love every drop
anglianwater

Cambridge Water

A proposed new reservoir in the Fens

Main site design report

May 2024

Contents

This document has been prepared and checked in accordance with ISO 9001:2015

Masterplanning Team: LDĀDESIGN fp

1 Introduction

1.1 Background

Anglian Water and Cambridge Water are proposing a new reservoir in the Fens that will secure water supply to our customers for future generations. This report describes the emerging design for the site proposed for the Reservoir. Responding to feedback from our first phase consultation, its purpose is to illustrate how the main reservoir site might be designed, and to invite feedback to inform the next stages of the Project's development.

The report focuses on the main site, which would include the reservoir and some connecting infrastructure, and which also has the potential to host visitor facilities, access routes, recreational paths and areas of new landscape and habitats. The preferred location of the main site was presented at Phase One Consultation in October to December 2022.

Beyond the main site, the Project includes associated water infrastructure, such as the transfer routes that will bring water to the reservoir and take it from the reservoir to the mains drinking water supply. The wider infrastructure is not the subject of this report but further information on this infrastructure can be found in other materials published alongside this report.

1.2 How the Project will be Consented

Nationally Significant Infrastructure Projects (NSIPs), such as the Fens Reservoir, have to apply for a Development Consent Order (DCO) under The Planning Act 2008 (PA 2008). A DCO would authorise the construction and operation of the Reservoir, and would also contain other powers required to facilitate this.

The National Policy Statement for Water Resources Infrastructure (NPS) sets out the policy requirements associated with developing and securing consent for an NSIP. The NPS covers topics such as biodiversity and environmental net gain, carbon and renewable energy, and recreation, all of which facilitate a consentable project that could become a positive legacy for the local community and across the region.

The PA 2008 lays down strict legal rules as to the elements of an NSIP and its associated development that can be authorised by a DCO. It follows that not all potential land uses in and around the reservoir could be legally authorised by the DCO and it is therefore likely that certain potential uses identified in this report would need to be brought forward separately (potentially by third parties) if it is ultimately considered that these would be appropriate long-term uses for the main site.

At this early stage, the precise scope of the DCO application for the Project is not yet fixed and will be informed by feedback received from this consultation, alongside other considerations. Nevertheless, in addition to describing the core elements of the Project that will fall within the DCO, this report aims to show possible long-term opportunities that might be unlocked at the main site, for the purpose of generating feedback and ideas. The full scope of the DCO application will be confirmed in a future phase of public consultation, and is likely to be more limited in scope and detail than some of the emerging design proposals described in this report.

1.3 The Emerging Design

The emerging design presented in this report reflects the emerging thinking of Anglian Water and Cambridge Water as to the design of the main site for the Fens Reservoir and how it could look. As such, references to the 'emerging design' in this report need to be read in light of this (as well as having regard to what can and cannot be consented through a DCO - see above).

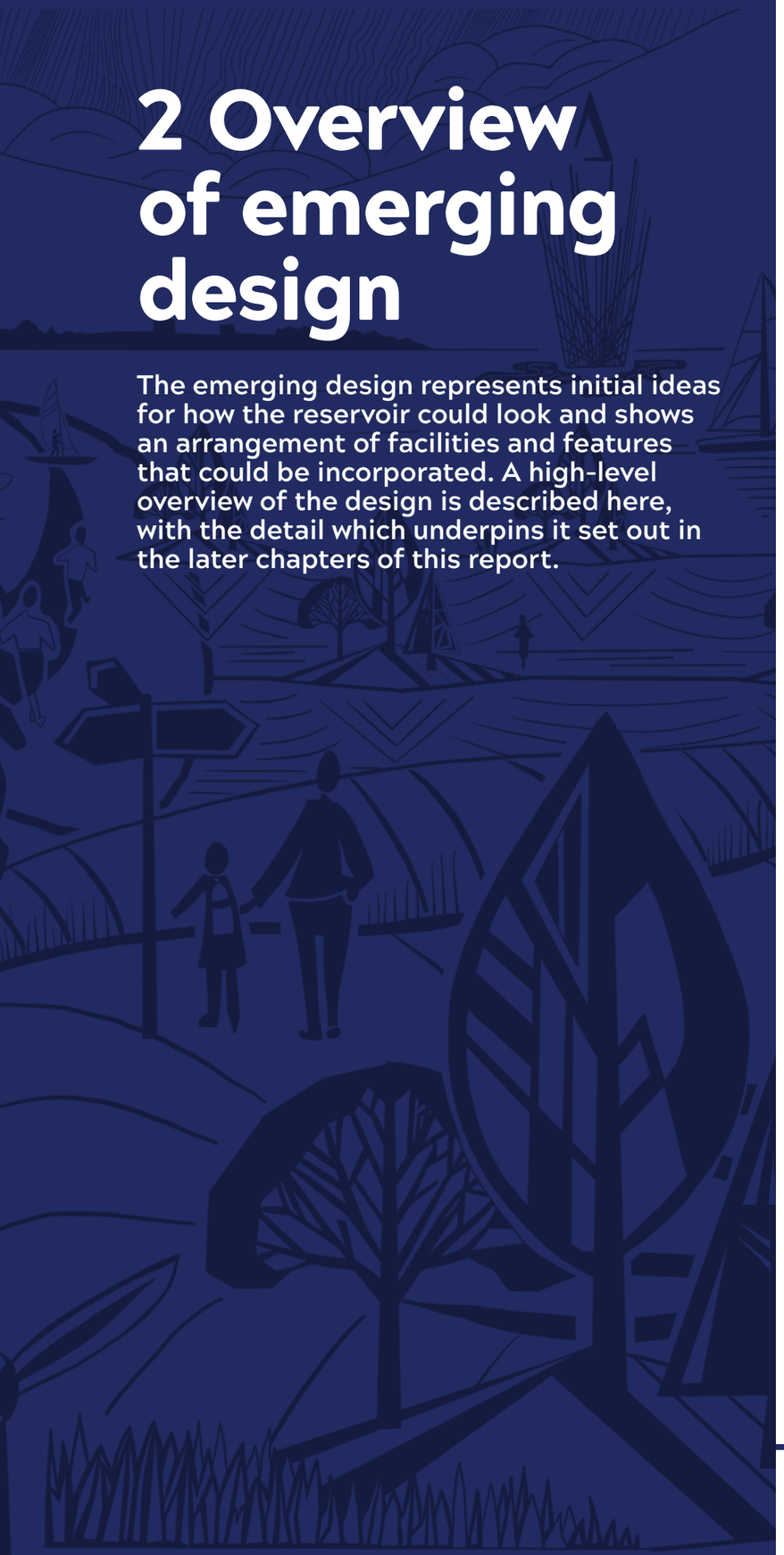
The emerging design has been developed through a masterplanning exercise led by landscape architects and architects, working in close collaboration with a wide range of engineering and environmental disciplines to generate an integrated, landscape-led design. It has also been guided by feedback received from the Phase One Consultation (refer to Chapter 3), and by focused engagement with statutory planning and environmental bodies, as well as peer review from the Independent Design Review Panel (see section 8.7).

Masterplanning is the process of developing a design for a site as a whole. It weaves together the functional and operational requirements of the Project with an understanding of the constraints and opportunities presented by the site and surrounding area. It also takes into consideration the concerns and aspirations of stakeholders and local communities as described above.

It is important to note that the emerging design presented and described in this report does not represent the final version of the reservoir design. Most elements of the design will be subject to continuing scheme development, informed by responses to consultation and in parallel with work to better understand the environmental impacts of the Project. The environmental impact assessment (EIA) process for the project is still at an early stage. The emerging design has been informed by discussions with relevant environmental disciplines but is not yet underpinned by a full assessment of environmental impacts. The outcomes of the EIA will be a key factor in determining the final design and in shaping the environmental benefits it can deliver.

There will also be further work to progress the engineering technical design and to plan the construction of the reservoir. In addition (as set out above), further work is required to determine which land uses could be included in the DCO and which might need to be brought forward (potentially by third parties) separately in the future.

However, the size and scale of the reservoir is broadly fixed by virtue of its water capacity requirements, albeit the overall shape is not fixed at this stage (including the profile of the inner and outer embankments). It should also be noted that whilst the options appraisal process has identified the preferred land area within which the water treatment works and its related development are proposed, the locations within this area for buildings, structures and any mitigation works have not yet been determined.



2 Overview of emerging design

The emerging design represents initial ideas for how the reservoir could look and shows an arrangement of facilities and features that could be incorporated. A high-level overview of the design is described here, with the detail which underpins it set out in the later chapters of this report.

2.1 Emerging Design

The emerging design has been developed to show how the reservoir could become a destination; an exciting new landmark centred around the new waterbody and inspired by and anchored in its setting, to be enjoyed by both the local community and people from further afield.

The bold shape of the reservoir and associated landforms suggested in the emerging design could provide a framework to accommodate a variety of experiences and opportunities, connected to the water itself and to the landscape in which it would sit. Some areas could be more suitable for active recreation and culture (generally to the west); others (to the east) could be more focused on nature and tranquillity. Some could feel open, with long views over the expansive fenland landscape; others could provide areas of shelter within new landforms and planting.

The distinctive ammonite shape and sculptural embankments suggested in the emerging design are inspired by the area's long, and unusually complex, history of being shaped by water. Many ammonites, small marine creatures, were found in the earth below the site, dating from a time when it was under the North Sea. As sea levels receded an industrious culture emerged around a wetland landscape rich in wildlife and resources. Since then, ambitious water management and man-made earthworks have shaped and moulded the very landscape with efficient, engineered drains and embankments. The proposals provide an opportunity to celebrate this multifaceted history in form and facilities. For example, new areas of managed wetland could give an experience of what the pre-drainage landscape was like, and the form of the embankments could take an imaginative, though clearly man-made, response to the integration of the infrastructure into the landscape.

The design could include a variety of habitats, with significant areas of different wetland types both inside the reservoir and surrounding it. These wetlands with their connection to the Forty Foot Drain could create a strong stepping stone between the internationally and nationally important wildlife sites at the Ouse Washes and the Nene Washes as well as the Great Fen project .

New woodland could be planted on the high ground to the north of the site, where it could also provide the setting and shelter for a new visitor centre and recreation facilities. The emerging design shows inclusive access to the water through the inclusion of a lagoon - an area of the reservoir which could maintain a more consistent water level. This could give better access for activities like open water swimming and kayaking, and for the enjoyment of the waterside with potential features such as new beaches, play areas and boardwalks.

The emerging design also presents a number of opportunities for walking, cycling and horse riding. Looping routes of various lengths could be provided around the reservoir for all users, with potential connections to Chatteris, Doddington and Wimblington. A more direct route could facilitate better connectivity between Chatteris and settlements to the north. Around these routes, the landscape design could aim to provide variety: shade, windbreaks, areas providing openness and views, informal varied routes, incidental play and conditions suitable for different habitats - seeking to create a resilient landscape that could be enjoyable for people and valuable for wildlife.

Artist’s impression of what the Fens Reservoir could look like looking from the south-west

3 Stakeholder Feedback

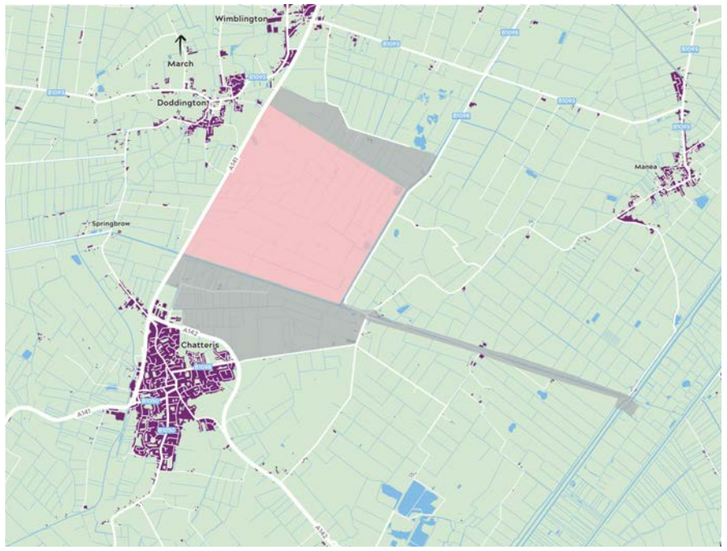
This chapter provides a summary of feedback in relation to the design of the reservoir from the Phase One Consultation which took place between 12 October and 21 December 2022. This early consultation gathered important opinions and information on our initial proposals and the responses received have helped to shape aspects of the ongoing design development of the reservoir.

3.1 Introduction

The purpose of the Phase One Consultation was to gather feedback and information on early proposals; this included the initial vision for the Project, and preliminary design ideas which were based around the overarching design principles being: climate, people, place and value

Specifically, the Phase One Consultation requested feedback on:

- The pink area - identified for the reservoir and its embankments
- The grey area - identified as potentially being needed for supporting infrastructure and during construction. This is also where wildlife and environmental areas, spaces for leisure and recreation, education facilities and other uses could be incorporated
- The very early concept design for the reservoir and the features consultees would like to see considered in the design of the reservoir.



Phase One Consultation, pink and grey areas

A Consultation Summary Report was produced following the Phase One Consultation.

Key themes of feedback from consultees included: connectivity with nearby communities, visual impacts including embankments, integration with existing features, access to nature and water, wildlife and nature and outdoor recreation

These themes have subsequently been considered in developing the design vision and evolving the indicative design principles (refer to Chapter 4). They also underpin many of the ideas which have inspired the emerging design (refer to Chapters 8 and 9).

Following Phase One Consultation, the Project Team has engaged with local planning authorities and statutory environmental bodies on the evolving design ideas; this engagement is summarised in section 8.7.

Features you'd like to see included in the reservoir

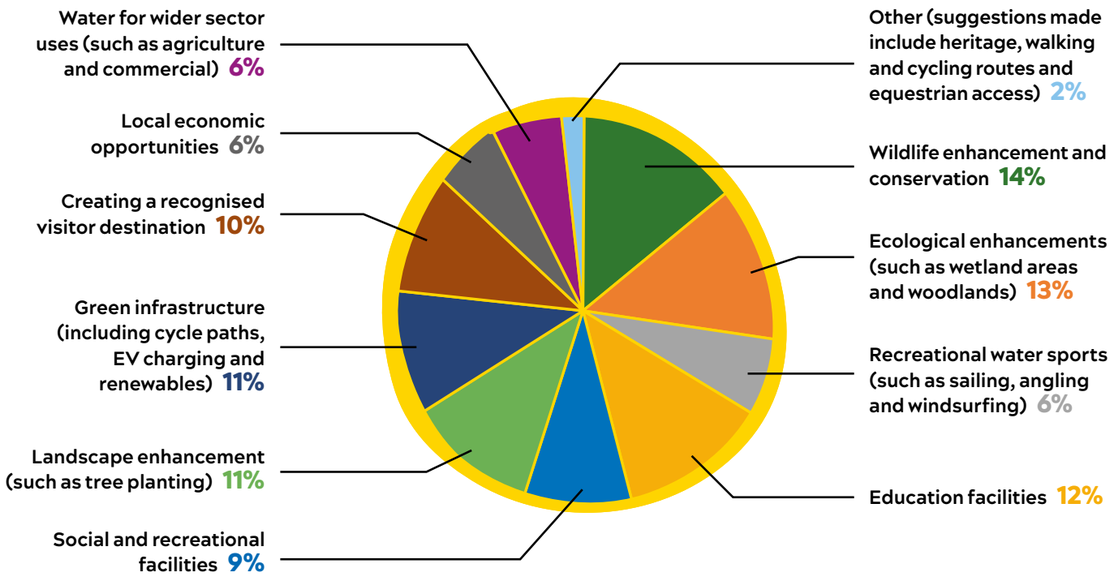


Chart summarising the breakdown of feedback received during Phase One Consultation

3.2 Fenland Nature

Feedback from Phase One Consultation

Support for the proposals for biodiversity net gain and to help address climate change.

Include tree planting, with black poplar (which thrive in fenland/marshland), native fruit and nut-producing varieties, and planting of flowers and pollen rich trees for pollinators.

Create new wetland habitats that will benefit bird and wildlife populations.

How the Project is responding:

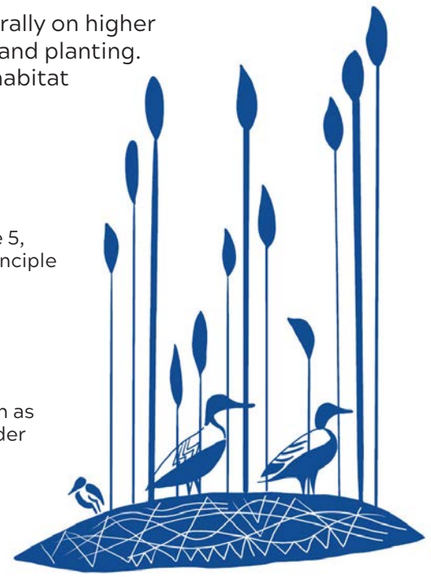
Whilst not all the environmental assessments and surveys have yet been completed, the emerging design includes indicative areas of land to be used for environmental mitigation and to achieve biodiversity net gain (BNG): where biodiversity increases compared to the environment before the project is constructed. For example, the new areas of wetland shown to the north-east, south-east and south-west of the reservoir could compensate for the loss of ditch habitat on the site and provide BNG.

The Environmental Impact Assessment processes will investigate the potential environmental impacts of the Project and will influence the design to seek to limit these impacts. The consideration of potential impacts on wading birds around the Ouse Washes will be an important part of this process.

Where appropriate to the existing landscape character (generally on higher ground), the emerging design shows potential areas of woodland planting. This planting could seek to improve the diversity of the new habitat and help to provide shelter and screening.

Further details on how the Project is considering the natural environment can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 5, page 16; Indicative Design Principle 8, page 17; Indicative Design Principle 9, page 17
- Chapter 6: Understanding the Site, Section 6.7 (Habitats and Biodiversity)
- Chapter 7: Opportunities, Section 7.6. (Nature-based Solutions)
- Chapter 8: Design Evolution, Section 8.4 - 8.6 (ecological mitigation as part of the permutation and option testing); Section 8.7 (Stakeholder Engagement)
- Chapter 9: Description of Emerging Design, Section 9.3 (Fens Waterside Park : Overall Approach); Section 9.4 (Illustrative masterplan); Section 9.7 (Component Area)



3.3 Connectivity with Nearby Communities

Feedback from Phase One Consultation

Existing footpaths should be incorporated into a new public rights of way network.

A segregated walking/cycling route along the A141 corridor and proposal for a controlled crossing on the A142 at Fenland Way, Chatteris are essential opportunities to maximise walking and cycling to the site.

Facilities to south of the Forty Foot Drain should be served by sufficient foot/cycle bridges. Residents from Doddington travelling on foot or bicycle would benefit from a passageway under the A141 rather than a footbridge.

Provide new and safe walking and cycling routes, with links to routes from Ely to Sutton along the A142 for March and Manea communities.

Ensure accessible and sufficient parking on site with electric charging points.

Introduce or improve public transport to the site. Consider the opportunity to link and provide a dedicated stopping off point to the potential Rapid Transport System link to St Ives with Chatteris and March and potentially to Wisbech.

How the Project is responding:

Opportunities for improved local connectivity between the settlements to encourage active travel are being explored through engagement with statutory stakeholders and will continue to be explored further.

The challenges surrounding wider connectivity are being investigated and routes that align with existing strategic active travel routes have been identified for consideration with stakeholders.

The Project is also seeking feedback on the type and locations of crossings across the A141 and A142.

Several potential crossings over the Forty Foot and Sixteen Foot Drains are being considered to assist with connectivity.

Car parking opportunities are included in the emerging design.

Further details on how the Project is considering public access and connectivity can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 6, page 16
- Chapter 6: Understanding the Site, Section 6.2 (Location of and Access to the Main Site) and Section 6.6 (PRoWs and Access to Greenspace)
- Chapter 7: Opportunities, Section 7.4. (Recreation) and Section 7.7 (Chatteris and Doddington Links)
- Chapter 8: Design Evolution, Section 8.4 - 8.6 (potential route options and permutations); Section 8.7 (Stakeholder Engagement); 8.8 (Subsequent Studies)
- Chapter 9: Description of Emerging Design, Section 9.3 (Fens Waterside Park : Overall Approach); Section 9.4 (Illustrative Masterplan); Section 9.7 (Component Area)

3.4 Carbon and Renewable Energy

Feedback from Phase One Consultation

Incorporate renewable energy

Explore how and where carbon sequestration and peat restoration can be incorporated into the reservoir's design.

How the Project is responding:

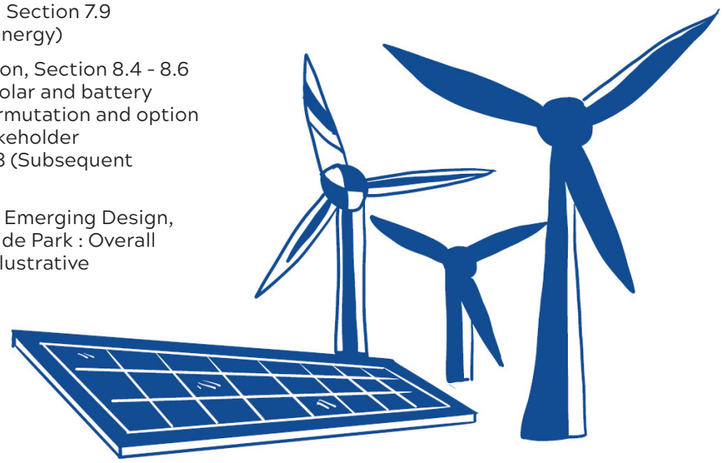
In November 2020, water companies unveiled a groundbreaking plan to deliver an operationally net zero water supply for customers by 2030 in the world's first sector-wide commitment of its kind. Anglian Water led the development of this plan and Cambridge Water was part of it.

In order to achieve this ambition, the Project has developed a strategy which calls for designers to reduce carbon emissions wherever possible and to explore the inclusion of renewable energy generation on site. Some initial ideas around the scale and location of renewable energy on the site are presented in the emerging design, albeit there is further technical work needed before definitive decisions on renewable energy generation can be made.

The Project will continue to consider how best to reuse the existing soil and peat during construction. This includes considering the potential extent of the impact on existing habitats such as peatlands.

Further details on how the Project is considering carbon and renewable energy can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 11, page 18
- Chapter 7: Opportunities, Section 7.9 (Carbon and Renewable energy)
- Chapter 8: Design Evolution, Section 8.4 - 8.6 (spatial arrangement of solar and battery storage as part of the permutation and option testing); Section 8.7 (Stakeholder Engagement); Section 8.8 (Subsequent Studies)
- Chapter 9: Description of Emerging Design, Section 9.3 (Fens Waterside Park : Overall Approach); Section 9.4 (Illustrative Masterplan)



3.5 Visual Impacts Including Embankments

Feedback from Phase One Consultation

Residents feel strongly that the reservoir be adequately landscaped to fit the surrounding environment, with a strong preference for it to look natural.

Concerns about relative height of embankments from surrounding settlements.

A straight-lined design runs risk of being uninspiring and disappointing to visit.

A more naturalistic design would be preferred and reduce visual impact of embankments.

Gently slope embankments rather than a sudden vertical barrier to help blend reservoir in with the landscape.

Suggest off site planting to help screen views of reservoir from nearby heritage assets.

Suitable tree planting should assist in reducing the visual impact on the landscape.

How the Project is responding:

The indicative embankment proposals in the emerging design have been conceived to be attractive, sculptural features which incorporate tree planting, where appropriate, helping to integrate them into the surrounding landscape. The form of the embankments could create a more naturalistic look to the reservoir, softening its edge and blending it into the landscape. Outside of the reservoir footprint there are areas of habitat and planting shown on the indicative masterplan. These areas have a focus on wetlands, in keeping with the fenland character and would soften and screen views of the embankments.

Further technical work, in particular a Landscape and Visual Impact Assessment (LVIA), will be undertaken as part of the EIA to assess the landscape and visual impacts; this assessment will help to identify mitigation and help refine the emerging design which is illustrated in this report.

Further details on how the Project is considering visual impacts including embankments can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 3, page 15
- Chapter 6: Understanding the Site, Section 6.3 (Landscape and Topography)
- Chapter 7: Opportunities, Section 7.3 (Embankment Integration and Tree Planting)
- Chapter 8: Design Evolution, Section 8.3 (Reservoir Shape); Section 8.4 - 8.6 (integration of embankments as part of permutation and option testing); Section 8.7 (Stakeholder Engagement)
- Chapter 9: Description of Emerging Design Section 9.3 (Fens Waterside Park : Overall Approach); Section 9.4 (Illustrative Masterplan); Section 9.5 (Embankment Integration); Section 9.6 (Embankment Height and Integration - Eye Level Views); Section 9.7 (Component Area)

3.6 Fenland History

Feedback from Phase One Consultation

Archaeological finds should be recorded and remain in situ wherever possible as standalone features or incorporated into heritage centre.

Consider fenland heritage and the story of the Fens. Recommend heritage and the human story of the fens is given central place within the placemaking agenda for the site and facilities.

The visitor centre could be used to directly display archaeological finds from the project.

Provide a heritage centre to explain the history of the Fens and the development of the water management network to the current day.

Paths around the reservoir could be considered for a heritage trail.

Potential impact on designated heritage assets nearby.

How the Project is responding:

The impact on heritage assets and the setting of these is being considered as part of the masterplanning process. A formal assessment will be undertaken as part of the EIA and will inform the final design. Some potential ideas for creative interpretation of local heritage are shown in the emerging design. For example, wetland planting could be chosen and arranged to illustrate evolution of the ecology of the Fens.

Information boards and objects around the reservoir could explain how people have interacted with this changing landscape throughout history and inform visitors about other heritage features within the landscape. Planting could be proposed where appropriate to minimise the impact on the setting of heritage assets nearby.

Further details on how the Project is considering cultural heritage can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 1, page 15
- Chapter 6: Understanding the Site, Section 6.5 (Heritage)
- Chapter 8: Design Evolution, Section 8.1 (Formative Design Themes); Section 8.3 (Consideration of reservoir shape response to heritage assets)
- Chapter 9: Description of Emerging Design, Section 9.3 (Fens Waterside Park : Overall Approach); Section 9.4 (Illustrative Masterplan); Section 9.7 (Component Area)

3.7 Integration with Existing Features

Feedback from Phase One Consultation

Exploration of navigable waterways and wildlife corridors.

Design should respect the surrounding landscape.

Public access routes should generally be relocated away from the existing watercourses to prevent disruption during maintenance operations or during flood events.

Link to existing tourism businesses, e.g. Skylark holiday accommodation and nearby Stonea Iron Age camp.

The proposed reservoir provides several potential opportunities to enhance navigation due to the proximity to the Forty Foot Drain and associated links to the River Nene, Great Fen, Old Bedford River, and River Great Ouse and wider canal system.

The reservoir could provide space for marinas and offline moorings etc., all of which are sought after in the area.

Be mindful of the emerging Local Nature Recovery Strategies and Biodiversity Net Gain.

Consider re-opening of Horseway Lock.

Opportunity to provide more wildlife corridors to other locally important sites (local fishing lakes near Skylarks, Ramsar, SPA, SAC, SSSI.)

How the Project is responding:

The emerging design illustrates how blocks of undisturbed habitat could be included on the eastern edge of the reservoir. This location fits in with existing wildlife corridors and those proposed in An Interim Nature Recovery Network for Fenland.

The indicative footpath routes shown in the emerging design have been positioned so they could provide alternative routes during periods of reservoir maintenance. A potential location for a marina has been incorporated into the emerging design, although whether and how this could be delivered requires further investigation. Stakeholders also raised the opportunities for navigational connections, which will be explored at the next stage of the Project as the design for the proposals for the associated water infrastructure are further developed.

The reservoir has the potential to become a destination which could attract additional visitors to existing tourism businesses. The development may open up further opportunities for new recreational activity associated with the waterbody.

Further details on how the Project is considering integration with existing features can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 1, page 15;
- Chapter 6: Understanding the Site, Section 6.4 (Settlement Pattern)
- Chapter 7: Opportunities, Section 7.3 (Embankment Integration and Tree Planting); Section 7.7 (Chatteris and Doddington Links); Section 7.8 (Marina & Navigation)
- Chapter 8: Design Evolution, Section 8.3 (Reservoir Shape); Section 8.4 - 8.6 (integration of embankments as part of permutation and option testing); Section 8.7 (Stakeholder Engagement)
- Chapter 9: Emerging Design, Section 9.4 (Illustrative Masterplan); Section 9.5 (Embankment Integration); Section 9.6 (Embankment Height and Integration - Eye Level Views); 9.7 (Component Area)

3.8 Visitor Hub

Feedback from Phase One Consultation

Buildings should enhance the landscape.

Buildings and facilities should take into account flat, open landscape.

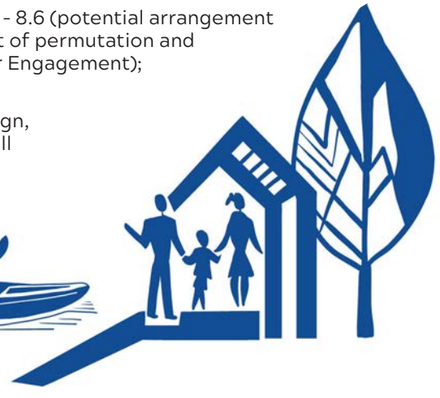
Suggest use of local materials and reflect vernacular in design of visitor centre. The visitor centre could display any archaeological finds from the project.

How the Project is responding:

A potential visitor hub has been incorporated into the emerging design, located at the north-west corner of the reservoir. Ideas for where other, smaller, visitor facilities could be located are also shown on the emerging design . The scale, use and appearance of these facilities will be considered in more detail at the next design phase.

Further details on how the Project is considering a visitor hub can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 2, page 15; Indicative Design Principle 9, page 17
- Chapter 6: Understanding the Site, Section 6.2 (Location of and Access to the Main Site)
- Chapter 7: Opportunities, Section 7.2 (Public Access to Water); Section 7.4 (Recreation)
- Chapter 8: Design Evolution, Section 8.4 - 8.6 (potential arrangement of recreation and access features as part of permutation and option testing); Section 8.7 (Stakeholder Engagement); Section 8.8 (Subsequent Studies)
- Chapter 9: Description of Emerging Design, Section 9.3 (Fens Waterside Park : Overall Approach); Section 9.4 (Illustrative Masterplan); Section 9.5 (Embankment Integration); Section 9.7 (Component Area)



3.9 Recreation and Accessibility

Feedback from Phase One Consultation

Support for the new walking routes which address the lack of these in the area.

Project will provide employment opportunities and will support the regional economy.

Support for the walking, cycling, sailing, angling, and horse-riding opportunities the proposals bring.

One of the local benefits of the proposed reservoir will be amenity and providing a suitable public open space to the local area.

Consider a range of amenities and the business case for tourism/water sports venue.

Accessible routes and facilities for people of all ages.

Consider paddle boarding, sailing and wild swimming and fishing .

Request to understand how opportunities for improving health and wellbeing will be maximised as part of the project:

Through green spaces and recreational activities

Working with communities to support education, training and pathways into work

How the Project is responding:

The scale and mix of potential recreational facilities is being developed in accordance with the requirements of national planning policy and will consider an appropriate balance between areas providing opportunities for recreational activity and areas for nature and environmental mitigation. Initial ideas are illustrated in the emerging design and include a mix of potential recreational facilities such as a visitor hub, a lagoon suitable for watersports, green space and indicative routes for walking, cycling and horse riding.

The emerging design shows potential footpaths and shared pathways across the site. A key part of the recreation offer could be a variety of looping walks (long/short, surfaced/unsurfaced), trails and cycle routes around the main site. A wide range of routes would aim to make the reservoir as accessible as possible. Further details on how the Project is considering recreation and accessibility can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 2, page 15; Indicative Design Principle 4, page 16; Indicative Design Principle 9, page 17
- Chapter 7: Opportunities, Section 7.2 (Public Access to Water); Section 7.4 (Recreation); Section 7.5 (Public Access to Reservoir Infrastructure); Section 7.8 (Marina and Navigation)
- Chapter 8: Design Evolution, Section 8.3 (Reservoir Shape); Section 8.4 - 8.6 (potential arrangement of recreation and access features as part of permutation and option testing); Section 8.7 (Stakeholder Engagement); Section 8.8 (Subsequent Studies)
- Chapter 9: Description of Emerging Design, Section 9.3 (Fens Waterside Park : Overall Approach); Section 9.4 (Illustrative masterplan); Section 9.5 (Embankment Integration); Section 9.7 (Component Area)

4 Vision and design principles

Good design is a key aspect of sustainable development, creating better places and helping make infrastructure projects beneficial and acceptable to communities.

Design visions and design principles are well-established means of promoting design quality in infrastructure projects. Their use is encouraged by both the Government and the National Infrastructure Commission. The design vision and indicative design principles for the Fens Reservoir are set out in this chapter. A more developed set of design principles will be presented at future consultations taking on board the further feedback received during second phase consultation.

Find out more and have your say

We would like to get your comments on our design vision and principles for the reservoir. Please see a guide to our proposals and Phase Two Consultation brochure for ways to provide your feedback:

www.fensreservoir.co.uk/documents

4.1 Design Vision

A design vision succinctly sets out what the Project is aiming to achieve. It seeks to capture the big ideas and aspirations behind the Project and express them in a way that can be readily understood and captures peoples' imagination, whilst expressing the Project's distinctive location and context.

The Project team have identified the key characteristics of the Fens Reservoir site which have informed the design vision in the box to the right:

The story of the Fens is one of extraordinary change. The once wooded landscape became marshland as sea levels rose in ancient times, with rivers winding through grazing marsh and reedbeds between 'islands' of higher land where people settled.

Then in the 17th century, a network of straight watercourses and ditches were built to drain the marshy fenland, dividing the land into rectangular fields. A historic natural environment, rich in biodiversity, has given way to a geometric and closely managed landscape that serves an important purpose as highly productive farmland.

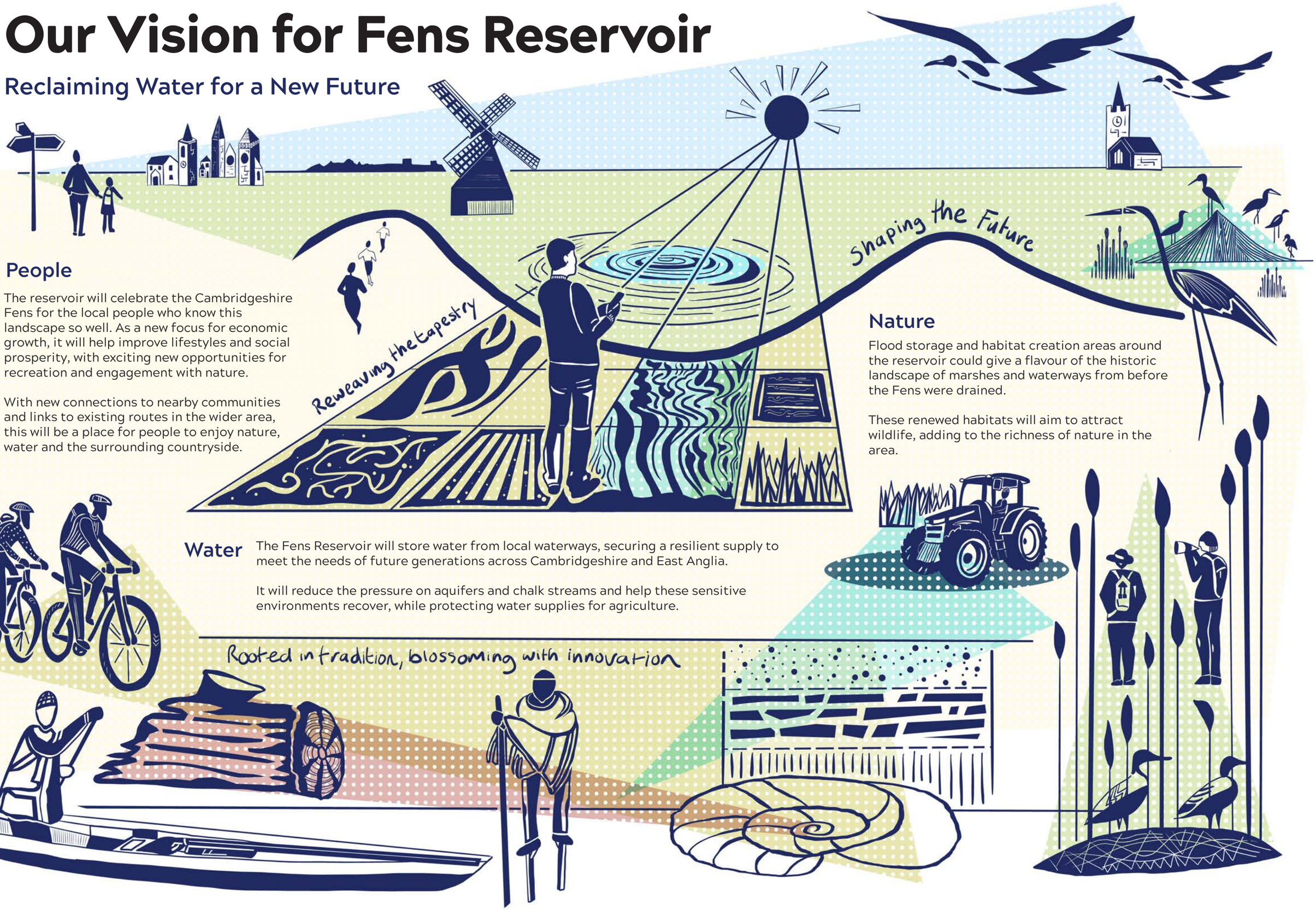
The flat, open land with its big skies means even small changes in ground levels are very noticeable. Tall features are striking and important, and the far-reaching views are only interrupted by vegetation or big buildings and structures, such as the embankments of the Ouse Washes.

The landscape has always been at the heart of the local economy. Many people are employed in farming and associated industries, actively managing the waterways and land. The reservoir offers a significant opportunity to provide better links to the countryside for people living in towns and villages on the Fen islands, such as Chatteris and Doddington.

The design vision for Fens Reservoir is presented opposite.

Our Vision for Fens Reservoir

Reclaiming Water for a New Future



People

The reservoir will celebrate the Cambridgeshire Fens for the local people who know this landscape so well. As a new focus for economic growth, it will help improve lifestyles and social prosperity, with exciting new opportunities for recreation and engagement with nature.

With new connections to nearby communities and links to existing routes in the wider area, this will be a place for people to enjoy nature, water and the surrounding countryside.

Nature

Flood storage and habitat creation areas around the reservoir could give a flavour of the historic landscape of marshes and waterways from before the Fens were drained.

These renewed habitats will aim to attract wildlife, adding to the richness of nature in the area.

Water

The Fens Reservoir will store water from local waterways, securing a resilient supply to meet the needs of future generations across Cambridgeshire and East Anglia.

It will reduce the pressure on aquifers and chalk streams and help these sensitive environments recover, while protecting water supplies for agriculture.

4.2 Design Principles

Design principles are a set of instructions or guidelines underpinning how a project should be designed. They set out the requirements the design needs to achieve in order to meet the aspirations and objectives for the Project, avoid or minimise harm to the environment and local communities and deliver multiple benefits and positive outcomes across the whole life of the Project.

Therefore, design principles provide a means for a DCO to ultimately control and make sure these requirements are delivered during the construction and operation of the Project.

During the Phase One Consultation, the broad principles that are guiding the development of the reservoir design were presented, based around the topics of climate, people, place and value.

Based on the design vision set out on the previous page, along with technical and environmental constraints, and feedback from the Phase One Consultation, this section presents an initial set of indicative design principles for the Fens Reservoir. These principles have guided the development of the emerging design described in section 9 of this report.

At this stage, the indicative design principles are relatively high-level and thematic. They will continue to be developed in response to the findings of the EIA process and further feedback from local communities, those affected by the Project and other stakeholders. Updated and more specific design principles will be presented at future rounds of consultation and they will continue to be refined into a detailed set of design principles for inclusion in the DCO. As part of this iterative process, additional design principles may be introduced as the Project progresses to make sure all aspects of the design are comprehensively covered in the DCO application.

At present, the indicative design principles only address the main site. As they are developed further, they will be expanded to include the associated water infrastructure, such as the upstream and downstream transfers, in advance of the next phase of consultation.

The following icons are used to indicate how each indicative design principle relates to the themes of climate, people, place and value referenced in the Phase One Consultation.

Indicative Design Principle 1:

A narrative landscape

The reservoir will be designed to celebrate the convergence of natural and man-made elements, drawing inspiration from the Fens' rich history of landscape-scale transformation and adaptation involving water. The reservoir, and the associated landscape works required to integrate it, will create a unique and complex landscape that helps to define this new era in water management; one where the Fens need to transform once again in response to the challenges of climate change.

Indicative Design Principle 2:

A destination where people enjoy water and nature

The reservoir will deliver the foundations for creating new multi-purpose and nature rich destination that will attract people from local communities and further afield. In doing so the reservoir would deliver opportunities to create many benefits for health and wellbeing, nature recovery, education and the local economy

These benefits could be achieved through a mix of passive and active recreational activity from inclusive and varied walking, cycling and horse-riding routes, to water-based recreation and facilities that maximise people's enjoyment of close physical and visual interaction with the water. Accessible areas will be designed so people can engage appropriately with nature whilst ensuring there is a balance between undisturbed and accessible areas to maintain ecosystem health and viability.

The landscape around the reservoir will be designed to add visual interest and provide moments of enclosure and shelter that counterpoint the predominant character of openness in the fenland landscape.

Indicative Design Principle 3:

A landmark

Take a distinctive and confident approach to the form and silhouette of the reservoir structures and earthworks so that they contribute to it becoming a new landmark in the region. Within the flat fenland landscape there is the potential for the new reservoir to be prominent in local views. It will provide new vantage points for long views across the fenland landscape, its dramatic skies and newly restored fenland habitats and to other regional landmarks on the horizon.

The design approach should be to celebrate the reservoir as a new intervention and point of wayfinding, rather than attempting to conceal it or prevent it from being a feature in the landscape.

Indicative Design Principle 4:

A focus for socio-economic growth

Consider opportunities in the design of the reservoir and location of its supporting infrastructure (such as access routes and essential mitigation), to support socio-economic opportunities for local communities. The core offer for recreation should provide a platform upon which others can build to provide additional amenity and local benefits.

Indicative Design Principle 5:

Wetland first

Where required, consider the opportunities and wider environmental benefits of creating wetland habitat, which was the defining habitat of the historic fenland landscape. Adapt the existing channel features to establish a unique perched wetland landscape around the reservoir with a network of marshes and waterways that supports a high diversity of fenland species and a resilient network of wetland habitat types whilst creating new carbon sinks and storing more water within the landscape.

Consider the capacity of wetland to deliver beneficial environmental and socio-economic outcomes as alternatives to engineered / carbon intensive solutions, as encouraged by planning policy and best practice. This could include exploring the use of innovative natural processes, such as infiltration beds, to improve quality of the water within the reservoir and as part of the water transfer and treatment process and using wetland to reduce carbon emissions, while increasing storage of both carbon and water and, potentially, mitigating flooding.

Indicative Design Principle 6:

Connecting nearby communities

The reservoir would seek to enhance connectivity between the neighbouring communities such as Chatteris, Doddington, Wimblington, Manea, Whittlesey, March and Wisbech, using the reservoir land as the conduit and as a destination in its own right, providing dedicated safe and attractive routes and crossings over busy roads and watercourses.

Where practicable, the reservoir design could promote active travel, including walking, cycling and horse riding, providing routes that connect into the wider Public Rights of Way network and align with local and regional Green Infrastructure strategies. Where necessary, improvements to existing highways would be considered to create safe environments for users.

Indicative Design Principle 7:

Moving the earth

Work with the subtle level differences in the existing landscape, landform, soils and geology to be efficient in the amount of earthmoving required in the construction of the reservoir. Make beneficial use of the material excavated within and close to the site to reduce the carbon footprint of the earthworks and their impact on local communities as far as practicable.

Where it is necessary to move it, carefully handle any peat found on the site to limit its release of greenhouses gases into the atmosphere.

Indicative Design Principle 8:

Contribute to a restored Fenland landscape

Create habitats that contribute and connect to the wider and growing network of restored habitats in the locality. Design and locate areas of required habitat creation to most effectively support local ecological networks. Create a rich and varied mosaic of the required habitats identified through the EIA both within and surrounding the reservoir. This may include wetland, grassland, woodland and scrub.

Connect the new habitat created by the reservoir into the evolving network of nature restoration projects that are connected by the Forty Foot and Sixteen Foot Drains. Carefully design the reservoir embankments on both inner and outer faces, and wetland habitat within and outwith the reservoir, to optimise their connection with habitat corridors along these adjacent watercourses.

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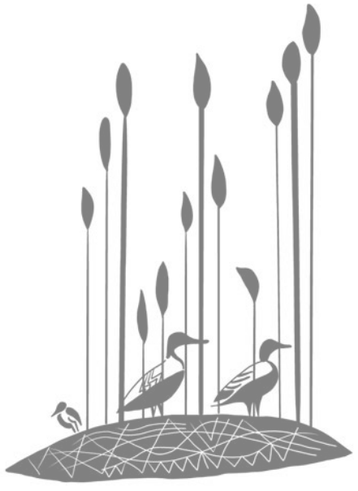
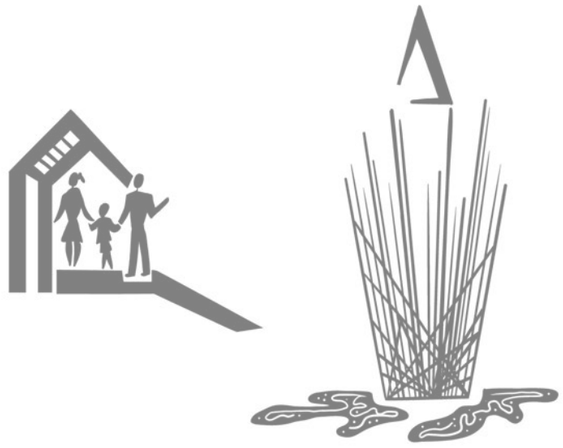


Indicative Design Principle 9:

Consistent and resilient access to the water

Designate areas within the reservoir that maintain, until the most persistent drought conditions, a consistent water level, promoting inclusive recreational access to the water and favourable conditions for the establishment of marginal and wetland habitat.

The creation of dedicated lagoons within the reservoir where water levels can be maintained will help facilitate access to the water via features such as beaches, jetties and pontoons and will also allow a range of wetland habitats to become established. From an earthworks and materials perspective, the optimal areas for creating weirs and lagoons to hold water are those associated with the higher ground, located in the north-west corner of the Fens Reservoir site.



Indicative Design Principle 10:

Well planned and seamlessly integrated operational infrastructure

Design and deliver integrated proposals that allow safe and secure access to these facilities for both operational staff and, where appropriate, the public. Where practicable features should have dual use and celebrate the civic importance of the reservoir infrastructure. Maximise opportunities to use operational features to promote recreation and create intriguing places that also tell the story of how essential water management is and how it is delivered.

Indicative Design Principle 11:

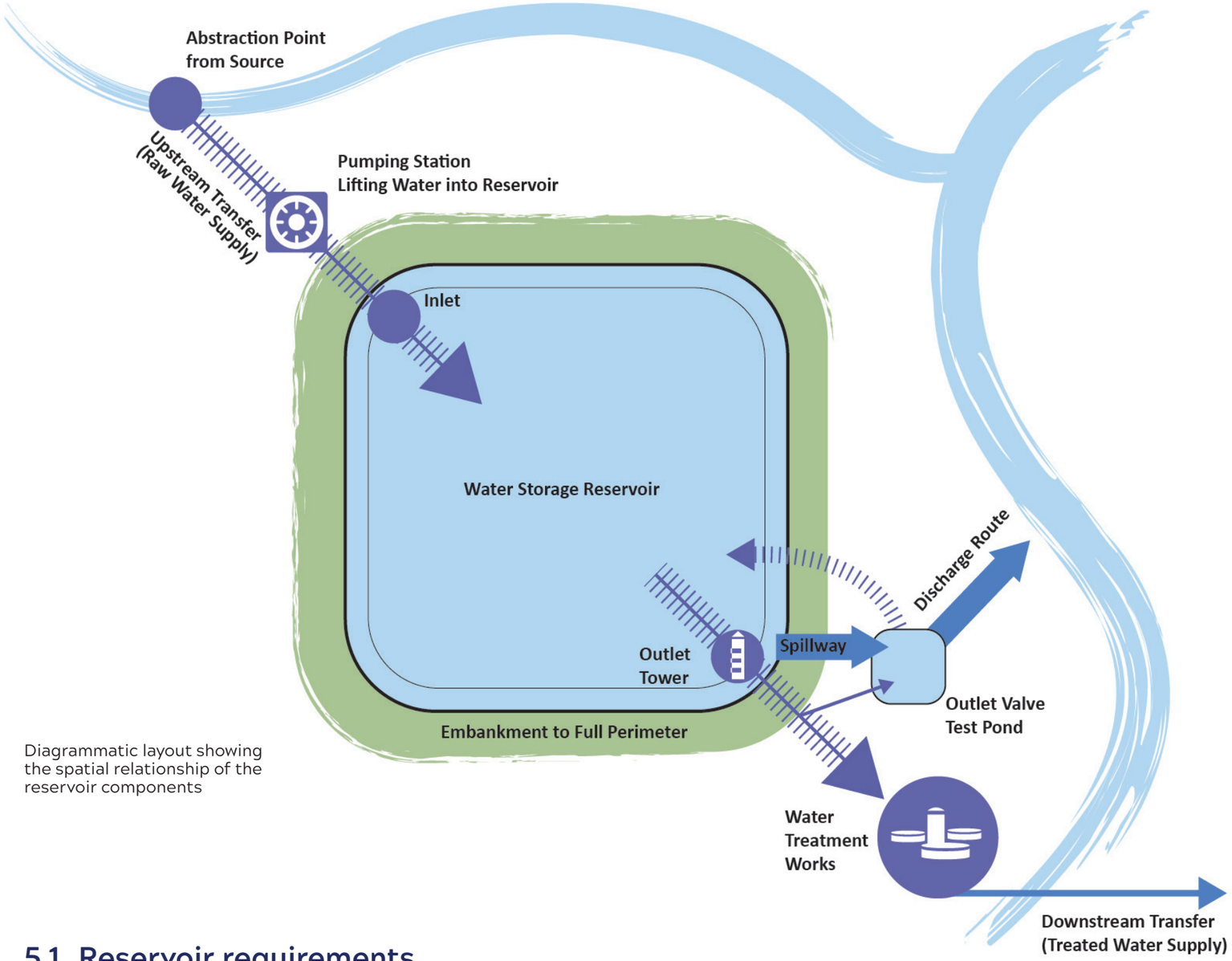
Decarbonised in operation

Design the reservoir to be constructed and operated to not just meet legislative and planning policy requirements to reduce greenhouse gas emissions, but also support Anglian Water's and Cambridge Water's objective to achieve net zero carbon emissions by 2030. The reservoirs and associated infrastructure would be designed to maximise efficient siting, positioning and use of materials, including maximising reuse of soil arisings on site.

Wherever practicable, opportunities would be explored to apply innovative new low-energy and nature-based processes and to use renewable energy generation infrastructure as sensitively as possible.

5 Technical Requirements

The following chapter provides a description of the main operational components of this type of reservoir, with reference to the relevant technical requirements which underpin the design; this covers the design of the reservoir embankments as well as other infrastructure associated with the circulation and treatment of water.



Diagrammatic layout showing the spatial relationship of the reservoir components

5.1 Reservoir requirements

Reservoirs located within existing river basins or valleys require one constructed embankment (dam) to stem and store the natural flow of water. These are known as impounding reservoirs.

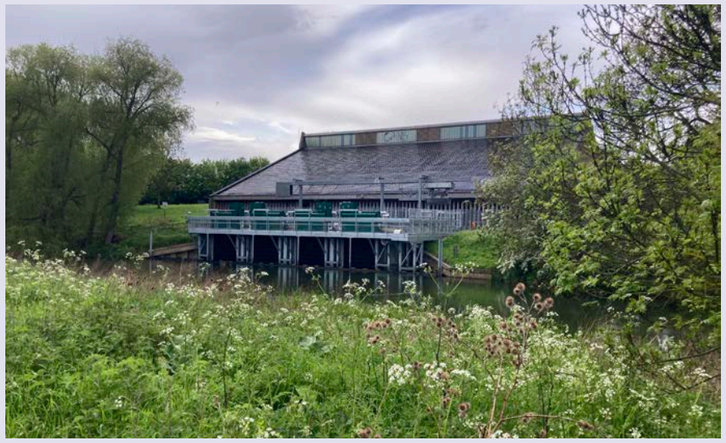
Reservoirs, such as the Fens Reservoir, which are in areas without appropriately scaled river basins or valleys, require newly constructed embankments on all sides and for water to be transferred both in and out, normally through pumping. These are known as non-impounding reservoirs.

Non-impounding reservoirs are made up of several components; these are shown in the adjacent generic diagram.

A high-level description of each component follows. There is further information on opportunities associated with the design of some of these components in Chapter 7.

5.2 Water Transfer and Inlet

As the reservoir is designed as a non-impounding reservoir, the water needs to be abstracted from an existing source of water and then transferred into the reservoir via either an open channel system (existing watercourses or newly created channels), via buried pipelines, or by a combination of both forms of transfer. On reaching the reservoir, water will enter at the inlet point via buried pipes and a pumping system, taking it either over or through the embankment itself. The water inlet is typically located at the opposite end of a reservoir to the point of extraction (the outlet); this creates circulation in the water which in turn benefits water quality.

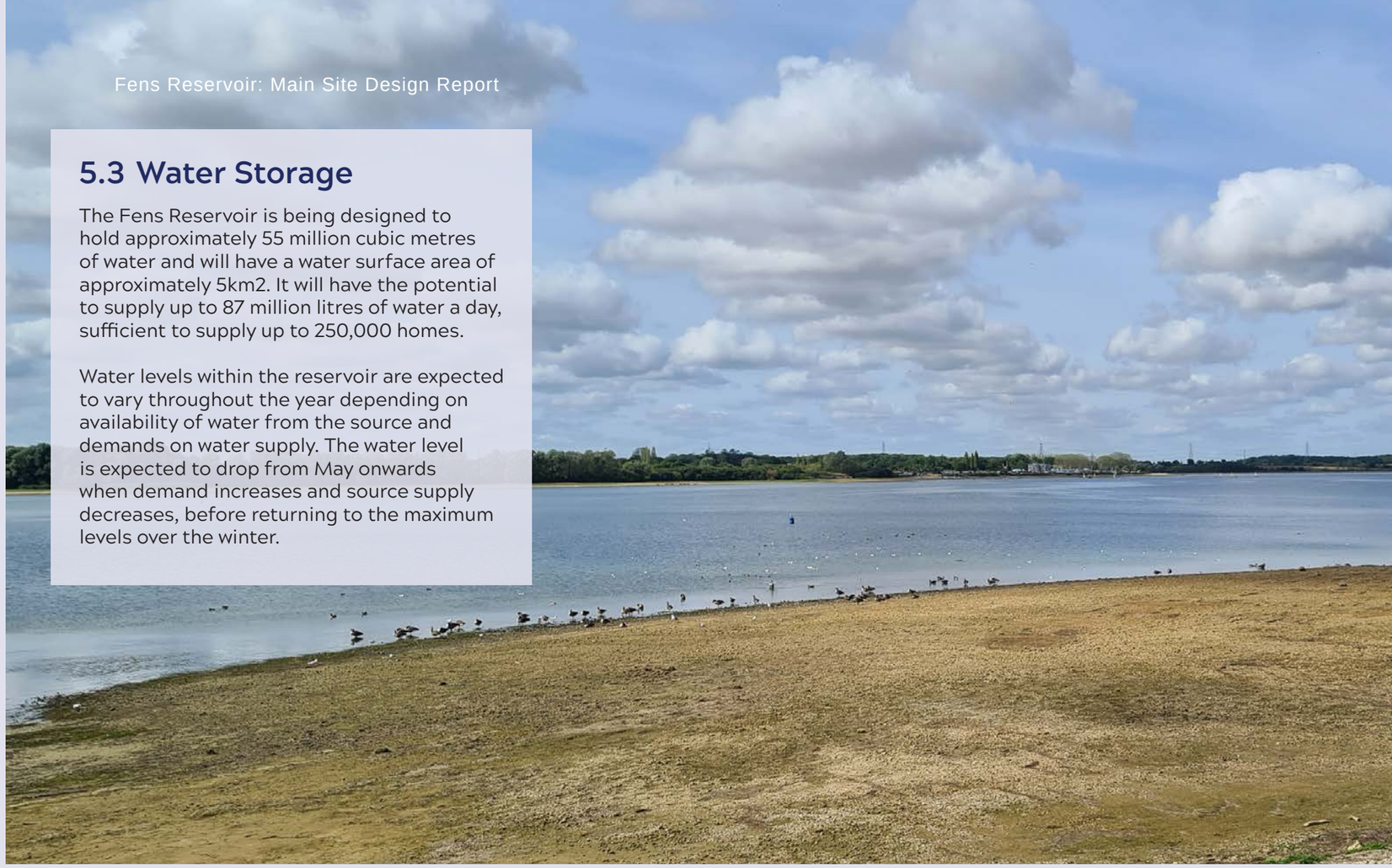


Example of a pumping station at Tinwell

5.3 Water Storage

The Fens Reservoir is being designed to hold approximately 55 million cubic metres of water and will have a water surface area of approximately 5km2. It will have the potential to supply up to 87 million litres of water a day, sufficient to supply up to 250,000 homes.

Water levels within the reservoir are expected to vary throughout the year depending on availability of water from the source and demands on water supply. The water level is expected to drop from May onwards when demand increases and source supply decreases, before returning to the maximum levels over the winter.



Example of how water levels can vary throughout the year at Grafham Water

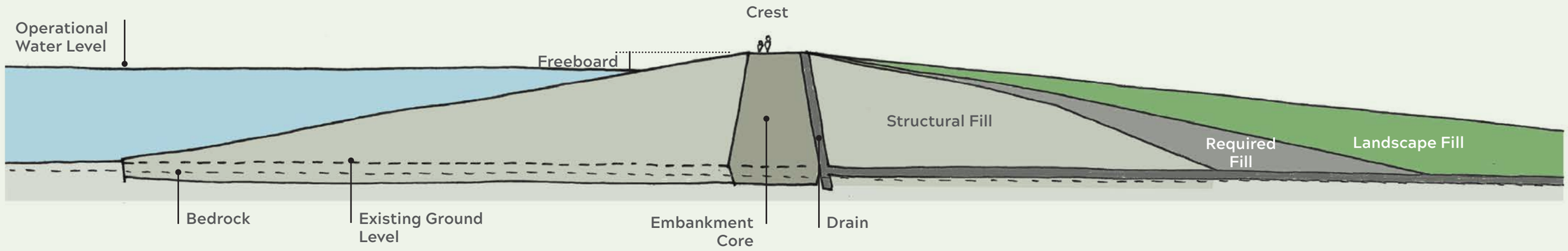
5.4 Outlet Tower

Water is removed from the reservoir via an outlet tower. The outlet tower is usually comprised of a vertical shaft structure with openings at three varying depths within the water. This allows the reservoir operator to extract from the level of the water with the preffered quality in a variety of environmental conditions. The majority of the infrastructure required for the outlet tower will be below water level, however, access into the shaft is required above water level and outlet towers often become prominent features of a reservoir.

The outlet tower is expected to be in regular operation and requires access by a walkway and/or tunnel for maintenance and operation.

Example of a typical outlet tower and bridge

Typical Embankment Cross Section



5.5 Embankments

The embankments are earthworks constructed to form a continuous dam around the reservoir and hold water. The embankments will be constructed over the existing bedrock with the aim of using material obtained from within the bedrock layer (clay) found on site. This is formed in layers and compacted to provide stability and create a low permeability dam. This structural feature is referred to as the embankment core.

Either side of the embankment core will be a zone of structural fill, comprising other material excavated on site. This is not compacted to the same degree as the embankment core and its purpose is to act as ballast which holds the embankment core in place. A drain will be required between the embankment core and structural fill.

On the outer slopes (downstream) slopes of the reservoir, layers of landscape fill would be placed to protect the embankment core and structural fill. The landscape fill can comprise superficial material (material found above the bedrock layer including topsoil and subsoil).

In most places, the embankment crest is required to be raised above the maximum water level. This is referred to as the freeboard and its purpose is to prevent water overtopping the embankment crest (typically by wave action). Localised sections of the embankment can be lowered (see reference to spillway opposite).

5.6 Water Treatment Works (WTW)

Once raw (untreated) water is transferred from the reservoir, it is conveyed to the WTW to be cleaned and treated to become suitable as potable (drinking) water. It is then transferred to the existing supply network via a pipeline. This is referred to as the downstream transfer.

The water treatment process requires specific filtration and treatment plant, some of which can be housed within buildings or structures.

The WTW will be set within a secure site with no public access to reduce the potential risk of contamination. The WTW will be located away from areas at risk of flooding to minimise potential risk of disruption to operations. There are opportunities to design both the site and buildings to complement their environment.

Hall Water Treatment Works

5.7 Managing safety at the reservoir

The reservoir is being designed in line with the latest national and international industry guidance and standards, and the legislation set out in the Reservoirs Act 1975.

This sets the requirements for good design, construction, surveillance and monitoring to ensure the integrity of the embankments. The design is also being developed to be resilient to anticipated future climate events, such as the potential for sea level rise or more extreme weather events.

While the failure of an embankment designed and constructed to current standards is a highly unlikely event, a clear plan for managing emergency situations is a further vital part of operating the reservoir. In addition to high quality design, construction and surveillance, a requirement is to be able to lower the reservoir's water level quickly in the event of an emergency (drawdown).

The plan for how such an emergency will be safely managed is in the early stages of development. The current work shows releasing water from the reservoir in a controlled manner into the Forty Foot Drain and the wider Middle Level system, then on to the sea, as the preferred option. This would avoid water being released into the Ouse Washes or Nene Washes. Assessment of options is continuing and will consider the potential environmental effects of an emergency drawdown event as part of the EIA.

Several safety features will be incorporated into the design of our reservoir. These include:

- monitoring and surveillance: as well as ongoing monitoring by skilled operatives and equipment, the potential for new intelligent monitoring equipment in the construction of the reservoir is also being considered.
- spillway: the spillway is a lowered section of embankment with a reinforced outer face. In the very unlikely case that the water level in the reservoir rises beyond the normal operating range, the spillway is designed to overtop, allowing the safe disposal of 'spilled' water.
- bottom outlet valve and pipe: the bottom outlet valve and pipe is designed to allow the water level within the reservoir to be lowered quickly in the event of an emergency that threatens the integrity of the embankment.
- test pond: each year the emergency procedure would be tested to ensure the necessary systems and plans are in place. At these times, water would be released into a test pond and held temporarily rather than being released. When the test is complete, the water would be pumped back into the reservoir. If there was ever a need to fully use the emergency procedure, the water would be released from the test pond into the watercourses closest to the reservoir.

Example of one of the ways that a spillway can be designed, Kinder Reservoir.

6 Understanding the Site

The environment and surroundings in which the Fens Reservoir will sit provide an important reference for the emerging design. The following chapter provides an overview of this context, looking at aspects of geography, ecology, human activity and cultural elements.

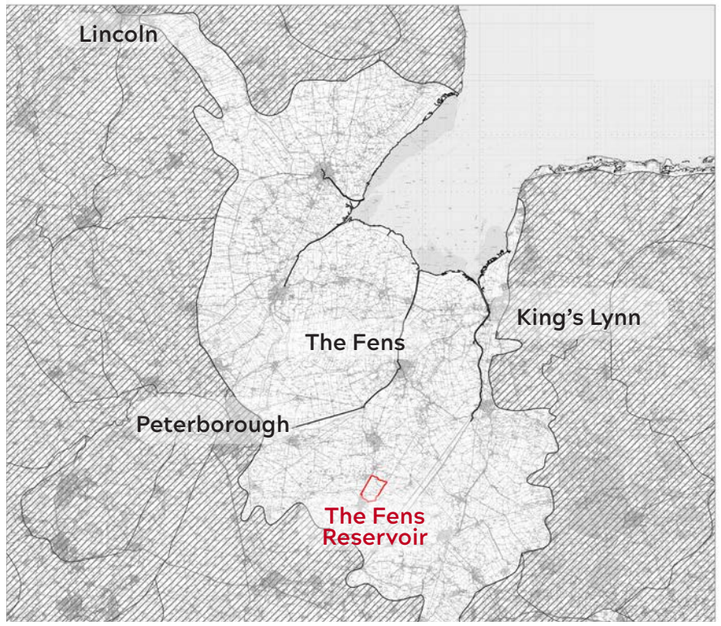
6.1 Geographical Context

The proposed location of the Fens Reservoir is in the Cambridgeshire Fens - part of the shallow basin bordered by Lincoln, Peterborough, Huntingdon, Cambridge, Downham Market and King's Lynn. The site is situated between the market towns of March and Chatteris within the Fenland District.

The reservoir will be located about 30km to the north of the city of Cambridge, approximately 7km south of the town of March, with the closest settlements being Chatteris to the south and Doddington and Wimblington immediately to the west.

The majority of the district is rural in character. The unique open, flat character of the fens means that new developments in the countryside and on the edge of settlements can have a significant effect on the landscape, even when viewed from a considerable distance.

The peaty land around the local settlements is largely used for agriculture and associated industries. It is drained by numerous ditches and dykes, and there are two large drainage rivers immediately adjacent to the site - the Forty Foot Drain, also known as Vermuyden's Drain, and the Sixteen Foot Drain.



The Fens basin and surrounding uplands

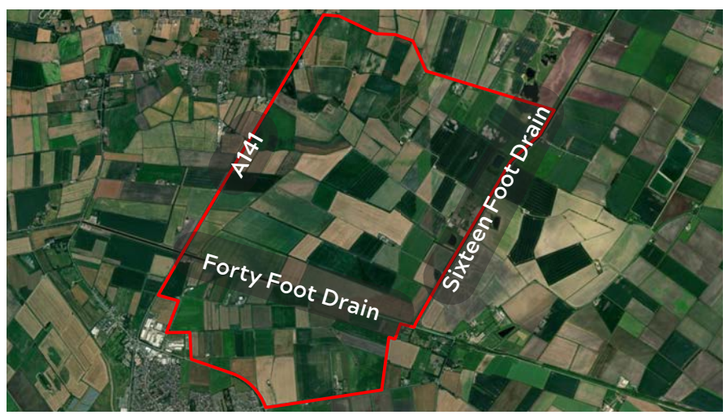
Sixteen Foot Drain and the B1098 which runs on its eastern bank on the east of the site.

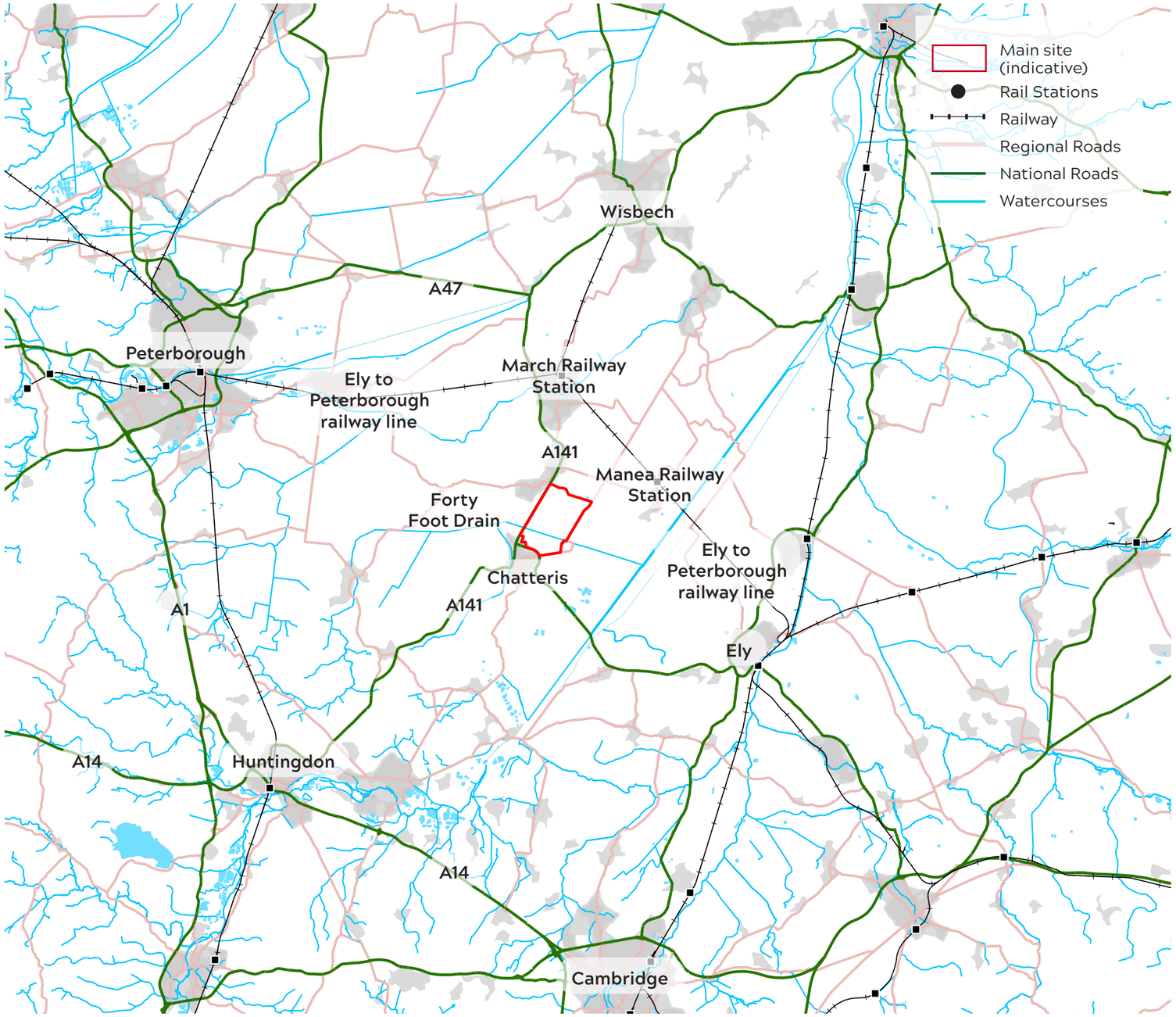
6.2 Local Transport Networks

The western boundary of the main site is formed by the A141 road (built on the embankment of the old Great Northern and Great Eastern joint railway) This road links up with the A1 and A14 to the south west and the A47 to the north east, giving the site and surrounding landscape east-west and north-south road connectivity.

The southern and eastern boundaries of the main site are formed by linear watercourses - the Forty Foot Drain and the Sixteen Foot Drain. These navigable watercourses are part of the Middle Level network which provides navigable access to the River Great Ouse and River Nene.

The Ely to Peterborough railway line runs about 4km north of the site. The nearest stations are March and Manea, both about 7km from the site. Active travel routes from these stations to the site do not currently exist.





Location of the Fens Reservoir site and surrounding access infrastructure

6.3 Landscape and Topography

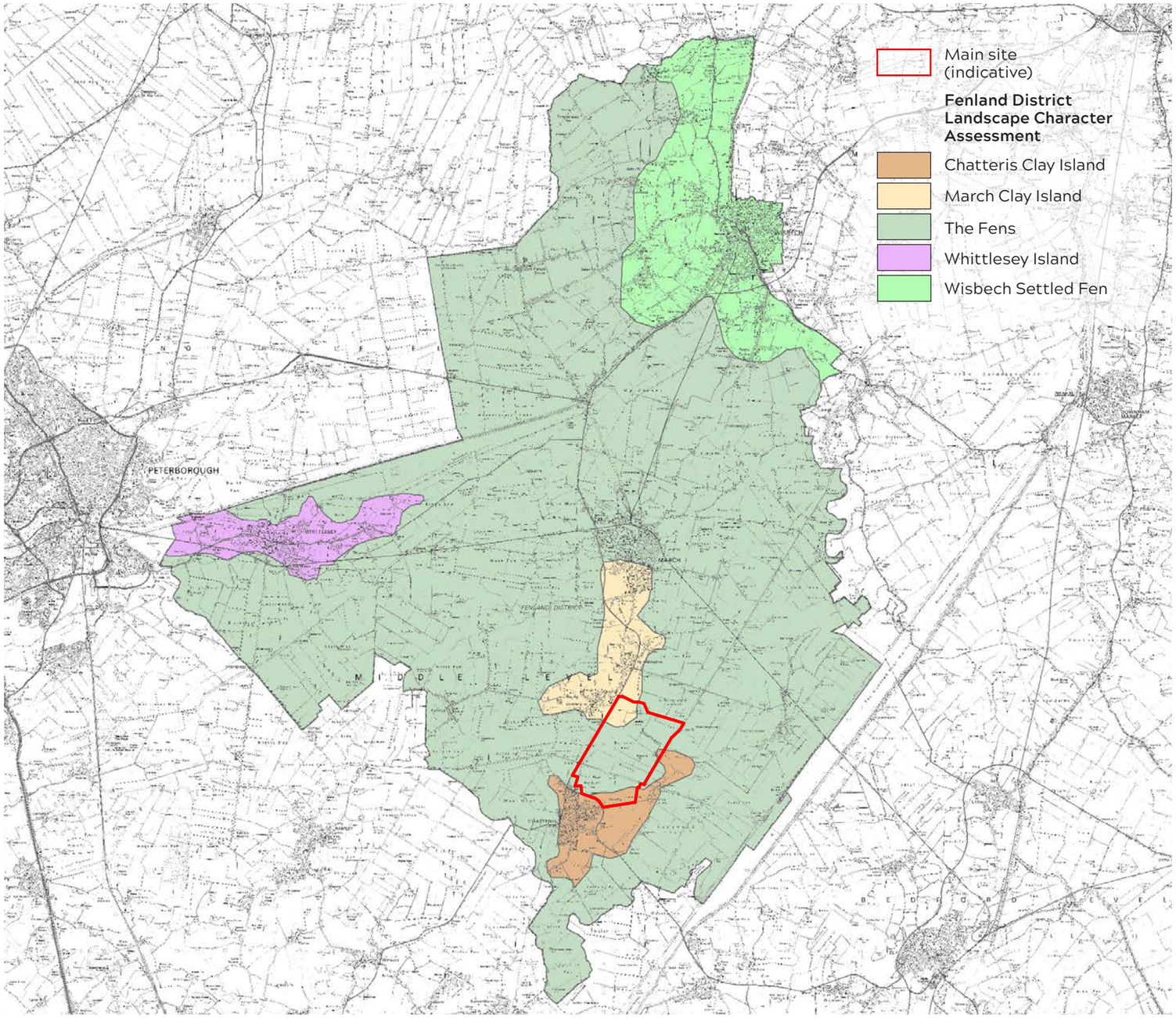
During a period of sea level fluctuation, freshwater peat and marine deposits filled dips and depressions across the fen basin creating an exceptionally flat landscape, with only a few 'islands' of higher ground rising above the plain. In the vicinity of the Fens Reservoir site, this process has contributed toward the creation of two distinct character areas, the fen islands above the historic water/sedimentation line and the drained fen area below.

The Drained Fen

The drained fen landscape was once the largest wetland in England and is now a predominately rich arable landscape. Within this flat landscape, expansive views and a dominant sky create a strong sense of place. The landscape is formed by a lattice of linear features, with elevated rivers, roads and railway lines proud of ground level and drainage channels below ground level dividing smaller parcels of land. Without vertical boundaries, fields merge into one another in views, creating the impression of much larger land parcels.

Typical view of the drained fen landscape.

Elevated watercourses are a distinct landscape feature within the drained fens.



Landscape character areas

Tree cover within the drained fen is very low, generally only associated with farmsteads (as a wind break) on slightly elevated ground. In the vicinity of the site, treed higher ground and areas of woodland associated with old gravel workings contribute towards a horizon that is more vegetated than is typical elsewhere in the drained fens.

Man-made features form the most prominent level changes in the drained fens. The embankments of the artificial rivers that convey water across the drained fens often sit over 2m, and up to 6m at the Ouse Washes, above the surrounding land.

The land has an artificial drainage regime that requires active management and maintenance. The Forty Foot Drain and Sixteen Foot Drain are prominent features in the landscape. Nightlayers and Bensons pumping stations sit within the Reservoir site. These pumping stations pump water from the lattice of linear drainage channels that form field boundaries into the elevated river network.

Post drainage, the peat that built up over thousands of years has wasted (degraded and shrunken following years of drainage and cultivation), resulting in large areas of land below sea level. This wastage, combined with the relative stability of the silt deposits that formed in the tidal creeks (called roddons) has created subtle topographic change now evident on the surface in part of the site.

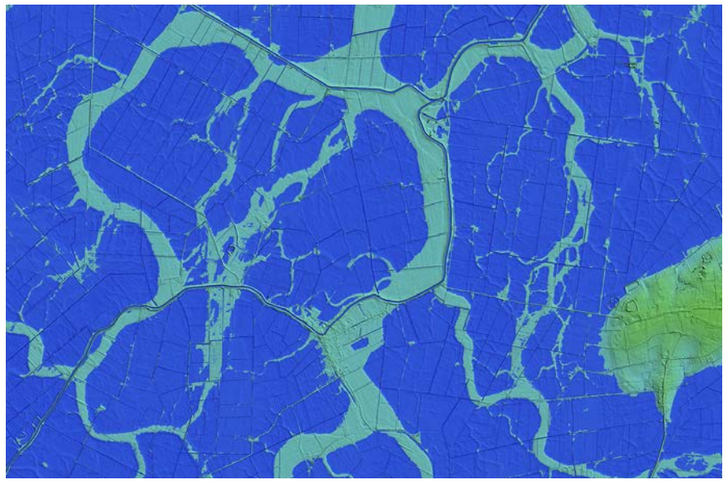
Fen Islands

The fen islands share more landscape characteristics with the places that lie at the edge of the fens than with the drained fen landscape that surrounds them. Before drainage, the fen islands sat above the water line, providing favourable places for settlement. Development, smaller fields with upright boundaries, trees and hedgerows create a stronger sense of enclosure on the fen islands. Watercourses, roads and land boundaries are more organic, often responding to subtle natural changes in topography.

March and Chatteris Fen Islands extend into the site. The areas within the site are severed from the broader fen islands by road corridors. This separation, alongside field aggregation and wooded vegetation removal over the years, makes the fen island areas within the site less distinct from the drained fen.

Linear field pattern typical of the drained fen landscape

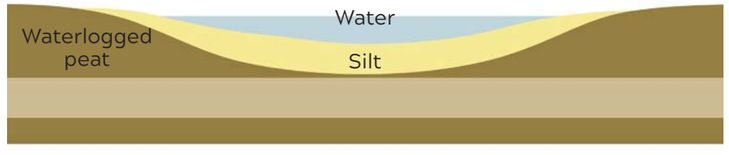
More organic field pattern on higher ground. Curving catchwater drain to the north of Witcham



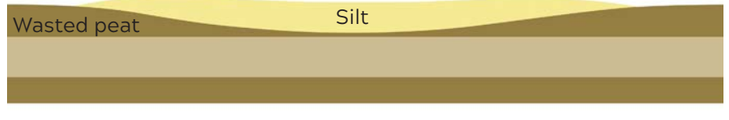
LiDAR of the site showing the raised roddon features in the topography.

Large linear embankment forming the eastern side of the Ouse Washes

Woodland on the site adjacent to the A141 in a view from the edge of Doddington



Tidal creek before fenland drainage. After Fowler (1932).



Post drainage, the roddon has become raised above the surrounding ground level. After Fowler (1932).

6.4 Settlement Pattern

Fen islands are the main areas of settlement and reliance on geological features is the main driving force behind the form of settlements. Off the main fen islands, farmsteads and small groups of houses are generally associated with small areas of slightly elevated land. However, roddons have also been used as a firmer footing for development: To the west of the proposed reservoir, the village of Benwick's High Street is built on a roddon and the seemingly random distribution of some farmsteads can be linked by the routes of the tidal creeks.

Chatteris fen island, to the south of the site, is broad and although the older parts of Chatteris sit on the March gravels, as the town has grown, a more nucleated settlement has been able to develop on this broad area of higher land. A light industrial area has developed on the northern edge of Chatteris on low land beyond the fen island. Wimblington and Doddington, to the west/north west of the site, lie on the March fen island. Like Chatteris, the older parts of Wimblington and Doddington have developed on the March gravels. However, both villages have retained a more linear form than Chatteris.

Benwick High Street, built on a roddon.

Vegetated farmstead on slightly elevated land

Chatteris High Sreet

Light industrial development on low land at the northern edge of Chatteris

The centre of Doddington village

St Peter's, Wimblington built 1874

St Nicholas Church, Manea built 1875

6.5 Heritage

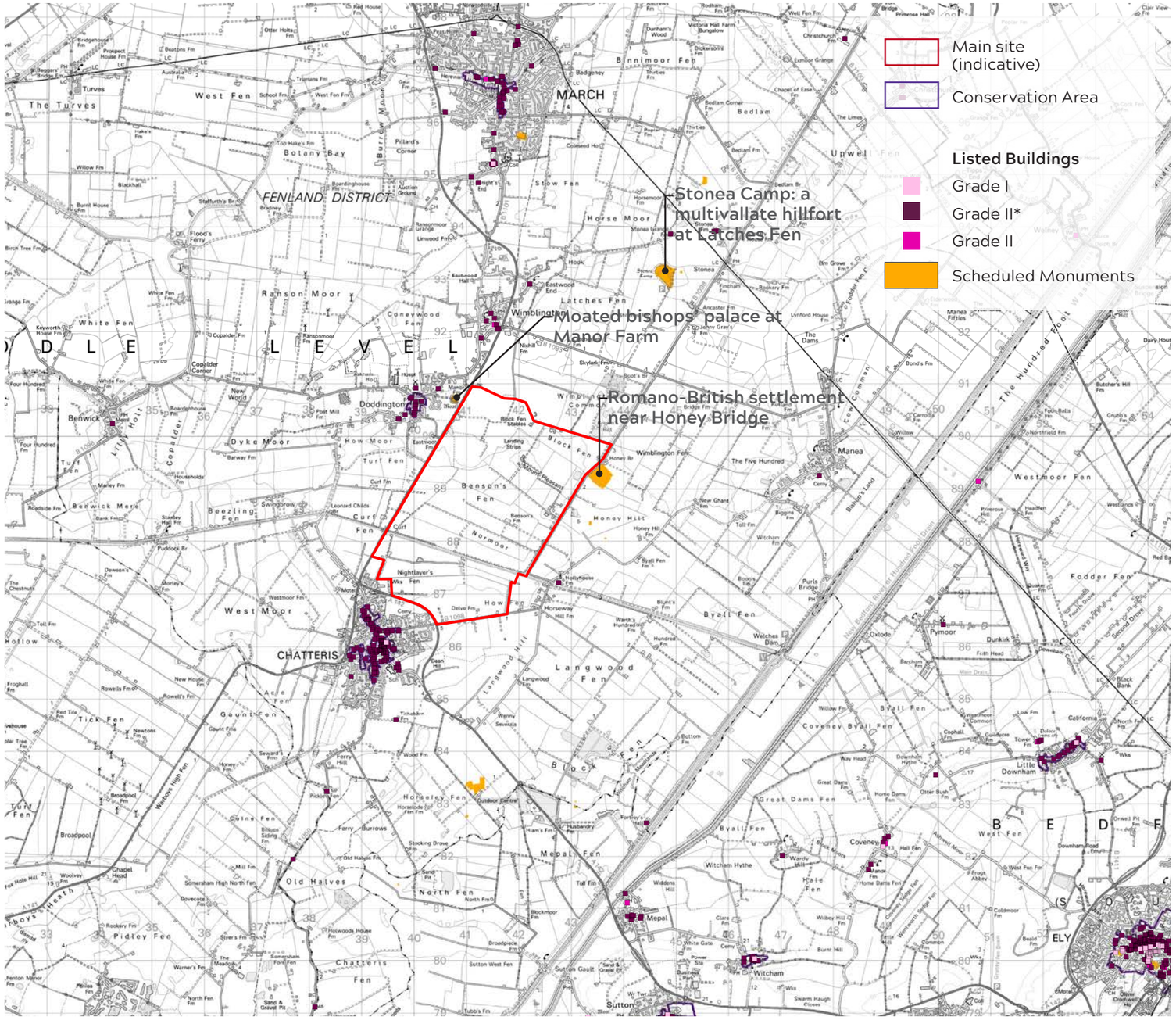
The fen basin is a highly dynamic landscape, that was heavily influenced by inundations of water - both from the sea and freshwater catchment. This is reflected in the geology of the Fens which is unique, complex and has seen several periods of significant transformation over relatively short periods of time. The oldest of the deposits within the Fens Reservoir site are from the West Walton Formation which were deposited within warm shallow seas in the Jurassic Period many millions of years ago and which, therefore, contain fossils of sea creatures such as ammonites. The constantly changing landscape has influenced how people have inhabited and interacted with the area over the past 10,000 years.

Just over 3km to the north of the site lies Stonea Camp, a multivallate hillfort. This Scheduled Monument dates to the Iron Age period.

Two Scheduled Monuments are located adjacent to the site. They are both located on the March Gravels geological deposits which also extend into the site. Honey Bridge, a Roman enclosure settlement, sits to the east, and approximately 60m west of the site is the scheduled Moated Bishop's Palace at Manor Farm, which was a high-status domestic residence established in the 13th century. Also associated with the Bishop's Palace is the Great Park. This was a deer park, located to the south-east of the moated manor, partially within the site. In 1380, it was 80 acres in size, with a "Little Park" which was 70 acres. By 1680, the Great Park measured around 320 acres. The park lay on the fen island, at the limits of the higher ground, which marked the transition to the wetter areas.

The post-medieval period saw substantial efforts to drain the fens. Reclamation at a national level began in 1539. As part of the Middle Level reclamation works, the Forty Foot Drain and the Sixteen Foot Drain were constructed in 1651. These, alongside the broader Middle Level system, have had a large impact upon the landscape of the area and the lives of its inhabitants.

1658 map showing the deer park associated with the moated Bishop's Palace



Plan showing heritage designations near the site

6.6 PRoWs and Access to Greenspace

According to the Fields in Trust Green Space Index, Fenland does not meet a minimum standard of green space provision. The area provides 17 sqm of greenspace per person, below the 24 sqm minimum standard required for people to use and reap the wellbeing benefits greenspace offers. Over 12% of the population do not have close (10 minutes) walking access to a local park or green space. At a neighbourhood level, none of the Lower Layer Super Output Areas (LSOA) near the site meet the minimum required standard for greenspace provision. An LSOA covering northern Chatteris performs especially badly, ranking in the bottom 10% across the country.

Public Rights of Way (PRoW) in the surrounding countryside are limited and can be challenging to access from settlements, providing few opportunities to offset the limited greenspace provision. It is possible to walk from the eastern edge to the western edge and from the northern edge to the southern edge of the main site on public footpaths. There is also a 5km looping route from Wimblington/Doddington into the site. However, accessing these footpaths is challenging, with some routes incorporating informal crossings over the busy A141 and others terminating at the B1098.

Walking options north from Chatteris towards the site are limited. The Greenwich Meridian Trail long-distance walking route suggests using Fenton Way. This is a road through a semi-industrial area without footpaths. Accessing Fenton Way also involves crossing the busy A142.

Walking options are also limited from Manea, a village to the east of the site. Although there are several PRoWs to the west of Manea, they do not extend to the reservoir site and terminate at roads without separate footpaths.

Routes for people riding cycles and horses are very limited in the vicinity of the site.

PRoW crossing point across the A141.

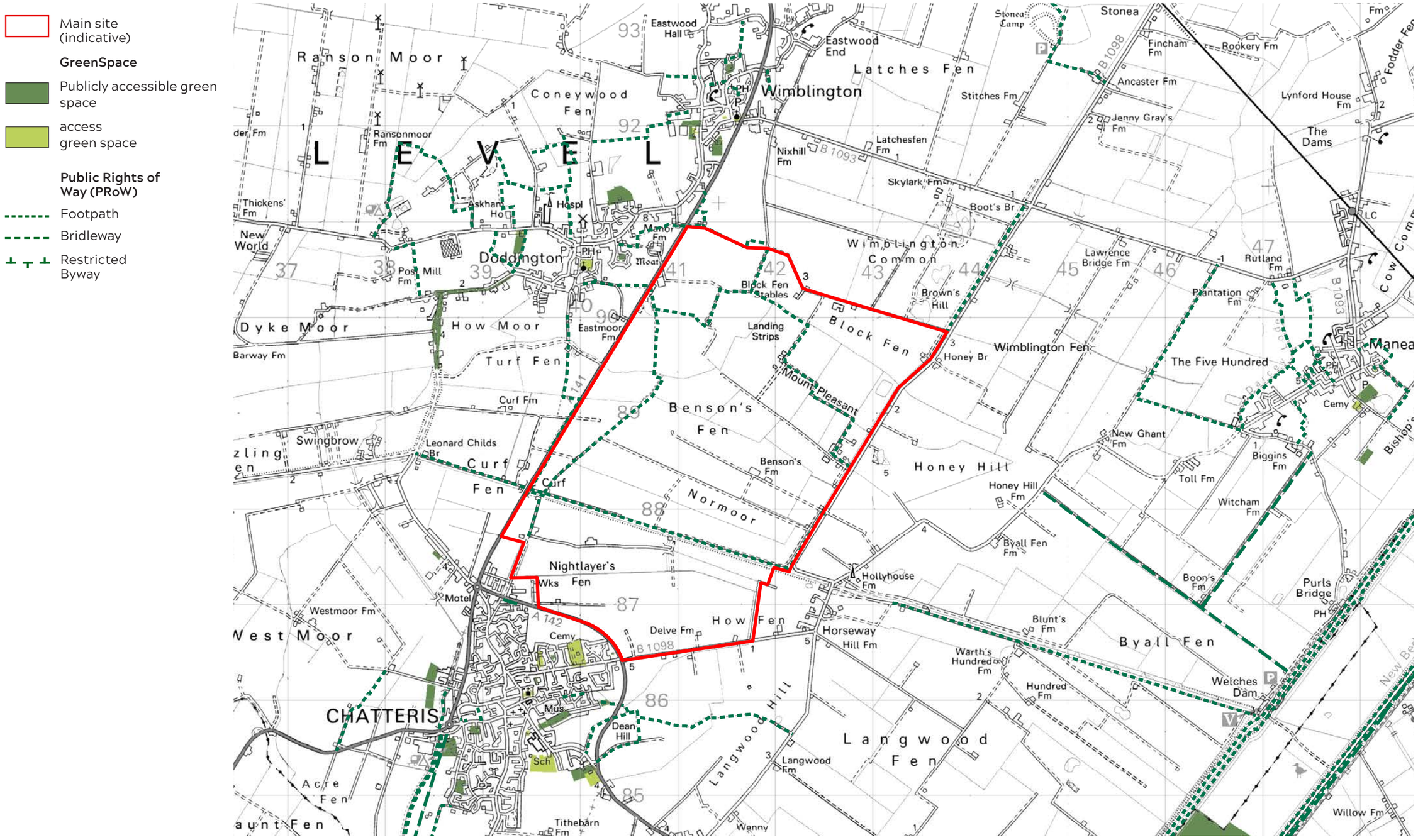
PRoW, terminating at the B1098.

Fenton Way, running through a semi-industrial area, without footpaths

Poor quality crossing point from PRoW south of the A142 to Fenton Way

Furrowfields green space in Chatteris. Many of the green spaces in Wimblington, Doddington and Chatteris appear to offer little opportunity for interaction with nature

Meeks Cemetery, Chatteris. An area of greenspace informally used for recreation



Areas of greenspace and the PRoW network in and around the Fens Reservoir site

6.7 Habitats and Biodiversity

Like much of the Cambridgeshire Fens, The Fens Reservoir site and wider surrounding landscape are under intensive agricultural use. The fields sit within a lattice of drainage channels that provide marginal habitats along their length. There are limited small areas of higher-value habitat within the site consisting of waterbodies, small blocks of trees and grassland. On the northern boundary of the site lies Wimblington Common Gravel Pits County Wildlife Site which consists of woodland, scrub, swamp and open water. Hedgerows and trees are rare in this landscape. Many arable fields are under enhanced stewardship and include field edge buffers, nectar flower mixes and low-input grassland.

Cambridgeshire is one of the most nature depleted counties across England, “yet history tells us that [The Fens] were once the richest landscape for people and for wildlife in Britain.”* Less than 1% of the original fenland habitats remain, however plans and works are ongoing to improve, enlarge and connect these important habitats.

5km to the east of the site lies the Ouse Washes internationally and nationally designated wetland and the Nene Washes internationally and nationally designated wetland is located about 12km north-west of the site. Bird migration between these internationally important areas over the Reservoir site is to be expected. The Goose and Swan Functional Land (land that has the potential of being regularly used by Ouse Washes qualifying species, particularly swans, for foraging and roosting), extends into the northeast corner of the Reservoir site and wraps around the eastern and part of the southern edge of the site.

The Fens Reservoir site is well placed to contribute toward connectivity of existing fen habitats. The Forty Foot Drain is classified as a proposed priority landscape corridor in the Fens for the Future document. This watercourse directly connects the Great Fen and the Ouse Washes. These two sites include areas which are of international and national importance for wildlife. The Great Fen is a landscape-scale fenland restoration project.

The Fens for the Future document can be viewed here: fensforthefuture.org.uk

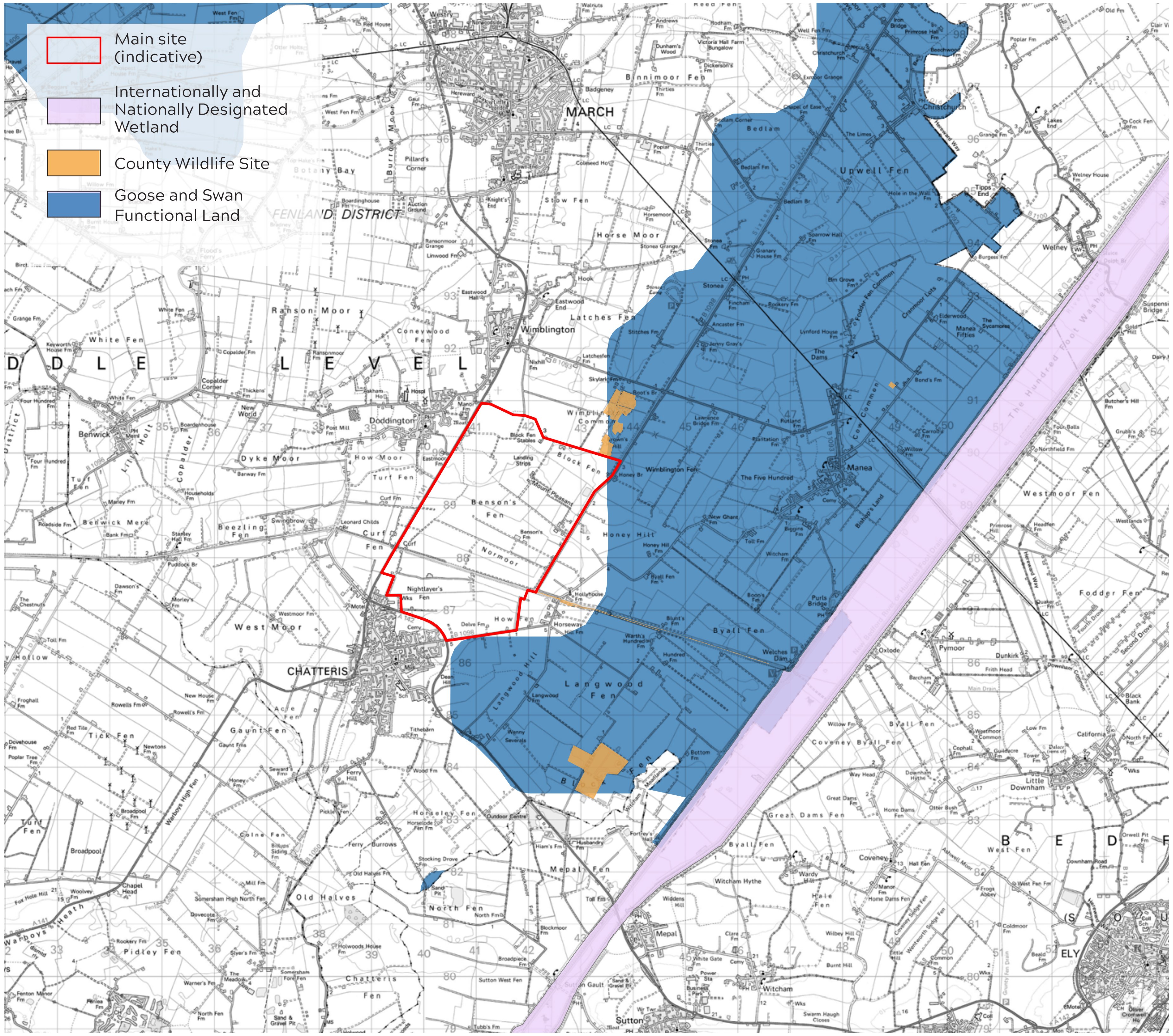
Swans on arable land within the zone of Goose and Swan Functional Land

Wimblington Common Gravel Pits County Wildlife Site

Ouse washes in flood

* Rotherham, I. (2013) The Lost Fens: England’s Greatest Ecological Disaster. The History Press

Holme Fen National Nature Reserve, within the Great Fen Project area



Plan showing the ecological designations of the area.

7 Opportunities

This section looks at opportunities to improve the design and integration of a standard, non-impounding reservoir to achieve multiple benefits for people, places and nature. These opportunities have been reviewed with reservoir safety experts to agree which of them should be explored at this stage. The Project Team also looked at how key challenges raised through feedback at Phase One Consultation could be addressed in the emerging design.

7.1 Reservoir Shape and Form

A standard engineered non-impounding reservoir, such as that found at Covenham reservoir, Lincolnshire (below), presents different challenges and opportunities for successful place making, habitat creation and integration within its landscape. Unlike impounding reservoirs (where a valley on an existing watercourse is dammed), the entire perimeter of a non-impounding reservoir is man-made embankment, usually built above existing ground levels. Each of these banks is carefully engineered to ensure it is safe and easy to maintain, which has often meant that non-impounding reservoirs have straight banks and steep slopes with few opportunities for planting and places that people can easily access the water's edge.

For NSIPs such as the Fens Reservoir, the NPS requires the design to be adapted and improved to achieve multiple benefits for people, places and nature. Opportunities identified were discussed with reservoir experts to agree which of them could be taken forward.

Covenham Reservoir - An example of a standard non-impounding reservoir. This approach would not meet the requirements of the NPS which will apply to the Fens Reservoir

Opportunities were explored to tailor the shape and form of the Fens Reservoir to its context and to meet other needs which are summarised below.

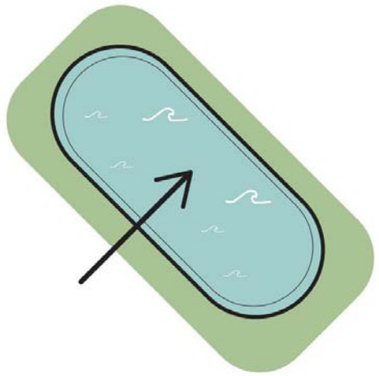
Arriving at the preferred shape and height of a reservoir involves balancing multiple factors. For example, if the reach (width of the reservoir) can be reduced sufficiently in the direction of the prevailing wind (from the south-west), there is less distance for the wind to increase the size of waves, and therefore the freeboard above the high water level can be reduced. However, a long, thin reservoir is less desirable in terms of water quality as zones of dead-water might be created which may then need to be remedied through electrically powered plant. This can also be the case with bays and other interruptions on the reservoir edge.

Optimising the shape is also closely related to achieving the best cut/fill balance for the scheme. This involves balancing the amount of material needed from excavation with the amount of material needed to create the embankments. Achieving a good balance reduces the amount to work required to move materials and, in turn, reduces the Project's carbon footprint.

Erosion protection is required to the inner face of the embankment around its entire perimeter. In standard non-impounding reservoirs, it is usual to achieve this with a hard treatment such as concrete or rip-rap. Opportunities

were identified that other forms of erosion protection could be possible. For example, there is a key opportunity around using lagoons (see Section 7.2 below) and wetland creation on the inner face of the embankment to reduce the amount of engineered surfacing.

As the surrounding area includes a mix of engineered and natural landscapes, the Project Team wanted to explore alternative contextual approaches to the size and shape of the reservoir.

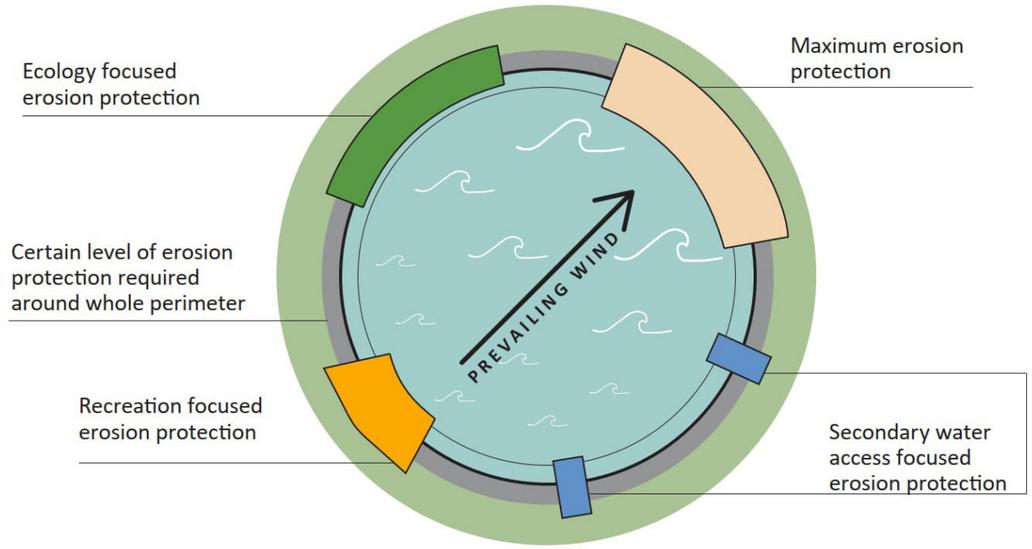


The opportunitiy to minimise the size of waves is minimal unless the shape is significantly changed in this direction.

Size of waves and prevailing wind direction are factors in determining a suitable inner face treatment.

The concepts of using a higher/smaller and lower/larger footprint of the waterbody were assessed to look at the different implications on factors including access to the site, prominence in local views, downstream impacts, cost (including land acquisition, construction method and material volumes), consentability and carbon.

Three design approaches were considered by the Project Team; Fen Isle, Drained Fen and Landmark. For more detail on how the shape evolved see Chapter 8.



There is the opportunity to use a range of erosion protection materials around the inner face of the reservoir that align with the use or character.

Beach is an example of a potential erosion protection treatment to the inner face of the reservoir. Amager, Copenhagen

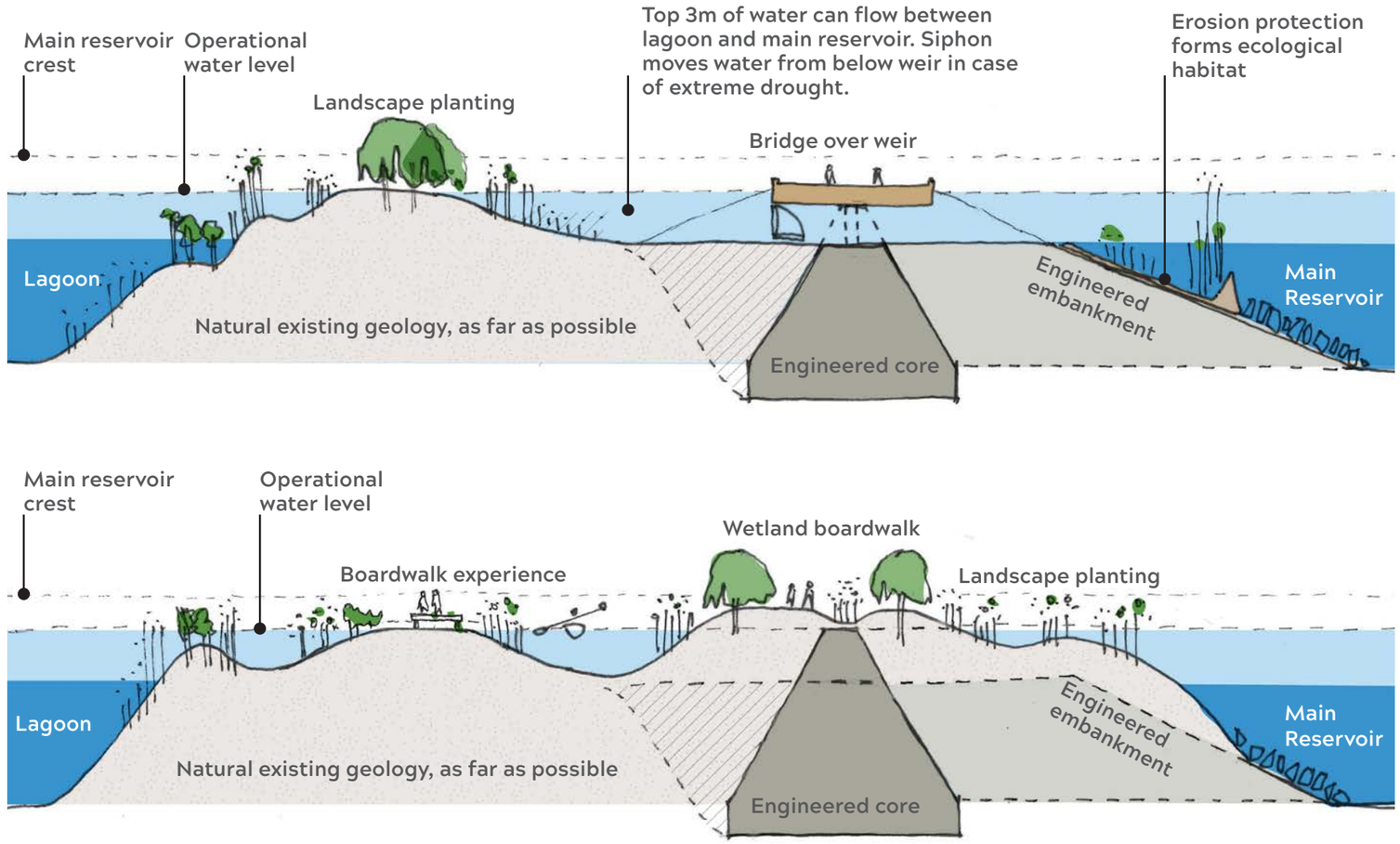
7.2 Public Access to Water

The new reservoir is designed to abstract and store water when it is in most abundant supply. It is not topped up in the dry summer months which means the main water level will fall by approximately 3m over the course of a typical year and crucially will be at its lowest when recreational demand is likely to be at its highest.

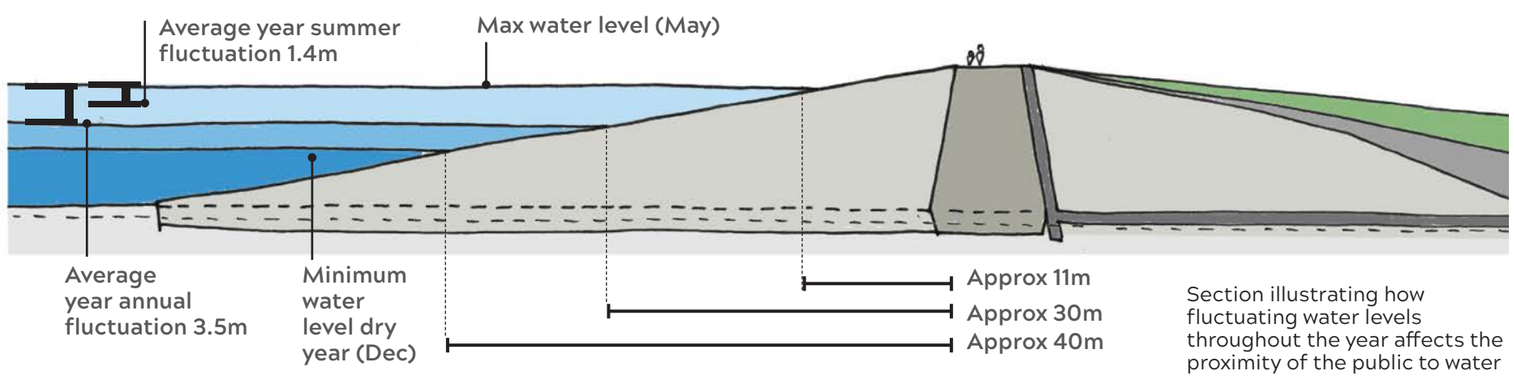
Such large annual (rather than tidal or seasonal) fluctuations, present challenges for gaining public access to the water and the establishment of marginal and wetland habitats on the inner embankment.

As a result of these fluctuations in water levels, the need for freeboard, and the relatively slack gradients of the internal face of the embankment, the distance of the water to people on the embankment crest will vary by around 20m in the average year.

To overcome this, the Project Team developed the concept of potentially using an internal weir within the reservoir to retain water levels in a discreet area of the waterbody at a much more consistent level. These areas are called lagoons and have been used at other reservoirs such as Rutland Water. The areas with consistent water levels mean access structures (jetties) and beaches could be designed for more fixed levels enabling opportunities for inclusive access for activities like swimming and sailing. It also makes successful establishment of marginal habitats more likely.



Sections illustrating potential ways that a lagoon created by an internal weir can bring people closer to the water.



Section illustrating how fluctuating water levels throughout the year affects the proximity of the public to water

7.3 Embankment Integration and Tree Planting

In line with planning requirements and the indicative design principles, the design is seeking to avoid creating a reservoir with monotonous embankment slopes that provide no shelter or integration with the surrounding landscape. Therefore, the Project Team looked at opportunities for planting and features on the embankments to improve accessibility and appearance.

A number of scenarios were discussed in detail with reservoir safety experts and several key opportunities (and constraints) identified:

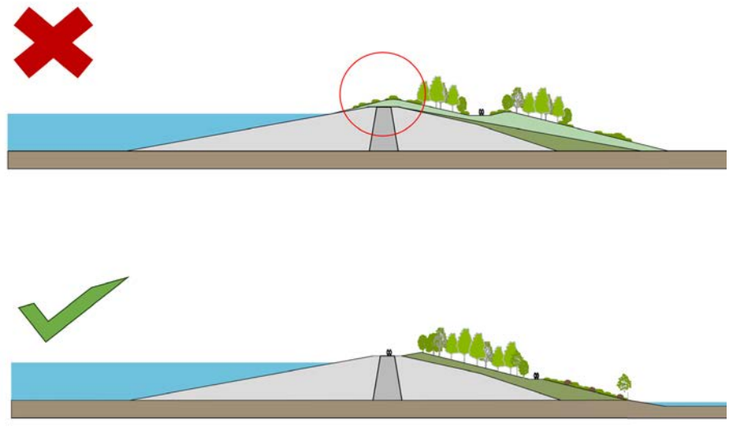
1 Additional “landscape” earthworks at shallower gradients could be placed on top of the engineering embankments and trees can be planted into the landscape earthworks, provided the tree roots do not penetrate the engineered embankments below. Further detailed work will be undertaken to determine which trees species will be most appropriate for this. Landscape fill can equally be applied within the inner slopes of the reservoir to facilitate vegetation establishment.

2 Landscape earthworks can extend above and overlap the crest of the engineered embankment. This is particularly important for providing shelter on what will be the most important recreational route, or to create visual interest, to screen or frame important views or help break up the horizontal alignment of the crest. However, a 5m width of the engineering crest must remain level and uncovered by landscape earthworks so that the inspecting engineers can immediately identify any settlement in the embankment.

3 Whilst landscape earthworks can be employed around the majority of the reservoir perimeter, there will need to be specific areas where the engineering embankment (planted with amenity grassland) is exposed for inspection.

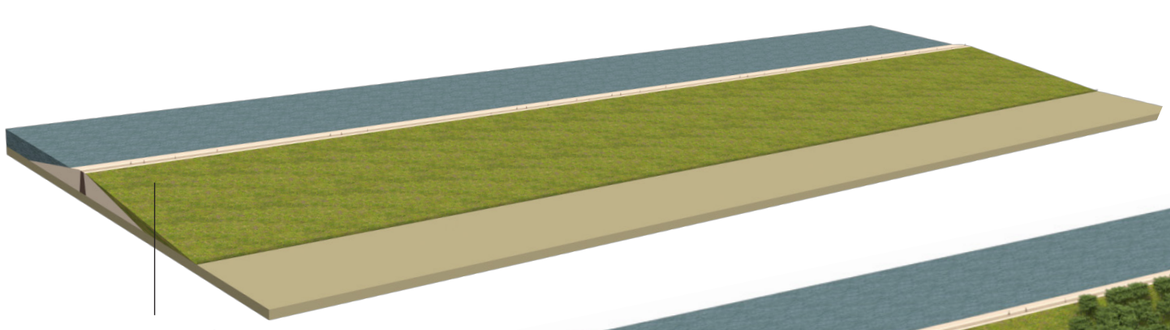
4 Wetland could be provided beyond the outer extents (the ‘toe’) of the engineered embankment - but no areas of wetland can be provided on the embankment itself.

5 Other infrastructure, such as parking and buildings, could be located on the embankments, subject to appropriate engineering design.



Example of ways in which tree planting near the embankment crest has been discussed and explored with input from the reservoir engineers

These opportunities are utilised in the emerging design, however it should be noted that the use of landscape earthworks on top of the embankments is contingent on the amount of material available from excavations on site. The extent of landscape earthworks, therefore is constrained by the “cut/fill” balance of earthworks and likely to vary as the design develops. The extent of habitat provided will also be informed by environmental assessments and requirements around Biodiversity Net Gain.



Poor Integration

Monotonous embankments should be avoided

Positive integration

Illustration showing a range of ways in which the embankment could be integrated into its surroundings

7.4 Recreation

Anglian Water's other reservoirs in the region such as Rutland Water and Grafham Water have become outdoor amenity destinations in their own right. Phase One Consultation showed local enthusiasm for a range of different recreational facilities at the Fens Reservoir.

The recreational features at the reservoir could include a mix of different experiences and activities. Examples may include:

- Inner lagoon with consistent water level (See Section 7.2 Public Access to Water)
- Beach/swim zone
- Water based activities
- Visitor centre
- Boardwalk loop and viewing experience
- Recreational routes for walking, cycling and horse riding - including circular loops around the reservoir
- Outdoor play facilities
- Nature and habitat areas
- Links to navigable waterways.

In line with the NPS, some of these may be delivered as part of the DCO. Recreation facilities which cannot be consented through the DCO would require separate consents and might be promoted by other parties in and around the site after the reservoir is complete.

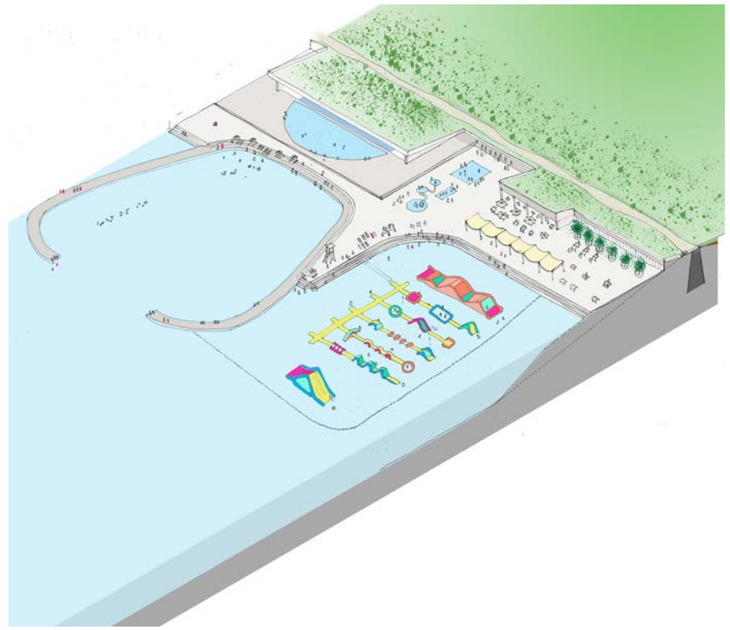


Illustration showing how access to water could be encouraged through water-based recreation.

Rutland Water beach

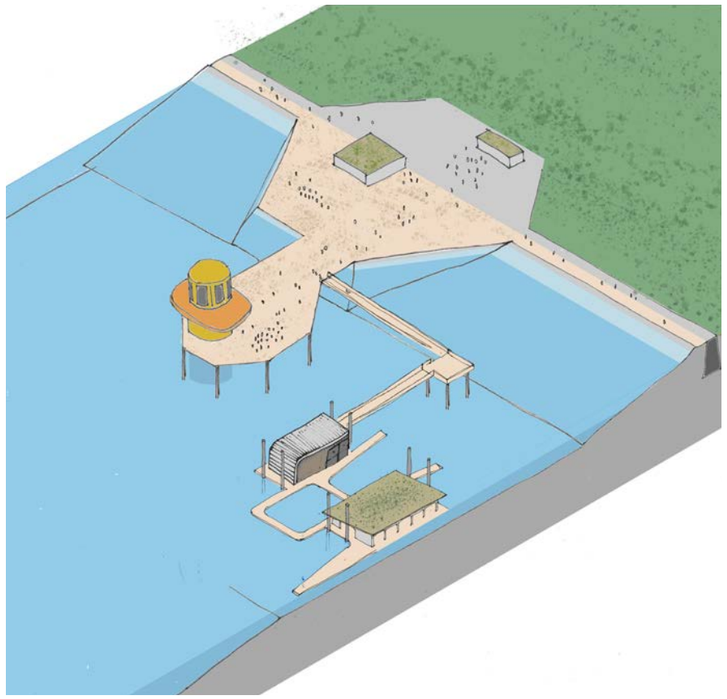


Illustration showing how access to water could be facilitated through required reservoir infrastructure

7.5 Public access to Reservoir Infrastructure

In developing the emerging design the Project Team has looked at how the reservoir operational infrastructure could be used and integrated seamlessly into the design proposals and increase public understanding of the process and importance of water resource management.

After a review of the security and access requirements associated with critical assets, the following opportunities and constraints were identified:

1. The outlet tower will house operational equipment that needs to be secure from the public. Should public access be provided to appropriate sections of the tower via an access pier or walkway, it would need to be separate and secure from the operational assets. The outlet tower and its connecting bridge could be used to get people closer to the water when the water levels are lower, however control measures would be required to ensure that this could be achieved safely and they are not exposed to fast-flowing currents.
2. The spillway area has a lower crest (less freeboard) and could be located where improved (lower) access to the water and a slacker gradient up to the crest level is achievable, however care will need to be taken that public access does not increase the risk of erosion of the spillway surface on the outer embankment. The width and treatment of the spillway can also be varied on the outer embankments to balance the risk of erosion on the surface. For example, a wide spillway can have a more natural treatment. A narrower spillway would need to be hardened due to the greater depth and velocity of water being channelled down it.
3. The outlet valve test pond generally requires a harder surface treatment to prevent establishment of habitats that could be damaged by emergency use. Opportunities to use this large “basin” as a part of the public amenity areas are limited. When water is discharged from the reservoir into the pond, energy dissipation is required to reduce the force of the water. A visual feature could be made of this, for example a vertical jet creating a water fountain, but access would be restricted.

Example of a typical outlet tower and bridge

7.6 Nature-Based Solutions

Nature-based solutions (NbS) involve working with nature to address societal challenges such as climate change, environmental degradation and water security. Specifically, they are actions that involve the protection, restoration or management of natural and semi-natural ecosystems effectively and adaptively, simultaneously benefiting people and nature.

The Project Team is actively exploring opportunities to use multi-functional environmental approaches or interventions that could be beneficial at the reservoir once its full environmental impacts are understood.

Relevant examples of this ecosystems led approach could include restoring wetlands to mitigate floods and improve water quality, using woodland planting and natural grasslands to absorb carbon and integrating fruiting trees into agricultural landscapes to enhance soil health and provide alternative sources of income.

Further detailed assessment of the natural capital of the site (the natural resources that provide benefits to people and nature) will be undertaken to help inform how nature based solutions could be incorporated within the reservoir design to maximise the range of benefits.

Example of wetland creation to improve water quality in the River Ingol at Ingoldisthorpe

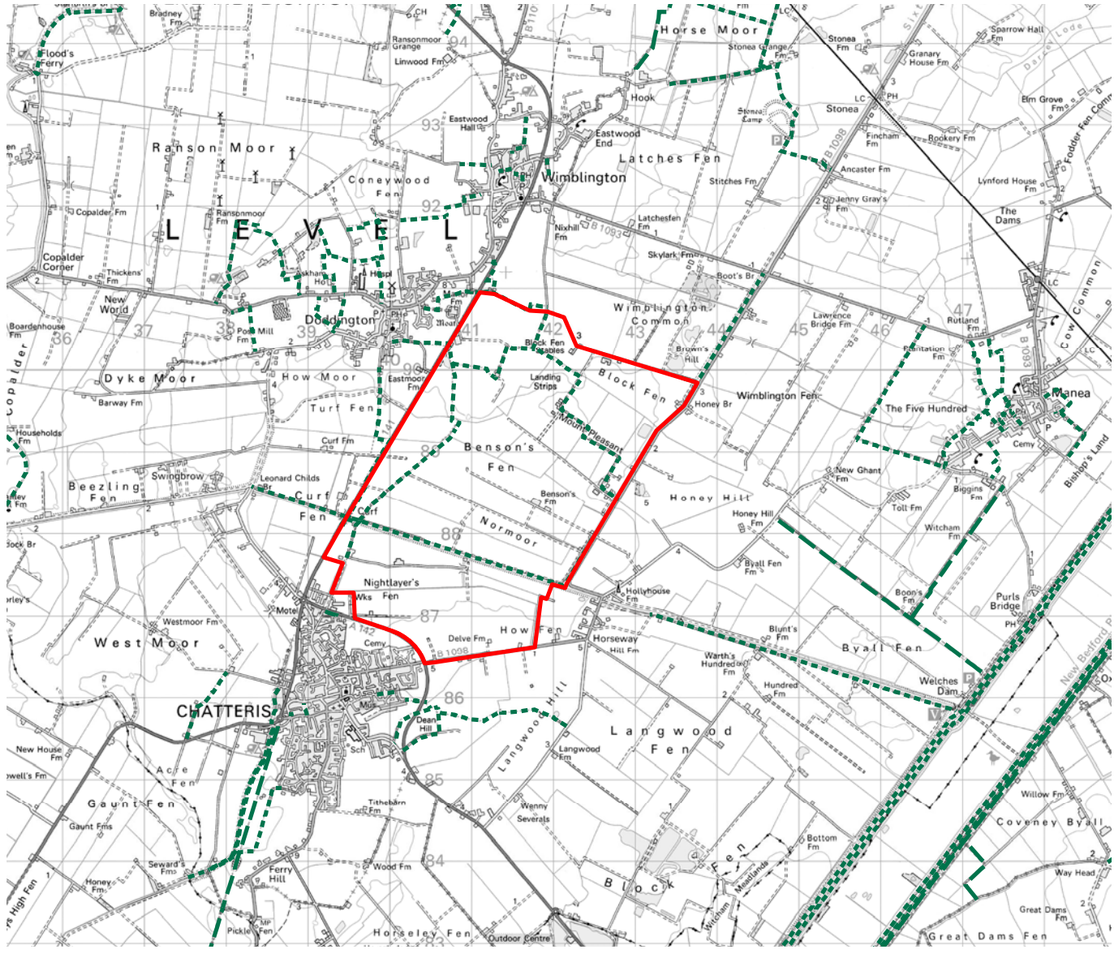
7.7 Chatteris & Doddington Links

Site analysis identified a lack of public open space available to the local settlements surrounding the reservoir (see section 6.6). Phase One Consultation identified the need to ensure nearby communities, such as Doddington, Wimblington, Manea, Whittlesey, March and Wisbech, can access the reservoir, and overcome existing barriers to movement, to ensure the benefits of the scheme are maximised.

The Project Team looked at a range of potential community connections into the reservoir site from the local settlements and explored plans for regional links that might assist in improving connectivity to March and beyond.

A number of opportunities for potential links, starting at open spaces and from existing PRoWs, were identified, with a view to providing attractive landscaped connections from settlements to the reservoir. These routes would need additional infrastructure to cross the busy A141 and A142 as well as the Forty Foot and Sixteen Foot Drains. All of these potential opportunities were taken forward for discussion with local stakeholders and a selection included in the emerging design. Further work with stakeholders is required to determine the feasibility of these links and the most appropriate delivery mechanism.

The team also considered the future potential development of the area that lies between the A142 and the Forty Foot Drain in ensuring good connections for the people of Chatteris. This area is designated as “Broad location for employment growth” in the draft Local Plan and the design team will continue to monitor how development here (by others) could facilitate improved links to the reservoir.



The existing PRoW network in and around the Fens Reservoir site

Main site (indicative)

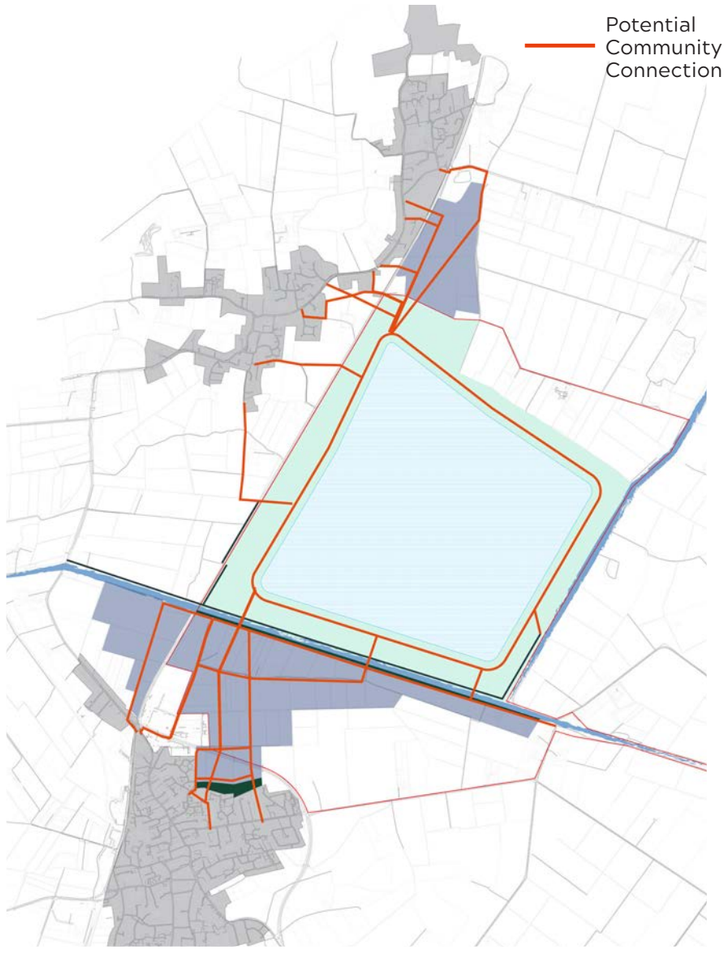
National Cycle Netowrk Route

Public Rights of Way (PRoW)

Footpath

Bridleway

Restircted Byway



Potential opportunities for local community connections that are being explored

7.8 Navigation

Improved facilities for navigation emerged as a strong theme from Phase One Consultation. In considering potential opportunities, the Project Team has reviewed the local and regional context provided by the existing waterways, the type and size of vessel, precedents for marina infrastructure in the region and future aspirations to improve the connectivity of recreational boating in Cambridgeshire through, for example, the 'Fens Waterways Link'.

This showed a good opportunity for the reservoir site to be accessed by boat. This could be via a marina with direct access to the waterway network (via the Forty Foot and Sixteen Foot Drains) that form the southern and eastern boundaries to the main reservoir site. Precedent studies of marinas in the vicinity identified that a medium-large marina might be appropriate in this location, and measure approximately 3.2 ha.

It should be noted, however, that further consideration is required as to the ability to provide such a facility as part of the 'core' project through a DCO. The working assumption at this time is that any new marina would need to be separately promoted and maintained by a third party. Anglian Water and Cambridge Water would seek, where reasonably practicable, to ensure such proposals are not precluded from coming forward in the future. There may also be an opportunity to repurpose a construction quay as a permanent recreational marina. This opportunity has been carried forward into the emerging design but will be subject to third party agreements and further feasibility.

View towards Hartford Marina, Huntingdon

View towards Hermitage Marina, Earith

7.9 Carbon and Renewable Energy

Anglian Water has a strong reputation for delivering significant reductions in the carbon footprint of its construction projects. Cambridge Water has proven experience in delivering innovative solutions to reduce carbon in operation. Both are generating and using an increasing amount of renewable energy and have committed to achieving net zero carbon emissions in operation by 2030. In line with these ambitions the Project is committed to:

- Reducing greenhouse gas emissions (i.e. a combination of what we refer to as capital carbon and operational carbon) to as low as reasonably practicable as per the National Policy Statement for Water Resources Infrastructure
- Achieving net zero operational carbon emissions as per Water UK's net zero Routemap
- Considering best value for water customers and;
- Maintaining an evidence based approach to identifying and driving low carbon opportunities.

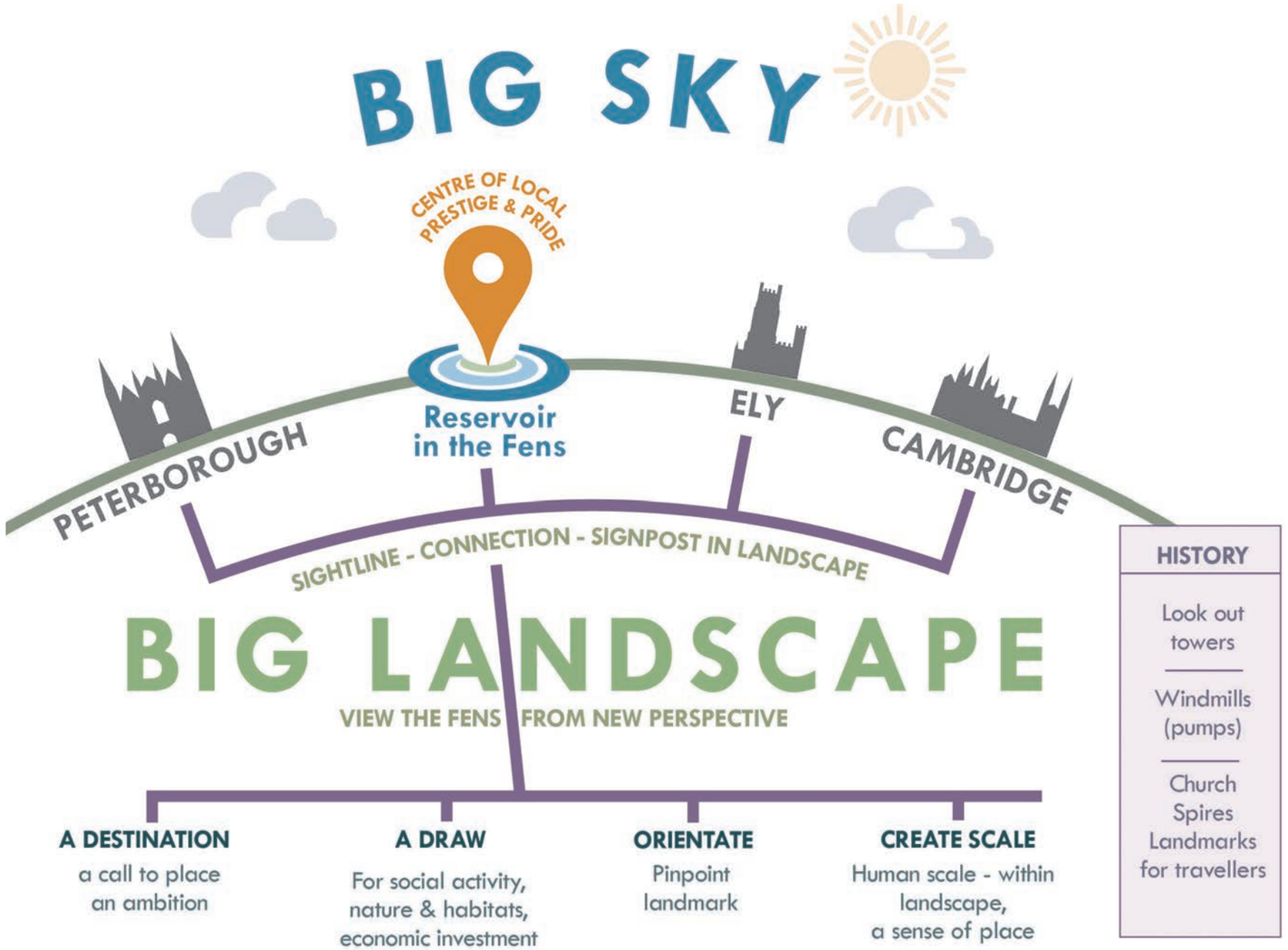
Designers are required to avoid, reduce and offset carbon emissions. Opportunities for the scale and mix of renewable energy are being considered, this includes both onsite and offsite generation. At the Fens Reservoir this could include a mixture of solar panels and wind turbines, balanced by battery storage, with one potential configuration shown in the emerging design for consultation.

This is however not a fixed proposal, and a significant amount of technical work is needed, including a full assessment of potential impacts and mitigation requirements through the EIA process, and acknowledging rapidly evolving technology, before the mix and amount of renewable energy provided as part of the Project is progressed.

8 Design Evolution

This chapter describes the evolution of the emerging design for Fens Reservoir, through an iterative process of option testing (considering alternative potential design solutions and arrangements of key elements) since Phase One Consultation.

The goal of this process was to test multiple variables and their interaction with each other. Through a series of spatial masterplanning exercises and workshops, different aspects of the reservoir design and the location of components and access were tested. This process built on the foundations of the visioning, site analysis and opportunities work described in earlier chapters.



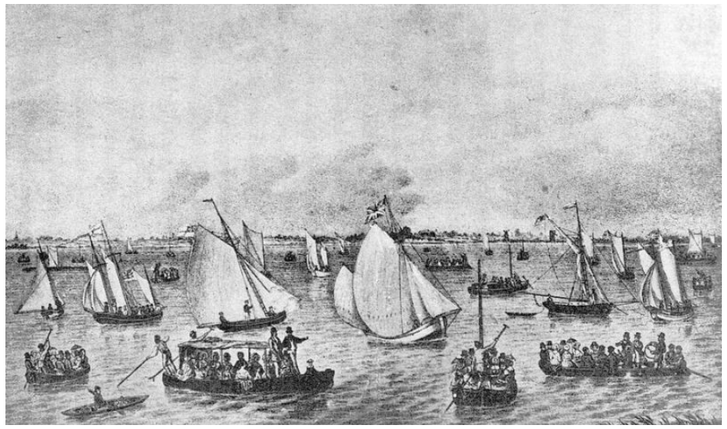
Concept diagram

8.1 Formative Design Themes and Concepts

The origins of the emerging design are grounded in very early vision work. Out of this developed the concept of the reservoir being a point of destination, a new landmark, in the expansive flat landscape. Scale studies showed that the reservoir could appear as a new “fen island”. Looking at the prominence of other islands and landscape, and the stated local desire for potential socio-economic benefits associated with the reservoir, it was clear that an ambitious approach to the design could be appropriate here. Together with tall well-designed structures, the reservoir could act as a key point of orientation and wayfinding in the region.

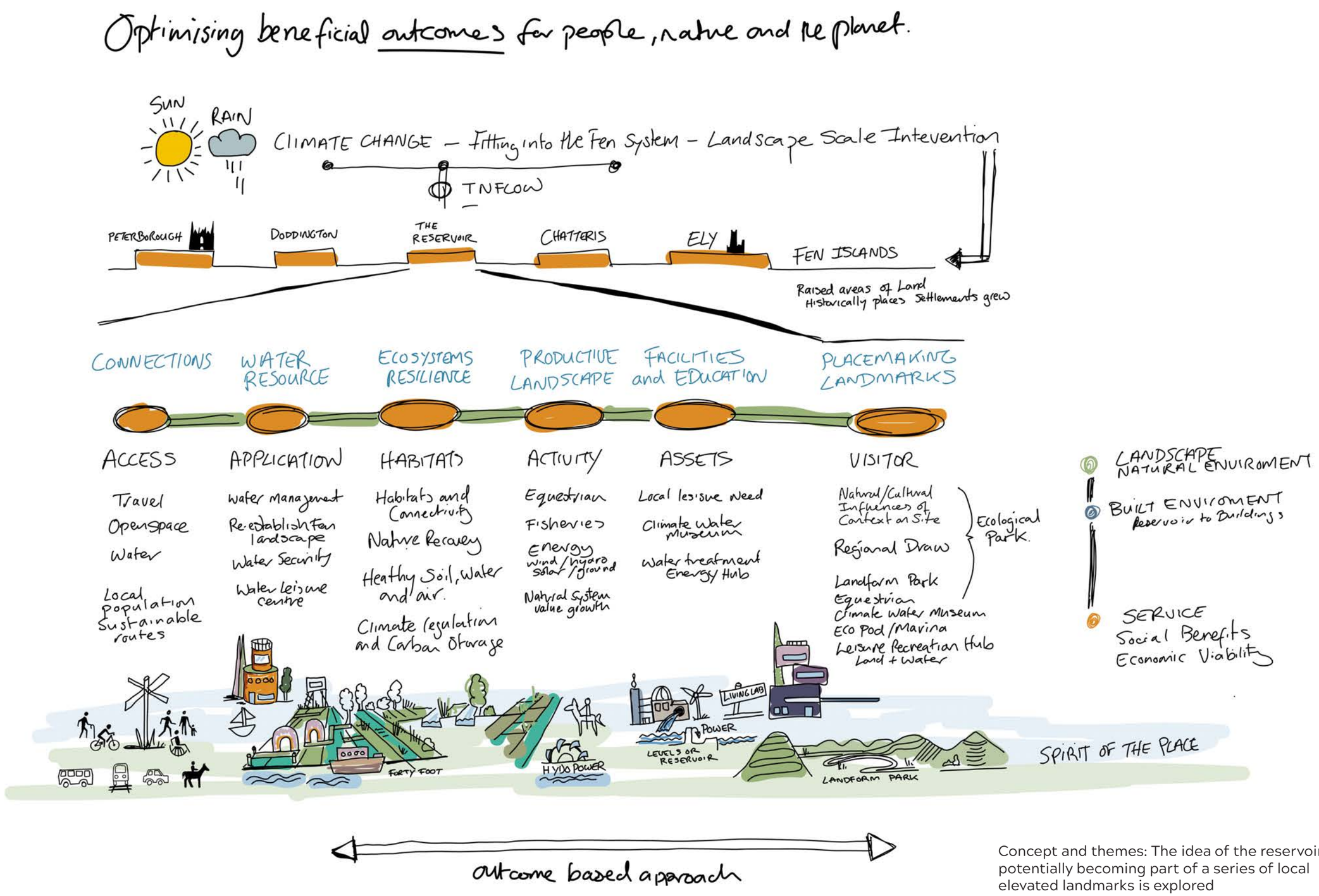
The Project Team was also inspired by local history that suggested close ties between the communities in towns and water. Archaeological discoveries, such as those at Must Farm and histories of the Fen Tigers and the draining of the Fens, shine a light on a way of life, with activities such as wildfowling, reed cutting and winter ice skating, that was once much more closely associated with a rich wetland habitat. In more recent years there are other examples of close interaction between town and water; local archives hold photographs of the old Chatteris Docks and concerts held on the Forty Foot Drain - using the banks as a natural amphitheatre. Also, the (now closed) Boat Pub on the site was previously connected to Chatteris over a footbridge that no longer exists.

The idea of landmark islands and improved connections between land and water informed a language of causeways, elevated paths and boardwalks connecting different zones of interest in and around the reservoir with local communities that is reflected in the emerging design.



Whittlesea Mere.
H M Heathcote ‘Reminiscences of Fen and Mere, published in 1876

Chatteris Town Band.
Credit Chatteris Museum, 2 Park St, Chatteris, PE16 6AE



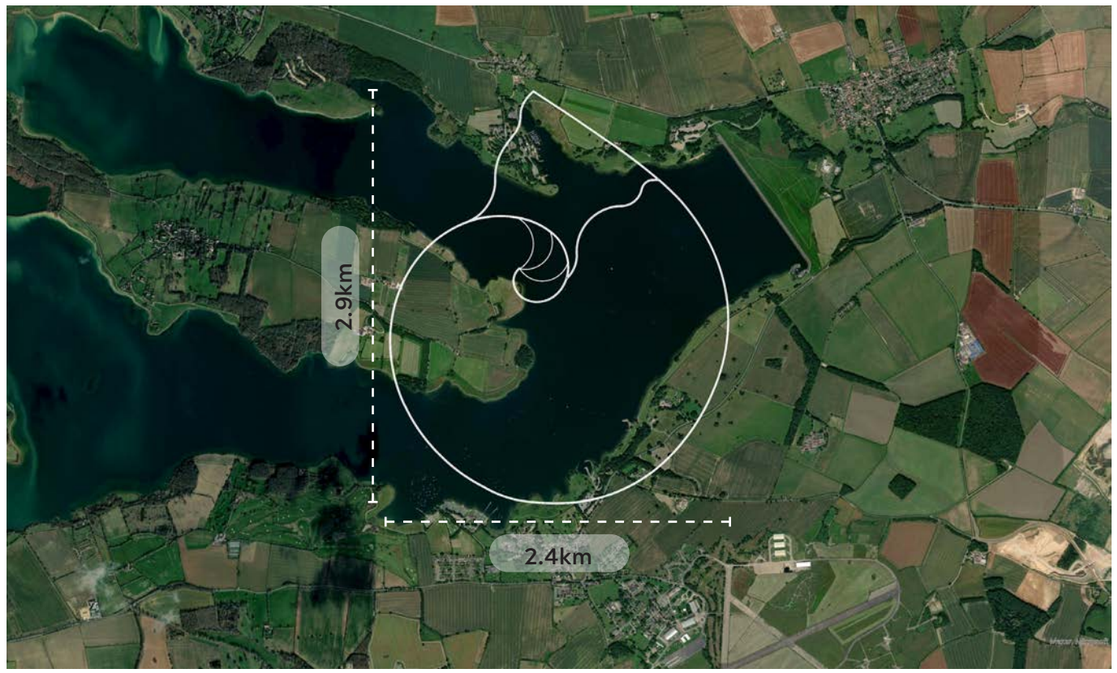
Concept and themes: The idea of the reservoir potentially becoming part of a series of local elevated landmarks is explored

8.2 Scale Comparisons

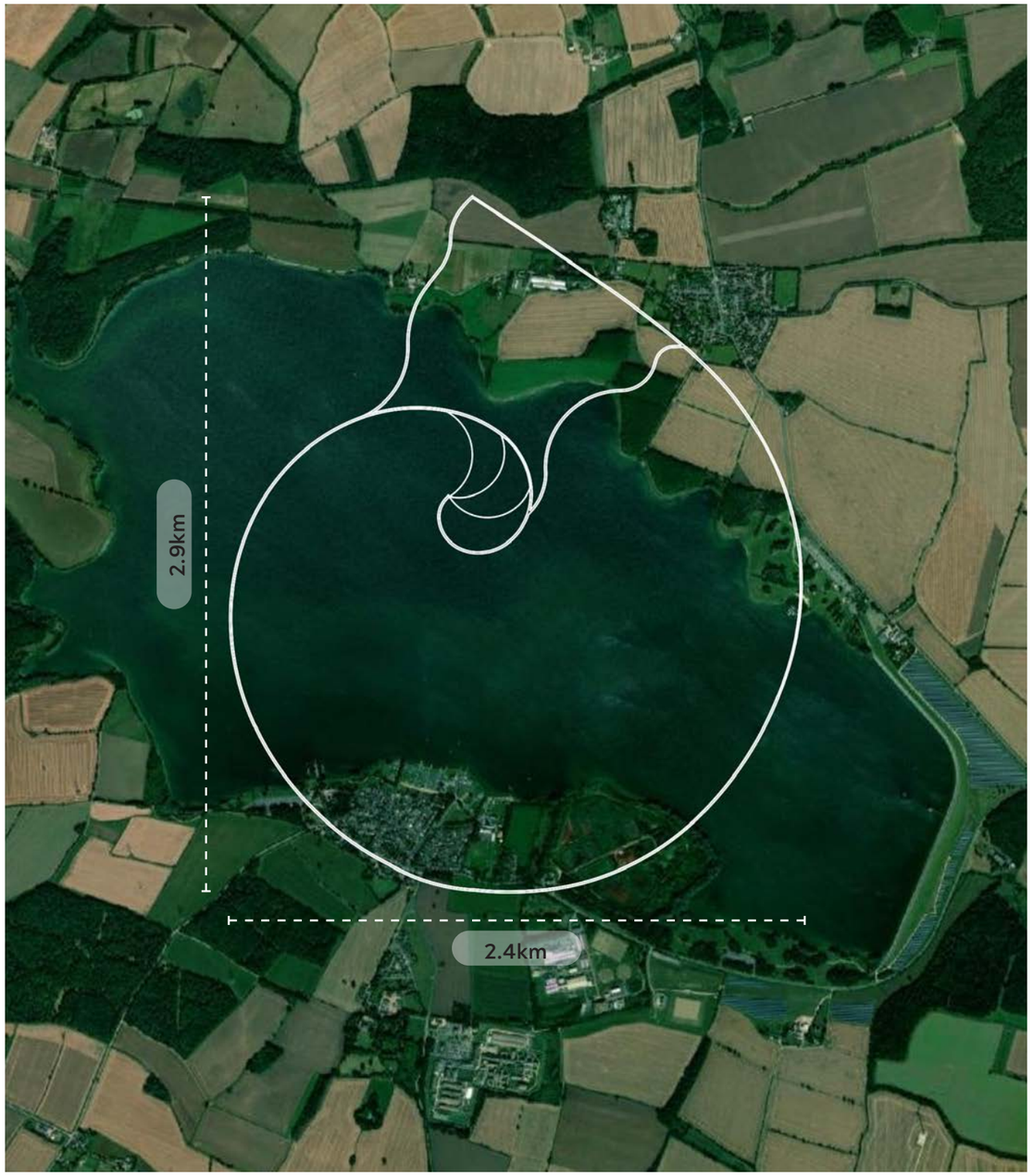
The Fens Reservoir is being designed to hold approximately 55 million cubic metres of water. This results in a reservoir with a water surface area of approximately 5km2.

The perimeter of the embankment crest of the reservoir is approximately 8km in length, and would take approximately two hours to walk at an average walking pace.

To put this into context and to help understand the scale of the reservoir, the indicative reservoir footprint showing the main waterbody and embankments has been overlaid onto aerial plans of Grafham Water and the dam end of Rutland Water.



Indicative reservoir footprint overlaid onto the east end of Rutland Water, showing the reservoir would be larger than the widest extent of Rutland Water



Indicative reservoir footprint overlaid onto Grafham Water

8.3 Reservoir Shape - A Response to Context

The process of defining the shape of the reservoir continued in parallel with the permutation and options testing process described below. This work was informed by feedback from the Phase One Consultation (Chapter 3), by technical requirements (Chapter 5) and by an understanding of the other contextual drivers which represented both constraints and opportunities (Chapter 6).

There are a number of considerations that need to be taken into account when developing the shape of the reservoir including:

- **Spatial constraints:** The A141, Forty Foot Drain and Sixteen Foot Drain bound the site.
- **Associated land uses:** Land uses including habitat creation and recreation need to be accommodated between the spatial constraints listed above and the water's edge.
- **Water quality:** Areas where reservoir water can become stagnant need to be avoided. Prominent peninsulas, pronounced bays or coves can only be incorporated if water flow can be maintained by the position of inlet/s.
- **Water level variation:** To maintain the recreational benefits of the waterbody, both on and off the water, a consistent water level lagoon should be explored (see section 7.2). This would need to be topped up by incoming water, meaning the reservoir inlet and recreational area need to be in close proximity. Analysis of similar recreational use determined that the lagoon should have an area of approximately 60ha.
- **Cost and carbon:** The proposed shape needs to be efficient in terms of cost as well as carbon emissions. The shape and height of the design needs to identify ways to minimise earthworks and limit the requirement to import or export material from site.
- **Landscape and visual:** The shape needs to work with and respond to its setting.

Possible inspiration: Linear water channels, roads and field edges of the drained fen

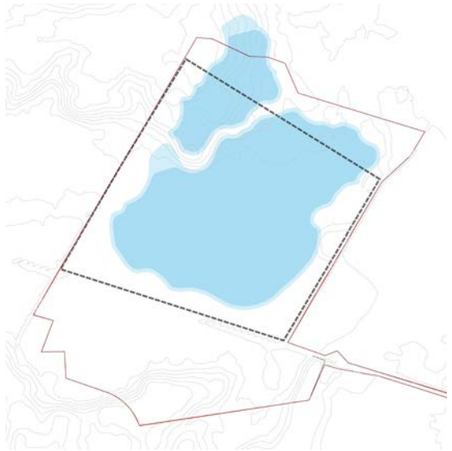
Possible inspiration: Organic curvy roads, water courses and field boundaries are associated with the higher ground

Please also refer to section 7.1.

On top of these technical considerations, a key objective of this process was ensuring that the form of the reservoir is tailored to its specific context and contributes to the distinct sense of place. Given the unusually dramatic transformations in the fenland landscape over its long history there are a number of visual cues that could serve as inspiration for the form of the reservoir. For example, should the shape respond to:

- The flat open expanse of a land previously submerged (or partially submerged) in water? Or;
- The irregular geometry of higher fen islands dotted throughout the landscape? Or;
- Other dominant features of the site such as the raised embankments and straight lines of the Forty Foot and Sixteen Foot Drains?

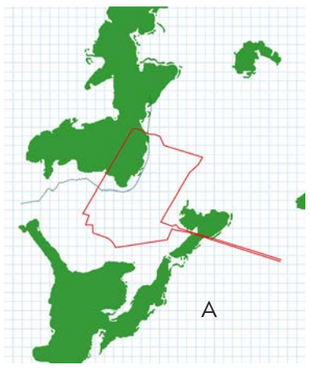
The Project Team sought to explore different approaches to context through exploration of three different shape options outlined on the next page.

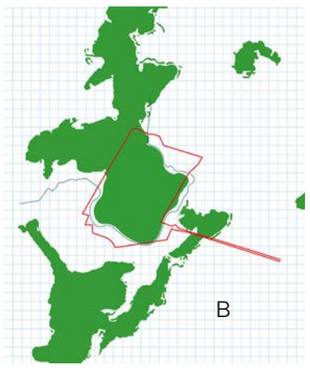


Fen Isle

To the north of the site is a gently sloping landscape, elevated above the drained fen. This part of the site rises to a height of 8-9m AOD. This is one of the highest parts of the March Fen Island and is one of the higher points in the surrounding area. The fen islands generally have a smaller scale than the surrounding fenland, with settlements surrounded by smaller fields, with trees and hedgerows providing a level of enclosure. Roads, ditches and field boundaries are more organic, responding to the subtle topography.

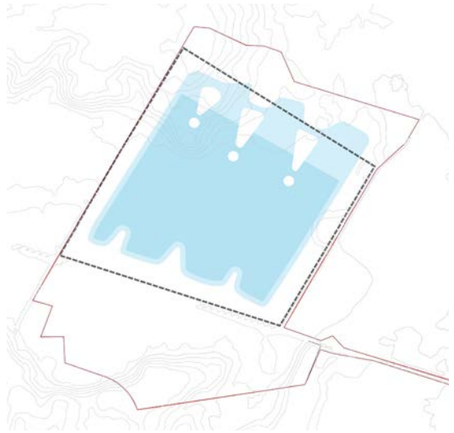
Reducing the height of the embankments, to an equivalent level to the March Fen Island, would involve increasing the footprint of the reservoir in order to provide the same volume of water. Blending the embankments into that fen island (so the reservoir appears as an extension of it) means the reservoir footprint would need to be extended to the north-west.





A) Organic shaped areas of higher ground sit above the grid-like form of the drained fen.

B) An extension of the organic higher ground to include the embankments of the proposed reservoir at a similar level to the highest parts of the March Fen Island.



Drained Fen

This approach echoes the bold linearity and efficiency of the Forty Foot and Sixteen Foot Drains that have subsequently influenced the modern agricultural field pattern. Raised rivers, roads, ditches and field boundaries are straight and combine to create a grid pattern across the landscape. This is a landscape that has been shaped by engineering principles. The linear channels maximise drainage falls, efficiently draining the land.

The proposal draws inspiration from post turf cutting landscapes in the Netherlands (turf cutting was previously undertaken on part of the reservoir site). This approach would echo the open vast landscape that it would sit within, a place where the sky plays a dominant role in the drama of the place.

Peninsulas and islands extending into the water body would break up the north and south edges and create smaller “bays” within the overall footprint, thereby reducing the reach of the reservoir and improving microclimate. However, the peninsulas were considered to have too great an impact on the circulation and quality of the water. Therefore, this proposal was not taken forward.

A flooded historic peat cutting landscape.

Landmark - Ammonite

The approach seeks landforms that could be designed to be unique, attractive landmark features of the landscape. The distinctiveness of such a landform could have a powerful place-making effect, reinforce local identity and create a sense of destination. This has been demonstrated in land-art proposals such as Northumberlandia Woman by Charles Jenks or the works of landscape architect George Hargreaves.

The approach requires a strong geometry. The use of the ammonite was influenced by the deep history of the site, as mudstone excavated from the site in ground investigations contained hundreds of fossilised remains of these marine creatures from a time when the site lay below shallow seas. The ammonite form also has the engineering efficiency that characterises the design of the Forty Foot and Sixteen Foot Drains; the round shape is efficient for both the containment and circulation of water within the reservoir with the central “curl” forming one edge of the reservoir lagoon.

Ammonites were found on site during ground investigation works.

8.4 Phase 1: Permutation Testing

In parallel to the shape study, permutation testing was undertaken. This approach was taken to explore, at a relatively high level, the design and spatial configuration of key components of the reservoir. It looked at potential interdependencies between different components, assessing which elements could work well together, and what efficiencies and multifunctionality could be gained by positioning elements nearer or further away from one another.

Alternative configurations of the key components were presented in the form of four distinct spatial permutations with each permutation using variations in reservoir shape and location of the raw water inlet and outlet points. The permutations were described thematically to give a sense of how the arrangement of components could be used to create a different identity or character for the reservoir.

Potential Visitor Hub and Site Access Point

Having one main visitor hub may streamline site management and maximise the commercial viability of the recreation offer. The visitor hub could be at the centre of a new publicly accessible greenspace within an area that currently has a greenspace under-provision. The visitor centre location should maximise accessibility to address green space inequality.

Extent and location of renewable energy

For more information refer to section 7.9. To achieve Anglian Water's and Cambridge Water's aim to achieve net zero operational emissions by 2030, the Project would need power to run its operations from a renewable source. Water treatment is an energy-intensive process and will run year-round. Pumping water up into the waterbody is likely to happen in colder, darker months and energy requirements for recreational activities may be higher during the summer. A mixture of renewable sources would be needed to provide the resilience necessary to create power around the year- the power produced from wind is generally higher in the winter and the power produced from the sun is higher in the summer. A battery storage system would help to bridge periods of lower energy production when conditions are not optimal for power production.

Associated Water Infrastructure

Water Treatment Works

The Water Treatment Works (WTW) is required to treat the water in the reservoir before it goes into supply. The Project explored a long-list of potential locations for the WTW through the associated water infrastructure options appraisal. The preferred location waas identified to the south of the reservoir site.

Upstream Transfer and Inlet Locations

The masterplanning process assumed that water will enter the reservoir via the Middle Levels watercourses. With Middle Level watercourses immediately adjacent to the site on the south and eastern boundaries, there is a great deal of flexibility in the location of the inlet at the reservoir.

Ecological Mitigation

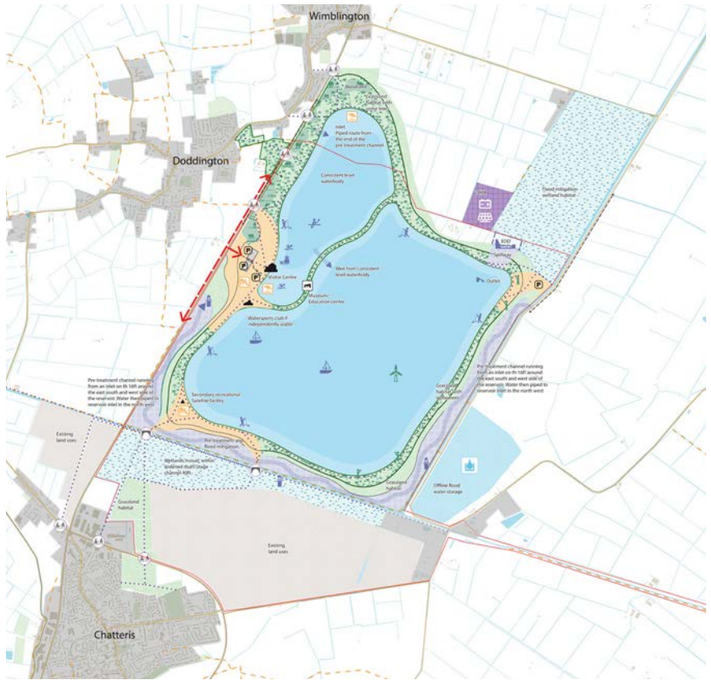
At the time of the permutation testing, little information was available on the extent and type of habitat replacement required resulting from impacts of the Project. Ecological mitigation focused therefore on replacement of ditches and watercourses lost beneath the reservoir and the form this could take.

Permutation A: National Offer

Permutation components

Visitor Hub
More ambitious. North west
Renewable Energy
23ha south of Forty Foot Drain
Water Treatment Works
South of Forty Foot Drain
Upstream Transfer
New channel and
pre-treatment wetland to the north
Outlet valve test pond and spillway
Multifunctional. South east
Ecological Mitigation
Wetland mosaic

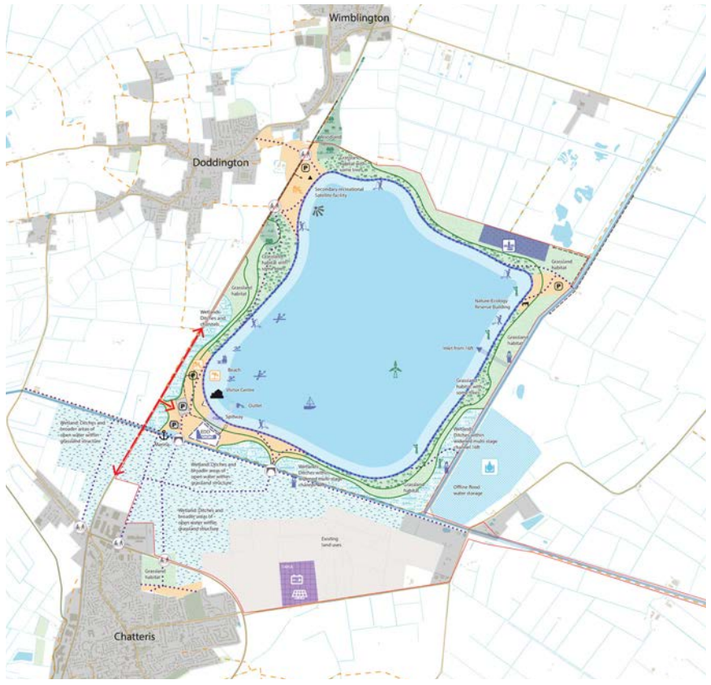
Permutation B: North South Connectivity



Permutation components

Visitor Hub
Modest approach. West
Renewable Energy
14 ha. North
Water Treatment Works
Off site
Upstream Transfer
Inlet from Sixteen Foot Drain into pre-treatment wetland
Outlet valve test pond and spillway
North east
Ecological Mitigation
Wetland mosaic

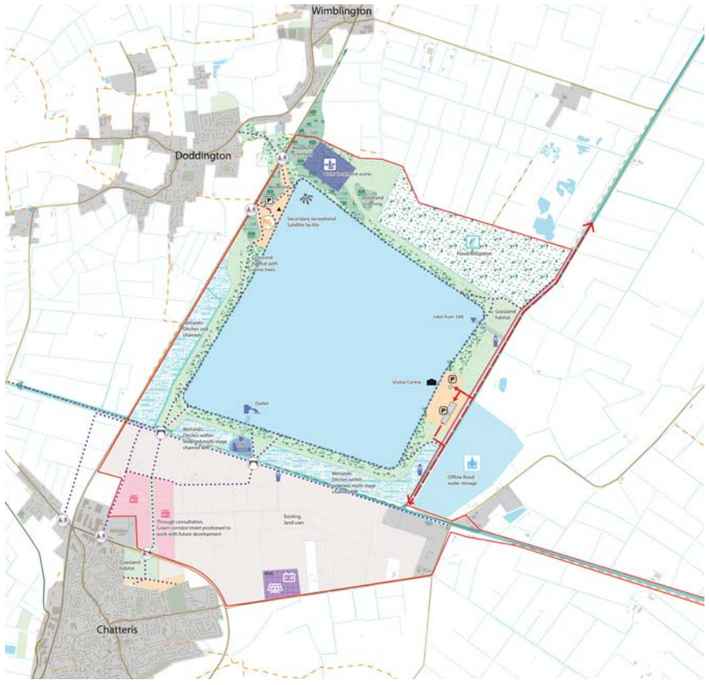
Permutation C: Chatteris Regional Country Park



Permutation components

Visitor Hub
Ambitious. South west
Renewable Energy
14ha south of Forty Foot Drain
Water Treatment Works
Northern embankment
Upstream Transfer
Inlet from Sixteen Foot Drain
Outlet valve test pond and spillway
South East
Ecological Mitigation
Linear ditches

Permutation D: Nature First



Permutation components

Visitor Hub
Minimum. East
Renewable Energy
9ha south of Forty Foot Drain
Water Treatment Works
North west
Upstream Transfer
Inlet from Sixteen Foot Drain
Outlet valve test pond and spillway
South
Ecological Mitigation
Linear ditches

8.5 Testing Outcomes & Insight Taken Forward

An appraisal of the permutations testing was undertaken by a cross-discipline internal steering group (stakeholder engagement was not sought at this early stage). The appraisal aimed to identify 'best performing' elements from each permutation to be taken forward into a more focussed phase of design development. The appraisal was based on the basic information gathered at the time of the permutation workshops. The following summarises the main outcomes from this stage:

Renewable Energy:
Efficiencies could be realised by locating renewable energy and battery storage adjacent to the Water Treatment Works. Solar panels can be placed on the water or the land. Further work is required to assess which is most suitable. With specialist assessments and surveys not complete at this stage of the Project, more work will be required later to further assess the viability of various renewable energy components on the different parts of the site.

Water Treatment Works:
It was deemed that locating a WTW on the edge of the reservoir was not technically feasible because of the difficulties it raised around the safety and inspection of the reservoir embankments. There would also be limitations on how effectively the appearance and screening of such a facility could be designed in such a constrained and prominent location. Therefore this option was not taken forward and the masterplanning process only included sites considered as part of the associated water infrastructure options appraisal process.

Ecological Mitigation:
Tree planting on the higher ground of the fen island near Doddington and Wimblington was considered a strong and appropriate feature of permutations A and B. The creation of wetland was also well supported as the primary form of habitat, though the quantum of habitat needed to meet BNG requirements and for onsite mitigation was not fully known and therefore should remain under review.

Lagoon:
Permutations C and D that did not include a lagoon were less preferred because of their limited capacity to provide a meaningful recreation offer. At the Phase 2 optioneering stage, both versions would include an appropriately sized lagoon for the broad recreation and habitat creation opportunities it could unlock.

Visitor Hub Location:
The visitor hub location on the eastern edge of the site was considered inappropriate as it may increase traffic on quiet local roads and disturb wildlife. This option was not taken forward. The benefits of having a hub on higher land overlooking the water were recognised, and the fact that it is more efficient to do this on the existing high ground to the north of the site. It was also noted that there was a case to locate visitor facilities closest to the largest nearby settlement, Chatteris (to the south). Both locations would be explored further at Phase 2.

8.6 Phase 2: Optioneering

Following outcomes of the permutation testing, two more developed spatial options were created, taking forward and combining the more favoured design elements from Phase 1. The outcomes from the reservoir shape development process were incorporated and distinct design narratives for each conceptual approach were prepared and presented as part of the workshop process.

Initial eye-level visualisations of both reservoir shapes (without planting and buildings) were produced to test their relative impact in the landscape.

At this point in the process, more developed estimates and guidance on some of the elements of the design was available from relevant specialists within the Project Team:

- Ecological mitigation: Based on an initial assessment by project ecologists of the site and habitat that would be lost, a target of providing around 100ha of wetland with a high proportion of marginal (edge) habitat in the new proposals was estimated.
- Renewable energy: Land allocation of 23ha was identified to facilitate generation of all required energy on site. However the size and numbers of wind turbines was not fixed.
- Water Treatment Works location: The southern area adjacent to the A142 emerged from the options appraisal process as the preferred location for the WTW.

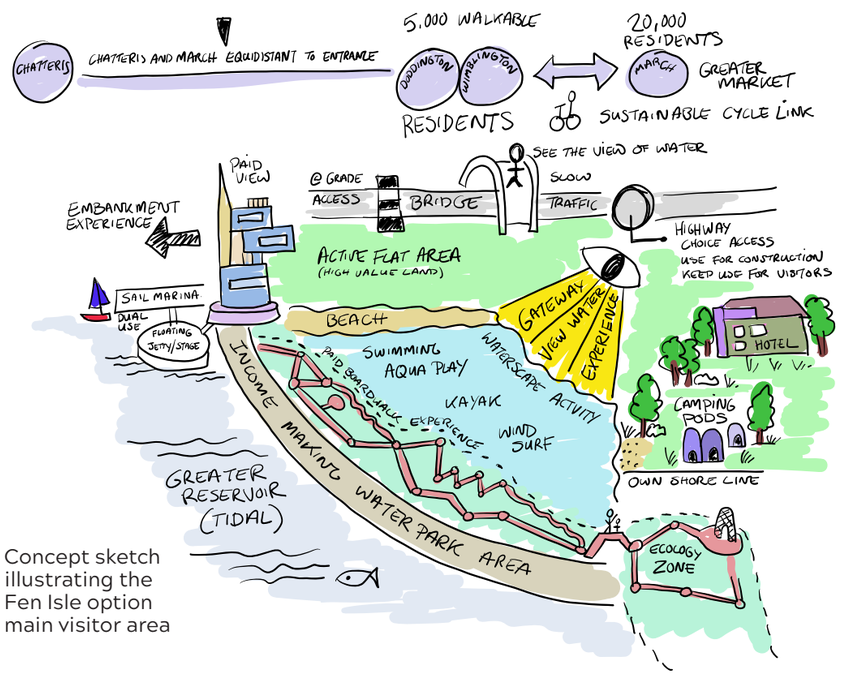
Option 1: Fen Isle

The proposed reservoir embankments are likely to be the highest landform in the fenland landscape, higher than the existing man-made earthworks associated with the Ouse Washes. The proposed heights are more comparable with the fen island landforms. This option imagines the reservoir as an extension to the March Fen Island landform, using a similar naturalised form.

A larger footprint for the main waterbody would bring the upper water level below the higher parts of the surrounding land, creating approximately 1km of “natural” shoreline in the north-west corner. It could create a strong relationship with the water for visitors upon arrival - a shop window for the activities on offer - something that is not usually possible with a non-impounding reservoir. The visitor hub would be located within the lagoon in the northern corner of the reservoir.

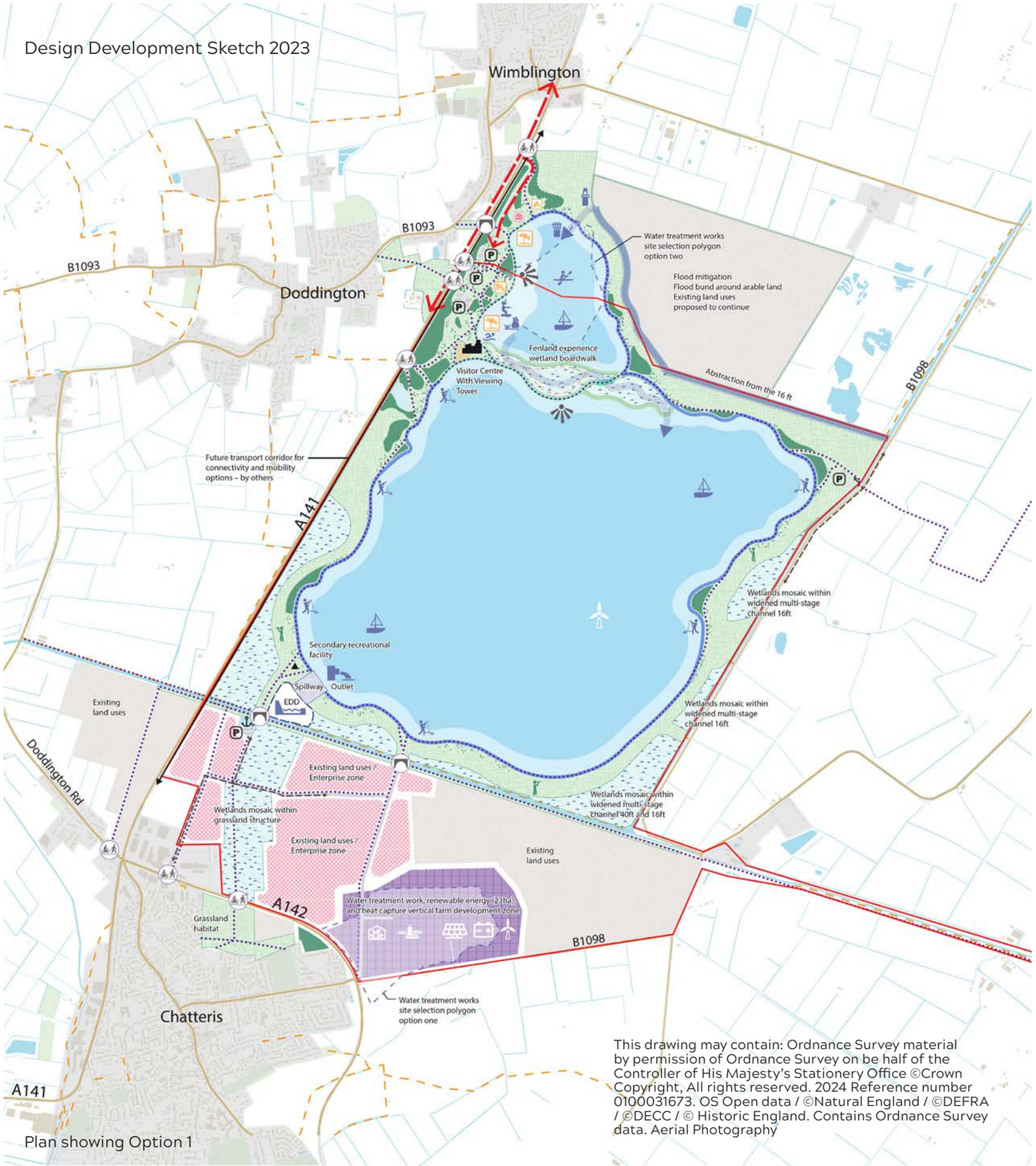
Drawing inspiration from the Fen Island landscape typology, the naturalised landform would facilitate an intricate edge with favourable microclimates, using planting to lessen the effects of the prevailing wind, lessen wave action and respond to the sun’s path. Trees and hedges are part of the Fen Island character, providing a level of enclosure and shelter rarely found in the surrounding drained fen. Under this concept, trees would be a prominent part of the designed landscape, especially above the 5m contour.

Achieving the lower water level required to create a section of natural shoreline leaves little space for habitat creation and flood mitigation beyond the toe of the embankment. Without further excavation, the Fen Isle concept would work best if it included land beyond the areas presented at Phase One Consultation.



Concept sketch illustrating the Fen Isle option main visitor area

Design Development Sketch 2023



Plan showing Option 1

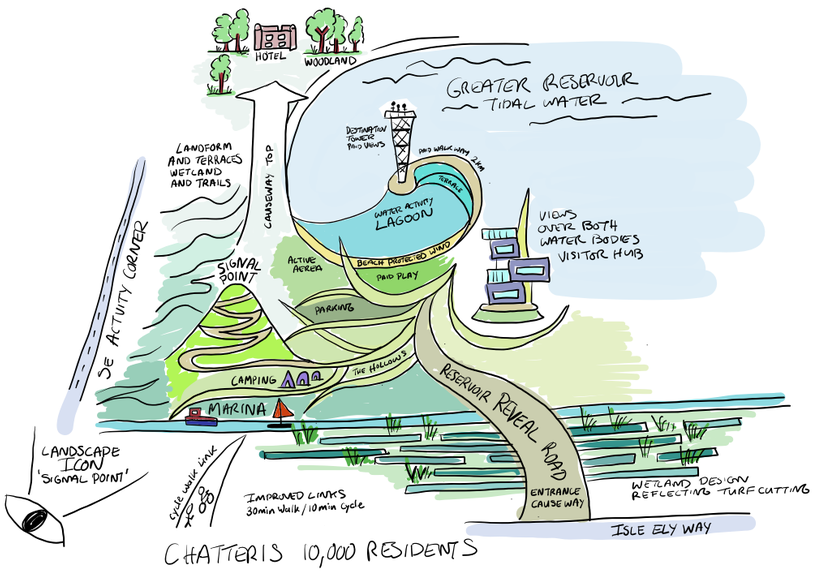
Option 2: Landmark (Ammonite South)

Option 2 had a compact footprint, aiming to use the embankments deliberately to create an intriguing and distinctive new landmark in the flat landscape. The approach drew inspiration from the ammonite fossils found on-site and the organic forms of the fenland roddons. It used these elements sculpturally to create playful contrasts with the linear landscape it would sit within.

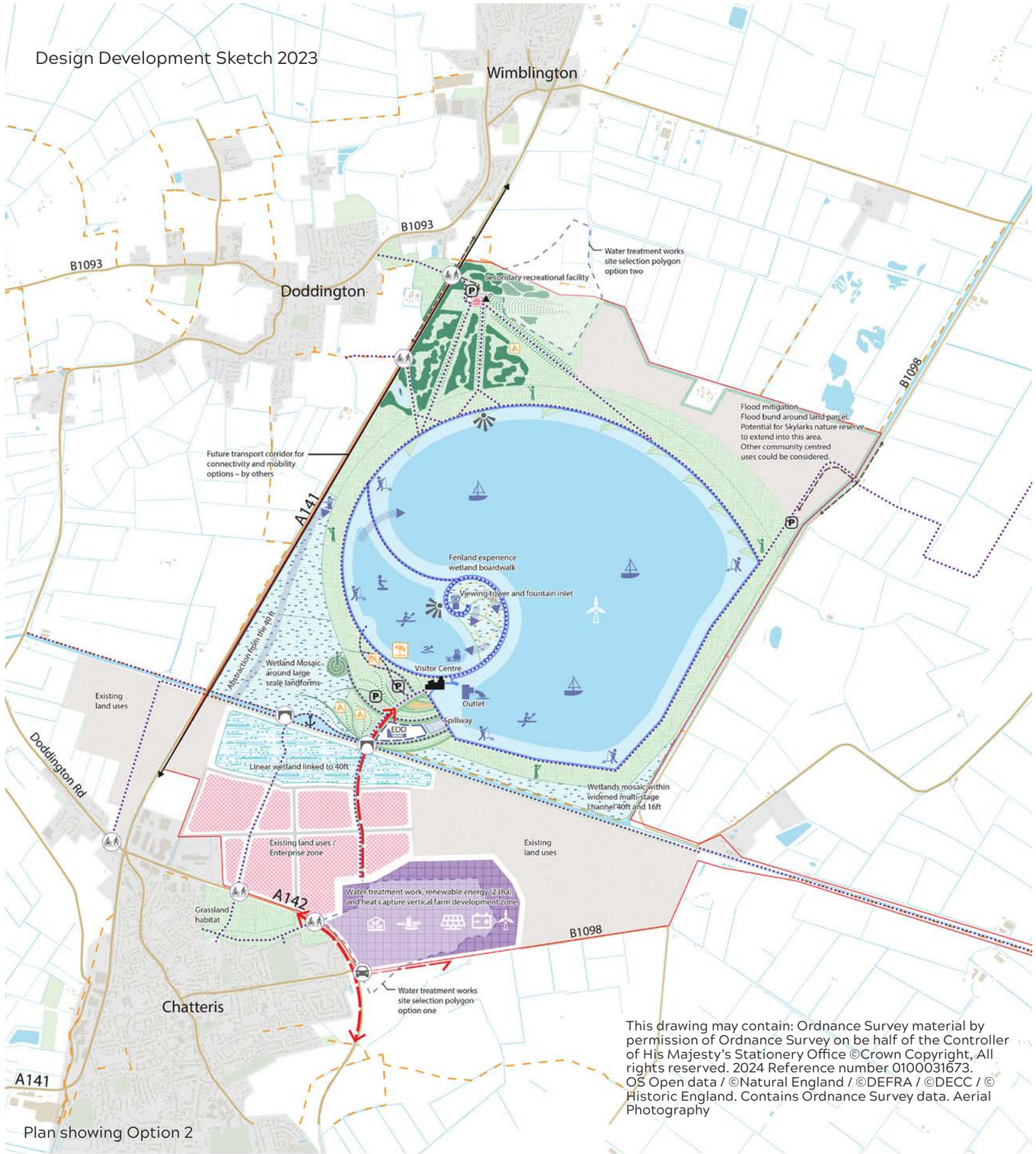
This option would concentrate recreational activity in the south, closer to Chatteris. To provide a good access platform to the water, landform elements inspired by roddons could create causeways and hollows to provide access, reduce the visual bulk and screen elements like parking on the outer faces of the embankment. A new road on an elevated causeway would provide access to the main visitor hub via a bridge over the Forty Foot Drain.

The broadly circular form is highly efficient in the containment and circulation of water, mirroring the direct engineering of the seventeenth century drainage schemes. The “swirl” at the centre of the reservoir could provide one edge of the weir separating the lagoon from the main waterbody. It could also hold an intriguing destination at the heart of the reservoir with a potential viewing tower overlooking a series of cascading wetlands.

To the north an area of woodland would be planted on the higher ground of the Fen Island. This was inspired by the historic use as a deer park, with vistas and woodland rides as a reference to the setting of the nearby Moated Bishops Palace.



Concept sketch illustrating the Landmark option main visitor area



Plan showing Option 2

8.7 Stakeholder Engagement

This section summarises feedback on the evolving masterplan designs from stakeholders representing the Local Planning Authorities and statutory environmental bodies. It also summarises the feedback from the Independent Design Review Panel (IDRP), commissioned by Anglian Water and Cambridge Water to provide professional peer review of the design proposals throughout the pre-DCO submission period.

This is not an exhaustive record of all engagement activities that have taken place or of all the different groups with whom the Project Team has met.

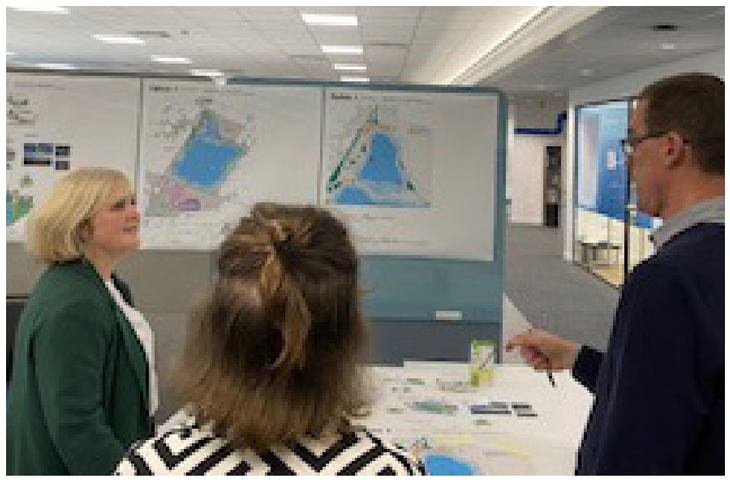
Anglian Water and Cambridge Water will continue to engage with consultees and stakeholders throughout the DCO process, whilst a record of all engagement will be provided in a Consultation Report at the point of the DCO application.

Stakeholder Feedback Summary

The following is a precis of stakeholder responses received so far on the design ideas and the spatial options as described in section 8.6. These are grouped into several overarching themes.

Connectivity with nearby communities

- Raised the importance of local connectivity, crossings over the A141 and A142 and that the quality of the routes provided should be as attractive as possible to make active travel options appealing.
- Welcomed the proposed network of routes connecting the reservoir with local communities and explained the benefits that a variety of recreational loops would create.
- Request that there also be reasonably direct north-south connectivity between Chatteris and Doddington.



Project team discussing emerging proposals with stakeholders.

Visual impacts including embankments

- Suggestion that sculptural earthworks could be polarising as many people may prefer to see naturalised embankments. However the sculptural approach was described as “innovative” as it could provide an alternative fenland visitor experience distinct from other offers such as Wicken Fen.
- Acknowledged that careful consideration is needed in the locations of proposed tree planting, ensuring they are appropriate to the landscape character.
- Concern about the height of the embankments and the visual impact they will have on the area, including on the setting of heritage assets.

Integration with existing features

- Highlight opportunities for improved navigation within the existing watercourses.
- Request for more information on how the embankments would integrate with existing features of the site, namely the A141 and the Sixteen and Forty Foot Drains.

Fenland Nature

- Encouraged about the wildlife and cultural heritage benefits that a “fenland experience” could create.
- Requested larger pockets of wetlands be created in the masterplan that would be more beneficial in supporting biodiversity.

Fenland History

- Request for more detail on the proposed fenland experience and wanted its design to acknowledge the dynamism of the environment throughout history.
- Impacts of the reservoir on the setting of heritage assets in the immediate vicinity of the reservoir.
- Supportive of ideas around tree planting in the north-west corner to create a wooded setting for the site of the moated Bishops Palace to the west of the A141.

Recreation and accessibility

- Encouraged about the principle to create new public space, with the health and wellbeing benefits that it can bring.
- Support for the concept of a lagoon and the opportunities that keeping a consistent water level could have on the Project.
- Recognition of the opportunity to walk out over the open water, for example at the outlet tower.
- Supportive of the creation of a network of walking, cycling and horse riding routes throughout the site and connectivity of these new paths.

Visitor Hub

- There was an agreement the visitor hub should be close to nearby communities, but that a study to understand the proposed visitor numbers would also be needed to determine whether the visitor hub should be in the north or the south of the site.

Area South of the Forty Foot Drain

- Support for the proposed location of the WTW.
- Concerns were raised about the visual impact that wind turbines would have in the landscape.

Independent Design Review Panel

In December 2023, an Independent Design Review Panel (IDRP) attended a site visit followed by an in-person review for the Fens Reservoir. The Phase 2 options (Fen Isle and Landmark), together with the emerging design concept were presented.

Feedback provided at the workshop is summarised below and collated under common themes.

Connectivity with nearby communities

Opportunity for local connectivity is likely to bring significant value to the community. The panel recommended that these plans and their associated benefits are communicated clearly when speaking with the community and wider stakeholders.

Visual impacts including embankments

Support proceeding with the emerging design for its dynamic form and the ancient site reference to palaeontology, which offers a strong narrative.

Recommendation to prepare visualisations of the ground level experience, in various locations, to communicate the visual impact that the reservoir designs will have in the existing landscape.

The IDRP suggested that visual interest can be created by adding diversity in viewpoints, creating more natural forms by distributing the landscape fill differently to the embankments. Suggestions to work with artists as a way to develop more imaginative landscape options.

Integration with existing features
Because of the historic connection between the people of the Fens and their use of the waterways for leisure, the IDRP welcomed the possibility to revitalise the wider drains for public use, which would add community value.

Fenland Nature
Acknowledged that the larger areas for wildlife in the emerging design are needed to achieve an effective wildlife habitat with limited human disturbance.

Recreation and Accessibility
The perimeter route around the reservoir should be conceived as an experience, providing a high-quality leisure space. The open landscape means that the site will be sensitive to strong winds. Shelter from the wind will be key to ensure that the perimeter route is attractive to visitors. Would like to see how local sports and leisure clubs may benefit or become involved with the delivery of the recreational offer, ensuring that the offer serves a local need.

Presentation of project context, design process and emerging design to IDRP and members of the Project team.

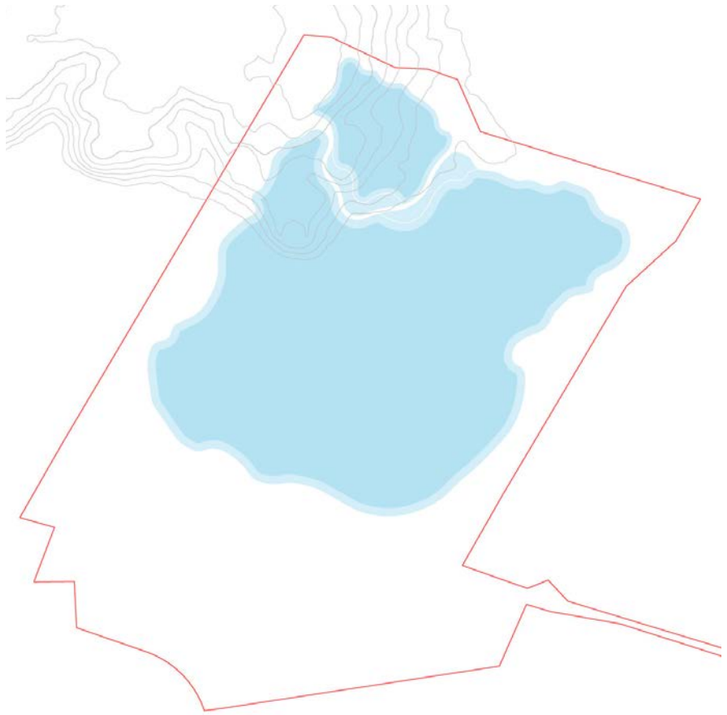
8.8 Subsequent Studies

In response to feedback received through the optioneering process, the design team undertook three further studies before development of the emerging design.

Fen Isle - small footprint

The Fen Isle option extended beyond the site boundaries communicated at Phase One Consultation in order to connect with the highest areas of the March Fen Island north of the site and keep embankment heights to a minimum.

Given some stakeholders' preference for a low, naturalistic treatment for the reservoir, the design team undertook a study to determine whether the benefits of the Fen Isle approach could be realised in a smaller footprint. A proposal was developed, though it lost much of the connection into the higher ground and reduced the length of the "naturalised shoreline" along the lagoon. This study was taken into consideration when making the decision to progress with the Landmark approach as the emerging design for Phase Two Consultation.



The Fen Isle concept applied within the Phase One Consultation boundary

Visitor Hub Location

The Phase 2 options showed potential locations for a visitor hub in the north-west corner and on the southern edge of the reservoir. No clear consensus on a preference for either location emerged. Further analysis was undertaken to inform the emerging design.

Proximity to people:
Reviewing population information, it would, initially, appear that locating the visitor centre in the south, close to Chatteris, would be preferable: In 2021, the population of Chatteris was 10,500, and the combined population of Doddington and Wimblington was less than half of that. March is located to the north of the reservoir and had a population of 22,000.

Closer analysis shows that more people live within 2km of the north-west location than the southern one. Most of Wimblington and Doddington lie within 2km of the north-west location but large parts of Chatteris are further than 2km from the southern location. As the distance from the reservoir site is increased, more of Chatteris is included and, therefore, the southern location is closer to more people using a 5km radius. The number of people living within 10km of the two hubs is very similar - with all of Chatteris and most of March within 10km of both visitor hub locations.

It takes around 20-25 minutes to walk 2km, beyond that distance walking becomes less viable for many people. A visitor hub in the north-west may therefore do more to provide non-motorised access for local communities than a southern one. This study also highlighted the need to provide good quality green links that extend to the edge of settlements and for public transport provision from surrounding settlements to the main visitor hub.

Access:
Once on site, the north-western option has significant benefits for accessibility from potential public transport drop-off points and car park locations. Located on higher ground makes it easier to provide inclusive access to the reservoir edge from a wide development platform with accessible gradients.

Earthworks cost and carbon impact:
The recreational hub should have a strong relationship with the waterbody. For access, this should include parking and outdoor recreation all at a level near the crest height. Locating the hub on higher ground to the north reduces the need for significant additional earthworks to create space for these uses (as would be required to the south). Locating the associated lagoon to the north would also reduce earthworks required for the separating weirs and be more efficient in terms of both cost and carbon impacts.

Capacity for development:
Enclosure, trees and hedges are part of the fen island character at the north-west of the site. These, with additional planting, can be used to integrate smaller-scale development in the landscape and screen views from Doddington and Wimblington. Initial assessment suggests the visual impact of car parking and buildings could be less here than in other parts of the site. The existing tree cover and landform also offer better protection from the prevailing wind in the north-west giving better potential for a year-round enjoyable microclimate.

Wind Turbine Location

Concerns were raised throughout the development process around the location of wind turbines within the design options. As a result, the Project undertook a high level constraints mapping exercise to help identify the most potentially appropriate zones for their location. This process considered a limited set of constraints; more detailed technical and environmental survey and assessment work will be undertaken at a later stage before decisions can be made on the viability, scale or location of renewable energy development.

The process mapped key constraints around existing features. For example, the Project team looked at the likely number and height of wind turbines required to generate the estimated energy needed in operation. Then, the acoustic performance of wind turbines currently on the market was investigated. From this an estimate of reasonable off-set distances to any nearby receptors (eg residential properties) was made. This process started to identify potential zones in and around the reservoir where it might be possible to locate the turbines , but it will be finalised when background noise surveys have been completed.

The constraints mapping process considered existing constraints and features in the area. This was then overlaid with the additional constraints and opportunities associated with the reservoir and associated infrastructure. For example:

- Areas on the eastern edge of the site were considered as less optimal because, once the reservoir is operational, they would be in the direct flight path of birds moving between the Ouse Washes and the new reservoir.
- Like other buildings and roads in the mapping, once the Water Treatment Works and access road are constructed they will also require buffer zones between them and the wind turbines.

Existing wind turbine to the north of Long Nightlayer's Drove

- Some constraints, like existing buildings, ditches and roads, are likely to be removed or relocated as part of the construction works so these buffers would no longer apply.
- Wind turbines would need to be located at an appropriate distance from new roads and routes for walkers, cyclists and horse-riders as well as re-aligned Public Rights of Way.

When these measures were taken into account, the indicative best performing location at this initial stage for wind turbines was identified as being close to the existing wind turbine near Nightlayers Drove.

8.9 Elements Taken Forward to the Emerging Design

The main design approaches adopted from workshops and engagement with statutory bodies during the optioneering phase were:

- A primary visitor hub could be located in the north-west corner of the reservoir and there should be more extensive tree planting here.
- A secondary hub on the south side of the reservoir closer to Chatteris could enhance the town's links with the reservoir. Closely associating this hub with navigation on the Forty Foot Drain could be beneficial.
- Larger pockets of habitat would be taken forward, located on the eastern edge of the reservoir and along the Forty Foot Drain corridor to align with the Lawton Principles of habitat design.
- The options appraisal process identified the preferred location for the Water Treatment Works was to the south of the reservoir, subject to careful design and integration.
- The Landmark design approach would be taken forward into the emerging design, both for its potential benefits and the need to engage a broader audience with this more exciting approach.

Landmark design approach: Landform at the National Arboretum, Canberra Australia

9 Description of Emerging Design

This chapter describes the emerging design proposals for the Fens Reservoir, focusing on the permanent works to the main reservoir site. It does not represent a fixed solution but gives a sense of the types of facilities and features which could be included alongside the core engineering elements which are needed to operate the reservoir.

As explained in section 1 of this report, it might not be possible to include all the facilities and features in the DCO application, given the legal and policy tests that have to be met. If it is desired to take forward aspects that cannot be included in the DCO, they would need to be brought forward by other means (potentially by third parties). In addition, the EIA process for the project is still at an early stage and its outcomes will determine the feasibility or otherwise of some of the identified opportunities.

Find out more and have your say

We would like to get your comments on our emerging design for the reservoir. Please see a guide to our proposals and Phase Two Consultation brochure for ways to provide your feedback:

www.fensreservoir.co.uk/documents

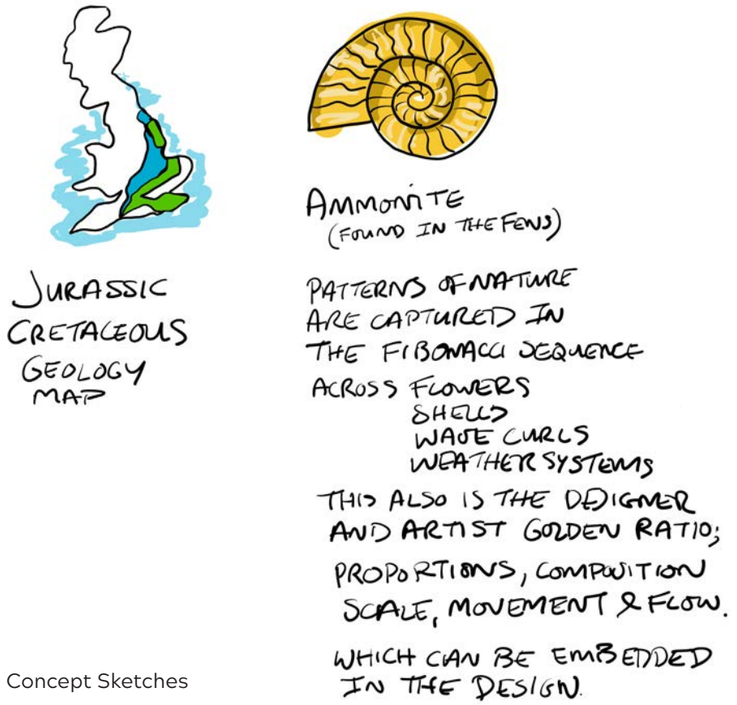
9.1 Overview

The design process described in Chapter 8 has led to the development of an emerging design for the Fens Reservoir. The ideas presented in this chapter illustrate how the reservoir could be configured, incorporating the core engineering components alongside non-operational elements such as recreational facilities, areas for habitat creation and landscape integration, and other land uses.

The proposals have been considered in the context of the design vision and indicative design principles (chapter 4) which set out broader ambitions for the Project, and the conceptual thinking described in section 8.1.

9.2 Emerging Design Concept

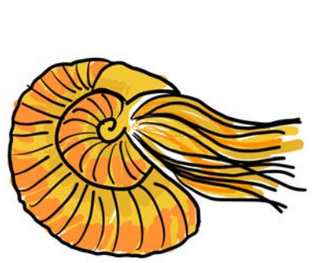
The Fens have had a highly dynamic relationship with water over the last 10,000 years, starting when rising sea levels separated Britain from mainland Europe, creating an island. On the Fens Reservoir site, marine and estuarine clays are layered with horizons of peat, which formed in freshwater built up over this time. However, the area's relationship with the sea goes back much further. The bedrock clays under the site and surrounding area were deposited in a marine environment millions of years ago. Fossilised ammonites, a shelled marine animal, were found on the site during ground investigation surveys.



Concept Sketches

Inspiration has been taken from the ammonite form which has influenced the development of the emerging design, including the overall shape of the reservoir and secondary landform elements across the site. The shape has synergies with the engineering efficiencies associated with the drained fen: the surrounding drainage channels are linear to reduce their length and therefore increase gradients/falls in them. In non-impounding reservoir design, engineering principles would lead toward a circular waterbody, like the ammonite proposal, which is efficient from a bank-capacity perspective and optimal for embankment integrity and water circulation/water quality.

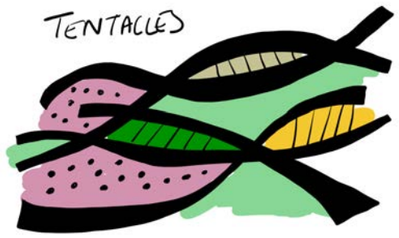
The emerging design includes secondary landforms to provide shade, windbreak, temperate moderation, areas providing openness and views, informal varied routes, incidental play and conditions suitable for different habitats. Within the emerging design, these landforms have been inspired by ammonite shells and tentacles as well as more recent fenland landscape features including roddons and turf cutting. Successional changes in vegetation within the undrained fens and the transitions between drier, higher ground and the wetter areas below have helped to form the design on and around the landforms, aiming to create a resilient landscape that would be enjoyable for people and valuable for wildlife.



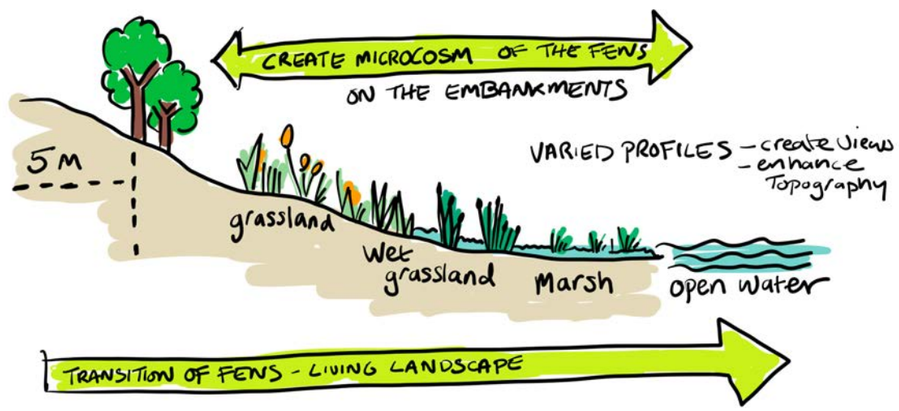
LANDFORMS OF TENTACLES

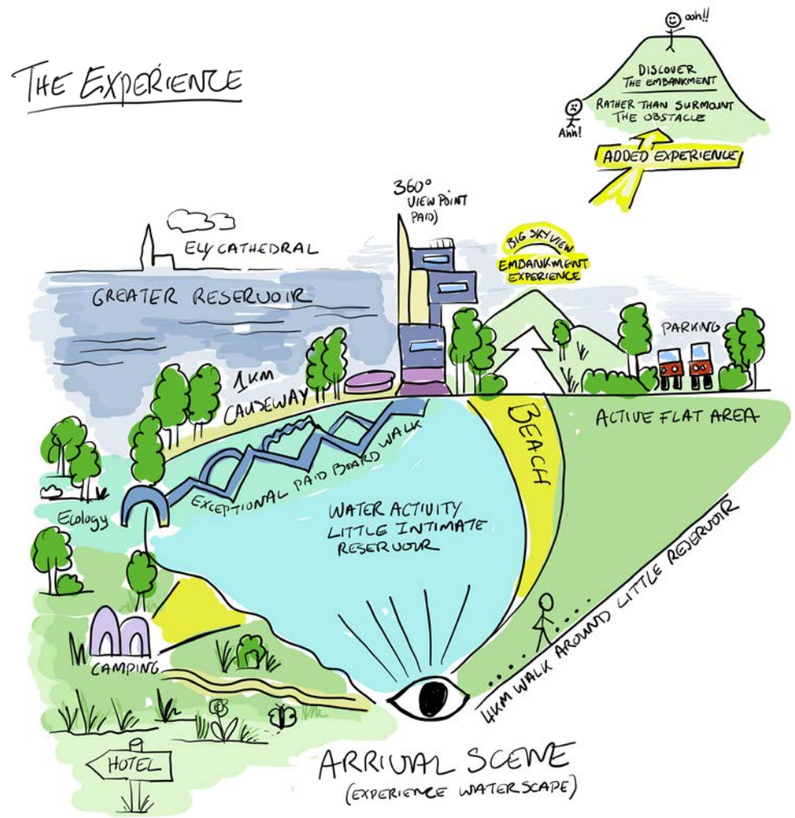
LANDSCAPE IS MADE OF MANY LANDFORMS
Islands, plains, wetland
Streams ...

THESE ALLOW US TO EXPRESS SHAPE, SCALE, FLOW.



ROADONS – WATERFLOW
RIDGES + TURF CUTTING
FLUID DYNAMICS - OF FLOW
REFLECTING WATER WITH CURVES
RIDGES OFFERING PROTECTION
WIND, SUN, MICRO CLIMATES
HIDDEN HOLLOWS: PLAY.
PARKING
ACTIVITY





Concept Sketches

9.3 Fens Waterside Park

Overall Approach

The emerging design aims to provide a variety of experiences and opportunities that are connected in different ways to the water itself and the landscape in which the reservoir will sit. The distinctive ammonite shape is employed with the intention of reinforcing the potential of the new reservoir as a unique regional destination.

The peninsula formed at the centre of the reservoir could be the fulcrum around which the reservoir is arranged. Around this the reservoir could be split into quadrants. The most active areas - the visitor centre and recreation hub - are shown in the north-west with the most passive areas, where nature and tranquillity could dominate, in the south-east, with the other parts of the reservoir mediating between these extremes.

The emerging design shows how a combination of distinctive landforms, lagoons and wetlands could be used, both within and outside of the reservoir footprint to organise and activate different parts of the site for their associated uses. A variety of habitats could be included, with significant areas of different wetland types both inside the reservoir and surrounding it and new woodland on the high ground to the north of the site. Each is located to complement and connect with similar habitats in the broader landscape.

The new reservoir embankments would be the highest feature in the typically flat landscape and their sculptural form could be designed to add interest, facilitate planting and provide both areas of enclosure and shelter as well as places to enjoy the expansiveness of the fenland landscape.

Indicative artist's impression of the view across the lagoon towards the Central Terrace with the illustrative visitor centre in the foreground.

Potential links from the reservoir to the Forty Foot Drain and Chatteris beyond are shown on the illustrative masterplan - but the design between Forty Foot Drain and A142 is undefined. There are a number of emerging and potential requirements for land uses to support the infrastructure necessary to serve the reservoir and new Water Treatment Works.

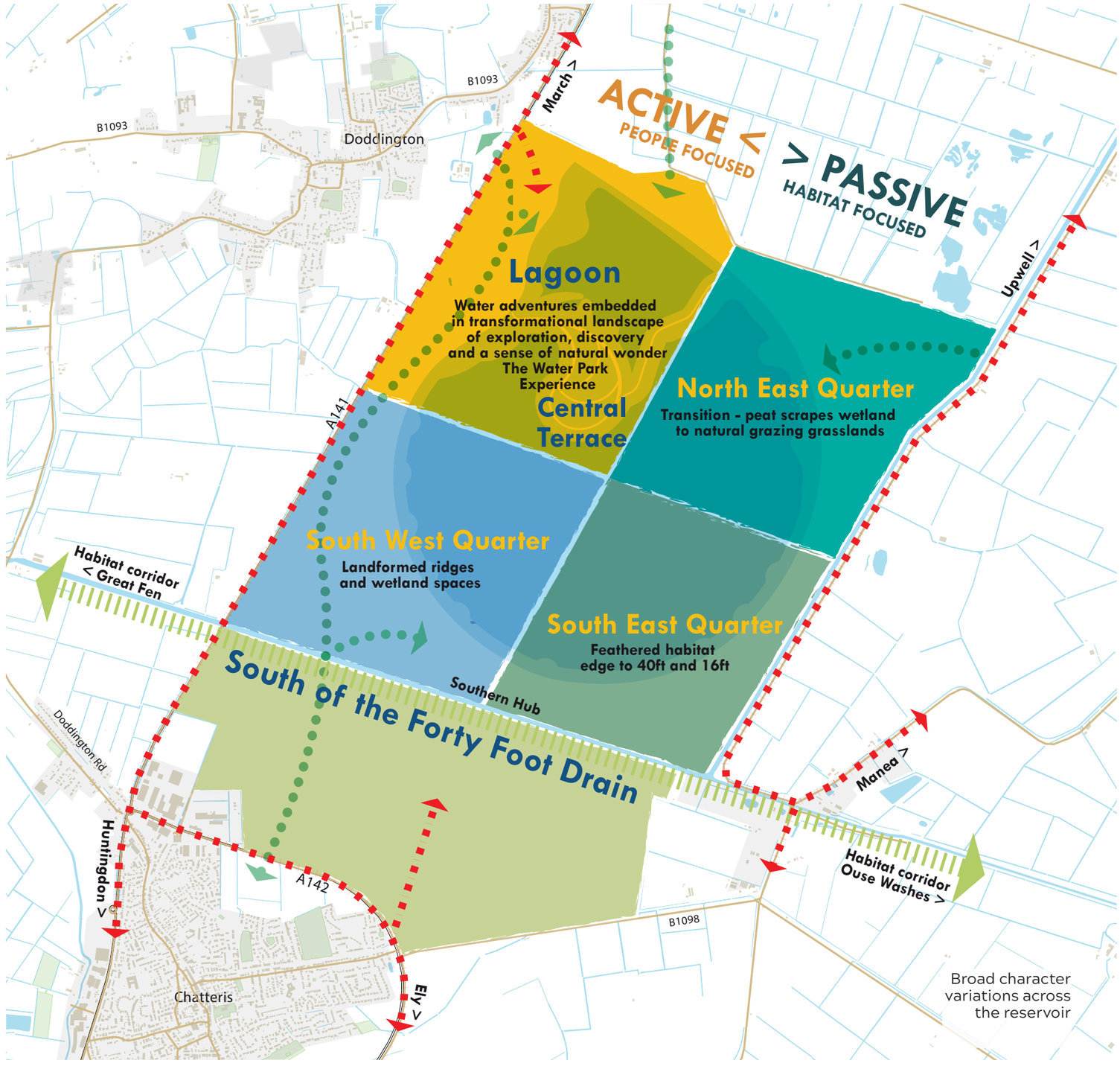
Ideas that form part of the emerging design include:

1 The shape of the reservoir was developed to accommodate new pockets of wetland associated with the adjacent watercourses in three “corners” surrounding it. This could provide larger areas of habitat that connect better in the broader landscape.

2 The primary visitor hub is shown in the north-west corner - with a secondary marina-focused hub to the south more easily accessible from the Forty Foot Drain and for people coming from Chatteris, to maximise access for local communities.

3 Cultural heritage is shown at the heart of the proposals with a new area of wetland at the centre of the reservoir which could explain the history and landscape of the Fens.

4 Opportunities for a comprehensive network of footpaths, cycleways and horse-riding routes could connect into the wider PRoW network and present new opportunities for off-road active travel routes between settlements.



9.4 Illustrative Masterplan

The concept described in section 9.3 has led to the creation of the illustrative masterplan which is shown here (right).

The following sections in this chapter cover, in more detail, specific elements of this emerging design, including an explanation of how the reservoir is likely to operate; studies to convey the scale of the development and embankments, including consideration of their visual impact; and finally examples of component areas which could be created to enhance the sense of place.

The illustrative masterplan for the Fens Reservoir

Key

Indicative Locations for Primary Infrastructure (Operational Reservoir)

- Upstream transfer (open channel)
- Water discharge point into reservoir
- Outlet tower
- Outlet valve test pond
- Spillway
- Water treatment works
- Preferred water treatment works site selection area
- Pumping station
- Wetland water inlet
- Proposed toe of outer embankment

Renewable Energy:

- Indicative location for new wind turbine
- Indicative location and extent of floating solar
- Indicative location and extent of land-based solar and battery storage

Other renewable energy technologies are being considered. Further work will be undertaken to identify preferred technologies, scale and locations.

Indicative Landscape Elements

- Woodland
- Wetland
- Floating wetland
- Grassland
- Land potentially required for environmental mitigation and/or enhancement
- Landform

Indicative Access Elements:

- Proposed shared path
- Existing Public Right of Way
- Proposed vehicular access route
- Opportunities for community links (to be explored further)
- Proposed road crossing for walking, cycling and horse riding
- Proposed all user bridge
- Proposed waterway crossing for walking, cycling and horse riding
- Proposed boardwalk crossing
- Existing waterway crossing for walking, cycling and horse riding
- Proposed parking

The location and alignment of routes shown on the masterplan are also indicative at this stage and further work will be undertaken to define and refine these.

Indicative Opportunities for Recreation

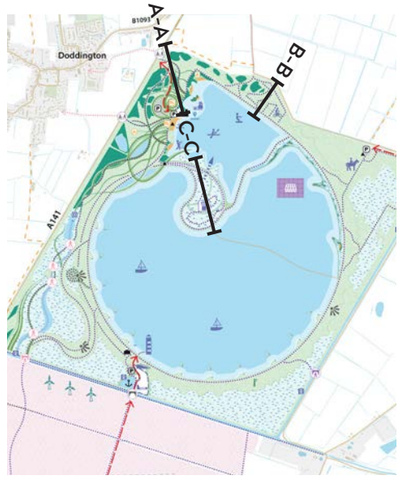
- Buoy line - demarcating extent of recreation
- Visitor centre
- Secondary recreational facility
- Tertiary recreational facility
- Viewing tower
- Potential location for marina and associated facilities
- Recreational links
- Beach
- Camping
- Sailing
- Swimming
- Play
- Viewpoint
- WakeBoard
- Aquaplay
- Fishing
- Bird Watching
- Paddle Sport
- Point of access to the water

9.5 Embankment Integration - Cross Sections

Shown below and opposite are a series of illustrative cross sections through the reservoir embankment to show how the height, slope and landscape treatment of the embankments could vary around the reservoir.

Annotations refer to potential features of the emerging design described in this chapter.

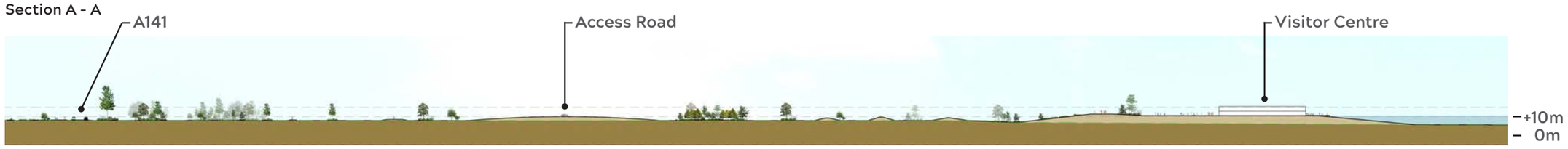
The current designs for the reservoir embankments show them at an estimated crest height of between 10 and 15m AOD (Above Ordnance Datum). This overall height is not fixed and will be subject to ongoing assessment, design and refinement.



Existing Ground

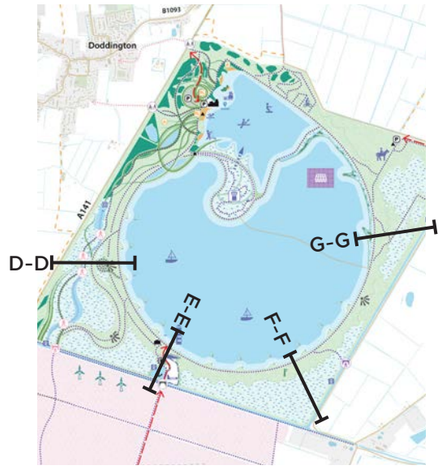
Proposed Ground

Section A - A



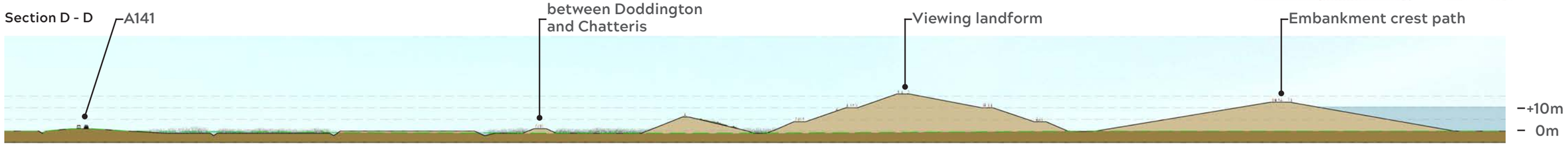
Section B - B

Section C - C

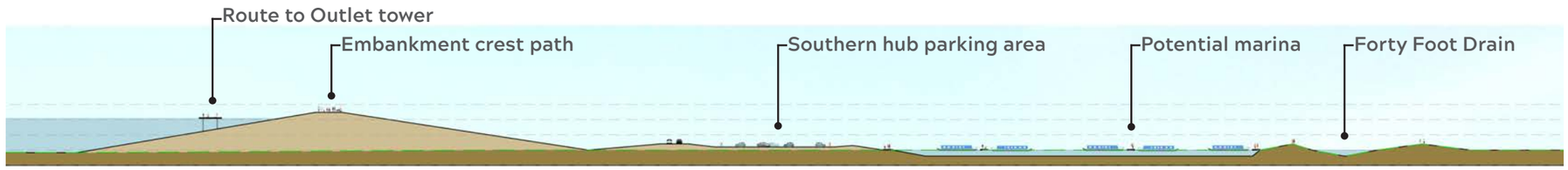


Existing Ground
Proposed Ground

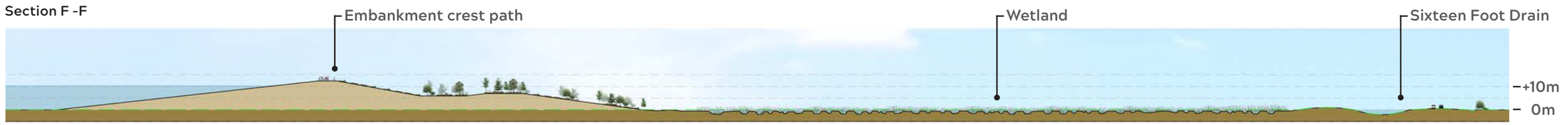
Section D - D



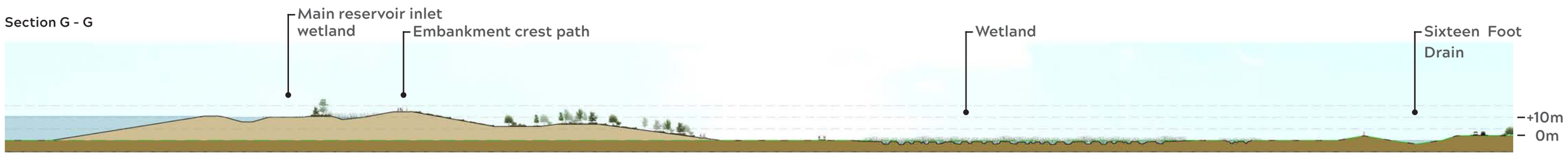
Section E - E



Section F -F



Section G - G



9.6 Embankment Height and Integration

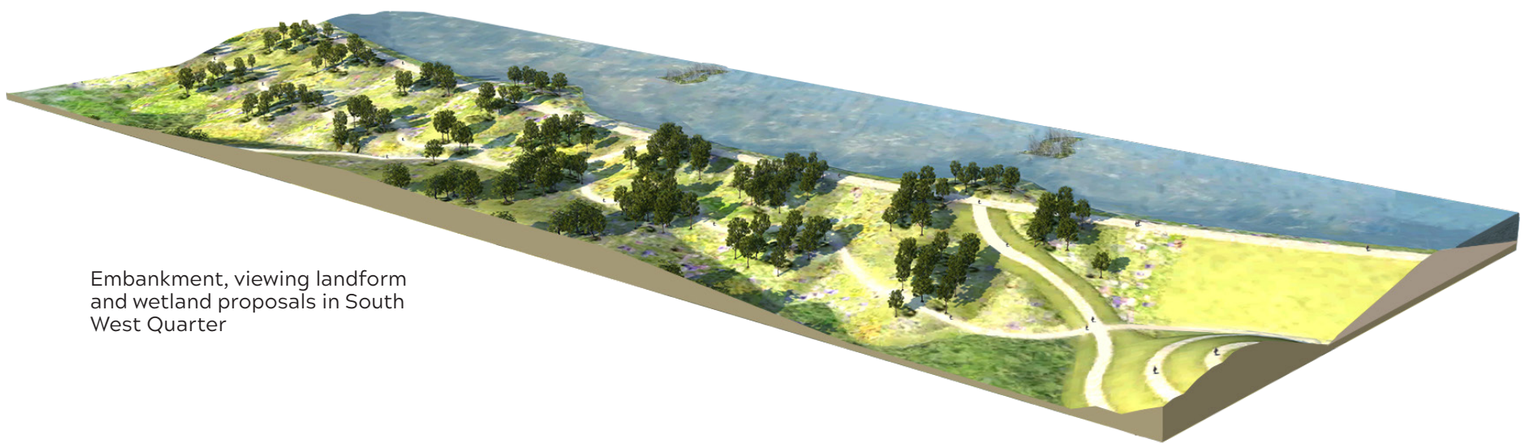
Design development since the Phase One Consultation has unlocked the opportunity for a lower embankment, with the crest height now anticipated to be between 10 and 15m AOD.

This overall height is not fixed and will be subject to ongoing assessment, design and refinement. This is dependent in part on the volumes of materials excavated and reused in the embankments and the need to maintain sufficient storage capacity in the reservoir to meet supply demands.

The height of the embankments is closely tied to the final shape of the reservoir (and therefore volume of water stored) and the ground conditions that determine how much earth must be excavated to get down to the bedrock upon which the embankments can be built. From initial surveys it is known that the bedrock is overlaid by different thicknesses of superficial deposits (peat and clays) across the site; further analysis is needed to determine which areas will be excavated, safely stored and, potentially, reused. This may involve its use in the creation of new wetland (for peat) and landscape earthworks (for clays and topsoil) to integrate the reservoir embankments within the site and create new areas for nature.

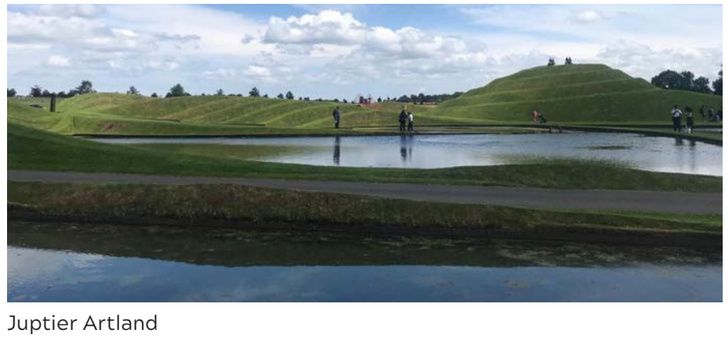
As explained in Chapter 7, the outer embankments can be designed to different slope angles and to incorporate planting to help break up their scale and provide better integration. Landscape earthworks could be used around the whole reservoir site perimeter to both make use of the superficial deposits and break up the scale of the embankments.

The landscape earthworks in the emerging design use a sculpted or land-art approach with curvaceous landforms rising above extensive pockets of wetland at the outer edges of the embankment. A sculptural approach to the embankment could create a varied and interesting landscape. The approach shown was influenced by the ridges on an ammonite shell. A terrace or series of terraces could help to reduce the perceived height of the embankment, whilst providing different route options, creating varied looping routes and options that may be more suitable for different weather conditions. Trees could be established on terraces and shallower parts of the embankment, providing habitat value and shelter for people on the crest and further breaking up the embankment's visual mass.



Embankment, viewing landform and wetland proposals in South West Quarter

Northala Fields. Credit Toby Smith



Juptier Artland

Viewpoint 1

Existing view from viewpoint 1 (junction of Forty Foot and Sixteen Foot Drains)

Artist's impression of proposed view from viewpoint 1

Illustrative photorealistic eye-level views of the emerging design have been prepared from three locations around the reservoir to give a sense of the embankment scale and indicate how landscape elements such as earthworks and planting could be used to soften their appearance. The embankments are shown with a crest height of 12.5m AOD and the planting illustrated within the views is shown at 15 years maturity.

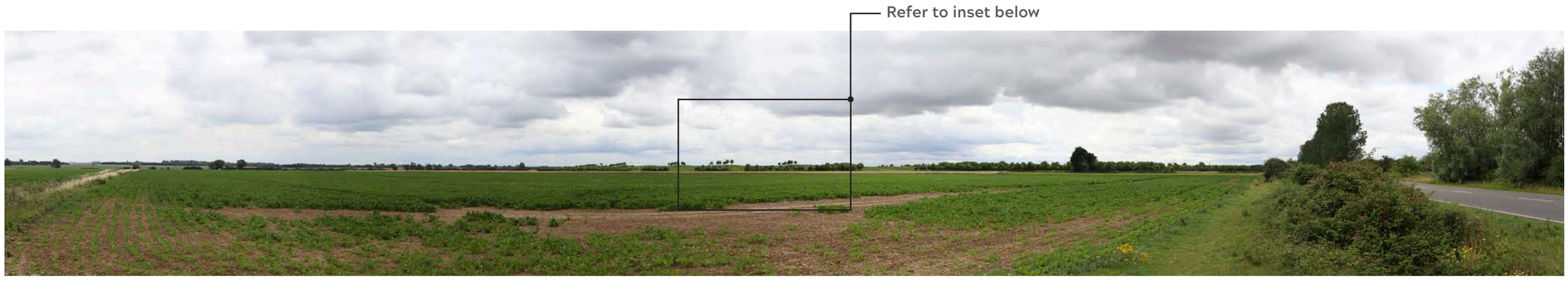
A formal assessment of landscape and visual impacts will be undertaken as part of the EIA and will inform the embankment profiling and planting proposals, taking on board consultation feedback.

For land use, please refer to key on p61

Inset - Zoomed in view from viewpoint 1

Viewpoint 2

Existing view from viewpoint 2 (A141 near Doddington)



Artist's impression of proposed view from viewpoint 2

For land use, please refer to key on p61

Inset - Zoomed in view from viewpoint 2

Viewpoint 3

Existing view from viewpoint 3 (edge of Chatteris)

Artists impression of proposal from viewpoint 3

For land use, please refer to key on p61

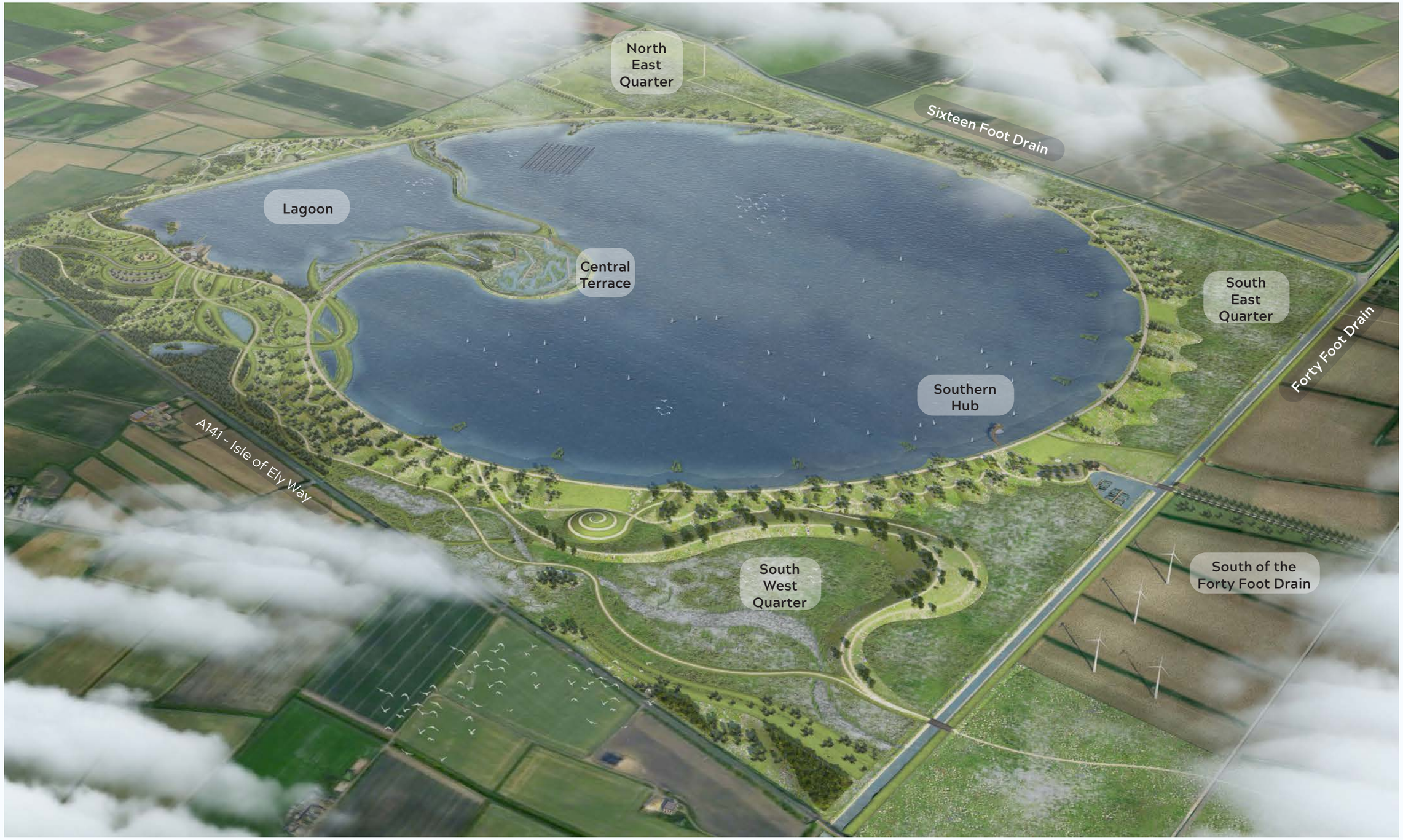
Inset - Zoomed in view from viewpoint 3

9.7 Component Areas

The emerging design for The Fens Reservoir presents opportunities to provide a rich and varied experience for visitors. This could be achieved in different ways in different parts of the reservoir, creating variations and contrasts in character and activities between one area and another.

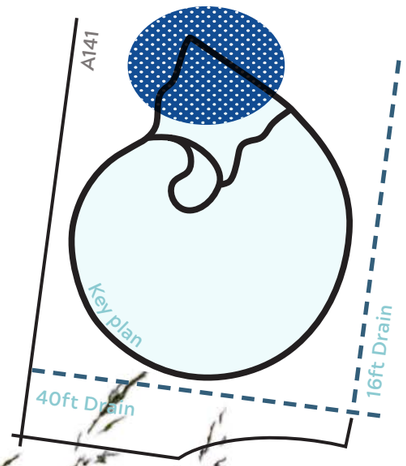
To illustrate how this might be done, potential design ideas for two areas of the reservoir are shown on the following pages.

Following this, a summary is provided of the considerations and opportunities that could shape the design in the remaining component areas of the reservoir.



Approximate locations of component areas indicated on artist's impression of the reservoir from the south-west

Lagoon



The emerging design illustrates how this part of the reservoir could be the main hub of activity for the new reservoir. It would be well positioned with access from the A141, with the expectation that this road could serve as a key strategic route for visitors to the reservoir. The main visitor centre buildings and car park could be located here along with public transport drop-off points.

To provide space to accommodate a broad mix of on-water recreational activities, alongside quieter wildlife-focused areas, a smaller waterbody could be designed to provide a maintained water level. Because the existing land is higher in this area, it may be possible to provide a broad and more naturalistic platform of land between the embankment crest and the waterline of the western shore which would make inclusive and intuitive access to the water easier. This land could gently slope down toward the water with space for beaches, a waterside visitor centre and play area. Other parts of the lagoon could be fringed by wetland vegetation, naturalising the banks and bringing nature and people together.

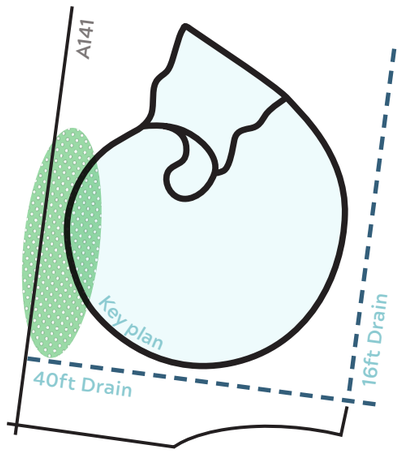
Woodland planting in this area could be inspired by the deer park that historically surrounded the nearby Moated Bishop's Palace.

Potential features of the emerging design:

- A large lagoon (separated from the main reservoir by an accessible causeway and weir) which could have maintained water levels, allowing access to the water from the embankment and the establishment of wetland habitats around its margins.
- A visitor centre building with associated parking, access and outdoor spaces.
- The start and end point for walking, cycling and horse riding routes. Safe crossings of the A141 could ensure links to the PRoW network and connections to nearby communities.
- Potential visitor facilities such as beaches and areas for water-based and land-based recreational activities.
- Potential for a high-quality play area close to the visitor centre.

...a glistening lagoon bay, the turquoise water broken only by the children squealing with delight...

South West Quarter



A unique new landscape could be created at the south-west corner of the reservoir, using sculptural earthworks and significant new areas of wetland - inspired by the historic landscape of lowland wetland meeting the higher landforms like the fen islands and historic drain structures. Along with the Lagoon, the South West Quarter could form the busier edge of the reservoir. A number of looping routes and boardwalks could enable visitors to experience the proposed and wider landscape from a variety of new vantage points.

The difference between the existing ground and crest level of the embankment is much greater here than in the north-west and the embankments would appear higher. The embankments could be designed to integrate with a broader area of sculptural landform that could emerge from a new area of wetland. Paths could be located to provide varied experiences for visitors, including a crest path with expansive views and a lower path offering a more sheltered environment interacting with larger areas of vegetation.

Outside of the reservoir footprint, the emerging design could include wetlands with organic meandering courses that have lots of edge habitat - a valuable resource. Water abstracted from the Forty Foot Drain could run through this area before being pumped up to the reservoir.

Potential features of the emerging design:

- The South West Quarter could be the main route between a visitor hub to the north and smaller visitor facilities in the south. It could also provide a new off-road walking and cycling route for those travelling between Chatteris and Doddington.
- A proposed non-vehicular bridge over the Forty Foot Drain could provide access to the South West Quarter from the south, where routes down to the wetlands or up to the crest could be provided.
- New areas of broad and shallow wetland particularly focused on creating invertebrate habitat.
- Tree planting above and outside of the crest and on the outer and inner edges of the embankment could create more secluded and sheltered places around the crest.
- Potential areas of floating wetland inside the reservoir could rise and fall with the varying water levels.
- Possibility for lookout points across the reservoir and wider landscape from the potential new landforms.

...the offering of stillness and quiet, a place to reflect the majesty of the energised fenland landscape.

Wetlands below sculptural landform. Robin Forster Photography

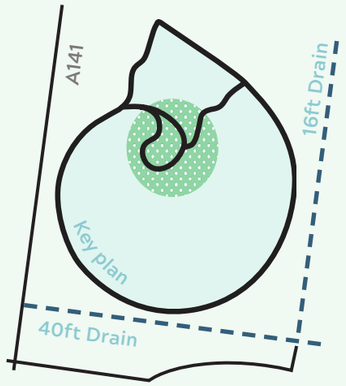
Walking, cycling and horse-riding connectivity over water

Areas of broad and shallow wetland could surround...

...new landform features that could offer lookout points over the reservoir

Northala Fields.
Credit Toby
Smith

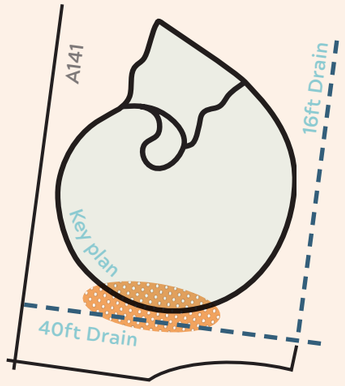
Central Terrace



Considerations and opportunities:

- The weirs separating the lagoon from the main water body could become a unique peninsula destination at the centre of the reservoir with good access to visitor amenities at the lagoon visitor centre.
- The landscape could be designed as a fenland experience, drawing inspiration from the history of the fens with a variety of wetland types looking at plant succession in the freshwater peat fens and how people and fauna interacted with these different vegetation groups throughout history.
- Architectural features and attractive boardwalk routes through wetlands could draw people through the new landscape.
- The water entering the reservoir could become a central feature of this area, running through elevated channels on either side of a footpath along the crest of the weir,
- Possibility of interpretation of local history and archaeological finds.
- Potential opportunity for a viewing tower at the centre of the reservoir with expansive views over the fenland landscape and towards local and more distant landmarks like Ely Cathedral.

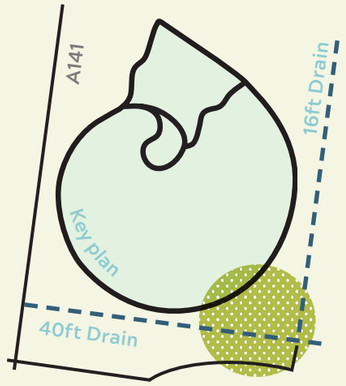
Southern Hub



Considerations and opportunities:

- Potential location for a secondary visitor hub accessed via a new bridge across the Forty Foot Drain and a road connection to the A142. The hub could provide facilities such as sailing, parking and toilets to support recreational use of the reservoir and a stopping point for those travelling along the Forty Foot Drain.
- The outlet tower could be designed as a landmark and could potentially be partly accessible to the public.
- Essential infrastructure such as the testing pond and spillway could be located here to provide a buffer between the Southern Hub and the quieter nature focused South East Quarter.
- Potential location for a marina off the Forty Foot Drain (to be delivered by others outside the DCO) enabling access to the reservoir by boat. Associated facilities (parking and hospitality) could provide a good destination for shorter journeys to the reservoir from Chatteris to the south.

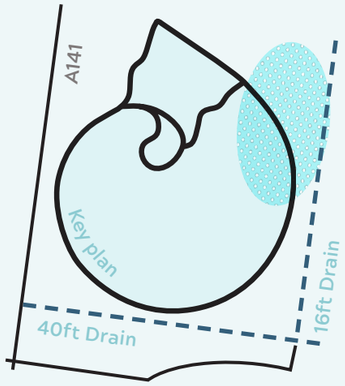
South East Quarter



Considerations and opportunities:

- Potential for new wetland connecting the reservoir into the network of ecological sites via its adjacent watercourses.
- Apart from maintaining an existing PRoW link to the B1098, public paths could be restricted to embankment crest level to reduce disturbance to the wetland.
- Landform above the crest level could be adapted to and hide the human silhouette of visitors from birds within the wetland, (helping to maximise habitable space for birds) and incorporate bird hides.
- This part of the site is well placed to offer views towards Ely Cathedral from the crest. The design could be developed to frame the view and guide eyes towards key landmarks.

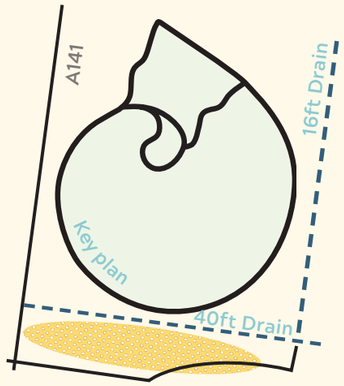
North East Quarter



Considerations and opportunities:

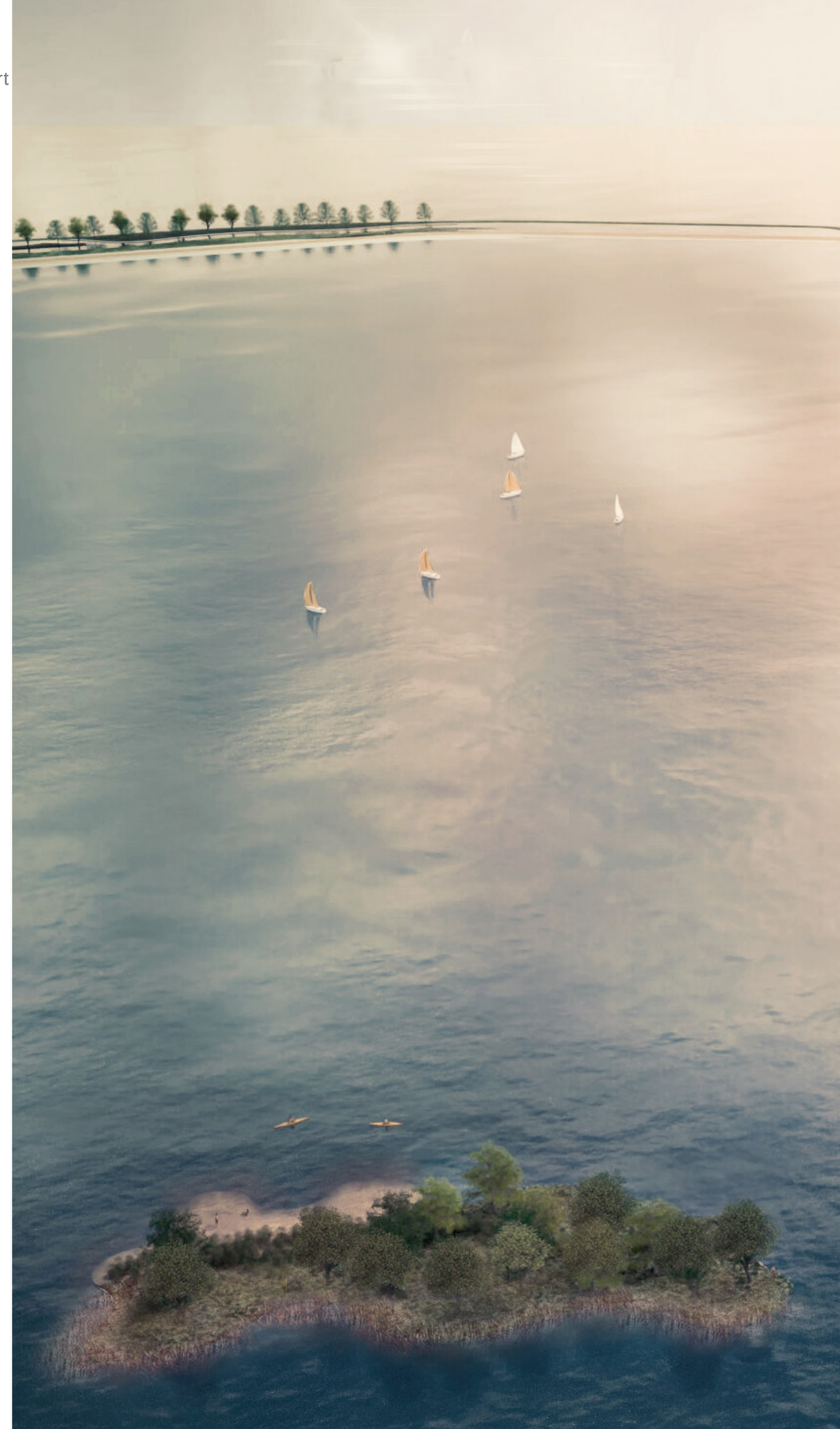
- Different types of wetland and wet grassland could be created in this quarter where existing ground levels here are slightly higher than the southern half of the site. To create wetlands, some excavation would be required to allow water to flow into the area without the need for pumping.
- Potential for a nature-priority zone on the water of the reservoir separated from recreational users and opportunity to include some wetland areas on the inner embankment of the reservoir fed by the adjacent lagoon. This quieter area could also accommodate floating solar panels on the water.
- This area could accommodate a small car park accessed from the B1098.
- The design of facilities and excavation in this area would need to be carefully considered to minimise the possible impact upon the Romano-British settlement near Honey Bridge Scheduled Monument to the east of the site and potential buried archeology.
- Potential for looping walking, cycling and horse-riding routes from the access road. This route could include inclusive gradient slopes up to the crest, part of the crest route and sections through the proposed wetland.
- A simpler sculptural embankment could include landform above the crest level path height, to hide the human form of visitors from birds within the wetland, helping to maximise usable wetland habitat below.
- There is some existing tree cover in this part of the site including that on the Wimblington Common Gravel Pits County Wildlife Site. Tree planting and careful design of landform on the crest could provide shelter for visitors.

South of the Forty Foot Drain



Considerations and opportunities:

- Potential vehicular access to the facilities of the Southern Hub from a new A142 road junction. This could connect the operational infrastructure of the reservoir (eg the outlet tower) with the Water Treatment Works and improve access to adjacent land.
- Walking, cycling and horse-riding routes could provide access to the reservoir (and on to Doddington) from Chatteris. Safe and controlled crossings across the A142 could be part of these routes.
- Potential to locate new wind turbines near to the existing wind turbine, and solar array and battery storage adjacent to the Water Treatment Works.
- Depending on the final proposals for the area, works may be required to Nightlayers Pumping Station and the associated drainage channels.
- Areas adjacent to the Forty Foot Drain may be needed for further environmental mitigation.
- The design for the WTW will be developed to be appropriate to its setting.
- Some of the area has been identified as a future area for employment growth in the Draft Local Plan.



...tiredness is a badge of honour, a sign of a day well-spent, and their happiness hums with the rhythm of the crickets chirping their evening song.

Indicative artist's impression of the view across the lagoon towards the Central Terrace with the illustrative visitor centre in the foreground.

10 References and Glossary

References:

- Fens for the future Ecology,

  M. O., (2012). FENS FOR THE FUTURE A Strategic Plan for Fenland: A Proposal for an Enhanced Ecological Network, Shrewsbury: s.n.

- An Interim Nature Recovery Network for Fenland

  Baker, M.P. (2023). An Interim Nature Recovery Network for Fenland. Wildlife Trust for Bedfordshire, Cambridgeshire & Northamptonshire

- Fields in Trust Green Space Index

  Trust, F. i., (2024). Green Space Index. [Online]

  Available at: https://fieldsintrust.org/insights/green-space-index

  [Accessed 2024].

Above Ordnance Datum (AOD)
Above ordnance datum is a vertical height above sea level.

Agricultural Ecosystems
Ecosystems that are created to support land for farming.

Arable
Land used or suitable for growing crops.

Capital carbon
Emissions associated with the creation of an asset.

Crest/ crest level
The level of the top of the dam.

Dam
A dam is a man-made barrier built to hold water.

Development Consent Order (DCO)
Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP). This includes energy, transport, water and waste projects. This is in place of other consents such as planning permission and compulsory purchase orders. Introduced in 2008 to speed up the planning process for NSIP projects.

Downstream
Components of the solution between the raw water reservoir to supply.

Drain
Engineered drainage channel.

Embankment core
Central section of an embankment dam made from an impermeable material to stop water passing through the dam.

Embankment dam
A dam made mainly from natural materials.

Environmental Impact Assesment (EIA)
Environmental Impact Assesment (EIA) is a process of evaluating the likely environmental impacts of a project or development proposal.

Fenland / the Fens
An area of low-lying land in eastern England.

Fields in Trust Green Space Index
The Green Space Index is a data tool designed to track and analyse green space provision across Great Britain.

Green space index, web page.

Freeboard
The height differential between the top water level and the crest of the reservoir embankment.

Goose and Swan Functional Land
Natural England's Goose and Swan Functional Land identifies land which is functionally linked to the Ouse Washes Special Protection Area (SPA) and Ramsar site. Land within this area, identified through a British Trust for Ornithology (BTO) research project, has the potential of being regularly used by Ouse Washes qualifying species, particularly swans, for foraging and roosting.

Impounding reservoir
A type of reservoir that is created by blocking natural flow of water with a dam or embankment. The flow may be from a stream or river. They may also be fed by groundwater springs.

Independent Design Review Panel (IDRP)
Design Review is an independent and impartial evaluation process in which a relevant panel of experts assess the design of a proposal. The projects that Design Review deals with are usually of public significance, and the process is designed to improve the quality of places for the benefit of the public

Inlet /inlet pumping
The point at which water enters the reservoir.

Lagoon
A body of water hydraulically connected to the main reservoir but separated by a dividing weir. The water level can be controlled to be more consistent than the main reservoir and facilitate a greater recreational use.

Landform
A natural or manmade land feature

Lower Layer Super Output Areas (LSOA)
Made up of groups of OAs, usually 4 or 5. They comprise between 400 and 1,200 households and have a usually resident population between 1,000 and 3,000 persons.

Middle Level network
The Middle Level is the central and largest part of the Great Level of the Fens, drained in the 17th Century.

National Cycle Routes
The National Cycle Network is a UK-wide network of signed paths and routes for walking, wheeling, cycling and exploring outdoors.

The National Cycle Network - Sustrans.org.uk

National Policy Statement (NPS)
National Policy Statements are produced by the government and comprise the government's objectives for the development of nationally significant infrastructure in a particular sector and state. They provide the framework within which Examining Authorities make their recommendations to the Secretary of State.

Nationally Significant Infrastructure Project (NSIP)
In the water industry this includes the construction of new dams/ reservoirs where the volume of water to be held back by the dam or stored in the reservoir is expected to exceed 30Mm3 and water transfer schemes where the deployable output of the facility to be constructed as a result of the development will exceed 80 million litres per day.

Non-impounding reservoir
A type of reservoir that does not obstruct the flow of a river and is normally filled by pumping water into it.

Nucleated settlements
A settlement clustered around a central point.

Open water
A large body of water.

Operational water level
The maximum level at which water is held within the reservoir.

Outlet tower
The outlet tower draws-off water at different levels in the reservoir and transfers the water out of the reservoir.
The supply pipe passes from the outlet tower to the WTW.

Output Areas (OAs)
Output Areas (OAs) are the lowest level of geographical area for census statistics.

Peat
a brown deposit resembling soil, formed by the partial decomposition of vegetable matter in the wet acidic conditions of bogs and fens.

Perched wetland
Wetlands that sit upon a perched water table.

Phase One Consultation
10 week consultation that took place between 12 October and 21 December 2022. Feedback was sought on two key parts of the proposals - the areas identified for the reservoir and an early concept design.

Public Rights of Way (PRoW) Network
A network of routes which the public have a legal right to pass along, the land may be owned by a private individual.

Rights of way and accessing land:
Use public rights of way - GOV.UK (www.gov.uk)

Pumping station
A utility building that pumps water from one place to another.

Ramsar
The designation of wetlands of international importance.

Reservoir
A natural or artificial lake used as a source of water supply.

Riverscapes
The features of the landscape which can be found on and along a river.

Roddon
A roddon is the dried raised bed of a watercourse such as a river or tidal-creek, especially in The Fens in eastern England. Such raised silt and clay-filled beds are ideal for settlement in the less firm peat of The Fens.

Saturated anaerobic conditions
The exclusion of air through water saturation.

Scrub
A transitional habitat where grassland and meadow changes into woodland. They typically contain shrubs and trees, as well as wildflowers and grasses.

Spillway
A spillway is used to prevent uncontrolled overtopping of the embankment. The spillway crest is proposed to be above the operational water level to reduce water loss from spills over the spillway at normal operational levels.

Swamp
Area of land permanently saturated, or filled, with water.

The Reservoirs Act 1975
Reservoir safety is regulated through the Reservoirs Act 1975. The Act applies to “large raised reservoirs” - reservoirs which store more than 25,000m3 above ground level.

Upstream
Components of the solution between the abstraction point to the raw water reservoir.

Water treatment works (WTW)
Site that contains the water treatment processes. The process of removing contaminants and bacteria from water abstracted from water sources such as reservoirs and aquifers before delivering clean and safe water to customers for consumption.

Watercourse
A brook, stream, or artificially constructed water channel.

Weir
A low dam that is built across water to raise the water level, divert water or control its flow.

Wetland
An area of land that is either covered by water or saturated with water.

Woodland
A woodland must meet all the following, as defined in the government publication in the link below:

- a minimum area of 0.5ha
- a minimum width of 20m
- a potential tree canopy cover of at least 20%
- a canopy consisting of specimens that meet the definition of trees

Guidance Definition of trees and woodland. Government website

love every drop
anglianwater

Cambridge Water

Get in touch

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