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Environmental Statement Addendum – Appendix 8 Flood Risk Assessment Addendum

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1. FLOOD RISK ASSESSMENT ADDENDUM

1.1. OVERVIEW AND CONTEXT

1.1.1.1. This Flood Risk Assessment ('FRA') Addendum, referred to as the 'FRA Addendum' hereafter, has been prepared to supplement the Flood Risk Assessment (APP-439) prepared in November 2019 as part of the Environmental Statement ('ES') Chapter 20 (Surface water Resources and Flood Risk) (APP-135). The November 2019 FRA is referred to as the 'FRA' hereafter.

1.1.1.2. This FRA Addendum has been prepared in response to the update to the Environment Agency's Flood Map for Planning (Environment Agency, Gov.uk, 2020c), which took effect in January 2020, and resulted in the proposed location of the Landfall Optical Regeneration Stations ('ORS') changing from Flood Zone 2 to Flood Zone 3, as well as other minor changes to the Flood Zones, flood risk profile and predicted extreme flood levels within the coastal environment of the Proposed Development within Section 5 to 10 of the Onshore Order Limits.

1.1.1.3. The updated Flood Map for Planning can be seen in the updated Figure 20.4 (APP-309 Rev02), and also with the Figure 20.1 (APP-306 Rev02) updated accordingly.

1.1.1.4. This FRA Addendum provides detail of the change in flood risk profile and relevant changes to the FRA (APP-439). This FRA Addendum should also be read in conjunction with the Sequential and Exception Test Addendum (Appendix 9 of the ES Addendum, document reference 7.8.1.9) which documents that the Sequential and Exception Test is still passed for the Proposed Development when taking into account the changes in the Flood Map for Planning.

1.2. STUDY METHODOLOGY

1.2.1.1. Changes to the flood risk profile and updated proposed flood risk mitigation to reflect these changes, have been established through consultation with the Environment Agency.

1.2.1.2. This Addendum only considers the change to the Flood Map for Planning within the tidal and coastal environment of the Proposed Development (Section 5 to 10 of Onshore Order Limits). It has not re-assessed the flood risk profile and environment outside of Portsea Island and/ or north of the tidal/ coastal flood extent north of Farlington and Port Downs as no changes have occurred to the Flood Map for Planning in other locations (Section 1 to 4 of Onshore Order Limits).

1.3. POLICY CONTEXT

1.3.1.1. Overarching policy including the National Planning Policy Framework (NPPF) (MHCLG, 2019) and National Policy Statement for Energy (EN-1) (HMSO, 2011) relevant to this assessment has not changed. Further details of the policy context can be found in the FRA (APP-439).

2. CHANGES TO FRA (APP-439)

2.1. OVERVIEW

2.1.1.1. This section of the FRA Addendum provides an overview of where changes relevant to this assessment have occurred. It also identifies where no changes have occurred (and as such, where the FRA (APP-439) remains relevant).

2.2. EXISTING SITE AND BASELINE DATA

2.2.1.1. No change.

2.3. PROPOSED DEVELOPMENT

2.3.1.1. No change.

2.3.1.2. Reference to the Sequential and Exception Test Addendum (Appendix 9 of the ES Addendum, document reference 7.8.1.9) should be made in relation to a re-assessment of the Sequential and Exception Test acceptability.

2.4. CLIMATE CHANGE

2.4.1.1. The gov.uk and Environment Agency Guidance 'Flood risk assessments: climate change allowances' (Environment Agency, 2016) published on 19 February 2016 was considered within the FRA (APP-439), with reference to 15 February 2019 update which included guidance in line with the UK Climate Projections 2018.

2.4.1.2. Since the preparation of the FRA (APP-439) the guidance has been updated on 17 December 2019 and 16 March 2020 to include:

1. Updated sea level rise allowances based on UKCP18 projections.
2. Added guidance on how to:
   a. calculate flood storage compensation,
   b. use peak rainfall allowances to help design drainage systems,
   c. account for the impact of climate change on storm surge,
   d. assess and design access and escape routes for less vulnerable development.
3. Changed guidance on how to apply peak river flow allowances so the approach is the same for both flood zones 2 and 3.

2.4.1.3. Within the FRA (APP-439), in relation to construction, it was stated that: "*As the Proposed Development construction is proposed to be brought forward within the next few years, as agreed through consultation with the Environment Agency, no allowance for climate change is considered for the current day scenarios/ construction stage of the Proposed Development*." This statement is still considered to be valid and remains unchanged.

2.4.1.4. Within the FRA (APP-439), in relation to operation, climate change was considered separately for the Converter Station, Onshore Cable Corridor and Optical Regeneration Station(s). A summary of the climate change guidance, recent guidance updates and how it relates to this assessment is provided hereafter:

- Converter Station - peak rainfall allowances have remained unchanged from that used to inform the FRA (APP-439);
- Onshore Cable Corridor – the FRA (APP-439) stated:

  "*During operation, the Onshore Cable Corridor and associated equipment will be in a mix of Flood Zones 1, 2 and 3, however the majority of equipment will be buried and have a negligible impact upon, or have a negligible impact from, the flood risk environment associated to peak rainfall, peak river flows and sea level rise.*

  Therefore, the impacts of climate change are not predicted to have any impact on the Onshore Cable Corridor during operation and are not considered further and therefore remains unchanged."

  This statement is still considered to be valid and remains unchanged.
- Optical Regeneration Station(s) - the peak rainfall allowances considered in the FRA (APP-439) have remained unchanged however the updated climate change guidance has updated allowances for sea level rise as discussed below.

  Sea level rise allowances are based on the gov.uk and Environment Agency Guidance 'Flood risk assessments: climate change allowances' (Environment Agency, 2016). The allowances from 15 February 2019 (used in the FRA(APP-439)) are summarised below in Table 1, alongside the allowances from the 16 March 2020 guidance.

  The proposed mitigation presented within this FRA Addendum considers the latest allowances from 16 March 2020 guidance.

Table 1 - Extract of Environment Agency Predicted Annual Rates of Sea Level Rise (South East) (Environment Agency, 2016)

Sea Level Rise in Millimetres (mm) per Year (15 February 2019 allowances)				
	2018-2025	2026-2055	2056-2085	2086-2115
Upper End	4	8.5	12	15
Sea Level Rise in Millimetres (mm) per Year (16 March 2020 allowances)				
	2018-2035	2036-2065	2066-2095	2096-2125
Upper End	6.9	11.3	15.8	18.2

2.5. DEFINITION OF FLOOD HAZARD

2.5.1.1. The definition of flood hazard provides detail of the identified sources and mechanisms of flooding associated within the Order Limits and associated to the Proposed Development and uses the same approach taken within the FRA (APP-439).

2.5.1.2. The assessment considers flood risk profile, sources and mechanisms of flooding during:

- the current day scenario: with no allowance for climate change in association with the construction of the Proposed Development; and
- the future scenario: with an allowance for climate change in association with the elements of the Proposed Development that are expected to either impact or be impacted by the future flood risk environment. These discrete elements of the proposed development include:
  - Converter Station Area;
  - Link Pillar(s); and
  - ORS.

2.5.1.3. This FRA Addendum has been prepared to take into the consideration the change to the Flood Map for Planning within the tidal and coastal environment (Section 5 to 10 of the Onshore Order Limits) only. The resultant change in flood hazard is discussed in Section 3 of this FRA Addendum.

2.5.1.4. No changes to the flood risk profile from non- tidal/ coastal sources or outside of Section 5 to 10 of the Onshore Order Limits have been considered within this FRA Addendum as no changes have occurred to the Flood Map for Planning in other locations (Section 1 to 4 of Onshore Order Limits).

2.5.1.5. The same approach taken within the FRA (APP-439) has been applied when assessing the flood risk/ probability, as presented in Table 2.

Table 2 - Fluvial and Tidal Flooding

Flood Source	Flood Risk/ Probability Rating	Description
Fluvial/ Tidal	Negligible	Located within Flood Zone 1, away from any fluvial/tidal floodplain; **or** located in an area of very low risk according to the Environment Agency's Risk of Flooding from Rivers and Sea/ gov.uk 'Long term flood risk information' Map **and** the site is located a significant distance and/or elevation away from the nearest fluvial/tidal feature; **or** another source of data suggests this is the appropriate rating.
	Low	Located within Flood Zone 1 but located close to a fluvial/tidal floodplain; **or** located in Flood Zone 2; **or** located in an area of low/ very low risk according to the Environment Agency's Risk of Flooding from Rivers and Sea/ gov.uk 'Long term flood risk information' Map; **or** located within Flood Zone 2 or 3 but is defended to a 1 in 100 (1%) year flood level and the defences are publicly maintained to a 'good' standard; **or** another source of data suggests this is the appropriate rating.
	Medium	Located within Flood Zone 3 **and** located in an area of medium risk according to the Environment Agency's Risk of Flooding from Rivers and Sea/ gov.uk 'Long term flood risk information' Map; **or** another source of data suggests this is the appropriate rating.
	High	Located within Flood Zone 3 **and** located in an area of high risk according to the Environment Agency's Risk of Flooding from Rivers and Sea/ gov.uk 'Long term flood risk information' Map; **or** another source of data suggests this is the appropriate rating.

2.6. FLOOD RISK MITIGATION

2.6.1.1. Section 4, of this FRA Addendum, considers the implications for the proposed flood risk mitigation based on the changes to the flood risk profile.

2.7. OFFSITE IMPACTS

2.7.1.1. As changes to the flood risk profile have only been considered in the tidal/ coastal environment there are no changes in offsite impacts expected in relation to the Proposed Development and the assessment within the FRA (APP-439) remains unchanged.

2.8. RESIDUAL RISK/ EXCEEDANCE EVENTS

2.8.1.1. The updated residual risks associated with the changes in the flood hazard and flood risk mitigation (discussed in Section 3 and 4 respectively) are considered within Section 5 of this FRA Addendum.

3. CHANGE TO DEFINITION OF FLOOD HAZARD

3.1. TIDAL AND COASTAL ENVIRONMENT FLOODING HAZARDS

3.1.1.1. Based on correspondence with the Environment Agency (Environment Agency, 2020a) it has been confirmed that following the submission of the FRA (APP-439), the gov.uk Flood Map for Planning was updated in late January 2020 resulting in a change to the Flood Zones along the eastern extent of Portsea Island (Section 7 to 10 of the Order Limits) and Farlington/ Drayton (Section 5 to 7 of the Order Limits), as illustrated in Plate 1.

3.1.1.2. The Environment Agency (Environment Agency, 2020a) stated that the change is based on new hydraulic modelling undertaken by JBA in 2018 which "*included simulation of the offshore and nearshore environment, with multiple tidal cycles and wave overtopping represented. The new model gives a more realistic picture of the areas that may be flooded in an extreme event*" (in comparison to the extreme still water level previously considered to inform the Flood Map for Planning prior to the update in January 2020).

3.1.1.3. The Environment Agency (Environment Agency, 2020b) have also stated that the "*JBA 2018 model results, used to inform the new Flood Map for Planning, shows the extreme event scenario with wave overtopping for the present day; which in this model is 2015*".

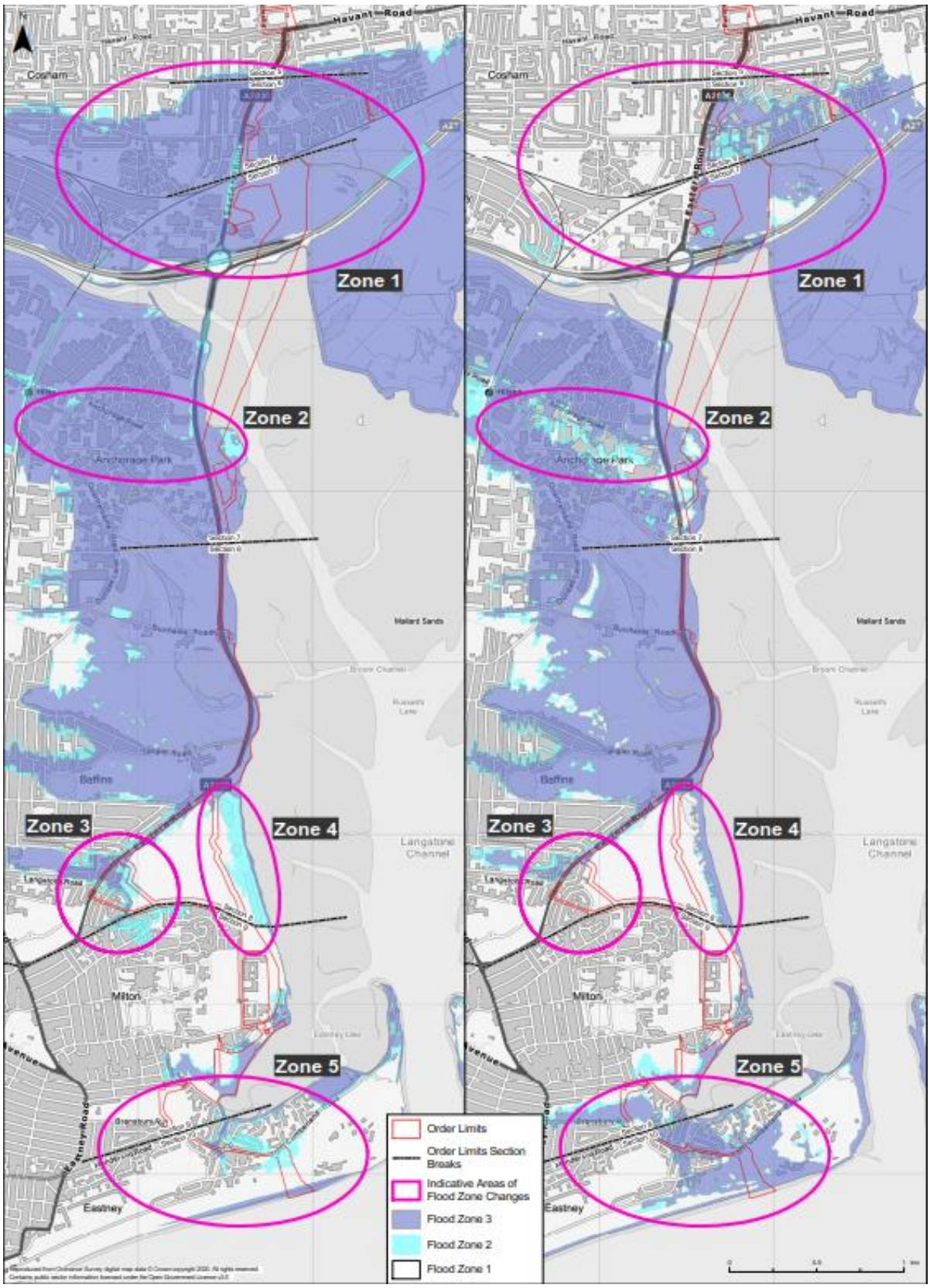

Plate 1 - Flood Map for Planning (November 2019: Left; January 2020: Right)

3.1.1.4. As illustrated within Plate 1 it can be seen that the Flood Zones have changed in a number of locations, the main changes are highlighted as 'indicative areas of Flood Zone changes' and zones 1 to 5 in Plate 1 and are summarised in Table 3.

Table 3 - Summary of Change in Flood Map for Planning presented in Plate 3-1 from FRA (APP-135)

Plate 1 Indicative Areas of Flood Zone Changes	Proposed Development Section of Onshore Order Limits	Approximate Geographical Location	Change in Flood Map for Planning/ Commentary
Zone 1	Section 5 to 7	Farlington/ Drayton	Reduced extent of Flood Zones 2 and 3
Zone 2	Section 7	Eastern Road (near Anchorage Park)	Reduced extent of Flood Zones 2 and 3
Zone 3	Section 8	Eastern Road (near Milton Common Western Extent)	Reduced extent of Flood Zones 2 and 3
Zone 4	Section 8	Milton Common Eastern Extent	Increased extent of Flood Zone 3
Zone 5	Section 9 & 10	Easteny	Increased extent of Flood Zone 3

3.1.1.5. Table 4 and Table 5 provide an overview of the modelling results from the JBA 2018 modelling for the wave overtopping during the 1 in 200 year return period events (0.5% Annual Exceedance Probability ('AEP')) and 1 in 1000 year return period events (0.1% AEP); 2015, 2065 and 2115 scenarios.

3.1.1.6. All levels are stated above ordinance datum Newlyn ('AODN') based on the digital terrain model (DTM) data provided by the Environment Agency and used as part of the JBA 2018 modelling.

Table 4 - JBA 2018 Model Results Wave Overtopping (undefended) (Levels AODN)

Location	Easting, Northing	0.5% (2015)	0.5% (2065)	0.5% (2115)	0.1% (2015)	0.1% (2065)	0.1% (2115)
Farlington Playing Fields	467748, 104753	2.13	2.41	2.72	2.27	2.55	2.88
Eastern Road	467483, 102538	3.31	3.64	4.06	3.49	3.81	4.23
Eastern Road	467378, 103411	8.08	8.40	8.83	8.26	8.58	9.00
Eastern Road	467606, 101933	6.86	7.18	7.60	7.03	7.35	7.77
Milton Common	467604, 100774	2.39	3.49	4.07	2.75	3.78	4.21
Eastney (ORS Site)	467818, 99130	4.12	4.18	4.31	4.23	4.31	4.45

Table 5 - JBA 2018 Model Results Wave Overtopping (defended) (Levels AODN)

Location	Easting, Northing	0.5% (2015)	0.5% (2065)	0.5% (2115)	0.1% (2015)	0.1% (2065)	0.1% (2115)
Farlington Playing Fields	467748, 104753	No Flood	2.16	2.79	1.12	2.71	2.99
Eastern Road	467483, 102538	2.38	2.42	4.03	2.39	2.58	4.22
Eastern Road	467368, 103412	No Flood	2.83	3.97	1.94	3.14	4.21
Eastern Road	467593, 101927	1.77	1.82	4.03	1.78	2.59	4.22
Milton Common	467604, 100774	No Flood	3.55	4.04	2.77	3.78	4.21
Eastney (ORS Site)	467818, 99130	4.07	4.14	4.31	4.19	4.26	4.41

3.1.1.7. The JBA 2018 modelling, which forms the basis of the Environment Agency's updated Flood Map for Planning extent within the tidal/ coastal environment, has been undertaken using the previous climate change allowances for sea level rise discussed in Section 2.4 of this FRA Addendum; however it does not consider the latest 2020 climate change allowances for sea level rise as this modelling study was undertaken prior to the updated guidance released in March 2020. A qualitative comparison of the latest climate change allowances against the JBA 2018 modelling results and climate change allowances has been undertaken. This qualitative comparison has subsequently been used to inform the mitigation outlined within Section 4 of this FRA Addendum within paragraph 4.3.3.16 and 4.3.3.17.

3.1.1.8. The JBA 2018 modelling results provide the maximum flood extent in each location based on a number of various modelled events; however in comparison, the extreme sea level considered as part of the FRA (APP-439) was based on the Coastal Design Sea Levels (2018) which, in turn, is based on a single predicted extreme sea level. A comparison of the 1 in 200 year return period flood levels from the JBA 2018 modelling results, now available, and in the Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels considered within the FRA (APP-439) are provided in Table 6.

Table 6 –Summary of Environment Agency Predicted Extreme Sea Level and latest Predicted extreme levels at Eastney (Section 10 of Order Limits

Dataset	Easting, Northing	0.5%	0.1%
Environment Agency Coastal Design Sea Levels 2018 (Levels in FRA (APP-439))	468789, 100080	3.17 (2017)	3.33 (2017)
JBA 2018 Modelling Results (Levels considered within this FRA Addendum)	467818, 99130	4.07 (2015)	4.19 (2015)

3.1.1.9. The observed difference between the Environment Agency data sets is based on a more refined hydraulic model now being available (see paragraph 3.1.1.2.) and as "*the new model gives a more realistic picture of the areas that may be flooded in an extreme event"* (Environment Agency, 2020a), this dataset is therefore considered hereafter.

3.1.2. FARLINGTON/ DRAYTON (ONSHORE CABLE CORRIDOR)

Assessment of Climate Change

3.1.2.1. As stated in Section 2.4 of this FRA Addendum and as assessed within the FRA (APP-135), climate change is not predicted to have any impact on the Onshore Cable Corridor during operation and therefore is not considered further.

Overview of Change to Tidal and Coastal Environment Flooding Hazard

3.1.2.2. The ground level within the Farlington Playing Fields is between appropriately 0.3m AODN in the north east and 2.0m AODN in the south.

3.1.2.3. Based on the JBA 2018 modelling results during the current day (2015) undefended scenario, extreme water level during the 1 in 200 year wave overtopping event is 2.13m AODN, in comparison to 3.17m AODN previously considered within the FRA (APP-439).

3.1.2.4. Therefore, the water depth depending on the location within the Farlington Playing Fields could be expected to range between 1.83m and 0.13m in depth depending on the location within the playing fields, however no flooding is predicted during the defended scenario which takes into consideration the presence of flood defences and high ground.

3.1.2.5. This extreme scenario is based on wave overtopping at the low spot of the roundabout on the A27 and the most north eastern extent of Langstone Harbour.

Summary

3.1.2.6. Based on the JBA 2018 modelling results available the probability of tidal flooding during the current day scenario assessed within the FRA (APP-439) remains unchanged and is considered to be low based on the high ground created by Havant Bypass flyover, with a residual risk of **medium** associated to the risk of surcharging back through Farlington Marshes Gutter, surcharging through any surface water outfalls that create a pathway between Langstone Harbour and north of the Havant Bypass flyover and limited overtopping.

3.1.3. EASTERN ROAD, MILTON COMMON AND EASTNEY (ONSHORE CABLE CORRIDOR)

Assessment of Climate Change

3.1.3.1. As stated in Section 2.4 of this FRA Addendum and as assessed within the FRA (APP-135), the impacts of climate change are not predicted to have any impact on the Onshore Cable Corridor during operation and therefore are not considered further.

Overview of Change to Tidal and Coastal Environment Flooding Hazard

3.1.3.2. As stated within the FRA (APP-439) the ground level along Eastern Road, Milton Common and Eastney of the Onshore Cable Corridor within Section 7 to 10 on Portsea Island varies along its length.

3.1.3.3. Based on the JBA 2018 modelling results during the current day (2015) scenario, extreme water level during the 1 in 200 year, wave overtopping at 3 isolated locations has been considered.

3.1.3.4. Typically, the predicted undefended extreme flood level is 3.31m AODN in comparison to 3.17m AODN previously considered within the FRA (APP-439).

3.1.3.5. However, there are isolated peaks at the interface between the land (Eastern Road) and coastal environment (Langstone Harbour) which peak at 8.08m AODN and 6.86m AODN at easting and northing 467378, 103411 and 467606, 101933 respectively.

3.1.3.6. These peaks of 8.08m AODN and 6.86m AODN are likely to be the product of limitations in the modelling and are not considered to be representative of the actual likely water level along Eastern Road and therefore these abnormal peaks are not considered.

3.1.3.7. In comparison the predicted defended extreme flood level, from the JBA 2018 modelling results, is much lower at 2.38m AODN and 1.77m AODN at 467483, 102538 and 467593, 101927. Furthermore, the extent of flooding during the defended scenario is significantly reduced when considering the presence of flood defences and high ground.

Summary

3.1.3.8. Based on the new modelling results available the probability of tidal flooding during the current day scenario assessed within the FRA (APP-439) remains unchanged and is considered to range from **low** to **medium** along the Onshore Cable Corridor within Section 7 – 10 of the Onshore Order Limits, when taking into consideration the presence of the existing flood defences, high ground and history of overtopping.

3.1.4. LANDFALL OPTICAL REGENERATION STATION(S) SITE

Overview of Change to Tidal and Coastal Environment Flooding Hazard (including assessment of climate change)

3.1.4.1. As stated in Section 2.4 of this FRA Addendum and as assessed within the FRA (APP-135) the impacts of climate change are considered at the ORS due to the proposed permanent infrastructure above ground.

3.1.4.2. As stated within the FRA (APP-439) the ground level at the proposed location for the Landfall ORS is circa. 3.4m AODN.

3.1.4.3. Based on the JBA 2018 modelling results during the current day (2015 scenario) extreme water level during the undefended 1 in 200 year and 1 in 1000 year wave overtopping event is 4.12m AODN 4.23m AODN respectively; in comparison the Coastal Design Sea Levels 2018 extreme water levels for the 1 in 200 year and 1 in 1000 year wave overtopping events are 3.17m AODN and 3.33m AODN respectively.

3.1.4.4. Based on the JBA 2018 model results the water depth above ground level during the undefended current day scenarios could be expected to be about 0.72m in depth in 200 year return period flood event and 0.83m in depth in the 1000 year return period flood event.

3.1.4.5. When considering the predicted flood level for the defended current day scenario for the 200 year and 1000 year of 4.07m AODN and 4.19m AODN, the flood water depth could be expected to be about 0.69m and 0.79m respectively.

3.1.4.6. The future predicted scenarios (2115) in comparison to the current day scenarios (2015) only increase by a maximum of 0.24m due to the volumetric dispersion of overtopping over the impacted area.

Summary

3.1.4.7. Based on the new modelling results the current day probability of tidal flooding has increased from low, considered within the FRA (APP-439), to **medium** (due to the new modelling results) and the future probability of flooding from the sea has increased however is still considered as **medium** and remains unchanged from the FRA (APP-439).

3.1.5. TIDAL AND COASTAL ENVIRONMENT FLOOD HAZARD SUMMARY

3.1.5.1. When taking the new JBA 2018 modelling data available as discussed above into consideration, the overall assessment in relation to the probability of flooding within the tidal and coastal environment remains unchanged from the FRA (APP-439) apart from the current day probability of flooding at the ORS which has increased from **low** to **medium**.

3.1.5.2. The FRA (APP-439) concluded that in the areas north of Ports Down (southern end of Section 5 of the Order Limits), the probability of tidal flooding is assessed to be **negligible** due to ground elevations north of Ports Down of approximately 90m AODN which are significantly higher than the ground elevations south of Ports Down which fall from 4m AODN to sea level. This assessment remains unchanged.

3.1.5.3. Based on the JBA 2018 modelling data available discussed within this FRA Addendum the probability of tidal flooding within Flood Zone 2 and 3 of the Onshore Cable Corridor between Sections 5 – 10 of the Onshore Cable Corridor) ranges from **low** to **medium**, when taking into consideration the presence of the existing flood defences, high ground and history of overtopping. This assessment remains unchanged from the FRA (APP-439).

3.1.5.4. Based on the JBA 2018 modelling results the current day probability of tidal flooding has increased from **low**, considered within the FRA (APP-439), to **medium** (due to the JBA 2018 modelling results) and the future probability of flooding from the sea has increased however is still assessed as **medium** and remains unchanged from the FRA (APP-439).

3.1.5.5. The proposed mitigation, with consideration of the new predicted flood water levels, are presented within Section 4 of this addendum.

4. CHANGE TO FLOOD RISK MITIGATION

4.1. CONTEXT

4.1.1.1. With reference to the change in tidal/ coastal environment and flooding hazard detailed in Section 3, the proposed principles for flood risk mitigation set out in the FRA (APP-439) remain valid and unchanged. However, where new modelling results are available, good practice would dictate that the predicted flood levels should be taken into consideration in relation to the proposed mitigation and flood risk resilience measures.

4.1.1.2. In this context, the following sections of this FRA Addendum consider the recommendations and mitigation measures proposed during the construction and operation of the Proposed Development in relation to the tidal and coastal flood risk. No other sources of flood risk are considered hereafter as there are no known changes to the flood hazard from any other sources.

4.2. CONSTRUCTION

4.2.1.1. The proposed principles set out in the FRA (APP-439) remain valid and unchanged during construction.

4.2.1.2. However, any construction works in areas located within the tidal/ coastal Flood Zone 2 or 3 (Sections 5 to 10 of the Onshore Cable Corridor) should take into consideration the latest flood risk modelling results available as outlined within this FRA Addendum.

4.2.1.3. This information should subsequently be used to inform specific proposed methods of works and risk assessments which will be developed by the appointed contractor during the detailed design and used to inform any required Environmental Permitting.

4.3. OPERATION

4.3.1. CABLE, JOINT BAYS AND LINK BOXES (WITHIN ONSHORE CABLE CORRIDOR)

4.3.1.1. The proposed principles set out in the FRA (APP-439) remain valid and unchanged.

4.3.2. LINK PILLARS & JOINT BAYS (WITHIN ONSHORE CABLE CORRIDOR)

4.3.2.1. The proposed principles set out in the FRA (APP-439) remain valid and unchanged.

4.3.3. LANDFALL OPTICAL REGENERATION STATION(S)

4.3.3.1. The flood hazard of the ORS is medium; however, predicted flood levels as a result of the new modelling results have increased.

4.3.3.2. The Environment Agency (Environment Agency, 2020a) has confirmed that: "*despite the building now being in Flood Zone 3, we are absolutely still comfortable with the building being located there based on its usage (i.e. non-residential) and the approach you have already outlined regarding in-built mitigation*" (which refers to the mitigation presented within Section 6.2 of the FRA (APP-439).

4.3.3.3. Based on consultation with the Environment Agency and interrogating the modelling results of the JBA 2018 model, the parameters of the tidal flood risk mitigation principles still remain valid, however, the actual design levels and proposed mitigations have been adjusted to reflect the most up to date modelling information.

4.3.3.4. It should also be noted that acceptability in the context of the sequential and exception test, as detailed in the Sequential and Exception Test Addendum (Appendix 9 of the ES Addendum, document reference 7.8.1.9) has been re-assessed.

4.3.3.5. Essential infrastructure in Flood Zone 3 should be designed and constructed to remain operational and safe in times of flood in accordance with the NPPF (MHCLG, 2019) and Flood Risk and Coastal Change PPG (MHCLG, 2014) and is applicable to the ORS as the proposed location for the ORS is now classified as Flood Zone 3 rather than Flood Zone 2.

4.3.3.6. The tidal/ coastal flood resilience measures proposed within the FRA (APP-439), generally remain valid and reference to the principles of the FRA (APP-439), which remain, and new mitigation is made hereafter.

4.3.3.7. Flood resilience to the ORS was proposed within the FRA (APP-439) to be provided through a raised external threshold with additional secondary resilience through an internal raised threshold, where feasible, by raising the equipment inside the building off the floor level (where internal raising can be accommodated within the spatial constraints of the buildings).

External Raised Threshold and Finished Floor Level

4.3.3.8. The floor level and external threshold of the ORS will be set above the 1 in 200yr predicted tidal flood event flood level during the future 2065 scenario (40 year serviceable life) as a minimum requirement), which includes an allowance for sea level rise.

4.3.3.9. Based on a commercial decision to provide increased flood resilience it is expected that the finished floor level (external threshold) of the ORS will be set above the predicted 1 in 1000yr predicted tidal flood event flood level during the future 2065 scenario (40 year serviceable life), which includes an allowance for sea level rise. This exact level will be refined and fixed during detailed design, with the ORS remaining within the assessed spatial parameters at all times.

Internal Raising

4.3.3.10. Consistent with the FRA (APP-439), where feasible, the provision of an internal raised threshold, by raising equipment off the floor, would act as an additional freeboard from the external finished floor level to the bottom of the equipment inside the ORS(s). This would provide further resilience against uncertainties of the predicted flood levels and uncertainties in climate change and sea level rise as well as potential exceedance events, whilst also facilitating resilience to a longer serviceable life.

4.3.3.11. The exact level of internal and external raising would be determined during detailed design based on the level of resilience deemed to be appropriate for the Proposed Development's vulnerability. The final level of resilience will be based on acceptable commercial risk management to the Proposed Development.

Future Resilience to Climate Change

4.3.3.12. Consistent with the FRA (APP-439), at this planning stage, it is proposed to design the ORS for the 40-year serviceable life, with the proposed finished floor level of the ORS(s) being above the future flood level taking into account sea level rise over the life span of the development (40 years.).

Possible Design Option (Detailed to show design feasibility, exact design to be confirmed during detailed design)

4.3.3.13. Taking into consideration the updated predicted extreme flood water levels based on the JBA 2018 modelling, a possible option for flood resilience is presented below, assuming an existing ground level of 3.4 m AODN.

4.3.3.14. It should be noted that this design option is to demonstrate buildability and design feasibility and the actual design proposed could be subject to change and will be developed during detailed design. The current presented design option includes resilience up to the 1 in 1000yr tidal flood event flood level during the future 2065 scenario (40 year serviceable life) to provide additional flood resilience however the exact design levels will be confirmed during detailed design based on the acceptable commercial risk.

- External raised threshold of 950 mm (4.35m AODN) – which is above the modelled 1 in 1000yr tidal flood event flood level (undefended 4.31m AODN, defended 4.26m AODN) during the future 2065 scenario.
- Internal raised threshold to bottom of equipment of 300 mm (4.65m AODN) providing additional resilience against uncertainties linked to climate change scenarios.

4.3.3.15. Based on the predicted undefended and defended extreme water levels, as presented in Table 4 and Table 5 respectively, the ORS(s) would remain dry for all predicted events up to and including the 1 in 1000yr tidal flood event flood level during the future 2065 scenario (40 year serviceable life) providing a high standard of resilience against tidal and coastal flooding in line with the requirement that essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

4.3.3.16. As discussed within Section 3 of this FRA Addendum, it is noted that the 2018 JBA modelling does not take into consideration the latest climate change allowances (see paragraph 3.1.1.7) that were introduced in March 2020 to the Environment Agency Guidance 'Flood risk assessments: climate change allowances' (Environment Agency, 2016). However, a comparison of the Environment Agency Guidance 'Flood risk assessments: climate change allowances' (Environment Agency, 2016) for climate change sea level rise as presented in Table 7 illustrates the predicted difference in cumulative sea level rise allowances and shows that the differences are limited.

Table 7 – Comparison of Climate Change Sea Level Rise Allowances

Cumulative Sea Level Rise to Year:	Pre 2020 Allowances (mm)	March 2020 Allowances (mm)	Difference (mm)
2065	419	483.9	64.9
2085	659	799.9	140.9
2105	959	1139.9	180.9

4.3.3.17. By undertaking a like for like comparison of the predicted cumulative sea level rise based on the pre 2020 and March 2020 allowances it is considered that the internal raised threshold of 300mm provides a freeboard which adds resilience and mitigates existing uncertainties related to latest climate change sea level rise allowances in comparison over the life span of the development (40 years).

5. CHANGE TO RESIDUAL RISKS/ EXCEEDANCE EVENTS

5.1. CONSTRUCTION

5.1.1.1. The proposed principles set out in Section 8.1 of the FRA (APP-439) remain valid and unchanged during construction.

5.2. OPERATION

5.2.1. CABLE, Joint Bays and Link Boxes(within ONSHORE CABLE CORRIDOR)

The proposed principles set out in Section 8.2 of the FRA (APP-439) remain valid and unchanged.

5.2.2. LINK PILLARS & Joint Bays (within Onshore Cable Corridor)

5.2.2.1. The proposed principles set out in Section 8.2 of the FRA (APP-439) remain valid and unchanged.

5.2.3. OPTICAL Regeneration Station(s)

5.2.3.1. The tidal flood hazard of the ORS(s) has increased as a result of the new modelling results and is now located within Flood Zone 3 in comparison to Flood Zone 2 as discussed throughout this FRA Addendum.

5.2.3.2. The ORS(s) will be designed to be safe in case of an extreme tidal flood event with an allowance for climate change would provide resilience against climate change uncertainties over the life span of the development (40 years.) based on the latest JBA 2018 modelling results.

5.2.3.3. Consistent with the FRA (APP-439), where feasible and subject to detailed design, the provision of an internal raised threshold would act as an additional freeboard from the external finished floor level to the bottom of the equipment inside the ORS(s). This would provide further resilience against uncertainties of the predicted flood levels and uncertainties in climate change and sea level rise as well as potential exceedance events, whilst also facilitating resilience to a longer serviceable life.

5.2.3.4. Events of a greater magnitude are extremely unlikely, however if they were to occur, they are expected to result in limited flooding based on the flood resilience measures already in place.

5.2.3.5. The level of resilience against tidal and coastal flood risk and sea level rise against the likely operational life of the ORS will be considered further during detailed design.

6. CONCLUSION AND RECOMMENDATIONS

6.1.1.1. New modelling undertaken by JBA in 2018 on behalf of the Environment Agency has changed the Flood Map for Planning in the tidal/ coastal area within Section 5 to 10 of the Order Limits and Proposed Development, most notably with the proposed location of the ORS changing from Flood Zone 2 to Flood Zone 3.

6.1.1.2. This FRA Addendum captures the changes in flood risk for the Proposed Development from the FRA (APP-439) as a consequence of those changes.

6.1.1.3. This FRA Addendum demonstrates that the Proposed Development still meets the requirements of the National Policy Statement for Energy (EN-1) (HMSO, 2011) and National Planning Policy Framework (MHCLG, 2019) in relation to flood risk when taking into consideration the proposed mitigation measures incorporated into the design parameters for the Proposed Development.

6.1.1.4. The latest flood risk data and information will be brought to the attention of the designer and appointed contractor, with reference to the latest modelling results for the tidal/ coastal environment within Section 5 to 10 of the Onshore Order Limits, for consideration for the proposed detailed design and construction works/ methodologies to ensure flood risk on-site is appropriately managed.

6.1.1.5. Where activities are being undertaken in areas at risk of flooding, the Applicant and their appointed designer and appointed contractor will obtain relevant Environmental Permits from the relevant regulatory bodies, these permits are likely to include:

- Flood Risk Activities Permit;
- Ordinary Watercourse Consent;
- Temporary de-watering; and
- Other relevant approvals from highways authority or statutory undertaker who maintains any watercourse/ sewer assets.

6.1.1.6. The proposed design measures within this FRA Addendum and or suitable equivalents will be taken forward into the implementation of the Proposed Development to limit the potential risk of flooding during operation and to ensure there is no increase in flood risk up to the proposed design standard.

6.1.1.7. The findings of this FRA Addendum have not changed the overall principles and conclusions of the FRA (APP-439) used to inform the Environmental Statement Chapter 20 (APP-135), however appropriate consideration of the new JBA 2018 modelling results should be considered within the baseline and mitigations, as detailed within this FRA Addendum.

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