

Liberty Steel – Modular Data Centre

784-B079802

Hydraulic Modelling Report

Third Issue

ERA4 Limited

June 2026

Document prepared on behalf of Tetra Tech Limited. Registered in England
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Appendices

Appendix A: Flood Maps

Flood Frequencies

The frequency of a flood can be quoted in terms of a return period, which is defined as the average time between years with at least one larger flood, or as an annual exceedance probability (AEP), which is the inverse of the return period.

Return periods can be expressed more succinctly than AEP. However, AEP can be helpful when presenting results to members of the public who may associate the concept of return period with a regular occurrence rather than an average recurrence interval.

The following table is provided to enable quick conversion between return periods and annual exceedance probabilities.

AEP (%)	50	20	10	5	3.33	2	1.33	1	0.5	0.1
AEP	0.5	0.2	0.1	0.05	0.033	0.02	0.013	0.01	0.005	0.001
Return Period (years)	2	5	10	20	30	50	75	100	200	1000

1.0 Introduction

1.1 Background

- 1.1.1 Tetra Tech have been appointed by ERA4 Limited to carry out hydraulic modelling of the tidal River Usk at Newport to understand the flood risk to the proposed development site at the former Liberty Steel works.
- 1.1.2 The NRW Flood Map for Planning shows the area encompassing the former steelworks site buildings site to be at risk of flooding from the sea. A railway embankment cuts through the site to the east of the existing buildings and acts as an informal tidal defence to the eastern extents of the site. Figure 1-1 provides an extract of this mapping showing the area of tidal flood zone and adjacent protected area.

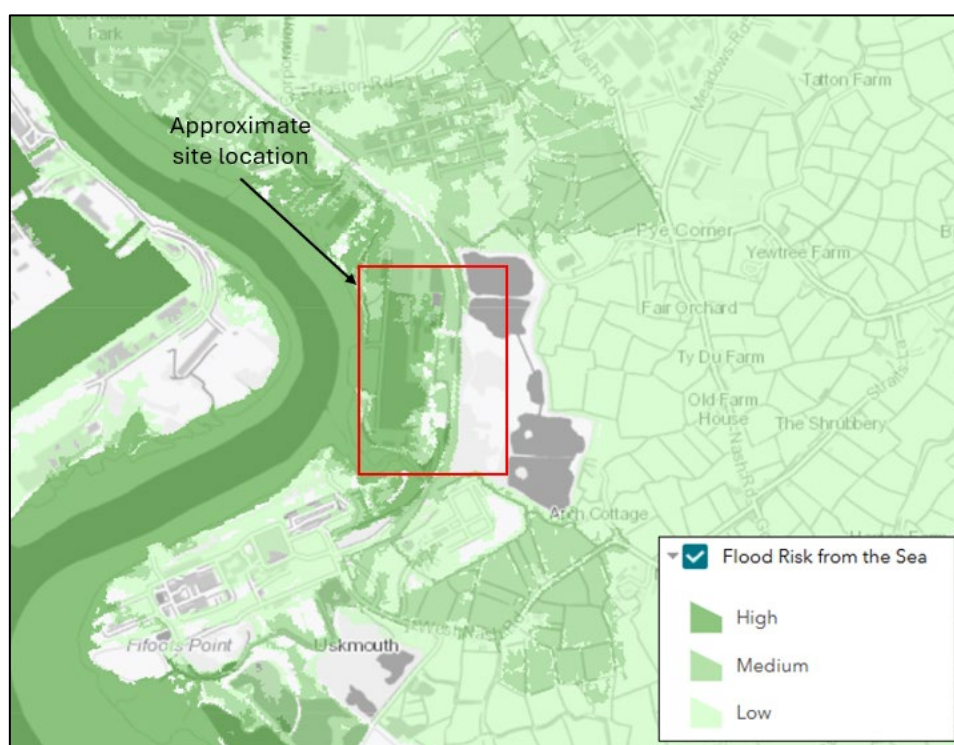


Figure 1-1: Extract from the NRW Flood Map for Planning showing risk of sea flooding local to the former Liberty Steelworks

- 1.1.3 Natural Resources Wales (NRW) already hold a hydraulic model of the River Usk which was made available to Tetra Tech upon request for the purposes of local hydraulic modelling and Flood Consequence Assessment.

1.2 Scope

1.2.1 The scope of the works detailed in this hydraulic modelling report comprises the following updates to the existing Usk model supplied by NRW:

- Necessary updates to the supplied modelling to ensure the topography local to the site is representative. This included the addition of local topographical survey provided by the client as well as other terrain updates using available NRW LiDAR Digital Terrain Model (DTM).
- Update to the tidal boundary conditions in the model to reflect the latest applicable extreme sea level modelling guidance and climate change scenario modelling provided by NRW as part of TAN15.
- Updates to the modelled climate change scenarios for the fluvial model components to reflect the latest applicable climate change scenario modelling provided by NRW as part of TAN15.
- Model runs for a number of applicable epochs for both the undefended and defended scenarios for a tidally dominated design event. This is the tidal 0.5% AEP + fluvial 50% AEP event as outlined in TAN15 guidance.
- Review of available flood defence asset data local to the site supplied by NRW and development of a feasible defence breach scenario to model a possible breach of an appropriate NRW Usk flood defence local to the site.
- Interpretation of the modelled flood depths and extents local to the site.
- This report also assesses the floodplain impact of a proposed development within a small parcel of the former Liberty Steelworks site.

1.3 Purpose of this report

1.3.1 This report outlines the development of a hydraulic model that has been used to understand flood risk to the site and beyond. This technical report details the hydraulic modelling methods applied and assumptions made within the approach. It details the data used together with the results of any quality assurance and validation checks.

- 1.3.2 This hydraulic modelling study will be used to understand which areas of the development site are at risk of flooding from the tidally dominated River Usk prior to development, and to generate design flood levels for the site to inform future development.

1.4 Study area description

- 1.4.1 The site is located at the former Liberty Steelworks site, off Corporation Road in Newport, nearest postcode NP18 2BU.
- 1.4.2 Figure 1-1 shows the location of the site including the wider site area, the footprint of the former Liberty Steelworks building, and an additional area for development east of this.

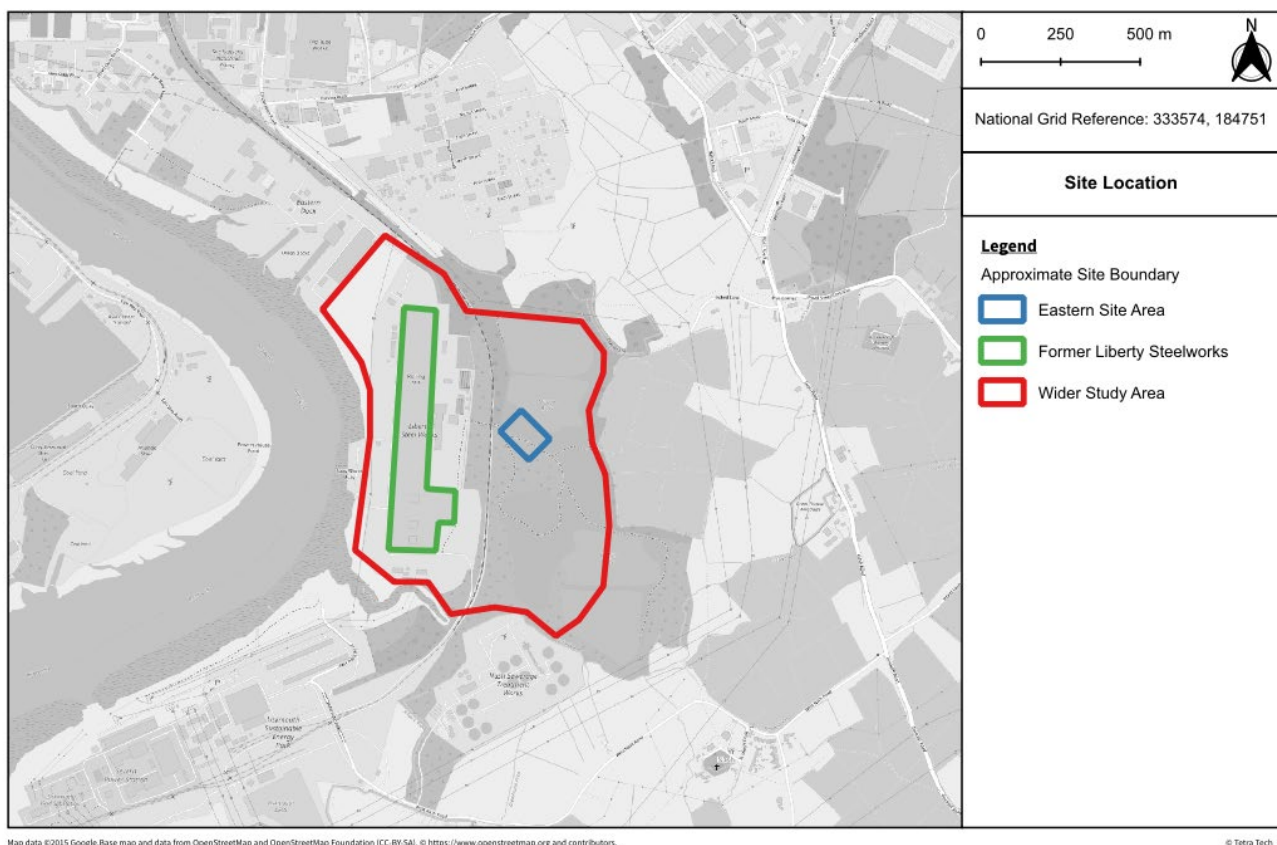


Figure 1-2: Site location

1.5 Disclaimer

- 1.5.1 This report has been prepared by Tetra Tech on behalf of ERA4 Limited in connection with the scope of the report as described in Section 1.2 above and taking into account the particular instructions and requirements set out in Tetra Tech's fee proposal and the Client's acceptance. It is not intended for and should not be relied on by any third party and no responsibility is undertaken to any third party.
- 1.5.2 Tetra Tech accepts no duty or responsibility (including in negligence) to any party other than ERA4 Limited and disclaims all liability of any nature whatsoever to any such party in respect of this report. This report cannot be reproduced without Tetra Tech's written consent.
- 1.5.3 This assessment has been completed based on the best available data at the time of writing. Flood risk and climate change is an evolving science and therefore documents such as this should be revisited at regular intervals in the future when new flood risk and climate change information, guidance or data is published.

2.0 Available data

2.1 Data availability

2.1.1 A number of data sources have informed the development of this hydraulic modelling study. Table 2-1 lists these sources.

Table 2-1. Data available

Data	Description	Source	Date
Hydraulic model of the River Usk	- ESTRY-TUFLOW linked 1D/2D hydraulic model of the tidal River Usk from the coastline at Newport. - The accompanying hydrological report was not provided, however a spreadsheet containing the previously updated model's tidal boundary and storm surge methodology was provided.	Natural Resources Wales	Originally produced in 2000. Regularly updated by NRW with the latest update in 2022 to reflect latest tide levels, updates to QMED fluvial flow.
LiDAR DTM	Natural Resources Wales LiDAR Composite DTM 1m	Natural Resources Wales	LiDAR flown between 2020 and 2022
Additional local topographical information	- Drone Topographic survey supplied by client detailing existing site topography at a high resolution. - Additional topographic information showing level area of site at 10.55mAOD	Client (ERA4 Limited)	Unknown
TAN15	- Guidance for Flood Risk Assessment in Wales. - Latest climate change and extreme sea level modelling guidance applicable to the	Natural Resources Wales	March 2026

	study area provided in NRW document <i>Climate change allowances and flood consequence assessments (2026)</i> .		
Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels	UK dataset providing tidal nodes with associated latest extreme design sea level data.	Environment Agency	2018
NRW Flood Defence Structures GIS dataset	- Dataset detailing NRW listed flood defence assets. - No asset condition information is provided in this dataset. NRW was contacted for any further information on local flood defence assets but none was received.	NRW	Last updated by NRW in May 2026
NRW flood mapping showing areas benefitting from defences	- Flood Map for Planning dataset showing areas benefitting from flood defences. - The site is not shown to benefit from flood defences. The railway embankment acts as an informal flood defence, however it is not managed with this function in mind and therefore isn't applicable to this mapping.	NRW	Last updated by NRW in May 2026

3.0 Hydraulic model build

3.1 Overview and supplied modelling

3.1.1 Tetra Tech received the NRW River Usk hydraulic model in April 2026. This is a linked 1D-2D ESTRY-TUFLOW model covering the tidally influenced reach of the River Usk at Newport. Figure 4-1 shows the 1D and 2D model extents.

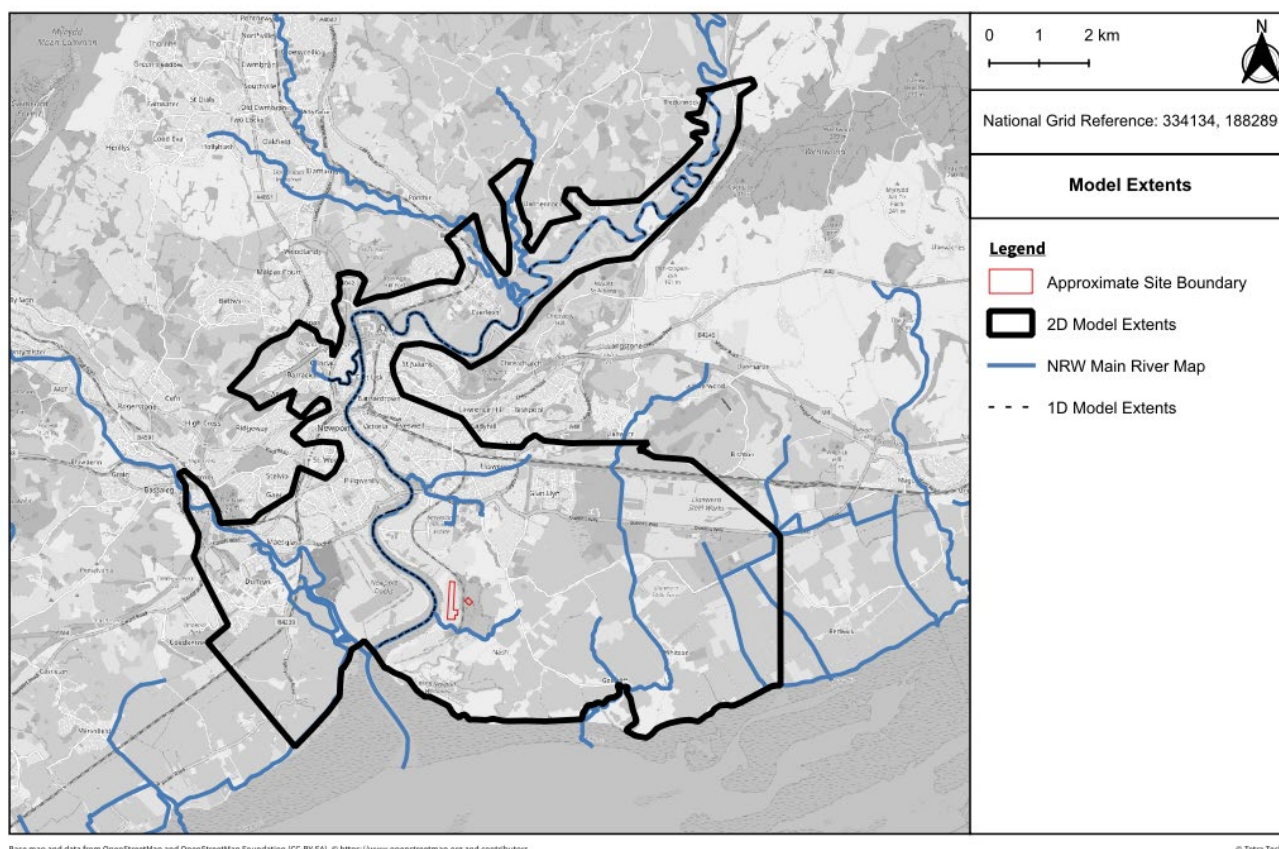


Figure 3-1. 1D and 2D model extents

3.1.2 The supplied modelling comprises two appropriate scenarios for use in this study:

- DEF – Defended scenario incorporates flood defences including NRW defences in the Usk estuary as well as other flood defences within the area.
- UND – Undefended scenario comprising deliberate lowering of flood defences to provide a worst-case scenario

- 3.1.3 As detailed in Section 1.2, a number of updates to the supplied modelling were made in order to ensure it was fit for use to provide an appropriate representation of flooding to the site. These updates are detailed below.

3.2 2D domain and terrain amendments

- 3.2.1 The supplied modelling was constructed using 2m LiDAR DTM data originally flown in 2010.
- 3.2.2 Latest NRW LiDAR Composite DTM at 1m resolution was obtained from NRW and incorporated into the model to provide a more up-to-date representation of ground elevations within the 2D model domain. The LiDAR tiles that make up the model domain area were either flown in 2020 or 2022 and is the most up to date terrain data available for the site. The LiDAR was checked using satellite imagery and survey data where available to confirm that topographical features were being represented appropriately.
- 3.2.3 Additional information on existing site levels was also provided by the client including:
- A recent topographic drone survey of the site area.
 - Additional level information for the area within the site known to be at 10.55mAOD.
- 3.2.4 Figure 3-2 shows the extents of this drone survey and also the area of the additional level information.

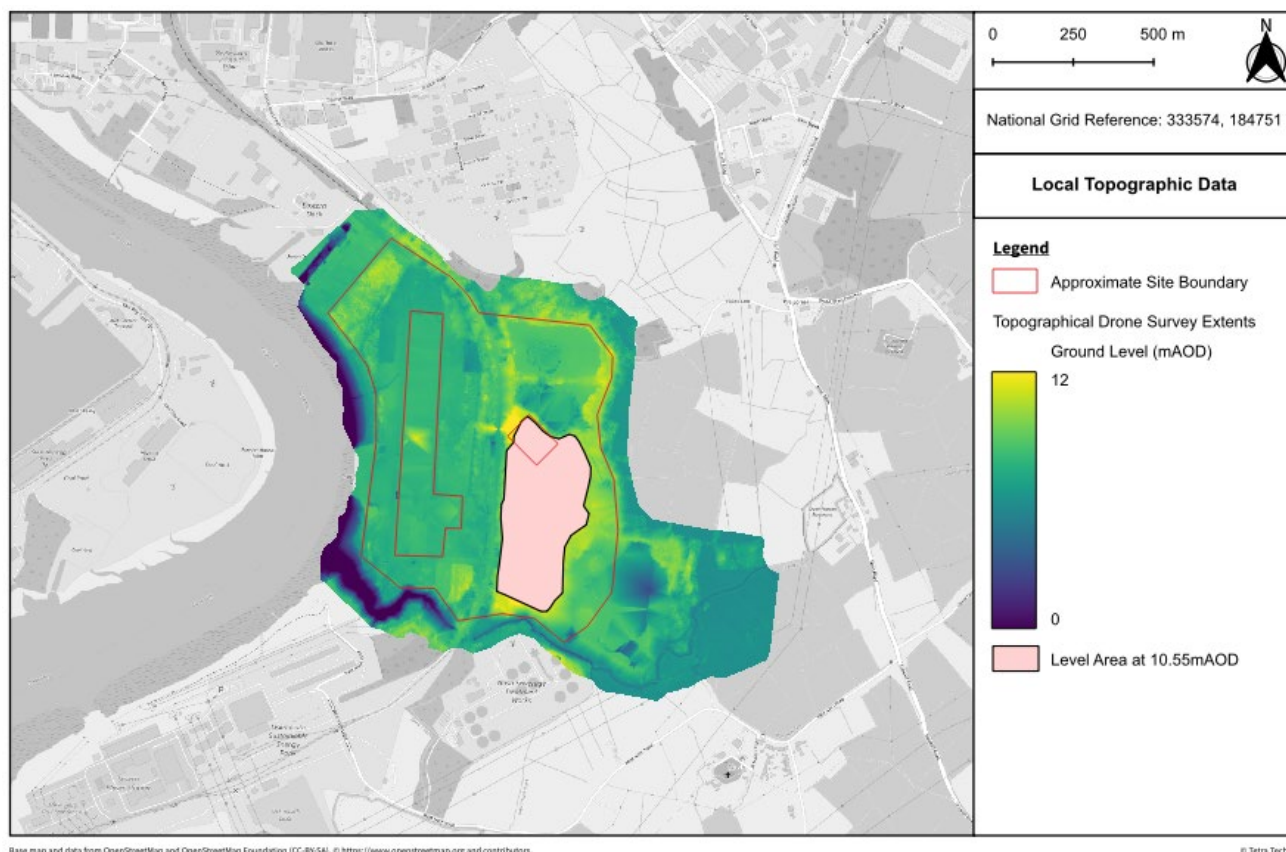


Figure 3-2: Additional local topographic information provided by client

- 3.2.5 The drone survey was provided in a 3D CAD format. This data was processed to produce a triangular irregular network (TIN) (a vector-based surface used to represent surface topography) which was then exported into a Digital Elevation Model (DEM) raster to import into the hydraulic model. A TUFLOW *zshape* region was used to improve the triangulation within the central area of the left site boundary to smooth out an area of unrealistic high points in the TIN.
- 3.2.6 Topographic adjustment was also made to the terrain to represent the level area at 10.55mAOD using a TUFLOW *zshape* region.
- 3.2.7 An initial water level of 9.0mAOD was applied to the former sludge beds at the site, just north of the eastern site area parcel. This level has been estimated from the NRW LiDAR DTM.
- 3.2.8 The supplied model also comprises a number of terrain amendments to incorporate supplementary survey data where available and representation of defence crest levels. To ensure an accurate representation of local terrain, topographic points

previously incorporated into the model as part of a 2008 survey of the top of bank adjacent to the site were removed in place of the updated topographic information.

3.2.9 The model 2D domain is represented with a grid cell size of 10 m. This study has retained this resolution. It is considered acceptable due to the large spatial extent of the hydraulic model 2D domain. The primary mechanism of flooding to the site is from tidal sources driven by extreme sea level, and therefore this resolution is considered suitable for providing a representative assessment of flooding at the site.

3.2.10 No amendments to the 1D model of the Usk channel were made as no additional data relating to the watercourse was available. It is assumed that the existing channel representation within the model is suitable.

3.3 Hydrology and extreme sea level boundary conditions

3.3.1 The model hydrology comprises two elements:

- Fluvial inflows to represent river flows from the Usk catchment for a 50% AEP event (commensurate to the median annual maximum river flow, QMED)
- A tidal boundary at the downstream extent of the River Usk. This boundary condition is representative of the tidal cycle at Newport, coupled with a design storm surge to generate extreme sea levels in the estuary. The tidal curves in the model are aligned to ensure they coincide with the fluvial QMED peak.

3.3.2 Latest TAN15 guidance from NRW provides a methodology for assessment of climate change on both extreme sea levels and fluvial flows¹. These model components were both updated in line with this guidance.

3.3.3 The following fluvial climate change uplifts have been applied to the Usk flows for the 2070 to 2125 epoch as per the anticipated development lifetime.

- Central allowance: 35%
- Upper Central allowance: 70%

¹ <https://www.gov.wales/sites/default/files/publications/2026-03/climate-change-allowances-and-flood-consequence-assessments.pdf>

3.3.4 NRW provide three different epochs applicable to the Newport region for generation of extreme sea level; present day (i.e. no climate change or sea level rise applicable), 2100s, and 2130s.

3.3.5 The following dataset provides the baseline sea level for Newport:

- Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018).

3.3.6 The tidal curve has then been scaled to accommodate the additional sea level increases for the future epochs. Finally, the storm surge utilised in the supplied model is then applied to this tidal curve to scale the sea level tidal boundary appropriately.

3.3.7 Table 3-1 provides the latest NRW sea level rise estimates for the future epochs, and Table 3-2 presents the final peak sea levels at the tidal boundary following the application of sea level rise and storm surge.

Table 3-1: NRW estimated sea level rise (in metres) for Newport by 2100 and 2130

Local Authority Area	Allowance (percentile)	Mean sea level rise (m) by 2007-2100 (UKCP18 baseline 1981-2000)	Mean sea level rise (m) by 2007-2130 (UKCP18 baseline 1981-2000)
Newport	70th	0.87	1.25
	95th	1.14	1.68

Table 3-2: Peak sea levels following application of NRW sea level rise and storm surge

Event and climate change scenario	Peak sea level at tidal boundary (m AOD)
2100s Upper Central	9.20
2130s Upper Central	9.58
2100s Upper	9.47
2130s Upper	10.01

4.0 Flood defences

4.1 Assessment of existing flood defences

- 4.1.1 The NRW flood defence dataset was obtained and reviewed in line with the other flood defences also included in the NRW Usk hydraulic model. Figure 5-1 shows the defence locations local to the site.
- 4.1.2 It is observed that no formal defence listed in the NRW dataset protects the site from tidal flooding. There are other defences also included in the model. These are generally situated along the Usk banks just north-west of the site however as these are not listed in the formal flood defence dataset, it is expected that these therefore do not provide the required standard of protection to defend from a 0.5% AEP tidal event.
- 4.1.3 Figure 5-1 shows the locations of the NRW and other defences local to the site.

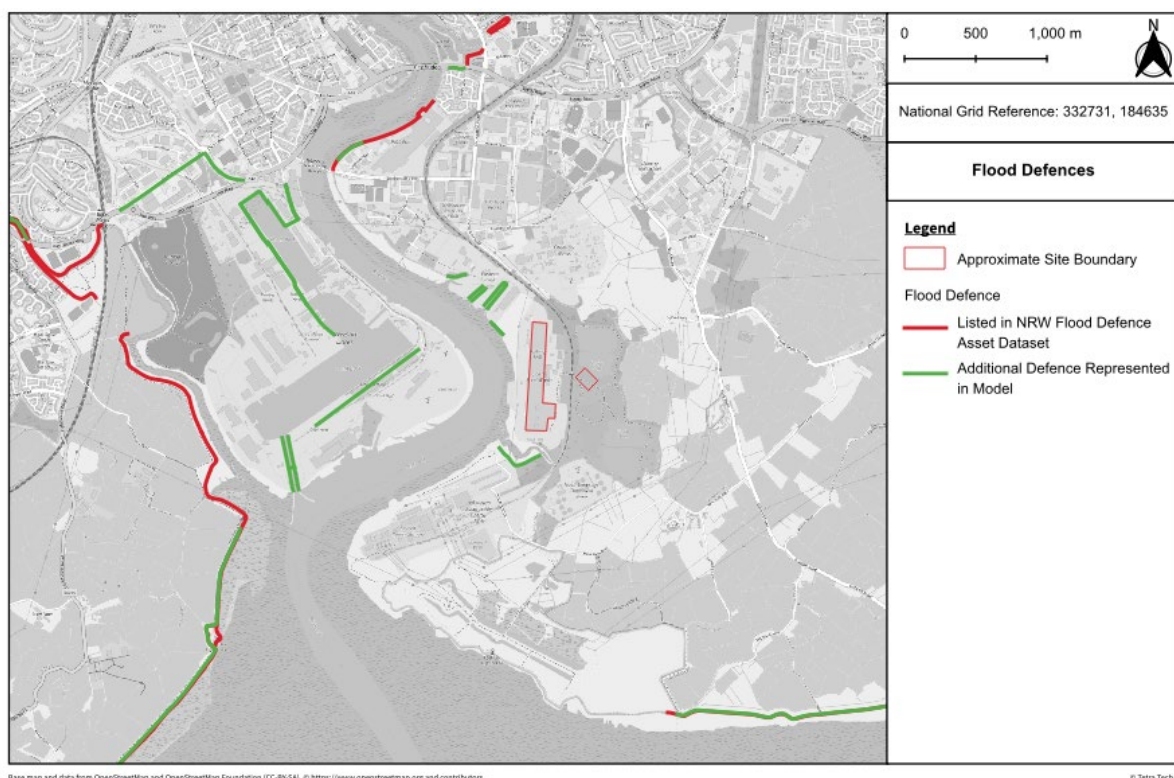


Figure 4-1: Locations of NRW Flood Defences and additional defences including in NRW Usk hydraulic model

- 4.1.4 A feasible defence breach scenario was developed based on the local defences adjacent to the site, shown in Figure 4-2.
- 4.1.5 The NRW LiDAR data showed that this defence crest level is approximately 8.9m AOD in this location.
- 4.1.6 A 50m wide breach, centrally located across the defence, was therefore incorporated into the model. The breach was triggered once the tidal level in the adjacent 2d model cell reached the crest level of the defence.

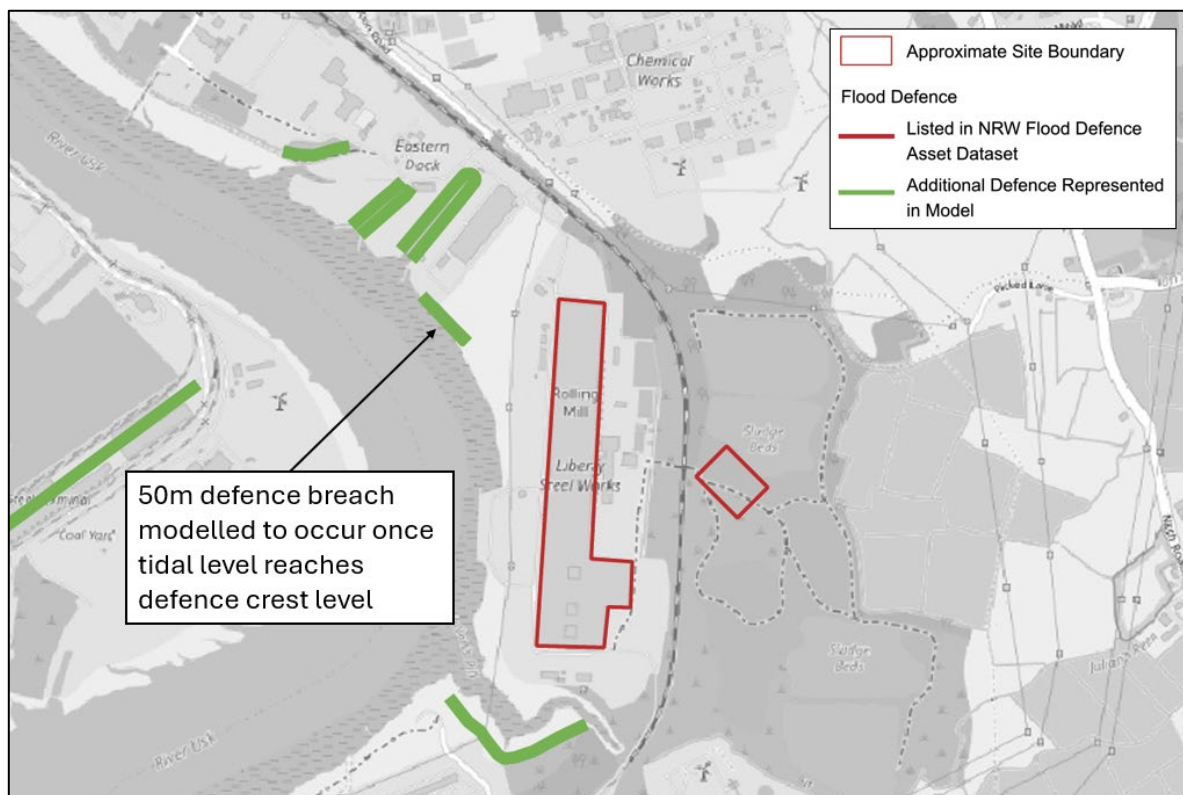


Figure 4-2: Selection of flood defence for development of feasible breach scenario

5.0 Model performance and outputs

5.1 Maximum flood depths and levels

- 5.1.1 Maximum depth maps for all modelled runs are provided in Appendix A.
- 5.1.2 The western parcel of land on the site floods consistently across all events and scenarios, throughout the various modelled epochs and climate change uplifts, whilst the eastern parcel does not flood in any of the modelled scenarios for both present day and future climate change. This is due to the eastern parcel of land being elevated significantly above the western parcel of land.
- 5.1.3 Table 5-1 provides a summary of the maximum flood level in both parts of the site (as outlined in Figure 1-2), and the proposed development footprint (as outline in Figure 6-1), for the different modelled scenarios for the 0.5% Tidal AEP + 50% Fluvial AEP event.

Table 5-1: Maximum flood levels in both parcels of the site (taken at centroid of boundary)

Scenario	Maximum flood level (m AOD)		
	Former Liberty Steelworks building	Eastern site area	Proposed Development Footprint
Defended Present Day	8.21	N/A	8.36
Defended 2100 Upper Central	9.20	N/A	9.22
Defended 2100 Upper	9.46	N/A	9.47
Defended 2130 Upper Central	9.56	N/A	9.58
Defended 2130 Upper	9.97	N/A	10.00
Undefended Present Day	8.21	N/A	8.36
Undefended 2100 Upper Central	9.21	N/A	9.22
Undefended 2100 Upper	9.46	N/A	9.48

Undefended 2130 Upper Central	9.56	N/A	9.58
Undefended 2130 Upper	9.97	N/A	10.00
Defended (Breach) Present Day	8.21	N/A	8.36
Defended (Breach) 2100 Upper Central	9.20	N/A	9.22
Defended (Breach) 2100 Upper	9.46	N/A	9.47
Defended (Breach) 2130 Upper Central	9.56	N/A	9.58
Defended (Breach) 2130 Upper	9.97	N/A	10.00

6.0 Development Scenario

- 6.1.1 Development proposals for a data centre facility within the study area at the Former Liberty Steelworks site were provided in order to develop a model scenario to assess the impact of the proposed development on floodplain storage.
- 6.1.2 A proposed development scenario comprising raising of the development footprint above the design flood level using a TUFLOW Zshape feature was implemented into the model.
- 6.1.3 Figure 6-1 provides the location of this raised development platform within the site.

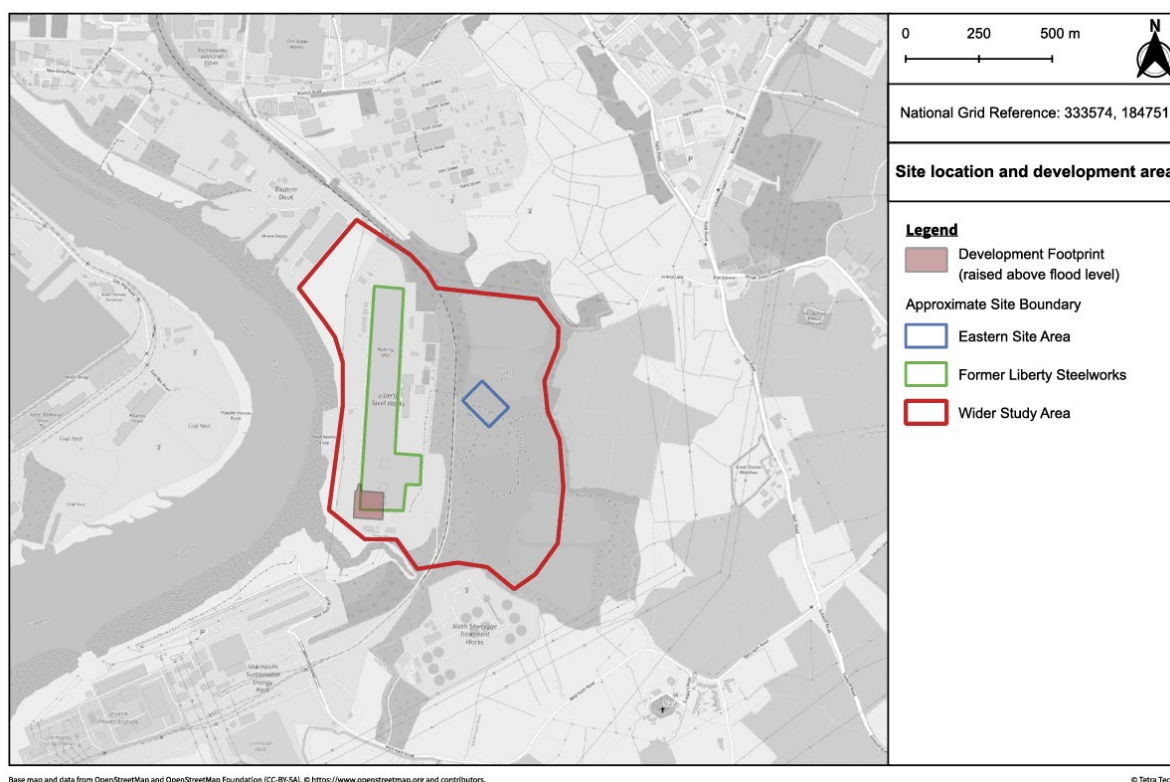


Figure 6-1: Study area and location of TUFLOW Zshape feature to raise development footprint above flood level

- 6.1.4 The model was then run for both the undefended (UND) and defended (DEF) scenarios for the 2130s Upper Central climate change allowance for the design combined 0.5% tidal + 50% fluvial event. The Upper Central climate change allowance has been used as this is considered to be suitable due to the proposed data centre uses of the development.

6.1.5 Depth-difference mapping provided in Figure 6-2 and Figure 6-3 confirms that the impacts of this raised development footprint are negligible. Areas adjacent to the east of the development footprint show marginally decreased flood depths between 0.01 m and 0.02 m.

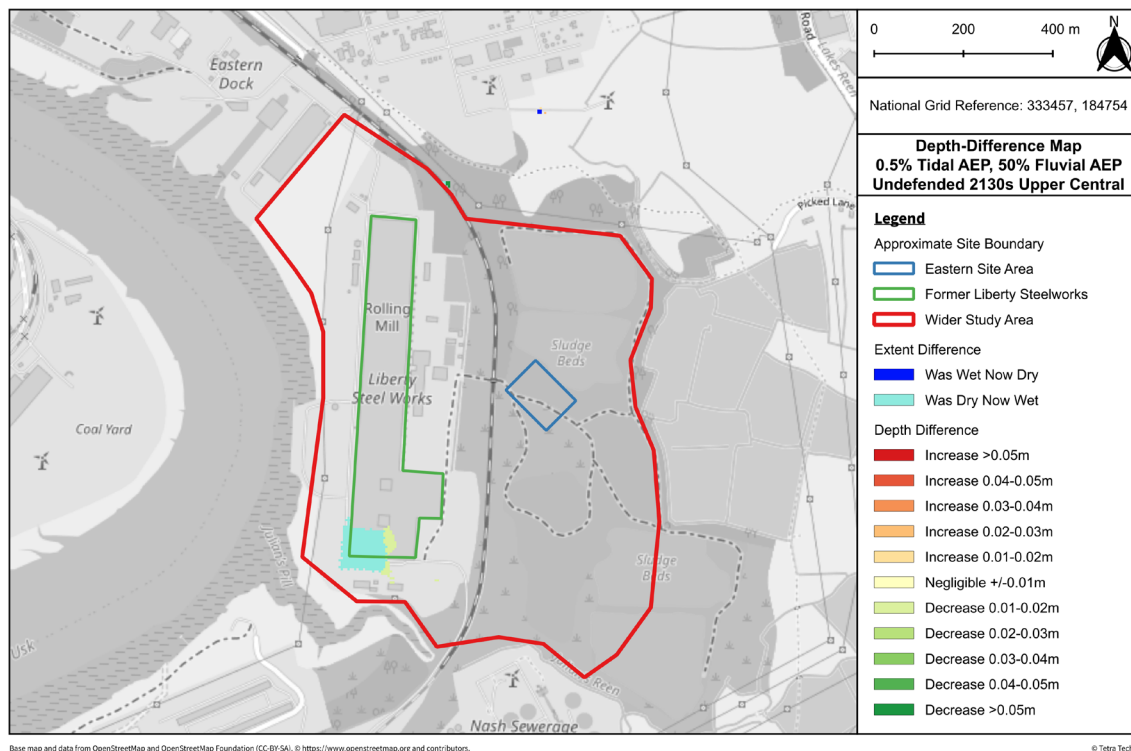


Figure 6-2: Depth-difference map, undefended scenario 2130 Upper Central climate change allowance

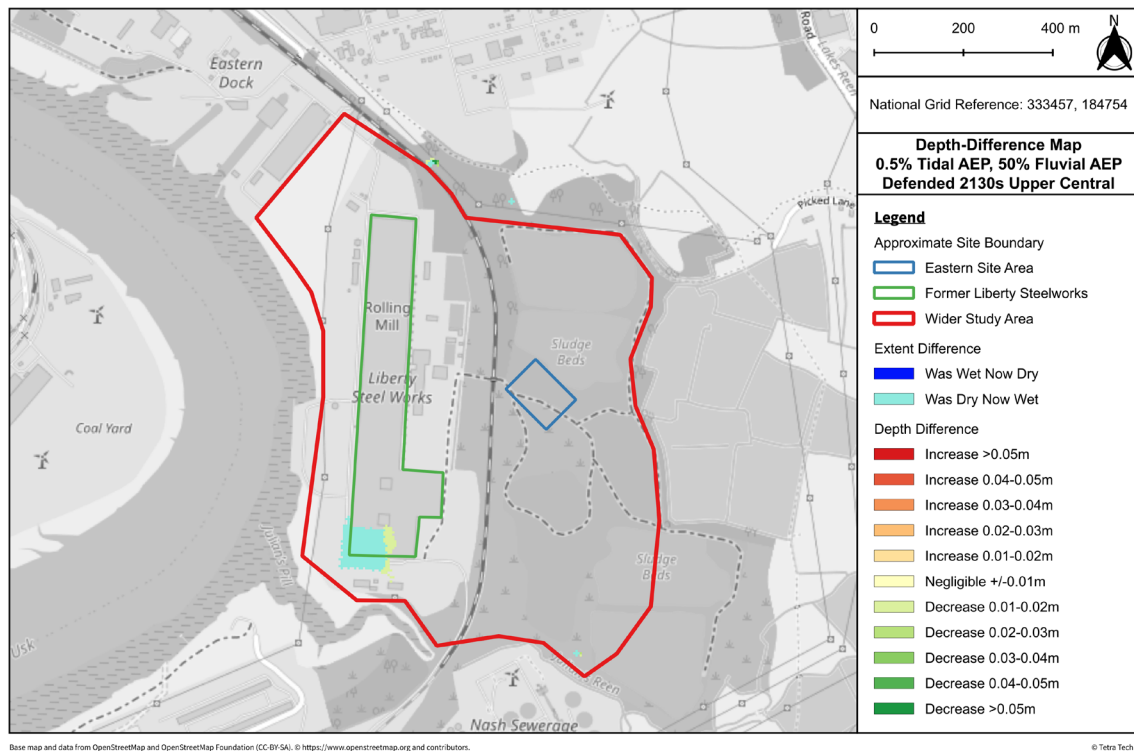


Figure 6-3: Depth-difference map, defended scenario 2130 Upper Central climate change allowance

7.0 Conclusion

7.1 Overview

- 7.1.1 Tetra Tech received the existing River Usk tidal and fluvial combined hydraulic model from Natural Resources Wales.
- 7.1.2 This model covers a large area of the tidal Usk including the former Liberty Steel site and surrounding land.
- 7.1.3 The received model has been updated to reflect recent changes to NRW sea level rise forecasts and guidance. It has also had fluvial climate change uplifts adjusted to reflect latest guidance for the Usk.
- 7.1.4 Topographic information in the model has also been updated including latest available NRW LiDAR for the full model domain and local drone survey of the site.
- 7.1.5 The model has been run for a range of scenarios for the 0.5% AEP tidal + 50% AEP fluvial event, including defended, undefended, and a breach scenario of local defences.
- 7.1.6 The eastern site area remaining dry in all scenarios, whilst the former steelworks area floods consistently across the epochs. A full suite of design levels has been established for the site to inform future development.
- 7.1.7 The NRW flood defence dataset shows that the site is not known to be benefitting from flood defences. The modelling confirms this as flood levels within the defended and breach scenario are consistent.
- 7.1.8 A scenario has been modelled to understand the impact of a small, raised development platform within the floodplain at the site. This modelling has been compared against the baseline scenario outputs and shows a minimal decrease to flood depths and levels within the immediate site area.

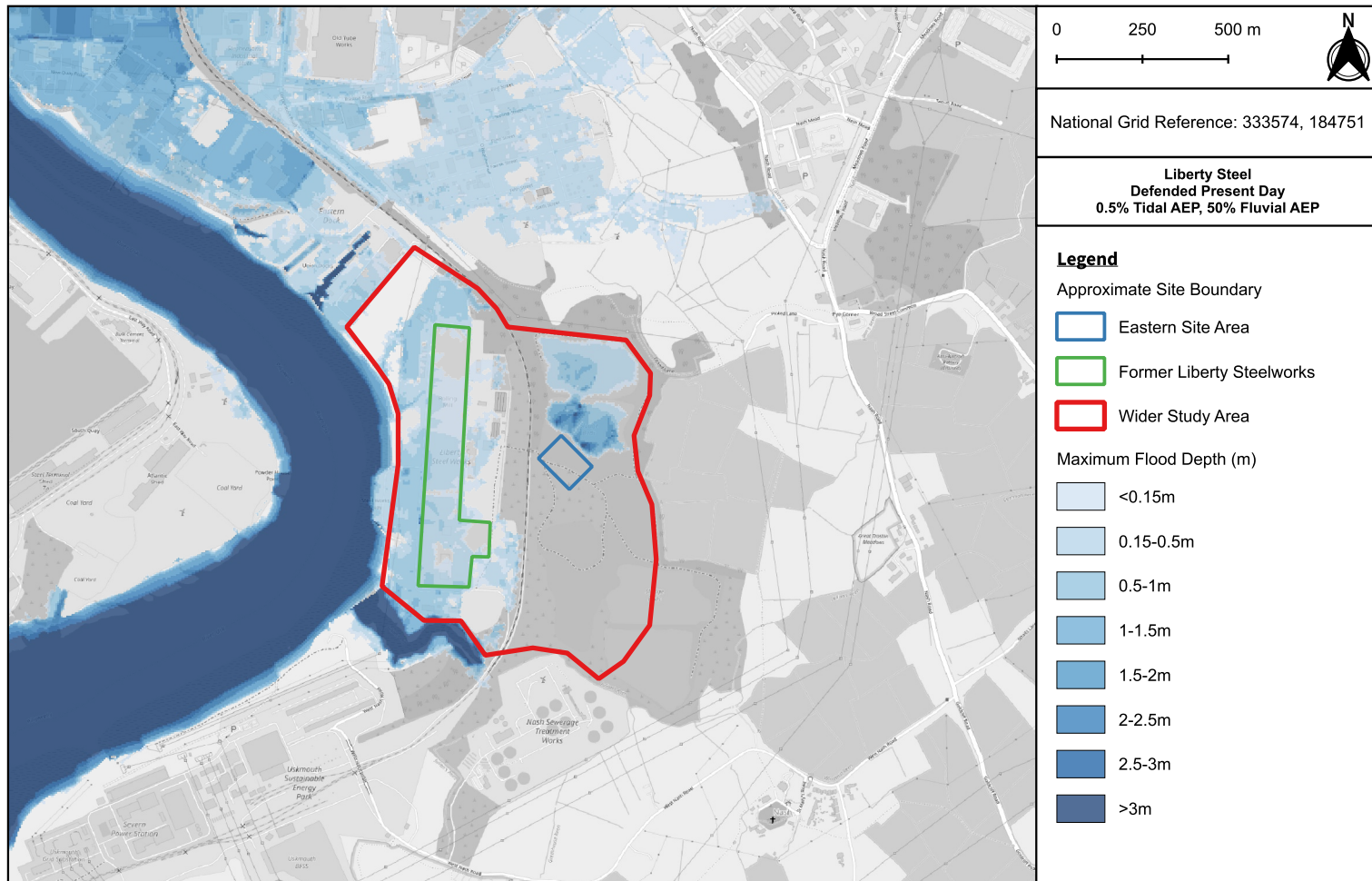
7.2 Assumptions

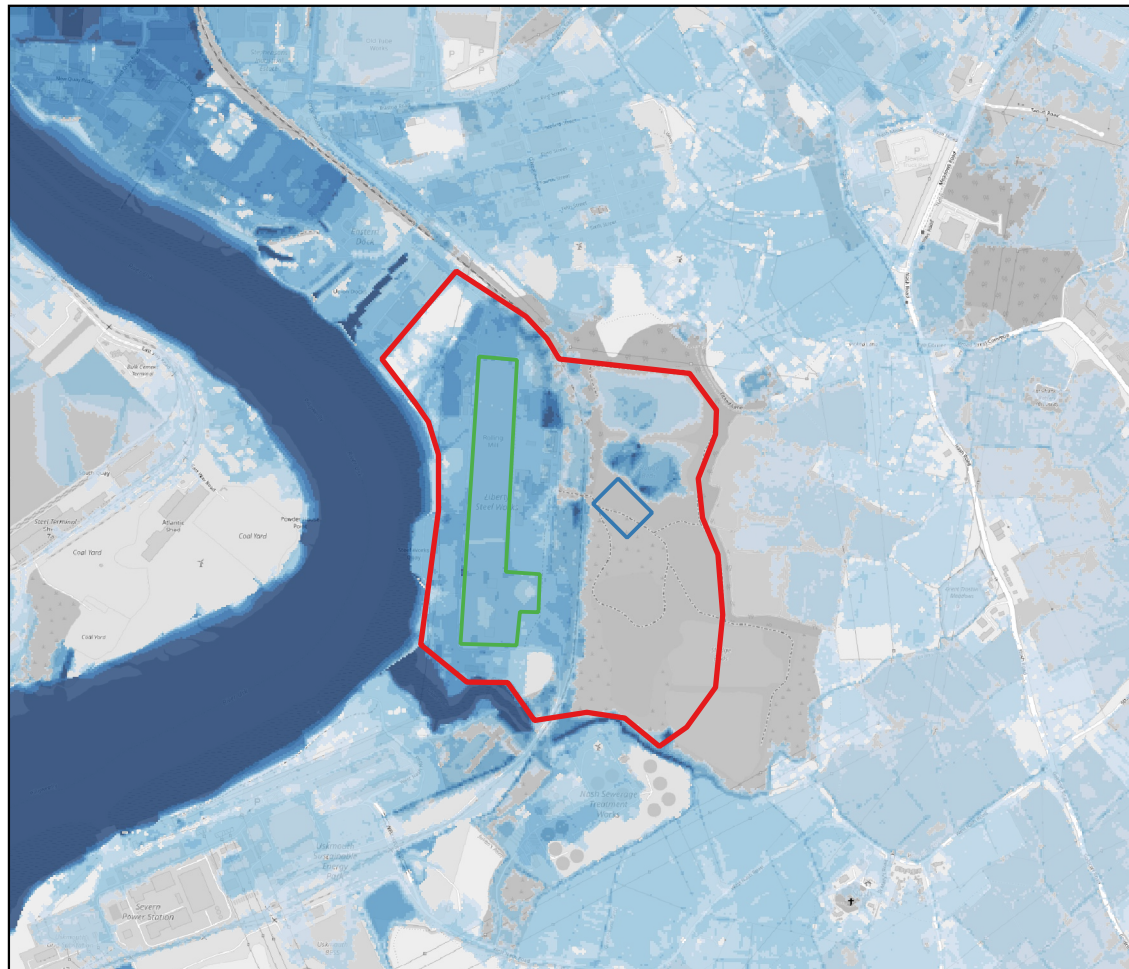
- 7.2.1 This modelling study has assumed that the representation of the River Usk in the supplied NRW model is representative of the current condition of the watercourse in

this area. No additional cross-sectional data relating to this watercourse was available to update these model components.

- 7.2.2 It is assumed the NRW LiDAR Composite DTM and the additional topographic changes applied to the model provide an accurate representation of the study area.

Appendix A: Flood Maps





0 250 500 m



National Grid Reference: 333574, 184751

Liberty Steel
Defended 2100 Upper Central
0.5% Tidal AEP, 50% Fluvial AEP

Legend

Approximate Site Boundary

 Eastern Site Area

 Former Liberty Steelworks

 Wider Study Area

Maximum Flood Depth (m)

 <0.15m

 0.15-0.5m

 0.5-1m

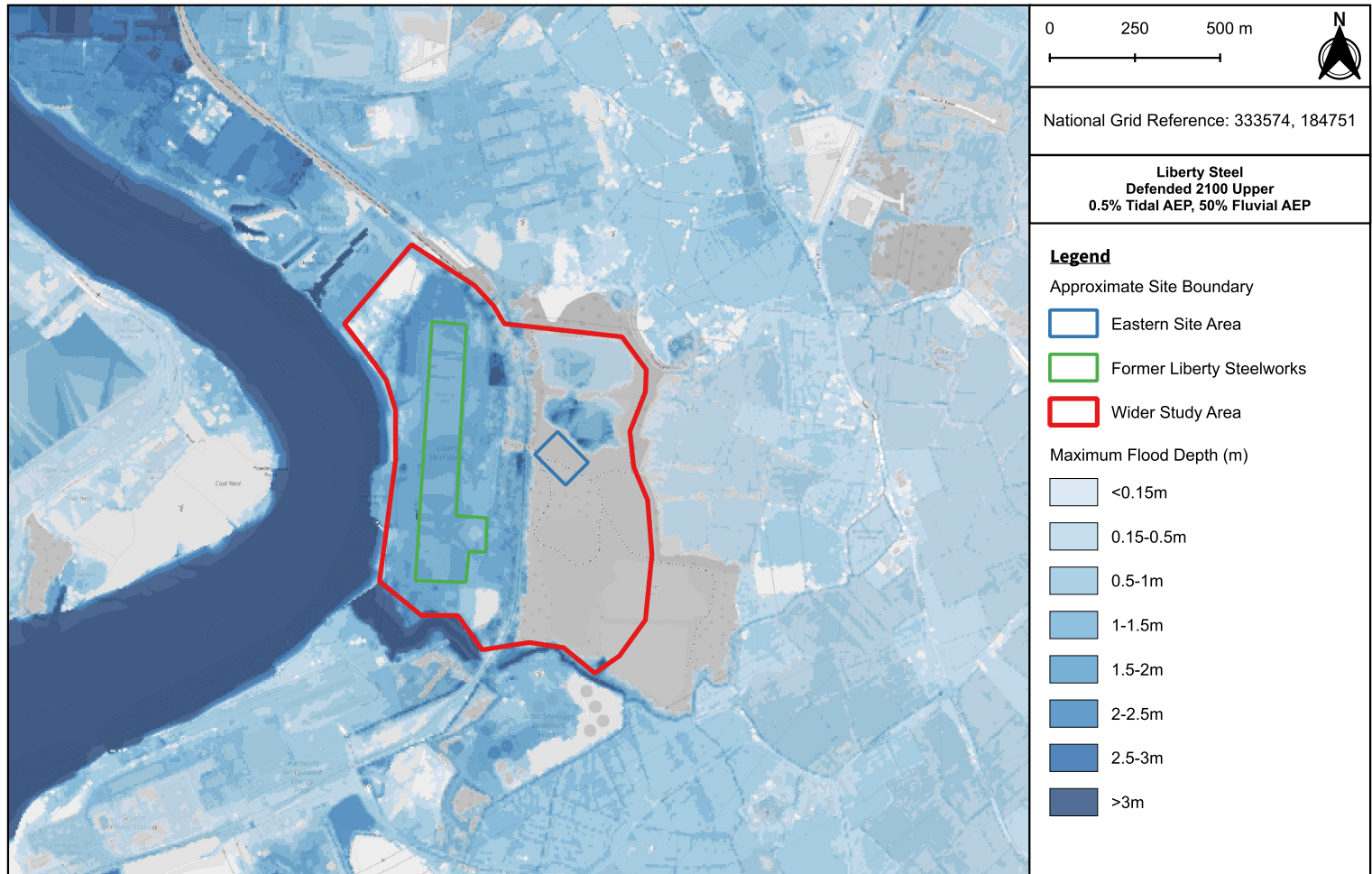
 1-1.5m

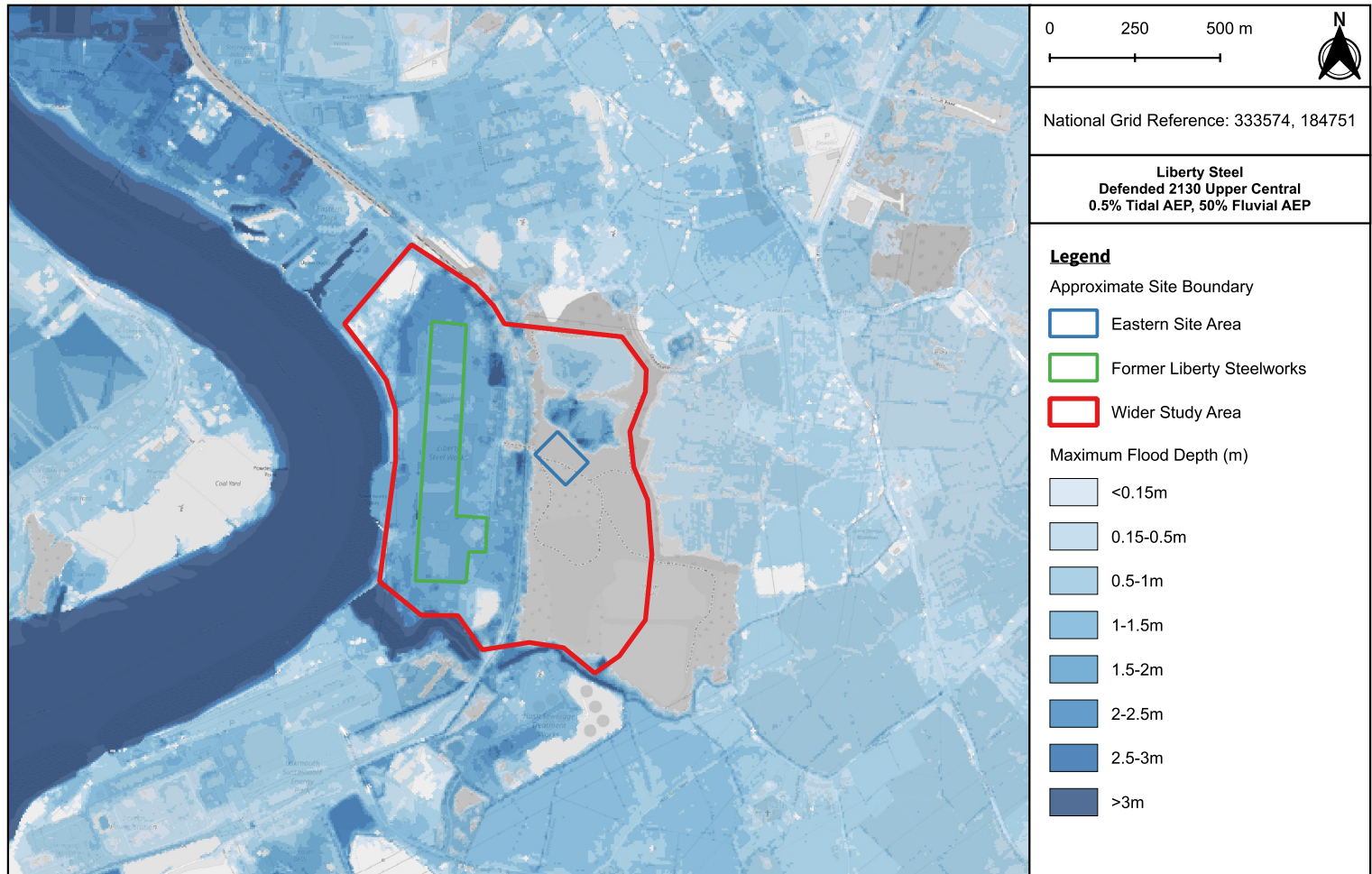
 1.5-2m

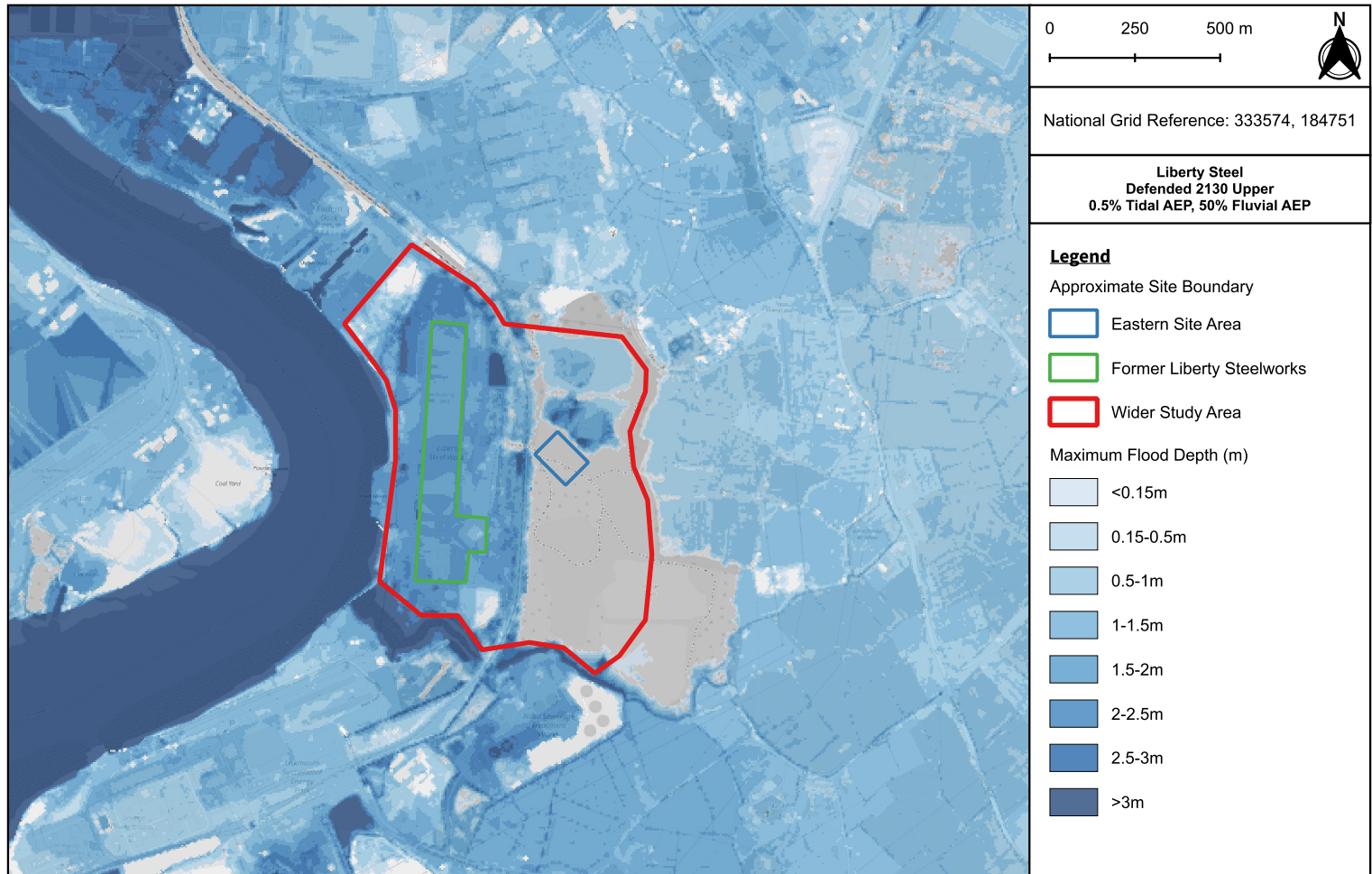
 2-2.5m

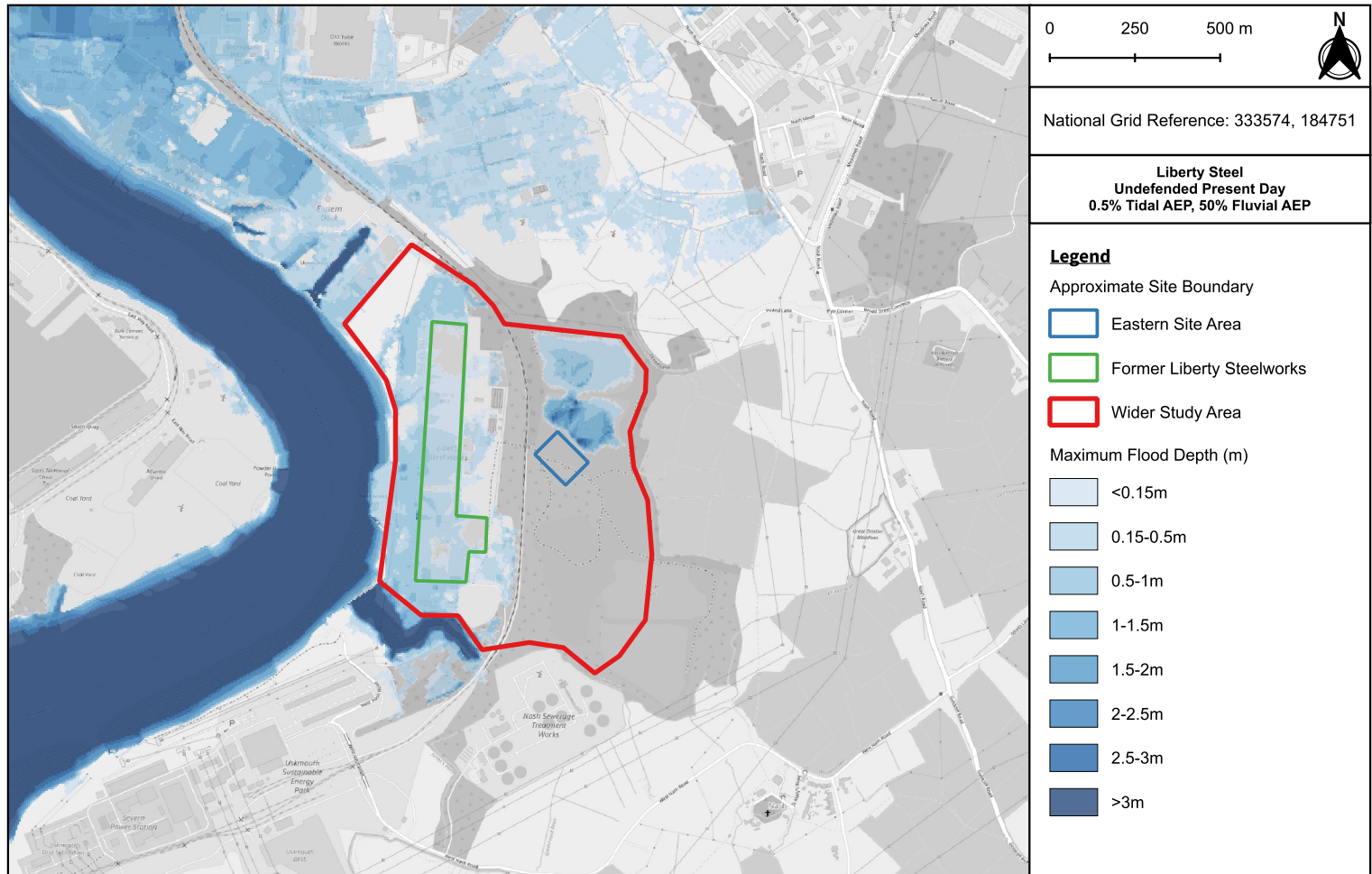
 2.5-3m

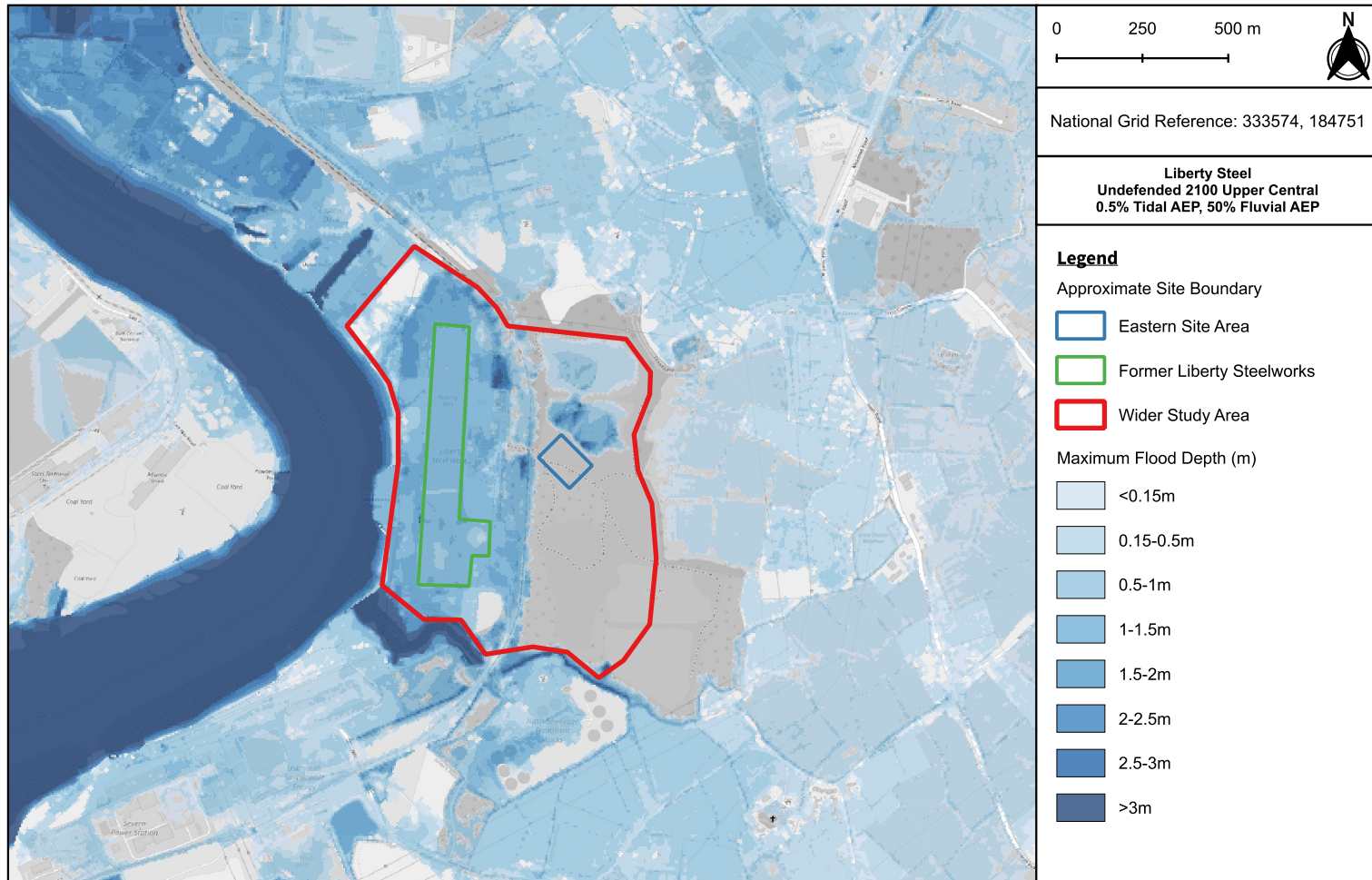
 >3m

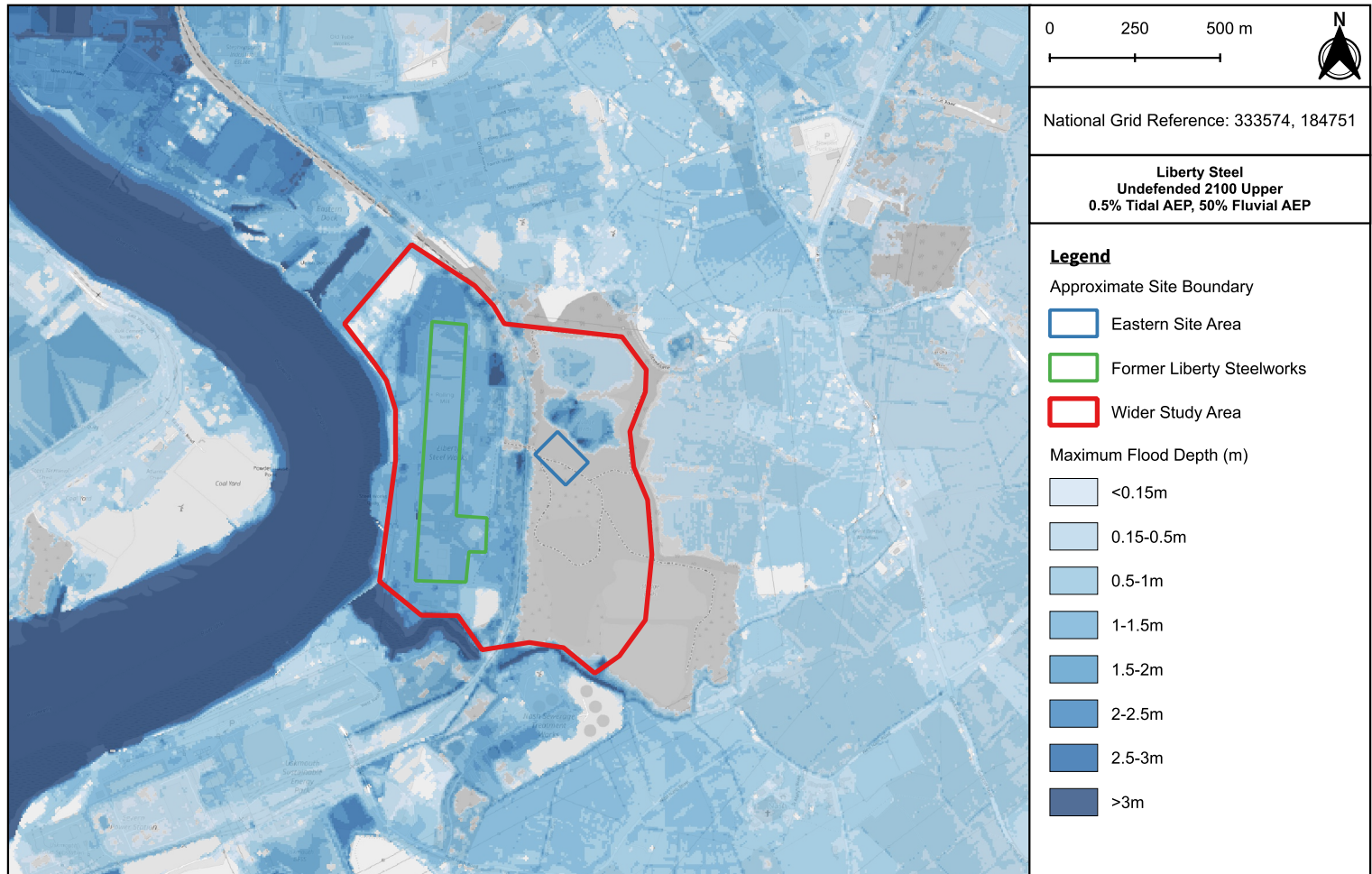


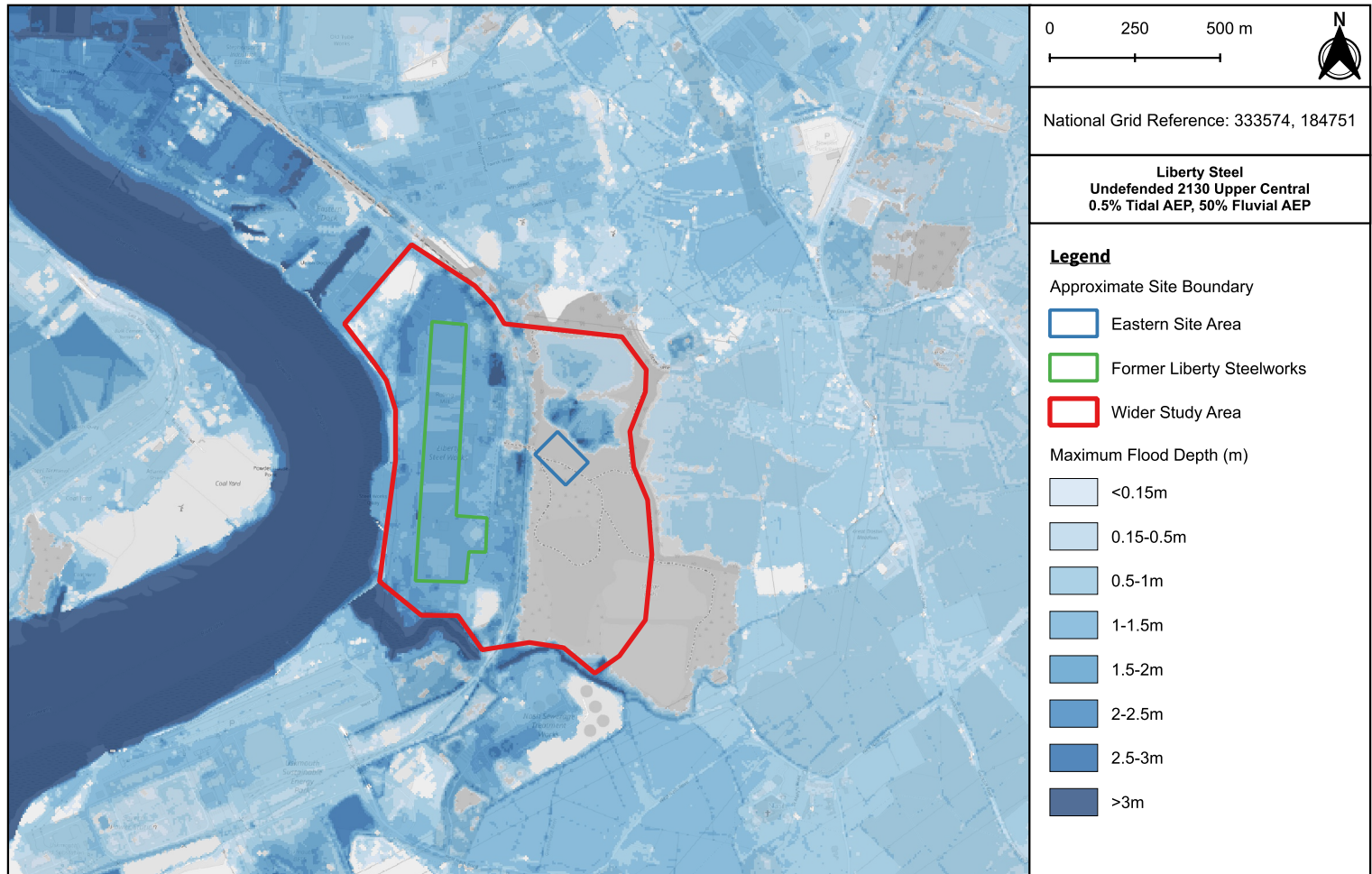


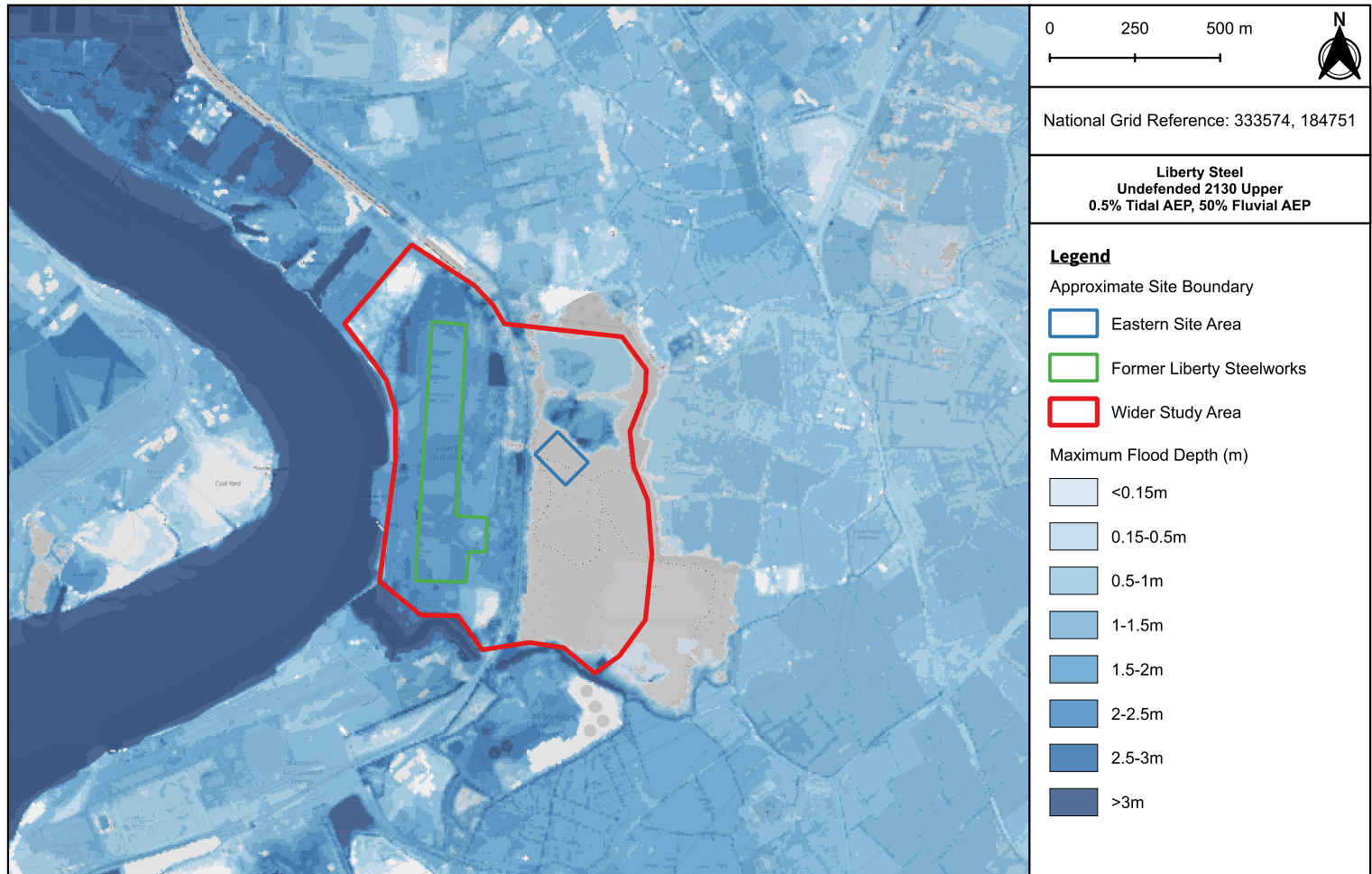


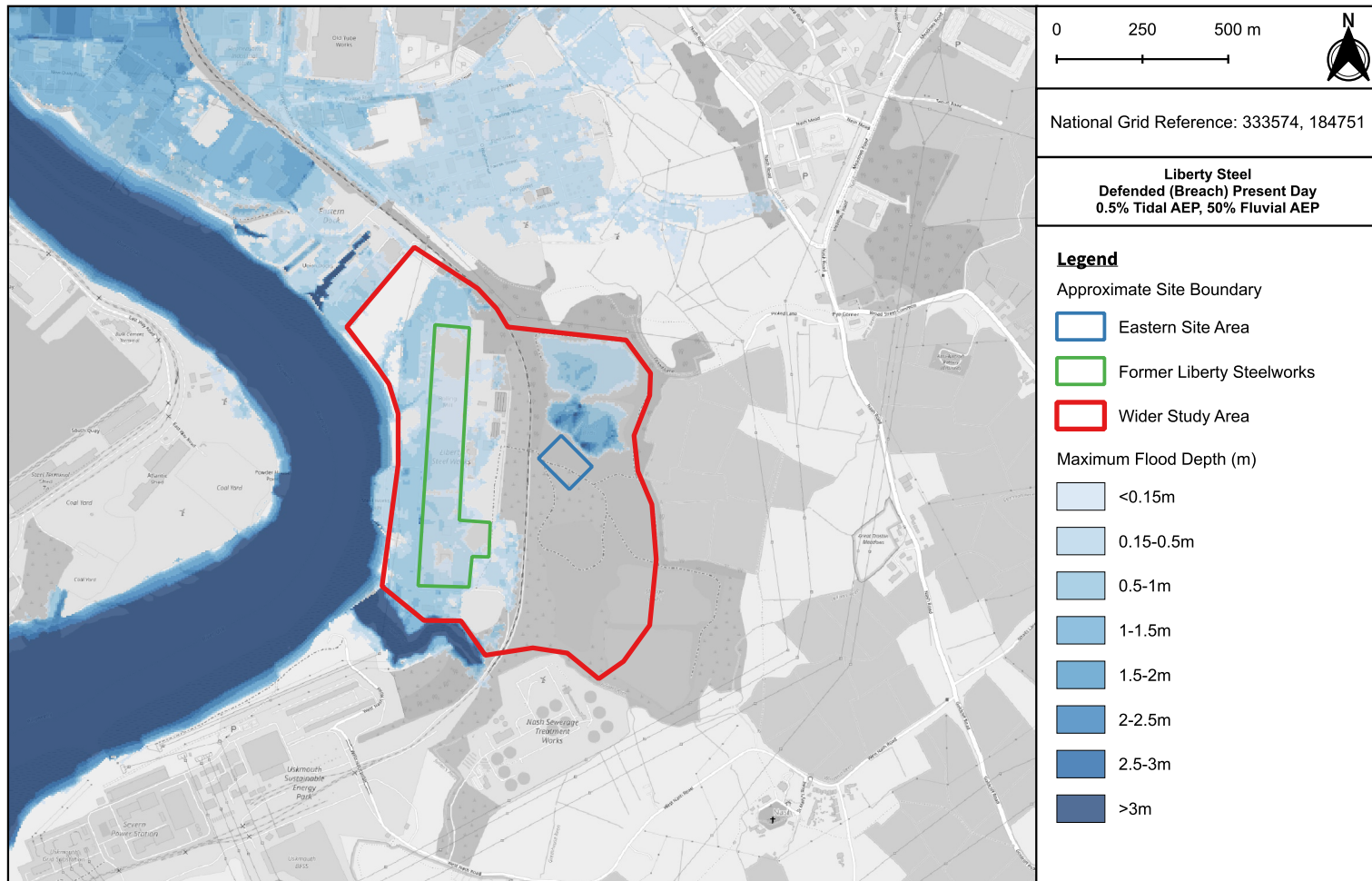


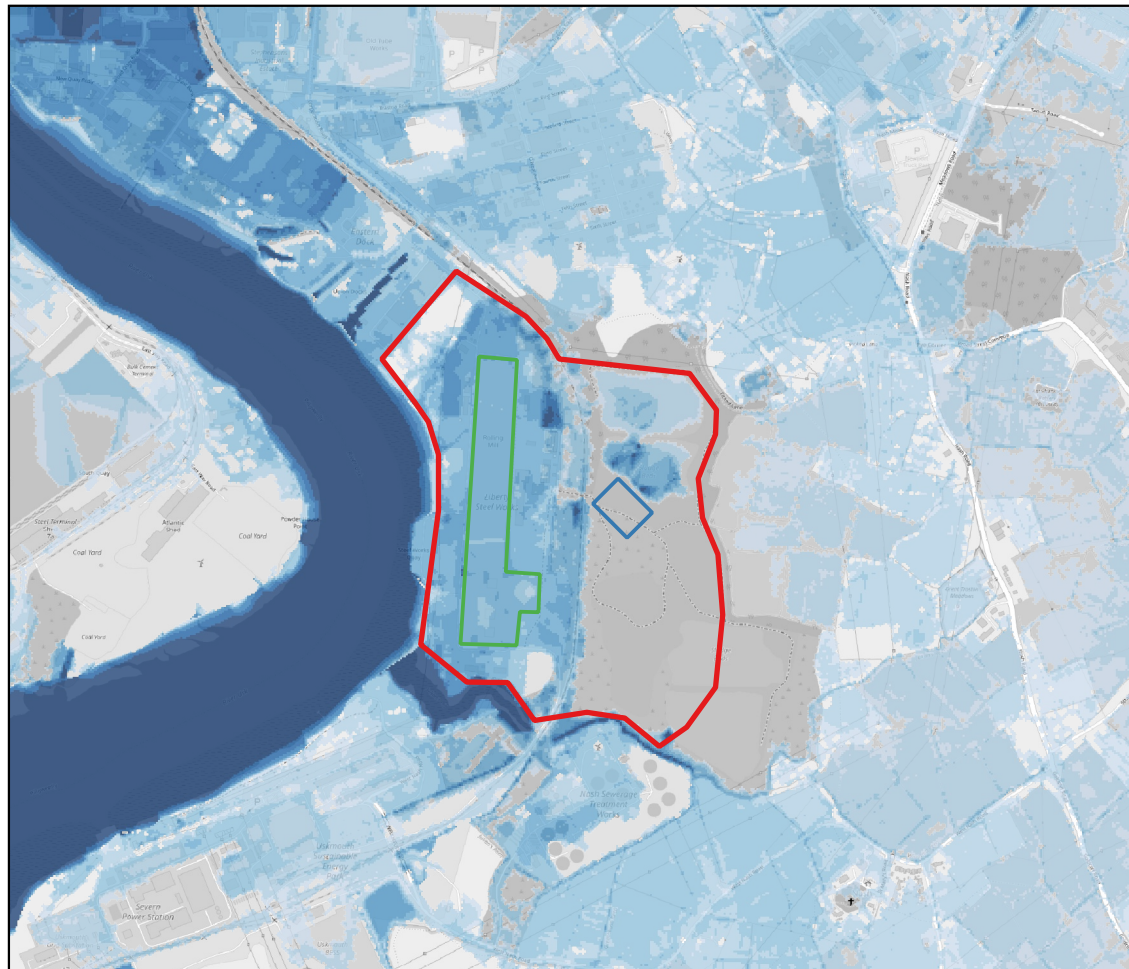












0 250 500 m



National Grid Reference: 333574, 184751

**Liberty Steel
Defended (Breach) 2100 Upper Central
0.5% Tidal AEP, 50% Fluvial AEP**

Legend

Approximate Site Boundary

 Eastern Site Area

 Former Liberty Steelworks

 Wider Study Area

Maximum Flood Depth (m)

 <0.15m

 0.15-0.5m

 0.5-1m

 1-1.5m

 1.5-2m

 2-2.5m

 2.5-3m

 >3m

