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Your Ref: TR030001

Our Ref: JD.AMEP.A.L12/0048

Date: 23rd November 2012

For the attention of Robert Upton

Dear Sirs

APPLICATION FOR DEVELOPMENT CONSENT
BY ABLE HUMBER PORTS LTD FOR THE PROPOSED ABLE MARINE ENERGY PARK

The Infrastructure Planning (Examination Procedure) Rules 2010 – Rule 17 Further Information

Thank you for your letter dated 15th November 2012.

Please find attached requested additional information on the program of works.

Yours sincerely

[redacted]

RICHARD CRAM
Design Manager

Enc

ABLE MARINE ENERGY PARK

CONSTRUCTION PROGRAMME

Response to Rule 17 Letter Further Information
Dated 15th November 2012

CONTENTS

1. INTRODUCTION

1.1. This document provides a response to the Examining Authority's Rule 17 letter issued on 15th November which requested the applicant to:-

> *'(a) provide an authoritative version of the timetable tabled at the Specific Issue hearing on 13th November (with any necessary corrections) to be entered as an examination document;*
>
> *(b) if applicable, provide any alternative versions that the applicant has considered that might reduce any risks associated with compensation measures;*
>
> *(c) give a clear narrative explanation of any differences between any versions provided.'*

1.2. In essence, the Examining Authority is seeking a consideration of alternative solutions, by way of alternative programmes, that might result in a lesser effect on the integrity on the SPA. In this respect the Opinion of Advocate General Kokott in Case C-239/04 *Commission v Portugal (Castro Verde)* [2006] ECR. I- 10183, is noted below:-

> *'43. The absence of alternatives cannot be ascertained when only a few alternatives have been examined, but only after all the alternatives have been ruled out. The requirements applicable to the exclusion of alternatives increase the more suitable those alternatives are for achieving the aims of the project without giving rise – beyond reasonable doubt – to manifest and disproportionate adverse effects.*
>
> *44. Among the alternatives short-listed in that way, the choice does not inevitably have to be determined by which alternative least adversely affects the site concerned. Instead, the choice requires a balance to be struck between the adverse effect on the integrity of the SPA and the relevant reasons of overriding public interest',* (emphasis added)

1.3. Thus, whilst alternative programmes are presented in this report as requested by the Panel, the ecological benefits and disbenefits need to be considered against the reasons of overriding public interest for this particular case.

1.4. Section 2 includes a copy of the programme tabled at the Issue Specific Hearing ('the ISH programme') together with an explanation of the principal constraints that have been considered in its preparation. It also contains a corrected version that addresses comments made orally at the Hearing.

1.5. Section 3 reviews cases where time lags similar to that proposed for AMEP have been permitted in compensation schemes for port development.

1.6. Section 4 includes an appropriate, qualitative ecological risk assessment of the base programme and identifies the likely residual risk.

1.7. Sections 5 and 6 provide two alternative programmes that have been considered.

1.8. Section 7 reviews the overriding public interest and the potential consequences of delay on the aims of the project.

2. PROGRAMME SUBMITTED AT THE ISH ON 13TH NOVEMBER

2.1. Figure 2.1 is a copy of the Gantt Chart tabled at the ISH Hearing on 13th November 2012 ('the ISH programme').

2.2. Figure 2.2 is a corrected version of the ISH programme, which is hereafter referred to as 'the base programme'. It contains a few minor changes to clarify that the development of biomass in the grassland is uncertain, but expected to lie within the range 0f 2-4 years and is produced using a different software package.

Discussion of the Base Programme

2.3. The base programme assumes that if the DCO is granted, then it can be implemented without legal challenge.

2.4. The programme follows the time lines for the development of the compensation sites detailed in EX28.3: Part 5: Table 5.1. The time line for the further over-compensation site at East Halton is taken from EX28.3: Part 8: Table 7.1.

2.5. The start dates for the construction of the works at Cherry Cobb Sands are different for the wet grassland site and for the Managed Realignment/Regulated Tidal Exchange (MR/RTE) site. The development of the wet grassland and roost commences immediately following the granting of the DCO. This element of the works will be covered by a separate planning consent for which an application has been submitted to East Riding of Yorkshire Council (ERYC); a decision is expected in January 2013. Planning of those works may commence immediately thereafter, allowing those works to start in spring/summer 2013. The plot was partly seeded in late 2012, when 9 ha of the site was sown with a grassland seed mix.

2.6. The works associated with the construction of the MR/RTE site will be consented through the DCO and works will not be able to commence until all relevant construction precedent requirements have been discharged. Five months has been allowed for such activities to be completed and for works to commence.

2.7. The draft legal agreement (EX28.3: Part 10) constrains the commencement of the quay works such that the applicant must use reasonable endeavours to ensure that the existing flood defence forming part of the MR/RTE site at Cherry Cobb Sands is breached within 15 months of the start of the Quay works. This is to ensure that the time lag between habitat loss and the development of the functionality of the compensation site is limited.

2.8. The base programme allows a period of 22 months for the development of the MR/RTE site, which includes a winter period of settlement/ consolidation of the new flood defences before the breach and for the establishment of a vegetated sward over the defences, as required by the EA.

This means that the breach takes place 27 months after the granting of the DCO (5 months mobilisation plus 22 months construction). Given the voluntary constraint that quay works may not commence within 15 months of the planned breaching of the RTE site, then quay works can only start 12 months after the granting of the DCO at the earliest. These constraints are taken into account within the base programme.

2.9. A further significant constraint on construction is the restriction on marine piling set out in Schedule 8 of the draft DCO. These restrictions prohibit any piling, in any year, between 7th April and 1st June ('the prohibited period') in any year. Given the significant mobilisation and demobilisation costs of marine piling plant, it is essential that the marine piling programme is managed so that it does not straddle the prohibited period. Accordingly, piling works must start as soon as possible after 1st June to ensure that marine piling works are completed by 7th April of the following year. It is anticipated that the piling works will be undertaken in a 6-month timescale by two rigs working simultaneously.

2.10. A direct consequence of the base programme is that habitat within the Humber Estuary SPA/SAC/SSSI/Ramsar site will be lost before the compensatory habitat gains full functionality. The potential impact of this is that approximately 41 ha of functional mudflat will be either lost directly in the short term or will be disturbed by construction activity before functional compensation is in place.

FIGURE 2.1

Programme Tabled at ISH Hearing 13th November 2012

Attached.

	Type	Start Date	Finish Date
2	**CHERRY COBB WET GRASSLAND**	**9/10/12**	**1/7/17**
3	Grass Seeding 9 Ha	9/10/12	9/10/12
6	9 Ha Biomass Development	9/10/12 9/10/14	8/10/14 7/10/16
4	Planning Approvals	21/1/13	21/1/13
5	Construction & Seeding	24/5/13	2/7/13
7	17 Ha Biomass Development	3/7/13 3/7/15	2/7/15 1/7/17
8	Fill Roost with Water	3/7/13	22/3/14
22	**OVER-COMPENSATION OPTION**	**9/10/12**	**7/10/16**
23	Grass Seeding 38 Ha	9/10/12	9/10/12
24	38 Ha Biomass Development	9/10/12 9/10/14	8/10/14 7/10/16
1	**SoS DECISION**	24/5/13	24/5/13
12	**CHERRY COBB MR/ RTE**	**3/11/13**	**31/12/18**
13	Construction	3/11/13	30/5/15
14	Breach the Sea Wall	30/8/15	28/9/15
15	Warping up	29/9/15	1/4/17
16	Early Colonisation	11/10/15	18/3/17
17	Biomass Development	2/4/17	31/12/18
20	**AMEP**	**1/6/14**	**30/5/16**
21	Marine Construction	1/6/14	30/5/16

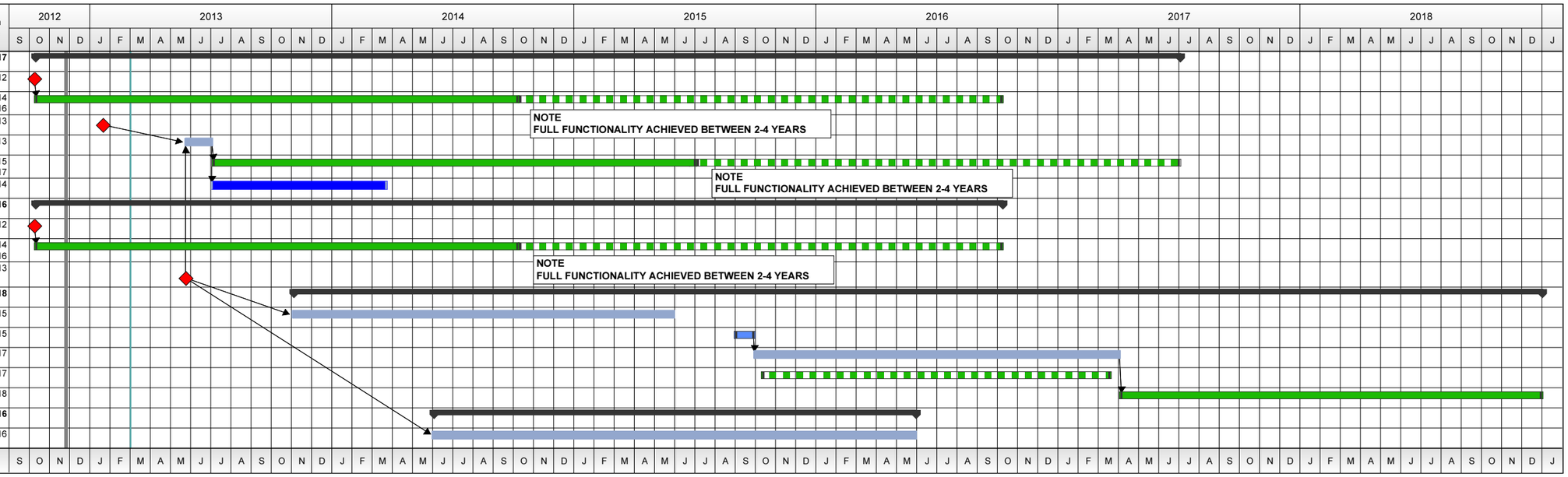

FIGURE 2.1

Programme tabled at the ISH Hearing 13th November 2012

FIGURE 2.2

Programme Tabled at ISH Hearing 13th November 2012 with Corrections

Attached.

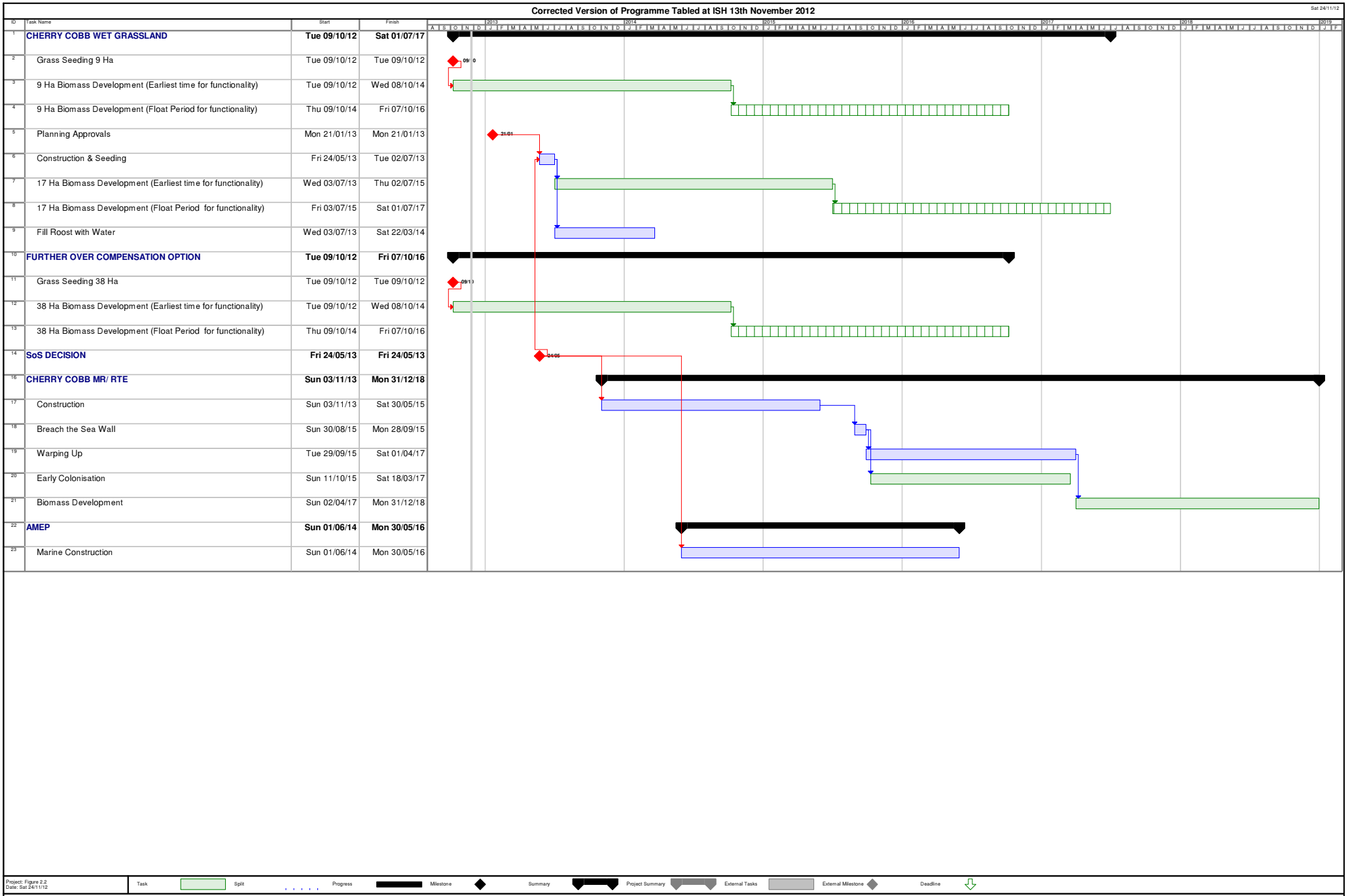

Figure 2.2: Base Programme - Corrected Version of the Programme Tabled at the ISH Hearing on 13 November 2012

3. TIME LAGS IN DEVELOPING LONG TERM FUNCTIONAL HABITAT

Precedent

3.1. Time lags for compensatory habitat have previously been permitted on the Humber Estuary for Immingham Outer Harbour (IOH) (2005) which displaced up to 603 over-wintering waterfowl (mean of peak counts) from the intertidal area. In that case, the only obligation on the developer, ABP, with regard to the timing of their development of IOH, as stated in the legal Agreement, was that they have sufficient 'proprietary interest' in the compensatory habitat sites before their development commenced. There was thus no requirement for the compensatory habitat to be functional at the time the habitat loss occurred. Again, in HST v Secretary of State for Transport and ABP [2005] EWHC 1289 (Admin), ('the HST case') HST sought to argue that the granting of a Harbour Revision Order for IOH had been unlawful because, '*it was critical that the replacement habitat be available before, or at the latest at the same time as, the destruction of the existing habitat* (but) *there was no trigger to start the compensatory works in the agreement, something usually achieved by a prohibition on development until the compensation measures were in place*'. In rejecting this, Ousely J observed that the argument failed '*because of the advice which* (The Secretary of State) *had received from English Nature as to the satisfactory nature of the compensation measures. The* (compensation) *land had been increased to its present size* (as set out in the legal Agreement) *to take account of the risks and possible time lags between work starting and the replacement reaching its full potential'*. If that approach had been wrong as a matter of law, it would have been unlawful regardless of whether Natural England had agreed the approach.

3.2. In the event, construction of the port development and the development of the managed realignment sites ran broadly in parallel, and the formal opening of the realignment site at Welwick (shortly after they were breached) took place approximately 10 months after Immingham Outer Harbour became operational.

3.3. Details of compensation proposals for other port development within the Natura 2000 network, and associated time lags, are included in Table 3.1 below.

3.4. Subsequent to the HST case, two relevant guidance documents have been published which reinforce the approach taken in the present case:-

- 'Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC Clarification Of The Concepts Of: Alternative Solutions, Imperative Reasons Of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion Of The Commission', (EC, 2007)
- 'Habitats Directive: Guidance on the Application of Article 6(4) Alternative solutions, imperative reasons of overriding public interest (IROPI) and compensatory measures', (DEFRA (Draft), 2012).

3.5. EC 2007 states that:-

- *'A site must not be irreversibly affected before compensation is in place.*
- *The result of compensation should be effective at the time the damage occurs on the site concerned. Under certain circumstances where this cannot be fully achieved, overcompensation would be required for the interim losses.*
- *Time lags might only be admissible when it is ascertained that they would not compromise the objective of 'no net losses' to the overall coherence of the Natura 2000 network.*
- *Time lags must not be permitted, for example, if they lead to population losses for any species protected in the site under Annex II of Directive 92/43/EEC or Annex I of Directive 79/409/EEC, requiring particularly attention when it entails priority species.*
- *It may be possible to scale down in time compensatory measures according to whether the significant negative effects would presumably arise in the short, medium or long term'.*

3.6. Taking the above issues in turn:-

- The compensation scheme is designed to ensure that the coherence of the Natura 2000 network is maintained in the long term.
- A time lag will occur between the loss of functional habitat and the development of functionality within the RTE compensation site. Accordingly, a package of supplementary overcompensation and further overcompensation measures is provided to address this, namely, an alternative roost site for Black-tailed Godwits (BTGs) as well as grassland habitat to provide a secure foraging resource over all stages of the tide. The additional wet grassland also accounts for any uncertainty that might be associated with the development of functionality within an RTE site. It is to be noted that the time lag relates to the achievement of full functionality. The increased functionality of the RTE will be progressive over the time lag period.
- As compensation is designed to provide habitat on a 'like-for-like' basis, no net losses are anticipated.
- No species protected in the site under Annex II of Directive 79/409/EEC (now 2009/147/EC) are likely to be affected. A single Annex I species of Directive 92/43/EEC, the Bar-tailed Godwit (BarTG), is likely to be affected by the development as it currently forages on the intertidal area. This is further addressed below.
- The geomorphological impacts of the development give rise to negative effects that will only arise in the long term. These effects are being compensated for immediately.

3.7. The BarTG is most commonly found in the Outer Estuary and its occurrence on the Killingholme foreshore was <1% of the Humber Estuary population on all but one occasion in the TTTCs undertaken by IECS between May 2010 and April 2011; that was in March 2011. WeBS counts do not record any BarTG on the Killingholme foreshore. According to ENRR 547, its preferred roost sites lie along the north shore whilst it mainly feeds in Spurn Bright and in Patrington Bay, and Pyewipe on the south shore is used in late winter and spring.

3.8. Given the typically low usage of the foreshore by BarTG's, (<1% of the population in all but a single count) the loss of the NK foreshore will not credibly result in the loss of the population or could be expected to have any significant impact upon it. Any change in the BarTG population is likely to be indistinguishable from natural variation; the five year range for this species on the Humber is 186 to 5 926.

3.9. DEFRA 2012 states that:-

'If there is uncertainty or a time lag between harm to the site and the establishment of compensatory measures, a larger area of compensation may be needed, coupled with a monitoring and management strategy that would require the applicant to take action if the compensation is not successful'.

Scheme	Area affected	Compensation	Ratio	Timing
AMEP (proposed)	44 ha mudflat 13.5 ha estuary	101.5ha falling to a minimum of 44 ha of mudflat	2:1 falling to 1:1 for intertidal; 1:1 for estuary	Reasonable endeavours that breach shall be no more than 15 months after start of construction
Bathside Bay	69ha of mudflat 2.8ha of saltmarsh 5ha of sand/shingle	69ha of mudflat 10-20ha of saltmarsh 5ha of sand/shingle	1:1 for mudflat and sand/shingle, 4-8:1 for saltmarsh	Reasonable endeavours that breach is no more than 27 months after start of construction
The Bristol Deep Sea Container terminal	Direct loss at the Avonmouth Site of 2.0ha of intertidal mudflat forming part of the SPA and the cSAC; a further 11.5ha of intertidal mudflat forming part of the cSAC; and a further 20.0ha of intertidal habitat (including 0.5ha saltmarsh) forming part of the SSSI. Localised alteration of the hydrodynamic regime leading to short to medium term functional change, as a result of significant accretion of fine sediments above background rates, in the vicinity of the Avonmouth Site to 60.0ha of intertidal mudflat and 5.0ha of atlantic saltmarsh forming part of the SPA, the cSAC and the Ramsar Site; and a further 15.0ha of intertidal mudflat forming part of the cSAC. Total: 113.5ha	A minimum of 120ha of estuarine intertidal habitat.	Just over 1:1 (less than 1.1:1)	Compensation site to be fully operational and subject to tidal inundation for a minimum of two winters. 'Winter' meaning the minimum period of December to February (inclusive)
Immingham Outer Harbour and Quay 2005	Direct loss of 22ha of mudflat inside pSPA and 4ha outside pSPA Indirect estimated loss of 5ha Total: 31ha	59ha initially, never falling below 31ha	Nearly 2:1 falling to 1:1	ABP to have proprietary interest in land and have obtained any consents for two of three sites before construction; the third (a MR scheme) as soon as reasonably practicable. No maximum time lag specified.

Scheme	Area affected	Compensation	Ratio	Timing
London Gateway Port	Loss of 25ha undesignated mudflat, including 9ha used by wintering wildfowl associated with the SPA Conversion of up to 5ha designated mudflat from intertidal to subtidal (predicted to occur through coastal processes) Conversion of up to 10ha of designated mudflat to saltmarsh (predicted to occur through coastal processes) Accumulation of silt on up to a further 50ha of designated mudflat leading to 'net functional change' Total: 74 ha	A minimum of 74ha of intertidal mudflats (split across two MR sites) to provide habitat for displaced wintering waterfowl	1:1 from the outset	Breach to create one site (site A - up to 33ha) before commencement of construction, breach for other site (site X – rest of 74ha) no later than 48 months after start of construction.

Table 3.1: Compensation Agreed for Port Development in the UK

4. ECOLOGICAL RISK ASSESSMENT OF THE TIME LAG

4.1. As set out in the applicant's submissions, the correct test to be applied in respect of the certainty required for the compensation scheme is that the decision maker should have the requisite degree of confidence having regard to all the circumstances. Even if the test incorporates the precautionary approach, the level of precaution taken into account in the decision making process needs to be proportionate to the level of risk, its duration and whether or not any potential consequences are reversible. This approach is made clear in current Government guidance on the application of the precautionary principle, which is reproduced in Annex 1. In particular the following text from the guidance is noted below:-

'(precautionary) *measures must observe the principle of proportionality, taking account of short-term and long-term risks; must not be applied in a way resulting in arbitrary or unwarranted discrimination; and should be consistent with measures already adopted in similar circumstances or following similar approaches',* (emphasis added, page 15 of the guidance).

Short-Term Ecological Risk

4.2. The principal residual risk that arises from the base programme is that a range of bird species will be displaced from the reclamation area and will need to find an alternative foraging resource before the compensatory habitat has fully developed its biomass. Notwithstanding this, the alternative roost on the north bank will be functional at the time that the marine works commence and will provide a site for BTGs to use, from which they may exploit the invertebrate resource along the Cherry Cobb Sands foreshore. Even if an intensification of the use of the Cherry Cobb Sands in turn led to other species being displaced from there, those displaced birds would relocate in turn (and so on), until either all birds are ultimately absorbed into new areas or a proportion are displaced to other sites altogether on a temporary basis, the further over compensation site on the south site will assist in providing further feeding opportunities for all bird species including the BTG.

4.3. The need for the compensatory habitat to be functional for the benefit of the SPA birds therefore represents a highly precautionary approach, since the birds have foraging opportunities in other areas within the SPA boundary. It is to be recalled also, that in the absence of the development going ahead, there can no reasonable scientific doubt that the existing NKM foreshore will lose some of its existing functionality as saltmarsh conversion progresses further.

Qualitative Short-Term Ecological Risk Assessment

4.4. The short-term ecological consequence of the project being implemented in accordance with the base programme has been risk assessed by suitably qualified and experienced ornithologists, viz. Messrs Les Hatton and Andy Coates of ERM.

4.5. AMEP will result in effects on qualifying interest shorebirds of the Humber Estuary SPA and Ramsar site and, in particular, BTGs due to the large proportion of the Humber Estuary SPA population of this species that will be affected. In applying the precautionary principle a number of different scenarios, which could arise, have been considered and these are presented in the table below. In reviewing these scenarios, the focus has been on the effects of short-term consequences, as sufficient compensation will be provided beyond the short-term once it has matured. Due consideration has been given to both the likelihood of a particular scenario occurring and the resulting effects if it does occur, taking account of the available information including about the reversibility of the effect.

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
1	Black-tailed godwits (BTGs) not disturbed, continue to use NKHP roost; Sufficient feeding resource remains, all LSE species continue to feed on remaining NKM foreshore.	No increased energy expended to forage by BTGs; Other species not displaced from feeding resource.	Noise levels will be restricted by requirements set out within the Development Consent Order (DCO) to avoid disturbance effects to NKHP. Visual intrusion will also be limited by requirements set out in the DCO to avoid disturbance effects on NHKP. Previous development has occurred around NKHP over the past 10 years, however, BTG populations have increased (Percival, 2011). NKHP will retain an estuary frontage. BTGs have previously used NKHP as a roost while foraging on the north bank (Mander & Cutts, 2005; Catley, 2009). Annex 10.1 of the ES (Benthic and Fish Surveys Report) indicates that feeding resources are unevenly distributed across the foreshore. Whilst transect 3 (in the most used count sectors C and D) had the highest abundance of *Hediste* and *Macoma,* these species are present in similar numbers on transects 8 and 12 (*Hediste)* and 1, 11 and 12 (*Macoma)*. Areas 11 and 12 are outside the AMEP footprint and 8 is likely to have reduced levels of impacts from AMEP. *Corophium* levels are high on transects 9-12 outside the AMEP footprint.	It is highly likely that the BTGs or at least a proportion of them will continue to use the NKHP. The reduction in foraging resource makes it highly likely that resources will be depleted earlier and be subject to higher competition. Birds may respond by: • extending the time spent feeding; and/or • exploiting additional food resources within or adjacent to the estuary. In this scenario it is likely there will be increased energy expenditure. It is likely there will be displacement both temporally (i.e. birds will move sooner) and spatially (birds will exploit other areas).
		No increased energy expended to forage by BTGs; All or a proportion of other species displaced from feeding resource.		Although the evidence indicates that remaining areas at NKM contain patches of suitable prey items at suitable densities, it is unlikely this will be sufficient for all bird species. Therefore, increased energy expenditure and displacement is likely to occur.
	SUMMARY:	Highly likely that NKHP will continue to be used, but likely that increased energy costs will arise. Low risk of birds being displaced through disturbance.		

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
2	BTGs not disturbed, continue to use NKHP roost; **BTGs feed elsewhere in estuary. Other LSE species continue to use NKM foreshore.**	Increased energy expended to forage by BTGs; No displacement of other species from feeding resource elsewhere in estuary. Increased energy expended to forage by BTGs. All or a proportion of other species displaced from feeding resource elsewhere in estuary.	Evidence for non-disturbance of the roost as above; visual and noise disturbances will be controlled and hence the roost will remain viable. Catley (2009) and BTO Trends report (Austin *et al* 2008) indicate that alternative feeding sites are used by BTGs within the Humber Estuary. These areas are accessed either from NKHP, or "new" managed re-alignment sites. Current suite of birds using NKM foreshore largely feed on different range of species (see EX28.3: Part 2, Baseline), and therefore there is limited competition between species. Chapter 11 of ES notes a discrepancy between numbers roosting at NKHP and those feeding at NKM in some months (i.e. more birds roost at NKHP than feed at NKM). Accretion predicted north of AMEP quay (EX 8.8 and 8.7A). Given the history of NKM since HIT, it is likely this will improve the feeding resource to the north of AMEP, but this is a long-term effect.	Highly likely BTGs will continue to use NKHP, as strong evidence base from Catley that they also exploit other sites from this roost. Possible that other species may continue to use NKM, but more likely a proportion will move to other sites including area immediately north of AMEP in response to accretion.
	SUMMARY:	Highly likely that NKHP will continue to be used but that increased energy costs will arise. Some birds may remain to feed at NKM, but others likely to be displaced. Moderate risk of BTGs and other LSE species being displaced to other feeding sites in estuary		

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
3	All LSE [1] species disturbed, all or a proportion of BTGs seek roosting elsewhere in estuary; BTGs feed elsewhere in estuary. Other LSE species continue to feed on NKM foreshore.	Increased energy expended by BTGs to feed and roost; Other species displaced from roosts elsewhere in estuary; Roosting capacity freed up at NKHP (potentially not utilisable).	See above Carrying capacity of the Humber Estuary is unknown and those papers that have addressed issue indicate up 2%-8% of estuary mudflat (total c.10 000 ha) needs to be lost before survival rates are likely to fall (Stillman *et al*, 2005) WeBS counts show high variability between years (Holt *et al*, 2012) suggesting flexibility in capacity of the Humber Estuary to absorb birds. Ability of Humber Estuary to absorb over 5,000 BTGs between 1996-2010 has been shown (Catley 2009; Percival 2011). There is no evidence of the capacity limits being reached at NKHP. Catley (2009) indicates ongoing problems with the NKHP roost in terms of water management and sparrowhawk attacks from increasingly dense vegetation. This may limit bird use of the NKHP roost in long term.	Highly unlikely species will be disturbed from roost as disturbance controlled. Likely that a proportion of both BTG and LSE species will remain to feed on remaining habitat at NKM and area north of AMEP, particularly if area upstream of AMEP accretes to some degree as predicted (EX11.24) Likely that a proportion of birds will feed elsewhere on estuary. Likely that both BTG and LSE species that stay and those that are displaced will expend more energy.

([1]) Bird species for which a Likely Significant Effect was agreed as reported in the Statement of Common Ground for the Shadow Habitats Regulations Assessment of AMEP (24 August 2012)

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
		Increased energy expended by BTGs to feed and roost; Other species displaced from roosts elsewhere in estuary; Roosting capacity freed up at NKHP (potentially not utilisable). All or a proportion of other species displaced from feeding resource elsewhere on estuary.		Unlikely birds from other roost in Humber Estuary sites will be displaced. Unlikely additional roosting will take place at NKHP. Low risk that all of species will be displaced from the Humber Estuary. Unlikely significant (i.e. >1%) numbers of LSE species will be displaced from other roost sites. Unlikely that BTGs or other species will be displaced from Humber Estuary given that there is no evidence, or reason to believe, carrying capacity has been reached.
	SUMMARY:	Highly likely that NKHP will continue to be used as a roost but that increased energy costs will arise. Some birds (BTG and LSE) may remain to feed at NKM but others likely to be displaced elsewhere within the Humber. Unlikely other species will be displaced from roosts. Low risk that birds will be displaced from the Humber Estuary as a whole.		

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
4	BTGs not disturbed, continue to use NKHP roost; **BTGs feed elsewhere in estuary. Other LSE species cease to use NKM foreshore.**	Increased energy expended to forage by BTGs; No displacement of other species from feeding resource elsewhere in estuary.	See Above	Highly likely BTGs will continue to use NKHP as strong evidence base from Catley reports that they exploit other sites in the Humber Estuary from this roost. Likely that a proportion of BTGs will feed elsewhere within Humber Estuary, although a proportion are likely to remain at NKM and in its immediate vicinity.
		Increased energy expended to forage by BTGs and other LSE species; All or a proportion of other species displaced from feeding resource elsewhere in estuary.		Likely that BTG and LSE species that stay, and those that are displaced, will expend more energy. Unlikely all, or a proportion of species, will be displaced given what evidence there is does not indicate carrying capacity has been reached.
	SUMMARY:	Unlikely NKHP roost will be abandoned. Very low risk that there will be a complete cessation of feeding at NKM but likely there will be displacement of both BTGs and LSE species to other parts of estuary.		

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
5	All LSE species disturbed, all or a proportion of BTGs seek roosting elsewhere in estuary; BTGs feed elsewhere in estuary. Other LSE species cease to feed on NKM foreshore.	Increased energy expended by BTGs and other LSE species to feed and roost; Other species displaced from roosts elsewhere in estuary; Roosting capacity freed up at NKHP (potentially not utilisable).	See above Allen (2006) indicates that there are high levels of abundance of the main prey items for the birds particularly around Cherry Cobb Sands and Stone Creek, where previous roost sites have become unsuitable due to a lack of management.	Highly likely BTGs and LSE species will continue to roost at NKHP. Unlikely other species will be displaced from roosts elsewhere in Humber Estuary. Unlikely additional use will be made of NKHP
		Increased energy expended by BTGs and other LSE species to feed and roost; Other species displaced from roosts elsewhere in estuary; Roosting capacity freed up at NKHP (potentially not utilisable). All or a proportion of other species displaced from feeding resource elsewhere on estuary.		Likely that energy costs will rise for BTGs and LSE species. Likely that a proportion of BTGs will feed elsewhere in Humber Estuary as they have done in past. Unlikely all LSE species will cease to use what is left of NKM.
	SUMMARY:	Unlikely roost disturbance will occur. Likely that proportion of BTGs will feed elsewhere in Humber Estuary. Low risk that all birds will abandon NKM.		

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
6	Insufficient roosting / feeding resource remains, all or a proportion of BTGs abandon estuary for another Natura 2000 site.	Population decline of BTGs in Humber Estuary. No displacement of other species within Humber Estuary. Displacement of BTGs or other species elsewhere.	As above. The Cardiff Bay study (Burton *et al*, 2003) indicated displacement for range of estuarine species but this was after complete loss of the site and without any compensation. Survival rates (birds were assumed to be dead if they were not re-sighted) for redshank declined from 0.846-0.778 over three years). However it should be noted that redshank numbers on the Severn as a whole have increased since barrage closure in 1999, this despite a general downward national trend, with the 5 year peak mean for the Severn now 2,926 (Holt et al, 2012) It is expected that both the RTE and CCSWG will develop functionality over time. The wet roost site will provide improved access to feeding resources elsewhere on the estuary. There has been a decline in use of a roost site on north shore near to CCS due to lack of management.	Unlikely there would be a population decline of BTGs within the Humber Estuary although possible interim declines could occur whilst functionality of the compensation package develops. It is unlikely increased use of other parts of Humber by BTG will displace other species given natural variability in numbers. It is possible, but unlikely, that a proportion of BTGs will be displaced from the Humber Estuary and use alternative sites such as the Wash when populations of waders are high (good breeding success) and resources low (poor invertebrate recruitment). Displacement could, therefore, occur in the interim whilst the compensation package develops full functionality.
	SUMMARY:	Moderate risk that some BTGs will go to other regional resources (e.g. Wash).		

Ref	POTENTIAL OUTCOME	SHORT TERM CONSEQUENCE (2014-2018)	EVIDENCE BASE	LIKELIHOOD
7	Insufficient feeding or roosting resource to be found elsewhere in Natura 2000 network.	Population decline of BTGs globally. No displacement of other species within Humber Estuary. No displacement of BTGs or other species elsewhere.	The Humber Estuary supports a peak of approximately 7% of Natura 2000 network during the autumn/winter period (based on an assumed 61,000 flyway population and 5 year peak mean for the Humber Estuary of 4,351 (Holt *et al*, 2012). AMEP affects 2,566 foraging BTG (4.2%) Non-breeding population of BTGs (islandica) is continuing to increase throughout its range including in the UK (Holt *et al*, 2012; Jensen *et al*, 2008; Gill *et al*, 2007; EC, 2007). Iberian population includes both continental and Icelandic sub-species. As the continental sub-species is declining, it is likely that there will be an overall increase in Iberia, due to an increase in numbers of the Icelandic sub-species. UK population is increasing despite considerable inter variation in numbers at individual sites, and has increased again on the Humber Estuary since 2008 / 2009 after decreases in the two preceding years (Holt *et al*, 2012). BTGs are a long-lived species that even in poorer quality breeding habitat are replacing themselves at a greater than 1:1 ratio (Gunnarsson et al 2005). The Icelandic sub-species has demonstrated its ability to expand. .into new areas in large numbers (e.g. c10% increase in UK population through expansion into E and NW England).	Likely that any short term displacement effects within the wider Natura 2000 network will be low and reversible.
	SUMMARY:	Short-term effects on the population of the BTGs within Humber Estuary SPA cannot be excluded but if they do occur there can be confidence that the effects are reversible. Long term, effects on the coherence of the network are not likely. The Icelandic sub-species population is continuing to increase throughout its range and there is no suggestion that carrying capacity has been reached. This sub-species has demonstrated an ability to expand into new areas in significant numbers.		

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5. ALTERNATIVE PROGRAMME 'A' TO REDUCE THE RESIDUAL RISKS OF THE BASE PROBRAMME

5.1. A residual short-term effect on the population of the BTGs within Humber Estuary SPA cannot be excluded if the base programme is implemented, but if that does occur there can be confidence that the effects are reversible. Long-term, effects on the coherence of the network are not likely. The Icelandic sub-species population is continuing to increase throughout its range and there is no suggestion that carrying capacity has been reached. This sub-species has demonstrated an ability to expand into new areas in significant numbers

5.2. The residual risk could be mitigated by further limiting the start date for the marine works so that the time lag between the starting and the breach occurring in the compensation site being made is further reduced.

5.3. If the most disruptive elements of the marine works, which are the piling works are restricted during 2014, then the BTGs will continue to have the benefit of the NKM foreshore during Autumn 2014, given that the Marine Licence restricts percussive piling to only a small percentage of the time.

5.4. However, restricting the percussive piling works further than provided for in the draft DML introduces the potential commercial risk that the marine piling cannot be completed in a single campaign. If, for example, the piles proved harder to drive than anticipated, or cold weather compelled a cessation of piling (another restriction) then the piling campaign may take longer than its planned 6-month duration. Limiting the start of piling until the beginning of October 2014 would provide 6 months to complete an anticipated 6-month campaign. However, winter working will be less productive than summer working due to a greater potential for adverse weather conditions; this includes a greater risk in the winter that waves restrict vessel jacking operations and higher wind speeds restrict lifting operations. Therefore it is considered that percussive piling works could be further limited so that the applicant made reasonable endeavours to complete the breach within 12 months of the start of percussive piling. Thereafter percussive piling would be limited to the periods stated in the draft DML. This programme is illustrated in Figure 5.1.

5.5. The benefit of the delay in the percussive piling is that the vast majority of the mudflat at Cherry Cobb Sands would be available during the autumn of 2014 and be subject to more limited disturbance. Accordingly, it would not be until the autumn of 2015 that BTGs were most significantly affected by displacement from their preferred feeding area.

FIGURE 5.1

Alternative A Programme, Piling works to commence no earlier than 12 months prior to the Breach

Attached.

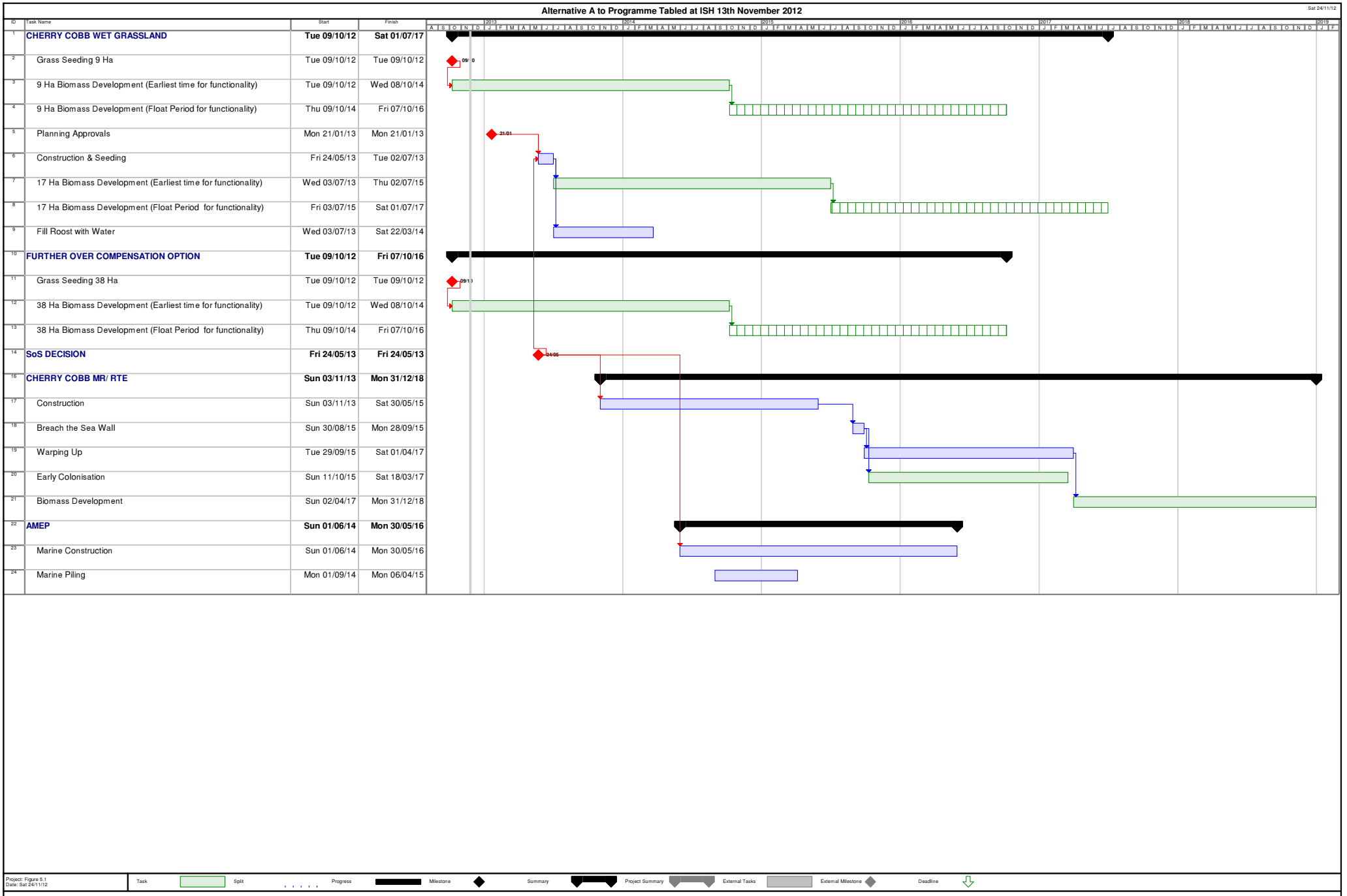


Figure 5.1: Alternative A to Programme Tabled at ISH Hearing 13 November 2012

6. ALTERNATIVE PROGRAMME 'B' TO REDUCE THE RESIDUAL RISKS OF THE BASE PROGRAMME

6.1. To further reduce short term risks to the SPA assemblage further, the percussive marine piling would need to be deferred until 4 months before the breach of the MR/RTE site. This programme is shown in Figure 6.1.

6.2. The benefit of this programme is that the wet grassland area has had a further 12 months to develop its biomass potential. The drawback is significant delay to the project.

FIGURE 6.1

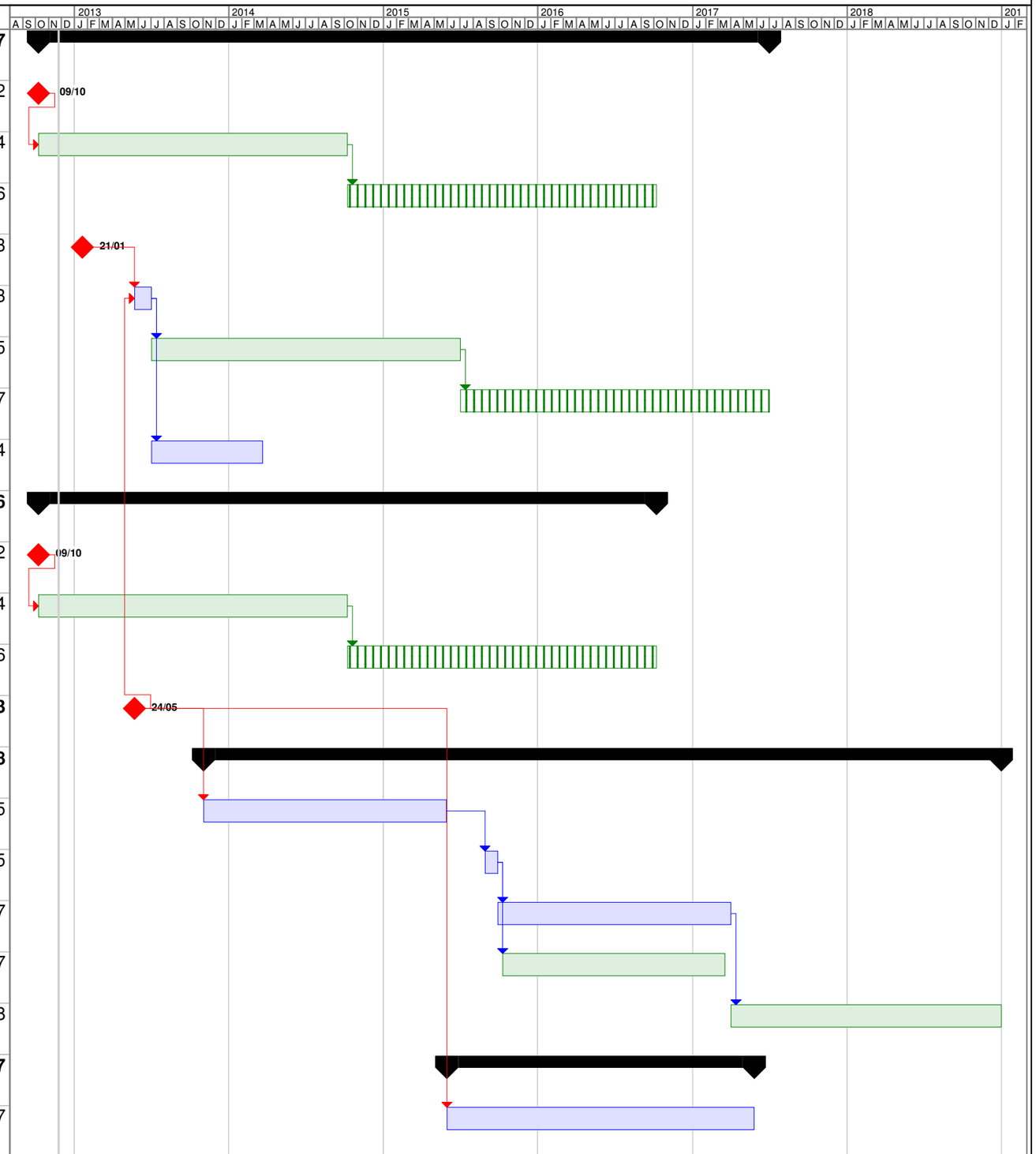
Alternative B Programme, Marine works to commence 4 months prior to the Breach

Attached.

Alternative Programme No.2 of Programme Tabled at ISH 13th November 2012

Sat 24/11/12

ID	Task Name	Start	Finish
1	**CHERRY COBB WET GRASSLAND**	**Tue 09/10/12**	**Sat 01/07/17**
2	Grass Seeding 9 Ha	Tue 09/10/12	Tue 09/10/12
3	9 Ha Biomass Development (Earliest time for functionality)	Tue 09/10/12	Wed 08/10/14
4	9 Ha Biomass Development (Float Period for functionality)	Thu 09/10/14	Fri 07/10/16
5	Planning Approvals	Mon 21/01/13	Mon 21/01/13
6	Construction & Seeding	Fri 24/05/13	Tue 02/07/13
7	17 Ha Biomass Development (Earliest time for functionality)	Wed 03/07/13	Thu 02/07/15
8	17 Ha Biomass Development (Float Period for functionality)	Fri 03/07/15	Sat 01/07/17
9	Fill Roost with Water	Wed 03/07/13	Sat 22/03/14
10	**FURTHER OVER COMPENSATION OPTION**	**Tue 09/10/12**	**Fri 07/10/16**
11	Grass Seeding 38 Ha	Tue 09/10/12	Tue 09/10/12
12	38 Ha Biomass Development (Earliest time for functionality)	Tue 09/10/12	Wed 08/10/14
13	38 Ha Biomass Development (Float Period for functionality)	Thu 09/10/14	Fri 07/10/16
14	**SoS DECISION**	**Fri 24/05/13**	**Fri 24/05/13**
16	**CHERRY COBB MR/ RTE**	**Sun 03/11/13**	**Mon 31/12/18**
17	Construction	Sun 03/11/13	Sat 30/05/15
18	Breach the Sea Wall	Sun 30/08/15	Mon 28/09/15
19	Warping Up	Tue 29/09/15	Sat 01/04/17
20	Early Colonisation	Sun 11/10/15	Sat 18/03/17
21	Biomass Development	Sun 02/04/17	Mon 31/12/18
22	**AMEP**	**Mon 01/06/15**	**Fri 26/05/17**
23	Marine Construction	Mon 01/06/15	Fri 26/05/17



Project: Figure 6.1
Date: Sat 24/11/12

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Figure 6.1: Alternative B to Programme Tabled at ISH Hearing on 13 November 2012

7. IROPI AND THE URGENCY OF THE NEED

7.1. Alternative programmes must be balanced against the IROPI case, which is set out in Chapter 8 of the shadow Habitats Regulations Report submitted with the application. The potential impacts of any material delays to the project, primarily as a result of a need to postpone construction to mitigate any time lag, are considered below.

7.2. The development of the Able Marine Energy Park (AMEP), by any measure, represents a significant project with considerable potential to address a number of critical objectives in the context of both Local and National policies and expectations.

7.3. The potential of AMEP is fully recognised by Central Government – as an example it is the UK's largest Enterprise Zone affording occupiers the opportunity to take advantage of Enhanced Capital Allowances. Equally the Examination has heard from North Lincolnshire Council with regards to their overarching dependence on the development's economic impacts and also how AMEP is central within the strategy adopted by the Humber Local Enterprise Partnership.

7.4. The combination of the scale (circa 325ha) and location (central to major North Sea Wind Farms) of AMEP provides a singular opportunity (certainly in UK and probably in European terms) to establish a large and integrated industrial cluster. This has not been contested by any other party. Such a cluster would be capable of supporting multiple (up to 3) Turbine Manufacturers (OEMs) and their supply chain(s) and this would provide a range of benefits:-

7.4.1 Whilst the UK, even prior to Round 3, already has the largest number of installed Offshore Wind Turbines none of the principal components have been manufactured within the UK. To address this imbalance and, in part, to address the current and likely ongoing levels of subsidy that support the sector, the UK needs to have the appropriate (and in the case of AMEP, bespoke) facilities to attract inward investors. Only the best facilities will enable the maximum economic development opportunities - in terms of job and wealth creation – and the much-needed associated opportunities for indigenous businesses.

7.4.2 DECC has tasked the Developers of Round 3 Wind Farms to seek to ensure that the projects have a minimum UK content of 50 per cent. This is much more likely to be achieved through the co-location of OEMs and their suppliers which in turn significantly reduces logistics costs, as well as the risks, in importing some (or all) components.

7.4.3 The key challenge facing the emerging Offshore Wind sector is indeed to reduce cost. DECC has set a target to reduce the cost per megawatt hour to £100 from an estimated £150 and again a multi-user facility/cluster is best placed to make significant cost reductions in this regard. Indeed Energy Minister John Hayes speaking at the All Party Parliamentary Yorkshire and Northern Lincolnshire Group (21st November 2012) highlighted these targets and the very clear message that, 'scale drives down cost'.

7.5 Again these factors are unchallenged. In anticipating the development, of what is effectively a new manufacturing sector, it is true to say that progress has been much slower than forecast. From 2008 a number of existing and potential turbine manufacturers commenced detailed site selection processes with, at the time, a view that production - almost exclusively linked to emerging Round 3 opportunities – could commence as early as 2013. With no single manufacturer as yet even formally committed to any UK Port location that original expectation has proved to be optimistic. The sector cites a policy hiatus and a lack of clarity and certainty in the levels of ongoing subsidy as being the principal obstacle. However, that position has been compounded by a number of other factors including: the rate at which new turbine technology (larger turbines) is developing; delays in the submission of Round 3 Planning Applications (only Moray Firth has so far made an application) and, of course, prevailing economic conditions.

7.6 Notwithstanding the above it is expected that imminent announcements (before the end of 2012) regarding Electricity Market Reform and the 'contract for difference strike price' will improve the level sector's overall level of confidence. This, in turn, is likely to have an impact on the decision-making process of would-be manufacturers and inward investors.

7.7 It is also notable that in the last 2 years other European market opportunities have emerged. Germany, in the wake of its policy shift away from Nuclear, has established its own demanding targets for Offshore Wind power generation and with it the expectation for the domestic production (and potential export) of manufactured components. Similarly France, perhaps characteristically, has inextricably linked domestic production to the procurement process for their new offshore wind farms.

7.8 So whilst momentum had stalled – and in some respects this suits the present planning timescales for AMEP – new policy announcements and pressures from other emerging European opportunities are set to revitalise and expedite the sector's decision-making process. Whilst it is very unlikely that any UK produced turbine will be installed at a Round 3 project before the end of 2016, it is known that manufacturers are planning to be installing in 2017.

7.9 **From an industry perspective this requires a major facility being consented in 2013 and, in the case of a 2-year construction period, development starting in 2014**.

7.10 Whilst the reality – as it so often does for emerging industries – may see a slower rate of development, a port developer has to have facilities available to react to market perceptions and expectations. If it cannot, its prospects are at best constrained and, at worst, they may be eliminated.

7.11 It is no exaggeration to state that AMEP is a genuinely singular opportunity - no other UK location has the potential to attract the critical mass of activity and, from a single site, deliver the unique economies of scale and direct economic impacts. Again this has not been seriously disputed and certainly no evidence has been lead to dispute this conclusion.

7.12 The basic case is fundamentally linked to the fact that the project will deliver significant socio-economic benefits to the UK generally and for the Humber region in particular. Furthermore, and through enabling the growth of the emerging renewable energy sector – and on an unprecedented scale – will also have beneficial consequences of **primary** importance for the environment by enabling the necessary transition to low carbon energy production.

7.13 The AMEP application – see particularly Chapter 5 of the ES and Chapter 8 of the shadow Habitat Regulations Assessment – details a plethora of policy documents that support urgent development. These include the broader issues of International and EC commitments in respect of climate change through to the National imperatives of Energy Security and sustainable economic growth and on to the regional and local regeneration needs of an economically deprived area of the UK.

7.14 Finally it is perhaps worth summarising the immediate and tangible benefits that are at greater risk if the start of the development was delayed beyond 2014:-

7.14.1 AMEP will comprise a facility that will not only produce wind turbines but will also provide a base for their installation. Many activities on the site will involve companies based in the region, elsewhere in the UK, or in Europe. It is estimated that the completed Project will create some 4,100 direct FTE jobs on the site related to the manufacturing of offshore wind turbines and 5,000 direct FTE jobs in the Yorkshire and Humber region and elsewhere in the UK (excluding installation works). In addition, there will be up to 3,200 direct FTE jobs in total (i.e. locally, in the rest of the region, and the rest of the UK) related to the installation of the wind turbines. Furthermore, assessments of indirect jobs, however unreliable, envisage in excess of a further 1,000 new jobs in the wider local area and further 1,500 new jobs in the region.

7.14.2 AMEP activities will also make a significant contribution to the economy in terms of Gross Value Added (GVA). The direct on-site annual GVA is estimated at £264.5 million.

7.15 In broad summary therefore, given the restriction that may be imposed on use of the quay, the greater the constraints that are imposed on commencing the works, the greater the risk that development does not proceed and also that a smaller fragmented industry emerges of much reduced benefit to the UK generally, and the Humber sub-region in particular.

ANNEX 1

ILGRA Guidance on the Application of the Precautionary Principle

INTERDEPARTMENTAL LIAISON GROUP ON RISK ASSESSMENT

THE PRECAUTIONARY PRINCIPLE: POLICY AND APPLICATION

The purpose of ILGRA is to help secure coherence and consistency within and between policy and practice in risk assessment as undertaken by Government, and help disseminate and advance good practice. ILGRA reports to Ministers.

Ministers have agreed that this paper should be published on the ILGRA website.

ILGRA welcomes comments on this paper - please send your comments to the ILGRA Secretariat, robert.wellens@hse.gsi.gov.uk by 30 September 2002.

Summary

This paper outlines policy guidelines on the precautionary principle agreed by the Interdepartmental Liaison Group on Risk Assessment (ILGRA). The key points are:

- The purpose of the precautionary principle is to create an impetus to take a decision notwithstanding scientific uncertainty about the nature and extent of the risk.
- Although there is no universally accepted definition, the Government is committed to using the precautionary principle, which is included in the 1992 Rio Declaration on Environment and Development.
- The precautionary principle should be invoked when:
  - there is good reason to believe that harmful effects may occur to human, animal or plant health or to the environment; and
  - the level of scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision-making.
- The precautionary principle should be distinguished from other drivers that require caution such as society's view on the extent of protection afforded to children or others considered to be vulnerable, or the wish to ensure that conventional risk assessment techniques deliberately over rather than under-estimate risk.
- Action in response to the precautionary principle should accord with the principles of good regulation, i.e. be proportionate, consistent, targeted, transparent and accountable.
- Applying the precautionary principle is essentially a matter of making assumptions about consequences and likelihoods to establish credible scenarios, and then using standard procedures of risk assessment and management to inform decisions on how to address the hazard or threat.
- Decision-making should bring together all relevant social, political, economic, and ethical factors in selecting an appropriate risk management option.
- Invoking the precautionary principle shifts the burden of proof in demonstrating presence of risk or degree of safety towards the hazard creator. The presumption should be that the hazard creator should provide, as a minimum, the information needed for decision-making.
- Decisions reached by invoking and applying the precautionary principle should be actively reviewed, and revisited when further information that reduces uncertainty becomes available.

Contents

Introduction – need for a consistent approach

1. Intuitively, precaution should be easy – the proverbial 'better safe than sorry'. However, for regulators precaution is often controversial, with no simple answers.

2. Precaution is controversial because the 'why', 'when' and 'how' of precautionary intervention goes to the heart of the regulation of hazardous activities and their place in society. For example, a view that risks should be managed and hazardous activities banned only as a last resort would not be shared by those who favour risk avoidance and so would prefer to remove the hazard altogether.

3. Annex 1 develops this into a spectrum of contrasting views on the precautionary principle, ranging from 'weak' to 'strong' precaution. In practice the position adopted should reflect the commitment to sustainable development that gives full weight to economic, social and environmental factors. The precautionary principle should not, therefore, be an obstacle to innovation. Properly applied it is a positive, proportionate policy tool to encourage technological innovation and sustainable development by helping to engender stakeholder confidence that appropriate risk control measures are in place.

4. Although it is widely accepted that the precautionary principle should be invoked in deciding how hazardous activities should be addressed, there is considerable debate about what the principle means, and about how it should be applied in practice. There is an obvious need for consistency between Departments. Ministers endorsed ILGRA's second report (December 1998) [1], which included a remit to "develop a consistent policy on a precautionary approach". This initiative was picked up in the commitment in the Sustainable Development White Paper [2] (May 1999) "to develop a more consistent approach to the principle across Government" and to "report on this work in forthcoming reports on this Strategy". ILGRA's work on the precautionary principle is also noted in the Government's response to the Phillips Inquiry on BSE [3].

5. The policy proposed in the following paragraphs seeks to clarify and develop existing understanding, and should underpin domestic application of the precautionary principle by Departments. The policy is broadly consistent with, but elaborates on, the European Commission's Communication [4] on the precautionary principle, which was broadly endorsed by EU Heads of Government in a European Council Resolution at Nice in December 2000 [5]. The main elements of the Resolution are summarised in Annex 2. As with any policy, however, its application is subject to constraints such as the requirements of

existing international treaties or agreements. Nevertheless, the policy is intended to be forward-looking and should inform the UK line in negotiating these treaties and agreements as they evolve.

Definition of the precautionary principle

6. There is no universally accepted definition of the precautionary principle. The Sustainable Development White Paper, set out the Government's commitment to use the precautionary principle by reference to the 1992 Rio Declaration on Environment and Development [6]:

'Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation.'

Since 'Rio', however, the UK has signed a number of international agreements which include different formulations of the precautionary principle, reflecting the context and negotiating circumstances.

7. Although the precautionary principle was originally framed in the context of preventing environmental harm, it is now widely accepted as applying broadly where there is threat of harm to human, animal or plant health, as well as in situations where there is a threat of environmental damage.

8. However, the definition is only a starting point. Policy guidelines are needed to indicate when, for example, the precautionary principle should be invoked, how a risk-based approach can continue to be followed when the scientific uncertainty is such that conventional risk assessment cannot in itself determine the level of risk, and how decisions should be made on appropriate precautionary measures.

Purpose of the precautionary principle

9. The definition makes clear that where there is scientific uncertainty the precautionary principle establishes an impetus to make a decision that seeks to avoid serious damage if things go wrong.

Key Point

The purpose of the Precautionary Principle is to create an impetus to take a decision notwithstanding scientific uncertainty about the nature and extent of the risk, i.e. to avoid 'paralysis by analysis' by removing excuses for inaction on the grounds of scientific uncertainty.

Invoking the precautionary principle

10. The precautionary principle should be applied when, on the basis of the best scientific advice available in the the time-frame for decision-making:

- there is good reason to believe that harmful effects may occur to human, animal or plant health, or to the environment; and
- the level of scientific uncertainty about the consequences or likelihoods is such that risk cannot be assessed with sufficient confidence to inform decision-making.

11. Such criteria are inevitably judgmental. Nevertheless:

– 'good reason' to believe that harmful effects may occur could be demonstrated by empirical evidence; by analogy with another activity, product or situation which has been shown to carry a substantial adverse risk; or by showing that there is a sound theoretical explanation (tested as necessary by peer review) as to how harm might be caused; and

– 'harmful effects' could be gauged by reference to factors such as severity, irreversibility, uniqueness, numbers affected, temporal and spatial extent, and knock-on effects [7].

Key point

The precautionary principle should be invoked when:

i. there is good reason, based on empirical evidence or plausible causal hypothesis, to believe that harmful effects might occur, even if the likelihood of harm is remote; and

ii. a scientific evaluation of the consequences and likelihoods reveals such uncertainty that it is impossible to assess the risk with sufficient confidence to inform decision-making.

12. Clearly care is needed in making judgements on whether there is good reason to believe that harmful effects might occur, and on the extent of scientific uncertainty. 'Absence of evidence of risk' should never be confused with, or taken as, 'evidence of absence of risk'. An immediate and likely consequence of invoking the precautionary principle is research that seeks to reduce uncertainty. However, where appropriate and thorough research still finds no evidence of risk, this should be taken into account in the judgements made.

The precautionary principle and other cautionary policies

13. The focus on scientific uncertainty brings out an important distinction between:

- the precationary principle; and
- other drivers for caution.

14. For example, even where there is little scientific uncertainty, Government Departments may be cautionary in situations where:

a) the nature of a hazard, or those exposed to a hazard, reduce the extent of society's toleration of risk, e.g. where
   - the consequences of a hazard are known to be serious or catastrophic, or are associated with high levels of dread/aversion (e.g. failure of containment in a nuclear power station, or exposure to products known to be carcinogenic or highly toxic);
   - the hazard is novel;
   - those exposed to a hazard are considered to be vulnerable or disadvantaged (e.g. children);
   - reliance on individual choice on the basis of information provided (e.g. via warnings or labels) is impossible or unreasonable (e.g. air pollution);
   - the benefits from tolerating a hazard are not considered to be justified. This could arise because society considers that the benefits can be forgone, or because there are acceptable alternatives with lower risk (e.g. the ban, with very limited exceptions, on the supply and use of asbestos);
b) there is a wish to ensure that conventional risk assessment techniques do not knowingly underestimate risk. Examples of cautionary conventions in risk assessment include:
   - the use of uncertainty factors in the assessment of the health risks from chemicals;

– ‘over-engineering’ of bridges and other major structures.

15. The precautionary principle, therefore, will not be relevant when acting to address, for example, hazards from a major chemical plant handling well-known flammable or toxic products. The regulatory approach to such a plant, however, is cautionary because: risk is imposed on the general public living around the plant; the consequences, if the hazard were to be realised, are potentially serious; such plants are known to produce relatively high levels of dread/aversion; and the conventional techniques to estimate risk contours around the plant tend to overestimate rather than underestimate risk. On the other hand, issues such as BSE and genetic modification are examples of hazards where scientific knowledge, even when pushed to the limit, cannot presently provide conclusive answers about the nature and extent of the risks.

16. In short, the precautionary principle is narrower than ‘being cautionary’. At first sight this is counterintuitive because ‘principle’ implies universality.

Key point

The Precautionary Principle:

- is narrower than ‘being cautionary’; and
- is <u>not</u> relevant unless scientific uncertainty is a significant factor and there is good reason to expect harmful effects.

Extent of precaution – good regulation

17. The ‘Rio’ definition of the precautionary principle (paragraph 6) is silent on the extent of precaution required, other than noting that measures should be cost effective. However, the extent to which the principle requires action erring on the side of caution is not unlimited - precaution has to be balanced against other principles that shape the response to risk. In practice precaution is bounded by application of the principles of good regulation [8]. In addition, invocation of the precautionary principle should be non-discriminatory [9].

Key point

Action in response to the precautionary principle should accord with the principles of good regulation, i.e. invocation of the precautionary principle should:

a) lead to action that is
   - proportionate to the required level of protection;
   - consistent with other forms of action;
   - targeted to the risk; and

b) be invoked in a process that is:
   - transparent; and
   - accountable to stakeholders and ultimately to the political process.

Applying the precautionary principle

18. Although invoking the precautionary principle means taking action when scientific uncertainty rules out sufficient information for risk assessment, it doesn't mean that a risk-based approach is abandoned – decisions continue to be informed by the best available scientific advice, taking into account the uncertainties. A risk-based approach is preserved by establishing credible scenarios.

Credible scenarios

19. The precautionary principle is applied in practice by making assumptions about consequences and likelihoods to establish credible scenarios. Risk assessment and management can then proceed on the basis of the assumptions made. In practice a range of alternative scenarios is usually established. Where possible, the range should include the most likely and worst case scenarios. Annex 3 describes the approach in more detail.

20. Application of the precautionary principle requires considered judgement in selecting the appropriate scenarios on which to base risk management decisions. In particular:

- the assumptions made about consequences and likelihoods should err on the side of caution and so seek to avoid harmful effects if things go wrong; but
- the bias towards caution should be tempered by application of the principles of good regulation, particularly proportionality and consistency in the assumptions made and the risk management measures selected.

21. In practice erring on the side of caution usually means giving more weight to the consequences of the risk than to the likelihood, especially when the consequences are irreversible.

> **Key point**
> Applying the Precautionary Principle is essentially a matter of making assumptions to establish credible scenarios, and then using standard procedures of risk assessment and management to inform decisions on how to address the hazard.

Decision-making

22. Decision-making requires all relevant factors to be brought together in selecting the appropriate risk management option – in the words of the Nice European Council Resolution (reference 5) "risk management measures must be taken by the public authorities responsible on the basis of a political appraisal of the desired level of protection". This presupposes examination of the benefits and costs of action and inaction, and that "the examination must take account of social and environmental costs and of the public acceptability of the different options possible".

Openness and transparency

23. Transparency, openness and engagement of stakeholders are essential in any process of risk assessment and management. Key aspects of the process include sensitivity to stakeholder views in framing the risk issue, and stakeholder input in clarifying uncertainties and contributing to risk management options. However, where the precautionary principle is invoked and applied, openness becomes critically important in achieving an outcome that stakeholders regard as valid. Openness demands candour in exposing, for example:

- the information on which risk assessment was undertaken;
- the scientific uncertainties and reasoning for invoking the precautionary principle, and any uncertainty factors already built into the risk assessment;
- the assumptions made in establishing credible scenarios;
- the many factors that influence the choice of risk management measures.

24. Transparency and openness also help to ensure proportionate outcomes by exposing where judgements have been made at each stage of the decision-making process.

Burden of proof

25. The general presumption in western societies is that the regulator has to demonstrate reasonable grounds to intervene (Annex 1). However, invocation and application of the precautionary principle carries a general presumption that the burden of proof shifts away from the regulator [10] having to demonstrate potential for harm towards the hazard creator having to demonstrate an acceptable level of safety.

26. One consequence is that invoking the precautionary principle shifts the onus to provide the scientific evidence for risk assessment from the regulator to the hazard creator. This is exemplified in licensing or approval regimes imposed to address more serious hazards considered to merit a strongly precautionary approach, such as nuclear power generation and pesticides. In such permissioning regimes the requirements on applicants or holders of licences or approvals to provide scientific evidence can be onerous, and can include action to reduce scientific uncertainty.

27. However, in practice the extent to which a permissioning regime shifts the burden of proof away from the regulator is variable, reflecting a mixture of policy and scientific factors. For example, the UK regimes for licensing nuclear power stations and approving pesticides both require applicants to provide the scientific evidence needed to assess risk. However, in the nuclear regime the applicant does a risk assessment and the regulator challenges why risks cannot be reduced further [11]. In contrast, in the pesticide regime the regulator undertakes the risk assessment and demonstrates an acceptable level of safety [12]. In short, flexibility is needed and the extent to which the burden of proof shifts towards the hazard creator is determined case-by-case.

28. There are, however, exceptions to the general rule that invoking the precautionary principle puts the onus on the hazard creator to provide the scientific information needed for risk assessment (paragraph 26 above). Where there is significant value for society in reducing uncertainty, yet there is little or no prospect of the work being done by the private sector, it may be appropriate for Departments to act in the public interest by, for example, undertaking research to plug information gaps. Examples of such situations include research to establish the nature and extent of any adverse effects resulting from climate change, or to investigate a generic range of pharmaceuticals that has the potential to address a prominent disease or condition.

Key point

Unless there are constraints, the presumption should be that:

- as a general rule, the hazard creator should provide, as a minimum, the information needed for decision-making; but
- Departments should retain flexibility to determine 'regime-by-regime' the extent to which the burden of proof should shift towards the hazard creator in demonstrating presence of risk or degree of safety.

Hierarchy of control measures

29. Invocation of the precautionary principle should trigger consideration of the whole range of risk management options, which could include, for example, information and guidance, publicity campaigns, stronger enforcement and/or larger penalties, and of course, research to reduce uncertainty. An outright ban on an activity or product should be a last resort.

30. Nevertheless, within this position regulators should be able to impose on hazard creators a preferred hierarchy of controls that follows established good practice in risk reduction. For example, good risk management practice in health, safety and environmental protection starts from the position that, wherever practicable, it is better to avoid hazards by substitution or careful process/equipment design than to 'bolt-on' measures to reduce the risks. This would be particularly true for hazards where there are considerable uncertainties in the estimates of the risks attached to them.

Review

31. Decisions reached by invoking and applying the precautionary principle should be:

- kept under active review;
- revisited when further information that reduces uncertainties becomes available, and modified as appropriate [13].

Key point

Decisions reached by invoking and applying the precautionary principle should be actively reviewed to:

- ensure that the action taken resulted in what was intended; and
- check whether decisions previously reached need to be modified to take account of, for example, advances in technology, new knowledge about the risks from research, or any other information which may reduce uncertainty in the nature and likelihoods of potential consequences.

Annex 1

Contrasting views of precaution (paragraph 3)

‘Weak’ precaution	‘Moderate’ precaution	‘Strong’ precaution
Presumption of unfettered market-led development and technological innovation	Underlying presumption of unfettered market-led development and technological innovation but recognition that this can sometimes be overthrown where there are high levels of societal concern	No presumption of either market led or technologically driven development
Regulators intervene only where there is positive scientific evidence of risk and intervention demonstrably cost-effective	Presumption of intervention as under ‘weak’, but case by case flexibility to shift the onus of proof towards the risk creator	Risk creator demonstrates safety of activity. Little credence in cost effectiveness
Presumption of risk management Banning very rare	Underlying presumption of risk management Banning possible, but a last resort	Presumption of risk avoidance Banning likely
Presumption of free trade on the basis of objective scientific criteria. Individual preferences and societal concerns given no weight	Underlying presumption of free trade on the basis of scientific criteria. Recognition that individual preferences and societal concerns matter	No automatic presumption of free trade Individual preferences and societal concerns dominant

Annex 2

European Resolution on the precuationary principle (paragraph 5)

In summary, the Resolution on the precautionary principle, which was endorsed by Heads of Government at a General Affairs Council at Nice in December 2000, provides that:

- use should be made of the precautionary principle where the possibility of harmful effects on health or the environment has been identified and preliminary scientific evaluation proves inconclusive for assessing the level of risk
- the scientific assessment of the risk must proceed logically in an effort to achieve hazard identification, hazard characterisation, appraisal of exposure and risk characterisation
- risk management measures must be taken by the public authorities responsible on the basis of a political appraisal of the desired level of protection
- all stages must be conducted in a transparent manner, civil society must be involved and special attention must be paid to consulting all interested parties as early as possible
- measures must observe the principle of proportionality, taking account of short-term and long-term risks; must not be applied in a way resulting in arbitrary or unwarranted discrimination; and should be consistent with measures already adopted in similar circumstances or following similar approaches
- measures adopted presuppose examination of the benefits and costs of action and inaction, and the examination must take account of social and environmental costs and of the public acceptability of the different options possible
- decisions taken in accordance with the precautionary principle should be reviewed in the light of developments in scientific knowledge.

Annex 3

Credible scenarios (paragraph 19)

1. The essence of the approach is shown in Figure 1. The horizontal axis represents increasing uncertainty in the consequences of a hazard; the vertical axis represents increasing uncertainty in the likelihood that the hazard will be realised (including uncertainty as to impacts over time, e.g. climate change).

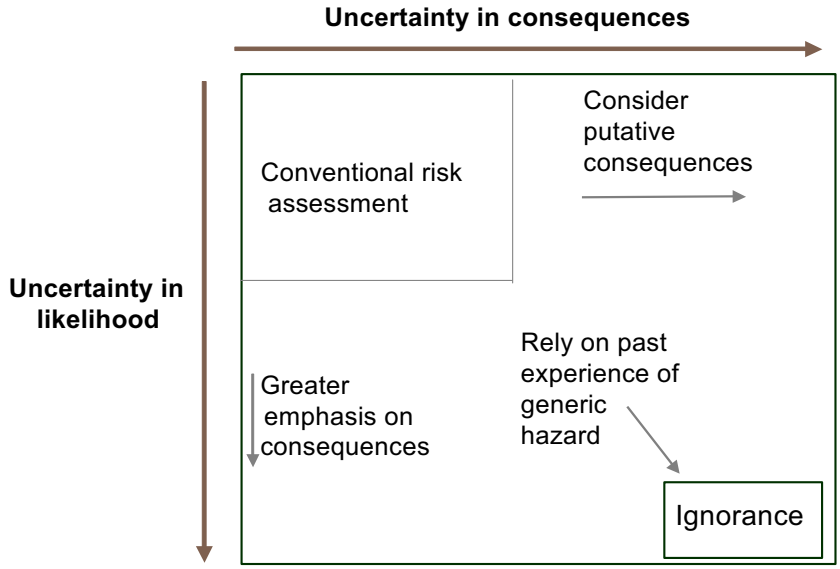


Figure 1

2. In the upper left-hand corner of Figure 1 - in the box labelled conventional risk assessment - consequences and likelihoods can be established and their robustness checked. Here conventional risk assessment gives an estimate of the risk generally accepted as valid by the stakeholders – the precautionary principle is not relevant. However, moving along the axes in Figure 1 the uncertainties increase, and the precautionary principle has to be invoked and applied to move to a decision. In these circumstances, reasonable assumptions have to be made about consequences and likelihoods. Moving towards the far right of the horizontal axis, for example, credible consequences are assigned, and moving towards the bottom of the vertical axis the assumption is made that the assumed consequences will occur (i.e. the risk will be realised). Each set of assumptions establishes a credible scenario.

3. The risk assessment undertaken in this way will obviously not be as full as that resulting from conventional risk assessment but, with good judgement applied case-by-case in establishing the scenarios, this will not be a serious disadvantage. Once the scenarios have been established, conventional means can be used to identify and evaluate, so far as possible, the benefits and costs (advantages and disadvantages) of risk management actions to inform, but not determine, decision-making. Where elements are difficult or impossible to express in monetary terms, they should be carried forward qualitatively in decision-making.

References

1 *Risk assessment and risk management: improving policy and practice within government departments*, second ILGRA report to Ministers (December 1998), http://www.hse.gov.uk/dst/ilgra/minrpt2.htm

2 *A better quality of life: a strategy for sustainable development for the UK,* White Paper (May 1999), http://www.sustainable-development.gov.uk/uk_strategy/

3 *Response to the report on the BSE inquiry*, Cm 5263 (2001), http://www.defra.gov.uk/animalh/bse/general/response.pdf

4 The Communication can be found at http://europa.eu.int/comm/dgs/health_consumer/library/pub/pub07_en.pdf

5 Presidency Conclusions, Nice European Council Meeting 7, 8 and 9 December 2000, http://europa.eu.int/council/off/conclu/dec2000/dec2000_en.htm

6 *Rio declaration on environment and development*, made at UNCED 1992, ISBN 9 21 100509 4, http://www.unep.org/Documents/Default.asp?DocumentID=78&ArticleID=1163

7 These criteria have been developed by the Environment Agency.

8 *Principles of good regulation*, Better Regulation Task Force (October 2000), http://www.cabinet-office.gov.uk/regulation/taskforce/2000/PrinciplesLeaflet.pdf

9 The European Commission's Communication on the precautionary principle (reference 4 above) explains non-discrimination as meaning that "comparable situations should not be treated differently and that different situations should not be treated in the same way, unless there are objective grounds for doing so."

10 Or whoever is entitled to challenge the hazardous activity.

11 The high level of dread/aversion associated with radiation, and the absence of a threshold of exposure for mutations that may lead to cancer, results in a regime based on keeping exposure as low as reasonably practicable.

12 For pesticides the basis of approval is to screen out genotoxic carcinogens and establish (usually on the basis of animal tests) acceptable intakes at which no effects would be expected.

13 Where there is confidence that further information, e.g. from a research programme, will reduce uncertainty within a fixed timescale, consideration should be given to making a commitment in advance to review after this period.