South East Strategic Reservoir Option

Preliminary Environmental Information Report

Chapter 3 - Consideration of alternatives

Date: October 2025

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3 Consideration of alternatives

3.1 Introduction

3.1.1 This chapter outlines the development of the South East Strategic Reservoir Option (hereafter referred to as the 'Project') and details the reasonable alternatives considered, including alternatives to the Project and alternative component parts of the Project. It highlights how environmental considerations have informed the decision-making process and outlines the main reasons for selecting the chosen options (in the context of the reasonable alternative options), taking into account likely potential effects of the Project on the environment. It describes how design alternatives within the Project have been considered and developed in order to meet Project vision and design principles as discussed in Chapter 1: Introduction.

3.1.2 In the Water Resources Management Plan 2024 (WRMP24) produced by Thames Water (Thames Water, 2024a), the Project is defined as a fully bunded reservoir with a live storage capacity of 150 million cubic metres (Mm^3), a pumping station incorporating energy recovery turbines, a conveyance tunnel to transfer flows to/from an intake/outfall structure on the banks of the River Thames, an auxiliary drawdown channel to allow the release of water from the reservoir in emergency scenarios, a main access road (from the A415) and a road diversion to the south (the Steventon to East Hanney Road), a rail siding to facilitate the delivery of construction materials and recreational facilities, landscaping and creation of new habitats. The Project was also noted to have the potential for interdependencies with other projects, namely the Thames to Southern Transfer (T2ST) (identified by Southern Water), the Thames to Affinity Transfer (T2AT) (identified by Affinity Water), the Farmoor Transfer and potential future connections into the Project for the Severn to Thames Transfer (STT) and the Swindon and Oxfordshire (SWOX) potable water transfer. The components of these related projects that form part of the Project and where space is proposed to be safeguarded for future development are described in Chapter 2: Project description.

3.1.3 Thames Water as the 'Applicant' submitted an Environmental Impact Assessment (EIA) Scoping Report (Thames Water, 2024b) for the Project to the Planning Inspectorate (PINS) in August 2024, which included a summary of the consideration of alternatives that had been undertaken for the Project at that stage. An EIA Scoping Opinion was adopted by PINS on behalf of the Secretary of State (SoS) on 8 October 2024 (PINS, 2024).

3.1.4 PINS requested that the Environmental Statement (ES) provides a high-level summary of the 2019 and 2024 Water Resources Management Plans (WRMPs) to demonstrate why alternative approaches were not considered to be feasible. An overview of the WRMP process is provided in Section 3.4 and a summary of how alternatives were considered within the WRMPs is provided in Sections 3.3, 3.5, 3.6 and 3.7.

3.1.5 PINS also requested that the ES specifically demonstrate how environmental constraints, viability and consultation have refined options and locations for renewable energy generation and energy storage (if planned to be provided). Section 3.8 discusses renewable energy generation options. However, the position and need for battery storage has not been confirmed at this stage and assumptions have been made at this stage, as noted in Chapter 2: Project description.

3.1.6 Further design development of the Project components undertaken after the publication of the PEI Report will be outlined in the ES and form part of the Applicant's Development Consent Order (DCO) submission.

3.2 Legislation, policy and guidance

3.2.1 Regulation 14(2)(d) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') requires that an ES must include '*a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*'. Paragraph 2 of Schedule 4 to the EIA Regulations provides examples of 'reasonable alternatives', including development design, technology, location, size and scale.

3.2.2 The National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2025) paragraph 3.5.1 advises that applicants should comply with all legal and policy obligations on the assessment of alternatives including the requirements of the EIA Regulations as specifically addressed in this chapter. Other legal and policy requirements in relation to alternatives are set out in the NPS (for example through The Conservation of Habitats and Species Regulations 2017, The Water Environment (Water Framework Directive) Regulations 2017 (as amended), and policies relating to National Parks, flood risk and National Landscape designations). These will be addressed in detail in the DCO submission but have informed the overarching approach and decision making at both the strategic level, and within the Project, as described in this chapter.

3.2.3 All water companies in England and Wales are legally required to produce a WRMP in line with sections 37A–D of the Water Industry Act 1991 and the Water Resources Management Plan Regulations 2007. The overall aim of the WRMP is to demonstrate how companies will ensure a resilient and efficient water supply, considering in particular challenges associated with ensuring resilience during drought periods in the face of climate change and population growth.

3.2.4 Paragraph 2.5.2 of the NPS states that '*if a water company identifies a future deficit in supply, it will need to assess the water resources and demand management options to eliminate the deficit and justify its preferred option in its* [WRMP]'. This emphasises the role of the statutory duty to prepare, publish and maintain a WRMP to set out the plan for how water companies will manage and develop water resources so that they can meet their supply obligations in considering and identifying the preferred solution type for meeting that need.

3.2.5 Paragraph 3.5.3 of the NPS advises that: '*the consideration of alternatives, as required under the Environmental Impact Assessment Regulations, must begin in the earliest stages of scheme evolution. The starting point should be a review of the optioneering carried out for the regional and water resource management plan development processes…'.* This chapter provides an overview of the optioneering and appraisal completed as part of the regional water resources planning and water company WRMP process (Sections 3.3 to 3.7) and subsequent design development up to the current stage (Section 3.8).

3.2.6 As per paragraph 1.4.2 of the NPS, water companies WRMPs are prepared to '…*set out how companies will manage demand and develop water resources where necessary, so as to be able to meet their water supply obligations*.' WRMPs are prepared on a five-year

cycle. Paragraph 1.4.3 of the NPS states that '*It is through the process of preparing, consulting on, and finalising the publication of these water resources management plans that decisions are made on what additional water resources infrastructure is needed.'*

3.2.7 The role of WRMPs to identify the solutions needed and appraise the different options is explained in the July 2025 update to the NPS. Paragraph 3.5.2 of the NPS advises that: '*information from the water resources management plan options appraisal process (and associated statutory assessments) will be relevant to demonstrate how alternative options have been considered, insofar as required under paragraph 3.5.1 and noting that the question of need would not be reopened when considering applications for development consent'*. Consequently, this chapter contains summary details of the WRMP options appraisal process leading to the selection of the Project. In addition, the chapter provides an overview of reasonable alternatives considered in relation to location, size and scale, technology and design development, noting how the current Project design has evolved as a result of assessments undertaken and feedback received.

3.2.8 Paragraph 1.4.5 of the NPS states: '*For nationally significant infrastructure projects included in a published final water resources management plan, the 'need' for that scheme has been demonstrated in line with government policy. The applicable statutory requirements for water resources management planning, and 'need' will not be revisited as part of the application for development consent. The Examining Authority and the Secretary of State will begin start [*sic*] their assessment of applications for infrastructure covered by the National Policy Statement on that basis*'. Further references to support that the need of the Project has been addressed through the water resources management planning process can be found in NPS paragraphs 1.4.6, 2.4.4 and 2.5.12.

3.2.9 PINS Advice Note Seven: EIA: Process, Preliminary Environmental Information and ES, (PINS, 2020) states that PINS considers a good ES is one that: '*explains the reasonable alternatives considered and the reasons for the chosen option taking into account the effects of the Proposed Development on the environment*'. This chapter sets out a summary of the reasonable alternatives considered up to the publication of the PEI Report. The ES will include an updated description, having regard to any relevant responses to consultation and ongoing engagement, and the decision-making process, having specific regard to likely environmental effects.

3.3 Background to the Project

3.3.1 The South East of England continues to face significant pressure on its water resources and is designated as being in serious water stress by the Environment Agency. London and the Thames Valley is already one of the most densely populated parts of the country with over ten million people living and working in the area, and which is forecast to grow significantly. By 2050, it is forecast there will be around two million more people living in the area supplied by Thames Water, and by 2075, this population is forecast to rise to over 13 million.

3.3.2 As the climate changes, there are likely to be more severe and frequent droughts. To help address this risk and following recommendations from the National Infrastructure Commission, the government requires water companies to ensure water supplies are more resilient to severe drought.

3.3.3 Water companies are to increase the level of resilience in water supplies to ensure customers are protected against '1-in-200 year' droughts (compared to current levels which are around '1-in-100 year' resilience) as soon as practicable. Water companies are also to provide a '1-in-500 year' level of resilience by 2040.

3.3.4 Thames Water currently supplies its customers with around 2600 megalitres per day (Ml/d) of water a day. WRMP24 forecasts that without action, there will be a deficit of over 375Ml/d additional water in 2035 and an extra 1,000Ml/d of water every day by 2050, including an extra 320Ml/d of water to reinforce water supplies to a 1-in-500 year drought. Assuming that Thames Water will continue to impose hosepipe bans during a drought, a deficit of around 260Ml/d is forecast for the Thames Water area.

3.3.5 Demand management measures, including reducing leakage and consumption, included in WRMP24 are forecast to meet a large proportion of the forecast deficit. However, even with these measures, a significant regional water supply deficit is forecast during times of drought. It is this deficit in water supply during times of drought which the Project is looking to address.

3.4 Regional and water companies water resources planning

3.4.1 In the 2020-2025 five-year planning period, the Environment Agency set out the National Framework for Water Resources (Environment Agency, 2020). This sets out the strategic direction that regional water resource plans should plan to reduce abstractions where they cause environmental problems and includes the long-term ambition of sustainable abstraction by 2050. The framework requires water companies to work together in regional groups to produce regional water resources plans. The framework sets out the requirement for five regional water resource plans for England. Each regional group must produce a single plan that builds resilience to a range of uncertainties and future scenarios. The groups are required to develop a preferred water resources plan for the region, through a set of options that present the best value to customers, society and the environment, rather than simply least cost.

3.4.2 Thames Water, Southern Water and Affinity Water have been working collaboratively to develop strategic plans for water supplies as part of Water Resources South East (WRSE), which is an alliance of six water companies that supply drinking water across South East England. This approach ignores water company 'boundaries' to identify the best value, long-term plan for the whole of the South East. The approach is designed to work in tandem with the WRMP process to address water supply challenges on a regional scale.

3.4.3 Options were identified collaboratively with WRSE partners to identify solutions that would benefit the region, improving the regional resilience of water supplies. These were appraised both individually by the water companies and by WRSE to identify the best value regional plan. The Final Regional Plan (2025) Water Resources South East (WRSE, 2025) was published in June 2025.

3.4.4 Alongside the development of regional water resources plans, the WRMP process is undertaken by all water companies in line with the Water Resources Planning Guideline (Environment Agency, Ofwat and Natural Resources Wales, 2023). The process consists of the following steps:

- Identification of the forecast water demand, including consideration of population growth, climate change and changes in water use (e.g. due to improved efficiency in fixtures and fittings, and the use of smart meters)
- Identification of the forecast water available for public supply, including consideration for climate change
- Identification of the forecast in reduced abstraction, in line with the National Framework for Water Resources
- Consideration for uncertainties in forecasting, developing scenarios to be planned for.
- Preparation of the constrained list of options to be considered for programme appraisal. This step consisted of:
  - Preparing the unconstrained list of all possible options, irrespective of environmental impact or viability. This list was developed from a generic list of option types, including supply, demand and network efficiency solutions. This also incorporated options identified to provide wider regional benefit by WRSE and in joint-working with other water companies or third parties, such as water transfers from neighbouring water company areas or a water trade with a third party.
  - Feasibility assessment and screening of options. This step progressively developed the unconstrained list into a list of feasible options through the consideration of multiple criteria covering engineering constraints, environmental and social impacts, land and property, legal, planning, supply potential, carbon, cost and future resilience. This step results in the preparation of the constrained list of options.
- Programme appraisal and scenario testing. This final step is to undertake appraisals of multiple combinations of the hundreds of water resources options on the constrained list to identify the most appropriate combination that would be able to address the supply and demand requirements identified earlier in the process. This is undertaken using complex decision support tools which analyse performance and cost. The outcome is referred to as the best value plan.

3.4.5 Throughout the development of the regional plan and WRMP, assessments of the environmental impacts and opportunities associated with the options and the emerging plan are undertaken to provide inputs to the screening and feasibility assessments, and programme appraisal stage. Environmental assessments across the WRSE region have either been undertaken using consistent methodologies between water companies, or have been undertaken centrally by WRSE. This includes the following assessments:

- Strategic Environmental Assessment (SEA)
- Habitats Regulations Assessment (HRA)
- Water Framework Directive Assessment (WFD)
- Biodiversity Net Gain and Natural Capital Assessment (BNG & NC)
- Invasive Non-Native Species Assessment (INNS)

3.4.6 Likewise, engagement is carried out during the preparation of WRMPs. This includes the Environment Agency who are consulted to determine which future pathway would be most suitable to consider. Draft WRMPs are published for statutory consultation with the public and other stakeholders prior to the finalisation of the best value plan, which is presented in the final published WRMP.

3.4.7 Thames Water, Southern Water and Affinity Water have each followed the process outlined above during the development of their respective WRMPs, in alignment to the regional plan prepared by WRSE. These have been published as follows:

- Water Resources Management Plan 2024 (WRMP24) (Thames Water, 2024a)
- Final Draft Water Resources Management Plan 2024 (Southern Water, 2025)
- Water Resources Management Plan 2024 (Affinity Water, 2024)

3.5 Do-nothing scenario

3.5.1 The South East is identified as an area of significant economic growth, making up around 37% of the national economy. As set out in the overview document from WRMP24 (Thames Water, 2024c), having insufficient water to support this level of growth would cost London's economy alone around £500 million each day.

3.5.2 Paragraph 2.1.3 of the NPS explains that '*there is a critical and urgent need to build resilience in the water sector to address pressures on water supplies*'. The requirement for water companies is set out in the Water Resources Planning Guideline (WRPG) (Environment Agency, Natural Resources Wales and The Water Services Regulation Authority, 2023). Water companies must ensure a positive supply-demand balance in all water supply zones, in all future planning years and provide adequate level of resilience in water supplies to ensure customers are protected against '1-in-500 year' droughts. This is planned for through the preparation and delivery of WRMPs.

3.5.3 The Project consists of infrastructure critical to the resilience of future public water supply as set out in the WRMPs prepared by Thames Water, Southern Water and Affinity Water and the regional plan prepared by WRSE. Therefore, the 'do-nothing' scenario is not viable.

3.6 Identification of the Project

3.6.1 The preparation of WRMP24 was undertaken following the approach outlined in Section 3.4. The unconstrained list of options considered in the preparation of Thames Water WRMP24 identified multiple alternative options to reduce demand for water (Thames Water, 2024d) and produce future resources (Thames Water, 2024e). These were categorised as below:

- Demand options:
  - Leakage
  - Metering
  - Water efficiency
  - Incentive Schemes
  - Non-potable (e.g. harvesting or recycling water)
  - WRSE Region-Wide (demand options that could be applied region-wide)
- Resource options:
  - Reuse
  - Desalination
  - Raw water transfer (including the Severn to Thames Transfer (STT) as described in Chapter 2: Project description)

- Reservoirs (including the South East Strategic Reservoir Option, the main component of the Project)
- Direct river abstraction
- Raw water purchase
- Aquifer recharge
- Aquifer storage and recovery
- Groundwater
- Removal of Deployable Output Constraints (on existing assets)
- Catchment management
- Inter-zonal transfers
- Inter-company transfers

3.6.2 Preparation work for WRMP24 built upon the options identification work undertaken for the previous 2019 WRMP cycle, however the WRMP process was undertaken using revised planning guideline from the Environment Agency (Environment Agency, 2023). This guideline reflects the need for long-term resilience to be considered in the WRMP, which was considered alongside an increase emphasis on climate change.

3.6.3 This included a backcheck exercise of the options previously considered, or rejected, to validate decisions previously made. This also included the review and updating of the feasibility reports produced during the WRMP19 for each option type (raw water transfers, reservoirs, water recycling, direct river abstraction, desalination, inter zonal transfers and groundwater). These are reported as feasibility study addenda reports to WRMP24 (Thames Water, 2024f).

3.6.4 A series of environmental appraisals were undertaken at each stage of the options identification and appraisal, as detailed in WRMP24 Section 9 – Environmental Appraisal (Thames Water, 2024g).

3.6.5 The options identification and development process carried out in collaboration with WRSE confirmed that the Project forms an essential part of the regional strategy for long-term water security.

3.6.6 The Project was identified as part of the best value plan within WRMP24 following a comprehensive adaptive planning assessment. The analysis, supported by environmental modelling and scenario testing, concluded that the Project would provide a robust and operationally resilient response to long-term water supply challenges facing the South East of England, particularly under high-demand and severe drought conditions. It would act as a regional storage and transfer hub for London and the South East. During appraisals, it was noted to perform well against key appraisal metrics, including strategic value, environmental performance (e.g. nature conservation and non-traffic impacts on local residents during construction), and regional compatibility, due to its potential role in facilitating inter-company transfers. The Project performed less well in environmental appraisal metrics for land use and land quality, floodplain encroachment, and archaeology and the historic environment. The reasons for selection of the Abingdon site are noted in paragraph 3.7.18.

3.6.7 Clear and robust reasoning for the screening decisions made during the options appraisal at WRMP24 are recorded in WRMP24 Technical Appendix P: Option list tables (Thames

Water, 2024h) and WRMP24 Technical Appendix Q: Scheme rejection register (Thames Water, 2024i).

3.7 Identification of the scale and location of the WRMP Project

3.7.1 As part of the WRMP process, potential locations for reservoirs were identified, and the feasibility of these alternative locations and their potential scale was considered. As outlined in Section 3.4, options considered to be feasible were appraised as part of multiple combinations of the hundreds of different water resources options on the constrained list (which included other types of water resource options) to identify the most appropriate combination that would be able to address the supply and demand requirements for the region. The alternative reservoir proposals considered are discussed in this section to provide an understanding of how this process led to a reservoir at Abingdon being added to the constrained list, including the size options. This ultimately led to a 150Mm^3 capacity reservoir at Abingdon being selected as part of the best value plan. The analysis presented in this section is therefore a simplification of the process followed to identify the location and scale of the reservoir.

3.7.2 Potential reservoir sites were identified initially during the preparation of WRMP19 based on the following criteria that sites needed to meet (Thames Water, 2017):

- The site must be located within the catchment of the River Thames
- The site must be located primarily (more than 90%) on impermeable strata
- The site must avoid areas of major development - any site should be free from elements of built development, including being 100 metres (m) distant from strategic road networks or operational railways, and more than 50m distant from a settlement or group of dwellings
- The site must be located near the River Thames, upstream of Windsor or a main tributary river that flows into the River Thames upstream of Windsor (in the Upper Thames area)

3.7.3 This assessment established, in spatial terms, those areas that were unsuitable for reservoir development. The subsequent stages of site identification assessed potential reservoir sites against absolute constraints. These included the presence of Ramsar, European designated sites, Sites of Special Scientific Interest, World Heritage Sites, Scheduled Monuments or Grade I listed buildings within a proposed site area, or a clay thickness of less than 10m.

3.7.4 For sites that passed this stage, further constraints were considered including size, property and legal criteria, planning, socio-economic and environmental criteria, including flood plain encroachment, and engineering criteria.

3.7.5 This identified six feasible sites, of which three (Abingdon, Marsh Gibbon and Chinnor) were taken forward into the constrained list for WRMP19. For WRMP 24, a back-check was undertaken to reassess options rejected at WRMP19, including the previously rejected options at Aylesbury, Ludgershall and Haddenham, and progressed through the feasibility assessment process for WRMP24. Alongside the consideration of location, size was intrinsically part of the appraisal to identify options to be added to the constrained list for WRMP24.

3.7.6 A summary of the alternative locations and sizes of reservoirs considered to be feasible at WRMP24 is provided in Table 3.1 as taken from the Resource Options – Reservoirs Feasibility Report Addendum (Thames Water, 2024j).

Table 3.1 Feasible alternative location and capacity reservoir options considered in WRMP24

	30Mm³	50Mm³	75Mm³	100Mm³	125Mm³	150Mm³
Abingdon	✓	✓	✓	✓	✓	✓
Marsh Gibbon	✓	✓	✓	✗	✗	✗
Chinnor	✓	✗	✗	✗	✗	✗
Aylesbury	✓	✓	✗	✗	✗	✗
Ludgershall	✓	✓	✗	✗	✗	✗
Haddenham	✓	✗	✗	✗	✗	✗

Consideration of each reservoir option

3.7.7 The Aylesbury options were rejected in WRMP19 due to the proximity of a Major Development Area with outline planning permission for new housing, schools and an employment area being granted immediately to the south and south-west of the site, the potential for impacts on visual amenity and construction complexity. A larger 75Mm³ capacity option was considered at WRMP19 and revisited for WRMP24 as part of the backcheck exercise. However, this was not considered viable for WRMP24 due to a new development within the footprint of the reservoir.

3.7.8 The Ludgershall site was rejected in WRMP19 due to poor performance across many criteria, including the likely need for off site compensation storage for flood plain encroachment, landscape impacts and cost. For WRMP24, after the backcheck exercise, these options were added to the Feasible List and assessed again.

3.7.9 The Haddenham option was rejected in WRMP19 due to poor performance across many of the criteria, including landscape and visual impacts as well as complex construction requirements. For WRMP24, after the backcheck exercise, the option was added to the Feasible List and assessed again.

3.7.10 All reservoir options at Aylesbury, Ludgershall and Haddenham were rejected after further screening and were not included on the constrained list of options for WRMP24. They were rejected as they performed comparatively worse against Stage 3 Feasibility criteria compared to Abingdon, Marsh Gibbon and Chinnor.

3.7.11 All feasible size options at Abingdon, Marsh Gibbon and Chinnor were included on the constrained list as the best performing options. After WRMP19 the design for these options were developed further in order to explore the likely costs in more detail.

3.7.12 A 100Mm³ capacity reservoir at Marsh Gibbon was ruled out as the conceptual ground model for the site, and subsequent review of the earthworks cut fill balance, showed that it is not possible to obtain this storage capacity within the identified potential site. A geotechnical review undertaken after the publication of WRMP19 indicated that the clay volume that would be won from the borrow pit was significantly smaller than that previously assumed. This was due to shallower borrow pit excavation than originally assumed,

therefore a larger footprint reservoir would be required to achieve the same storage volume leading to more clay being required for construction of longer reservoir embankments. As a result, the Marsh Gibbon 100 Mm³ option would not fit within the identified potential site and was rejected.

3.7.13 At the Chinnor site, a 75Mm^3 capacity reservoir was considered and rejected as part of the feasibility assessment as it performed poorly across a number of the assessment criteria including cost, effects on archaeology and the historic environment, and floodplain encroachment. A 50Mm^3 capacity reservoir was considered as part of the validation list, however further development of the conceptual ground model for the site, and subsequent geotechnical review indicated that the clay volume that would be won from the borrow pit was significantly smaller than that assumed in WRMP19. This was due to shallower borrow pit excavation than originally assumed, therefore a larger footprint reservoir would be required to achieve the same storage volume leading to more clay required for construction of the longer reservoir embankments. As a result, the updated Chinnor 50Mm³ option would require a footprint similar to that assumed for the Chinnor 75Mm³ option at WRMP19 and was therefore rejected for the same reasons.

Consideration of combined options

3.7.14 All six of these reservoir locations and the STT pipeline would discharge into the upper River Thames where there is a combined discharge limit of 600Ml/d. WRMP24, Appendix Q: Rejection Register (Thames Water, 2024i) explains that '*scenario runs of the investment model were undertaken to assess which options within the combined limit were selected* [for the constrained list]*. STT and SESRO were selected as preferred options and in combination reach the 600 Ml/d discharge limit*.' These scenario runs considered the constrained list options at Marsh Gibbon (30Mm^3, 50Mm^3 and 75Mm^3), Chinnor (30Mm^3) and Abingdon (all options).

3.7.15 The best performing options which would in combination reach the 600Ml/d discharge limit were found to be SESRO and STT. Plans where STT was included in place of SESRO were assessed as being more expensive, resulting in greater carbon emissions and would not deliver the same environmental or water supply resilience benefits, particularly under severe future drought scenarios. This led to SESRO being selected as part of the best value plan. The Project was noted in the WRMP24 to provide a resilient source of water with low operating costs that can facilitate transfers within the WRSE region, and so would provide the ideal base of an adaptive plan for an uncertain future.

Selection of Abingdon reservoir option

3.7.16 The location of the Project was determined as part of the WRMP24. The provision of a reservoir at Abingdon was preferred in WRMP19 and, after being revisited in the preparation of WRMP24 (Thames Water, 2024a) and the WRSE plan, was reconfirmed as part of the best value plan.

3.7.17 The WRMP24 appraisals (Thames Water, 2024g) noted the potential for significant negative effects on the North Wessex Downs Area of Outstanding Natural Beauty (now referred to as National Landscapes).

3.7.18 In accordance with the appraisal process carried out, the location near Abingdon was selected because it:

- Is close to the River Thames (<5 kilometres (km)) and is upstream of existing water abstraction points used by Thames Water, Affinity Water and South East Water.
- Has reasonably flat land (53-65m AOD).
- Has the right geology and ground conditions for a reservoir, e.g. the site has enough thickness of clay to retain large volumes of water (underlain by thick deposits of Kimmeridge and Gault clay) whilst providing the materials to be able to construct the clay embankments.
- There are very few environmentally designated sites within the vicinity, with the site consisting mainly of low productivity arable land.
- Initial Habitats Regulations Assessment screening assessments identified that no likely significant effects would be likely to arise from any of the Abingdon size options, either alone or in combination with other plans and projects.
- The site was also recognised to have the potential to deliver habitat creation and enhancement, delivering a biodiversity net gain.
- Is close to a railway line (the Great Western Main Line railway – London to Bristol) and is close to major road links that would be used to deliver construction materials (the A34 to the immediate east and A415 to the north).

Scale of the Project

3.7.19 The Project was proposed as part of the Thames Water WRMP19 at a size of 150Mm^3 to secure long-term resilience (Thames Water, 2019). This solution was preferred in WRMP19 and, after being revisited in the preparation of WRMP24 (Thames Water, 2024a) and the WRSE plan, was reconfirmed as part of the best value plan.

3.7.20 A variety of capacity options were considered at Abingdon as part of WRMP19 and WRMP24 as shown in Table 3.1. In addition, two phased delivery options were considered in WRMP24 to provide either 80Mm^3 (phase 1) plus 42Mm^3 (phase 2), and 30Mm^3 (phase 1) plus 100Mm^3 (phase 2).

3.7.21 The smallest capacity options (50Mm^3 and 30Mm^3) were rejected during the preparation of WRMP19 as these would limit development of larger capacity options on the same site in future. This rejection reasoning was backchecked at WRMP24 and found to remain valid.

3.7.22 The phased delivery options tended to be more expensive as they involve more earthworks overall for the volume of storage created, and would need to be developed in multiple construction phases and so construction phase impacts could be of a longer duration, experienced over two separate time periods, although with lower levels of activity during each. This was confirmed within Gate 2 appraisal work completed prior to WRMP24 (Thames Water, 2022).

3.7.23 Smaller reservoir sizes were found to reduce local impacts while larger sizes were confirmed to offer increased regional resilience.

3.7.24 The larger 150Mm^3 option was selected as part of the overall best value plan over the alternative sizes (75Mm^3, 100Mm^3 and 125Mm^3) as it was found to be more cost effective whilst providing a greater level of supply resilience and reducing the need for expensive additional infrastructure to meet the required supply. Overall, the construction impacts of the 150 Mm^3 option were considered greatest (Thames Water, 2022).

3.7.25 During the development of the WRSE plan during the WRMP24 cycle, further modelling and sensitivity runs were carried out to assess how the WRSE plan performs with and without SESRO to understand the consequences of its omission. Following the modelling, the size of the reservoir was confirmed at 150Mm^3. Paragraph 12.29 of the WRSE plan (June 2025) states that: '*The plan with the SESRO reservoir proposal at 150 Mm^3 outperformed the plans with other size variants in the resilience and Strategic Environmental Assessment benefit scores. This indicated that the plan with the 150 Mm^3 SESRO reservoir proposal was more resilient and better able to adapt and evolve to future challenges compared to the plans with smaller SESRO reservoir proposals*'.

3.8 Design development

3.8.1 As discussed in Chapter 2: Project description, Section 2.1, the Project vision, design principles and objectives have shaped the Project's functional requirements, a broader vision and strategic design framework that serve to deliver a holistic, coherent design approach, aiming to deliver not just a reservoir, but also a nature reserve and country park.

3.8.2 This section provides descriptions of the reasonable alternatives considered for key Project components, the main reasons for selecting chosen options and a comparison of environmental effects. Design development has been undertaken for the following key Project components to date, and is reported in this section:

- The shape and position of the reservoir
- Watercourse diversions
- Connections between the new reservoir and the River Thames, including:
  - The reservoir tunnels
  - The emergency drawdown approach
  - The river tunnel alignment
  - The intake/ outfall structure position
- Locations for the T2ST Water Treatment Works (WTW)
- The main access road into the site
- The Steventon to East Hanney Road diversion
- The Wilts and Berks Canal provision
- 132kv cable diversion
- The Rail Siding and Materials Handling (RSMH) facility
- Renewable energy provision, including consideration of floating solar, ground-mounted solar and wind generation

3.8.3 In addition, the draft Order limits have been extended since the EIA Scoping Report was prepared. This has largely been driven by the identification of areas for habitat creation and/or enhancement, protected species relocation and for potential reprovision of solar farms. Further details are included later in this section under the 'Habitat enhancement and creation for protected species mitigation' and 'Renewable energy - Ground-mounted solar' subheadings.

3.8.4 Ongoing design development is noted at the end of this section. Any updates will be included in the ES.

Reservoir shape and position

3.8.5 As discussed earlier in this chapter, the need for and the location of the Project, including the reservoir capacity, are identified by the WRMP based on an indicative reservoir design. Development of the reservoir shape and position has since been subject to further development.

3.8.6 The shape, form and embankment footprint of the reservoir have been developed through an iterative design process guided by the Project objectives and key constraints such as underlying geology, ground conditions and the spatial configuration of the surrounding land uses.

3.8.7 A detailed constraints assessment was undertaken to determine how the reservoir could best fit within its surrounding context as is reported in SESRO Option Appraisal Documents Option Appraisal Context and Methodology Report (Thames Water, 2024k). Parameters were identified from the constraints assessment (discussed below), which have constrained the shape and position of a reservoir at the Site. These constraints were used to develop the concept design.

3.8.8 Since the concept design, the design of the reservoir embankment has been refined, drawing on landscape context and character studies. Crest profiles and embankment shoulders have been sculpted with varying radii and undulations to echo other local landforms, reduce linearity and create a more natural visual profile.

Spatial constraints

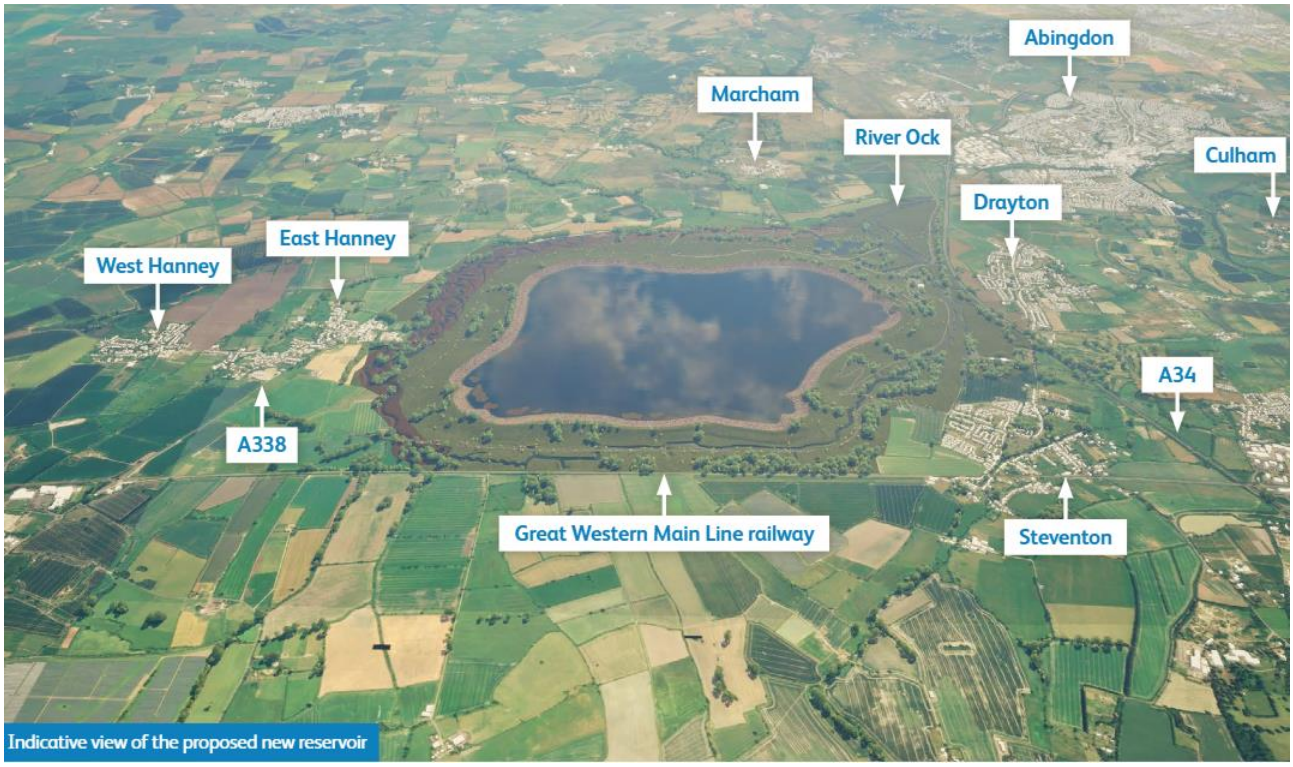
3.8.9 The Core Project Area (as shown on Figure 2.1 Project overview) within the draft Order limits for the reservoir location is bounded to by the River Ock to the north, the A34 and the village of Steventon to the east, the Great Western Main Line (GMWL) to the south and the A338 and village of East Hanney to the west. The reservoir would sit within these extents to make best use of the available space without impacting existing major infrastructure.

3.8.10 The space must also accommodate necessary associated infrastructure such as a road diversion, watercourse diversions, compensatory flood storage and environmental mitigation. These initial requirements have largely determined the size and shape of the reservoir footprint as follows and as shown in Plate 3.1:

- North – moving the reservoir north would encroach onto the River Ock floodplain requiring increased replacement flood storage and higher embankments as the land falls towards the river.
- East – the south of the eastern embankment of the reservoir curves around Steventon to create a buffer between the village and the base of the embankment as well as retaining an existing electricity sub-station. Further north the reservoir embankment extends further east towards the A34. It is necessary to retain a corridor between the base of the embankment and the village / A34 for the eastern watercourse diversion, diversion of utilities and operational access.
- South – the southern extent of the reservoir embankment is constrained by the need to accommodate watercourses, the Steventon to East Hanney road diversion, utility diversions, and the proposed construction of the RSMH facility in a corridor between the embankment and existing railway line.

- West – the western side of the reservoir is shaped to curve around East Hanney and provide sufficient space for the western watercourse diversion, replacement flood conveyance and compensation, and operational access.

Plate 3.1 Spatial constraints of the Project



Reservoir embankment height constraints

3.8.11 Early indicative design ranges put the reservoir embankment heights at between 15m above existing ground level on the southern side of the reservoir, increasing to around 25m on the northern side of the reservoir ((Thames Water, 2022). The current design parameters described in Chapter 2: Project description indicate that embankment heights above existing ground level have increased slightly, now ranging from 14.9m to 26.8m, with an average of 20.5m to 21.9m. This design refinement has been made to support the Project cut and fill balance position by reducing the surplus material generated, whilst allowing more flexibility to embankment slope profiles to improve safety during construction. The final embankment gradients would be defined during detailed design post-consent. A higher structure would require a corresponding increase in the width of the embankment base to deliver structurally sound embankment slopes, and this in turn requires a greater volume of clay material.

3.8.12 The Project is aiming for a cut and fill balance of clay and subsoil across the draft Order limits as far as reasonably practicable. The reservoir embankment would be formed of clay that is dug out from the centre of the reservoir bowl and placed to form the reservoir embankments. Material dug from the Site that is not suitable for the structural embankments would be used for landscaping. In this way no material would be imported to form the main structural and landscaping elements of the Project, although imports of materials are likely to be needed for other elements (e.g. wave protection as described in Chapter 2: Project description). Increasing the height of embankments increases the cut

and fill volumes beyond those currently assumed, and so an increase in embankment height that reduced the overall footprint of the reservoir cannot be easily achieved for the required operational capacity. It would require a significant increase in excavated clay volume which is constrained by the geological constraints as described below.

Geotechnical constraints

3.8.13 A large deep hole would be formed by the clay extraction. The location, size and orientation of the excavation area is a function of the reservoir footprint (set by the spatial constraints) combined with the underlying ground conditions.

- Underlying ground – The reservoir arrangement is constrained by the thickness and alignment of the clay strata on the Site. Those clay strata are underlain by a permeable and water-bearing stratum, and the elevation of the bottom of the clay dips towards the south-east of the Core Project Area. There is a need to retain a sufficient thickness of bedrock clay under the bed of the reservoir to avoid water pressures within the underlying strata causing ground instability. This requirement limits the maximum depth and also constrains the shape and extent of the excavation area within the reservoir. The excavation area shape and size is also defined by the objectives of enabling natural currents to develop in the reservoir to aid mixing of the water for the purpose of ensuring water quality, and to reduce the amount of storage which is not available for water supply.
- Embankment stability – The reservoir arrangement is also constrained by the need for the excavation area to be a sufficient distance from the reservoir embankment to avoid affecting embankment stability. A minimum distance of 50m between the internal side of the embankment and the excavation area has been adopted in the design.
- Embankment foundation – The slopes of the structural perimeter reservoir embankment are designed to maintain embankment stability and are a function of the properties of the clay foundation at the Site. The embankment would be constructed on the bedrock clay, which will form its foundation. The properties of the underlying geology and bedrock clay are understood through intrusive ground investigation and understanding will increase as more data is collected and the design is developed.

Summary

3.8.14 To summarise the constraints assessment, the Project is physically constrained and defined by A roads to the west and east, the village of Steventon to the south-east, the village of East Hanney to the south-west, the main line railway to the south and the floodplain of the River Ock to the north. The identification of the reservoir shape and position is informed by geological constraints (i.e., the presence of sufficient thickness of underlying clay), which limit the location and depth of the borrow pit excavation, the need to fit other water and non-water infrastructure into the Core Project Area to achieve the defined capacity of 150Mm^3, and the need to balance cut material and fill material in the earthworks design to reduce imported and exported soil from the Project. This has led to a refinement of the reservoir embankment parameters in response to these factors, rather than a series of options that have been appraised.

Watercourse diversions

3.8.15 Given the scale and nature of the Project the only option for watercourse diversions is to divert them around the embankments. Their location was set by constraints analysis rather than optioneering. Following consideration of constraints, the area to the west of the reservoir, between the embankment and the A338, provides sufficient space and flexibility to adjust ground levels to deliver the necessary flood conveyance capacity.

Emergency Drawdown

3.8.16 The emergency drawdown function of the reservoir is necessary to enable the water level in the reservoir to be lowered quickly in an emergency. Water removed from the reservoir needs to be conveyed to a watercourse with sufficient hydraulic capacity to safely receive this flow during normal conditions. An options appraisal was undertaken as described in SESRO Connectivity to the River Thames Option Appraisal Report (Thames Water, 2024l) which considered three options which would deliver water to the same river reach of the River Thames. A summary of the findings is provided below.

Option A

3.8.17 Option A consists of two elements for discharging flows from the reservoir during emergency events. The Auxiliary Drawdown Channel (ADC) is a surface channel and a conveyance tunnel both of which would transfer water via gravity to the River Thames outfall structure.

3.8.18 Option A was discounted as it included levees for the ADC across the River Thames floodplain which would have unacceptable impacts on flooding. The design was, therefore, revised and developed into Option B.

Option B

3.8.19 Option B consists of both the ADC and a conveyance tunnel, capable of transferring the same flows as Option A but without the associated levees for the ADC.

3.8.20 Option B has more surface works than Option C due to the need for the ADC and greater potential to impact the existing road network during construction as the ADC requires a crossing under the A34 (including permanent diversion of the A34). Option B also introduces additional operation and maintenance activities associated with locks and gated structures. This option would also require the removal of priority habitats but would represent an opportunity for habitat creation and recreation. However, public benefit would not outweigh the costs.

Option C

3.8.21 Option C does not include the ADC and instead utilises the conveyance tunnel and the intake/ outfall structure alone to transfer water to the River Thames in an emergency.

3.8.22 Option C was chosen as the preferred option in relation to engineering as it does not include the ADC and for environment as it would have the least impact upon vegetation clearance, priority habitats and noise receptors. It also has lower capital and carbon costs compared to other options.

Reservoir tunnels

3.8.23 The reservoir tunnel configuration has been refined through consideration of tunnel size, the number of tunnels to be provided, the pipework arrangement and construction methodologies.

3.8.24 The proposed tunnel has been amended from a single smaller diameter tunnel being considered at the EIA scoping stage, to the proposed arrangement of two 6m diameter tunnels.

3.8.25 This twin tunnel arrangement allows pipework to be maintained while keeping the tunnel diameter within reasonable limits, allowing space for the main access point and for maintenance access around the pipework in accordance with standards. The twin tunnels allow full isolation of one tunnel while keeping the reservoir operational, making maintenance easier and safer. This arrangement also avoids the need to actively siphon water from the reservoir.

3.8.26 This arrangement is the current preferred solution as this design complies with relevant standards, including guidance on drawdown capacity, as well as addresses previous spatial constraints. It is anticipated that further design development could lead to cost savings, including the possibility of reducing pipe diameters. From a buildability perspective, the enlarged tunnel dimensions will facilitate easier and safer installation of pipework. From an environmental perspective, this would result in a slight increase in excavated material and waste generation, and concrete consumption. However, there was no further environmental detriment or improvement identified with the change.

River Tunnel alignment

3.8.27 The River Tunnel is a key component of the Project's water conveyance system. It would transfer water to and from the River Thames via a pumping station and an intake/outfall structure located on the right bank near Culham. The alignment considered at the EIA scoping stage assumed a curved alignment.

3.8.28 As part of the ongoing design refinement process, an additional optioneering assessment has been carried out to explore a straight-line horizontal alignment for this tunnel. This also considered the potential to vary the alignment to fall between the curved alignment and the straight-line alignment (these are shown as Option 1 and Option 2 on Plate 3.2). This alternative alignment seeks to reduce the overall tunnel length, with the aim of optimising construction programme and cost efficiency, while also contributing to a reduction in carbon emissions through reduced material usage and construction-related energy consumption.

Plate 3.2 Alignment of Option 1 (curved) and 2 (straight-line) and constraints identified

Option 1 – Curved river tunnel alignment

3.8.29 Option 1 represents the concept design for the River Tunnel, extending approximately 3,530m with a 6m internal diameter. The alignment includes two horizontal curves and a straight transition. It was developed to avoid new development to the north of Drayton and crossing buildings, and to follow existing property boundaries to reduce land sterilisation.

3.8.30 The crossings of roads and utilities were designed at optimal angles to reduce construction complexity. The design carefully avoids pylons, sensitive historical sites and landfill areas. The shaft to tunnel transition point was set approximately 260m from the pumping station.

Option 2 – Alternative (straight-line) river tunnel alignment

3.8.31 Option 2 proposed a straighter tunnel alignment of approximately 3,260m in length, also with a 6m internal diameter. It retained the same start and end points as Option 1 but eliminated all horizontal curves, thereby shortening the tunnel length and potentially reducing construction time, cost, and associated carbon emissions.

3.8.32 The straight-line route directly intersects Drayton, where significant above ground buildings and utilities are present. This alignment may impact existing high voltage overhead (HVO) power line poles or pylons within its settlement zone of influence, particularly where foundation conflicts may arise.

3.8.33 In addition, the straight-line alignment was found to increase the risk of amenity impacts on the local community during construction, including heightened levels of noise, vibration, dust, and disruption from heavy goods vehicles (HGVs).

3.8.34 Additionally, the Option 2 alignment passes under historical quarries and landfill, potentially extending to the top level of the Kimmeridge Clay formation. This presents a high risk of groundwater contamination and ground gas due to unlined commercial and household waste.

3.8.35 In the Option 2, the STT (Severn Thames Transfer) connection would be relocated to suit the new tunnel alignment. This action was found to primarily impact the pipeline connection from a hydraulic perspective, the landscape area and utility impact assessment.

Preferred option

3.8.36 Option 1 remains the preferred option as it avoids Drayton, most listed buildings and any new development planned in the future, resulting in fewer planning and consent difficulties.

3.8.37 In contrast, Option 2, and potential variations in alignment between Option 1 and 2, would require additional work such as further ground investigation, utilities search, relocation of the shaft to tunnel transition shaft, and would extend beyond the safeguarded area for the Project and therefore increase delivery risk. Furthermore, the straight-line alignment presents environmental risks as it passes directly under historical quarries and landfill sites at the end of the tunnel, increasing the likelihood of encountering contaminated land and groundwater leakage, which are avoided by Option 1.

Intake/outfall structure position

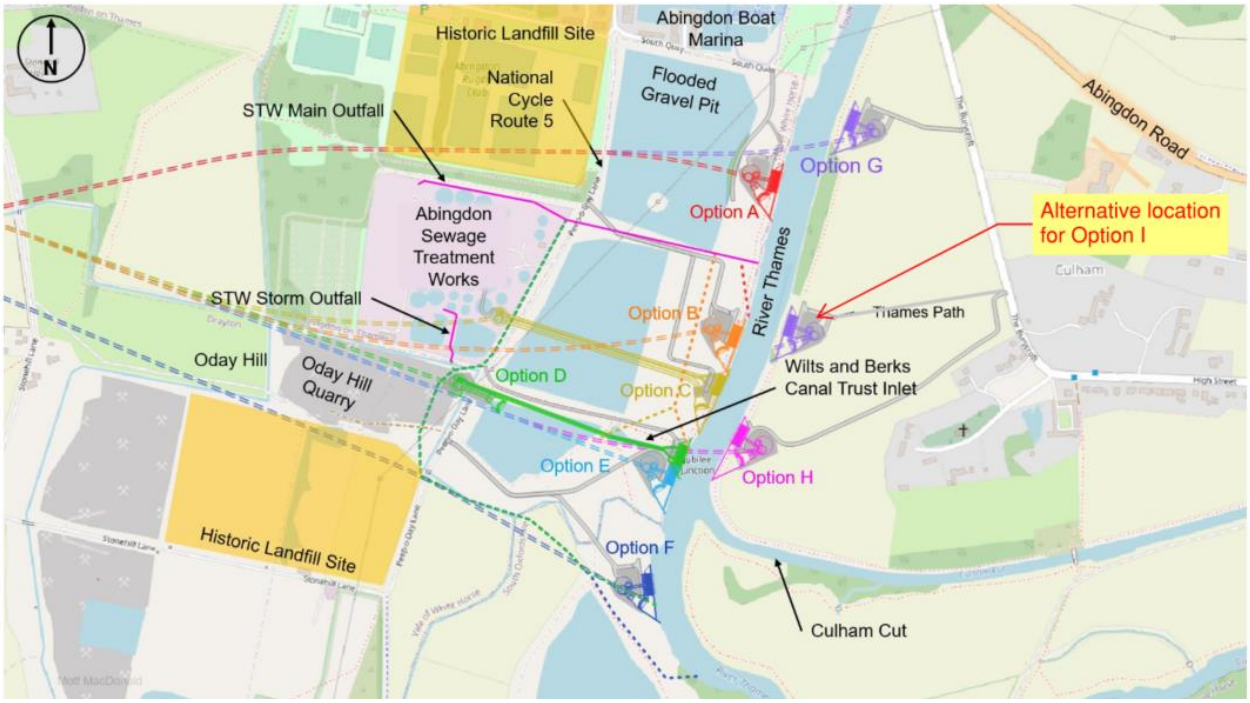
3.8.38 The intake/outfall structure is designed to abstract water from the River Thames for reservoir filling and to discharge water back into the river to support downstream water supply abstraction when necessary. Its location determines the end point of the river tunnel, which originates near the pumping station adjacent to the reservoir embankment.

3.8.39 Eight potential locations (Options A to H, see Plate 3.3) were initially identified and appraised in 2024. A summary of the appraisal undertaken is provided below. The full details of the appraisal can be found in the SESRO Connectivity to the River Thames Options Appraisal Report (Thames Water, 2024l). From the initial eight options, Option B was selected as it would provide sufficient space during construction, requires fewer structures and less complex construction techniques, and has one of the shorter tunnel lengths, leading to less programme risk. It also performed moderately in terms of capital costs. Option B was also preferred primarily for land quality as there was little risk identified of landfill disturbance from the associated pipeline route. Overall, Option B was deemed to be the preferred option as it performs moderately well across all themes, except for flood risk. The option would be located within Flood Zone 3, which presents a high risk of flooding. This issue was highlighted as a concern in consultation with the Environment Agency in 2024.

3.8.40 To address this issue, along with a potential conflict with the proposed future road corridor, a new alternative (Option I, see Plate 3.3) has been considered in design development. Option I would be situated on the eastern bank of the River Thames, south of Option G. This location offers a lower flood risk compared with Option B and lies at the edge of the corridor safeguarded by the local council.

3.8.41 As part of the updated assessment, five of the original eight options (Options A, D, E, F and H) were excluded from further consideration when compared to Option I, as they demonstrated significant disadvantages across multiple appraisal criteria relative to the remaining viable alternatives. A summary of the options considered is provided below.

Plate 3.3 Location Plan of Intake/ Outfall Structure Options



Option A

3.8.42 This option would be located on the western bank, upstream of Abingdon STW outfall, south of Abingdon Marina.

3.8.43 This option would result in difficulties with space and logistics and have a relatively long construction programme. It would require significantly more complex additional structures compared to other options and would likely result in the disruption of National Cycle Network (NCN) Route 5 during construction. Alongside Options G and H, this option is closer to sensitive noise receptors. The option would pass beneath or within 100m of the Sutton Town Park historical landfill or the Sutton Wick No.1 landfill and, therefore, there may be significant risks associated with disturbance of contaminated materials.

Option B

3.8.44 This option would be located on the western bank, upstream of the Wilts and Berks Canal Trust inlet. Option B would consist of a combined intake and outfall shaft located on the western bank of the River Thames. The option would be in proximity of the Abingdon Sewage Treatment Works (STW), requiring a relatively short tunnel length and fewer structures. The design would simplify the construction approach in comparison to other options and so reduces programme risk. While the site is constrained and located in Flood Zone 3, it avoids major planning constraints such as the Oxford Green Belt and safeguarded transport corridors. Impacts on local heritage and public access are considered manageable.

3.8.45 This option was preferred in 2024, as it was found to perform moderately well across all themes, particularly for engineering and constructability. As per Option A, this option would likely result in the disruption of National Cycle Network (NCN) Route 5 during construction.

The option would be more distant from historical landfill and landfill sites, reducing the risks associated with disturbance of contaminated materials.

Option C

3.8.46 The intake and outfall for this option would be located on the western bank, upstream of the Wilts and Berks Canal Trust inlet. Option C would involve separating the intake/outfall structure and tunnel shaft, connected by culverts. The shaft would be located outside of flood zone 3 with this option.

3.8.47 This option was found to have the highest total cost, although this is not a material differentiator. The option would require two separate site locations which would increase haulage distance for construction materials. Option C is the only option which reuses a disused area within the premises of an existing sewage treatment works, an existing Thames Water asset, which is both a risk and opportunity. The option would require significantly more complex additional structures compared to other options and would likely result in the disruption of NCN 5 during construction. The option would be more distant from historical landfill and landfill sites, reducing the risks associated with disturbance of contaminated materials. Alongside Option D, this option has the highest forecast capital greenhouse emissions. This design introduces considerable engineering complexity, especially due to constraints within the STW, risks from working near high-voltage pylons and a flooded gravel pit, and space limitations. The option was confirmed to require more maintenance than other options. This was considered less favourable in comparison to Option B.

3.8.48 While the option offers a potential reduction in visual impacts near the river and lies partially in Flood Zone 2, it would result in greater maintenance requirements, more construction risk and higher overall delivery effort. The increased complexity and dispersed construction footprint made Option C less favourable.

Option D

3.8.49 The intake for Option D would be located on the western bank, south of the Abingdon STW and the outfall would be located on the western bank, upstream of the Wilts and Berks Canal inlet. The shaft would be located outside of flood zone 3 with this option.

3.8.50 The option would require two separate site locations which would increase haulage distance for construction materials. This option requires significantly more complex additional structures compared to other options and would likely result in the disruption of NCN 5 during construction. The option would pass beneath or within 100m of the Sutton Town Park historical landfill or the Sutton Wick No.1 landfill and, therefore, there may be significant risks associated with disturbance of contaminated materials. Alongside Option C, this option has the highest forecast capital greenhouse emissions.

Option E

3.8.51 This option would be located on the western bank, immediately downstream of the Wilts and Berks Canal Trust inlet.

3.8.52 This option was least preferred as the intake/outfall would affect floodplain grazing marsh priority habitat. The option would pass beneath or within 100m of the Sutton Town Park

historical landfill or the Sutton Wick No.1 landfill and, therefore, there may be significant risks associated with disturbance of contaminated materials.

Option F

3.8.53 This option would be located on the western bank, downstream of Culham Cut.

3.8.54 The option would result in fewer trees being removed when compared to other options, similarly to Option G. Whilst all options could result in open close-range views from the River Thames and Thames Path National Trail and some residential properties on the north-west edge of Culham, Option F was found to also have views from a Registered Park and Garden. This option was least preferred as the intake/outfall would affect floodplain grazing marsh priority habitat.

Option G

3.8.55 This option would be located on the eastern bank, upstream of Abingdon STW outfall, south of Abingdon Marina. The shaft would be located outside of flood zone 3 with this option. The option would be within an area safeguarded for a future bypass for southern Abingdon.

3.8.56 This option would have the longest tunnel, requiring extra time to complete compared to other options, potentially affecting the filling time for the reservoir. The option would result in fewer trees being removed when compared to other options, similarly to Option F. The option could also affect the 'openness of the green belt' as well as the potential for construction and associated traffic to lead to noticeable changes to the visual amenity of the community on the western edge of Culham. Alongside Options A and H, this option is closer to sensitive noise receptors. The option would pass beneath or within 100m of the Sutton Town Park historical landfill or the Sutton Wick No.1 landfill and, therefore, there may be significant risks associated with disturbance of contaminated materials.

3.8.57 This option did provide some advantage in terms of more straightforward access for construction. This design potentially improves flood resilience. However, the interaction of this option with Oxford Green Belt and safeguarded land for the bypass south of Abingdon, both of which present major planning and land use challenges. While technically the option is considered feasible, these planning conflicts, environmental drawbacks and limited long-term benefits made Option G a less favourable solution.

Option H

3.8.58 This option would be located on the eastern bank, upstream of Culham Cut. The shaft would be located outside of flood zone 3 with this option.

3.8.59 This option would have the longest tunnel, requiring extra time to complete compared to other options, potentially affecting the filling time for the reservoir. This option requires significantly more complex additional structures compared to other options. Option H is likely to result in the loss of known archaeology on the eastern bank of the River Thames. The option could also affect the 'openness of the green belt' as well as the potential for construction and associated traffic to lead to noticeable changes to the visual amenity of the community on the western edge of Culham. Option H is least preferred from a landscape and visual perspective, due to effects on visual amenity on the western edge of Culham during construction. Alongside Options A and G, this option is closer to sensitive

noise receptors. The option would pass beneath or within 100m of the Sutton Town Park historical landfill or the Sutton Wick No.1 landfill and, therefore, there may be significant risks associated with disturbance of contaminated materials.

Option I

3.8.60 Option I was developed to address some of the disadvantages of Option G while maintaining a location on the eastern bank. Although it would lie within Flood Zone 2 and offers similar flood resilience benefits to Option G, it would still conflict with safeguarded transport land and the Oxford Green Belt, therefore experience similar planning constraints as are reported for Option G. This design requires a permanent diversion of Thames Path and would introduce construction traffic impacts affecting Abingdon and surrounding rural routes.

Preferred option

3.8.61 Option B remains the preferred option as it performs most consistently across all assessment criteria with no major drawbacks other than its location within Flood Zone 3. While Options C, G, and I do offer comparable ratings in terms of engineering design, cost, and whole life carbon, Option B stands out for its balanced performance and fewer planning, land use, and community-related constraints.

3.8.62 Option C is less preferrable as it has significant constructability and operability issues because construction will be divided between two separate work areas and additional material will be required to be imported on site to construct the culverts.

3.8.63 Although Options G and I offer slightly improved constructability and flood resilience, these designs suffer from major planning and land acquisition risks, as both are located within the Oxford Green Belt. These options also introduce significant disruption to the local community and long-term impacts such as the diversion of the Thames Path.

3.8.64 In contrast, Option B avoids Green Belt constraints, has fewer impacts on access and recreation, and presents fewer environmental concerns. Despite requiring flood risk mitigation, Option B provides the most pragmatic and deliverable solution overall.

3.8.65 In terms of flood risk and the sequential test, to justify why other locations to Option B are not "reasonably available". In respect of sites within Flood Zone 2, the Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2022) states that the exception test is only required where the vulnerability classification of the proposed development is “highly vulnerable”. This means that an exception test is not required for any development on Flood Zone 2 which is categorised in any of the lower vulnerability classifications. In respect of sites within Flood Zone 3a, the PPG states that the exception test is only required where the vulnerability classification of a proposed development is “more vulnerable” or “essential infrastructure”. The intake/outfall structure would be considered to be essential infrastructure.

3.8.66 The intake/outfall structure would appear to fall within the description of "water compatible" development in annex 3 of the NPPF, which is the lowest vulnerability, although further technical confirmation of this would be required. If, as anticipated, the structure falls within water compatible development an exception test would not be required. It should be noted that this applies to each of the options equally.

Thames to Southern Transfer Water Treatment Works location

3.8.67 The T2ST project would transfer available water from the reservoir to the Southern Water Hampshire area, Thames Water's Kennet Valley water resource zone and South East Water's Basingstoke area. Options appraisals were undertaken in 2022, to determine the most appropriate treatment and transfer solution from the proposed source of water at identified sites within Oxfordshire and Berkshire, to the destination for water in Hampshire. Sites for water treatment, pumping stations and other infrastructure were also assessed. Options were screened against a series of criteria, including invasive non-native species (INNS) transfer risk, water quality, infrastructure requirements, capital and operating costs, carbon costs and environmental and social impacts.

3.8.68 Potable water options were identified as being preferred to raw water options, on the basis that potable options would only require one treatment site, compared to multiple treatment sites for the raw water options (Southern Water, 2022). Potable options have therefore less land take requirements and less associated social and environmental impact than raw water options.

3.8.69 The options appraisal work also concluded that the preferred water source for T2ST was a connection to the reservoir with the water treatment works located close to the point of abstraction from the reservoir (Southern Water, 2022).

3.8.70 Further options appraisal work was carried out in 2024 to consider the location of the T2ST WTW. A number of alternative sites located both within and outside the SESRO site (as defined at the time) were assessed considering, environmental impact, engineering performance, capital and operating cost, carbon footprint, and planning constraints.

3.8.71 Due to the landscape sensitivity of the North Wessex Downs National Landscape all alternative WTW sites were located outside of the National Landscape area due to the strong policy protection afforded to National Landscapes by the NPS for Water Resources Infrastructure (Defra, 2025).

3.8.72 Due to the risk of INNS transfer it was also necessary for all alternative WTW sites to be located to the north of the River Lambourn Site of Special Scientific Interest.

3.8.73 The options appraisal work concluded that the preferred location of the T2ST WTW is within the SESRO site close to the abstraction point from the reservoir. All alternative sites outside the draft Order limits would require longer pipeline lengths and were discounted on grounds of the associated increase in carbon footprint and higher capital and operational cost.

3.8.74 Assessment of options with the SESRO site initially considered eight potential areas for the WTW within the draft Order limits. A constraints mapping exercise was undertaken to exclude areas that posed significant challenges to securing development consent. Following initial screening, six areas were ruled out due to constraints such as spatial limitations or conflict with other infrastructure. Two areas, one to the south of the reservoir and one to the north-east, were taken forward for more detailed appraisal.

3.8.75 Within the two remaining areas, four potential location options (Options 1-4) for the WTW (see Plate 3.4) were then identified and assessed, taking into account the required pipeline length from the reservoir abstraction point, access arrangements, constructability and environmental integration.

3.8.76 The outcome of this appraisal stage was that Options 2 and 4 were identified as the most favourable options for the T2ST WTW location. Option 2 is located adjacent to the proposed pumping station in the north-east corner of what is now defined as the Core Project Area, approximately 700m west of Drayton. The SESRO pumping station is the T2ST abstraction point from the reservoir. Option 4 is located approximately 1km north-east of Option 2 and around 600m north-west of Drayton.

3.8.77 Subsequent further appraisal of Options 2 and 4 was undertaken based upon the emerging masterplan for SESRO and the design of the reservoir embankment. Option 2 has become very spatially constrained with other infrastructure and the embankment toe which has increased the construction complexity and reduced the viability of this location.

3.8.78 Option 4 was selected as the preferred option as it would improve the visitor experience by keeping visitor access separate from operational areas. It also helps reduce construction complexity because the site is larger and spatially separated, providing more flexibility in design and construction.

Plate 3.4 Indicative locations of the WTW options considered in the SESRO Order limits

Main access road

3.8.79 The main access road for the Project is key to the Project. During construction, it is intended that the access will enable the import of materials via the strategic road network, supported by haul roads around the Site for efficient movement of workers, materials and equipment. Upon completion, the fully complete permanent access would serve operational, maintenance and recreational needs, with public access provided. To reduce impacts on the local road network, connection to a road in close proximity to the strategic road network is preferable. Since the A34 is the only strategic road in the locality of the Project, it was considered to be the most appropriate vehicle access road to reduce impact on the local road network.

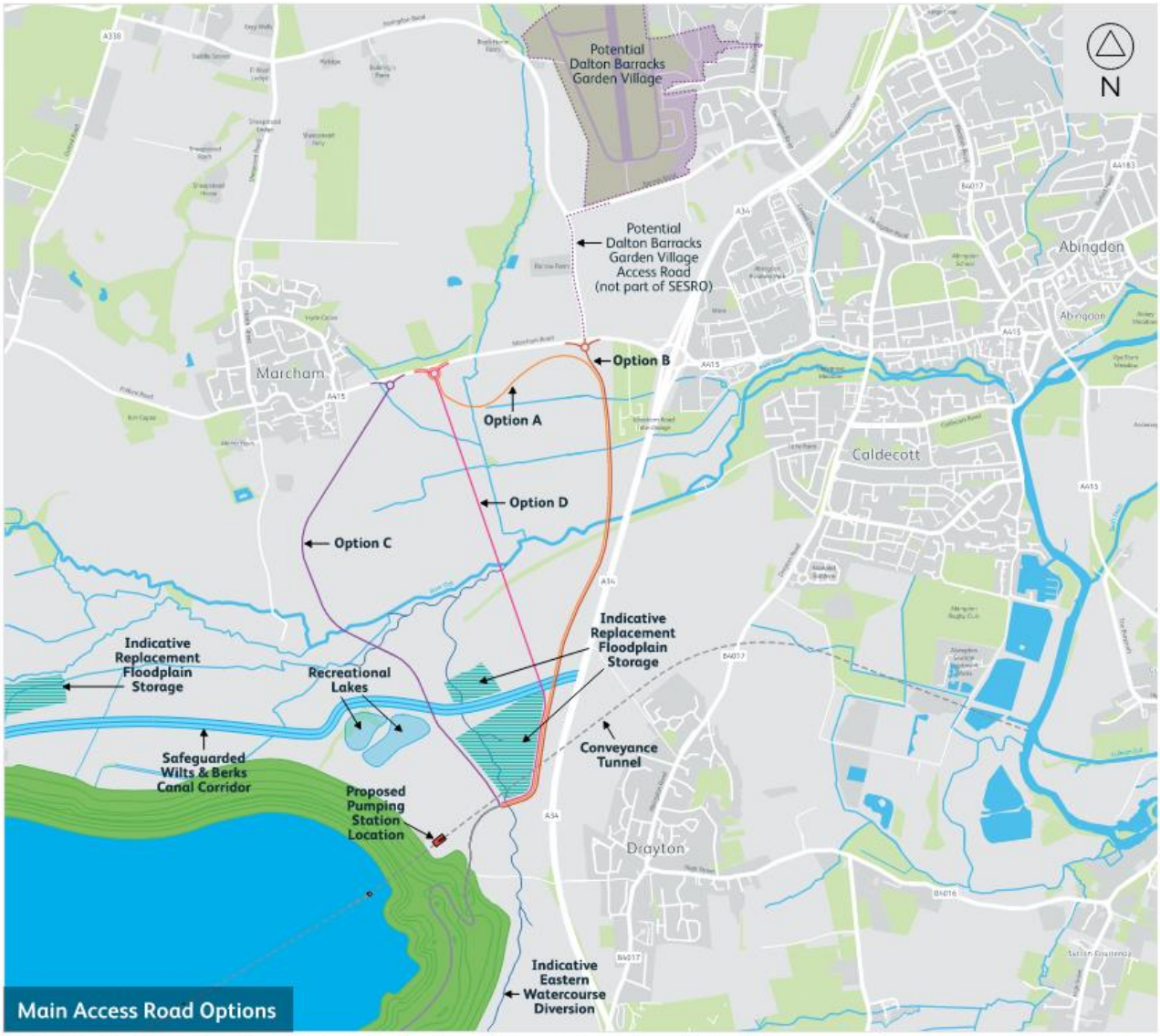
3.8.80 The alignment of the access road to the Project directly from the strategic road network is strongly constrained by National Highways policy against connections on sections of the road network designed for high-speed traffic. This is set out within paragraph 20 of the Department for Transport's circular titled Strategic road network and the delivery of sustainable development (Department for Transport, 2022). As such, a permanent direct access to the reservoir from the A34 was considered unlikely to be an acceptable option.

3.8.81 An access to the Site which uses the Milton Interchange junction of the A34 and the A4130 has been discounted because this would require high levels of construction traffic to pass through Steventon, Rowstock or Grove/Wantage and over the Great Western Mainline resulting in additional effects on these communities.

3.8.82 As a result of the constraints and issues above, the A34 Marcham Interchange with the A415 been identified as the preferred access road to the Project, and the A415 as the suitable road on which to create a junction that can provide access to the reservoir. Taking into consideration the Air Quality Management Area (AQMA) and restricted road geometry in Marcham; any junction should be located to the east of Marcham, between Marcham and the A34 Marcham Interchange.

3.8.83 An options appraisal was carried out to assess the potential alignments for the main access road. The appraisal considered a range of constraints, including the need to avoid flood zones, reduce impact on the strategic road network (such as the A34) and avoid routing construction traffic through Steventon to limit effects on local communities. Four options (Options A to D, see Plate 3.5) were considered, all of which would connect to the A415 near the A34 Marcham Interchange to the A34 via a new roundabout to be provided by the Project. The full details of the appraisal can be found in the SESRO Access and Diversion Roads Options Appraisal Report (Thames Water, 2024m).

Plate 3.5 Locations of Main Access Road Options



Option A

3.8.84 This option would connect to the A415 with a roundabout junction located approximately 1.2km west of the A34 Marcham Interchange. Option A would be located east of the village of Marcham and outside of the Air Quality Management Area (AQMA). The route would be approximately 5.12km long, heading east then south to the reservoir. This route was developed with the possibility of providing flood alleviation benefits to Abingdon, as part of the area safeguarded as Policy CP14 in the Vale of White Horse Local Plan 2031 (Vale of White Horse District Council, 2022). Also, Option A actively supports delivery of Abingdon Flood Alleviation Scheme proposals as were developed by the Environment Agency in 2018. These continue to be investigated by Thames Water in partnership with the Environment Agency to see if there are any opportunities to reduce flood risk alongside the Project.

Option B

3.8.85 Option B would be largely the same as Option A, but with the roundabout junction located approximately 440m west of the A34 Marcham Interchange. This design results in a shorter overall route length of approximately 4.27km. The junction aligns with an unnamed road leading to Gozzards Ford, which may also serve the proposed Dalton Barracks housing development which is currently a Site Allocation in the Dalton Barracks Strategic Allocation Supplementary Planning Document (SPD) adopted by the Vale of White Horse District Council formally on 8 April 2022 (Vale of White Horse District Council, 2022).

Option C

3.8.86 Option C would be approximately 4.41km in length and includes a section of the proposed Marcham Bypass which is currently a Site Allocation Dalton Barracks Strategic Allocation SPD adopted by the Vale of White Horse District Council formally on 8 April 2022 (Vale of White Horse District Council, 2022). It was considered to explore whether the main access road could connect to the A415 via the eastern section of a possible future South Abingdon Bypass (which is currently a Site Allocation).

Option D

3.8.87 Option D represents the most direct alignment to the reservoir, with a total length of approximately 4.05km. It shares the same junction location with Option A but does not offer any significant integration opportunities with other future developments.

Preferred option

3.8.88 Overall, all route options were considered likely to have very similar environmental impacts.

3.8.89 Option C was identified as the least preferred due to the identified noise impacts and the potential to affect the setting of more historic receptors than other options. Option C would also require the largest number of watercourse crossings (11), whilst other options have either seven crossings (Options B and D) or eight crossings (Option A). None of the options are considered to carry a WFD water body scale deterioration risk.

3.8.90 Option B was identified as the preferred option. Option B was preferred in terms of landscape and visual impact as it is nearest to the existing A34 and has a lower likelihood of air quality impacts due to distance from receptors. Option B would be the closest option to the A34 while maintaining a safe distance from the Marcham Interchange, avoiding traffic impacts and the nearby allotments. Option B also allows for coordination with other future developments, such as the Dalton Barracks housing, the South Abingdon Movement Corridor and the Abingdon Flood Alleviation Scheme, helping to reduce overall impact.

3.8.91 Ongoing design refinement means that minor adjustments to the route have been made to respond to design development, landownership considerations, and to reduce potential environmental impacts. The roundabout as shown on Figure 2.1: Project overview has been moved further west along the A415 than illustrated for Option B, but not as far west as Option A. This amendment has been made to support optimal traffic performance and improve traffic flow for vehicles approaching the Marcham Interchange. Any further refinement will be undertaken in consultation with the potential development to the north, with the aim of enabling a shared roundabout. Any further amendments will be assessed within the ES.

Steventon to East Hanney Road

3.8.92 The current Steventon to East Hanney Road runs within the proposed reservoir footprint. As such, there is a need for it to be diverted to the south of the reservoir. An options appraisal was published in 2024 considering four options (A, B1, B2 and C). Full details are available in SESRO Access and Diversion Roads Option Appraisal Report (Thames Water, 2024m).

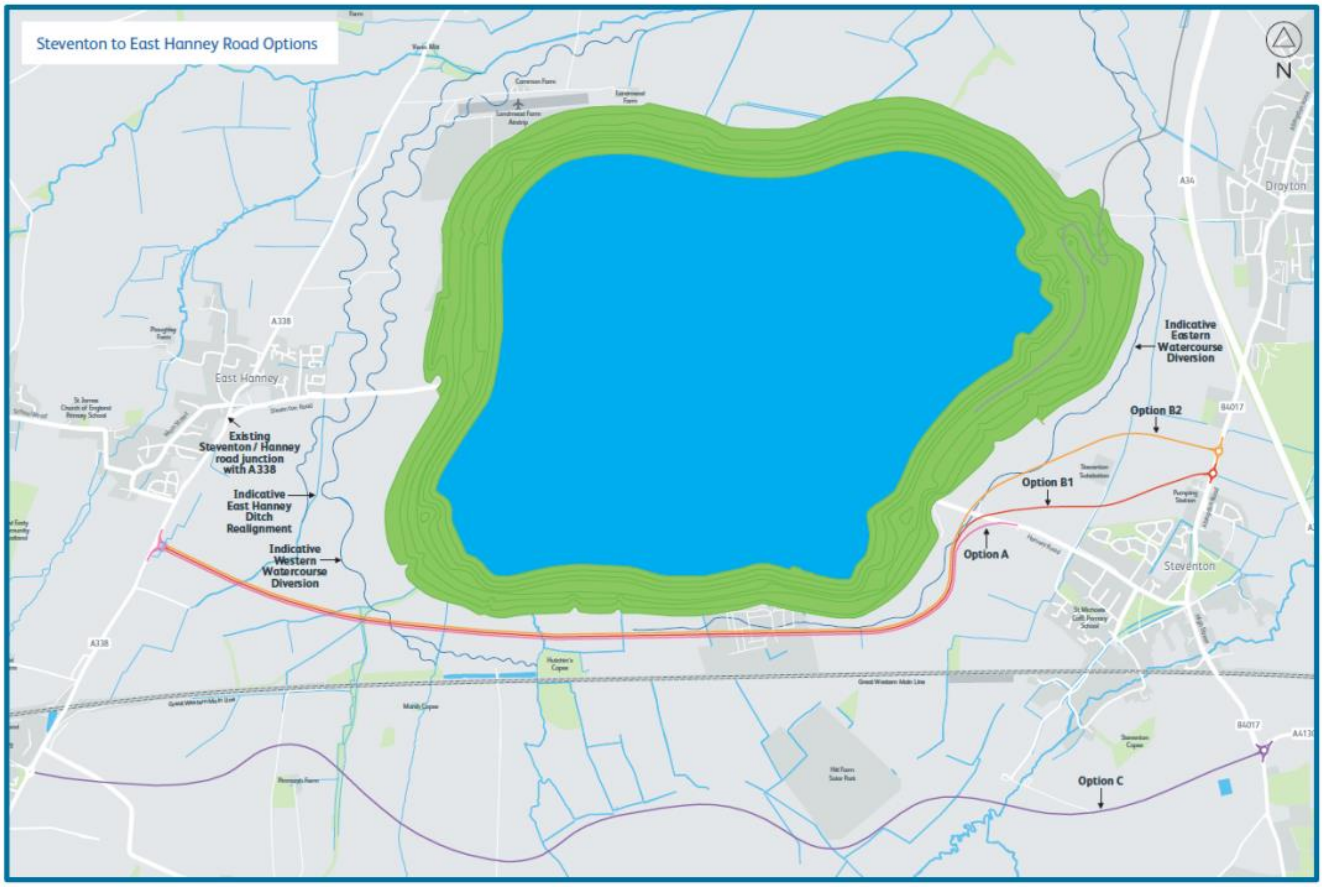
3.8.93 A summary of the findings as were presented in the EIA Scoping Report is provided below and locations are shown in Plate 3.6. Following options appraisal in 2024, the preferred option was identified as that connecting to the existing Hanney Road through Steventon, marked as Option A.

3.8.94 Since the adoption of Option A, further design development has taken place to refine the alignment, considering proximity to the proposed reservoir embankment, more detailed consideration of environmental constraints and the potential for Oxfordshire County Council as highways authority to adopt the realigned road. Several options have been developed and considered as reported below.

3.8.95 Overall, the alignment presented on Figure 2.1: Project overview (and based on the Option A alignment) is considered to offer the best balance between engineering feasibility, cost efficiency, ecological risk management, and deliverability within programme constraints.

2024 Options appraisal summary

Plate 3.6 Steventon to East Hanney road diversion options as presented in EIA Scoping Report



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Option A

3.8.96 From Steventon, Option A would result in the road being diverted to the south from its current alignment from Hanney Road and routed west along the southern extent of the reservoir embankment. The option would be approximately 5.1km long and would include a new roundabout junction with the A338 around 800m south of the existing junction

3.8.97 Option A was selected as the preferred option in 2024, as it performs slightly better than other options as it maintains the shortest direct road link between the two villages, would have the least effect on the visual amenity of Steventon and has the potential to require fewer utility diversions than Options B1 and B2.

Option B1

3.8.98 Option B1 would be similar to Option A, however, this option differs at the eastern end where a new junction with the B4017 would be introduced to the north of Steventon. This option would be routed north of the existing sub-station and would have a total length of approximately 6.4km.

3.8.99 This option would require utility diversions and would have more interaction with existing high voltage overhead lines and water infrastructure. Option B1 would be the furthest away from Steventon. However, would result in similar environmental impacts as Option A and B2.

Option B2

3.8.100 Option B2 would be similar to Option A, however, this differs at the eastern end where a new junction with the B4017 would be introduced to the north of Steventon. This option would be routed south of the existing sub-station, closer to existing properties than B1, and would be approximately 6.2km long.

3.8.101 This option was slightly preferred over B1 as it is likely to require less diversion of the overhead high voltage cables. Option B2 would be relatively close to residential properties. However, would result in similar environmental impacts as Option A and B1.

Option C

3.8.102 Option C would be routed to the south of the GWML. At the alignment's eastern end, the existing junction of the B4017 and the A4130 would likely need to be upgraded. At the western end of the alignment the road connects into the existing roundabout on the A338 in north Grove and would be approximately 7.2km long.

3.8.103 This option performed poorly in relation to all themes. Option C would be the most complex route to construct and introduces additional third-party impacts by being located away from the Core Project Area. Option C would have the highest relative cost, however, this is not a material differentiator. This option was the least preferred from an environmental perspective as it is located closer to the North Wessex Downs National Landscape. Option C would also move the route further away from its existing location, which is likely to increase journey times and impact existing bus routes.

Appraisal after further design development

3.8.104 Design development of the reservoir embankments and the availability of updated ecological survey data has led to a review of the road alignment to that presented in the PEI Report. Minor refinements to the alignment have been made to achieve a required 50m offset from the reservoir embankment, to maintain reservoir capacity of 150Mm³ and respond to identified ecological constraints.

3.8.105 As part of the review, the potential to relocate the road alignment to the south of the railway was reconsidered, reflecting views raised during previous non-statutory consultation in 2024. While this could provide a more direct route to the A34 for residents of East Hanney, it would require an additional estate road to serve local access needs, leading to an overall greater land take, higher whole-life costs and carbon, and more complex land acquisition requirements. The road alignment also forms part of the proposed utility diversion corridor, further constraining relocation to the south. The option of relocating the road south of the railway was therefore discounted.

3.8.106 The refined alignment, as shown on Figure 2.1: Project overview, would meet the requirement for a 50m offset from the reservoir embankment and so allowing the full 150Mm^3 reservoir capacity to be achieved within the Site. The alignment is considered to be suitably curved and adoptable by Oxfordshire County Council at 50mph. The route

would avoid impacts on the Cuttings and Hutchin's Copse Local Wildlife Site (LWS) and Great Crested Newt pond but would affect veteran trees and require species mitigation along this alignment. This refined alignment is considered to offer a balance between engineering feasibility, cost efficiency, ecological risk management, and deliverability within programme constraints.

Wilts and Berks Canal

3.8.107 The Project includes realignment and recreation of a section of the water channel for the Wilts and Berks Canal, as the historic alignment of this canal would be lost under the footprint of the reservoir. The route of the canal through the draft Order limits was identified as being safeguarded in previous stages of design in accordance with the local planning policy. This proposal has been revisited in discussion with stakeholders, with options to restore the canal to various levels of functionality being considered. Five options have been identified and appraised, as summarised below.

Option 1 - Protected Route for Future Canal

3.8.108 Option 1 proposes the safeguarding of a 50m wide corridor within the draft Order limits for potential future construction of the water channel for the Wilts and Berks Canal. No works would be undertaken by the Project, other than protecting the alignment.

3.8.109 While this is the lowest-cost solution and presents minimal construction complexity, it would offer no immediate environmental enhancements or community benefit. The lack of canal features or public access means there would be no contribution to BNG, active travel, or landscape integration. Furthermore, this option carries the greatest planning and consenting risk as it fails to align with local policy objectives or demonstrate delivery of safeguarded infrastructure. No additional long-term value would be created for the community over and above that provided by the recreational facilities associated with the reservoir, proposed recreational lakes and public access to the wider landscape delivered by the Project.

Option 2 - Dry Ditch Canal (Unlined)

3.8.110 Option 2 would introduce physical works along the canal corridor within the draft Order limits, including dry earthworks for the canal profile and a towpath, without introducing canal lining, water or lock features. This option would significantly improve the landscape integration compared to Option 1 and would provide enhanced environmental performance through some habitat creation and amenity use. It would also reduce planning and consenting risks by actively demonstrating delivery of a safeguarded asset, aligning more closely with local policy objectives. However, as the canal would remain dry and non-navigable, the long-term recreational and heritage value is considered limited.

Option 3a - Lined Canal without Locks

3.8.111 This option would provide a water-filled canal with lining and water management features but excluding locks or navigation infrastructure. It offers a substantial improvement in biodiversity and community amenity over Options 1 and 2, delivering water-based habitat, recreational visual interest and a fully integrated towpath for active travel. The canal would provide BNG benefits. Although whole-life maintenance costs would be higher, this is considered to be offset by better alignment with local planning policy objectives. However,

the absence of navigation infrastructure limits future canal restoration potential unless further upgrades are made beyond the scope of the Project.

Option 3b – Lined Canal with Basic Lock Shells

3.8.112 This option was developed based on Option 3a and would incorporate the construction of basic lock shells to preserve the vertical alignment of the canal for potential future navigation. While the locks would not be fully operational, the design would enable the canal to be more easily upgraded at a later stage. This offers improved future-proofing over Option 3a while retaining the same benefits in terms of water features, BNG, and visual amenity. The option also aligns well with local policy and planning, with moderate additional construction and maintenance costs.

Option 4 – Full Navigable Canal

3.8.113 Option 4 was developed upon Option 3a and Option 3b, and would incorporate the construction of locks, pumps and navigation features. This design improves the future-proofing over Option 3a and 3b, while retaining the same benefits in terms of water features, BNG, and visual amenity. The option also aligns well with local policy and planning, with moderate additional construction and maintenance costs. It enhances legacy potential without committing to full integration with national waterway network.

Selected Option

3.8.114 All options that would include the excavation of the channel as part of the Project would offer a benefit to the Project in terms of reducing the engineering risks of constructing a canal close to the reservoir embankment after completion of the Project. Option 3a has been selected as the preferred option as it would provide BNG benefits alongside community amenity benefits. This option aligns well with local planning policy objectives and the canal corridor will be safeguarded to enable potential future upgrade to a full navigable canal.

132kV cable diversion

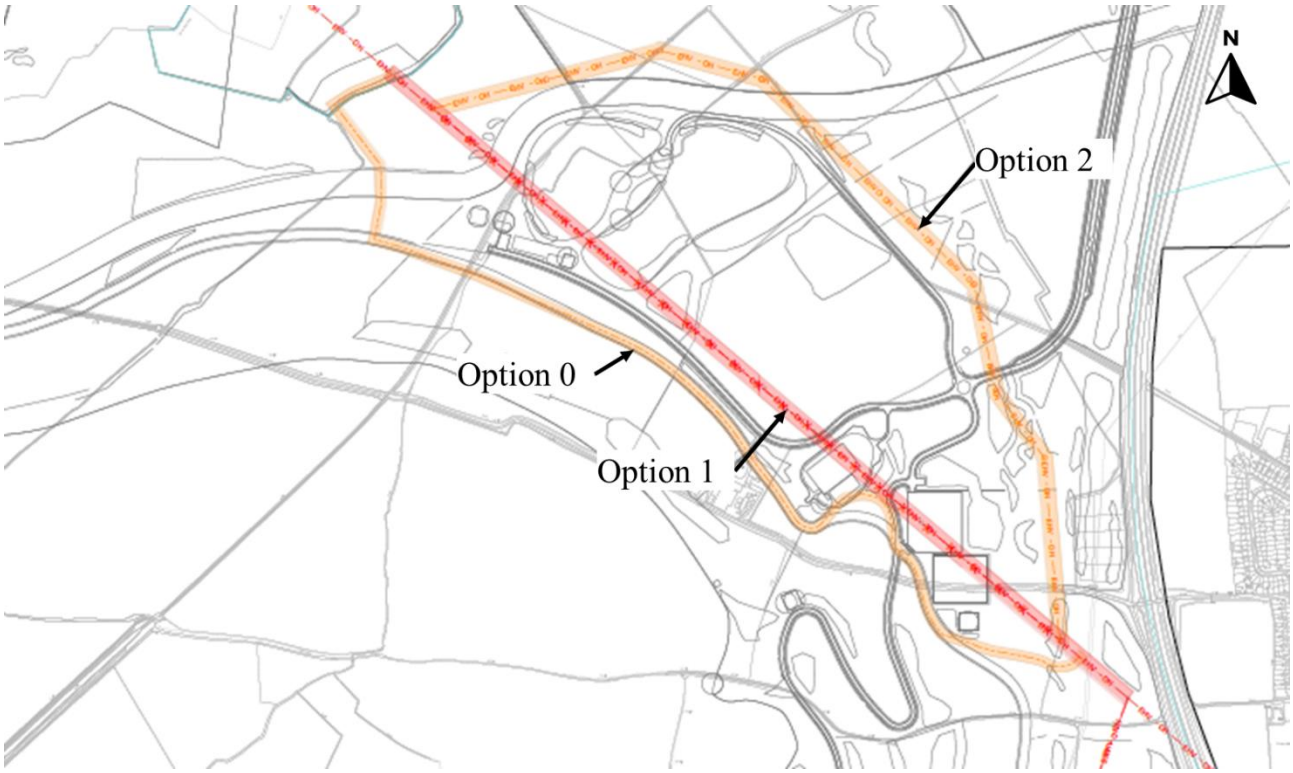
3.8.115 In order to facilitate the construction of the Project, the existing 132kV overhead electricity cable which runs through the draft Order limits is proposed to be rerouted overhead to the north-east of the existing alignment. The existing 132kV overhead able is owned by Scottish and Southern Electricity Networks (SSEN) and there is an approximate length of 1.7km the apparatus which clashes with the design components, including both operational and recreational facilities. Three options were identified for the 132kV apparatus and an options appraisal assessment was undertaken to identify the preferred option.

3.8.116 It should be noted that this asset is classed as non-contestable[1] by the asset owner, SSEN; and therefore the final responsibility for the diversion design sits with them. This design may

[1] Non-contestable works are those connection tasks within the electricity distribution network that must be carried out by the Distribution Network Operator (DNO) or their designated agents. These works are considered essential for maintaining the safety and integrity of the network.

vary from the options outlined below. Thames Water is in discussion with SSEN on this route, which will continue to be reviewed.

Plate 3.7 Route map of 132kV cable diversion options



Option 0 – Proposed underground diversion considered at EIA scoping stage

3.8.117 This option proposed an underground diversion of the existing 132kV overhead apparatus due to clashes with the proposed lakeside recreational buildings and operational buildings in this area. The route for this diversion would follow the base of the proposed reservoir embankment to the south of the existing overhead line.

3.8.118 The main construction impacts would be upon the water environment and ecology, however these impacts were considered manageable and mitigatable. The construction of the underground cable would require deep excavations near the proposed water channel for the Wilts and Berks Canal alignment within the draft Order limits, which would present logistical and safety challenges. In addition, the diversion would include transition works at either end of the underground section to connect back into the overhead line, which may introduce further construction and environmental implications.

3.8.119 The appraisal noted limited potential for environmental impacts once the cables are laid. However, operational maintenance was considered to be more complex compared to overhead systems.

3.8.120 It should be noted that no discussions have taken place with SSEN regarding outage requirements for this asset and therefore assumptions have been made as to the programme for these works.

Option 1 – Existing 132kV overhead line to be retained

3.8.121 This option would retain the existing 132kV apparatus in its current alignment.

3.8.122 This approach offers the lowest capital and carbon cost. This design avoids construction phase environmental impacts and delivery programme risk. This option performs favourably in terms of cost performance as there would be no diversion works required. Though there would be a likely an increase in construction costs of adjacent design elements due to the increased methodology complexity, these additional costs are not anticipated to outweigh the overall benefits of this option. Significant engineering challenges arise as it would not be possible to construct key components such as the pumping station beneath the existing overhead line due to limited headroom and safety constraints.

3.8.123 As such, major elements of the design as previously developed and consulted upon would need to be reconfigured. This would not only pose a risk to programme but would also conflict with the outcomes of earlier options appraisal works which identified preferred locations for Project components with the existing overhead line constraints already taken into account. Also, Option 1 would result in a worsening in environmental effects over Option 0, as the existing landscape and visual impact from above ground pylons would remain (including to the North Wessex Downs National Landscape), and this provides very limited opportunity to mitigate the impact through environmental design.

Option 2 – Proposed overhead diversion

3.8.124 This option proposes the diversion of the existing 132kV line above ground to a new alignment that avoids the key areas required for the reservoir infrastructure and recreational features. This option performs favourably in terms of cost comparatively to Option 0, as costs associated with overhead diversion works are cheaper than underground diversion works. The overhead cables would be protected in agreement with the Distribution Network Operation (DNO) and in accordance with HSE Guidance, allowing the construction to take place safely with appropriate controls.

3.8.125 Overhead lines were also noted to be simpler and quicker to maintain and more efficient to operate than buried lines. Similar to Option 1, this option would result in a worsening in environmental effects over Option 0, as the existing landscape and visual impact from above ground pylons would remain (including to the North Wessex Downs National Landscape) and this provides very limited opportunity to mitigate the impact through environmental design.

3.8.126 As with Option 0, no discussions have taken place with SSEN regarding outage requirements for this asset; and therefore this currently poses a risk to the programme for these works.

Preferred option

3.8.127 Option 2 was confirmed as the preferred option as it would enable delivery of the SESRO masterplan without requiring redesign and risking programme delay, whilst offering lower costs and carbon emissions compared to undergrounding (Option 0). It would also avoid the significant constructability and design conflicts posed by retaining the existing line (Option 1).

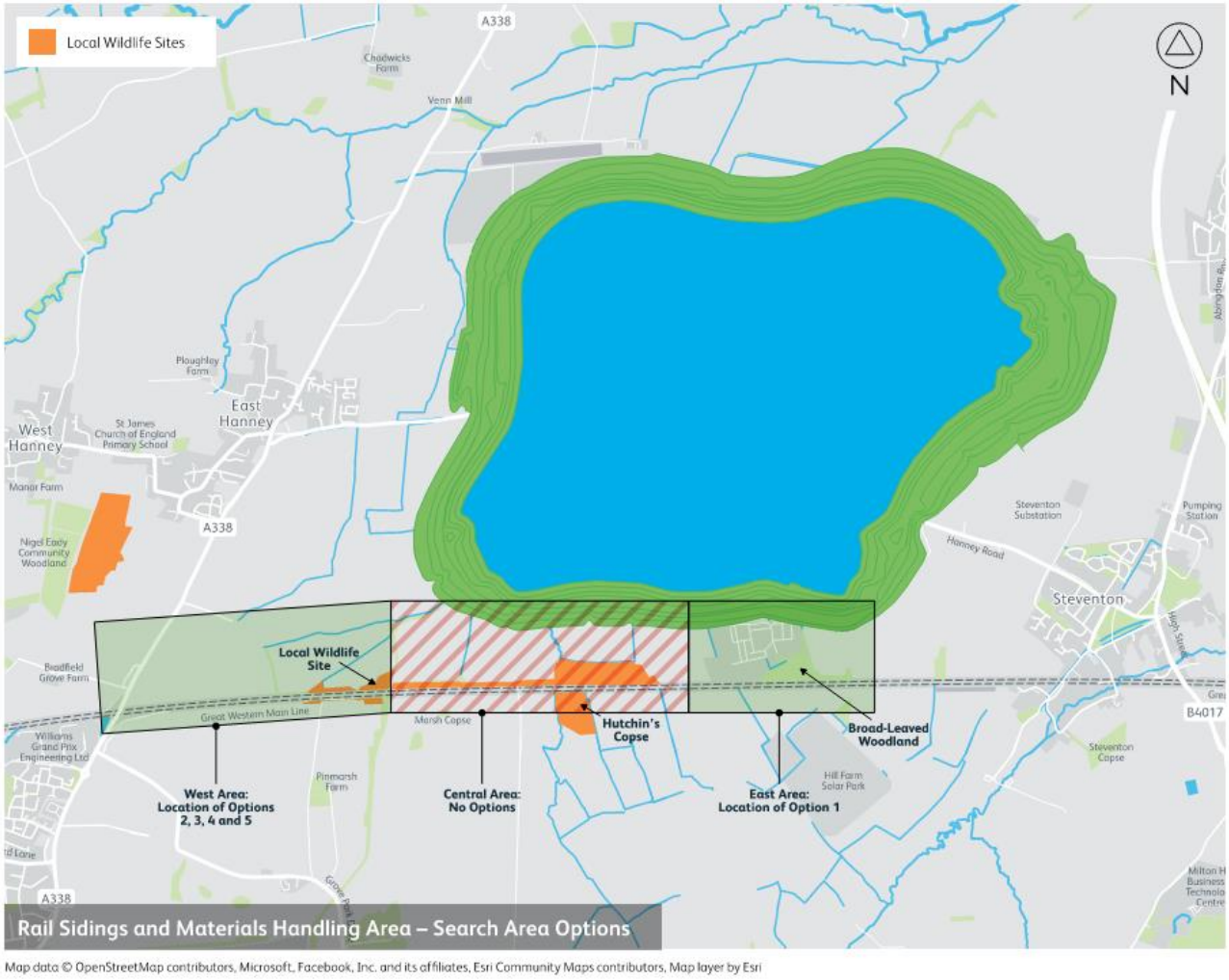
3.8.128 While Option 2 would retain and extend the landscape and visual impact of an overhead line due to additional pylons being required, it performs more favourably overall in terms of operability, constructability, relative cost, and programme delivery, making it the most balanced and feasible solution despite some residual risks. In addition, unlike Option 0, Option 2 would not require transition works at either end of an underground section, which may otherwise introduce additional construction and environmental implications.

Rail siding and materials handling facility

3.8.129 An RSMH facility is proposed to support the construction of the Project to facilitate the delivery of certain materials by rail freight and therefore reduce the total volume of material imported and exported by road. The final layout for the RSMH facility and connections to the GWML continue to be optimised and will be confirmed through engagement with Network Rail. This optimisation includes a review of all aspects of the RSMH facility design and incorporates design developments on the Project. The location for the RSMH facility is shown on Figure 2.2: Construction elements.

3.8.130 Options have previously been explored to identify suitable locations for the siding within three locations as shown in Plate 3.8. An options appraisal was undertaken which considered topographic, environmental and land use constraints, as well as interactions with existing and proposed infrastructure. The appraisal focused on land adjacent to the GWML between the A338 and A34, and two storage volume scenarios (370,000m³ and 220,000m³) were used to test feasibility. The appraisal considered the potential to import of construction materials, with train movements assumed to arrive from the west and depart to the east to turn around at Didcot. Five options (Option 1 – 5) are identified and appraised, as summarised below. The full details of the appraisal can be found in the SESRO Rail Siding and Materials Handling Area Options Appraisal Report (Thames Water, 2024n).

Plate 3.8 Locations of Rail Sidings and Materials Handling Area Options



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Option 1

Plate 3.9 Option 1 Layout (220,000m^3 stockpile capacity)

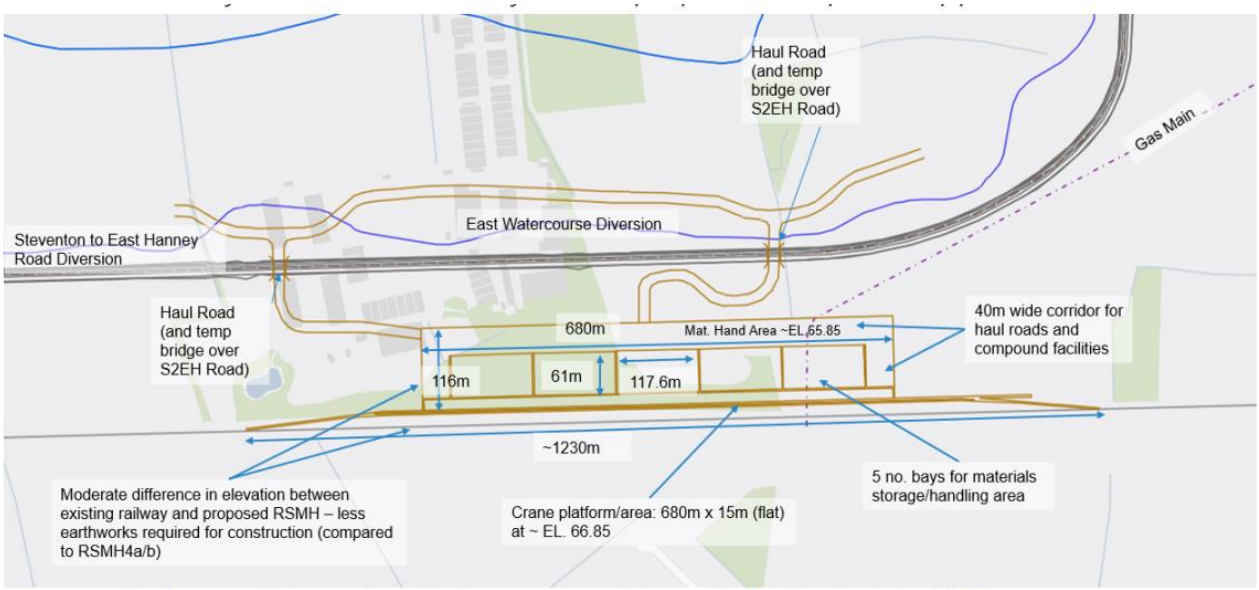

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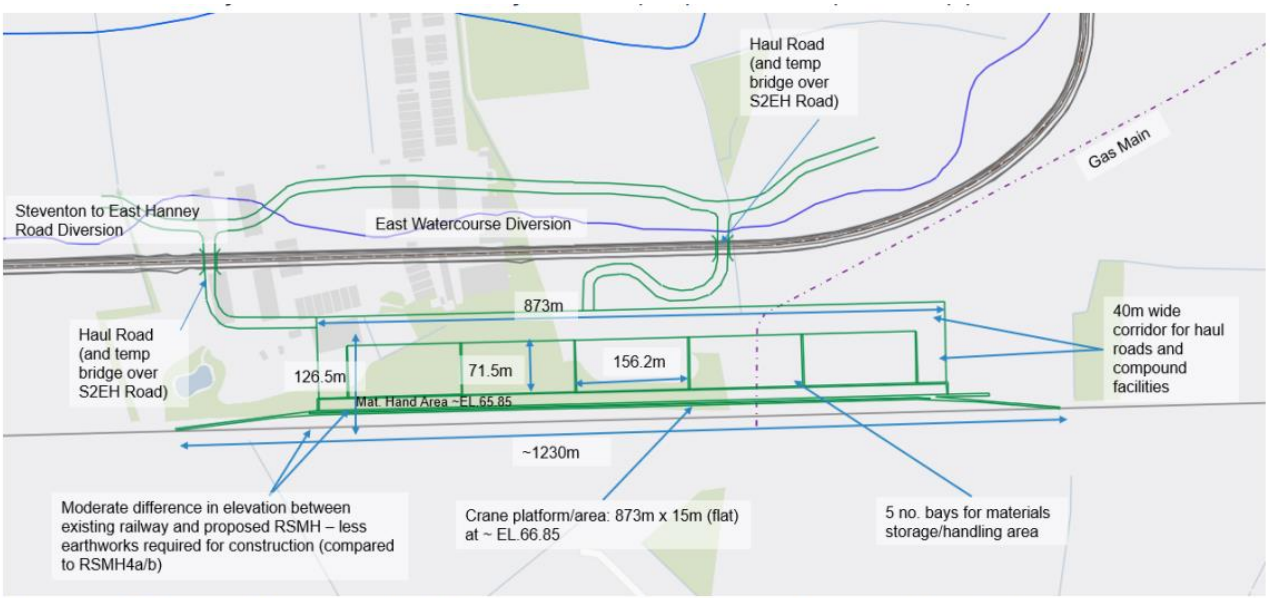
Plate 3.10 Option 1 Layout (370,000m^3 stockpile capacity)



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3.8.131 Option 1 (Plate 3.9 and Plate 3.10) would be located in the eastern-most area as shown on Plate 3.8, approximately 1.5km west of Steventon. This would be on the two-track section of the GWML and would require modifications to allow trains to exit either east or west.

3.8.132 This option performed better environmentally than the other options considered due to its smaller land take requirements and limited impact on the Cuttings and Hutchin's Copse LWS in comparison options positioned further west.

3.8.133 However, this design was considered likely to have a high risk of rejection by Network Rail given the potential operational impacts on the GWML which is a busy and strategically

important national route. As other options (4a and 4b) were identified that would likely be preferable to Network Rail, this option was rejected.

Options 2 and 3

Plate 3.11 Options 2 and 3 positions

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3.8.134 Options 2 and 3 would be located in the west area but were discounted before appraisal for feasibility reasons. Both options would require the construction of an embankment for new track taking trains coming from the west to the sidings, and additional track to allow trains to get back onto the existing GWML. Option 2, to the eastern extent of the West Area would not be able to connect into the GWML before an existing crossing point at the Collins underbridge. Option 3 would be located close to the existing four track section of the GWML, enabling the existing northern relief line to be extended for the railway sidings, possibly making construction and railway operation simpler. However, Option 3 would be located within an existing fluvial flood zone, as well as close to sensitive residential units.

3.8.135 As a result, these options were amalgamated and developed into Option 4 for further assessment.

Option 4

Plate 3.12 Option 4a and Option 4b Layout (220,000m^3 stockpile capacity)

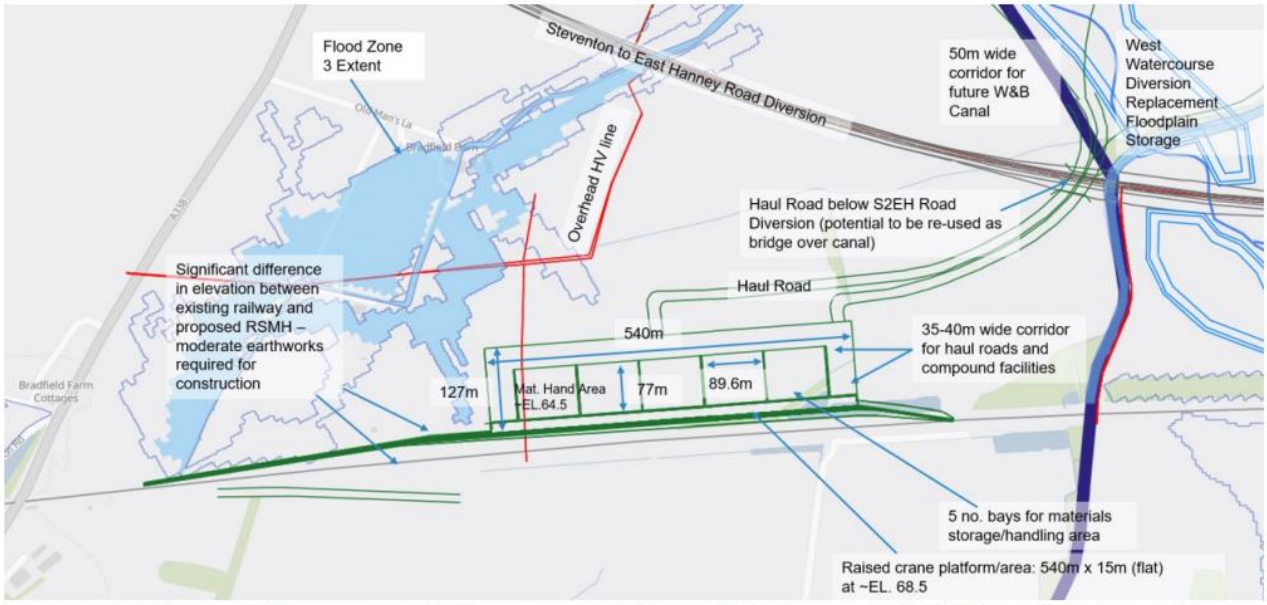

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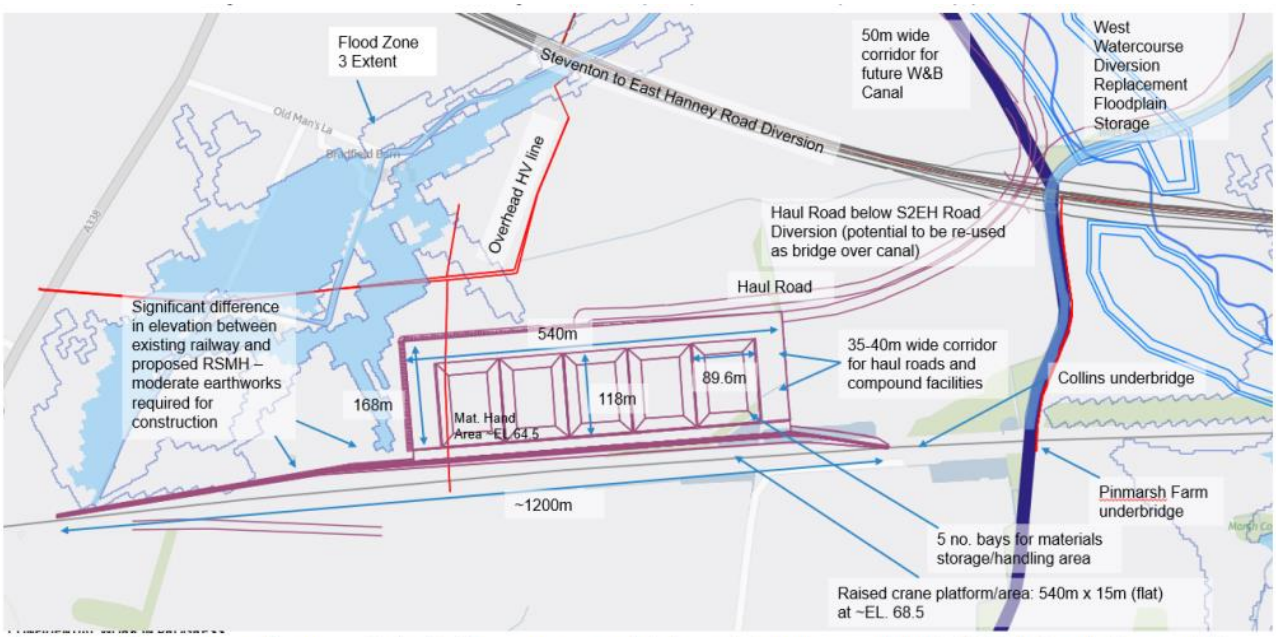
Plate 3.13 Option 4a and Option 4b Layout (370,000m^3 stockpile capacity)



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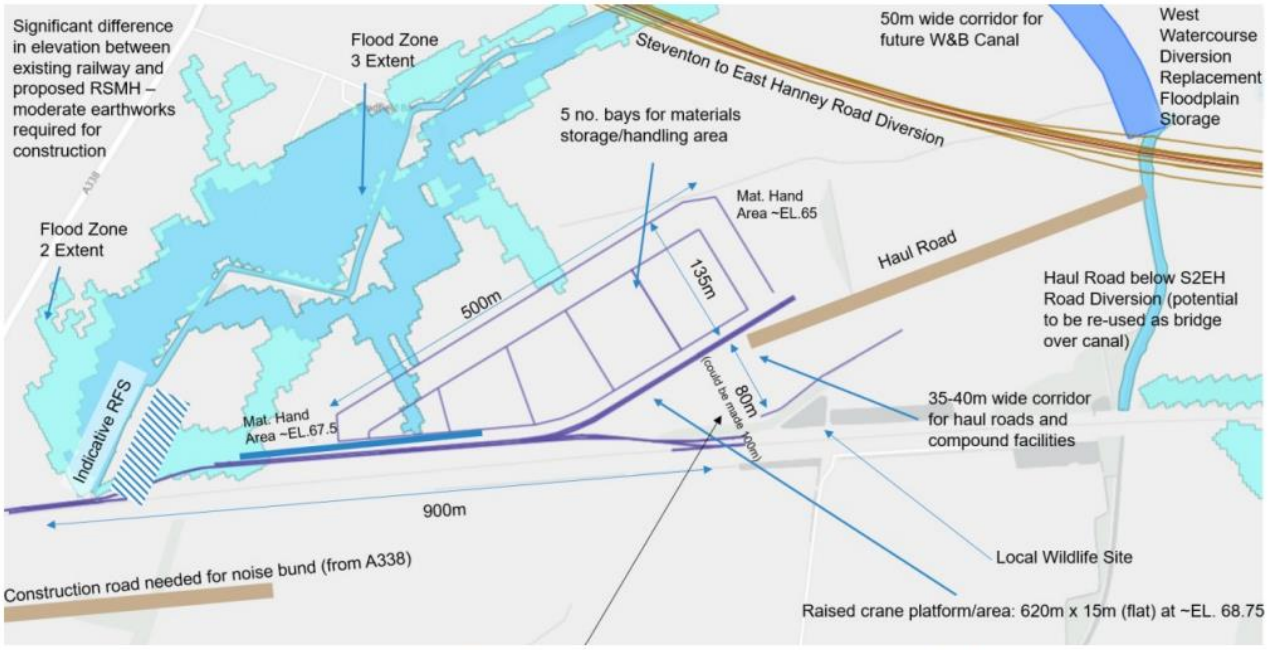
3.8.136 Option 4 comprises Option 4a (allowing exit east and west) and Option 4b (eastbound exit only) (see Plate 3.12 and Plate 3.13) with the same location and layout, but alternative signalling requirements. This option would be located centrally in the West Area between Options 2 and 3. This option allows an embankment for the railway in and out of the sidings at the Collins underbridge.

3.8.137 This option would avoid the existing fluvial flood zone while offering distance from sensitive residential properties. However, the option was found to have adverse environmental impacts due to the proximity and encroachment into the Cuttings and Hutchin's Copse LWS.

3.8.138 Option 4b was taken forward for further development as it would require less complex signalling modifications than Option 4a, and although not considered a material differentiator, Option 4b would have a lower capital cost and carbon associated with it than Option 4a. This is due to the fewer signalling modifications required, which means a shorter programme, but it also means less possession works, which incur costs to Network Rail.

Option 5

Plate 3.14 Option 5 (370,000m^3 capacity)



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3.8.139 Option 5 was developed from Option 4b to reduce the potential environmental impact by avoiding the Cuttings and Hutchin's Copse LWS. The option would be located approximately 1km south of East Hanney. It reduces environmental impacts by increasing the distance from the Cuttings and Hutchin's Copse LWS and receptors through a rotated alignment.

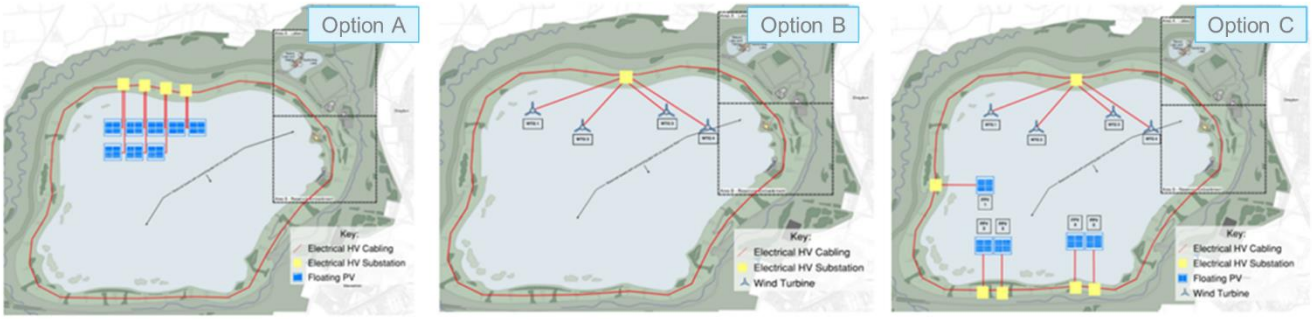
3.8.140 Option 5 was selected as the preferred option, as it performed more favourably than Option 4b across a range of environmental criteria. In particular, Option 5 avoids land take from the Cuttings and Hutchin's Copse LWS, which is an area of high conservation value due to the presence of priority woodland habitat, whereas Option 4b would require some land take. Option 5 is also preferred due to the absence of known archaeology in comparison to Option 4b. Its configuration, including an additional spur off the main siding, provides extra flexibility to refine the design alongside discussion with Network Rail. Subsequent design development has updated assumptions regarding train movements and the RSMH facility design as outlined in Chapter 2: Project description. However, these changes do not materially affect the reasons for selecting Option 5 as the preferred location. As noted above, this refinement and discussion is ongoing at the time of preparing the PEI Report.

Renewable energy - Floating solar and wind

3.8.141 To ensure the Project is delivered in an environmentally responsible manner and in line with the requirements of the NPS for Water Resources Infrastructure (Defra, 2025) (paragraph 4.4.13), sustainable energy options are being explored, including floating solar panels and wind turbines. Three options (Options A to C, see Plate 3.15) have been considered which reflect different combinations of wind and floating solar installed within the draft Order limits

of the Project. These options focus on larger scale generation potential to inform the current Project design and they are compared to a baseline option (no new solar or wind energy being provided). A summary of the appraisal is provided below.

Plate 3.15 Indicative layouts of floating solar and wind options, with associated electrical infrastructure.



Option A – Maximum Floating Solar Capacity

3.8.142 Option A would maximise the use of floating solar PV (38.7MW) across the reservoir, with no wind turbines included. This configuration significantly increases the potential annual renewable energy generation to approximately 39.4GWh/year.

Option B – Maximum Wind Energy Capacity

3.8.143 Option B introduces a maximum number of wind turbines (8.8MW) without any floating solar PV. It is estimated to generate up to an annual output of 39.6GWh/year. The layout would include multiple wind turbine generators and supporting electrical infrastructure placed strategically around the reservoir. This option would provide strong generation capacity using wind only, but it would introduce greater visual impacts compared to the solar option, with the tall structures breaking the skyline in views across a characteristically flat landscape. Noise impacts would also arise from turbine operation.

Option C – Maximum Generation Capacity (Hybrid)

3.8.144 Option C combines both floating solar PV (21.5MW) and wind turbines (8.8 MW) to achieve the highest total installed capacity of 30.3MW and annual energy generation of approximately 61.5 GWh/year. It would maximise renewable energy output through a hybrid configuration, distributing both floating PV and wind assets across the reservoir. This option would best meet broader decarbonisation goals, consistent with the UK Government's commitment to achieving net zero greenhouse gas emissions by 2050 as set out in the Overarching National policy Statement for Energy (EN-1) (Department for Energy Security Net Zero, 2024). However, it also presents the most intensive land and water use impacts due to extensive infrastructure required.

Preferred option

3.8.145 The provision of renewable energy generation would demonstrate alignment with Government objectives and policy. Option A (maximum floating solar) was considered as the most favourable option. From an environmental perspective, Option A performed more favourably overall in the appraisal. Compared with Options B and C, Option A avoids the introduction of tall turbines and cranes that would increase construction phase landscape

and visual effects, avoids potential changes to the setting of heritage assets and avoids the operational noise impacts (including amplitude modulation) associated with wind turbines. Construction traffic associated with Option A would be limited to the main reservoir construction routes, with only minor additional effects anticipated on receptors in Marcham. In terms of technical and operational considerations, floating solar would be less complex to maintain and replace over the lifetime of the reservoir when compared to wind. Therefore, Option A was identified as the preferred option.

Renewable energy - Ground-mounted solar

3.8.146 There are existing operational solar farms located within the draft Order limits and they would be lost as a result of the Project. Options for the reprovision of ground-mounted solar as part of the Project are being considered in line with the requirements of the NPS for Water Resources Infrastructure (Defra, 2025) (paragraph 4.4.13). Locations were shortlisted to provide approximately 100ha (capable of providing sufficient installed capacity[2] of 69.5 megawatts (MW)) and considered in an options appraisal which considered the following matters:

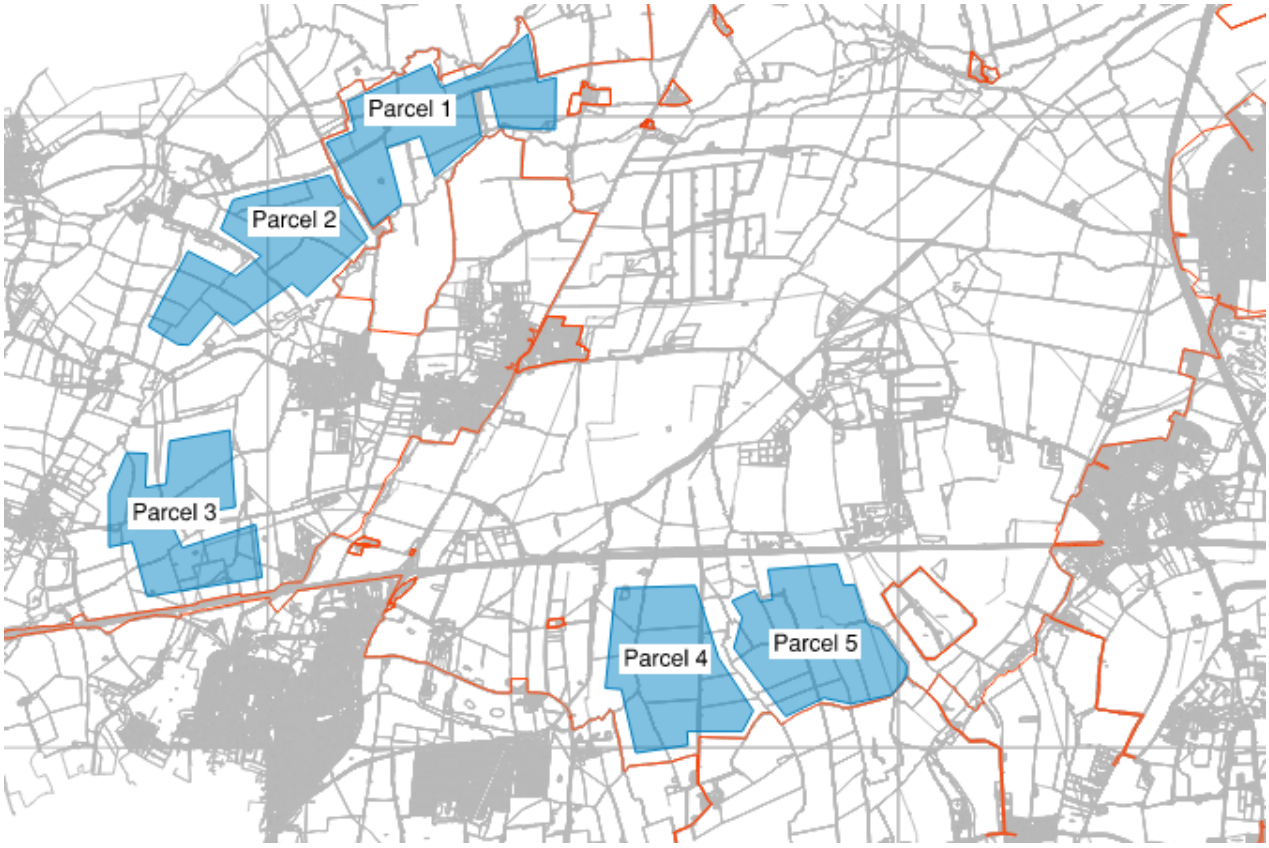
- Physical properties such as size, topography, access, and field boundaries
- Additional softer environmental constraints, including Green Belt, Flood Zone 2, and other local sensitivities
- Buffers to hard environmental constraints
- Avoidance of sites with existing planning consents in place
- Locations with the potential to allow connection to existing grid connection points
- Alignment with published District Landscape Character Areas
- Land ownership, with preference given to sites owned by a single entity where ownership data is available (noting that Parcels 4 and 5 meet this criterion, while ownership for Parcels 1 to 3 would be confirmed at a later stage)

3.8.147 Once the above factors had been considered, landscape and visual considerations were identified as the key differentiators in the appraisal of ground-mounted solar. This appraisal summarises the findings of the options study and is supported by a landscape site walkover and assessment. The evaluation considered the degree of visual containment, the sensitivity of the landscape to solar development, and potential effects on the North Wessex Downs National Landscape (NWDNL) and other designated heritage assets.

3.8.148 A summary of the appraisal is provided in following paragraphs.

[2] 'Installed capacity' refers to the total maximum output the installed system can produce under ideal conditions, typically measured in kilowatts (kW) or megawatts (MW).

Plate 3.16 Location options evaluated for ground-mounted solar installations



Parcel 1

3.8.149 Parcel 1 is the most visually contained of all locations assessed and is expected to experience the least visual impacts. According to the South Oxfordshire and Vale of White Horse Renewables Study 2024 (South Oxfordshire and Vale of White Horse, 2024), the majority of the site is classified as having 'moderate-high' sensitivity to solar development of this scale, representing a lower sensitivity than the other four sites, all of which are categorised as 'high' sensitivity. No likely impacts are anticipated on the NWDNL. While there is potential for cumulative impacts from a solar farm to the south (consented in 2024) and a proposed scheme to the north (pending a planning decision until August 2025). Despite a solar planning refusal on this site approximately ten years ago, the anticipated landscape and visual effects remain notably less than at the other parcels.

Parcel 2

3.8.150 Parcel 2 is more open and visually exposed than Parcel 1, being more closely surrounded by roads and subject to attractive long-range views towards the hills of the NWDNL. The openness of the site and its visibility from surrounding viewpoints would increase the prominence of any solar development, resulting in higher potential for landscape and visual effects compared to Parcel 1. Potential adverse effects may arise on heritage assets as a result of changes to their settings, particularly in relation to the conservation area of West Hanney and the listed buildings within it

Parcel 3

3.8.151 The northern half of Parcel 3 was subject to a recent planning refusal in 2024 for solar development, with the decision citing detrimental effects on the setting of and views towards the NWDNL, as well as impacts on the setting of Denchworth Conservation Area. The southern half of the parcel is worth considering should a smaller scale re-provision be acceptable, or should provision be split over two parcels. However, the sensitivity of potential visual effects for this option remains high. Potential adverse effects may arise on heritage assets due to changes to their settings, particularly in relation to the conservation areas of West Hanney and Denchworth and the listed buildings within them.

Parcel 4 and Parcel 5

3.8.152 Parcel 4 and Parcel 5 are not recommended for solar development from a landscape and visual perspective, primarily due to their potential impacts on the setting of the NWDNL. These represent significant consenting risk. These parcels are relatively open and exposed, with visibility from several Public Rights of Way, further increasing its potential for adverse visual effects.

Preferred option

3.8.153 The appraisal suggests that of the options presented, the most favourable pathway for renewables provision may be Parcel 1 based on its relatively low visual impact and lower sensitivity classification when compared with the other four parcels. The South Oxfordshire and Vale of White Horse Renewables Study 2024 (South Oxfordshire and Vale of White Horse, 2024) categorises most of the land within Site 1 as having 'moderate-high' sensitivity to solar development of this scale, which is notably less sensitive than the other four sites, all classified as 'high' sensitivity. It is the most visually contained location assessed, with no likely impacts on the NWDNL, and it offers the best opportunity to reduce adverse landscape and visual effects. While cumulative impacts from nearby consented and proposed solar farms require consideration, Parcel 1 remains the most favourable option in terms of landscape and visual suitability.

Habitat enhancement and creation for protected species mitigation

3.8.154 Existing habitats within the Core Project Area make up a large network of foraging and connectivity for the existing protected ecological species on Site. Given the length of the construction programme, it is recognised that these impacts on habitats and species will need to be mitigated and replacement habitats provided ahead of any species-specific on site mitigation activities.

3.8.155 The requirements for the relocation of protected species are being developed based on desk-based and reasonable worst-case assumptions on survey data available, noting that surveys are ongoing at the time of preparing the PEI Report. Suitable sites in close proximity have been identified to avoid displacing species too far from their original location (as per best practice guidance and in line with licensing requirements) and to provide a blend of habitats in alignment with the Local Nature Recovery Strategy. The position of these sites would also facilitate the recolonisation of Site after construction. The extent and design of the Project Priority Areas for Biodiversity (PABs) will continue to evolve to reflect the outcome of environmental surveys and ongoing design development.

3.8.156 Areas of land within the draft Order limits, but outside of the Core Project Area has been identified as shown on Figure 2.1: Project overview. This area has been identified:

- To avoid designations within the Local Plan including safeguarding zones (Mineral Safeguarding Area, the Wilts and Berks Canal safeguarding zone and the Marcham Movement Corridor) (Oxfordshire County Council, 2022; Vale of White Horse District Council, 2019)
- To avoid any approved planning applications
- To support the Local Nature Recovery Strategy in terms of potential woodland and grassland habitat placement (Oxfordshire County Council, 2024)

3.8.157 Protected species mitigation strategies and associated land requirements will continue to be developed up until the submission of the DCO application, and will be informed by:

- Ongoing protected species surveys
- Land condition and constraints (i.e. ongoing agricultural soils classification surveys other on site features such as drainage)
- Engagement with relevant landowners and other stakeholders, including Natural England and Oxfordshire County Council, and Network Rail in terms of any requirements for planting close to the GWML

Ongoing Design Development

3.8.158 A wide range of detailed investigations and surveys are underway within the draft Order limits, including archaeological and ecological surveys, and the results from ground investigation work. These assessments are essential to help shape the design which is also subject to consultation and ongoing engagement with stakeholders.

3.8.159 Elements of design development are ongoing, with the following remaining subject to further development:

- Refinement of the scale and appearance of the River Thames Intake / Outfall structure to integrate the structure into the landscape
- Consideration for a preferred foul drainage connection between the option to connect to either Abingdon STW or Drayton STW as described in Chapter 2: Project description
- Optimisation of the design for the RSMH facility and connections to the GWML through engagement with Network Rail
- The protected species mitigation strategy for species relocation during the construction phase
- Wave protection requirements for the reservoir
- Infrastructure requirements are being refined e.g. space provision within the pumping station
- The provision of recreational buildings, including scale and location

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