regard the 2 key functions of the geological barrier in relation to the transport of radionuclides in groundwater as being to ensure, firstly, low flows through the DWR so that the physical and chemical barriers can operate to retain short-lived and most long-lived radioactivity (amounting to some 99% of the total radioactivity of the emplaced waste) and, secondly, that there is sufficient dilution of those radionuclides released from the vaults in order to limit concentrations to regulatory limits. Nirex notes the importance of groundwater dilution to the Swiss NAGRA project as outlined in NRX/13/3, p.81-83. The RCF is designed to establish whether the geological setting at Sellafield can perform these key

functions and Nirex contends that the site has the characteristics favourable for doing so in the very long term.

6A.36 The "Regional Evaluation" stage of Nirex's site selection was carried out using qualitative features and indicators to identify generic geological environments [COR/501, para. 6.3.2], but it was considered unlikely that any one location would prove superior to all others in terms of all the physical properties offered by the host environment. Again, it was generic post-closure radiological safety assessments which were applied when narrowing the list from 500 to 39 candidate sites [COR/501, para. 6.5.8]. As it is the total geological and hydrogeological character of the site which is relevant to risk performance and the safety case, rather than site performance on individual attributes, Nirex asserts that the promise of Sellafield, or any other short listed site, needs to be established through site investigation and modelling to build sufficient understanding of conditions in that setting, a view it sees supported by the regulator [HMP/1/1, paras. 7.6-7.7].

6A.37 Furthermore, Government policy and regulatory guidance makes it necessary only to meet the regulatory requirements for pre-closure and post-closure safety performance, which Nirex expects to meet at Sellafield, and not exceed them. No further reductions need be sought in Nirex's view if the estimated risks at a location are below the target and BPM is employed, a situation unchanged from the requirements of the Green Book [GOV/302, para. 3.8 & 3.9]. It is also unaffected by the reduction in the annual dose [para.6A.18 above]. Calculated collective dose is not a primary consideration but good engineering practice and good science will need to be demonstrated.

6A.38 Whilst consideration of other sites with theoretically lower risks is not precluded by such an approach, in Nirex's contention, nevertheless it is for the regulator to decide whether a safety case based on a higher risk than $10^{-6}/y$ would be acceptable. It is not Government policy, nor regulatory guidance, that an authorisation application consistent with the risk target should be refused because another site has, or might have, the potential for a lower risk. The risk target of $10^{-6}/y$ of an individual developing either a fatal cancer or a serious hereditary defect is accepted as being well below the level of risk of between $10^{-4}/y$ and $>10^{-3}/y$ implied by the natural background radiation in the United Kingdom [HMP/1/1, para. 6.20]. The risk to dose factor is 0.06 per Sv, made up of 0.05 for risk of death and 0.01 for risk of developing a serious hereditary defect [NRX/15/3, para.10(i)].

6A.39 Nirex adds that for the PCSA, the DWR risk would have to be predicted to a degree of accuracy acceptable to the regulators: other regulatory requirements will have to be met: the pathways highlighted in the NRPB's Radioactivity Review [GOV/416] would involve short lived radionuclides which would have decayed: present day nuclear facilities would not be operating when the potential DWR risks would apply: measures can be taken to reduce the radiological impact of natural radiation, and the peak additional doses from a DWR would be relatively very small. Furthermore, public doses of radioactivity would be minimised by reduction of waste transportation.

6A.40 Although Nirex is not responding to the Irish Government on any matter of policy, it points out that there is no UK Government policy that DWRs should not be sited on the coast of the Irish Sea. At the technical level, the very extent of the Irish Sea over the timescale of 10^8 years is of course problematic. But, using preliminary safety assessments

at Sellafield as an example, the forecast peak radiation risk to an individual from an eventual marine discharge from a repository in the PRZ [COR/522, Vol.3, Table 6.18, Fig.6.6 & Section 9.1(g)] would be incurred by an inhabitant of the mainland which is currently England, and that at well below 10^{-6} . The peak risk that might be incurred by an inhabitant of the present continental shelf around Ireland for ^{129}I would be insignificant [NRX/15/34, para.12].

6A.41 Dr Elliott concedes that disposal is a radiologically advantageous option over surface storage [WR/E/1A] and Nirex believes that there is no evidence to support the proposition that the 1 mSv/y level could be reached from artificial sources. Even adding the 1 Msv/y level postulated to the average annual dose quoted by NRPB for Cumbria results in a lower average annual dose than Cornwall, Derbyshire, Devon, Northamptonshire and Somerset and is comparable to many other counties [NRX/15/24]. In addition, Nirex does not accept that any increased cancer incidence in Cumbria is associated with the presence of the Sellafield nuclear facilities or atmospheric fallout [NRX/15/42, p.7].

6A.42 **Cumbria**, while agreeing with Nirex on the requirements of a geological barrier [COR/501, paras. 3.2.6 & 3.2.7], and that suitability of any particular site must be based upon a safety assessment of the predicted performance of the complete repository system at the site, submits that environments in which low permeability basement underlies sedimentary cover (BUSC) provide the best overall performance of land based options with respect to post-closure radiological safety [CCC/4/1 and CCC/4/11]. It regards it as relevant to consider whether a site has the characteristics which are likely to lead to a successful safety case and feels that departures from BUSC characteristics would lead to substantial problems in proving a safety case. It also suggests that the post-closure design requirements imply a Tolerability of Risk zone between $10^{-6}/\text{y}$ and $10^{-5}/\text{y}$ along the lines recommended by the RWMAC/ACSNI Study Group & the NRPB [GOV/208, paras.76-7].

6A.43 In Cumbria's view, the BUSC concept is characterised by groundwater movement taking place predominantly in sedimentary rocks overlying older low permeability basement rocks. Because of the difference between the permeabilities in the basement and cover rocks being measured in orders of magnitude, and of the lack of a significant hydraulic gradient within the basement rocks, there should be little interchange of groundwater between the 2 formations. If there were to be any interchange, the presence of alternating impermeable and permeable rocks within the cover sequence would act as a barrier to upward migration [CCC/4/11, Fig.2a].

6A.44 Cumbria maintains that the Sellafield variant [idem, Fig.2b] has an inherent flaw in comparison with the BUSC concept because groundwater recharge to the basement rocks, which outcrop some 2.5 km (rather than some 64 km as in CCC/4/1) away from the PRZ, will provide a driving force for groundwater to flow through the repository volume. This is not regarded by Cumbria as a variation of BUSC but as fundamentally different. Sellafield also has a major fault of hydraulic significance (the FHFZ) about 500m downstream of the PRZ, unlike examples in CCC/4/1; and the sandstones in the sedimentary sequence in CCC/4/1 do not rely upon dilution within them to satisfy the safety case. As regards comparison with other sites, Cumbria points to the lack of data such as quantitative

information on type III fractures in Nirex's post closure performance assessment [COR/522] to enable any meaningful comparison to be made.

6A.45 Cumbria also believes that the novelty of DWR science means that outcomes are inherently uncertain, but that an ideal BUSC environment should produce a margin in the safety case to allow for uncertainties such as the effects of climate change. Deviation from an ideal BUSC environment could result in, for example, there being some hydraulic continuity between the basement and cover rocks, plus permeable layers in the latter being exploited as aquifers. Then there could be short groundwater return times and exposure of radionuclides to the biosphere, and human ingestion, at significant concentrations. Furthermore, complexity of geology, and particularly faulting, makes the controls on groundwater flow much more difficult to define, predict and model.

6A.46 **Gosforth** strongly advocates a cautious approach, including the selection of simple and safe potential DWR sites, in view of the many uncertainties it perceives. It also draws attention to a potential hazard from the cumulation of plutonium oxide particles from contaminated waste, a concern shared by **Mrs M S K Higham**. While Mrs Higham sees a health risk through eventual release of the particles into the biosphere, Gosforth is concerned that recurrent criticality incidents could take place in the DWR creating heat, steam, gas and radiation [WR/GPC/1, particularly pp.10 & 11], a matter which Nirex takes seriously and is working upon [NRX/15/41]. **Mr S Balogh** draws the analogy of such a fission reaction with the Oklo phenomenon [GOV/630, pp.303-7]. Gosforth sees the solution in the design of a dry DWR [idem, p.12-13].

6A.47 **Friends of the Earth** particularly identify the need for avoidance of dewatering, and so derogation of shallow and surface water resources, and other perturbation effects in any DWR. Nirex accepts that the geochemical characteristics of a PRZ could be fundamentally important to the control of radionuclide transport through oxidisation, complexation, sorption and mineralisation [eg FOE/8/1 & FOE/8/14], and yet these, like the impact of excavation damage on fluid flow, and fluid fracture flow generally, are complex areas of science with many unknowns.

6A.48 They agree with Cumbria, Greenpeace, **Patricia McKenna MEP**, **Mr J Fitzsimons MEP** and others that the host rock needs to facilitate detailed characterisation and hydrogeological modelling on a regional scale. The many uncertainties point to the need for application of the precautionary principle in site selection in their opinion and merit subsection of research results to peer review. They also highlight the need for validated modelling of baseline conditions at any location.

6A.49 **Greenpeace** submits that geological investigations are characterised by uncertainty and it shares the view of Friends of the Earth on the need for application of the precautionary principle. Radiological safety is paramount in site selection as set out in the optimisation guidance in Directive 80/836/EEC (as amended by 84/467) in its view and all exposures to radioactivity should be ALARA and the risk broadly acceptable [GOV/701, para.175]. Nirex accepts that BPM should be applied regardless of risk and concedes that a further reduction in the safe radiation dose level in future cannot be ruled out. Greenpeace points out that Nirex welcomes the "explicit recognition" that uncertainties in human dosimetry do not have

to be taken into account in making radiological assessments in the regulator's draft guidance [NRX/12/17, para.8.7] and that it is not prepared to accept that the risk of $10^{-5}/y$ is an upper bound on optimisation. Greenpeace sees this as a contradiction of the regulator's guidance that the dose constraints (i.e. 0.3 mSv/y) place an upper bound on optimisation [HMP/1/1, para.6.6], which it equates to a risk of $10^{-5}/y$ [idem, para.6.8]. This demonstrates that Nirex is showing a candid disregard for fundamental principles relating to radiation protection, in its view.

6A.50 A low groundwater flux and chemical containment by groundwater is crucial to providing sufficient levels of safety for chlorine and uranium respectively in Greenpeace's contention should the engineered chemical barrier fail. It also sees a requirement for simple groundwater flow and evidence for geologically long term stability of water or a downward rather than upward flow. Sufficient generic research and validated hydrogeological models are also needed to support any detailed safety assessment with the requisite degree of confidence.

6A.51 Greenpeace and others consider that a tectonically active location could increase groundwater flows through a DWR as could glaciation [GOV/507, p.12]. Furthermore, they share the view of Friends of the Earth that perturbation of the hydrogeological regime during RCF/DWR construction must be avoided.

6A.52 The Irish Government adds that it regards hydrogeological and geological complexity as making the radiological impact of a DWR on the marine environment impossible to predict over an extended timescale such as that required by the waste inventory. It sees reliability in prediction as fundamental to the principle of sustainable development. Uncertainty requires application of the precautionary principle which, in this instance, means the assessment of alternative inland sites.

6A.53 Together with Patricia McKenna and Mr Fitzsimons, it considers that there is already an excessive concentration of nuclear activity in the general Sellafield area and that the addition of a DWR will add to it unacceptably in terms of health and safety so exposing the Irish people to further risk. It believes that optimisation of protection requires inter alia, keeping ALARA, economic and social factors being taken into account, the number of people exposed to ionising radiation - EC Commission v. Belgium Case C-376/90: 1992 2 CMLR 513 at para.23. These concerns are shared by the Isle of Man Government [WR/IOM/1].

6A.54 GAG has misgivings about the shift of emphasis from a safe natural host rock to a multi-barrier containment system because it sees this leading to a compromise on the degree of safety achieved and an undermining of proper site selection. It regards safety as being of pre-eminent concern in site selection.

6A.55 South Cumbria Citizens, together with other local groups and individuals, are also concerned about the uncertainties arising from human error generally, but particularly in predictions and assumptions supporting the safety case. They cite national and international nuclear accidents and resulting pollution in support of the proposition that insufficient caution is displayed generally by the nuclear industry and regulators [WR/SCC/1]. They draw particular attention to the probability of an uneven distribution of radionuclide pollution [SCC/6/5] and the inherent susceptibility of exposed populations to "second event" radiation

damage from some radionuclides [SCC/6/4]. The NRPB's investigation into this phenomenon is open to question in their view.

6A.56 Interested Persons in their written representations reflect an overwhelming concern that radiological safety should be paramount in site selection of a DWR. There is a similar measure of feeling that geological and hydrogeological stability and predictability should characterise any PRZ. Some of these representations are from persons with specialist knowledge. The concern is supported by instances of miscalculation and error in nuclear industries at home, as mentioned by the Irish Government and South Cumbria Citizens above, and abroad in Russia for example when disposing of waste [WR/A/2] or operating nuclear plant [WR/M/146].

6A.57 Dr Patricia Elliott is concerned at the burden on a local population in terms of radiation exposure when that population already has a high average exposure to various sources of radiation, and the highest in UK from artificial sources [WR/E/1A & 1B]. She cites the cumulative impact of doses from natural and artificial sources and additional doses received by certain groups (eg high fish consumers) which could already approach the 1 Msv/y level. History has shown that populations have received significant exposures of radiation as safe dose levels have been revised downwards [WR/E/1B].

6A.58 Ms J Allis-Smith draws attention to the need to review the health profile of communities resident in any potential DWR location in order to ensure that levels of cancer, especially amongst children, are not unduly high [WR/A/81]. The potential effects of radioactivity on children, and its high incidence in Cumbria, is also cited by Mrs S D'Arcy [WR/D/104] and Mrs P A Kilshaw [WR/K/2]. Their point is reinforced by Mr R Stirzaker [WR/S/247] who also draws attention to the significant radiotoxicity of some substances, and especially ^{14}C and ^{40}K .

6A.59 Dr W R Burton, formerly technical co-ordinator for a UKAEA radioactive waste design study, perceives serious shortcomings in deep disposal where high salinity and a high head of groundwater is encountered causing early return of radionuclides to the biosphere [WR/B/57 & WR/B/57 Enclosure, p.5]. He believes that these shortcomings would be exacerbated by perturbation, gas generation of the wastes and erosion of rock cover [WR/B/57 Enclosure, pp.5-7, WR/B/57A, pp.1-3 & WR/B/57B].

6A.60 My conclusions about basic DWR locational criteria are merely a preliminary step in appraising the overall scientific & technical benefits of the RCF. For the general international & national criteria are just lists of indications, with a choice of DWR location really expected to conform to only a number of the indications in any list. Nevertheless, the indications are significant, since many of the more detailed submissions on the benefits of the RCF, to be considered later, stem from them. Moreover, the Assessor's advice is that 2 principles of overriding value can be derived from his review of the geological, geomorphological & hydrogeological criteria. One principle is that the location should be in a region of low hydraulic gradients, so that there should be slow-moving & long groundwater pathways: and the other is that the geology & hydrogeology of the site and its district should be sufficiently uncomplicated as to be readily characterisable & predictable.

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6A.61 Although Nirex rightly draws attention to the difference between the respective storage requirements for HLW and ILW, the 2 principles hold good for DWRs for long-lived, alpha-bearing ILW. Indeed, the importance of the 2 principles is to my mind emphasised by the nature of the various uncertainties highlighted by other parties and elaborated upon in Chapter 6C, such as over the particular science of physico-chemical reactions within the repository; the circular difficulties of affecting the natural groundwater & rock mechanics; and establishing the baseline geochemical conditions. The multiple natural barriers afforded by the setting of the DWR need to be understood before a mixed natural & artificial multiple barrier can be properly devised to complement them and produce a reliable PCSA.

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6A.62 Moreover, whilst there has been a shift of focus in the guidance from the properties of the host rock to the wider hydrogeological setting, there are still some common factors relating to geodynamic stability. The host rock & general locality should not be liable to be affected by climatic changes, neotectonics, seismicity, volcanism & diapirism to such an extent that these could unacceptably impair the isolation capability of the overall disposal system. Rather more specific advice on some aspects of stability has been introduced by Euradwaste Series No.6, including distancing the site from geothermal anomalies or volcanic evidences. However, this guide's short timescale for tectonic movement appears to require further consideration in relation to the 10⁸ design period used for risk predictions.

6A.63 The requisite features of potentially suitable environments identified for Nirex by the BGS in 1986 were part of the shift in focus, and complied with the general principles. The extent to which Nirex's ultimate choices of site contained these features remains to be evaluated in later Chapters of this report. There is an inevitable element of circularity between the role of an overall safety assessment on the whole system in finally showing whether the regulatory protection standards are satisfied, and the essential prerequisite that the host rock & its hydrogeological setting are uncomplicated enough for their character to be satisfactorily described. Although the concept of a Groundwater Return Index has been devised to help reduce this circularity at the first stage of site selection, I accept the view of the BGS, as broadly endorsed by the Assessor, that the concept is impracticable for the UK.

3C.23

6A.64 In any event, it seems to me that the Irish Government's basic objection, founded on international law, is now raising a fundamental difficulty about some of the environments identified for Nirex. For PERA specifically mentioned the huge dilution offered by migration of the residual amounts of long-lived radionuclides to a marine receptor in the biosphere, and the prospect of effective marine dilution of any leakage of radionuclides [COR/501, paras.3.2.8 & 3.3.3]. Such factors obviously would have influenced the choice of potential environments, particularly small islands and seaward dipping & offshore sediments. I have already concluded that international treaty law subscribed to by the UK suggests that, where an eventual marine discharge is foreseen, the location must be at least specifically justified, and the potential effects on the marine environment must be considered in addition to the dilution value on the human pathway.

6A.65 For its part, much of Cumbria's scientific case rests on the concept of the BUSC environment. As I understand the issues, there are a number of points to be made when considering the differences between Cumbria & Nirex over this concept. The first is that, for our purposes, it does not matter who devised the concept so long as it is a practicable one. Then, the description of "basement rocks under sedimentary cover" is intended to refer

to an essential, basic element of the concept, but cannot give the complete picture: it is not suggested that in every instance of basement rocks under sedimentary cover there would be a promising situation for a DWR. For example, the presence of a number of faults of large displacement & which enhanced conductivity between the basement rock and the cover would appear difficult to reconcile with the concept. Thirdly, in the Assessor's view, the 2 principles set out in 6A.60 above effectively mean that in applying the concept in specific instances we should be looking for some minimum scale of hydrogeological system. Finally, Nirex seemingly does not share the judgement of Cumbria, endorsed by the Assessor, that an essential element of the concept is a mix of relatively low & high permeability layers in the sedimentary cover, serving to further inhibit potential vertical flow.

6A.66 In consequence, Nirex is relying in its present work on some dilution by the groundwater in the sedimentary cover, whereas the BUSC concept is for the flows in the sedimentary cover to be, if anything, an active barrier. Whilst reliance on appropriate dilution capabilities is contemplated by modern guidelines, it would not in my view be appropriate to transform a theoretical barrier into a receptor, thereby turning this particular concept on its head. Although Nirex has cited the importance of groundwater dilution to the NAGRA project in support of its own approach, the Assessor advises me that the geological setting there is so different that no useful comparison can be made with Sellafield.

6A.67 On the other hand, this does confirm the crucial role claimed by Nirex for establishing through site investigation & modelling the total geological & hydrogeological character of a preferred site. Also the yardstick of the site characterisation need be no lower than the 10^{-6} risk target, since the optimisation of the site selection & justification of the final choice, which the planning authority wishes to review, logically come before that. But the very point in this case, of course, is that Nirex is seeking permission to proceed further with its preferred site's characterisation whilst delaying that review. The difficulty yet again is Nirex's failure to appreciate that it is for the planning authority and not the regulators to review the choice of location, and that the authority is entitled to its own view about the acceptability of the risk, so long as it does not seek to substitute its own detailed risk assessment for that of the regulators.

6A.68 Cumbria and Greenpeace have so far, however, made one important error in interpreting Cm 2919. Although both the NRPB and the RWMAC/ACSNI Study Group advocated the application of the Tolerability of Risk approach to DWR safety, with an upper bound risk of 10^{-5} to complement the lower bound of 10^{-6} , this is specifically rejected by the 4th sentence of para.78 of the White Paper in respect of post-closure safety. The Government has confirmed in this its preliminary conclusion that it is inappropriate to rely on a specified risk limit or risk constraint as the criterion for determining the acceptability, ie as an upper bound, of a disposal facility. The references in the draft regulatory guidance to an upper bound expressly relate to pre-closure safety.

6A.69 Be that as it may, Cumbria has not so far indicated that it is minded to significantly evaluate site selection against any criterion relating to existing radiation levels, whether directly or indirectly by reference to human health. The anxieties of those who criticise the nuclear industry's attitude to dosimetry & its prediction record, and who emphasise the remaining uncertainties about the low-level & secondary effects of artificial radiation, are somewhat understandable, but in their turn they tend to display some lack of awareness, in

my view. For, in addition to the Assessor's point about the positive function of the Sievert as a qualitative measure of the potential harm from radiation, the general radiological protection principles of justification, optimisation & limitation are essentially precautionary, all being aimed at minimising exposure to radiation from artificial sources and not simply at avoiding unacceptable levels. Paradoxically, it is also necessary to keep a sense of perspective by considering the health of potentially millions of future generations, and not concentrating too much on the present.

6A.70 It is certainly invalid to claim by dint of aggregating the estimated doses of different critical groups that the Cumbrian population has the highest average UK exposure to radiation from artificial sources. Nor is it obvious that there would be a net detriment in terms of current exposures to radiation from artificial sources if the DWR were located in Cumbria. Then to take radiation from natural sources into account, as Nirex wishes to emphasise for the very long term and some of its opponents for the short term, would seem to me to run counter to the general principles of radiological protection. Recent experience suggests that the particular risk to guard against is the accumulation by any means of isotopes discharged from the DWR; and it appears that the draft regulatory guidance seeks to do this. Therefore I agree with the Assessor that insufficient reasons have been put forward for the planning system, in focusing on the location of the DWR, to contemplate setting criteria based on levels of existing radiation from artificial or natural sources.

3C.2

6A.22

3B.28

6B. SITE SELECTION PROCESS

6B.1 Nirex accepts that there is an onus upon it to demonstrate that it followed a rational procedure for identification of Sellafield as the location at which to concentrate further investigations for the DWR development in July 1991 [NRX/12/1, p.11]. Nirex carried out its site selection procedures under the aegis of the (now superseded) Green Book which required the developer to show that a rational procedure for site identification had been followed and had not ignored a clearly better option for limiting radiological risks [GOV/302, paras. 5.3 & 5.4].

6B.2 Nirex's DWR site selection procedure started with consultation with the BGS in 1985 and was intended to follow IAEA guidelines to proceed in stages from generic to specific site assessments carried out in progressively increasing detail, the number of candidates being reduced as the requirements to be satisfied were refined and enhanced [COR/501, para. 6.1.1].

6B.3 The 1983 guidelines [GOV/501, Table 6.1] set out 4 main stages:

- a. Planning and general studies - to develop overall plans and criteria and review basic data.
- b. Regional evaluation - a search on a national scale to define favourable areas of the country - supported by laboratory and reconnaissance field work as appropriate.
- c. Site identification - the identification of specific candidate sites for comparative evaluation and the selection of outstanding prospects for physical exploration to confirm their suitability.
- d. Site confirmation - the final choice based on the results of in situ investigation and laboratory and other studies.

6B.4 The guidelines suggest that at each stage of the site investigations, societal, ecological and national legislative issues are considered and the regulatory body should be involved in accordance with national requirements [GOV/501, Table 6.1 footnote].

6B.5 The 1994 IAEA guidelines for HL/ α wastes [GOV/507] advise 4 similar stages to those above except that site identification becomes site characterisation involving the study and investigation of one or several potential sites to demonstrate that they are acceptable, and in particular from the safety point of view [idem, para. 324]. A reasonable comparative evaluation may be made between sites at the characterisation stage on the basis of their ability to meet all safety requirements and of their acceptability for construction of the disposal facility [idem, para. 327]. The result of this stage is the identification of one or more preferred sites for further study, shown by preliminary safety assessment to be potentially suitable for a repository [idem, para. 326].

6B.6 At the conclusion of the characterisation stage the preferred sites are identified. The final site selection is expected to involve judgements based on socio-economic, environmental and political considerations [idem, para. 328]. Site confirmation consists of detailed investigations at the preferred site(s) to:

- a. support or confirm site selection of a preferred site(s); and
- b. provide additional site specific information required for detailed design, safety analysis, environmental impact assessment and for licensing [idem, para. 329].

6B.7 The siting process should proceed according to a plan developed in consultation with the regulatory authority, and should include the establishment of guidelines or criteria for site characteristics and procedures for applying them as well as optimisation for long term safety concerns [GOV/507, para. 310]. The potential worth of "volunteer" sites and existing nuclear sites or land adjoining existing nuclear facilities are suggested for special consideration in site selection, the latter particularly in relation to waste transportation [idem, para. 302]. The guidance suggests early identification of factors or criteria which might result in the rejection of a site during the planning stage and that they be investigated during the area survey (regional evaluation) stage, even if such factors are not among the most easily applied [idem, para. 314]. The area survey generally involves regional mapping and site screening during which consideration should be given to important groundwater resources, national parks, historic monuments, national laws and regulations [idem, paras. 317 to 323].

6B.8 Although site selection in the UK is no longer a matter for the regulators, they would be willing to comment on site selection to the planning inquiry into the DWR application. Whatever site was selected, they would expect the same performance requirements to be met. Examples of economic and social factors taken into account by the regulators on the issue of site suitability can be found in the decisions on THORP [GOV/632] and the Sizewell B Power Station [GOV/633].

6B.9 The RWMAC/ACSNI Study Group recommended [GOV/409] that:

- a. The details of the site selection process should be publicly transparent.
- b. The various stages of the open site selection process must ensure that sites for further consideration satisfy the "acceptable risk" level of the TOR criteria. The contribution expected from the engineered barriers should be stated at the outset (as noted in 6A.26d above).
- c. The TOR criteria cannot be directly applied in the early selection process stages (hence the recommendation of the development of groundwater return indices - see para.6A.26e & 6A.27 above).
- d. The selection of preferred areas, and sites within those areas, for detailed investigation leading to the eventual selection of a preferred site should involve the relevant local authorities and there should be public consultation.

- e. The necessary regulatory (licensing and authorisation) procedures should be effectively and efficiently undertaken in parallel with the planning process.

6B.10 Nirex have carried out the following procedure so far:

- a. The identification of 500 sites in Great Britain based on desk studies and then the incremental sieving down to 12 sites for detailed consideration in a multi-attribute decision analysis (MADA) process.
- b. In 1988, the MADA process considered 12 sites, splitting one of the offshore options into 2 to make 13 sites, and recommended a short list of sites for further investigation to the Nirex Board.
- c. In 1989 the Nirex Board decided to investigate further 3 of the sites recommended by the MADA group, one of which was not pursued in the event (see 6B.32).
- d. In 1991 the Nirex Board decided to restrict further investigations to Sellafield.

Steps a. to c. above are described in COR/501, Chapter 6 and fall short of physical exploration including field drilling and environmental studies [idem, para. 6.1.2]. The process is summarised at idem/Fig. 6.4.

6B.11 During the first stage of site selection several reassessments and re-evaluations were made to ensure an adequate level of assurance that the groundwater regimes could be characterised and modelled [idem, para. 6.4.1]. Locations in areas of national environmental importance eg National Parks, AONB's, Heritage Coastlines and Districts and Boroughs with a population density exceeding 5 persons per ha, or near major population centres, were excluded from further consideration [idem, paras. 6.4.2 & 3] because sufficient sites were believed to exist elsewhere. This reduced the area of search [idem, Figs. 6.2 & 6.3]. The population density criterion was applied because of perceived public acceptability and disturbance effects of a DWR [idem, para. 6.4.3]. Off-shore areas were screened for practical and geological constraints and potential oil or gas exploration [idem, para. 6.4.4]. Some 30% of the land area of Great Britain was classified within the 4 hydrogeologically promising environments [idem, Fig.6.2]

6B.12 Following the definition of the areas of search, specific sites were sought within these areas for evaluation. Consideration was also given to some sites outside the areas of search which appeared to offer particularly favourable features coupled with a satisfactory geology [idem, para. 6.5.1]. Nearly 500 potential DWR sites were then identified, including a site underlying Sellafield works (referred to in the MADA process as Site 9 - Sellafield A).

6B.13 Further scrutiny reduced the sites to some 200 coastal and inland showing real potential including favourable generic geological characteristics. This scrutiny excluded sites designated as SSSI's and those, although with a population density less than 5 persons per ha, near major population centres. The sites were reduced to about 160 by exclusion of those with potential ownership constraints because Nirex does not possess compulsory purchase powers [idem para 6.5.4], and then to some 120 imposing a flexibly applied land area

guideline of 400 ha inland and 200 ha coastal [idem, para. 6.5.5]. Further detailed scrutiny by BGS to select sites with the best potential hydrogeological performance reduced the number to 39 [idem, para. 6.5.6].

6B.14 At this stage a site near to the east of Sellafield works, in addition to "Sellafield A", was included (referred to in the MADA process as Site 10 - "Sellafield B") [NRX/12/11 & NRX/12/11A, correcting COR/104, Enclosure, para. 3.5.3]. The 1980 IGS (now BGS) study had marked the Volcanic rocks below Windscale and Drigg as having good potential [COR/616/Fig.2, p.5] but, because of their 900-1,000 m depth, the cost of investigation was described as likely to be prohibitive. The potential for ILW disposal within the overlying sandstones was considered to be limited although some prospect of success was suggested involving leachate discharging into the Irish Sea [idem, pp.7-9]. The nature of the volcanics below Sellafield was considered speculative at that time [idem, pp.7-9]. 1988 desk studies of the Sellafield area pointed Nirex to the "Sellafield B" location where the BVG was considered to be at an accessible depth. Neither the location for Sellafield A nor that for Sellafield B overlap the PRZ.

6B.15 A list of 17 land-based and 2 off-shore sites resulted from examination of site availability and specialist assessment on a comparative basis of radiological safety, geology, socio-economic and environmental issues, DWR design concepts and transport [COR/501, para. 6.5.7]. During this assessment transport and its costs became an important issue and attribute values were not always dependent on quantitative measures [idem, para. 6.5.11, 6.5.13]. Further refinement led to 12 sites going forward for detailed decision analysis in the MADA process which were judged to be at least acceptable on the attributes of concern. The candidates comprised coastal, inland and island sites underlain by hard rock; coastal and inland sites underlain by basement rock under sedimentary cover (BUSC); coastal sites underlain by seaward dipping sedimentary rock; and 2 generic offshore sites, one being underlain by sedimentary formations off the east coast of England, and the other by igneous rock off the west coast of Scotland [idem, para. 6.5.14]. The latter offshore site was later divided into a shallow and a deep option by the MADA team to make the 13 sites mentioned above [6B.11(b)].

6B.16 The MADA sites are set out in Tables 2 and 3 to NRX/18/6 and the attributes used in the analysis are at idem, Table 1. The numbered order of attributes is the same on all 3 tables. The attributes are clustered around major and minor nodes [idem, Fig.1 and COR/101A, Enclosure, Appendix 1, Fig.1]. The latter reference gives percentage weighting figures for the base case. The geological characteristic of each site is at NRX/12/18, Table 5.3 and NRX/12/14, Table 1. The MADA exercise team reduced the 12 (then 13) potential DWR sites down to a short list of sites worthy of investigation. Their objective was not to determine which was the best site and neither were they structured to do so.

6B.17 The MADA team of 14, including the facilitator and analyst from the London School of Economics, comprised a mix of 4 Nirex employees and 8 consultants from BGS (2), JMP (1 transport specialist), UKAEA (2) and Pidea (3 planning/environmental specialists). They performed their function of choosing a short list for Nirex as the DWR developer, by generating conditionally prescriptive values. They deliberated over 5 meetings with the help of computer assisted requisite decision modelling and saw their work as pioneering in this field. The additive, or compensatory, models were considered sufficient in form and content

simply to obtain a short list of sites for further investigation and are distinguishable from more complex models which may be used for site selection such as those which are normative, satisficing or descriptive.

6B.18 The team of experts drew up the list of attributes which could discriminate between sites [NRX/18/6/Fig.1] and provided scales and weightings for them to reflect their relative importance [NRX/18/6/Tables 2 to 5 and COR/101A/Enclosure, Appendix 1, Fig.1]. Preference scores represented "best guess" evaluations of the options on the attributes and were tested for independence through weighting assessment after a process of normalisation. Uncertainty in many of the "best guesses" was recognised by participants and taken into account by establishing 90% confidence intervals around the "best guesses".

6B.19 The nature of requisiteness in the modelling is illustrated by the treatment of the pre and post-closure safety attributes. For 3 of the pre-closure safety attributes a great deal more work would have been needed for the experts to provide confidence intervals, and in the light of the overall low weighting on the safety attributes, the extra work would not have affected the overall scores of the options. For the 4 post-closure safety attributes uncertainty was considered to be expressed entirely by intervals of confidence solely on Attribute 18 (safety to individuals).

6B.20 Sensitivity analyses were also carried out using varying weightings of the major nodes [NRX/18/6/Table 6 and Figs. 3 to 7] to check consistency. These analyses did not include the possibility of further changes to the dose risk limit but some revisions were made to weightings in the iterative process looking at overall results and applying pessimistic weightings. The group eventually agreed to accept weights of 100 on costs, 20 on robustness, 10 on safety and 10 on environment as a base case with other weighting sets used in the sensitivity analysis [idem, Table 6]. The cumulative weighting in percentage terms was costs 71.4, robustness 14.3, safety 7.1 and environment 7.1 [idem, Table 4 & Fig.1]. The difference in costs was thus judged to be 10 times more important than the difference in safety for the sites considered which relates to valuing a life at £300,000. The cumulative weights for the base case [idem, Table 4], showing the discriminating power of the attributes, reflect the group's judgement based upon information available in Autumn 1988. The exercise showed several sites consistently less or more preferred to others, even when pessimistic scores were substituted for "best guesses", and sites were reassessed according to relative advantages and disadvantages, leading to the recommendations listed below.

6B.21 The MADA team identified stakeholders interested in the short list of sites as being Nirex Board, National Environmental Groups, Local Residents, Local Authorities, HM Treasury, Regulatory Bodies, Politicians, Scientific and Technical Community, European Neighbours. The team provided weightings for the views of these groups though each participant was limited by the facilitator to 5 factors in total no matter how many roles were played. There was no check that each stakeholder was represented fully, or at all, in the choices made.

6B.22 Although the preliminary results of the consultative exercise, "The Way Forward" [COR/203], provided some input into the exercise, there was no formal linking of the 2 exercises because the consultative exercise, published in COR/204, was incomplete at the time of the MADA team's meetings. Sellafield was the only location specified as being under

active consideration for a DWR during "The Way Forward" consultations, although noted as being geologically "complex" [COR/203, para. 5.2.7] and "uncertain" [idem, para. 6.3], a point recognised in the MADA exercise. At that time hard rocks in low relief terrain, small islands and seaward dipping offshore sediments were suggested by BGS as hydrogeological environments preferred over inland basins of mixed sedimentary rocks and low permeability basement rocks under sedimentary cover (BUSC), the former group of 3 being simple and predictable and probably yielding a sufficient number of sites for further investigation [idem, para. 5.2.5]. The concept foreseen for Sellafield in "The Way Forward" was a fully engineered offshore facility below the sea bed with access by underground tunnel from a point on the Sellafield site [idem, para. 6.3].

6B.23 In terms of site selection, the "Responses to the Way Forward" [COR/204] found concern about blight, especially in areas dependent upon tourism, agriculture and fishing; unanimous support for the paramountcy of safety, including during transport of waste; and concern at any radioactive pollution of the sea. Local support was not seen by many as an important factor in site selection [idem, paras 7.6 et seq.]. Some matters were the subject of mixed views eg. the importance of excluding areas of high amenity and the level of population density. The report showed a degree of support for deep disposal [idem, Map 4]. It reported Copeland (quoting not from their official response but from their leader's press release of a BNFL initiative) as welcoming the possibility of developing a new approach towards the storage and disposal of LLW and ILW [idem, para. 1.3.16], and Cumbria's qualified support for investigation of an off-Sellafield facility [idem, para. 1.3.6]. Local support was represented in the MADA exercise to the extent of Attribute 24 - local experience - nearness to a nuclear establishment [NRX/18/6, Table 1] which, at 1.3% weighting in the base case model [idem, Table 4], had little impact on the MADA result.

6B.24 In 1988, RWMAC responded to "The Way Forward" by declaring support for a pragmatic approach to site selection but on the basis of a fixed set of assessment criteria [GOV/412, para. 12]. It also recognised some difficulty in publicly identifying more than one site for investigation prior to development [idem, para. 13].

6B.25 MADA sites were paired for comparison near the end of the procedure to keep in play sites of different geological environments and, after reaching conclusions on the sites, the group re-introduced geology, but not geographical spread, as a discriminating factor to arrive at the recommendation that at least 3, and perhaps up to 5, sites were worthy of further investigation. These were:

- a. If 3 sites: Sellafield B (Site 10), BUSC Sites 6 or 7, and Coastal Hard Rock (CHR) Dounreay (Site 1) or Low Relief Hard Rock (LRHR) Site 2.
- b. If 4 sites: Sellafield B, BUSC Sites 6 or 7, (CHR) Dounreay or LRHR Site 2 and island Site 3.
- c. If 5 sites: Sellafield B, BUSC Sites 6 or 7, (CHR) Dounreay, LRHR Site 2 and island Site 3.

6B.26 Site 6 was found to be marginally better than Site 7 but, because they were both geologically similar, Site 7 was not recommended for further investigation concurrently with

Site 6. Dounreay and Site 2 were both recommended for further investigation because they were assessed as being geologically different and relatively good. Site 3 was assessed as being as good overall as Dounreay and Site 2, and particularly good on robustness though less good on environmental issues.

6B.27 BUSC Site 8 had been dropped in preference to Sites 6 and 7 because it did not score so well on 9 attributes [NRX/18/6, Table 6] although it scored better than 7 on geologically predictive (Attribute 12), transport capital (Attribute 1) and economic resource sterilisation (Attribute 27) in the base case [NRX/18/6, Table 3]. Sites 5 and 13 were dropped after the fourth meeting because they scored consistently poorly. Site 4 was dropped because it showed little difference in overall scores and sensitivity analysis from Site 3 [NRX/18/6/Figs.3-7].

6B.28 The results of the MASCOT modelling of radiological safety in the MADA post-closure safety analysis [COR/501, Table 5.2] required adjustment to account for program inputs based on judgements rather than calculations [idem, 5.6.6, 5.6.10 & NRX/12/14, para. 8]. Sellafield B was adjusted (from 0.0003 mSv/y to 0.02 mSv/y) by the time of the MADA exercise but others were adjusted between the MADA and issue of PERA by factors of up to 100 to allow for site specific uncertainties [NRX/12/14, Table 1]. No other change was made subsequently as a result of the increase in dose estimates for individual sites or for the dose to risk conversion factor [NRX/15/32, para. 9, NRX/12/14, paras. 4-8 & Table 1]. The outcome in terms of preference scores for post-closure safety reflected in PERA made little overall change to relative site performance as found by the MADA team [NRX/12/18, Table 5.2].

6B.29 As regards pre-closure radiological safety for waste transport, estimates of collective doses to the public of up to 1.2 man Sv/y (60 man Sv during the 50 year operating period for the DWR) were considered small in relation to 2000 man Sv/y from cosmic rays and terrestrial radiation [COR/501, para. 5.3.7]. In MADA, Sellafield B demonstrated the lowest risk to the public from waste transport and DWR (Attribute 16) some 37 man Sv less than Sites 5, 6, 7, 8, 11, 12 and 13 and some 152 man Sv less than Dounreay and Caithness (Site 2). The latter 2 sites were lowest for workers (Attribute 14) [NRX/18/6, Table 2].

6B.30 In 1989, after the MADA exercise and the consultation process ["The Way Forward" -COR/203], and assuming the site selection process had been based upon a thorough methodology, Nirex regarded it as clear that the sites under consideration were divided between those where there was a measure of support for nuclear activities in the local community and those where there was not [COR/501, para. 6.7.11]. Sellafield B, Dounreay and Site 2 (Caithness) were selected. Caithness was then proposed for designation as an SSSI and, also recognising the technical, practical, time and resource constraints on investigating several sites simultaneously, Nirex decided to limit further investigations to just 2 areas with a perceived measure of local public support, namely Dounreay and Sellafield [COR/501, para. 6.7.11]. This set aside Sites 3, 6 and 7 recommended by the MADA team, of which Sites 6 and 7 were acknowledged to have a potential for lower radiological risks than the 2 locations selected. The Government accepted the Nirex Report of its decision to concentrate on Dounreay and Sellafield [GOV/211] after consulting with RWMAC who had published their views [GOV/402/Appendix C]. The conceptual DWR design [COR/501/Fig.4.2] was refined and preparations made for a DWR planning application [COR/208, NRX/12/1, pp.5-

7] with a continuing expectancy that surface investigations would be sufficient for the supporting safety assessment [NRX/12/2, p11-17].

6B.31 The surface implications of Sellafield B were considered in MADA by reference to the Pelham School Estate [NRX/12/11A] which is some 2.4km north west of the RCF location. Nirex moved the location to Longlands Farm in 1989 to avoid the Carboniferous Limestone present under Sellafield B. The Newton Manor Estate, including Longlands Farm, had been offered for sale to BNFL in 1987, but was not purchased until March 1989.

6B.32 The further investigations at Dounreay and Sellafield led to Nirex's decision in 1991 to concentrate on Sellafield as its preferred choice with Dounreay remaining as the next option [NRX/12/1 p.11, NRX/12/2, p.10]. The key factor in the choice was that 60% of the waste destined for the DWR would arise from Sellafield. That position remains the case with some small change in percentages, although no optimisation of waste transportation has been calculated since the MADA exercise. Sellafield has its own rail infrastructure.

6B.33 The decision to concentrate on a single site was determined by costs and demands on highly specialised scientific manpower. It was also recognised that much further work was required before a long term safety case could be made. The Dounreay investigation results were summarised in COR/506 and published in December 1994. It was decided to proceed with the RCF as a contingent development stage in September 1992.

6B.34 The geological and hydrogeological requirements within the PRZ include a minimum of 100 m to 200 m of BVG cover over the DWR and a maximum depth below ground level of 1000 m. The PRZ is contained by the presence of permeable Carboniferous Limestone to the north west, the Fleming Hall Fault Zone (FHFZ) to the southwest, the Seascale Fault Zone (SFZ) to the southeast and the National Park boundary (A595T), where BVG cover is reducing, to the north east [COR/518, Vol.1, Drgs.010054, 010061 & 010062 & NRX/2/3/Fig.4.1]. The 2 fault zones are presumed to be associated with enhanced hydraulic conductivity.

6B.35 The 1:1,000,000 scale national vulnerability map included in the former NRA's 1992 Policy & Practice for the Protection of Groundwater [GOV/131] indicates a Major Aquifer with soil of High Leaching Potential running down the Cumbrian coast from St Bees Head to the Ravenglass Estuary, and extending inland over the PRZ. The 1992 document also contains the NRA's policy statement on physical disturbance of aquifers and groundwater flow [idem, pp.26-7]. The NRA's consultation reply on the RCF planning application [COR/107, letter of 11 November 1994] made no specific reference to this policy statement nor to the ES [COR/101], Chapter 7 of which addresses effects on water resources, including groundwater. The NRA reply dealt instead with a miscellany of technical matters, including an outstanding application for consent to discharge and the possibility of requiring an abstraction licence. In further communications [culminating in COR/113C Addendum], the NRA sought planning restrictions on the RCF development, to avoid groundwater contamination and to control groundwater discharge from the RCF. These matters are considered in Chapters 5E and 7A of this report.

6B.36 Until the RCF planning application stage, the MADA process had been publicly summarised in COR/501. On receipt of the planning application Cumbria sought, and

received, further information on the site selection process [COR/101A & COR 104, Appendix D]. At this inquiry more information on the site selection process was provided by Nirex witnesses. The site selection process has not been the subject of peer review, although Nirex has called upon external expertise for comments and advice at some points in the programme [eg COR/516]. It is accepted by the parties that more information has been made available to this inquiry on site selection than to any other body, including RWMAC and the Royal Society.

6B.37 **Nirex** does not accept that it needs to justify the merits of its choice of sites or of the sequential sieving of those sites to the point of decision to concentrate further investigations on Sellafield and Dounreay and then on Sellafield alone. The rationality of the site selection procedure is clearly distinguishable from the merit of the decisions made during the procedure. In its view the latter is appropriate for a review of alternative sites at the stage of a planning application for a DWR and not for the RCF application. Nevertheless, the overall process of site investigation, carried out with the aid of several different groups of consultants, was generally satisfactory and thus can now be endorsed by the Secretary of State.

6B.38 It points out that the IAEA guidelines make provision for individual site characteristics to be taken into account in the practical application of site selection [GOV/501, pp.2 & 19], as well as socio-economic factors [idem, p.23] and this has been done. The procedures kept a wide range of siting options under review, whilst at the specific level this PRZ is spacious enough for both the RCF and the DWR. The RCF has been sited potentially to enable its utilisation by the DWR for drainage and in connection with ventilation, spoil removal and emergency access while ensuring that the DWR rock volume suffers no adverse perturbation effects. It does not accept that this PRZ would be so geologically complex that so much intrusive investigation would be needed as to compromise the safety case. Cumbria concedes that the IAEA guidelines were followed: and generally there has been little criticism of the thoroughness of the systematic reduction of 500 sites to 12.

6B.39 As to the MADA exercise, Cumbria accepts that MADA provided a reasoned basis to proceed to identification of a short list and that Sellafield emerged fairly from this process as a candidate site. Greenpeace acknowledges the validity of MADA as a technique.

6B.40 All the MADA sites were seen by Nirex as having the potential to achieve the regulator's risk target of 10^{-6} /y [COR/101A/Enclosure, para. 4.1.1], even after the change to the calculated post-closure annual doses to an individual [NRX/12/14 & NRX/12/18, Tables 5.1-5.3], because of the very conservative model of engineered barriers, of hydraulic conductivity, and of containment of some heavy metals. Little importance was therefore placed upon the margins by which the target could be exceeded by any site [GOV/409, paras.3.37 & 3.38] or on the weighting for post-closure safety.

6B.41 Although safety is a material consideration in planning terms, in the MADA exercise, costs, for example, were a greater discriminator between sites and so merited greater weighting. It points out that, provided BPM is employed to limit discharges, then the risk target does not need to be exceeded under present guidance or under the Green Book [GOV/208, para. 78, HMP/1/1, para. 6.17, GOV/302, para. 5.3] because post-closure safety

is already assured. This is not tantamount to ignoring any "clearly better option for limiting radiological risks" [GOV/302, para. 5.4]. The sites thought by the MADA group to have potential for lower risks were considered by the Board and discounted for good reason. Furthermore, the CASCADE study revealed very low collective doses for post-closure safety (attribute 19) [COR/501, Table 5.2] and the longer term estimates (attribute 20), weighted on a value curve [NRX/18/6, Fig.2], are similarly small. Nirex regards safety other than post-closure radiological performance as also being important, as in the case of public doses associated with waste transport, which would be minimised by location near Sellafield where the bulk of the waste is generated, a point reinforced by Dr Cunningham. The performance of the hard rock off-shore option, although having a low post-closure radiological risk, was marred by conventional safety considerations [COR/501, para. 6.6.10].

6B.42 In the MADA sensitivity analyses, the variations in base case nodal weightings of costs, robustness, safety and the environment, and displays of the scores for one node against the scores for any other node [NRX/18/6, Figs.3 to 7], were thorough and sufficient and have not been queried by any party. Shifts of about 14% points (about a fifth) on the total weight on costs [NRX/18/6, Fig.4], and some 8% points (more than double) on the total weight on safety [NRX/18/6, Fig.6], would be needed before Sellafield B loses the highest weighted preference score. Until the safety weighting is increased from 7% to some 67%, or the cost weighting drops to some 30%, Sellafield B remains in the top 4 of the MADA sites. If the safety weighting is increased to 67%, the implied value of a life increases from £300,000, twice the figure recommended by the NRPB [NRX/18/2], to some £7.4m [NRX/18/5].

6B.43 Progressively increasing the weighting on Attributes 12 and 13 (geological certainty and investigability) would eventually take overall preference scores for Sites 2, 3, 4, 6, 7 and 8 above Sellafield B, but Sites 4 and 8 were not robust to sensitivity analysis and so were dropped by the team. Sites 2, 3, 6 and 7 were all included in the recommended short lists and so it is unclear how an increase in weighting on Attributes 12 and 13 would have aided the MADA team's judgement.

6B.44 A weighting of over 45% on the environment node would be needed to displace Sellafield B and Cumbria does not suggest that too little importance had been given to it. Indeed, Nirex points out that 5 of Cumbria's 7 weighting sets give this node a weighting of 5%, 2% less than in the MADA Base Case [CCC/6/10, Tables 3,4]. This is not surprising in view of the environmental screening stages in the preceding sieving process.

6B.45 Although the treatment given to divergent perspectives is disputed by some objectors, further inputs would have simply produced another range of views on weightings which the MADA team would also have needed to resolve. Sellafield B scored consistently well on a wide range of weighting sets designed to simulate different perspectives as it was. Nirex submits that the merits of the MADA team's judgement are not the issue, but whether that judgement was reasonable having regard to such divergent considerations as cost to developer, customers and consumers and meeting the regulatory target. In its view the team's judgement was reasonable and rational, and it was considered by RWMAC to be "defensible" [GOV/402, Appendix C]. Re-runs of MADA results up to 1994 have not altered Nirex's view of the outcome of the exercise.

6B.46 RWMAC also accepted the logic in identifying Dounreay and Sellafield for further investigation and establishing their suitability before evaluating other sites in detail, an approach accepted by Government [GOV/211]. The rationality of the Nirex Board's approach in first concentrating investigations at these 2 sites due to scarcity of resources has not been challenged. Nirex contends that the importance of support in the local community recognises reality [COR/104, COR/407, COR/411] and does not prevent any planning application being decided on material considerations according to law. Public controversy severely hampered the site investigations for a shallow repository between 1983 and 1987; and there was no measure of local authority support for a DWR in the areas of Sites 3, 6 or 7. In contrast, local people already familiar with potentially hazardous industry understand it better, and feel more comfortable living alongside it.

6B.47 Nirex refutes the assertion that the potentially suitable extensive areas of East Anglia and east-central England identified in COR/501/Figs. 6.2 & 6.3 are likely to be less complex than the BVG. The geophysical surveys show the basement rocks to be more varied and complex than previously thought [NRX/14/4]: there are too few boreholes to allow confident prediction of the basement geology: the rocks are just as folded, cleaved fractured and faulted as rocks of a similar age in the Lake District and Belgium: some Tremadoc rocks contain small quantities of methane: and data on the hydrogeological characteristics of deep basement rocks in the UK are sparse, especially for hydraulic conductivity [NRX/14/5, paras.3.3i, 4(iii), 4(iv) & 4(v)(d)]. BUSC Site 6 could therefore be as faulted in its basement rocks as the BVG even though it may seem superficially simpler geologically. Furthermore, the minimisation of ILW transportation, resulting in the lowest collective dose to the public during the DWR operating period at Sellafield, almost exactly offsets the post closure advantage over 10⁵ years of the generic BUSC option evident from COR/501/Table 5.2.

6B.48 The decision in 1991 to concentrate on Sellafield as the preferred choice did not mean that Nirex had decided to submit a planning application for a DWR at this location [NRX/12/2, p.10 para. 3] and that remains the case today. The 1991 decision as such has not been criticised, and was also entirely rational. Preliminary assessments have been made on DWR post-closure performance to demonstrate that the site holds good promise [COR/522], and on matters such as earthquake risk [COR/516, para. 3.1.1(a)], glaciation [COR/527] and chemical effects [COR/525]. This investigative, research and assessment work is progressing at Sellafield but, if a DWR application were to be made in the future at Sellafield, further investigative work is not intended at other potential DWR sites except perhaps Dounreay. Other sites considered in the selection process remain options if needed. A DWR inquiry for Sellafield would probably have the benefit of reworking of existing data as far as alternative sites are concerned so the work carried out in the 1980s would not be entirely relied upon.

6B.49 The scale of the shift from Sellafield B to Longlands Farm is too small in Nirex's view to uncouple the site selection process leading to the MADA short list and the Board's decisions to concentrate on Dounreay and Sellafield and then Sellafield alone. The depth of the BVG at Sellafield B is no less than the present PRZ and the cost of constructing waste transport arrangements would be similar for both locations.

6B.50 As to the purported lack of public information and involvement with the site selection process, Nirex points out that confidentiality was in the interests of not needlessly

concerning the public about potential DWR sites and has not hampered Cumbria and Greenpeace from making their arguments based upon COR/501 as amplified at the inquiry. "The Way Forward" [COR/203] and its Responses [COR/204] effected consultation on the broad approach and the rationality of the site selection procedure is unaffected by the absence of additional public involvement. Furthermore, Nirex asserts that public involvement in site selection is a matter for Government policy and Government has not suggested that there should be such involvement, even in Cm 2919. In accordance with its policy Nirex has published a wide range of information of high quality on the DWR programme and scientific activities in order to promote public confidence for which it has earned praise [GOV/407, para. 4.6, COR/605, sections 1.9 & 6.8]. It intends to continue to be pro-active in improving the quality of its interaction with interested parties [NRX/12/6].

6B.51 **Cumbria** finds it striking that the Nirex Board did not follow the recommendations of its own MADA team, and take the common sense course of investigating at least one BUSC site with a more robust and promising generic geology than Sellafield B as demonstrated in the Bredehoeft and Maini Paper 1981 [CCC/4/1]. This would have given more confidence in validity of techniques and promise of potential host environments. Extensive areas of East Anglia and east-central England identified in COR/501/Figs. 6.2 & 6.3 are likely to be far less complex than the BVG, particularly the Tremadoc and possibly intrusive igneous rocks in east-central England. Nirex concedes that data from deep basement rocks in UK are sparse and borehole data does not allow confident prediction of their geology or hydraulic conductivity [NRX/14/5, paras.3.3i, 4(iii), 4(iv) & 4(v)(d)]. Cumbria believes that disposal of ILW does require simple and determinable geology. In order to cope with the paucity of data an investigation programme at alternative sites should involve at least 2 to 4 boreholes of the sort used for the first few years of the Sellafield investigation.

6B.52 A BUSC site, with relative lack of complexity and vertical continuity and low hydraulic heads, would enable a more readily achievable safety case which is where the balance of public interest lies, in Cumbria's view. It contends that Sellafield locations do not exhibit crucial BUSC characteristics, and points out that there are more potential BUSC sites than the MADA Sites 6 and 7, as others were identified in the pre-MADA stages. Many sites with better potential than Sellafield have been discarded, and passing over the best site options for limiting radiological risks at the short list stage is tantamount to ignoring it in Green Book terms. It considers that the MADA exercise distorted the proper comparative rankings, particularly of Sellafield B, BUSC Site 6 and Dounreay; and Nirex made insufficient allowance for the problems involved in a long and difficult process of investigation.

6B.53 Cumbria considers the lack of weight given to the risk of failure and to safety in the MADA exercise to be a fundamental flaw. Geological certainty (combining predictive - Attribute 12; and investigability - Attribute 13: [NRX/18/6/Fig.1 & Tables 1-3]) attracts a base case total weighting of only 3.97% [COR/101A Enclosure, Annex 1, Fig.1]. The base case weighting for post-closure safety is only 6.82% [COR/101A/Enclosure/Annex 1/Fig.1]. These weights are plainly inadequate when the public regard safety as paramount.

6B.54 This can be seen by changing the emphasis of the weighting in the base case [CCC/6/10, Table 4], and particularly increasing the weight on the predictability of the host

geology as shown at CCC/6/10, Table 2 to a wholly credible weighting set. An increase in Attribute 12 (geological certainty) - [NRX/18/6, Table 1] from 3.27% to 20%, and a reduction in Attribute 4 (operations costs) - [NRX/18/6, Table 1] from 32.47% to 15.74%, result in BUSC Site 6 scoring first (81.5) with Sites 2, 3, 7 and 8 all scoring better than Sellafield (76) and Dounreay scoring poorly at 74.3. Furthermore in CCC/6/10, Table 1 (referring to detailed weightings in CCC/6/9, Table 4), Site 6 performs best overall in a sample of 5 of the sites recommended by the MADA team. BUSC Site 7 is second, and a worthy alternative to Site 6, in each case. Sellafield B comes fourth of the 5 and Dounreay always last. This outcome is consistent with Nirex's concession that only 3 of the sites would meet the regulatory target at the lower 90% confidence limit, not including Sellafield B nor Dounreay.

6B.55 The point is reinforced by examining the cost of a life, which Cumbria considers to have been too low. Although the figure used of £300,000 was an increase on the £150,000 suggested by NRPB for very low individual doses in 1986 [NRX/18/2], in transport a sum of £600,000 was adopted at that time and valuations have increased markedly since with £2M being commonly quoted in literature [CCC/6/7]. Nirex concedes that the value of a life would alter with context and even with personal expert judgement.

6B.56 If the value of a life is taken as £2M [CCC/6/10, Table 5], the cost and safety relative node weights are changed from 10:1 (MADA Base Case) to 1.5:1. Leaving robustness (14.29%) and environment (7.14%) unchanged, cost (71.43%) becomes 47.14% and safety (7.14%) becomes (31.43%) [idem, Table 7]. Site 6 (87%) then becomes preferred to Sellafield B (83.7%). Discounting costs further narrows any lead Sellafield B had in the MADA exercise over BUSC Site 6 [idem, Tables 6-8]. The MADA exercise showed that Site 6 should have been included in any pair of sites chosen for further investigation. In addition, the BUSC sites would meet the risk target for the new dose limits introduced after the MADA exercise and publication of PERA [COR/501] whereas Sellafield B and Dounreay would not.

6B.57 Cumbria is surprised that Site 12 had to be rejected because it was found to be virtually uninvestigable since such elementary criteria should have been applied at the earliest stages of site selection, and not left for the last 12 sites. On the other hand, population density should have been a site discriminator rather than acting as an eliminator with a threshold of 5 persons per ha. In turn, land ownership was introduced as a factor far too early when technical considerations should have been overriding.

6B.58 Proceeding with Sellafield and Dounreay can no longer be justified on evidence now available in Cumbria's judgement, having regard to the complexity, cost, novelty and long term nature of the DWR project. The inherent difficulty in replicating investigation, and the knowledge imbalance between sites acknowledged by Nirex, places a premium on making the correct choice first time. However, both of the sites preferred by the Nirex Board had been predicted to fail to meet the regulatory requirement at the lower 90% confidence limit. Dounreay was exactly on the risk target, offering no leeway at all on best estimates. Although the Board's decision to concentrate on sites in areas having some familiarity with the nuclear industry is politically and commercially understandable given the (then) recent trauma of the shallow sites search, it was short sighted and flawed as a means of site selection in land use planning terms. It constituted elimination of sites because of local opposition

which is not a ground for refusing planning permission [PPG1, para. 42]. The 1989 endorsement by Government was expressly made subject to the normal planning procedures: and RWMAC actually had reservations about Sellafield & Dounreay meeting the regulatory target, & the realism of hydrogeological assumptions [GOV/402, para.2.25].

6B.59 Cumbria points out that the composition of local authorities is transient and, like local communities, they may change their views. It submits that to reject Site 6 for an apparent lack of support from a local authority when considering such an important long term project of this sort was not rational, especially as each of the MADA team's recommended group of sites included a BUSC site, and during the MADA process little weight (1.3% [NRX/18/6, Table 4]) was given to "community support", simulated by "local experience - nearness to a nuclear establishment" - Attribute 24 [NRX/18/6, Table 1].

6B.60 Cumbria also finds some inconsistency between using waste transport as the discriminator between Sellafield and Dounreay on one hand and the emphasis on the safety of waste transport in the Sellafield (BNFL) Discharge Authorisation 1993 [GOV/632] and the Sizewell B Nuclear Power Station determination 1994 [GOV/633] on the other.

6B.61 The Nirex Board was over optimistic about the time necessary to demonstrate that a site could support a satisfactory safety case. Investigation is, by its nature, drawn out, lengthy and difficult to draw back from; and has safety implications for the locality. Moreover, because of the flaws in site selection, a site with some fundamentally unsatisfactory features has been selected in preference to a manifestly more suitable option. Site 6 would be likely to meet the design target, stricter since MADA, without the need for optimisation.

6B.62 Cumbria contends that Sellafield was effectively chosen as the DWR site in 1991 and then entered a confirmatory stage as the sole focus of investigation. This inquiry has presented the first opportunity for sufficient evidence to be made available for proper public scrutiny of the selection of the appeal site. This is a particularly important point in the light of the RWMAC/ACSNI Group advice on the need for transparency and availability of information [GOV/409, particularly at p.48].

6B.63 Copeland shares Cumbria's concern that Nirex decided to focus investigations on Sellafield and Dounreay on the basis of a measure of local support for nuclear activities [COR/501, para. 6.7.11]. Nirex concedes that this factor is not material in planning terms albeit important to Nirex. Copeland points out that responses to "The Way Forward" suggested that local support for radioactive waste management should not be decisive [COR/204, paras. 7.6,7.7 & 7.9] and disagrees with Nirex's interpretation of its view as supportive [COR/501, para. 6.7.8]. Although concerned that the future of civil nuclear activities in the Borough could be put at risk by investigations elsewhere, Copeland regards safety as being paramount in the search for the "best" site, wherever it is [NRX/12/2, p.1].

6B.64 It also points out that, although it is Government policy that there is to be one DWR, that does not apply to the RCF. Since there now needs to be an RCF wherever there is to be a DWR, it suggests that investigating a number of candidate sites in parallel would give Nirex's site selection process some credence. As it is, Copeland regards the selection process

as being flawed, with insufficient attention being given to alternative sites and the RCF development being unjustified.

6B.65 Gosforth also feels that there has been a lack of public consultation on site selection, and complains that the site shifts which took place from the Sellafield undersea proposal to Sellafield A, Sellafield B and then Longlands Farm were not made clear at the time. It, like some other Councils [eg WR/SLC/1], has misgivings about the site selection exercise because of the lack of some detail and the lack of emphasis on safety - a concern shared by Mr Dale Campbell-Savours MP, who seeks the very best geological characteristics for the DWR. Longlands Farm is an unsuitable site in Gosforth's submission, and the Parish Council lacks confidence in future decision-making on the project.

6B.66 The Rt Hon Dr J Cunningham MP envisages site selection at the time of a DWR application, together with consideration of economic and social aspects as well as geological evidence collected from the most rigorous scientific examination of the area, plus a thorough debate on all aspects of the safety case. The Windscale and Calder Shop Stewards Committee draws attention to the high proportion of nuclear waste and handling expertise already at Sellafield and sees increased safety in disposal locally underground.

6B.67 The Irish Government shares the views and concern of the Isle of Man Government [WR/IOM/1] and other objecting parties that the site selection process has not been open, as required by Council Directives 85/337 & 90/313/EEC and Appendix II of the 1991 Espoo Convention [see also Chapter 3A above] and that insufficient weight has been given to safety and the environment. It points out that Sellafield B did not attract the highest scores for predictability of geology and the level of post-closure safety in the MADA exercise. Furthermore, the MADA exercise failed to take account of the special quality and status of the marine environment.

6B.68 Greenpeace maintains that the choice of Sellafield for further investigation now has to accord with the precautionary principle and the sustainable development strategy and cannot be justified primarily by arguments of cost. It shares Cumbria's view that Sellafield has been chosen for the DWR over better sites subject only to confirmatory investigation; and so DWR safety effects are material and should be considered at this stage. Detriment through radiation exposure is inevitable for a DWR and is a material planning consideration - Stringer v Minister of Housing and Local Government [1970] 1 W.L.R 1201 at 1294. No real assessment of the benefits of disposal can be balanced without taking account of other sites holding potential for greater levels of radiological protection.

6B.69 Delaying a review of alternative sites until a DWR planning application or authorisation is not in the public interest in terms of time, money and public anxiety in Greenpeace's submission. It points out that the memories of witnesses to the site selection exercise are already failing, and the MADA "audit trail" is incomplete.

6B.70 There are strong indications that Nirex has, in selecting Sellafield, ignored a clearly better option for limiting radiological risk and failed to undertake a rational procedure for site identification, as required by the Green Book. In the MADA exercise, the imposition of a

threshold for post-closure safety to society $0-10^5$ yrs (Attribute 19) - [NRX/18/6, Table 1] on all the sites except offshore Site 13 [see idem, Table 3] precluded the long term public safety benefits from making any difference to the final ranking order of sites. This imposition was inconsistent with the lack of a threshold for pre-closure radiological safety to workers (Attribute 14) or the robustness node.

6B.71 Greenpeace also regards the application of the value curve to longer term post-closure safety [NRX/18/6, Fig.2] as indefensible, for it failed to make risks ALARA. Because the MADA team considered, and then assumed, that all 13 sites would meet the 10^{-6} risk target, and so only a threshold of risk needed to be achieved without optimisation, they applied the value curve to relate long term individual post-closure safety to preference. This meant that differences between sites which had higher risks were given greater value than differences between those sites with lower risks, and thus MADA failed to give due weighting to sites which performed considerably better than Sellafield B on safety. The low overall weighting on safety, together with a value curve on individual safety, tended to disguise sites with safety advantages even though they may have had similar costs. This approach is inconsistent with keeping radiation risks ALARA and should be contrasted with that taken by the US Department of Energy in its analysis of 3 candidate radioactive waste repositories [GNP/1/2, p.175-176]. Moreover, the value of a life should not have been an input into the MADA exercise. That amounted to making a cost/benefit calculation on a single yardstick, whereas MADA-type exercises should be utilised to suggest valuations of a life rather than assume them.

6B.72 Greenpeace criticises several other aspects of the exercise including the restriction of sensitivity testing to the nodal group of attributes, namely costs, robustness, safety and environment [idem, Fig.1]. Sellafield B's position in the preference scores was more volatile than Nirex suggests. For example, Sites 6 and 7 performed better on long term safety, predictability and investigability; and Sellafield B failed to meet the safety target under pessimistic assumptions [NRX/18/3]. Site ranking sensitivity should have been tested against changes in individual attributes to explore divergencies rather than convergencies. Greenpeace contends that Sites 6, 7 and 12 would better accord with the principles of sustainable development. The variation of approach during the process in relation to geological discriminators undermined the credibility of the site selection process. Utilising the pessimistic assumptions would be more consistent with the precautionary principle.

6B.73 Similarly, divergent perspectives in the MADA exercise did not reflect a proper balance of views but were obtained in an ad hoc and idiosyncratic fashion. Focus groups would probably have attached greater weight to safety than the specialists. Local experience of the nuclear industry, despite being of overriding importance in later site selection, is unclear in its meaning and relevance to various parts of the site selection process. Moreover, the assertion that only Caithness and Copeland gave some measure of support in responses to "The Way Forward" seems questionable, since the County Council for Suffolk, a BUSC area, gave qualified support [COR/204, Map 4 and para. 1.3.5].

6B.74 Nirex's change of site from Pelham House School to Longlands Farm was another anomaly. In principle, the short list of sites should have been reviewed and fresh comparisons made when Sellafield B proved unacceptable. The cumulative base weight of Attribute 3 - repository capital costs - had been 3rd highest of all at 16.23 [NRX/18/6, Table

4], and Sellafield B had been estimated at £444M at 1988 prices [idem, Table 2]. The estimated cost of the PRZ at 1995 prices is £1,820M [MRX/12/18, Table 4.1]. Even discounting back to 1988 by the Retail Price Index, the estimate would be £1,650M, which would rank the PRZ as the second most expensive after the discounted Site 13. This factor alone warranted re-evaluation of the short list.

6B.75 Greenpeace also regards the MADA exercise as not in accord with Government policy because exposure pathways and health effects yet to be recognised, considered as uncertainties in the Green Book [para. 3.8], were not included in the exercise; and neither was any comprehensive evaluation of uncertainties. It believes that the effects of glaciation and risk of geological fault movement are both very relevant to the promise of the appeal site, in terms of their potential for significant hydrogeological effects, yet they have not been taken properly into account in the site selection process contrary to international guidance [GOV/507, p.12]. It is not confident that Nirex has taken, or will take, sufficient account of uncertainties in its safety assessment citing Nirex's response to the consultation on the new draft guidance [HMP/1/1] as a case in point [NRX/12/17, para. 8.7-8.8]. It sees this again as being in conflict with the proper application of the precautionary principle.

6B.76 **FOLD** and **NSCNFLA**, would expect sufficient information to be available at this stage on alternative sites to enable an assessment to be made of likely hydrogeological characteristics and uncertainties in geology, and to include results of BGS site visits and borehole data. An environmental and radiological evaluation of a DWR for each site would also be appropriate including reasons for rejection or choice of any site.

6B.77 NSCNFLA finds the published information in PERA, more recently supplemented by COR/104, pp.91-119 and at the inquiry, inadequate, obscure and misleading in character as exemplified by the revelation during the inquiry that the PRZ was not the same location as MADA Sellafield B. The rationality of the whole site selection exercise is more apparent than real in its view because of the anomalies found and the lack of information available, particularly on the MADA process.

6B.78 NSCNFLA refers to the variety of interpretations placed upon local support reported in COR/501, paras. 6.7.8, 6.7.11, "The Way Forward" Study [COR/204, para. 1.3.16 & Table 4.2], COR/104, p.106 paras. 4.1.10-11 and in oral evidence which it regards as confusing and misleading. It cites the position of Copeland as a case in point for the Borough Council did not support deep disposal in its locality in its press release [NRX/12/1, p.4] which in any event was considering an undersea DWR accessed from neither Sellafield B nor the PRZ locations.

6B.79 **Friends of the Earth** consider that an unsuitable site has ultimately been chosen, because there may well be insufficient space for both the RCF and the DWR within the PRZ due to the likely perturbation effects of the RCF and the need for the DWR to be free from the effects of the RCF damage zone and in stable baseline conditions. Nirex concedes that it cannot engineer a solution to every complex geological problem.

6B.80 **GAG** takes issue that local support for nuclear activities was scientifically assessed in the site selection exercise and that it is material. It shares the view of **CORE**, **Cumbrian FOE Groups**, **South Cumbria Citizens** and others who lack confidence in this PRZ and that

safety has been, or will be, given sufficient priority over economic considerations. They, and **Mr S Balogh** amongst others, are also critical of the MADA exercise citing a failure to declare agreed criteria for attributes beforehand and conduct the selection exercise openly or rationally as examples. GAG does not comprehend how any meaningful comparison of alternative sites could be carried out in the future without comparable detail for those other sites; nor does **The Highland Regional Council** [WR/HRC/2]. GAG sees postponement of this consideration to a DWR inquiry as pre-empting the outcome so rendering the exercise meaningless, a concern also of **The National Trust** [WR/NTR/2, para. 11(1) & (4)]. GAG also points to the geological problems with Sellafield B as being the product of inadequate data during site selection which erroneously judged all sites as having the potential to satisfy the demanding post-closure target.

6B.81 **Mr J Fitzsimons MEP** and **Patricia McKenna MEP** feel that local residents around candidate DWR sites have a right to know the identity of the sites despite any alarm which may be caused and they are critical of the lack of transparency in the selection process. The overwhelming proportion of those writing share these views and are sceptical that Sellafield has been selected for sound reasons of long term public interest [eg WR/KUD/1, WR/R/48] or complying with international guidelines. They regard the Sellafield site as having been effectively selected for the DWR, unless some intractable problem is discovered, yet the PRZ appears seriously flawed through shortcomings in geology and hydrogeology [WR/ACC/1], a point supported by **Mr E McGrady MP** [WR/M/196].

6B.82 **Mrs M Higham** draws attention to the views of the IGS (now BGS) in 1975 that more than one site should be investigated at one time to obviate delays of many years caused by a single failure [GOV/201 para. 405]. Delays also prolong the local hazard from plutonium contaminated waste in temporary storage [HIG/1/7, p.134, para. 21 & p.137, para. 358]. She also fails to see how a DWR inquiry could assess the relative merits of different sites when so much more essential data will be available for Sellafield, including that from the RCF, than any alternative. She supports the proposition that site selection should be examined now; and emphasises that "The Six Parish Councils Committee" responded to "The Way Forward" that none wished to have the sole national DWR [HIG/1/4, P.6, point 6]. This was a reiteration of earlier submissions to the House of Commons Environment Committee [HIG/1/7, p.134 paras. 13 & 14, p.137 para. 395].

6B.83 Mrs Higham suggests that the Longlands Farm site would involve greater commitment than Sellafield B to tunnelling, adding significantly to the estimated costs and reinforcing the argument for a re-evaluation of the short list.

6B.84 **Ms J Sutcliffe** points out the advances in knowledge which are taking place and advocates a cautious approach to site selection.

3B.42 6B.85 **I have already concluded that**, as matters of law & policy, outlines of the main
3B.45 alternative sites for the DWR studied by Nirex should be considered as part of this appeal;
4A.52 and there should not be set tests or formulae for applying the development plan's basic
policy. There is no reason in law, or of planning policy, of which I am aware for
distinguishing between the rationality of the overall site selection procedure and the merits
of individual decisions made during that procedure. Whilst any sensible exercise of

judgement or discretion should naturally be respected, an illogicality or absurdity in a single but key decision is capable of undermining an entire procedure, in my view. Hence an assessment of the comparisons made between candidate sites necessarily entails a review of both the overall rationality and individual decisions. The Green Book, for example, used to call for both a demonstration of a rational procedure and a comparison of options. Also the planning authority in this case has required more material on the decision to focus on Sellafield by reference to other locations which may provide a better prospect of limiting radiological risk.

6B.86 This review of alternative sites cannot lawfully be postponed until the DWR application itself is made. Such a delay would also be unrealistic in practice, since it is clear from Nirex's evidence to this inquiry that full written records have not been kept of the MADA exercise and personal memories are understandably fading, whereas a very large body of data is being built up on the PRZ & its setting. Moreover, I consider it to be in the public interest to review the selection of this site before yet more time & money are devoted to the investigation of it. For example, if it were to transpire later that Nirex had been persisting with an unsuitable site, the temporary storage of plutonium wastes & others would have been prolonged unnecessarily.

6B.87 Whilst basically it was for Nirex to set about the exercise in its own way, Nirex must have expected that the exercise would be subject to a public inquiry at some stage. The Advisory Committee's approval of the results of the exercise was qualified by a perceptive caution about the suitability of the 2 identified sites, whilst the brief Ministerial statement on radioactive waste management policy was cast in terms which did not pre-empt any land-use planning judgement. There is also the point that, although it is easier to judge with hindsight, the benefit of hindsight does have to be applied in a case of this significance. The first matter that has to be addressed on this basis is that the national area of search (the guidelines' "regional evaluation") was mapped with a precision commended by the Assessor but with some predisposition towards maritime settings, due to the diluting property of the sea. It now seems that such a bias is contrary to international law; and it appears that even at the time little heed was paid to public concern about radioactive pollution of the sea.

6B.88 In my judgement, there are also criticisms to be made of the gradual reduction to 12 sites from the original 500 or so which were delineated out of the modified areas of search. In this respect, I endorse the Assessor's analysis of the process from the geological & hydrogeological viewpoints, and now add my own comments from the overall planning perspective. In the first instance, it would in my experience have been more conventional to proceed to search for a location for a development of this significance by assessing complete grid squares instead of immediately delineating potential sites. I consider that this hasty delimitation might well have contributed to other premature decisions discussed below.

6B.89 On the other hand, it was in accordance with international guidelines and national planning policy to exclude locations of national environmental importance from the initial area of search. Such locations should be examined only if a search of the rest of the country has failed to identify a suitable site. Also PERA [COR/501, para.6.4.3] fairly summarised the arguments on the importance of population density to the exercise, as to do with public perception & minimisation of disturbance on the one hand and regulatory assurance & long term population changes on the other: and it concluded that areas of low population density

are to be preferred. However, the consequent decision was not merely to apply this preference but rather to eliminate from the area of search all local authority districts exceeding the average population density threshold advised by the NII for the siting of nuclear power stations. To my mind this decision not only arbitrarily transformed a preference into an eliminator of the same order as a designation of national conservation importance, but also then applied the eliminator on a crudely extensive basis. The combined effect of the 2 exaggerations was bound to be significantly excessive, in my judgement.

6B.90 Because Nirex has no compulsory purchase powers, land ownership was a direct eliminator at one stage in the reduction process; and in terms of land assembly & availability it was indirectly involved at other stages. But Nirex's programme is of national importance and is being promoted in the very long term public interest. Although national policy is that a compelling case must be made for compulsory purchase, in my experience the procedure is utilised to provide land for development projects some of which are much less significant than this one. Also Ministers have reserve compulsory purchase powers if local authorities are unwilling to use theirs. I find it extraordinary that some land was eliminated from further consideration for this national project, which should benefit millions of generations to come, merely because of a deficiency in the powers of the body conducting the search.

6B.91 Since I have concluded that there should be further public consultation on the main alternative sites before this RCF could proceed in any event, I consider most of the debate about the lack of rigour in the simulation of public views during the MADA exercise to be rather academic now. The public could again express its views at first hand. But for the public to be meaningfully engaged in this way, it is important to be clear about the relative objectivity & robustness of the values which were fed into the exercise. Although the previous consultation round was incomplete when the MADA group started work, there is no doubt that the Nirex Board was aware that the public regarded safety as paramount when the Board considered the group's recommendations. Yet the Board treated another, vague factor of local support as crucial instead, and did not fully implement its advisory group's suggested geological factors, which might have been regarded as a proxy for safety. The very different application by the Board of the discriminative powers of local support & geology without referring the exercise back to the MADA group for re-assessment casts doubt on the consistency & credibility of the entire exercise, in my view.

6B.92 Also, whilst the MADA group's estimates of individual post-closure safety are now thought by Nirex to have included some very conservative assumptions about engineered barriers, hydraulic conductivity & heavy metal containment, it has become clear to me from the detailed scientific & technical evidence summarised throughout the Assessor's report that these factors are still essentially unknown variables. The critical alteration for individual dose estimates was not Nirex's re-working of the doses, but the ICRP 60 revision of the dose-risk factor. The Assessor confirms Cumbria's point that, on the information available to Nirex in 1989, only the BUSC Sites & the Offshore West Site would have met the new regulatory target for post-closure safety to the individual.

6B.93 This shows to me that the MADA group made a basic error in attaching little importance or weight to the different margins by which the sites seemed to meet the then regulatory target. Whilst the geologically-related attributes were realistic & constructive for site comparison if the geological criteria had been applied rigorously & consistently in the

earlier stages of the process, the group did not deal fully with the underlying uncertainties. As Greenpeace points out, the group failed to distinguish between optimising site selection and optimising at the selected site. Although the group showed awareness of the limited confidence which could be gained from its predictions of individual post-closure safety, it failed to comply with what is now called the precautionary principle, and take this uncertainty forward into the ranking of the sites, unlike its approach towards other Attributes related to safety. In other words, the group regarded Post-Closure Safety as assured at most of the Sites when really it was not. It seems that the previous sifting had not been completely rigorous & consistent. The Offshore Sites for example had come through even though the West ones were hardly investigable and the East one failed to meet the old regulatory target.

6B.94 To be fair to those involved, this is not altogether surprising given the Assessor's views that the quality of the available data was bound to be uneven, with the areas least likely to be subject to human intervention also the least likely to have been explored. But this cannot detract from the point that, on the information available, only the BUSC Sites appeared both really investigable and likely to meet the new regulatory target. The retention of Sellafield A was in any event surprising in the light of the history of mining the host rock. This highlights another basic point - that too much importance was assigned to costs in my view since, whilst for instance assumed to be particularly low for transport from Sellafield A, costs are only a transitory factor compared to post-closure safety. I consider that the high weighting of costs was contrary to what is now the principle of sustainability, and resulted in their having grossly excessive discriminative power.

6B.95 This compounding error seems to have stemmed from feeding into the exercise a notional value for a life. Valuing a life which is involuntarily lost to a perhaps unsuspected hazard is almost always a very controversial calculation, in my experience. Again, I agree with Greenpeace that, if anything, MADA-type exercises should be used to try to resolve such controversy, rather than by-pass it with an assumption. The age of, and the caveats within, the NRPB document on which the MADA group apparently relied do not persuade me otherwise, especially in the light of comments by the regulators as in the THORP authorisations that any calculation of fatalities is a notional statistical one, with the deaths unattributable to any particular individuals, any particular country or any particular time [GOV/632, para.61].

6B.96 Although in this relativity exercise safety could not be allowed to be paramount to the extent of virtually devaluing every other potential discriminator, I consider that the shifts needed, according to the sensitivity analysis, for Sellafield B to lose the highest weighted preference score were very modest given the 1988 public consultation response. Indeed, it would not have been unreasonable, in my view, to drop the costs weighting to below 30%. On the other hand, whilst minimising the risks associated with the transport of waste accords with the guidelines & the consultation response, the particular emphasis on it is rather difficult to reconcile with the official view of the UK regulators [GOV/633, para.3.119] & Nirex itself [COR/205, p.12] that the arrangements for radioactive materials transport ensure the public's safety and that therefore any associated risks are extremely small.

6B.97 Looking at the Attributes directly related to geology, Sellafield scored badly on Predictability or Certainty, tending to correspond with the Assessor's view that Sellafield B would not have survived the full series of geological checks in the reduction process if it had

been included from the start. Judging by his advice, it should have been obvious that there were particular complexities involved with Sellafield B, given its location along the boundary between the Irish Sea Basin & the Lake District Dome, and where regional hydrogeological conditions & groundwater heads are poorly mapped; plus the known inconsistencies in the lithology of the BVG; and the presence of the Carboniferous limestone layer. I draw a strong inference from this that special consideration was being given to Sellafield B as land adjoining existing nuclear facilities. Even though such a consideration would individually conform to modern international guidelines, the Assessor's view is that it was always likely to be unproductive in the UK; and in this instance its introduction disrupted the methodical site identification approach which he strongly favours.

6B.98 As for the preferred geological areas, I accept the Assessor's advice that there is a strong case for the selection of a BUSC site for detailed investigation, in accordance with the MADA group's recommendations. On the information available to us, there do seem to be areas of England further to the south-east where both the basement rocks & overlying sedimentary strata are favourable for a repository location. The simple point is that whilst BUSC Site 6 for example could be as faulted in its basement rocks as the PRZ, this is quite unlikely. Moreover, it appears to me that the scientific case for investigating the leading BUSC site instead of Dounreay was overwhelming. Virtually the only reason for taking the opposite line was local support [as summarised in COR/204, para.1.3.16 & Table on p.13].

6B.99 Returning to Sellafield B in this context, there seems to be little strength in the belated argument that Sellafield B is itself a form of BUSC site. The claim tends to confuse the description with the basic concept. The BGS has not mapped any BUSC area in West Cumbria. The hydrogeological region around Sellafield has too great a variation in elevation compared with its limited horizontal extent to provide the requisite low hydraulic gradients & long groundwater flow-paths. The sedimentary layers would not necessarily be a barrier to upward flow, but might well instead act in part as a diluent, notwithstanding the presence of a significant potable aquifer carrying a risk of human intrusion.

6B.100 Considerable weight has nevertheless been attached by Nirex to the argument that Sellafield B was nearly always amongst the leading Sites in the MADA analysis. This was always rather surprising in the light of the previous rejection of other special sites: and in my judgement the remaining strength of this point has been further reduced by the revelation that the current PRZ is not Sellafield B. The switch from Sellafield B to the current PRZ has been explained by Nirex as due to a fresh appreciation of the hydraulic conductivity of the Carboniferous limestone layer under Sellafield B. But, as pointed out by the Assessor, the likely properties of such layers were known to Nirex and its advisors before Sellafield B was introduced into the site selection process. Although it may well be that the cost of a drift from Sellafield Works to Sellafield B or the PRZ would be broadly the same, and I suspect that the increase in DWR construction costs is due more to better estimating than a shift in site, again it was rather inconsistent & secretive not to return to the selection process.

6B.101 This episode not only raises questions about the quality of the inputs to the MADA work, but also suggests again considerable determination to stay near Sellafield, as is implicitly acknowledged in the ES. It also shows how towards the end of the site identification process Nirex was effectively treating the Sellafield vicinity on something like a grid basis, despite having opted at the start for potential site delineation. Even now the

6B.38 preliminary safety case seems sensitive to a precise location within the PRZ. Although the
6B.79 Assessor advises that there should be space in the PRZ for both the RCF and the DWR, there
is some force in FOE's reservations, since this would be subject to laying out the repository
vaults in an irregular pattern in the rock so as to avoid the main faults, which seemingly
Nirex is still struggling to characterise.

6B.44 6B.102 Leaving further examination of the PRZ to subsequent Chapters, and turning briefly
3B.43 to the Environmental Node in the MADA exercise, although Cumbria has not attached much
importance to this Node this is consistent with the authority's approach that it is concerned
particularly with better prospects of limiting radiological risk. I note that, in turn, Nirex's
3A.24 reference to the environmental screening stages in the sieving process tends to confirm my
3C.23 view that Nirex is capable of supplying outline environmental information on the 12 Sites,
although there is now an outstanding point that the impact on the marine environment must
be considered.

6B.33 6B.103 It is not for me to comment on the adequacy of the resources available to Nirex for
6B.46 its programme, but to my mind its claim that it can only afford to concentrate on a couple
of sites is another reminder of the importance of reviewing now the appropriateness of its
original choice, for socio-economic as well as other reasons. Also I agree to some extent
6B.62 with Cumbria that Nirex has blurred the distinction between the guidelines' site identification
6B.5 (or "characterisation") and confirmation stages, even allowing for the 2 different meanings
of "characterisation". Difficulties like this might have been avoided if a plan for the site
6B.7 selection procedure had been agreed with the various regulators as recommended by the
guidelines.

6B.46 6B.104 I do consider that it was legitimate for the Board to take into account local support
6B.78 for its enterprise, no matter how vaguely defined or expressed, for it must be a type of
6B.6 political consideration contemplated by the guidelines. However I also accept that such
support cannot be a material planning consideration in its own right; and note that it was not
6B.23 favoured as a criterion in the 1988 public consultation response. Local support, despite its
smack of voluntariness, is in my view at the most a transitory advantage in relation to such
6B.59 a long-term project, and may well be merely an ephemeral one. Although it might, for
example, be a ground for preferring one BUSC site to another, it cannot be a powerful
enough point for deferring indefinitely further investigation into any BUSC site. In any
event, whilst Greenpeace seems wrong to imply that Suffolk was publicly mapped as a BUSC
6B.73 area in 1988 [see COR/204, Map 1], it is by no means clear that there was no support from
the then mapped areas [idem, compare Maps 1 & 4].

3C.73 6B.105 Putting on one side the factor of local support, it seems likely from the Assessor's
6A.31 analysis that some potential BUSC sites could be located well inland from the sea. In that
case there is too a cogent argument of international law that they should be examined before
any relatively coastal site such as the PRZ. It also now seems unfortunate that the generic
environment of inland basins was discarded so readily, albeit presumably because of their
frequent association with minerals exploitation. This tends to typify the short-cuts made
within the rationale of the site selection process, which actually ended with an arbitrary
identification of the PRZ regardless of potentially greater public benefits elsewhere. The
remaining Chapters of this Section of the report examine whether the PRZ nevertheless shows
promise.