The Fishbourne Footpath to Nature Recovery project

Detailed Stage Design Report

P06

October 2025

Prepared for:
Chichester Harbour Conservancy

www.jbaconsulting.com

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Client	Chichester Harbour Conservancy
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This report describes work commissioned by Chichester Harbour Conservancy. Hannah Webster of JBA Consulting carried out this work.

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The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report.

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Executive Summary

The Fishbourne Footpath to Nature Recovery Project, located at Apuldram Meadow, aims to remove barriers to coastal change through nature-based solutions, enabling the creation of saltmarsh habitat and providing a public footpath resilient to effects of climate change over the next 50 years. The project directly supports the aims of the Chichester Harbour Protection and Recovery of Nature (CHaPRoN) partnership and is aligned with Natural England's recommendations to address saltmarsh loss, improve biodiversity, and facilitate community adaptation to climate change. This pilot is intended to act as a replicable model for nature recovery and enabling high-quality public access across Chichester Harbour.

The site is located on the eastern side of the Fishbourne Channel within Chichester Harbour. The Harbour has multiple statutory designations including Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar, and Site of Special Scientific Interest (SSSI), and the site itself is situated within the Chichester Harbour National Landscape.

The project has been developed in direct response to Natural England's condition review of Chichester Harbour 'Condition review of Chichester Harbour sites: intertidal, subtidal and bird features (NERR090)' which concluded that the Chichester Harbour SSSI would be downgraded from 'Unfavourable - No Change' to an 'Unfavourable Declining' condition. The project also seeks to address the failure of the existing sea wall resulting in the closure of Public Right of Way (PRoW) footpath 3059.

The project comprises two main elements:

- The removal of approximately 210m of failing sea wall along the western and southern site boundaries, to restore tidal connectivity with the Harbour and enable the development of approximately 5 hectares of intertidal saltmarsh habitat.
- Landward realignment of PRoW 3059, repositioned at a crest level of 3.0mAOD to align with the projected Highest Astronomical Tide in 2075, ensuring resilient pedestrian access over the next 50 years.

Design development followed a multi-disciplinary assessment approach through outline and detailed design phases, including geotechnical, environmental, landscape, heritage and planning considerations. In the outline design, optioneering was completed to identify the preferred realignment route by considering ways to maximise the potential area for saltmarsh creation and consider how the realigned footpath would interact with existing site features, including Footpath 555, Fishbourne Stream, ridge and furrow features, drainage ditches and underlying utilities (including the Southern Gas Network (SGN) high-pressure gas main).

Through the detailed design, a geotechnical assessment was undertaken using a desk study approach based on limited site-specific ground investigation data. Key considerations included a slope stability and settlement assessment to inform the footpath design and specification. Drainage design was also considered at this stage, to ensure that the existing land drainage features are maintained through the footpath realignment.

The environmental design includes an assessment of predicted habitat change using site levels and tidal projections. Saltmarsh development is expected to establish to

increasing extents within the short-, medium-, and long-term epochs (2030, 2050, 2075).

The landscape design has responded to the National Landscape designation and the site's rural and estuarine context. The proposed embankment is to be grassed with native planting and visual mitigation has been included where appropriate. Visualisations have been developed to illustrate change scenarios in 2030, 2050, and 2075, aimed to support the planning application and stakeholder engagement.

The final design comprises a realigned footpath through Apuldram Meadow, utilising existing high ground where possible to provide views across Fishbourne Channel and to Chichester Cathedral. The footpath will have a crest level of 3.0mAOD with a 3m wide crest, comprising a 2.0m surfaced path and 0.5m verges. In order to minimise project cost and carbon, the reuse of concrete from the removed sea wall has been considered through the design.

A planning application has been submitted to Chichester District Council with associated licences and consents for the removal of the sea wall and footpath realignment. The planning application is available for view on their website (https://www.chichester.gov.uk/view-planning-applications).

An assessment of funding sources has identified multiple viable routes for initial construction costs and long-term management. These include the sale of BNG and watercourse units, carbon and nitrate credits, CHC partner contributions (e.g. Southern Water, EA), Countryside Stewardship Higher Tier agreements, and targeted charitable funding. The site's proximity to designated features and public access enhancements increases its eligibility for multiple schemes.

A detailed buildability review has been completed based on assumed contractor methodology. This includes the removal of the existing sea wall, phased footpath construction, installation of drainage crossings, SGN gas pipe considerations, reuse of materials on site, and habitat-sensitive working practices.

Monitoring of the retained northern embankment and the wider landscape is proposed post-construction to monitor the benefits of the project and ensure lessons are captured and shared to enable future schemes to achieve success.

1 Introduction

1.1 Purpose of the Design Report

JBA Consulting (JBA) were commissioned by Chichester Harbour Conservancy (CHC) to undertake the detailed design of the realignment of a footpath and habitat creation at Apuldram Meadow, Chichester.

This Design Report provides:

- A description of the project origin and objectives.
- An overview of the flood risk.
- A description of the design assumptions, decision-making process and methodology used to develop the detailed design (engineering, environmental and landscape).

For further information on wider project background, general design requirements (i.e. design and performance standards), design input data (i.e. tidal data, design storm conditions) and general design methodologies, reference should be made to OIP-JBA-00-00-DS-Z-0001-Design_Input_Statement.

1.2 Project background

Chichester Harbour is of exceptional environmental importance, regarded as a locally, nationally, and internationally crucial site for sensitive habitats, wildlife and migratory birds. Due to this, Chichester Harbour is designated as a Ramsar site, Special Protection Area (SPA), Special Area of Conservation (SAC), a Site of Special Scientific Interest (SSSI) and a National Landscape Area (formerly known as an Area of Outstanding Natural Beauty (AONB)), among other local protections.

In February 2021, Natural England published a report called the 'Condition review of Chichester Harbour sites: intertidal, subtidal and bird features (NERR090)' which assessed the Harbour's special habitats and species and whether the existing conservation actions are appropriate, or changes are required. The outcome of the report downgraded Chichester Harbour SSSI from 'Unfavourable - No Change' to an 'Unfavourable Declining' condition. The overriding reasons for this downgrade is the continued loss of saltmarsh, poor quality saltmarsh and mudflat habitat, water quality and the continued decline of many bird species.

In response to the declining habitat and biodiversity within the Harbour, Chichester Harbour Conservancy (CHC) formed the Chichester Harbour Protection and Recovery of Nature (CHaPRoN) partnership initiative alongside specialist organisations (including the Environment Agency (EA), Natural England, Sussex Inshore Fisheries and Conservation Authority (IFCA), Coastal Partners, Royal Society for the Protection of Birds (RSPB), Chichester District Council and Southern Water) aiming for the protection and recovery of nature in Chichester Harbour.

In November 2024, Chichester Harbour Conservancy appointed JBA Consulting to complete the design and submit a planning application for the 'Fishbourne Footpath to Nature Recovery project' (hereby referenced as 'the project'). The project aims to create new saltmarsh habitat by removing a section of sea wall (which is contributing to coastal squeeze) and realign a Public Right of Way footpath (PRoW 3059) to enable the public to continue to access and enjoy the site over the next 50 years.

1.3 Project overview

Apuldram Meadow is located in southeast England, 2.5km southwest of Chichester, and the site is positioned on the eastern side of the Fishbourne Channel within Chichester Harbour. The existing sea wall at Apuldram Meadow is contributing to a loss of intertidal habitat through coastal squeeze (defined as 'the loss of natural habitats or a deterioration in their quality caused by man-made structures or human activity, DEFRA). The decline of saltmarsh habitats and the poor condition of the sea wall at Apuldram Meadow, along with sea level rise, has driven the need to adapt to coastal change and ultimately contribute to the restoration of saltmarsh habitat within the Harbour.

The existing sea wall of Apuldram Meadow consists of an earth embankment with a concrete exposed face at the northern boundary and a mixture of concrete blockwork, cemented natural stone and shuttered concrete repairs along the western and southern boundaries. PRoW 3059 runs along the embankment crest. In recent years, storm events have exploited age-related weaknesses in the sea wall, and have, in several locations, disintegrated the existing hard facing at the west and south. This has led to the fill (clay, sand, gravel) becoming exposed and being vulnerable to erosion. For safety reasons, the failures in the sea wall resulted in the permanent closure of PRoW 3059.

The project will remove sections of the hard concrete outer shell (west and south sections) to allow for a natural breach of the earth bank. Once established, the natural breaches will enable saline water to flood across the meadow during high tide and enable saltmarsh to establish. PRoW 3059 will be realigned landward, within Apuldram Meadow, above the future tide level (3m AOD, 2075 Highest Astronomical Tide). As the effects of climate change are realised and usage of the lower lying PRoW 555 becomes restricted (due to tidal inundation), the realigned PRoW 3059 will maintain a quality access route for the public for at least 50 years post-project completion.

The project will not be removing the existing sea wall (north) as the condition assessment (Royal HaskoningDHV, 2023) found the asset to be in good condition. Subject to the condition of the northern sea wall remaining in good condition following project completion, CHC plans to reopen this section to the public. It is planned to serve as a walkway to enable the public to enjoy panoramic views of the Fishbourne Channel. The route will be monitored and remain for a period until the route is no longer viable (i.e., until it is deemed unsafe due to erosion/ failures). Monitoring and potential future schemes are considered in section 11 of this report.

The ambition is that this pilot project (and the lessons learned from it) forms a blueprint for similar interventions across Chichester Harbour to alleviate the pressure of coastal squeeze and aiding in the recovery of mudflat and saltmarsh habitat and improving biodiversity, whilst maintaining public access. It is hoped that this project sets an excellent example of how we can work with nature to adapt to the effects of climate change and the ever-changing coastline for the benefit of people and nature.

1.4 Project objectives

The following objectives were identified and have influenced the design process:

- To conserve and enhance natural beauty (National Landscapes in England).
- "To have regard for leisure and recreation and the conservation of nature (CHC Act of 1971)"
- To connect people with nature.
- To help communities understand and adapt to a changing coastline.

- To improve the natural environment and naturalise the site by removing hard structures along the coastline.
- To restore habitat and create intertidal saltmarsh to address coastal squeeze in Chichester Harbour.
- To create a standardised approach that can be replicated along the coastline.

The project objectives directly align with several of Natural England's recommendations as set out in the 'Condition review of Chichester Harbour sites: intertidal, subtidal and bird features (NERR090)':

- Opportunities to recreate saltmarsh habitat should be identified e.g. by realignment sea defences.
- Remove barriers to coastal changes caused from inappropriate coastal management including coastal squeeze, which are resulting in saltmarsh erosion and interrupting sediment supply.

The project also directly aligns with goals outlined in the 2023 Environmental Improvement Plan (DEFRA), specifically Goal 1 (thriving plants and wildlife), Goal 7 (mitigating and adapting to climate change), Goal 8 (reduced risk of harm from environmental hazards) and Goal 10 (enhancing beauty, heritage and engagement with the natural environment).

2 Site constraints

2.1 Services constraints

A PAS 128 Type C walkover was undertaken by JBA Consulting and a Type D detection study was conducted by Groundwise Searches Ltd in November 2024 prior to the commencement of the Outline Design.

The following services were identified within the detection study and are shown on the design drawings (provided in Appendix A). The following services were identified:

- Southern Gas Network (SGN) Gas pipe
- Southern Water sewer (abandoned)

Where clashes have been noted in the design, these have been recorded in the Designer's Risk Register (OIP-JBA-00-00-RR-C-0001-Designer_Risk_Register) and the Hazard's and Constraints Plan (OIP-JBA-00-00-DR-C-1001-Hazards_&_Constraints_Plan).

2.1.1 SGN gas pipe

A high-pressure gas pipe runs from the southwest boundary of the site, beneath Apuldram Meadow and the west embankment, following a north-westerly direction beneath Fishbourne Channel. The asset is owned by Southern Gas Network (SGN). Plans provided by SGN (P014GE15 and P014E14, provided in Appendix B) show that the gas pipe is buried to a depth of approx. 2m. This asset acts as a significant constraint and early engagement with SGN was completed to enable a loading assessment for the raised footpath and the early inclusion of any control measures that may need to be put in place.

A loading assessment, to be completed by SGN, will review the impact of the realigned footpath on the SGN pipeline with regards to acceptable loading at the pipe level. SGN will advise whether bridging measures are required within the design. This is to ensure no detrimental settlement, cracking, ultimate or serviceability breaches could occur when taking into account the material and sizing of the existing pipe, construction tolerances and impact of embankment construction. They will also consider any temporary or permanent condition impacts (e.g. plant or excavation).

2.1.2 Southern water sewer (abandoned)

An abandoned surface water sewer runs from the Southern Water Wastewater Treatment works in the southeast of the site boundary through the open meadow, towards the east of the site and through the northern access point outside of the site boundary. The sewer runs for approximately 225m in linear length across the site. The pipe is 200mm in diameter and the depth of the sewer is unknown.

2.2 Structural constraints

There are several existing structures on the site which are located either within or near to the proposed realigned footpath (PRoW 3059) as shown in Figure 2-1. These include:

- A 240m long coastal earth embankment with a solid concrete exposed face with a clay, sand and gravel fill at the northern boundary of the site. The typical crest level of the defence is 3.4mAOD and the lowest crest level is 3.12mAOD. The typical toe level of the concrete apron is 1.8mAOD.

- A 210m long coastal earth embankment with an exposed face consisting of a mixture of concrete blockwork and shuttered concrete repairs with a clay, sand and gravel fill on the western and southern extent of the site. The typical crest of the defence is 3.80mAOD on the southern extent and 3.60mAOD on the western extent. The lowest crest level for the southern extent is 3.67mAOD and 3.43mAOD for the western extent. The typical toe level of the concrete apron is 2.20mAOD on the southern extent and 1.70m AOD on the western extent.
- PRoW 3059 runs along the crest of the coastal embankment but is permanently closed due to the exposed face on the southern and western extents deteriorating during storm events over the last few years which exploited age-related weaknesses.
- PRoW footpath 555 runs through the centre of the site from north to south. Following the closure of PRoW 3059, CHC installed a boardwalk along the existing PRoW 555 footpath to enable its use throughout the year.
- The Southern Water Wastewater Treatment Works boundary fencing runs along the southern boundary of the site.
- Two outfall structures to the north of the site with one draining the site through the southern bank of the stream and the other draining the stream into the harbour via the Fishbourne Stream. The outfalls are formed of a concrete headwall and wingwall structures, a non-return tidal flap valve at the downstream end and an earth embankment and an inlet structure at the upstream end. The harbour outfall is operated and maintained by the Environment Agency.

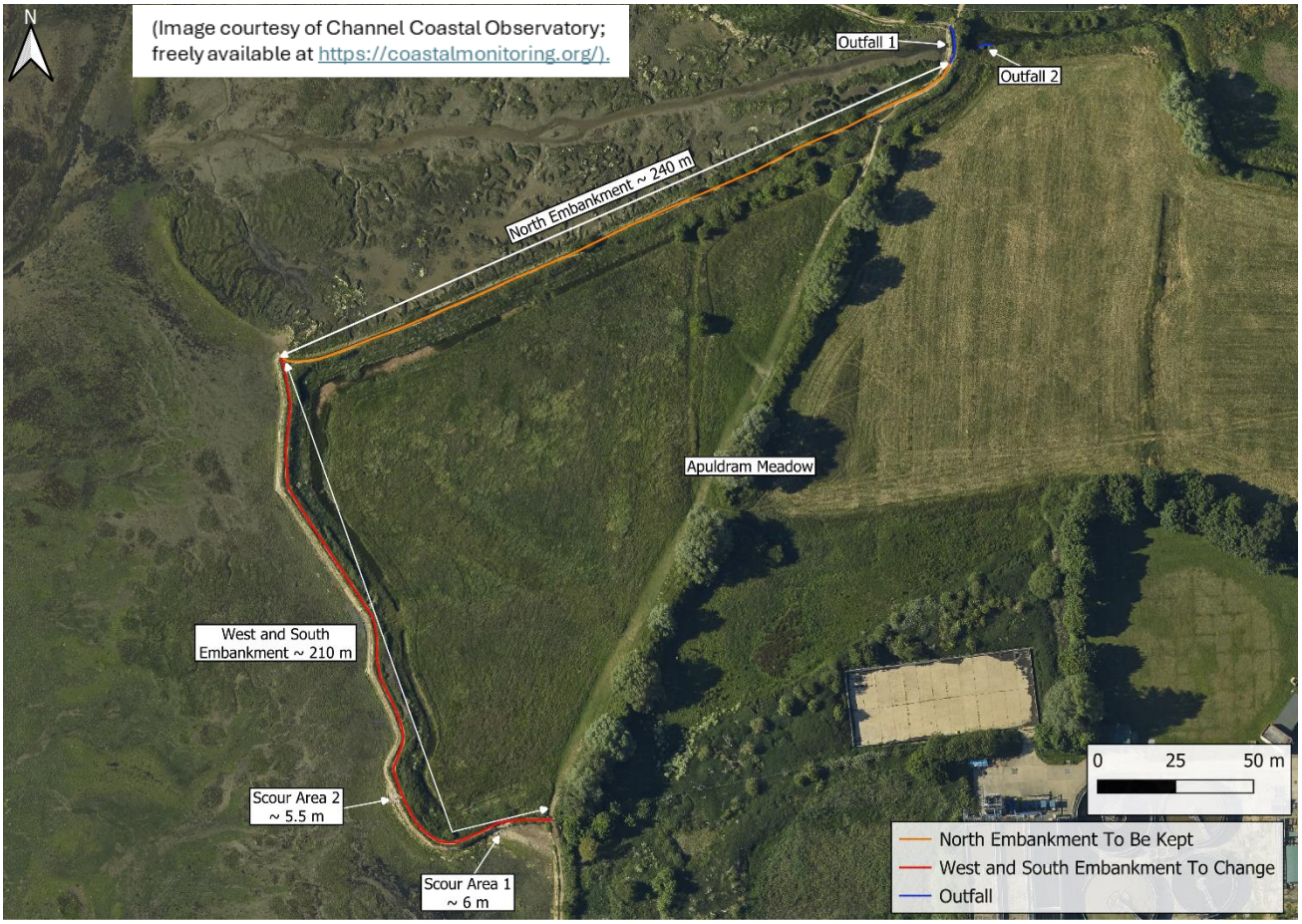

Figure 2-1: Existing structural constraints

2.3 Environmental constraints

2.3.1 Ecological constraints

A detailed assessment of potential ecological constraints on site has been completed and the outputs are outlined in the Preliminary Ecological Appraisal (OIP-JBA-00-00-RP-EN-0005-Preliminary_Ecological_Appraisal). The key constraints are summarised below.

The following statutory designations have been identified within the proposed site boundary and therefore all have the potential to be impacted by the proposed works through direct habitat loss or damage, disturbance, and/or changes in water quality. The statutory designations are listed below and shown in Figure 2-2.

- Solent Maritime Special Area of Conservation (SAC)
- Chichester and Langstone Harbours Special Protection Area (SPA)
- Chichester and Langstone Harbours Ramsar
- Chichester Harbour Site of Special Scientific Interest (SSSI)

The data search from Sussex Biodiversity Record Centre (SxBRC) identified three Local Wildlife Sites (LWS) within 2km of the proposed site boundary.

- Fishbourne Local Wildlife Site (adjacent to the north boundary of the site)

- River Lavant Marsh Local Wildlife Site (115m south of the site)
- Chichester Canal Local Wildlife Site (1.5km east of the site)

The site at Apuldram Meadow supports several ecologically important habitats. The proposed project has the potential to result in the small-scale temporary and permanent loss of these habitats and therefore mitigation measures and habitat compensation through BNG requirements, should be considered throughout the design and construction.

The UKHab Survey conducted as part of the Preliminary Ecological Appraisal (JBA Consulting, 2025) identified the following habitats within the site boundary. These are listed below and shown in Figure 2-3.

- g3c - Other Neutral Grassland
- g3c19 - Other Neutral Grassland; Coastal and Floodplain Grazing Marsh
- h3d - Bramble Scrub
- w1g - Other Broadleaved Woodland
- u1e701 - Built Linear Feature; Sea Wall
- t2a - Coastal Saltmarsh
- t2d - Intertidal mudflats
- r2b - Other Rivers and Streams
- r1g50 - Other Standing Water; Ditch

Habitats present on or adjacent to the site have the potential to support numerous protected and notable species. The data search from Sussex Biodiversity Record Centre (SxBRC) combined with the ecological walkover completed as part of the Preliminary Ecological Appraisal (JBA Consulting, 2025) identified the following protected and notable species within a 2km radius from the site boundary which should be considered throughout the design and construction:

- Breeding and wintering bird populations
- Badger
- Bats
- Otter
- Water vole
- Reptiles
- Amphibians
- Invertebrates
- Invasive non-native species (INNS)

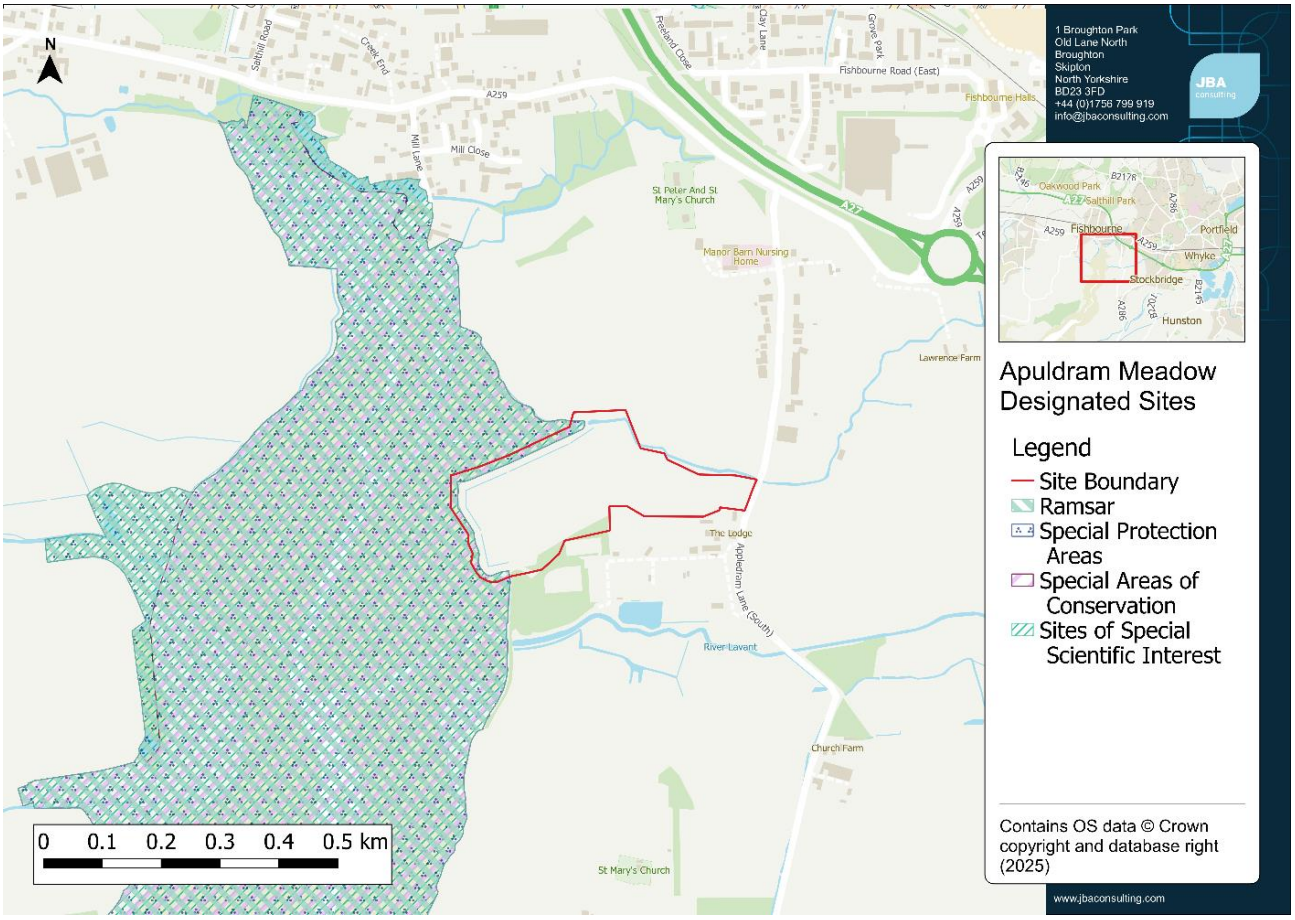

Figure 2-2: Designated Sites within and surrounding the site boundary

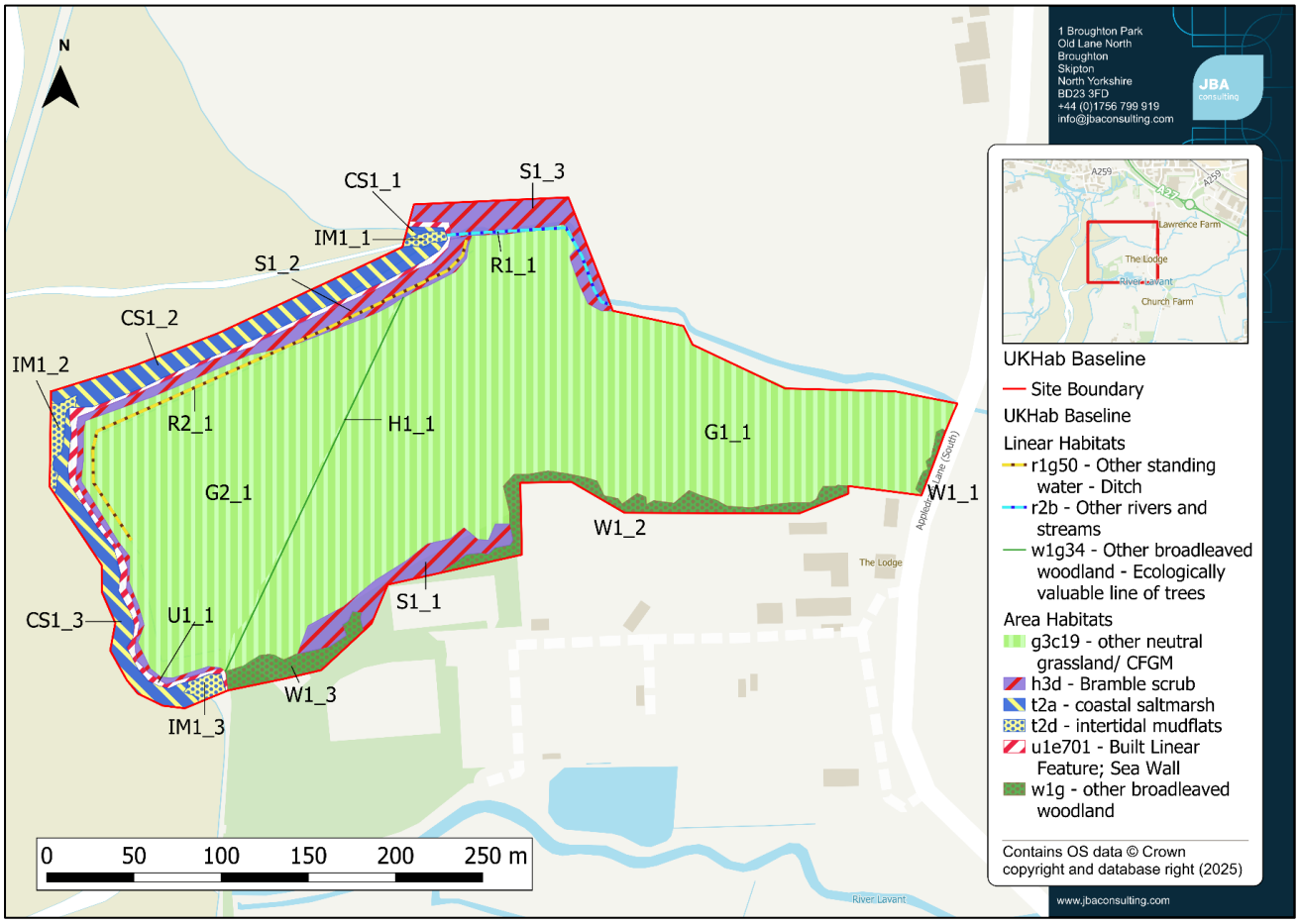

Figure 2-3: UKHab Map within the site boundary

2.3.2 Landscape and Visual Amenity Constraints

The proposed development site is rural in character and heavily influenced by its coastal floodplain and intertidal features. The site is situated within:

- The Chichester Harbour National Landscape.
- The National Landscape Character Area (NCA) 126: South Coast Plain.
- The West Sussex County Council landscape character area: Chichester Harbour and Pagham Harbour (SC3).
- 215m of the Fishbourne Conservation Area, which incorporates the Fishbourne Roman site.

The National Landscape and landscape setting requires conservation and enhancement of its features to ensure the protection of the designated landscape. The development has the potential to impact on this National Landscape.

The National Landscape Assessment identifies suitable mitigation measures which will ensure that the designated landscape remains conserved and enhanced by the proposed development. The results of the assessment are provided in the National Landscape

Assessment (OIP-JBA-00-00-RP-L-0001-National_Landscape_Statement) and summarised in section 7.4 of this report.

2.3.3 Arboricultural Constraints

The following trees have been identified from the Topographic Survey (Grantham Coates Surveys, 2024) and the Tree Condition and Valuation survey (JBA Consulting, 2024).

The survey recorded 31 assets, including 28 individual trees and 3 Groups, which have been categorised according to BS 5837 and are summarised below:

- No individual trees and no groups were found to be of High quality – CAT A
- 2 groups (G029 & G030) and 26 individual trees were found to be of moderate quality – CAT B
- 1 group (G004) and 1 individual tree (T004) were found to be of low quality – CAT C
- 1 individual tree (T005) was found to be unsuitable for retention – CAT U

Further details are outlined within the Arboricultural Survey Report (OIP-JBA-00-00-RP-EN-0001-Arboricultural_Survey) and Tree Constraints Plan (OIP-JBA-00-00-DR-EN-0001-Tree_Constraints_Plan).

2.4 Geotechnical constraints

A detailed desk study assessment of potential geotechnical issues on site is included in JBA's desk study (OIP-JBA-00-00-RP-GT-0001-Geotechnical_Desk_Study). A summary of the key constraints is provided in the following sections.

2.4.1 Unexploded ordnance (UXO)

The proposed development site has a low unexploded ordnance (UXO) risk according to online publicly accessible maps produced by Zetica. Like any construction site, the risk of encountering UXO cannot be completed ruled out and should be considered by the Contractor in the Construction Method Statement, and mitigated by using appropriate toolbox talks and site briefings during construction, given the severe consequences of a potential UXO strike.

2.4.2 Contamination

The potential for contamination sources to exist on site was found to be minimal. Contamination sources include chemicals from possible previous farming activities, localised areas of made ground from construction of previous structures on site and placement of services. The concrete blockwork on the existing defence was noted to be of unknown composition, and so if any contaminants are present this will limit the re-use possibilities within the new construction. It is thought that the sea wall was constructed in the 1800s (as evidenced in the Heritage Impact Assessment, OIP-JBA-00-00-RP-HE-0002-Heritage_Statement) and therefore the risk of asbestos within the concrete is low. Contamination testing is currently underway to confirm whether any contaminants are present.

2.4.3 Other geotechnical risks

The desk study highlights various geotechnical risks, most of which are a result of a lack of information on ground conditions. There is currently no ground investigation data on site which could confirm whether geotechnical hazards (including compressible soils,

shrinkable soils, solution features, high groundwater table, slope instability on existing the existing river banks, and sulphates) are present. The design of the new embankment will need to take these risks into account and where required, include conservative measures (e.g. a dig and replace layer up to 1m deep beneath the new embankment, and inspection of the formation level to ensure competent soils. The depth of the dig and replace layer is to be proportional to the height of the raised footpath segments).

It is recommended that the ground conditions are confirmed as part of the first phase of construction, including advance inspection pits or trial trenches to formation depth. The construction methodology is outlined in section 10 of this report.

2.5 Heritage constraints

Data searches identified 90 recorded assets and events within the study area, this has been defined as an area extending 1km from the site boundary, as identified by the Red Line Boundary. The locations of designated heritage assets are shown in Figure 2-4 and the non-designated heritage assets shown in Figure 3-5. At the time of the data search there were two Conservation Areas, one Registered Park and Garden, one Scheduled Monument and 24 Listed Buildings within 1km of the Site.

Details are outlined in the Heritage Impact Assessment (OIP-JBA-00-00-RP-HE-0001-Hertiage_Impact_Assessment) and a summary of the key constraints provided in the following sections.

2.5.1 Designated Heritage assets

There are no World Heritage Sites, Registered Historic Battlefields or Protected Wreck Sites within the study area. Designated heritage assets include:

- Fishbourne Conservation Area (NHLE 12529) - located approximately 214m to the north of the site.
- Dell Quay Conservation Area (NHLE 12530) - located approximately 960m to the southwest of the site.
- Fishbourne Roman Palace, Grade II* Registered Park and Garden (1001211) – located to the north of the site.
- Fishbourne Roman Site, Scheduled Monument (1005829)- located approximately 270m north of the site.
- The study area contains 24 Listed Buildings (two Grade I and 22 Grade II), 18 of which fall within the Fishbourne Conservation Area.

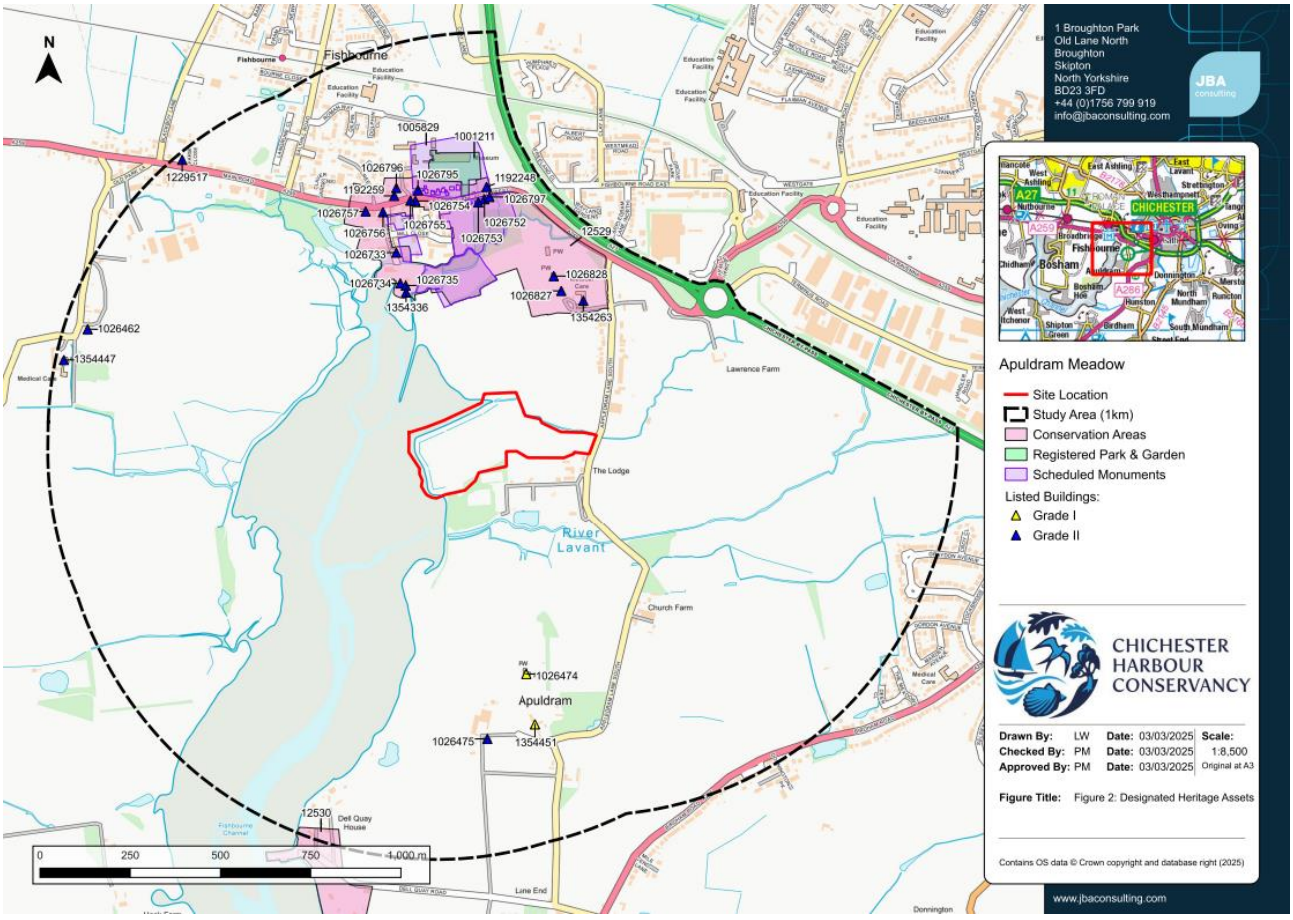

Figure 2-4: Designated Heritage Assets within and surrounding the site boundary

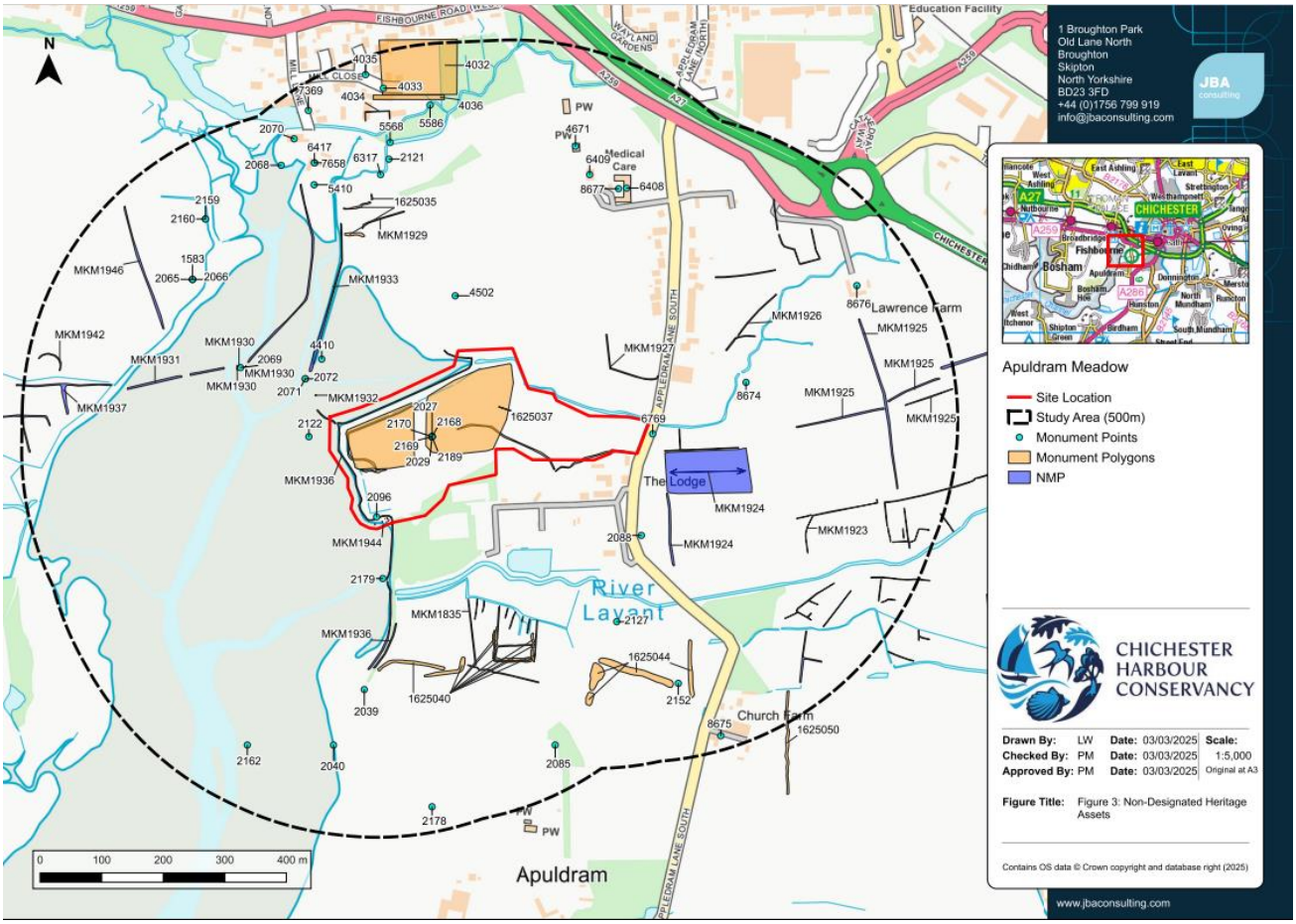

Figure 2-5: Non-designated Heritage Assets within and surrounding the site boundary

2.5.2 Heritage Site Walkover

The design has been informed by a heritage site walkover (JBA Consulting, 2025) which assessed the site conditions and potential for effects on the setting of nearby heritage assets as part of the proposed project.

2.6 Planning constraints

The Red Line Boundary outlines the planning area to be considered as part of the project. Figure 2-6 shows the extent of the Red Line Boundary and is the basis for all assessments completed as part of the planning application.

Key planning constraints include:

- The environmental sensitivity of the site in relation to European designated sites.
- The potential for impact on the National Landscape.
- The presence of Public Rights of Way (PRoW).
- Impact of construction activities on nearby roads and residents.
- The site flood risk.
- Impact on Best and Most Versatile (BMV) agricultural land.

- Design of the proposals and compliance with policy 44 of the Chichester Local Plan Key Policies.

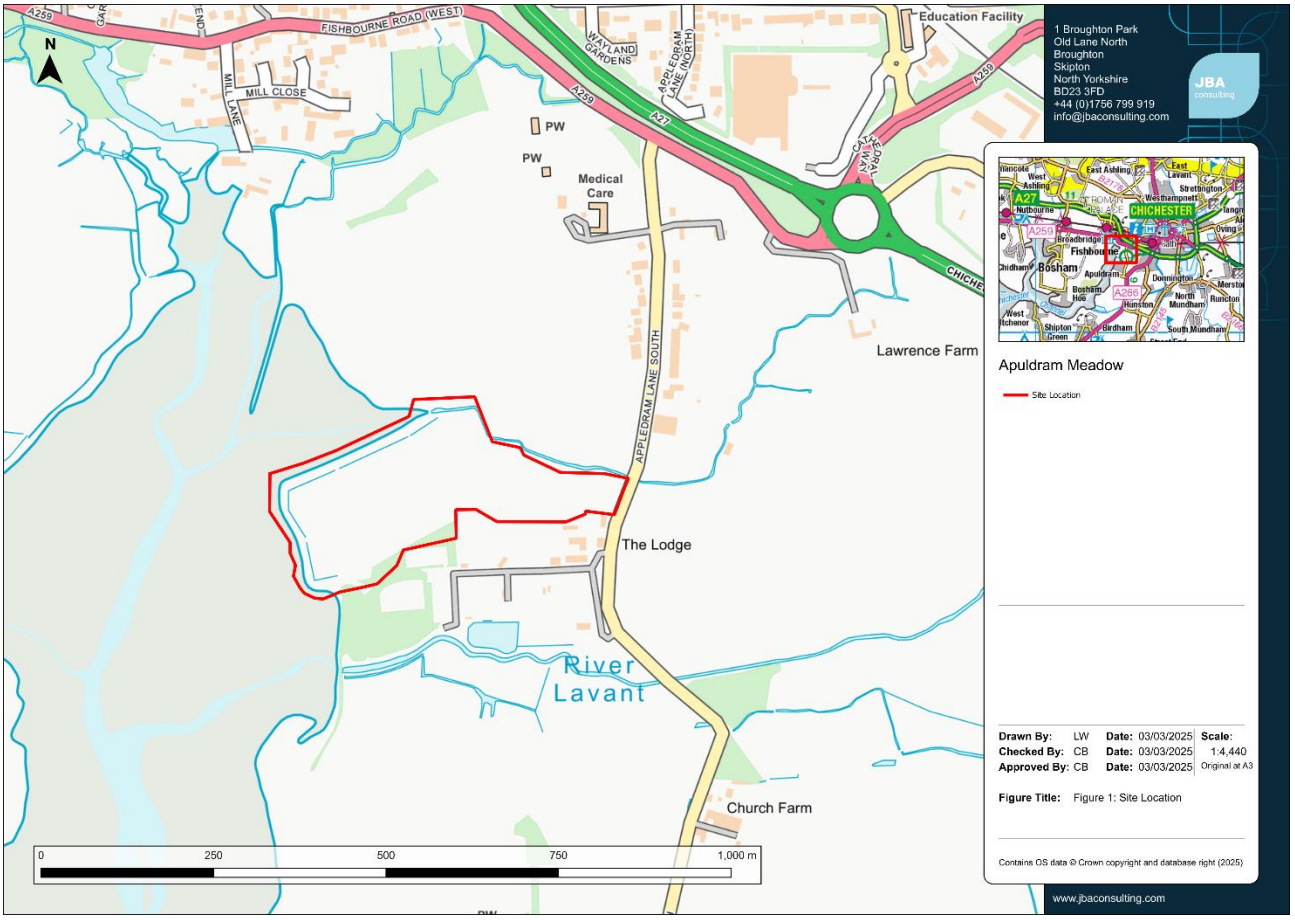

Figure 2-6: Red Line Boundary

3 Design input conditions

3.1 Design information

The following data has been shared and/or obtained through the design:

- Fishbourne Footpath – Feasibility Study (Royal Haskoning DHV, 2023).
- Topographical Survey (Grantham Coates Surveys, 2024).
- PAS 128 Type D Services Search (Groundwise, 2024).
- UXO report (Zetica, 2024).
- UKHab Survey and ecological walkover (JBA Consulting, 2024).
- UKHab Survey and ecological walkover (CHC, 2025).
- Water Framework Directive walkover (JBA Consulting, 2024).
- Landscape walkover (JBA Consulting, 2025).
- Heritage walkover (JBA Consulting, 2025).
- Plans of the SGN gas main - P014GE15 and P014E14 (SGN, 1994).
- Information about the Southern Water sewer (Southern Water, 2025).

The following list of deliverables have been produced by JBA Consulting as part of the outline and detailed design development stage:

- Design Input Statement
- Geotechnical Desk Study
- Concrete Testing Plan
- Outline Design drawings
- Arboricultural Impact Assessment (including Tree Constraints Plan)
- EIA Screening
- Planning Design and Access Statement
- National Landscape Statement
- Flood Risk Assessment
- Heritage Impact Assessment
- Biodiversity Net Gain Assessment
- Coastal Squeeze Assessment
- Habitat Regulations Assessment
- WFD Screening, Scoping and Impact Assessment
- Detailed Design drawings
- Design Risk Register
- Specification for works

3.2 Key standards and guidance

The following design standards have been used throughout the design development of the realigned footpath.

- Adnitt C., Brew, D. Cottle R., Hardwick M., John S., Leggett D., McNulty S., Meakins N., Staniland, R. (2007). Saltmarsh Management Manual, R&D Technical Report SC030220.
- Armour layers. Journal of Waterway, Port, Coastal, and Ocean Engineering, 114(1), 66-80.
- British Geological Society (2019) Geology of Britain Viewer.
- BS 6349-1; (2000) Marine Structures Part 1: Code of practice for general criteria.
- BS 8300-1:2018 Design of an accessible and inclusive built environment. External environment - code of practice.
- BS EN 1997-1:2004 Eurocode 7: Geotechnical design. General rules (+A1:2013) (incorporating corrigendum February 2009).
- BS EN 1997-2:2007 Eurocode 7: Geotechnical design. Ground investigation and testing (incorporating corrigendum June 2010).
- BSI. PAS 1192-2:2013 Specification for information management for the capital/delivery phase of construction projects using building information modelling.
- BSI. PAS 1192-6:2018 Specification for collaborative sharing and use of structured Health and safety information using BIM.
- CIRIA (2010), The Beach Management Manual (second edition).
- CIRIA (2019), Culvert, screen and outfall manual.
- DEFRA (2018) UK Climate Projections 18.
- Environment Agency, 2010. Flood and Coastal Erosion Risk Management: appraisal guidance.
- Environment Agency (2017), Accounting for residual uncertainty: updating the freeboard guide, Report – SC120014.
- Environment Agency (2018), Safety, Health, Environment and Wellbeing (SHEW) Code of Practice (CoP).
- Environment Agency (2007) Management of flood embankments - A good practice review. R&D Technical Report FD2411/TR1.
- Legget D. J., Cooper N. J. and Harvey R. (2004) Coastal and Estuarine Managed Realignment — Design Issues. CIRIA, London.
- NA to BS EN 1997-1:2004:2007 UK National annex to Eurocode 7: Geotechnical design. General rules (+A1:2014) (incorporating Corrigendum No. 1).
- NA to BS EN 1997-2:2007:2009 UK National Annex to Eurocode 7: Geotechnical design. Ground investigation and testing.
- National Highways, Manual of Contract Documents for Highway Works, various dates
- National Highways (2016), Volume 1 Specification for Highway Works, Series 600 Earthworks.

- Parker R., Bolam S., Foden J., Morris D., Brown S., Chesher T., Moller I. (2004) Suitability Criteria for Habitat Creation - Report I, R&D Technical Report FD1917TR1.
- Townend, I. (2008) Breach design for managed realignment sites, Maritime Engineering, 161.
- US Army Corp of Engineers (2002), Coastal Engineering Manual.
- West Sussex County Council (2014) Public Rights of Way Standard Details. Rural footpath drawing and King Charles III England Coast Path (KCIIIECP) specification.

3.3 Design criteria

The new footpath will be designed to the following criteria:

- Design life: 50 years (2075).
- The realigned footpath will be designed to accommodate only a pedestrian load (5.00 kN/m^2) with a crest width of 3.00m (2.00m footpath width in accordance with West Sussex County Council Public Rights of Way Standard Details and 0.50m either side for H&S and maintenance) and inland and seaward slopes with a 1 in 3 gradient. This includes a. The embankment will not be designed to accommodate any vehicle load (for maintenance or Health & Safety).
- Crest level fixed at 3.00mAOD.
- Embankment will not be designed to contain flood water (including groundwater) or to resist scour or erosion caused by wave action and tidal current.

The realigned footpath will be designed with a crest level of 3.0mAOD, which represents the Highest Astronomical Tide (HAT) level in 2075. The footpath will not be designed to provide any coastal flood protection, but to provide a 'dry' footpath for the next 50 years to enable the public to continue to enjoy views of the Fishbourne Channel. The decision was made not to provide coastal flood protection as part of the footpath realignment, due to the presence of low-lying ground to the north of site boundary providing a flow route around the proposed alignment.

4 Flood risk

Whilst the proposed development does not seek to address the flood risk at Apuldram Meadow, it is important to consider the different types of flood risk present within the site boundary through the design, for planning and during construction.

It is noted that the land within the Red Line Boundary is the original flood plain and the flood risks outlined in sections 4.2 to 4.4 is the current flood risk (pre-project implementation). There are no properties within the Red Line Boundary but local receptors are considered in section 4.5.

The following sections discuss the flood risk at the site present day and in future with the effects of climate change and a Flood Risk Assessment has been completed to support the planning application (OIP-JBA-XX-XX-RP-EN-Apuldram_FRA).

4.1 Historic flooding

The EA Recorded Flood Outlines and Historic Flood Map datasets indicate that the site has not previously experienced flooding. However, Appendix B of the SFRA, available on the Chichester District Council website, identifies two locations in close proximity to the site that experienced flooding due to a high spring tide coinciding with high flow rates from the River Lavant, known as 'tide locking'.

4.2 Tidal and Fluvial flood risk

The site is located on the eastern side of the Fishbourne Channel within Chichester Harbour. The site is bordered to the north by Fishbourne Stream. Based on existing modelling, the site lies within Flood Zone 3, which corresponds to an event with greater than or equal to a 0.5% probability of occurrence in any given year. The 2023 Chichester District Council SFRA further defines the site as being within Flood Zone 3b (functional floodplain).

The proposed development is classified as 'water-compatible development' under the National Planning Policy Framework (NPPF). This classification of development is considered compatible with Flood Zone 3a and 3b.

The EA Flood map for planning is provided in Figure 4-1.

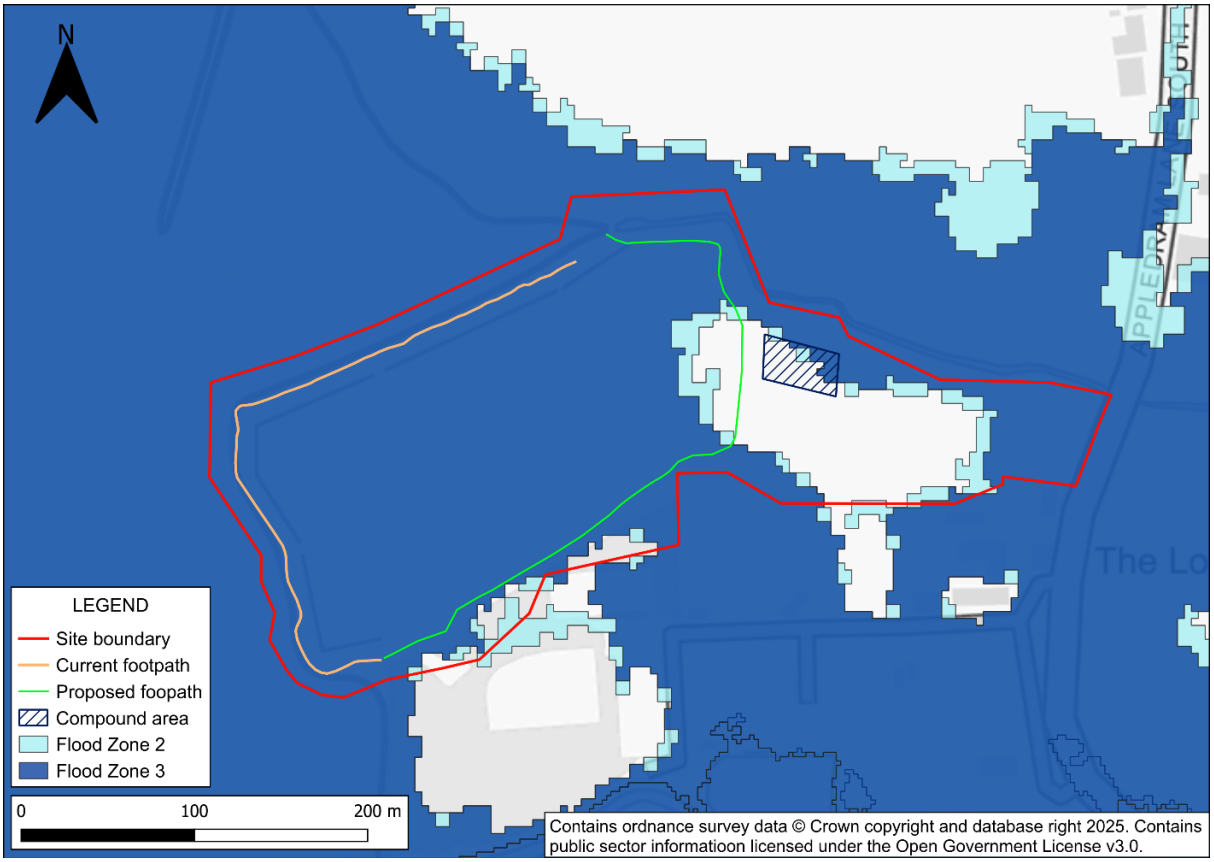

Figure 4-1: Flood map for planning

4.3 Pluvial flood risk

The Risk of Flooding from Surface Water (RoFSW) dataset has been used to determine the potential extents of pluvial flooding at the site. RoFSW mapping indicates that the surface water flood risk to the site as a whole is low, with localised areas of medium and high risk around the edges of the western half of the site. The areas of high-risk correlate to several of the drainage ditches present within the site boundary. Where the drainage ditches interact with the proposed footpath design, these have been considered through the design development and are discussed in section 8.2.5 of this report.

Figure 4-2 shows the Risk of Flooding from Surface Water (RoFSW) dataset for the site.

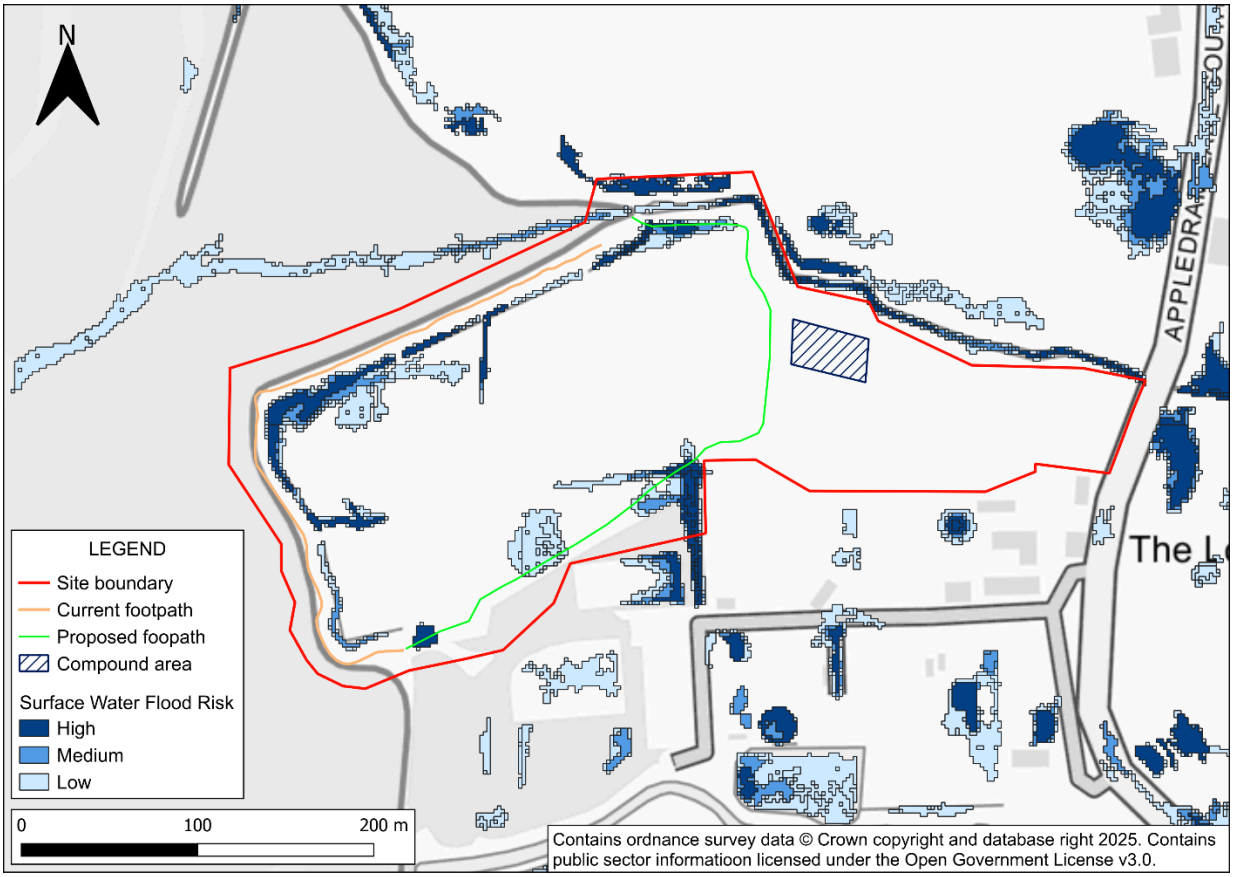

Figure 4-2: Risk of flooding from surface water mapping

4.4 Groundwater flood risk

Given the sites proximity to the River Lavant and the presence of underlying highly productive chalk aquifers, it is likely that relatively shallow groundwater is present beneath the site.

The recent SFRA for Chichester District Council used the JBA Consulting groundwater map to identify groundwater flood risks in the area, classifying the site as having groundwater levels between 0.5 and 5 meters below ground level. This classification is supported by data from borehole SU80SW106, which recorded a groundwater depth of 1.1 meters below ground level.

In summary, the risk of localised groundwater flooding at the site is high, which is consistent with parts of the site being low lying land adjacent to an estuary.

4.4.1 Other flood risks

The Flood Risk Assessment (OIP-JBA-XX-XX-RP-EN-Apuldram_FRA) also considers flood risk from:

- Sewers
- Reservoirs

The flood risk from sewers is deemed negligible, based on the site location and historic information. The are no reservoirs within the vicinity of the site, therefore no reservoir flood risk is present.

4.5 Overview of future flood risk

The following sections discuss the impacts of climate change and risk to key receptors in and around the site.

4.5.1 Climate change

An analysis of the impacts of climate change were taken in accordance with the latest UK Climate Projections (UKCP18). Within UKCP18, estimates for sea level rise are provided under Representative Concentration Pathways (RCP) for greenhouse gas emission scenarios. These scenarios include RCP2.6, RCP4.5 and RCP8.5 for low, moderate, and high greenhouse gas emission scenarios, respectively. Within the three scenarios, the estimate is further refined by 70th and 95th percentile probability levels. In simple terms, this should be interpreted as the relative likelihood of the projected change being at, or less than, the given change. For this project, the high RCP8.5 emissions scenario has been chosen, using the 70th percentile (higher central) as the design allowance. The 95th percentile (upper end) allowance in planning for more severe climate impacts will be used for sensitivity checking and ultimate limit state (ULS).

An allowance based on the 70th percentile is exceeded by 30% of the projections in the range and at the 95th percentile, it is exceeded by 5% of the projections in the range. The increase in sea level under RCP8.5 emissions scenario using the 70th and 95th percentile can be seen in Table 4-1.

Table 4-1: Climate change increase in sea level allowance (m).

Timeframe	Climate change increase in sea level allowance (m)	
	70th percentile	**95th percentile**
2025-2075	0.435	0.564

4.5.2 Tidal data and extreme water levels

Admiralty Total Tide software was used to extract the underlying astronomical tide for the site. The astronomic tide levels are based on the closest secondary harmonic port, known as Dell Quay, which is within close proximity to the site. This secondary harmonic port displays values for the Highest Astronomical Tide (HAT), Mean High Water Spring (MHWS), and Mean High Water Neap (MHWN) only. Therefore, the standard harmonic port of Chichester Harbour (Entrance) was used for the Mean Sea Level (MSL), Mean Low Water Neap (MLWN), Mean Low Water Spring) MLWS, and Lowest Astronomical Tide (LAT). The tide type found at Fishbourne is a semi-diurnal.

Extreme Still Water Level (SWL) conditions were obtained from the Environment Agency's (EA) Coastal flood boundary conditions for UK mainland and islands project, which produced the Coastal Flood Boundary Dataset (CFBD). The CFBD contains the estimated extreme sea levels throughout the UK based on research involving more than 40 Class A water level gauges. The astronomical and CFBD extreme water levels were uplifted to account for projected sea level rise at the site based on the UKCP18 RCP 8.5 climate projection.

The predicted astronomical and extreme water-levels at present day and future epochs at Apuldram Meadow are presented in Table 4-2 for a 70th percentile projection. They have been based on the CFBD estuary boundary point 4604_5.

Table 4-2: Tide and extreme water levels at Apuldram Meadow (UKCP18 RCP 8.5 70th percentile)

Tide or extreme water level (annual recurrence interval) (year)	Present Day (2024) water levels (mAOD)	Climate Change water levels (mAOD)				
		2025	2050	2075	2100	2125
200	3.44	3.45	3.58	3.88	4.19	4.51
100	3.37	3.38	3.51	3.81	4.12	4.44
50	3.30	3.31	3.44	3.74	4.05	4.37
20	3.21	3.22	3.35	3.65	3.96	4.28
10	3.14	3.15	3.28	3.58	3.89	4.21
5	3.07	3.08	3.21	3.51	3.82	4.14
1	2.90	2.91	3.04	3.34	3.65	3.97
HAT	2.57	2.58	2.71	3.01	3.32	3.64
MHWS	2.17	2.18	2.31	2.61	2.92	3.24
MHWN	1.17	1.18	1.31	1.61	1.92	2.24
MSL	0.13	0.14	0.27	0.57	0.88	1.20
MLWN	-0.83	-0.82	-0.69	-0.39	-0.08	0.24
MLWS	-1.83	-1.82	-1.69	-1.39	-1.08	-0.76
LAT	-2.53	-2.52	-2.39	-2.09	-1.78	-1.46

4.5.3 Local receptors to flood risk

There are several receptors within (Footpath 555) and close (all others listed) to the site boundary that are or will be at tidal flood risk within the next 50 years. Receptors other than Footpath 555 are outside the site boundary and are at flood risk through flow routes outside the site boundary. The following key receptors have been considered, and an overview of their flood risk is outlined in Table 4-3.

- Footpath 555
- Fishbourne Stream along the northern boundary of the site
- Southern Water's Wastewater Treatment Works (WWTWs)
- Residential properties (on Appledram Lane South, adjacent to the WWTWs)

- Appledram Lane South

Table 4-3: Key receptors and their flood risk

Receptor	Description	Flood risk (present day)	Future flood risk
Footpath 555	Footpath 555 has a varying level across the site boundary. At the northern tie in with the existing PRoW the level is 2.52mAOD, and at the southern tie in the level is 2.36mAOD. The lowest point of the footpath is 2.15mAOD near the northern tie in.	The footpath is below the Highest Astronomical Tide (HAT) present day (2.57mAOD).	N/A - The footpath is likely to be extinguished by 2040.
Freshwater Fishbourne Stream	Freshwater Fishbourne Stream has a bed level between 0.70m AOD and 0.95m AOD (within the Topographic survey extent). Low ground is present to the north of the site boundary between 1.00mAOD and 2.51mAOD*.	Fishbourne Stream is below the HAT present day (2.57mAOD).	By 2075, Fishbourne Stream is predicted to be inundated every Mean High Water Spring (MHWS).
Southern Water's WWTWs	The WWTWs has a varying site level between approx. 2.5mAOD (central, southern and eastern areas) to 4.6mAOD (northern and western areas).	The WWTWs lowest areas are below the HAT present day (2.57mAOD). The highest areas are above the 1 in 200-year (0.5% AEP event) flood level in 2075.	By 2075, the WWTWs is predicted to flood every Mean High Water Spring (MHWS).

Residential properties (on Appledram Lane South, adjacent to the WWTWs)	The residential properties are at a level of approx. 2.90m AOD.	The residential properties are at the 1 in 1 year (100% AEP event) flood level present day (2.90mAOD).	By 2075, the properties will be below the HAT (3.01mAOD).
Appledram Lane South	Appledram Lane South (outside the site boundary) has a level of approx. 2.90m - 3.0mAOD.	Appledram Lane South is at the 1 in 1 year (100% AEP event) flood level present day (2.90mAOD).	By 2075, the Appledram Lane South will be below the HAT (3.01mAOD).

*Limited survey details due to dense brambles and no access at time of survey.

The levels used in Table 4-3 for Footpath 555 and Fishbourne Stream are based on the Topographic Survey (Grantham Coates, 2024). LiDAR was used for all other receptors.

5 Footpath design philosophy

5.1 Optioneering

Through the design process, a range of footpath crest levels were considered (as documented in OIP-JBA-00-00-DS-Z-0001-Design_Input_Statement) and a fixed realignment crest level of 3.00mAOD was determined. The level was chosen to offer a 'dry' footpath across the design life (2075), being at the level of the Highest Astronomical Tide (3.01m AOD) in 2075. The level also results in a much smaller and shorter duration coastal squeeze impact when water levels reach the realigned footpath, compared to those with a higher crest level.

5.2 Footpath alignment design

To determine the final footpath alignment, an optioneering process was undertaken which involved dividing an open area of Apuldram Meadow (to the eastern extent of the site) into four areas, as shown in Figure 5-1. The process enabled area specific variations and constraints (e.g. interaction with drainage ditches, services constraints and landscape) to be taken into consideration when determining the final alignment. Decisions on the alignment are outlined in the following sections.

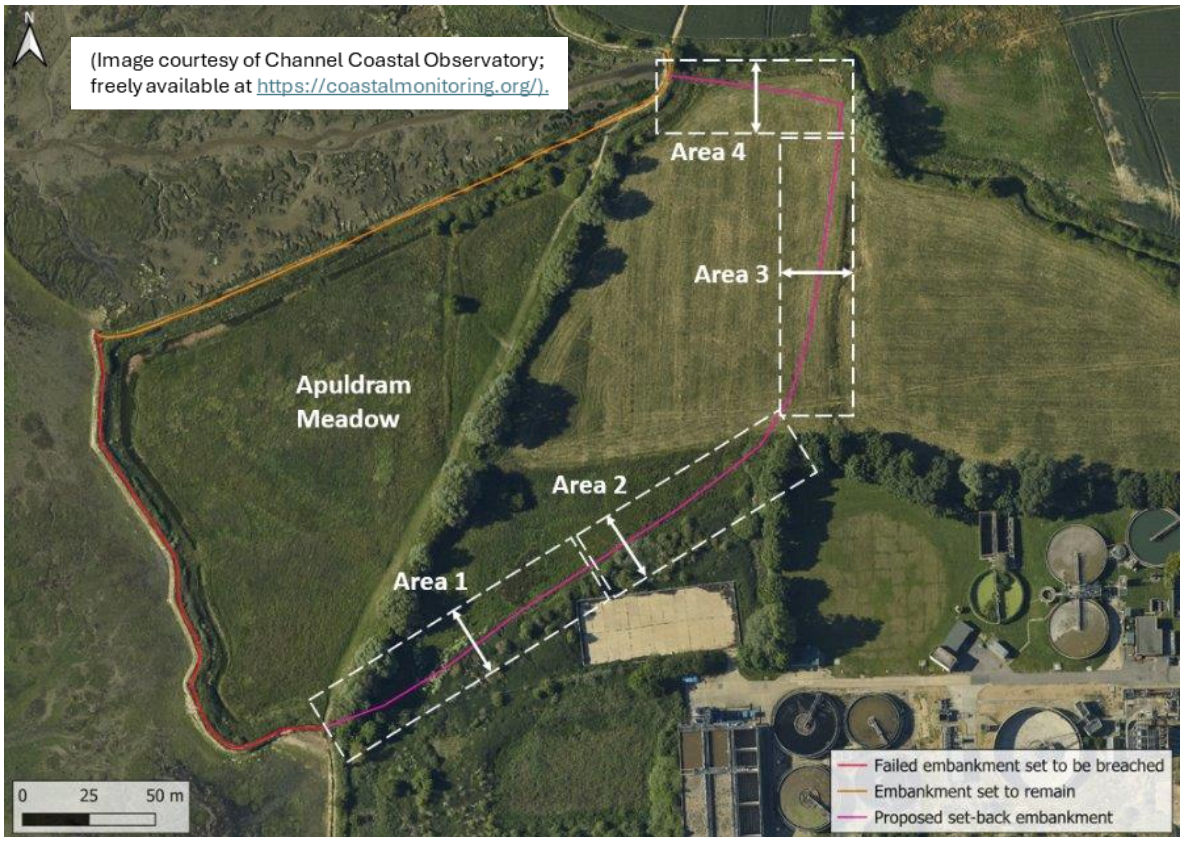

Figure 5-1: Areas which defined the development and assessment of embankment alignment options (Contains Ordnance Survey data © Crown copyright and database right 2015).

5.2.1 Area 1

The following key constraints are present in Area 1:

- Southern Water Wastewater Treatment Works boundary fencing. Minimum offset of 2.00m required from the boundary.
- Southern Gas Networks (SGN) gas pipe to the western extent.
- Ground raising required to meet the required design level (3m AOD).

The preferred option taken forward into the detailed design was a realigned footpath 2.00m from the boundary fencing. The option was chosen as it maximised the area available for saltmarsh habitat and utilised the existing raised ground at the southern boundary, therefore reducing the fill requirements and providing a smaller load on the SGN gas pipe.

5.2.2 Area 2

The following key constraints were present in Area 2:

- Southern Water Wastewater Treatment Works boundary fencing. Minimum offset of 2.00m required from the boundary.
- Existing drainage ditch.
- Minimum 2.00m offset from existing tree extents (considered further in the detailed design following completion of the Tree Constraints Plan).
- Ground raising required to meet the required design level (3m AOD).

The preferred option taken forward into the detailed design was a realigned footpath 5.00m inland from the boundary fencing. The option was chosen as it crossed the existing drainage ditch at the narrowest point (reducing the fill volume required) and reduced the risk of impacting the existing tree line and root protection areas.

5.2.3 Area 3

The following key constraints were present in Area 3:

- Variation in topography.

Area 3 had limited constraints on the realigned footpath alignment. The preferred option taken forward into the detailed design was a realigned footpath that utilised the naturally high topography (reducing the fill volume requirement). The option was chosen as it maximised the area available for saltmarsh habitat, followed the existing topography (including the existing Ridge and Furrow heritage features) and enables views of Chichester Cathedral to the north-east of the site boundary.

5.2.4 Area 4

The following key constraints were present in Area 4:

- Boundary fencing at the top of the slope of the outfall channel. Minimum offset of 2.00m required from the fencing.
- Proximity to the freshwater Fishbourne Stream.
- Interaction with outfall slope and risk of undermining/ structural concerns of the new realigned footpath.
- Interaction with existing drainage channel and existing drainage culvert/ headwall structure.

- Minimum 2.00m offset from existing tree extents (considered further in the detailed design following completion of the Tree Constraints Plan).
- Ground raising required to meet the required design level (3m AOD).

A preferred option was not determined at this stage, but the following principles were taken forward into the detailed design. The realigned footpath will be positioned a minimal distance from the boundary fencing and utilise the existing culvert as the drainage ditch crossing. It was recommended that further works were required to determine the exact alignment, and these are outlined in Section 8 (Detailed Design) of this report.

5.2.5 Preferred alignment

The preferred alignment was formed using Civils 3D based on the optioneering process.

In addition, there are two engineering activities which will be considered through the detailed design and are discussed in Section 8 of this report.

- Service crossing design (if required): Based on the PAS128 Type D desktop utility search outputs and discussions with SGN regarding the high-pressured gas pipe, it is possible that a services span may be required to enable the new realigned footpath to cross the existing services without imposing unacceptable loads onto them.
- Alignment of the tie in at the north with PRoW 555: Based on the topographic survey, an existing, but covered due to vegetation growth, culvert was identified at the northern extent of the site where the realigned footpath is set to tie in with the existing northern embankment and footpath 555.

5.3 Cross-section design

Following the analysis of the topographical survey, environmental and landscape and health and safety considerations, the following parameters were assigned to the typical cross section for the new realigned footpath (OIP-JBA-00-00-DR-C-3001-Typical_Section):

- Crest level of minimum 3.00mAOD.
- Crest width of minimum 3.00m (as stated in Environment Agency, 2007). This includes a 2.00m footpath width in accordance with West Sussex County Council Public Rights of Way Standard Details and 0.50m either side for H&S and maintenance.
- Footpath to be formed of a 100mm thick type 1 limestone top dressing and 200mm thick sub-base layer.
- Realigned footpath to be constructed with predominantly class 2 (cohesive) fill material. Typically, a minimum undrained shear strength of 50kPa, density of 19-21KN/m^3 and maximum permeability of 1x10^{-5}m/s.
- Slopes of 1:3 for H&S and maintenance purposes but will not offer geotechnical and erosion performance standards from wave action and overtopping.
- Top surface of slopes to be covered with seeded topsoil and wildflower meadow to achieve coverage.
- The footpath width will not be designed for vehicle access for maintenance purposes and is designed to support pedestrian load only. If plant machinery is required, maintenance will be carried out from the toe of the slope.

5.4 Geotechnical Design

JBA Consulting undertook an initial Geotechnical Desk Study (refer to section 2.4). Various geotechnical risks were identified through the Geotechnical Desk Study which may affect the proposed raised footpath including soil compressibility, settlement, shrinkable soils, slope instability, solution features, groundwater levels, and seepage resistance (these are listed in more detail below). This is particularly of concern at the north of the site where the realigned footpath is set to be close to the existing watercourse.

At this stage of design, given the maximum height of the proposed embankment earthworks are minimal or low (0 to 2m), the design covers the risk by adopting shallow earthwork gradients (1V:3H side slopes) with proposed dig and replacement for up to 1m underneath the formation of the embankment. Based on experience on similar schemes, this is considered to cover the risk from ground conditions reasonably, together with on-site validation of the formation strength of the natural material at base of the treated layer (defined as the 'dig and replace' layer, where some of the ground is replaced with imported engineered fill).

Should the design geometry change, such as utilising steeper gradients (steeper than 1V:3H) and/or a need to construct earthworks with increased heights above formation level (H>1.5m) than currently adopted in the outline design, a detailed geotechnical assessment will need to be undertaken to assess the changes, and in some cases, may warrant a need for a full ground investigation comprising of windowless sampling holes (typically up to 8m depths) or cable percussion boreholes (with capability to drill deeper of the order of 15-25m), to cover for the ground hazard risks.

It should be noted that there is a section in Area 2, as mentioned above, where overall earthwork height is up to 1.95m (less than 2m). However, this includes a central dip under the crest, implying some of the earthwork height is formed by a dig and replace below existing GL. Therefore, the overall design height above existing ground level is less than 1.5m, or typically within the limits of earthwork heights assessed.

5.4.1 Seepage

Although a detailed seepage analysis was not undertaken as part of the works, incorporating cohesive material (Class 2) into the embankment, either as a core or as the full structure, means the risk of water infiltrating through the embankment is low. In addition, the proposed cohesive dig and replace layer, or foundation, beneath the raised earth will act to lengthen the seepage pathway of any water that is infiltrating the ground from the ‘wet side’ of the embankment and therefore is expected to reduce loss of fine material from the underlying ground. This reduces the risk of voids forming or loose zones within the ground and embankment itself.

5.4.2 Slope Stability

Slope stability checks were undertaken on the most onerous section of the embankment based on geometry and loading consideration (worst-case design section), which is considered to be Area 4 due to the presence and proximity of an existing freshwater watercourse and bank.

Due to the unknown ground characteristics, moderately conservative parameters were assumed for the existing ground based on information obtained through the Geotechnical Desk Study.

The embankment was modelled as being fully cohesive (DMRB MCHW Class 2 fill) and this will be specified as part of the earthwork specification for the project, typically expected to provide a minimum undrained shear strength of 50kPa and compacted to standard earthwork specification requirements to achieve a 90% density of between 20-21kN/m3.

The maximum embankment height checked in slope stability assessment is 1.06m, which represents the most onerous out of the four typical cross sections, for area 1, 2, 3, and 4. The height was checked with a proposed slope gradient of 1V:3H side slopes. The typical design considerations in this report will be expected to be representative for up to localised 1.5m height of earthwork and typically up to design height 1.1m.

It should be noted that there is a section in Area 2, as mentioned above, where overall earthwork height is up to 1.95m (less than 2m). However, this includes a central dip under the crest, implying some of the earthwork height is formed by a dig and replace below existing GL. Therefore, the overall design height above existing ground level is less than 1.5m, or typically within the limits of earthwork heights assessed.

As well as slope stability of the raised footpath embankment itself, this analysis sought to explore any effects the embankment loading could have on the existing slope. A layer of low-strength superficial deposits was assumed to be present, and both drained and undrained conditions were modelled to simulate short-term (during construction) and long-term (permanent) cases. Various water levels were also modelled to cover maximum external water levels and differential levels with ground water, and the ground characteristics and actions were factored as per Eurocode EC7.

The various modelled scenarios resulted in adequate factors of safety or degree of utilisation being achieved in all instances. However, as a precautionary measure and good practice, it is recommended that the embankment be built as remote as possible from the northern river bank in order to reduce risk of activating a slope failure due to any unidentified weak zones of soil.

5.4.3 Settlement

In the absence of ground investigation data from within the site boundaries, various assumptions were made in order to undertake a settlement analysis.

The theoretical components of overall settlement are as follows:

- Immediate settlement due to initial compression of underlying soils from embankment loading;
- Secondary settlement or consolidation resulting from expulsion of water or drainage of cohesive soils over the long-term;
- Self-weight settlement within the embankment; and
- Tertiary settlement, or ‘creep’ a component that would occur in highly organic or peat containing ground.

Due to the unknown ground characteristics, it is not practical to assume thickness of superficial compressible deposits and their parameters for detailed settlement estimates; however, based on experience, and knowing that settlement is a function of overall embankment height (as known in this case, 1.1m and up to 1.5m; typically creating surcharge loading of 30kPA together with a pedestrian loading of 5kPA) and thickness of superficial deposits immediately underlying the embankment together with its compressibility (unknown in this case), reasonable measures have been included in the design to reduce risk of unacceptable settlements.

Thickness of superficial deposits immediately underlying the embankment together with its compressibility is not known. With a 1V:3H slope gradients, there is a large footprint of earthwork, together with 1m dig and replace underneath the existing ground level, the effect of the presence of loose or compressible soils immediately underneath the embankment will be minimised. There is a likelihood that underneath the replaced/ improved layer, the soils underneath may still be compressible. However, an on-site validation check has been included in the design to confirm the formation strength of the natural subgrade soils during construction, and a minimum value undrained shear strength (Cu) or equivalent CBR test value to be achieved such that an overall reasonable factor of safety is achieved in vertical soil bearing capacity. This will ensure the serviceability settlements are controlled to an acceptable value.

It should be noted that the above is standard earthwork best practice and will be reasonable as long as the site does not contain excessive organic/ highly aggressive or contaminated/ peat comprising soils to significant depths; and based on the desk study undertaken, this has been reasonably discounted.

On-site validation and verification of existing ground conditions before placement of earthwork fill will need to be undertaken. Suitable drainage measures, and/or inclusion of appropriate geotextile/ geogrid layers at the interface with natural ground will help control and minimise settlements and any differential movements are allowed in the design.

5.4.4 Fill Requirements

At outline design stage, it was assumed that the embankment and its foundation will be entirely comprised of Class 2 cohesive fill (exact fill to be confirmed based on material source and availability). An alternative could be to construct the embankment with granular shoulders, provided the inner section, or core, comprises a low permeability clay to prevent seepage through the embankment. Though not designed to be a flood defence, any direct passage of water through earthwork can result in fines loss and progressive failure. However, the alternative solution (gravel shoulders) is not recommended at this stage as it is likely to involve some complex detailing for the geometry of the clay core and shoulders and requirements for interface drainage and geotextiles to prevent shrink, swell or cracking of the core, together with considerations for clay and sand differential behaviour in contact with water.

Part of the footpath construction will possibly include crushed concrete from the existing defence. Laboratory testing of samples is currently underway to determine its suitability for re-use.

5.5 Breach design

At Apuldram Meadow there are two embankments, the north embankment and the west and south embankment. The north embankment is set to remain in situ, with the west and south embankment set to breach naturally and the material to be potentially reused as part of the construction of the new realigned footpath.

5.5.1 Concrete removal and reuse

As mentioned in previous sections, the west and south embankment (see Figure 5-2) is formed of an earth embankment with concrete and stone blockwork along the exposed face, a concrete apron along the toe, a (closed) footpath along the crest and vegetation growth on the landward slope. The asset is approx. 210m long and the typical crest of the defence is 3.8mAOD on the southern extent and 3.6mAOD on the western extent.

The typical toe level is 2.2mAOD on the southern extent and 1.7m AOD on the western extent. The existing defence is in a poor condition overall. The crest width of the embankment is typically smaller than 1.5-2.0m.

Figure 5-2: Section locations and embankment element types for the west and south embankment

The existing concrete and stone blockwork face has deteriorated significantly resulting in cracking, slumping, voiding behind the blockwork and displacement of the blockwork. Local bank erosion has occurred at two locations where the defence is close to breaching, initially developed during Storm Eunice in February 2022 and have since worsened.

Three elements have been identified within this embankment, with typical sections of each shown below:

- Type A: Concrete blockwork & concrete apron
- Type B: Concrete encasement/ shuttered concrete repair & concrete apron
- Type C: Concrete structure failed

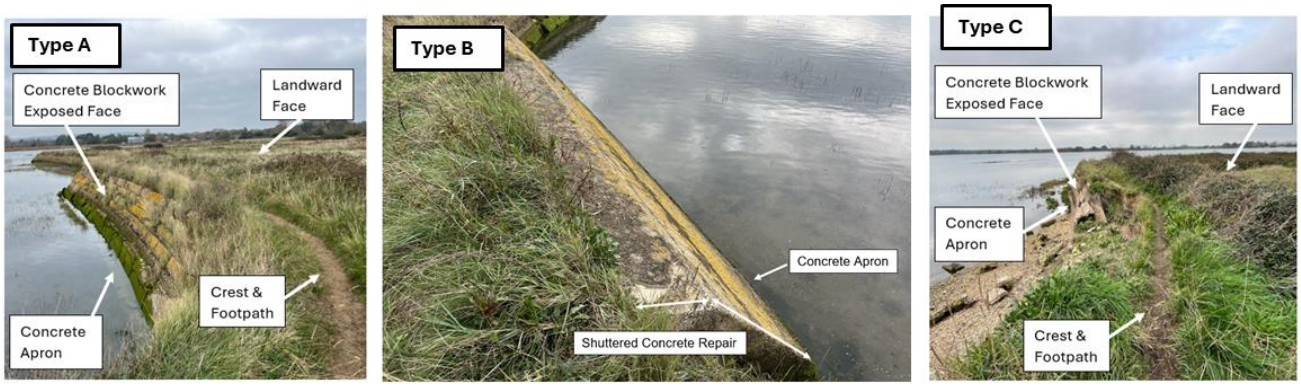

Figure 5-3: Concrete types A

A high-level assessment was completed of the likely amount of concrete to reuse or dispose of based on the topography survey (Grantham Coates Surveys, 2025). As outlined in the Concrete Testing Plan (OIP-JBA-00-00-PL-C-0001-Concrete_Testing_Plan) the estimated mass of concrete to remove is 480 tonnes. This is based on a set of assumptions outlined in the detailed report.

As part of the project, options to reuse the concrete on site were considered to reduce the project costs of importing material and the overall carbon cost of transporting or disposing of the concrete. The following options were considered:

- Concrete blockwork to be re-used at realigned footpath exposed tie-in location with existing defence. Focusing on area at risk to longer term erosion.
- Concrete blockwork and shuttered concrete repairs to be crushed and re-used as a subbase of the new footpath.
- Concrete blockwork to be re-used along the new footpath as a landscape feature.
- Concrete blockwork to be re-used as environment features e.g. to create hibernaculums at the higher elevations of the site, to create solitary bee banks and solitary bee posts.

Concrete testing is currently being undertaken to determine the composition and strength of the materials and understand whether the concrete can be re-used in the design, opportunities for material reuse off site and/or inform waste implications.

6 Environmental design philosophy

6.1 Ambition and Opportunity of the Site

Along with the project objectives stated in Section 1.4, one of the main ambitions of the project from an environmental perspective is to facilitate the adaptation of the site, to address coastal squeeze within Chichester Harbour and to improve the overall condition of Chichester Harbour SSSI.

This will be achieved by creating approximately 5 hectares of intertidal saltmarsh habitat by 2075, whilst also realigning the footpath, ensuring that walkers can continue to enjoy the views of Chichester Harbour, all while increasing the community's resilience to sea level rise.

6.2 Predicted saltmarsh creation

Using LiDAR data combined with tide and extreme water levels (UKCP18 RCP 8.5 70th percentile) to determine the present day and future tidal extents, the predicted intertidal habitat creation extents at present day (within the first 5-years of concrete removal from the west and south sea wall), mid-term (2050) and long-term (2075) were established. The levels used are presented in Table 4-2, in section 4 of this report. It is important to note that sediment accretion rates and bed shear stress levels were not considered in these estimations and therefore should be used as an approximate indicator of which type of habitats may be created in the short- and long-term.

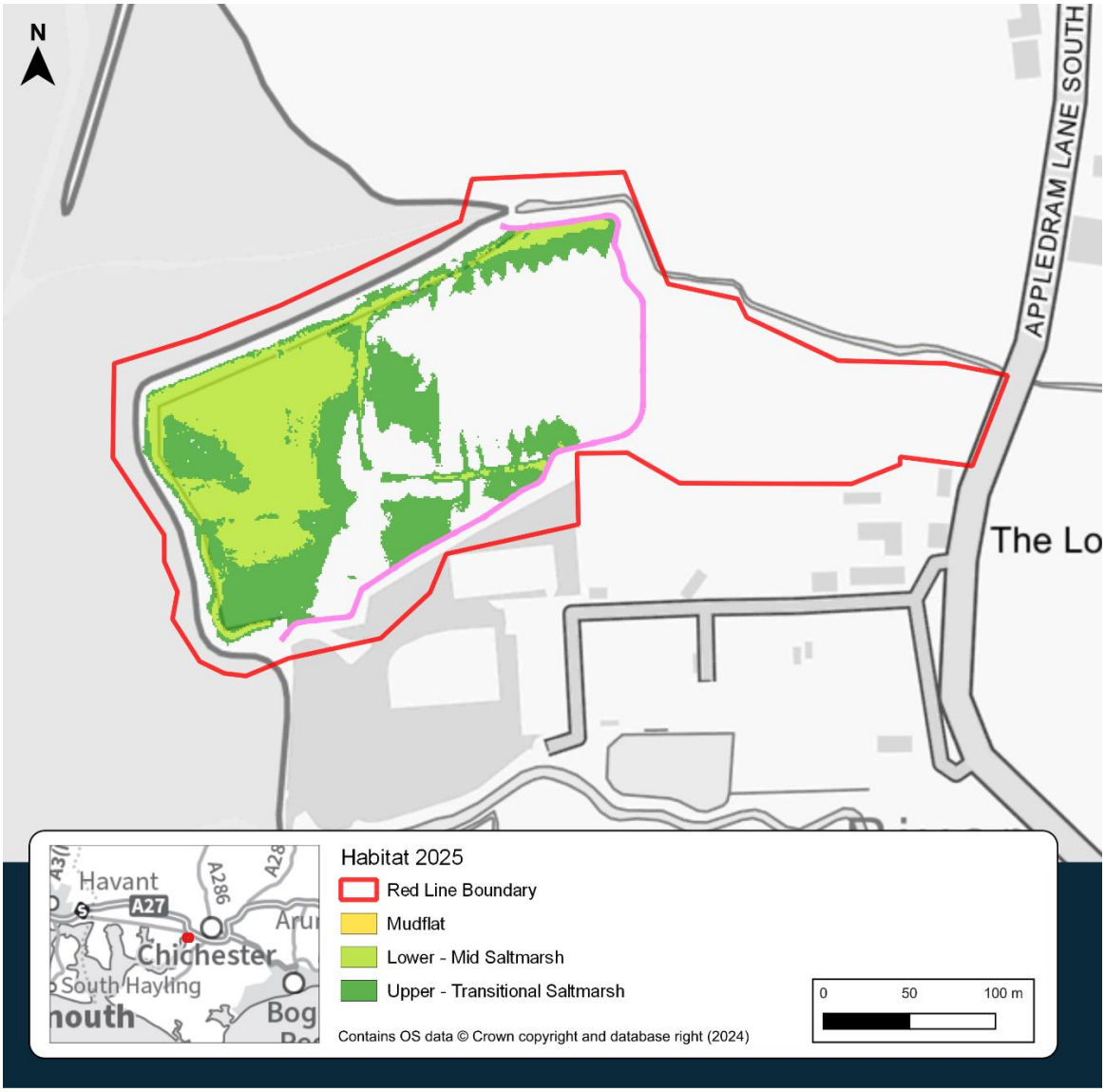

Figure 6-1: Predicted saltmarsh creation at present day (short-term epoch, within the first 3-5 years of breach). Saltmarsh extents are based on LiDAR data combined with tide and extreme water levels (UKCP18 RCP 8.5 70th percentile)

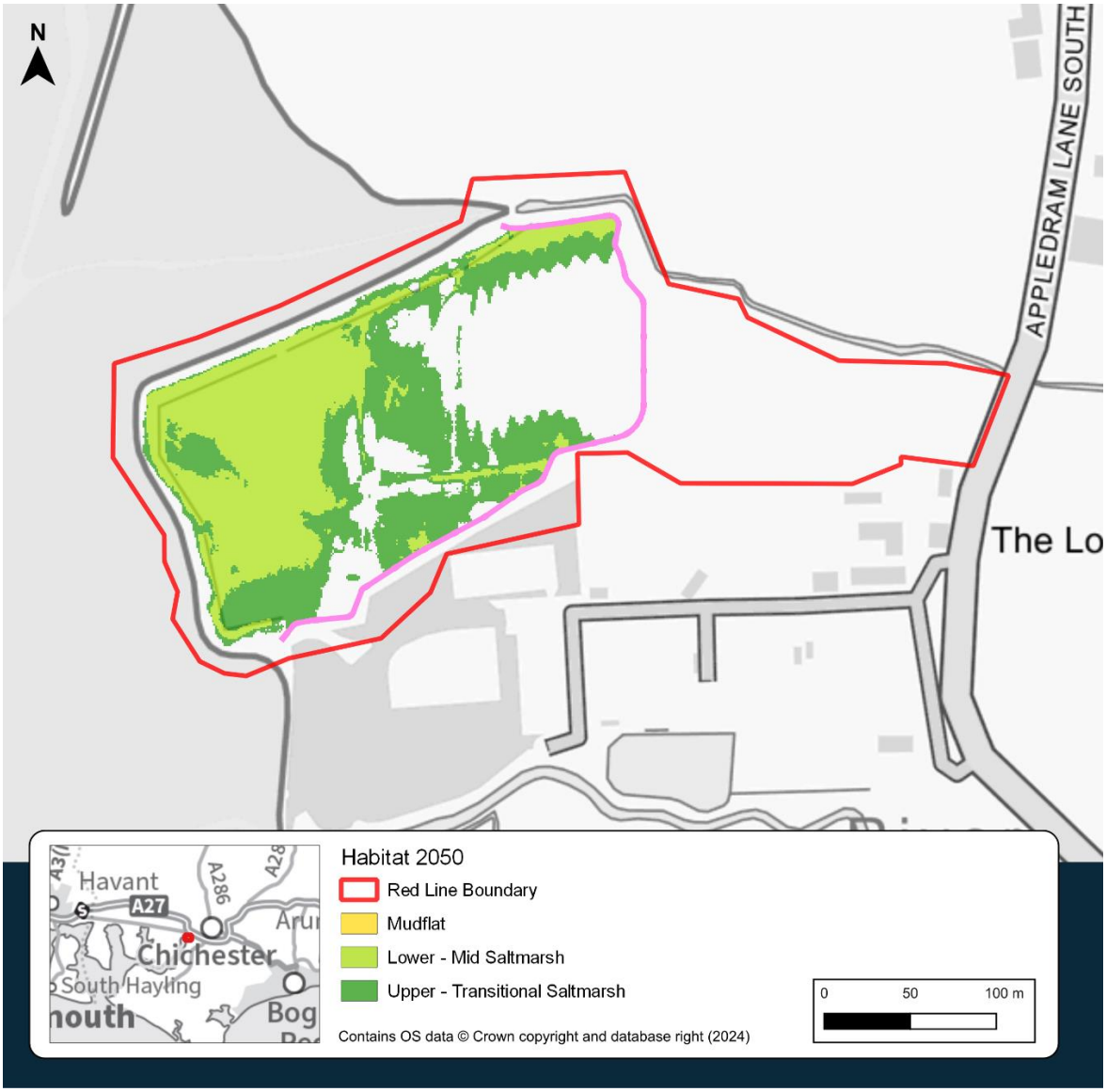

Figure 6-2: Predicted saltmarsh creation in 2050 (mid-term epoch). Saltmarsh extents are based on LiDAR data combined with tide and extreme water levels (UKCP18 RCP 8.5 70th percentile)

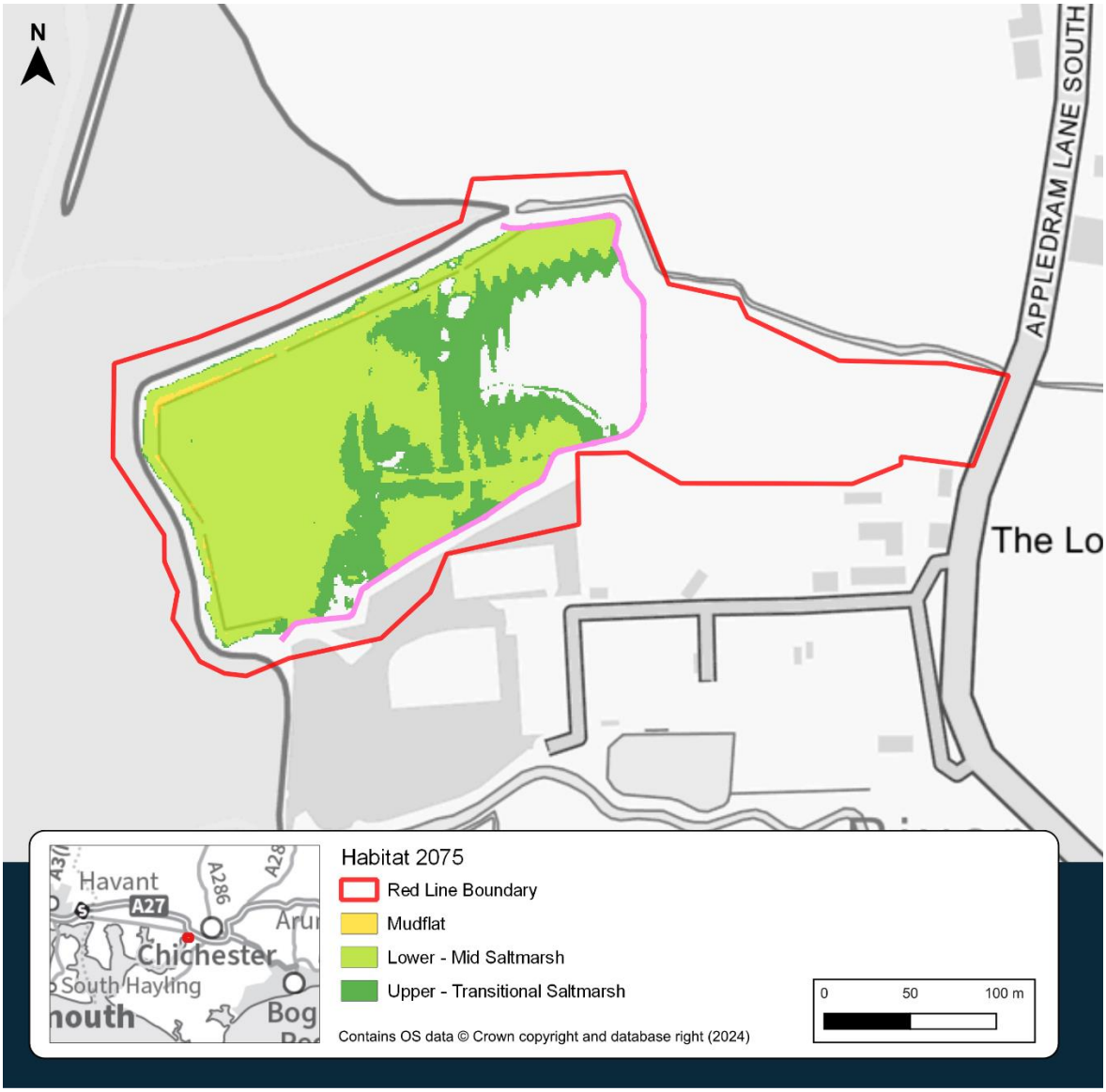

Figure 6-3: Predicted saltmarsh creation in 2075 (long-term epoch). Saltmarsh extents are based on LiDAR data combined with tide and extreme water levels (UKCP18 RCP 8.5 70th percentile)

6.2.1 Carbon sequestration

A high-level assessment of carbon sequestration at the site has been undertaken. This assessment provides a baseline understanding of approximately how much carbon is captured by the existing habitats currently present at the site, providing a carbon sequestration baseline.

This baseline assessment is then expanded to assess the potential carbon that could be sequestered as a result of the delivery of the habitat creation project.

Comparing the baseline carbon sequestration rates against the predicted habitat creation scenario enables us to establish the carbon sequestration losses and gains per habitat type. The predicted carbon sequestration rates for the new habitats are then

extrapolated to understand how much carbon the site has the potential to sequester over time.

It should be noted that the carbon sequestration calculations provided here are only indicative, many of the habitats present at this site have not been studied in detail from a carbon sequestration perspective. To counter the uncertainties associated with the figures used we have provided Low, Medium and High carbon sequestration rates.

Carbon Sequestration Rates - Baseline

Baseline carbon sequestration rates for the existing habitat at the site are presented in Table 6-1. The current total carbon sequestrated per annum is predicted to be between 5 to 24 Tonnes of CO2e per annum.

Table 6-1 Baseline Sequestration rates (tCO2e/year) per habitat

Habitat Type	Baseline Area (Ha)	Low	Med	High
Coastal and Floodplain Grazing Marsh	5.83	2.92	5.83	11.66
Broadleaved Woodland	0.28	0.42	0.85	1.38
Bramble Scrub	0.63	0.32	0.63	1.89
Coastal Saltmarsh	0.48	1.43	3.82	9.08
Littoral Mud	0.07	0.04	0.07	0.22
Hedgerows	0.24	0.00	0.00	0.00
Other rivers, streams and ditches	0.43	0.01	0.02	0.04
Total (tCO2e/year)		**5.14**	**11.23**	**24.28**

Carbon Sequestration Rates - Predicted

Predicted carbon sequestration rates for the proposed habitat at the site are presented in Table 6-2. The predicted total carbon sequestrated per annum is predicted to be between 14 to 87 Tonnes of CO2e per annum.

Table 6-2 Predicted Sequestration rates per habitat (tCO2e/year)

Habitat Type	Baseline Area (Ha)	Low	Med	High
Coastal and Floodplain Grazing Marsh	2.30	1.15	2.30	4.60
Broadleaved Woodland	0.28	0.42	0.85	1.38
Bramble Scrub	0.39	0.20	0.39	1.17
Coastal Saltmarsh	4.20	12.59	33.58	79.76
Littoral Mud	0.07	0.04	0.07	0.22
Hedgerows	0.24	0.00	0.00	0.00
Other rivers, streams and ditches	0.43	0.01	0.02	0.04
Total (tCO2e/year)		**14.41**	**37.21**	**87.18**

Comparison of Baseline versus Predicted Sequestration Rates

When the baseline carbon sequestration rates are compared against the predicted carbon sequestration rates (Table 6-3), it can be seen that there is a decrease in carbon sequestration for grazing marsh and bramble scrub and an increase in carbon sequestration for salt marsh. The remaining habitats are neutral because they are not altered by the proposed habitat restoration. Overall, there is a predicted increase in carbon sequestration between 14 to 87 Tonnes of CO2e per annum (depending on the Low, Medium and High carbon sequestration rates used).

Table 6-3 Comparison between Baseline and Precited Sequestration rates (tCO2e/year)

Habitat Type	Low	Med	High
Coastal and Floodplain Grazing Marsh	-1.77	-3.53	-7.06
Broadleaved Woodland	0.00	0.00	0.00
Bramble Scrub	-0.12	-0.24	-0.72
Coastal Saltmarsh	11.16	29.76	70.68
Littoral Mud	0.00	0.00	0.00
Hedgerows	0.00	0.00	0.00
Other rivers, streams and ditches	0.00	0.00	0.00
Total (tCO2e/year)	**9.27**	**25.99**	**62.90**

Predicated Carbon Sequestration Rates for 2030, 2050 and 2075

Tables 6-4 to 6-6 provide total predicted carbon sequestration rates for 2030, 2050 and 2075 this is summarised as follows:

- 2030 Total predicted sequestration rates:
    - Between 72 to 436 (Total tCO2e).
- 2050 Total predicted sequestration rates (Total tCO2e).
    - Between 360 to 2179:
- 2075 Total predicted sequestration rates:
    - Between 720 to 4359 (Total tCO2e).

Table 6-4 2030 Predicted Sequestration Rates per habitat (Total tCO2e)

Habitat Type	Low	Med	High
Coastal and Floodplain Grazing Marsh	5.75	11.50	23.00
Broadleaved Woodland	2.12	4.23	6.91
Bramble Scrub	0.98	1.95	5.85
Coastal Saltmarsh	62.97	167.92	398.81
Littoral Mud	0.18	0.37	1.10
Hedgerows	0.00	0.00	0.00
Other rivers, streams and ditches	0.05	0.11	0.22
Total (tCO2e)	**72**	**186**	**436**

Table 6-5 2050 Predicted Sequestration Rates per habitat (Total tCO2e)

Habitat Type	Low	Med	High
Coastal and Floodplain Grazing Marsh	28.75	57.50	115.00
Broadleaved Woodland	10.58	21.15	34.55
Bramble Scrub	4.88	9.75	29.25
Coastal Saltmarsh	314.85	839.60	1994.05
Littoral Mud	0.91	1.83	5.48
Hedgerows	0.00	0.00	0.00
Other rivers, streams and ditches	0.27	0.54	1.08
Total (tCO2e)	**360**	**930**	**2179**

Table 6-6 2075 Predicted Sequestration Rates per habitat (Total tCO2e)

Habitat Type	Low	Med	High
Coastal and Floodplain Grazing Marsh	57.50	115.00	230.00
Broadleaved Woodland	21.15	42.30	69.09
Bramble Scrub	9.75	19.50	58.50
Coastal Saltmarsh	629.70	1679.20	3988.10
Littoral Mud	1.83	3.65	10.95
Hedgerows	0.00	0.00	0.00
Other rivers, streams and ditches	0.54	1.08	2.15
Total (tCO2e)	**720**	**1861**	**4359**

6.2.2 Construction Carbon Assessment

In addition to the environmental benefits associated with habitat restoration and long-term carbon sequestration, the Fishbourne Footpath to Nature Recovery project has undergone an assessment of its construction-stage carbon emissions. This has been undertaken using the Environment Agency's Carbon Calculator (v7.2) to quantify the capital carbon associated with materials, transport and site activities during the construction phase.

This section presents the outputs of that assessment, offering a breakdown of embodied emissions linked to the proposed footpath realignment, concrete removal, material reuse and associated groundworks. The figures in

Table 6-7 below support the project's overarching design objectives and provide insight into the carbon associated with the delivery of replicable recovery schemes.

Table 6-7: Summary of Construction Carbon Emissions (EA Carbon Calculator v7.2)

Carbon Source	tCO_2e (tonnes of carbon dioxide equivalent)
Materials (embodied carbon)	283.0
Transportation (materials + plant)	20.5
Waste and disposal	1.7
Total Capital Carbon (A1-A5)	305.4
Estimated Whole Life Carbon (inc. 50-year use & maintenance)	307.7

While this carbon analysis complements the saltmarsh carbon sequestration evaluation described separately in Section 6.2.1, it provides a clear account of construction-phase emissions.

6.3 Other environmental consents and considerations

6.3.1 Environmental Impact Assessment (EIA) Screening Report

An EIA Screening letter was completed in February 2025 and sent to Chichester District Council Planning Department and the Marine Management Organisation (MMO), to assess whether there are any likely significant impacts on the site and if the proposed project constitutes EIA development.

The MMO provided a screening response on 1st April 2025 to confirm that the proposed project does not constitute EIA development. The response from Chichester District Council (CDC) was received on 30th April 2025 which outlined that an ES was required.

Following additional conversations with CDC, an updated EIA was submitted on 9th September 2025, clarifying elements of the project. The MMO and CDC provided a screening response on 15th October 2025 to confirm that the proposed project does not constitute EIA development

6.3.2 Water Framework Directive (WFD) Compliance Assessment

A WFD Screening and Scoping assessment was completed by JBA Consulting (OIP-JBA-00-00-RP-EN-0007-S3-P02-WFD_Compliance_Assessment) which screened all the WFD waterbodies which could potentially be impacted by the proposed works and determines whether any should be scoped in for the Impact Assessment. The scoping assessment identifies whether the waterbody receptors, identified during the screening assessment, are at risk from the proposed project. If any Quality Elements are found to be at risk of detrimental impact, further assessment and/or mitigation may be required.

The assessment highlights that with best practice construction methods and mitigation (which will be set out in the CEMP), the proposed works will be WFD compliant. An assessment of the Environment Agency Mitigation Measures has shown that the works will help deliver these some of these measures and will not prevent any others being delivered in the future.

The WFD assessment has shown that the proposed works are not likely to have a significant impact on the biological, hydromorphological, physico-chemical, or chemical quality elements for the Chichester Harbour water body, the Lavant (Sussex) water body, or the unnamed chalk stream.

With regards to the quantitative and chemical saline intrusion quality elements for the Chichester Chalk groundwater body, by removing the existing sea wall, this could theoretically increase saline instruction to the water body by allowing tidal water to move further landward than currently; however, as the sea wall is already degraded, there are no nearby abstractions and the proposed raised footpath will not be a barrier to the natural landward shift of the freshwater-saline interface, the risk of an impact is considered low and therefore no mitigation is considered as necessary.

The following recommendations are proposed to support the delivery of the project and compliance with the requirements of the WFD:

- Develop a CEMP.
- Restrict works near watercourse during sensitive times (e.g. fish spawning).

- Avoid machinery entering or working too close to watercourses.
- Ensure pollution prevention measures are in place (spill prevention and containment, correct storage of construction materials).
- Ensure sediment and runoff control measures are in place (silt fencing, minimising exposed soil, construct during dry periods).
- Offset any habitat losses through post-construction enhancement.
- Ensure there is connection between the floodplain and watercourses where possible.
- Employ best practice to reduce the extent and spread of invasive non-native species, if any are identified prior and during construction.

It is also important to note that the assessment was undertaken with the current site plans provided. Should the design or scope of the work alter significantly, this report would need to be revised to determine WFD compliance.

6.3.3 Coastal Squeeze Assessment

A Coastal Squeeze Assessment was completed by JBA Consulting (OIP-JBA-00-00-RP-EN-0009- Coastal_Squeeze_Assessment), which presents the findings of an assessment of the likely future coastal squeeze losses at the site.

The assessment follows the methodology described in the Flood and Coastal Erosion Risk Management Research and Development Programme's What is Coastal Squeeze? (Pontee et al., 2021).

The screening assessment confirmed a more detailed assessment was required, based on:

- There are structures relevant to coastal squeeze.
- There is not an absence of accommodation space.
- Sea levels are predicted to rise in the area.

The detailed assessment concluded that initially, once the existing sea wall is removed and the embankment naturally breaches, Initially, once the existing sea wall is removed and the embankment naturally breaches, it is predicted that there will be 2.34 hectares of saltmarsh created at the site through footpath realignment by 2030 and by 2075, is it is estimated to reach 3.47 hectares.

Overall, the proposed project will enable the restoration and creation of intertidal saltmarsh habitat, therefore it will not be contributing to coastal squeeze within Chichester Harbour. Furthermore, due to an area of high ground (above HAT in 2075) seaward of the proposed footpath, saltmarsh will not establish within the project design life. This indicates that there is space for future establishment of saltmarsh beyond 2075 and that the proposed footpath is not contributing to coastal squeeze within Chichester Harbour and will instead help alleviate it.

6.3.4 The coastal birds forage on the saltmarsh and mudflats, which will be increased in extent and condition, so low tide foraging ability is not lost, but gained. Habitats Regulations Assessment

A Habitats Regulations Assessment screening and appropriate assessment was completed by JBA Consulting (OIP-JBA-00-00-RP-EN-0006-S3-P02-HRA_Screening_and_AA) due to the proposed project being immediately adjacent to

internationally designated sites, namely the Chichester and Langstone Harbours Ramsar and Special Protection Area (SPA) and the Chichester Harbour Special Area of Conservation (SAC).

The assessment concluded that the proposed works will not have an adverse impact upon the Solent Maritime SAC, Chichester and Langstone Harbour SPA and Ramsar either alone or in-combination with any other plans or projects, providing the following mitigation measures are implemented:

- Industry standard pollution prevention measures, particularly addressing the risks of fuel and concrete spills, and biosecurity measures should be followed on site and outlined in a CEMP.
- Impacts on habitats will be minimised by limiting machine access and using agreed access routes to avoid sensitive habitats.
- Where possible, works should be completed during the summer months to avoid the wintering bird season (between October and March inclusively). If completing the work throughout the wintering bird season cannot be avoided further surveys may be required in order to establish the presence or absence of qualifying bird species utilising the wetland areas adjacent to the proposed site. If works take place during a period when designated species are present further mitigation may be required following discussions with the statutory body. This may include, but is not restricted to, timing restrictions for the proposed works including tidal restrictions such as only carrying out the works two hours either side of low tide.
- Breeding tern species are unlikely to be significantly affected by the works, as they are unlikely to nest in close proximity to the site due to lack of suitable nesting habitat. An Ecological Clerk of Works will be on site to check the area for nesting birds during the enabling works, including construction of the site compound. A pre-construction bird survey will be completed to determine the nesting bird risks and then program logistics will be amended accordingly, if required.

This assessment should be revised when the final construction methodology becomes available to ensure that mitigation measures to avoid impacts upon the designated sites are appropriate and sufficient.

6.3.5 Site of Special Scientific Interest (SSSI) Assent

A SSSI Assent application was completed by JBA Consulting (OIP-JBA-00-00-RP-EN-0010-S3-P01-SSSI_Assent) due to the proposed project being immediately adjacent to the Chichester Harbour SSSI.

The assessment concluded that the proposed works will not have an adverse impact upon Chichester Harbour SSSI, providing the following mitigation measures are implemented:

- Habitat features of the SSSI including intertidal saltmarsh:

Any habitat loss via the construction works will be temporary and localised and small scale. An Environmental Clerk of Works (EnvCoW) will inspect the site before any construction work goes ahead to ensure sensitive habitats and species are avoided.

To minimise disturbance and habitat degradation, plant will keep to agreed haul routes and not stray outside of these areas. It is considered that in this case the haul routes will rapidly recover following the completion of the works. It is not anticipated that any plant will encroach onto the foreshore area, as all construction will be carried out from the landward side. The creation of saltmarsh habitat as part of the project will compensate for any temporary losses as a result of the proposed works.

- Assemblages of non-breeding birds:

Timing the works during the summer months to avoid the wintering bird season (between October and March inclusively) would negate impacts to wintering birds as a result of the proposed works. If completing the work throughout the wintering bird season cannot be avoided further surveys may be required in order to establish the presence/absence of qualifying bird species utilising areas within the SPA adjacent to the proposed site.

If the proposed works take place during a period when designated species are present further mitigation may be required following discussions with the statutory body. This may include, but is not restricted to, timing restrictions for the proposed works including tidal restrictions such as only carrying out the works 2 hours either side of low tide.

Aggregations of breeding birds (i.e. Common Tern Sterna hirundo, Little Tern Sterna albifrons, Sandwich Tern Sterna sandvicensis):

No suitable nesting habitat was identified within the works footprint or directly adjacent to the site boundary during the ecological walkover conducted in December 2024.

An EnvCoW will be on site to check the area for nesting birds during the enabling works, including construction of the site compound. A pre-construction bird survey by a competent ornithologist will be completed to determine the nesting bird risks and then program logistics will be amended accordingly if required.

- General measures:

Industry standard pollution prevention measures, particularly addressing the risks of fuel and concrete spills, and biosecurity measures should be followed on site and outlined in a CEMP.

This assessment should be revised when the final construction methodology becomes available to ensure that mitigation measures to avoid impacts upon Chichester Harbour SSSI are appropriate and sufficient.

6.3.6 Biodiversity Net Gain Assessment

A Biodiversity Net Gain (BNG) Assessment was completed by JBA Consulting (OIP-JBA-00-00-RP-EN-0008-BNG_Assessment) to quantify the biodiversity value of the site prior to the proposed project, and the potential predicted value post-works. This is measured in biodiversity units calculated according to the habitats present based on their size, distinctiveness and condition using the Defra Statutory Biodiversity Metric. This enables quantification of the predicted change in biodiversity value as a result of the proposed works, with the objective of achieving a net gain in biodiversity.

The proposed project will result in the creation of saltmarsh throughout the project boundary. However, through the creation of saltmarsh the proposed project would result in the loss of areas of priority habitat coastal grazing marsh and linear tree habitat.

The grassland habitats present on site are currently recorded as the priority habitat Coastal and floodplain grazing marsh under Natural England's Priority Habitats

Inventory. It is believed that due to a change in management practises, namely an absence of any grazing or any cutting regime over the last several years, the grassland habitats now represent poor quality habitat that lacks several important features expected within Coastal Grazing Marsh and closer represent neutral grassland and modified grassland communities. As such two iterations of the statutory biodiversity metric have been completed:

1. One representing the grassland habitats believed to be represented following the surveys completed as part of this assessment, and;

2. One iteration representing the classification under the Priority Habitats Inventory where all grassland habitats on site are mapped as Coastal Grazing Marsh.

- Summary of BNG results representative of the most recent habitat surveys (2025):

In summary using the Statutory Biodiversity Metric calculator, the BNG baseline assessment found that the existing site had 38.43 habitat units, 2.11 hedgerow units and 4.07 watercourse units. Based on the above proposal the creation of saltmarsh would deliver 38.67 habitat units (an increase in 0.24 units), 0.84 hedgerow units (a decrease in 1.27 units) and 5.65 units (an increase in 1.57 units).

If the habitats are enhanced as outlined in this report, the project is predicted to achieve a 0.62% Biodiversity Net Gain in habitat units, a 60.03% Biodiversity Net Loss in Hedgerow units and a 38.63% Biodiversity Net Gain in river units. The trading rules have not been satisfied. An overview of the headline results from the BNG metric can be seen in Table 4-1.

- Summary of BNG results representative of the Priority Habitats Inventory:

In summary using the Statutory Biodiversity Metric calculator, the BNG baseline assessment found that the existing site had 64.22 habitat units, 2.11 hedgerow units and 4.07 watercourse units. Based on the above proposal the creation of saltmarsh would deliver 53.59 habitat units (a decrease in 10.63 units), 0.84 hedgerow units (a decrease in 1.27 units) and 5.65 units (an increase in 1.57 units).

If the habitats are enhanced as outlined in this report, the project is predicted to achieve a 16.55% Biodiversity Net loss in habitat units, a 60.03% Biodiversity Net Loss in Hedgerow units and a 38.63% Biodiversity Net Gain in river units. The trading rules have not been satisfied.

In order to satisfy the trading rules 25.99 units of coastal grazing marsh and 1.27 units of medium distinctiveness or higher hedgerow habitat are required. Further units will be required in order to achieve a target of 10% biodiversity net gain. It is believed that following pre-application advice from Chichester District Council, the proposed project may qualify for Rule 4:

- The recent habitat survey (2025) has identified the grassland habitats now represent poor quality habitat that lacks several important features expected within Coastal Grazing Marsh and closer represent neutral grassland and modified grassland communities
- The overall ecological benefit delivered through the creation of saltmarsh and the ultimate large-scale restoration of natural processes to allow for the recovery of intertidal habitats within Chichester Harbour and improvement of

the overall condition of Chichester Harbour SSSI, which will compensate for the loss of Coastal Grazing Marsh on site.

- Historic mapping illustrates that no sea wall was present in 1840 but was present in 1875, therefore the sea wall around Apuldram Meadow was constructed between the 1840's and 1875. If this evidence allows us to assume the wall was constructed post-1850, this will provide sufficient supporting evidence that the realignment will be restoring the saltmarsh habitat within Chichester Harbour.

This was discussed with the Chichester District Council LPA during a pre-application meeting on the 24th April 2025 to determine whether this evidence would satisfy the exceptional ecological circumstances in which Rule 4 can be applied are occurring on the site. It was determined that they are open to discussion, however the Environmental Officer will need to see the BNG assessment to make a final decision.

If the LPA are satisfied that Rule 4 can be applied the creation of off-site compensatory Coastal Grazing Marsh habitat will not be required. Furthermore, the proposed woodland planting will compensate for any ecological value lost through the loss of linear tree habitat that the statutory biodiversity metric trading rules will not be satisfied. This is because the ecologically valuable line of tree habitat that will be lost is recorded in the metric as a linear hedgerow habitat and therefore in order to satisfy the trading rules should be compensated for by a linear hedgerow habitat in the same distinctiveness band or higher.

The proposed tree planting will result in the creation of broadleaved woodland, which is recorded as an area habitat in the metric and therefore will not compensate for the metric loss of linear hedgerow habitat. Due to ecological benefit provided by the creation of broadleaved woodland habitat, it is considered that it is ecologically justifiable that the trading rules are not met in this scenario.

This was discussed with the LPA in a pre-app meeting on 24th April 2025 and it was agreed that the proposed tree planting and creation of broadleaved woodland will sufficiently compensate for the loss of the line of trees and provide an overall ecological benefit and therefore it has been accepted that the trading rules don't need to be satisfied in this scenario.

A separate detailed management and monitoring plan will be required prior to implementation of the works to allow for the long-term management and monitoring of created habitats.

6.3.7 Potential Coastal Grazing Marsh Compensation

Coastal Grazing Marshland (CGM) represents an important habitat found across the world, predominantly in middle to high latitudes. Floodplain and Coastal Grazing Marsh represents a priority habitat, designated as high distinctiveness under the Statutory BNG metric and therefore any losses need to be compensated for with like for like habitat.

Implementing the proposed project at Apuldram Meadow will result in a loss of CGM and as such compensatory Floodplain and Coastal Grazing Marsh habitat will be required to satisfy the BNG trading rules. It is noted that land to the east of the new footpath will remain as Coastal Grazing Marsh habitat post project implementation.

An assessment of potential locations for creation of compensatory CGM in the vicinity of Apuldram Meadow has been completed, to provide an understanding of future opportunities in the local area.

Royal Haskoning DHV undertook a coastal grazing marsh (CGM) study in 2022 on behalf of CHC and the EA. The study developed a method to search for potential sites within Chichester Harbour, to revert agricultural land back to CGM, and identified which ecological, morphological, topographical, and hydrological aspects to consider during a search.

In terms of baseline data used, the national UKCEH land cover map was used, verified by the UKHab survey undertaken on site by a JBA Ecologist, together with a data search from Sussex Biodiversity Records Centre. Table 6-8 details the datasets considered within the wider search.

Present day and future (2075) Highest Astronomical Tide (HAT) were also used to determine the extent at which areas of land could be restored/ converted to coastal grazing marsh habitat.

Table 6-8: Table showing the data and relevant material required for the search in order to determine any constraints and opportunities

Name	Source
GIS Datasets	
Solent Bird Studies	Coastal Partners
CEH Land Cover	Defra Portal
Internationally designated sites (SPA/SAC/Ramsar)	JBA
Nationally designated sites (SSSI, NNR)	JBA
Locally designated sites (LNR)	JBA
Solent Waders and Brent Goose Strategy (SWBGS)	Coastal Partners
HCRP Tactical Site Search (2018) studies shapefiles	Coastal Partners
Topography/Lidar data	CCO
Strategic regional habitat mapping	CCO
Flood risk mapping	EA
Coastal Defences (2014)	CCO
Reporting/Plans/Information:	
Brent Geese detailed study	CP
Coastal grazing marsh feasibility report	CHC/EA
Hayling Island Strategy	EA/CP
HCRP Tactical Site studies sheets	Coastal Partners
Local Development Plans	LAs

Several areas adjacent to the site boundary were identified as potential for coastal grazing marsh compensation (if required). Figure 6-4 shows the previously identified 'tactical sites' from a desk-based survey, Fishbourne A and Fishbourne B, (Coastal Partners, 2018).

Figure 6-5 has been included to show the other sites considered with the constraining features greyed out. Constraining features include the following which make the sites not suitable for coastal grazing marsh are listed in Table 6-8.

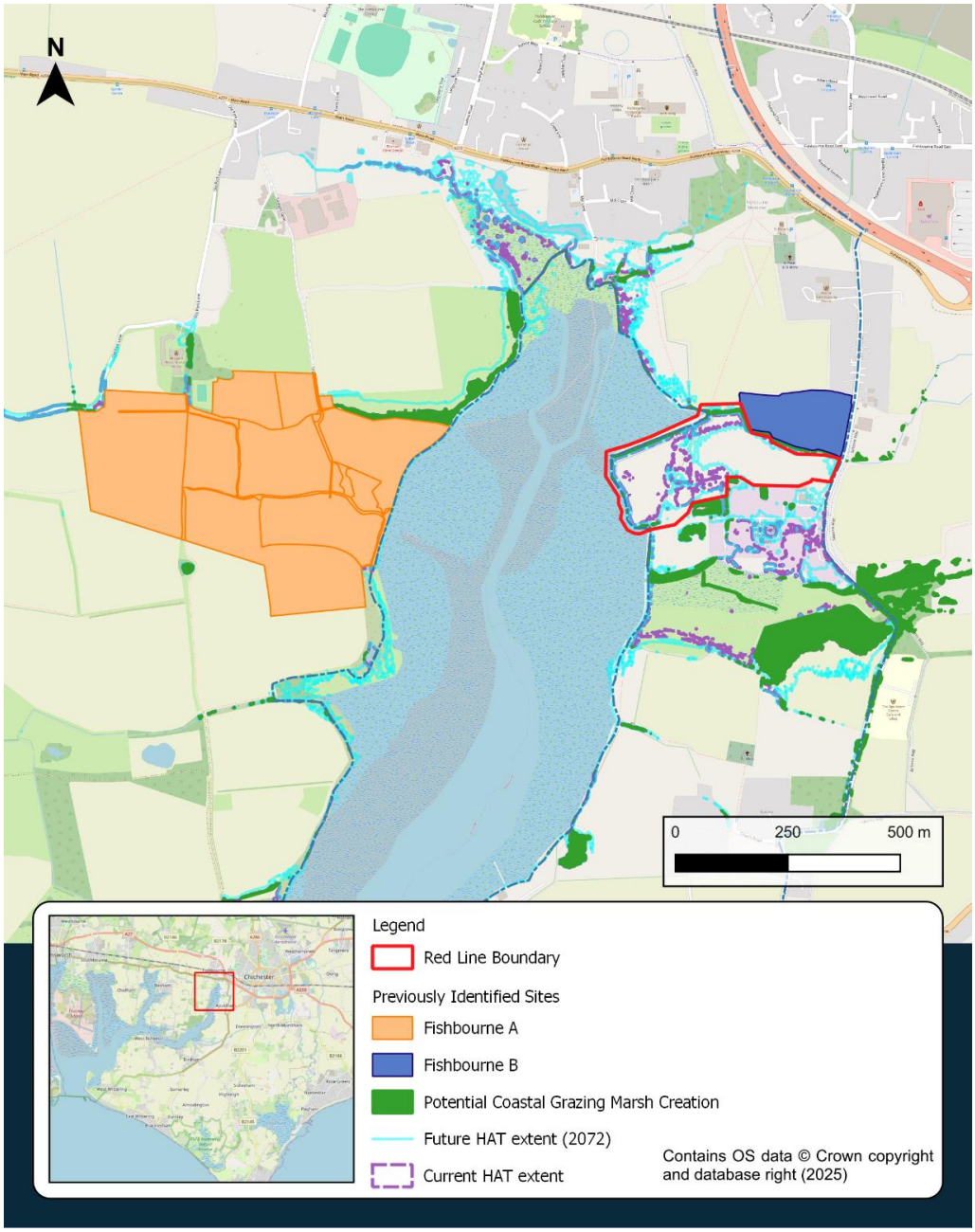

Figure 6-4: Proposed habitat compensation areas to replace lost coastal grazing marsh habitat taking ecological and geomorphological constraints into consideration. Note: Fishbourne A and B were sites previously identified in the Environment Agency's Tactical Site Search.

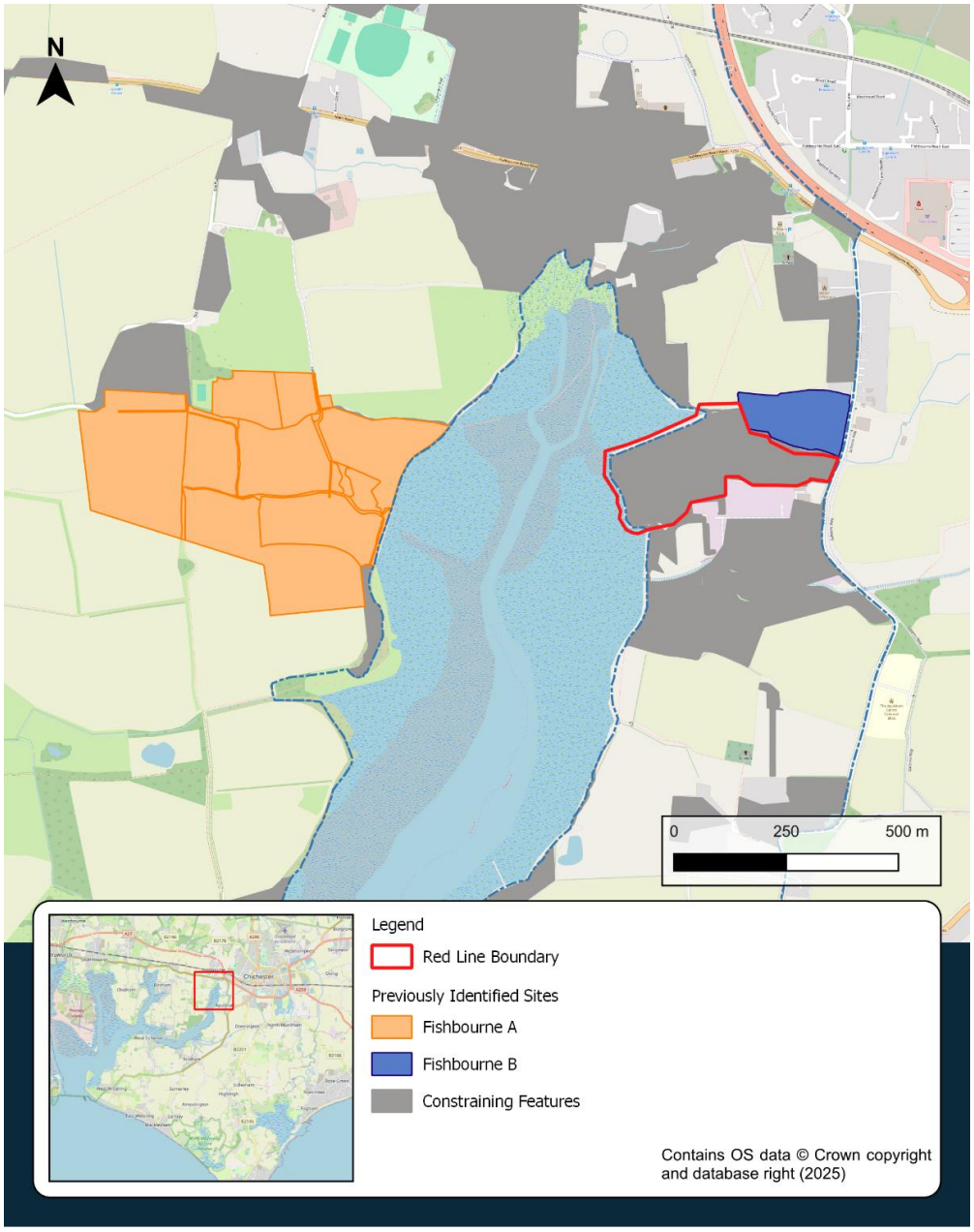

Figure 6-5: Constraining features of the surrounding sites when considering habitat compensation

In exceptional ecological circumstances, such as when a site has optimal conditions for restoration of a wildlife-rich or historic natural habitat, Rule 4 can potentially be applied. If the requirements of Rule 4 are met it can be implemented through deviations from the biodiversity metric trading rules. Deviation from biodiversity metric trading rules can occur when there is a clear ecological justification for the habitat intervention which is not being reflected by the biodiversity metric tool. It is believed that this project may qualify for Rule 4 as the overall ecological benefit delivered through the creation of

saltmarsh and the ultimate restoration and recovery of intertidal habitats within Chichester Harbour will compensate for the loss of Coastal Grazing Marsh on site.

This needs to be discussed further with the LPA in order to determine whether they are satisfied that the exceptional ecological circumstances in which Rule 4 can be applied are occurring. If they are satisfied that Rule 4 can be applied, the creation of off-site compensatory Coastal Grazing Marsh may not be required.

7 Landscape design philosophy

7.1 Overview

The proposed development site is rural in character and heavily influenced by its coastal flood plain and intertidal features. The site is situated within the statutory designated area of the Chichester Harbour National Landscape which is protected as a nationally important landscape. The primary management goal for this landscape is one of setting, which requires conservation and enhancement of setting features for the future.

The high landscape and visual value and sensitivity of the site have been taken into consideration in delivering the detailed design, with the focus on the coastal environment, managed realignment, intertidal habitat creation and understanding of the recreational value of the publicly accessible open space.

The visual sensitivity of this section of coastline running through the site is considerable, given its location within Chichester Harbour and in relation to the setting of nearby settlements including Fishbourne Village, City of Chichester and its Cathedral tower and the PRoW network.

7.2 Outline Design

The outline design process involved preliminary research and optioneering of the footpath realignment, site survey, and collaborative engagement with the Client. The following deliverables set out the outline landscape design:

- Landscape Context Plan – a spatial representation of the key landscape characteristics and key viewpoints in relation to the wider landscape context and the site access.
- Landscape Concept Plan - landscape design proposals which aim to deliver mitigation of the potential adverse landscape and visual effects of the realignment, landscape and environmental enhancement, and prepare for opportunities for future site development which would align with objectives for nature recovery and community engagement.

7.3 Detailed Design

Through the detailed design, landscape enhancements were confirmed, and artistic illustrations were created for use during stakeholder and community engagement. The aim of the visualisations is to represent the predicted landscape change at 2030, 2050- and 2075 by illustrating:

- Birds eye view – to illustrate 3 scenarios of a) 2030, b) at 2050, c) at 2075.
- Perspective 1 (Viewpoint 7). View northwest towards Fishbourne Channel in 2030. The visualisation illustrates the raised footpath in the near future following the project, with the majority of concrete having been removed and existing breaches exacerbated. Some concrete blockwork will remain to reinforce weak points and offer erosion protection to the new realigned footpath. Existing Footpath 555 still in-situ and passable. The view will be from the southern access toward the new footpath.
- Perspective 2 (Viewpoint 1). View looking west towards Fishbourne Channel at 2050. The visualisation illustrates the expected saltwater inundation and the establishment of saltmarsh. The view is from the start of the new footpath line. The line of deadwood (due to tree line along Footpath 555 deteriorating over time

due to saltwater inundation) represents an important habitat in itself and provides perching posts for birds, e.g., heron. Saltmarsh users (e.g., birds and pollinators) are represented in this visualisation.

- Perspective 3 (Viewpoint 15). View northeast towards Chichester with Chichester Cathedral Tower in the distance. This represents the predicted view in 2075, with the drawing illustrating the footpath from the sluice bridge at its junction with the new footpath and the proposed linear woodland creation on the dry side of the embankment. The view captures the new intertidal habitats in the foreground, as well as some of the faunal species that utilise saltmarsh, such as godwits, oyster catchers and curlews as well as pollinators.

The final artistic illustrations are provided in Appendix C.

7.4 National Landscape Statement

In accordance with the National Policy Planning Framework (NPPF), the conservation and enhancement of the landscape and scenic beauty within National Landscape areas are the key driver behind their high status of protection. A National Landscape Statement is required alongside the planning application to demonstrate how the special features of the National Landscape have been considered in the design process.

Our Statement includes a National Landscape Impact Appraisal to demonstrate how the proposed project will meet the requirements set out within the Joint Chichester Harbour AONB Supplementary Planning Document (SPD). These requirements include conservation and enhancement of the natural beauty of the landscape; protection of the flora and fauna which is a special quality within the National Landscape resulting in biodiversity gains; and meeting the requirements of the Chichester Harbour Management Plan.

7.5 Landscape Masterplan

To accompany the planning application and the National Landscape Statement submission, the landscape detailed design is represented on the Landscape Masterplan. This comprises:

- A measurable, CAD based plan with defined new public footpath (accommodating continuity of PRoW 555), and all environmental mitigation measures and enhancements.
- Indicative materials and planting palette – to include footpaths, signage, habitat enhancements (e.g. hibernacula) and an indicative list of appropriate native planting types (e.g. for the proposed screening woodland).

The Landscape Masterplan is provided in Appendix C.

7.6 Planting schedule

7.6.1 Trees

It is considered that there is adequate space available to compensate for the loss of trees identified in the BNG Assessment (OIP-JBA-00-00-RP-EN-0008-BNG_Assessment).

Due to the loss of the tree line running adjacent to the existing footpath (PRoW 555), 0.56km of linear tree/ hedgerow habitat will be required under mandatory BNG requirements.

Under the current proposal 0.42 hectares of broadleaved woodland creation is currently proposed through the planting of a mix of native trees and shrubs and following discussion with Chichester District Council LPA on the 24th April 2025, it has been deemed as acceptable. Please refer to Section 6.3.6 (Biodiversity Net Gain Assessment) for further details.

7.6.2 Additional planting

Opportunities outlined in section 7.5 of this report have been developed as part of the design. As outlined in the Landscape Masterplan (OIP-JBA-00-00-DR-L-0010-Landscape_Masterplan), additional enhancements and planting have been included in the design to benefit the site and its users.

8 Detailed Design

8.1 Specification for Works

A specification for the construction of the new realigned footpath has been produced by JBA Consulting (OIP-JBA-00-00-SP-GT-0001-Specification_for_Works). Unless stated otherwise, the specification is based on the Specification for Highway Works published by the Stationery Office (formerly HMSO) as Volume 1 of the Manual of Contract Documents for Highway Works. The full works specification is provided alongside this design report.

8.2 Engineering overview

As part of the detailed design of the realigned footpath, the following drawings were produced:

- OIP-JBA-00-00-PL-C-1001-A4-C01-Site_Location_Plan
- OIP-JBA-00-00-DR-C-1001-A4-C01-Hazards_&_Constraints_Plan
- OIP-JBA-00-00-DR-C-2001-A4-C01-General_Arrangement_Sheet_1_of_6
- OIP-JBA-00-00-DR-C-2002-A4-C01-General_Arrangement_Sheet_2_of_6
- OIP-JBA-00-00-DR-C-2003-A4-C01-General_Arrangement_Sheet_3_of_6
- OIP-JBA-00-00-DR-C-2004-A4-C01-General_Arrangement_Sheet_4_of_6
- OIP-JBA-00-00-DR-C-2005-A4-C01-General_Arrangement_Sheet_5_of_6
- OIP-JBA-00-00-DR-C-2006-A4-C01-General_Arrangement_Sheet_6_of_6
- OIP-JBA-00-00-DR-C-3001-A4-C01-Typical_Section_Sheet_1_of_2
- OIP-JBA-00-00-DR-C-3002-A4-C01-Typical_Section_Sheet_2_of_2
- OIP-JBA-00-00-DR-C-4001-A4-C01-Typical_Surface_Details
- OIP-JBA-00-00-DR-C-4002-A4-C01-Typical_Drainage_Details

Key changes from outline design to detailed design are discussed in the subsequent sections of this section.

8.2.1 Footpath alignment

Following agreement of the alignment at outline design, three updates were made to the northwest, northeast and southern alignments.

In the northwest section, the realigned footpath has been adjusted, as discussed further in section 8.2.5, to utilise the existing culvert, improve side slopes and minimise impact on the Fishbourne stream.

In the northeast section, the realigned footpath originally followed the highest natural topography, avoiding existing trees and following as close to Fishbourne Stream as possible. This resulted in an extended and unnatural alignment as highlighted through the concept landscape assessment. Therefore, the footpath was diverted to form a more natural curve in the northeast, whilst maintaining the required distance from existing tree extents.

In the southern section the realigned footpath follows adjacent to the Southern Water Wastewater Treatment Works boundary fencing. The footpath was originally offset from the boundary by a minimum of 2m. Through the detailed design, an update to a 5m offset from the boundary fencing to the toe of the slope of the realigned footpath has

been made to allow for the screening of the Southern Water treatment works in the form of wet woodland planting. The 5m offset also considers future root exclusion zones.

8.2.2 Tie-in with existing northern embankment

At outline design, the specific tie-in of the realigned footpath with the existing northern embankment and PRoW 555 and 3059 was not finalised. Discussions with the Client identified a preference for the realigned footpath to pass over the covered section of an existing land drainage structure at a chainage of 13m on the new realigned footpath plan (OIP-JBA-00-00-DR-C-3001-A4-C01-Typical_Section_Sheet_1_of_2).

This has resulted in the slopes of the realigned footpath becoming steeper from a 1 in 3 slope to a 1 in 2 slope on both sides. This raises a potential stability risk of the realigned footpath. It is recommended that works are to be carried out at the start of construction to confirm the structural and loading capacity of the existing land drainage structure. The preferred option is to lengthen the existing culvert (or replace if required) to allow for shallower slopes, as discussed further in section 8.2.5 of this report.

8.2.3 Realigned footpath surface details

The typical surface details of the realigned footpath are outlined in OIP-JBA-00-00-DR-C-4001-A4-C01-Typical_Surface_Details. The following have been added through the detailed design:

- Both the seaward and landward slopes in specific areas of the realigned footpath have been formed using Erosamat type 3/20Z 500M to ensure the slopes are maintained following a natural breach of the existing embankment. This location of the erosion mapping is outlined in the detailed design drawings (OIP-JBA-00-00-DR-C-2001-General_Arrangement_Sheet_1_of_6, OIP-JBA-00-00-DR-C-2002-General_Arrangement_Sheet_2_of_6 and OIP-JBA-00-00-DR-C-2003-General_Arrangement_Sheet_3_of_6 provided in Appendix A).
- 400/8 U pins at 2.6 pins/m2 installed at 10 degrees off perpendicular.

8.2.4 Formation Level

Due to the lack of data on ground conditions within the site, including soil types and strengths/ densities, several precautions have been included in the works specification and drawings. These have been included to minimise the risk to the functioning and safety of the structure from ground-related hazards. Section 5.4 provides details on the main identified ground hazards and describes how the risk was mitigated during the design. For the construction phase, the following measures are to be implemented:

- Instrumentation.
- A suitably qualified geotechnical engineer or engineering geologist providing a watching brief during construction in order to a) confirm soil type at the base of the excavation and b) measure the soil strength using a method appropriate to the soil type (e.g. CBR or undrained shear strength).
- Secugrid and separation geotextile included at formation level beneath embankment foundation (to provide additional support to embankment and reduce mixing of soil types).
- Surveying of the embankment surface at defined time intervals to determine whether settlement is within expected limits.

8.2.5 Drainage design

The alignment of the proposed embankment includes two crossings of ordinary watercourses as shown on Figure 8-1. Watercourse crossing design has been undertaken considering West Sussex County Council Lead Local Flood Authority Culvert Policy and West Sussex County Council standard details.

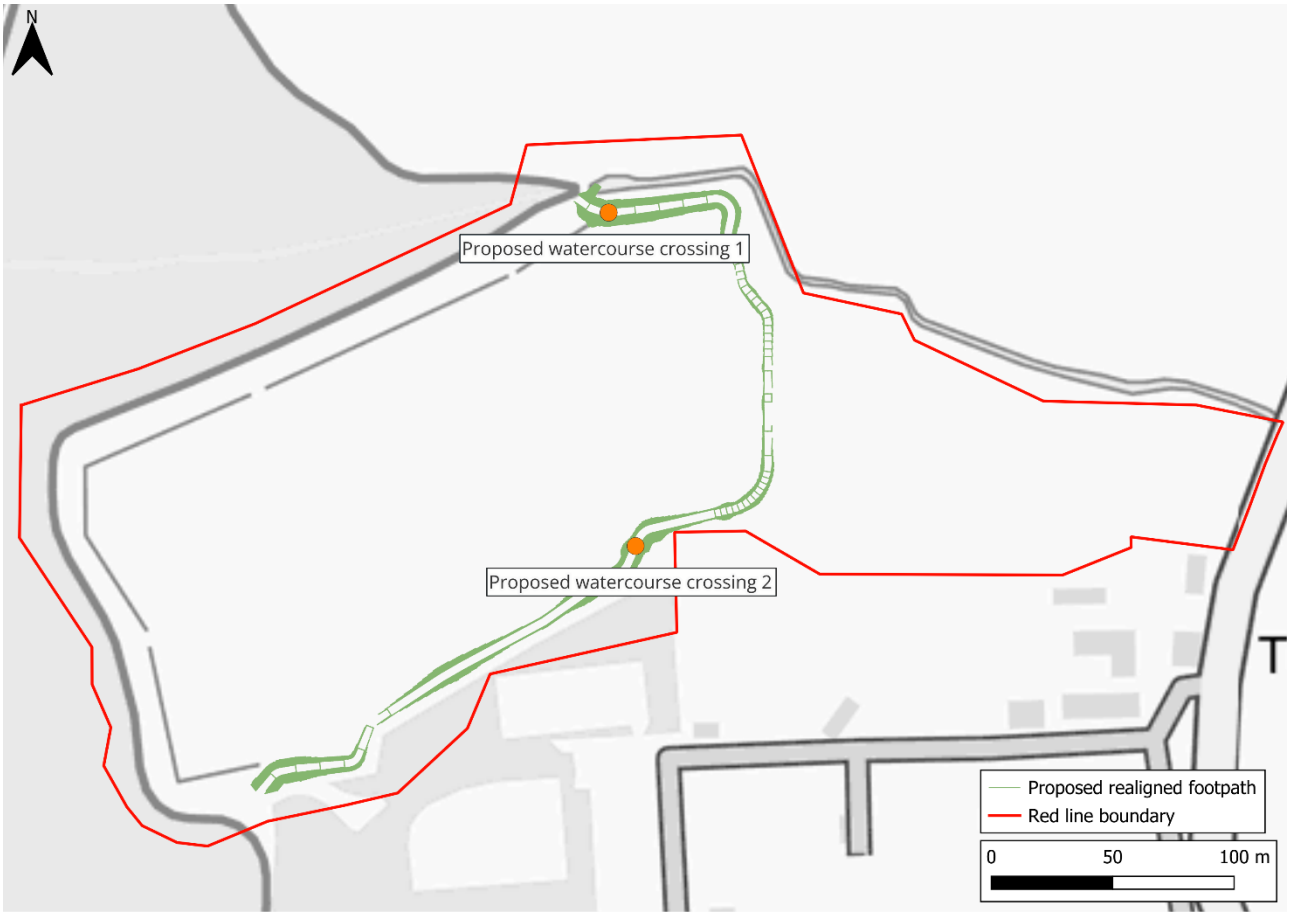

Figure 8-1: Proposed watercourse crossings for the proposed realigned footpath.

The first watercourse crossing is located in the far north extent of the site where the proposed footpath ties into the existing north embankment. There is an existing culvert which is currently serving as a field crossing. As outlined in Section 8.2.2, assessment of the suitability of the culvert for reuse is recommended (e.g. CCTV survey) in the site set up phase of construction. Should the culvert be found to be in an appropriate condition, it is proposed to be utilised to minimise disturbance to the Fishbourne Stream. The existing culvert will be extended southwards with the geometry of the culvert maintained to ensure no reduction in flow capacity, with a new brickwork headwall to the culvert's upstream extent (as shown on OIP-JBA-00-00-DR-C-3001-Typical_Section_Sheet_1_of_2 and OIP-JBA-00-00-DR-C-4002-Typical_Drainage_Details).

The second watercourse crossing is located in the southern extent of the site along the Southern Water boundary fence (as shown in Figure 8-1). It is proposed to introduce a new 600mm diameter culvert, to maintain connection directly upstream to the proposed wet woodland. Further site investigations are required to confirm the intended direction of this watercourse, i.e. if it flows east to west and is connected to the watercourse which leads to proposed watercourse crossing 1, or if the watercourse leads to the wet woodland. Design has been undertaken assuming a worst case east to west flow and providing a pipe with a diameter the same as the existing downstream culvert. This design diameter will not impede the overall capacity of the watercourse. The new culvert will be designed to ensure a minimum self-cleansing velocity of 1m/s.

As per Approved Document H and WSCC standard details, it is proposed to provide a ST4 concrete bed and surround to the new culverts. This is a result of cover depths and the risk of vehicular loading during construction. Safety measures are included as part of the culvert designs due to the increased footpath slope steepness and the introduction of vertical walls. The new and existing culvert have been assessed as not requiring safety screens in accordance with CIRIA guidelines.

8.2.6 SGN crossing

As outlined in the PAS128 Type D survey and in the outline design drawings, the realigned footpath crosses over a high-pressure gas pipeline with a 400mm pipe diameter in the southwest extent of the plan (~chainage 405m). JBA undertook a high-level estimation of the extra load caused by the new realigned footpath to be considered by SGN through the loading assessment, to understand any risks with the design on the existing pipeline.

The additional loadings comprise a consideration of both existing loads (from the existing overburden on the pipe from the soil) and expected loads that are to be imposed from the new embankment. This estimate was derived using predicted/ expected unit values for both the existing soil (for which no data has been obtained) and for the embankment fill. The dig and replace layer beneath the embankment was included in the loading from existing soil.

The high-level estimation outlined the following:

- Assumed pipe depth of 2m below ground level.
- Height of the realigned footpath to be 0.8m above existing ground level.
- Design assumes no vehicle movements.
- Assumed unit weight of cohesive embankment fill to be 20-21 kN/m3.
- Assumed unit weight of existing soil estimated to be a maximum of 22 kN/m3 (inclusive of 'dig and replace' foundation layer).
- Total pressure at crown of the pipe estimated to be approximately 65-70 kN/m2, which consists of:
- Extra weight of the new realigned footpath (approximately 0.8m high): 17 kN/m2.
- Pedestrian load: 5 kN/m2.
- Weight of the existing ground soil above the pipe (estimated to be 2m below existing ground level): 44 kN/m2.

Additionally, contact with SGN has been made regarding the removal of concrete on the existing western embankment where the pipeline passes through this area. The method for removing the concrete is to be confirmed with the contractor but the anticipated methodology is as follows:

- Construct plant haulage route through Apuldram Meadow to access the sea wall and processing area.
- Construction of temporary haul road on the eastern side of the sea defence embankment to provide stable access for long-reach excavator and dump trucks to remove wall and transfer to the processing plant for crushing.
- Breaking out and removal of existing concrete and stone blockwork from sea wall using a long-reach excavator and dumper trucks.
- Debris to be lifted into dumper truck which transport to material stockpile location (outlined as the compound area, provided in section 10 of this report).
- Exposed seaward face of existing embankment to be re-profiled using long reach excavator to make embankment stable.

At the time of writing, the latest communication received from SGN (04/04/25) confirmed they had attended site and are processing the loading assessment. The report will be updated once the loading assessment has been completed.

8.2.7 Southern Water abandoned sewer crossing

As identified in the PAS128 Type D Utility Survey, an assumed abandoned Southern Water owned sewer pipe was identified running through the site extent, from the Southern Water WWTWs to just north of the existing outfall structure draining the Fishbourne Stream. Contact was made with Southern Water to obtain further details regarding this asset, and they confirmed the asset is classified as abandoned and was decommissioned in 2008. The sewer pipe consists of cast iron and has a pipe diameter of 200mm. However, there is no information regarding the depth of the asset. Therefore, it is recommended at construction that a further PAS128 Type B or A survey could be undertaken, to assess the depth of the abandoned asset to avoid any potential service strikes and to understand the loading capabilities to avoid any damage to the asset.

8.3 Environmental overview

As part of the detailed design and the requirements for the planning application, the following environmental deliverables were completed:

- Biodiversity Net Gain (BNG) Assessment
- Habitats Regulations Assessment Screening and Appropriate Assessment
- SSSI Assent Application
- Water Framework Directive Compliance Assessment
- Coastal Squeeze Assessment
- Heritage Impact Assessment
- Indicative Landscape Visualisations at 2030, 2050 and 2075
- Landscape Masterplan
- Landscape Planting Palette

- Flood Risk Assessment.

Overall, it is estimated that 3.95ha of coastal grazing marsh, 0.24ha scrub and 0.24km of linear hedgerow habitat (in the form of a line of trees) will be lost due to the proposed project; however, by realigning PRoW 3059 and allowing the sea wall to breach and inundate the site, approximately 5ha of intertidal saltmarsh habitat by 2075 will be gained to help address coastal squeeze in Chichester Harbour and to improve the overall condition of Chichester Harbour SSSI. 0.42ha of linear broadleaved woodland will also be created as part of the project.

9 Funding and Investment

9.1 Overview

To deliver the project and create new habitat, funding is required primarily for the upfront capital construction, but potential funding sources have been identified that can be used for the following:

- Capital construction.
- Longer term management and maintenance of the habitat.
- Surplus funding that can be invested into other CHC environmental projects.

The site is at an advantage in its ability to attract funding because:

- The land is not currently designated but lies adjacent to designations.
- The site is comprised of a habitat that may be replaced with habitat of greater value.
- The project's emphasis on habitat restoration, intertidal habitat creation, and public engagement aligns with multiple national funding streams that support environmental enhancement, climate adaptation, and sustainable land management.

The following funding sources have been identified and subdivided into six main groups outlining their applicability to the project, along with next steps.

9.2 Nature Markets

Nature markets are selling the environmental gain from the development of new habitat to offset the development needs of others, including BNG habitat, BNG watercourse, nitrate and carbon. There is a regulated market to meet legislative needs and a voluntary market, for example, Social Corporate Responsibility (SCR). The BNG could be prioritised to projects partners, for example EA FCERM development, Southern Water AMP8 development and important developments supported by the LPA. BNG watercourse units are particularly valuable and may be of interest to Southern Water and the EA.

9.2.1 BNG units

To access BNG funding, a landowner can sell biodiversity units to developers who need to meet the needs for BNG uplift of their development. This process involves several key steps:

- Assessing the potential for BNG units. This assessment should be conducted using the statutory biodiversity metric and a qualified ecologist will need to complete a survey and measure the biodiversity value of your existing habitat.
- Securing Agreements. These agreements include the rights to the BNG Units generated and a conservation covenant or planning obligation to ensure the habitat will be maintained for at least 30 years.
- Registering the Site. The land must be registered as a biodiversity gain site on the government's public register, operated by Natural England.
- Sale of the BNG Units. Engage potential buyers with BNG obligations (e.g. a developer, who will use it to achieve their BNG). The landowner can negotiate terms and prices directly or work through brokers.

- Record Transactions. Create a record linking the BNG Units to specific development projects on the public register.
- Once the habitat has been created or enhanced, it must be maintained for at least 30 years. The landowner is legally responsible for the management of the habitat to achieve the target condition. This will all be detailed and agreed within a Habitat Management and Monitoring Plan.
- Further information on the selling and management of biodiversity units can be found here: https://www.gov.uk/guidance/sell-biodiversity-units-as-a-land-manager [Accessed: 03/04/2025].

9.2.2 Funding mechanisms 1 - use of a third party

BNG can provide a source of upfront capital funding if following certain funding mechanism pathways. One of the most established models involves entering into a long-term lease agreement with a third-party biodiversity offset provider, such as the Environment Bank. Under this model, the third-party BNG provider supplies the upfront capital to fund all habitat creation works and assumes responsibility for managing the land to deliver the required uplift. In return, they administer the sale of BNG units over the 30-year term and retain most of the income. The landowner typically receives a fixed annual payment or a share of revenue over time. This structure is attractive for landowners seeking a low-risk, hands-off approach with the capital provided. It also means relinquishing control of the site for the duration of the agreement and limits opportunities to layer or stack additional environmental credits on the same land parcel, as it depends on the third-party provider's model, legal agreements, and whether overlapping benefits can be claimed without double-counting.

9.2.3 Funding mechanisms 2 - sell direct

A further option is to sell biodiversity units directly to a private body requiring units to offset development (e.g. Southern Water). In some cases, the developer may fund and deliver the habitat works directly on leased land, or they may provide an upfront payment for the right to use the land for offsite BNG. This model can provide a simple and relatively quick capital injection and can be an effective way to unlock value from the site. However, this model is typically transactional in nature and may offer limited long-term income or integration with wider site goals. If the developer leads implementation, there may be reduced control over habitat design and delivery standards, which can risk missed opportunities for co-benefits such as access, landscape connectivity, or long-term ecological resilience. This is particularly a risk where the developer's focus is on meeting minimum compliance rather than delivering broader outcomes.

The likelihood of funding depends on local development demand. Saltmarsh units, for example, are high value but require buyers with suitable offset needs in coastal areas (e.g. coastal defences or water treatment works).

9.2.4 Carbon and Nitrate

The creation of saltmarsh is likely to deliver carbon sequestration benefits. This area could be eligible for voluntary carbon credit schemes if restored and managed to sequester measurable amounts of carbon in soil and biomass.

Stacking carbon with BNG is only allowed if the carbon outcome arises from a separate or additional intervention, such as hydrological enhancement or re-wetting outside the

BNG calculation area. This would require soil carbon baselining, verification, and a long-term monitoring commitment.

The area may be eligible for nutrient mitigation payments. Payments are typically offered by housing developers needing to meet nutrient neutrality obligations or water companies seeking to reduce nutrient loads in watercourses. Nutrient markets can be a reliable funding source where arable reversion reduces nutrient loading into sensitive catchments where payments for reductions are being targeted.

Carbon and Nitrate Markets can provide both upfront capital and long-term income. Land-use changes generate credits or reductions, which are sold to developers or water companies. Projects must be registered under approved schemes (e.g. Woodland Carbon Code or local nitrate trading platforms). Funding likelihood is moderate to high, depending on location and demand.

9.3 CHC Partners

If aligned with strategic priorities, the EA may offer upfront capital or long-term management funding by leasing land or entering legal agreements to offset coastal squeeze from other FCERM projects. This would require direct engagement and negotiation with the EA. Southern Water may also provide capital funding through the Water Industry National Environment Programme (WINEP), particularly where projects contribute to water quality or biodiversity outcomes. The site could also be integrated into Southern Water and RSPB's Three Harbours Project, allowing for joint funding applications and in-kind support from the RSPB, especially for habitat creation and public engagement. The likelihood of funding is moderate, dependent on alignment with EA's offset needs, Southern Water's WINEP objectives, and existing partnership priorities.

9.4 Environmental Land Management Schemes (ELMs)

Defra funding for ongoing management of agricultural land for environmental benefit is currently undergoing change so the confidence over these sources is low. In addition, this is smaller scale funding more suitable for ongoing maintenance not upfront capital.

The Environmental Land Management (ELM) programme is the UK Government's principal post-EU funding mechanism for rewarding landowners and managers for delivering environmental public goods. ELM is made up of three main components: the Sustainable Farming Incentive (SFI), Countryside Stewardship (CS) and Landscape Recovery (LR). As of April 2025, the SFI has hit its £1.05 billion budget cap for 2024/25 and 2025/26, prompting a pause on new applications. Defra is reviewing the scheme, with updates expected in summer 2025. LR is tailored for ambitious initiatives that involve significant land use changes and habitat restoration over extensive areas (typically between 500 to 5,000 hectares). The LNR component of England's ELM scheme primarily serves as a strategic framework rather than a direct funding source. It aims to identify local priorities for nature recovery and propose actions to achieve them.

Therefore, of these, CS is relevant to the Fishbourne Footpath to Nature Recovery Project due to the focus on habitat creation, coastal adaptation, and public access to nature.

9.4.1 Countryside Stewardship (CS) Options

CS schemes can provide funding to land managers to improve the local environment. They can support a wide range of environmental interventions including restoring wildlife habitats, creating woodlands, enhancing the environment and responding to climate

change. They also include schemes that aim to manage flood risk. The scheme has been established to support Defra's 25-year Environment Plan. It is thought that this project may be applicable for funding, with CS Higher Tier (CSHT) funding applications expected to open in Summer 2025 by invitation. Of particular relevance to this project is the Higher Tier, which funds complex or environmentally significant sites including Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA), and Special Areas of Conservation (SAC), all of which are present at or near the Apuldram Meadow site. The payment rates and action details are outlined in Annex A of the CSHT preview guidance. Each eligible land parcel enrolled under a CSHT action receives a fixed annual payment per hectare (or per 100 metres, depending on the action) for the duration of the agreement, either 5, 10, 15, or 20 years, depending on the specific option selected. These payments are made annually in arrears, based on compliance with agreed management prescriptions. For example, managing saltmarsh under action CT3 would receive £724/ha/year for 5 years, subject to verification through inspections or remote monitoring. The key potential actions, payment rates, agreement length and applicability are summarised in Table 9-2. The payment rates are not sufficient to fund upfront capital costs but are more suitable for ongoing management.

Table 9-2: Payment rates and actions for CSHT from 2025 preview guidance

Action Code	Action Description	Payment Rate (£/ha/year)	Agreement Length	Applicability
CT3	Manage coastal saltmarsh	724	5 years	Supports long-term management of newly created saltmarsh post-realignment.
CT4	Create intertidal and saline habitat on arable land	812	20 years	Applies where arable land is being converted to tidal habitat.
CT7	Create intertidal and saline habitat on intensive grassland	494	20 years	Applies where improved grassland is being converted to intertidal habitat.

Action Code	Action Description	Payment Rate (£/ha/year)	Agreement Length	Applicability
SW12	Make room for the river to move	1489	20 years	Relevant to areas being reconnected to tidal or floodplain water flows.

Funding for Public Rights of Way (PRoW) improvements in Fishbourne is likely to be provided via CS as well. Projects that focus on improving footpaths, bridleways, and other access routes, especially those that connect communities to natural areas, could align with the objectives of these schemes. Engaging with Natural England or the local authority can provide guidance on eligibility and application processes for such funding opportunities.

Agreement conditions include strict eligibility rules, habitat baselining, and monitoring requirements, with Natural England support often required during application. Payments are administered by the Rural Payments Agency and are subject to change based on annual reviews.

9.4.2 Other government grants

A list of other potential government grants that have been used for nature conservation and habitat creation are:

- Defra Species Survival Fund
- Rural Payments Agency - Water Restoration Fund
- UK Seafood Fund (Defra)
- Environment Agency - Water Environment Improvement Fund (WEIF)
- Environment Agency (EA) Bathing Water Improvement Programme
- Environment Agency fisheries - fishing permits
- Environment Agency - Enforcement Undertakings
- Marine Management Organisation (MMO) Grants
- Fisheries and Seafood Scheme (FaSS)
- European Maritime Fisheries Fund
- Natural England - e.g. Species Recovery Programme Capital Grant scheme
- King Charles III England Coast Path (Natural England)
- Bird Aware Solent (Local Authorities)

9.5 Charities

There are many charities that fund environmental projects including coastal restoration. A selection of the most relevant are provided in the following sections.

9.5.1 National Lottery Heritage Fund

The Fishbourne Footpath to Nature Recovery Project aligns well with the National Lottery Heritage Fund (NLHF), which supports projects that connect people with nature and local heritage. While ecological restoration will be funded through schemes like Countryside Stewardship, NLHF can support the realignment of the Public Right of Way (PRoW 3059), the creation of viewing points, and interpretation efforts that highlight the historic and ecological transformation of Apuldram Meadow.

NLHF offers small grants (up to £250,000) and large grants (over £250,000), covering up to 90% of eligible project costs. This includes capital items like path surfacing and signage, as well as revenue funding for community engagement and educational materials. The fund could help enhance public access to the site, promote understanding of coastal dynamics, and encourage local participation in the project.

The NLHF supports both capital and early-stage management costs. Applications are made via an open grant process, often in two stages. Funding is competitive but accessible, especially for projects that link nature restoration with community or historical significance.

9.5.2 Esme Fairbairn Foundation

The Esme Fairbairn Foundation provides funding for projects focused on environmental sustainability, biodiversity conservation, and community engagement. It supports both capital projects and operational costs, with an emphasis on habitat restoration, landscape-scale conservation, and public access to nature. The foundation is particularly interested in projects that deliver biodiversity recovery, land-use change, and ecosystem restoration, making it a suitable funding source for the Fishbourne Footpath to Nature Recovery Project.

This funding could support capital works such as saltmarsh restoration, wetland habitat creation, and public access improvements like viewpoints and interpretive signage. It also aligns with the project's goal of engaging local communities through volunteer-led conservation and environmental education. Grants typically range from £10,000 to £500,000 and support both one-off capital projects and long-term engagement activities. The funding mechanism is well-suited to ensuring the sustainability of Fishbourne Footpath to Nature Recovery Project's habitat restoration and public engagement initiatives.

The Esmee Fairbairn Foundation mainly funds long-term nature recovery and systemic change, with limited support for capital works. Applications are accepted year-round and assessed for strategic impact. Securing funding is challenging and best suited to well-developed projects with strong delivery capacity and alignment with the foundation's goals.

9.5.3 Wildfowl and Wetland Trust Potential Partnership

If a partnership could be established, the Fishbourne Footpath to Nature Recovery Project would be aligned with the Wildfowl and Wetland Trust's (WWT) mission of wetland and wildfowl habitat restoration. The project focuses on saltmarsh restoration, tidal re-inundation, and improving biodiversity in a coastal wetland area that is home to migratory birds and other wildlife species, which are directly supported by wetland ecosystems. The arrangement would need to be a partnership and would need to align with WWT's needs.

Specific areas of alignment include:

- Saltmarsh and Wetland Restoration: the project aims to restore 5 hectares of saltmarsh by 2075 by breaching the existing sea wall, which will reintroduce tidal flow and support the creation of a diverse wetland habitat.
- Wildfowl and Bird Habitat Enhancement: As the project is set to provide key habitats for migratory bird species (such as waders and waterfowl), WWT actively support the enhancement and management of these habitats, making the area more suitable for bird populations.
- Public Access and Education: The creation of viewing points, interpretive signage, and community involvement activities (e.g., volunteering for habitat monitoring) are all activities supported by WWT, which aims to promote public awareness of wetland conservation.

The Fishbourne Footpath to Nature Recovery Project closely aligns with the WWT mission, particularly around saltmarsh restoration, tidal re-inundation, and bird habitat enhancement. WWT funding is typically accessed through partnership and can support both capital works—such as removing the sea wall to restore 5 hectares of saltmarsh by 2075, together with ongoing habitat management.

9.5.4 Other charities and funding paths

Other potential grants from charities include:

- Green Match Fund - match funding mechanisms
- SITA Enriching Nature Programme - support projects within ten miles of landfill sites (owned by any company)
- Veolia Environmental Trust
- Biffa Award - Biodiversity Fund
- Waste Recycling Environmental Ltd (WREN now SAPCA) - Communities Fund
- Garfield Weston Foundation
- Swire Charitable Trust
- The Royal Countryside Fund - Supporting Rural Communities Programme

10 Buildability Statement

As part of the project, JBA Consulting with specialist input from JBA Bentley, has devised the anticipated construction methodology for the project.

Please note that no Early Contractor Engagement has been undertaken for the project, and therefore the methodology is to be confirmed once a Contractor has been appointed.

The general anticipated high-level construction methodology is:

- Pre-works consents and relevant permits to be obtained.
- Site mobilisation, set up of compound and set down areas.
- Materials Management Plan required for site works including imported soils and reuse of crushed concrete.
- Site processing area for crushed concrete to be established together with relevant permits.
- Vegetation and tree clearance where required.
- Ground conditions established at proposed footpath realignment via inspection pits.
- Confirmation of presence and condition of structures (the existing culvert) and services (abandoned Southern Water sewer).
- Existing footpath 555 is closed and alternative route determined.
- Establish required haul roads for plant and materials.
- Importation of acceptable cohesive engineering fill (e.g. from riverbanks of the River Fishbourne, Havant reservoir or other local suppliers).
- Removal of concrete structures from the west and south embankment.
- RE-use of concrete (e.g. crushing, movement on site).
- Construction of new footpath including drainage crossings.
- Construction of erosion protection at south tie-in location.
- Construction of final section of new footpath (construction traffic route).
- Site monitoring, clear-up and demobilisation.

10.1 Anticipated construction methodology for the removal of hard structures (concrete blockwork and concrete shuttered repairs) from the existing sea wall

- Construct plant haulage route through Apuldram Meadow to access the sea wall and processing area.
- Construction of temporary haul road on the eastern side of the sea defence embankment to provide stable access for long-reach excavator and dump trucks to remove the sea wall and transfer to the processing plant for crushing.
- Breaking out and removal of existing concrete and stone blockwork from sea wall using a long-reach excavator and dumper trucks.
- Debris to be lifted into dumper truck which transports to material stockpile location (not on designated foreshore).

- Exposed seaward face of existing earth embankment to be re-profiled using long reach excavator to make embankment stable.

Note: No public/operative access permitted along crest of frontline defence at any point following removal of concrete and stone blockwork due to embankment instability risks.

10.2 Anticipated construction methodology for the south tie-in location where erosion protection is still required (stone pitched exposed face).

- Review of condition of existing embankment following removal of west and majority of south section. If deemed in a good condition, no further works required. If deemed in a poor condition, the following steps are to be undertaken.
    - Excavation and re-profiling around existing embankment southern tie-in location to achieve required working area and embankment formation level.
    - Placement of suitable geotextile along interface of earth embankment face and proposed re-used stone erosion protection.
    - Placement of recycled stone to form a suitable stone pitched revetment slope.
    - Grout recycled stones in position to form erosion protection.
    - Backfill excavated earth material and compact over stone pitched revetment face to re-form the existing embankment frontline defence position.

Note: Safe method of working to be considered further in relation to high tides once the majority of the concrete from the existing embankment has been removed.

10.3 Anticipated construction methodology for the realigned footpath (PRoW 3059)

- Ground preparation works within the realigned footpath footprint including excavation to formation level. Watching brief required. Removal of topsoil and any soft soils (<20kPa). Install geotextile and placement of basal layer of crushed/ processed concrete (Class 1 material).
- Placement of drainage pipe/ culverts through realigned footpath, along with any associated foundation materials and structures.
- If required, construction of approved bridging structure over buried SGN owned high pressured gas main pipe (design to be approved by SGN).
- Placement of suitable geotextile along the interface of imported granular fill (crushed concrete) and existing in-situ ground along the realigned footpath footprint.
- Placement, compaction and profiling of acceptable cohesive fill material (assumed to be Class 2) forming the realigned footpath. Embankment gradients are to be 1V:3H, unless otherwise stated for specific areas.
- Allow embankment to consolidate, subject to class of material used and lift height accordingly. Include period of monitoring to assess settlement following embankment lifts (before final footpath construction) – timescales TBC. If settlement is less than a specified value, footpath construction can proceed.

Monitoring can be completed with settlement pins (one or two at existing GL and one or two at top of fill). Settlement monitoring method to be confirmed.

Repeat steps above along full length of realigned footpath.

- Construction of footpath along crest.
- Placement of seeded topsoil along realigned footpath banks and either side of footpath.

10.4 Anticipated site compound area and transport routes

As outlined in Figure 10-1, the proposed compound area and transport routes have been identified to inform the buildability statement and environmental assessments to support the planning application. These will be confirmed prior to construction once a Contractor has been appointed and exact plant determined, this will include confirmation of crossing points over the SGN gas main.

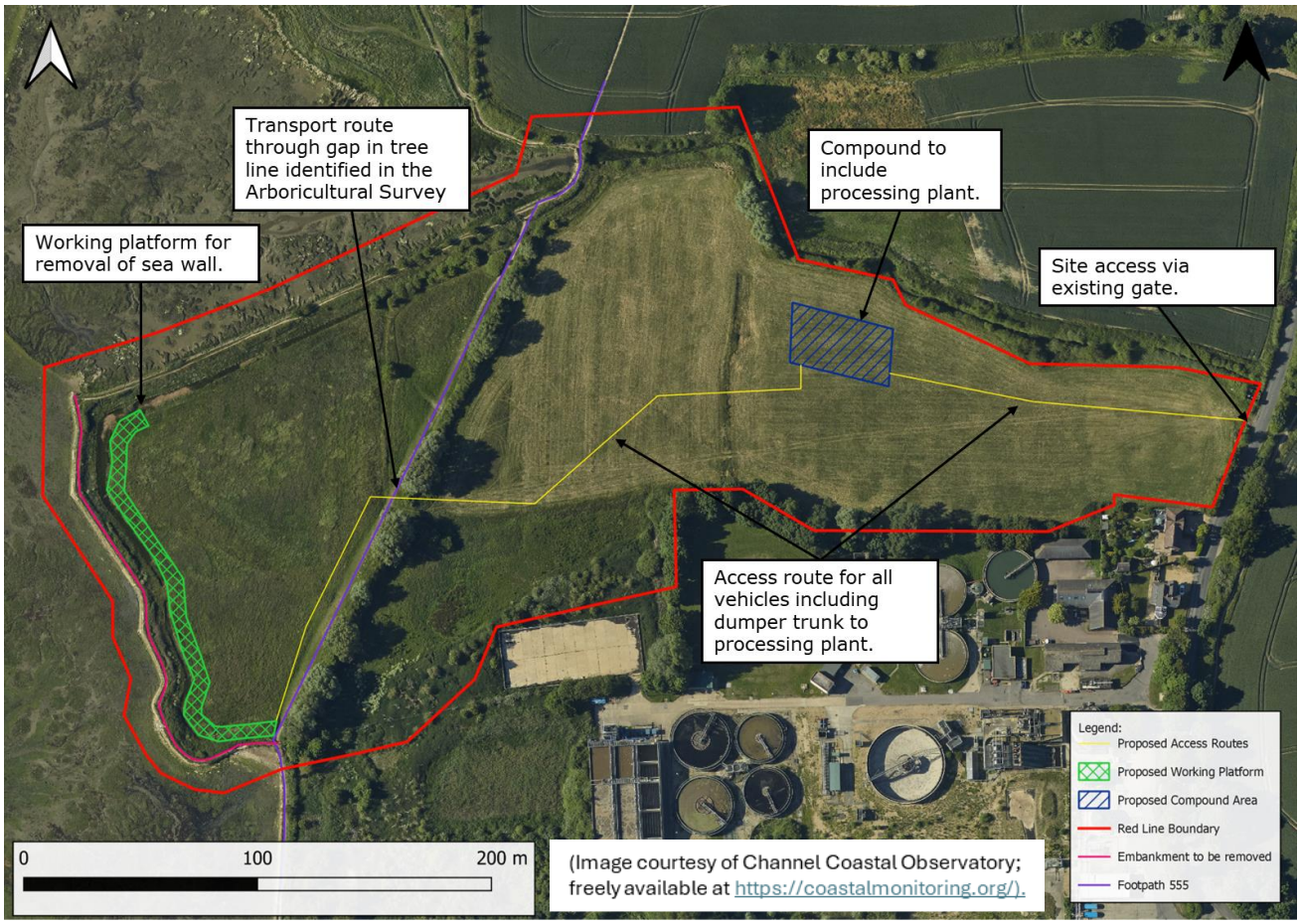

Figure 10-1: Proposed site compound area and key construction traffic routes

10.4.1 Construction plant

The proposed scheme is estimated to require the following construction plant on site:

- 1 x Tracked Long-reach arm excavator

- 1 x Pneumatic Breaker for Long-Reach excavator
- 2 x 10-tonne dump truck with hydraulic tipping
- 1 x JCB 3X excavator
- 1 x tracked bulldozer
- 1 x Vibratory Roller to suit materials to be compacted.

10.4.2 Vehicle movements

The following vehicle movements have been estimated for the project delivery, and are to be confirmed by the contractor when appointed:

- 5no. lorry movements for site set up (including setting up the compound with offices and bringing machinery to site)
- 50no. tipper truck movements for importing and removing material from site (importing fill and removing concrete). It is noted that concrete may be reused on site, and therefore this number would reduce.

The planning and sequencing of the vehicle movements will be carefully planned to reduce impacts to the local highway network.

11 Monitoring and potential future schemes

11.1 Monitoring of the northern embankment (to remain in-situ as part of this project)

Chichester Harbour Trust will continue to monitor the existing sea wall (north) that will remain in-situ (as the landowner will remain responsible for the safety of the structure during and post the project). As outlined in the Landscape Design (Section 7 of this report) the northern section of the existing PRoW 3059 will be reopened to the public and information boards will be installed to explain the ambition of this project and likely landscape changes over the next 50 years.

No active interventions will be made to the northern embankment, and the path will be monitored by Chichester Harbour Trust and closed when the embankment is no longer viable. At this stage, Chichester Harbour Trust will consider future interventions e.g. removal of the concrete or allowing the embankment to naturally breach and potentially form high-tide roosts.

11.2 Future projects

The EA have a future ambition to withdraw maintenance and potentially remove the tidal flap valve at the point where Fishbourne Stream runs along the north of the site meets Chichester Harbour and allow the area to return to natural processes.

This is not included as part of this project and will be subject to future consideration and associated consents and permissions.

12 References

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13 Appendices

A – Detailed Design Drawings

See the following issued Design drawings and associated drawing documents:

- OIP-JBA-00-00-PL-C-1001-A4-C01-Site_Location_Plan
- OIP-JBA-00-00-DR-C-2001-A4-C01-General_Arrangement_Sheet_1_of_6
- OIP-JBA-00-00-DR-C-2002-A4-C01-General_Arrangement_Sheet_2_of_6
- OIP-JBA-00-00-DR-C-2003-A4-C01-General_Arrangement_Sheet_3_of_6
- OIP-JBA-00-00-DR-C-2004-A4-C01-General_Arrangement_Sheet_4_of_6
- OIP-JBA-00-00-DR-C-2005-A4-C01-General_Arrangement_Sheet_5_of_6
- OIP-JBA-00-00-DR-C-2006-A4-C01-General_Arrangement_Sheet_6_of_6
- OIP-JBA-00-00-DR-C-3001-A4-C01-Typical_Section_Sheet_1_of_2
- OIP-JBA-00-00-DR-C-3002-A4-C01-Typical_Section_Sheet_2_of_2
- OIP-JBA-00-00-DR-C-3500-A4-C01-Drainage_Details
- OIP-JBA-00-00-DR-C-4001-A4-C01-Typical_Surface_Details

B – Services Information

- P014GE15
- P014E14

C - Landscape Plans and Visualisations

See the following issued plans and visualisations:

- OIP-JBA-00-00-RP-L-0001-National_Landscape_Statement
- OIP-JBA-00-00-DR-L-0009-Landscape_Masterplan
- OIP-JBA-00-00-DR-L-0003-S3-P01-Birds_Eye_View_Current
- OIP-JBA-00-00-DR-L-0004-S3-P01-Birds_Eye_View_2050
- OIP-JBA-00-00-DR-L-0005-S3-P01-Birds_Eye_View_2075
- OIP-JBA-00-00-DR-L-0006-S3-P01-Viewpoint_7_2030
- OIP-JBA-00-00-DR-L-0007-S3-P01-Viewpoint_1_2050
- OIP-JBA-00-00-DR-L-0008-S3-P01-Viewpoint_15_2075

A - Detailed Design Drawings

Provided separately due to the size.

B - Services Information

C - Landscape Plans and Visualisations

Provided separately due to the size.