Land at Deal Ground and May Gurney, Norwich

Nature Conservation Management Plan

(to address requirements of Condition 8d of 12/00875/O [Norwich City Council] and Condition 38d of 2011/0152/O [South Norfolk Council])

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1 Introduction

1.1 Background and Proposals

1.1.1 Aspect Ecology is advising Serruys Property Company Ltd regarding ecological matters in respect of proposed development of land at Deal Ground and May Gurney, Norwich, centred at grid reference TG 247 074 (see red line boundary on Plan 6592/NCMP1). The proposed development lies within a larger landholding which notably includes Carrow Abbey Marsh CWS (see blue line boundary on Plan 6592/NCMP1), the majority of which is proposed for retention and ecological enhancement. This larger area comprises the 'survey area'.

1.1.2 The site is split into two main parcels, comprising the 'May Gurney' land which forms the southern part of the site, to the south of the River Yare, and the larger 'Deal Ground' land to the north of the River Yare.

1.1.3 The site is in receipt of outline planning permission (refs. 12/00875/O [Norwich City Council] and 2011/0152/O [South Norfolk Council]) for mixed development, including residential and commercial uses with landscaping and biodiversity enhancements. This document forms part of the reserved matters submission for development of 670 residential dwellings at the site, and relates to management of part of the application site and the wider landholding, hereafter referred to as the 'management area' (see Plan 6592/NCMP1).

1.2 Planning Conditions

1.2.1 Condition 8, part d of outline planning permission 12/00875/O (Norwich City Council) and Condition 38, part d of outline planning permission 2011/0152/O (South Norfolk Council) are relevant to the Nature Conservation Management Plan. The full wording of part d of the condition is as follows (as amended on 8 March 2023 under non-material amendment application 23/00183/NMA [Norwich City Council]):

"*Prior to commencement of the spine road and/or together with the submission of any reserved matters for any phase as approved under condition 14 (whichever is earlier), a Framework Environmental Action Plan (FEAP) covering the site and the adjacent County Wildlife Site (CWS) shall be submitted to and agreed in writing by the local planning authority. For each phase, a detailed EAP shall include the following:…*

d) A comprehensive Nature Conservation Management Plan relating to land inside the red line boundary depicted on drawing number 1565/NCMF2 (9.16 chapter 9 Ecology). The Plan shall include details of management responsibilities, plan review arrangements, funding, a schedule of management actions covering all phases of development (construction and long-term operation) and include provisions for any unforeseen cessation in management.

The agreed Framework EAP Plan shall be updated prior to the commencement of each phase. The development shall be undertaken in accordance with the approved EAP and the land shall be managed in accordance with the agreed Nature Conservation Management Plan thereafter. Any subsequent variations to the EAP shall first be approved in writing by the local planning authority."

1.2.2 A separate Environmental Action Plan has been produced to address parts a to c of the above conditions.

1.3 Site Overview

1.3.1 The site is located in Trowse, south-east Norwich, within an urban-edge context. The site is bound by the River Wensum to the north, beyond which lies industrial and former industrial land with a railway depot. The River Yare intersects the site (separating the Deal Ground and May Gurney land) and runs adjacent to the east of the Deal Ground land, beyond which lies parkland (including Whitlingham Country Park) and residential development within the boundary of the Norfolk Broads Authority. An asphalt plant and railway line lies to the west of the site, with more dense development beyond this.

1.3.2 The survey area comprises a number of different habitats, primarily comprising former industrial land in the north and south, and an area of fenland in the east. Woody vegetation including wet and dry woodland, scrub, scattered trees, and Bramble thickets, is present in various locations across the survey area. In addition, relatively small areas of species-poor neutral grassland and tall ruderal vegetation are present in parts of the survey area.

1.4 Purpose of the Report

1.4.1 This report sets out a management plan of the CWS and adjacent green infrastructure within the proposed development site, hereafter referred to as the 'management area' (see Plan 6592/NCMP1), and hence aims to inform part d of the relevant conditions described above.

2 Ecological Constraints

2.1.1 The ecological constraints of the management area are informed by a suite of ecological survey work, most recently in 2022. This most recent survey work included plant community (NVC) survey and specific survey work to map the population of Desmoulin's Whorl Snail *Vertigo moulinsiana*. The findings of this survey work are set out within Aspect Ecology's Baseline Ecological Appraisal for the site.

2.1.2 The habitats and species of interest within the management area are summarised in Table 2.1 below.

Table 2.1 Habitats and plant species representing ecological constraints within the site and the adjacent CWS (together referred to as the 'survey area').

Habitat type / feature	Description
Eutrophic floodplain fen (mostly designated as Carrow Abbey Marsh CWS)	An area of fen habitat intersected with a drainage ditch system is present in the centre and east of the survey area, and dominates the management area. The majority of this habitat falls within the CWS designation. The fen habitat is somewhat variable in its vegetation types, the majority being dominated by Greater Pond Sedge *Carex riparia*, while Reed Sweet-grass *Glyceria maxima*, Reed Canary-grass *Phalaris arundinacea* and Common Reed *Phragmites australis* are locally dominant. At the southern end, the fen becomes drier and transitions into tall ruderal vegetation. The vegetation is consistently tall and dense, with no evidence of recent management or access. In the absence of management, the fen is gradually drying with encroachment of trees and scrub at the margins. This is evidenced by the change of vegetation types since the previous survey in 2009, with a shift to less wet, species poorer communities.
Wet woodland (mostly designated as Carrow Abbey Marsh CWS)	Six areas of wet woodland were recorded within the survey area, five of which lie within the management area. All of these woodlands are young in nature and are dominated by Willow species, much of which has recently colonised historically open fen, which is reflected in the ground flora.
River Yare	The River Yare flows along much of the boundaries of the survey area. Much of the river is natural in character, measuring approximately 6-10m in width, and supports some aquatic vegetation. The banks support a mixture of tall ruderal vegetation with scattered trees, especially in the south and the central portion of the stretch along the Deal Ground land, while dense woodland in the form of W4 and W11 abut the river in the southern and northern sections of the Deal Ground land. In the southern part of the survey area, adjacent to the May Gurney land, the riverbank is variable with some areas of stone walling or metal sheet piling but predominantly comprising heavily shaded steep banks supporting sparse vegetation largely dominated by Ivy.
Nationally Scarce plant species	One plant species of conservation importance was recorded within the survey area, namely Marsh Fern *Thelypteris palustris*, which was recorded close to the River Wensum in an area of felled woodland (formerly W2), now occupied by colonising vegetation (PDL8). This species is listed as Nationally Scarce, albeit Norfolk is a significant stronghold. Its known extent within the application site is limited to one small patch, while the species has not previously been recorded within the survey area, such that it is likely to either be a recent colonist or has for some time only occurred as a very small population. Previously, Hoary Mullein *Verbascum pulverulentum* has been recorded within the site, but this was not re-recorded in 2022.

Habitat type / feature	Description
Invasive species	Three invasive plant species listed on Schedule 9 of the Wildlife & Countryside Act 1981 (as amended) were recorded within the survey area. These comprise Japanese Knotweed *Reynoutria japonica*, Giant Hogweed *Heracleum mantegazzianum*, and Himalayan Balsam *Impatiens glandulifera*. Japanese Knotweed in particular forms dense stands in parts of the application site and appears to have expanded its extent since 2009. Giant Hogweed and Himalayan Balsam were only recorded in the fen habitat and along the banks of the River Yare.

2.1.3 In addition to the habitat and plant community surveys, specific faunal surveys were undertaken at the survey area in 2008 to 2009 for bats (tree and building inspection surveys, emergence/re-entry surveys and manual activity surveys), Badger *Meles meles*, Water Vole *Arvicola amphibius*, Otter *Lutra lutra*, breeding birds, Great Crested Newt *Triturus cristatus*, reptiles, and invertebrates. The bat inspection survey and Badger survey work was updated in 2022, while specific survey work was undertaken for Desmoulin's Whorl Snail *Vertigo moulinsiana*. In addition, the update survey in 2022 also included an assessment of any change in the site's likely value for fauna. These findings are set out in the Baseline Ecological Appraisal for the site, while Table 2.2 below summarises the faunal constraints in relation to the management area. Update Phase 2 faunal surveys are being undertaken in 2023. The results of these surveys will be reviewed when available and should any revisions to this NCMP be necessary, an update will be provided.

Table 2.2. Faunal species representing ecological constraints in relation to the management area.

Faunal species	Description
Bats (roosting)	Numerous trees within the survey area have been identified as providing bat roosting potential, occurring as individual scattered trees, tree groups or within woodland areas.
Bats (foraging and commuting)	The survey work recorded a moderate level of foraging activity, attributable to Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle, Noctule *Nyctalus noctula*, and *Myotis* species including Daubenton's Bat *M. daubentonii*. Soprano Pipistrelle and Common Pipistrelle were the most frequently recorded species. The greatest levels of activity were associated with the River Yare corridor along the eastern margin of the survey area, which provides connectivity to the adjacent Whitlingham Country Park, where known roosts are present. Groups of trees and scrub around the fen margins were also subject to regular use. More occasional activity was recorded in the fen habitat and along the River Wensum. Update habitat assessment in 2022 concluded that there is unlikely to be any significant change in bat activity patterns across the survey area.
Water Vole *Arvicola amphibius*	Survey work for Water Vole was undertaken along the river banks and within the ditches in the fen in the Deal Ground land in 2009. No evidence of this species was recorded, which is consistent with previous surveys undertaken in 2000 and 2003. The apparent absence of this species was explained by the limited open water in ditches within the survey area, and the scarcity of grass cover along the river banks. The 2022 habitat assessment concluded that the site remains of poor suitability for Water Vole, albeit the species is known to occur along the River Yare at Whitlingham Country Park, and may therefore occur sporadically along the Yare corridor.

Faunal species	Description
Otter *Lutra lutra*	Survey work in 2009 for Otter along the banks of the River Yare and River Wensum within the survey area found no evidence of use by Otter, although the dense vegetation along the River Yare corridor was identified as potentially suitable habitat for Otter. The species was considered unlikely to frequent other habitats within the survey area, e.g. within the fen, because of the lack of year-round standing water. Habitat assessment in 2022 concluded that there was no significant change to the previous assessment, with any interest focussed along the River Yare corridor.
Other mammals (including Priority Species)	The Priority Species Harvest Mouse *Micromys minutus* could be present within the fen habitat and Hedgehog *Erinaceus europaeus* could utilise the drier parts woodland and scrub habitats. Polecat *Mustela putorius* has also been recorded in the local area and could use the drier woodland and scrub habitats.
Reptiles	Survey work undertaken in April to August 2009 recorded a low population of Grass Snake *Natrix natrix* in grassland and fen habitat across both the Deal Ground and May Gurney land, although the population was considered to represent a good size within the fen habitat. No other reptile species were recorded. Habitat assessment in 2022 concluded that the suitability of the survey area remains similar to 2009, with slightly reduced suitability due to tree and scrub encroachment.
Birds	Breeding bird survey undertaken at the Deal Ground land in 2009 recorded a total of 53 species, of which 26 were considered to be breeding or probably breeding within the survey area, and 7 possibly breeding. The remaining 20 species were observed flying over or foraging at the survey area, but presumed to be breeding elsewhere. A good density of breeding birds was recorded within the survey area overall, with the fen habitat in particular supporting a significant assemblage of birds, in contrast to the drier areas of woodland, scrub, ruderal and grassland habitats which supported a much reduced diversity of species. Notable species recorded within the fen included the Schedule 1 species Cetti's Warbler *Cettia cetti* and the RSPB red-listed species Grasshopper Warbler *Locustella naevia* and Cuckoo *Cuculus canorus*, while the red-listed species Linnet *Carduelis cannabina* was recorded within scrub. In addition, the Schedule 1 species Barn Owl *Tyto alba* and Kingfisher *Alcedo atthis* were recorded as non-breeding individuals, recorded hunting over the fen and along the River Yare, respectively. Amber-listed species included Sedge Warbler *Acrocephalus schoenobaenus*, Willow Warbler *Phylloscopus trochilus* and Reed Bunting *Emberiza schoeniclus*, all of which were recorded in the fen habitat. Update habitat assessment in 2022 concluded that the previous evaluation remains appropriate, albeit there could be a minor change in the bird assemblage, reflecting the higher prevalence of scrub and woodland at the expense of fen and tall ruderal vegetation. However, this is not likely to significantly alter the conservation importance of the assemblage.
Fish	Fisheries data held by the Environment Agency for the Rivers Wensum and Yare in the vicinity of the site include records of three UK Priority Species and one Annex 2 species. These species could occur within the stretches of river adjacent to the survey area.
Desmoulin's Whorl Snail	Survey work for invertebrates undertaken in 2009 recorded the presence of Desmoulin's Whorl Snail in sedge-dominant vegetation and the ditches within the fen habitat. Update survey work in October 2022 recorded this species in approximately half of the sample points taken within the fen. The distribution of the species was patchy and concentrated on the south-central part of the fen.

Faunal species	Description
Other invertebrates	Survey work for terrestrial invertebrates undertaken at the Deal Ground land in 2009 identified a total of 592 species of invertebrates. This assemblage included 17 Priority Species, one Nationally Rare RDB3 species (Twin-spotted Wainscot Moth *Archanara geminipuncta*, associated with reedbeds), 14 Nationally Notable species, and 30 Nationally Local species. These species of conservation interest were primarily associated with wetland and ruderal habitats, which supported 40% and 42% of the species of conservation interest within the survey area, respectively. Woodland habitat was of comparatively lower interest, supporting 26% of the species of conservation interest within the survey area. Update habitat assessment in 2022 identified that the condition of habitats for invertebrates remains similar to the situation in 2009, albeit the gradual drying of the fen and associated reduction in floristic diversity may have reduced the value of this habitat for invertebrates. The distribution of ruderal habitats within the site has shifted since 2009, with the majority now located along the River Yare banks, which are likely to be of particular importance for invertebrates. Overall, the value of the survey area for invertebrates is likely to be unchanged since the previous assessment.

3 Aims and Objectives

3.1 Scope of the Management Plan

3.1.1 This management plan incorporates areas of the retained Carrow Abbey Marsh CWS and adjoining green infrastructure within the proposed development, as indicated in principle on drawing number 1565/NCMF2, which was included within Chapter 9 of the Environmental Statement for the outline planning application. The boundary of the management area has since been refined according to the detailed design of the reserved matters application, as set out at Plan 6592/NCMP1.

3.2 Requirement for Management

3.2.1 Before the development of a management plan, it is first necessary to consider whether any management is required or whether the existing situation is acceptable. The fen habitat which dominates the management area is essentially a successional stage, such that in the absence of management, it would be expected to develop into wet woodland. As such, continual management is required to maintain fen habitat. The fen within the management area has not been managed for many years, such that it is in a gradual transition towards scrub and woodland, especially in the east of the fen where the extent of woody vegetation has substantially increased since the previous survey work in 2009. As such, under a 'do nothing' scenario, the fen is predicted to eventually be lost to scrub and ultimately wet woodland. Therefore, intervention through appropriate restoration and ongoing management is considered necessary to maintain the presence of fen habitat, and reverse and arrest the recent trend of succession to scrub and woodland.

3.3 Aims and Objectives of Management

3.3.1 The management aims and objectives have been designed to deliver a balanced approach to enhancing the value of the CWS for the habitats and faunal populations of interest. Such a balanced approach is appropriate given the differing habitat preferences of each species. For example, Desmoulin's Whorl Snail and Grass Snake favour more open habitats, while many breeding birds such as Cetti's Warbler favour scrubby vegetation. Therefore, the management plan seeks to provide habitat diversity to cater for a variety of species, while focussing on the existing and historic fenland interest.

3.3.2 The overarching aim of the management plan is to arrest and reverse the ecological decline in condition of the CWS, restoring and creating a good example of the Priority Habitat 'lowland fens' which is representative of the local area and supports a diversity of associated habitats such as wet woodland, scrub, and tall ruderal vegetation.

3.3.3 To achieve this aim, the following objectives are proposed:

- Restoration of the fen through the introduction of sensitive ecological management in the form of low-density livestock grazing, to arrest and reverse the decline in its condition and secure the continued presence of the Priority Habitat 'lowland fen' in perpetuity;

- Maintain and enhance habitat diversity through the retention of wet woodland, scrub, tall ruderal vegetation, and fen habitats, in addition to the creation of new habitats such as wildflower meadow within Kiln Park;

- Localised clearance of woody vegetation where fen vegetation remains present below the canopy to restore fen habitat where this has recently been colonised by trees or shrubs;
- Provision of suitable access and infrastructure within and throughout the fen for livestock;
- Establishment of new habitats including swales to draw the fen out into the built development, in addition to a variety of habitats within Kiln Park for multi-functional use;
- Control and eradication of non-native invasive plant species;
- Control of access into the CWS by the public and pets;
- Monitoring of management operations and identification of any remedial measures or alterations required to achieve the above aims and objectives.

3.4 Guidance and Information Sources

3.4.1 This management plan has been informed by a number of guidance documents relating to habitat management, and more specifically lowland fen management, for nature conservation. These include the following publications:

- The Fen Management Handbook, (2011), editors: A. McBride, I. Diack, N. Droy, B. Hamill, P. Jones, J. Schutten, A. Skinner, and M. Street. Scottish Natural Heritage, Perth.
- Fen Management Strategy (undated). Broads Authority.
- Managing Habitats for Conservation (1995), editors: W.J. Sutherland, D.A. Hill. Cambridge University Press.

3.4.2 In addition, the management plan is informed by a Nature Conservation Management Framework (Aspect Ecology, September 2010) for the area, which is included at Appendix 9.16 of the ES chapter for the outline application.

4 Management Activities

4.1 Management Components

4.1.1 To address the above aims and objectives, the following management components are identified for which management activities will be specifically tailored. The management components are informed by the Nature Conservation Management Framework submitted for the outline planning application, while a separate component has been specified for invasive species, given their prevalence across the management area. The locations of each of the spatial components (A to F) are shown on Plan 6592/NCMP1.

- **Component A:** Fen habitat and associated ditch system;
- **Component B:** Woodland;
- **Component C:** Scrub;
- **Component D:** River bank (River Yare);
- **Component E:** Swales;
- **Component F:** Kiln Park;
- **Component G:** Invasive species;
- **Compartment H:** General management procedures.

4.1.2 Specific management prescriptions relating to each component are set out below and are also set out in the corresponding management sheets (see Annex 6592/NCMP1) which should be handed over to the management contractor, together with Plan 6592/NCMP1 showing the locations of each component A to F.

4.2 Component A: Fen Habitat and Associated Ditch System

4.2.1 Management of the fen habitat and ditch system will focus on the following management activities, described in turn below.

Low intensity grazing regime

4.2.2 **Rationale.** Grazing is proposed as the primary form of fen management to interrupt the process of succession to scrub and woodland. Low grazing densities of livestock will promote structural diversity within the fen vegetation (vegetation height and density) and can encourage the appropriate seral stages of succession to develop into a mosaic of habitats across the fen. In addition, this will ensure that large quantities of organic matter do not accumulate within the fen, which can smother the germination of some plant species, although areas of decaying vegetation will still be available for a range of invertebrates and also as egg laying sites for Grass Snake.

4.2.3 **Livestock type.** Cattle are typically preferred for conservation management of fens, because they provide a variable sward when stocked at low to moderate densities. An appropriate breed of cattle will be used that are well suited to wetland conditions with low maintenance requirements, for example, a lighter traditional breed or single sucker beef cattle.

4.2.4 **Stocking density.** Initially, a low density of 2 or 3 cattle should be introduced to monitor their activity and effects on the fen and minimise the risks of any harmful effects such as excessive poaching. Depending on ongoing outcomes, the stocking density could be slightly increased up to a likely maximum of 8 cattle (equating to approximately 2 per hectare) to provide a suitable diversity of vegetation.

4.2.5 **Grazing period.** A relatively late grazing period is favoured for fen management. This should be timed to coincide with the driest season and avoid prolonged grazing during wet periods, to minimise poaching which can cause lasting damage. Typically, a grazing period from July to October is suitable for conservation management of fens, although there should be flexibility depending on annual weather conditions.

4.2.6 **Extent of livestock access.** The livestock will have access to the entire CWS where it falls outside of the proposed development site, including drier parts in the south, and areas of tree cover which are especially prevalent in the east (see Plan 6592/NCMP1). This is important for welfare purposes, for example during periods of high temperatures or unexpected flooding. Access across ditches will be provided by a series of culverted bridges to be installed under the proposed development (see Plan 6592/NCMP1). Stock-proof fencing will be installed along the top of the banks of the River Yare to prevent erosion from livestock poaching, with the exception of small drinking bays if required.

4.2.7 **Containment.** A stock-proof fence, alongside gates for access, will be installed around the intended grazing area prior to the introduction of any livestock. The fence will not only prevent livestock from entering the proposed development site, but will also exclude livestock from the vast majority of the river banks (with the exception of drinking points if required) by installing fence at least 2m from the banks of the River Yare.

4.2.8 The fencing adjacent to the proposed development site will be accompanied by further physical measures to deter access by the public and pets, including thorny shrub planting and a wet ditch system (as set out within the Environmental Action Plan). The fencing will be subject to regular (at least monthly) inspection by the appointed management company to ensure it remains stock proof. Any damage to the fence will be repaired at the earliest opportunity and consideration will be given to moving livestock off the site should any fencing vulnerabilities be identified, until these have been repaired.

4.2.9 **Welfare.** The livestock will have unrestricted access to a reliable source of fresh drinking water. Drinkers should preferentially be sited in drier parts of the fen (e.g. in the south) to minimise poaching. If necessary, livestock will also be provided access to small parts of the River Yare for drinking, although the majority of the banks will be fenced off to prevent erosion and siltation. Cattle handling facilities will be installed adjacent to the access gate into the CWS, as required. Livestock should be regularly checked, especially initially when welfare checks should be undertaken by the farmer at least daily to ensure the cattle adjust to the site conditions.

Ditch restoration

4.2.10 The existing ditch network across the fen will be restored to provide the wet and humid conditions favoured by Desmoulin's Whorl Snail, with dense emergent vegetation. To achieve this, selective clearance of decaying vegetation will be undertaken along approximately 30% of the total ditch length, to deepen the ditches and provide open water habitat.

4.2.11 In addition, the opportunity will be taken to re-profile selected sections of a number of ditches, with long sloping banks to encourage the development of transitional vegetation communities.

4.2.12 The above work will be undertaken using light machinery in late summer or autumn following a period of dry weather, to minimise ground disturbance from machinery movement. Machinery will follow the same access tracks into and out of the fen to minimise disturbance. The work will be supervised by a suitably qualified ecologist, at least initially, to ensure that damage to existing habitats is minimised.

4.3 Component B: Woodland

4.3.1 Management of the woodland will focus on maintaining the areas of woodland within the CWS, and enhancing its value through selective coppicing. Livestock will also have access to the majority of the woodland, thereby helping to control its expansion into the adjacent fen and improving structural diversity.

4.3.2 **Rationale.** Coppicing is a common management technique for willow woodland, which has the benefit of controlling the expansion of the woodland into the adjacent fen, while benefitting fauna such as invertebrates and birds (including Grasshopper Warbler, Sedge Warbler and Reed Bunting) through the rotation cycle. This management activity prevents the development of extensive areas of closed-canopy woodland which tend to be less favoured by fenland bird species and would eventually lead to the loss of a fen ground flora.

4.3.3 **Coppicing cycle.** Coppicing will be undertaken on a 10 year rotational cycle, focussing on younger specimens. Mature specimens will be retained as 'standard' trees, in recognition of their value for fauna particularly as they begin to provide dead and decaying wood, and to minimise the risk of damaging trees with bat roost potential. In addition, any trees with cavities, crevices or dense Ivy cover will be retained given that these could provide potential bat roost features. If at risk of canopy failure, selected pollarding of mature trees will be undertaken.

4.3.4 To provide habitat diversity, no more than 30% of any one woodland area will be coppiced during any one cycle, with coppiced blocks scattered across several small compartments rather than concentrating in one particular area. Hand tools will be used for coppicing, because of the relatively small area and the difficulties associated with machinery access, which would likely cause substantial ground disturbance.

4.3.5 Cut wood should be partly disposed of off-site, and partly retained to provide habitat piles within the management area which will benefit species such as Grass Snake and saproxylic invertebrates. The habitat piles will be sited in a variety of situations, including open and sunny locations and more shaded and sheltered positions, to maximise opportunities for a wide range of fauna.

4.3.6 **Timing.** The 10 year coppicing cycle should be undertaken outside of the bird nesting season, i.e. avoiding the period March to August inclusive, and also avoid particularly wet periods to minimise damage to vegetation. As such, the early autumn period (September and October) is likely to be optimal.

4.4 Component C: Scrub

4.4.1 Management of the scrub habitat will comprise retention of some scrub, particularly around the margins of the wet woodland and on drier ground, in addition to small-scale coppicing of selected areas to re-invigorate the fen ground flora.

4.4.2 **Rationale.** Scrub is of value to a variety of fauna, particularly birds such as Cetti's Warbler, while scrub edge is recognised as a valuable habitat for invertebrates. However, the extent of scrub within the management area has increased in recent years and threatens the conservation value of the fen. As such, small-scale coppicing will be introduced to restore the fen vegetation which persists below the scrub but which would eventually be lost through shading without management intervention.

4.4.3 **Coppicing.** The coppicing regime will follow the methodology for the wet woodland (Area B) set out above, i.e. comprising a 10 year cycle. The areas to be coppiced will focus on retaining scrub around wet woodland and on drier ground, and maximising the length of scrub edge. Coppicing will be timed to be undertaken during the autumn period, as for the wet woodland. Cut wood should be partly disposed of off-site, and partly retained to provide habitat piles in a variety of situations within the management area to benefit faunal species.

4.4.4 In addition, livestock will have access to areas of scrub, which will likely cause some localised small-scale disturbance which will enhance structural diversity, breaking up extensive areas of dense scrub which are of limited wildlife value and restricting the encroachment of scrub into adjacent fen habitat.

4.5 Component D: River Bank (River Yare)

4.5.1 Management of the River Yare banks will seek to maintain and manage vegetated buffer strips adjacent to the river channel to help reduce the effects of soil erosion. In addition, woody vegetation will be managed to ensure a diversity of microhabitats is available along the riverbank, including more shaded areas contrasted with more open areas to encourage the growth of aquatic and marginal vegetation.

4.5.2 **Rationale.** The banks of the River Yare were identified as an important ecological feature during the ecological surveys, primarily on the basis of the relatively undisturbed habitats, which includes unbuilt banks (for the most part) with shallows and aquatic vegetation. The river corridor is also of value for a variety of fauna, including invertebrates, breeding birds, and potentially Otter. However, the ecological value of the river corridor is threatened by the presence of invasive plant species, including Giant Hogweed and Himalayan Balsam. Therefore, management will aim to preserve and enhance the ecological value of the river corridor through a 'light touch', low intensity management regime, with the exception of invasive plant species which will be subject to control measures.

4.5.3 **Tree and shrub management.** To maintain open areas along the river banks, small-scale selective coppicing or pollarding of young trees and shrubs will be undertaken on a 10 year rotation. This work will only be applied to a small proportion of trees and shrubs, e.g. 20 to 30%, to avoid damaging any existing ecological interest. The stumps of trees or shrubs will be left in place and untreated to allow regrowth and to maintain faunal interest associated with the stumps.

4.5.4 **Rotational management of bankside vegetation.** Management of the bankside herbaceous vegetation will be undertaken according to a long rotation. This will involve annual cutting a section of tall ruderal vegetation, totalling no more than 25% of the bank length in any one year, to increase habitat diversity. This will be undertaken on a rotational basis, with a different section cut in each year. Some areas of permanently uncut vegetation will be retained to allow establishment of trees and shrubs, further increasing habitat diversity, while providing permanent areas of cover for species such as Otter. Cutting will be undertaken in late summer or autumn, avoiding the bird breeding season. This work will be undertaken using hand-held machinery such as brushcutters, to avoid disturbance to the

river banks. The cut material should be removed and either stacked into a designated area or removed off-site.

4.6 Component E: Swales

4.6.1 New swales will be provided within the 'Marsh Reach' development, with the aim of drawing the existing fen into the area of built development, providing a soft interface between the extensive and naturalistic fenland and the built development. The swales will be designed to have a gently sloping bank profile, encouraging a diversity of bankside vegetation including aquatic species, marginal species, through to tall ruderal species associated with the drier upper banks. Establishment of fen vegetation within the swales will be aided by translocation of fen habitat from the small areas where fen is to be lost under the proposals, supplemented by additional planting. Details of the translocation process are set out in the Environmental Action Plan for the site.

4.6.2 **Rationale.** Management of the swales will aim to manage and maintain vegetation within the swales to encourage a diversity of vegetation and prevent succession to scrub and woodland. Given the more urban context (compared with the fen described above), management will also aim to deliver a high aesthetic value, in addition to biodiversity value. This will be achieved through rotational cutting rather than grazing. Rotational cutting will allow some areas of tall vegetation to remain year-round.

4.6.3 **Monitoring of vegetation establishment.** During the establishment phase of both the translocated fen turfs and sown vegetation, the vegetation will be regularly monitored for the first five years by the management contractor. Consideration will be given to supplemental watering if required. Should any areas of translocated or seeded vegetation fail to establish, supplemental sowing will be undertaken. Consideration will be given to the reasons for failure, and the seeding mix adapted to more appropriate conditions if considered necessary.

4.6.4 **Rotational cutting.** Annual cutting will be undertaken in late summer (e.g. September), on a rotational basis. No more than one third of each swale should be cut each year. Cutting should be undertaken with small machinery or hand tools (e.g. brushcutters) to minimise ground disturbance, and should preferably be undertaken following a period of reasonably dry weather. The cut material should be removed and either stacked into a designated area where this would not disrupt amenity value, or be removed off-site.

4.6.5 **Visual amenity.** If deemed necessary to improve visual amenity of the swales, a boundary strip (e.g. 1 or 2 metres) at the interface with the built development can be subject to regular mowing during the growing season. This could help residents to understand that the low intensity management of the swale interior is an intentional part of the management regime rather than an area which has been neglected.

4.7 Component F: Kiln Park

4.7.1 Kiln Park will comprise a new area of public open space to the north of the fen. In addition to providing areas of public open space, the park will provide landscape and biodiversity benefits through the creation of habitats including wetland meadow, trees and scrub, and amenity grassland, in addition to hard surfacing to facilitate public recreation.

4.7.2 **Rationale.** The rationale for management of Kiln Park is to deliver multifunctional open space for the benefit of public recreational use, landscape amenity, and biodiversity benefits. As such, the management prescriptions will vary from areas of more intensively mown amenity grassland for recreational use, to taller-sward wetland meadow managed

on a rotation allowing patches of ruderal and herb species to develop to provide a source of nectar and an undisturbed refuge for fauna, to areas of trees and scrub subject to minimal intervention.

4.7.3 **Amenity grassland.** Management of the amenity grassland will aim to provide recreational use and a high level of amenity through regular cutting (e.g. once every two weeks) using machinery during the growing season. Erosion (e.g. through excessive trampling) will be monitored with any grassland turfs reinstated and/or protected through temporary fencing where necessary.

4.7.4 **Wetland meadow.** For the first year after sowing, areas of wetland meadow will be managed according to the same regime as the amenity grassland, to prevent competitive species from becoming highly dominant. Following this first year, cutting will be undertaken on an annual basis in late summer (e.g. August or September), on a rotational basis, with no more than one third of the total area of meadow cut in any one year. In addition, some areas of rarely cut grassland (e.g. once every five years) will be allowed to develop to encourage tall herbs to establish. Depending on the sward establishment, an additional spring cut may be considered if competitive grasses become dominant. Arisings from cutting will be removed and either piled into designated areas at the edge of scrub, or removed off-site.

4.7.5 **Trees and shrubs.** Areas of new tree and shrub planting will be subject to appropriate protection and aftercare to encourage successful establishment, with any failed specimens replaced as necessary. Management of established or retained scrub will be limited to cutting at the margins to prevent scrub encroaching into adjacent habitats, while allowing some areas to develop into a dense structure.

4.8 Component G: Invasive Species

4.8.1 Three invasive plant species were recorded within the management area, namely Japanese Knotweed, Himalayan Balsam and Giant Hogweed. These three species are listed on Schedule 9 of the Wildlife & Countryside Act 1981 (as amended), and have potential to outcompete native flora. Therefore, the entire management area will be subject to annual monitoring for these species, with appropriate control measures implemented to prevent their further spread, and ideally to eradicate them from the site.

4.8.2 In addition, the proposed development adjacent to the management area will increase the risk of other invasive species becoming established, particularly from unauthorised disposal of garden waste. Therefore, management will include annual monitoring and removal of any other identified invasive species.

4.8.3 Control and eradication of the three invasive species identified on site will be undertaken according to best practice measures, as set out for each species in turn below.

4.8.4 **Japanese Knotweed.** Current best practice guidance from the Environment Agency, Defra, and Natural England advocates the use of approved herbicides to control and eradicate Japanese Knotweed[1]. This should be undertaken by (or under the close supervision of) a contractor holding a certificate of competence for herbicide use. A Control of Substances Hazardous to Health (COSHH) assessment must be undertaken prior to starting work. Any application of herbicide near water (within 5 m) will require approval from the Environment Agency.

[1] https://www.gov.uk/guidance/prevent-japanese-knotweed-from-spreading

4.8.5 Currently, glyphosate is recommended to treat this species. Herbicide should be applied within the period July to October, and repeated annually for at least three years until the plants completely stop regrowing. After this three-year period, the site should be monitored for at least two years during the growing season to identify any regrowth. Glyphosate can sprayed onto foliage or by stem injection. Spraying should be undertaken during dry and calm weather conditions.

4.8.6 **Himalayan Balsam.** Mechanical control, such as hand-pulling or cutting, is recommended to control this species, because these methods are effective and the proximity of the plant to a watercourse (namely the River Yare) poses risks associated with herbicide use. In order to be effective, plants should be pulled between May and July (before the seed-pods ripen) or cut between March and May. Ideally, multiple visits should be undertaken within this period to remove newly emerging seedlings. Hand-pulling should aim to pull up the root system, while cutting should be as close to ground level as possible. This procedure should be repeated annually until no new regrowth emerges (likely two to three years).

4.8.7 **Giant Hogweed.** A combination of chemical and mechanical control is typically required for large stands of this species, which is particularly prevalent along the River Yare. Given the dense and tall stand of this species, mechanical cutting is initially recommended, because of the difficulties in efficiently applying herbicide to all plants in such a dense and tall stand. Therefore, the plants should be cut to ground level (e.g. using brushcutters) in March or April. Appropriate PPE should be worn bearing in mind the toxicity of this plant. Following cutting, follow-up spot herbicide treatment using glyphosate (or other approved herbicide) should be undertaken in May or June. Cutting and/or herbicide application should continue over multiple visits during the spring and early summer annually, until regrowth has ceased. This is likely to take between five and ten years.

4.8.8 **Fencing and signage.** Where stands of invasive species are located in proximity to publicly accessible areas, such as footpaths and roads, consideration will be given to the installation of temporary fencing and signage. This will (i) discourage the public from entering the area, which could exacerbate the spread of the species and, in the case of Giant Hogweed, could pose health hazards, and (ii) increase awareness about the need for vegetation management, given that extensive areas of cut or dying vegetation could otherwise lead to public concern.

4.9 Component H: General Management Procedures

4.9.1 Other general management procedures will be undertaken throughout the management area, including maintenance of faunal enhancements, removal of litter, maintenance of public access and infrastructure, and weed control. Methods for the creation of faunal enhancements and infrastructure such as physical barriers are set out in the Environmental Action Plan for the site, while this section relates to the ongoing management and maintenance of such features once created.

4.9.2 **Maintain habitat piles and hibernacula.** A series of habitat piles and hibernacula will be created throughout the management area using the arisings from woodland and scrub coppicing. These will be maintained and/or supplemented through the periodic creation of new features, using arisings from management. This could include small scattered piles of cut fen / grassland vegetation, and piles of woody vegetation from management of trees and shrubs. Any new features created will be sited in a variety of situations, including open and sunny locations and more shaded and sheltered positions, to maximise opportunities for a wide range of fauna.

4.9.3 **Maintain Otter holt adjacent to River Yare.** The Otter holt which is to be created along the River Yare (as set out in the Environmental Action Plan) will be subject to annual inspection by the management contractor to ensure it remains in place and fit for use. This will include checking that the entrance holes are free of obstruction and that the structure has not collapsed. Should the Otter holt become damaged, a replacement holt will be provided in a suitable alternative location, following the procedure for the holt creation set out in the Environmental Action Plan, while also considering any design improvements which could increase the longevity of the Otter holt.

4.9.4 **Maintain kiln building to provide features for roosting bats.** The kiln building is proposed for enhancement to provide bat roosting opportunities, as set out within the Environmental Action Plan. This will be subject to an annual inspection from the ground by the management contractor. The inspection will include checking the integrity of the structure, the condition of the metal grille at the entrance to the kiln, and any public disturbance. Where the grille has become damaged or people have gained access, suitable repair measures will be arranged to deter further public access.

4.9.5 **Maintain bat and bird boxes within the CWS.** Bat and bird boxes will be subject to annual inspection from the ground by the management contractor, to ensure they remain securely fixed in place and remain suitable for occupation. Should any boxes become damaged, dislodged or removed, these will be replaced in a similar location.

4.9.6 **Litter removal.** The site will be regularly inspected for litter and dumped items, with suitable removal off-site as required.

4.9.7 **Maintain public access and associated infrastructure.** Public access infrastructure such as paths and litter bins, for example within Kiln Park, will be regularly inspected and maintained to provide a high amenity and ensure safe public access. Surfaced pathways will be maintained through regular removal of any colonising weeds by hand, removal of litter, mud and plant debris by hand removal or use of a high-pressure spray, and inspection and repair of any defects in surfacing.

4.9.8 **Maintain fencing, gate, and access bridges across fen.** Livestock infrastructure such as stock-proof fencing, the access gate, bridges across the ditches, and drinking facilities will be regularly inspected and repaired as necessary to ensure the safe containment and welfare of livestock, unhindered access by the farmer, and to deter public access into the fen. This will include inspections and repairs as necessary.

4.9.9 **Weed management.** Newly created habitats in particular pose a risk of weed establishment, from both native (e.g. Common Ragwort) and non-native weed species. The presence and extent of such species will be monitored at least annually, and more frequently during the establishment phase of newly created habitats. Where any such species become dominant, or invasive non-native species are identified, these will be subject to suitable control measures depending on the species in question. This could include more regular cutting and/or spot treatment of herbicides. In general, the use of herbicides will be restricted to the minimum quantity and frequency necessary, and consideration will be given to alternative control measures such as cutting or hand weeding.

5 Implementation and Management Structure

5.1 Management Responsibilities

Serruys Property Company Limited owns the entirety of the management area. The landowner's nominated Landscape Maintenance Contractor will be responsible for the overall ongoing maintenance operations of the site, including areas of landscape planting within the development. Consideration will be given to developing an agreement with local conservation grazing organisations to provide grazing services within the CWS.

5.2 Plan Period

5.2.1 This management plan addresses a period of 20 years from commencement of management activities. The 20 year period is considered sufficient to deliver the aims and objectives of this management plan, including the creation of new habitats and restoration of existing habitats. Within this period, the plan will be subject to periodic review, as set out under the monitoring section below, whilst a full review will be undertaken at the end of this 20-year period, to identify ongoing management requirements.

5.3 Funding

5.3.1 Implementation of the measures set out under this Management Plan will initially be funded by Serruys Property Company Limited or any subsequent landowner who takes on responsibility for the site. In the long term, management will be handed over to an appointed management company or other body, to be funded by an annual charge from the residents of the proposed development or by dividends from an invested sum.

5.4 Schedule of Management Actions

5.4.1 A schedule of management actions covering all phases of development (construction and long-term operation) is provided in Annex 6592/NCMP1.

6 Monitoring

6.1 Requirement for Monitoring

6.1.1 A five-year programme of ecological monitoring was proposed under the outline application, to inform the success of the management plan. This is considered appropriate given that the first five years are likely to be critical in the success of the management plan, following which new habitats should be established and favourable management should be introduced to the existing habitats. The monitoring visits will therefore identify how the management plan should be adapted going forward, to suit the dynamic conditions on site.

6.2 Monitoring Methodology: Years 1-5

6.2.1 For the first five years after the commencement of this management plan, monitoring will be undertaken by a suitably qualified ecologist. One visit should be undertaken per year, within the optimal season for botanical work (May to September inclusive). Each visit should include an update extended Phase 1 habitat survey, in order to map the distribution of habitats within the monitoring area and any changes from the baseline situation. Particular attention will be given to the progress of establishment of new habitats, including identification of any failed areas which may require reseeding / replanting.

6.2.2 In addition, the monitoring visit will assess the suitability of management measures in retained habitats, including the woodland, scrub, and fen. This will include recording the proportion of woodland and scrub subject to management, and the success of ground flora regrowth in managed areas. Grazing levels in the fen will also be monitored, by measuring the minimum and maximum sward height and the approximate percentage coverage of short-sward versus long-sward vegetation.

6.2.3 Monitoring visits will also include mapping the distribution of invasive plant species, including Himalayan Balsam, Japanese Knotweed, and Giant Hogweed, and the apparent success of control measures for these species. Faunal enhancement features such as bat boxes and bird boxes will be inspected from the ground to ensure they remain in place and fit for purpose. Any adverse impacts on habitats or fauna, e.g. from recreational pressure, will be identified to inform suitable management measures going forward.

6.3 Monitoring Methodology: Years 5-20

6.3.1 Following the initial monitoring phase, routine monitoring will be undertaken by the appointed management body at least annually until the end of the 20 year plan period. This will involve monitoring the ongoing success of management operations to achieve the objectives specified in this plan, with any remedial measures identified. In addition, a full update Phase 1 habitat and invasive species survey, following the methodology set out above, will be undertaken every five years (i.e. in years 10 and 15).

6.4 Plan Review

6.4.1 This NCMP will be subject to review every five years, following the corresponding ecological monitoring visit. The review will include an appraisal of the effectiveness of the management prescriptions in delivering the specified aims, and objectives. The review will consider whether the current management prescriptions remain appropriate, or whether any amendments should be introduced in order to meet the objectives. The findings of the review, and any proposed changes to the management prescriptions, will be submitted to the LPA.

6.5 Provisions for Unforeseen Cessation in Management

6.5.1 Should any of the monitoring visits identify that any part of the management activities contained within this management plan have unexpectedly ceased, remedial actions will be proposed. This will be guided by the management activity in question. For example, if proposed habitats have failed to establish, this may require reseeding or replanting followed by an appropriate aftercare period. Alternatively, cessation of management of existing habitats may simply require re-commencement of the planned management activities without further amendment. Any such remedial measures will be reported within the 5-year review to be prepared by the appointed ecologist, or sooner in the form of an interim review if considered necessary by the appointed ecologist.

7 Conclusions

7.1.1 Aspect Ecology has produced a Nature Conservation and Management Plan to address Condition 8d of outline planning permission 12/00875/O (Norwich City Council) and Condition 38d of outline planning permission 2011/0152/O (South Norfolk Council). The Management Plan builds on the Nature Conservation Management Framework Plan produced for the outline application (Appendix 9.16 of the Environmental Statement).

7.1.2 The management plan covers the retained parts of the Carrow Abbey Marsh County Wildlife Site (CWS), in addition to areas of green infrastructure within the proposed development site, which together form the management area. The overarching aim of the management plan is to arrest and reverse the ecological decline in condition of the CWS, restoring and creating a good example of the Priority Habitat 'lowland fens' which is representative of the local area and supports a diversity of associated habitats.

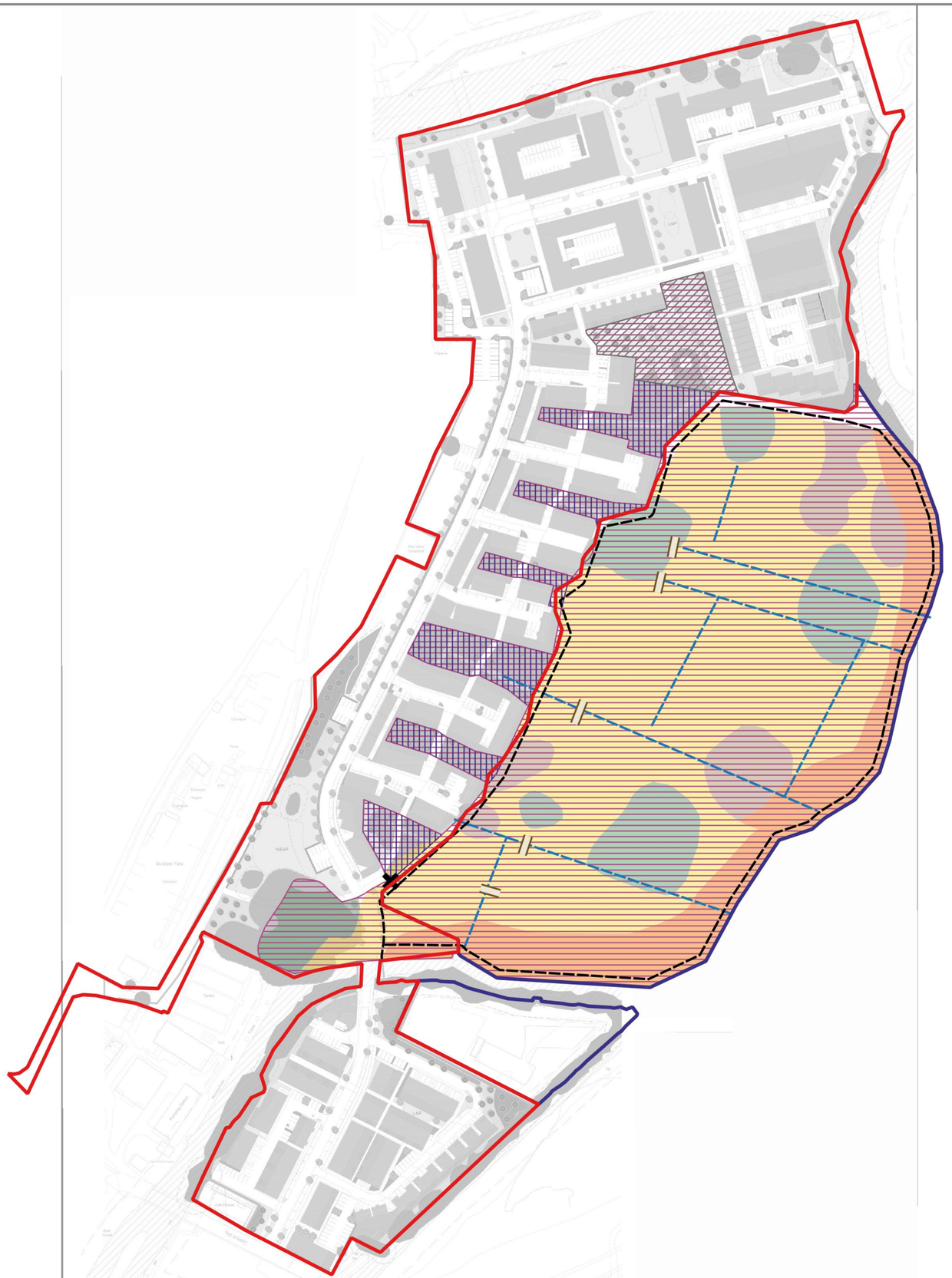
7.1.3 The identified management components include the fen habitat, wet woodland, scrub, river bank, proposed swales, the proposed Kiln Park, and invasive species. For each of the respective management components, this plan identifies specific management prescriptions and monitoring activities (see Annex 6592/NCMP1).

7.1.4 A programme of monitoring is proposed to ensure the management operations are kept under review and amended to meet the management objectives where appropriate.

7.1.5 Following the implementation of this plan, it is concluded that the ecological condition of the CWS will be fully restored to a favourable condition in the long-term.

Plan 6592/NCMP1:

Management Compartments



Key:

- Site Boundary
- Survey Area
- Management Area
- Compartment A: Fen & Ditches
- Compartment B: Woodland
- Compartment C: Scrub
- Compartment D: River Bank
- Compartment E: Swales
- Compartment F: Kiln Park
- Stock Proof Fence
- Bridge
- Ditches
- Livestock Access Gate

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Land at Deal Ground and May Gurney	PROJECT
Management Compartments	TITLE
6592/NCMP1	DRAWING NO.
B/AM	REV
June 2023	DATE

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Annex 6592/NCMP1:

Management Prescriptions

Habitat / Activity	Frequency	Initial Management (Construction Phase)												Ongoing Management											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A. Fen habitat and associated ditch system																									
Installation of stock-proof fence around grazing area, bordered by thorny shrub planting and wet ditch system	-																								
Provision of suitable livestock infrastructure such as drinking sources and bridges over ditches	-																								
Grazing by low density of suitable livestock (e.g. light traditional cattle breed)	Continuous grazing in late summer, depending on weather conditions																								
Monitoring of stock-proof fencing	At least monthly																								
Ditch restoration	Once, during dry weather																								
B. Woodland and C. Scrub																									
Rotational coppicing (up to 30%)	10-year cycle																								
Grazing by low density of suitable livestock (e.g. light traditional cattle breed)	Continuous grazing in late summer, depending on weather conditions																								
D. River Bank (River Yare)																									
Selective coppicing or pollarding	10-year cycle																								
Rotational cutting of up to 25% of bankside herbaceous vegetation	Annually																								
E. Swales																									
Monitoring of vegetation for first five years	At least twice per year																								
Watering during prolonged dry periods for first five years	As required, up to twice per month																								
Supplemental sowing / planting of failed vegetation where necessary	As required																								
Rotational cutting of up to a third of vegetation in each swale	Annually																								
If deemed appropriate, regular mowing of 1-2m boundary strip for visual amenity	Up to twice per month																								

Habitat / Activity	Frequency	Initial Management (Construction Phase)												Ongoing Management											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
F. Kiln Park																									
Amenity grassland - regular mowing during growing season	Up to twice per month																								
Amenity grassland and wetland meadow - reseeding/laying turfs where damaged or failed	As required																								
Wetland meadow - regular mowing during first year of establishment	Up to twice per month																								
Wetland meadow - rotational cutting of up to a third of area	Annually, or twice per year to reduce grass dominance																								
Trees and shrubs - protection and aftercare including mulching, maintenance of tree guards/stakes	Monthly monitoring																								
Trees and shrubs - replacement of failed planting	As required																								
Shrubs - annual trimming at margins	Annually																								
Watering during prolonged dry periods	As required up to twice per month																								
G. Invasive Species																									
Japanese Knotweed - herbicide application by spraying or stem injection	Annually, for at least 3 years until regrowth ceases																								
Himalayan Balsam - hand-pulling	At least once per year, before seed pods ripen, for at least 2 or 3 years until regrowth ceases																								
Himalayan Balsam - cutting (if preferred to hand pulling)	At least once per year, for at least 2 or 3 years until regrowth ceases																								
Giant Hogweed - mechanical cutting	At least once per year, or 5-10 years																								
Giant Hogweed - spot herbicide treatment of regrowth	At least once per year, for 5-10 years																								
Monitoring extent and regrowth of all invasive species	Annually																								

Habitat / Activity	Frequency	Initial Management (Construction Phase)												Ongoing Management											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
H. General Management Procedures																									
Creation of habitat / deadwood piles using arisings from management	Annually																								
Monitor and maintain Otter holt	Annually																								
Monitor (externally) and maintain kiln bat roost	Annually																								
Inspect (from ground) and maintain bird and bat boxes	Annually																								
Monitor and remove litter	Monthly																								
Monitor, maintain and clean access infrastructure e.g. paths, fencing, gates	Monthly																								
Monitor and maintain livestock fence, gates, bridges in fen	Monthly																								
Monitoring and management of weeds	As required																								

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