APPENDIX G4- Detailed Worst Case Scenario Tables.

The Tables in this appendix provide the detail and explain the thinking behind the summary worst case scenario Tables provided in Chapter 11 Benthic Ecology and Intertidal Ecology (Tables 11.12a to 11.12c). Much of the terminology and parameters used within these tables if described in Chapter 5: Project Description.

Numbers presented in the tables are only displayed to the nearest two decimal places, therefore when these are added together they may be different from the total displayed. All totals are calculated using the whole figure including all decimal places.

Table 1 Worst case scenario for Project Alpha assessment (includes WTGs, array cables and ancillary structures and any activities to place maintain or remove these)

Effect	Worst case scenario	Justification
Construction		
Direct impact on benthos due to physical disturbance	The worst case scenario is that the maximum possible area of disturbance occurs in the most sensitive habitats. The maximum area of disturbance is calculated below and is comprised of the: Array cables, The WTG GBS, meteorological masts and substations. **Maximum area of disturbance** Area of disturbance from cable installation: (355km x 10m = **355ha** Area of disturbance from 8 WTG with GBS foundations	The worst case scenario is established by defining the maximum amount (spatial extent) of habitat disturbance that Project Alpha could have. This is termed the Area of Influence. For array cables the maximum footprint is established through assumption maximum extent of cabling using the installation technique with the largest footprint). This is represented by the ROV, which has an approximate footprint width of 4m (Note, this is assuming that a no array cable will be rock or mattress protected and therefore form a permanent loss of substrate see Effect below). For foundation structures the maximum area of disturbance is represented by the maximum number of

Effect	Worst case scenario	Justification
	with 72m baseplate: 1931m^2 × 8 **= 1.54ha**. Area of disturbance from 67 WTG with Tubular Jacket & Suction Piles foundations: 1773m^2 × 67 = **11.88ha.** **Area of disturbance of OSP:** Project Alpha could include up to 3 structures two with an area of influence of 1400m^2 and one of 2474m^2 =**0.53ha** **Area of disturbance of Jack-up vessels:** 121.5×6×75 + 121.5×6×3 + 121.5×6×8 = **5.78ha** **Area of disturbance of Meteorological masts:** 1773m^2×3 = **0.53ha**	structures (8 WTGs) which may be placed on GBS structures with a 72m baseplate and the remaining 67 WTG being placed on Tubular Jacket & Suction Piles. The actual area or footprint of each foundation is subtracted from this calculation and is included in the worst case scenario for *Direct impact on benthos due to the loss of habitat* (see the entry below). Up to three substations will be constructed within Project Alpha the area of disturbance is calculated by taking the maximum area of influence of these structures (which occurs when the GBS option is used) and subtracting the footprint of these structures (the footprint is included in Direct impact on benthos due to the loss of habitat). Any other development scenario or installation technique considered within Chapter 5 Project description would result in less of a disturbance footprint. The jack-up vessel will have 6 legs each with a footprint of approximately 20.25m^2 (4.5m×4.5m). Therefore a total footprint per deployment of 121.5m^2. The maximum number of movements has been estimated as six per WTG foundation and meteorological mast, with eight movements for each substation structure. Therefore, the total footprint is based on a maximum number of 75 WTG, 3 metmasts and 3 ancillary structures. The foundation type, on which meteorological masts may be placed, that will have the largest area of disturbance

Effect	Worst case scenario	Justification
	The total quantifiable construction disturbance (Area of Influence) is therefore is therefore 355ha+1.54ha+ 0.11.88ha 0.53ha+5.78ha+0.53ha **= <u>375.27ha</u>**	(Temporary area of influence minus the permanent zone of influence) are Tubular Jacket & Suction Piles**.** up to three mat masts may be placed within the Alpha site
Direct impact on benthos due to the loss of habitat	The worst case scenario is that the maximum possible area of habitat loss occurs in the most sensitive habitats. The maximum area of habitat loss is calculated below and is comprised of the: Array cable protection, The WTG GBS (plus scour protection), meteorological masts (plus scour protection) and substations (Plus scour protection). **<u>Maximum area of habitat loss:</u>** **WTG GBS foundations with 72m baseplates:** Alpha may include up to 8 WTG on GBS with a 72m base plate 10,923m^2×8 =**8.74ha**. **WTG Tubular jacket on suction piles**. Alpha may include 67 WTG. 7467m^2×67=**50.03ha.**	The loss of subtidal habitat will result from the placement of built structures (and associated scour protection material) on the seabed. The worst case scenario is therefore, represented by the largest permanent footprint off all structures place on the seabed. The 72m^2 baseplate GBS foundations have a larger footprint than any of the other foundations under consideration and there may be up to 8 of these within the array. The remaining 67 WTG may be placed on any of the other foundations described in Chapter 5: Project description, however the foundation and associated scour which would result in the greatest loss of habitat (worst case) is the Tubular jacket on suction piles (as displayed in Table

Effect	Worst case scenario	Justification
	Area of habitat loss from OSP: 18,265m^2 + (5,555m^2×2) =**2.94ha** **Area of habitat loss from Meteorological mast foundations**:7467m^2 ×3 = **2.24ha** **Area of habitat loss from Cable protection:** Rock placement or mattresses to protect array cables may in a worst case scenario be deployed over 10% of the cables and will be 7m wide. Therefore 7×35.5km= **24.85.ha** Therefore the total maximum habitat loss will be 8.74ha+50.3ha+2.94ha+2.24ha+24.85 = **88.80ha**	5.6 Chapter 5 Project description) The option for ancillary structures that would result in the greatest footprint within the Alpha site is one HVDC converter (footprint estimated at 18,265m^2) platform and two HVAC collection platforms (footprint estimated at 5555m^2). A maximum of three meteorological masts will be installed during construction of Project Alpha. The largest footprint will result if these are supported by Tubular Jacket & Suction Piles(see Table 5.6 in Chapter 5: Project description). The GBS footprints for metmasts are the same as for WTG. It has been estimated that up to 10% of the total length of the total array cables may be protected with either rock or matrices. As the total length of array cable is calculated to be 335km long the amount that may be protected on the seabed will be 35.5 in length and the protection will be up to 7m wide.
Increased suspended sediments and mobilisation of contaminants leading to smothering	The worst case scenario would result in the maximum amount of sediment being released in the shortest time. The greater the amount of sediment released the higher the potential for contaminant release. Installation of up to 75 WTGs and up to 3 met. masts on conical GBS foundations at spacings of 610m.	The 'worst case' scenario is represented by that which could result in the maximum volume of arisings (and therefore, maximum volume of material that could potentially be brought into suspension). Maximum potential number of WTGs and met. masts at closest possible spacings and using largest cross-

Effect	Worst case scenario	Justification
	Installation of up to 3 OSP on cross-beam GBS. **Maximum amount of sediment that will be released:** Release of up to **642,200m^3** of seabed material side-cast to seabed adjacent to foundation or returned to water column from dredger hopper during seabed preparation works for conical GBS. A further **53,500m^3** of seabed material similarly disposed during seabed preparation works for cross beam GBS (OSP). Array cables: 355km of array cabling buried to depths of between 0.5m and 2.1m across a 3m wide trench. Maximum total excavation **2,236,500m^3** It is assumed that cable burial will be achieved using jetting ROV within the 36 month offshore construction programme (from the 3rd Quarter 2016 to the 3rd Quarter 2019). Therefore the total released material will be 642,200m^3 +53,500m^3+2,236,500m^3 = **2,932,200m^3**	sectional area foundation type. Maximum potential number of OSP using largest cross-sectional area foundation type. Maximum potential number of WTGs, OSPs and Met Assumes 72m diameter conical GBS at up to 8 sites within Project area and 52m diameter conical GBS at other locations, with total of 75 WTG and 3 met. masts. 100m x 75m rectangular cross beam GBS used at up to 3 OSP locations. No material re-use as ballast. Includes for potential use of suction cutter dredging. Maximum trench dimensions. Assumes an indicative installation rate using jetting of 237.5m/hr, which is slower than for cutter and plough. Jetting fluidises or liquefies the sediment, making it more readily re-suspended. Offshore working may be restricted to between April and September each year.
Operation		
Direct impact on benthos due to physical disturbance caused by maintenance	The worst case scenario is will result from the maximum foreseeable amount of maintenance activity which has	Maintenance activity may impact on benthos if the plant used interacts with the seabed. The scenario therefore,

Effect	Worst case scenario	Justification
activities	the potential to cause disturbance to the seabed. Periodically large components such as gearboxes and blades may need to be replaced. In this case a large crane vessel or jack-up, similar to that used for turbines installation, would be used to carry out the necessary works. The Jack-up vessel has a footprint of 121.5m^2 in total per movement. It is not possible to determine the number of maintenance activities that will disturb the seabed. No such activities are planned.	provides for the maximum level of seabed disturbance from jack-up vessels. Use of DP vessels would not have an impact on the subtidal habitat.
Indirect impacts on benthos from changes in current regime resulting in habitat loss	Presence of 75 WTGs and 3 met. masts on conical GBS foundations at spacings of 610m. Presence of up to 3 OSP on cross beam GBS. Foundations: Scour hole formation on the seabed adjacent to each foundation under a 1 in 50 year storm. Total scour hole development covers a seabed area of **353,178m^2** at conical GBS. A further area **of 2,886m^2** affected by rectangular / square GBS for OSP. Total Area: 353,178m^2 + 2,886m^2 = **35.61ha**	Maximum potential number of WTGs and met. masts at closest possible spacings and using largest cross-sectional area foundation type. Maximum potential number of OSP using largest cross-sectional area foundation type. Assumes that no scour protection is provided. Conical GBS causes greatest scour areas of all substructure / foundation types during a 1 in 50 year storm condition due to combined wave and current action. Assumes 72m diameter conical GBS at up to 8 locations within Project area and 52m diameter elsewhere, with total of 75 WTG and 3 meteorological masts. Rectangular (100m x 75m) GBS used at up to 1 OSP location and square (40m x 40m) GBS used at up to 2 OSP locations.
Increased suspended sediments and mobilisation of contaminants leading to smothering of benthic ecology	Scour hole formation on the seabed adjacent to each foundation under a 1 in 50 year storm. Total volume of material released from seabed due to scour hole development around conical GBS is **340,296m^3**. A	Assumes that no scour protection is provided. Conical GBS causes greatest scour volumes of all substructure / foundation types during a 1 in 50 year storm condition due to combined wave and current action. Assumes 72m

Effect	Worst case scenario	Justification
	further **5,226m^3** released from scour around rectangular / square GBS. Total released material is therefore 340,296m^3 + 5226m^3 = **345,522m^3** In the event that scour protection is provided, no scour will occur, but there will be the physical footprint on the seabed caused by the scour protection materials.	diameter conical GBS at up to 8 locations within Project area and 52m diameter elsewhere, with total of 75 WTG and 3 met. masts. Rectangular (100m x 75m) GBS used at up to 1 OSP location and square (40m x 40m) GBS used at up to 2 OSP locations. Secondary scour around the limits of the scour protection will be insignificant.
Alteration of habitats (colonisation of structures)	The worst case scenario for the area created habitat created will be approximately the same as the worst case scenario for the area of habitat loss. This was calculated as **88.80ha** see *Direct impact on benthos due to the loss of habitat* in line 2 of this table.	Aligned with seabed footprint (see loss of habitat in construction phase). The scenario provides for the maximum available surface area for colonisation, any other scenario will result in a lower surface area. Note: The eventual increase in area available for colonisation by benthic species will be greater than this due to the three dimensional nature of the structures, however a calculating this precise area would be complex and unlikely to lead to a realistic outcome.
Decommissioning		
Impact on subtidal habitat	Removal of all cabling and build structures (based on worst case assumptions detailed under construction).	Arrangements associated with decommissioning will be determined prior to construction and a full Decommissioning Plan for the project will be drawn up and agreed with Marine Scotland. Until the arrangements have been clarified, the worst case scenario is that all structures will be removed.

Table 2 Worst case scenario for Project Bravo assessment (includes WTGs, array cables and ancillary structures and any activities to place maintain or remove these)

Effect	Worst case scenario	Justification
Construction		
Direct impact on benthos due to physical disturbance	The worst case scenario is that the maximum possible area of disturbance occurs in the most sensitive habitats. The maximum area of disturbance is calculated below and is comprised of the: Array cables, the WTG GBS, meteorological masts and substations. **<u>Maximum area of disturbance</u>** **Area of disturbance from cable installation:** (355km x10m = **355ha** **Area of disturbance from 8 WTG** with GBS foundations with 72m baseplate**:** 1931m^2 × 8 **= 1.54ha**. **Area of disturbance from 67 WTG** with Tubular Jacket & Suction Piles foundations: 1773m^2 × 67 = **11.88ha.** **Area of disturbance of OSP:** Project Bravo could include up to 2 structures one with an area of influence	The worst case scenario is established by defining the maximum amount (spatial extent) of habitat disturbance that Project Bravo could have. This is termed the Area of Influence. For array cabling the maximum footprint is established through assumption maximum extent of cabling using the installation technique with the largest footprint). This is represented by the ROV, which has an approximate footprint width of 4m (Note, this is assuming that a no array cable will be rock or mattress protected and therefore form a permanent loss of substrate see Effect below). For foundation structures the maximum area of disturbance is represented by the maximum number of structures (8 WTGs) which may be placed on GBS structures with a 72m baseplate and the remaining 67 WTG being placed on Tubular Jacket & Suction Piles. The actual area or footprint of each foundation is subtracted from this calculation and is included in the worst case scenario for *Direct impact on benthos due to the loss of habitat* (see the entry below). Up to two substations will be constructed within Project

Effect	Worst case scenario	Justification
	of 2100m^2 and one of 1400m^2 =**0.35ha**	Bravo the area of disturbance is calculated by taking the maximum area of influence of these structures (which occurs when the GBS option is used) and subtracting the footprint of these structures (the footprint is included in Direct impact on benthos due to the loss of habitat). Any other development scenario or installation technique considered within Chapter 5 Project description would result in less of a disturbance footprint.
	Area of disturbance of Jack-up vessels: 121.5×6×75 + 121.5×6×3 121.5×6×8 = **5.54ha**^{2}	The jack-up vessel will have 6 legs each with a footprint of approximately 20.25m^2 (4.5m×4.5m). Therefore a total footprint per deployment of 121.5m^2. The maximum number of movements has been estimated as six per WTG foundation and meteorological mast, with eight movements for each substation structure. Therefore, the total footprint is based on a maximum number of 75 WTG, 3 metmasts and 3 ancillary structures.
	Area of disturbance of Meteorological masts: 1773m^2×3 = **0.53ha**	The foundation type, on which **Meteorological masts** may be placed, that will have the largest area of disturbance (Temporary area of influence minus the permanent zone of influence) are Tubular Jacket & Suction Piles**.** up to three mat masts may be placed within the Alpha site
	The total quantifiable construction disturbance (Area of Influence) is therefore is therefore 355ha+1.54+11.88ha+ 0.35ha +5.54ha+0.53ha **= <u>374.84ha</u>**	
Direct impact on benthos due to the loss of	The worst case scenario is that the maximum possible	The loss of subtidal habitat will result from the placement of built structures (and associated scour protection

Effect	Worst case scenario	Justification
habitat	area of habitat loss occurs in the most sensitive habitats. The maximum area of habitat loss is calculated below and is comprised of the: Array cable protection, The WTG GBS, meteorological masts and substations. **<u>Maximum area of habitat loss:</u>** **WTG GBS foundations with 72m baseplates:** Alpha may include up to 8 WTG on GBS with a 72m base plate 10,923m^2×8 =**8.74ha**. **WTG Tubular jacket on suction piles**. Alpha may include 67 WTG. 7467m^2×67=**50.03ha** **Area of habitat loss from OSP:** 13,009m^2 + 5,555m^2 =**1.86ha** **Area of habitat loss from meteorological mast foundations**: 7467m^2 ×3 = **2.24ha**	material) on the seabed. The worst case scenario is therefore, represented by the largest permanent footprint off all structures place on the seabed. The 72m^2 baseplate GBS foundations have a larger footprint than any of the other foundations under consideration and there may be up to 8 of these within the array. The remaining 67 WTG may be placed on any of the other foundations described in Chapter 5: Project description, however the foundation and associated scour which would result in the greatest loss of habitat (worst case) is the Tubular jacket on suction piles (as displayed in Table 5.6 Chapter 5 Project description) The option for OSPs that would result in the greatest footprint within the site is scenario two which is presented in Chapter 5: Project Description and would include one HVDC converter (footprint including scour protection estimated at 13,009m^2) platform and one HVAC collection platform (footprint with scour protection estimated at 5555m^2). A maximum of three meteorological masts will be installed during construction of Project Alpha. The largest footprint will result if these are supported by Tubular Jacket &

Effect	Worst case scenario	Justification
	Area of habitat loss from cable protection: Rock placement or mattresses to protect array cables may in a worst case scenario be deployed over 10% of the cables and will be 7m wide. Therefore 7×35.5km= **24.85ha** Therefore the total maximum habitat loss (calculated from the raw figures) will be 81.92ha+ 3.28ha+1.86ha+ 24.85.ha **= <u>87.71ha</u>**	Suction Piles(see Table 5.6 in Chapter 5: Project description). The GBS footprints for metmasts are the same as for WTG. It has been estimated that up to 10% of the total length of the total array cables may be protected with either rock or matrices As presented in Chapter 5: Project Description. As the total length of array cable is calculated to be 335km long the amount that may be protected on the seabed will be 35.5 in length and the protection will be up to 7m wide.
Increased suspended sediments and mobilisation of contaminants leading to smothering	The worst case scenario would result in the maximum amount of sediment being released in the shortest time. The greater the amount of sediment released the higher the potential for contaminant release. As for Project Alpha, but with release of up to **642,200m^3** of seabed material side-cast to seabed adjacent to foundation or returned to water column from dredger hopper during seabed preparation works for conical GBS. A further **16,000m^3** of seabed material similarly disposed during seabed preparation works for square (40m x 40m) GBS.	The 'worst case' scenario is represented by that which could result in the maximum volume of arisings (and therefore, maximum volume of material that could potentially be brought into suspension). Maximum potential number of WTGs, OSPs and Meteorological masts at closest possible spacings and using largest cross-sectional area foundation type As for Project Alpha, but with up to 2 OSP considered on square (40m x 40m) GBS.

Effect	Worst case scenario	Justification
	Array cables: 355km of array cabling buried to depths of between 0.5m and 2.1m across a 3m wide trench. Maximum total excavation **2,236,500m^3** Cable burial achieved using jetting ROV within the 36 month offshore construction programme (from the 3rd Quarter 2016 to the 3rd Quarter 2019). Total released material is therefore 642,200m^3 +45,000m^3+2,236,500m^3 **= 2,894,700m^3**	
Operation		
Direct impact on benthos due to physical disturbance caused by maintenance activities	The worst case scenario is will result from the maximum foreseeable amount of maintenance activity which has the potential to cause disturbance to the seabed. Periodically large components such as gearboxes and blades may need to be replaced. In this case a large crane vessel or jack-up, similar to that used for turbines installation, would be used to carry out the necessary works. The Jack-up vessel has a footprint of 121.5m^2 in total per movement. It is not possible to determine the number of maintenance activities that will disturb the seabed. No such activities are planned.	The worst case scenario for habitat loss during operation will occur if no scour protection is deployed around the foundations for WTGs, meteorological masts and ancillary structures. The ensuing scour will result in the habitat surrounding these devises to be lost. Calculations for the size of the scour pits is presented in Chapter 7 Physical processes. The worst case scenario for habitat loss during operation as a result of ancillary structures would be option 1 as presented in Chapter 5 Project description which would result in 3 substations within the Alpha Site in the worst case scenario these would have GBS foundations. Up to three meteorological masts could be positioned within the Alpha site and the worst case scenario would

Effect	Worst case scenario	Justification
		be that these all have GBS
Indirect impacts on benthos from changes in current regime resulting in habitat loss	As for Project Alpha, but with total scour hole development covering a seabed area of **353,178m^2** at conical GBS. A further area of **1,036m^2** affected by square (40m x 40m) GBS for OSP. Total affected Area =353,178m^2+1,036m^2 **=35.42ha**	As for Project Alpha, but with up to 2 OSP considered on square (40m x 40m) GBS.
Increased suspended sediments and mobilisation of contaminants leading to smothering of benthic ecology	As for Project Alpha, but with total volume of material released from seabed due to scour hole development around conical GBS of **340,296m^3**. A further **1,194m^3** released from scour around square (40m x 40m) GBS. Total released Material is therefore 340,296m^3 +8,064m^3 **= <u>341,490m^3</u>**	As for Project Alpha, but with up to 2 OSP considered on square (40m x 40m) GBS.
Creation of new habitats (colonisation of structures)	Aligned with seabed footprint (see loss of habitat in construction phase). The scenario provides for the maximum available surface area for colonisation, any other scenario will result in a lower surface area. Note: The eventual increase in area available for colonisation by benthic species will be greater than this due to the three dimensional nature of the structures, however a calculating this precise area would be complex and unlikely to lead to a realistic outcome.	The worst case scenario for the area created habitat created will be approximately the same as the worst case scenario for the area of habitat loss. This was calculated as 87.71ha see *Direct impact on benthos due to the loss of habitat* in line 2 of this table.

Effect	Worst case scenario	Justification
Decommissioning		
Physical on subtidal habitat	As for Project Alpha, except only 2 OSP	As for Project Alpha, except only 2 OSP

Table 3 Worst case scenario for Transmission Asset Project Assessment (Includes ancillary structures within Alpha and Bravo)

Effect	Worst case scenario	Justification
Construction		
Direct impact on benthos due to physical disturbance	Infrastructure within the Project Alpha and Project Bravo site boundaries (Also assessed as part of Project Alpha and Bravo, see Tables 1 and 2) The worst case scenario is that the maximum possible area of disturbance occurs that can occur in the most sensitive habitats. The maximum area of disturbance is calculated below and is comprised of the: OSPs and Jack-up movements **Area of disturbance from OSPs** is 0.53ha **(**Project Alpha, Table 1) and 0.35ha (Project Bravo, Table 2). Therefore 0.53ha + 0.35ha = **0.88ha** **Area of disturbance from Jack-up vessel legs:** 121.5×8×4**= 0.39ha** Therefore the total area of disturbance is **1.27ha** ECR corridor The worst case scenario is that the maximum possible area of disturbance occurs in the most sensitive habitats.	The worst case scenario is established by defining the maximum amount (spatial extent) of habitat disturbance that Transmission Asset Project [Arbroath] could have. Four options are currently being considered for the ancillary structures and ECRs as presented in Chapter 5: Project description. Option 4 would have largest area of disturbance and therefore this is what is presented in the previous column. As shown in Table 1 and 2, option 1 (as presented in Chapter 5 Project Description) will create the largest area of disturbance. OSPs area of disturbance is calculated by taking the area of influence from both Project Alpha and Bravo The jack-up vessel will have 6 legs each with a footprint of approximately 20.25m^2 (4.5m×4.5m). Therefore a total footprint per deployment of 121.5m^2. The maximum number of Jack-up movements per OSP structure is eight. Therefore the maximum area of disturbance is based on four OSP structures. For export cabling the maximum footprint is established by using the maximum possible extent of cabling and

Effect	Worst case scenario	Justification
	In the worst case six export cables with a combined length of 530km. The area of influence of the installation process is a corridor of up to 15m wide. Therefore 530000m×15m =**795ha** Total area is therefore 1.27ha+795ha **= <u>796.27ha</u>**	assuming that the installation process will effect a corridor 15m in width around the cable (this is assuming that all cable will be buried and no cable protection will be used).
Direct impact on benthos due to the loss of habitat	<u>Infrastructure within the Project Alpha and Project Bravo site boundaries (Also assessed as part of Project Alpha and Bravo, see Tables 1 and 2)</u> The worst case scenario is that the maximum possible area of habitat loss occurs in the most sensitive habitats. The maximum area of habitat loss is calculated below. **Habitat loss from OSPs** is 2.94ha **(**Project Alpha, Table 1) and 1.86ha (Project Bravo, Table 2). Therefore 2.94ha + 1.86ha = **4.8ha** <u>ECR corridor</u> The worst case scenario is that the maximum possible area of habitat loss occurs in the most sensitive habitats. **Rock placement** or mattresses to protect export cables will in a worst case scenario be deployed over 10% of	The loss of subtidal habitat will result from the placement of built structures (and associated scour protection material) on the seabed. As shown in Table 1 and 2, option 1 (as presented in Chapter 5 Project Description) will create the largest area of disturbance. Habitat loss caused by OSPs is calculated by taking the Habitat loss from both Project Alpha and Project Bravo. It has been estimated that up to 10% of the total length of the total Export cable length may be protected with either rock or mattresses. As the total maximum length of export cables is calculated to be 530km long the amount that may be protected on the seabed will be 53km in length and the protection will be up to 7m wide.

Effect	Worst case scenario	Justification
	the cables and will be 7m wide. The maximum length of the export cables will in scenario 4 be 530km. Therefore 7×53000m= **37.1ha** Therefore total area lost is 2.22+37.1= **41.9ha**	
Increased suspended sediments and mobilisation of contaminants leading to smothering of subtidal habitats and species	Infrastructure within the Project Alpha and Project Bravo site boundaries (Also assessed as part of Project Alpha and Bravo, see Tables 1 and 2) Installation of 5 OSPs (3 in Project Alpha and 2 in Project Bravo) on conical GBS foundations (50m water depth) at spacings of 610m The release of up to **69,500m^3** of seabed material side-cast to the seabed adjacent to the substructure or returned to the water column from the dredger hopper during seabed preparation works has already been assessed in detail for OSPs as part of the Project Alpha and Project Bravo assessments (where they have greatest potential for cumulative impact), but the findings are cross-referenced within this assessment because OSPs form part of the Transmissions Asset Project consent application. ECR corridor Export cables:530km of export cabling buried to depths of between 0.5m and 3m across a 3m wide trench which results in **4,770,000m^3.**	The 'worst case' scenario is represented by that which could result in the maximum volume of arisings (and therefore, maximum volume of material that could brought into suspension) and the method by which the material is re deposited on the seabed. Assumes the installation of up to 1 OSP on rectangular (100m x 75m) GBS and up to 4 OSPs on square (40m x 40m) GBS, with seabed preparation for each type of GBS to a depth of up to 5m. No material re-use as ballast. Includes for potential use of suction cutter dredging. Up to six 275kv export cables (HVAC) to be installed along an indicative 70km export cable corridor to landfall at Carnoustie. Maximum trench dimensions and buried cable length.

Effect	Worst case scenario	Justification
	Cable burial achieved using jetting ROV within the 24 month offshore cabling activity programme (from the 3rd Quarter 2015 to the 3rd Quarter 2017).	Assume an indicative installation rate using jetting of 237.5m/hr, which is slower than for cutter and plough. Jetting fluidises or liquefies the sediment, making it more readily re-suspended. Offshore working is restricted to between April and September each year.
Direct impact on intertidal ecology due to physical disturbance	Trench excavation at up to 6 locations extending shallow offshore works to the duct entrances Surface disturbance from vehicles associated with construction activities	Excavation of cable trenches in the intertidal and shallow subtidal area using a backhoe excavator may be required to install the export cables into the cable ducts. Beach access may be required, particularly for trench excavation. This may be achieved via temporary local access over the coastal defence or by use of an existing point of access nearby.
Operation		
Increased suspended sediments and mobilisation of contaminants leading to smothering of benthic ecology	Infrastructure within the Project Alpha and Project Bravo site boundaries (Assessed as part of Project Alpha and Bravo, see Tables 1 and 2) The scour hole formation on the seabed adjacent to each substructure under a 1 in 50 year storm has already been assessed in detail as part of the Project Alpha and Project Bravo assessments (where they have greatest potential for cumulative impact), but the findings are cross-referenced within this assessment because OSPs form part of the Transmissions Asset Project consent application. Total volume of material released from seabed due to scour hole development is **6,420m^3.**	Maximum potential number OSPs at closest possible spacings and using 49m baseplate diameter conical GBS Assumes the presence of up to 1 OSP on rectangular (100m x 75m) GBS and up to 4 OSPs on square (40m x 40m) GBS Assumes that no scour protection is provided around rectangular/square GBS.

Effect	Worst case scenario	Justification
	In the event that scour protection is provided, no scour will occur, but there will be the physical footprint on the seabed caused by the scour protection materials.	Secondary scour around the limits of the scour protection will be insignificant.
Direct impacts on benthos due to habitat disturbance/loss	The scour hole formation on the seabed adjacent to each OSP substructure under a 1 in 50 year storm has already been assessed in detail as part of the Project Alpha and Project Bravo assessments (where they have greatest potential for cumulative impact), but the findings are cross-referenced within this assessment because OSPs form part of the Transmissions Asset Project consent application. Total scour hole development covers a seabed area of **0.39ha**	Assumes the presence of up to 1 OSP on rectangular (100m x 75m) GBS and up to 4 OSPs on square (40m x 40m) GBS Assumes that no scour protection is provided around rectangular/square GBS.
Direct impacts on intertidal ecology due to maintenance activities	Unplanned maintenance operations requiring vehicular plant access to the buried cable during low water. Maximum potential area of disturbance would be as specified for construction phase.	Any maintenance activity required on the intertidal section of the export cables could require vehicular access. The worst case area of impact is therefore in line with that provided for under construction.
Indirect impacts from alteration to human activities	Safety zones of 50m during operation and 500m during maintenance around the ancillary structures will be applied for. A maximum of five ancillary structures are proposed within the Transmission Asset Project	Maximum area from which other human activities will be excluded is a temporary safety zone of 500m around substations and a permanent safety zone of 50m.
Creation of new habitats (colonisation of structures)	The scenario which will create the greatest area new habitat will be approximately the same as the worst case scenario for the area of habitat loss. This was calculated as **4.8ha** for the infrastructure within Alpha	Aligned with seabed footprint (see loss of habitat in construction phase). The scenario provides for the maximum available surface area for colonisation, any other scenario will result in a lower surface area.

Effect	Worst case scenario	Justification
	and Bravo and **37.1ha** within the ECR see *Direct impact on benthos due to the loss of habitat* in line 2 of this table. Total =**41.9ha**	Note: The eventual increase in area available for colonisation by benthic species will be greater than this due to the three dimensional nature of the structures, however an calculating this precise area would be complex and unlikely to lead to a realistic outcome.
Decommissioning		
Impact on intertidal ecology	Removal of six export cables.	Arrangements associated with decommissioning will be determined prior to construction and a full Decommissioning Plan for the project will be drawn up and agreed with Marine Scotland. Until the arrangements have been clarified, the worst case scenario is that all structures will be removed.
Impact on subtidal habitat	Removal of all cabling and build structures (based on worst case assumptions detailed under construction).	Arrangements associated with decommissioning will be determined prior to construction and a full Decommissioning Plan for the project will be drawn up and agreed with Marine Scotland. Until the arrangements have been clarified, the worst case scenario is that all structures will be removed.