From:	[redacted]
To:	SizewellC
Subject:	Deadline 10 submission
Date:	12 October 2021 18:09:38
Attachments:	SCFoE_SZC_Deadline 10_V1.4_Final.pdf

Dear PINS

Interested Party ID: 20025904

I attach one of our Deadline 10 submissions, written on our behalf by our ecohydrological advisers and approved by our members.

Two further submissions are following.

Yours sincerely
Rachel Fulcher, Coordinator
Suffolk Coastal Friends of the Earth

Suffolk Coastal Friends of the Earth

Interested Party ID: 20025904

THE SIZEWELL C PROJECT

NNB Generation Co (SZC) Ltd

EN010012

Deadline 10: FINAL WRITTEN SUBMISSION

Review and summary comments on the ecohydrological aspects of the impacts of the proposed development on Sizewell Marshes SSSI, and the proposals for creation of compensatory fen meadow habitat.

Authors

Dr David Mould, Dr Rob Low & Jonathan Graham

Acknowledgements

Suffolk Coastal Friends of the Earth would like to thank Suffolk Wildlife Trust, the RSPB and the Minsmere Levels Stakeholder Group for their kind assistance during the preparation of this submission.

[redacted]@yahoo.co.uk

This submission provides specialist review of documents, and identifies significant residual areas of concern relating to;

1. The assessment of ecohydrological impacts on Sizewell Marshes SSSI from the main development; and
2. The proposed creation of compensatory fen meadow habitat.

1. Assessment of ecohydrological impacts on Sizewell Marshes SSSI

We have highlighted numerous serious concerns with the assessment of ecohydrological impacts on Sizewell Marshes SSSI from the proposed development in previous submissions, some of which are re-stated below. This section is a specific response[1] to REP3-042 Appendix B[2], which was produced by the Applicant to address some of these concerns.

Comments on specific paragraphs (within REP3-042 Appendix B)

Paragraph 1.2.10. suggests that an absence of tidal variation in the peat water levels demonstrates that there is a low degree of hydraulic continuity between the Crag and the Peat. However, Paragraph 1.5.11 notes that peat is a compressible medium, and suggests that small changes in water pressure can be accommodated without an observable change in groundwater level. If the latter is true, it seems clear that small-scale tide-related variations in water pressure in the Peat could be accommodated without an observable change in groundwater level, and therefore that an absence of response to tidal variations does not automatically imply a lack of hydraulic conductivity between the Crag and the Peat.

Paragraph 1.2.16 and the title of Plate 1 (and Plates 3, 4 and 5) make reference to components of the water balance to Sizewell Marshes SSSI. However, the diagram actually provided as Plate 1 (and associated plates) implies that the presented water balance is for the peat within Sizewell Marshes SSSI. The difference might seem small, but it is critical.

Our serious concerns over the impact assessment relates to the water balance for the peat, and how the relative contributions of various sources of water could change under the development scenario. If the water balance presented in Plate 1 is for the whole SSSI (as the title states), it is impossible to know what proportion of surface water simply flows through the SSSI, and therefore makes no contribution to the peat water balance. If a large proportion of surface water bypasses the peat, the relative contribution of groundwater inflows to the peat water balance will be much higher than is shown in Plate 1.

The figures[3] for water balances shown in Plate 3 are given in Table 1. It is assumed that this water balance is for the peat alone, an assumption which (potentially significantly) minimises impacts in the current context. It can be seen that for both summer (pale green highlight) and winter (grey highlight) periods, approximately 4% of total water contributions to the peat are transferred from groundwater to surface water, when comparing the baseline to early construction periods. The

[1] As requested by Stephen Mannings in his email (8th October 2021) to Ben McFarland (RSPB) and others.

[2] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-005470-D3%20-%20The%20Sizewell%20C%20Project%20-%20Comments%20on%20WRs%20Appendices.pdf

[3] The resolution of this figure within the provided pdf is very poor, and the figures are quite difficult to read.

hydrochemical significance of this change does not appear to have been explored quantitatively by the Applicant (see below).

Table 1. Modelled water balance components for Sizewell Marsh (see assumption in text).

Wetland Component	m^3/d	%	m^3/d	%	m^3/d	%	m^3/d	%
	Baseline				**Early construction**			
	Summer		**Winter**		**Summer**		**Winter**	
Surface water	2,634	55.6%	3,127	65.0%	2,525	58.2%	3,101	69.0%
Groundwater	1,532	32.3%	1,279	26.6%	1,235	28.4%	1,012	22.5%
Recharge	574	12.1%	407	8.5%	575	13.2%	383	8.5%
Total	4,740	100%	4,813	100%	4,335	100%	4,496	100%

Paragraph 1.4.3 notes that the maximum predicted (modelled) change in groundwater levels within the SSSI coincides with the peak dewatering activity within the cut-off wall (December 2024). It is worth noting that drawdown impacts are generically likely to be less severe during winter periods than during summer periods, because of higher effective rainfall (rainfall minus evapotranspiration) during winter periods.

Our view is that the coincidence of peak dewatering activity with the period when drawdown impacts are generically less severe (i.e. winter), as modelled, is highly dependent on the construction schedule. As is known from similar projects[4], construction schedules are frequently delayed, and therefore it is entirely possible that peak dewatering activity will coincide with the summer period when drawdown impacts are generically more severe. The fact that entirely possible delays in the construction schedule, which could cause an increase in drawdown impacts, have not been assessed with the model, appears to be a serious weakness in the impact assessment.

Paragraph 1.4.7 notes that "the predicted change relative to baseline conditions is smaller than the seasonal variation observed in peat groundwater levels". It is worrying to have to point out that comparison of predicted (water level) change with seasonal (water level) variation is completely irrelevant and, worse, demonstrates a very poor understanding of ecohydrology. It implies, for example, that if the seasonal range in a peat water table is 0.40 m (e.g. 0.00 to 0.40 mbGL), then a non-significant drawdown impact might be 0.39 m. The resulting seasonal range in the peat water table would be 0.39 to 0.70 mbGL: this is clearly unfounded and has no scientific basis whatsoever.

[4] In July 2017, EDF announced that the construction of Hinckley Point nuclear power station was 15 months behind schedule (https://www.theguardian.com/uk-news/2017/jul/03/hinkley-point-c-is-22bn-over-budget-and-a-year-behind-schedule-edf-admits

Other key concerns which are yet to be addressed satisfactorily by the Applicant

- We have persistently drawn attention to the fact that hydrological supporting conditions for the M22 fen meadow community are partly defined by the elevation of the water table relative to the ground surface, but that the Applicant is monitoring, and has conducted the ecohydrological impact assessment, using shallow piezometric levels. These two variables potentially have very different values at a single location, and we have asked for field-collected evidence that this is not the case for the Applicant's monitoring within the SSSI. This evidence has not been forthcoming, and therefore we are still in a position where the whole ecohydrological impact assessment for M22 has been carried out using inaccurate data.
- Our main concern with the Applicant's proposed strategy for mitigating water table drawdown within the SSSI caused by the development is that it will mean that a greater proportion of poor-quality surface waters will support water table elevation within the fen meadow; it is therefore, essentially, a concern over water quality. We are therefore strongly of the opinion that six-monthly water quality monitoring within the SSSI, as still appears in *9.87 Draft Water Monitoring and Management Plan – Tracked Changes Version (September 2021)*[5] is clearly inadequate to address and manage our concerns, and we would like to see two-weekly monitoring, at least during the early development phase.
- Measurements of water levels within the peat (be it piezometric level or water table elevation – see above) need to be expressed relative to a defined elevation within the micro-topography of the meadow surface. The micro-relief of the meadow surface (0.1 m) is of the same order as the guideline 0.15 m range for M22 fen meadow community, and therefore a defined and consistent metric for ground surface elevation in relation to each monitoring point is vital for accurate and consistent assessment of water level data.

Further elements for a best-possible ecohydrological impact assessment

In our view, the following additional work and reporting should have been carried out in pursuit of a best-possible ecohydrological impact assessment:

- High-frequency sampling of surface water inflows to Sizewell Marshes SSSI, with the resulting data being clearly presented in reporting, such that the nutrient and other determinand status of inflowing waters was clear. We are still unclear about nutrient concentrations in the inflowing surface waters, in terms of absolute values and temporal variation. This is a critical uncertainty, since the Applicant is proposing to increase the contribution of surface waters (over that of groundwater) to maintenance of water table elevation in the peat, which is turn supports the nutrient-sensitive M22 fen meadow plant community. It should be noted that the Applicant was not accepting this during ISH11 despite it being clear from their written submissions.
- Use of the numerical model to simulate mitigation of development-related water table drawdown within the SSSI through manipulation of ditch water levels (as described in Section 1.6). Analysis of the results of such a simulation would have allowed the changes in the relative contributions of groundwater and surface waters to maintaining water table elevations in the

[5] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-007611-Sizewell%20C%20Project%20-%20Other-%20SZC%20Bk9%209.87(A)%20Draft%20Water%20Monitoring%20and%20Management%20Plan%20Tracked%20Changes%20Version.pdf

peat, under the proposed mitigation scenario, to be quantified. The fact that a fully-functioning and calibrated groundwater-surface water model has not been used for this purpose is extremely difficult to understand.

- It is also important to note that all of the predicted impacts are taken from the central, best-estimate numerical model. There has been no accounting for real uncertainties in the values for critical variables within this model, to which drawdown impacts are sensitive, as demonstrated through the model sensitivity testing (APP-298)[6]. It is our strong view that very plausible "what-if" scenarios with regard to values used for model variables should have been propagated through the assessment, to the point where the feasibility and ecohydrological impacts of the hydrological mitigation strategy across the plausible range of impact predictions could be understood.
- Using the results of 1 and 2, and other available data, hydrochemical mixing calculations could have been carried out to provide a quantitative estimate of the likely changes in nutrient concentrations of groundwater in the peat. The results could have been compared with hydrological supporting conditions for M22, as defined through the guideline nutrient concentrations of irrigating waters (e.g., Environment Agency, 2010).

In our view the work detailed above is the obvious final step in the assessment of ecohydrological impacts of the proposed development, and it is highly disappointing that it has not been carried out and/or presented in an application as significant as that for Sizewell C. It now means that important decisions will have to be made on the basis of highly sub-optimal information, and in the context of many unresolved (but resolvable) uncertainties.

[6] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-001914-SZC_Bk6_ES_V2_Ch19_Groundwater_and_Surface_Water_Appx19A_Part_1_of_6.pdf

2. The proposed development of compensatory fen meadow habitat

The following represents a review of 9.64 Draft Fen Meadow Plan – Tracked Changes Version (September 2021)[7].

Paragraph 1.2.2 notes that the proposals are informed by data collected up to and including early July 2021, and claims that '*a substantive portion of the data for* [sic] *summer period has informed the proposals*'. It also notes that this is important as both groundwater and surface water level are typically lowest in summer, and these levels and related seasonal trends are likely to be amongst the most important variables in determining the potential for establishing new fen meadow.

It is our view that:

- Surface water flows, and groundwater levels and discharge, generally reduce throughout the summer meaning that, for example, groundwater levels and discharge generally reach their annual minimum in September or early October. In this context, late-summer hydrological monitoring data is clearly of much more value than the early-summer data with which the plans have been developed, in relation to assessing the hydrological feasibility of fen meadow creation.
- Planning for water-related habitat creation should be carried out with full knowledge of the hydrological environment, including its longer-term variation over at least 3-5 years. The current plans must be viewed as highly uncertain as they are based on less than one year of hydrological monitoring data.

It is highly concerning that proposals for fen meadow creation at Pakenham are currently based on only four months (March to July 2021) of hydrological data, with March and April, on average, being associated with the highest annual groundwater levels. A comprehensive data set encompassing hydrological variation annually (from month to month) is critically important in understanding potential site supporting conditions for fen meadow communities.

2.1 Benhall

Paragraph 2.3.4. appears to claim that comparison of riverbed and river water elevations '*indicate the potential for groundwater discharge to the river*'. It is extremely difficult to understand the reasoning here.

Paragraph 2.3.5. notes the presence of a nearby groundwater abstraction, but says its impact on groundwater levels within the site is likely to be minimal because of the relatively low abstraction quantities. It is impossible to judge this assertion as neither the distance separation of the abstraction from the site, nor the licensed abstraction quantity allowed each year, is provided.

2.2 Pakenham

Paragraph 4.3.20 essentially says that the hydrological functioning of part of the site (the ground around HA-1) which currently supports M22 remains uncertain. There is reference to a perched water table, but no detail is provided. This demonstrates a fundamental lack of understanding regarding the site's hydrological functioning.

[7] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-007607-Sizewell%20C%20Project%20-%20Other-%20SZC%20Bk9%209.64(A)%20Draft%20Fen%20Meadow%20Plan%20Tracked%20Changes%20Version.pdf

2.3 General and conclusions

As a general point, the hydrological and hydrogeological feasibilities of fen meadow creation at the three sites are extremely difficult to review effectively as there is an absence of diagrams which show the detailed conceptual understanding of current (baseline) and post-fen creation situations. Such a diagram (cross section and/or plan) should be prepared for each distinct part of the sites, and should include at least piezometer and dipwells, groundwater/surface water levels (seasonal), proposals for ground surface lowering ('sculpting'), groundwater-surface water interactions.

At a minimum, conceptual model diagrams from previous reports should have been updated with the latest interpretations, as based on the latest monitoring data; the detailed and often very confusing narrative descriptions provided (e.g., Section 4.3 for Pakenham) do not allow a full understanding of the sites to be conveyed and critically reviewed.

For Benhall and Halesworth, construction of a water control structure is proposed, with the control level being adjusted up or down, based on review of monitoring data. More information is needed in this regard. For example, will continuous adjustment be necessary, and if so at what frequency? Depending on the answers, are the proposals sustainable in the long-term?

The proposals for post-fen creation monitoring are insufficiently detailed. Firm proposals for the frequency of both data collection and review are required, alongside criteria to determine whether the fen creation is being successful. Since the hydrology of the sites will react almost instantaneously to the habitat creation works, early-period review should concentrate on hydrological monitoring, and specifically whether the required hydrological supporting conditions for M22 fen meadow are evident. None of this detail has been provided.

In relation to the proposed development of compensatory fen meadow habitat, we therefore conclude:

1. Reporting of monitoring data, its interpretation, and plans for habitat creation is not sufficiently detailed to allow the feasibility of fen meadow habitat creation to be assessed with appropriate rigour.
2. The periods of hydrological and hydrochemical monitoring at the sites have been far too short to allow longer-term hydrological regimes to be characterised with any certainty.
3. Plans for fen meadow creation need to be sustainable, and therefore should not rely on continuous adjustment of water control structures over the long-term.
4. The plans for post-fen meadow creation monitoring are insufficiently detailed.
5. The Applicant has confirmed its requirement to create compensatory fen meadow habitat. While no scheme can be guaranteed to be successful, there is nevertheless a strong requirement for the Applicant to provide sufficiently detailed and researched proposals so that an outcome of success is considered highly likely – a process highlighted in ISH10 by the Examining Authority and described in his own words as "reasonable endeavours". It is our opinion that the proposed fen habitat creation (for reasons highlighted above) falls woefully short of this aim, both in scope and in requirements. Natural England raised concerns in their written statement for ISH10 regarding "the likelihood of success" of fen meadow compensation and it is our opinion that the current proposals, with the serious uncertainties we highlight, are more likely to be unsuccessful and therefore should not be relied upon with any confidence.

3. References

Environment Agency (2010). *Ecohydrological guidelines for lowland wetland plant communities.* Fens and mires update, March 2010.