The Sizewell C Project

9.53 Written Submissions Responding to Actions Arising from ISH6: Coastal Geomorphology (14 July 2021)

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CONTENTS

APPENDICES

1 ISSUE SPECIFIC HEARING 6: COASTAL GEOMORPHOLOGY

1.1 Introduction

1.1.1 This document contains the Applicant's written submissions responding to actions arising from Issue Specific Hearing 6 (ISH6) on coastal geomorphology held on 14 July 2021.

1.1.2 This document corresponds to the Applicant's **Written Summaries of Oral Submissions made at ISH6** (Doc Ref. 9.46) submitted at Deadline 5.

1.2 Technical Note from East Suffolk IDB SoCG

1.2.1 Reference was made to a Technical Note in the **Statement of Common Ground between SZC Co. and East Suffolk Internal Drainage Board** [REP2-067].

1.2.2 HPQC confirmed that the note was in preparation and would be submitted at Deadline 6. HPQC confirmed the title of the proposed Technical Note is "*Minsmere Sluice Operation Evaluation Technical Note*". This Technical Note considers the context and operation of the sluice, summarises the range of potential mechanisms resulting from the proposed development which could impact on the sluice and provides a summary of the impact assessment, with signposting into relevant documents within the Application.

1.3 Ocean Acidification

1.3.1 It is important to note that no activity undertaken by SZC Co. will affect the robustness or integrity of the Coralline Crag outcrop at Thorpeness.

1.3.2 The Coralline Crag, is a substrate consisting substantially of calcareous material and is potentially susceptible to dissolution under acidic conditions.

1.3.3 As a point of clarification, it should be noted that oceans and the UK seas are not acidic, they are technically alkaline, but in the future will be less alkaline.

1.3.4 The process of acidification primarily affects an organism's ability to uptake calcium and store it in their shells or bone structure (Ref. 1). In relation to non-living organisms, the extent of dissolution, where calcium dissolves into the water, is a function of pH, temperature, salinity, organic content and pressure, but can be broadly considered by the aragonite saturation (see below).

1.3.5 Aragonite is the form of calcium that is most easily dissolved (calcite is less soluble). Where the aragonite saturation is <1 then dissolution can occur.

1.3.6 A comprehensive review relevant to UK waters can be found in the Marine Climate Change Impacts Partnership (MCCIP) Science Review 2017 on Ocean Acidification (Ref. 2). This review incorporates forecast modelling for 2080-2099 under the extreme RCP8.5 scenario and shows no regions in the southern North Sea are below the aragonite saturation (**Figure 1**). It is not a process that will reduce resilience of the Coralline Crag at Thorpeness during the operational lifetime of the nuclear station.

1.3.7 Predicted argonite saturation levels beyond 2099 are not available but given the projections in **Figure 1** are for the extreme RCP8.5 scenario, changes significant changes to the extent they may affect the integrity of the Coralline Crag at Thorpeness are not predicted.

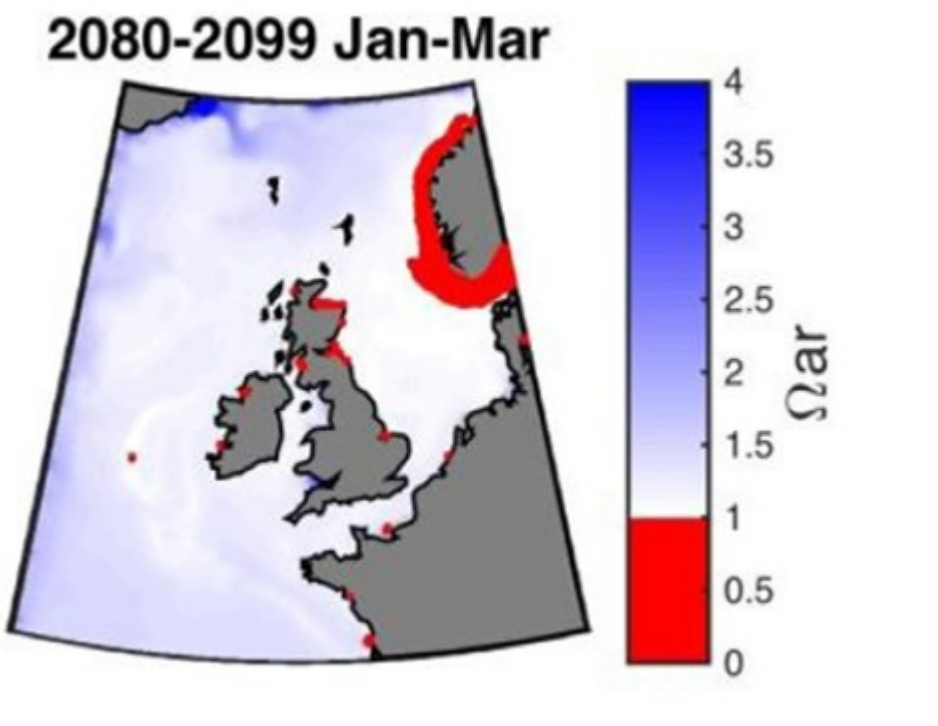

Figure 1: Seasonal changes in projected sea surface aragonite saturation (Ωarg) for 2080-2099 under a high CO2 emissions scenario (RCP 8.5). Undersaturated water shown in red, affecting parts of UK coast in January-March.

1.4 Approach to Technical Review and Governance

1.4.1 The Sizewell C Marine Technical Forum (MTF) was established in 2015, following on from the success of the equivalent forum established post-

consent for Hinkley Point C, as a means to consult with marine statutory stakeholders on relevant elements of the SZC project in pre-application.

1.4.2 The MTF has terms of reference, that were agreed by members (SZC Co, Marine Management Organisation (MMO), Environment Agency (EA), Natural England (NE) and East Suffolk Council (ESC)) in 2015, that covered both pre-application and post-consent engagement. The MTF operates under an Independent Chair and the Terms of Reference allow the Chair to invite other 'guest' members to attend with the agreement of other MTF members. To date, RSPB and Suffolk County Council have also attended selected MTF meetings.

1.4.3 To date, the MTF has reviewed and fed back on technical reports that support the Sizewell C DCO EIA as well as initial review of the **Coastal Processes Monitoring and Mitigation Plan** (CPMMP) (latest version to be submitted at Deadline 5 (Ref. 6.14(A)).

1.4.4 The MTF provides a useful, transparent means by which stakeholders can provide feedback on SZC assessments and documents.

1.4.5 Its continued existence is secured in the **Deed of Obligation** (Doc Ref. 8.17(E)) (Paragraph 10 of Schedule 11), with its agreed terms of reference annexed to the same. There are ongoing discussions between SZC Co., ESC and the MMO on this point.

1.5 Climate Change in tide

1.5.1 UKCP18 (Ref. 3) states:

"Mean sea level rise results in a direct increase in both low and high waters. However, since the propagation of tide and surge is dependent on water depth, there is also a potential for mean sea level change to have a more spatially complex effect on local tidal range and the extent of storm surges above the high tide. Changes to currents might also occur and could affect aspects such as sediment transport."

1.5.2 Pickering et. al (2012) (Ref. 4) investigated the effect of sea level rise (SLR) on the tides of the northwest European Continental Shelf, focusing primarily on the M2 tidal constituent (the dominant semi-diurnal tidal component at Sizewell). This study investigated a 2m SLR scenario.

1.5.3 Under the UKCP18 RCP8.5 95th percentile scenario (the most extreme plausible scenario, but considered unlikely to occur), SLR of 2m as assessed in Ref 4 would not occur until post 2150.

1.5.4 Figure 2 shows that the increase in tidal range along the Suffolk coast that would be expected from a 2m SLR is approximately 5cm.

1.5.5 A 5cm increase in tidal range is very small compared with the existing tidal range at Sizewell of approximately 2.1m (between Mean High Water Spring and Mean Low Water Spring). A 5cm increase equates to a tidal range increase of just 2%.

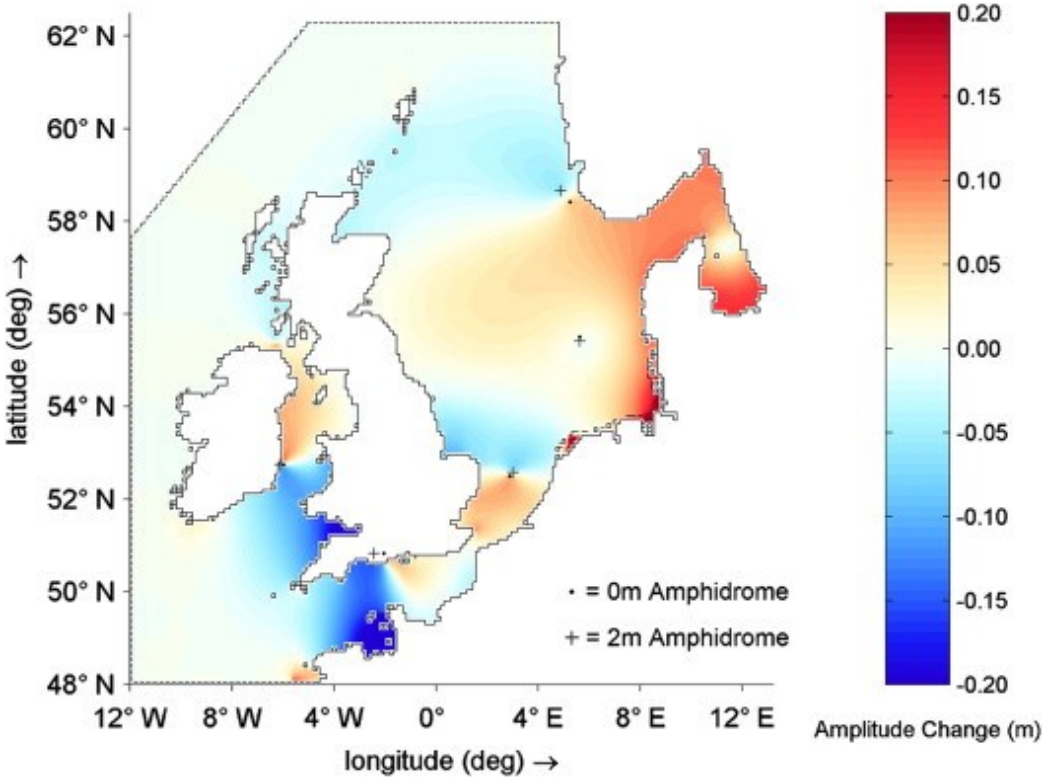

Figure 2: Plot shows the increases (red) and decreases (blue) of the M2 amplitude with 2 m of SLR (sourced from Ref. 4).

1.5.6 Increased tidal range does not necessarily result in increased tidal currents because increasing depth brought about by SLR tends to reduce currents.

1.5.7 Overall, the effect of minor increases in tidal range is not considered to be likely to make a material change to the impacts and extents of the activities under the EIA as part of the coastal geomorphology assessment [APP-311]).

1.6 Lifetime of Hard Coastal Defence Feature

1.6.1 The Hard Coastal Defence Feature would need to be in place up to 2140, as set out in the **Coastal Defences Design Report** [REP2-116].

1.7 DCO/DML - Maintenance Activities Plan

1.7.1 As described by the Applicant at ISH6, the condition requiring maintenance activities plan (MAP) to be submitted under Condition 34 of the deemed Marine Licence is necessary to allow for maintenance works in areas that will become licensable areas once the power station cooling water system is flooded with seawater. As clarified by the Applicant, these are activities that are fully within the remit of the MMO and there are no maintenance activities that would be covered in this plan that would relate to activities on land above MHWS which are not already covered by the **CPMMP** (Doc Ref. 6.14(A)). See the Applicant's **Written Summaries of the Oral Submissions made at Issue Specific Hearing 6** (Doc Ref. 9.46) for further details.

1.8 CMMP

1.8.1 Revision 2 of the **Coastal Processes Monitoring and Mitigation Plan** is submitted at Deadline 5 (Ref. 6.14(A)).

1.9 Response to National Trust

1.9.1 As described in the report entitled **SZC Co.'s Comments on Submissions from Earlier Deadlines** (Doc Ref. 9.54). SZC Co will provide a written response to the National Trust's Written Representations at Deadline 6.

1.10 Coastal Defences – Reduction in seaward extent

1.10.1 Further details of the reduced seaward extent of the coastal defences are set out in **Appendix A** of this document.

1.11 Response to Professor Blowers

1.11.1 Professor Blowers' OBE Written Representation [REP2-209] states '*The project should be assessed as a whole on whether the site is 'potentially suitable' for the deployment of a new nuclear power station*'. Professor Blowers' specific area of expertise is social science and planning, and a large part of his written representation addresses concerns over the long-term sustainability of the site, particularly ethical aspects relating to the management of waste. This response focusses exclusively on the aspects of his submission relevant to coastal geomorphology.

1.11.2 Thus, in Section 1 (Objection to the project as a whole), Professor Blowers writes:

"*The new power station would be a gross intrusion into the landscape and have devastating impacts on habitats, wetlands, and marine environment*", while in his conclusions he also adds "*During the period of operation up to the end of this century it must be questioned whether proposed defences and managed adaptation will be fully effective against the maximum credible scenario of climate change impacts of sea-level rise, storm surges and coastal processes*."

1.11.3 The impacts on the marine geomorphology have been assessed as insignificant (**Volume 2 Chapter 20** of the **ES** [APP-311] and **Volume 1 Chapter 2** of the **ES Addendum** [AS-181]). The **CPMMP** (Ref 4.16(A)) outlines *measures* designed to maintain the natural function of the geomorphic system over the operations and decommissioning phases. The report **Preliminary Design and Maintenance Requirements for the Sizewell C Coastal Defence Feature** [REP3-032] shows that the soft defences are suitable for the stated timescale.

1.11.4 Professor Blowers writes (Section 2: SZC and Climate Change):

"*One study that includes ice sheet contributions to SLR indicates that a high though by no means improbable global warming of 50C could lead to a 2m rise in sea-levels by 2100 (Bamber et al., 2019). The impacts of such rises in terms of flooding, storm surges and coastal processes are uncertain and, according to UKCP18, 'we don't yet know whether storm surges will become more severe, less severe or remain the same' (UKCP18, 2018, p.2)* …

"*A process of monitoring is proposed with 'adaptive management' measures (such as increasing the height of defences) if necessary. It must be questioned whether these defensive measures will be proof against any eventuality or against deteriorating circumstances such as cliff and beach erosion or severe flooding or storm surges. And the impacts of the defences on coastal processes, erosion and flooding are also issues for careful consideration*."

1.11.5 The **Sizewell C Coastal Defences Design Report** [REP2-116] submitted at Deadline 2 (and plans submitted at Deadline 3 [REP3-004]) describes the design intent of the sea defences and demonstrate that the design meets the necessary criteria for the worst case but plausible climate change scenario (RPC8.5). Furthermore, the Office for Nuclear Regulation (ONR) will need to be satisfied that the site is protected from external hazards, taking full consideration of climate change and extreme events, prior to issuing the Nuclear Site Licence.

1.11.6 The impact of the defences on coastal processes have been assessed – there is no impact from the HCDF unless it is exposed and the **CPMMP**

(Doc Ref. 6.14(A)) outlines mitigation via the SCDF to ensure that the HCDF is not exposed. This has been assessed in **Preliminary Design and Maintenance Requirements for the Sizewell C Coastal Defence Feature** [REP3-032] and **Storm Erosion Modelling of the Sizewell C Soft Coastal Defence Feature** [REP3-048], which furthermore confirm that the design of the SCDF is viable with sea level rise as presently anticipated up to 2099. Ongoing work will assess the viability beyond this date, including adaptive defences and the effects of natural shoreline recession and this will be reported at Deadline 7.

1.11.7 A significant part of Professors Blowers' submission concerns the security of stored nuclear wastes on site, possibly until 2165, in the context of climate change and sea level rise. Waste disposal routes and site security are, again, not directly matters for this response, but he notes:

"*beyond 2100, the uncertainties in modelling the rate of global warming, SLR and other impacts of climate change lead into the realm of indeterminacy…*"

1.11.8 This indeterminacy is recognised, and the ES has made no specific projections for coastal change this far into the future. Instead, the approach is to extend assessment of the function of the proposed mitigation (SCDF) beyond 2100 and this further modelling of more extreme future coastal conditions will be provided at Deadline 7.

1.11.9 Professor Blowers further writes:

"[Future] *generations will have little or no benefit from SZC but will bear the burdens of risk, cost and effort of continuing to manage the decommissioning and radioactive wastes on a site that will become increasingly vulnerable to flooding and the impacts of climate change on coastal processes.*"

1.11.10 As noted above, the matter of flood risk is a separate topic but the impacts of climate change on coastal processes have been assessed based on UKCP18 projections for changes in wind, wave and water levels. The consequent impacts of these changes on shoreline development have been explored as far into the future as was considered reasonable to project (see **Volume 2 Chapter 20 Appendix 20A** of the **ES** [APP-312]). Assessments in **Preliminary Design and Maintenance Requirements for the Sizewell C Coastal Defence Feature** [REP3-032] and **Storm Erosion Modelling of the Sizewell C Soft Coastal Defence Feature** [REP3-048] suggest that longshore coastal processes can be maintained under future marine conditions, with consequently limited impacts on the wider shoreline. This will be supplemented with additional modelling of sea level rise and

shoreline change conditions appropriate to the decommissioning phase and the adapted HCDF to be reported at Deadline 7.

REFERENCES

1 Fernand, L and Brewer P ICES Cooperative Research Report Rapport des Recherches Collectives No. 290 April 2008 Changes in surface C 0 2 and ocean pH in ICES shelf sea ecosystems

2 Marine Climate Change Impacts Partnership (MCCIP) Science Review on Ocean Acidification (2017) http://webcache.googleusercontent.com/search?q=cache:h4vNkQEoBjEJ:www.mccip.org.uk/media/1760/2017arc_sciencereview_001_oac.pdf+&cd=2&hl=en&ct=clnk&gl=uk

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4 Pickering, M.D., Wells, N.C., Horsburgh, K.J. and Green, J.A.M., 2012. The impact of future sea-level rise on the European Shelf tides. *Continental Shelf Research*, *35*, pp.1-15.

APPENDIX A: SEAWARD EXTENT OF COASTAL DEFENCE FEATURES

APPENDIX A: COASTAL DEFENCES – REDUCTION IN SEAWARD EXTENT

1.1 Introduction

1.1.1 SZC Co. is cognisant that the coastline is used and enjoyed by many and its character and amenity experience is key. It is also where people will interact most closely with Sizewell C. Refined coastal defence features that both meet strict design requirements and reflect existing coastal characteristics are therefore now well progressed.

1.1.2 The design of the coastal defences is underpinned by a full appreciation of the Suffolk Coast and Heaths AONB coastline character and the Suffolk Heritage Coast, which are expressed in the Design Principles outlined in the **Design and Access Statement** submitted at Deadline 5. They will inform the ongoing refinement of the design and are secured in Requirement 12B of the draft **Development Consent Order** [REP2-015].

1.2 Permanent Hard Coastal Defence Feature

1.2.1 SZC Co. has continued to evolve the seaward extent of the Permanent Hard Coastal Defence Feature (HCDF) in response to stakeholder concerns and is reducing the seaward extent of the permanent HCDF in two ways:

- Paring back the main permanent HCDF frontage along the beach by five metres. The seaward extent of the toe was at Easting 647620 and it is now at Easting 647615. This has been achieved by reducing the distance between the landward side of the HCDF and the outer security fence by five metres, which has a positive knock-on effect on the whole structure.

- Paring back the Permanent HCDF at the intersection with the Permanent BLF by 15 metres, to align with the reduced seaward extent set out above. The seaward extent of the toe was at Easting 647630 and is now at Easting 647615. This has been achieved by removing a laydown area and turning head where the permanent BLF and its access road meet.

1.2.2 The proposed Eastings listed above are shown on the cross-sectional drawings of the **Coastal Defence Feature Plans** submitted at Deadline 5. Drawing SZC-SZ0100-XX-000-DRW-100262, Rev, 02 in this plans pack also now shows the existing fence line on the beach for greater clarity.

1.2.3 Prior to the change in coastal defence parameter heights accepted in April 2021, the seaward extent of the toe was 647612 (3m further landward than

the proposed design) as explained in Table 3.4 of the **Coastal Defences Design Report** [REP2-116]. The 3m seaward advance since that original position is considered by SZC Co. to be acceptable on balance as the HCDF is now designed to not require adaptation under the "Reasonably Foreseeable" climate change scenario. Under this scenario, there is therefore now no need to clear established coastal vegetation and habitats partway through the operational life of the power station.

1.2.4 At Deadline 6, SZC Co. will update Paragraph 3.1.61 of the **Construction Method Statement** [REP3-016] to confirm that four additional terrestrial piles (above Mean High Water Spring) are required to support the two additional removable deck spans for the permanent BLF that are required now that the HCDF does not extend as far seaward as it did previously.

1.2.5 The revisions set out in this note lie within the submitted and assessed parameters and do not require any updates to environmental assessments or the parameters already applied for.

1.2.6 The reports entitled **Preliminary design and maintenance requirements for the Sizewell C Soft Coastal Defence Feature** [REP3-032] and **Storm Erosion Modelling of the Sizewell C Soft Coastal Defence Feature** [REP3-048] are scheduled to be updated at Deadline 7 and will take account of the reduced seaward extent of the HCDF.

1.3 Temporary Hard Coastal Defence Feature

1.3.1 SZC Co. has also continued to evolve the design of the Temporary HCDF to reduce the extent of the 7.3mAOD sheet-pile wall where feasible. This is the case particularly following concerns raised by the RSPB and Suffolk Wildlife Trust relating to the Temporary HCDF at the interface between the northern extent of the Northern Mound and the RSPB/Minsmere land boundary.

1.3.2 It is no longer necessary to construct this 7.3mAOD sheet pile wall around the perimeter of the Northern Mound because SZC Co. will implement the permanent rock armour landscaped design in this location from the outset. This brings the benefits of addressed the concerns identified above and allowing early planting to take place to integrate the feature into the wider AONB and Heritage Coast landscape.

1.4 Spatial overlay

1.4.1 In addition to the updated **Coastal Defence Feature Plans** submitted at Deadline 5, an overlay showing the changes is shown below at **Plate 1**.

Plate 1: Coastal Defence Feature: Reduced Extent