The Sizewell C Project

6.18 Fourth Environmental Statement Addendum
Volume 3: Appendices Part 2 of 2

Revision:	1.0
Applicable Regulation:	Regulation 5(2)(a)
PINS Reference Number:	EN010012

September 2021

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

SizewellC
Doing the power of good for Britain
EDF CGN

CONTENTS

PART 1

PART 2 (THIS PART)

APPENDIX 3A BEEMS TR552 SIZEWELL C DESALINATION PLANT CONSTRUCTION DISCHARGE H1 TYPE ASSESSMENT

BEEMS Technical Report TR552 Cefas Sizewell C Desalination Plant Construction Discharge Assessment

BEEMS Technical Report TR552

Sizewell C Desalination Plant Construction Discharge Assessment

Cefas BEEMS Technical Report TR552
Sizewell C Desalination Discharge Assessment

NOT PROTECTIVELY MARKED

Table of contents

Cefas BEEMS Technical Report TR552 Sizewell C Desalination Discharge Assessment

NOT PROTECTIVELY MARKED

List of Tables and Figures

Tables

Figures

Cefas BEEMS Technical Report TR552 Sizewell C Desalination Discharge Assessment

NOT PROTECTIVELY MARKED

Executive Summary

NNB Generation Company (Sizewell C) Ltd (SZC Co.) is planning to build a new nuclear power station at Sizewell, Suffolk (SZC). Any development at Sizewell that includes discharges to, or operations in the adjacent marine environment must be considered in relation to their potential effect on coastal water quality. A temporary desalination plant and associated infrastructure is required to produce potable water for the construction period and is anticipated to be required from October 2023 to June 2028 at the latest. This report provides a H1 type assessment of the expected discharges from the desalination process.

The outfall is located close to the outfall of the proposed Fish Recovery and Return Tunnel, beyond the inner bank. To prevent ingress of glass eels and other early life-stages of fish and invertebrates the seawater intake would consist of a Passive Wedge-Wire Cylinder (PWWC) screen with a mesh size of approximately 2mm. As a result, screening at the intake will be of sufficient size to prevent entrainment of fish and debris. No fish recovery or return infrastructure is required. The outfall will discharge beyond the inner bank. Brine is available for discharge without further treatment and will be discharged over 24 hours/day.

Although the discharge will be highly saline the results within the mixing zone model CORMIX indicate that excess salinity falls to within 1 Practical Salinity Unit of background levels within ca., 6 -10 m and well within the natural variation at the site.

Various activities during the construction period of the Project can add nitrogen and phosphorus to discharges to the marine environment, including the desalination concentrate discharge, and this can influence algal growth. The total loading of these nutrients was evaluated as part of an annual assessment using a combined phytoplankton and macroalgal model. The nutrient inputs from treated sewage and groundwater during construction and including the desalination inputs, is predicted to lead to a 0.39% increase in annual production indicated by modelling. However, this would have only a small influence on the ca., 4% reduction in production that results from entrainment of phytoplankton at Sizewell B. Overall, these small changes would not be detectable against a natural background of inter annual variation in production within Sizewell Bay.

The desalination concentrate also contains elevated levels of various metals and other substances resulting from the concentration in the desalination process. Three metals, chromium, lead, and zinc exceeded an initial screening assessment, indicating they might exceed their respective Environmental Quality Standards (EQS) beyond the immediate discharge. Therefore, more detailed modelling was undertaken for these metals using a mixing model, CORMIX. In all cases, the plume area above the respective EQS for each metal was relatively small, with a maximum estimated area of exceedance of 0.08 ha for chromium with the other metals being below this area. This modelling provides a precautionary assessment as it does not take account of natural mixing processes and the relatively shallow waters at this location would be expected to be well mixed.

As part of the surface water pollution risk assessment there are specific requirements for the minimisation of the annual loads of selected hazardous substances such as cadmium and mercury which require further consideration. Neither metal was shown to exceed threshold loadings following a cumulative annual assessment which incorporated all input sources of these metals during the construction period.

The discharge rate and the magnitude of the chromium, zinc and lead concentrations for the desalination concentrate are similar to those for assessments made for other construction discharges which were assessed as not significant.

Cefas BEEMS Technical Report TR552
Sizewell C Desalination Discharge Assessment

NOT PROTECTIVELY MARKED

1 Introduction

1.1 Background to site

SZC Co is planning to build a new nuclear power station at Sizewell, Suffolk (SZC). The new power station will be located on the Suffolk coast, northeast of Ipswich and south of Lowestoft. The approximate National Grid reference for the centre of the proposed development is TM 4730 6410. The new power station will be built near and to the north of the Sizewell B station which will continue to operate after the commissioning of SZC. Sizewell A, which is located to the south of Sizewell B, ceased operation in 2006.

Any development at Sizewell that includes discharges to, or operations in the adjacent marine environment must be considered in relation to their potential effect on coastal water quality.

A desalination plant and associated infrastructure is required to produce potable water for the construction period from October 2023 to June 2028, or at the latest before commencement of operation of Sizewell C. The outfall pipe headwork is located close to the outfall of the proposed Fish recovery and Return Tunnel, beyond the inner bank. The intake is ca., 100 m northeast of the outfall location. Screening at the intake will be of sufficient size to prevent entrainment of fish and debris. No fish recovery or return infrastructure is required. The outfall will discharge beyond the outer longshore bar. The location of intake and outfall pipes are shown on Figure 2-1. The outfall structure for discharge of waste concentrate is in a maximum depth of water of ca., 5.8 m. Water discharge will be between 1 m and 1.8 m above the seabed. Minimum discharge depth is therefore ca., 4.8 m. The Seawater Reverse Osmosis (SWRO) desalination plant will operate for 20 hours/day with some activities, such as sludge dewatering restricted to shorter operating periods. Brine is available for discharge without further treatment and will be discharged over 24 hours/day.

Approximately 60% of the abstracted seawater would be discharged back into the sea. The discharge would consist of concentrated saline water, increased concentrations of naturally occurring metals as well as added phosphorus.

1.2 Objectives

At each phase of the development (construction, commissioning, and operation) the potential and extent of any effects on water quality will be assessed. Assessment will take account of temporary and permanent discharges from the site. This report provides supporting information for screening assessment of potential discharges of concentrate wastewater from the desalination plant during the construction period only.

2 Assessing potential concerns for marine water quality

2.1 Background

A detailed list of the currently available EQS values that have been assigned as reference values for water quality for both the freshwater and marine environments and are described for other surface waters (Transitional and coastal waters, TraC Waters) for priority hazardous substances and other pollutants under Directive 2013/39/EU (implemented by the Water Framework Directive (Standards and Classification) Directions (England and Wales, 2015). The Water Framework Directive increased the list of chemicals for consideration as priority substances to 45 of which 29 are classed as specific pollutants (Defra, 2014). Following assessment, chemical status is recorded as 'good' or 'fail'. The chemical status classification for the water body is determined by the worst scoring chemical.

The water quality monitoring campaigns (defined periods of monitoring) for marine water quality are described in detail within BEEMS Technical Report TR189 and in BEEMS Technical Report TR314 (an update of monitoring reported in BEEMS Technical Report TR189 that includes data on selected determinands from monitoring conducted in 2014/15). A Sizewell Water quality literature review in BEEMS Technical Report TR131 provides historic information on background water quality for the Suffolk coastal waterbody. This document also provides details of all the relevant Screening EQS values for saltwater and the legislation and guidance documents from which they are derived.

2.2 Contaminants of concern for the desalination concentrate discharge

Various chemical and physical standards for the protection of marine water may be affected by the discharges from SZC.

During construction and commissioning a construction discharge outfall (CDO) will be in place to collect and allow discharge of various wastewater streams to the marine environment. However, the desalination plant will have a separate intake and discharge as shown in Figure 2-1. The discharge flow rates for the desalination plant are shown in Table 1. The desalination process generates a wastewater concentrate with elevated concentrations of salts and trace metals and these are shown in Table 2.

Table 1 Maximum flow rate of the desalination concentrate discharge.

Flow Characteristics	**Desalination Wastewater Concentrate Trade Effluent**
Maximum volume of effluent discharged per day (m^3/day)	6000
Maximum rate of discharge (l/s)	69

Table 2 Maximum concentrations of substances (based on measured dissolved concentration except where indicated) likely to be present in the desalination wastewater concentrate and relevant EQS values and marine background concentrations. (The nutrients nitrogen and phosphorus are considered in section 4.0)

Substance	**Maximum concentration µg l^{-1}**	**Maximum (total) concentration µg l^{-1}**	**Saltwater EQS AA µg l^{-1}**	**Saltwater EQS MAC µg l^{-1}**	**Marine Background concentration µg l^{-1}**
Aluminium	19.6	21.52	24[i]	-	12
Arsenic	1.71	4.17	25	-	1.07
Cadmium	0.08	0.08[2]	0.2	1.5	0.05
Chromium	0.93	2.94	0.6	32	0.57
Copper	3.55	4.80	3.76	-	2.15
Iron	165	2352	1000	-	<100
Lead	-	3.38	1.3	14	2.07
Mercury	0.03	0.03[2]	-	0.07	0.02
Nickel	1.3	2.70	8.6	-	0.79
Zinc	24.95	31.66	6.8		15.12
Ammoniacal nitrogen	18.02 (NH_4-N)	NA	21 (NH_3-N)	-	11.38
Boron	4929	4956	7000	-	4225

[1] Annual average EQS value (Golding et al., 2015); [2] total value the same as dissolved due to influence of values below detection.

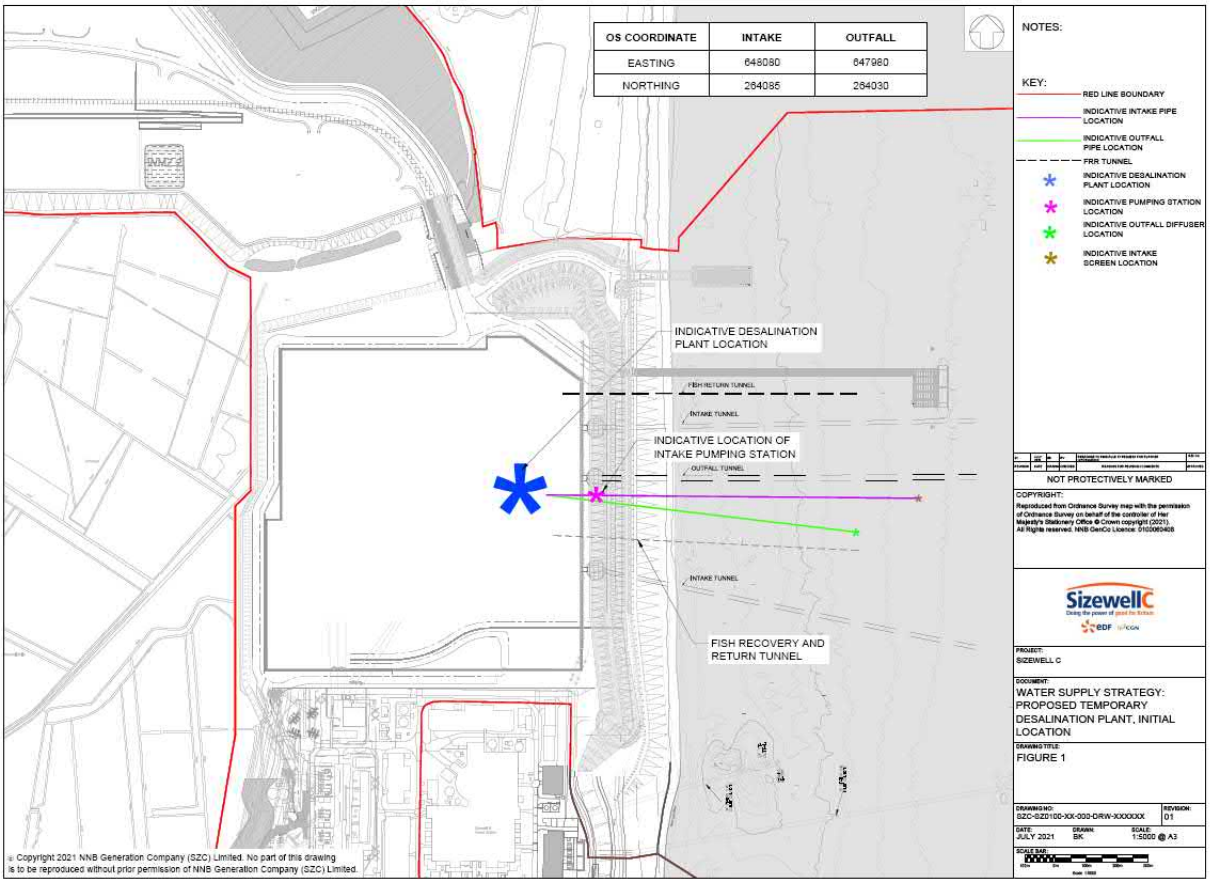

Figure 2-1 Indicative construction phase desalination intake and outfall plan.

3 Screening assessment of desalination concentrate discharge

3.1 Background

As part of a surface water risk assessment to comply with Environment Agency and the Department for Environment Food and Rural Affairs guidance (Defra, 2016), the concentration of substances present in the discharge must be assessed against a list of specific pollutants and compared with their EQS. Initial screening tests (historically referred to as H1 tests) were conducted to determine if the concentrations of priority substances and specific pollutants in the discharge exceeded their respective EQS. For any substances that breach the EQS in the initial screening tests (Test 1), a further screening test was applied to take account of initial dilution upon discharge (Test 5). The brine discharge from the desalination process would contain higher concentrations of naturally occurring metals and trace elements present in natural seawater. As the discharge concentrate from the desalination plant is saline and has an approximate salinity of 53 and so is much more dense than natural seawater and would sink to the seabed. The high salinity would invalidate further stages of screening assessment and require more detailed modelling to be applied.

However, as the discharge is to the subtidal, and seawater at this location is well mixed and a diffuser will be employed to further facilitate mixing, the screening test 5 is considered appropriate here (Table 3) to identify the higher priority discharges for modelling.

3.2 Screening assessment

The maximum concentrations discharged in the desalination concentrate (Table 2) are used for assessment of Test 5 as shown in Table 3. The maximum concentration values are based on the total daily loading for each chemical divided by the total volume of concentrate produced and discharged over a 24 hour period. The assessment includes the screening of the source terms against the saltwater EQS values presented in the Water Framework Directive (Standards and Classification) Directions (England and Wales) (Defra, 2015).

The updated guidance for surface water pollution (Defra, 2016) recommends the application of an initial test (Test 1) for discharges to Transitional and Coastal (TraC) waters in which the discharge concentration is compared to the relevant quality standard or equivalent for that substance. Where the discharge concentration exceeds the standard concentration, further assessment is required. for the purposes of this assessment, a more precautionary assessment was undertaken whereby any discharge concentration when divided by the EQS in Test 1 which produces a value of ≥0.5 was considered for further screening. As this construction discharge will be subtidal and is over 50 metres offshore, a further test (“Test 5”) was considered appropriate. Test 5 is normally not advocated in the case of high salinity discharges but is applied here to provide an indication of the priority order of substances for modelling. The modelling outputs for the worst-case substances modelled then provides an envelope for the extent of effects of the lower concentration discharges. With reference to values shown in Table 3, Test 5 divides the concentration of a substance and volume discharged in litres/second (the discharge specific Effective Volume Flux, EVF) by its EQS minus background concentration in micrograms/per litre (the location specific Allowable Effective Volume Flux, AEVF). If the EVF is not greater than the AEVF, then the discharge is considered insignificant and is screened out. The AEVF references the discharge depth, and this value can be up to a maximum of 3.5 metres. For Sizewell, the water depth at the desalination outfall concentrate headworks discharge relative to chart datum is ca., 4.2 metres therefore a maximum value of 3.5 is used as the AEVF for comparison in Table 3.

Cefas BEEMS Technical Report TR552 Sizewell C Desalination Discharge Assessment

NOT PROTECTIVELY MARKED

Table 3 Determination of whether after discharge and initial mixing the calculated contribution to substances of concern from the site desalination concentrate (using maximum concentrate values based on total measured concentrations) during the main construction period is likely to exceed the acceptable threshold above which significant impacts may occur. (values in test 1 ≥0.5 were then taken forward to Test 5; Text in bold indicates test failed.)

Parameter value	Calculated total substance discharge concentration µg l^{-1}	TraC Water test 1 <100%EQS	Pass/Fail	TraC Water test 5 EVF<AEVF	Pass/Fail
Aluminium	21.52	**0.9** (21.52/24[i])	≤1.0 (Pass)	0.12 (21.52x0.069[ii])/(24-12[iii])	0.12<3.5[iv] (Pass)
Arsenic	4.17	0.17 (4.17/25)	≤1.0 (Pass)		
Cadmium	0.08	0.41 (0.08/0.2[v])	≤1.0 (Pass)		
Chromium	2.94	**4.9** (2.94/0.6)	≥1.0 (Fail)	6.76 (2.94x0.069[ii])/(0.6-0.57[iii])	**6.76>3.5[iv] (Fail)**
Copper	4.8	**1.28** (4.8/3.76)	≤1.0 (Pass)	0.21 (4.8x0.069[ii])/(3.76-2.15[iii])	0.21<3.5[iv] (Pass)
Iron	2352	**2.35** (2352/1000)	≤1.0 (Pass)	0.18 (2352x0.069[ii])/(1000-100[iii])	0.18<3.5[iv] (Pass)
Lead	3.38	**2.60** (3.38/1.3)	≥1.0 (Fail)	N/A[vi]	**N/A**
Mercury (MAC)	0.03	**0.48** (0.03/0.07)	≤1.0 (Pass)	0.05 (0.03x0.069[ii])/(0.07-0.02[iii])	0.05<3.5[iv] (Pass)
Nickel	2.7	0.31 (2.7/8.6)	≤1.0 (Pass)		
Zinc	31.66	**4.65** (31.66/6.8[ii])	≥1.0 (Fail)	N/A[vi]	**N/A**
Ammoniacal nitrogen	18.02	0.014 (0.3[vii] /21)	≤1.0 (Pass)		
Boron	4956	**0.71** (4956/7000)	≤1.0 (Pass)	0.12 (4956x0.069[ii])/(7000-4225)	0.12<3.5[iv] (Pass)

[i] Annual average EQS value (Golding et al., 2015); [ii] maximum desalination concentrate discharge m^3/sec [iii] mean background concentration Sizewell TR189;[iv] Allowable effective volume flux is taken as a value of 3.5, [v] cadmium is assessed against annual average mean but would pass as 95th percentile standard of 1.5 µg/l also; [vi] The background concentration for Sizewell from monitoring

data in BEEMS Technical Report TR314 was higher (zinc 15.12 μg/l, lead 2.07) than the seawater EQS; [vii] This figure is the maximum proportion of un-ionised ammonia calculated with the un-ionised ammonia calculator for total ammonia and starting conditions for the concentrate (salinity 53.8, temperature 19.4C and pH 7.8 as described below).

From the results shown in Table 3, just over half of the substances screened would fail the initial test or produce a screening value close to a failure value of '1'. Therefore, a precautionary assessment was undertaken which involved a second screening test for values from test 1 of ≥0.5. The second screening test (test 5) is not robust for assessment of highly saline discharges (although here improved mixing is facilitated by use of a diffuser) and is used here to indicate substances that are considered to have priority for assessment. Chromium would clearly fail screening test 5 and zinc and lead were also further investigated by undertaking more detailed modelling assessment, as the high background values for both these metals were already shown to exceed EQS levels based upon reported monitoring data in BEEMS Technical Report TR314.

For ammonia (NH_4) the changing physicochemical conditions influence the proportion of un-ionised ammonia (NH_3, considered the most toxic form) relative to ionised ammonia present, and this can be calculated using the Environment Agency calculator (Clegg and Whitfield, 1995). However, the starting concentration of NH_4 is only equivalent to 0.3 $\mu g\ l^{-1}$ un-ionised ammonia (average concentrate pH 7.8 and salinity 53.8 and 95th percentile temperature 19.4). Subsequent mixing of the concentrate discharge to reach the background salinity of seawater would only marginally increase the un-ionised ammonia to 0.4 $\mu g\ l^{-1}$ un-ionised ammonia (average Sizewell seawater pH 8.05 and salinity 33.3 and 95th percentile temperature 19.4). During mixing the concentrate contribution to un-ionised ammonia would therefore remain considerably below the EQS 21 $\mu g\ l^{-1}$ NH_3-N (as an annual average).

3.3 Significant load assessment

As part of the surface water pollution risk assessment there are specific requirements for the minimisation of the annual loads of selected hazardous substances discharged to the environment and cadmium and mercury are included in this category and therefore require further assessment. Total annual loads in desalination concentrate discharges are 0.07 kg for mercury and 0.18 kg for cadmium. Based on estimates of annual construction discharges including these trace metals a total cumulative load for cadmium over 3.5 years of the construction period was 0.45 kg and for mercury was 0.05 kg (BEEMS Technical Report TR193). The combined source loadings for cadmium (0.63 kg) and mercury (0.12 kg) do not exceed significant annual loads (in discharges) of 5kg/year for cadmium and 1 kg/year for mercury.

4 Assessment of nitrogen and phosphorus discharges during construction

4.1 Background

During construction, discharges that overlap with the desalination discharge include relatively small quantities of nitrate and phosphate; primarily from groundwater and treated sewage. During the construction period the exact mass of the discharges has considerable variation, depending on which activity is occurring and varies considerably with the workforce on site. The details of this variation are described in BEEMS Technical Report TR193, where worst case examples have been used.

Table 4 shows a summary of the nitrogen and phosphorus loading from different sources during the construction period which include groundwater and treated sewage. The only conditioning chemical expected in the discharge concentrate is phosphorus, derived from use of a membrane descaling chemical.

Descaling chemical use is expected to add 3.3 g per cubic metre of concentrate. In 6000 m^3 of concentrate this represents a total of 19.8 kg/day. The phosphorus discharge loading for desalination is a composite of chemical addition in the membrane cleaning process added to the natural phosphorus background in the seawater. Most phosphorus in the seawater used for desalination (99%) is expected to be rejected by the reverse osmosis membranes used in desalination and would be increased in concentration relative to the natural background in the reject concentrate. The average phosphorus background concentration is 33 $\mu g\ l^{-1}$ (BEEMS Technical Report TR314) and an additional load to the concentrate (above that naturally present as background) would be 33 x 4000 (m^3) =0.132 kg. The total loading from antiscaling chemical input and added natural phosphate background therefore =19.9kg (19.8 + 0.132)/day.

For nitrogen with just the added background concentration in the brine and no other additions the total addition is small and represents ca., 0.56 kg/day.

Typically, in offshore waters of the UK, nutrient concentrations are reduced to very low levels due to phytoplankton uptake, but in the near shore coastal waters (3-5 km from the coast) off Sizewell due to the turbid nature of the coastal environment and continual freshwater input from the south of the area (River Orwell and River Deben), there are background summertime inputs of nutrients. Observations (BEEMS Technical Report TR314) show these to be around 10 µMol l^{-3} for nitrate and 0.65 µMol l^{-3} for phosphate. As the daily exchange of water is around 10%, the total additional mass of nitrate per day in summer is the volume x 10% x concentration of the nutrient. This gives a daily exchange of 16.9 tonnes of nitrate and 2.4 tonnes of phosphate. During construction (Table 4) maximum daily inputs are less than 0.2% for nitrogen and just under 2% for phosphate relative to the normal daily exchange of nutrients at the boundary (based on the summer period when background nutrient concentrations are low) and therefore these would be indistinguishable from the modelled situation without the SZC discharges.

Cefas BEEMS Technical Report TR494
Sizewell C Hydrazine Commissioning
Discharge Plume Modelling

NOT PROTECTIVELY MARKED

Table 4 Summary of nitrogen and phosphorus construction discharges including desalination. Figures are shown relative to the daily exchange with the wider environment

Substance	Peak loading in construction (groundwater+ sewage + desalination) kg per year and (per day)	Daily exchange with wider environment based on summer period (i.e. minimum background for nutrients), kg	Fraction of maximum possible daily loading in construction and desalination
Nitrogen (as N)	6278 (17.20)[1]	16900 (as N)	0.10%
Phosphates (as P)	16724 (45.82)[2]	2440 (as P)	1.88%

[1] The nitrogen loading during construction are derived from groundwater and sewage as described in BEEMS Technical Report TR193 section 5.4 (16.64 kg/day) and 0.56 kg/day from desalination concentrate inputs. [2] The total phosphorus loading of 45.82 kg/day is made up of a loading during construction derived from groundwater and sewage as described in BEEMS Technical Report TR193 section 5.5 (25.92 kg/day) and 19.9 kg/day from desalination concentrate inputs and background.

During the summer period, nitrogen can be limiting in the marine environment in Sizewell Bay. Therefore, to confirm that expected nutrient loadings from construction do not significantly influence conditions in Sizewell Bay a combined phytoplankton and macroalgal model (CPM) has been deployed. The CPM used is as detailed in BEEMS Technical Report TR385. Four runs have been considered as follows:

1. Productivity with no Sizewell B (SZB) operating,
2. A scenario which incorporates the effect of SZB together with the construction discharges from SZC,
3. A scenario which includes the SZB operation combined with desalination discharges associated with SZC
4. and a scenario that includes desalination and construction discharges associated with SZC only.

It should be noted that a factor to account for mortality of phytoplankton through power station entrainment is also included in the modelling. The effect of a power station can be simulated by increasing the daily natural mortality by the fraction of the box model volume that the power station filters each day. In the baseline situation with just SZB operating the entrainment and chlorination at SZB is predicted to reduce phytoplankton production by 4.4% (Table 5). The additional nutrient input from the desalination plant overlaid on the background entrainment mortality, increases annual production in the Sizewell Bay region by 0.17% over the existing SZB situation, so there is still an overall reduction in production due to the entrainment impact of SZB, but this is slightly reduced (Table 5). When construction and desalination nutrient inputs are combined the entrainment impact of SZB is further reduced (a production increase of 0.39%), but overall, there is still a reduction in production of 3.92% relative to the natural production of Sizewell Bay without the influence of SZB entrainment.

Table 5 Summary of nitrogen and phosphorus construction discharges and from the desalination plant. Figures are shown relative to the daily exchange with the wider environment.

Scenario	Phytoplankton Annual Gross Production ($g\ C\ m^{-2}\ y^{-1}$)	Percentage difference from SZB
Sizewell Bay	56.53[1]	+4.40%
SZB operation only (included mortality due to SZB but no additional nutrients)	54.04	0
SZB operation + Desalination	54.13	+4.24% (+0.17%)
SZB operation + SZC Construction discharge	54.33	+3.92% (+0.39%)

1 BEEMS Technical reports assessed the production of Sizewell Bay as 56.8 g C m -2 y-1, the value here uses the same conditions but is run on updated software which has resulted in a non-significant difference in the estimated carbon value.

5 Summary of screening assessment and further modelling

5.1 Screening results

Except for zinc and lead, the discharge concentrations of all substances listed in Table 3 as present in the desalination concentrate passed the TraC waters test 5 assessments. Chromium would pass the screening assessment based on the dissolved concentration of 0.57 $\mu g\ l^{-1}$ however, for an assessment using the total concentration, 1.8 $\mu g\ l^{-1}$, it would fail, and so is also assessed with more detailed modelling.

Zinc, monitoring data (BEEMS Technical Report TR314) indicates a zinc background concentration of 15.12 $\mu g\ l^{-1}$ which exceeds the annual EQS of 6.8 $\mu g\ l^{-1}$ (dissolved concentration). For the desalination concentrate the discharge concentration is assessed to be 24.95 $\mu g\ l^{-1}$ dissolved zinc (total zinc 31.66 $\mu g\ l^{-1}$) and would fail screening. For lead, there is no dissolved concentration data and a total concentration in the background seawater 2.07 $\mu g\ l^{-1}$ (increasing to 3.38 $\mu g\ l^{-1}$ in the discharge) already exceeds the annual EQS of 1.3 $\mu g\ l^{-1}$ (dissolved lead concentration).

5.2 CORMIX modelling

5.2.1 Discharge assessment methodology

The release and mixing of chemicals and trace metals in the desalination discharge was modelled using CORMIX US EPA supported mixing zone model (CORMIX Version 12.0GT HYDRO1 Version 12.0.0.0 2021). The proposed discharge is a low volume of dense brine, with concentrations of some contaminants exceeding EQS levels.

The proposed design of the desalination outfall consists of a single riser with two duckbill diffusers discharging between 1-1.8 m above the seabed. CORMIX can be used to either model a single riser with a single discharge outlet or a diffuser with a minimum of 3 risers. As such, a conservative approach is taken to model the desalination outfall as a single riser discharge 1 m off the seabed as this represents the worst-case discharge conditions. A contraction ratio of 0.65 is used on the end of the outfall pipe (i.e., a nozzle) to increase the jet velocities and enhance the mixing of the plume. However, the full diffuser proposed will result in a smaller plume than those modelled herein.

The location and basic properties of the proposed discharge are shown in Table 6.

Table 6 Desalination discharge conditions.

Discharge Characteristics	Value
Location OSBG	647980 E 264030 N
Charted water depth (surface to bed) at discharge location	5.8 m
Discharge flow	69 µg l^{-1}
Discharge salinity	53.8 PSU[1]
Depth of discharge (above seabed)	1.00 m
Pipe diameter	0.25 m

[1] practical salinity units

Three substances from Table 3 have been modelled using CORMIX: these are the trace metals, lead, zinc, and chromium.

For lead, the mean background total concentration is 2.07 µg l^{-1} whilst the EQS is 1.3 µgl^{-1} (based on the dissolved concentration). The background total lead levels are in exceedance of the EQS. The EQS for lead therefore cannot be used as the threshold value for the CORMIX modelling. The detection limit for lead in seawater samples (BEEMS Technical Report TR314) is 0.04 µgl^{-1}. Therefore, the threshold value for lead was set at 2.07+0.04 = 2.11 µgl^{-1}, which represents the limit at which lead would no longer be detected above the background concentration.

The mean background concentration of zinc in the environment is 15.12 µgl^{-1} whilst the EQS is 6.8 µgl^{-1}. Since the natural background levels exceed the EQS level, the EQS cannot be used as the threshold value for the CORMIX modelling. The detection limit for zinc in seawater samples (BEEMS Technical Report TR314) is 0.4 µgl^{-1}. Therefore, the threshold value for zinc was set at 15.12+0.4 = 15.52 µgl^{-1}, which represents the limit at which zinc would no longer be detected above the background concentration.

The mean background concentration of chromium in the environment is 0.57 μgl^{-1} whilst the EQS is 0.6 μgl^{-1}so the modelling assessment was considered against the natural background.

The CORMIX modelling provides a conservative estimate, as it does not include additional mixing and dilution due to waves.

5.2.2 Modelling a dense saline plume

It should be noted that with a dense saline plume with a discharge in an offshore location, unless mixing occurs, there may be an impact on seabed features in the local area. Consideration of the tidal cycle is useful in understanding the likely modes of impact. When the flood tide is at its strongest (with flow to the south), the discharge plume will be initially denser than the background salinity meaning it will sink to the seabed and will then be advected in a long narrow streak that eventually mixes up into the water column. As mixing occurs, the concentration within the streak will rapidly drop. At low water, near slack tide, a pool of the discharged water will form at the seabed which will be advected northwards as the ebb tide increases.

To investigate how the plume evolves over the state of the tide, multiple stages of the tide have been considered: peak flood, peak ebb, high water, and low water. As the water depth at the discharge is only 5.8 m, there is a risk of seabed impacts from slack water pooling at low water, where the depths and low velocities will inhibit mixing. Therefore, a sensitivity analysis around low water was conducted, with tidal flows conducted at 0.5, 1 and 2 hours either side of low water.

As the discharge is very dense compared to background, more than 20 PSU above background, the discharge pipe will employ a diffuser. The basic shape of the diffuser used in the CORMIX modelling is shown in Appendix Figure 9-1.

5.2.3 Results of CORMIX modelling

As the plume is dense, it will sink to the seabed and travel along the seabed. As a diffuser is used on the discharge outlet, mixing is enhanced, and the seabed impact is minimised. Although the discharge has a higher density than the receiving seawater the diffuser heads facilitate more rapid mixing and will limit the area at the seabed that is influenced by the discharged plume. For excess salinity to fall to within 1 PSU above background, it would require 95% mixing or a 19-fold dilution. The results from CORMIX modelling indicate that this would be achieved within ca., 6-10m.

For lead, the EQS is reached at ca.11–20 m, depending on the tidal state. For zinc, the limit of detection is reached within ca. 13-25 m. For chromium, the EQS is not reached at low water and the following half an hour, with concentrations of 0.61 μgl^{-1} extending ca. 38.5 m, compared to an EQS of 0.6 μgl^{-1}.

Appendix Table 7 summarises for lead, zinc, and chromium the distance the discharge plume travels at different states of the tide before reaching the relevant EQS. The maximum extent of the plume is for chromium ca., 38.5 m in length with an estimated peak area of exceedance of 0.08 ha (maximum areas of exceedance are derived from a calculated tidal ellipse assuming maximum plume extent is 5.9 times its width based on plume modelling with particle release reported in BEEMS Technical Report TR333). For lead the maximum extent for the discharge plume in exceedance of the EQS is 20.0 m, with an estimated peak area of exceedance of 0.02 ha. For zinc the maximum plume extent in exceedance is 24.9 m with an estimated peak area of exceedance of 0.03 ha. Based on the assumption that the maximum plume extent 38.5m (for chromium) represents the radius of a circle around the discharge point, the maximum bounding area affected by substances in the desalination discharge would be precautionarily estimated as <0.5 ha.

6 Interaction with CDO discharge

The chosen easting of the desalination outfall places it directly in line with the CDO but approximately 300 m to the south meaning the discharges of both follow the same hydrodynamic streamline. The desalination intake is offset from the CDO by approximately 100 m east meaning the risk of recirculation from the CDO discharges into the desalination plant are minimal.

Consideration has been given the combined discharges of both the CDO and the desalination plant, as both are discharging some of the same chemicals assessed in the CORMIX modelling: zinc, chromium, and lead.

Previous CORMIX modelling of chromium and zinc discharges from the CDO, presented in BEEMS Technical Report TR306, highlight that chromium would fall below the EQS within 25 m and zinc within 3 m of the discharge point. CORMIX modelling of the desalination plant has shown that chromium would fall below the EQS within 38.5 m and zinc would fall below the limit of detection with 24.9 m from the point of discharge. As such, the likelihood of the two plumes combining at levels above the EQS is very low given the two outfalls are separated by 300 m.

GETM modelling was also undertaken for the CDO discharges for comparison, which showed slightly larger plume extents. These were due to GETM underpredicting the initial dilution, as discussed in BEEMS Technical Report TR306. Plume concentrations from the CDO at the location of the desalination intake were extracted to assess the recirculation potential. **Error! Reference source not found.** shows the excess concentration above background for zinc, chromium, and lead.

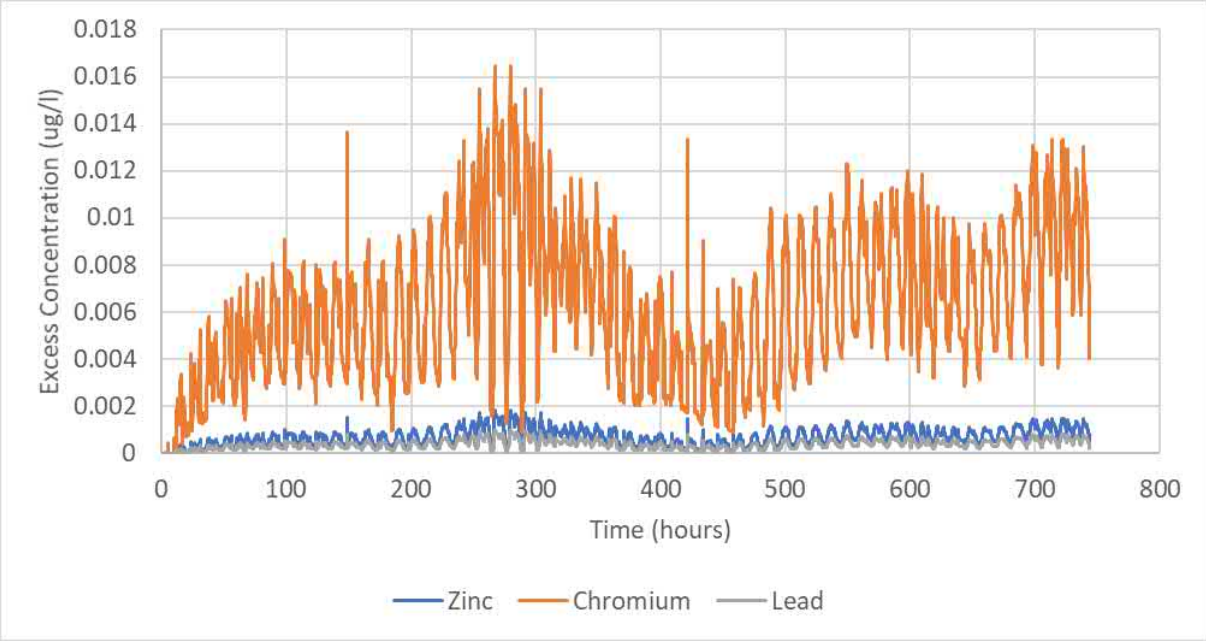

Figure 6-1 Excess concentration extracted from GETM at the location of the desalination intake

The maximum recirculation concentration at the desalination intake was 0.002 µg l^{-1} for zinc, 0.016 µg l^{-1} for chromium and 0.001 µg l^{-1} for lead. Both zinc and lead were shown to have lower values than their respective limits of detection. The addition of a further 0.016 µg l^{-1} of chromium, to the source concentration, at the desalination intake was investigated with CORMIX. Under the worst hydrodynamic condition, the plume only extended a further 2 m. As this does not affect the conclusions of the H1 assessment, the combined discharges of the CDO and desalination were not considered further.

7 Conclusion

A desalination plant and associated infrastructure is required to produce potable water for the construction period from approximately October 2023 to June 2028 or later, but would be decommissioned and removed prior to commencement of operation of Sizewell C. An assessment was undertaken for the discharge of substances present in the planned desalination concentrate discharge during the construction period. The concentrate would be highly saline ca., 20 PSU above the seawater background. Although the discharge has a higher density than the receiving seawater, the diffuser head facilitates more rapid mixing and limits the area at the seabed that is influenced by the discharge plume. The results of CORMIX modelling indicate that excess salinity falls to within 1 PSU of that at background within ca., 6-10 m which is well within the natural variation at the site (conditions at the discharge site are well mixed and would also facilitate mixing but are not included in this more precautionary assessment). Except for the influence of the high salinity of the concentrate at the point of discharge upon initial plume behaviour the elevated salinity is expected to have negligible effects upon marine species beyond a few metres from the point of discharge.

Various activities during the construction period can add nitrogen and phosphorus to discharges to the marine environment and this can influence algal growth. Descaling chemicals used for cleaning the Reverse Osmosis (RO) membranes used for desalination contain phosphorus so this together with the phosphorus background in the seawater is also rejected in the desalination concentrate. Background phosphorus and descaling chemicals together contribute ca., 20 kg/d phosphorus. Based on the seawater natural nitrogen background levels, the RO process also results in increased nitrogen concentration of ca., 0.6 kg/d in the desalination discharge. The nitrogen and phosphorus inputs from the desalination process were considered together with other construction activity inputs (treated sewage and groundwater) and the total loading was evaluated in an annual assessment using a combined phytoplankton and macroalgal model. The additional nutrient loading of the desalination discharge during the construction period is predicted to result in a 0.17% increase in annual production in Sizewell Bay relative to the baseline situation including SZB. The combination of construction period nutrient inputs from treated sewage and groundwater with those for desalination, result in an increase of 0.39% in production relative to the current baseline with SZB. However, despite these additional nutrient inputs there is still an overall reduction in production in Sizewell Bay due to the influence of SZB. The influence of SZB in reducing production in Sizewell Bay and the small positive additions to production that would occur due to nutrient inputs from construction and desalination would not be detectable against a natural background of inter annual variation in production within Sizewell Bay (Appendix 22H of the Marine Ecology and Fisheries ES, BEEMS Technical Report TR385). This level of change is therefore evaluated to have a negligible impact.

The desalination concentrate also contains elevated levels of various trace metals and other substances resulting from the concentration process.

As part of the surface water pollution risk assessment there are specific requirements for the minimisation of the annual loads of cadmium and mercury discharged to the aquatic environment which require assessment. Neither metal was shown to exceed threshold loadings for a cumulative annual assessment incorporating all input sources which include these trace metals during the construction period.

There was shown to be insufficient ammonia present in the discharge to present a risk from the proportion of un-ionised ammonia (the more toxic form) exceeding its EQS under the expected discharge physicochemical conditions, so no further modelling assessment was required.

A screening assessment of substances present in the desalination discharge identified three metals: zinc, lead and chromium which would fail the assessment and would need more detailed modelling to be conducted. Using the US EPA mixing zone model CORMIX the maximum discharges of lead, zinc and chromium were evaluated to determine the extent of any areas of EQS exceedance. Modelling was conducted using a simple diffuser. For the three metals assessed using CORMIX the plume area above the EQS was between 0.02 to 0.08 ha. Other substances that just exceeded their respective EQS in Test 1 (Table 3) but were not taken forward for modelling are likely to act in combination within the lower plume area of 0.02 ha where zinc, chromium, and lead would all exceed their respective EQS. The diffuser would facilitate more rapid mixing of the saline discharge, but the plume would still sink and influence areas of the seabed close to the discharge point. A precautionary assessment derives an area above EQS for any discharge that is not >0.5 ha at the seabed (this assumes the maximum extent of any discharge, based on chromium represents the radius of a circle around the discharge point). The modelling provides a precautionary assessment as it does not take account of natural mixing processes and the relatively shallow waters at this location would be expected to be well mixed (BEEMS Technical Report TR189). Based on this assessment the desalination concentrate discharge would be expected to have negligible effects on background water quality beyond the immediate small, localised area influenced by the discharge.

8 References

BEEMS Technical Report TR131. Sizewell- Water Quality Literature Report. Cefas, Lowestoft. (ES Appendix 21A)

BEEMS Technical Report TR189. Sizewell Marine Water Quality Monitoring Final Summary Report. Cefas, Lowestoft. (ES Appendix 21B)

BEEMS Technical Report TR193 Ed.5. Sizewell C H1 assessment - supporting data report. Cefas, Lowestoft. (ES Appendix 21F)

BEEMS Technical Report TR314. Sizewell supplementary water quality monitoring data 2014/2015. Cefas, Lowestoft. (ES Appendix 21C)

BEEMS Technical Report TR333. Sizewell- Modelling the optimal position for a fish recovery and return outfall for Sizewell C. Cefas, Lowestoft.

BEEMS Technical Report TR385. Sizewell- Modelling the effect of Sizewell C entrainment on the phytoplankton of Sizewell Bay. Cefas, Lowestoft. (ES Appendix 22H)

Clegg S. L. and Whitfield, M. 1995. A chemical model of seawater including dissolved ammonia, and the stoichiometric dissociation constant of ammonia in estuarine water and seawater from -2° to 40 °C. *Geochim. et Cosmochim. Acta* 59, 2403-2421.

Defra. 2014. Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307788/river-basin-planning-standards.pdf.

Defra. 2015. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 CONTENTS, 40. Available from: http://www.legislation.gov.uk/uksi/2015/1623/pdfs/uksiod_20151623_en_auto.pdf.

Defra 2016. GOV.UK. Clearing the Waters for All Guidance. Last updated 9 November 2017. Available from: https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters.

Golding L. A., Angel, B.M., Batley, G.E., Apte, S.C., Krassol, R. and Doyle, C.J. 2015. 2015. Derivation of a water quality guideline for aluminium in marine waters. *Environmental Toxicology and Chemistry, Vol. 34, No.1*, pp. 141-151.

.

9 Appendix

9.1 Cormix modelling supplementary data

The results presented here are indicative of the performance of a basic diffuser. The outfall used for the CORMIX modelling is a single port riser discharging 1 m off the seabed, with a single nozzle with a contraction ratio of 0.65 (i.e., there is a narrow nozzle on the end of each to enhance discharge momentum and increase mixing) and a pipe diameter of 0.25 m. As the discharge is denser than the background water, the outfall pipe is discharged upwards at an angle of 45°, to project the flow up into the water before sinking to the seabed, to enhance mixing.

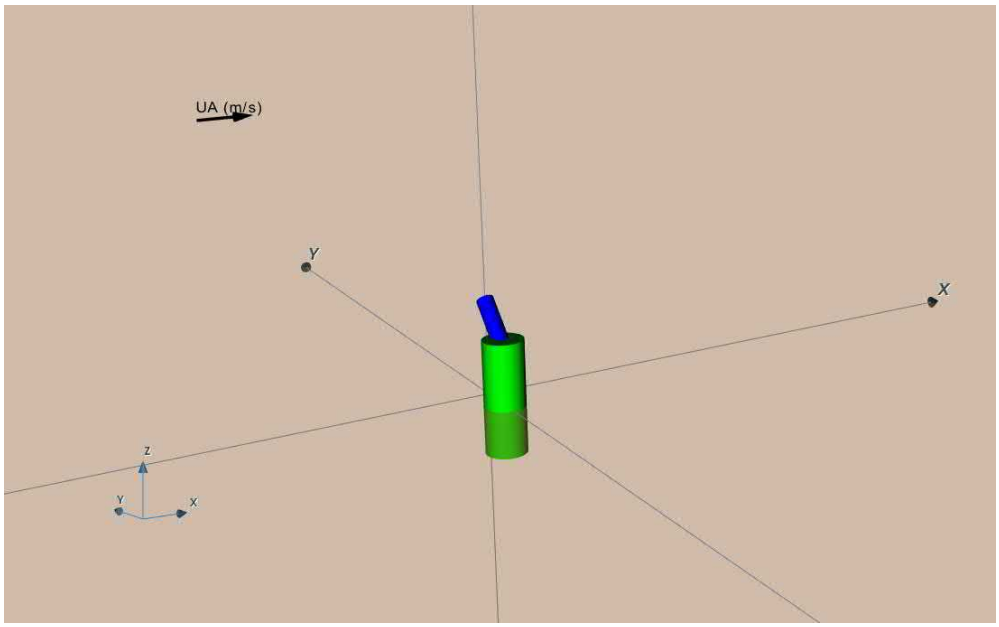

Figure 9-1 Basic shape of the diffuser used in CORMIX.

Figure 9-2 and Figure 9-3 show the plume geometry under peak flood and low water conditions, respectively. Whilst the plots show the concentrations specifically for chromium, the plume geometry is the same for zinc and lead, but the concentrations within the plume would be different.

Figure 9-4 and Figure 9-5 show the centreline plume concentration and dilution, respectively, for lead under peak flood conditions.

Figure 9-6 and Figure 9-7 show the centreline plume concentration and dilution, respectively, for chromium under peak flood conditions.

Figure 9-8 and Figure 9-9 show the centreline plume concentration and dilution, respectively, for zinc under peak flood conditions.

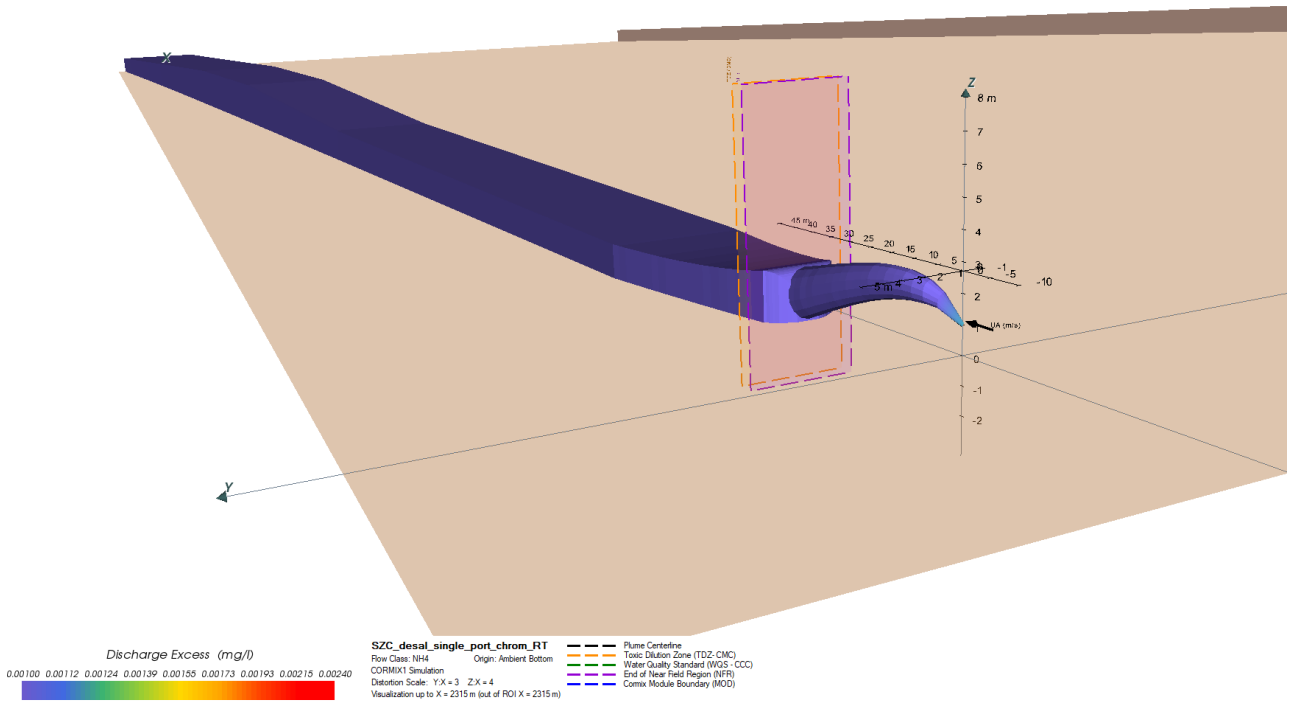

Figure 9-2 Plume geometry under peak flood conditions with a single port riser

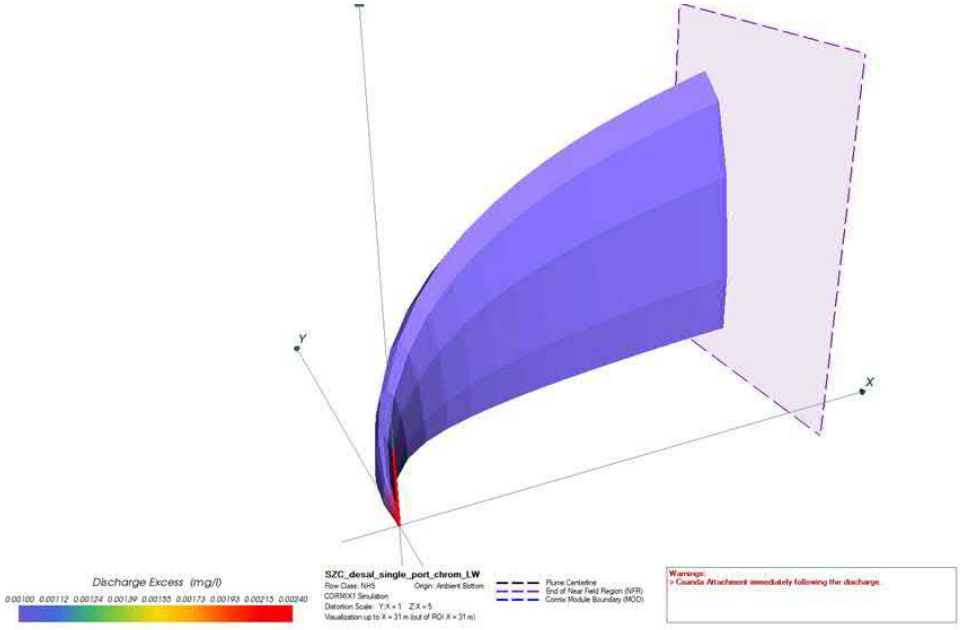

Figure 9-3 Plume geometry under low water conditions with a single port riser.

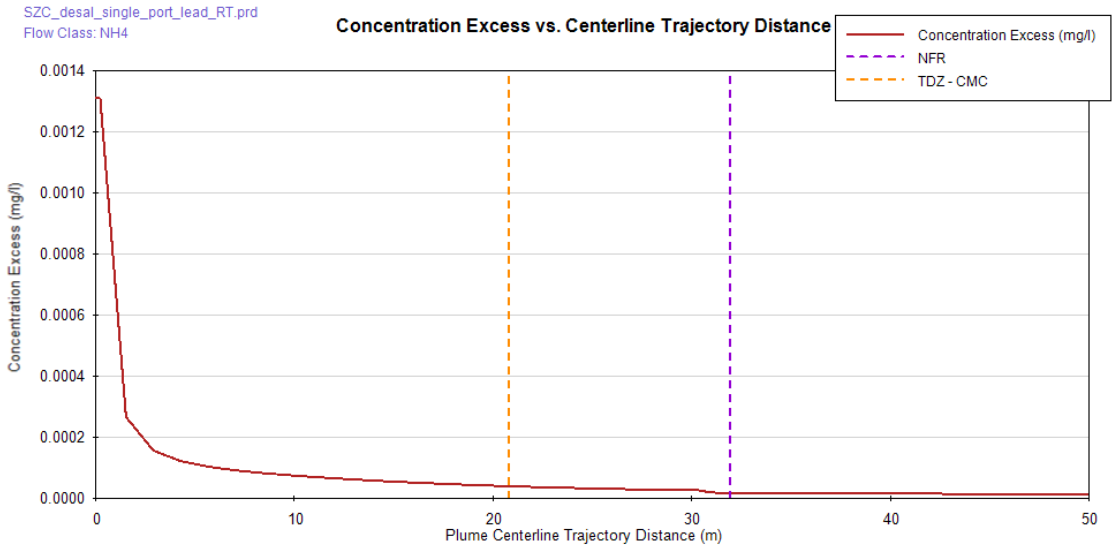

Figure 9-4 Centreline plume concentration for lead under peak flood conditions with diffuser. (CMC represents EQS value).

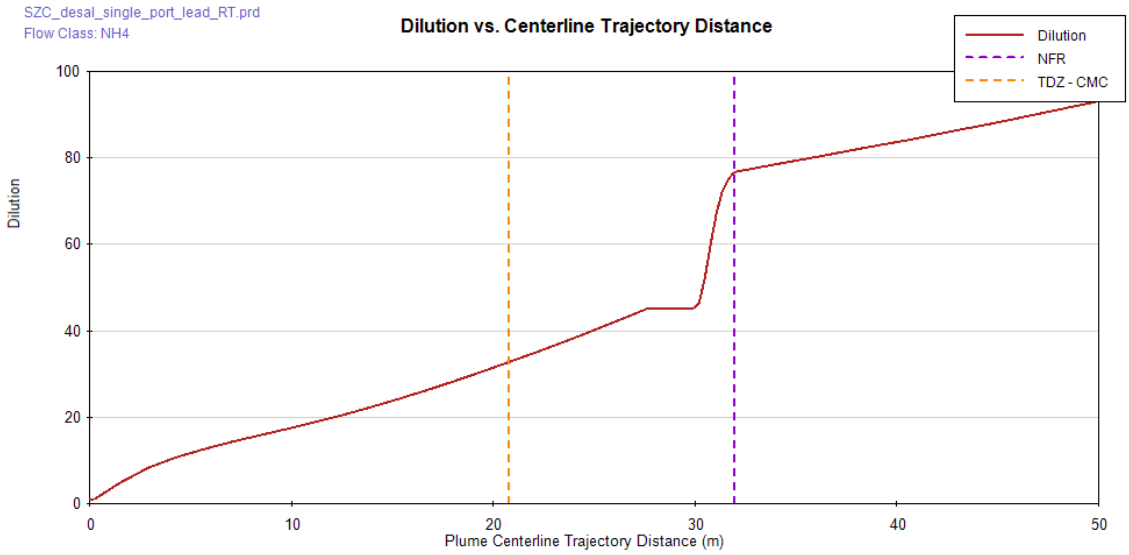

Figure 9-5 Centreline plume dilution for lead under peak flood conditions with diffuser. (CMC represents EQS value).

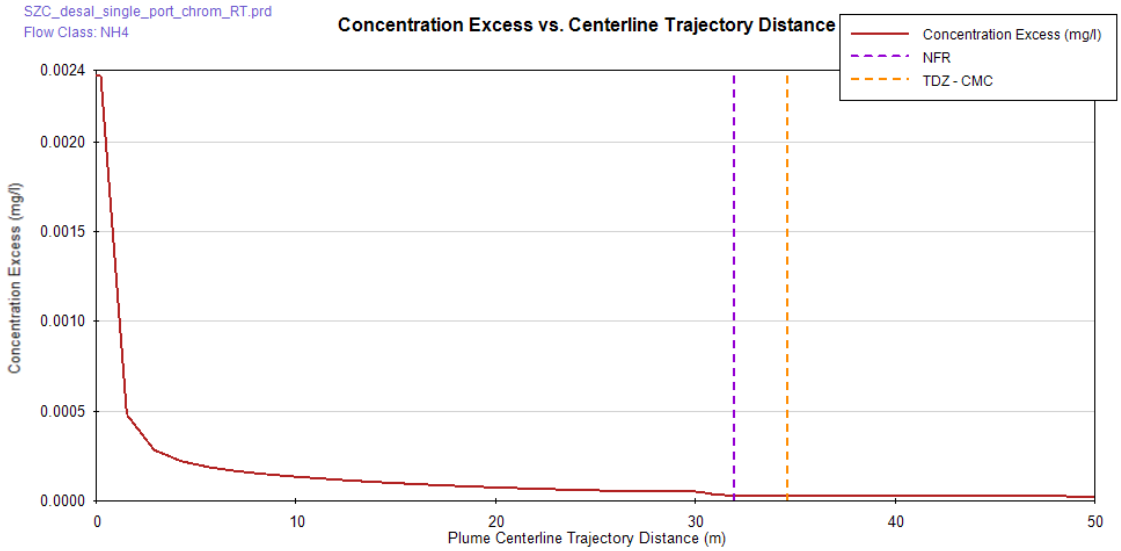

Figure 9-6 Centreline plume concentration for chromium under peak flood conditions with single port riser (CMC represents EQS value).

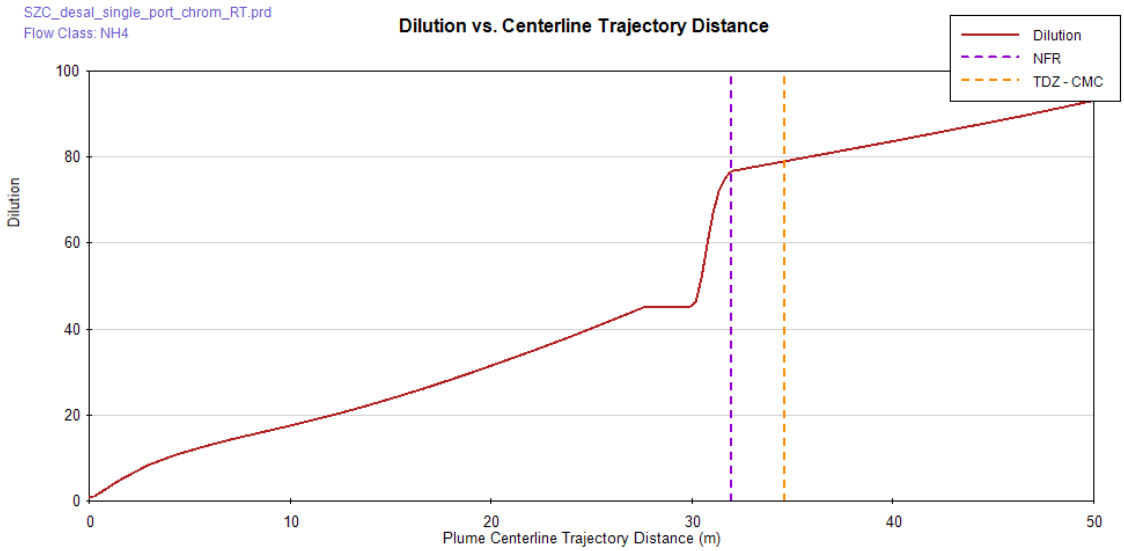

Figure 9-7 Centreline plume dilution for chromium under peak flood conditions with single port riser. (CMC represents EQS value).

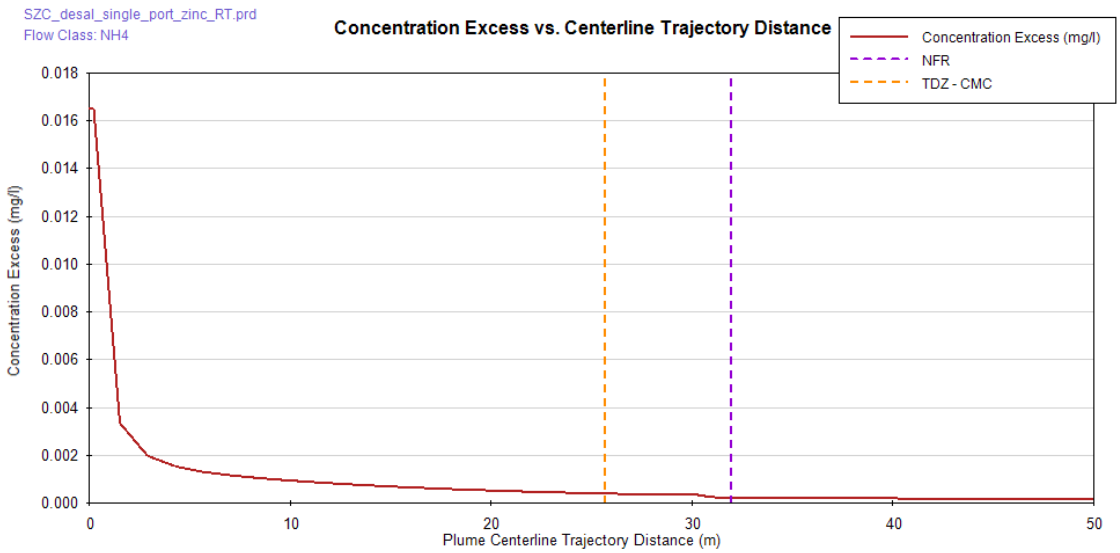

Figure 9-8 Centreline plume concentration for zinc under peak flood conditions with single port riser. (CMC represents EQS value).

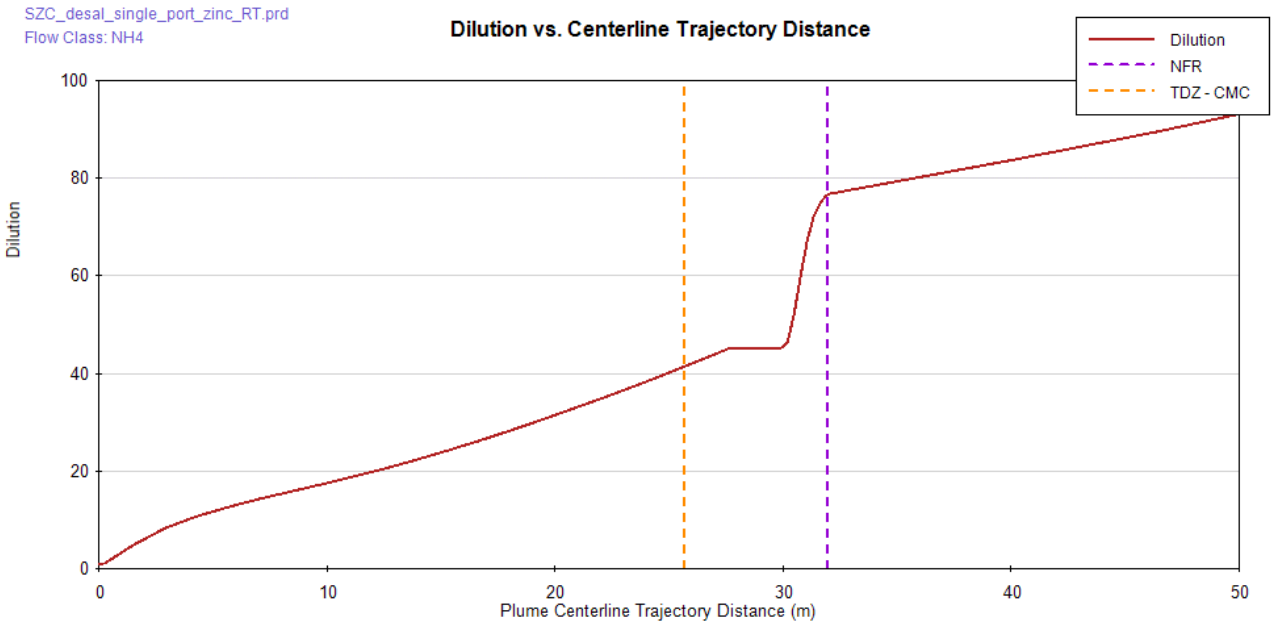

Figure 9-9 Centreline plume dilution for zinc under peak flood conditions with single port riser. (CMC represents EQS value).

Cefas BEEMS Technical Report TR494
Sizewell C Hydrazine Commissioning
Discharge Plume Modelling

NOT PROTECTIVELY MARKED

Table 7 summarises the distances the plume travels before falling below the threshold of detection (for lead and zinc) or below the EQS using the diffuser. Note, for some conditions the EQS may not be reached, as denoted by NA (Not Achieved) as the CORMIX simulation reaches a condition of tidal state reversal and the plume cannot propagate any further.

Table 7 Summary of distances to EQS threshold.

Chemical	Distance to Threshold (m)									
	Rising Tide	High Tide	Falling Tide	Low Tide -2 hrs	Low Tide -1 hr	Low Tide - 0.5 hrs	Low Tide	Low Tide +0.5 hrs	Low Tide +1 hr	Low Tide +2 hrs
Lead	20.04	11.52	19.23	16.54	13.82	10.88	10.96	12.45	13.57	14.87
Zinc	24.90	14.15	23.93	20.51	17.08	13.35	15.01	17.51	16.80	18.43
Chromium	31.50	24.62	31.10	24.96	21.78	26.25	NA*	NA	25.39	24.22

Table Note:

i) NA means threshold 'Not Achieved' before tidal state reversal. NA* For chromium, the EQS is not reached at low water and the following half an hour, with concentrations of 0.61 μgl^{-1} extending ca. 38.5 m, compared to an EQS of 0.6 μgl^{-1}

APPENDIX 3B ENVIRONMENTAL RISK RECORD

Sizewell C Major Accidents and Disasters Environmental Risk Record

Introduction

This Appendix sets out the results of the review process undertaken for major accidents and disasters (MA&D) to arrive at the risk events set out in the Environmental Statement (ES) and Fourth ES Addendum.

A screening exercise of all identified project risks related to MA&D was first undertaken to identify which risks have the potential to result in serious damage without any mitigation.

This Environmental Risk Record sets out all such potential hazards and threats, with the identified hazard and threat sources, pathways, and receptors. Study areas for each hazard or threat were determined on the basis of the impact areas of past incidents of a similar nature or on the basis of professional judgement. A description of the receptors within the study areas for the identified hazards and threats is provided in **Tables 27.4** and **27.5** of the ES.

Each hazard was assigned a 'severity of harm' and 'duration' category on the basis of the risk assessment criteria followed within local Suffolk Risk Register under the Civil Contingencies Act (CCA) 2004 (Contingency Planning) Regulations 2005 (Ref. 1.1) and Chemicals and Downstream Oil Industries Forum (CDOIF) Guidelines for Environmental Risk Tolerability for COMAH Establishments (Ref. 1.2), assuming a reasonably foreseeable worst case impact and no mitigation. By combining the 'severity of harm' and 'duration' category, a 'consequence' category for the hazard was determined on the basis of the criteria set out within CDOIF guidelines.

Risks potentially resulting in a MA&D were further assessed in order to determine whether the tolerability of the risk with mitigation in place is acceptable. To do this, the likelihood of the risk event occurring with mitigation in place was determined on the basis of the definitions used in the Suffolk Risk Register under the CCA and the CDOIF guidelines. Risk tolerability limits set out within CDOIF were adapted, as they presented a worst-case assessment, to derive whether with mitigation in place the risk is tolerable, tolerable if As Low As Reasonably Practicable (TifALARP) or intolerable. This Environmental Risk Record summarises the mitigation relied upon.

Each hazard or threat has been considered on an individual basis. Where a hazard or threat has the potential to result in another hazard, this has been clearly identified within the Environmental Risk Record to identify where an assessment of the additional hazard that could occur can be found.

All risks categorised as tolerable or TifALARP are considered as 'not significant', all risks categorised as 'intolerable' are categorised as 'significant' for the purposes of the EIA.

Review of risks

The objective of this risk review is to determine whether additional mitigation measures may be required to manage the identified risks to the environment to be ALARP. This has been done in consultation with the SZC Co. project team.

A major accident, in the context of this assessment, means an uncontrolled event caused by a man-made activity or asset that may result in immediate or delayed serious damage to human health, welfare and/or the environment and requires the use of resources beyond those of EDF Energy or its contractors to manage. It should be noted that malicious intent is not accidental, however, the outcome e.g. aeroplane crash, may be the same and therefore the same mitigation measures will apply to both deliberate and accidental events.

A disaster in the context of this assessment, is a naturally occurring phenomenon such as an extreme weather event (e.g. storm, flood, extreme temperatures) or ground-related hazard events (e.g. subsidence, landslide, earthquake) with the potential to cause an event or situation that leads to immediate or delayed serious damage to human health, welfare and/or the environment and requires the use of resources beyond those of EDF or its contractors to manage.

Serious damage has been defined as the potential loss of life or permanent injury and/or permanent or long-lasting damage to an environmental receptor which cannot be restored through minor clean-up and restoration efforts.

References

Ref 1.1 Her Majesties Stationary Office (2005), Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005.
Ref 1.2 Chemicals and Downstream Oil Industries Forum Guidelines, Environmental Risk Tolerability for COMAH Establishments.

Definitions for Severity of Harm

Assessment Terminology		No Serious Damage		Severe		Major		Catastrophic	
Receptors		CCA Ref	CDOIF ref	CCA Ref	CDOIF ref	CCA Ref	CDOIF ref	CCA Ref	CDOIF ref
		Insignificant	No Serious Damage	Minor or Moderate	Severe	Significant	Major	Catastrophic	Catastrophic
CCA Ref	**CDOIF ref**	While this level of harm might result in a significant effect, it is not considered to result in serious irrecoverable damage and therefore is outside the scope of the MA&D assessment.		The lowest level of harm that might be considered to result in serious damage.					
Health	People (including workers, members of the public)	Insignificant number of injuries or impact on health	Small number of minor injuries	Small number of people affected, no fatalities, and small number of minor injuries with first aid treatment Or Moderate number of fatalities with some casualties requiring hospitalisation and medical treatment and activation of MAJAX, the automated intelligent alert Notification system, procedures in one or more hospitals	Substantial number of people requiring medical attention	Significant number of people in affected area impacted with multiple fatalities, multiple serious or extensive injuries Significant hospitalisation and activation of MAJAX procedures across a number of hospitals	Multiple life changing injuries, potential loss of life in low numbers.	Very large numbers of people in affected area(s) impacted with significant numbers of fatalities, large number of people requiring hospitalisation with serious injuries with longer-term effects	Potential loss of life in high numbers and substantial number of life changing injuries.
Social		Insignificant number of persons displaced and personal support required Insignificant disruption to community services, including transport services and infrastructure		Minor damage to properties Minor displacement of a small number of people for < 24 hours and minor personal support required Minor localised disruption to community services or infrastructure < 24 hours Or Damage that is confined to a specific location, or to a number of locations, but requires additional resources Localised displacement of >100 people for 1-3 days, or Localised disruption to infrastructure and community services		Significant damage that requires support for local responders with external resources 100 to 500 people in danger and displaced for longer than 1 week. Local responders require external resources to deliver personal support or Significant impact on, and possible breakdown of, delivery of some local community services.		Extensive damage to properties and built up environment in affected area requiring major demolition General and widespread displacement of more than 500 people for prolonged duration and extensive personal support required Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support	
Economic		Insignificant impact on local economy		Negligible impact on local economy and cost easily absorbed Or Limited impact on local economy with some short-term loss of production, with possible additional clean-up costs		Significant impact on local economy with medium-term loss of production Significant extra clean-up and recovery costs		Serious impact on local and regional economy with some long-term, potentially permanent, loss of production with some structural change Extensive cleanup and recovery costs.	
	Designated Land/ Water Sites (Nationally important) *(e.g. NNR, SSSI, MNR)*		<0.5ha or <10%		>0.5ha or 10-50% of site area, associated linear feature or population	Significant impact on environment with medium-to long-term effects	>50% of site area, associated linear feature or population	Serious long term impact on environment and/or permanent damage	n/a
	Designated Land/Water Sites (Internationally important) *(e.g. SAC, SPA, Ramsar)*		<0.5ha or <5% (<5% LF/Pop)		>0.5ha or 5-25% of site area or 5-25% of associated linear feature or population		25-50% of site area, associated linear feature or population		>50% of site area, associated linear feature or population
	Other designated Land *(e.g. ESA, AONB, National Park, etc.)*		<10ha or <10%		10-100ha or 10-50% of land		>100ha or >50% of land		n/a
	Scarce Habitat		<2 ha or <10%		2-20ha or 10-50% of habitat		>20ha or >50% of habitat		n/a
	Widespread Habitat - Non designated Land		<10ha		Contamination of 10- 100ha of land, preventing growing of crops, grazing of domestic animals or renders the area inaccessible to the public because of possible skin contact with dangerous substances. Alternatively, contamination of 10ha or more of vacant land.		100-1000ha (applied as per text under 'Severe')		>1000ha (applied as per text under 'Severe')
	Widespread Habitat - Non designated Water		n/a		Contamination of aquatic habitat which prevents fishing or aquaculture or renders is inaccessible to the public.		n/a		n/a
	Groundwater Source of Drinking Water		Interruption of drinking water supply <1000 person-hours or For England & Wales only <1ha SPZ		Interruption of drinking water supplied from a ground or surface source (where persons affected x duration in hours [at least 2] > 1,000) or For England & Wales only 1-10ha of SPZ where drinking water standards are breached		>1 x 10^7 person-hours interruption of drinking water (a town of ~100,000 people losing supply for month) or For England & Wales only 10-100ha SPZ drinking water standards breached		>1 x 10^9 person-hours interruption of drinking (~1 million people losing supply for 1 month) or For England & Wales only >100ha SPZ drinking water standards breached

Definitions for Severity of Harm

Assessment Terminology		No Serious Damage		Severe		Major		Catastrophic	
Receptors		CCA Ref	CDOIF ref	CCA Ref	CDOIF ref	CCA Ref	CDOIF ref	CCA Ref	CDOIF ref
		Insignificant	No Serious Damage	Minor or Moderate	Severe	Significant	Major	Catastrophic	Catastrophic
Environment	Groundwater – non Drinking Water Source	Insignificant impact on environment or Minor impact on environment with no lasting effects	<1ha	Limited impact on environment with short-term or long-term effects	1-100ha of aquifer where water quality standards are breached (or hazardous substance is discernible)		100-10,000ha		>10,000ha
	Groundwater in unproductive strata		Groundwater not a pathway to another receptor.		*Where the groundwater is a pathway for another receptor assess against relevant criteria for the receptor.*				
	Soil or sediment (i.e. as receptor rather than purely a pathway)		Contamination not leading to environmental damage (as per ELD), or not significantly affecting overlying water quality		Contamination of 10- 100ha of land etc. as per Widespread Habitat; Contamination sufficient to be deemed environmental damage (Environmental Liability Directive)	Significant impact on environment with medium-to long-term effects	Contamination of 100-1000ha of land, as per Widespread Habitat; Contamination rendering the soil immediately hazardous to humans (e.g. skin contact) or the living environment, but remediation available	Serious long term impact on environment and/or permanent damage	Contamination of >1000ha of land, as per Widespread Habitat; Contamination rendering the soil immediately hazardous to humans (e.g. skin contact) or the living environment and remediation difficult or impossible.
	Built environment *Under CDOIF, this is limited to Grade 1 / Cat A Listed buildings, scheduled ancient monuments, conservation area, etc*		Damage below a level at which designation of importance would be withdrawn.		Damage sufficient for designation of importance to be withdrawn.		Feature of built environment subject to designation of importance entirely destroyed.		n/a
	Particular species (Note - these criteria apply nationally - i.e. England, Wales, Scotland)		Loss of <1% of animal or <5% of plant ground cover in a habitat.		Loss of 1-10% of animal or 5-50% of plant ground cover.		Loss of 10-90% of animal or 50-90% of plant ground cover.		Total loss (>90%) of animal or plant ground cover.
	Marine		<2ha littoral or sublittoral zone, <100ha of open sea benthic community, <100 dead sea birds (<500 gulls), <5 dead/significantly impaired sea mammals		2-20ha littoral or sublittoral zone, 100-1000ha of open sea benthic community, 100-1000 dead sea birds (500-5000 gulls), 5-50 dead/significantly impaired sea mammals		20-200ha littoral or sub-littoral zone, 100-10,000ha of open sea benthic community, 1000-10,000 dead sea birds (5,000-50,000 gulls), 50-500 dead/significantly impaired sea mammals		>200ha littoral or sublittoral zone, >10000ha of open sea benthic community, >10000 dead sea birds (>50000 gulls), >500 dead/ significantly impaired sea mammals
	Fresh and estuarine water habitats		Impact below that of Severe		WFD Chemical or ecological status lowered by one class for 2-10km of watercourse or 2-20ha or 10-50% area of estuaries or ponds. Plus interruption of drinking water supplies		WFD Chemical or ecological status lowered by one class for 10-200km of watercourse or 20- 200ha or 50-90% area of estuaries and ponds. Plus interruption of drinking water supplies		WFD Chemical or ecological status lowered by one class for >200km of watercourse or >200ha or >90% area of estuaries and ponds. Plus interruption of drinking water supplies

Sources:
CDOIF Guideline - Environmental Risk Tolerability for COMAH Establishments: https://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf
Cabinet Office's Emergency Preparedness guidance on part 1 of the CCA: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/61027/Chapter-4-Local_20Responder-Risk-assessment-duty-revised-March.pdf

Definitions for Duration / Recovery Criteria

Description	Short term	Medium term	Long term	Very long term or Permanent
	Harm with such short recovery is not considered a MA&D.			
Population	Injury or impairment lasting up to 1 week	Injury or impairment lasting up to 4 months but no permanent consequences	Some permanent restriction to leisure and work activities	Death/fatality
Groundwater or surface water drinking water source (public or private)	n/a	n/a	Harm affecting drinking water source or SPZ < 6 years	Harm affecting drinking water source or SPZ >6 years
Groundwater (except drinking water sources): WFD Hazardous/Non Hazardous Substances	WFD hazardous substances < 3 months	WFD hazardous subtances > 3 months	WFD hazardous substances > 6yrs	WFD hazardous substances >20 years
	WFD non-hazardous substances < 1yr	WFD non-hazardous substances > 1y	WFD non-hazardous substances >10 years	WFD non-hazardous substances >20 Years
Surface water (except drinking water sources – see above)	< 1year	>1 year	>10 years	>20 years
Land	< 3 years or < 2 growing seasons for agricultural land	> 3 years or > 20 growing seasons for agricultural land	>20 years	>50 years
Built environment	Can be repaired in < 3 years, such that its designation can be reinstated	Can be repaired in > 3 years, such that its designation can be reinstated	Feature destroyed, cannot be rebuilt, all features except world heritage site	Feature destroyed, cannot be rebuilt, world heritage site
Marine	< 1year	>1 year	>10 years	>20 years

Source: CDOIF Guideline - Environmental Risk Tolerability for COMAH Establishments:

https://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf

Level of Consequence

	Duration			
Severity of Harm	Short term	Medium term	Long term	Very long term or Permanent
Catastrophic	Not MA&D	C	D	D
Major	Not MA&D	B	C	D
Severe	Not MA&D	A	B	C
No Serious Damage	Not MA&D	Not MA&D	Not MA&D	Not MA&D

Source: CDOIF Guideline - Environmental Risk Tolerability for COMAH Establishments:
https://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf

Level of consequence considers the severity of harm and the duration of the harm to separate hazards and threats into five categories ('Not a MA&D' and categories A to D). 'Not a MA&D' represents the lowest level of consequence and category 'D' the highest.

Definitions for Likelihood and Tolerability

Probability	**Extremely improbable**	**Extremely remote**	**Remote**	**Rare**	**Unlikely**	**Likely**	
CDOIF Quantitative definition	Less than 1 in 10,000,000 yrs	1 in 1,000,000 to 1 in 10,000,000 yrs	1 in 100,000 yrs to 1 in 1,000,000	1 in 10,000 to 1 in 100,000 years	1 in 100 years to 1 in 10,000 years	Greater than 1 in 100 years	
CCA Quantitative definition	> 1 in 20,000 chance over 5 years			> 1 in 2,000 chance over 5 years	> 1 in 200 chance over 5 years	> 1 in 20 chance over 5 years	> 1 in 2 chance over 5 years
CCA Qualitative definition	Negligible			Rare	Unlikely	Possible	Probable
Category D	Tolerable	TifALARP*	Intolerable	Intolerable	Intolerable	Intolerable	
Category C	Tolerable	Tolerable	TifALARP*	Intolerable	Intolerable	Intolerable	
Category B	Tolerable	Tolerable	Tolerable	TifALARP*	Intolerable	Intolerable	
Category A	Tolerable	Tolerable	Tolerable	Tolerable	TifALARP*	Intolerable	
Not a MA&D	Not within the scope of MA&D assessment						

*TifALARP= Tolerable if ALARP (As Low As Reasonably Practicable)

Significant effect = unacceptable/ intolerable risks

Not significant effect = acceptable (tolerable) and TifALARP risks

Sources:
CDOIF Guideline - Environmental Risk Tolerability for COMAH Establishments:
https://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf

Cabinet Office's Emergency Preparedness guidance on part 1 of the CCA:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/61027/Chapter-4-Local_20Responder-Risk-assessment-duty-revised-March.pdf

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Proposed mitigation	Post-mitigation			Sources of information
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence		Likelihood	Tolerability	Significance of Risk	
CONSTRUCTION														
Vulnerability of the proposed development to natural disasters during construction														
C1	Flooding from rivers, surface water, groundwater reservoirs and sewers	MDS/ AD	Periods of heavy or extreme rainfall resulting in the flooding of the construction site and surrounding areas Proposed development affecting drainage pathways Not covered under this item: Release of contaminants into the environment, resulting in a major pollution incident due to run-off from the construction site (see Risk ID C18 and C19); Disruption to utilities (Covered under risk IDs C20-23 and IDs C41-C44).	On site: Construction personnel and equipment Off-site: Properties General public Agricultural land and livestock Sensitive environmental receptors - Biodiversity / ecological, heritage receptors	On site: Damage to construction equipment and risk of injury to construction personnel due to flooding; Off-site: Damage to and evacuation of affected properties, ecological sites and heritage assets due to flooding as a result of the proposed development; Damage to crops.	Relevant catchment area modelled in the Flood Risk Assessment (FRA)	Major	Medium term	Category B	**Outline Drainage Strategy** - sets out measures for the attenuation of flood waters during construction of the main development site and associated development sites and the operation of temporary associated development sites via Sustainable Drainage Systems (SuDS), where required. Furthermore, a groundwater control strategy is proposed to manage groundwater flooding risk at the main development site. Foul water drainage strategy sets out measures to prevent sewer flooding. Maintenance and cleaning schedule would be implemented for the management of the drainage system. **Code of Construction Practice (CoCP)** - sets out requirements for emergency preparedness and monitoring of extreme weather events. 24/7 on-site emergency response provision and financial contributions to emergency services. **Flood risk emergency plan** - to identify safe access and escape routes, demonstrate free and safe movement of people during a design flood and set out the potential for evacuation before a more extreme event.	Remote	Tolerable	Not significant	Flood Risk Assessments (FRAs) Outline Drainage Strategy Code of Construction Practice (CoCP) Community Safety Management Plan (CSMP)
C2	Coastal flooding	MDS	Coastal flooding as a result of a storm event or tsunami or breach of flood defences resulting in the flooding of the construction and surrounding areas. Not covered under this item: Release of contaminants into the environment, resulting in a major pollution incident due to run-off from the construction site (see Risk ID C18 and C19); Disruption to utilities (Covered under risk IDs C20-23 and IDs C41-C44).	On site: Construction personnel and equipment Off-site: Properties General public Agricultural land and livestock Sensitive environmental receptors - biodiversity / ecological, heritage receptors	On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury; Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.	Relevant catchment area modelled in the Flood Risk Assessment (FRA)	Major	Medium term	Category B	**Main development site design -** as construction works progress, measures embedded within design will mitigate the risk of flooding. These measures include: -during initial stages of construction, a temporary reinforced coastal flood defence with crest level of 7m AOD would be built to form a haul road used for construction until the main sea defence is completed. - a raised platform to a level of 7.3m AOD, which has been set above the still water level for 1 in 1,000-year return period events for the theoretical maximum lifetime of the proposed development with an allowance for sea level rise with climate change. - The new coastal flood defence crest level would be 10.2m AOD with adaptive design to potentially raise the defence up to 14.2m AOD in the future to minimise the risk of overtopping in the later stages of the proposed development's lifetime, if required. The crest height has been set above the still water level for 1 in 10,000 year return period events over the lifetime of the proposed development with an allowance for sea level rise with climate change. - An adaptive design for the SSSI crossing to enable future raising from 7.3m AOD to 10.5m AOD to reduce the risk of overtopping. **CoCP** - sets out requirements for emergency preparedness and monitoring of extreme weather events. An appropriate risk management plan is required for the initial stages of construction while the temporary coastal defence is being constructed. **Section 106 -** financial contributions to emergency services. 24/7 on-site emergency response provision	Remote	Tolerable	Not significant	FRA CoCP CSMP
C3	Storms and Gales	MDS/ AD	Strong winds resulting in the potential movement of debris across the construction site.	On site: Construction personnel and equipment Utilities Off-site: Properties General public	On site: Damage to construction equipment and risk of injury or death of construction personnel; Off-site: Damage to property and risk of injury to general public	500m radius	Major	Very long or permanent	Category D	**CoCP** - sets out requirements for monitoring of extreme weather events. A safe system of work will be established for the operation of lifting equipment, including the fitting of lifting equipment with anemometers and stopping work during strong winds, if required, in line with the requirements of Lifting Operations and Lifting Equipment Regulations 1998 (LOLER). 24/7 on-site emergency response provision and financial contributions to emergency services.	Extremely improbable	Tolerable	Not significant	CoCP CSMP
C4	Drought	MDS/ AD	Prolonged periods of dry weather creating hard and dry surfaces across the construction site. Potential creation of dust from construction site due to dry weather Not covered under this item: Heat exhaustion of construction personnel (considered under risk ID C5); Wildfires (considered under risk ID C12)	On site: Construction personnel and equipment Off-site: Properties General public Agricultural land Sensitive environmental receptors - biodiversity / ecological, heritage receptors	On site: Soiling of equipment; Off-site: Dust deposition on properties, agricultural land, and sensitive environmental sites.	500m radius	No Serious Damage	Short term	Not a MA&D	The effects are unlikely to result in serious damage as defined for the purposes of the MA&D assessment. Effects due to dust emissions from the construction site and appropriate mitigation have been considered as part of the air quality assessments presented in Volumes 2 to 9 of the ES.	N/A	N/A	Not significant	Air Quality ES and ES Addenda chapters CoCP
C5	Heatwave	MDS/ AD	Extreme heat impacting construction workers	On site: Construction personnel	On site: Heat exhaustion of construction personnel	Site only	Severe	Short Term	Not a MA&D	The effects are unlikely to fall within the scope of the MA&D assessment. On-site 24/7 Sizewell Health service would provide first aid.	N/A	N/A	Not significant	
C6	Cold and snow	MDS/ AD	Extreme cold weather including snowfall impacting the construction site Not covered under this item: Utilities freezing on-site - see disruption to utilities (Covered under risk IDs C20-23 and IDs C41-C43). Icy surfaces resulting in traffic accidents involving construction traffic - see Risk ID C37 Melting snow and ice washing pollutants and contaminants into surrounding areas - see Risk ID C18 and C19	On site: Construction personnel and equipment	On site Risk to the health of construction workers due to freezing temperatures; Failure of construction machinery;	Site only	Severe	Medium term	Category A	**CoCP** - sets out requirements for emergency preparedness and monitoring of extreme weather events. A safe system of work will be established for the operation of construction machinery and for undertaking works, which will consider risks associated with adverse weather conditions, such as snow (e.g. risks associated with frozen machinery, as well as any increased risk of slips, trips and falls for work at height). 24/7 on-site emergency response provision. The contractor is to comply with the provisions of the Health and Safety at Work Act 1974, ensuring occupational health and safety arrangements are in place;	Remote	Tolerable	Not significant	CoCP CSMP
C7	Lightning and Electrical Storms	MDS/ AD	Tall equipment which may attract lightning (e.g. cranes) Not covered under this item: Fire at a Sizewell C Project site (considered under risk IDs C14 and C15). Loss of electricity (considered under risk IDs C20) Loss of telecommunications (considered under risk IDs C23)	On site: Construction personnel and equipment	On site: Damage to construction equipment and risk of injury or death of construction personnel;	Site only	Major	Very long or permanent	Category D	**CoCP** - sets out requirements for emergency preparedness and monitoring of extreme weather events. A safe system of work will be established for the operation of equipment which may attract lightning or for any works at increased risk (e.g. roofing, pipework etc.). 24/7 on-site emergency response provision	Extremely improbable	Tolerable	Not significant	CoCP CSMP
C8	Reduced visibility, e.g. due to volcanic ash, dust, sand or fog	MDS/ AD	Volcanic eruptions overseas can produce ash clouds which may reach the UK and impact on the construction site. Reduced visibility at the construction site due to weather. Not covered under this item: Traffic accidents involving construction traffic due to adverse weather - see Risk ID C37	On site: Construction personnel	On site: Deposition of ashes, sand on construction areas and equipment Reduced visibility limiting construction works.	Site only	No Serious Damage	Short term	Not a MA&D	The effects are unlikely to result in serious damage as defined for the purposes of this assessment, assuming that any work would stop if visibility was seriously reduced. **CoCP** - sets out requirements for emergency preparedness and monitoring of extreme weather events.	N/A	N/A	Not significant	CoCP
C9	Ground instability hazards, e.g. landslides, ground collapse and sinkholes	MDS/ AD	Unstable ground conditions, landslides, sinkholes following heavy rainfall	On site: Construction personnel and equipment Off-site: Properties General Public Agricultural Land Sensitive environmental receptors	On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury; Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.	500m	Major	Very long or permanent	Category D	**Ground investigation -** Additional ground investigation to confirm ground conditions and ground related risks. **Geotechnical design** - design of earthworks and foundations and selection of materials in accordance with relevant standards, taking into account potential for ground movement and compaction.	Extremely Remote	TifALARP	Not significant	Geology and Land Quality ES and ES Addenda chapters
C10	Seismic hazards such as earthquakes or tremors	MDS/ AD	Earthquakes, tremors resulting in physical damage	On site: Construction personnel and equipment Off-site: Properties General Public Agricultural Land Sensitive environmental receptors (ecological and heritage sites)	On site: Collapse and subsidence of ground can lead to damage to equipment or injury; Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.	500m	Catastrophic	very long term or permanent	Category D	24/7 on site emergency services provision. **Geotechnical design -** design of earthworks and foundations and selection of materials in accordance with relevant standards, taking into account potential for ground movement and compaction. All safety critical features would be seismically qualified.	Extremely Improbable	Tolerable	Not significant	British Geological Survey and Musson and Sargeant (2007)
C11	Space weather (e.g. geomagnetic storms, radiation storms and solar flares)	MDS/ AD	Increased radiation risk to human health Disruption to railway signalling Not covered under this item: Loss of communication (covered under risk ID C23 and C44) Loss of electricity transmission network (covered under risk IDs C20 and C41)	On site: Construction workers	On-site Increase in exposure to radiation resulting in illness Disruption to the use of East Suffolk Line, Saxmundham to Leiston branch line and green rail route	Site only	No Serious Damage	Short term	Not a MA&D	In line with Public Health England guidance, a significant space weather event may cause people on the ground to receive an unusual radiation dose, however it would be far too small to produce an observable health effect Disruption to railway signalling would stop freight trains from running, however is unlikely to result in serious damage.	N/A	N/A	Not significant	Cabinet Office (2015) Space weather preparedness strategy. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/449593/BIS-15-457-space-weather-preparedness-strategy.pdf PHE (2014) Space weather and radiation. Available at: https://www.gov.uk/guidance/space-weather-and-radiation

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Proposed mitigation	Post-mitigation			Sources of information
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence		Likelihood	Tolerability	Significance of Risk	
C12	Wildfires	MDS/ AD	Wildfire spreading onto the construction site <u>Not covered under this item:</u> Emergency response activities could result in impacts on sensitive receptors off-site (covered under risk ID C24)	On site: Construction personnel and equipment Off-site: Properties General Public Agricultural Land Sensitive environmental receptors (ecological and heritage sites)	On site: Damage to construction equipment and risk of injury or death of construction personnel; Off site: Fire spreading from site to a neighbouring site resulting in damage to property and risk of injury or death to the general public; Physical damage to sensitive environmental receptors; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.	500m	Catastrophic	very long term or permanent	Category D	**CoCP** - sets out requirements for fire prevention and control. 24/7 on-site emergency response provision	Extremely Improbable	Tolerable	Not significant	Met Office Fire Severity Index
C13	Extreme humidity condition (high and low)	MDS/ AD	Periods of high and low humidity impacting the construction site	On site: Construction personnel and equipment	On site: Risk of illness for construction personnel and failure of equipment.	Site only	Severe	Short Term	Not a MA&D	The effects are unlikely to fall within the scope of the MA&D assessment. On-site 24/7 Sizewell Health service would provide first aid.	N/A	N/A	Not significant	N/A
Vulnerability of the construction of the proposed development to major accidents from on-site sources and the potential major accidents resulting from construction works and operation of temporary associated developments														
C14	Fire and/or explosion at the main development site	MDS	Cutting or drilling into unidentified utilities; Release of ground gas as a result of construction activities; Fire/ explosion at a neighbouring site leading to a domino effect; Unexploded Ordnance (UXO); Storage and handling of fuel or other flammable and combustible material; Electrical faults and faulty wiring; Hot work operations (e.g. welding, smouldering, grinding etc.); Smoking; Portable heaters; Temporary lighting and lamps; Not covered under this item: Emergency response activities could result in impacts on sensitive receptors off-site (covered under risk ID C24)	On site: Construction personnel and equipment Off-site: Properties General Public Agricultural Land Sensitive environmental receptors (ecological and heritage sites)	On site: Damage to construction equipment and risk of injury or death of construction personnel; Off-site: Fire spreading from site to a neighbouring site resulting in damage to property and risk of injury or death to the general public; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.	500m	Major	very long term or permanent	Category D	**CoCP** - utilities searches, further Ground Investigations, and a detailed UXO desk study and risk assessment would be used to determine mitigation measures required to minimise risks associated with these hazards. Fire safety risks at the construction site will be managed in compliance with CDM Regulations 2015 and Regulatory Reform (Fire Safety) Order 2005 (FSO) (England and Wales). A fire risk assessment will be completed and implemented to manage the risks throughout construction, including emergency plans and procedures and measures for the safe storage and handling of fuel. Any hot work operations will be completed under a Hot Work Permit. **Main development site design** - Gas mitigation measures would be provided in the buildings on site and other relevant structures where required, the design of which would be dependent on the risk profile and the nature/usage of the building/structure. 24/7 on-site emergency response provision and financial contributions to emergency services.	Extremely Remote	TifALARP	Not significant	CoCP CSMP
C15	Fire and/or explosion at the off-site associated development sites	AD	Cutting or drilling into unidentified utilities; Release of ground gas as a result of construction activities; Fire/ explosion at a neighbouring site leading to a domino effect; Unexploded Ordnance (UXO); Storage and handling of fuel or other flammable and combustible material; Electrical faults and faulty wiring; Hot work operations (e.g. welding, smouldering, grinding etc.); Smoking; Portable heaters; Temporary lighting and lamps; <u>Not covered under this item:</u> Emergency response activities could result in impacts on sensitive receptors off-site (covered under risk ID C24)	On site: Construction personnel and equipment Off-site: Properties General Public Agricultural Land Sensitive environmental receptors (ecological and heritage sites)	On site: Damage to construction equipment and risk of injury or death of construction personnel; Off-site: Fire spreading from site to a neighbouring site resulting in damage to property and risk of injury or death to the general public; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition;	500m	Major	very long term or permanent	Category D	**CoCP** - utilities searches, further Ground Investigations, and a detailed UXO desk study and risk assessment would be used to determine mitigation measures required to minimise risks associated with these hazards. Fire safety risks at the construction site will be managed in compliance with CDM Regulations 2015 and Regulatory Reform (Fire Safety) Order 2005 (FSO) (England and Wales). A fire risk assessment will be completed and implemented to manage the risks throughout construction, including emergency plans and procedures and measures for the safe storage and handling of fuel. Any hot work operations will be completed under a Hot Work Permit. **Associated development site design** - Gas mitigation measures would be provided in the buildings on site and other relevant structures where required, the design of which would be dependent on the risk profile and the nature/usage of the building/structure. 24/7 on-site emergency response provision and financial contributions to emergency services.	Extremely Remote	TifALARP	Not significant	CoCP CSMP Geology and land quality ES and ES Addenda chapters
C16	Unexploded Ordnance in the marine environment	MDS	Disturbance of unidentified UXO during the installation of marine infrastructure	On site: Construction personnel and equipment Sensitive environmental receptors - marine environment receptors Off-site: Sensitive environmental receptors - marine ecology	On site: Death or injury of construction personnel. Mortality and potential mortal injury of fish species and marine mammals Off-site: Mortality and potential mortal injury of fish species and marine mammals	3.5km of offshore works area	Major	very long term or permanent	Category D	**Draft Marine Mammal Mitigation Protocol** - detailed marine UXO risk assessment would be used to determine mitigation measures required to minimise risks. If UXOs are discovered at the site, alternative disposal methods and relocation would be considered over underwater detonations, if possible.	Extremely remote	TifALARP	Not significant	Marine Ecology and Fisheries ES and ES Addenda chapters
C17	Ground instability - collapse of deep excavations and stockpiles	MDS/ AD	Collapse of slopes during deep excavations and stockpiling	On site: Construction personnel and equipment Off-site: Properties General Public Agricultural Land Sensitive environmental receptors (ecological and heritage sites)	On site: Collapse and subsidence of ground that can lead to damage to equipment and death or injury of construction personnel. Off-site: Damage to property, agricultural land, heritage assets and risk of injury or death to the general public; Physical damage to sensitive environmental sites.	500m	Major	very long term or permanent	Category D	**Ground investigation** - Additional ground investigation to confirm ground conditions and ground related risks. **Geotechnical design** - design of earthworks and foundations and selection of materials in accordance with relevant standards, taking into account potential for ground movement and compaction. **Materials Management Strategy (MMS)** - stockpiling of materials will be undertaken in accordance with the MMS. **Main development site design** - deep excavation within the cut off wall will be sheet piled and ground anchors used to maintain the stability of slopes.	Extremely remote	TifALARP	Not significant	Geology and Land Quality ES and ES Addenda chapters
C18	Major leaks and spillages at the main development site resulting in contamination or release of hazardous substances	MDS	Handling and storage of hazardous substances, i.e. chemicals and fuels; Loss of containment; Contaminated run-off from site; Creation of new drainage pathways to sensitive receptors	On site: Construction personnel and equipment Off-site: Properties General public Agricultural land Sensitive environmental receptors (ecological and heritage sites, groundwater, surface water and marine receptors)	On site: Risk of contact with hazardous substances to construction personnel Off-site: Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	5km	Major	Long term	Category C	**Outline Drainage Strategy** - measures embedded within the drainage design for pollution prevention and control. **CoCP** - measures relating to pollution prevention included within the CoCP, including arrangements for incident response and control, compliance with regulatory requirements (such as Control of Substances Hazardous to Health Regulations) and environmental permits.	Remote	TifALARP	Not significant	Outline Drainage Strategy CoCP
C19	Major leaks and spillages at the off-site associated development sites resulting in contamination or release of hazardous substances	AD	Handling and storage of hazardous substances, i.e. chemicals and fuels (note quantity of hazardous substances to be stored at AD sites is expected to be minimal); Loss of containment; Contaminated run-off from site; Creation of new drainage pathways to sensitive receptors	On site: Construction personnel and equipment Off-site: General public Agricultural land Sensitive environmental receptors (ecological and heritage sites, groundwater and surface water receptors)	On site: Risk of contact with hazardous substances to construction personnel Off-site: Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	500m	Severe	Long term	Category B	**Outline Drainage Strategy** - measures embedded within the drainage design for pollution prevention and control. **CoCP** - measures relating to pollution prevention included within the CoCP, including arrangements for incident response and control, compliance with regulatory requirements (such as Control of Substances Hazardous to Health Regulations) and environmental permits.	Remote	Tolerable	Not significant	Outline Drainage Strategy CoCP
C20	Loss or failure of electricity transmission	MDS/ AD	Unidentified utilities impacted by excavation, piling, cutting and drilling works. Damage to electricity transmission network from meteorological conditions or due to flooding impacting the proposed development. <u>Not covered within this item:</u> Disruption of utilities can lead to an interruption of communications (covered under risk ID C23 and C44) and services which may increase other MA&D risks;	On site: Construction equipment and activity Off-site: Properties served by such utilities	On site: Failure of equipment reliant on mains power. Disruption to construction activity and the operation of AD sites. Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response. Limited ability to implement and effective safety, security and environmental management systems Off-site Disruption to properties Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.	500m	Severe	Medium term	Category A	**CoCP** - sets out requirements for emergency preparedness. Utilities connections would be protected at all times during the construction works. Inspection pits for buried utilities would be performed and clearances clearly demarcated on site. Critical services may require back up power supply or batteries. 24/7 on-site emergency response provision.	Remote	Tolerable	Not significant	
C21	Loss or failure of gas supply	MDS/ AD	Unidentified utilities impacted by excavation, piling, cutting and drilling works. Damage to gas supply network from meteorological conditions.	On site: Construction equipment and activity Off site: Properties served by such utilities	On site: Failure of equipment reliant on gas supply (e.g. CHP plant at accommodation campus). Disruption to construction activity and the operation of AD sites. Off-site Disruption to properties	500m	No Serious Damage	Short term	Not a MA&D	The loss of utilities is unlikely to result in serious damage as defined for the purposes of this assessment. Utilities connections would be protected at all times during the construction works. Inspection pits for buried utilities would be performed and clearances clearly demarcated on site.	N/A	N/A	Not significant	
C22	Loss or failure of water supply	MDS/ AD	Unidentified utilities impacted by excavation, piling, cutting and drilling works. Damage to water supply network from meteorological conditions.	On site: Construction equipment and activity Off-site: Properties served by such utilities	On site: Disruption to construction activity and the operation of AD sites. Limited ability for an emergency response plan to be implemented, if reliant on water supply, and delay to emergency response. Limited ability to implement and effective safety and environmental management systems Off-site Disruption to properties Limited ability for an emergency response plan to be implemented, if reliant on water supply, and delay to emergency response.	500m	Major	Long term	Category C	**CoCP** - sets out requirements for emergency preparedness. Utilities connections would be protected at all times during the construction works. Inspection pits for buried utilities would be performed and clearances clearly demarcated on site. 24/7 on-site emergency response provision. **Main development site design** - includes water resource storage area for the provision of on-site water supply.	Remote	TifALARP	Not significant	CoCP CSMP

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Proposed mitigation	Post-mitigation			Sources of information
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence		Likelihood	Tolerability	Significance of Risk	
C23	Loss or failure of telecommunications	MDS/ AD	Unidentified utilities impacted by excavation, piling, cutting and drilling works. Loss of telecommunications due to cyber attack Damage to electricity transmission or telecommunications networks from meteorological conditions.	On site: Construction activity Off-site: Properties served by such utilities	On site: Interruption of communications and services which may lead to other MA&D risks; Limited ability of an emergency response plan to be implemented and delay to emergency response Limited ability to implement effective safety, security and environmental management systems Off-site Disruption to properties Limited ability for an emergency response plan to be implemented and delay to emergency response	500m	Catastrophic	Very long term or Permanent	Category D	**CoCP** - sets out requirements for emergency preparedness. Utilities connections would be protected at all times during the construction works. Inspection pits for buried utilities would be performed and clearances clearly demarcated on site. 24/7 on-site emergency response provision.	Extremely Remote	TifALARP	Not significant	CoCP CSMP
C24	Emergency response activities implemented on a Sizewell C Project site impacting on sensitive receptors	MDS/ AD	Water from fire extinguishing draining into environmentally sensitive areas and/ or controlled waters	On site: Sensitive environmental receptors (surface water, groundwater, marine receptors) Off site: Agricultural land Sensitive environmental receptors (surface water, groundwater, marine)	On site: Contamination and pollution of identified sensitive environmental receptors Off-site: Contamination and pollution of identified sensitive environmental receptors	500m	Severe	Medium term	Category B	**Outline Drainage Strategy** - measures embedded within the drainage design for pollution prevention and control. **CoCP** - measures relating to pollution prevention included within the CoCP, including arrangements for incident response and control, compliance with regulatory requirements (such as Control of Substances Hazardous to Health Regulations) and environmental permits.	Remote	Tolerable	Not significant	Outline Drainage Strategy CoCP
C25	Absent or deficient safety and environmental management systems (e.g. inadequate planning, resource provision, procedures)	MDS/ AD	Increased risk of MA&D hazards described within this register.	On site: Construction personnel and equipment Off-site: General public Agricultural land Sensitive environmental receptors (ecological and heritage sites, groundwater, surface water and marine receptors)	As described within this register for all hazards relevant to the construction phase.	500m AD sites 5km MDS	Catastrophic	very long term or permanent	Category D	**CoCP** - construction works will be completed in compliance with accredited safety and environmental management systems (e.g. certified to ISO 45001 and 14001 standards or equivalent). Regular audits will be undertaken to monitor compliance against the site management systems.	Extremely remote	TifALARP	Not significant	CoCP
C26	Marine Navigation	MDS	Risk of collision, disruption to activities and vessel grounding	On-site/ off-site Construction personnel and equipment Commercial and fishing vessels Sensitive environmental receptors in the marine environment	On-site/ off-site Loss of life or injury Contamination of the marine environment	An assessment of the marine navigation risks is presented in Volume 2 , Chapter 24 of the ES. The assessment concludes that the all marine navigation risks are considered not significant. An assessment of marine navigation risks assoicated with Proposed Change 19 is presnted in Section 3.11 of Chapter 3 of the Fourth ES Addendum.				**CoCP** - measures set out within the CoCP to mitigate marine navigation risks during construction, including but not limited to communication of information, compliance with relevant regulatory requirements, deployment of temporary safety zones around works areas, implementation of a delivery and logistics plan and Fisheries Liaison Officer to safely manage marine navigation. Furthermore, buoyed construction zones and patrol launch to assist vessels in difficulty are proposed.	TifALARP, Not significant			Marine Navigation ES chapter and Navigational Risk Assessment CoCP Section 3.11 of Chapter 3 of the Fourth ES Addendum.
C27	Construction within the marine environment	MDS	Handling and storage of hazardous substances, i.e. chemicals and fuels; Loss of containment; Contaminated run-off from site;	On-site/ Off-site: Sensitive environmental receptors in the marine environment	Off-site: Risk of contact with hazardous substances by general public; Contamination of marine environment	5km	Catastrophic	very long term or permanent	Category D	**CoCP** - measures set out within the CoCP relating to pollution prevention in the marine environment, including compliance with relevant environmental permits for construction discharges to the sea, site-wide speed restrictions for all working vessels and compliance with relevant regulatory controls. Measures set out with regards to emergency arrangements and incident control.	Extremely remote	TifALARP	Not significant	Marine Ecology and Fisheries ES and ES Addenda chapters CoCP
C28	Absent or deficient security provision (e.g. inadequate planning, resource provision, procedures)	MDS/ AD	Increased risk of vandalism/ crime/ terrorism	On site: Construction personnel and equipment Off-site: General public	On site: Death or risk of injury to construction personnel; Damage to construction equipment Off-site: Risk of long term injury of death of members of the public	500m	Catastrophic	very long term or permanent	Category D	**Main development site and associated developments design -** Implements Secured By Design principles, provision of security fencing, lighting and CCTV amongst other security arrangements. **CoCP** - 24/7 on-site security provision. Security vetting and drug and alcohol testing will be implementing across the site. Required standards of behaviour as a condition for working on site will be set out in the Workers Code of Conduct. Preparation of Safe Systems of Work. **Section 106** - financial contributions to emergency services.	Extremely remote	TifALARP	Not significant	CSMP
C29	Ionising radiation risk from radiography during construction	MDS	Ionising radiation risk from radiography during construction, impacting on the health of site workers	On site: Construction personnel	On site: Risk of long term injury to construction personnel	Site only	Severe	Very long term or Permanent	Category C	**CoCP** - requirement for compliance with relevant regulatory requirements (e.g. Risk Analysis as required by the CDM Regulation, Ionising Radiation Regulations, regulations for the carriage of dangerous goods) **NSL** - contractors mobile permits.	Extremely remote	Tolerable	Not significant	Radiological Considerations ES Chapter
C30	Train derailment or collision	MDS/ AD	Object on the line human factors including driver error leading to train travelling at the wrong speed, signal error, unsafe decisions or points wrongly set Rolling stock failure	On site: Construction personnel and general public Off-site: General public	On site: Risk of injury or death to members of the public or construction personnel using a level crossing. Off-site: Risk of injury or death to members of the public or construction personnel in proximity to the operational railway.	Site only	Major	Very long term or Permanent	Category D	Design and operation in accordance with relevant Network Rail standards.	Extremely remote	TifALARP	Not significant	
C31	Injury to member of public using level crossing	AD	Introduction of new level crossings and increased train frequency at existing level crossings on the Saxmundham to Leiston branch line.	On site: Construction personnel and general public	On site: Risk of injury or death to members of the public or construction personnel using a level crossing.	Site only	Major	Very long term or Permanent	Category D	Design and operation in accordance with relevant Network Rail standards.	Extremely remote	TifALARP	Not significant	
Vulnerability of the construction of the main development site and associated developments, and operation of temporary associated developments to major accidents from off-site sources														
C32	Civil nuclear incident at Sizewell B	MDS	Civil nuclear incident at Sizewell B impacting Sizewell C construction	On site: Construction personnel and equipment	On-site: Risk of injury or death to construction workers and damage to equipment/ site	Site only	Major	Very long term or Permanent	Category D	**CoCP -** sets out requirements for emergency preparedness. 24/7 on-site emergency response provision **NSL-** LC 11 requires emergency arrangements on a nuclear licenced site that will reflect the adjacent hazard and the construction site area will be enveloped with this.	Extremely remote	TifALARP	Not significant	CoCP CSMP
C33	Fire at a neighbouring site	MDS/ AD	Fire at a neighbouring site impacting on the construction of the proposed development or the operation of temporary associated developments Not covered under this item: Potential to result in fire on site (covered under risk ID C14) Impeded access to site, limiting the ability to implement emergency response activities (covered under risk ID C49).	On site: Construction personnel and equipment	On-site: Indirect effects on human health and equipment due to smoke and ash deposition.	Site only	Severe	Short term	Not a MA&D	Effects are not likely to fall within the scope of the MA&D assessment. Sizewell Health will provide first aid on site.	N/A	N/A	N/A	
C34	Explosion and structural collapse at neighbouring sites	MDS/ AD	Explosion and structural collapse at a neighbouring site impacting on the construction of the proposed development or the operation of temporary associated developments Not covered under this item: Impeded access to the main development site, limiting the ability to implement emergency response activities (covered under risk ID C49);	On site: Construction personnel and equipment	On site: Falling debris or collapse of infrastructure within the neighbouring area resulting in damage to construction equipment and risk of injury of construction personnel	Site only	Major	Long term	Category C	**CoCP -** sets out requirements for emergency preparedness 24/7 on-site emergency response provision.	Extremely remote	Tolerable	Not significant	
C35	Contamination or release of hazardous substances by off-site sources	MDS/ AD	Contamination or release of hazardous substances from off-site sources impacting on the construction of the main development site and associated development or the operation of temporary associated development.	On site: Construction personnel	On site: Risk of contact with hazardous substances to construction personnel	Site only	No Serious Damage	Short term	Not a MA&D	Effects are not likely to fall within the scope of the MA&D assessment. Sizewell Health will provide first aid on site.	N/A	N/A	N/A	
C36	Vandalism/crime/terrorism leading to increased risk to the safety of members of public and site workers	MDS/ AD	Criminal damage/ vandalism; Theft; Terrorist acts; Unauthorised access to the construction site; Ionising radiation exposure from stolen goods.	On site: Construction personnel and equipment Off-site: General public	On site: Death or risk of injury to construction personnel; Damage to construction equipment Off-site: Risk of injury or death to the general public.	500m	Catastrophic	Very long term or Permanent	Category D	**Main development site and associated developments design -** Implements Secured By Design principles, provision of security fencing, lighting and CCTV amongst other security arrangements. **CoCP** - 24/7 on-site security provision. Security vetting and drug and alcohol testing will be implementing across the site. Required standards of behaviour as a condition for working on site will be set out in the Workers Code of Conduct. **Section 106** - financial contributions to emergency services.	Extremely improbable	TifALARP	Not significant	
C37	Road Traffic Accident on the wider traffic network (including high consequence dangerous goods)	MDS/ AD	Traffic accident on the wider traffic network involving Sizewell C construction traffic Traffic accident on the wider network involving the carriage of high consequence dangerous goods associated with Sizewell C construction Not covered under this item: Could limit the ability to implement emergency response activities (covered under risk ID 49);	Off-site: Motorised and non-motorised users of routes assigned for proposed development's construction traffic Properties Sensitive environmental receptors	Off-site: Death or injury of road users on construction personnel; Damage to properties; Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	Area modelled within the Transport Assessment	Major	very long term or permanent	Category D	**Construction Traffic Management Plan (CTMP)** and **Construction Worker Travel Plan (CWTP)** set out measures for the management of construction traffic, including measures to reduce risks associated with road safety. **Traffic Incident Management Plan** sets out arrangements to control Heavy Goods Vehicles (HGV) and bus movements in the event of an incident on the routes between park and rides and the main development site, and sets out proposals for coordinated working practices between EDF Energy, Suffolk County Council and emergency services in the event of a traffic incident. **Section 106 -** financial contributions to emergency services. Pollution prevention and control measures are set out under risk ID C18 and C19.	Extremely remote	TifALARP	Not significant	
C38	Civil unrest or protest	MDS/ AD	Members of the public protesting; Construction staff industrial action Not covered under this item: Criminal damage or vandalism - see risk ID C36.	On site: Construction personnel and equipment	On site: Disruption to construction activities.	Site only	No Serious Damage	Short term	Not a MA&D	No effects resulting in serious damage as defined for the purposes of this assessment are considered likely to occur as a result of civil unrest or protest.	N/A	N/A	Not significant	
C39	Outbreak of disease (emerging infectious disease or pandemic influenza)	MDS/ AD	Disease outbreak or epidemics impacting construction workers.	On site: Construction personnel and equipment	On site: Death or risk of injury to construction personnel.	Site only	Catastrophic	Very long term or Permanent	Category D	**Section 106** - On-site 24/7 Sizewell Health service for construction personnel and financial contributions to emergency services.	Extremely remote	TifALARP	Not significant	

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Post-mitigation			
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence	Proposed mitigation	Likelihood	Tolerability	Significance of Risk	Sources of information
C40	Animal health – notifiable disease	MDS/ AD	Disease outbreak impacting the movement of construction workers and materials. Not covered under this item: Impacts on limiting emergency response activities are considered under risk ID C49	On site: Construction personnel and equipment	On site: Restricted access to site	Area modelled within the Transport Assessment	No Serious Damage	Medium term	Not a MA&D	No effects resulting in serious damage as defined for the purposes of this assessment are considered likely to occur.	N/A	N/A	Not significant	
C41	Loss or failure of electricity transmission	MDS/ AD	Damage to electricity transmission network from other developments or meteorological conditions impacting on service provision for proposed development. Not covered within this item: Disruption of utilities can lead to an interruption of communications (covered under risk ID C23 and C44) and services which may increase other MA&D risks.	On site: Construction equipment and activity	On site: Failure of equipment reliant on mains power. Disruption to construction activity and the operation of AD sites. Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response. Limited ability to implement and effective safety, security and environmental management systems	Site only	Severe	Medium term	Category A	**CoCP** - sets out requirements for emergency preparedness. Critical services may require back up power supply or batteries. 24/7 on-site emergency response provision.	Remote	Tolerable	Not significant	
C42	Loss or failure of gas supply	MDS/ AD	Damage to gas supply network from other developments or meteorological conditions impacting on service provision for proposed development.	On site: Construction equipment and activity	On site: Failure of equipment reliant on gas supply (e.g. CHP plant at accommodation campus). Disruption to construction activity and the operation of AD sites.	Site only	No Serious Damage	Short term	Not a MA&D	The loss of utilities is unlikely to result in serious damage as defined for the purposes of this assessment.	N/A	N/A	Not significant	
C43	Loss or failure of water supply	MDS/ AD	Damage to water supply network from other developments or meteorological conditions impacting on service provision for proposed development.	On site: Construction equipment and activity	On site: Disruption to construction activity and the operation of AD sites. Limited ability for an emergency response plan to be implemented, if reliant on water supply, and delay to emergency response. Limited ability to implement and effective safety and environmental management systems	Site only	Major	Long term	Category C	**CoCP** - sets out requirements for emergency preparedness. 24/7 on-site emergency response provision. **Main development site design** - includes water resource storage area for the provision of on-site water supply.	Remote	TifALARP	Not significant	CoCP CSMP
C44	Loss or failure of telecommunications	MDS/ AD	Damage to electricity transmission or telecommunications networks from other developments or meteorological conditions impacting on service provision for proposed development.	On site: Construction activity	On site: Interruption of communications and services which may lead to other MA&D risks; Limited ability of an emergency response plan to be implemented and delay to emergency response Limited ability to implement effective safety, security and environmental management systems	Site only	Catastrophic	Very long term or Permanent	Category D	**CoCP** - sets out requirements for emergency preparedness. 24/7 on-site emergency response provision.	Extremely Remote	TifALARP	Not significant	CoCP CSMP
C45	Food supply contamination	MDS/ AD	Pollution incident Large radiation releases from nuclear matter	On site: Construction personnel	On site: Risk of injury to construction personnel.	Site only	Severe	Long term	Category B	**Section 106** - Sizewell Health will provide first aid on site. 24/7 on-site emergency response provision	Remote	Tolerable	Not significant	
C46	Local fuel supply failure	MDS/ AD	Risk of disruption to construction activities associated with availability of construction workforce	On site: Construction personnel	On site: Disruption to construction processes dependent on fuel supply; Limit the ability to implement and effective safety, security and environmental management systems Limited ability for an emergency response plan to be implemented, if reliant on fuel supply, and delay to emergency response.	Site only	Severe	Medium term	Category A	**Main development site and associated developments design** - connection to mains power would be provided at the early stage of the construction programme. **CoCP** - sets out requirements for emergency preparedness. Critical services may require back up power supply or batteries. 24/7 on-site emergency response provision.	Remote	Tolerable	Not significant	
C47	Poor air quality	MDS/ AD	Off-site event resulting in the release of particulate matter and hazardous gases into the surrounding environment.	On site: Construction personnel	On site: Risk of harm to the health of construction personnel	Site only	Severe	Short term	Not a MA&D	Effects are not likely to fall within the scope of the MA&D assessment. Sizewell Health will provide first aid on site.	N/A	N/A	Not significant	
C48	Cyber-attack and digital data security	MDS/ AD	Hackers Security breach of the construction site Not covered under this item: Could result in the failure or loss of telecommunications (covered under risk IDs C23 and C44). Unauthorised access to the site and risk of vandalism/ crime/ terrorism (covered under risk ID C36)	On site: Construction personnel and equipment;	On site: Loss of sensitive information which can increase the likelihood of crime/ terrorism/ vandalism; Could limit the ability to implement and effective safety, security and environmental management systems	Site only	Catastrophic	Very long term or Permanent	Category D	SZC Co will implement procedures and processes for dealing with sensitive information. Contractors will be required to comply with SZC Co requirements for data security.	Extremely Remote	TifALARP	Not significant	
C49	Aviation Crash	MDS/ AD	Aircraft incident within the construction site Not covered under this item. Fire and/ or explosion at the main development site or associated development sites (Covered under Risk ID C14 and C15) Fire at neighbouring site (Covered under Risk ID C33) Explosion or structural collapse at neighbouring site (Covered under Risk ID C34).	On site: Construction personnel and equipment	On site: Risk of injury to construction personnel.	Site only	Catastrophic	very long term or permanent	Category D	**CoCP** - sets out requirements for emergency preparedness 24/7 on-site emergency response provision	Extremely improbable	Tolerable	Not significant	
C50	Failure of financial system	MDS/AD	Failure of the financial system resulting in a reduced public services Not covered under this item. Impacts on the ability of an emergency response plan to be implemented (Covered under Risk ID C53)	On site: Construction personnel and equipment	On site: Limited ability of an emergency response plan to be implemented and delay to emergency response Increased response time or lack of available resources may lead to other MA&D risks	Site only	Catastrophic	Very long term or Permanent	Category D	**CoCP** - sets out requirements for emergency preparedness 24/7 on-site emergency response provision	Extremely improbable	Tolerable	Not significant	
C51	Radiation releases from foreign nuclear sites	MDS/ AD	Exposure of construction staff to radiation from foreign nuclear matter	On site: Construction personnel	On site: Risk of harm to the health of construction personnel	Site only	Severe	Long term	Category B	Effects are not likely to fall within the scope of the MA&D assessment. Sizewell Health will provide first aid on site.	Extremely improbable	Tolerable	Not significant	
C52	Influx of British Nationals	MDS/ AD	Displacement of construction staff in local accommodation resulting in disruption to construction activity	On site: Construction activity	No pathway to create a MA&D	Site only	No Serious Damage	Medium term	Not a MA&D	There is no pathway to create a MA&D.	N/A	N/A	Not significant	
Construction of the proposed development/ operation of temporary associated developments impacting on the vulnerability of a receptor to a MA&D hazard														
C53	Impacts on the ability of an emergency response plan to be implemented	MDS/ AD	Access for emergency services to construction site being restricted Construction works impeding or obstructing the response of emergency services for another site. Delivery of Abnormal Indivisible Loads (AIL) restricting the response of emergency services	On site: Construction personnel and equipment Off-site: General Public Agricultural Land Sensitive environmental receptors	On-site/ off-site Full or partial obstruction to the operation of emergency services, leading to a slow response time and increased number of deaths/ injuries or spread of contamination for risk events described for construction.	Construction traffic routes (HGV and AIL routes)	Catastrophic	Very long term or Permanent	Category D	**S 106 -** preparation of a Construction Travel Management Plan (CTMP) to set out arrangements for the management, monitoring and review of Sizewell C construction traffic and AILs (e.g. notifications of AILs to be provided to Highways England, SCC and police). **Main development site design:** Multiple emergency access routes provided to the main development site.	Extremely remote	TifALARP	Not significant	
OPERATION														
Vulnerability of the proposed development (main development and permanent associated developments) to natural disasters during operation														
O1	Flooding from rivers, surface water, groundwater reservoirs and sewers	MDS/ AD	Flooding of the site and properties downstream Run-off from site Not covered under this item: Release of contaminants into the environment, resulting in a major pollution incident due to run-off from the site (see Risk ID O14 and O17); Disruption to utilities (Covered under risk IDs O18-21 and IDs O34-O37). Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Sensitive environmental receptors on site Operational personnel Sizewell C infrastructure Off-site: General public Properties Agricultural land Sensitive environmental receptors (ecological and heritage receptors)	On site: Damage to Sizewell C infrastructure and risk of injury to operational personnel due to flooding; Off-site: Damage to and evacuation of affected properties due to flooding; Damage to crops; Physical damage to sensitive environmental receptors;	Relevant catchment area modelled in the Flood Risk Assessment (FRA)	Major	Medium term	Category B	**Main development site design -** The main platform level has been set above the 1 in 1,000-year fluvial flood event with climate change allowance up to the theoretical maximum site lifetime of 2190. Discharge of surface water drainage and treated effluent to the sea in compliance with an operational water discharge activity permit, with sufficient capacity to attenuate flows to maintain safe operation, access and no flooding of safety classified buildings. Furthermore buildings on the main platform would be built with a flood resistant design. Maintenance and cleaning schedule would be implemented for the management of the drainage system. Cut off wall will remain in place during operation which will mitigate the risk of groundwater flooding and any underground structures would be designed to be flood resistant. **Nuclear Site Licence (NSL)** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **Generic Design Assessment (GDA)** - safety measures embedded within design through the GDA process. **Associated developments design -** Two village bypass final finished ground levels have been set to be above the fluvial flood levels during a 1 in 100-year with an allowance for climate change. Similarly, the proposed development will not be at risk of surface water flooding due to the highway drainage design. There is very limited risk of flooding of Sizewell link road, and highway improvements sites. **Flood risk emergency plan** - to identify safe access and escape routes, demonstrate free and safe movement of people during a design flood and set out the potential for evacuation before a more extreme event.	Remote	Tolerable	Not significant	Outline Drainage Strategy FRA

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Post-mitigation			
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence	Proposed mitigation	Likelihood	Tolerability	Significance of Risk	Sources of information
O2	Coastal flooding	MDS	Coastal flooding as a result of a storm event or tsunami or breach of flood defences resulting in the flooding of the main platform and surrounding areas Not covered under this item: Release of contaminants into the environment, resulting in a major pollution incident due to run-off from the site (see Risk ID O14 and O17); Disruption to utilities (Covered under risk IDs O18-21 and IDs O34-O37). Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Operational personnel Sizewell C infrastructure Off site: Properties General public Agricultural land Sensitive environmental receptors (ecological and heritage receptors)	On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury; Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors;	Relevant catchment area modelled in the Flood Risk Assessment (FRA)	Catastrophic	very long term or permanent	Category D	**Main development site design** - measures embedded within design: - a raised platform to a level of 7.3m AOD, which has been set above the still water level for 1 in 1,000-year return period events for the theoretical maximum lifetime of the proposed development with an allowance for sea level rise with climate change. - The new coastal flood defence crest level would be 10.2m AOD with adaptive design to potentially raise the defence up to 14.2m AOD in the future to minimise the risk of overtopping in the later stages of the proposed development's lifetime, if required. The crest height has been set above the still water level for 1 in 10,000 year return period events over the lifetime of the proposed development with an allowance for sea level rise with climate change. -An adaptive design for the SSSI crossing to enable future raising from 7.3m AOD to 10.5m AOD to reduce the risk of overtopping. **NSL -** in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process.	Extremely remote	TifALARP	Not significant	FRA
O3	Storms and Gales	MDS/ AD	Strong winds resulting in the potential movement of debris across the site. Not covered under this item: Road traffic accidents on 2VBP and SLR (see risk ID O29)	On site: Operational personnel Sizewell C infrastructure	On site: Damage to Sizewell C infrastructure and risk of injury or death of operational personnel and road users;	Site only	Severe	Very long or permanent	Category C	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process	Extremely improbable	Tolerable	Not significant	
O4	Drought	MDS/ AD	Prolonged periods of dry weather creating hard and dry surfaces across the site. Potential creation of dust from site due to dry weather Not covered under this item: Heat exhaustion of personnel (considered under risk ID O5); Wildfires (considered under risk ID O12)	On site: Operational personnel and equipment Off-site: Properties General public Agricultural land Sensitive environmental receptors	On site: Soiling of equipment; Off-site: Dust deposition on properties, agricultural land, and sensitive environmental sites;	500m radius	No Serious Damage	Short term	Not a MA&D	The effects are unlikely to result in serious damage as defined for the purposes of the MA&D assessment. Effects due to dust emissions from the operation of the site and appropriate mitigation have been considered as part of the air quality assessments presented in Volumes 2 to 9 of the ES.	N/A	N/A	Not significant	Air Quality ES and ES Addenda chapters
O5	Heatwave	MDS/ AD	Extreme heat impacting operational workers Not covered under this item: Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Operational personnel	On site: Heat exhaustion of operational personnel;	Site only	Severe	Short Term	Not a MA&D	The effects are unlikely to fall within the scope of the MA&D assessment.	N/A	N/A	Not significant	
O6	Cold and snow	MDS/ AD	Extreme cold weather resulting in snow and ice on site Not covered under this item: Utilities freezing on-site - see disruption to utilities (Covered under risk IDs O18-21 and IDs O34-O37). Icy surfaces resulting in traffic accidents - see Risk ID O29 Melting snow and ice washing pollutants and contaminants into surrounding areas - see Risk ID O14 and O17 Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Operational personnel	On site Risk to the health of operational personnel due to freezing temperatures;	Site only	Severe	Medium term	Category A	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process	Remote	Tolerable	Not significant	
O7	Lightning and Electrical Storms	MDS/ AD	Risk of cloud-to-ground lightning striking within site during operation and maintenance activities Not covered under this item: Fire at the main development site (considered under risk IDs O14). Loss of electricity (considered under risk IDs O18) Loss of telecommunications (considered under risk IDs O21)	On site: Operational personnel	On site: Damage to Sizewell C infrastructure and risk of injury or death of operational personnel.	Site only	Major	Very long or permanent	Category D	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process	Extremely improbable	Tolerable	Not significant	
O8	Reduced visibility, e.g. due to volcanic ash, dust, sand or fog	MDS/ AD	Volcanic eruptions overseas can produce ash clouds which may reach the UK and impact on the construction site. Reduced visibility due to weather. Not covered under this item: Traffic accidents - see risk ID O29	On site: Operational personnel	On site: Deposition of ashes and sand on site. Reduced visibility limiting operational activities.	Site only	No Serious Damage	Short term	Not a MA&D	The effects are unlikely to result in serious damage as defined for the purposes of this assessment.	N/A	N/A	Not significant	
O9	Ground instability hazards, e.g. landslides, ground collapse and sinkholes	MDS/ AD	Unstable ground conditions, landslides, sinkholes following heavy rainfall. Risks associated with existing ground conditions (e.g. ground instability) get mitigated during the construction of the proposed development. Therefore during operation, no hazard source - receptor pathway remains.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Geology and Land Quality ES and ES Addenda chapters
O10	Seismic hazards such as earthquakes or tremors	MDS/ AD	Earthquakes, tremors resulting in physical damage Not covered under this item: Traffic accidents - see risk ID O29 Damage to equipment/ structures resulting in a nuclear incident (see risk ID O14)	On site: Operational personnel Sizewell C infrastructure Off-site: General public Properties Agricultural land Sensitive environmental receptors (ecology and heritage sites)	On site: Collapse and subsidence of ground can lead to damage to equipment and risk of injury or death to operational personnel; Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.	500m	Catastrophic	very long term or permanent	Category D	Data collated by British Geological Survey and Musson and Sargeant (2007) demonstrate that the seismic hazard of the UK is considered to be very low. **NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. Seismic qualification of safety critical structures. **GDA** - safety measures embedded within design through the GDA process	Extremely Improbable	Tolerable	Not significant	
O11	Space weather (e.g. geomagnetic storms, radiation storms and solar flares)	MDS/ AD	Disruption of telecommunications Not covered under this item: Loss of telecommunication (covered under risk ID O21 and O37) Loss of electricity transmission network (covered under risk IDs O18 and O34 Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Operational personnel Sizewell C infrastructure	On site: Increase in exposure to radiation resulting in illness	Site only	No Serious Damage	Short term	Not a MA&D	In line with Public Health England guidance, a significant space weather event may cause people on the ground to receive an unusual radiation dose, however it would be far too small to produce an observable health effect	N/A	N/A	Not significant	Cabinet Office (2015) Space weather preparedness strategy. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/449593/BIS-15-457-space-weather-preparedness-strategy.pdf PHE (2014) Space weather and radiation. Available at: https://www.gov.uk/guidance/space-weather-and-radiation
O12	Wildfires	MDS/ AD	Wildfire spreading onto the construction site Not covered under this item: Emergency response activities could result in impacts on sensitive receptors off-site (covered under risk ID O22)	On site: Operation personnel Sizewell C infrastructure Off site: Properties General public Agricultural land Sensitive environmental receptors (ecological and heritage sites)	On site: Damage to buildings and equipment and risk of injury or death of operational personnel; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition. Off-site: Fire spreading from site to a neighbouring site resulting in damage to property and risk of injury or death to the general public; Physical damage to sensitive environmental receptors; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.	500m	Catastrophic	very long term or permanent	Category D	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process	Extremely remote	TifALARP	Not significant	
O13	Extreme humidity conditions (high and low);	MDS/ AD	Periods of high and low humidity impacting the site Not covered under this item: Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Operational personnel	On site: Risk of illness for operational personnel.	Site only	Severe	Short Term	Not a MA&D	The effects are unlikely to fall within the scope of the MA&D assessment.	N/A	N/A	Not significant	N/A
Vulnerability of the operation of the proposed development to major accidents from on-site sources and the potential major accidents resulting from its operation														

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Proposed mitigation	Post-mitigation			Sources of information
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence		Likelihood	Tolerability	Significance of Risk	
O14	Civil nuclear incident or major accident at Sizewell C	MDS	Nuclear incident Internal Missiles, explosions, Fire and flooding Internal Explosions Internal Fire Internal Flooding Internal Electromagnetic Interference (EMI) / Radiofrequency interference (RFI) Accidental aircraft crash Malfunctioning of equipment Major leaks and spillages Radiography	On site: Sizewell C workers Off-site: General public Agricultural land Sensitive environmental receptors (ecological, heritage sites, groundwater, surface water, marine receptors)[1]	On-site: Risk of injury or death to workers Off-site: Risk of injury or death to general public Contamination of sensitive environmental receptors	Separate regulatory processes are in place to assess and control the safety of UK EPRTM reactors for the operation of the Sizewell C nuclear power station, a detailed risk assessment is therefore not presented as part of the EIA. These hazards would be assessed in detail as part of the Nuclear Site Licensing requirements. For example, as part of Nuclear Site Licensing Regime, NNB GenCo (SZC) will need to ensure the safe operation of the Sizewell C Project and protection of the workers, public and environment. This includes providing the Office for Nuclear Regulation with a robust Safety Case demonstrating that all hazards associated with the development or that may impact the development are well understood and adequate arrangements are in place to reduce these risks to an acceptable level. In addition, it requires appropriate emergency plans and arrangements to be established and agreed with the local authority, for the range of accidents and incidents that could occur. These processes will ensure that risks relating to Nuclear Safety are reduced to TifALARP. Furthermore the assessment of risks associated with the use and storage of hazardous substances will be assessed and consented under the COMAH				**GDA -** Nuclear safety principles established as part of the Generic Design Assessment process and subsequent detailed safety assessment process. **NSL -** Compliance with the requirements of Nuclear Site Licence **REPPIR -** On-site and off-site emergency arrangements in compliance with REPPIR **COMAH and HSC -** Compliance with the requirements of operational environmental permits, COMAH consent and Hazardous Substances Consent **Environmental permits** - discharges will be made in compliance with the requirements of the water discharge activity, combustion activity and radioactive substances regulations permits.	TifALARP, Not significant			Radiological Considerations ES Chapter
O15	Marine Navigation	MDS	Risk of collision, disruption to activities and vessel grounding	On-site/ off-site Operational personnel and equipment Commercial and fishing vessels Sensitive environmental receptors in the marine environment	On-site/ off-site Loss of life or injury Contamination of the marine environment	An assessment of the marine navigation risks is presented in Volume 2 , Chapter 24. The assessment concludes that the all marine navigation risks are considered not significant.				**Main development site design** - Intake/outfall structures will be marked with buoys or beacons. Offshore pilings for the BLF will be marked with buoys. During AIL deliveries, a temporary safety zone or minimum safe passing distances will apply, thereby restricting access to beachfront recreational and fishing activities in immediate area. A delivery and logistics plan will be developed for AIL deliveries. Cooling water intake/outfall headwork positions will be marked on Admiralty charts. Details of the cooling water intake/outfall headwork positions will be included in fishermen's awareness charts issued by Kingfisher. Notice to Mariners to identify presence of infrastructure	TifALARP, Not significant			Marine Navigation ES and ES Addenda chapters and Navigational Risk Assessment
O16	Ground instability and Unexploded Ordnance	MDS/ AD	Collapse of ground during maintenance activities Disturbance of unidentified UXO within the site Risks associated with existing ground conditions (e.g. ground instability) get mitigated during the construction of the proposed development. Therefore during operation, no hazard source - receptor pathway remains	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
O17	Major leaks and spillages at two village bypass and Sizewell link road resulting in contamination or release of hazardous substances	AD	Leaks and spillages from road traffic accidents; Contaminated run-off from site;	On site: Sensitive environmental receptors on site Operational personnel Sizewell C infrastructure Off-site: General public Properties Agricultural land Sensitive environmental receptors (ecological, heritage, groundwater and surface water receptors)	On site: Risk of contact with hazardous substances to workforce and general public Off-site: Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	500m	Severe	Long term	Category B	**Outline Drainage Strategy -** measures embedded within the drainage design for pollution prevention and control.	Remote	Tolerable	Not significant	Outline Drainage Strategy
O18	Loss or failure of electricity transmission	MDS/ AD	Damage to electricity transmission network from meteorological conditions or due to flooding impacting the site Not covered under this item: Disruption of utilities can lead to an interruption of communications (covered under risk ID O21 and O37) and services which may increase other MA&D risk Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Operation of Sizewell C Off-site: Properties served by such utilities	On site: Failure of equipment reliant on mains power. Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response. Limited ability to implement an effective safety, security and environmental management systems Off-site Disruption to properties Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response	2km	Severe	Medium term	Category A	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Remote	Tolerable	Not significant	
O19	Loss or failure of gas supply	MDS	Damage to gas supply network from meteorological conditions.	On site: Operation of Sizewell C	On-site Failure of back up CHP plant	Site only	No Serious Damage	Short term	Not a MA&D	The loss of gas supply is unlikely to result in serious damage as defined for the purposes of this assessment	N/A	N/A	Not significant	
O20	Loss or failure of water supply	MDS/ AD	Damage to water supply network from meteorological conditions.	On site: Operation of Sizewell C	On site: Disruption to operation Limited ability for an emergency response plan to be implemented, if reliant on water supply, and delay to emergency response. Limited ability to implement and effective safety and environmental management systems	Site only	Major	Long term	Category C	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Remote	TifALARP	Not significant	
O21	Loss or failure of telecommunications	MDS/ AD	Cyber Attack Damage to electricity transmission or telecommunications networks from meteorological conditions.	On site: Operation of Sizewell C	On site: Interruption of communications and services which may lead to other MA&D risks; Limited ability of an emergency response plan to be implemented and delay to emergency response Limited ability to implement effective safety, security and environmental management systems	Site only	Catastrophic	Very long term or Permanent	Category D	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Extremely Remote	TifALARP	Not significant	
O22	Emergency response activities implemented on the main development site impacting on sensitive receptors	MDS/ AD	Water from fire extinguishing draining into environmentally sensitive areas and/ or controlled waters	Off-site: Sensitive environmental receptors (surface water, groundwater, marine); Agricultural land	Off-site: Contamination and pollution of identified sensitive environmental receptors	500m	Severe	Medium term	Category B	**Outline Drainage Strategy** - measures embedded within the drainage strategy for pollution prevention and control. **NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process	Remote	Tolerable	Not significant	
O23	Absent or deficient safety/ environmental management systems (e.g. inadequate planning, resource provision, procedures)	MDS/ AD	Increased risk of MA&D hazards described within this register.	On site: Operational personnel Off-site: General public agricultural land Sensitive environmental receptors (ecological and heritage sites, groundwater, surface water and marine receptors)	As described within this register for all hazards relevant to the operation phase.	As determined under REPPIR	Catastrophic	very long term or permanent	Category D	**NSL** - Procedures and processes are required and are routinely audited by both internal and external regulators under the Nuclear Site Licence (LC17)	Extremely remote	TifALARP	Not significant	
O24	Absent or deficient security provision (e.g. inadequate planning, resource provision, procedures)	MDS/ AD	Increased risk of vandalism/ crime/ terrorism	On site: Operational personnel Off-site: General public	On site: Risk of long term injury or death of operational personnel Damage to Sizewell C infrastructure Off-site: Risk of long term injury of death of members of the public	As determined under REPPIR	Catastrophic	very long term or permanent	Category D	**NSL** - Procedures and processes are required and are routinely audited by both internal and external regulators under the Nuclear Site Licence (LC17)	Extremely remote	TifALARP	Not significant	
Vulnerability of the Proposed Development to major accidents from off-site sources														
O25	Civil nuclear incident at Sizewell B	MDS	Civil nuclear incident at Sizewell B impacting Sizewell C	On site: Operational personnel and Sizewell C infrastructure	On-site: Risk of injury or death to construction workers and damage to equipment/ site	Separate regulatory processes are in place to assess and control the safety of UK EPRTM reactors for the operation of the Sizewell C nuclear power station, including in the event of an incident at the neighbouring Sizewell B site. A detailed risk assessment is therefore not presented as part of the EIA. These hazards would be assessed in detail as part of the Nuclear Site Licensing requirements. For example, as part of Nuclear Site Licensing Regime, NNB GenCo (SZC) will need to ensure the safe operation of the Sizewell C Project and protection of the workers, public and environment. This includes providing the Office for Nuclear Regulation with a robust Safety Case demonstrating that all hazards associated with the development or that may impact the development are well understood and adequate arrangements are in place to reduce these risks to an acceptable level. In addition, it requires appropriate emergency plans and arrangements to be established and agreed with the local authority, for the range of accidents and incidents that could occur. These processes will ensure that risks relating to Nuclear Safety are reduced to TifALARP.				**GDA** - Nuclear safety principles established as part of the Generic Design Assessment process **NSL** - Compliance with the requirements of Nuclear Site Licence **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Extremely remote	TifALARP	Not significant	

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Proposed mitigation	Post-mitigation			Sources of information
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence		Likelihood	Tolerability	Significance of Risk	
O26	Fire at a neighbouring site	MDS/ AD	Fire at a neighbouring site impacting on the operation of the proposed development Not covered under this item: Potential to result in fire on site (covered under risk ID O14) Impeded access to site, limiting the ability to implement emergency response activities (covered under risk ID O45) Malfunctioning of equipment resulting in an accident (see risk ID O14).	On site: Operational personnel	On site: Indirect effects on human health and equipment due to smoke and ash deposition.	Site only	Severe	Short term	Not a MA&D	Effects are not likely to fall within the scope of the MA&D assessment.	N/A	N/A	N/A	
O27	Explosion and structural collapse at neighbouring sites	MDS/ AD	Explosion and structural collapse at a neighbouring site impacting on the operation of the proposed development Not covered under this item: Impeded access to site, limiting the ability to implement emergency response activities (covered under risk ID O45) Malfunctioning of equipment resulting in an accident (see risk ID O14).	On site: Operational personnel	On site: Falling debris or collapse of infrastructure within the neighbouring area resulting in damage to equipment and risk of injury of personnel;	Site only	Major	Long term	Category C	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken.	Extremely remote	Tolerable	Not significant	
O28	Contamination or release of hazardous substances by off-site sources;	MDS/ AD	Contamination or release of hazardous substances from off-site sources impacting on the operation of the proposed development	On site: Operational personnel	On site: Risk of contact with hazardous substances to operational personnel	Site only	No Serious Damage	Short term	Not a MA&D	Effects are not likely to fall within the scope of the MA&D assessment.	N/A	N/A	N/A	
O29	Impacts on road safety caused by the operational traffic of the proposed development	MDS/ AD	Increase in road traffic and changes to junction layouts Traffic accident on the wider network involving the carriage of high consequence dangerous goods associated with Sizewell C	On-site/ Off-site Motorised and non-motorised users of the road network	On site/ Off-site Death or injury of road users or operational personnel Damage to properties; Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	Area modelled within the Transport Assessment	Major	very long term or permanent	Category D	Highways have been designed in accordance with the Design Manual for Roads and Bridges and other relevant design standards. Compliance with legislative requirements for the carriage of dangerous goods. See risk ID O17 for pollution prevention.	Extremely remote	TifALARP	Not significant	Transport Assessment and Addenda
O30	Vandalism/crime/terrorism leading to increased risk to the safety of members of public and site workers	MDS/ AD	Criminal damage/ vandalism; Theft; Terrorist acts; Unauthorised vehicles accessing the construction site; Direct Vehicle Impact; Ionising radiation risk radiation exposure from stolen goods.	On site: Operational personnel Off-site: General public	On site: Death or risk of injury to operational personnel Damage to Sizewell C infrastructure Off-site: Death or risk of injury to members of the general public	As determined under REPPIR	Catastrophic	Very long term or Permanent	Category D	**NSL** - in compliance with the conditions of the NSL, security arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - security measures embedded within design through the GDA process	Extremely remote	TifALARP	Not significant	
O31	Civil unrest or protest	MDS/ AD	Members of the public protesting; Operational staff industrial action Not covered under this item: Criminal damage or vandalism - see risk ID O30	On site: Operational personnel and Sizewell C infrastructure	On site: Disruption to operation and potential damage to Sizewell C infrastructure.	Site only	No Serious Damage	Short term	Not a MA&D	No effects resulting in serious damage as defined for the purposes of this assessment are considered likely to occur as a result of civil unrest or protest.	N/A	N/A	Not significant	
O32	Outbreak of disease (emerging infectious disease or pandemic influenza)	MDS/ AD	Disease outbreak or epidemics impacting the workers.	On site: Operational personnel	On site: Death or risk of injury to operational personnel.	Site only	Catastrophic	Very long term or Permanent	Category D	**NSL** - in compliance with the conditions of the NSL, security arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken.	Extremely remote	TifALARP	Not significant	
O33	Animal health – notifiable disease;	MDS/ AD	Disease outbreak impacting the movement of operational workers and materials. Not covered under this item: Impacts on limiting emergency response activities are considered under risk ID O45	On site: Operational personnel	On site: Restricted access to site impacting on Sizewell C operations which may lead to other hazards	Area modelled within the Transport Assessment	Major	Very long term or Permanent	Category D	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken.	Extremely remote	TifALARP	Not significant	
O34	Loss or failure of electricity transmission	MDS/ AD	Power shortage in the wider electricity transmission network. Damage to electricity transmission network by other development or meteorological conditions impacting on the service provision for proposed development. Not covered within this item: Disruption of utilities can lead to an interruption of communications (covered under risk ID O21 and O37) and services which may increase other MA&D risks; Malfunctioning of equipment resulting in an accident (see risk ID O14)	On site: Existing infrastructure Operation of Sizewell C	On site: Failure of equipment reliant on mains power. Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response. Limited ability to implement an effective safety, security and environmental management systems	Site only	Severe	Medium term	Category A	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Remote	Tolerable	Not significant	
O35	Loss or failure of gas supply	MDS	Shortage in the wider gas supply network. Damage to gas supply network by other development or natural disaster.	On site: Operation of Sizewell C	On-site Failure of back up CHP plant	Site only	No Serious Damage	Short term	Not a MA&D	The loss of gas supply is unlikely to result in serious damage as defined for the purposes of this assessment	N/A	N/A	Not significant	
O36	Loss or failure of water supply	MDS/ AD	Shortage in the wider water supply network. Damage to water supply network by other development or natural disaster.	On site: Operation of Sizewell C	On site: Disruption to operation Limited ability for an emergency response plan to be implemented, if reliant on water supply, and delay to emergency response. Limited ability to implement and effective safety and environmental management systems	Site only	Major	Long term	Category C	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Remote	TifALARP	Not significant	
O37	Loss or failure of telecommunications	MDS/ AD	Power shortage in the wider electricity transmission network. Damage to electricity transmission or telecommunications networks by other development or meteorological conditions.	On site: Operation of Sizewell C	On site: Interruption of communications and services which may lead to other MA&D risks; Limited ability of an emergency response plan to be implemented and delay to emergency response Limited ability to implement effective safety, security and environmental management systems	Site only	Catastrophic	Very long term or Permanent	Category D	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **GDA** - safety measures embedded within design through the GDA process **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Extremely Remote	TifALARP	Not significant	
O38	Food supply contamination	MDS/ AD	Pollution incident Large radiation releases from nuclear matter	On site: Operational personnel	On site: Death or risk of injury to construction personnel.	Site only	Severe	Long term	Category B	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Extremely remote	Tolerable	Not significant	
O39	Local fuel supply failure	MDS/ AD	Risk of disruption to operational activities associated with travel to site and movement of materials	On site: Operational personnel and Sizewell C infrastructure	On site: Disruption to operation; May increase another MA&D risks; Could limit the ability to implement and effective safety, security environmental management systems Could limit the ability of an emergency response plan to be implemented	Site only	Severe	Medium term	Category A	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Remote	Tolerable	Not significant	
O40	Poor air quality	MDS/ AD	Off-site event resulting in the release of particulate matter and hazardous gases into the surrounding environment.	On site: Operational personnel	On site: Risk of harm to health to operational personnel	Site only	Severe	Short term	Not a MA&D	Effects are not likely to fall within the scope of the MA&D assessment.	N/A	N/A	Not significant	
O41	Cyber-attack and digital data security	MDS/ AD	Hackers Security breach of at the operational site Not covered under this item: Could result in the failure or loss of telecommunications (covered under risk IDs O21 and O37). Unauthorised access to the site and risk of vandalism/ crime/ terrorism (covered under risk ID O30)	On site: Operational personnel and Sizewell C infrastructure	On site: Loss of sensitive information which can increase the likelihood of crime/ terrorism/ vandalism; Could limit the ability to implement and effective safety, security and environmental management systems	Site only	Catastrophic	Very long term or Permanent	Category D	**NSL** - in compliance with the conditions of the NSL, information security arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken.	Extremely remote	TifALARP	Not significant	
O42	Failure of financial system	MDS/AD	Failure of the financial system resulting in a reduced public services Not covered under this item. Impacts on the ability of an emergency response plan to be implemented (Covered under Risk ID O45)	On site: Operational personnel and Sizewell C infrastructure	On site: Limited ability of an emergency response plan to be implemented and delay to emergency response Increased response time or lack of available resources may lead to other MA&D risks	Site only	Catastrophic	Very long term or Permanent	Category D		Extremely improbable	Tolerable	Not significant	
O43	Radiation releases from foreign nuclear sites	MDS/ AD	Exposure of operational personnel to foreign nuclear matter	On site: Operational personnel	On site: Risk of harm to the health of construction personnel	Site only	Severe	Long term	Category B	Effects are not likely to fall within the scope of the MA&D assessment. Sizewell Health will provide first aid on site.	Extremely improbable	Tolerable	Not significant	
O44	Influx of British Nationals	MDS/ AD	Displacement of operation personnel in local accommodation resulting in disruption to operation	On site: Operation of Sizewell C	No pathway to create a MA&D	Site only	No Serious Damage	Medium term	Not a MA&D	N/A	N/A	N/A	Not significant	

ID	Hazard	Site	Hazard source and/ or pathway	Receptor	Reasonably foreseeable worst case consequence if event occurred (i.e. potential significant effect)	Pre-mitigation				Post-mitigation			
						Maximum study area of potential impact	Worst Case Severity of Harm	Duration	Category of Consequence	Proposed mitigation	Likelihood	Tolerability	Significance of Risk	Sources of information
Operation of the proposed development impacting on the vulnerability of a receptor to a MA&D hazard														
O4S	Limiting the ability of an emergency response plan to be implemented	MDS/ AD	Access for emergency services to site being restricted or disruption to public services Impacts on the ability of an emergency response plan to be implemented Delivery of Abnormal Indivisible Loads (AIL) restricting the response of emergency services	On site: Sizewell C workers Off-site: General public agricultural land sensitive environmental receptors	On-site/ Off-site Insufficient access to emergency services, leading to a slow response time and increased number of deaths/ injuries or spread of contamination	AIL routes	Catastrophic	Very long term or Permanent	Category D	**NSL** - in compliance with the conditions of the NSL, emergency arrangements will be established and adequate arrangements implemented for safe operation. A periodic and systematic review and reassessment of the safety case would be undertaken. **REPPIR** - On-site and off-site emergency arrangements in compliance with REPPIR	Extremely remote	TifALARP	Not significant	