
Appeal Decisions

Inquiry commenced on 19 April 2016

Site visit made on 21 April 2016

by **Elizabeth Hill BSc(Hons), BPhil, MRTPI**

an Inspector appointed by the Secretary of State for Environment, Food and Rural Affairs

Decisions dated: 16 September 2016

Appeal Refs: **APP/WAT/15/316 & 317**

Land at Plumsgate Road and Ludham Road, Catfield, Norfolk

- The appeals are made under section 43 of the Water Resources Act 1991 and Regulations 12 and 13 of the Water Resources (Abstraction and Impounding) Regulations 2006, as amended, against a refusal to renew abstraction licences at the above sites.
 - The appeals are made by Mr Andrew Alston against the decisions of the Environment Agency.
 - The applications Refs NPS/WR/007223 and NPS/WR/007224, both dated 20 December 2011, were refused by notices dated 8 May 2015.
 - The applications proposed the renewal of existing abstraction licences numbered AN/034/009/008 and 009.
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Decisions

Appeal Ref: **APP/WAT/15/316**. The appeal is dismissed.

Appeal Ref: **APP/WAT/15/317**. The appeal is dismissed.

Preliminary matters

1. The inquiry commenced on 19 April 2016 and sat on 19-20, 22, 26-29 April and 3-4 May 2016. The main parties represented were the Environment Agency (EA), the appellant and Mr and Mrs Harris as the Rule 6 (R6) party. A full-day accompanied site visit was held on 21 April 2016 and visited sites on Catfield Fen, Sutton Fen and Barton Broad. Closing submissions were made in writing on 6 May 2016 and the inquiry was closed in writing on 9 May 2016.
 2. Snipe Marsh and Catfield Fen are units within the Ant Broads and Marshes Site of Special Scientific Interest (SSSI) which is itself a component of The Broads Special Area of Conservation (SAC). The Broads SAC is a European site which is protected under the provisions of Article 6 of the Habitats Directive (Council Directive 92/443/EEC, as amended). In a letter dated 14 March 2016, the EA advised that the conclusion of their Statement of Case had, in part, been based on the impact of the abstractions on water levels and hydrological functioning at Snipe Marsh. The EA had proceeded on the basis of the advice of Natural England (NE) that the plant communities on Snipe Marsh included the Tall-Herb Fen (*Phragmites australis* *Peucedanum palustre* – S24 on the British National Vegetation Classification (NVC)) which was associated with Calcareous Fen, a priority habitat under Annex I of the Habitats Directive.
 3. However, since that was submitted, NE made it clear to the EA that they do not consider the Tall-Herb Fen community on Snipe Marsh to be part of the Special
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Area of Conservation (SAC) feature Calcareous Fens. Having given the matter further consideration in the light of the available ecological evidence, the EA does not consider that Snipe Marsh contains any other Habitats Directive feature which could be adversely affected by the proposed abstractions. Therefore, the EA is not inviting these decisions to uphold their submitted evidence in relation to potential impacts on Snipe Marsh.

4. Catfield Fen, however, does contain the Annex I priority habitat, Calcareous Fen, and the Fen Orchid, designated as a species of Community interest under Annex II of the Habitats Directive. Therefore, the EA has invited these decisions to uphold their submitted evidence in respect of the potential impact of the abstractions on Catfield Fen.
5. The R6, opposing the proposals, requested the right to cross-examine the EA, who refused the applications. However, I declined this request, since both parties had similar aims in the inquiry and their arguments about the harm to the fen were similar. The R6 party had the opportunity to give evidence, cross-examine the appellant and submit written material during the course of the inquiry.
6. Two Statements of Common Ground between the appellant and the EA were submitted at the start of the inquiry, one on water matters and the other on legal matters, which principally examined Articles 6(3) and 6(4) of the Habitats Directive.

Main Issue

7. Although Catfield Fen and Snipe Marsh lie within the Broadland Special Protection Area (SPA), impacts on the bird interest of the area were not raised as an issue during the inquiry and no evidence was provided to suggest that significant effects on the SPA were likely.
8. Therefore, the main issue for both appeals, based on Article 6(3) of the Habitats Directive is: whether it can be concluded beyond reasonable scientific doubt that the renewal of the abstraction licences would not have an adverse effect, either alone or in combination with other projects, on the integrity of sites protected by European law, namely, The Broads SAC. Articles 6(3) and 6(4) have been transposed into UK legislation by Regulations 61 & 62 of the Conservation of Habitats and Species Regulations 2010 and it is this legislation which applies to the appeal and on which it must be determined.
9. If it cannot be concluded that there would not be an adverse effect on integrity under Article 6(3), then under Article 6(4), alternative solutions for the project must be assessed and, if there are no alternative solutions, then an assessment would need to be made of whether the project needs to be carried out for imperative reasons of overriding public importance (IROPI) and compensatory measures sought. Finally, the implications of these applications for the Broadland Ramsar site and the Ant Broads and Marshes Site of Special Scientific Interest (SSSI), including the applicability of protection in the case of non-planning appeals, needs to be assessed.

Reasons

Background

10. The proposal seeks the renewal of two abstraction licences. The licence at Plumsgate Road has been in existence since 1986 and has been the subject of previous short term renewals. It allows for abstraction from April to October each year from the Crag aquifer for spray irrigation with a current total limit of 68,000 cu metres per year. The Ludham Road licence has been in existence since 1988 and has also been subject to previous short-term renewals. It also allows seasonal abstraction from the Crag for spray irrigation with a current total limit of 22,700 cu metres per year.
11. Catfield Fen, to which the evidence relates, lies on the eastern side of the River Ant, approximately south-west of the village of Catfield, and is underlain by the Crag aquifer from which abstraction would take place. It lies within the Ant Broads and Marshes SSSI, which is within the Broads SAC and the Broadland Ramsar site. Catfield and other fens on the Broads have been the subject of significant peat excavation (turbary) both in the 19th century and earlier. In the case of Catfield, the Commissioner's rond, a barrier to water from the River Ant (the external system), was built to control water flow in Units 3 and 11 of the SSSI (the internal system) through two sluices. The manipulation of water levels in the internal system probably allowed for peat cutting initially but subsequently allowed commercial reed and sedge cutting. The water was drained to allow for cutting but the system remained under water at other times. Since larger-scale commercial reed and sedge cutting largely ceased around the 1990s the internal system has been managed on a conservation basis.
12. In their Determination Report on the applications, the EA explain, in their Appropriate Assessment and its addendum, that NE expressed concerns in 2011 that Catfield Fen was drying out. Further groundwater modelling work was undertaken by AMEC Foster Wheeler (AMEC), on which the EA's "minded-to" Determination Report on the granting of renewals was in part based, stated that the risk arising from the abstractions was "low". Following consultations on that report, further concerns were raised and new information was submitted, including information on water chemistry from Mr and Mrs Harris who are a R6 to the inquiry. NE and the Broads Authority, and the EA reviewed the original Appropriate Assessment. The conclusion of the Appropriate Assessment as amended by the later addendum stated that the EA could not conclude beyond reasonable scientific doubt that abstraction under the licences, alone and in-combination with other projects (other abstractions in this case), would not have an adverse effect on the integrity of sites protected by European law. These matters form the basis of the appeals.

Designations

13. The Broads SAC was designated under the Habitats Directive. The qualifying features of relevance to the appeal include:
 - 1) H7210 - Calcareous Fen with *Cladium mariscus* and species of the *Caricion davallianae* - calcium-rich fen dominated by great fen sedge (saw sedge). The Calcareous Fen is a priority habitat type under Article 1 (d) of the Habitats Directive as being a natural habitat type that is in danger of disappearance and the conservation of which the Community has special responsibility;

2) H6410 Molinia meadows on calcareous, peaty or clay silt laden soils (*Molinia caerulea*) – purple moor grass meadows;

3) H7140 Transition Mires and Quaking Bogs – very wet mires often identified by an unstable quaking surface.

In addition, the fen orchid, *Liparis loeselii*, is a plant species of Community interest whose conservation requires the designation of a SAC and is of interest in these appeals.

14. The Broadland Ramsar site features relevant to the appeals are similar to the features listed above but also include assemblages of rare plants and invertebrates.
15. The Ant Broads and Marshes SSSI, which is contained within the SAC and Ramsar site, includes Catfield Fen, which has an assemblage of water beetles listed in the SSSI citation. The specific areas of concern for the appeals are Units 3 and 11 of the SSSI, as Unit 35 is a water body known as Catfield Broad, contained within Unit 11. Unit 3 is owned by Butterfly Conservation and managed by the Royal Society for the Protection of Birds (RSPB) and Unit 11 is owned and managed by Mr and Mrs Harris, R6.

Evidence of ecological change

16. The conservation objectives for the Broads SAC site include to 'Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;
- The extent and distribution of qualifying natural habitats and habitats of qualifying species
 - The structure and function (including typical species) of qualifying natural habitats
 - The structure and function of the habitats of qualifying species
 - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
 - The populations of qualifying species, and,
 - The distribution of qualifying species within the site'.
17. Articles 6(1) and 6(2) of the Habitats Directive also set out the need to prevent the deterioration or significant disturbance of the site's qualifying features.
18. The EA's view at the inquiry was that a number of changes could constitute an adverse effect in respect of the Habitats Directive. These include: a decrease in the extent of natural habitats, a decrease in the populations of qualifying features, a change in the distribution of a natural habitat, a change in the distribution of qualifying species and the deterioration of a qualifying feature.
19. There was some discussion at the inquiry as to what would constitute an adverse effect rather than just a change. In such cases the main parties' view was that it would need to be a harmful effect which would conflict with the conservation objectives and therefore adversely affect site integrity. The appellant argued that the effect would also need to be "lasting and irreparable"

and that any impacts of the proposals would be limited to Units 3 and 11 and not affect the overall integrity of the SAC.

Calcareous Fen

20. The extent and quality of the Calcareous Fen habitat feature was one of the main points of dispute between the appellant and the other parties. The impact of an increase in Sphagnum cover on this habitat feature was also in issue.
21. Calcareous Fen is listed in Annex 1 of the Habitats Directive, having *Cladium mariscus* and species of the *Caricion davallianae* - calcium-rich fen dominated by great fen sedge (saw sedge), as being a priority habitat type whose conservation requires the designation of a SAC. The assemblage also includes the fen orchid. NE's evidence also points to mosaics of underlying species, like brown mosses and fen orchid, which, together with small sedges of the species *Caricion davallianae*, are apparent widely across the Catfield Fen, which would also assist in defining areas as Calcareous Fen.
22. NE's opinion was that Calcareous Fen could be equated to S24e of the National Vegetation Classification (NVC) on Unit 3, which was a pragmatic approach to recording it on the ground. The appellant's view was that at least 11% coverage by *Cladium mariscus* was required to define Calcareous Fen as a SAC habitat. However, NE evidence points to this criterion being likely to underestimate its presence and that Table 4.1 appended to Dr Painter's rebuttal for the appellant underestimates the amount of Calcareous Fen in Units 3 and 11. There was no agreement on this point which the appellant has claimed led to the deletion of Snipe Marsh from the EA's case. In their letter of 14 March 2016, on the advice of NE, the EA did not pursue their evidence on Snipe Marsh, since the Tall- Herb Fen on Snipe Marsh was not considered to be part of the SAC feature Calcareous Fen. However, they maintained their view that Calcareous Fen as identified by S24e is present on Catfield Fen.
23. An up-to-date map of the Habitats Directive protected habitats was not available but the AMEC map of 2007, associated with informing their groundwater modelling, shows Annex I Habitats. This shows large areas of Calcareous Fen on Unit 3, in areas associated with former turbary and also areas on Rose Fen and South Marsh in Unit 11. The map was checked by Dr Painter, and found to have a broad correspondence with his 2015 quadrat data against the map, with some mismatches, including Transition Mire being indicated where there were also samples of Calcareous Fen material. Similarly, Transition Mire on Unit 3 was underreported. Later on in the inquiry the R6 party's ecologist, Dr Parmenter, also reported more Calcareous Fen in Unit 11 from recent surveys than was shown on the AMEC map and submitted a map showing these areas. However, it was claimed by the appellant that these areas are not threatened by Sphagnum and also that the map was based on the presence of S24e and subject to the debate above.
24. On Unit 3, Mr Mason of the RSPB had charted the decline of the S24e community, with a loss of 51.8% from 1991 to 2015, with the loss being attributed to the increase of Sphagnum and other, poorer S24 communities. On Unit 11, Dr Parmenter also found Calcareous Fen in decline following survey work undertaken in 1991, 2013 and 2015. Although it was agreed that the surveys had some limitations in terms of comparability of the 1991 study to later ones, it forms time series data, which I consider can be helpful. Changes between 1991 and 2013 were interpreted by RSPB as increasing species

diversity and a loss of calciphiles on Middle Marsh on Unit 3 and Mill Marsh on Unit 11, despite similar management over this time, representing qualitative change in the nature of the Calcareous Fen.

25. The Ellenberg scores presented in evidence by all the main parties show increasing acidity values and some drying across Catfield Fen. Features of drier conditions were present on some of the areas as seen on the site visit, including the presence of bog myrtle and birch scrub, especially on the fen edges but also elsewhere, which has been ascribed to natural succession by the appellant. However, they could also indicate that the processes at work on the fen are more complex, relating to drying as well as acidification.
26. There are some difficulties in using the NVC classification as a good monitoring tool, as acknowledged by Dr Parmenter. However, there is some agreement by NE and the R6 that there are changes occurring to the Calcareous Fen sub-communities, which could contribute to less favourable conditions for Calcareous Fen. There was also evidence from NE that the trajectory of change in these areas appears to have become more rapid, although that is challenged by the appellant.
27. Calcareous Fen is a priority habitat for the purposes of the Habitats Directive. The appellant has said that some of the changes noted are to other habitats protected by the Habitats Directive, for example, to Transition Mires, which need the presence of certain Sphagnum species for designation. However, changes from the priority Calcareous Fen habitat to non-priority Annex I habitats would count as a deleterious change, since the priority habitats are those which are subject to the greatest level of protection under the Habitats Directive. Whilst some of the surveys carried out have limitations in terms of comparability and there remain uncertainties about the scale of such changes and the causes for them, the changes have been shown to be adverse by the surveys carried out by NE, Mr Mason and Dr Parmenter. As such, it seems to me that there is evidence of decline of this priority habitat.

Fen orchid

28. The fen orchid is an important component in the ecological interest of Catfield Fen, since it was agreed in evidence that the fen contains over 50% of the national population of this plant, which is a designated feature of the SAC and also a European Protected Species under Annex IV of the Habitats Directive. It is a major concern of NE on Unit 3. One of the main areas of disagreement at the inquiry was the extent to which the plant is threatened by Sphagnum growth and changing environmental conditions. Orchid spikes were counted on part of Mill Marsh West (part of Unit 3) by the RSPB in 2013, 2014 and 2015, which showed increasing numbers of spikes, particularly in 2015, in parts of the site. The appellant attributes this to a possible delayed effect in increasing water levels following a change in management, since Sphagnum needs very wet conditions to thrive.
29. However, in other areas of Unit 3, where there has been an increase in Sphagnum growth, there has been a loss of 209 spikes from 2013 to 2015 (which the RSPB say is 32% of the total spikes recorded in 2013). The surveys are apparently conflicting in their overall results but the loss of orchids is concentrated in areas where Sphagnum is increasing. There are some possible discrepancies in the counts, some of which were partial rather than full and it needs to be taken into account that not all the orchid spikes emerge every

year. In addition, there is no convincing evidence on what has caused the short-term increase in spikes in some areas. The RSPB say that the majority of the fen orchid population is within 35m of the advancing front of Sphagnum, which is known to be able to introduce acidic conditions in which the orchid cannot survive.

30. The already noted decline in certain areas would be a change in the distribution of a qualifying feature and count as a deterioration in terms of Calcareous Fen. Article 3 of the Habitats Directive requires their habitats to be maintained or where appropriate, restored, at a favourable status. The RSPB estimate that the continued trend of Sphagnum growth would mean the extinction of the fen orchid in 20 years on Mill Marsh West, a significant area for the species.
31. Mr Pankhurst of Plantlife, an acknowledged expert on the fen orchid, described the status of the plant as "vulnerable", due to the small number of sites on which it exists and the changes in populations, which are known not to persist once Sphagnum becomes dominant. His view is that plants would be unlikely to survive beyond 12-18 months once having become smothered by Sphagnum and that it would be difficult to reverse changes back to the original conditions once Sphagnum had become established. Whilst the appellant has argued that a 12-18 month period would allow abstraction to continue for the renewal time requested without further damage to the fen orchid population, it would allow for continued changes that would be difficult to reverse, with no details given by the appellant as to how any such reversal could be brought about.
32. There are other species like deer and slugs which eat the orchid but Mr Pankhurst's view was that the Sphagnum was the dominant threat. The appellant's view was that there were other sites where orchid colonies were established outside Catfield Fen but these have smaller populations and Mr Pankhurst stated that it was the concentrations of the plants on relatively few sites that pose the greatest risks to the species. He also stated that, although there are conservation and reintroduction schemes for the orchids, these can take a long time and cannot be guaranteed to succeed. In any event, such initiatives seek to establish more sites rather than mitigate for losses on existing sites.
33. The counts carried out by RSPB identified changes in the distribution of the fen orchid and these represent losses in parts of Catfield Fen, despite the increases noted elsewhere. There are concerns, when NE's evidence shows Unit 3 is shown as having an "unfavourable – declining" conservation status, as to how any losses in terms of distribution could be reversed, when any such changes would have a negative impact on a qualifying feature for the SAC.

Molinia meadows

34. The *Molinia* meadows are found on Middle Marsh on Unit 11 and comprise the M24 community of species (purple moor grass – meadow thistle), which qualify as an Annex I habitat under the Habitats Directive. NE's evidence was that meadows are based on solid peat but are threatened by Sphagnum colonisation on the eastern side. Although they conceded on cross-examination that shorter term abstraction to the end of March 2018 would not threaten the *Molinia* meadows and that currently the conservation objectives on Unit 11 were being met, NE's view was that this was one of a number of adverse changes which indicated that there was an overall threat to the qualifying features forming the SAC. Their evidence points to a longer-term threat from

Sphagnum, which would cause the classification to change from M24 to M25 (purple moor grass - tormentil) which is typical of more acidic conditions and is not a habitat listed in Annex I of the Habitats Directive. As such, it would be shown to be a loss of a SAC feature to a non-SAC feature.

35. Although Molina meadows are not a priority habitat under the Habitats Directive, they are an Annex I habitat and a qualifying feature of the SAC. I conclude that the changes identified could mean a loss to the Molinia meadows from Sphagnum encroachment, which could happen with increasing speed if the current rapid rate of change continued, which would represent a deterioration of a designated site feature.

Transition Mires and Quaking Bogs

36. Transition Mires and Quaking Bogs, which are typified by an unstable quaking surface are an Annex I habitat and a qualifying feature of the SAC but not a priority habitat under the Habitats Directive. A number of areas of this habitat type are shown on the AMEC plan on Unit 3 and the north of Unit 11 and are thought to be related to the natural succession of plant growth over former turf ponds. All of the main parties agreed that this process is taking place in areas of former turf ponds and that frequent Sphagnum presence is part of the plant assemblage in such habitats. The Higher Level Stewardship (HLS) agreements covering these areas make specific reference to this. It was agreed at the inquiry that, although encouraged to spread in some areas, Sphagnum is not required everywhere across the fen either by the HLS agreements or for the maintenance of the Transitional Mires and Quaking Bogs. Although Transition Mires and Quaking Bogs are an Annex I habitat, an increase in the extent of this habitat type which led to a loss of Calcareous Fen, as a result of the renewal of the abstraction licences, would represent a loss of priority habitat.

Invertebrates - SSSI and Ramsar features

37. As noted above, Units 3 and 11 comprise part of the Ant Broads and Marshes SSSI and the Broadlands Ramsar site. The invertebrate assemblage is one of the Ramsar features. The level of protection afforded to this feature is disputed by the appellant, since the Ramsar convention has not been incorporated into UK legislation. This is discussed further below. There has been no decline in milk parsley, a food for swallowtail butterfly larvae, in surveys submitted with the appeal and no evidence was submitted to the inquiry of change to the butterfly population. The main concern is the assemblage of water beetles which is also cited in the designation of the SSSI.
38. The EA put forward a letter from Professor Foster, a respected entomologist, emphasising the importance of Catfield Fen for water beetles and the need to protect areas used by them from Sphagnum, which would change the chemistry of the water close to them to being more acidic. However, it was not established with any certainty by the submissions of any of the main parties that the water chemistry would adversely impact on the water beetle assemblage.
39. Surveys of the water beetles on Catfield Fen were carried out by Geoff Nobes in 2003. His more limited update, in 2014, concluded that there was a decline in the numbers of beetles, especially in the rarer species on the fen relating to the Permanent Wet Mire: Moss and tussock fen (W313)(an ISIS code developed by NE for invertebrate assemblages), as stated by NE, which is a SSSI feature of

interest. The Nobes material does not attribute pH change as a cause of the decline, although NE does so in terms of environmental change to which the beetles are susceptible.

40. Although Dr Painter for the appellant suggested that appropriate management could create further habitat for the beetles, the RSPB has already done so in Unit 3 and that has not made a positive difference to the decline of the beetle numbers. It was also suggested by Dr Painter that the beetles are a mobile population that could fly or move elsewhere and therefore the overall population would not be threatened. However, no other credible evidence was put forward, other than acidification, for the change in the distribution of the beetles, which is having a negative impact in terms of the SSSI designated features.

The spread of Sphagnum

41. It is agreed between NE and the appellant that Sphagnum occurs naturally as part of the plant assemblage at Catfield Fen and, as set out in Giller and Wheeler work (1988), Sphagnum was identified as early as 1911 on the site. The spread of Sphagnum has been established from the late 1970s onwards in the documents by Wright (1978) and Giller and Wheeler (1988). However, Dr Parmenter has said that from her surveys and knowledge of the site Sphagnum growth had been at fairly stable levels until about 2000, but then it started to spread rapidly. It was also established in the inquiry that Sphagnum can grow in non-acidic conditions, although it does need very wet conditions. After it has established itself, it can cause further acidification around the plants through the production of hydrogen ions, known as the positive feedback loop, as stated by Dr Barendregt for the R6 and supported by Dr Carey for the EA. Dr Barendregt's view was that the fen had reached a "tipping point", since the growth of Sphagnum was no longer inhibited by the buffering of alkaline groundwater from which it would be difficult for the fen to recover. However, the evidence about the tipping point was not specifically supported by other parties, although reference was made to the possibility of lasting and irreparable harm to the fen as a result of Sphagnum growth.
42. Surveys of the spread of Sphagnum had been carried out by Mr Mason of the RSPB and Dr Parmenter. Mr Mason's survey on Unit 3 attempted to replicate a survey carried out in 2003 by Ms J Harris. The appellant's view was that the original survey might have underestimated the Sphagnum area, a point disputed by R6 ecologist, Dr Parmenter, and that there were considerable differences between the surveys, including the risks of using hand-held GPS, although all parties recognise Mr Mason's familiarity with the site, which supports the accuracy of the survey.
43. Dr Painter's study of Sphagnum growth also showed increasing areas being covered with the moss, with an estimate of about 1.25m further spread per year. This is consistent with the rates of overall growth in Mr Mason's study, although Dr Painter states that the spread represents a continuous rate, rather than an increasingly rapid rate. However, Mr Mason's study shows faster rates of growth in certain directions, which appear to be related to conditions on site. There is a dip in the amount of Sphagnum present in the 2003 survey but the rate has since picked up and become even greater. In some places on Mill Marsh West the rate of growth has been much faster over the period 2014-2015, a rate of 5m on average and up to 12m in some directions. Moreover,

Dr Painter has said in his rebuttal that the survey did not take new areas of Sphagnum into account, which might well underestimate the total area of Sphagnum. However, none of the evidence put forward explains the recent, more rapid expansion of the Sphagnum.

44. A further area of concern was the expansion of Sphagnum on areas of solid peat, which was shown to me on Unit 11 on the site visit. As far as is known such areas have never been subject to turbarry and therefore the growth of Sphagnum in this area could not have been due to natural succession. Dr Painter's evidence in this respect relates to the eventual growth of wet woodland over a former turf pond, following various stages, including open reed/swamp fen where Sphagnum is characteristic. Dr Parmenter's survey work on Middle Marsh in Unit 11 recorded a few clumps of Sphagnum in 1991 (2 quadrats out of 11) rising to 10 out of 11 quadrats in 2013 and being a co-dominant species. NE has said that the processes for the rapid expansion of Sphagnum over solid peat are not fully understood, but they discount natural succession as being a full explanation for Sphagnum expansion in such areas.
45. NE's view was that the continuing and accelerating increase in the spread of Sphagnum more generally could result from a range of factors but as a consequence of changes in the hydrochemical environment, rather than drying out. Their advice to the EA, in coming to a decision, was that the rapid change could be caused by site vegetation management, surface water management, natural succession or water abstraction. The potential causes for such changes are examined below.
46. The appellant has advocated Sphagnum management, by pulling it up from problem areas, such as around fen orchids, and then selling it to florists as has been done in the past. However, even if it were to be a practical solution and evidence was given by the RSPB that it would not be so, this would not overcome the cause of the problem and would present a continuing management issue. In any event, the EA consider that this would be a proposal for mitigation, which would need to be carried out by third parties. No funding has been offered by the appellant for such work and the EA's view was that any such mitigation would require Appropriate Assessment.

Causes of ecological change

Groundwater

47. I turn next to consider the reasons put forward for these changes. Abstraction has taken place by the appellant since about 1986. Groundwater modelling has been undertaken by AMEC who provide modelling for the EA for groundwater abstractions in the area, using the North East Anglia Chalk (NEAC) model, including a water chemistry analysis model (PHREEQC). The appellant's water witness agreed the EA's water balance calculations, which examined the amount of precipitation falling on the fen, evapotranspiration and surface water run-off from the surrounding areas and surface water inflows from the external system, as resulting in a shortfall of 181mm across the fen. However, the main issue between the appellant and the EA and R6 party was whether groundwater would flow upwards through the peat layers which lie in the bottom of the fen to bring alkaline groundwater to its surface.
48. It was agreed in evidence that peat is laid down as horizontal layers of vegetation. All the water witnesses agreed that it would be much easier for the

- groundwater to flow horizontally along the peat layers than vertically through them, with a figure of 10 times the permeability being estimated by the EA. In addition, there are two layers of clay which might inhibit upward flow. The first clay layer is at the base of the peat, between it and the Crag, which thins and disappears towards the edge of the fen, and there was also debate about whether there are thin layers of clay within the peat itself. Ditches and turf or decoy ponds cut down into the Crag also provide routes through the peat layer. However, Dr Bradley for the R6 party questioned the amount of water that would flow through the peat horizontally from the ditches due to the distances involved. Dr Barendregt confirms the lack of conductivity in the peat horizontally from the ditches and his view is that the flows are from groundwater. His view was that the vertical movement, even though it was more limited, was the more important of the flows.
49. The survey work of Professor Gilvear between 1987-9, and subsequently published in reports and articles in 1989, 1993, 1994 and 1997, indicated that the movement of groundwater upward was possible through "windows" in the clay layer between the peat and the Crag. Dr Parmenter's auger survey in 2013 showed that clay layers within the peat were discontinuous and, in some areas, the peat lay directly on the Crag. The extent to which these pathways occur and the amount of water that would be allowed through to the surface layers of peat is uncertain, especially since, in presenting his evidence to the inquiry, Professor Gilvear found that Fig 5C of his 1997 paper, which showed the groundwater heads, had been incorrectly labelled and he subsequently stated that it did not show a clear picture of the hydrology of the site.
 50. Work by Wheeler and Shaw (2000) showed only small amounts of groundwater reaching the surface, with precipitation being the main water source as set out in Wheeler and Giller (1986b), but pointed to the need for more research. Similarly, Mr Dodds, for the appellant, has examined Professor Gilvear's 1989 data at Appendix 2 to the 1997 paper. The original data could not be produced to the inquiry, but if it is assumed to be correct, then he claims, in his 2nd rebuttal, that it shows different gradients above and below the clay layer between the Crag and the peat, with only a consistent flow of water from the Crag into the peat during limited periods.
 51. The EA's NEAC model has been developed to inform the EA's decision on abstractions in the area. It has 2 main parts. The 4R part takes into account: rainfall, evapotranspiration, crop or vegetation type and land surface data and the MODFLOW part is used to undertake calculations of groundwater movements, using a 3-D grid. The basis of the grid for the model is 200m square cells, with 624 columns and 620 rows informed by data from 10,000 boreholes, other hydrological data and geological information. The EA accept that the grain of the model is coarse but maintain that it is sufficiently robust to assist with decision-making on abstraction and represents a reasonably cost-effective means of doing so.
 52. Dr Bradley for the R6 party remains critical of the size of the grid, agreeing on this matter with Professor Rushton of the University of East Anglia who examined the model on behalf of the Broads Authority. His concerns were that the model is not able to represent near-surface sediments and detailed geometry of the fen, including individual drains, ponds and sluices. The EA claim that his concerns about the modelling were overcome during the course

- of determining the applications but nevertheless the matter remains a concern of the R6 party.
53. The model is also limited by the data available from the dipwells and piezometers in the fen and Dr Grout for the EA states that it would be desirable to increase the amount of water monitoring for the water table and in the deeper Crag. However, Mr Lewis of AMEC was confident in the results obtained from the measurements on the fen with the dipwells placed 50-100m apart showing uniform responses in terms of temporal water level variations. This does not tally with Dr Barendregt's work which shows differences in groundwater composition both vertically and horizontally. Both Dr Bradley and Dr Parmenter have commented that at very least, the wider model needs to be informed by more detailed ecological survey work on the ground, through a multi-disciplinary approach.
54. Dr Parmenter has also criticised the interpretation of the Ecohydrological Guidelines (EchG) in the modelling in relation to water levels. However, it was the effect on water chemistry, rather than levels that was a reason for the refusal of the applications. A point on the rooting depth of wetland plants was corrected in Mr Lewis' rebuttal. Other issues raised by Dr Parmenter included the assessment of water ranges for the S24 plant community. However, the dipwell data corresponds to the EchG ranges for that community and suggests that it is not the water levels in themselves that are responsible for the changes but that there are other processes at work.
55. The AMEC report (2014), which formed part of the technical support to the EA's RSA (Restoring Sustainable Abstraction) Programme shows the calculated effects of abstraction on the internal system at Catfield Fen, and informed the Appropriate Assessment for the EA "minded to" decision on the applications for renewal of the abstractions. Further information and comment, which the EA viewed as substantive, but on which they subsequently reduced their reliance, was provided by Mr and Mrs Harris (based on the work of Pyne and Barendregt), a survey from the RSPB on the distribution of the fen orchid and Calcareous Fen and surveys of the growth of Sphagnum from RSPB and Dr Parmenter for the R6 party.
56. Giller and Wheeler (1988) showed an increase in pH value and dissolved solids in peat pore water with increasing depth, which they say indicates the presence of upwardly moving groundwater. However, this can vary across the fen, both due to location, plants like Sphagnum and barriers to vertical and horizontal movement. Mr Dodds also rebuts the conclusions drawn by Mr Lewis from this work, since his view is that it reflects changes at a shallow level, not the deeper groundwater, but that this is not a simple relationship. It can also vary seasonally and be influenced by evapotranspiration, which is high on the fen in the summer, and interaction with peat, silt and clay, plants, water levels and pollution.
57. In attempting to show the change over time, in 2014 Mr Mason of the RSPB, tried to replicate the sampling in Giller and Wheeler (1988). The results show an overall consistent decline in pH to more acidic conditions, which might provide some of the explanation for the growth of Sphagnum. Dr Carey of AMEC notes that there are changes in the methodology used between the two surveys, including the season and exact location of the sampling, but states that these would not explain all of the differences between the studies and

agreed that there would be a loss of buffering as a result of the recorded changes.

58. The report on the work by Pyne and Barendregt was submitted in summary to the EA. At the inquiry the EA were criticised by the appellant in not looking at the full document and accepting work that was essentially a Masters project. However, the EA (Dr Grout) say that they took a cautious approach to that study. An electrical conductivity probe was used to examine solutes in water, which gave information on its chemistry. The work showed that in areas of Sphagnum there was a lowering of pH following the release of hydrogen ions and a greater amount of conductivity at depth than would be expected, indicating a low pH which could not be buffered by what Dr Barendregt viewed as reduced amounts of upwelling groundwater. The report does not, however, consider other potential causes for chemical change, including evapotranspiration, interaction with silts and clays and transfer of water from dykes. In cross-examination, Dr Barendregt was clear about the limitations of Ms Pyne's work, including the detailed methodology, but remained convinced of the results of it, in implicating abstraction in the changes to water chemistry, which translates into changes in the ecology of the fen.
59. The EA's hydrochemistry model, PHREEQC, also examined the mixing of rainwater, which is acidic, with base-rich groundwater. The basic groundwater modelling calculated the changes in groundwater over time which showed a decrease in the upward flow of groundwater and the changing ratio in respect of rainwater. The PHREEQC model predicts a small increase in acidity, about 0.1 in pH, as recorded in the EA's decision. The decision document records that it "predicted the average pH change due to the difference between the naturalised (no abstraction position) and the fully licenced in-combination level of abstraction was 0.1pH units", with a maximum, infrequent, spike of 0.16pH units. When the appellant's abstractions were considered alone, the change was of a magnitude less than 0.1pH units and barely detectable. At the inquiry it was explained by the EA that the actual change could be a lot more or a lot less, as the figure is approximate, and they did not want to imply a spurious accuracy to the figure. However, background levels were said by the appellant to be able to vary within 2pH units, which more than covers the predicted range.
60. AMEC's Dr Carey, in his rebuttal, admits that the model does not reflect the complex environment of the fen, since it puts forward an average result across the whole fen. As such he considered that the results on the chemistry changes should be viewed with caution but also that the changes are consistent with the increase in acid-loving plants. Such conclusions would not be inconsistent with those drawn by Pyne and Barendregt, although that study concentrated on the impact of Sphagnum and its self-sustaining processes on the chemistry of the fen and could provide localised, rather than general, results in the areas of Sphagnum.
61. Mr Dodds had carried out some sampling on ground and surface water on the fen but acknowledged that this was a limited survey. Nevertheless he considered that this showed no significant change in water quality/ acidity over the historical period. Since he disputes any significant upflow of groundwater through the peat to the surface, he considers that the main source for alkaline water could be from the ditches on the fen. However, Dr Carey notes that this would not explain the presence of more alkaline water at depth, which is more

- consistent with Professor Gilvear's conceptual model (and that of Dr Grout of the EA). However, the pathways of water from different sources, and therefore chemistry, are not fully understood at the fen due to the complexities of the water environment there, although the linkages between surface and groundwater have been acknowledged by all parties. It was also conceded by Mr Dodds at the inquiry that, in any event, the alkaline water would not need to reach the surface to affect the balance of rainwater, which would become more dominant, compared to groundwater and the overall acidity of the fen.
62. The appellant's abstractions are only two of the abstractions in the area and the largest of the local abstractions is at Anglian Water Services (AWS) at Ludham Road. The appellant's view that this was the more important influence in terms of abstractions, since it is much larger and constant, and that the contribution of the appellant's abstractions is very small and seasonal in comparison.
63. Professor Gilvear's diagram of cones of depression set against the groundwater catchment area of Catfield Fen based on the AMEC report, which was admitted at the inquiry to be schematic, indicates the potential for in-combination impacts. These were acknowledged to have been taken into account in the NEAC model by Professor Gilvear. At the inquiry, Professor Gilvear estimated that, in the summer season, the Alston abstractions had the potential to be between 80-90% of those of the AWS. However, if pumping continued at this rate it would soon exceed the maximum annual rate and therefore would be unlikely to occur. There is also some overlap of the areas covered by the cones of depression, which would mean that some distortion, including enlargement into the groundwater catchment area for the fen would be likely.
64. The EA decision took the in-combination effects into account. However, the PHREEQC modelling indicated that the impact of the appellant's abstraction is of the order of ten times less than AWS' abstractions. Nevertheless, the EA's calculations cannot rule out any impact of the Alston abstractions on their own and, as such, the EA concluded that they needed to be included in any in-combination analysis. The AWS abstraction, which as a public water supply is subject to decision-making under the Asset Management Plan process and OFWAT, rather than the Review of Consents being undertaken by the EA. Abstraction will cease around 2020, as described by Dr Bayley at the inquiry, but the decision in these appeals and hence the continued abstractions cannot wait until this date. This would be contrary to the need to determine the appeals in accordance with the Habitats Directive.
65. In conclusion, it was agreed at the inquiry that precipitation, which is acidic, is likely to have the greatest influence on the hydrochemistry of the fen. The NEAC modelling, as indicated by Mr Lewis at the inquiry, indicated that there would be "quite a lot" of groundwater entering the internal fen system some of it through the ditches and some driven upwards through hydraulic pressure and through evapotranspiration in places where there are known connections between the Crag and the surface of the peat. However, there is no certainty about the amounts of groundwater reaching the surface of the fen. Although the evidence put forward on the influence of the horizontal layers of peat impeding flow and the groundwater heads data of Professor Gilvear commented on by Mr Dodds throws some doubt on those amounts, Dr Parmenter's auger survey has shown the peat to be variable in nature. Nevertheless, I do not consider that it has been shown that the groundwater levels reaching the

- surface are so limited that the changes exhibited would not be influenced by local abstraction and hence are capable of influencing the ecology of the site.
66. NE has rejected the proposition that the fen is drying out and the HLSs require the fen to be kept in a squelchy condition on Units 3 and 11. NE says that requirements to keep the fen wet are being met. However, there are certainly areas which are exhibiting drying with a change in vegetation in these areas. There may well be other processes at work, like some natural succession on previous turf ponds, but it is possible that they are also influenced by a lack of groundwater, as suggested by the EA and the R6.
67. The AMEC PHREEQC modelling goes on to ascribe a general change in pH of 0.1pH units across the fen. When the appellant's abstractions were considered alone the change was of a magnitude less than 0.1pH units, but there could be no precision about this and it was explained by the EA that this could vary and could be either higher or lower. Given the different ground conditions across the fen, this is likely to vary in its influence and will change the relative influence of the alkaline groundwater and the acidic precipitation. However, there is not sufficient evidence to rule out the role of abstraction in hydrochemical change. Ecological change can indicate that important changes are taking place to the hydrology of the fen, and, as the Wheeler and Shaw (1995) paper suggests, these changes can be important indicators.
68. The changes in the ecology indicate an increasing acidity but there is evidence that it is the degree of wetness rather than acid conditions which allows the establishment of Sphagnum. However, in my view, its establishment on solid peat areas rather than in the former turf ponds in the area could not be explained by the evidence presented. The role of Sphagnum, once established, in creating more acidic conditions through the positive feedback loop, which are capable of influencing the ecology around them, such as fen orchids is an important point and this is not taken into account in the 0.1pH change, which examined sources of water within the peat, based on the NEAC groundwater model.
69. The fen represents a complex environment in terms of its physical structure, the internal and external water systems and the processes which might be happening, signalled by the changes in ecology. From the evidence presented and having regard to the precautionary principle, it cannot be ruled out that abstraction contributes to such changes.

Management

70. A second potential cause of ecological change is the management of the site both in terms of land use and water levels, which the appellant has said is more influential than abstraction. Once the rond had been constructed, the internal water system on the fen was managed through a system of ditches and sluices to the external water system and River Ant. There are some linkages between the internal and external systems through leakage via the rond and the southern bund, occasional damage to the sluices and through surface water flooding, although there is no evidence that these have a significant impact on the water regime of the internal system, apart from water flowing over the southern bund, mainly in winter.
71. It is thought that initially the water management system was used to allow turf cutting, creating turf ponds and lowering the surface of the cut areas.

Following the decline of peat cutting, reed and sedge were harvested on the fen. At the inquiry, Mr Starling of Broads Reed and Sedge Cutting Association (BRASCA) described the use of the sluices to put water onto the fen after cutting to protect the young growing shoots and taking the water off later on in order to allow it to be harvested. This was called the "water on-water off" water management technique at the inquiry and was said to have discouraged Sphagnum growth, being too wet in the spring and too dry in the summer for it to flourish. He also said that such arrangements were informal and would have been undertaken by the cutters and he had no direct involvement in water management techniques on the fen.

72. Evidence was presented to the inquiry that the management regime has not changed since the decline of reed and sedge cutting, with Mr Riches, land agent for the R6 party, stating at the inquiry that the sluices had only been opened about 5 times in the last 17 years and that management on Unit 11 of the fen had not changed in the last 30-40 years. NE has confirmed that the unit is being well-managed in terms of the conservation features of the site based on an extensive audit in 2012, following concerns expressed by Mr Alston. The management of Unit 11 is the subject of an HLS agreement, which Mr Riches stated had largely codified the management of the fen over a long period, including water management agreements with NE. The current HLS agreement, only recently agreed, requires that the unit is kept "squelchy" underfoot, with the whole surface wet from October to May.
73. Unit 3 is managed by the RSPB for Butterfly Conservation (BC) and in their written representations BC say that they have required high water levels on their land as part of its management. Since 1992, there has been a series of management plans approved by NE and reviewed annually for the unit, which include commercial sedge cutting, short rotation summer fen cutting, winter fen cutting, path cutting, scrub clearance, turf pond creation, and mulching of Sphagnum (undercut with a brushcutter and the arisings piled or burnt). In addition, there is management to support the invertebrate population, including the important water beetle assemblage.
74. Other management changes cited by Dr Painter for the appellant as having an adverse effect include the lack of turf excavation. It is thought that lowering the surface level brings the fen into greater contact with the more alkaline water at a lower level and removes the harder, drier surface area of the peat. Fen levels were lowered generally on part of Unit 11 in 2003, but generalised lowering of the surface elsewhere has not been carried out for some time.
75. Although the RSPB note that, despite the management being similar to other Broads sites, the restoration of Unit 3 has not proceeded as expected. New turf ponds on the unit were dug in periods from 1992 onwards but these have had mixed results, with some being species-poor, with the restored open fen continuing to support more acid-loving species. NE comment in their evidence that the recolonisation of these areas by vegetation is at an early stage and that care would be needed in its use as a management tool.
76. The appellant and Mr Starling of BRASCA have drawn attention to the differences in the commercial and conservation cuttings of the reed and sedge. Commercial harvesting was carried out by a reciprocating mower and Dr Painter for the appellant says that this cuts low, removing developing tussocks and preventing the build up of surface vegetation and fen litter. This form of

management together with the burning of Sphagnum in situ is claimed to set back its growth and remove material which can contribute to natural succession. Some cutting to comply with conservation objectives has been carried out using reciprocating mowers, as confirmed by Mr Harris, the R6 party, although the RSPB say that they have used brushcutters for some activities on Unit 3, they confirm that they have never burnt Sphagnum in situ. The appellant claims that brushcutters are not effective in removing surface material and undergrowth, which allows the build-up of fen litter with consequent colonisation with other plant growth, although this is disputed by RSPB and NE who say that the impacts can be similar to those of the reciprocating mowers.

77. In addition, evidence has been presented by RSPB that the conservation management of Unit 3 has included commercial sedge cutting and that fen litter and scrub have been removed to try to prevent natural succession. As such, the conservation management has been similar to the commercial management that preceded it on the fen. NE has confirmed that Units 3 and 11 have been managed in accordance with their HLS agreements, including water levels, and the audit of Unit 11 in 2012 confirmed this. Despite being well-managed, Unit 3 is in an "unfavourable – declining" condition with respect to its conservation objectives, which the RSPB attribute to the lack of suitable hydrological conditions, compared to other fen sites with similar management, which are in better condition.
78. The area has been managed both in terms of water levels and land use for a considerable period of time as an environment in which the protected habitats and species were supported. The appellant claims that there has been a change in management practices which has exacerbated adverse change to the conditions on the fen.
79. However, the conditions on Units 3 and 11 are largely controlled and agreed by NE through HLS agreements, which have been in existence for some time and, in addition, there is convincing evidence that these agreements largely codified existing land and water management agreements which had been in existence since about the 1970s. Whilst there might not have been the stricter regimes of "water on and water off", which BRASCA describe, the HLS agreements have been drawn up and advised on by NE to protect the SAC habitats and species.
80. There might well have been other influences from time to time, including the breakdown of sluices or flood/surge events, but these are likely to have not been major influences on the hydrology and hydrochemistry of the fen and any flood event changes would have returned to normal reasonably quickly. In my view, management changes have had a limited impact on the ecological changes noted on the fen, with NE having control over the management through HLS over a significant period of time.

Natural succession/ terrestrialisation

81. Dr Painter, for the appellant, argues in his written evidence that conditions on Catfield Fen can be explained by the process of natural succession. An example of natural succession in a wider area of water was shown to me on the site visit at Barton Broad. It is agreed between the parties that natural succession is a natural process within the fens, raising the fen surface by the build-up of organic matter which results in further vegetation changes. The

later stages of this process include the growth of more shrubby plants like *Myrica gale* (bog myrtle), bramble and *Betula pubescens* (downy birch).

82. NE's view is that terrestrialisation is a form of natural succession that has resulted in the gradual development of vegetation over older turf ponds, dug extensively in the fen following the building of the rond in the 19th century. The progression of the process is illustrated by Dr Painter in Figures 4.1a and 4.1b in Appendix 1 to his proof. It is agreed by the EA and the appellant that the floating vegetation over the turf ponds with an increase in the build-up of material at surface levels and the growth of *Sphagnum*, associated with the later stages of natural succession, leads to an increased influence for rainfall, which is the predominant water source on the fen in any event.
83. Dr Painter agrees the role of the reduction in the amount of base-rich groundwater in triggering the change from rich, Calcareous Fen to poor acidic fen. The studies by Giller and Wheeler (1988) and Pyne and Barendregt, reflect greater alkalinity at depth than at the surface. Dr Painter goes on to state that, although this has traditionally been associated with the accumulation of peat above the level of the penetration of groundwater, more recent evidence from outside the Broads shows that the process can be triggered by climatic drying or groundwater abstraction.
84. Nevertheless, the changes being experienced at Catfield Fen appear to be much more rapid than would be expected with longer term processes like natural succession and terrestrialisation. In addition, the changes have been associated with areas where there is solid peat, which have never been the subject of turbarry, especially on Unit 11. NE says that such processes are not fully understood and although they might produce the same end result they cannot give a complete explanation for the observed changes to the ecology.
85. There is evidence of natural succession and terrestrialisation on parts of the fen and it is acknowledged to feature more widely in the Broads and elsewhere. It is a natural process and drying out, although being ruled out by NE as the main influence on changes to the fen, is indicated in the Ellenberg scores in both Mr Mason and Dr Parmenter's work. In my view, it is a minor contributory factor to the more complex processes going on in the fen.

Other causes

86. Other causes of changes have been considered by the EA in coming to a decision on the abstractions, for example, the role of climate change in the ecological changes, which might cause more flood events and/or dry summers. However, this does not appear to offer an explanation of the ecological change in its own right but may be an influence on the other processes at work on the fen. Flooding from the River Ant over Catfield Fen is possible during big surge events, bringing in river water with different chemistry, including agricultural run-off. On the site visit, I was shown the area of the Southern Bund where flow into and out of the internal system and external system has occurred, particularly when water levels are higher. However, this source of water is accepted as not being a major influence on the ecological change on the fen.
87. All of the above processes have been noted by contributors to the inquiry, but none of them appear to be major contributors to change on the fen.

Conclusions on Main Issue (assessment of the effect on the integrity of the protected sites)

88. In its Statement of Case, as refined by its openings and closings, the appellant set out a number of legal principles. The first was that the impact of the renewal applications on the integrity of the SAC as a whole needed to be considered. As already stated, no evidence was provided that significant impacts on the SPA were likely. In this case the evidence concerned only two units, Unit 3 and Unit 11, out of 35 units of one of the 28 constituent SSSIs (the Ant and Broad Marshes SSSI). In the legal SOCG, the appellant and the EA agreed that this meant that the decision maker had to be satisfied that the plan or project would not have a negative effect on the constitutive elements of the site concerned, in this case The Broads SAC, having regard to the reasons for which the site was designated and their associated conservation objectives. The *Sweetman v An Bord Pleanála (c-258/11) [2013]* case was referred to by the parties. The Advocate General's opinion on this case states that the 'notion of 'integrity' must be understood as referring to the continued wholeness and soundness of the constitutive characteristics of the site concerned'. Therefore, evidence on constituent areas can be capable of affecting the integrity of the site as a whole.
89. The conclusions above indicate that the continued abstraction cannot be shown beyond reasonable scientific doubt not to adversely affect the integrity of the site, in terms of the loss or deterioration of habitats and species for which the SAC was designated. It should also be noted that the conservation objectives for the Broads SAC require that the extent and distribution of qualifying natural habitats and habitats of qualifying species should be maintained or restored, as should the natural structure and function of those habitats. This does not support the idea that effects on any of the constituent parts of the SAC would not affect the integrity of the site as a whole.
90. In *Smyth v SoS for Communities and Local Government [2014]* the Court of Appeal required "a strict precautionary approach" to be applied and in *Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij (c-127/02) [2004]* (Waddenzee) the European Court of Justice held that consent can only occur if it is certain that the project will not adversely affect the integrity of the site, that being the case where "no reasonable scientific doubt remains as to the absence of such effects". The appellant draws the distinction between this, as assessed by the expert judgment of the competent authority and the impossibility of "absolute certainty" as set out in the Advocate General's opinion in *Waddenzee*. I have taken these legal principles into account when coming to decisions on the appeals.
91. In their proof of evidence NE set out their use of site condition assessment in the assessment of the European site's objectives to implement the provisions of the Habitats Directive. The tables show Unit 3 as being "unfavourable – declining" in 2014, compared to "unfavourable – no change" in 2010 and 2011 and "unfavourable – improving" in 2013. These positions largely relate to the amount of scrub on the Unit and its clearance in 2013. However, threats to the condition of the Unit are identified as being the impact of abstraction on the internal fen and, from 2013 onwards the increase in Sphagnum and hydrological change. The 2014 comment on the condition status reflects the

results of a survey in 2013 which showed a reduction in the extent of suitable habitat for fen orchid, which shows a continuing threat to the species despite more spikes being counted in the 2015 survey by RSPB on Mill Marsh West. It also showed threats through species distribution change (Sphagnum expansion) and from water abstraction.

92. Although the appellant has disputed the amount of Calcareous Fen on Units 3 and 11 and the survey work, I consider that the evidence presented to the inquiry, set out above, has shown a decline in its distribution on Units 3 and 11. As a Habitats Directive priority habitat, any loss would be significant. The fen orchid, which is a plant species of Community interest, has been shown to be declining in parts of its known habitat but expanding in other areas. Plantlife, the acknowledged expert group on the fen orchid has described its status as vulnerable, in the light of the encroaching Sphagnum. The Molinia meadows also face a threat from encroaching Sphagnum and this would have an impact on a qualifying feature for the SAC. Finally, the Transition Mires and Quaking Bogs, which are also qualifying habitats, are not under threat and their area might increase with further Sphagnum development. In itself, this would increase the amount of a qualifying habitat but it would be at the expense of Calcareous Fen, a priority habitat, and Molinia meadows, which is also a qualifying habitat. Therefore it is the priority Calcareous Fen habitat and fen orchid priority species, together with the Molinia meadows as a qualifying habitat, that are of greater concern.
93. NE has identified the threat to fen orchid habitat as a principal concern, despite the "improving" conditions on Unit 3 in 2013. The appellant has suggested that, as matters are improving, the conservation objectives on Unit 3 could be met in the future. However, there is no certainty that this would be the case, since habitat for the fen orchid is in decline and there are changes in its distribution. The RSPB has charted significant decline in the S24e community, a proxy for Calcareous Fen, of 51.8% from 1991-2015, with a more general loss of calciphiles indicated. Sphagnum is increasing in this area and there is evidence in the Ellenberg scores both of an increase in acidification and also drying.
94. There is evidence from the EA's model for increasing acidity as a result of abstraction which, although the amount of change in pH is uncertain, indicates a pathway for changes to hydrochemical conditions, which has the potential to cause decline in calciphiles and Calcareous Fen. Whilst there is no definite evidence for the cause of Sphagnum increase, it has been shown to increase acidity once established, leading to further threat to the fen orchid. At the inquiry the appellant suggested that the Sphagnum around the orchid could be pulled up, which the EA consider to be a form of mitigation, and latterly have suggested a condition to ensure a scheme would come forward. However, no draft of wording for the condition was suggested, there was no explanation of how it would work and no finance for the scheme has been offered. In addition, if it were to have been considered as mitigation, the EA's view is that the mitigation itself could require Appropriate Assessment, in order to ensure that it, in itself or in-combination, would not have adverse effects on the integrity of a protected European site and I agree that this could be necessary.
95. The RSPB consider that on Unit 3 there have been losses of species which are features of the SAC and SSSI and they consider that while the hydrological conditions remain unsuitable, losses will continue. The evidence from the RSPB

from the Broads and elsewhere suggests that, unless hydrological conditions are improved, and I agree that it would not be certain that the protected habitats and species on the fen could recover. Prolonging the period of abstraction would make restoration more difficult as more damage would have occurred.

96. On Unit 11 the condition is listed in NE's proof of evidence as "unfavourable - no change" in 2006, 2010 and 2011 but as "favourable" in 2013. By 2011 targets for the site were being met but threats were also noted in terms of changes to species distribution and hydrological changes. The condition survey in 2011 also mentions the need to remedy the potential impacts of abstraction on the internal fen. NE's evidence was that the "favourable" status might not remain in the future, since there has been a decline in Calcareous Fen. There is no harm at present to the *Molinia* meadows on the site and it was acknowledged by NE that, on its own, that would not be a reason to refuse the applications for renewal of the abstractions. There is also Transitional Mire on Unit 11 which requires *Sphagnum* as part of its assemblage and therefore there is no adverse impact in respect of this habitat.
97. Nevertheless, threats have been shown to Calcareous Fen on Units 3 and 11 and NE considers that it is not known whether integrity on Units 3 and 11 could be restored, in terms of the fen's ecological structure and function which enables it to sustain habitat, complex habitats and/or populations of species for which they are designated, in accordance with the Habitats Regulations Assessment draft guidance from DEFRA (July 2013). NE refer to the issue of the positive feedback loop increasing the *Sphagnum* area which could be difficult to control without more positive intervention in the fen to re-establish upward flows of groundwater, such as surface lowering, which would be a significant change to the natural environment.
98. Although there are uncertainties about the amount of groundwater reaching the surface of the fen, there are pathways where the Crag is in direct connection with the peat and, in addition, pathways also exist through ditches and potentially, where clay layers do not intervene, through peat. As such there is significant potential for groundwater to influence the ecology of the fen. However, it is likely, as put forward in evidence, that the situation is complex with other factors also at work, including drying in some areas and natural succession over former turf ponds. In addition, elements of the management schemes might have an influence, although from the evidence presented I give less weight to this, particularly as NE has been able to control it through the HLS schemes for a considerable period of time. As already discussed, change to groundwater flows can influence the chemistry and hence ecology on the surface of the fen.
99. In terms of the Ramsar/SSSI site, the now withdrawn policy PPG9 afforded protection to species affected in non-planning decisions, such as this one, but the only extant policies which relate to Ramsar/SSSI sites are the National Planning Policy Framework and Circular 06/2005, which relate to planning decisions. The EA also draw attention to a Ministerial Statement on 13 November 2010 that non-planning decisions will follow the approach in PPG9, but this no longer exists. There is a general duty towards protection for SSSIs in terms of s28G(2) of the Wildlife and Countryside Act 1981, as amended, which states that there is a duty on an authority "to take reasonable steps, consistent with the proper exercise of the authority's functions, to further the

conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which the site is of special scientific interest". However, I agree with the appellant that this does not convey any higher standard of protection than the Habitats Regulations.

100. The Habitats Regulations provide protection for habitats also used by the water beetles and, in any event, as the appellant points out, the Ramsar/SSSI objection would be unlikely to succeed if the objection under the stricter Habitats Directive were to fail. Nevertheless, from the evidence presented there has been adverse change to the water beetle assemblage. Although the cause for the change is not known, changes to water chemistry could not be ruled out.
101. The appellant has said that absolute certainty, as in *Waddenzee*, cannot be achieved in the approach to decisions under the Habitats Directive. The appellant also implies that the decision maker has to have evidence that there is reasonable scientific doubt about the adverse effect on the integrity of the site if permission is to be refused. However, as in *Smyth* "a strict precautionary approach" must be taken and *Waddenzee* stated that consent can only occur where "no reasonable scientific doubt remains as to the absence of such effects". In that sense, it is for the appellant to show that there is no reasonable scientific doubt. In this case, it has not been shown that no reasonable scientific doubt remains regarding adverse effects on site integrity. Many uncertainties and unresolved differences exist in the evidence presented and therefore a precautionary approach is necessary.
102. Therefore I consider that it cannot be concluded beyond reasonable scientific doubt that abstraction under the licences would not have an adverse effect on the integrity of sites protected by European law, namely, the Broads SAC. No concerns have been raised in relation to the bird populations for which the site is designated in the Broadland SPA. Conclusions on the Broadland Ramsar and Ant Broads and Marshes sites are considered below.

Impacts of time-limited abstraction

103. In its responses to others' Statements of Case the appellant referred to the need for the EA to have considered whether it would be possible for a temporary licence to be issued. This was defined at the inquiry as being for the period to 31 March 2018, which would only include one and half seasons, as it is a summer licence. The evidence for the changes on the fen has already been reviewed and there is no evidence that the change is ceasing but rather that adverse changes, in terms of Sphagnum expansion, are increasing in some areas, as is the potential impact on the fen orchid.
104. The appellant has also quoted legal authorities on the acceptability of authorising a project on a temporary basis if it would not cause lasting and irreparable damage to the site because the effects can be fully undone when the temporary permission ceases. The opinion of the Attorney General in *Waddenzee* and the findings of the Court of Appeal in *Smyth* both related to cases where the possible future effects of the proposal on the protected sites could not be assessed with sufficient certainty at the time of the initial authorisation. However, that is not the case here with a renewal, when the initial authorisation for the licenses was in the 1980s and there has already been the opportunity for some survey work to be carried out.

105. The appellant has said that the extension of time could be used for further monitoring. I agree that, if conducted properly, it could be useful but it would be likely that, even if the abstractions were then to stop immediately, positive change in terms of improvements would be gradual and take some time to start to show. Moreover, there is reasonable scientific doubt that any impacts from continued abstraction would be quickly and completely reversible and no evidence was put forward that this would happen naturally if abstraction were to cease. No mitigation has been put forward as part of the proposal and, although the appellant has suggested pulling up Sphagnum to protect fen orchids, there are no positive proposals as to how this would be implemented and funded and how this would address the reduction in Calcareous Fen.
106. The EA considered short-term renewal until the AWS abstraction had finished and then looking at the Alston abstractions under the RSA scheme. However, that would be, in part, dependent on finding alternative sources for public water supply. The point was raised again by the appellant at the inquiry, since the end date for the renewal would be 31 March 2018.
107. While abstraction continued any future restoration, the plans for which were not specified at the inquiry, could not proceed and it is likely that further damage would have occurred. From the evidence presented, it could not be certain that any such damage would be temporary and reversible, since it would be likely to exacerbate the existing damage to the site. The appellant's claim that any damage would be rapidly and completely reversible is not borne out by the evidence about attempts at restoration by Mr Mason on Unit 3. Whilst I do not give great weight to the point made by Dr Barendregt that the fen is approaching a "tipping point" on Unit 11, there is general consensus about the increase in Sphagnum on both Units 3 and 11, for which no formal mitigation has been submitted.
108. Therefore I conclude that similar impacts would exist for continued abstraction as those for more general abstraction and increasing the time period would only be likely to increase the damage to the fen which would be difficult to restore and certainly would not be restored or regenerate naturally over a rapid time scale. As a result, adverse effects on the integrity of the SAC cannot be ruled out even for a time-limited period.

Alternatives/ IROPI

Alternatives

109. A number of alternative solutions have been looked at by the appellant. Firstly, he has submitted an application for a reservoir at Church Farm, Catfield. It had been intended to fill the reservoir from a wintertime supply from a surface water source close to Barton Broad but this would need to be the subject of an access agreement and could also need treatment to preclude the spread of killer shrimp, a non-native species, and e. coli. As such, a groundwater abstraction would be preferred to prevent pollution of the reservoir and would be likely to have the same constraints as the existing abstractions. At the inquiry it was confirmed that the planning application had been refused on landscape grounds and a further application was being formulated, depending on the outcome of these appeals, although the expense of such a project, which is unlikely to be grant-aided, would be significant and would require a break in potato and salad cropping while it was being constructed and filled.

110. The EA considered 5 different options for mitigating or removing the impact of the proposal. These included: reducing the quantities of water abstracted or numbers of hours pumped in a day; adding a condition to the licences linked to observed water levels on the site when abstraction must reduce or cease; add a compensation discharge condition to the licences; issuing short-term renewals while further investigations are taking place; and, abstracting very small quantities. These were assessed in the Appropriate Assessment Addendum but rejected mainly due to the adverse impact on the applicant's business in ensuring the protection of the European site, practicalities in determining appropriate levels and amounts of water.
111. The EA also examined alternative sources of water. These included: surface water extractions/ reservoirs (see above); relocation of the abstraction point to a more sustainable location but this would still need to comply with environmental legislation; deepening the boreholes into the Chalk, a separate source from Crag but still connected and would be likely to have similar impacts; trading water but this could not happen until after the RSA exercise; and, mains water which would be expensive.
112. The appellant reasoned that there was an economic case for the abstractions to continue. If the water could no longer be used for spray irrigation, then a change in crops would be necessary as only certain fields could be used for potato crops without irrigation and salad crops could not be produced without it. Rental of land for potatoes and salad crops and associated water sales would also be affected. Instead combinable crops including an increase in grain and sugar beet would need to be considered. This would entail further investment in grain storage space and a loss in the investment put into irrigation. Losses would be unlikely to be offset by selling land for development since the area is within an AONB. Mr Alston has said that it would be likely that he would have the farm managed and withdraw from the business and in time it might well need to be sold and no longer be a family farming business, which would have a social impact on the family.
113. Alternatives have been examined by the EA and the appellant. However, none of the alternatives examined by either of these parties has put forward a viable alternative to the proposal.

IROPI

114. The economic argument for the continued abstractions was put forward by Mr Collison for the appellant, who provided further detail of the farming operation. He claimed that a change to crops in an arable rotation would cost some £1.25m per year, it would erode the capital base of the local businesses using the water by £2.5m, leading directly to the loss of 12.5 jobs, 8.75 of which would be in the local economy, and another 23.5 jobs in supporting roles. He also stated that there would be a risk that the farm would be removed from the HLS scheme, which would have implications for local ecology. His final argument was that the crops grown would be displaced to areas where environmental impacts could be worse and might mean loss of jobs to overseas growing areas, causing harm to the national economy.
115. The financial impacts on the appellant and associated businesses are private matters. However, it was acknowledged by Dr Bayley of the EA that job retention can be in the general public interest. Nevertheless, my view is that the proposal cannot be said to be overriding, in terms of being essential or

urgent, sufficient to outweigh the harm to a protected European site. The HLS scheme is generally in the public interest, but in this case there are many surrounding areas which are also covered by the scheme which provide protection for wildlife if it were to be lost. In any event, there would be some winners and some losers in terms of economic impact as Mr Harris stated that he might have to plough up pasture land on his HLS scheme, which would threaten the SAC, since it would allow runoff from agricultural land, which is currently absorbed by the pasture.

116. It was stated by Mr Harris and also Mr Patel and Mr Davis, that the beauty of the protected area and its wildlife was a draw for tourists, which in itself brought in some income, although this is likely to be a contributory factor to tourism income in the local area, rather than a main generator, like the waterways of the Broads. However, the continued inclusion of the Alston land in the HLS scheme would not be essential, would not outweigh the risk to the protected European site and therefore would not be of overriding importance. The displacement of crops to areas within the country and elsewhere would be unlikely as the same constraints would not apply all over Norfolk and it might be possible for the crops to be grown elsewhere locally without spray irrigation. As such, I consider that the public interest would not be adversely affected and neither would this provide an overriding case when weighed against the conservation interests.
117. Regulation 62(2) of the Conservation of Habitats and Species Regulations 2010 transposes Article 6(4) of the Habitats Directive which says that: "where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest". This applies to Catfield Fen, since the site includes priority habitats (as set out in Annex I to the Habitats Directive).
118. As such, it means that the only reasons for which consent for derogation can be granted relate to human health, public safety or beneficial consequences of primary importance to the environment. None of those apply in this case. Although the EA did not comment on this in their final Determination Report, they did not consider that there was a case for IROPI, although the financial implications of refusing the renewal of the abstractions were considered in the cost-benefit analysis in the Determination Report which supported their original conclusions. The EA also assert that overriding public interest necessarily means one of national significance. However, there is no authority for this claim and although nationally significant projects are more likely to establish IROPI but this does not mean that an issue of local importance could never do so. In this case, the scale of the abstractions is small, with local impacts, and could not be said to be significant nationally. The fact that the SoS has declined to recover these appeals for her own decision adds weight to the fact that they are not nationally significant.
119. In terms of IROPI, the appellant has argued that the principle of proportionality should be applied in this case in that, if the adverse effect on the integrity of the site were found not be that great, then the public interest would not need to be so great. However, the legislation ensures that the Appropriate

Assessment as a whole process is designed to be proportionate and any safeguards are built into this.

120. Therefore I conclude that Imperative Reasons of Overriding Public Interest do not exist in this case and as such the permissions could not be granted under Article 6(4) of the Habitats Directive. As such, compensatory measures would not be required and, in any event, no evidence was provided about the compensatory measures which could be provided and their delivery.

Appropriate Assessment

121. Before finally concluding on the decisions, since the impact of the proposals on protected habitats is the primary reason for refusal, I have decided to carry out an Appropriate Assessment on the proposals. They engage the Habitats Directive on the basis that they have the potential to adversely affect a number of European sites and their features. This is not disputed by any of the main parties. The European sites affected are:

The Broads SAC

No evidence was presented to suggest that the qualifying features of the Broadland SPA would be affected. Screening of the likely significant effects of the project, both alone and in combination, has already taken place in the assessment of the application by the EA as reported in its Determination Report. It is agreed between the parties that there are potential significant effects, so that any Appropriate Assessment is required to comply with Article 6(3) of the Habitats Directive and Regulation 61 the Conservation of Habitats and Species Regulations 2010. This Article contains a test requiring the decision maker to use the precautionary principle when making their decisions. This has been interpreted by the courts as meaning that the decision maker must conclude beyond reasonable scientific doubt that the abstractions would not have an adverse effect on site integrity prior to granting consent. The outcome of the HRA process was defined as the main issue for these decisions and the reasons above reflect the evidence presented on it at the inquiry.

122. There are a number of other licenced abstractions in the area, in addition to the appellant's boreholes. The largest, in terms of volume is the public water supply borehole for AWS. The in-combination effects of this abstraction in combination with the appellant's abstractions have been dealt with in the reasoning above and concluded that it could not be ruled out that the effects either alone or in-combination would not cause an adverse impact on the integrity of the site.
123. No mitigation was put forward as part of the applications which were determined by the EA. However, during the inquiry it was suggested Sphagnum moss that was threatening fen orchids on Unit 3 could be pulled up and either disposed of or sold commercially. It was also suggested that the proposal could be the subject of a suitably-worded condition, which would be imposed to ensure that a scheme for such mitigation was put in place. However, no details have been given of how such a scheme would work in practice and no funding has been offered by the appellant. The efficacy of such mitigation has been questioned, since the threat to the fen orchid would remain. Therefore I find that there are no mitigation proposals that would adequately protect the fen orchid, *Liparis loeselii*, a plant species of Community interest whose presence is one of the qualifying features of the SAC.

124. The evidence for the appeals forms the information required for the Appropriate Assessment and I conclude that there is sufficient information to make the assessment.
125. The reasoning above forms the Appropriate Assessment based on the information submitted at the inquiry. These also include the in-combination assessment. The conclusion to that assessment is that it cannot be shown beyond reasonable scientific doubt that abstraction under the licences would not have an adverse effect on the integrity of the site protected by European law, namely, The Broads SAC.
126. The section on the main issue also states that if it cannot be concluded that there would not be an adverse effect on integrity under Article 6(3), then under Article 6(4), alternative solutions for the project would need to be assessed and, if there are no alternative solutions, then an assessment would need to be made of whether the project needs to be carried out for imperative reasons of overriding public importance (IROPI) and compensatory measures sought. The second part of the reasoning above covers the evidence on the alternatives and IROPI.
127. I have concluded that I cannot be satisfied beyond reasonable scientific doubt that there would not be an adverse effect on integrity under Article 6(3). Under Article 6(4), alternative solutions for the project have been assessed in the reasoning above. I concluded that there are no alternative solutions to the abstractions and therefore it was necessary to assess whether the project needs to be carried out for imperative reasons of overriding public importance (IROPI) and, potentially, compensatory measures sought. I have considered the evidence on IROPI and have concluded that there are no Imperative Reasons of Overriding Public Importance in this case. No compensatory measures have been proposed.
128. Therefore, I conclude that, the applications have failed the test under Article 6 (3) and have also failed the test for derogation in Article 6 (4) of the Habitats Directive.

Ramsar/SSSI site

129. I have already discussed the legal implications for the Broadland Ramsar and Ant Broads and Marshes SSSI, including the applicability of its protection in the case of non-planning appeals. These sites are not European designated sites for the purpose of the Habitats Directive and Habitats Regulations and there no longer appears to be any policy directly addressing the way they should be dealt with in relation to water licence abstraction or other non-planning cases.
130. In terms of the Ant Broads and Marshes SSSI, it has already been concluded that no other credible evidence was put forward, other than acidification (linked to abstraction), for the change in the distribution of the beetles, which are designated features of the SSSI. Therefore it cannot be ruled out that the abstractions are having an adverse impact on the SSSI. There is a general duty under s28G(2) of the Wildlife and Countryside Act 1981 (as amended) to further the conservation and enhancement of SSSIs and this decision achieves that duty. As already discussed, this duty does not provide any higher level of protection than the Habitats Regulations.

131. It has been the Government's policy position for many years that Ramsar sites should be accorded the same amount of protection as European sites and it seems to me that there is nothing to indicate that the Government intends to change that position in relation to Ramsar sites affected by non-planning applications or appeals. Nevertheless there remains some uncertainty about this issue. However, even if Ramsar sites are not to be treated in the same way as European sites and so do not benefit from the same level of protection, in this case it makes no difference to the outcome of the appeals, since approval for the applications cannot be granted under the Habitats Regulations.

Other matters

132. I have considered the R6 party's request to include proposals for reform in this decision, including the EA's approach to modelling for abstraction cases and RSA more generally, which they say is my legal duty under the Habitats Directive and the pursuant Habitats Regulations 2010. Regulation 9(5) states that: "Without prejudice to the preceding provisions, a competent authority, in exercising any of their functions, must have regard to the requirements of the Habitats Directive so far as they may be affected by the exercise of those functions." However, I do not consider that this means that I need to consider proposals for reform in the decisions, I am required only to make the decisions in this case.

133. I also acknowledge that Mr and Mrs Harris have committed their time and resources into managing Unit 11 in accordance with the HLS to maintain and improve its conservation value. Mr and Mrs Harris have also said that the outcome of the appeals should influence the EA's RSA programme more generally. However, that is a matter for the EA and these decisions cover only the submitted appeals.

Final conclusions

134. For the reasons given above, I conclude that the appeals should be dismissed.

E A Hill

INSPECTOR

APPEARANCES

FOR THE ENVIRONMENT AGENCY:

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Mr D Gregory of Counsel
He called

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Mr T Harris, landowner, Catfield Fen

INTERESTED PERSONS:

Mr Patel BA FCA
Mr Davis
Mr Starling

Interested person
Interested person
Broads Reed and Sedge Cutters Association

Mr Pankhurst

Regional Conservation Manager, Plantlife

DOCUMENTS SUBMITTED AT THE INQUIRY

EA1 – Draft site visit map, submitted by the EA

EA2 - Opening statement, submitted by the EA

EA3 – Updated and corrected proof, Mr Mason, RSPB, submitted by the EA

EA4 – Plan, Catfield Hall Estate (site visit), submitted by the EA

EA5 – Aerial photograph, Ant Broads and Marshes (site visit), submitted by the EA

EA6 – Additionality Guide, English Partnerships, submitted by the EA

EA7 – Larger scale map of Fig 19 to Dr Grout's Appendices to his proof, submitted by the EA

EA8 – Clearer graph Fig 2 Mr Lewis' rebuttal evidence

EA9 – EA written closings

H1 - Statement Dr A Barendregt, in response to rebuttals, submitted by the R6(6) party

H2 – Opening statement, Rule 6(6) party

H3 - Email from Mr Pankhurst to Dr Parmenter, submitted by Rule 6(6) party

H4 – Extracts, Groundwater in the Environment, submitted by the R6(6) party

H5 – Harris Countryside Stewardship Agreement 2016, submitted by the R6(6) party

H6 – Boundary of Unit 11 Catfield Fen on map 4.4a from Dr Parmenter's PhD thesis, submitted by the R6(6) party

H7 – Plan, area of Calcareous Fen on Unit 11, submitted by the Rule 6(6) party

H8 – Further information Professor Gilvear, submitted by the Rule6(6)

H9 – Rule 6(6) party written closings

APP1 – Statement of Common Ground between the appellant (James Dodds) and the EA and AMEC Foster Wheeler on water issues, submitted by the appellant

APP2 – Statement of Common Ground between the appellant and the EA on legal principles, submitted by the appellant

APP3 – Appellant's opening statement

APP4 – Extracts Dr Parmenter's PhD thesis, and APP4a boundary of Unit 3 on plan added by Dr Painter, submitted by the appellant

APP5 – Determination of Environmental Variables, extract from Dr Parmenter's PhD thesis, submitted by the appellant

APP6 – Extract – Missing App 2 to Dr Painter's rebuttal, submitted by the appellant

APP7 – 2nd rebuttal proof of James Dodds, submitted by the appellant

APP8 – Catfield Fen Monitoring Data, submitted by the appellant

APP9 - Graph of piezometer data P12, P13 and P14, submitted by the appellant

APP10 – Appellant’s written closings

IP1 – Statement, Mr Pankhurst, Plantlife