



RSPB Shorne Marshes Habitat Enhancement Design and Access Statement PP-12831173



RSPB Shorne Marshes (RSPB,2015)

Contents

1. Introduction	3
1.1 RSPB Shorne Marshes	3
1.2 RSPB Vision	5
1.3 Overarching objectives	6
1.4 Overarching outcomes	7
2. Site Assessment	7
2.1 Historic Use	7
2.2 Landscape Character	8
2.3 Designations and Legal Protections	8
2.4 Statutory SSSI site condition assessment	9
2.5 RSPB site condition assessment	12
2.6 Social and Economic Context (including access)	15
2.7 Planning policy	16
2.8 Archaeology	16
2.9 Unexploded Ordnance (UXO)	16
2.10 Consultation	17
3. Design Process	17
3.1 Baseline data	17
1.1 Biological	17
3.1.2. Non-Biological	17
3.2 Evaluation and design considerations	18
3.2.1. Habitat(s)	18
3.2.2. Species and/or assemblages	18
3.2.3. Hydrology (incorporating neighbouring land use)	19
3.2.4. Soils	22
3.2.5. Topography	23
3.2.6. Archaeology and Unexploded Ordnance	24
3.2.7. Built infrastructure	25
4.Design Elements	25

1. Introduction

1.1 RSPB Shorne Marshes

RSPB Shorne Marshes sits to the east of Gravesend and the Milton Firing range, with Higham Bight and a large industrial operation of aggregates to the west, The Thames to the north, and the Thames & Medway Canal and surrounding agriculture to the south mostly arable of fruits and crops. The site contributes to a wider landscape of linked reserves along the Greater Thames Estuary – comprising over 700ha of habitat. Since October 2000, the site has been managed by the Royal Society for the Protection of Birds (RSPB).

Over the last 20 years, RSPB have worked hard to restore and enhance the site, so much so that the grazing marshes are very important site for breeding waders – particularly lapwings, redshanks and oystercatchers. The importance of Shorne is exemplified by its status one of last remaining breeding havens for snipe in Kent. As such, Shorne Marshes has been granted protected status, having been designated as a Ramsar site (an international designation for globally important wetlands) and as a Site of Special Scientific Interest (SSSI). This is due to its importance for an assemblage of breeding and wintering wildfowl and it acts as a key feeding pitstop for birds using the Greater Thames in their twice annual passage along the North Atlantic Flyway.

A new project aims to enhance the marsh habitat, in order to boost biodiversity and improve the sites resilience to climate change. Through landscaping, we will restore of 35ha of wetland grazing marsh and reedbed by creating hydrological features to enhance the wetland habitat. This will primarily include the creating of pools, scrapes and rills to help spread and retain water within the site thereby increasing feeding and breeding habitat extent and quality. When complete, this will allow Shorne Marshes to realise its full potential as wetland nature reserve worthy of its designations and suitable for many rare species appropriate to this habitat.

Freshwater wetland habitats in the UK are fragile ecosystems totally reliant on the correct hydrology and are at risk from various threats including, but not limited to, the following:

- Development
- Intensive drainage for agriculture and flood defence purposes
- Climate change including:
 - Sea-level rise leading to saltwater incursion where not defended by seawalls (and associated infrastructure) or able to retreat
 - Changes in precipitation patterns. Whilst there are various scenarios, winters are generally predicted to be wetter and the spring and summer seasons are generally expected to be drier

The biodiversity of many areas that were, or even are, considered prime wetland habitats have already been denuded due to inappropriate hydrology. The climate change predictions for precipitation, particularly in southeast England where the effects will be most acutely experienced, paint a bleak picture. As such, potential areas with conditions suitable to support the creation, or restoration, of prime wetland habitat within the region are limited, so any opportunity to do so is treated as a key priority for the Royal Society for the Protection of Birds (RSPB).

This project will work to address the below key issues facing the project site:

- Surface pools dry out, depriving wader chicks of food and habitat for other species.
- Existing hydrological systems are inefficient and do not provide the volume of water required to maintain wet features throughout the spring and summer, this is predicted to get worse due to climate change;

To enhance the habitats for birds and other wetland wildlife that use the site water needs to be retained into late spring and early summer. Currently, existing bunds that surround the site (created during a previous phase of habitat restoration interventions) help to keep water on site, but more features are need it to ensure water retained is for long enough and at a level appropriate to sustain breeding and feeding habitat.

This project will boost biodiversity and improve the sites resilience to climate change through landscaping. We will restore of 35ha of wetland grazing marsh and reedbed by creating pools, scrapes and rills to help diffuse and retain water within the site, thereby increasing feeding and breeding habitat quality. When complete, this will allow Shorne Marshes to realise its full potential as wetland nature reserve worthy of its designations and suitable for many rare species appropriate to this habitat.

Objectives

- To enhance internationally important habitats for birds and other wildlife.
- To improve opportunities for people to experience wildlife.
- To show that development can help enhance biodiversity.
- To contribute to the wider Greater Thames Landscape – a complex of nature reserves and wildlife sites managed for wildlife around the Greater Thames Estuary.

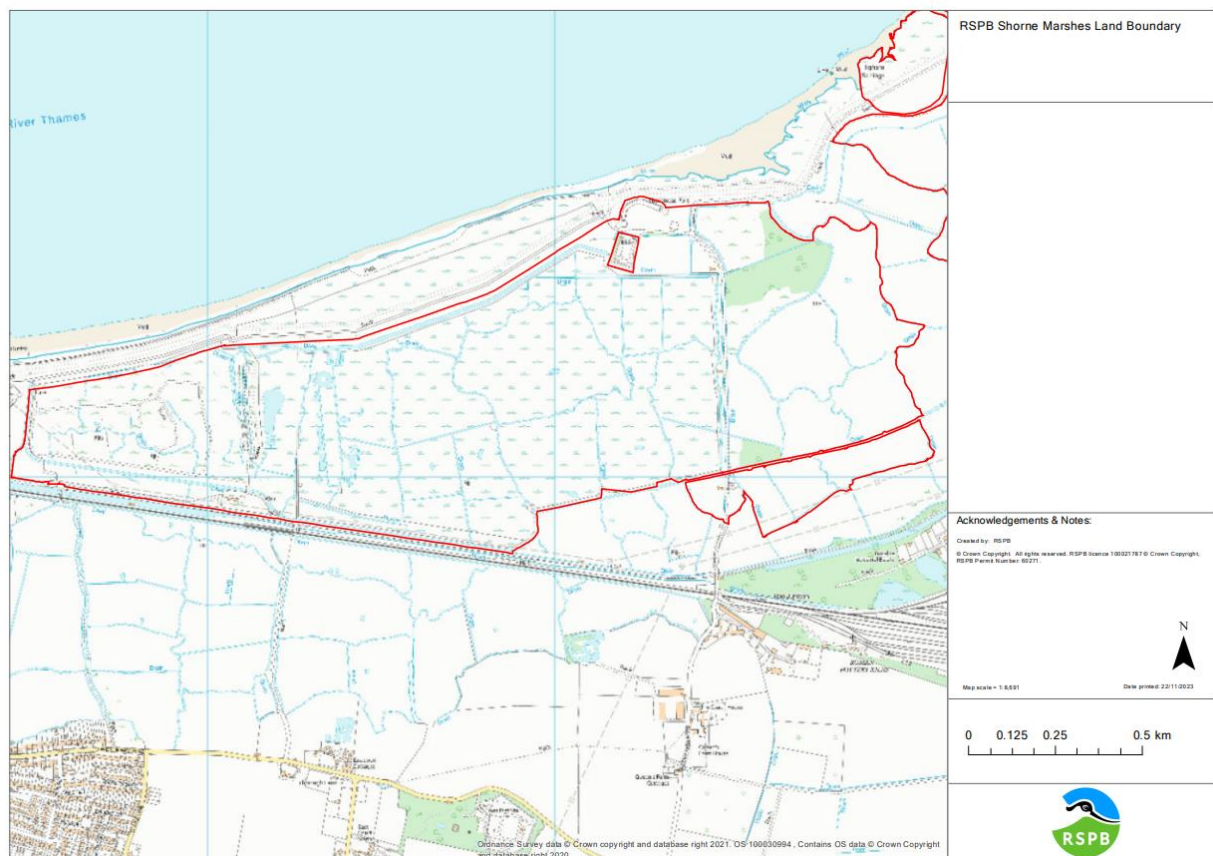


Figure 1: Shorne Marshes Location

The vast majority of the Project Area is designated as part of:

1. **The Thames Estuary and Marshes Ramsar Site** (no. 1025)

The citation is presented in the supporting document '*RSPB_Shorne_Marshes_RAMSAR*

2. **The South Thames Estuary and Marshes Site of Special Scientific Protection (SSSI)**
The citation is presented in the supporting document '*RSPB_Shorne_Marshes_SSSI Citation*'.

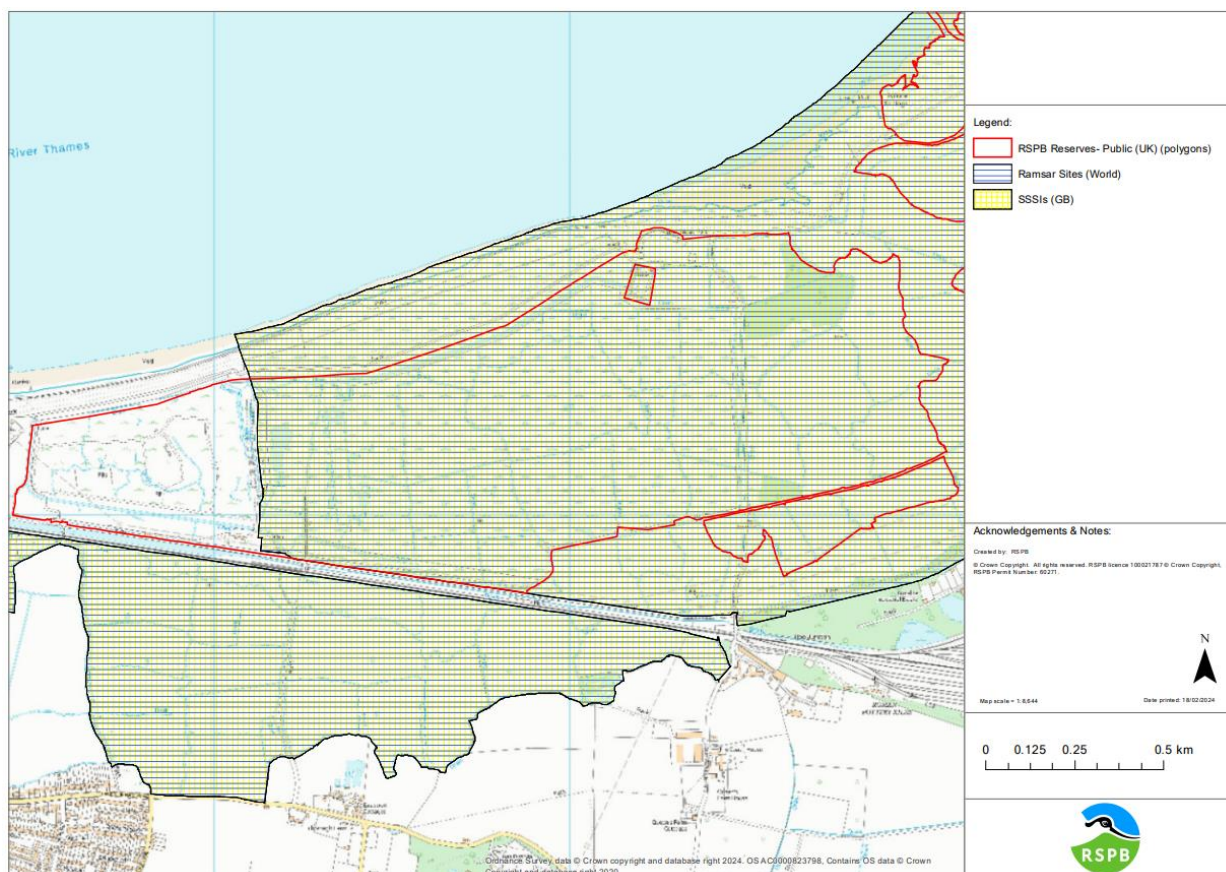


Figure 2: RSPB Shorne Marshes Designations

This proposal will contribute to the RSPB realising vision of a vibrant and fully functioning wetland reserve, that links to the wider landscape. This proposal directly responds to the Lawton Principles of 'Bigger, Better and more Joined up' and applies them to the Hoo Peninsula and wider Greater Thames Estuary Landscape.

1.2 RSPB Vision

The RSPB produces management plans on a 5-year cycle for each of its nature reserves. These documents set out the management and monitoring regimes for that period and, where the site is designated, are subsequently consented by Natural England to provide the authorisation to undertake the operations specified therein. Each management plan also has a vision presenting the aspirations for the reserve in 25 years' time. The following is the vision from the Shorne Marshes management plan 1st April 2019 – 31st March 2024.

Over the next 25 years, Shorne Marshes will be firmly cemented as the prime breeding wader reserve within the RSPB South East region's 'wader factory' that is North Kent. We will have completed the final improvements to the lowland wet grassland and reedbed habitats to ensure that every part of the reserve is as productive as it possibly can be for the species that are reliant on these habitats in this part of the UK.

Our management will be consistently delivering a vibrant wetland nature reserve where important populations of key species of conservation concern flourish. Our management will be dynamic and appropriate to the seasons for both resident species and migratory species at the relevant times of the year that profit from Shorne Marshes as a home.

Spring will be alive with the sound of up to 65 pairs of each of peewitting lapwing and over 75 pairs of chipping redshank. These ambitious numbers for the reserve will be, in no small part, due to the resurgence of these species' populations in the wider countryside. Water voles will continue to thrive in every ditch, European eel will have recovered and be part of a flourishing aquatic ditch environment whilst bearded tit will be heard pinging from the reedbeds throughout the year with marsh harrier a regular breeding bird and component of the ecosystem at the reserve.

Summer will be a time for important invertebrates with scarce emerald damselfly continuing to be spotted floating around ephemeral pools associated with sea-club rush and divided sedge whilst new 'emeralds' such as southern and willow will be a part of the assemblage having continued to colonise the UK. Working closely with key partners, our four rare carder bee species, particularly shrill carder bee, will be regular along the seawall as they seek out the nectar from the flowers that we will have ensured are present in sufficient quantities to support these long-tongued bees.

The scrub fields will have been maintained and managed to provide habitat for a small, but important, population of nightingales. However, and more significantly, the population of great crested newts in these fields will continue to be a noteworthy population in the southeast of England whilst the rough grassland element of the habitat will provide a nesting and hibernating resource for our scarce bumblebees.

Again, working with our key partners and using innovative solutions, we will have reversed the erosion of the saltmarsh at Higham Bight and maintained a sufficient area of this sparse habitat along the banks of the estuarine Thames, particularly in light of climate change and sea-level rise predictions. In addition, Higham Bight will continue to provide vital feeding and roosting habitat for a wide range of wader and duck species and continue to make a notable contribution to the habitat required by the vast assemblage of wintering waterfowl that congregates in the Thames Estuary every year. Finally, and the new most ambitious objective for Shorne Marshes, is that we will have surmounted the presently limited use that the reserve has for wintering waterfowl and the site will experience much larger numbers of waders and wildfowl as should be expected for a lowland wet grassland along the North Kent coast.

Whilst the vision experiences minor updates when a new management plan is produced to reflect the situation at the time of writing, the overarching objectives and outcomes have remained consistent since our involvement with Shorne Marshes in 2000 - and will do so into the future.

1.3 Overarching objectives

1. To maintain and increase favourable SSSI condition across the 107ha of lowland wet grassland at Shorne Marshes and maintain or increase populations of RSPB Priority Species and SSSI interest features. Specifically breeding and wintering waders and wildfowl alongside rare/sparse invertebrates, water voles, European eel and notable plant species.
2. To maintain and increase favourable SSSI condition of the reedbed at Shorne Marshes and maintain or increase populations of RSPB Priority Species and SSSI interest features.

Specifically breeding and wintering waders and wildfowl alongside rare/scarce invertebrates, water voles, European eel and notable plant species.

1.4 Overarching outcomes

- To support biodiversity and habitats of regional and national importance, the wet grassland will be modified to produce optimal hydrological management for breeding waders such as lapwing and redshank, wintering wildfowl such as teal and wigeon and passerines such as skylark. The headline species list will also include non-avian species such as water vole, European eel, rare bumblebees where applicable.
- Rills, scrapes and pools will be created to improve water retention and ensure optimal grazing habitat is restored for target species;
- Grassland, scrub and reedbed management will be provided by targeted grazing and mechanical management regimes.

2. Site Assessment

2.1 Historic Use

The history of the area can be described in 6 key words:

1. Settlement & invasion
2. Reclamation
3. Drainage
4. Farming
5. Defence

The earliest recorded evidence of settlement in the very local area are the remains of a number of Bronze Age round barrows present directly to the south of Shorne Marshes and dated somewhere between -2600 to -700. As part of the Thames Estuary, Shorne & Higham Marshes experienced the ramifications of the four major invasions of Britain that have shaped our civilisation with the effects of the change still felt today; Roman, Saxon, Danish and Norman. There is much evidence locally of Roman settlements but scant remains from Saxon, Danish and Norman periods. However, the most visible evidence of Saxon/Norman settlement is St Mary's Church in Higham.

The quantity of remains builds again from medieval times and it is during this period that the first attempts to 'control' the Thames and reclaim the marsh are found with remains of the first seawalls and counter walls being identified. The seawalls were gradually increased in height and drainage began in earnest to allow increased farming culminating in the building of the current seawalls in the 1980s in response to the 1953 floods.

In addition, all of Higham Bight was grazeable saltmarsh with Land Registry titles for the many parcels thereon. Around the end of the 19th and beginning of the 20th centuries, the saltmarsh and substrate was excavated, it is believed, to provide material for the burgeoning brick and cement making industry associated with the Cliffe area.

From the 16th century, the military influence significantly expanded around the area with various batteries established by the end of the 18th Century. The 3 forts of Shornemead, Tilbury and Cliffe

were completed around 1870 and the construction of defences for the Thames Estuary culminated during World War 2 with the installation of more structures along the banks of the river, such as the numerous pillboxes that still remain. Milton Ranges were in use as musket ranges. This morphed into rifle ranges and saw a significant increase in activity with Milton Barracks built in the early 1860s. Continued use as a military firing range finally ceased in the 1970s and saw the ranges used by private rifle clubs until resumption of use as part of the Metropolitan Police Specialist Training Centre operation in 2000.

The site was acquired as a reserve by the RSPB in October 2000 and has been managed as a nature reserve since then.

Shornemead Fort was designated a Scheduled Ancient Monument in 2021.

The site had a long history of un-authorised access especially on Shornemead Fort and the seawall by motorbikes and other vehicles.

See documents:

RSPB_Shorne_Marshes_Archaeological_Gazetteer

RSPB_Shorne_Marshes_Archaeological_Desk_Assessment

2.2 Landscape Character

Shorne Marshes sits to the east of Gravesend and the Milton Firing range, with Higham Bight and a large industrial operation of aggrates to the west, the Thames river to the north, and the Thames & Medway Canal and surrounding agriculture to the south mostly arable of fruits and crops.

Gravesham Council describes the landscape as:

The following key characteristics are identified for this area, all of which are relevant to the parcels defined adjacent to Gravesend:

- *Flat grazing marsh with a lack of vegetation*
- *Sense of remoteness with extensive views across marshes*
- *Network of ditches and meandering waterways divide the marshes in an irregular pattern leaving*
- *parcels of land of a medium scale*
- *No roads and limited development*
- *Features of historic interest including Shornemead Fort*
- *Extensive views across the River Thames and to higher ground to the south.*

The condition of the landscape of the Shorne and Higham Marshes character area is assessed as good, with sensitivity assessed as high. This is due to the intact landscape with few visual detractors and strong ecological integrity, and the simple open landscape with traditional field patterns and lack of settlement.

The guidelines for this character area state that planning should 'restrict development proposals that encroach onto the marsh from the urban fringe surrounds, seeking opportunities to improve the appearance of the urban edge.'¹

2.3 Designations and Legal Protections

As previously noted, Shorne Marshes is highly protected, and it is expected that the enhancement works will not only complement the designations but enhance the condition of this part of the designated sites, the habitats therein and the species noted in the citations. Furthermore, it is

¹ Gravesham%20Landscape%20Sensitivity%20and%20Capacity%20Studyw.pdf

expected that the enhancement works will provide significantly improved habitat conditions for a raft of fauna and flora of conservation concern not cited in the designations, including some with their own legal protection, that are present, or could be, at Shorne Marshes.

Impacts experienced during the creation of the habitat enhancements on the designated sites, the habitats and the fauna and flora as well as the long-term impacts after the habitats have been enhanced, both negative and positive, are discussed in detail in the documents:

- 'Shorne_Marshes_Report_to_Inform_an_Assessment_Under_the_Habitats_Regulations_for_European sites
- 'Shorne_Marshes_Ecological_Site_Assessment'. For residual sites/features of conservation concern not part of the European sites' appraisal

In addition, Shorne Marshes holds numerous archaeological features that are headlined by Shornemead Fort which has extra protection as Scheduled Ancient Monuments. It is RSPB's standard operating procedure to preserve all archaeological features irrespective of their level of protection i.e. this will include features that have not been identified on the Kent Historic Environment Register.

2.4 Statutory SSSI site condition assessment

Whilst assessments of the current condition of The Thames Estuary and Marshes Ramsar site and the Canal and grazing marsh, Higham Local Wildlife Site are not directly available, but the SSSI site condition assessments fulfil the function practically for all three designations. The following summarises the SSSI site condition assessments for the SSSI unit where the enhancements are proposed:

Unit Condition within the works areas:

024 – Favourable - 12/02/2009

Condition Threat Risk - High

Cattle grazing at time of survey giving rise to areas of short turf interspersed with taller tussocks, juncus and areas of tall herbaceous vegetation. Lots of ephemeral standing water and more permanent areas of water in the many ditches and drains with marginal emergent vegetation including common reed, sea club rush and reed mace. Signs of recent ditch reprofiling with the spoil levelled to create a low bund which was effectively increasing surface water. No scrub but an ungrazed area of about 2ha of common reeds at one end adjacent to a firing range installation. Unit assessed for value as breeding and over wintering bird habitat.

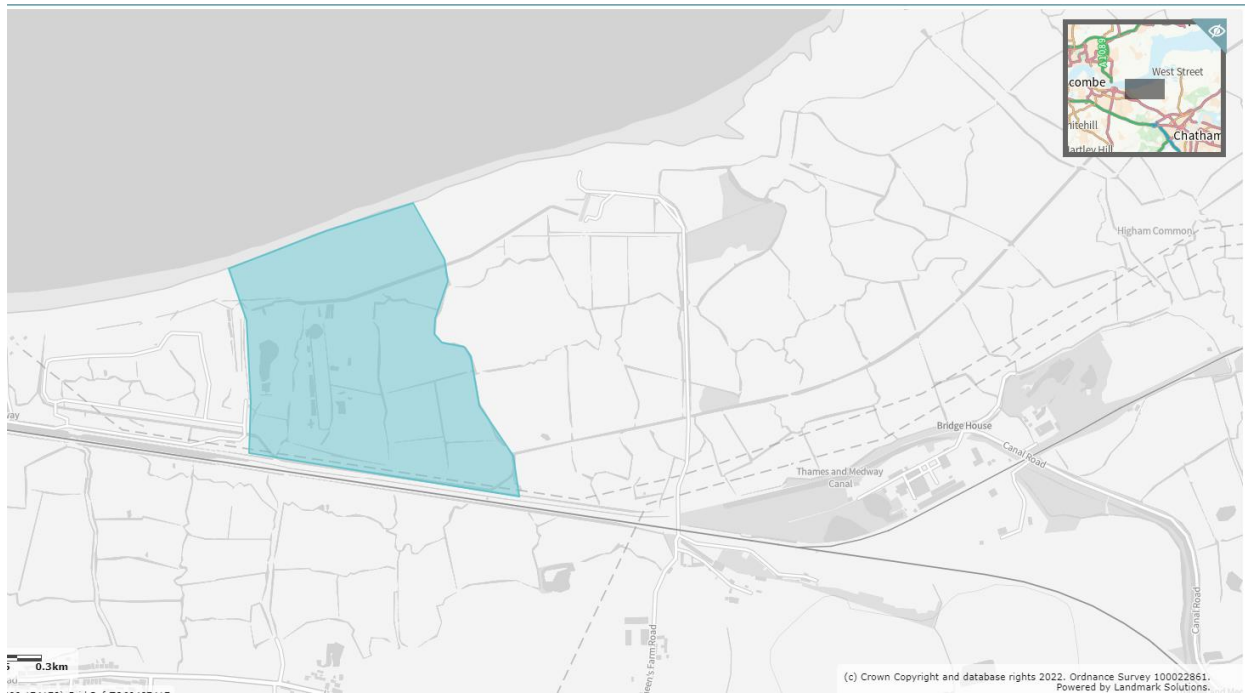


Figure 3: Map of Unit 24

026 – Favourable - 12/02/2009

Condition Threat Risk - High

Cattle grazing at time of survey giving rise to areas of short turf interspersed with taller tussocks, juncus and areas of tall herbaceous vegetation. Lots of ephemeral standing water and more permanent areas of water in the many ditches and drains with marginal emergent vegetation including common reed and reed mace. Scrub was more than occasional (between 5% and 10%) but this is deliberate to provide refuge for Great Crested Newts known to be on this unit. Unit assessed for value as breeding and over wintering bird habitat. Many birds on the unit including Shelduck, geese, Lapwing, Curlew, Avocet and flocks of Starlings.

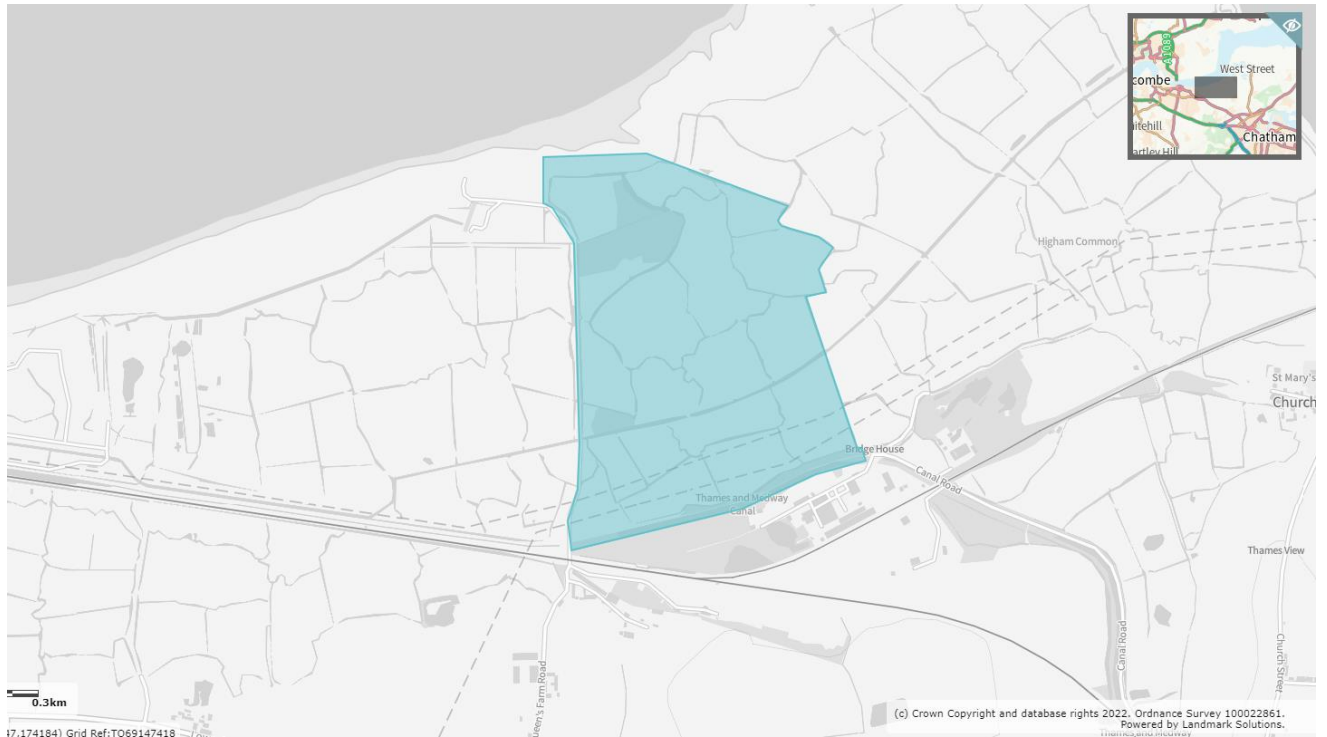


Figure 4: Map of Unit 26

Units Outside of works area:

025 – Favourable - 12/02/2009

Condition Threat Risk - High

Horses grazing parts at time of survey with supplementary feed and poached areas mainly beneath power lines and less than 5%. Also, sheep grazing at time of survey giving rise to areas of short turf interspersed with taller tussocks, juncus and areas of tall herbaceous vegetation. Lots of ephemeral standing water and more permanent areas of water in the many ditches and drains with marginal emergent vegetation including common reed and reed mace. Scrub was occasional on the landward side of the unit under the power lines, less than 5%. Unit assessed for value as breeding and over wintering bird habitat. Many birds on the unit including Shelduck, geese, Lapwing, Curlew, Avocet and flocks of Starlings.

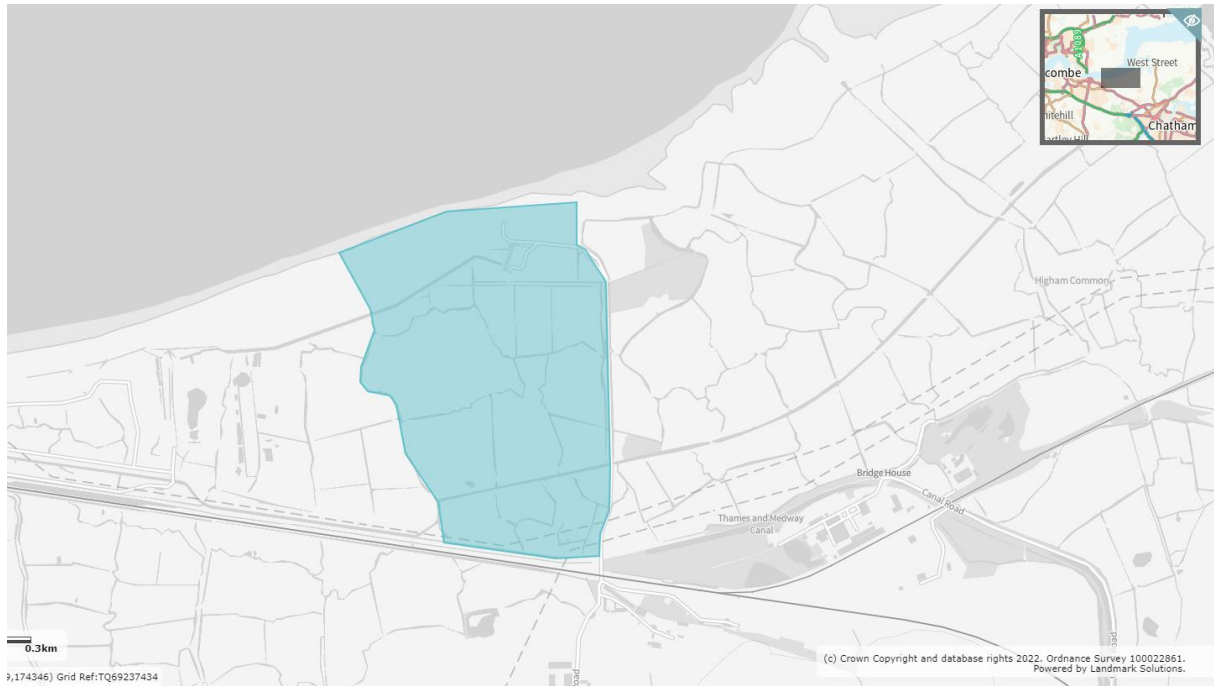


Figure 5: Map of Unit 25

2.5 RSPB site condition assessment

RSPB assessment of the habitats coincides entirely with the SSSI condition assessments of Shorne Marshes. All of the planned works is within the Favourable Unit 26. However, whilst we agree those parts of the site is Favourable, we do not assess them to be as Favourable as they could/should be, hence the desire to undertake the habitat enhancements.

2.5.1 Management plan objectives

Each RSPB management plan has detailed objectives and targets. The current Shorne Marshes management plan (1st April 2019 – 31st March 2024) has four distinct objectives based on broad habitat types with numerous targets for species and habitat conditions. Objective 1 covers the grassland habitat across the application area and is shown below with a compartment map for reference presented at Figure 6. This area is the subject to this planning application sit within this objective.

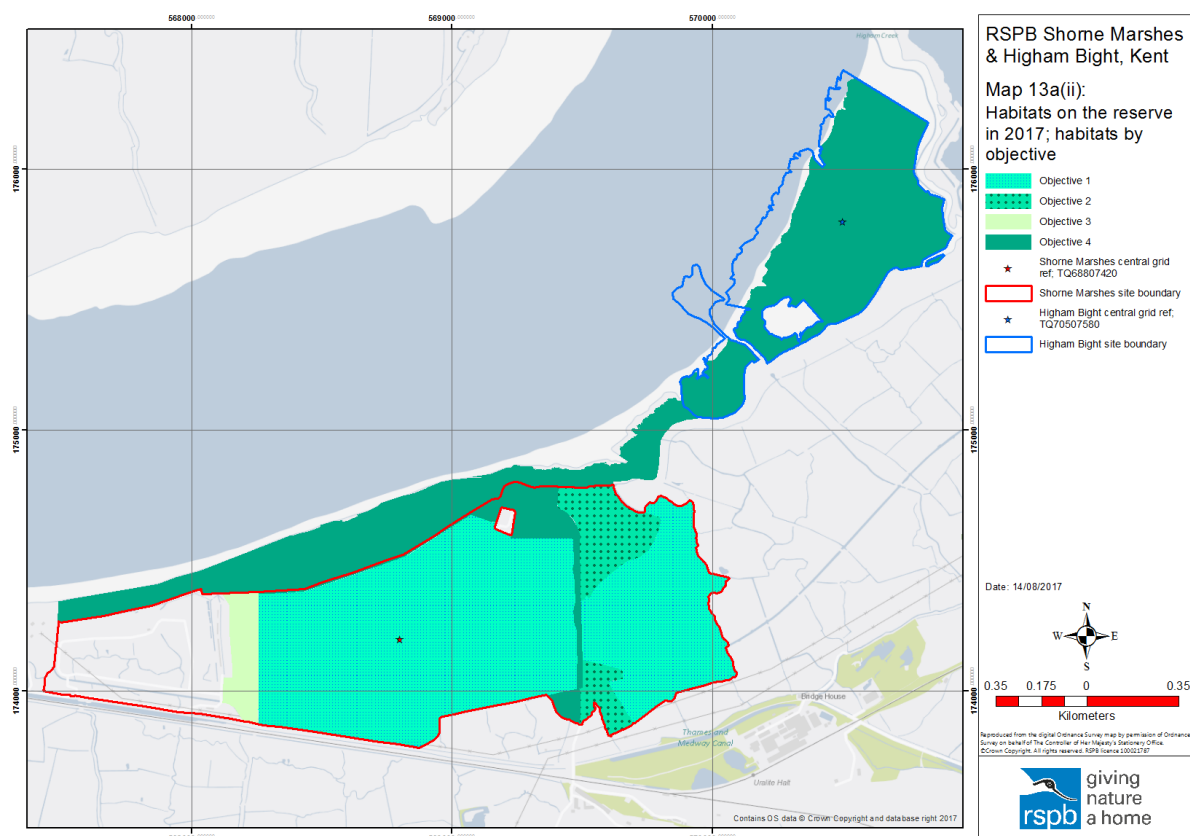


Figure 6: Shorne Marshes Management Objectives location.

Objective 1

To maintain favourable SSSI condition across the 107ha of lowland wet grassland at Shorne Marshes and maintain or increase populations of RSPB Priority Species and SSSI interest features. Specifically breeding and wintering waders and wildfowl alongside rare/scarce invertebrates, water voles, European eel and notable plant species.

Species targets

- Breeding **lapwing ≥65 pairs** in the final year of the plan
- Breeding **redshank ≥75 pairs** in the final year of the plan
- Breeding **oystercatcher ≥5 pairs** in the final year of the plan
- Lapwing & redshank productivity of **>0.8 fledged chicks per pair** annually
- Breeding **wildfowl ≥20 pairs from ≥5 species** in the final year of the plan.
Whole site target including areas covered by objective 3
- 5-year mean winter maxima of **wintering waders and wildfowl ≥500 from ≥13 species** in the final year of the plan
Whole site target including areas covered by objective 3
- Wintering **wigeon present for ≥3 of the 5 years** of the life of this plan
- **Scarce emerald damselfly present**
Whole site target including areas covered by objective 2
- **Shrill and brown-banded carder bees present**
Whole site target including areas covered by objective 2
- **Water vole present in 5/5 transects** with low density presence at a minimum
Whole site target including areas covered by objective 2 & 3
- Confirm and maintain **presence of European eel**
Whole site target including areas covered by objective 2 & 3
- Maintain **populations of 7 species of notable plants** (divided sedge, sea barley, frogbit, annual beard-grass, water-soldier, stiff saltmarsh-grass, Borrer's saltmarsh-grass)

Habitat conditions

- Habitat extent
 - 106.75ha
- Sward conditions (Cs 3-7, 9a, 10, 11a-16a, 20-25, 30-32, 37-40):
 - 1st March; Tussocky sward with median vegetation height <5cm over 90% of the LWG
 - November; Tussocky sward with median vegetation height <10cm over 80% of the LWG
 - 75% of rills, scrapes and other depressions free from *Scirpus*, *Juncus* and dock spp except in and around the pond system in Cs 3 & 4 where large stands of dense, emergent vegetation is required specifically for scarce emerald damselfly
- Sward conditions (Cs 8, 9b, 11b & P1-P6):
 - Predominantly rank sward
 - Regular dense emergent bank side vegetation (+/- *Scirpus*, *Phragmites* etc)
- Flooding conditions:
 - March to June; target of 30% (minimum) to 50% (optimum) flooding across all fields in March drawing down to 5% by the end of June
 - January to March; target of 30% (minimum) to 50% (optimum) flooding across all fields in January and maintained into March
- No scrub present (including bramble)
- Low levels of livestock poaching
- Ditch senescence (whole site target):
 - Open 10-30%
 - Mid succession 30-60%
 - Choked 20-30%
- No mink present

2.5.2 Targets within context

- Breeding **lapwing ≥65 pairs** in the final year of the plan
- Breeding **redshank ≥75 pairs** in the final year of the plan
- Breeding **oystercatcher ≥5 pairs** in the final year of the plan
- Lapwing & Redshank productivity of **>0.8 fledged chicks per pair** annually
- 5-year mean winter maxima of **wintering waders and wildfowl ≥500 from ≥13 species** in the final year of the plan
- **Water vole present in 5/5 transects** with low density presence at a minimum

- **75% of rills, scrapes and other depressions free from *Scirpus*, *Juncus* and dock spp** except in and around the pond system in Cs 3 & 4 where large stands of dense, emergent vegetation is required specifically for scarce emerald damselfly
- **January to March; target of 30% (minimum) to 50% (optimum) flooding** across all fields in January and maintained into March

2.6 Social and Economic Context (including access)

Access and public rights of way are shown in Figure 5. The visitor provision at the reserve is highly limited due to their remoteness and the use of Shorne Marshes as an overshoot area for Milton Ranges (the active Metropolitan Police rifle range). There is no direct public access to the reserve aside from Shornemead Fort, which is outside the danger area. However, with the Saxon Shore Way and King Charles III England Coast Path on the fringes the site, the habitat management and ecological delivery that we provide enhances the experience for the brave souls that do use this part of the famous walk in a wild and out-of-the-way location.

Peripheral access is provided by:

1. The Saxon Shore Way/King Charles III England Coast Path Public Right of Way to the north along the seawall. This allows direct access to Shornemead Fort
2. The Sustrans Public Right of Way to the south parallel with the railway and the Thames and Medway Canal
3. The Bridleway bisecting the reserve running between Shornemead Fort and the Shornemead level crossing

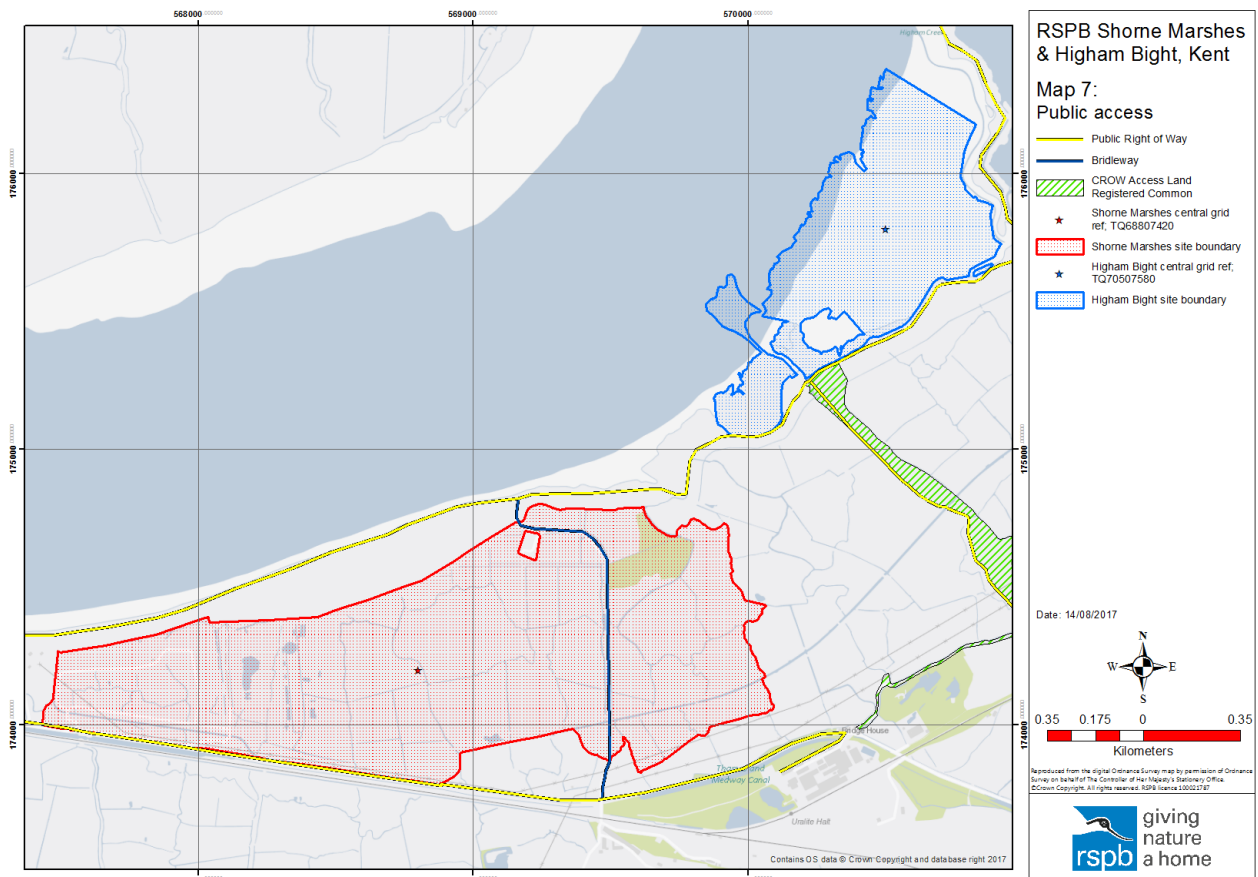


Figure 7: Shorne Marshes Public access

In addition, the RSPB has been a small, but key, partner in the development of the England Coast Path along the northern edge of Shorne Marshes. The path, runs parallel to the site's northern boundary and affords excellent views across the new nature reserve and will give visitors vantage points to view such charismatic species such as Lapwing, Redshank, Curlew and as well as Marsh harrier and Kestrel hunting over the marsh.

In addition, access is not entirely based on people roaming across a piece of land, the RSPB's operation already has a number of local people who volunteer with us at Shorne Marshes and across the RSPB estate and conduct biological surveys and habitat management – one of the best ways to really appreciate a special place. Volunteering opportunities are, and always will be, available to local people to enjoy their countryside and help preserve it for future generations.

2.7 Planning policy

This is addressed in detail in the document 'RSPB_Shorne_Marshes_Planning_Statement'.

2.8 Archaeology

Known archaeology on site is listed from the Kent Historic Records. See document *RSPB_Shorne_Marshes_Archaeological_Gazetteer*.

For this project the RSPB commissioned Canterbury Archaeological Trust to carry out a desk based assessment. See document *RSPB_Shorne_Marshes_Desk_Based_Assessment*

The desk based assessment suggests the potential impacts

There is a chance that extant archaeological features, artefacts or ecofacts may be disturbed or destroyed by groundworks within each PDA. The destruction of preserved archaeology without proper record risks a major negative impact on the historic environment.

Further mitigation of the potential effects of development groundworks is likely to be a condition on planning consent².

A watching brief will be commissioned for the works period.

2.9 Unexploded Ordnance (UXO)

The RSPB commission a Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment carried out by 6 Alpha.

The risk for the site has come back as HIGH, due to the history of the site

The most probable UXO threat is posed by WWII-era German HE bombs and British AXO/LSA/SAA, whilst IBs and British AAA projectiles (which were used to defend against German bombing raids) pose a residual threat.³

Due to this, surveys will be carried out on site before works beginning through Non-intrusive UXO Survey and/or EOD Engineer in the Watching Brief Role and/or Intrusive UXO Survey. A site safety sign of certificate will be granted before works commence.

² RSPB_Shorne_Marshes_Archaeological_Desk_Based_Assessment

³ RSPB_Shorne_Marshes_UXO_Desk_Based_Assessment

2.10 Consultation

The following organisations and individuals have been consulted as part of the assessment process:

- Natural England (NE)
- The Environment Agency (EA)
- North Kent Marshes Internal Drainage Board (NKMIDB)
- Canterbury Archaeological Trust
- 6 Alpha Associates – Special Risk Consultancy
- Mr K Loveridge (Tenant grazier)

3. Design Process

The aim of this project is to improve the area of Shorne Marshes for wading birds and restore them into a properly functioning wetland habitat. This entails undertaking groundworks to improve the in-field topography to facilitate improved water retention through the summer and spring. This will allow the retention of surface water, being the foremost element of a wetland habitat restoration/enhancement, at the key times of the year – the breeding and wintering seasons.

Since the early 1980s at Elmley Marshes on the Isle of Sheppey, this approach to transforming wetland habitats has been tried and tested throughout the RSPB's tenure along the North Kent coast – and many other places in the UK. Other successful transformations in North Kent have been delivered at Higham Marshes, Cliffe Pools, Northward Hill and Great Bells Farm where wetland fauna and flora now proliferate at levels not experienced previously or since the turn of the century – against a backdrop of widespread species declines.

3.1 Baseline data

To inform our design to improve water retention in the wetlands at Shorne Marshes, various surveys, assessments and other forms of data gathering have been undertaken – some since our first association with the site in 2000, some more recently. They are;

1.1 Biological

- Avian:
 - Breeding Bird Surveys (BBS)
 - Wetland Bird Surveys (WeBS) including wintering raptors
- Non-avian:
 - Mammals. Specifically, water vole but not exclusive of other species such as badger, bats, harvest mouse etc
 - Reptiles and amphibians. Specifically, great crested newt, common lizard, slow-worm and grass snake but not exclusive of other species
 - Invertebrates. Specifically:
 - Ditch invertebrates
 - Dragon and damselflies
 - Bumblebees
 - Ditch flora
 - Grassland flora
 - Non-Native Invasive Species (NNIS)
- Habitat
 - Ditch condition
 - Topography (LiDAR)
 - Hydrology
 - Soil profile via boreholes

3.1.2. Non-Biological

- Archaeology desktop assessment

- Services (Electricity, water etc)
- Unexploded ordnance (UXO) desktop analysis

Whilst most surveys and data gathering exercises are used to ensure that no damage to important features occurs, they also provide the information required to see where improvements can be made for the benefit of the important features. For example, creating rills as contained in the project will provide significant benefit to the important wetland flora and fauna assemblage.

3.2 Evaluation and design considerations

Combining all the deliverables, baseline data and comments over the last few years has led to a design that considers, compensates for and capitalises on a variety of constraints and opportunities within the reserve. The predominant design considerations are discussed below.

3.2.1. Habitat(s)

For a creation proposal, the habitats that could be fashioned would need to be defined. However, as this proposal is a restoration and enhancement of habitats already defined - lowland wet grassland this is a given and does not need further consideration in strategic terms. The intricate habitat conditions that we are intending to deliver are discussed in sections 2.5 above.

3.2.2. Species and/or assemblages

Once a habitat (or habitats) has been defined, it is RSPB's standard operating procedure to define which species will be targeted to drive management of the site going forward if all other considerations fall into place. The decision-making process considers various factors:

1. If the site is designated, what are the designated species/assemblages that would be appropriate to the habitat(s)?

For example, golden-samphire *Zostera angustifolia* is stated in the SSSI citation, but this species will never be found at Shorne Marshes within the works area because it requires a very different habitat. As part of our management planning process, the species and assemblages that are appropriate to restore, enhance and Shorne Marshes for are presented in sections 2.5 and 2.6 RSPB above. However, it should be noted that this is not to the exclusion of other species that are likely to take advantage of the enhanced site.

2. What is the potential for absent species of conservation concern to colonise or recolonise?

Using Black-winged stilts which nested on site in 2014-2017 as an example to illustrate the point, we would expect the proposal to make Shorne Marshes much more favourable for stilts to colonise due to improved water control across the site, absence of predators due to the installation of an anti-predator fence, and the lack of human disturbance, therefore more appropriate habitat. Additionally, and for example, it is not unreasonable to expect other species to colonise such as Spoonbill, with good nesting habitat on site in the form of scrub and the improvements to the hydrology on site will provide feeding opportunities.

3. Are there any conflicting habitat requirements?

Even on a single habitat type, there are niches within it that provide distinct conditions for

different species and/or assemblages. Too much change in favour of one species or assemblage could be detrimental to another and requires a balance to be found.

The classic example is the perceived conflict between management for water voles and breeding waders where grazing and high water levels are required for the latter whereas intensive ditch bank grazing and water levels so high that space is not left in banks for burrows to be made is highly detrimental to the former. By providing a mosaic of conditions via sympathetic management and habitat design, both water voles and breeding waders can flourish.

In this proposal we have utilised the extant topography and the scope of peak surface water with the creation of banks within high water level areas. The new hydrological regime will ensure ditches do not dry out (as they do currently), therefore increasing water vole habitat. In addition, the grazing regime will be extensive, and, in combination, all of these factors remove any detriment to either target.

3.2.3. Hydrology (incorporating neighbouring land use)

Being defined as a lowland wet grassland site and given the species/assemblages being targeted for increases in populations, the prime consideration is understanding the prevailing catchment(s) drainage system(s).

The hydrology of the area is predominantly a surface water regulated system. Groundwater does exist in the underlying chalk aquifer, but this is confined by the fine clays and silt sediments above. The mean annual rainfall in the area is approximately 600mm per year.

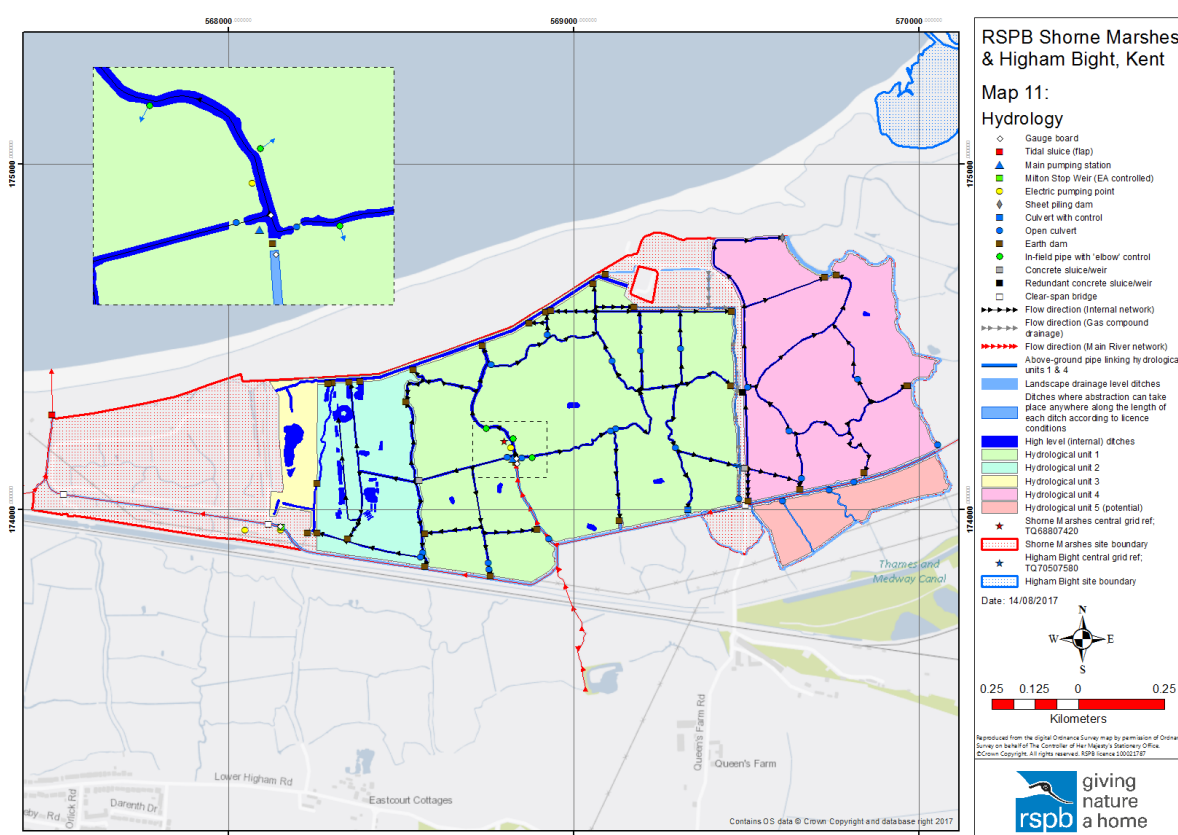


Figure 8: Shorne Marshes Hydrology

Shorne Marshes is part of a catchment that includes Higham Marshes to the east and Filborough Marshes to the south. The surface waters in these areas of the catchment eventually collect in the Denton New Cut and flow out into the Thames via a tidal outfall situated at the northwest corner of Milton Ranges. Water levels for the vast majority of the catchment (specifically Shorne and Higham Marshes) are controlled by the Milton Stop Weir at the southern edge of compartment 2. Flow in the Cut is consistently high throughout the year, primarily due to it being fed from run-off from the Higham-Strood railway tunnel. However, seasonal variation is managed via removing and replacing boards in the Milton Stop Weir. In winter, a 200mm board is removed to alleviate any potential for significant flooding across agricultural land in the catchment. This board is replaced during spring to ensure that sufficient water is maintained in the catchment to maintain linked watercourses as wet fences.

The Milton Stop Weir, the tidal outfall and a handful of other stop log structures in and around Higham Marshes that allow the function of releasing or holding water are managed and maintained by the Environment Agency as part of their remit for main river and flood management. The new North Kent Marshes Internal Drainage board has a few assets in the catchment and is currently working on updating the old, and out of date, Water Level Management Plan

Shorne Marshes hydrology

After many years of work, the majority of the site became isolated from the landscape drainage system in 2014/15 allowing the retention of high water levels irrespective of landscape level management. Strategically, there are 4 effective hydrological units and potential fifth unit:

1. Compartments 5-7, 9a-16a, 20-25, P2, P3, P4 & part P5:
This unit holds the prime abstraction facility, which is fed from the Denton New Cut via ditch number 1
2. Compartments 3, 4, 8, part P5 & P6:
This unit is linked/disconnected to unit 1 via a JKH stop log sluice at the western end of ditch 27
3. Compartments 2 & P1. This includes the northern perimeter ditch (44)
This unit is only linked to unit 2 at high water levels when water flows across the fields. This then flows north into the perimeter ditch. Some work is required to effectively separate/link the two units
4. Compartments 28-33, 38 & 40
This unit is linked/disconnected to unit 1 via a pipe at the eastern end of ditch 8 that then sits above and across ditch 51/50, runs under the bridleway and links with ditch 52/53. The control is a vertical stack inside ditch 8
5. Compartments 36, 37 & 39
This is a potential unit not linked to any other unit, it does not hold surface water and requires work to disconnect it from the landscape drainage system

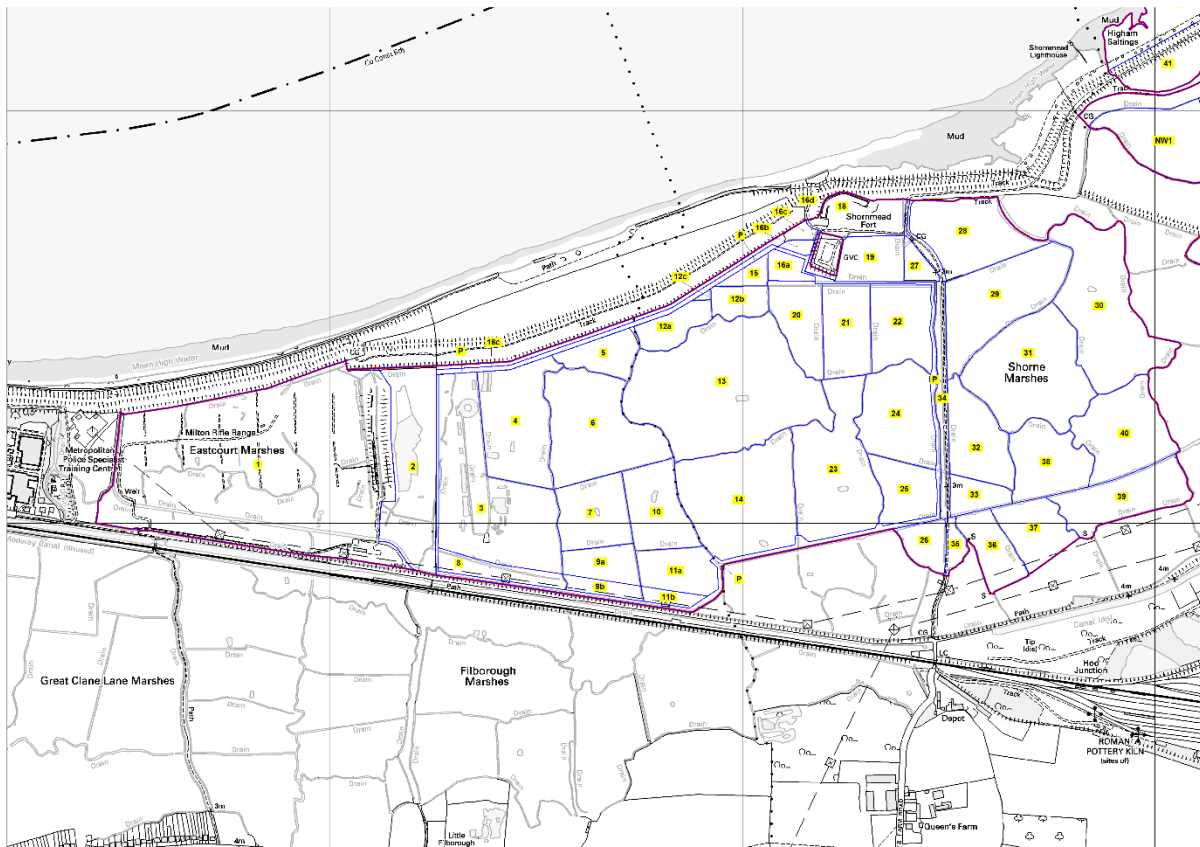


Figure 9: RSPB Shorne Marshes Compartment numbers

The numbering of the units signifies their order of priority and importance for flooding, particularly for years where water is a scarce resource, and the abstraction volume is insufficient to maintain the entire site in optimal conditions for breeding waders.

Abstraction is licensed between 1st November to 31st May and the conditions are:

- Between 1 April and 31 May:
 - 23,750m³ per year
 - 2,160 m³ per day
 - 90m³ per hour
- Between 1 November and 31 March:
 - 93,125m³ per year
 - 2,169 m³ per day
 - 90m³ per hour
- Points of abstraction can be from any ditch within the abstraction licence boundary but not from ditches that form the boundary
- The trigger level is 0.73m AOD or above as measured at the Milton Stop Weir
- The licence allows the use of the fixed pump and mobile pumps

In addition, the licence contains a volume and conditions for Higham Marshes and no abstraction is permitted at both sites at the same time.

The licence is currently being renewed due to expiring in March 2024. An increase in abstraction amount has been requested to allow appropriate flooding in the works area.

The high-level ditch network can act as a water storage facility but, to date, the scope is very limited and care must be taken to not remove too much water from the system and undermine the ecology of

the ditches and their provision as wet fencing throughout the year. Within unit 1, compartments 6, 13 & 14 have been individually isolated from the network and each compartment has a pipe and vertical stack linking/disconnecting them from the ditch system. The vertical stack can be lowered to allow water in from the ditch system at high water levels or raised to contain in-field water. In times of extreme drought, and providing that enough water is available in the ditch network, the internal pump point adjacent to the main abstraction point is used to transfer water from the ditch system into the compartments to maintain a core of flooded fields. Alternatively, mobile pumps can be used to provide the same function as the fixed pump.

3.2.4. Soils

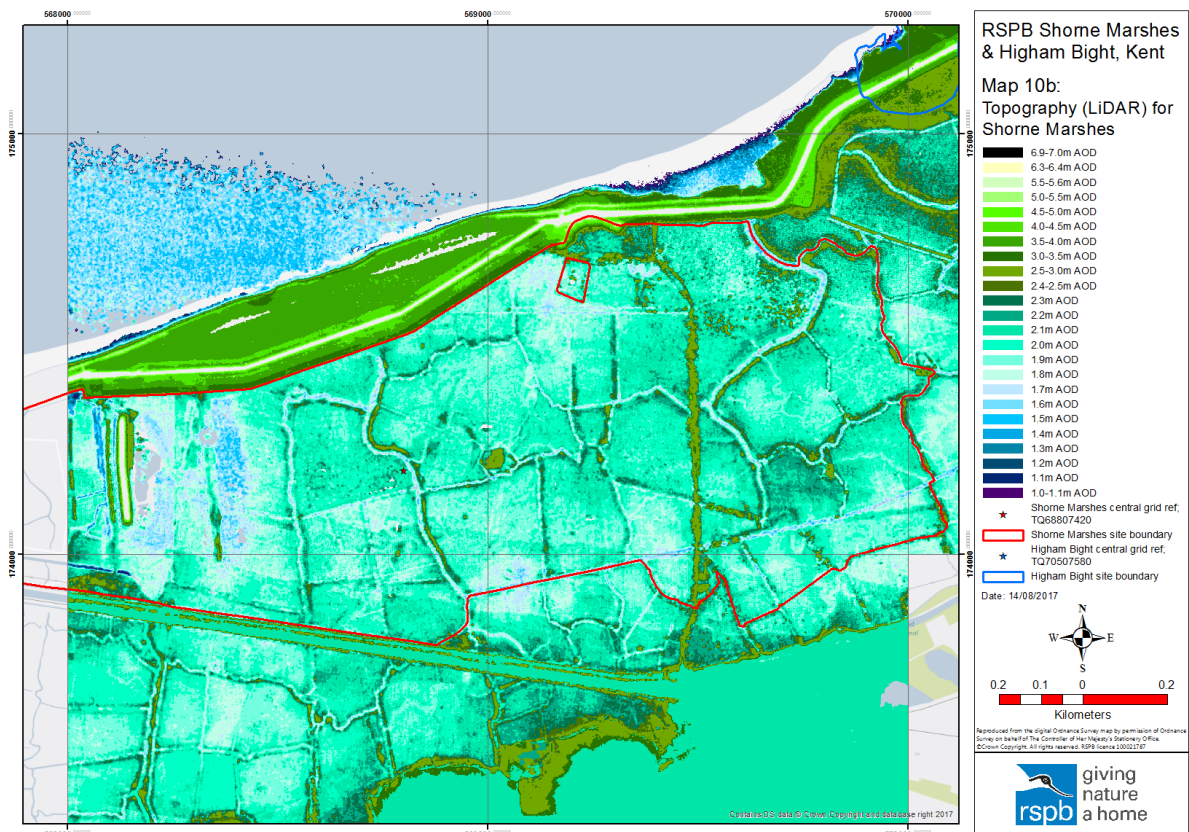
For any creation, restoration or enhancement of habitat into fully functioning high water tier wetland, the composition of the subsoil is key. Topsoil is expected to be porous, but if the site's subsoil is free draining i.e. peat or sand, then no matter how many lips, bunds, dams or culverts are installed, any surface water applied to the land will just drain away.

The bedrock geology comprises either Chalk (including Red Chalk) or a combination of Oldhaven, Blackheath, Woolwich and Reading and Thanet beds. Soils are loamy and clayey, typical of coastal flats around the Thames Estuary and with naturally high groundwater where drainage is not a limiting factor.

When these soils are wetted continuously they swell and seal and provide little opportunity for infiltration and seepage. When dry and cracked they are ineffective in retaining water at the soil surface. In field-capacity conditions, air capacity below the topsoil is expected to be low at <1% but in the topsoil may be between 5 and 10%. The hydraulic conductivity of the subsoil is expected to be very low in its swollen field capacity condition.

As stated above, the soils are excellent at retaining standing water providing that they are allowed to swell and seal and, because of this, are also extremely good for creating small-scale hydrological control structures such as dams and bunds.

See Map 10b for site topography determined from LiDAR data. Note that the data used is @10 years old and new features such as the security ditch are not shown. However, the in-field data shown remains valid.



3.2.5. Topography

Extant topography on a site is a crucial factor that defines how much or how little the field levels need to be manipulated to realise a wet grassland habitat's potential. The ideal scenario will have fields that have a wide variety of levels across the majority of each field. However, too many extremes in depths are undesirable. The ideal variation is within a 500mm band below the predominate surface level of the field. The variations should also be shallow rather than steep-sided i.e. a series of 500mm deep channels in a field is sub-optimal if the batters of the depressions are greater than 1:5. These depressions are so valuable on a wet grassland site because:

1. They hold water which holds a food source, either small aquatic invertebrates or seeds in suspension, with shallow expanses providing significant magnitudes more food than thin, linear features.
2. The batter areas provide another source of invertebrate biomass in the soils that, being damp, are easy to probe into. Wide, shallow batter areas provide easy foraging access with significant magnitudes more food than narrow, sharp batter areas.

Conversely, if the fields have too little variation above the surface level, it is likely that any surface water held therein will be in the form of extensive sheet flooding. This could easily cover the majority of a field's surface and, not only be detrimental to a wide variety of fauna and flora but be detrimental to the species that are being targeted for management. In very simplistic terms, whilst waders need an adequate provision of water in the spring, they nest on dry land.

Across the project area, there is a combination of too little topographical variation and, where present, sub-optimal topographical variation. As such, a series of rills, scrapes and islands will form an inherent part of the design. As discussed above, a very good example of habitat transformation that has provided inspiration for the scheme is Great Bells Farm on the Isle of Sheppey and that scheme is shown in Figure 6 below.

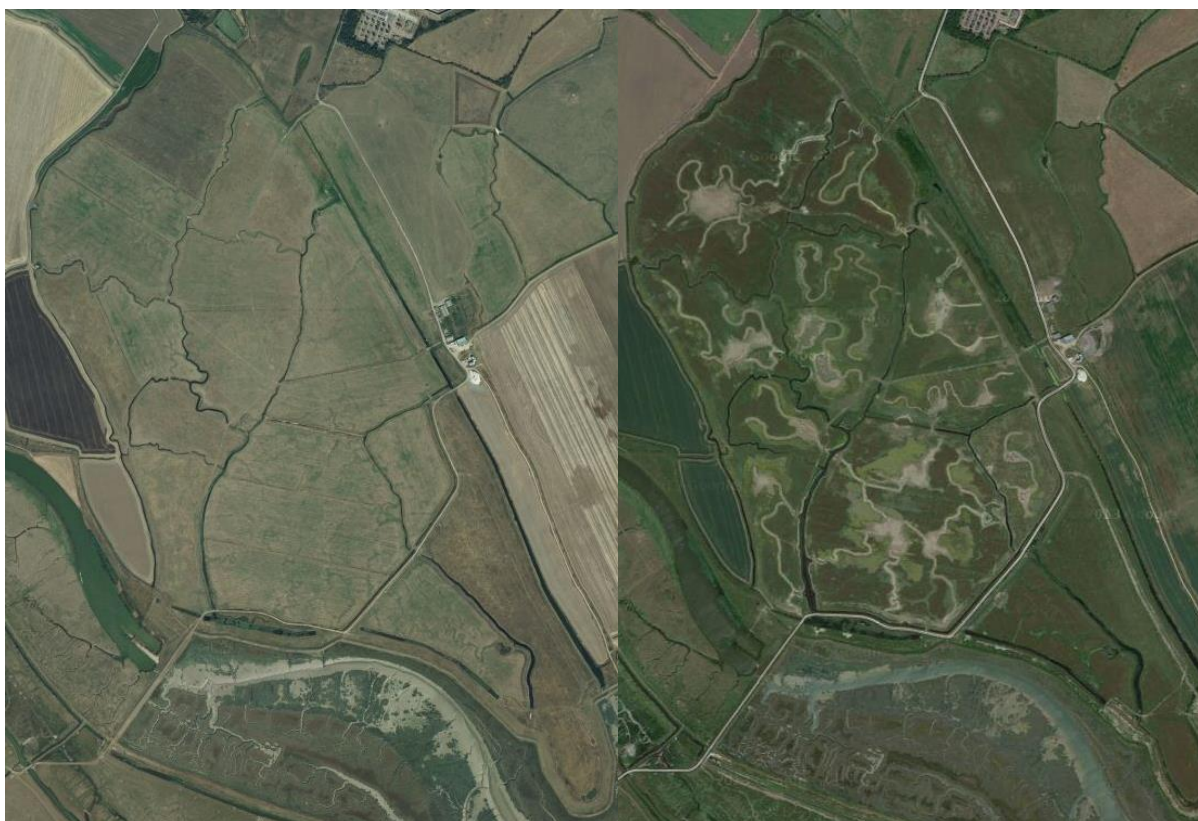


Figure 6: Great Bells Farm Nature Reserve on the Isle of Sheppey. The image on the right shows the site before transformation and the image on the left shows the site immediately after transformation activities.

3.2.6. Archaeology and Unexploded Ordnance

From experience on other sites where landscaping is required, two factors need to be accounted for in any design and its delivery, these are extant archaeology and the potential for unexploded ordnance to be unearthed

Archaeological features are generally easier to establish, and the features identified in the map and gazetteer (presented in the document 'Shorne Marshes Archaeology Gazetteer')

Having identified the known archaeological features and assessed the likelihood of unidentified archaeology, the presence of archaeology does not present an insurmountable obstacle in designing viable new wetland features and, conversely, with a sympathetic design i.e. creating rills and excavating scrapes to a shallow depth and avoiding identified features, the creation of the new wetland features do not present a risk to the extant archaeology. Furthermore, it is accepted that archaeological features in a wetland environment are better protected against deterioration. Overall, this project fulfils the RSPB's objective to ensure the preservation of all its archaeological assets.

A recent commissioned survey assessed the site as High Risk for UXO of finding unexploded ordnance. The report is presented in the document 'Shorne Marshes_UXO_Risk_Assessment'. While previous works have not found anything significant to date, it is an important consideration to ensure the works can be undertaken safely and that any UXO burden does not make the project unviable financially. The risk level attributed for multiple reasons (including the likelihood of WW2 ordnance), but principally due to the long term presence of the Milton Firing Range – which is likely to have led to a fair amount of small ordnance around the site. Given the advice contained within the reports, the level of UXO risk can be managed both physically and financially and the project remains viable.

This mitigation will take the form of onsite surveys before work is undertaken through a UXO specialist contractor, carrying out

1. Operational UXO Emergency Response Plan;
2. Non-Intrusive Methods of Mitigation
 - a. If required, Intrusive Methods of Mitigation
3. EOD Engineer in the Watching Brief Role
4. Safety sign of certificate

3.2.7. Built infrastructure

The built infrastructure present at Shorne Marshes comprises;

- Shornemead Fort
- Concrete Track through the centre of the reserve
- Reserve Signage including Rights of Way.
- Several sluices within ditches
- Overhead Phone line lines, underground gas services

There are underground utilities on the site, however they are not within 3 meters of the works areas and therefore do not present impediments to producing a design for the wetland enhancements, see document 'Shorne Marshes Line Search' for more information.

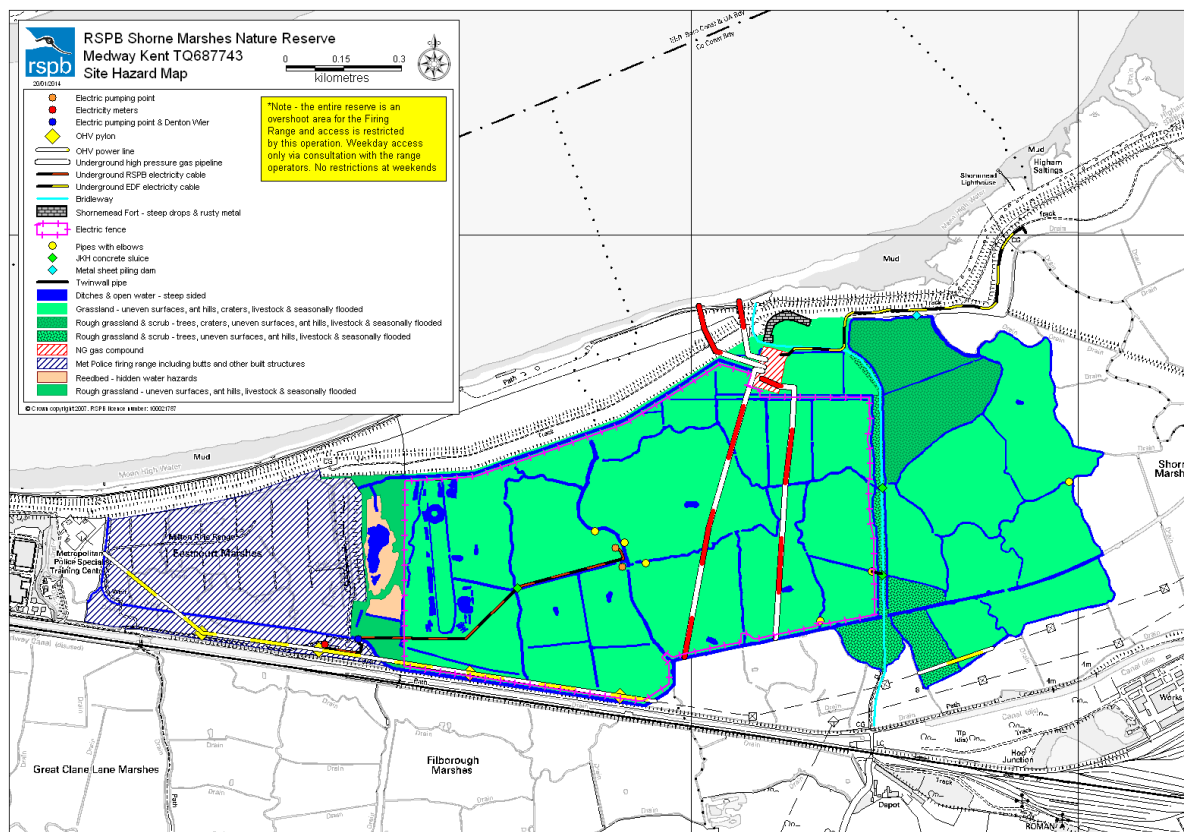


Figure 10: Site hazard map

Further, access is restricted due to the nearby Met Police Firing Range. Access should be agreed and checked with the training centre before any works on site.

4.Design Elements

Some hydrological control systems put in place during a previous restoration phase in 2007-13 have been beneficial to underpinning the hydrological strategy for the reserve, but another set of habitat enhancements are required to bring the habitat up to the highest quality. These are the creation of:

- **Rills and scrapes** – shallow excavations that will provide increased topographical variation and resilience to maintain surface water as water draws down over the breeding season. Starting in November, water levels will be raised to reach the peak extent by January/February and, beginning in April, water levels will be lowered steadily under full control until July when no, or little, surface water will be present across the fields. Subject to rainfall, some water will remain in the base of the rills and scrapes, but this will not be actively managed. Good levels of water will remain in the ditch network within the hydrological units, but the field surface will remain dry, or predominantly so, until November when the cycle is repeated. Whilst extensive surface water is highly valuable, if it is too shallow, such as would be created if only the strategy element was delivered, the surface water will evaporate too early for breeding waders to complete reproductive cycles. This will become more pronounced according to climate change predictions. Therefore, the increased topographical variation will compensate for this and provide much improved feeding opportunities. Design principles for rills and scrapes include:
 - A 'wide' range of depths to the excavations according to prevailing field topography with depths ranging from 100mm to 600mm and the average being 400-500mm deep.
 - The bases of all features are also designed to be holistic with the landscape drainage system level
 - Base width of all rills is 1m wide whilst scrapes are variable being amorphous shapes.
 - Batters of the rills will be predominantly 1:10 with scrapes having batters of 1:20 where possible or 1:10 as a minimum. Again, this maximises feeding opportunities in conjunction with a controlled, yet dynamic, water level management regime.



Figure 11: Rills and scrapes installed at RSPB Cliffe Pools in 2023 (MC/22/1755), planning granted by Medway Council. *Image:RSPB*

- **Bunds** – long, low, earth bunds that also serve to improve site access around the perimeters of the hydrological units and compartments which, by extension, helps to minimise disturbance by keeping the majority of access to the periphery. Design principles for perimeter lips are:
 - Crest width 4-6m wide with the crest at a minimum 400mm higher than peak water levels. The crest will also have a very slight camber to minimise rainfall ‘puddling’, thereby assisting with structural integrity.
 - Batters are shallow and will be 1:4 or 1:8 either side and 1:4 or 1:10 at the ends. Shallow batters increase the structural integrity of the lips and make them safer whilst driving along if a vehicle happens to veer off the edge.
 - Created entirely from site-won earth/clay and to ensure that these features are hydrologically secure they are ‘keyed-in’. This involves excavating a 2m wide by 200-300mm deep soil strip along the length of the feature at the centre of its footprint. The topsoil is removed to expose the subsoil and the resulting void is filled with site-won non-porous clay arising from other on-site excavations i.e. rills, scrapes, ditching. More site-won non-porous clay from other excavations is then placed above this to a level not more than 100mm from the finished height of the feature. The structure can then be formed to completion with more site-won clay and porous topsoil.



Figure 12: Bund installed at RSPB Higham Marshes, adjacent to Shorne Marshes, in December 2022 planning granted by Gravesham Council. (20220575). *Image: RSPB*

Approach;

- Using the natural topography of the site, from remnants of when the site saltmarsh/land drainage systems to expand the rills system. Field and length below including scape size. Using a tractor mounted spoil spreader to carry out the works.
- The rill system will mainly be made through the use of a 360 digger and tracked dumper trucks, to produce the spoil for the crossing points and bunds.

Detailed designs are presented in the document: RSPB_Shorne_Marshes_Design_Specification, compromising:

1. Site location plan at a scale of 1:7000.
2. Block plans:
 - a. Itemised scope of works in relation to any Public Rights of Way, Main Rivers and archaeological assets that are present showing the whole area at a scale of 1:2500 and 1:3000
 - b. Itemised scope of works including cross-section locations at a scale of 1:2,500.
3. Habitat Design plans
 - a. LiDAR-derived topography data
4. Cross section drawings for features
5. Schedule of Works