codling
wind park

EIAR Addendum

Appendix 6-A Modelling Report Addendum

Codling Wind Park Environmental Statement

Appendix 6-A - Numerical Modelling Technical Appendix Addendum

March 2026

DOCUMENT CONTROL

Version History					
Version	Date	Prepared by	Reviewed by	Approved by	Approved as
V01	31/03/2026	AS/LH	MRW	MRW	Final

Changes from the Previous Version	
V01	Original version.

Recipient	Distribution Method		
	Paper (copies)	PDF	Online
Lesley Jamieson (Natural Power)		x	

Holders of controlled copies will automatically be provided with subsequent approved versions of this document when they become available.

Glossary

Glossary remains unchanged.

Units and Conventions

Units and Conventions remains unchanged.

Contents

Figures

Tables

Executive Summary

The Executive Summary remains unchanged except for paragraph 3, which is replaced by the text below. This change has been made in response to FIR Item 6i(i-iii) (see FIR Response Document).

Significant points to note from the outputs of the model simulations performed are:

- The construction activities of the CWP project are predicted to have only a small effect on the prevailing hydrodynamic and wave regimes both within the array site and at locations towards the coastline.
- During disposal of dredge arisings following bedform clearance and cable trenching activities, SSC's local to the release locations are predicted to be enhanced to up to circa 400 mg\L.
- Enhanced SSCs are transient, and concentrations are predicted to reduce to background levels no more than c. 12 days after completion of the activity responsible for liberating sediments into suspension.
- The predicted thickness of the sediment deposited on to the seabed away from the release locations during the dredge disposal simulations following bedform clearance and cable trenching activities were minimal (e.g. sediment deposits on the seabed generated during these activities were predicted to be < 2-3 cm thick away from the immediate disposal/disturbance area, decreasing rapidly in thickness with distance). The thickness of the deposit is a function of the location and timing of the release, the composition of the material released and the prevailing metocean and hydrodynamic conditions.

1 Preface

Section 1 remains unchanged.

2 Development of the Marine Area Model

Section 2 remains unchanged except for subsections 2.2 and 2.3, where Figure 1 has been replaced with the Figure 2-A below. Additionally, the text and Figure 2-B below should be read in conjunction with Section 2.3. This revision was made in response to FIR Item 6b and FIR Item 6i, respectively (refer to the FIR Response Document).

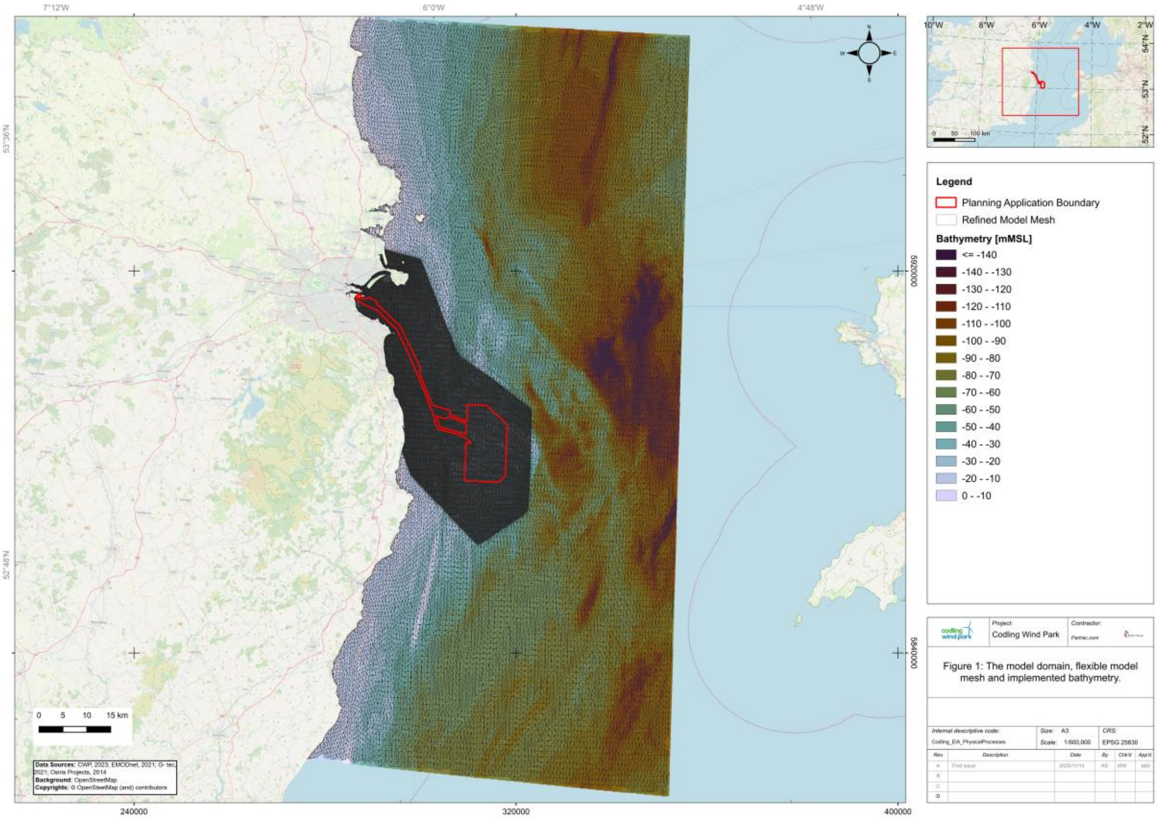


Figure 2-A: The model domain, flexible model mesh and implemented bathymetry.

The spatial variation in Manning's N coefficient (bed resistance) that was implemented into the model mesh is presented in **Figure 2-B.** Variations in bed resistance were determined based upon the regional seabed surface sedimentology as described by the BGS (2019).

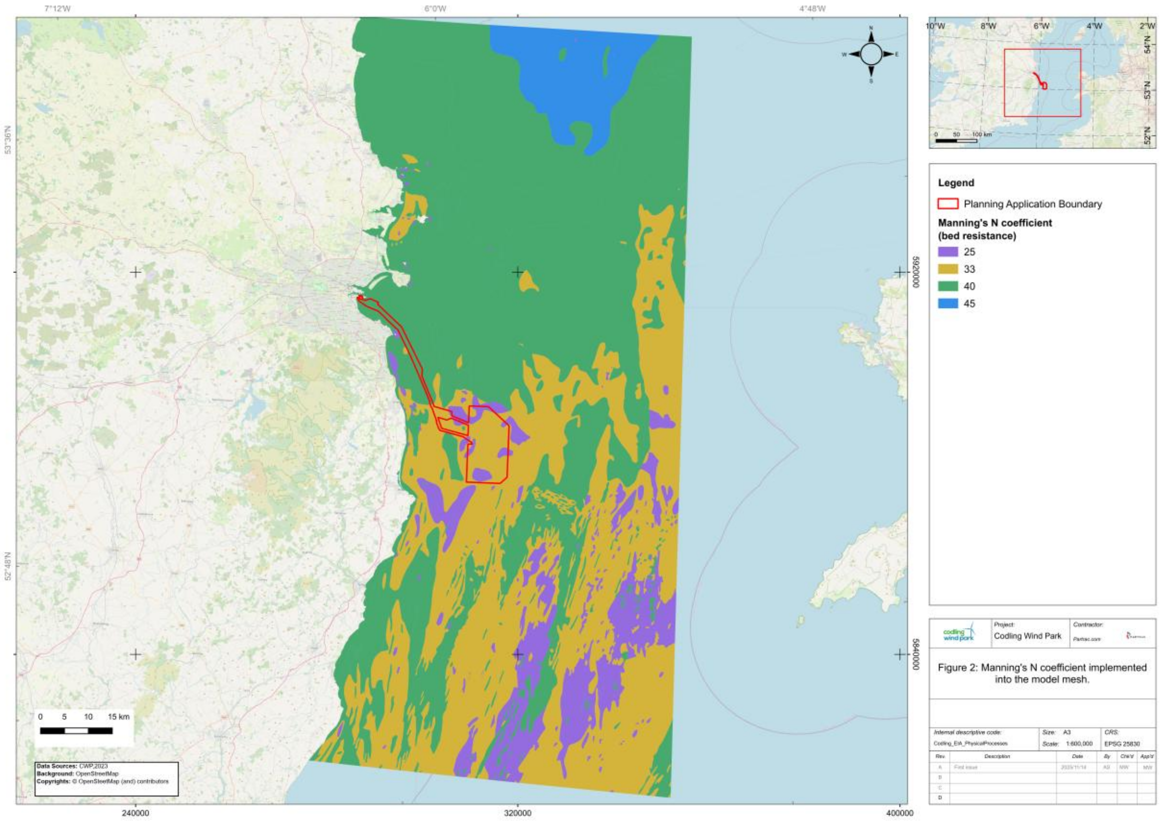


Figure 2-B: Manning's N coefficient implemented within the model mesh.

3 Model Calibration Validation – Stage 1

Section 3 remains unchanged.

4 Model Calibration Validation – Stage 2

Section 4 remains unchanged.

5 Model Simulations

5.1 Post Construction Impact

Section 5.1 is replaced entirely by the following text. This revision was made in response to FIR Item 6d (see FIR Response Document).

The introduction of structures into the marine environment has the potential to alter tidal and wave regimes on both local and regional scales. These changes in hydrodynamics also have the potential for a knock-on impact upon local and regional sediment transport processes, and seabed and coastal morphology. Specifically, flow speed influences the formation and type of bedforms, meaning that any significant modifications to flow patterns could in turn reshape the seabed over the lifespan of the project. Additionally, changes in tidal flow conditions and the wave regime have the potential to disrupt the balance between existing patterns of sediment erosion and deposition, influencing both the rate and direction of sediment transport. Persistent changes in the wave climate could further modify sediment mobilisation frequency, as well as the rates of erosion, transport and deposition. The primary objective of this analysis is to quantify the difference in key hydrodynamic and wave parameters between two model setups: a Baseline/Existing Scenario (without the presence of project infrastructure) and an Impact Scenario (with project infrastructure in place), thereby isolating the potential effects attributable to the presence of the windfarm infrastructure.

5.1.1 Model Parameterisation

To assess the effects on the prevailing regimes, WTG option A was implemented in the model domain, along with three OSSs.

The physical presence of WTG and OSS foundations are represented in the numerical model using an enhanced bottom friction approach, specifically a modified drag coefficient technique. Foundation locations are mapped onto the computational grid, and resistance terms such as bed resistance or vertical eddy viscosity are adjusted to account for blockage, turbulence, and wake effects induced by the structures. Following established literature (Christiansen *et al.*, 2023; Hosseini *et al.*, 2025), a spatially varying drag coefficient is applied at foundation elements to simulate energy dissipation caused by solid structures, effectively capturing wake effects, velocity reduction, and enhanced turbulence.

5.1.2 Scenario Simulations

To assess the potential impact of windfarm infrastructure on marine coastal processes, it is considered prudent to understand the changes that would be manifest under the most extreme conditions that have been experienced at the site. For the purposes of this assessment this included modelling of the 500- and 100-year joint probability events (waves and currents) that have occurred at the site in recent history.

The extreme events simulations are based on a joint Extreme Value Analysis (j-EVA) from MetoceanWorks' hindcast study[1] (MetOceanWorks, 2025), which defines the coupled probability of extreme current and wave conditions. This analysis was used solely to identify the representative extreme events. Once these events were selected, all hydrodynamic and wave simulations were carried out using the Partrac coupled hydrodynamic and wave model (see Section 2 to Section 4) to ensure consistency with the broader assessment framework. Two distinct joint-occurrence scenarios are simulated, each over a 48-hour period to capture pre-event, peak-event, and post-event dynamics. The first scenario represents a 500-year joint return period with high waves and high currents, centred on 16th October 2017, and includes a five percent enhancement on both wave height and current speed to match the 500-year joint return period. The second scenario represents a 100-year joint return period characterised, centred on 31st March 2010. A plot of the j-EVA utilised in this analysis is presented in Figure 5-A, and a wave rose / current rose for each of the 100- and 500-year RP events are presented in Figure 5-B and Figure 5-C, respectively. For each scenario, two simulations are conducted: a Baseline run without the project infrastructure (WTGs and OSSs) and an Impact run with the project infrastructure in place. It is important to note that these extreme-event scenarios represent realistic conditions that have been experienced at the Array site. The directional rose plots indicate that these high-stress events are most likely to originate from the north or south sectors. This reflects the dominant alignment of current flow, which is largely constrained along a north–south axis due to the regional bathymetry and tidal regime. Wave development from East or West is further limited by the large land masses of Wales and Ireland, which restrict the fetch in those directions.

---

[1] Validation of the Partrac hindcast was performed against the MetOceanWorks hindcast (see Section 3.1) to ensure compatibility between models. Based on this validation, it is considered appropriate for the intended purposes and does not compromise the integrity of the study.

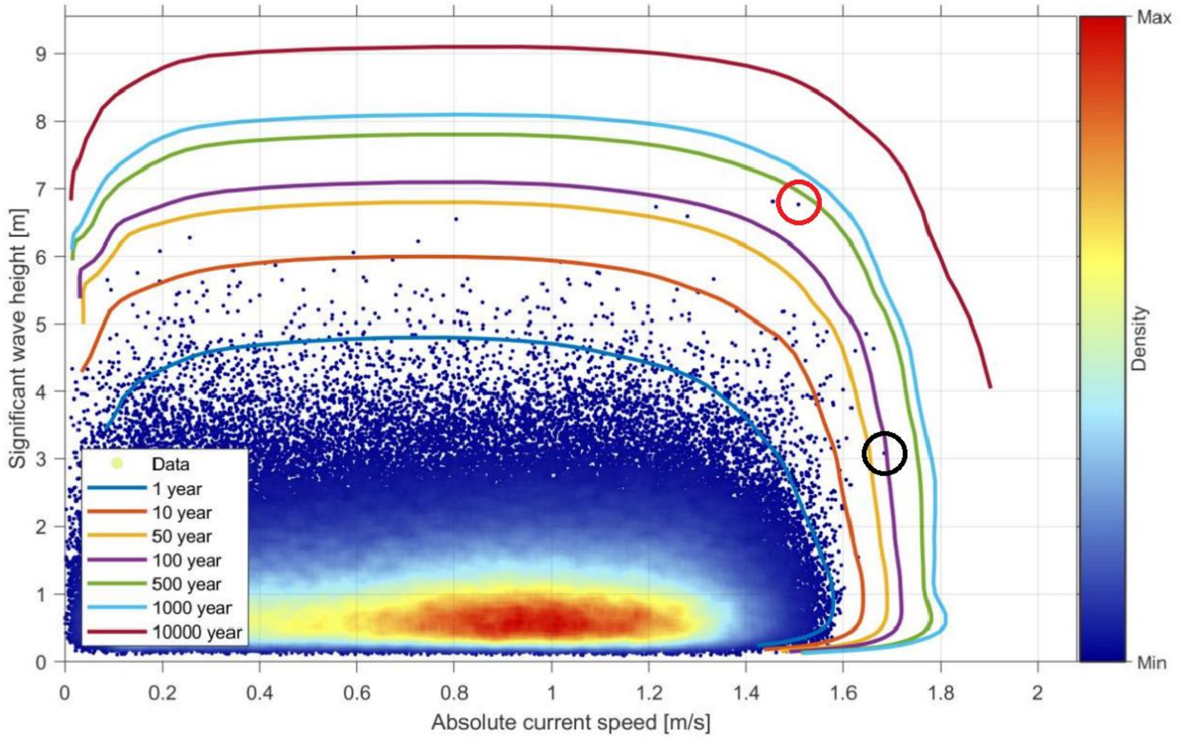


Figure 5-A: Joint Extreme Value Analysis of Significant wave height and absolute current speed. The black and red circles represent the 100- and 500-year events utilised, respectively. Figure modified from MetOceanWorks (2025).

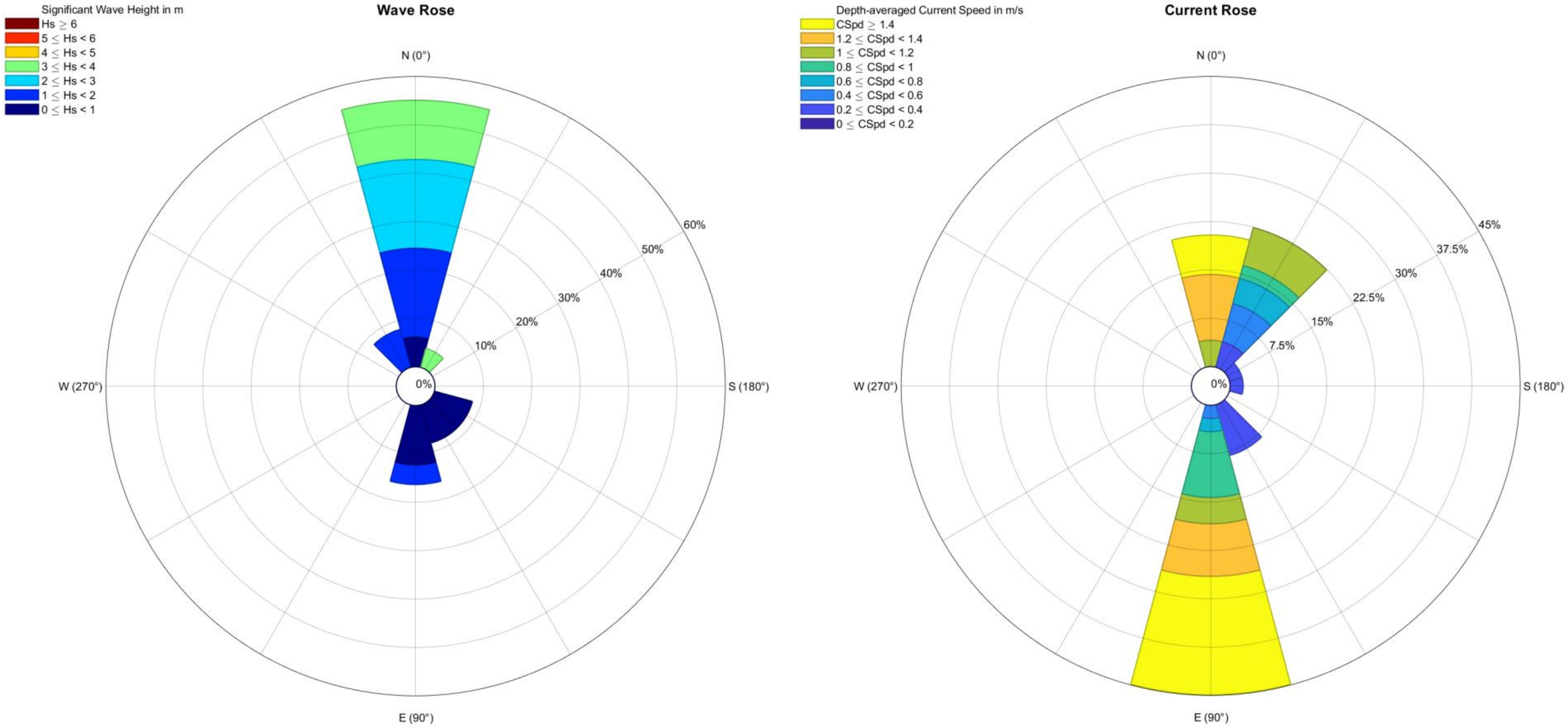


Figure 5-B: Wave rose (left) and current rose (right) for the 100-year RP event within the 30-year hindcast.

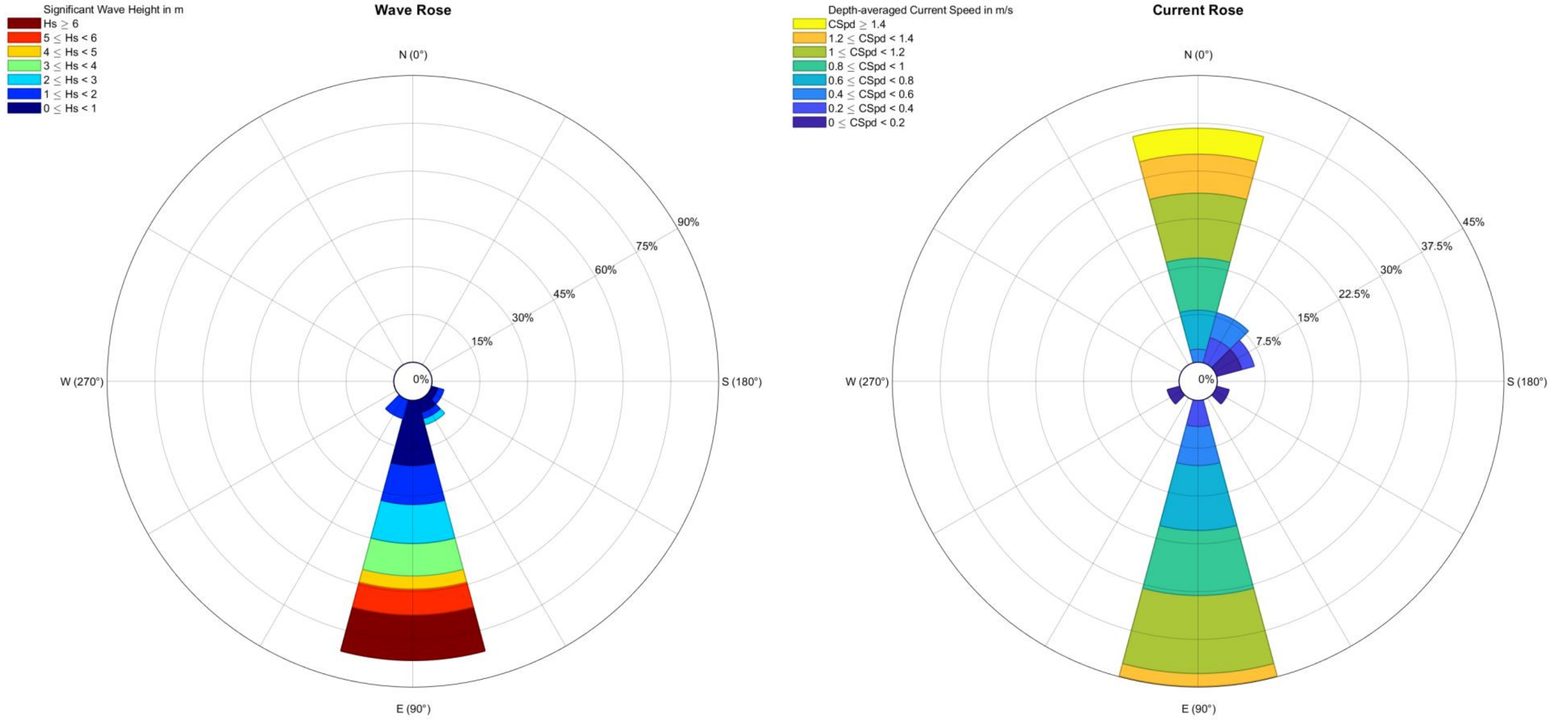


Figure 5-C: Wave rose (left) and current rose (right) for the 500-year RP event simulated.

5.2 Sediment Transport Simulations

5.2.1 Sediment Plume Dispersion

Section 5.2.1. remains unchanged except for point 2, which is replaced by the text below. This update has been made in response to FIR Item 6i (see FIR Response document).

> **Cable trenching activities**: Sediment plumes are also likely to be generated during cable trenching activities. Depending on the prevailing soil conditions, a combination of cable burial methods may be used including jetting, cutting, and ploughing. These simulations included for areas of necessary deeper cable burial where the OECC crosses the approaches to Dun Laoghaire harbour (in the zone of greater cable burial depth) and the RWE cable, up to 6.5 m and 3 m, respectively.

5.2.2 Disposal of Dredge Arisings: Environmental and Engineering Constraints

Section 5.2.2 remains unchanged.

5.2.3 Simulations Performed

Section 5.2.3. is replaced in its entirety by the following text. This revision has been made in response to FIR Item 6i (see FIR Response Document).

All of the activities that have the potential to disturb the seabed and liberate significant plumes of suspended sediment into the water column during the subtidal project construction campaign were simulated[2]. This included: i) the disposal of dredge arisings within the MAC application boundary, ii) trenching activities along the IAC and OECC[3], and iii) WTG / OSS foundation drilling activities.

Disposal of Dredge Arisings

To assess the potential impact of the disposal of dredge arisings, the following scenarios were simulated. For completeness two potential scenarios were modelled each of the OECC and the IAC routes, However, the total quantity of all of the proposed dredged material for each of the routes is disposed of during each of the

---

[2] As it is likely that bedform clearance and trenching activities will be intermittent in nature, rather than continuous, (e.g. installation of sections of the IAC and OECC routes, foundation drilling activities, and dredge disposal activities, will be performed independently of one another during the period of construction), representative scenarios were simulated independently.

[3] This analysis does not account for open-cut trenching activities within the transition zone to be performed during low tide (i.e. sub aerially). Activities involving shallow-trenching methodologies to be performed subtidally in the transition zone are included. Analysis of the impacts associated with cable trenching in the transition zone is provided in Appendix 6-B Intertidal Assessment.

scenarios, so for assessment purposes the worst case for each of the OECC and the IAC routes has been considered:

IAC

either

> **Scenario 1:** Release into the water column (at c.1m below the sea surface) of all material dredged from within the IAC array, disposal at a representative location close to the centre of the Array Site. Material released at a fixed location, as a periodic instantaneous discharge, with 24-hour operations.

or

> **Scenario 2:** Release into the water column (at c. 1m below the sea surface) of all material dredged from within the IAC array, disposal at a representative location close to the southern boundary of the array site. Material released at a fixed location, as a periodic instantaneous discharge, with 24-hour operations.

OECC

either

> **Scenario 3:** Release into the water column (at ~1m below the sea surface) of all material dredged from within the OECC, disposal to the east of the possible dredge disposal sites along the OECC. Material released at a fixed location, as a periodic instantaneous discharge, with 24-hour operations.

or

> **Scenario 4:** Release into the water column (at ~1m below the sea surface) of all material dredged from within the OECC, disposal to the west of the possible dredge disposal sites along the OECC. Material released at a fixed location, as a periodic instantaneous discharge, with 24-hour operations.

The parametrisation applied to the disposal of dredge arisings simulations are provided in **Section 5.2.5**. The location of the scenarios, and release locations, simulated for dredge disposal activities are presented in **Figure 5-D**.

Trenching Activities

To assess the potential impact of cable installation activities via trenching, the following scenarios were simulated:

Scenario 5: Release of liberated sediments during jet trenching activities along the entire subtidal OECC. Plumes of liberated sediments released reflect 24-hour trenching operations.

Scenario 6: Release of liberated sediments during jet trenching activities along the entirety of the IAC and Interconnector cable routes. Plumes of liberated sediments released reflect 24-hour trenching operations.

The parametrisation applied to each trenching scenario is presented in **Section 5.2.5**. The locations of the scenarios, and release locations, simulated for trenching activities are presented in **Figure 5-D**.

WTG & OSS Foundation Installation Activities

To assess the potential impact of WTG and/or OSS foundation installation activities the following scenario was simulated:

Scenario 7: Release of sediments generated during monopile drilling activities. The selected WTG and OSS locations correspond to those WTG/OSS locations situated in the shallowest water depths nearest to shore. The 12 selected (as specified in **Table 4-7** of **Chapter 4 Project Description**) shallowest water depth WTG and OSS foundation locations represent the realistic worst-case scenario, due to the increased likelihood of increased sediment entrainment driven by wave action at shallower water depths and proximity to shore.

The parametrisation applied to each foundation installation scenario is presented in **Section 5.2.5**. The location of the scenario, and release locations, simulated for foundation installation activities are presented in **Figure 5-D**.

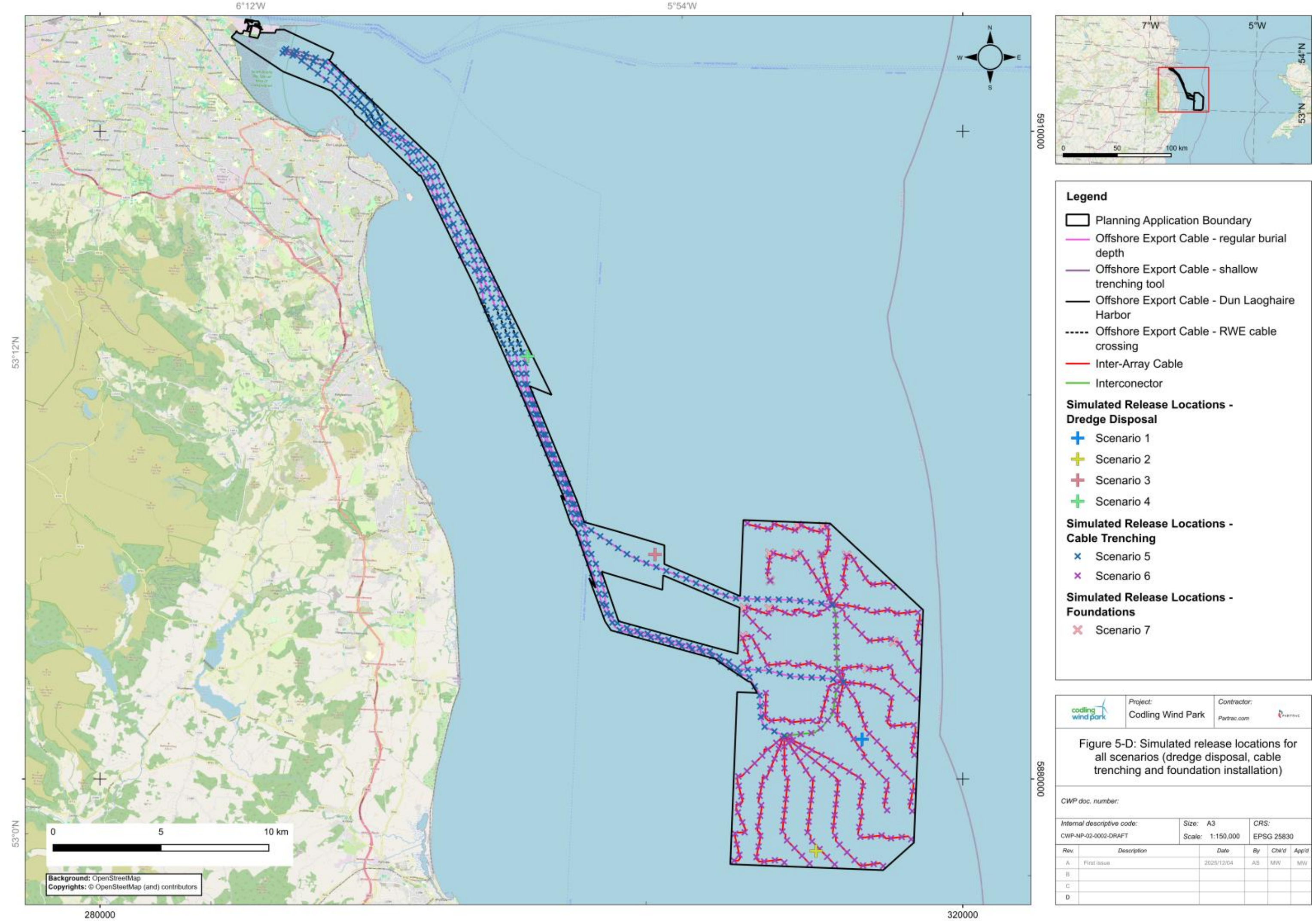


Figure 5-D: Simulated release locations for all scenarios (dredge disposal, cable trenching and foundation installation)

5.2.4 Model Setup

Section 5.2.4 is replaced entirely by the text below. This revision was made in response to FIR Item 6i (refer to the FIR Response Document).

The fate and transport of suspended sediment plumes generated during construction activities were assessed using a combination of the hydrodynamic-wave model (See Section 2 to Section 4) and Lagrangian particle tracking within the MIKE 21 modelling suite. The hydrodynamic (HD) and spectral wave (SW) components form the basis of the analysis, providing the time-varying environmental conditions that govern plume behaviour.

The hydrodynamic and wave forcing used for the plume dispersion modelling was taken directly from the hindcast (as described in Section 2 to Section 4), which spans a representative period covering a full lunar tidal cycle (Spring and Neap tides) but excludes high-energy events during which construction vessels would not operate[4]. A two-month period in summer 2004, with consistently operable conditions and minimal downtime, was selected to drive continuous 24-hour release scenarios. This represents a realistic yet conservative (worst-case) operational window in which residual currents and persistent low-level wave activity dominate sediment transport and maintain suspended material.

The particle tracking simulations (as described in Section 5.2.3) were simulated using the MIKE 21 Particle Tracking (PT) module. The PT module applies a Lagrangian, random-walk approach to track the movement of individual sediment particles throughout the model domain. This method effectively captures the spatial and temporal variability of currents and turbulence, providing a detailed representation of near-field plume behaviour. The PT module accounts for the key processes affecting sediment fate, including advection by the HD flow field, turbulent dispersion and particle settling. It also supports flexible release configurations, enabling continuous line sources (e.g., trenching along a cable route) or point sources (e.g., drilling or disposal). Model outputs include instantaneous suspended sediment concentration fields and cumulative seabed deposition thickness, both of which are critical for environmental impact assessment.

5.2.5 Model Parameterisation

Section 5.2.5 remains unchanged except for the following alterations:

- Paragraph 2, which is replaced by the text below in paragraphs 1; and,
- Paragraph 4, which is replaced by the text below in paragraphs 2 – 5.

---

[4] For the purposes of this assessment, vessel inoperability thresholds were defined as a significant wave height of 2.0 m and a wind speed of 15 m/s.

These changes have been made in response to FIR Item 6i (see FIR Response Document).

When dredge vessels discharge material, The release mechanisms influence the near and far field impact of the plume created. Sediment released close to the seabed will settle quickly, reducing the impact on the wider environment. Comparatively, sediment released at the surface will take longer to descend through the water column and will therefore subsequently be dispersed across a greater spatial extent. Each mechanism will also be associated with a different rate of release. To simulate this, a distinction is made between near-field and far-field plume motions, based on the differences in the physical processes governing the spreading/dispersion mechanisms. A dynamic plume descends rapidly to the seabed because of its high density relative to the surrounding seawater. A passive plume forms as the dynamic plume descends through the water column and mixes due to turbulent processes and interaction with the ambient seawater. To account for these processes within the model an empirical coefficient which limits the volume of fine sediment released into the water column is utilised. In this scenario a conservative 10% rate of loss (to the passive plume) of fine sediment (sand, silt, and clay) was applied. This rate is based upon findings reported by Becker *et al.* (2015). Coarser gravel sized materials are assumed to be deposited almost instantaneously on the seabed in the immediate vicinity of the disposal location, and therefore materials of this size are not available for transport (in the modelling) as part of the passive plume. For trenching activities, sediments that are liberated into the water column are released within the model domain, at 1 m above the seabed, as a semi-continuous, moving (at the pace of the trencher) passive plume. For all trenching simulations, 100% disaggregation is assumed during jetting.

For the dredge disposal simulations of Scenario 1, Scenario 2, Scenario 3 and Scenario 4, representative case maximum dredge volumes for bedform clearance were calculated and reported by the CWP Marine Engineering Team, being 832,500 m^3 and 595,650 m^3 for the IAC array and OECC, respectively (See **Table 4-3** of **Volume 2 Chapter 4 Project Description**). The volume of material to be dredged was determined from the geophysical survey data, identifying areas of potentially mobile bedforms that could constrain cable installation operations. Model scenarios simulated a single Trailing Suction Hopper Dredger ('TSHD'), working 24-hour operation, considering a typical TSHD dredging rate[5] of 4,000 m^3/hr. Sediments that are liberated into the water column are released into the model domain at 1 m below the sea surface. Using these parameters, the scenarios covered dredge-transit-release periods of 10.5 days (252 hours) for Scenario 1 and

---

[5] The PT dredge-transport-dispose setup assumes a 40,000 m^3 mega-TSHD operating at 4,000 m^3/hr, yielding a 10-hour loading phase followed by instantaneous dumping during each 12 hour period. This reflects a large offshore project where sailing time governs the cycle and is designed to represent a conservative, high-impact scenario. Two assumptions create a worst-case estimate of far-field dispersion: (1) instantaneous release, which maximises initial plume concentration by discharging the full 40,000 m^3 load wtihin a single model time step; and (2) maximized daily mass flux, achieved by operating near peak dredging capacity with a short cycle, producing the highest potential long-term sediment deposition in the model.

2, and 7.5 days (180 hours) for Scenario 3 and 4. These consisted of 21 and 15 releases at the disposal location, respectively, with a 12-hour interval between each release.

For the cable trenching simulation of Scenario 5, Export Cables, three parallel cable routes are modelled, installed sequentially under 24-hour operations, from onshore progressing offshore, with a trenching rate of 500 m/hr[6]. Trench dimensions vary along the route: typically 2 m depth, increasing to 3 m at the RWE cable crossing, and up to 6.5 m within the Dun Laoghaire Harbour approach. A constant trench width of 1.5 m is applied throughout. Spatial extents and sediment displacement volumes for all sections of the Export Cable route are provided in **Table 5-A**. Across the three Export Cables, the total sediment volume displaced is 423,415 m^3. The spatial extent and displaced sediment volumes have been calculated based on realistic worst-case specifications, as detailed in **Table 4-19** and **Table 4-26** of **Volume 2 Chapter 4 Project Description**. Using these parameters, Scenario 5 covered a release period of 11.25 days (270 hours).

For the cable trenching simulation of Scenario 6, IAC and interconnector cable trenching is assumed to occur sequentially one line at a time, under continuous 24-hour operations, with a trenching rate of 500 m/hr. Installation progresses from north to south, beginning at the outer edges of the array and moving inward. A maximum trench depth and width[7] of 1.5 m is applied along all simulated IAC and interconnector routes. The calculated spatial extents and displaced sediment volumes for these works are summarised in **Table 5-B**. The combined total sediment displacement associated with IAC and interconnector cable trenching is 297,731 m^3. The spatial extent and displaced sediment volumes have been calculated based on realistic worst-case specifications, as detailed in **Table 4-12** of **Volume 2 Chapter 4 Project Description**. Using these parameters, Scenario 6 covered a release period of 11.25 days (270 hours).

For the foundation drilling simulation of Scenario 7, installation is assumed to occur sequentially one location at a time, under continuous 24-hour operations, with a drilling rate of 5 m/hr, with Installation progressing from north to south. A drill diameter of 8.5 m and penetration depth of 36 m is applied to all foundation locations simulated. Sediments that are liberated into the water column are released into the model domain at 1 m above the seabed. The calculated spatial extents and displaced sediment volumes for these works are summarised in **Table 5-C**. The combined total sediment displacement associated with WTG foundation installation is 24,514 m^3. The spatial extent and displaced sediment volumes have been calculated based on

---

[6] A rate of 500 m/hr, identified as the maximum speed for jet trencher operations (see **Table 4-11** in **Volume 2 Chapter 4 Project Description**), was used for the assessment. This reflects the most conservative case, anticipated to result in the greatest sediment suspension.

[7] The trench width for all cables has been estimated based on the operational capabilities of both jet and mechanical trenchers, as well as guidance provided in published literature (e.g., Ortolani *et al.*, 2025).

assessment parameters as detailed in **Table 4-7** of **Volume 2 Chapter 4 Project Description**. Using these parameters, Scenario 6 covered a release period of 3.5 days (84 hours).

It is assumed that all drilling arisings become fully mobilised into the water column (to 1m above the seabed); this assumption is applied to ensure the modelling adopts a deliberately conservative approach. In reality, some proportion of the material will remain in clades, may remain within the drill hole, adhere to equipment, or settle rapidly near the release point. By treating the entire volume as suspended, the model represents a precautionary upper estimate of the sediment made available for transport within the water column. This approach provides a robust, worst-case assessment of potential dispersion, concentrations, and depositional patterns, ensuring that any predicted environmental effects are not underestimated.

Table 5-A: Export Cable spatial extent and displaced sediment volumes.

Parameter	Cable 1	Cable 2	Cable 3	Total
Regular Route				
Length (m)	33,035	36,444	35,607	105,086
Width (m)	1.5	1.5	1.5	-
Depth (m)	2	2	2	-
Area (m^2)	49,552	54,666	53,411	157,628
Volume (m^3)	99,104	109,331	106,821	315,257
Dun Laoghaire Harbour				
Length (m)	2,156	2,110	1,665	5,931
Width (m)	1.5	1.5	1.5	-
Depth (m)	6.5	6.5	6.5	-
Area (m^2)	3,233	3,165	2,498	8,896
Volume (m^3)	21,016	20,574	16,234	57,824
RWE cable crossing				
Length (m)	2,215	2,292	2,678	7,185

Parameter	Cable 1	Cable 2	Cable 3	Total
Width (m)	1.5	1.5	1.5	-
Depth (m)	3	3	3	-
Area (m²)	3,323	3,439	4,017	10,778
Volume (m³)	9,968	10,316	12,051	32,334
Shallow-Water Trenching				
Length (m)	2,000	2,000	2,000	6,000
Width (m)	1.5	1.5	1.5	-
Depth (m)	2	2	2	-
Area (m²)	3,000	3,000	3,000	9,000
Volume (m³)	6,000	6,000	6,000	18,000
Total Volume (m³)	136,088	146,221	141,106	**423,415**

Table 5-B: IAC & Interconnector spatial extent and displaced sediment volumes.

Parameter	IACs	Interconnectors
Length (m)	124,379	7,946
Width (m)	1.5	1.5
Depth (m)	1.5	1.5
Area (m²)	186,569	11,919
Volume (m³)	279,853	17,878

Parameter	IACs	Interconnectors
Total Volume (m^3) – IAC & Interconnectors	**297,731**	

Table 5-C: WTG foundation drilling spatial extent and displaced sediment volumes.

Parameter	WTG Foundation
Diameter (m)	8.5
Depth (m)	36
Volume (m^3)	2,043
Number of foundations	12
Total volume (m^3)	**24,516**

5.2.6 Model Outputs

Section 5.2.6 remains unchanged

6 Results

Section 6. is replaced in its entirety by the following text. This revision has been made in response to RFI Item 6d and FIR Item 6i (see FIR Response Document).

6.1 Disposal of Dredge Arisings following Bedform Clearance

During the modelled representative scenarios suspended sediment plumes created during dredge disposal operations were predicted to enhance SSC, local to dredge operations, and across the wider environment, transiently. **Table 6-A** presents a summary of the main findings obtained from each simulation.

The results indicate that dredging activities within the array site and along the OECC are not expected to influence SSCs over the long term, with concentrations returning to background conditions within a maximum of 11 days following completion of disposal activities. The effects remain strongly localised around the point of release, with peak SSCs confined to the immediate vicinity of the disposal location within the MAC boundary and diminishing rapidly from the source, typically over the order of 1 km, and the plumes are highly transient, with SSCs reducing to background c. 10 hours after release. Sediment plumes associated with the passive plume component are predicted to disperse up to approximately 7 km from the release point, across which fine material settles progressively onto the seabed. Deposition in the immediate vicinity away from the disposal site is expected to reach only a few centimetres in thickness, reflecting the portion of material that settles almost instantaneously; beyond this deposition becomes < 1 cm, and would not be discernible above the potential natural variation observed during storm events. It is anticipated that sediments deposited onto the seabed will be rapidly reworked by the prevailing hydrodynamic regime and integrated into the existing seabed sediment system[8].

The results for disposal Scenario 1 are presented in **Figure 6-A** to **Figure 6-D**. **Figure 6-E** to **Figure 6-H** present the results for disposal Scenario 2, and **Figure 6-I** to **Figure 6-L** present the results for disposal Scenario 3. **Figure 6-M** to **Figure 6-P** present the results for disposal Scenario 4. These results, for each of the four simulations performed, are presented as:

---

[8] At the location of disposal of each hopper load, the estimated thickness of the deposit on the seabed is a function of the area across which the material was deposited. To estimate the thickness of the deposit, approximations are made based on vessel specification, operational objectives etc. However, caution is urged when considering the cumulative thickness of deposits as this calculation does not account for the erosion, entrainment, mobilisation, and transport of these sediments once deposited on the seabed. Consequently, where several hopper loads are deposited within the same spatial area significant variability in the thickness of the observed deposit is likely.

- A spatial plot showing the maximum observed SSC values at any time during the model run (representing the maximum footprint of SSC resulting from the dredging operations), and the cumulative deposition thickness over the entire simulation; and,
- A series of time-sliced snapshots[9] showing the location (and predicted concentration) of the suspended sediment plume during the simulation; and,
- A time series of maximum suspended sediment concentrations throughout the simulation period for the entire model domain, presented as both total sediment mass in the water column and maximum SSC values over time.

---

[9] Snapshots were chosen to evenly represent the period when suspended sediment concentrations were above background levels (5 mg/L), capturing plume evolution from initial release through peak activity to near-background conditions.

Table 6-A: Findings obtained from the four simulations of the disposal of dredge arisings following bedform clearance.

Scenario	Location	Transport Direction	Transport Distance (km)	Predicted Transient Increases in SSC (mg/L)	Time Required to Return to Baseline SSCs	Cumulative Sediment Deposition Thickness Near the Disposal Location (m)
Scenario 1	IAC	North-South / slight East	4 - 7	c. 250	c. 11 days	c. 0.03
Scenario 2	IAC	North-South / slight East	5 - 6	c. 250	c. 11 days	c. 0.03
Scenario 3	EC	North-South / slight East	3 - 6	c. 400	c. 8 days	c. 0.04
Scenario 4	EC	North-South	2 - 4	c. 125	c. 8 days	c. 0.03

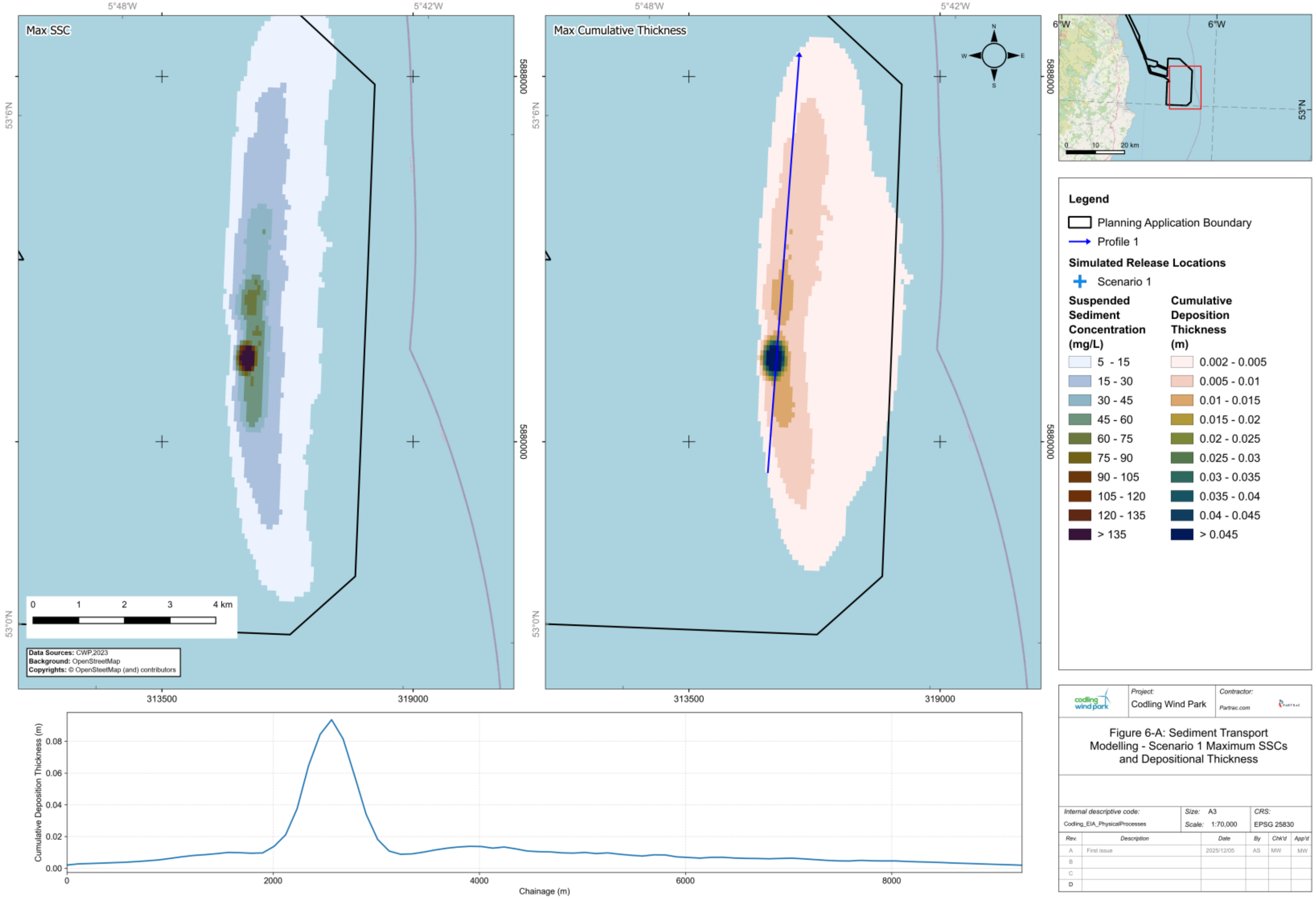


Figure 6-A: Sediment Transport Modelling - Scenario 1 Maximum SSCs and Depositional Thicknesses

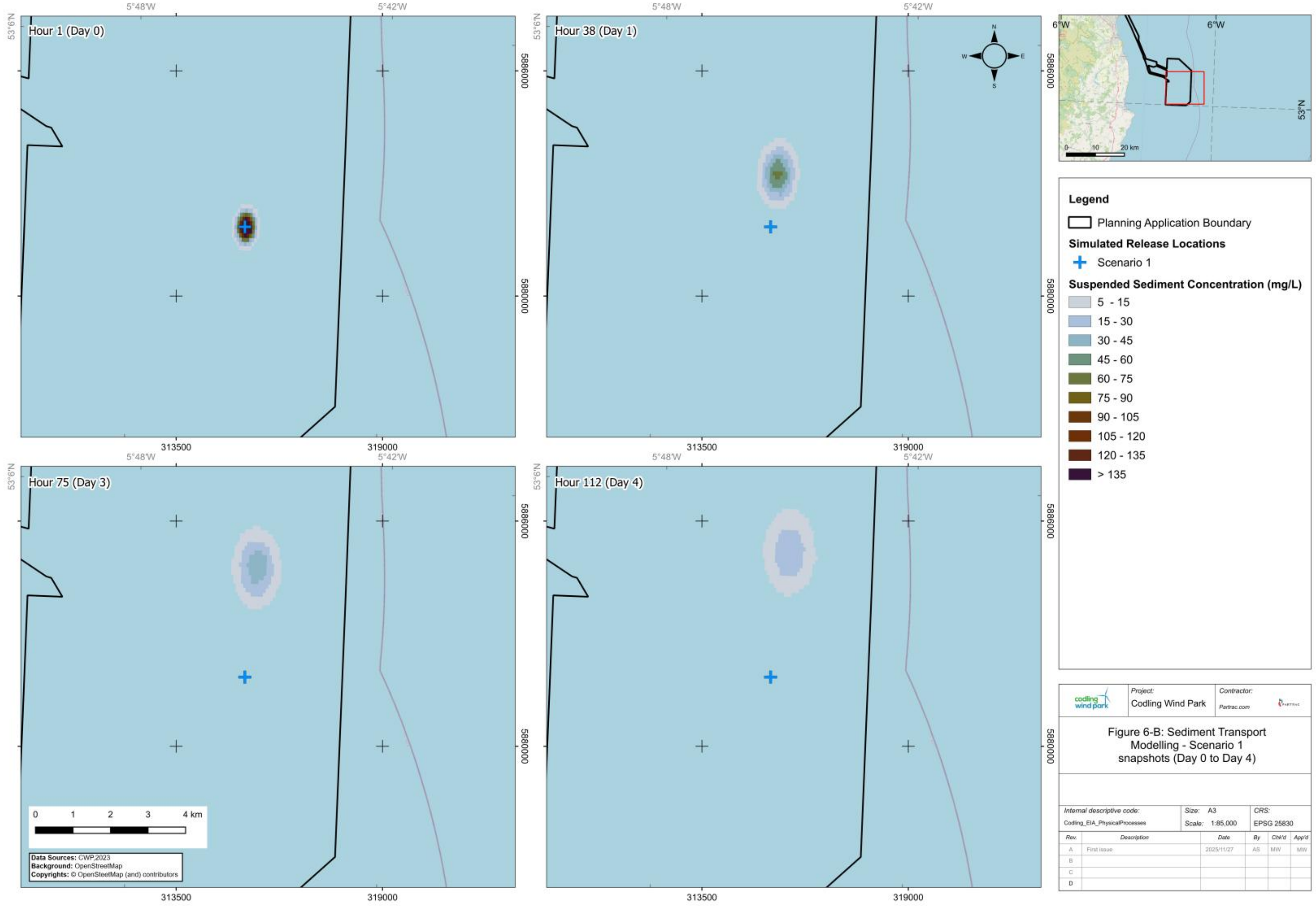


Figure 6-B: Sediment Transport Modelling - Scenario 1 snapshots (Day 0 to Day 4)

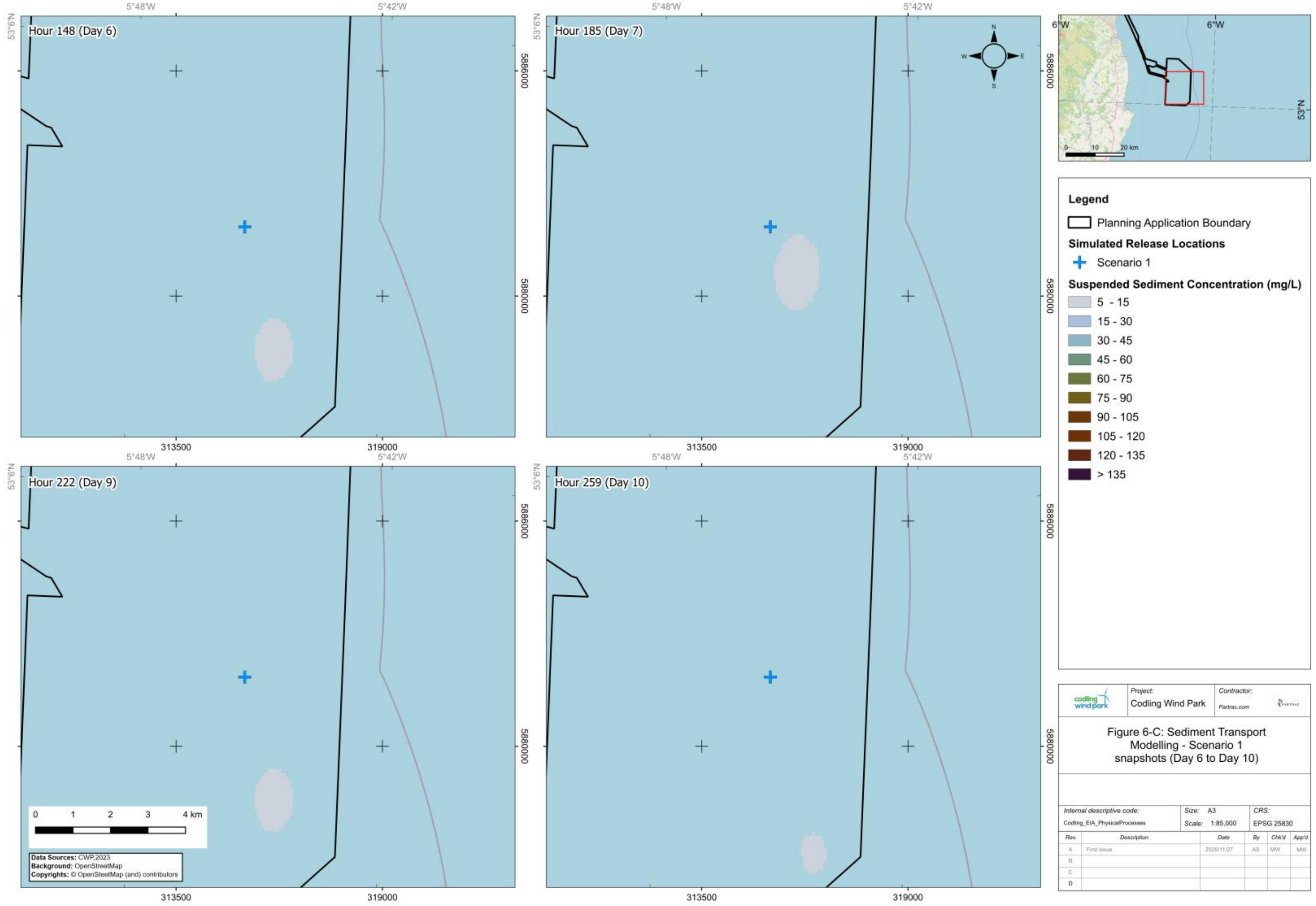


Figure 6-C: Sediment Transport Modelling - Scenario 1 snapshots (Day 6 to Day 10)

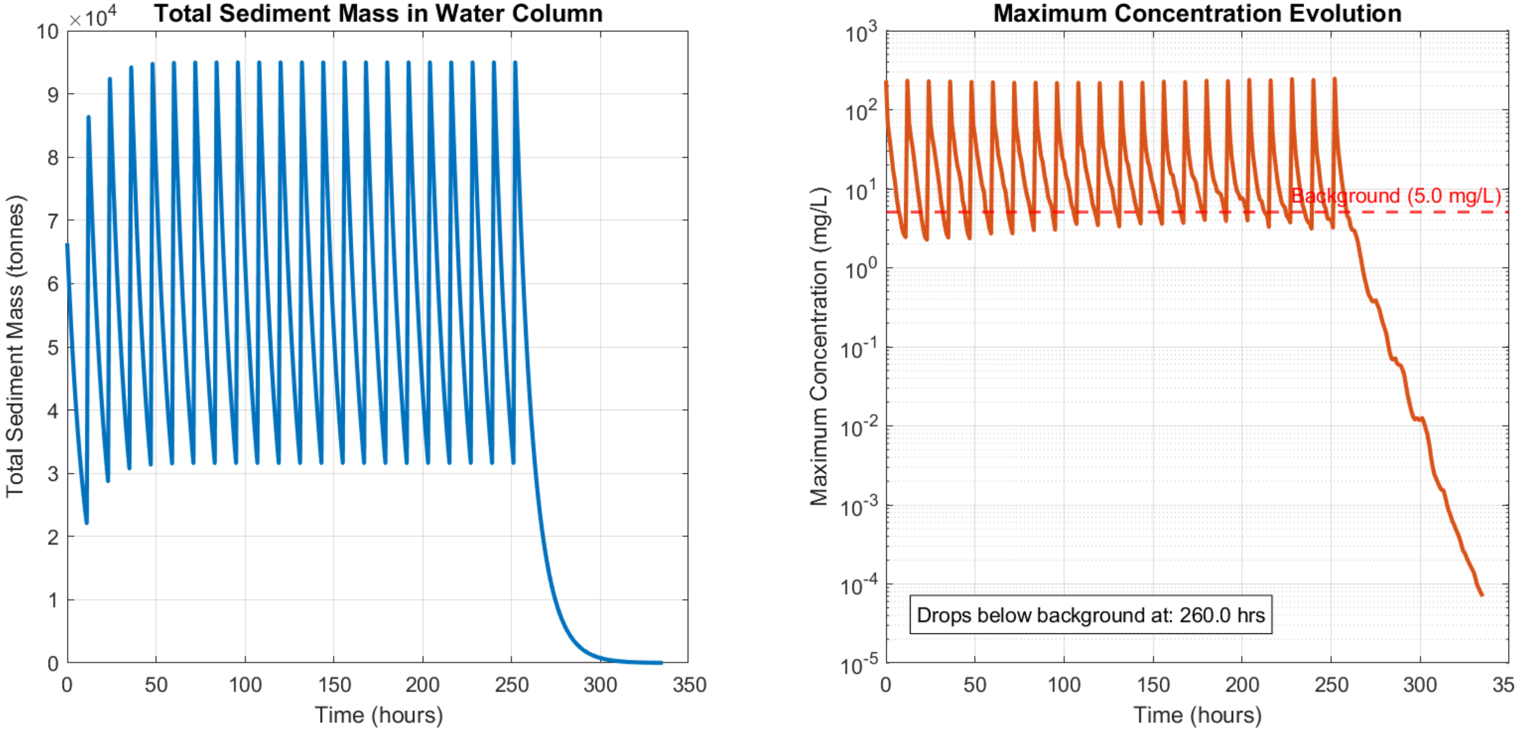


Figure 6-D: Evolution of suspended sediment over the simulation period for disposal Scenario 1. Left: Total sediment mass in the water column. Right: Maximum SSC over time

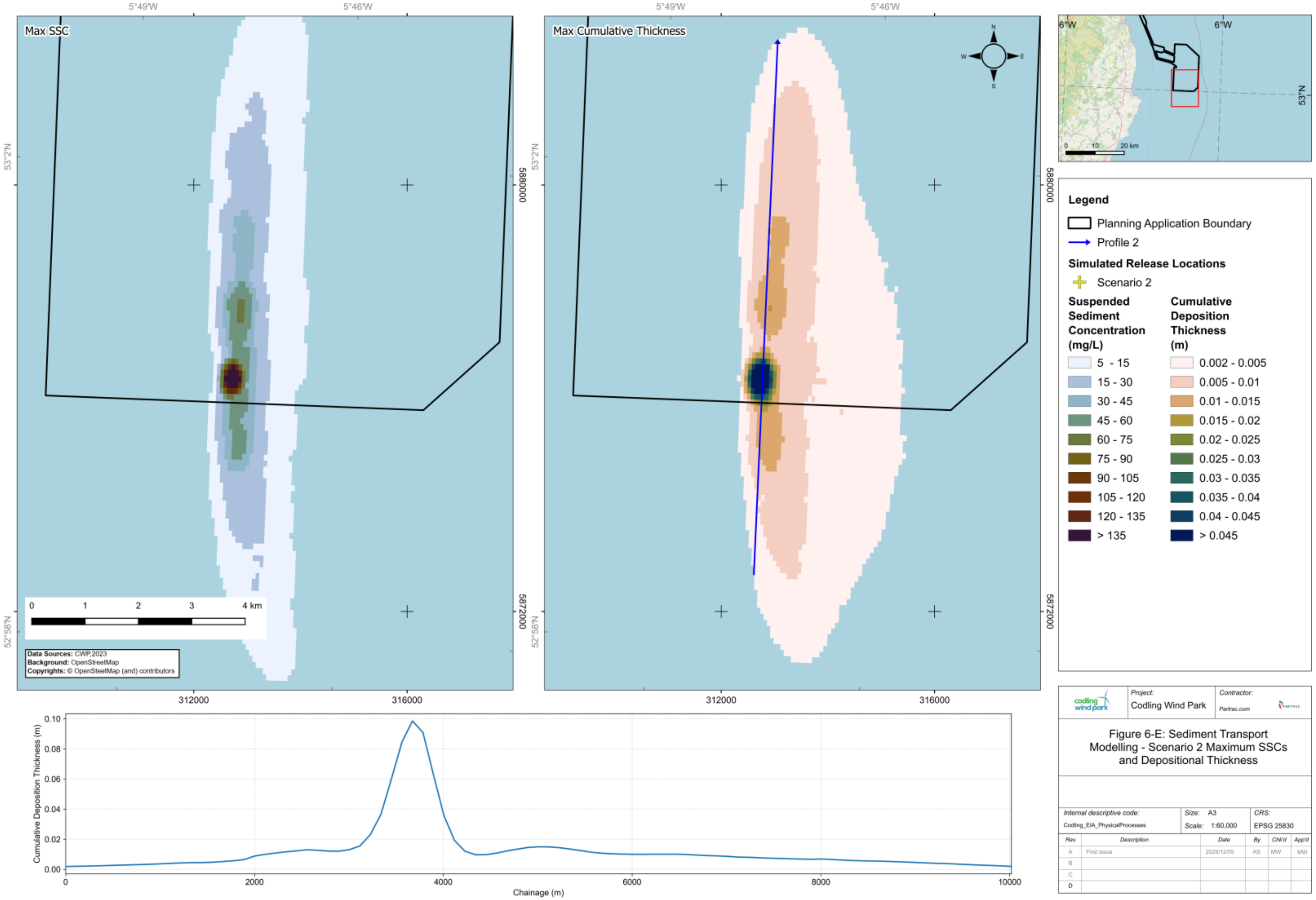


Figure 6-E: Sediment Transport Modelling - Scenario 2 Maximum SSCs and Depositional Thickness

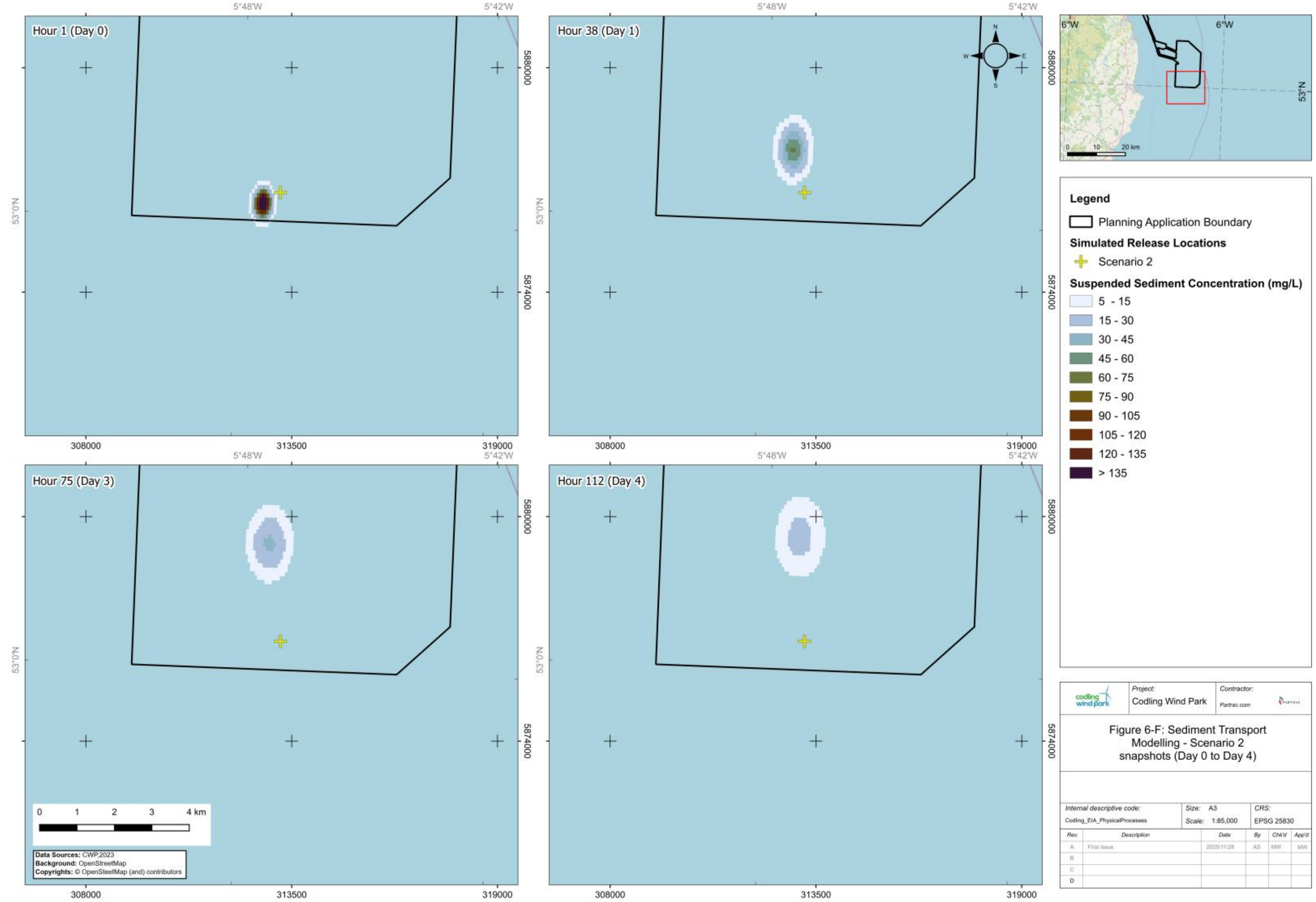


Figure 6-F: Sediment Transport Modelling - Scenario 2 snapshots (Day 0 to Day 4)

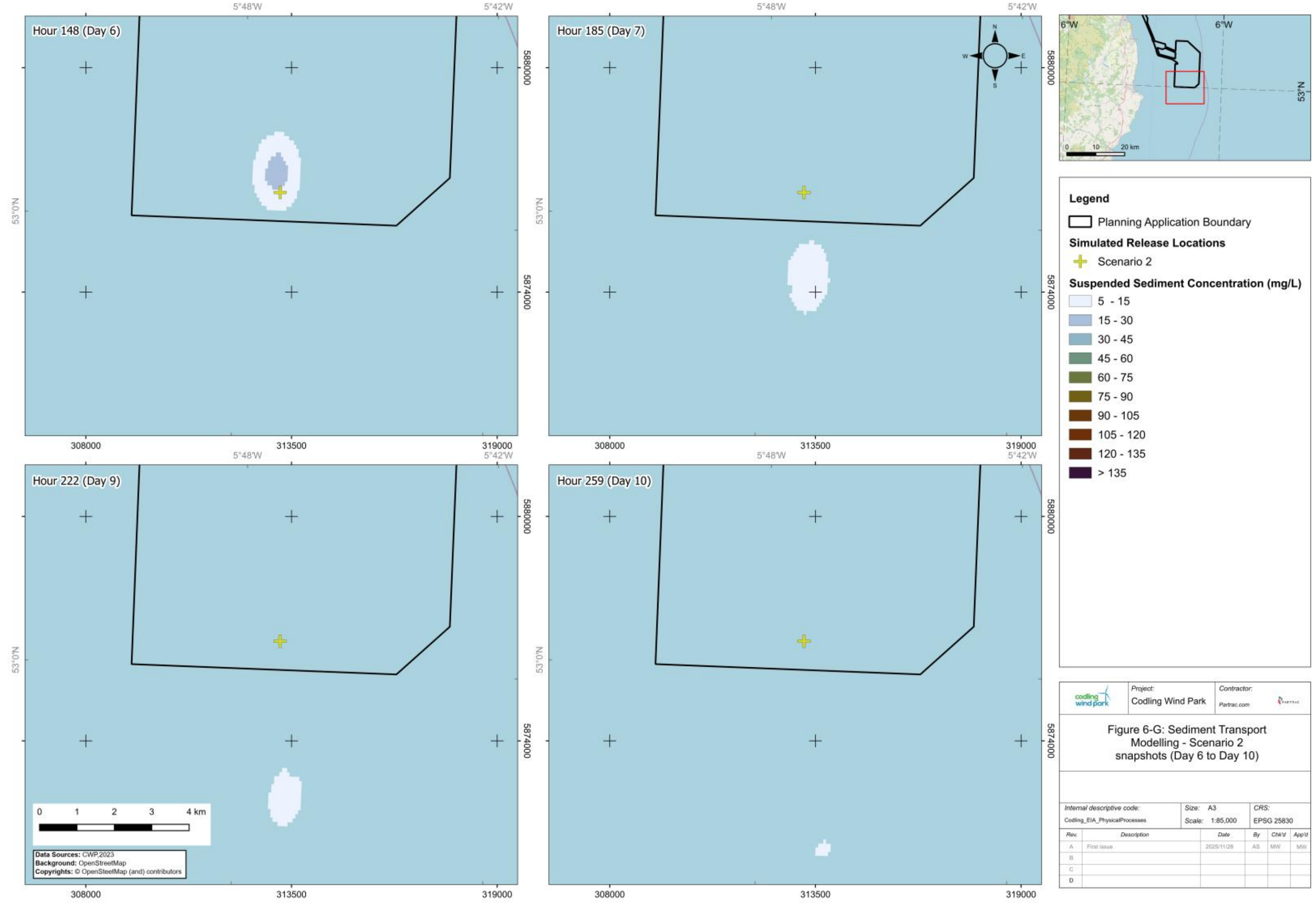


Figure 6-G: Sediment Transport Modelling - Scenario 2 snapshots (Day 0 to Day 4)

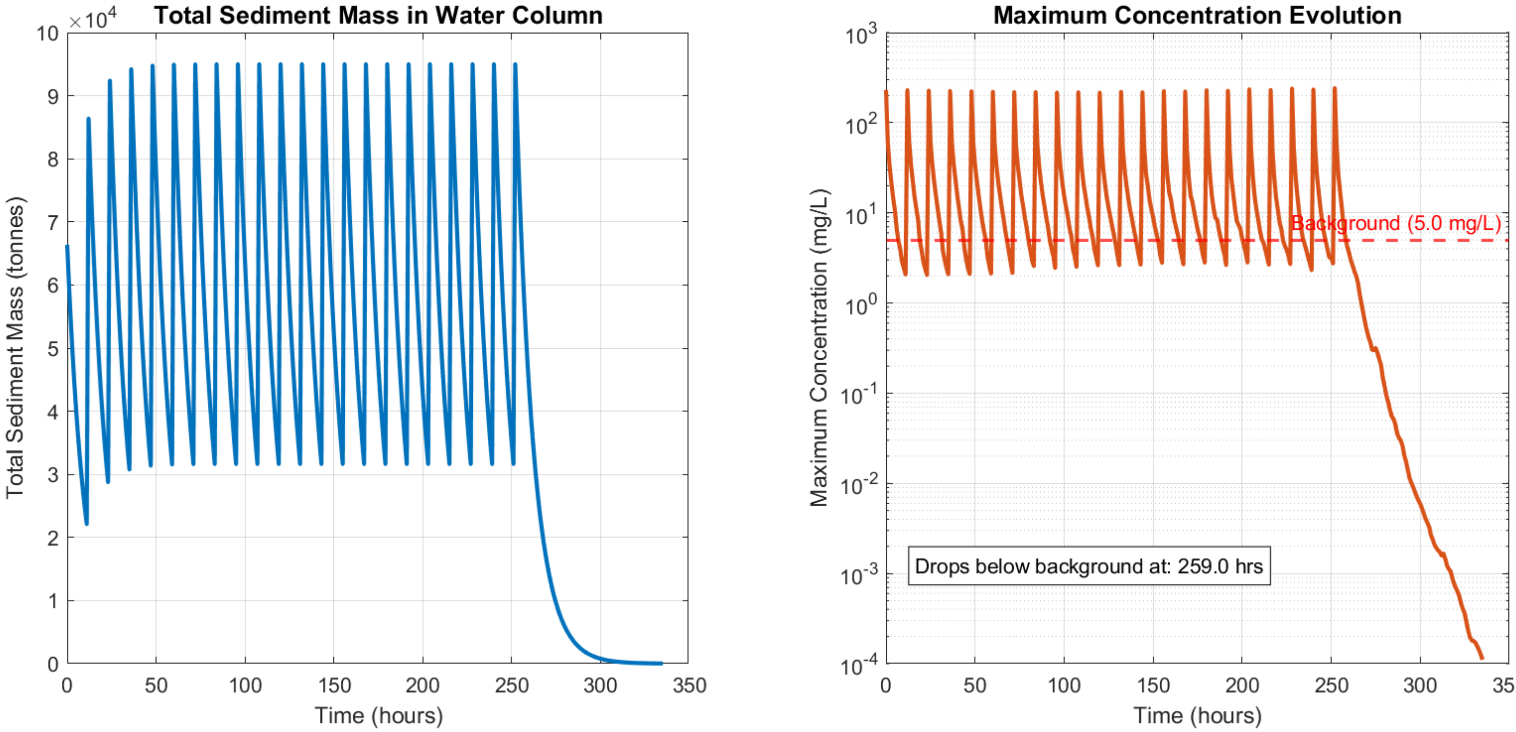


Figure 6-H: Evolution of suspended sediment over the simulation period for disposal Scenario 2. Left: Total sediment mass in the water column. Right: Maximum SSC over time

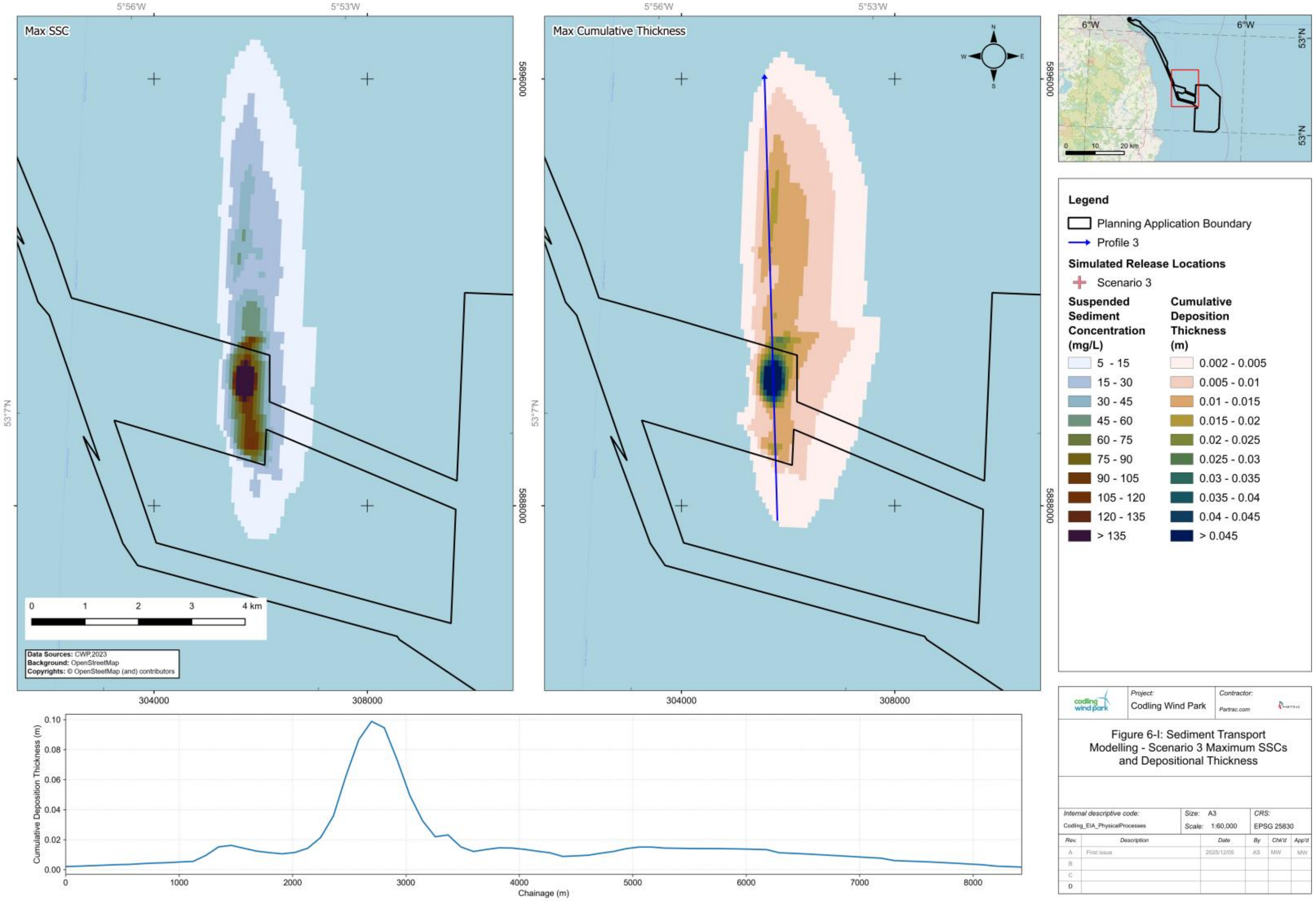
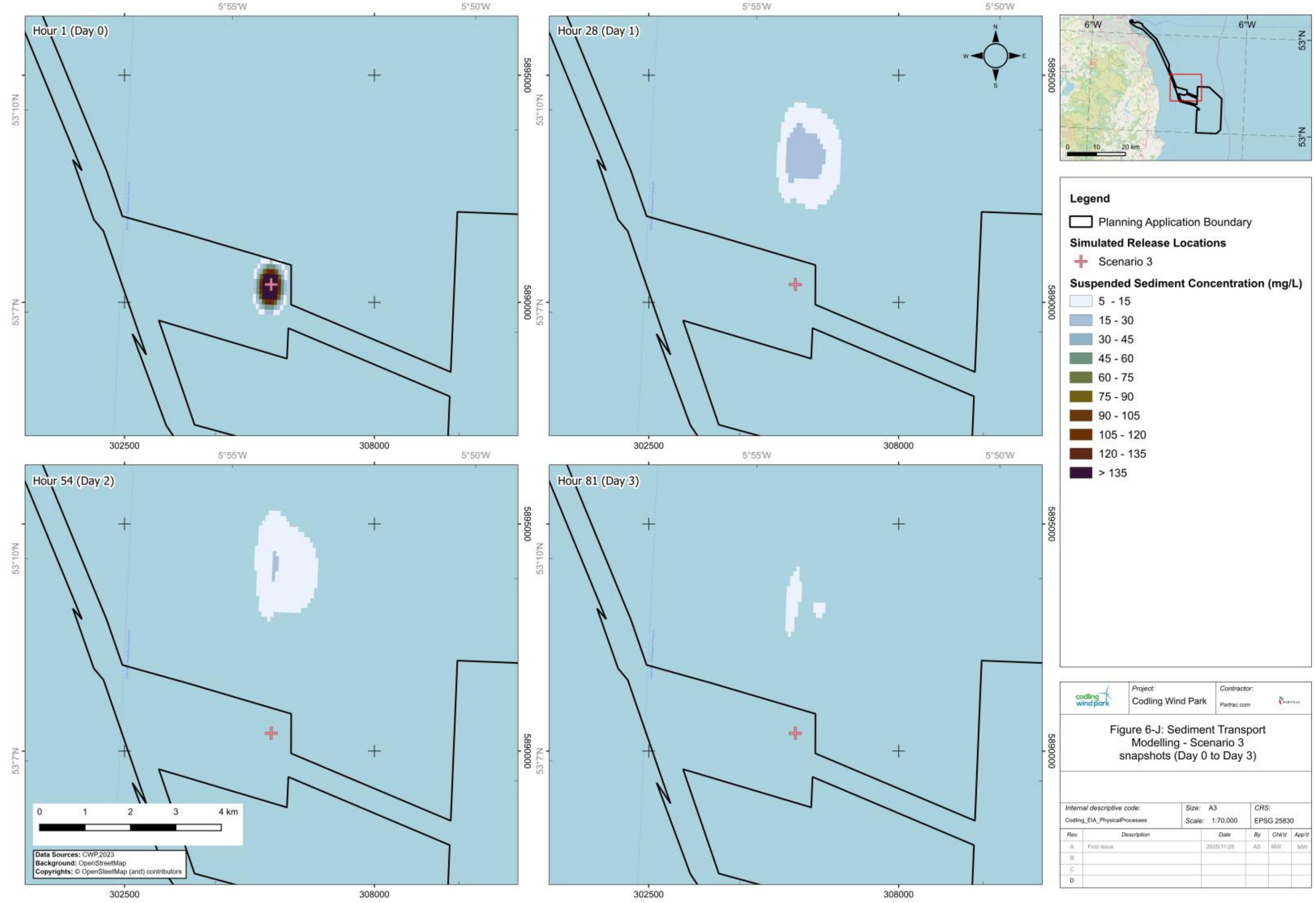


Figure 6-I: Sediment Transport Modelling - Scenario 3 Maximum SSCs and Depositional Thickness



Rev.	Description	Date	By	Chk'd	App'd
A	First issue	2025/11/28	AS	MW	MW
B					
C					
D					

Figure 6-J: Sediment Transport Modelling - Scenario 3 snapshots (Day 0 to Day 3)

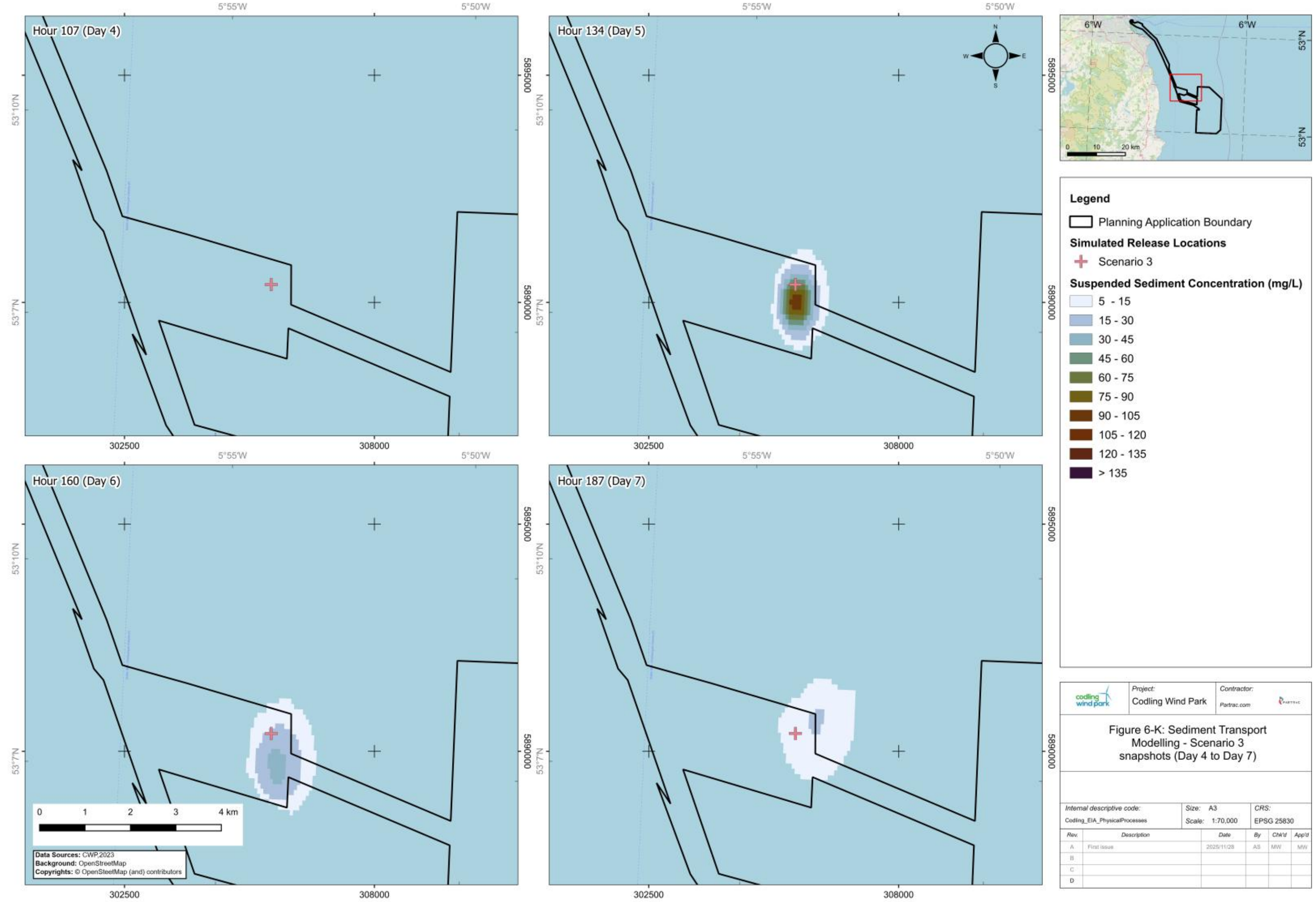


Figure 6-K: Sediment Transport Modelling - Scenario 3 snapshots (Day 4 to Day 7)

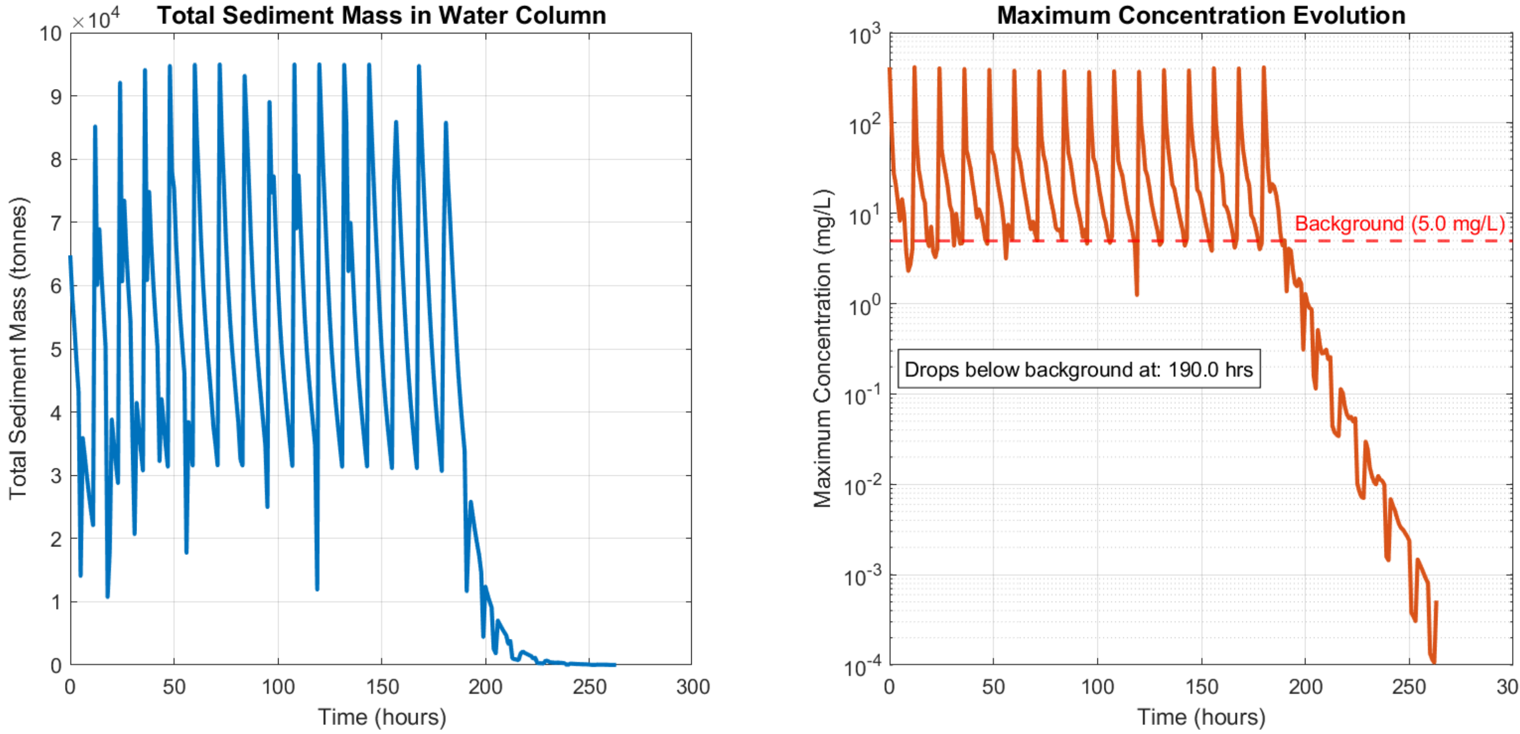


Figure 6-L: Evolution of suspended sediment over the simulation period for disposal Scenario 3. Left: Total sediment mass in the water column. Right: Maximum SSC over time

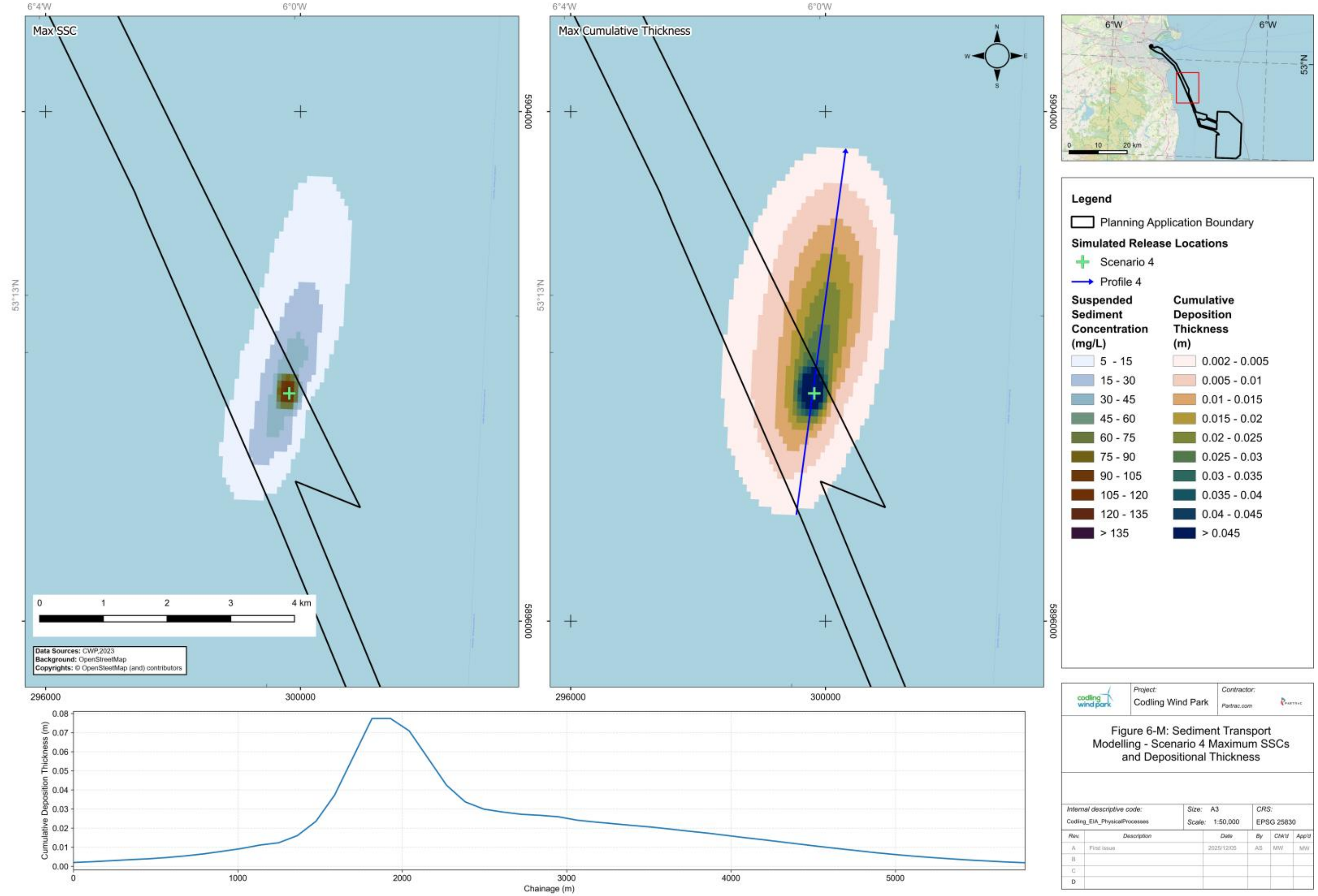


Figure 6-M: Sediment Transport Modelling - Scenario 4 Maximum SSCs and Depositional Thickness

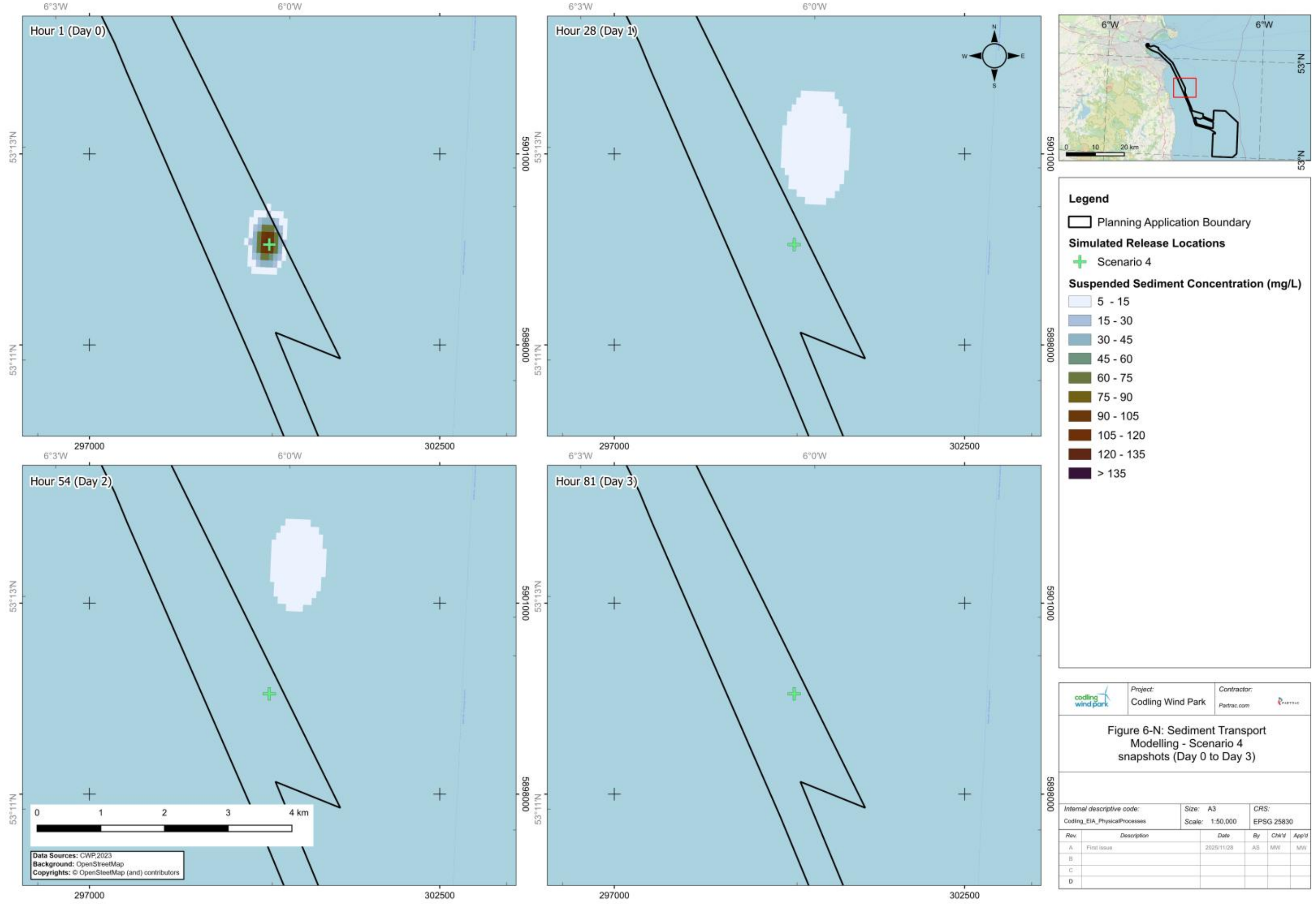


Figure 6-N: Sediment Transport Modelling - Scenario 4 snapshots (Day 0 to Day 3)

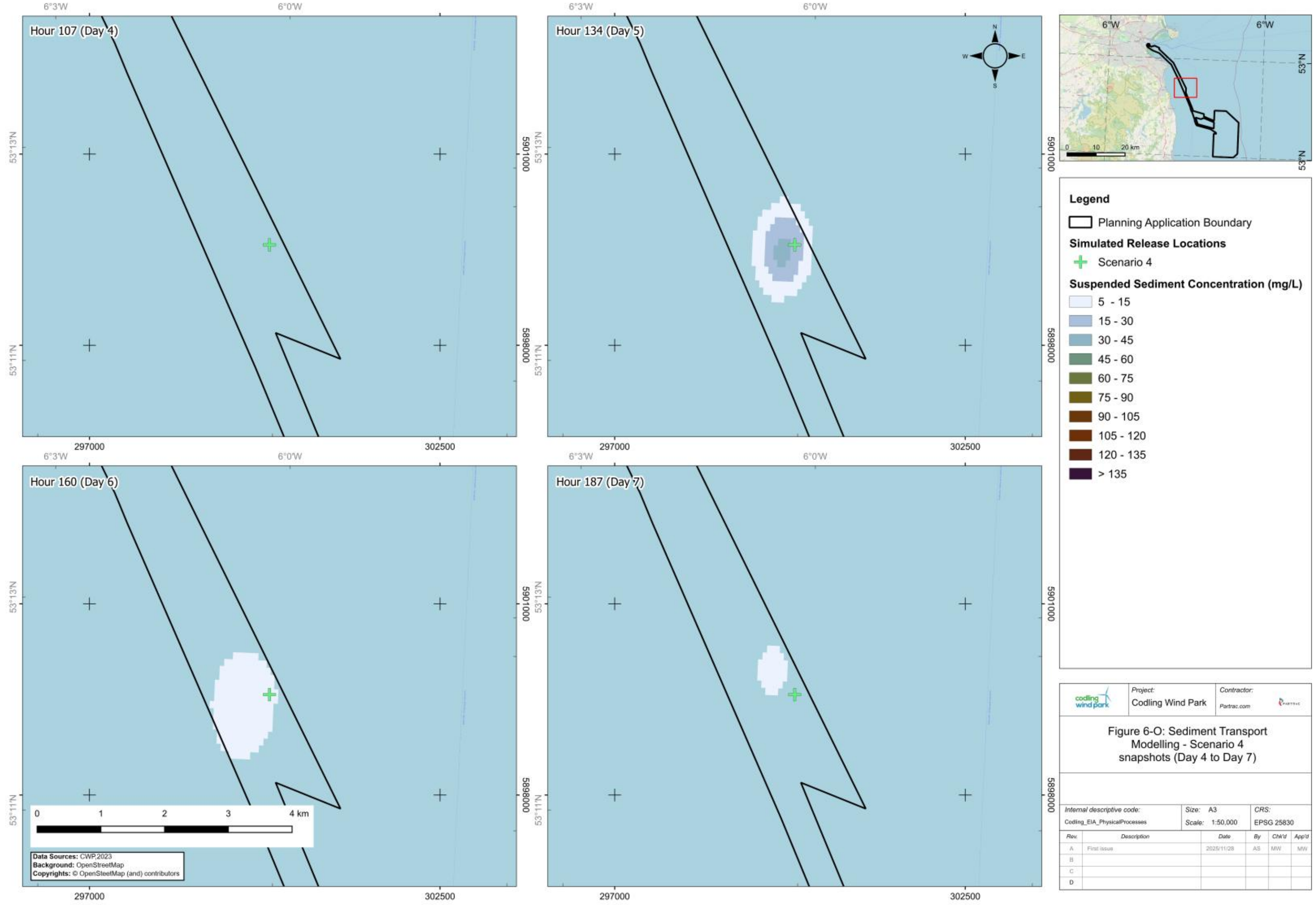


Figure 6-O: Sediment Transport Modelling - Scenario 4 snapshots (Day 4 to Day 7)

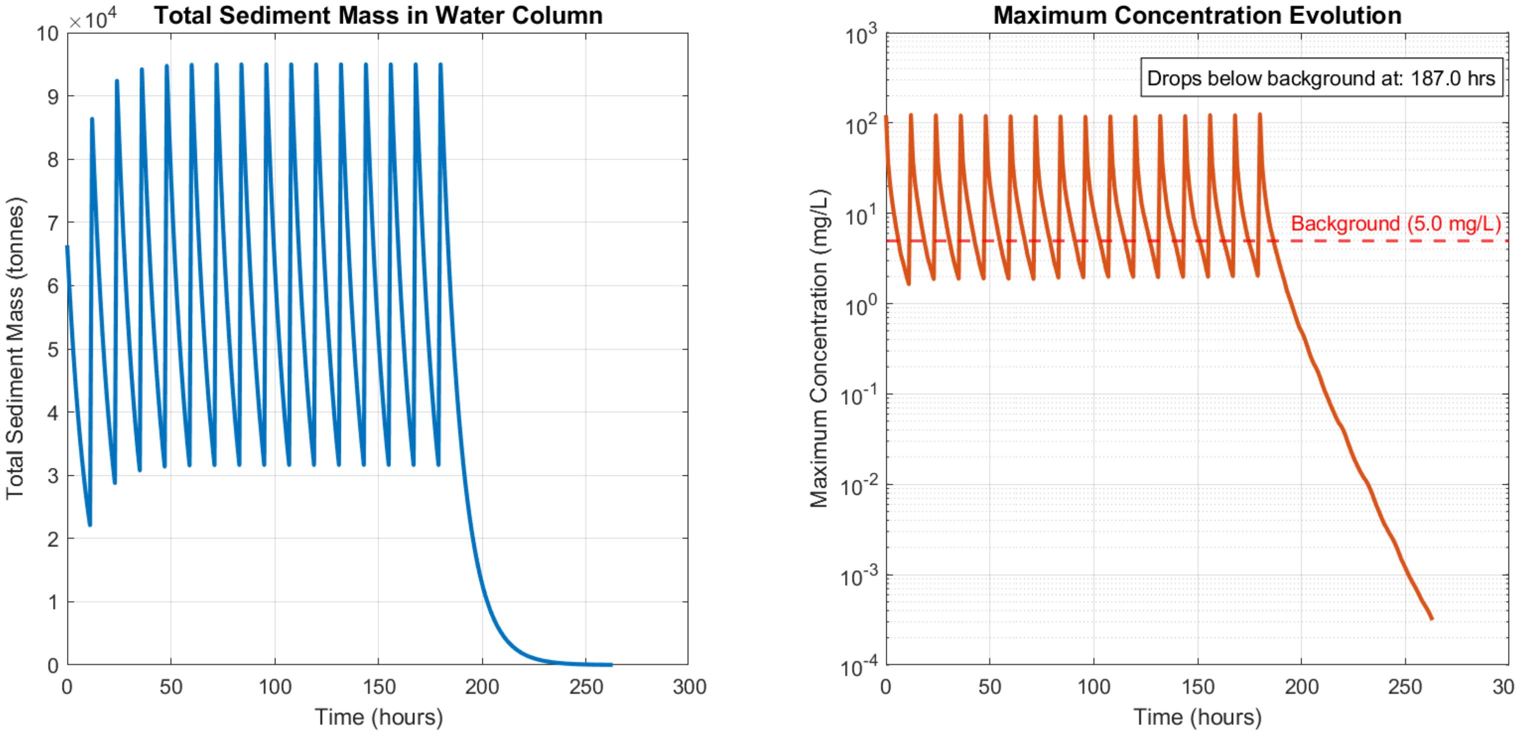


Figure 6-P: Evolution of suspended sediment over the simulation period for disposal Scenario 4. Left: Total sediment mass in the water column. Right: Maximum SSC over time

6.2 Trenching Activities

Similar to the dredge disposal activities, trenching activities that are to be performed as part of the construction phase of the CWP project are predicted to have a spatially limited, and transient, impact on SSCs local to the activity. Two scenarios were completed to simulate installation of: i) the Export (OECC) cables, and ii) the IAC and Interconnector Cables in the array area. Table 6-B summarises the results of these simulations.

The results indicate that trenching activities within the array site and along the OECC are not expected to have a significant impact on local and regional SSCs over the long-term, with SSCs returning to background conditions within a maximum of 12 days of the completion cable trenching operations. The effects are largely limited to those areas proximal to the trenching routes, as the sediment plumes generated deposit rapidly on to the seabed or are dispersed to background levels within c. 6 km of the trenched cable route. The thickness of the deposit on the seabed at the release location is anticipated to be on the order of a centimetre as a result of the immediately deposited part of the released material, beyond this deposition becomes < 1 cm, and would not be discernible above the potential natural variation observed during storm events. These sediments are anticipated to be rapidly reworked by the prevailing hydrodynamic regime and integrated into the existing seabed sediment system.

The results for the OECC installation (Scenario 5) are presented in Figure 6-Q to Figure 6-V. Figure 6-W to Figure 6-Z present the results for the IAC installation (Scenario 6). The results for each of the two simulations are presented as follows:

- A spatial plot showing the maximum observed SSC values at any time during the model run (representing the maximum footprint of SSC resulting from the dredging operations), and the cumulative deposition thickness over the entire simulation; and,
- A series of time-sliced snapshots[10] showing the location (and predicted concentration) of the suspended sediment plume during the simulation; and,
- A time series of maximum suspended sediment concentrations throughout the simulation period for the entire model domain, presented as both total sediment mass in the water column and maximum SSC values over time.

---

[10] Snapshots were chosen to evenly represent the period when suspended sediment concentrations were above background levels (5 mg/L), capturing plume evolution from initial release through peak activity to near-background conditions.

Table 6-B: Findings obtained from the two simulations for cable trenching.

Scenario	Location	Transport Direction	Transport Distance (km)	Predicted Transient Increases in SSC (mg/L)	Time Required to Return to Background SSCs	Cumulative Sediment Deposition Thickness Near the Disposal Location (m)
Scenario 5	EC	North-South / slight East	2 - 5	c. 140	c. 12 days	c. 0.01
Scenario 6	IAC	North-South / slight East	1 - 6	c. 80	c. 11 days	c. 0.01

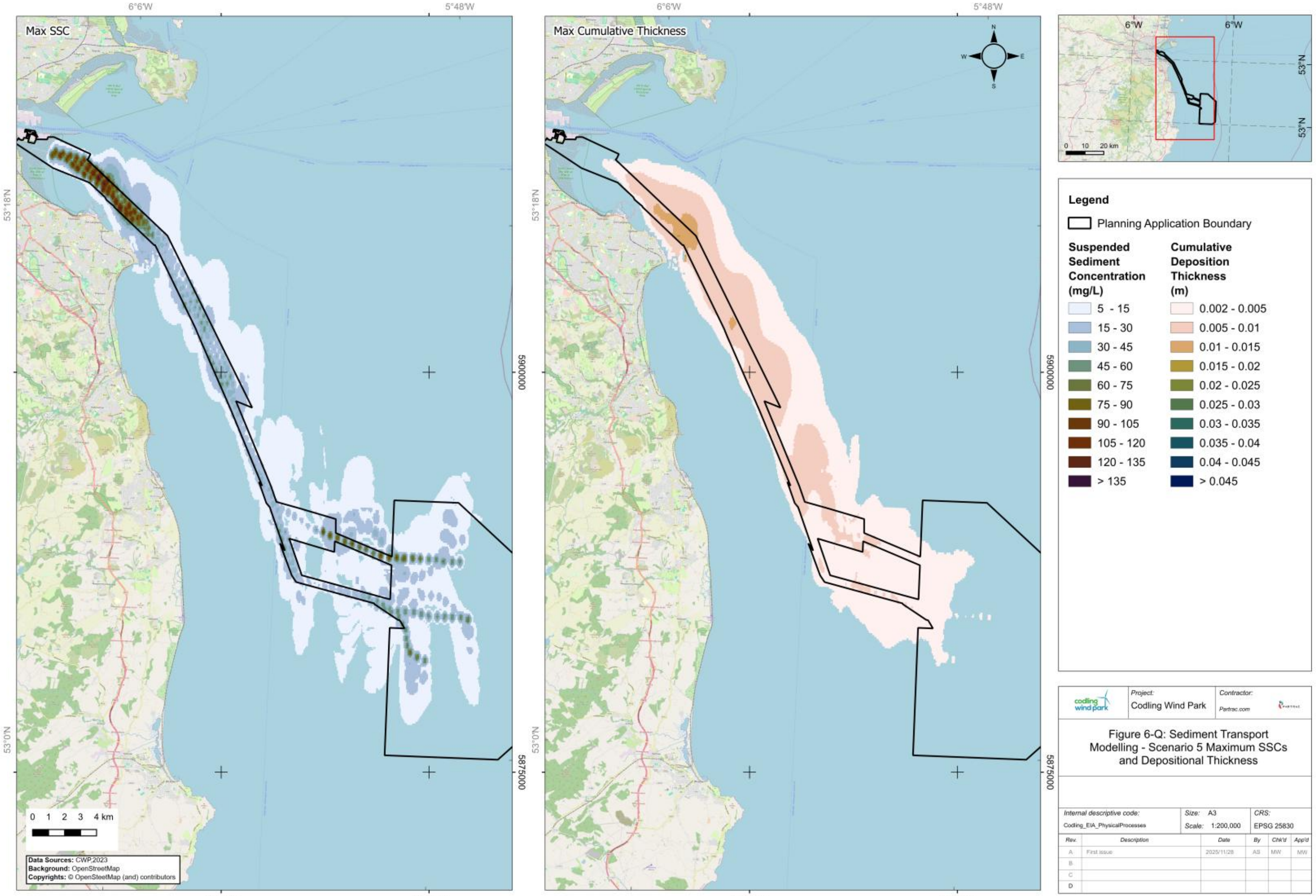


Figure 6-Q: Sediment Transport Modelling - Scenario 5 Maximum SSCs and Depositional Thickness

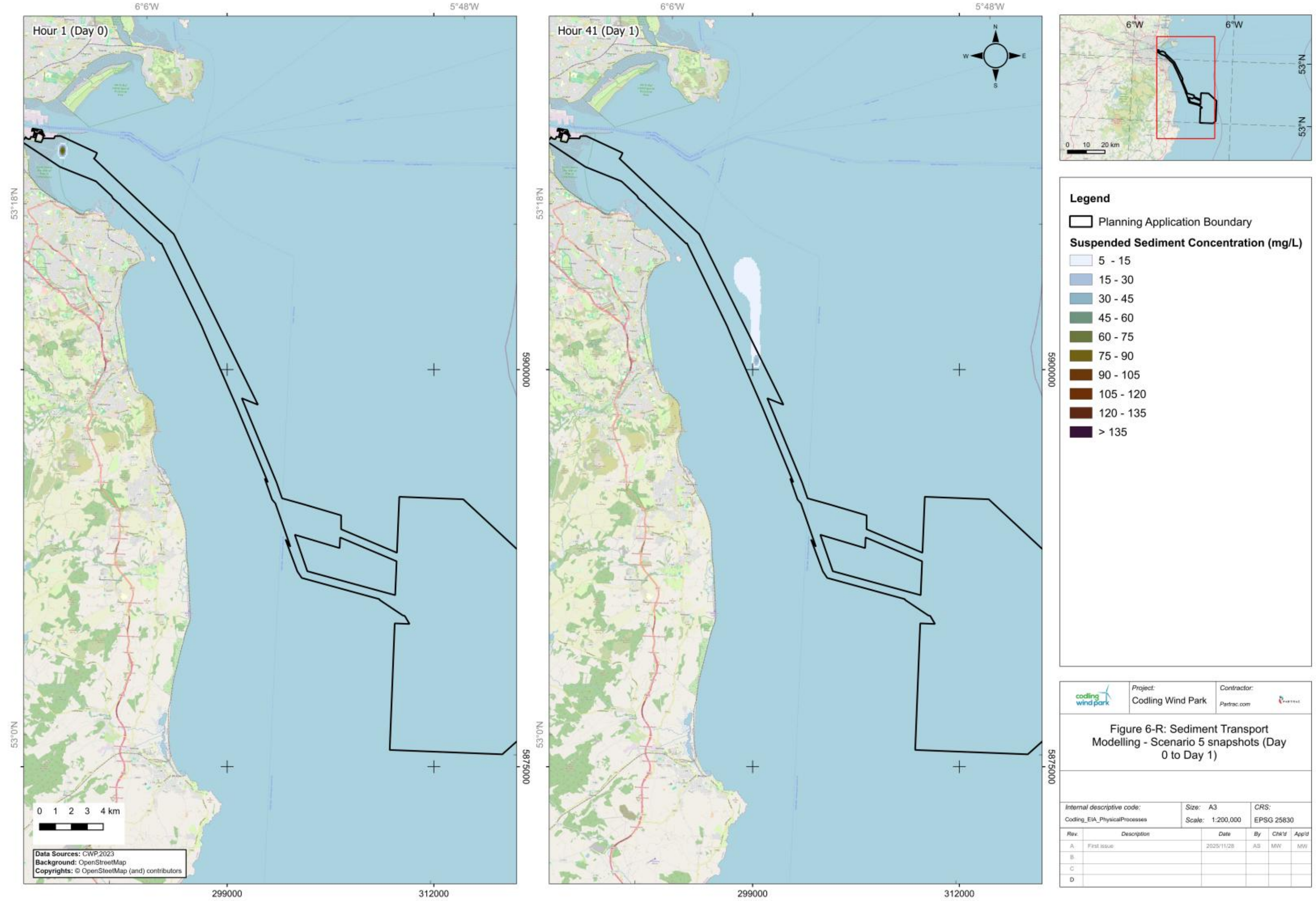


Figure 6-R: Sediment Transport Modelling - Scenario 5 snapshots (Day 0 to Day 1)

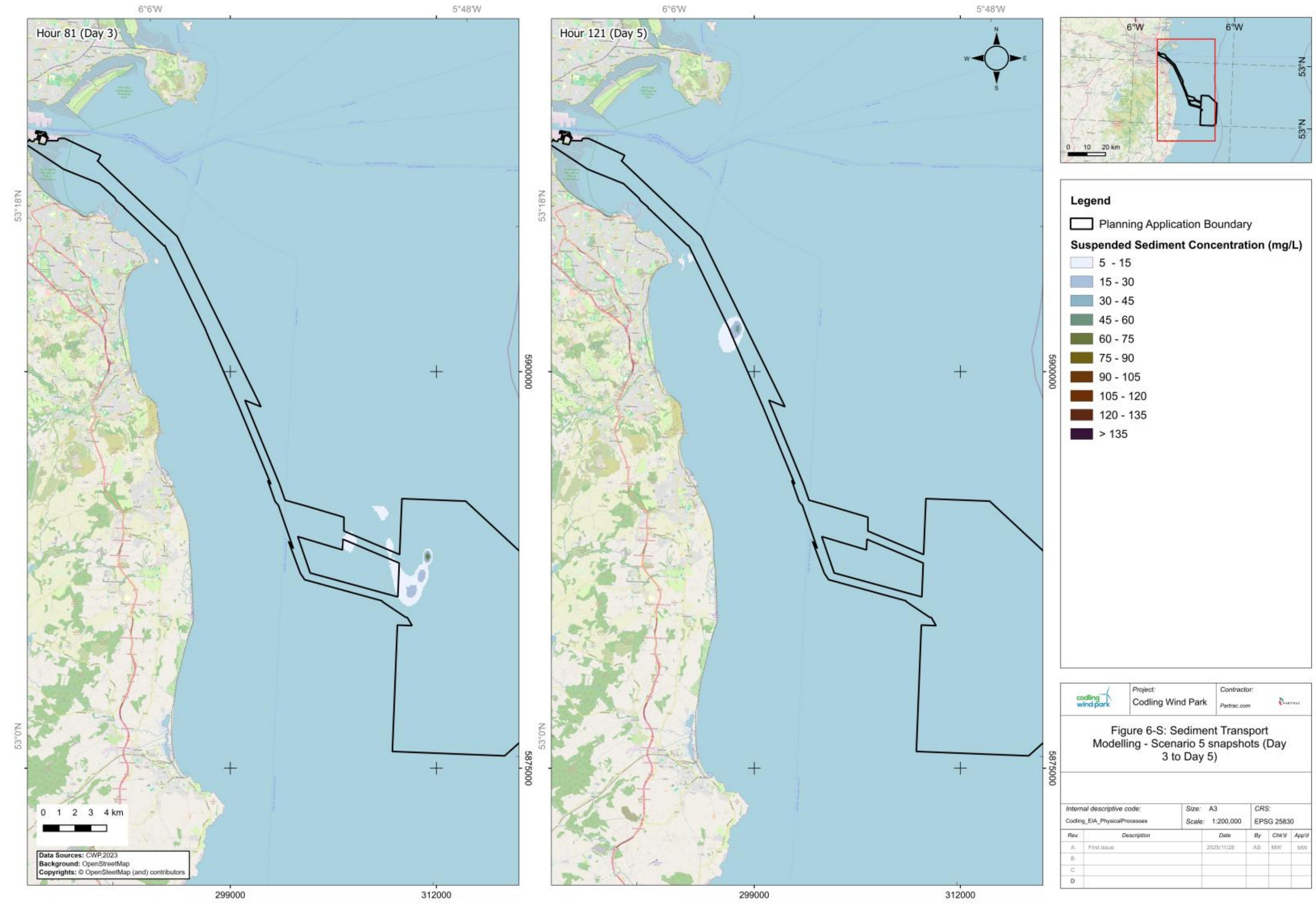


Figure 6-S: Sediment Transport Modelling - Scenario 5 snapshots (Day 3 to Day 5)

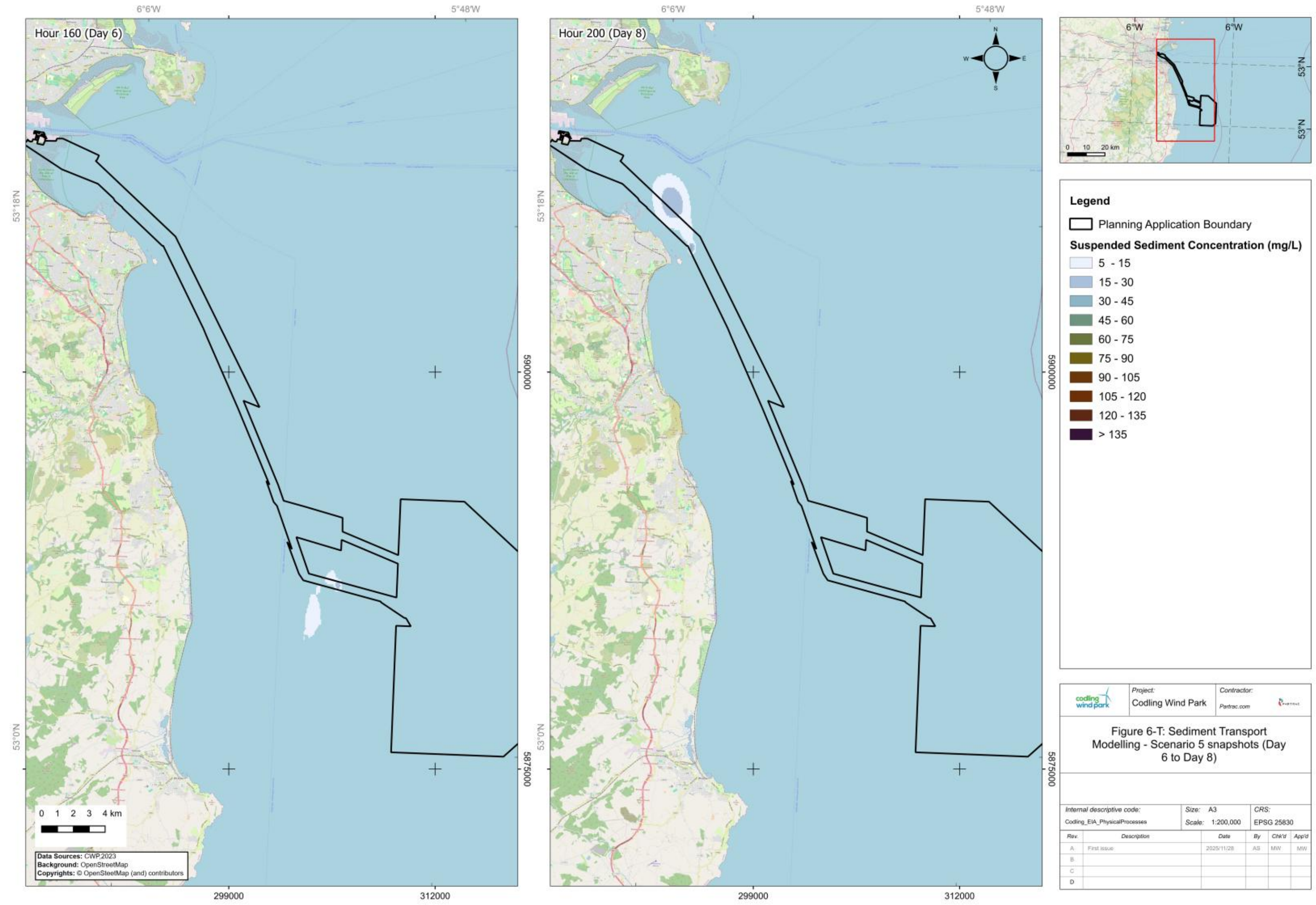


Figure 6-T: Sediment Transport Modelling - Scenario 5 snapshots (Day 6 to Day 8)

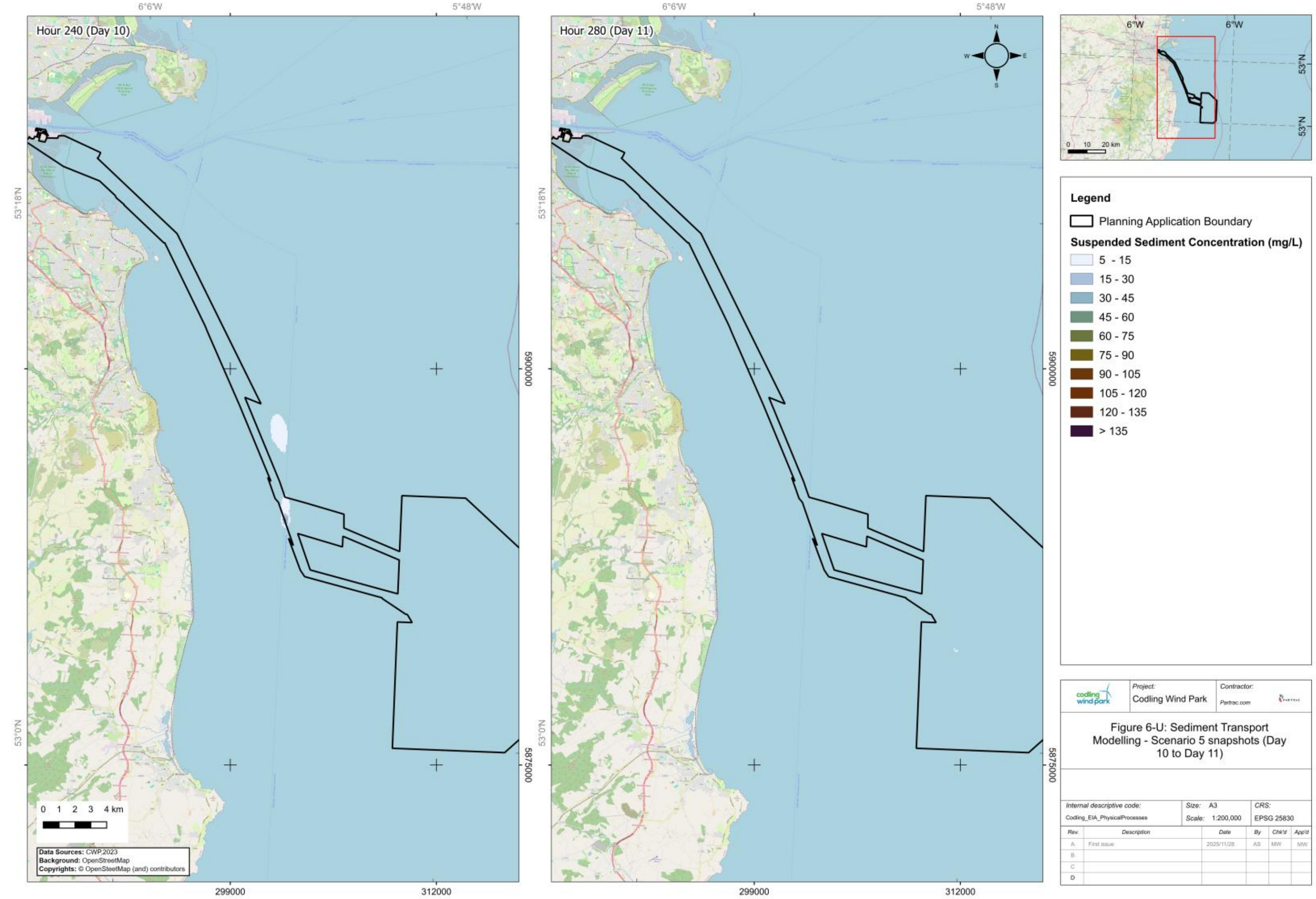


Figure 6-U: Sediment Transport Modelling - Scenario 5 snapshots (Day 10 to Day 11)

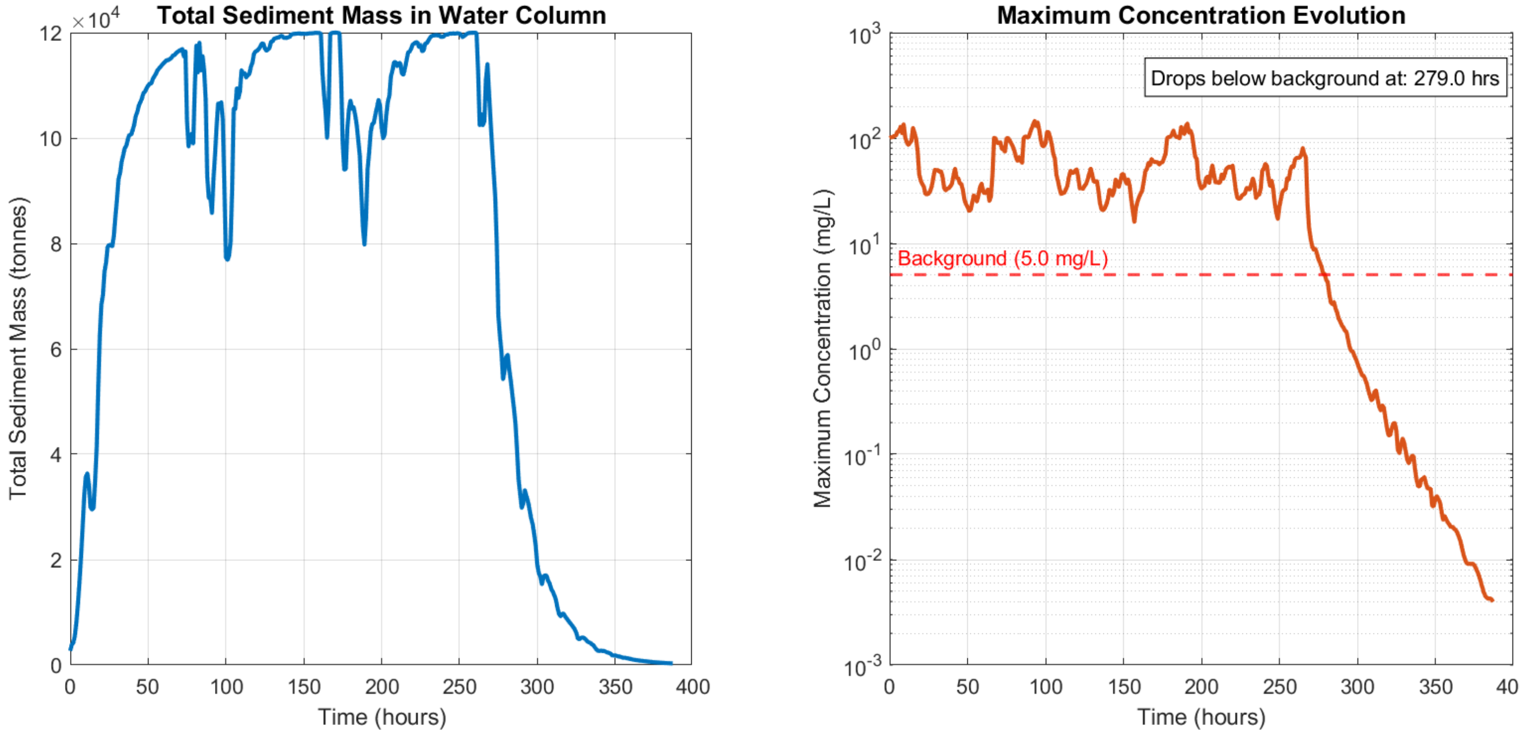


Figure 6-V: Evolution of suspended sediment over the simulation period for disposal Scenario 5. Left: Total sediment mass in the water column. Right: Maximum SSC over time

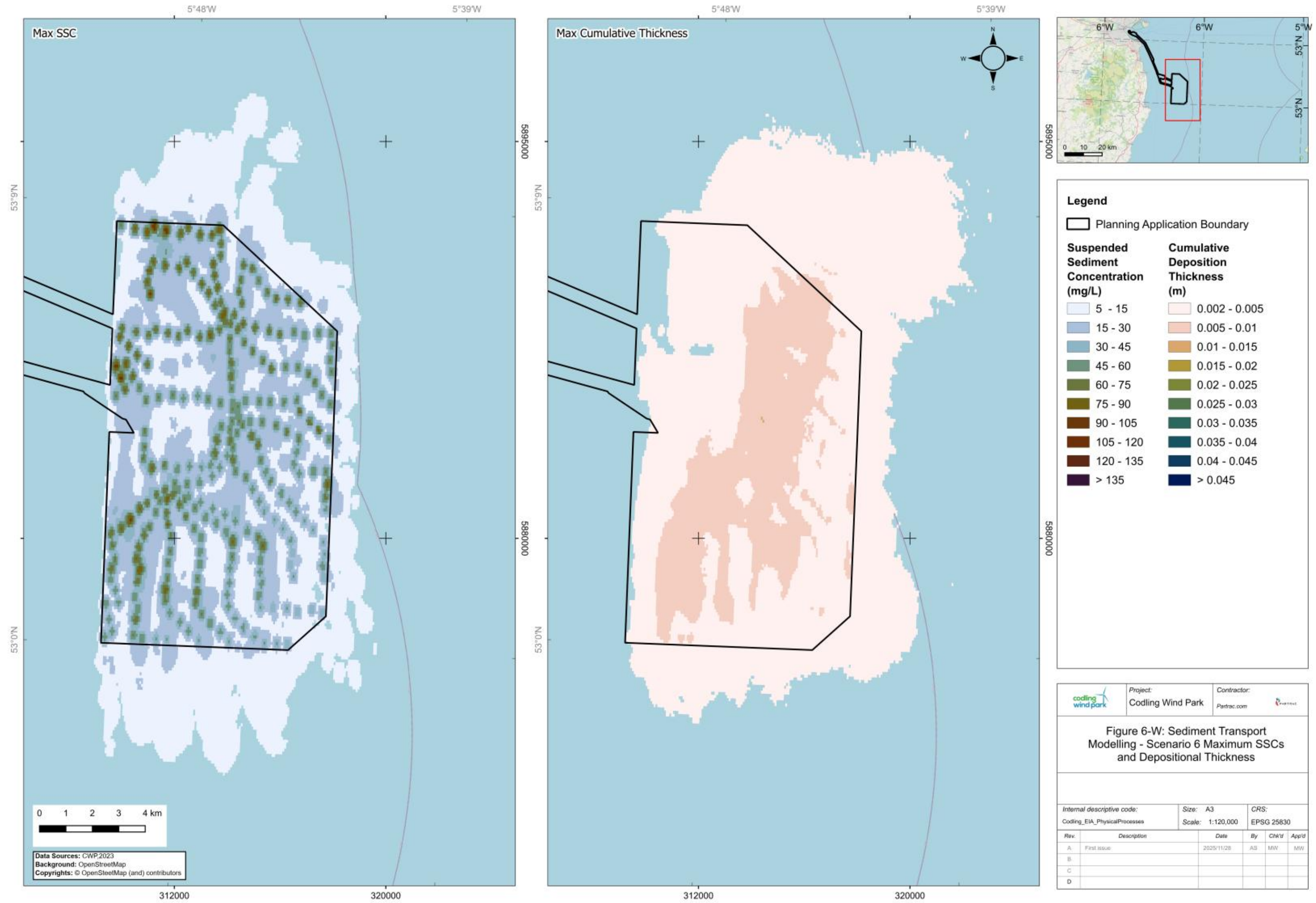


Figure 6-W: Sediment Transport Modelling - Scenario 6 Maximum SSCs and Depositional Thickness

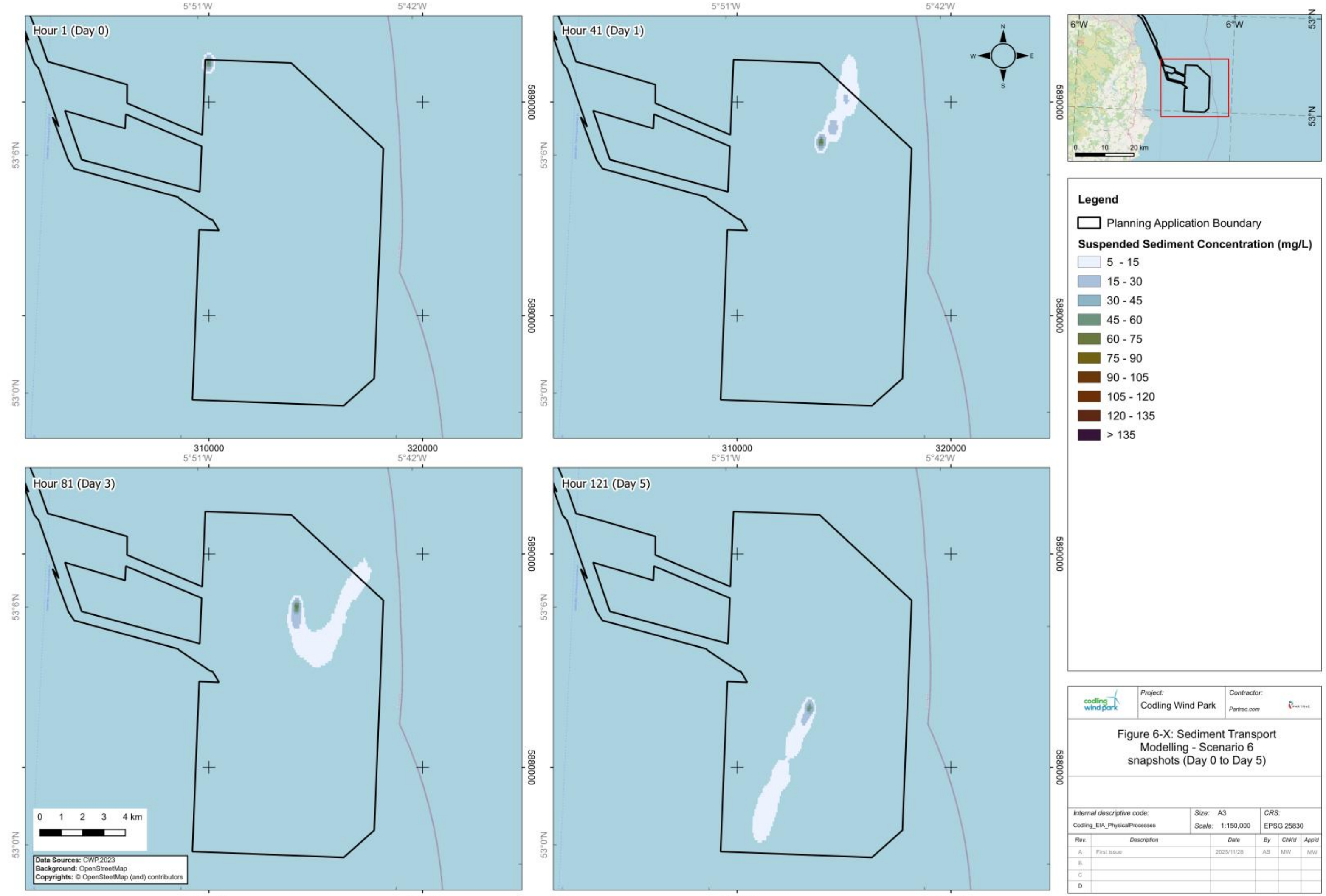


Figure 6-X: Sediment Transport Modelling - Scenario 6 snapshots (Day 0 to Day 5)

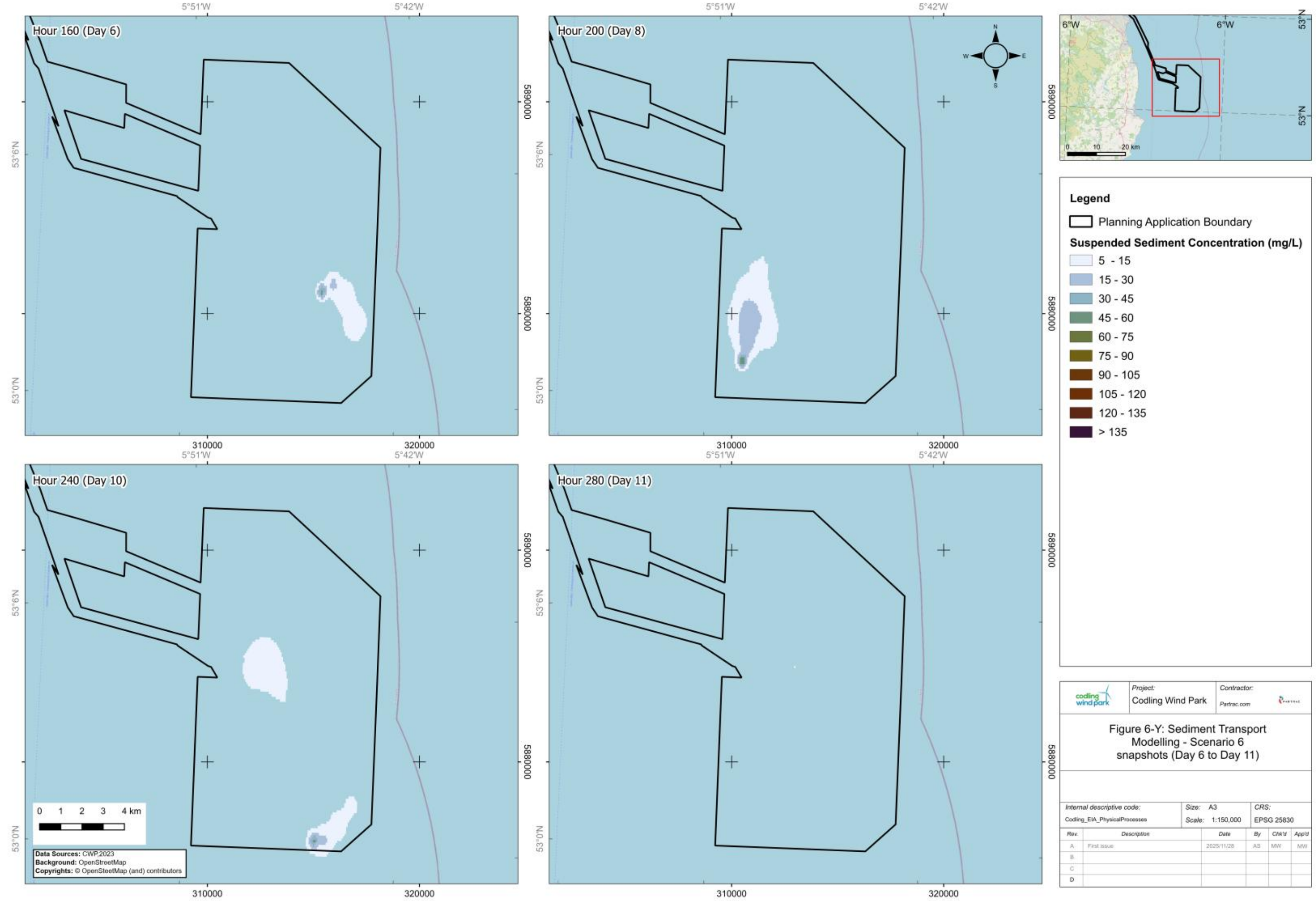


Figure 6-Y: Sediment Transport Modelling - Scenario 6 snapshots (Day 6 to Day 11)

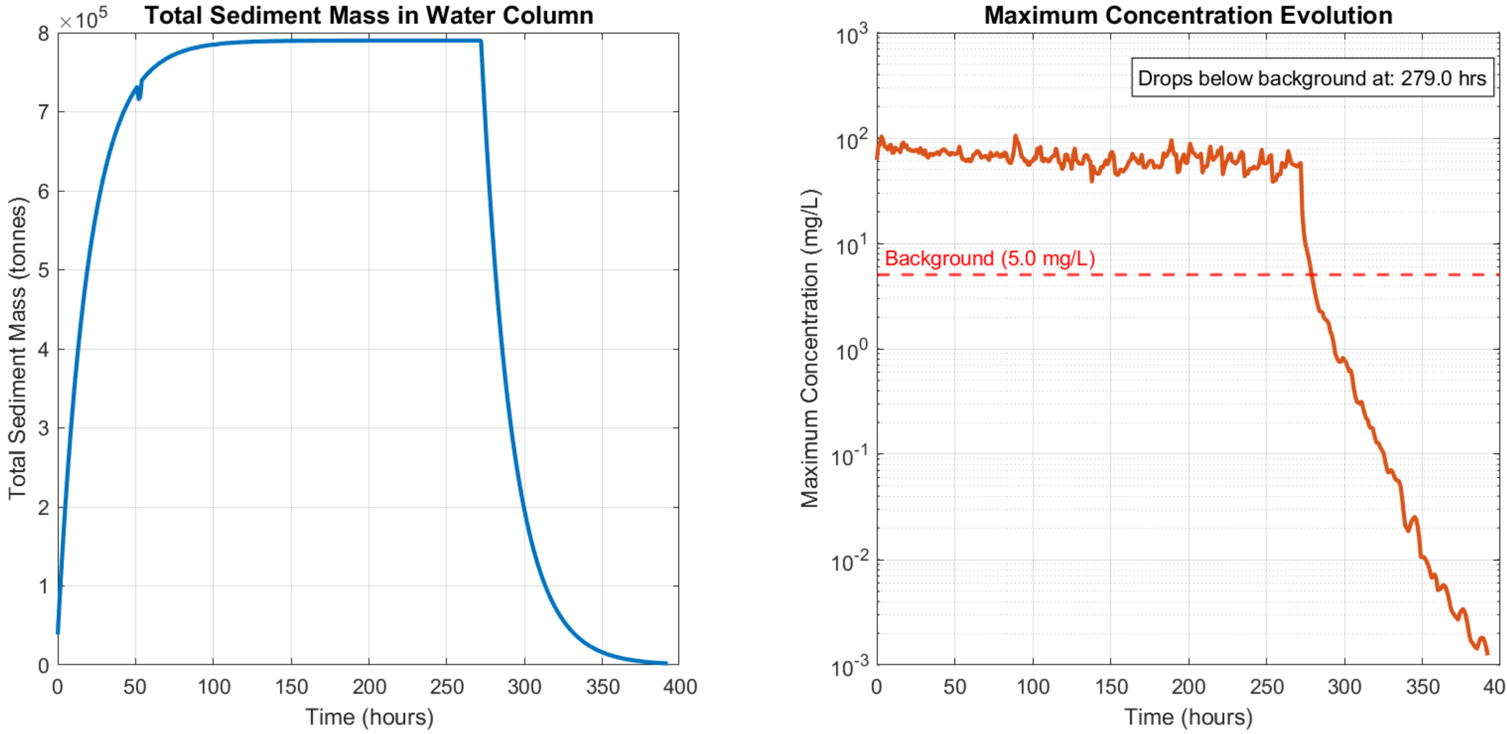


Figure 6-Z: Evolution of suspended sediment over the simulation period for disposal Scenario 6. Left: Total sediment mass in the water column. Right: Maximum SSC over time

6.3 Foundation Installation Activities

Similar to the dredge disposal and trenching activities, foundation installation (drilling) activities to be performed as part of the construction phase of the CWP project are predicted to have a spatially limited, and transient, impact on SSCs local to the activity. A single scenario was completed to simulate drilling associated with the installation of foundations. Table 6-C summarises the results of this simulation.

The results indicate that drilling activities within the array site are not expected to have a significant impact on local and regional SSCs over the long-term, with SSCs returning to background conditions within a maximum of 4 days of the completion of drilling activities. The effects are largely limited to those areas proximal to the drilling locations, as the sediment plumes generated deposit rapidly on to the seabed, or are dispersed to background levels within c. 2 km of the drilling locations. The thickness of the deposit on the seabed at the release location is anticipated to be negligible (< 3 mm).

The results for foundation installation (Scenario 7) are presented in Figure 6-AA to Figure 6-DD. The results for each of the simulations are presented as follows:

- A spatial plot showing the maximum observed SSC values at any time during the model run (representing the maximum footprint of SSC resulting from the dredging operations), and the cumulative deposition thickness over the entire simulation; and,
- A series of time-sliced snapshots[11] showing the location (and predicted concentration) of the suspended sediment plume during the simulation; and,
- A time series of maximum suspended sediment throughout the simulation period for the entire model domain, presented as both total sediment mass in the water column and maximum SSC values over time.

---

[11] Snapshots were chosen to evenly represent the period when suspended sediment concentrations were above background levels (5 mg/L), capturing plume evolution from initial release through peak activity to near-background conditions.

Table 6-C: Findings obtained from the simulation for foundation installation (drilling)..

Scenario	Location	Transport Direction	Transport Distance (km)	Predicted Transient Increases in SSC (mg/L)	Time Required to Return to Background SSCs	Cumulative Sediment Deposition Thickness Near the Disposal Location (mm)
Scenario 7	Array Area	North-South / slight East	2 - 3	c. 30	c. 4 days	< 3

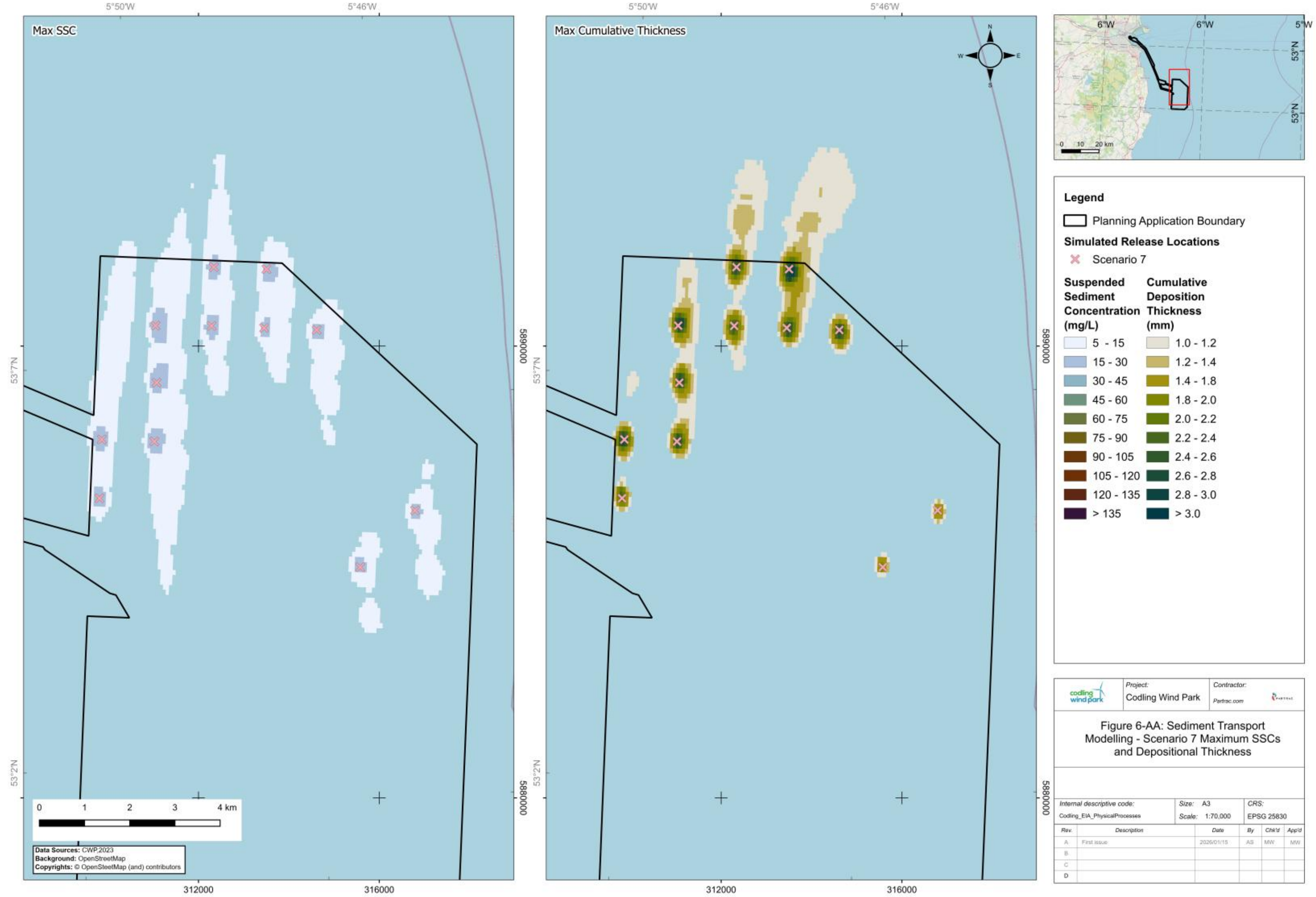


Figure 6-AA: Sediment Transport Modelling - Scenario 7 Maximum SSCs and Depositional Thickness

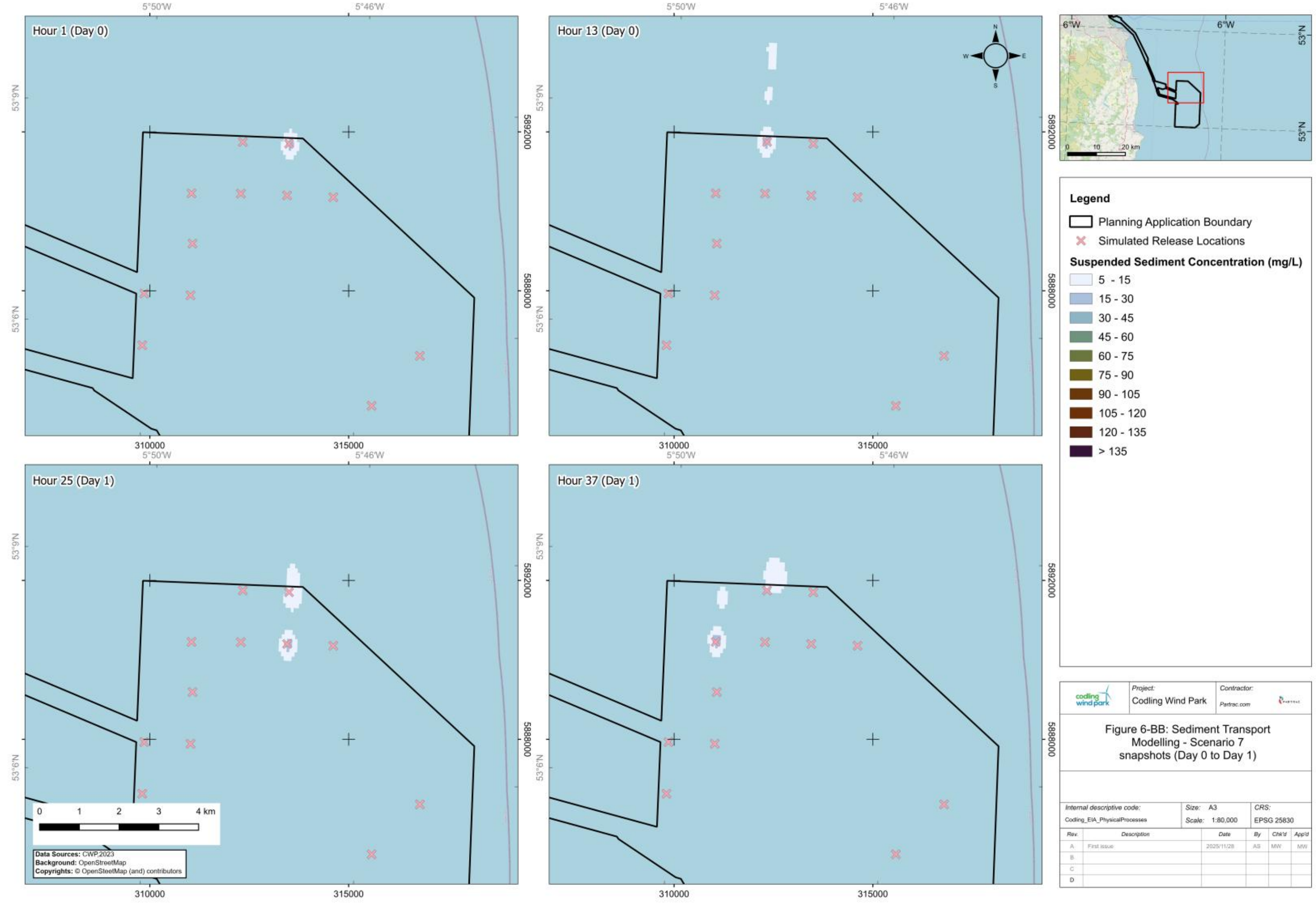


Figure 6-BB: Sediment Transport Modelling - Scenario 7 snapshots (Day 0 to Day 1)

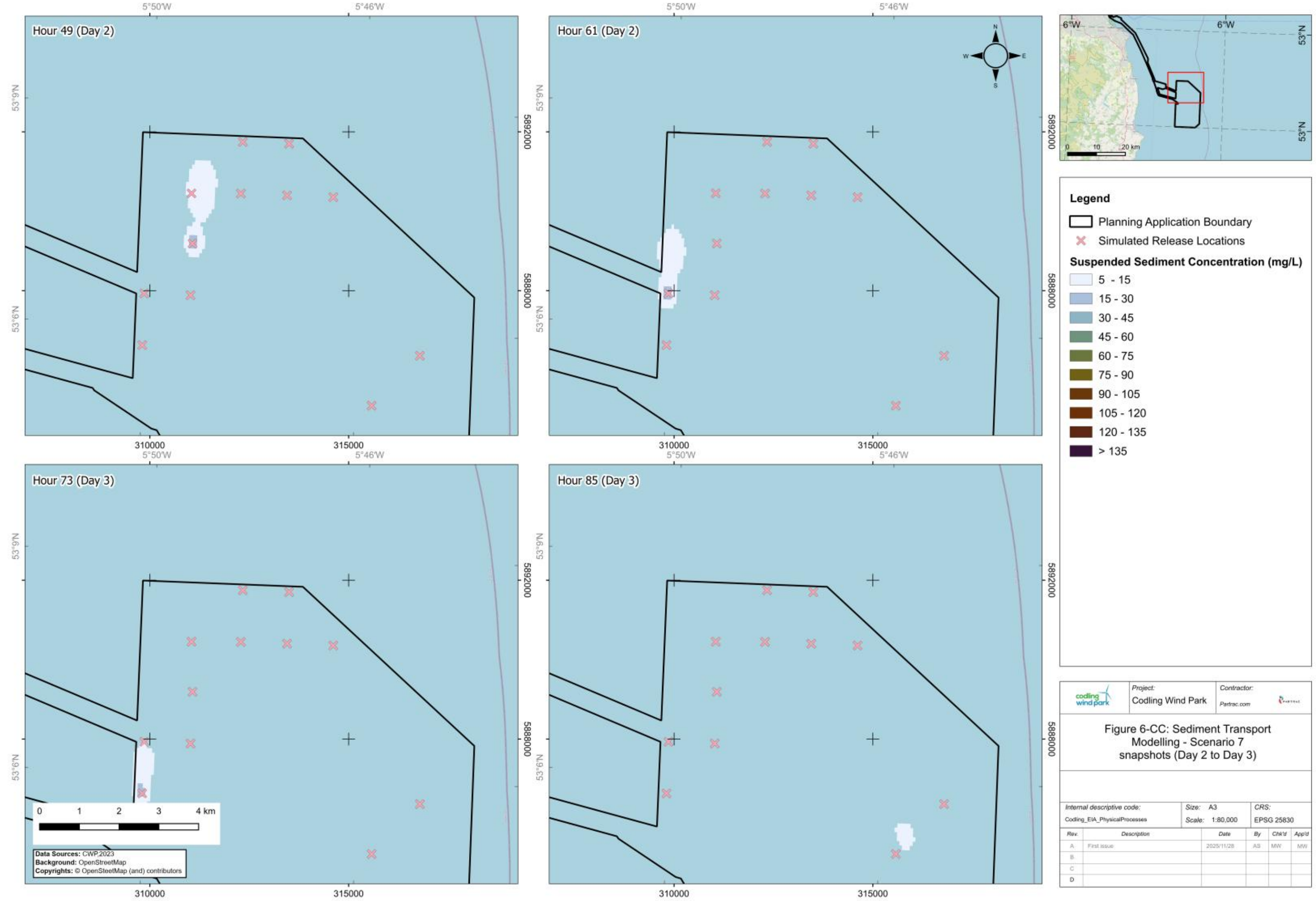


Figure 6-CC: Sediment Transport Modelling - Scenario 6 snapshots (Day 2 to Day 3)

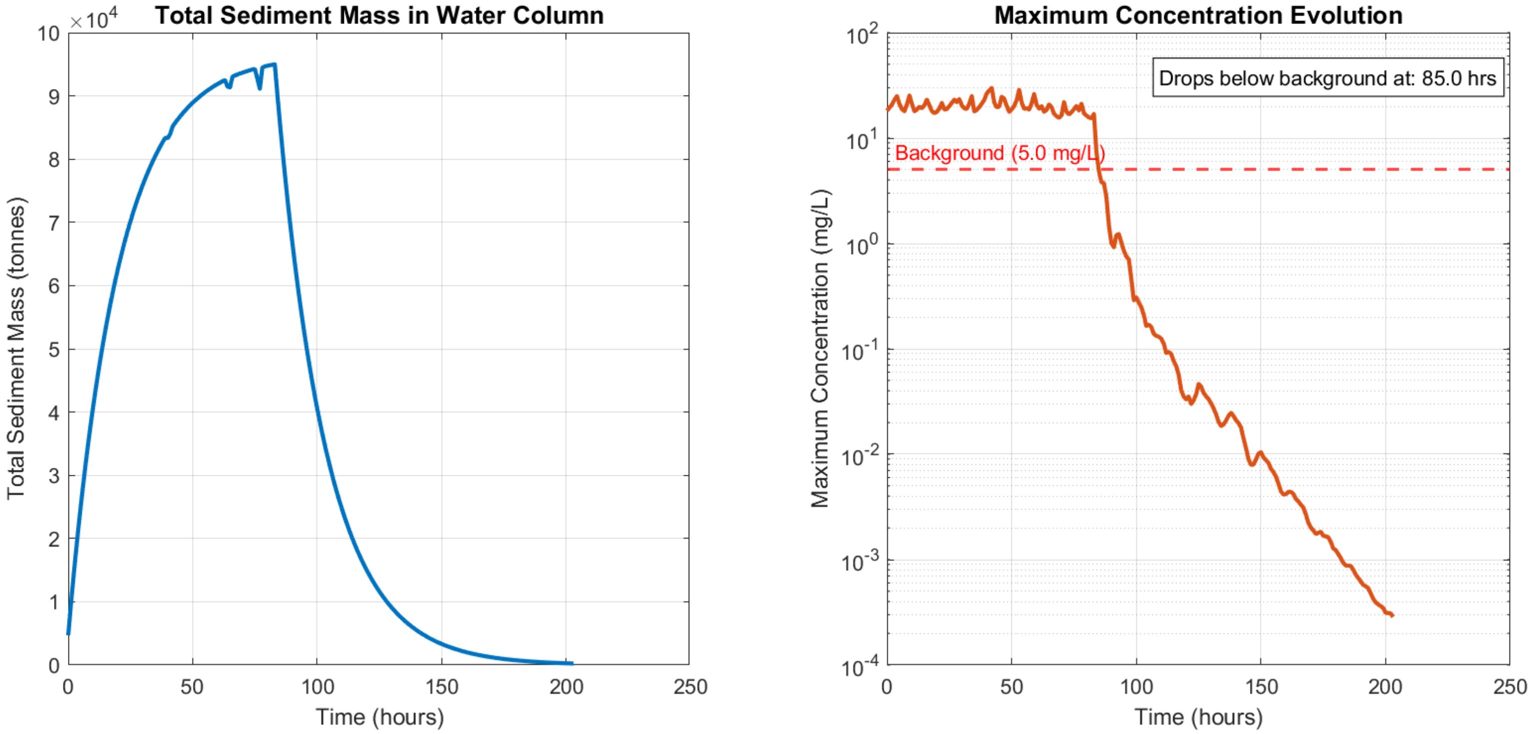


Figure 6-DD: Evolution of suspended sediment over the simulation period for disposal Scenario 7. Left: Total sediment mass in the water column. Right: Maximum SSC over time

6.4 Construction Campaign Summary

Figure 6-EE and **Figure 6-FF** illustrate the maximum, though transient, spatial extent of SSCs generated over the full construction campaign, incorporating results from all modelled scenarios (Scenario 1 to Scenario 7), which represent the disposal of dredge arisings, cable trenching, and WTG foundation installation. **Figure 6-GG** and **Figure 6-HH re**present spatial plots of the transient maximum percentage change in SSC relative to the background (5 mg/L).

As discussed previously, dredge disposal was simulated at four potential locations, whilst only two would occur in practice, one within the OECC and one within the IAC. To reflect this, two combined "statistical worst-case" footprints and depositional thicknesses are presented:

- Combination A: Scenarios 1, 4, 5, 6, 7 – representing the worst case[12] (nearshore OECC and furthest offshore IAC)
- Combination B: Scenarios 2, 3, 5, 6, 7

These aggregated outputs provide a conservative view of the maximum potential footprint under different disposal site selections.

---

[12] Combination A represents the worst-case scenario because it combines dredge disposal at the most nearshore OECC location, with disposal at the furthest offshore IAC site, maximising the potential spatial extent of suspended sediment and deposition.

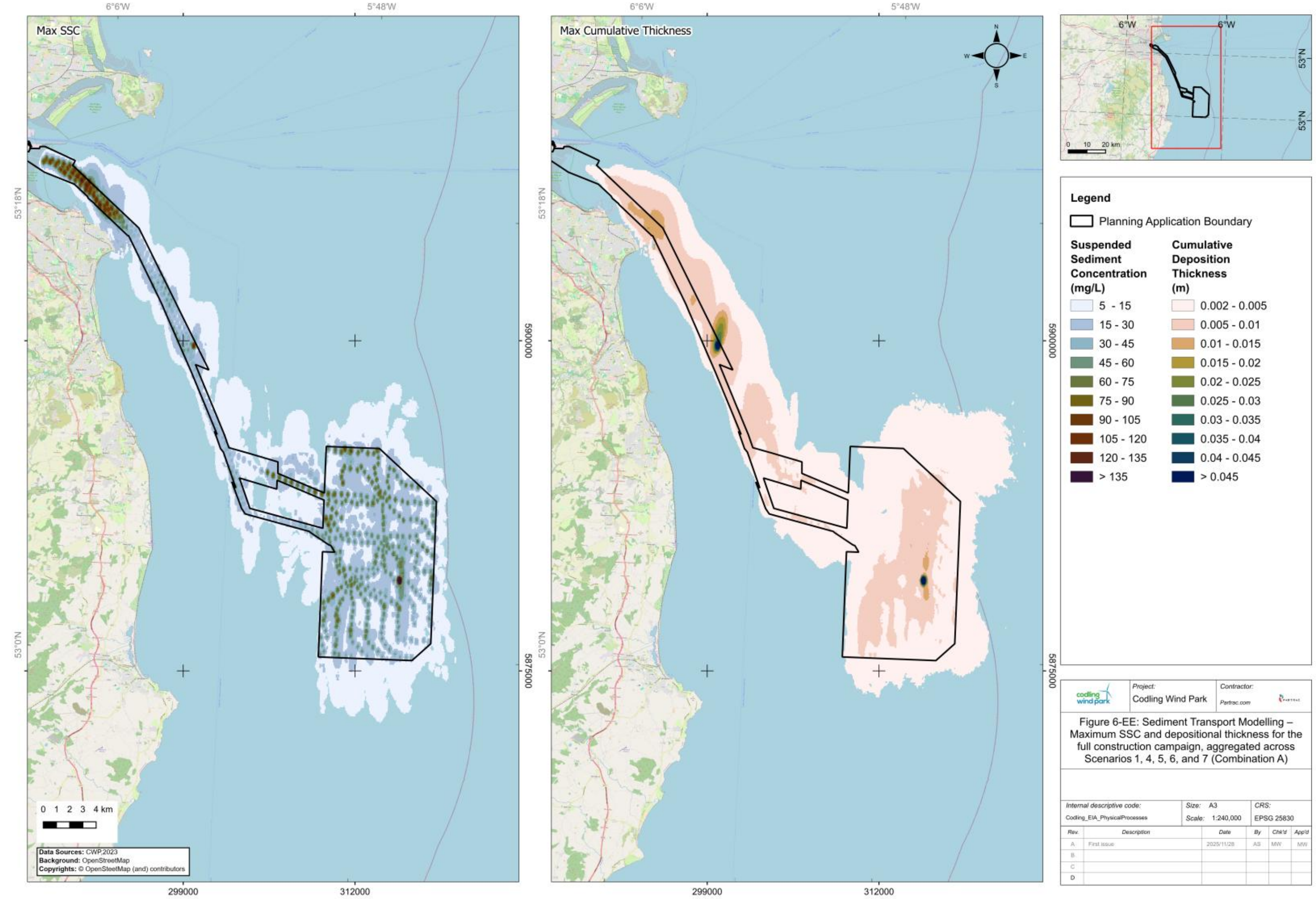


Figure 6-EE: Sediment Transport Modelling – Maximum SSC and depositional thickness for the full construction campaign, aggregated across Scenarios 1, 4, 5, 6, and 7 (Combination A)

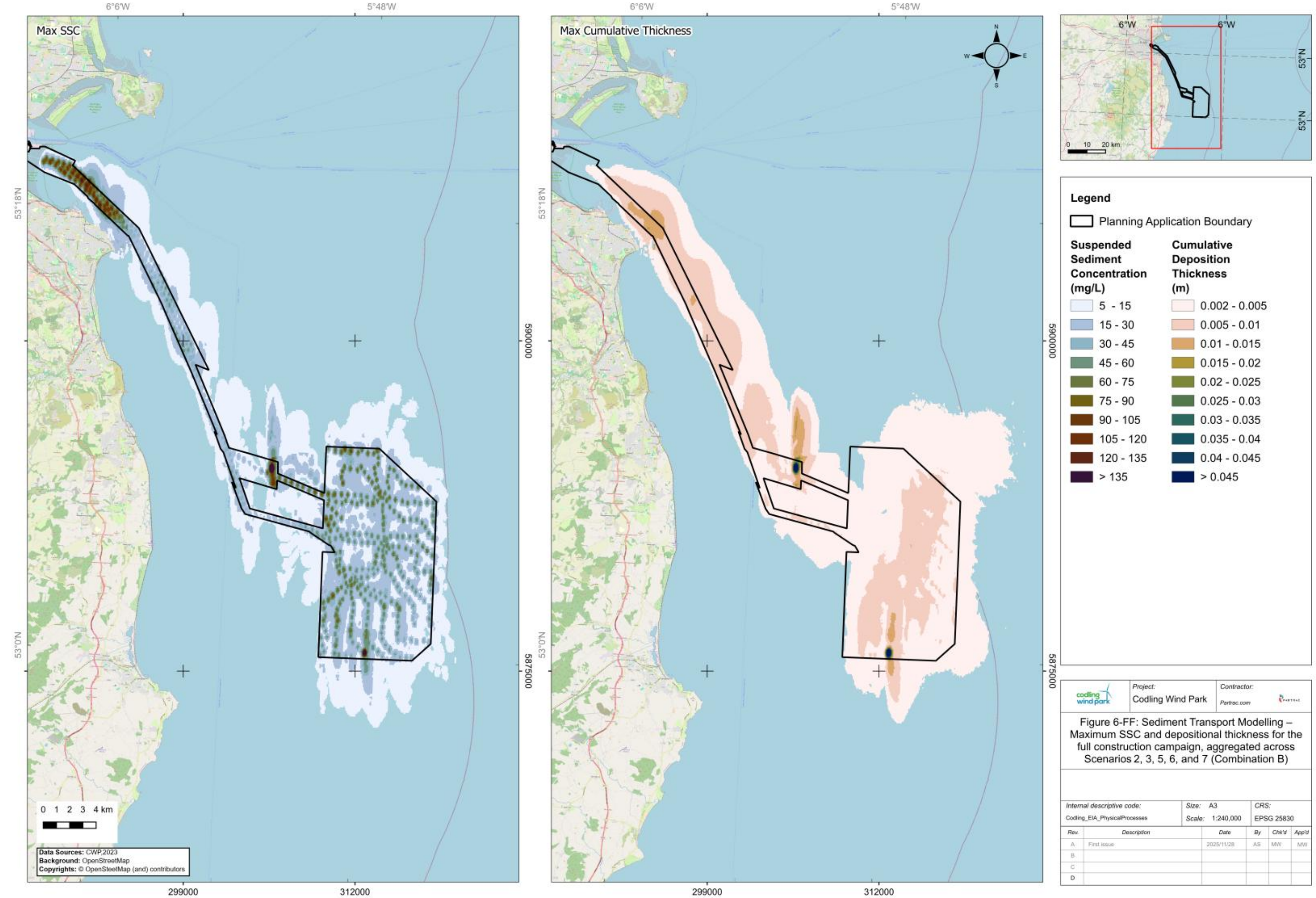


Figure 6-FF: Sediment Transport Modelling – Maximum SSC and depositional thickness for the full construction campaign, aggregated across Scenarios 2, 3, 5, 6, and 7 (Combination B)

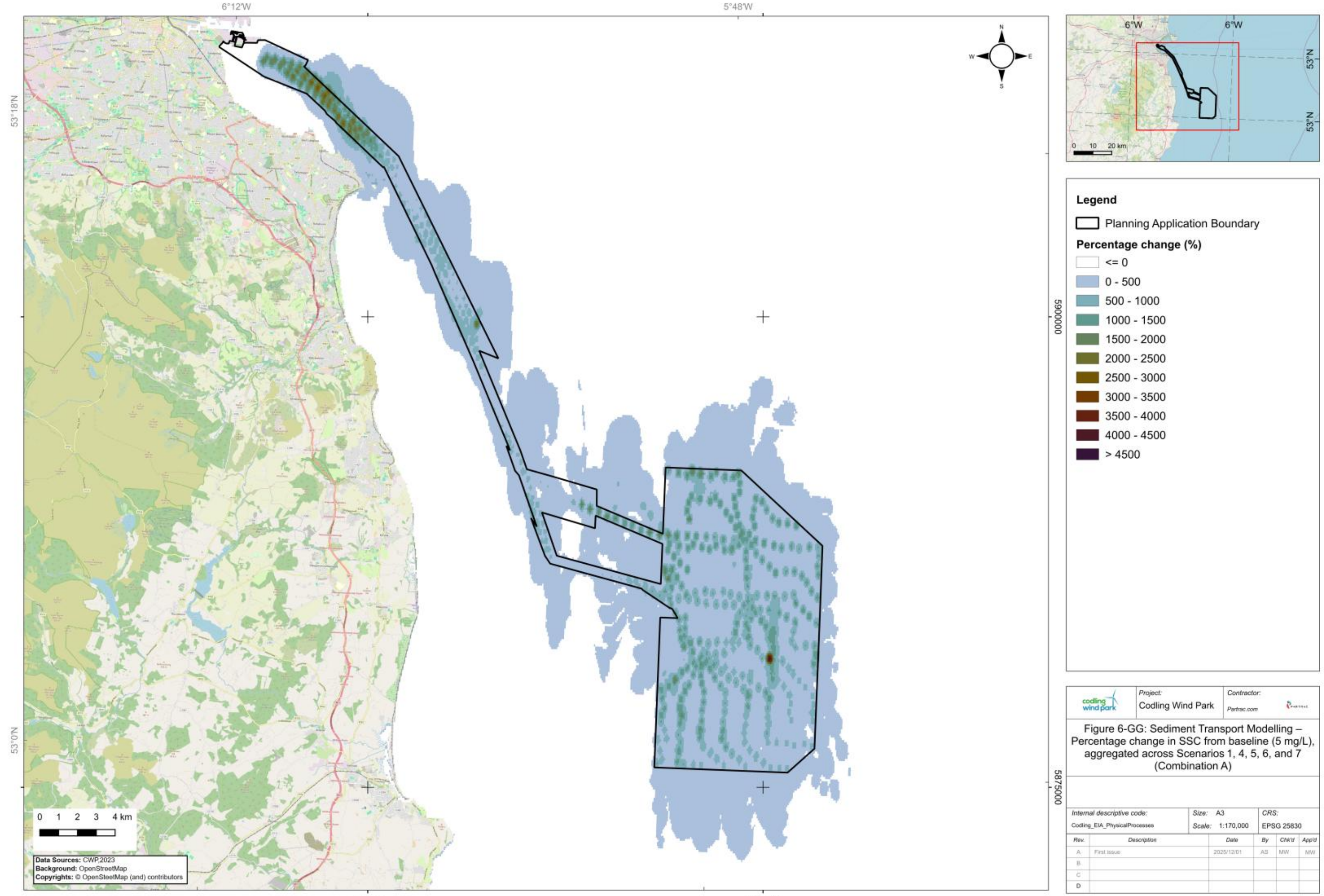


Figure 6-GG: Sediment Transport Modelling – Percentage change in SSC from background (5 mg/L), aggregated across Scenarios 1, 4, 5, 6, and 7 (Combination A)

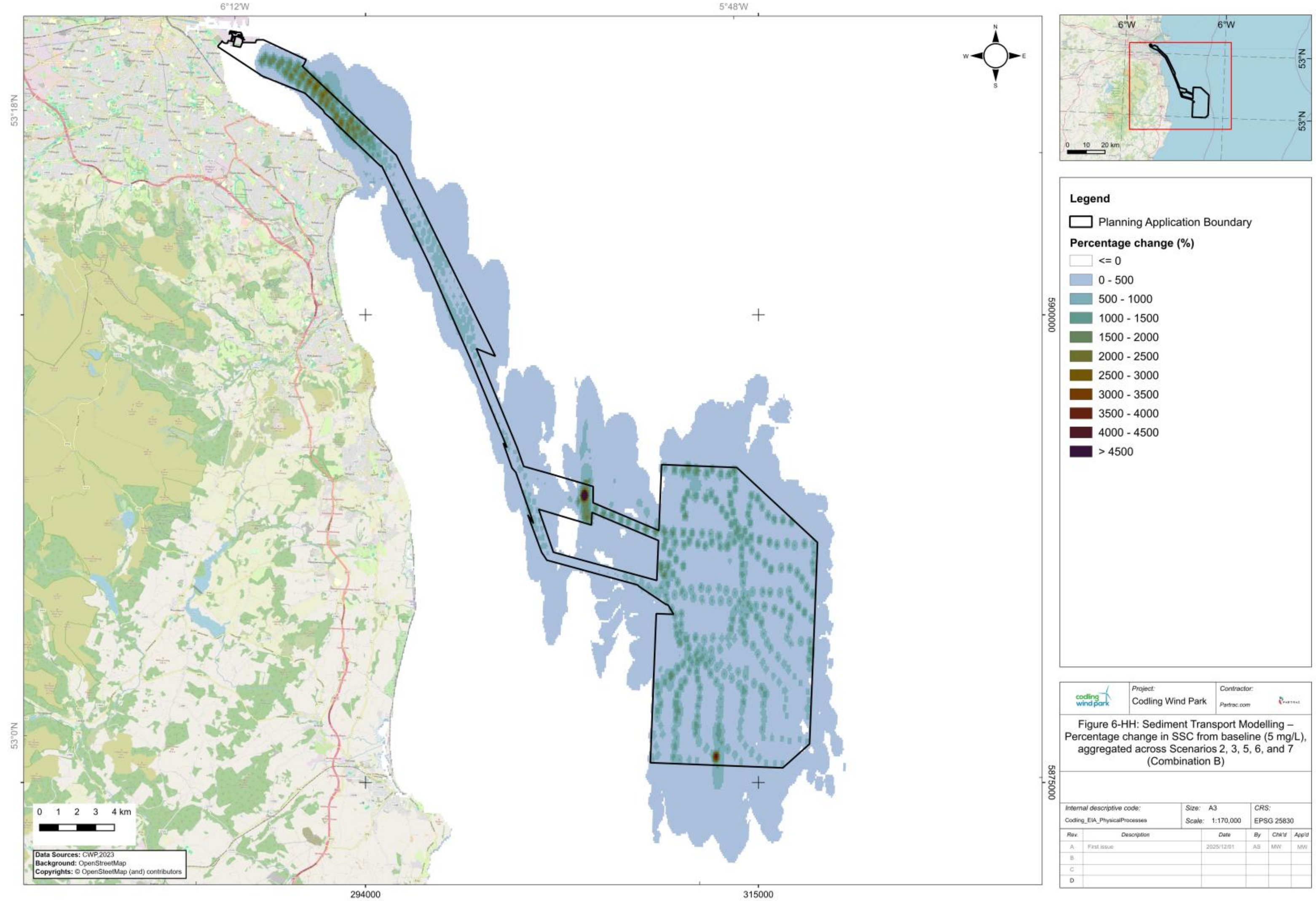


Figure 6-HH: Sediment Transport Modelling – Percentage change in SSC from background (5 mg/L), aggregated across Scenarios 2, 3, 5, 6, and 7 (Combination B)

6.5 Post Construction Impact

Under high stress conditions (100- and 500-year RP events), the impact of the construction of the windfarm is predicted to have only a minimal effect on the prevailing hydrodynamic and wave regimes, limited to locations proximal to infrastructure; there are no measurable far-field impacts from project infrastructure anticipated. Under 100-year and 500-year RP wave conditions, the presence of the wind farm is predicted to have only a minor effect on significant wave height, with differences of less than 6% between pre- and post-construction scenarios. These changes are highly localised and diminish rapidly, reducing to negligible levels within c. 1 km of the infrastructure. Under 100-year and 500-year RP hydrodynamic conditions, the construction of the windfarm was predicted to have a similar effect with up to c. 7% difference in current speed predicted at locations proximal to the project infrastructure due to the presence of the windfarm. These effects have negligible difference on the tidal regime away from the MAC application boundary, with no measurable difference between pre and post construction estimates of current speed predicted away from the array area. The effect of construction on water level across the array site and at the inshore locations nearer to the coastline is predicted to have < 6% difference between pre and post construction scenarios, though again, these changes are highly localised and diminish rapidly, reducing to negligible levels within c. 1 km of the infrastructure. Spatial plots of these results are presented in Figure 6-II to Figure 6-KK. These differences are based on the extreme event conditions modelled; under normal operational conditions, variations are expected to be further reduced. Overall, it is considered that the changes predicted fall within the natural variability of wave, current, and water level conditions anticipated over the lifetime of the CWP Project.

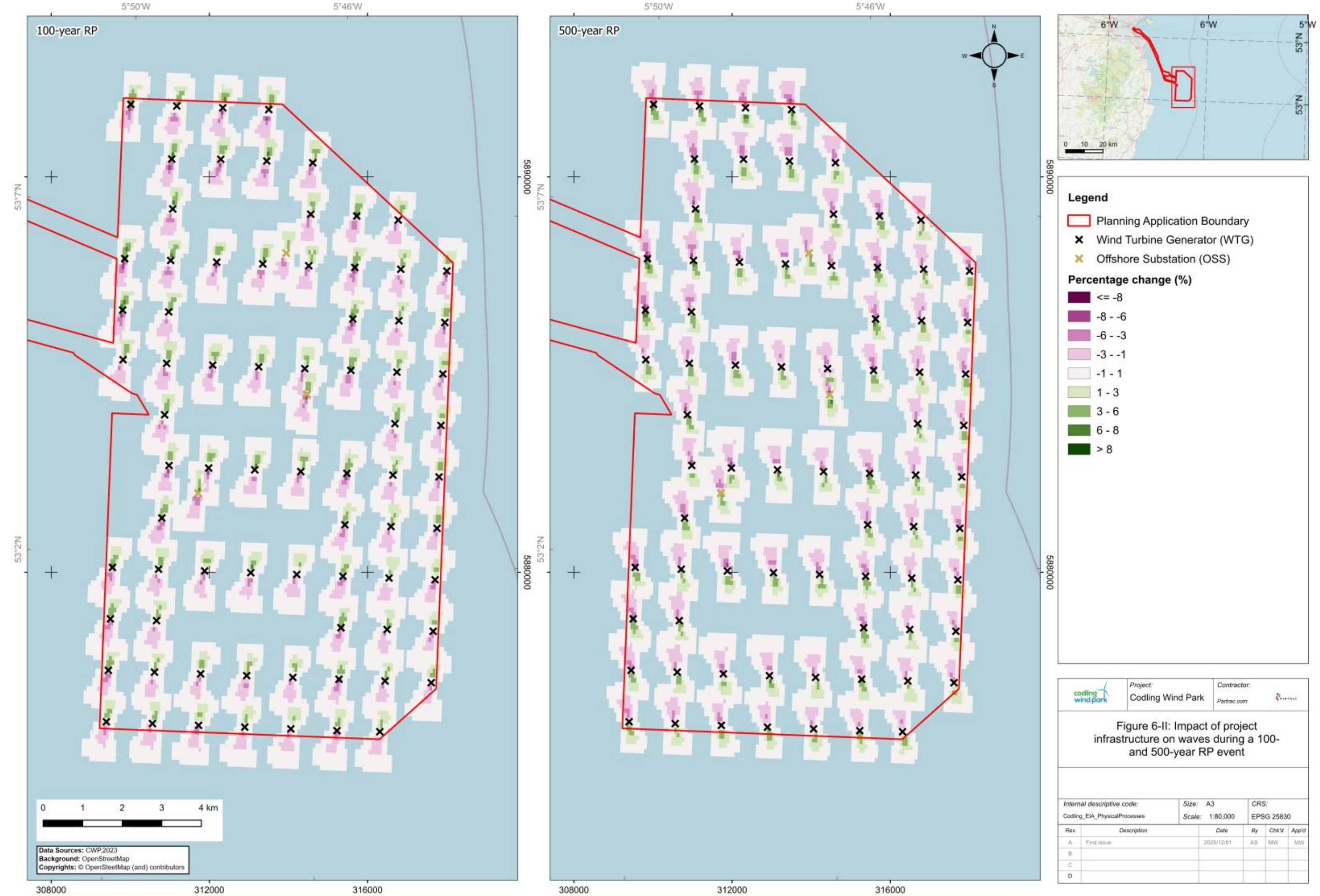


Figure 6-II: Impact of project infrastructure on waves during a 100- and 500-year RP event

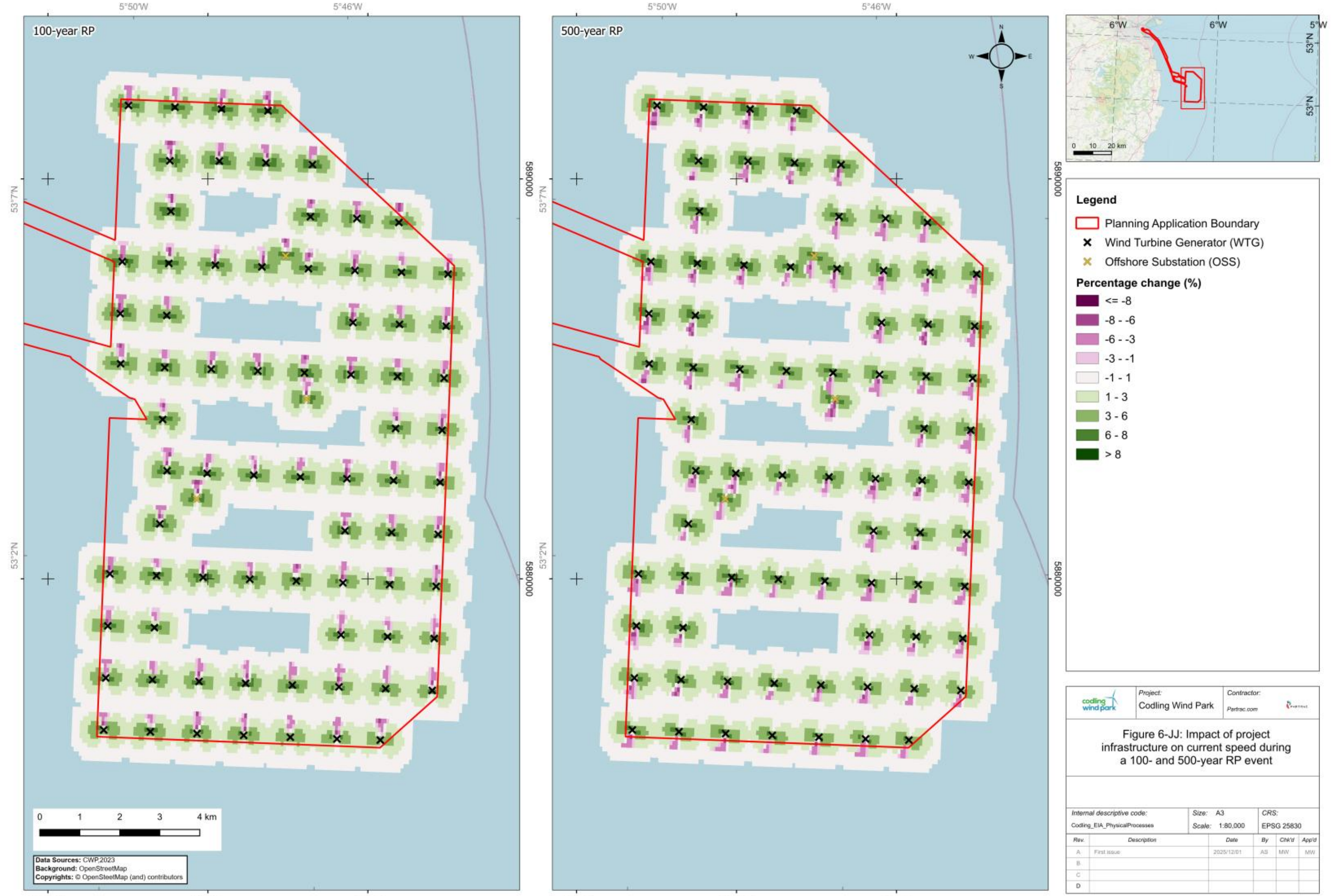


Figure 6-JJ: Impact of project infrastructure on current speed during a 100- and 500-year RP event

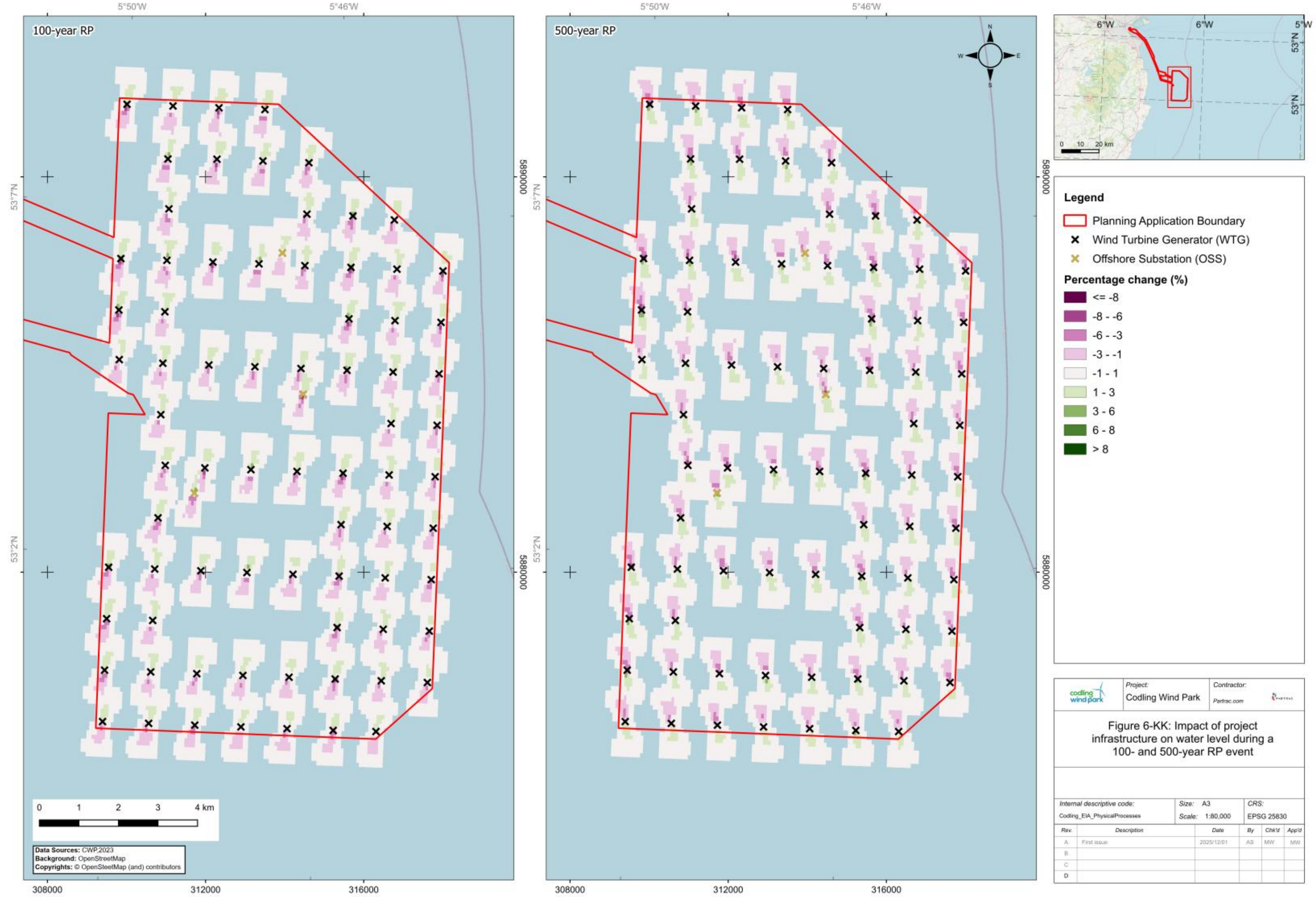


Figure 6-KK: Impact of project infrastructure on water level during a 100- and 500-year RP event

7 Concluding Remarks

Section 7 remains unchanged except for paragraph 3, which is replaced by the text below. This change has been made in response to FIR Item 6i (see FIR Response Document).

Significant points to note from the outputs of the model simulations performed are:

- The construction activities of the CWP project are predicted to have only a minimal effect on the prevailing hydrodynamic and wave regimes within the array site and a predominantly unmeasurable effect (within natural variability) outside of the MAC boundary towards the coastline.
- During disposal of dredge arisings following bedform clearance and cable trenching activities, SSCs local to the release locations are predicted to be enhanced by up to circa 400 mg\L above background.
- Enhanced SSCs in the water column are transient, and concentrations are predicted to reduce to background levels no more than c. 12 days after completion of the activity responsible for liberating sediments into suspension.
- The suspended sediment plumes estimated during the simulation testing were predicted to be dispersed mainly North / South, with slight transport towards the East quadrant (i.e. offshore). The predicted thickness of the sediment deposited away from the release locations during the simulations of dredge disposal following bedform clearance were minimal (e.g. sediment deposits on the seabed generated during these activities were predicted to be < 2-3 cm thick away from the immediate disposal/disturbance area, decreasing rapidly in thickness with distance). Though the fate of sediments liberated into suspension during construction activities is a function of:
    - Sediment composition and hydraulic characteristics.
    - Volumes of sediments liberated (released) into suspension.
    - Release location.
    - Height above the seabed of the release.
    - Timing of the release.
    - Residual tidal patterns, wave and wind action.

References

References remain unchanged and should be read in conjunction with the text below. This revision was made in response to FIR Item 6b and FIR Item 6i, respectively (refer to the FIR Response Document).

Becker, J., van Eekelen, E., van Wiechen, J., de Lange, W., Damsma, T., Smolders, T. and van Koningsveld, M. (2015). 'Estimating source terms for far field dredge plume modelling'. *Journal of Environmental Management*. 14, 282-293.

British Geological Survey (2019). Seabed sediments 250k. available from: https://www.bgs.ac.uk/datasets/marine-sediments-250k/. [Accessed on: 19 December 2023].

Christiansen, N., Carpenter, J. R., Daewel, U., Suzuki, N., and Schrum, C. (2023). 'The large-scale impact of anthropogenic mixing by offshore wind turbine foundations in the shallow North Sea'. *Frontiers in Marine Science*, 10, 1178330.

Hosseini, S. T., Pein, J., Staneva, J., Zhang, Y. J., and Staneva, E. (2025). 'Impact of offshore wind farm monopiles on hydrodynamics interacting with wind-driven waves'. *Ocean Modelling*, 195, 10252.

MetOceanWorks. (2025). 'Wave and Current Joint Extremes Study'. CWP document number CWP-E6-MET-02-REP-0007.

Ortolani, C., Irvine, J., Burley, L., Falepin, H., Prousanidou, A., and Tsopela, A. (2025). 'Framework for jet trenching performance prediction in cohesionless soils'. *Proceedings of the 5th International Symposium on Frontiers in Offshore Geotechnics (ISFOG 2025).*