Culham Storage

Environmental Statement

Non-Technical Summary

Prepared for:

Statera Energy Limited

Date:

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CONTENTS

INTRODUCTION

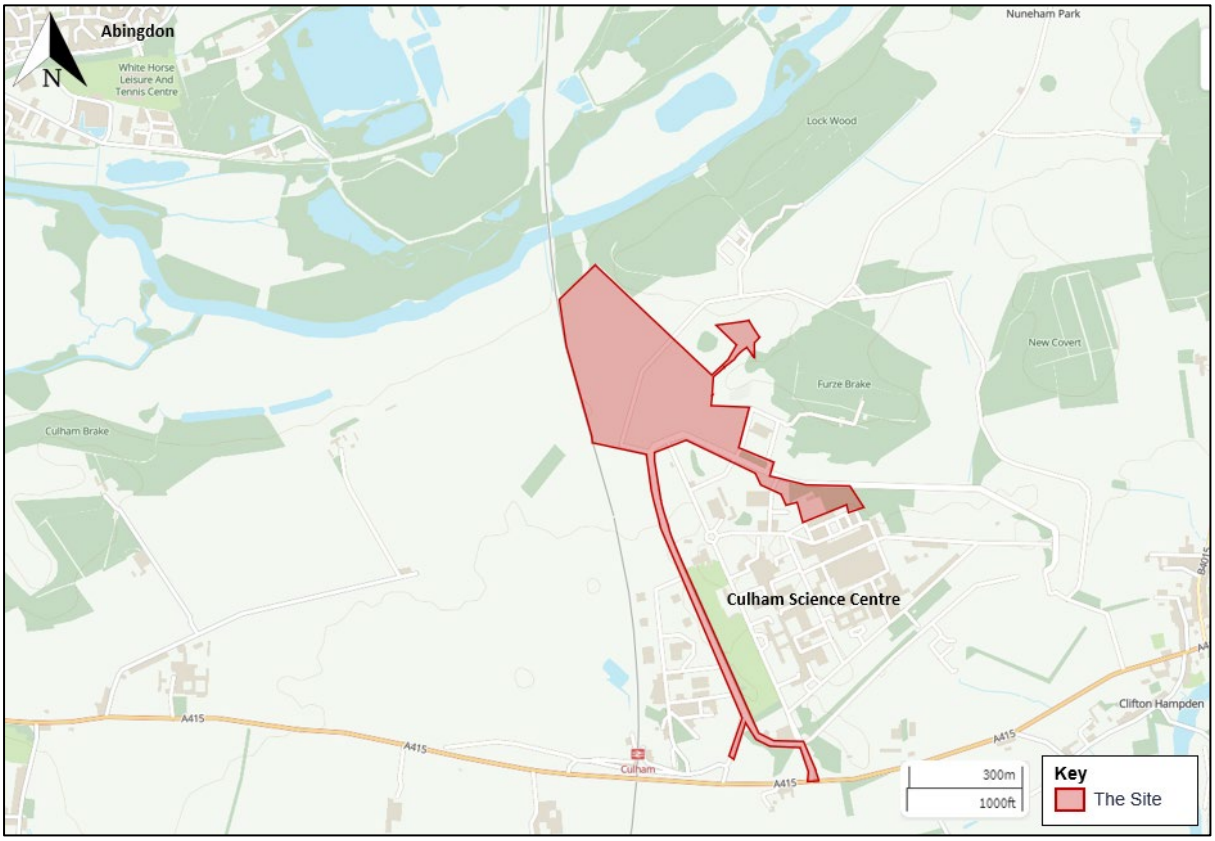
1 Statera Energy Limited (who are referred to as the 'Applicant') is seeking planning permission for the development of a Battery Energy Storage System, comprising a 500 megawatt battery storage facility with a connection into the Culham Jet Substation, with associated infrastructure, access and landscaping (the 'Proposed Development'), to the north of Culham Science Centre and near Clifton Hampden (the 'site'), within the administrative boundary of South Oxfordshire District Council.

2 The site is bordered by woodland to north; agricultural land, an area of woodland, and Thame Lane to the east; Thame Lane to the south, with Culham Science Centre to the south-east; and a railway line to the west (servicing Great Western Railway), adjoined by the Oxford Green Belt Way. The site location and planning application boundary are shown in Figure 1 and Figure 2 respectively.

3 This document is a Non-Technical Summary of the findings of the Environmental Impact Assessment which are reported on within the Environmental Statement. This Non-Technical Summary has been prepared to explain the Proposed Development, the likely significant beneficial and adverse environmental effects of the Proposed Development and the measures proposed to protect the environment. The Environmental Impact Assessment has identified the effects that could result during the enabling and construction works, when the Proposed Development is completed and in operational use and following decommissioning.

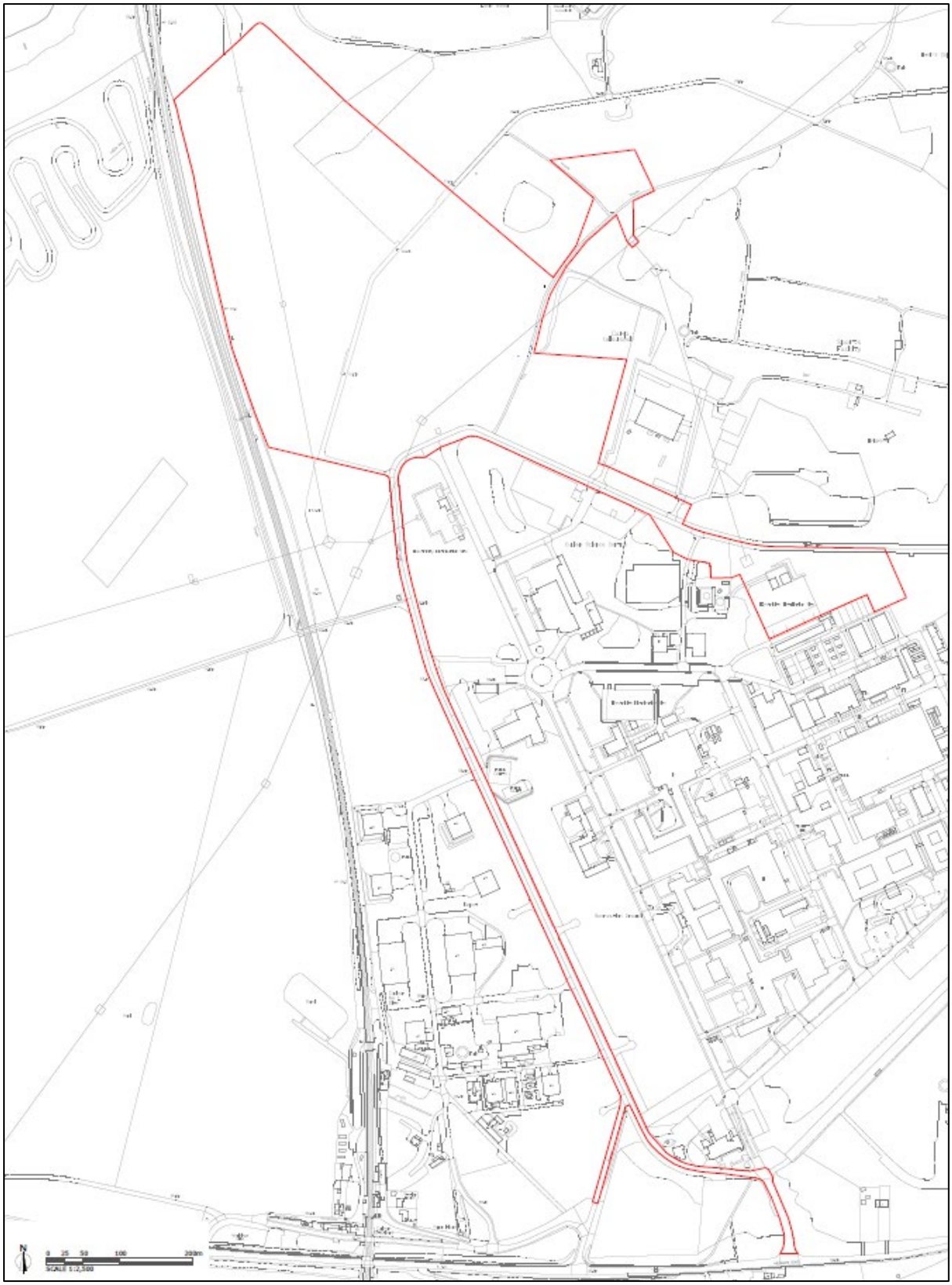
4 The Environmental Statement has been prepared in accordance with the relevant regulations relating to Environmental Impact Assessment[1].

Figure 1 Site Location[2]



[1] *Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended)*
[2] *Note: site red line boundary included in this figure is indicative for the purposes of illustrating site location.*

Figure 2 Application Red Line Boundary Plan



PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT AND NON-TECHNICAL SUMMARY

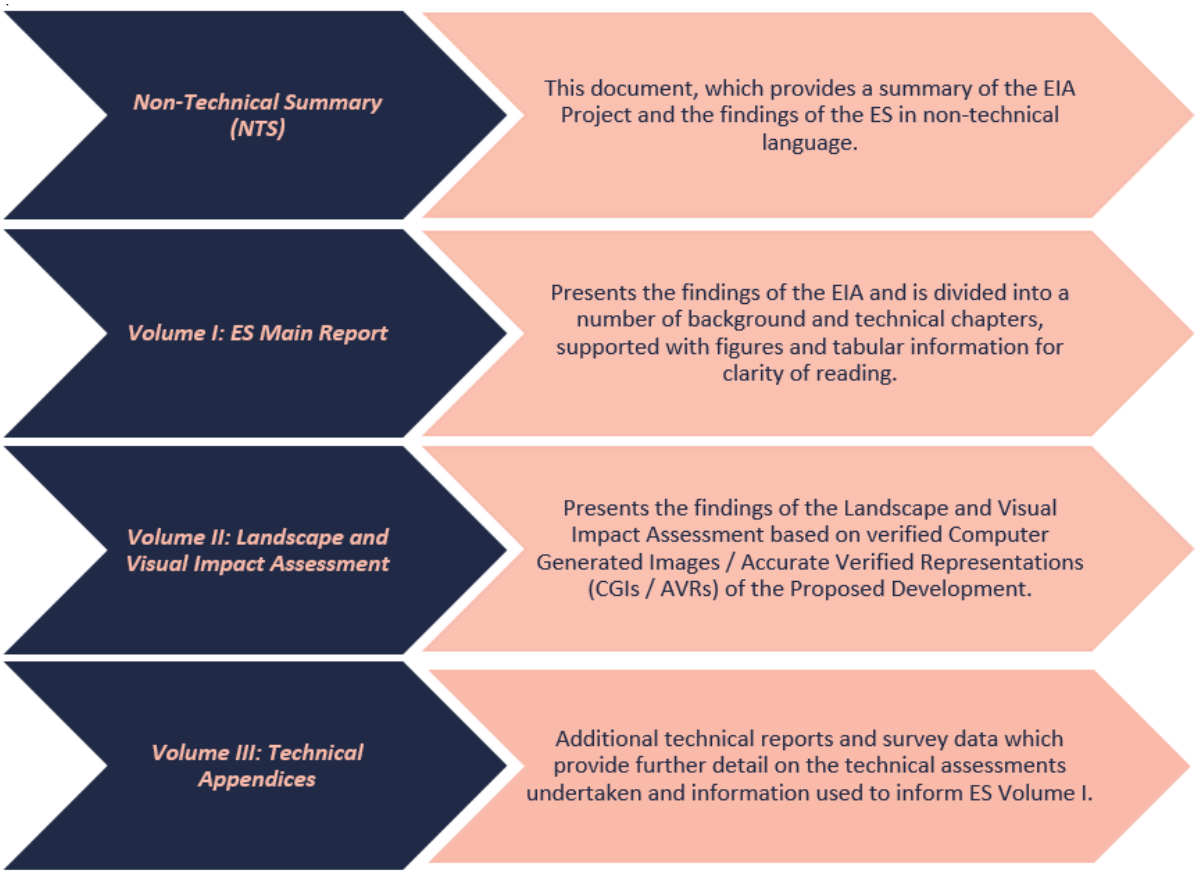
5 Environmental Impact Assessment is a process that allows the beneficial and adverse (positive and negative) likely significant environmental effects of certain projects on the environment to be identified and reported upon. This is required by law and helps the local authority (in this case, South Oxfordshire District Council) understand the environmental effects of a new development when they make their decision on whether to grant planning permission for it.

6 Measures to protect the environment, otherwise known as 'mitigation measures' have also been identified as part of the Environmental Impact Assessment process.

7 Trium Environmental Consulting LLP has undertaken the Environmental Impact Assessment for the Proposed Development and has prepared the Environmental Statement and this Non-Technical Summary document.

8 The Environmental Statement is made up of a number of documents (as set out in Figure 3) and so this Non-Technical Summary provides an overview of the Environmental Statement in non-technical language.

Figure 3 Content of the Environmental Statement



THE SITE AND SURROUNDING AREA

Site Description

9 The site covers a total area of 26.8 hectares and is located within the administrative boundary of South Oxfordshire District Council, near Clifton Hampden and approximately 2.5km to the east of Abingdon.

10 At present, the site predominantly comprises areas of open fields (typically harvested for hay and silage) and is crossed by a tarmac track (Thame Lane, a non-public highway) and an existing farm track. High voltage overhead transmission lines pass through the western and central areas of the site. The south-eastern extent of the site includes part of the exiting Culham substation and an area of land adjoining the substation comprising bramble scrub and neutral grassland..

11 The site is irregular in shape and is centred around National Grid Reference SU529965. The site is bordered by:

- Woodland to north, beyond which lies the River Thames;
- Agricultural land, an area of woodland, and Thame Lane to the east;
- Thame Lane to the south of the site, with Culham Science Centre to the south-east, beyond which is Abingdon Road (A415) and Culham Rail Station further south; and
- A railway line to the west (servicing Great Western Railway), adjoined by Oxford Green Belt Way, beyond which lies agricultural land and Culham Park Mx (off-road race track).

12 The site is accessed from the east, south-east and south by Thame Lane, which connects to Abingdon Road (A415) to the south.

13 Photos of the existing site are shown in Figure 4 and Figure 5 below.

Figure 4 View from Footpath 183/1/60 Looking North towards the Site

Figure 5 View from the Oxford Green Belt Looking North-East towards the Site

Environmental Context

14 The site and the surrounding area's main environmental features and designations are presented in Table 1 and illustrated in Figure 6 below.

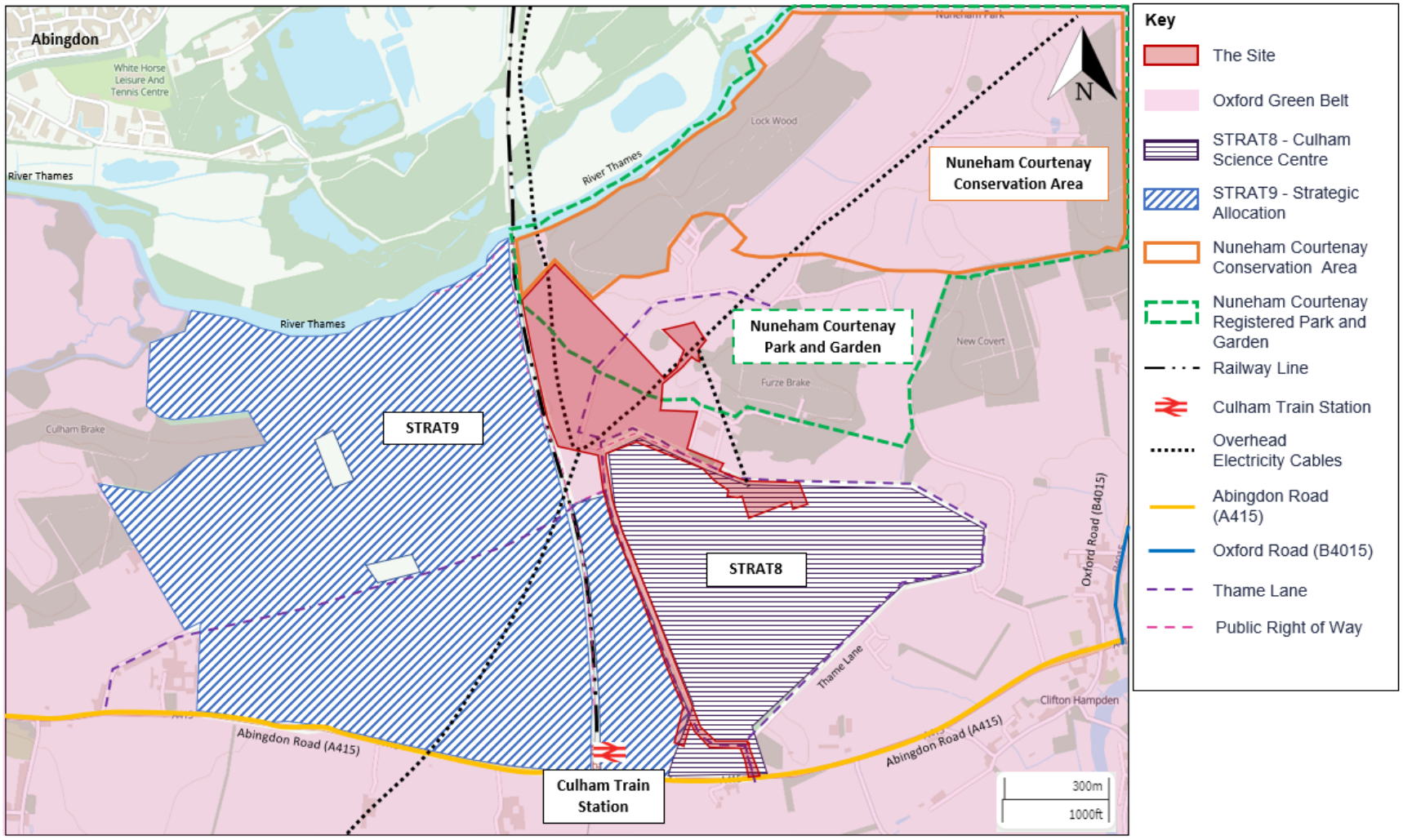
Table 1 Outline of the Site and Surrounding Area's Environmental Context

Environmental Topic	Key Features and Designations
Land Use and Soils	• The site comprises predominantly areas of open fields (currently harvested for hay and silage). • Soils within the site are a mixture of loamy sand, sandy loam and sandy clay loam with a range of gravel content in the subsoil. They are all well drained. • The agricultural land at the site has been classified as mostly Grade 2 (19.1ha) with smaller areas of Subgrade 3a (2.3ha) where the land is more gravelly at depth. There is also a small area of Subgrade 3b (0.3ha) next to the existing woodland at the north-eastern extent of the site where the subsoil is slowly permeable clay. The Grade 2 and Subgrade 3a agricultural land on site is considered to be BMV, with a total BMV land on site of 21.4ha.
Air Quality	• The site and its vicinity are not situated within an Air Quality Management Area (AQMA).
Archaeology and Built Heritage	• There are no World Heritage Sites, Scheduled Monuments, Historic Wreck or Historic Battlefield sites located within 1km of the site boundary. • Archaeological potential at the site includes finds from the following periods: – Early Prehistoric (Palaeolithic & Mesolithic); – Neolithic; – Bronze Age & Iron Age; – Roman; – Early Medieval;

Environmental Topic	Key Features and Designations
	– Medieval; and – Post Medieval & Modern. • Built heritage assets in the vicinity of the site with the potential to be affected by the Proposed Development include: – Nuneham Courtney Registered Park and Garden (Grade I) – note, the site is located partially within this Registered Park and Garden; – Nuneham Courtney Conservation Area; – Culham Station Ticket Office (Grade II*) listed building; – Thame Lane Bridge (Grade II) listed building; – Fullamoor Farmhouse (Grade II) listed building; and – Station House, a locally listed building.
Ecology and Biodiversity	• The site is not located within any local, national or international designated sites for nature conservation. • Habitats identified within the site are considered to be of negligible intrinsic ecological interest and includes four fields and a portion of a fifth field containing modified grassland, two areas and margins of other neutral grassland, bare ground, hardstanding, scattered trees and scattered scrub. No ponds or waterbodies were identified within the site or within 500m of the site (aside from north of the River Thames which is located approximately 130m north of the site).
Ground Conditions	• The site is currently undeveloped agricultural land. • The site is entirely underlain by the bedrock geology of the Lower Greensand Group. There are no records of superficial deposits at the site. • There are no extant mineral operations, areas safeguarded for minerals or areas designated for geological interest on-site.
Noise	• Nearby sources of noise are dominated by traffic noise on Abingdon Road (A415) and Oxford Road (B4015) to the south and south-east of the site respectively, railway noise related to the Great Western Railway trains operating on the railway line to the west of the site and operational noise from the Culham Science Centre located to the south of the site.
Transport and Access	• The site is accessed from the east, south-east and south by the Thame Lane, which connects to Abingdon Road (A415) to the south. • A railway line servicing Great Western Railway runs along the site's western boundary, and the National Railways Culham Station is located approximately 1km south from the centre of the site.
Water Resources and Flood Risk	• The closest water body to the site is a section of the River Thames, known locally as River Isis, located approximately 130m north of the site. A further branch of the River Thames is located approximately 2km to the south of the site. Located approximately 1.3km to the west of the site is Swift Ditch which is an artificial channel which feeds into the River Thames. • The site is located entirely within Flood Zone 1 (low risk of flooding). The site is not considered to be at risk from tidal sources due to its distance in-land. • The majority of the site is at a very low risk of surface water flooding with areas of low risk within the north-west of the site along the railway line and to the southern extent of the site adjacent to the Thame Lane. • The site is not located in a groundwater Source Protection Zone. • There are no records of drainage for the site and it has been assumed that no artificial drainage system will be present within the area as the land is currently agricultural land. The overall risk of flooding via artificial drainage system to the site is considered as low.

Environmental Topic	Key Features and Designations
Landscape and Visual Amenity	• The site lies within the Oxford Green Belt, with part of the site located within the Nuneham Courtenay Registered Park and Garden, with Nuneham Courtenay Conservation Area to the north of the site. • The site is visible from a short section of the Oxford Green Belt Way footpath, whereby to the north and east the site benefits from visual enclosure provided by Lock Wood and rising ground. The site is not visible from within the Thames valley. • The railway to the west passes the site in a cutting and so the site is not visible to rail users. No dwellings overlook the site apart from Warren Farm to the west which lies in the centre of a proposed urban expansion area (STRAT9 Strategic Allocation of the South Oxfordshire Local Plan).

Figure 6 Site and Surrounding Context[3]



[3] *The site boundary shown is indicative.*

ASSESSMENT METHODOLOGY

Scoping

15 One of the first stages of the Environmental Impact Assessment process is referred to as 'Scoping'. Scoping identifies the possible environmental effects of a development and the technical topics that need to be investigated further as part of the next stage of the Environmental Impact Assessment process.

16 As part of the 'Scoping' process, Trium Environmental Consulting LLP prepared a 'Scoping Report' which explained the proposed approach to the Environmental Impact Assessment. This was issued to the South Oxfordshire District Council (as the local planning authority) on 16th December 2022.

17 The South Oxfordshire District Council issued their opinion on the scope of the Environmental Impact Assessment (also known as a Scoping Opinion) on the 30th January 2023. The Environmental Impact Assessment has been undertaken in line with this Scoping Opinion. Any alternative methodology or assessment has been justified within the Environmental Statement.

Impact Assessment Methodology

18 The Environmental Impact Assessment process is undertaken in a number of stages, with each technical topic assessment following the same process.

19 Firstly, the 'baseline' is identified. The baseline considers the existing conditions of the area where the development will be located and includes both the site itself and the surrounding area.

20 Within the baseline conditions, a number of key environmental aspects which have the potential to be impacted by the Proposed Development are identified, which are defined as 'receptors'. The receptors addressed within the technical chapters of the Environmental Statement have been identified from a review of the available information collected as part of the description of the surrounding environmental context for each technical assessment and from historic and currently available information relating to the site itself. The sensitivity of the receptors to change is identified.

21 Where an area is subject to widespread, planned change, and is rapidly changing, a 'future baseline' is established for relevant technical assessments. This future baseline makes reasonable predictions (based on published information and professional knowledge / experience) of the likely change that may occur, across the area.

22 The impact (i.e., the resultant change) of the Proposed Development is then identified and the size of the impact (impact magnitude) is considered against the receptors. Impacts are identified during the enabling and construction works, when the Proposed Development is completed and operational, and following the decommissioning of the Proposed Development.

Scale and Nature of Effects

23 The size of the impact and how sensitive a receptor is to the impact defines the scale of an effect.

24 For defining the scale of an effect, the following language is used: 'negligible'; 'minor'; 'moderate'; and 'major'. Specific definitions are given in each technical chapter of the **Environmental Statement, Volume 1**, but generally the following criteria is used:

- '**Negligible**' - effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error, to an environmental resource or receptor;
- '**Minor**' - Small effect (slight, short or highly localised effect) of no significant consequence;
- '**Moderate**' - Medium effect (limited by extent, duration of impact magnitude), which may be considered significant; or
- '**Major**' - Large effect (considerable by extent, duration or magnitude, that may be in breach of recognised acceptability, legislation, policy or standards), which is considered significant.

25 For defining the nature of effect, the following language is used: 'neutral'; 'beneficial'; or 'adverse' in nature. Generally speaking, these terms mean the following:

- '**Adverse**' - Negative effects to an environmental resource or receptor.
- '**Beneficial**' - Positive effect to an environmental resource or receptor.
- '**Neutral**' - A neutral effect is one in which either there is no noticeable beneficial or adverse effect, or, in which the effect is considered neither beneficial nor adverse overall, having made a 'net equation' judgment that takes into account both beneficial and adverse impacts.

26 Once the effect has been identified, the assessment then determines whether the effect is considered 'significant' or 'not significant'.

27 If a significant adverse effect is identified, measures are required to reduce or remove the effect; these measures are referred to as 'mitigation measures'. Once the mitigation measures have been identified, the effect is re-assessed to understand whether the scale of the effect has changed because of the mitigation measures (referred to as 'residual effects').

28 As well as assessing the impacts of the Proposed Development on its own, effects resulting from a combination of the Proposed Development and other surrounding development schemes (known as 'cumulative schemes') are also assessed. These are referred to as 'cumulative effects'. In addition, the combination of lots of different effects from the Proposed Development on a single receptor are assessed as well, and these are referred to as 'effect interactions'.

29 All of the likely effects of the Proposed Development are reported within the Environmental Statement, and the likely significant beneficial, adverse and neutral residual effects (after mitigation measures) are specifically highlighted.

30 This Non-Technical Summary of the Environmental Statement is required to present a summary of the likely significant effects of the Proposed Development. As such, a summary of the likely significant effects relating to the development is contained within this Non-Technical Summary, with the detailed assessment being contained within in each relevant technical topic assessments of the Environmental Statement (**Volumes 1-3**).

Environmental Impact Assessment Technical Topics

31 Several technical topics have been considered as part of the Environmental Impact Assessment process. The below lists all the technical topics considered in the Scoping process. For some technical topics, initial research identified that no significant environmental effects would be likely and, on this basis, no further work in relation to these technical topics was necessary and these topics were 'scoped out' of the Environmental Impact Assessment, as agreed with South Oxfordshire District Council via their Scoping Opinion. Where significant environmental effects were considered likely, further detailed studies have been undertaken as part of the Environmental Impact Assessment.

32 The potentially significant environmental effects that were identified during the EIA Scoping process, and that have been considered within this EIA, relate to the following technical topics:

- Cultural Heritage (i.e., Archaeology and Built Heritage);
- Land Take and Soils (Agriculture);
- Climate Change; and
- Landscape and Visual.

33 A number of technical topics / disciplines were identified during the EIA scoping process that have been 'scoped out' of (i.e., excluded from) the EIA (as agreed with South Oxfordshire District Council via the Scoping Opinion) on the basis that significant environmental effects are not considered likely. The scoped out technical topics comprise:

- Water Resources, Drainage and Flood Risk;
- Ecology and Biodiversity;
- Geoenvironmental Conditions (Land Contamination, Ground Conditions and Groundwater);

- Traffic and Transport;
- Noise and Vibration;
- Air Quality;
- Waste and Materials;
- Project Vulnerability; and
- Socio-economics and Health.

Sensitive Receptors

34 The receptors that have been considered within the Environmental Impact Assessment are very varied and include the receptor 'groups' presented in Table 2.

Table 2 Sensitive Receptors

Topic	Key Receptor Groups
Cultural Heritage	• Possible archaeological remains beneath the site, including finds from the following periods: – Early Prehistoric (Palaeolithic & Mesolithic); – Neolithic; – Bronze Age & Iron Age; – Roman; – Early Medieval; – Medieval; and – Post Medieval & Modern. • Built heritage assets in the vicinity of the site, including: – Nuneham Courtney Registered Park and Garden (Grade I); – Nuneham Courtney Conservation Area; – Culham Station Ticket Office (Grade II*) listed building; – Thame Lane Bridge (Grade II) listed building; – Fullamoor Farmhouse (Grade II) listed building; and – Station House, a locally listed building.
Land Take and Soils	• Agricultural land, particularly Best and Most Versatile agricultural land, and • Soil resources.
Landscape and Visual	Landscape • Topography and watercourses; • Trees and hedgerows and other landscape features; • Landscape character of the site; • Character of the local landscape; and • Setting and character of the North Wessex Downs Area of Outstanding Natural Beauty. Views • View 1: Thame Lane, close to the Europa School, as it approaches the site from the west; • View 2: Thame Lane shortly after the entrance to Warren Farm, approaching from the west;

Topic	Key Receptor Groups
	• View 3: Thame Lane just before it crosses the railway when approaching from the west (also where it meets the Oxford Green Belt Way); • View 4: View from the Oxford Green Belt Way which runs along the west side of the railway; • View 5: View from the Oxford Green Belt Way as it passes the site on the west side of the railway where it meets PRoW 183 1/60 which crosses the railway • View 6: The Oxford Green Belt Way as it passes west of the site; • View 7: The Oxford Green Belt Way as it passes south of the site after crossing the railway; • View 8: from the Oxford Green Belt Way as it skirts the Culham Science Centre, south of the site; • View 9: from the Oxford Green Belt Way as it skirts the Culham Science Centre approaching the site of the proposed substation; • View 10: from the Oxford Green Belt Way as it skirts the Culham Science Centre; • View 11: from the Oxford Green Belt Way as it approaches the site of the proposed substation from the south; • View 12: The Oxford Green Belt Way as it approaches the site of the proposed substation from further south; • View 13: The Oxford Green Belt Way as it passes the proposed extension to the Culham Science Centre substation; • View 14: from within the Nuneham Courtenay Registered Park and Garden looking southeast; • View 15: From within the Nuneham Courtenay Registered Park and Garden looking southwest; • View 16: From within the Nuneham Courtenay Registered Park and Garden; • View 17: From within the Nuneham Courtenay Registered Park and Garden looking southwest; • View 18: Track adjacent to New Cottage within the Nuneham Courtenay Registered Park and Garden; • View 19: From the Public Right of Way along the south bank of the Thames, northwest of the site; and • View 20: from the top of Wittenden Clumps within the Site North Wessex Downs Area Of Natural Beauty. Heritage Assets • Nuneham Courtenay Registered Park and Garden; • Nuneham Courtenay Conservation Area; • Thame Lane Railway Bridge; • Culham Station Overbridge, ticket office and waiting room; • The Europa School; • Keepers Cottage and Venison House (Grade II); and • Clifton Hampden and Culham Conservation Areas.
Climate Change	• Global atmospheric mass of relevant Greenhouse Gases and consequent global warming potential.

ALTERNATIVES AND DESIGN EVOLUTION

35 The Environmental Statement provides an outline of the main alternatives to the Proposed Development and an explanation of the main reasons for the choice of the final scheme, taking account of potential environmental effects. The following section reviews those alternatives to the Proposed Development that have been considered, consisting of:

- The Do-Nothing / No Development Alternative;
- Alternative Sites; and
- Alternative Designs.

Do Nothing / No Development Alternative

36 The Do-Nothing / No Development Alternative refers to the option of leaving the site in its current state. The site is undeveloped, comprising areas of open fields, currently harvested for hay and silage.

37 Battery Energy Storage System facilities provide a means of allowing electricity from the grid to be imported and stored at times of low demand / high generation, which can then be exported back into the grid at times of higher demand / system stress.

38 Battery storage is a key part of the National Grid energy strategy and provides balancing services to help accommodate the increasing level of renewable energy generation. By importing excess renewable energy from the grid and storing it, batteries can capture energy that would otherwise be lost / unutilised. In respect of their storage ability, batteries offer opportunities to support the intermittent nature of renewables by storing the excess energy they produce and importing it back into the grid when demand requires.

39 The Proposed Development supports renewable planning policy in the National Planning Policy Framework and would help meet National Grid's requirement for ancillary services.

40 The 'No Development' option would therefore not result in the benefits that could be realised by the Proposed Development with regards to the import, storage and export at electricity, and the benefits this offers the grid and the viability of lower carbon energy. The Do-Nothing option on site has therefore not been considered in further detail.

Alternative Sites

41 The Applicant has identified that the site fulfils a number of key site selection criteria, whereby it is located within an area that requires additional backup capabilities to meet peak demand and can provide critical ancillary services at a strategic substation and important area of the grid network. The size of the site offers the potential for a large capacity Battery Energy Storage System facility, whilst also offering the potential to deliver significant Biodiversity Net Gain.

42 Furthermore, the Applicant holds an agreement with National Grid Electricity Transmission to connect its Battery Energy Storage System to Culham substation, located to the south-east of the site, which critically enables export and import for a battery system. The site location next to Culham substation presents the opportunity to precisely secure the right sort of grid connection offer allowing import and export for the battery system. The need for this type of facility is a direct consequence of the amount of renewable and intermittent generation that is now installed in the UK. The site location also provides direct and indirect benefit to the United Kingdom Atomic Energy Authority with regards to improved power security and resilience for their research facilities at Culham Science Centre.

43 Lastly, the site offers benefits with regards to the presence of a suitable access to / from the site, with its location away from main settlements and noise sensitive receptors. The existing condition and use of the site also offer benefits with regards to the lack of habitats with the potential to support protected species and given that the land is currently not used for intensive agricultural purposes.

44 As such, no alternative sites or locations have been considered by the Applicant for the Proposed Development.

Alternative Designs and Design Evolution

45 During the process of the designing the Proposed Development, no reasonable alternative schemes or designs (as a whole) have been developed, however the design of the Proposed Development has emerged and evolved to reflect the site constraints and opportunities, including key environmental considerations, and the outcomes from the pre-application consultation process with South Oxfordshire District Council. The design has also been guided by the Applicant's practical experience in developing and delivering Battery Energy Storage System sites. Furthermore, considerations with regards to functional requirements to ensure safe operation and optimum output and contractor specifications have also influenced the design evolution.

Key Design Considerations

46 The project team have worked extensively together to ensure that 'mitigation by design' principles have been incorporated into the evolving scheme, and so the evolution of the design has included, where relevant, consideration of environmental effects and issues.

47 Following analysis of the site and the surrounding context, initial design options were explored to test the site layout and design in order to assist in determining the most appropriate design for the site.

48 The key constraining factors considered during the design evolution of the scheme include:

- Existing overhead lines that run through the site;
- The site's location within the Nuneham Courtenay Registered Park and Garden, and the site's proximity to the Nuneham Courtenay Conservation Area;
- The Best and Most Versatile quality of the agricultural land on-site; and
- Existing arboriculturally valuable trees on the site.

49 Key objectives and opportunities for the site and the proposals include:

- Opportunity for significant Biodiversity Net Gain on-site, including the planting of native species and a number of targeted ecological enhancements within the site (as discussed further within the Environmental Statement);
- Provision of extensive landscaping, affording an enhancement to the setting of the Nuneham Courtenay Registered Park and Garden that will remain, and visual screening through targeted planting within the site from the Nuneham Courtenay Conservation Area to the north of the site;
- Creation of suitable drainage features to accommodate the increase in surface water runoff as a result of increased impermeable surfaces at the site;
- Provision of a new permissive path to allow access to a newly landscaped area; and
- Safe and optimal access to the site from the adjacent road network allowing access for heavy goods vehicles and emergency vehicles.

Consultation

50 Pre-application advice was sought from South Oxfordshire District Council, with a meeting held in September 2022. Written feedback was subsequently received, including responses from the Landscape Officer, Conservation and Design Officer, Oxford County Council (including the Transport Development Control Lead Officer, Flood Risk Engineer on behalf of the Lead Local Flood Authority, and Archaeologist), Forestry Officer and the Countryside Access Officer.

51 The feedback received recognised a number of constraints associated with the initial site layout and design. Of note, principal matters raised by the feedback included:

- The principle of development within the Oxford Green Belt;
- The potential landscape and heritage impacts associated with the development; and
- The potential loss of Best and Most Versatile agricultural land.

52 The Applicant has also undertaken thorough consultation with CEG (the promoter of a potential future housing development within the STRAT 9 allocated land to the west of the site). This engagement has focused around the operational noise of the facility and ensuring the facility can operate at an acceptable noise level in relation to the new proposed receptors.

Proposed Development Layout and Design Evolution

53 The design process has looked at various layout options. These were developed in response to inputs received during the consultation process and following an analysis of the site and surrounding context, as summarised above.

54 The fire and drainage design for the site has been influenced by other live applications where the Environment Agency and fire and rescue services have been consulted. As such, the Proposed Development design seeks to adhere to the latest guidance.

55 The key layout changes, and a description of how the layout has evolved between iterations of design, is provided below

56 Iterations 1 2 and 3 have been captured in Figures 7, 8 and 9 respectively, and the final Proposed Development layout is illustrated in Figure 10.

Iteration 1

57 The initial layout for the Proposed Development (Figure 7) was used to identify the broad shape and size of the Proposed Development elements and how theses would fit and be functional within the defined boundary of the site. This design iteration included 625 battery units with the layout focussing on locating the battery containers across the majority of the site. This was driven by maximising the potential output of the Battery Energy Storage System.

58 A number of spatial constraints were addressed in this initial design iteration, including:

- Avoiding electrical equipment under the overhead power lines;
- Maintaining an exclusion zone around the transmission towers for their stability and maintenance;
- Avoiding development over a water main which passes through the site from a Thames Water reservoir to the north;
- Avoiding development within an exclusion zone alongside the railway line; and
- Avoiding development adjacent to the existing concrete perimeter track to maintain access for large vehicles/loads.

59 Woodland planting was limited to the north and north-eastern extent of the site, with a single attenuation pond at the southern extent of the site. The Battery Energy Storage System substation within this design iteration was located within the southern extent of the site.

Iteration 2

60 Iteration 2 (Figure 8) built upon the initial concept design and included refinement of battery storage and inverter/transformer container locations across the site. This design iteration included a reduction of battery units to 432 units. This allowed for a greater extent of new woodland planning to the north, east and west of the containers. This was driven by the progressive landscape and visual impact assessment, which recognised the requirements for greater screening of the development from local receptors, particularly the Nuneham Courtenay Conservation Area to the north of the site.

61 This iteration includes the provision of an earth bund along the western extent of the site in order to screen the Proposed Development.

62 This design iteration also diverts the existing farm access within the site to the north of the existing group of trees at the north-eastern extent of the site. The location of the proposed substation and attenuation ponds were largely unchanged.

Iteration 3

63 Refinements were undertaken in Iteration 3 regarding the location of the battery storage and inverter/transformer container locations (see Figure 9), focussing on locating these elements within a smaller area at the southern extent of the site. This allows for a significantly greater area of new woodland and habitat provision at the northern and western extents of the site, affording the Proposed Development greater screening to local sensitive receptors, but also creating a much greater Biodiversity Net Gain. This site layout also removed all battery storage and inverter/transformer container within the Nuneham Courtenay Registered Park and Garden, with works within this area associated with the Proposed Development only comprising landscaping and the upgrading of the existing farm track.

64 The number of battery units was decreased to 296, with a more sympathetic design to the surroundings of the site. Despite the decrease, the system still offers a substantial generation asset to the grid. The southern attenuation pond has been re-sited following further drainage design to accommodate site surface water run-off and also to locate the pond next to new planting to enhance the ecological and biodiversity value of the waterbody. A second attenuation pond was added within the south-eastern extent of the site.

65 Inverters and transformers have been housed in sound insulated buildings to mitigate against potential noise spill. The inverter houses were designed to represent small agricultural buildings – 37 inverter houses are included, each housing 16 transformer / inverter units.

66 The substation has been relocated to the east of the Battery Energy Storage System, off of Thame Lane to site the customer substation as close to the Culham substation as possible to reduce the cable run and transmission losses. The existing farm access is maintained in its existing location within the final layout, with the Proposed Development proposing to upgrade this existing farm track to a 4.5m wide macadam surface.

67 The proposed earth bund along the western extent of the site was refined, screening the Proposed Development from the allocated urban expansion area (STRAT9 – Strategic Allocation of the South Oxfordshire Local Plan) and the section of the Oxford Green Belt Way footpath on the west side of the railway.

68 Furthermore, a number of permissible paths have been included within the final design iteration to allow for greater access to the site and new areas of habitat provision. Additionally, a 4m high acoustic fence was added to the western boundary of the site in response to futureproofing the site with regards to noise emissions and the potential for future development to the west of the site associated with the STRAT9 – Strategic Allocation.

Iteration 4 (Final Layout)

69 Further refinements have been made to the layout of the battery storage and inverter/transformer container locations (see Figure 10) to reflect additional fire safety measures, including additional and the re-location of fire water tanks for fire engine access across the site in the case of a fire and amendments to the internal routing to allow fire vehicles access around the outside perimeter of all units.

70 The attenuation pond within the south-eastern extent of the site has been removed as the western attenuation pond design has been established to meet the requirements of the Proposed Development with regards to site drainage. Drainage attenuation is also provided within a 500ml gravel layer in the site compound (see the **Flood Risk Assessment and supporting Conceptual Drainage Strategy** report submitted alongside the planning application).

71 The key difference between Iteration 3 and the final layout is the provision of a new tower within the north-eastern extent of the site. This tower will provide a cable easement to allow the connection of a second 400kV Didcot/Cowley circuit to the Culham Jet Substation. This will provide improved energy security and resilience and will reduce 400kV outages as the new cable will mean that the substation will be fed from two separate points of supply. The tower will be screened by strategic planting to reduce visual intrusion.

72 This final layout also includes an additional area of land to the west of the Culham substation to accommodate National Grid's new cable, which will be undergrounded connecting into the substation.

73 The site has also been designed with an impermeable membrane underneath the compound area to deal in response to the Environment Agency's concern over contaminated run off in the event of a fire and water being used to cool the neighbouring containers.

74 National Grid have also influenced the final design of the site with the addition of their plant.

Figure 7 Proposed Development Layout – Iteration 1

Figure 8 Proposed Development Layout – Iteration 2

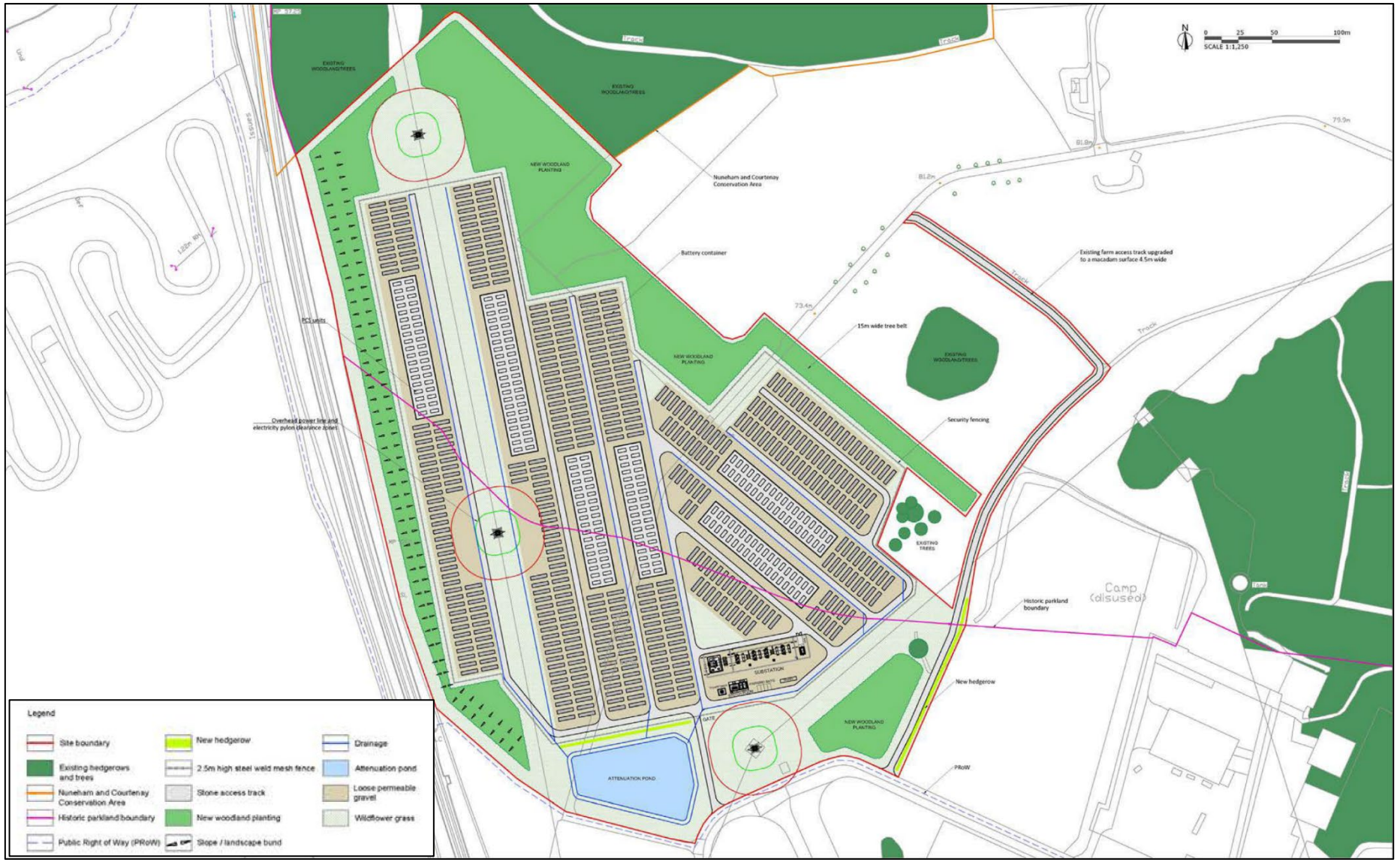


Figure 9 Proposed Development – Iteration 3

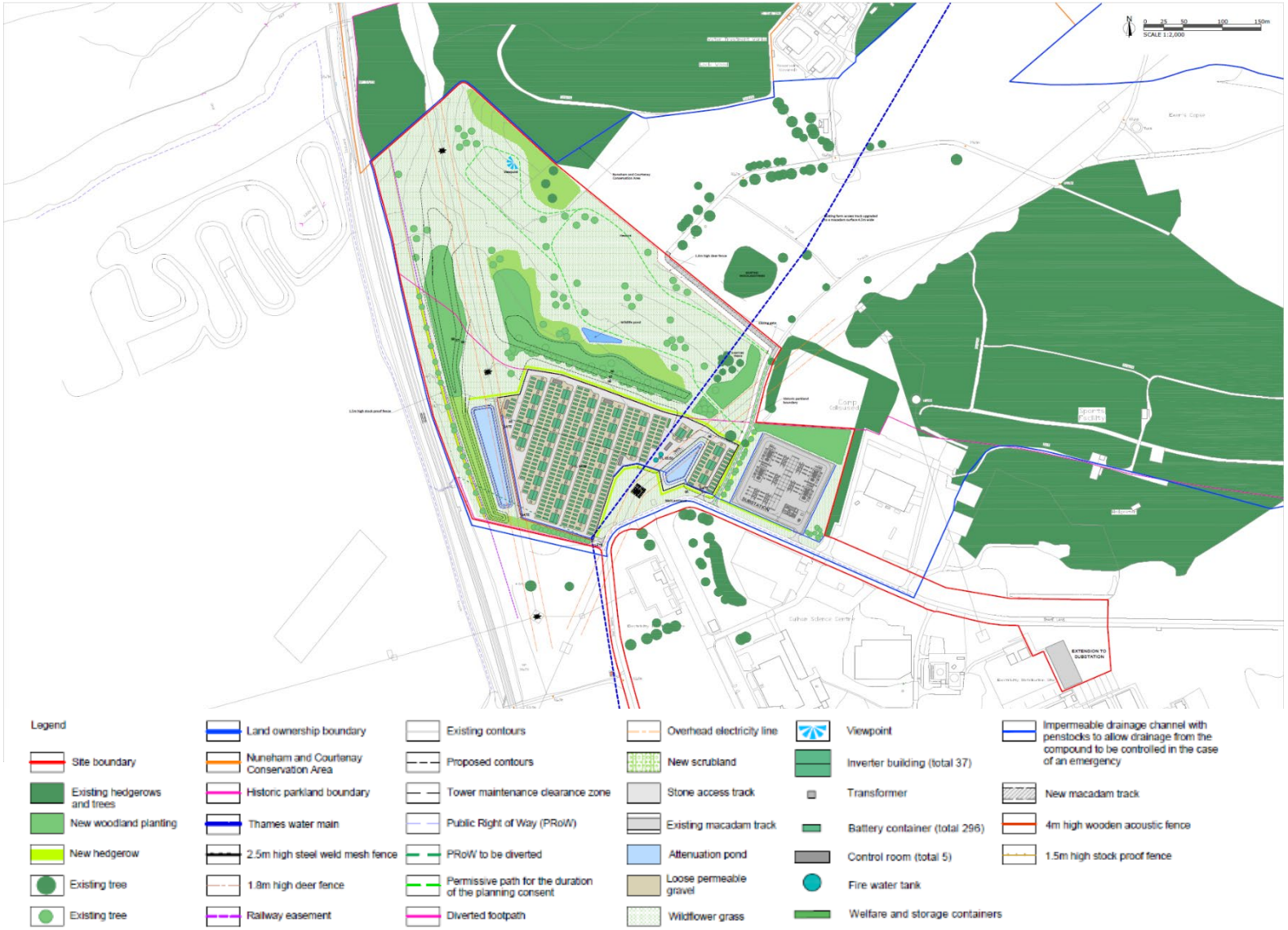
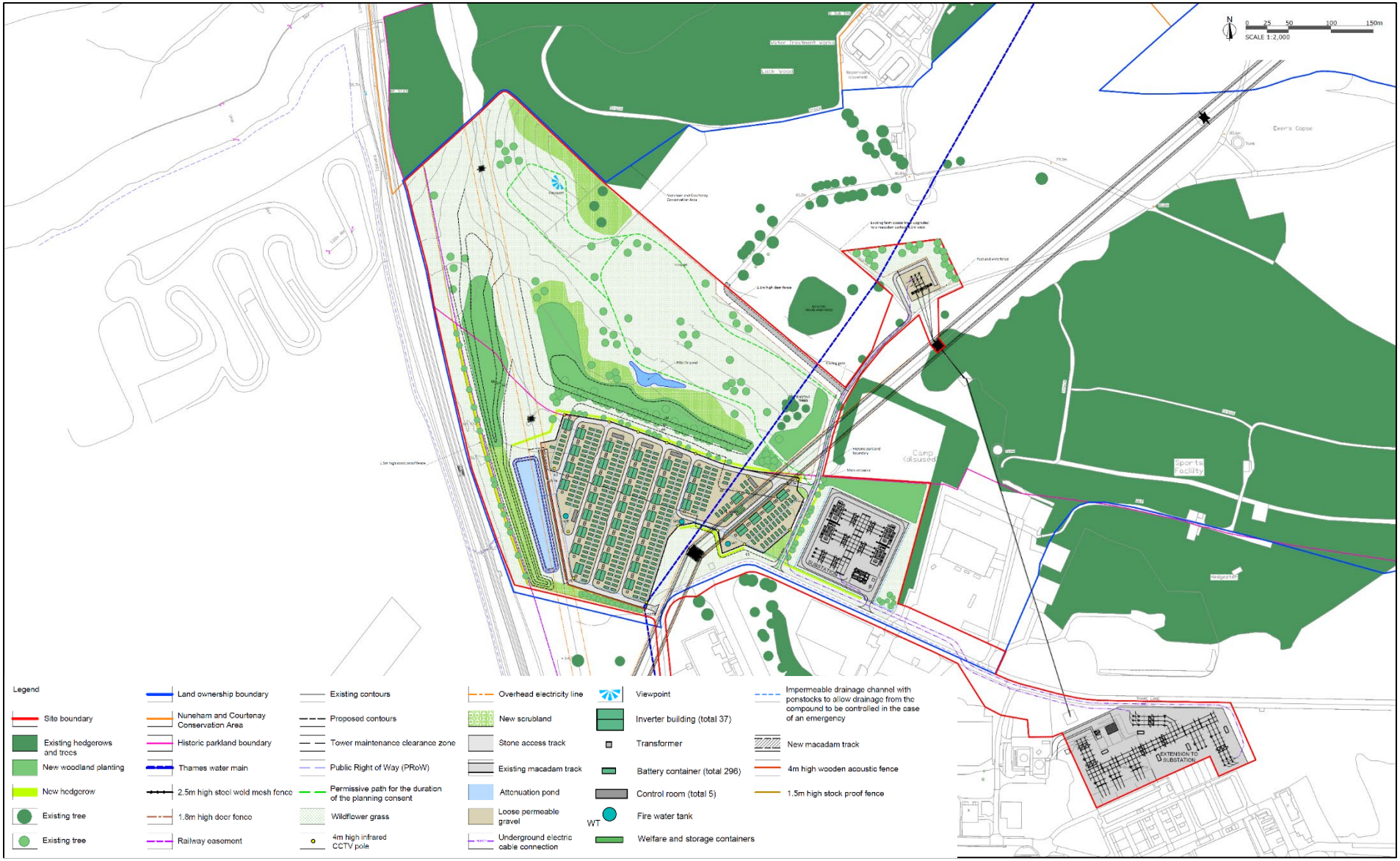


Figure 10 Proposed Development – Final Layout



THE PROPOSED DEVELOPMENT

75 The Proposed Development comprises a 500 megawatt battery storage facility, with 296 sound insulated lithium ion battery units housed within standard shipping containers (6.3m x2.4m x 2.8m) and 37 larger (12m x 9.5m x 4.05m) noise insulated inverter houses to accommodate the inverters and transformers.

76 Furthermore, the Proposed Development will comprise the following components:

- Vehicle tracks 4.5m wide and vehicle hardstanding areas;
- Loose permeable gravel around the battery units and buildings, with an impermeable membrane layer lining the compound areas;
- Erection of 2.4m high weldmesh fencing around the compounds (steel palisade around the customer substation) and 4m high wooden acoustic fence. CCTV security cameras will be mounted on 4m high posts;
- Three water storage tanks;
- An electricity substation compound with a seven 33 Kilovolt switch house/control room (13m x 5.5m x 3.5m), comprising transformers, busbars and other equipment of up to 10m in height;
- One storm water attenuation lagoon;
- A new permissive path within a landscaped area at the northern extent of the site;
- A 4m high acoustic fence that runs along the west and south side of the Battery Energy Storage System compound;
- An earth bund along the western boundary of the site;
- Removal of the non-public highway track (Thame Lane) within the site, and the upgrading of the existing farm track to a 4.5m wide macadam surface;
- Works to be undertaken by the National Grid Electricity Transmission as the statutory undertaker for electricity transmission in England and Wales.
  - a new drawn down tower,
  - cable easement, and
  - substation extension.
- Extensive landscaping in the form of hedge and woodland planting, and provision of a wildlife pond.

77 The grid connection for the Proposed Development would be via high voltage underground cable from the National Grid Substation on Thame Lane to the south of the site.

78 Works to be undertaken by the National Grid Electricity Transmission includes an extension to one of the existing substations within the Culham Science Centre as part of a wider upgrade of its electrical infrastructure. The extension will be on the east side of the northern substation. A high voltage underground cable will run from this extension to a proposed connection tower, which will be situated within the Registered Park and Garden, north of the battery energy storage system. The tower will allow the underground cable to connect aerially across to the existing overhead line. In terms of functionality, this is the only practical point of connection. The connection tower will be set within a compound protected by palisade fencing with proposed scrub and tree planting to reduce its visibility within the landscape.

Layout

79 Figure 10 shows the layout plan of the Proposed Development. Containers within the Proposed Development will be arranged in several parallel blocks to fit the shape of the site, considering the presence of the existing hedgerows and overhead power lines crossing the site.

Appearance

80 The containers proposed have been selected to reduce impact in terms of scale and visibility. The colour of the containers are proposed to be a dark green colour to better blend them into their surroundings.

Access and Parking

81 The Proposed Development, when operational, will be operated automatically, with limited need for personnel on site. Development traffic will likely comprise occasional maintenance vehicle access for security checks and routine maintenance, primarily by car and van as and when required, from the public road Thame Lane via the retained construction access. Operational visits are unlikely to involve more than three to four visits per week. A small number of parking spaces are available for occasions on-site for when personnel attend the site.

82 Within the site, internal access roads are also provided, as shown in Figure 11.

Operation and Maintenance

83 Due to the nature of the ancillary services provided by the Proposed Development, unlike a traditional power station, the facility needs to respond very rapidly to calls of frequency voltage and reactive power support and peaks in energy demand. It is therefore not possible to forecast any standard hours of operation or operational staff numbers. However, even when in operation, there is minimal on-site activity required during the plant lifecycle. The facility will be unmanned and be remotely controlled / monitored, with activity limited to occasional visits to undertake security checks and routine maintenance. It is unlikely to involve more than 3 or 4 visits by car or small van over a typical week with vehicle access being from Thame Lane via the retained construction access.

Construction Phase Logistics

Programme

84 The Applicant holds an agreement with National Grid Electricity Transmission to connect its Battery Energy Storage System to Culham substation. This agreement states a connection date in 2027. For National Grid Electricity Transmission to facilitate the connection, it is required to expand the existing substation which is subject to its own consenting and land optioning requirements.

85 Construction of the Proposed Development is anticipated to be undertaken over an 18-month construction programme, with approximately 8 to 10 months for civil works and 8 months for commissioning.

Construction Works Overview

86 The construction activities will comprise the following phases:

- Enabling works;
- Ground civil works;
- Main civil works;
- Electrical connection works; and
- Commissioning.

87 Typical construction plant and equipment to be used will include excavators, drilling rigs, graders and haulage vehicles, mobile and tower cranes, heavy and light goods vehicles.

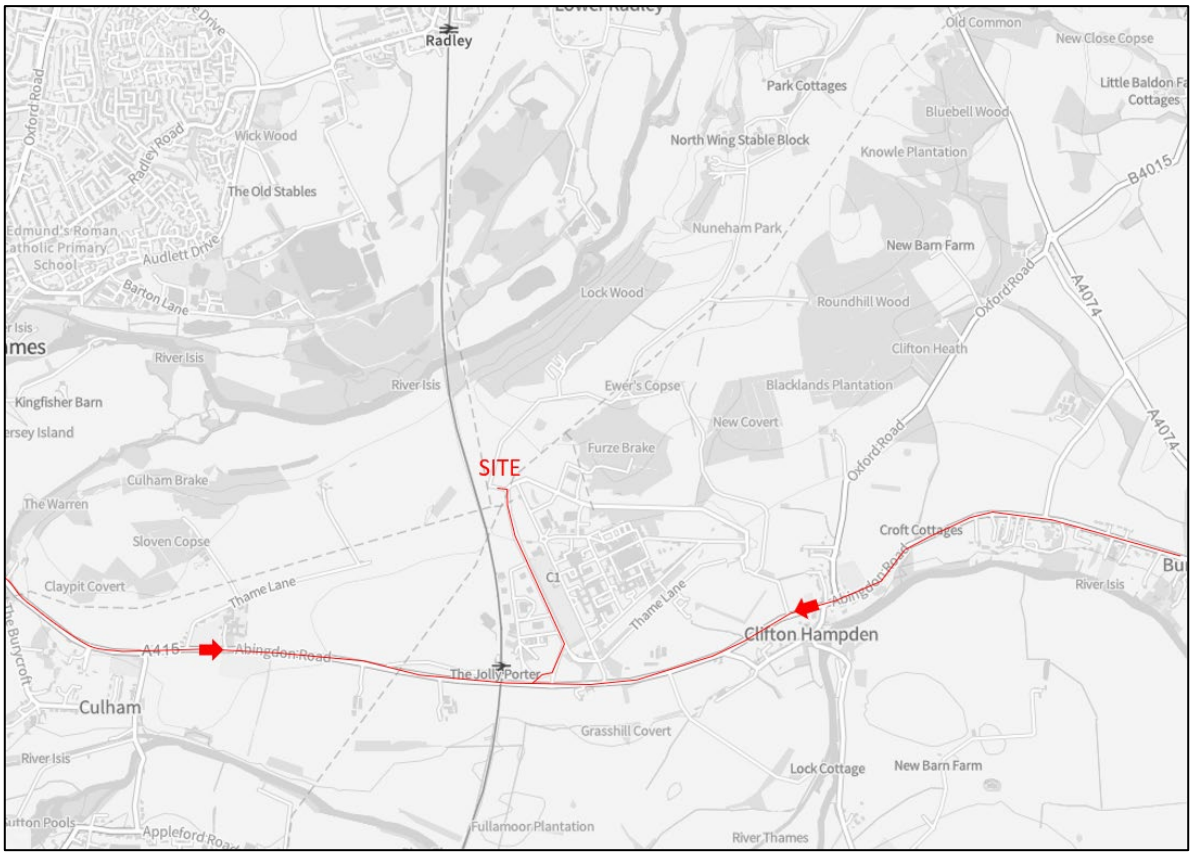
88 Normal construction working hours will be Monday to Friday 07:00–18:00 and Saturday 07:00–13:00 during winter months (October to March) and Monday to Friday 07:00-20:00 and Saturday 07:00-13:00 during summer months. Construction work and construction traffic movements shall not take place on Sun-days, bank holidays or after 13.00 on a Saturday unless such work is associated with an

emergency or with the prior written consent of the Local Planning Authority. Construction laydown areas would be located within the site boundary.

Construction Access

89 It is anticipated that all construction traffic will route via the M4 or M40 before utilising the local routes to access the site, as illustrated in Figure 11. All construction vehicles will approach the site via Abingdon Road (A415) and use the eastern junction with Station Road.

Figure 11 Construction Access Route for HGVs



Construction Traffic

90 The deliveries (and staff) will be directed to the construction compound. Equipment will be stored in the construction laydown area until it is required within the construction site, however much of the equipment will arrive pre-assembled and be installed directly on arrival.

91 Based on previous experience from other similar sites it has been considered that the development of a Battery Energy Storage System facility requires 1 Heavy Goods Vehicle per modified battery container. The 500 megawatt battery storage facility will therefore likely require approximately 296 Heavy Goods Vehicle loads (containers on 16.5m articulated lorries) to deliver the battery containers and associated electrical equipment. These deliveries will take place evenly over an approximately 8-week period which equates to approximately 37 loads per week or approximately 6 loads per day. Heavy Goods Vehicle movements across the programme as a whole are forecast to peak at approximately 35 per week or approximately 7 per day.

92 Traffic will be managed through traffic management principles, programming and coordination of all construction works and associated traffic to the site.

93 Further information regarding construction traffic can be found within the **Construction Traffic Management Plan**

Landscaping

94 The landscape design aims to mitigate the loss of rural character of the site resulting from the construction of the Proposed Development and seeks to enhance the setting of the higher quality Park and Garden.

95 The extensive landscape scheme includes the provision of woodland planting at the northern and eastern extents of the site, new scrubland, scattered tree planting, and hedge planting along the western, southern and north-eastern boundaries of the developed site area. The on-site attenuation basin will also be landscaped and managed to enhance biodiversity.

96 It is also proposed to erect an earth bund between the railway line and the overhead power lines and also to the north of the battery infrastructure. The aim of this earth bund is to screen the Proposed Development from the allocated urban expansion area (STRAT9 Strategic Allocation of the South Oxfordshire Local Plan) and the section of the Oxford Green Belt Way on the west side of the railway, and also the Registered Park and Garden and Conservation Area to the north. The bunding also assists acoustically and will also reduce views of the STRAT9 Strategic Allocation allocated site from higher ground within the Nuneham Courtenay Registered Park and Garden, particularly once the tree and hedge planting has established.

97 Furthermore, the Proposed Development's landscape design includes the retention of scattered trees in the north-east of the site, the enhancement of retained modified grassland habitats, and the inclusion of native species-rich hedgerow around the boundaries of the compound with some standard trees within the western hedgerow.

Ecological and Biodiversity Enhancements

Ecological Enhancements

98 The following ecological enhancements have been embedded within the design of the Proposed Development:

- The creation of 10.7 hectres of other neutral grassland;
- Two log piles 2m length and width and 1.5m height will be installed on the north of the site, alongside the existing neutral grassland habitat (on the edges of the modified grassland habitat which will be subject to enhancement);
- Three woodcrete / woodstone bat boxes (e.g., 2F Schwegler Bat Box) suitable for crevice-dwelling species will be installed on the scattered trees in the north-east of the site; and
- Three woodcrete / woodstone bird boxes suitable for starlings, woodpeckers and nuthatches (e.g., 3S Schwegler Starling Nest Box) or similar will be installed on the scattered trees in the north-east of the site.

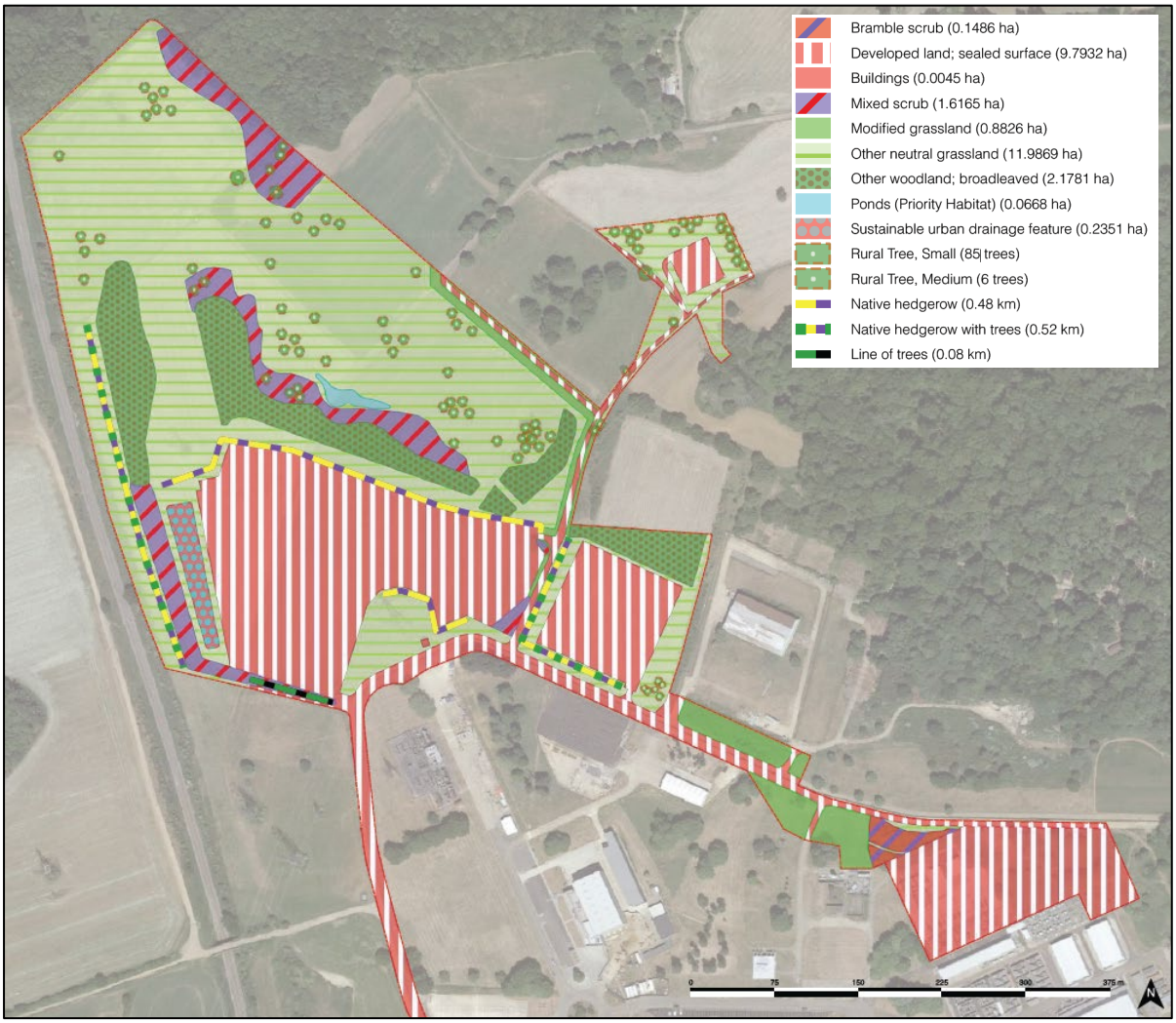
99 More information regarding ecological enhancements can be found within the Ecological Impact Assessment (**ES Volume 3, Appendix: Ecology and Biodiversity - Annex 1**).

Biodiversity Enhancements

100 After the implementation of on-site measures, the Proposed Development will deliver a net gain of 44.36 habitat units (i.e., a 68.51% increase from the baseline). The native species-rich hedgerow being created on-site will deliver 5.10 hedgerow units. Therefore, the Proposed Development ensures an achievement in biodiversity net gain at the site, satisfying the mandatory 10% net gain requirement under the Environment Act 2021 and Policy ENV3 of the South Oxfordshire District Council Local Plan, by improving biodiversity through the design of the new development.

101 More information relating to the Biodiversity Net Gain Calculations and the methods applied can be found within the Ecological Impact Assessment and the Biological Impact Assessment located in **ES Volume 3, Appendix: Ecology and Biodiversity - Annex 1 and Annex 2**. Figure 12 shows a plan of the different habitats included within the Proposed Development design.

Figure 12 Habitats Plan



Drainage and Flood Risk

Operational Drainage

102 The Proposed Development will increase the low permeability area on-site. The battery and substation infrastructure will sit on a porous gravel surface. The layout plan (Figure 10) includes an on-site attenuation basin at the western extent of the site for drainage attenuation. Drainage attenuation is also provided within a 500ml gravel layer in the site compound. Surface run off will be controlled at an agreed runoff rate.

103 More information regarding drainage can be found within the **Flood Risk Assessment and supporting Conceptual Drainage Strategy** report which is being submitted as a standalone report with the planning application.

Crime and Lighting

104 The facility will be enclosed by new 2.5m high fencing to offer site security and ensure that the equipment is protected from vandalism. CCTV units will include infrared capability for use at night-time.

105 As the facility is unmanned, only limited operational lighting is required.

Waste

106 Battery Energy Storage System facilities do not generate significant volumes of waste material during construction or operational phase. The materials anticipated to be required during the operational phase are expected to be limited to maintenance only.

107 The site will be controlled by a Site Waste Management Plan which will be submitted to the South Oxfordshire District Council prior construction phase, and will assist with the management of any construction waste.

108 An agreement is in place between the Applicant and the lithium-ion battery provider to ensure that at the end of the life of the batteries, as part of any future decommissioning works, the batteries will be recycled in line with appropriate industry standards by the manufacturer.

Fire Risk Management

109 Efforts to minimise and mitigate fire risk can be broken down across four main areas:

- **Battery energy storage system planning & design**: this includes the overall design of the site and specifically the separation of battery containers and other major equipment, i.e., transformers, inverters and sub stations. The spacing of containers is based on National Fire Protection Association standard NFPA855 (standard for the installation of stationary energy storage systems) which requires a 3m separation between containers. NFPA855 is a commonly applied and well-respected standard for batteries in the UK. The likely battery technologies have also been tested to UL9540A to rack level and the Lithium Iron Phosphate chemistry does not exhibit thermal runaway until temperatures are in the region of 150-200 degrees C, which is well above all thermal cut outs, and almost certainly never to be seen in operation. The batteries themselves also have overtemperature protection and fire suppression initiation. Suitable facilities for safely accessing and egressing the site are also provided, including
  - Two separate access points to the site to account for opposite wind conditions/direction;
  - Roads/hard standing capable of accommodating fire service vehicles in all weather conditions;
  - A perimeter road or roads with passing places suitable for fire service vehicles; and
  - Road networks on sites enabling unobstructed access to all areas of the facility.
- **Battery energy storage system construction**: the Engineering, Procurement, and Construction (EPC) contractor will have experience and familiarity with battery energy storage system technology, whereby causes for battery energy storage system fires can result from poor workmanship and the EPC contractor's lack of experience in the sector. Other important construction factors include the use of non-combustible materials within the insulation of the battery containers and the chosen ventilation and suppression systems for the site.
- **Battery energy storage system fire protection systems**: the battery energy storage system operator will ensure an adequate water supply is available for firefighters and that the local fire brigade have visited the site to familiarise themselves with the site. The fire brigade will have a plan devised to prevent any reignition scenarios and thermal runaway, and will be aware of Site Specific Risk Information (SSRI), including ensuring that the manufacturers' operational risk information is available for responding crews and the hazards associated with battery energy storage systems are fully understood. The SSRI will inform an effective Emergency Response Plan. Remote and continuous online monitoring, early detection sensors, appropriate venting to avoid the build-up of gas and automatic fire suppression systems to NFPA855 standard will also be in place. The battery energy storage system will be built according to established fire standards such as NFPA855 and/or IFC 2018/20, which address issues such as fire protection, spacing and ventilation; using battery technology tested to UL9540a (Large Scale Fire testing). Should thermal runaway conditions be detected, there will be a facility in place for the early alerting of emergency services. Detection systems will also be in place for alerting to other fires that do not involve thermal runaway (for example, fires involving electrical wiring). Continuous

combustible gas monitoring within units will also be provided. External audible and visual warning devices, as well as addressable identification at control and indicating equipment, will be utilised - this will enable first responders to understand what the warning is in relation to and aid in their decision-making. Suitable fixed suppression systems will be installed in units in order to help prevent or limit propagation between modules.

- **Battery energy storage system maintenance**: the site will have a dedicated maintenance schedule including monthly preventive checks, and thermographic testing. Site maintenance will include ensuring that combustibles are not stored adjacent to units and access is clear and maintained. Areas within 10m of battery energy storage system units will be cleared of combustible vegetation and any other vegetation on site will be kept in a condition such that they do not increase the risk of fire on site.
- **Signage**: signage will be installed in a suitable and visible location on the outside of battery energy storage system units identifying the presence of a BESS system. Signage will also include details of:
  - Relevant hazards posed;
  - The type of technology associated with the battery energy storage system;
  - Any suppression system fitted; and
  - 24/7 Emergency Contact Information.
- **Emergency plans**: site operators will develop emergency plans and share these with the Fire and Rescue Service. These include:
  - A Risk Management Plan - developed by the operator, which provides advice in relation to potential emergency response implications including:
    - The hazards and risks at and to the facility and their proposed management;
    - Any safety issues for firefighters responding to emergencies at the facility;
    - Safe access to and within the facility for emergency vehicles and responders, including to key site infrastructure and fire protection systems;
    - The adequacy of proposed fire detection and suppression systems (e.g., water supply) on-site; and
    - Natural and built infrastructure and on-site processes that may impact or delay effective emergency response.
  - An Emergency Response Plan - developed to facilitate an effective and safe emergency response, including:
    - How the fire service will be alerted;
    - A facility description, including infrastructure details, operations, number of personnel, and operating hours;
    - A site plan depicting key infrastructure: site access points and internal roads, firefighting facilities (water tanks, pumps, booster systems, fire hydrants, fire hose reels etc), drainage and neighbouring properties;
    - Details of emergency resources, including fire detection and suppression systems and equipment, gas detection, emergency eye-wash and shower facilities, spill containment systems and equipment, emergency warning systems, communication systems, personal protective equipment and first aid;
    - Up-to-date contact details for facility personnel, and any relevant off-site personnel that could provide technical support during an emergency;
    - A list of dangerous goods stored on site;

- Site evacuation procedures; and
- Emergency procedures for all credible hazards and risks, including building, infrastructure and vehicle fire, grassfire and bushfire.

110 The Fire Liaison Framework submitted in support of the planning application sets out the principles which underpin the Fire Liaison Framework, as well as the long-term approach with regards to fire and rescue liaison throughout the planning, commissioning and operational delivery phases of the Battery Energy Storage System scheme. Consultation will be undertaken with the local fire service and stakeholders throughout these phases as appropriate, as set out within the Fire Liaison Framework.

Decommissioning Phase

111 The Proposed Development is intended to function for a maximum of 40 years. Following this 40-year lifespan, the development will be dismantled and the land will be returned to its original state for agricultural purposes.

112 Once the Proposed Development is no longer in use, the lithium-ion batteries and other infrastructure contained within their containers will be extracted. An outstanding portion of the materials can currently be recycled. As the site will mainly consist of grassland, with minimal foundations, hard surfacing, and heavy infrastructure, restoring the land will be relatively easier to restore compared to a more intrusive developments that require more extensive foundations.

ENVIRONMENTAL IMPACT ASSESSMENT

113 The following sections of this Non-Technical Summary present a summary of the environmental technical topic assessments that have been undertaken. The tables within each section only provide a summary of the **significant** effects identified. Further details can be found within the Environmental Statement (**Volumes 1, 2 and 3**).

Cultural Heritage

114 The Cultural Heritage assessment undertaken has considered the effects of the enabling and construction, the operation and the decommissioning of the Proposed Development upon cultural heritage assets on and near the site and on the settings of any cultural heritage assets proximate to the site, including both above ground (built heritage) and below ground (archaeological) assets.

Enabling and Construction

Archaeology

115 The Proposed Development is considered to have the potential to have a Minor Adverse (**Significant**) effect on Later Prehistoric (Bronze Age) activity, Later Prehistoric (Iron Age) activity, and Roman activity buried archaeological remains, and a Moderate Adverse (**Significant**) effect upon Early Prehistoric Flintwork and Neolithic artefact finds and features during the enabling and construction phase. Completion of further evaluation trial trenching works will be undertaken. The Written Scheme of Investigation submitted with the Environmental Statement outlines the scope of the trial trenching and sets out that further work may be undertaken if remains are identified during the evaluation trial trenching.

116 Mitigation of the archaeological remains through excavation or similar strategy would ensure that any archaeological remains within the site are appropriately preserved by record prior to any adverse construction effects. Any strategy would be agreed with South Oxford District Council and their archaeological advisor in advance of development.

Built Heritage

117 There is potential for the enabling and construction works to result in Moderate Adverse (**Significant**) effects at Nuneham Courtenay Registered Park and Garden and Nuneham Courtenay Conservation Area given the proximity of the Proposed Development to these receptors and associated introduction

of visual changes and activity, along with additional noise and vibration, altering the ability to appreciate the importance of the heritage assets.

118 These significant adverse effects would be temporary and restricted to the construction phase of the Proposed Development, predominantly associated with the 8 to 10 months civils phase of the programme.

Completed Development

Archaeology

119 Whilst the ability to undertake archaeological fieldwork does not reduce the significance of effect upon the archaeological remains during construction, appropriate fieldwork followed by dissemination of the acquired data would be considered a residual beneficial effect during the operation of the Proposed Development, albeit a Negligible to Minor Beneficial effect and therefore Not Significant.

Built Heritage

120 During its operation, the Proposed Development will result in the expansion of the industrial area to the south, introducing new units into views looking south from the designated heritage assets. This will reduce the arable landscape visible from these assets, however, as the Proposed Development would be experienced against the backdrop of the existing Culham Science Centre industrial complex, it will not significantly alter the character of the views looking south from the designated heritage assets. Furthermore, the impact of the completed Proposed Development upon built heritage assets has been significantly reduced by embedded mitigation measures, primarily relating to proposed landscaping.

Decommissioning

Archaeology

121 **No effects** are anticipated with regards to archaeology during and following the decommissioning of the Proposed Development.

Built Heritage

122 As with the enabling and construction phase, there is potential for the decommissioning works to result in Moderate Adverse (**Significant**) effects at Nuneham Courtenay Registered Park and Garden and Nuneham Courtenay Conservation Area given the proximity of the Proposed Development to these receptors.

123 These significant adverse effects would be temporary and restricted to the decommissioning activities associated with the removal of the battery storage infrastructure.

Likely Significant Effects

124 Table 3 summarises the significant cultural heritage effects of the Proposed Development.

Table 3 Significant Cultural Heritage Effects

Receptor	Description of Likely Significant Effect	Scale and Nature of Residual Effect
Enabling and Construction		
Early Prehistoric Flintwork and Neolithic artefact finds and features	Effect of ground establishment works and construction activities on known and potential below ground archaeological remains and deposits	**Moderate Adverse** (Regional)
Later Prehistoric (Bronze Age) activity within the site, Identified Later Prehistoric (Iron Age) activity within		**Minor Adverse**[4] (Regional)

[4] *As set out in **ES Volume 1, Chapter 3: Cultural Heritage**, professional judgement has been used to determine whether an effect is significant or not. Where mitigation such as archaeological evaluation works may reduce the scale of an effect, the effect significance may remain the same. As such, a Minor Adverse effect may still be considered as 'Significant'.*

Receptor	Description of Likely Significant Effect	Scale and Nature of Residual Effect
the site, and Identified Roman activity within the site		
Nuneham Courtenay Registered Park and Garden and Nuneham Courtenay Conservation Area	Alteration to setting through construction works, including noise, dust, vehicle and construction plant movements and visual changes.	**Moderate Adverse** (National)
Decommissioning		
Nuneham Courtenay Registered Park and Garden and Nuneham Courtenay Conservation Area	Alteration to setting through decommissioning works, including noise, dust, vehicle and plant movements and visual changes.	**Moderate Adverse**[5] (National)

Land Take and Soils (Agriculture)

125 The land take and soils (agriculture) assessment has focussed on the following potential effects:

- Loss of agricultural land, including that of best and most versatile quality;
- Loss of and damage to the soil resources;
- Reinstatement of agricultural land use; and
- Enabling on-site soil resources to fulfil existing primary functions.

Enabling and Construction

Agricultural Land

126 The Proposed Development would result in the loss of 21.4 hectares of Best and Most Versatile agricultural land in Grade 2 and Subgrade 3a (of good to very good quality) during the enabling and construction period.

127 Areas of built development that require the use of agricultural land should be directed toward the lowest quality of agricultural land available, so far as is practicable, although the avoidance of Best and Most Versatile land is not possible on the site as all of the agricultural land is within the Best and Most Versatile category. There are no measures available to mitigate the loss of agriculture land during the enabling and construction period, therefore the loss of agriculture land has been assessed as being a Moderate Adverse effect (**Significant**).

128 It should be noted that although there will be a significant adverse effect with regards to the loss of agricultural land, whilst the site comprises Grade 2 and Subgrade 3a land, the land is currently harvested for hay and silage use, and as such is not utilising the site to its full potential from an agricultural point of view.

Soil Resources

129 Soil resources will be affected by the construction activities of the Proposed Development. As a primary function of the soil resource (agricultural use) will be lost, the effect upon soil resources during enabling and construction has been assessed as being a Moderate Adverse effect (**Significant**).

130 The Construction Environmental Management Plan, to be secured by condition attached to any planning permission, will address the measures set out in the Defra Construction Code of Practice for the Sustainable Use of Soils, which includes the most appropriate re-use for the different types of soils within the site, as relevant, and the proposed methods for handling and storing soils on-site. The adoption of these measures will ensure that the soil resources on-site will be able to continue to fulfil various ecosystem services and functions.

131 It should be noted that given that soils will not be removed from the site, most soils will be able to continue other various primary ecosystem functions on the site, principally as a medium for producing

[5] *Note, long-term effects associated with the permanent features (landscaping and the connection tower) within the Registered Park and Garden are considered to have an overall Negligible effect.*

biomass; for storage and cycling of water and carbon; and for supporting habitats, biodiversity and landscape planting.

Completed Development

132 **No effects** are anticipated once the Proposed Development is complete and operational.

Decommissioning

Agriculture Land

133 Following decommissioning, the reinstatement of the site to productive agricultural use would be a Negligible effect (Not Significant).

Soil Resources

134 Following decommissioning, the reinstatement of the site to productive agricultural use would allow the soil resources to fulfil their existing primary functions in addition to the other various ecosystem services and functions maintained throughout the operation of the Proposed Development. As such, the effect on soil resources will be a Negligible effect (Not Significant).

Likely Significant Effects

135 Given the above, Table 4 summarises the significant land take and soils (agriculture) effects of the Proposed Development during enabling and construction phase. No likely significant effects have been identified as a result of the completed development and following decommissioning.

Table 4 Significant Land Take and Soils (Agriculture) Effects

Receptor	Description of Likely Significant Effect	Scale and Nature of Residual Effect
Enabling and Construction		
Best and Most Versatile agricultural land	Loss of 21.4 hectares of land in Grades 2 and Subgrade 3a	**Moderate Adverse** (Local)
Soil resources	The soil is unable to fulfil all of its primary functions due to loss of agricultural land	**Moderate Adverse** (Local)

Climate Change

136 The climate change assessment is divided into two parts: Part A Climate Change Resilience and Adaptation and Part B Green House Gases Assessment. Part A addresses climate change resilience and adaptation and considers the potential for climate change to affect the Proposed Development, and Part B has focused on the effect of the operational Proposed Development on climate change with regards to the indirect avoidance of greenhouse gases facilitated by the Proposed Development.

Part A Climate Change Resilience and Adaptation

137 A future climate scenario has been considered within each of the technical topics covered in this Environmental Statement through the use of the future climate projections published by the Met Office (through the UK Climate Projections (UKCP18) website) and in accordance with the IEMA guidance '*Climate Change Resilience and Adaption*' (2020)'[6].

138 The aim of the assessment has been to consider whether the residual effect on receptors (under the current condition, without climate change) are likely to be different under an alternative future climate regime; in particular, to identify whether the potential impacts and residual effects of the Proposed Development will be worse or improve under the future baseline, and therefore if these changes alter the significance of effects identified for the Proposed Development under the current condition (without

[6] *IEMA (2020). Climate Change Resilience and Adaption (website: https://www.iema.net)*

climate change). A key aspect of the assessment (for each of the technical topics considered) has been to identify the likely effect of those receptors considered more vulnerable to changes in climate, having taken into account the resilience and adaptive measures (being either design or management) which are proposed for the Proposed Development in order to mitigate the risk presented by climate change.

139 The assessment has identified that the Proposed Development will adapt to and be resilient to climate change through the implementation of design measures such as:

- Measures to minimise the risks of increased flood risk and surface water run-off affecting the site or others, through the provision of attenuation basins on-site; and
- Selection of native and resilient planting for incorporation into the landscaping to reduce potential future maintenance / replacement.

140 Following the assessment of the future climate change scenario on the relevant technical topics (cultural heritage, land take and soils (agriculture) and landscape and visual), it is considered the residual effects of the Proposed Development would remain consistent with the effects identified as described throughout the Environmental Statement, and therefore no additional or different likely significant effects (in terms of the effect of climate change on the Proposed Development) have been identified.

Part B Greenhouse Gas Emissions Assessment

141 A greenhouse assessment was undertaken for the operational Proposed Development. Greenhouse gases are gases which have the potential to increase atmospheric temperatures, and which contribute to climate change. The Proposed Development will lead to the indirect avoidance of greenhouse gases throughout its operational lifetime.

142 It has been assumed that the Proposed Development would store renewable energy (likely generated by offshore wind, with the possibility of alternative sources), thereby enabling the displacement of gas-fired peaking plants. As such, the Proposed Development indirectly removes GHG emissions, that would otherwise have been emitted, from the atmosphere. Further, the development of energy storage facilities meets energy sector policies requiring an increased flexibility and adaptability of renewable energy supply to enable continued grid electricity decarbonisation.

143 The assessment established that the avoided greenhouse gases emissions from the operational phase of the Proposed Development in relation to the global atmospheric mass of the relevant greenhouse gases (a high sensitivity receptor) would result, conservatively, in a Negligible to **Significant** Beneficial effect. This significant beneficial effect is established on the basis that:

- it contributes to reducing carbon budget expenditure at a national and local level;
- it has an emissions intensity significantly lower than the grid average and that of the current baseline for flexible energy generation; and
- it is in keeping with local and UK energy and climate policy.

144 The Proposed Development is in line with the National Planning Policy Framework's principle of supporting new renewable and low carbon energy developments, in addition to their associated infrastructure, in order to contribute to reductions in greenhouse gases emissions. Further, the Proposed Development is supported by national energy and climate change policy (including the National Infrastructure Strategy, Sixth Carbon Budget, and Net Zero Strategy) which promote the decarbonisation of grid electricity, aided by the implementation of energy storage technologies.

145 By facilitating the expansion of renewable energy supply, the Proposed Development would assist the UK Government target of achieving a fully decarbonised power system by 2035, and becoming net zero by 2050.

Likely Significant Effects

146 Given the above, Table 5 summarises the significant climate change effects of the Proposed Development once is completed and operational.

Table 5 Significant Climate Change Effects

Receptor	Description of Likely Significant Effect	Scale and Nature of Residual Effect
Completed and Operational		
Global atmospheric mass of the relevant GHGs and consequent warming potential	Avoided greenhouse gas emissions due to the nature of the project	Negligible - **Significant Beneficial** (National)

Landscape and Visual

147 The landscape and visual impact assessment has considered the impact of the Proposed Development on potentially affected heritage receptors, landscape character areas, and visual receptors. Heritage receptors include designated heritage assets, such as World Heritage Sites, Scheduled Monuments, Listed Buildings, Registered Park and Gardens and Conservation Areas, as well as non-designated heritage assets, such as locally listed buildings. A landscape character area is identified as a distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and/or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse. The visual impact assessment relates to how people will be affected by changes in views and visual amenity at different places, including publicly accessible locations.

148 Figure 13 and Figure14 show the localised and long-distance viewpoints considered within the landscape and visual impact assessment respectively.

Figure 13 Localised Viewpoint Locations

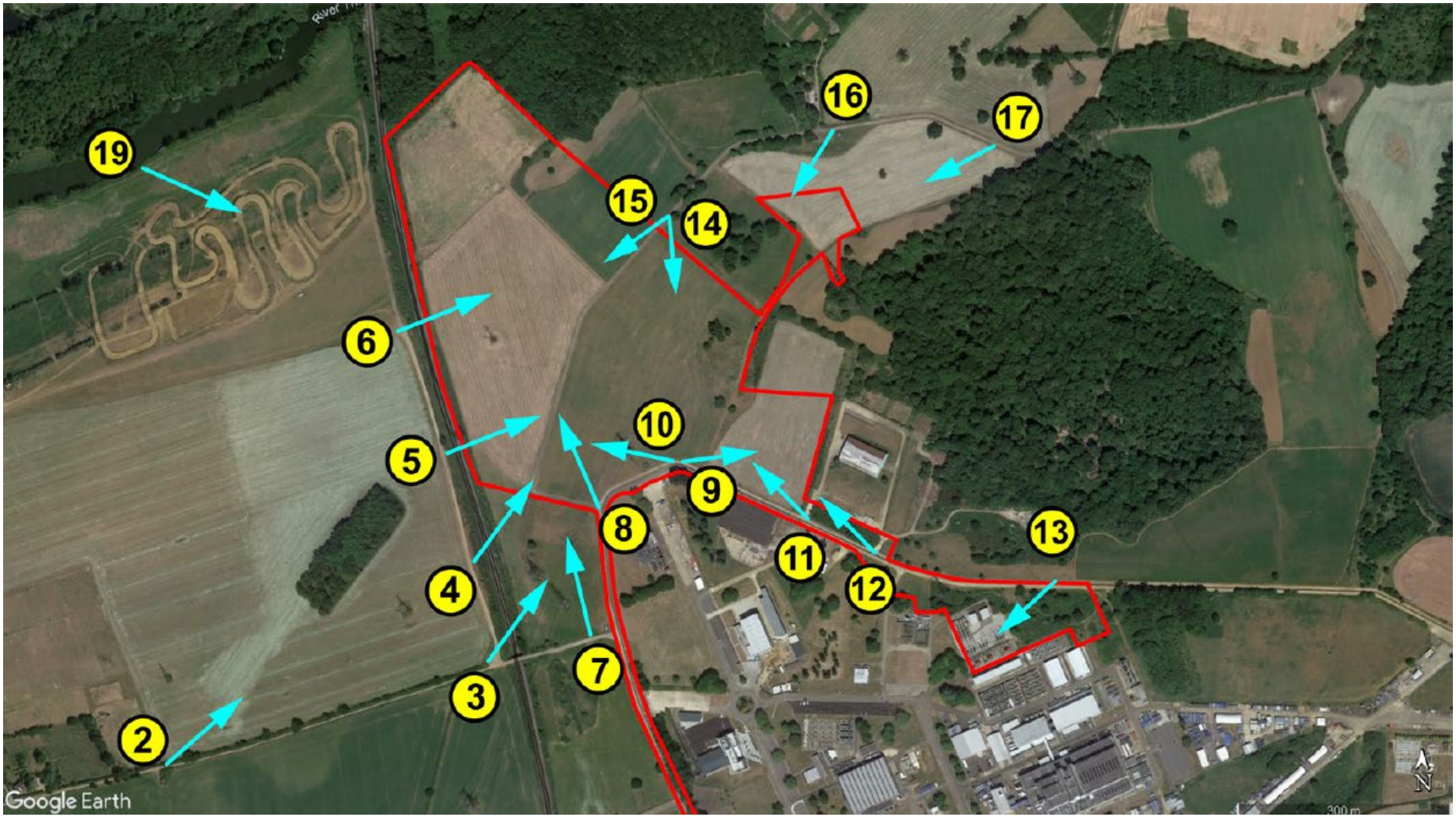
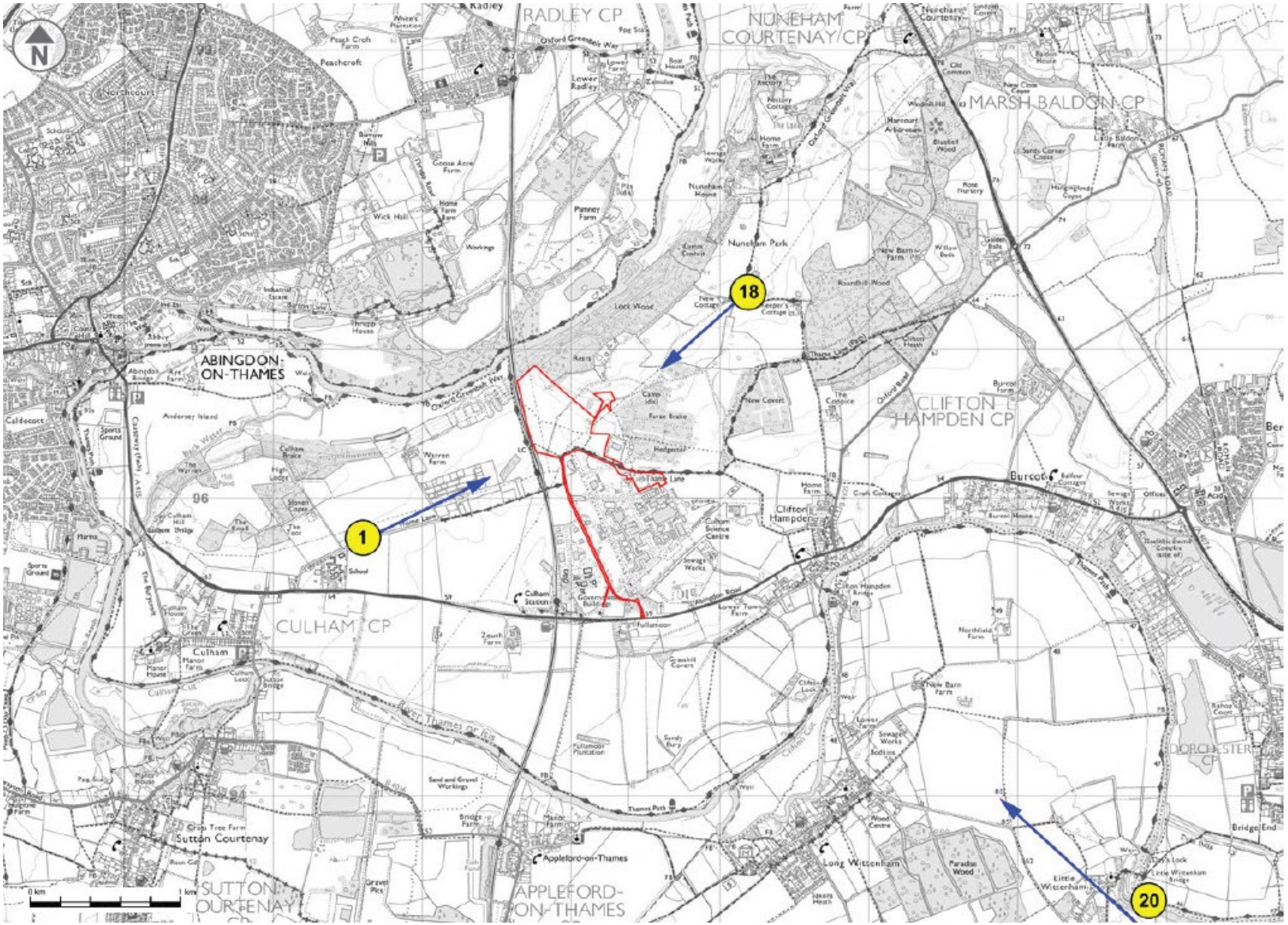


Figure 14 Long Distance Viewpoint Locations



Enabling and Construction

149 During the enabling and construction works, temporary significant adverse effects (Moderate to Major Adverse, **Significant**) are likely to be experienced in relation to the following views:

- View 4: View from the Oxford Green Belt Way which runs along the west side of the railway;
- View 6: The Oxford Green Belt Way as it passes west of the site;
- View 7: The Oxford Green Belt Way as it passes south of the site after crossing the railway;
- View 8: from the Oxford Green Belt Way as it skirts the Culham Science Centre, south of the site;
- View 9: from the Oxford Green Belt Way as it skirts the Culham Science Centre approaching the site of the proposed substation;
- View 10: from the Oxford Green Belt Way as it skirts the Culham Science Centre;
- View 11: from the Oxford Green Belt Way as it approaches the site of the proposed substation from the south;
- View 14: from within the Registered Park and Garden looking south;
- View 15: From within the Registered Park and Garden looking southwest; and
- View 16: From deeper within the Registered Park and Garden.

150 Furthermore, the landscape character of the site and the area of the Wooded Estatelands extending west across Warren Farm and 450m northeast within the Nuneham Courtenay Registered Park and Garden, and the landscape character and setting of the western edge of the Nuneham Courtenay Registered Park and Garden are likely to experience Moderate to Major Adverse (**Significant**) effects.

151 The most significant landscape and visual effects arising from the construction process will be the earthworks and moving machinery and workers on the site. Once the earthworks have been completed, the new landform will significantly reduce the visual effects of the works required to install the electrical equipment. Most of the equipment will be manufactured off-site and can be rapidly craned into place. Once in place, the remainder of the construction period comprises wiring up and testing, which has very little visual impact. Initially the earthworks will result in a magnitude of visual impact slightly greater than the operational impacts, but once completed the remainder of the works are unlikely to have a visual impact significantly greater than the operational impact. The landscape and visual effects arising from the construction process will be temporary in nature lasting only for the time it takes to complete these works on-site.

Completed Development

152 During the operation of the Proposed Development, temporary Moderate to Major Adverse (**Significant**) effects are likely to be experienced in Year 1 (i.e., before the primary landscaping mitigation embedded into the Proposed Development design has become established) in relation to the following views:

- View 3: Thame Lane just before it crosses the railway when approaching from the west (also where it meets the Oxford Green Belt Way;
- View 4: View from the Oxford Green Belt Way which runs along the west side of the railway;
- View 7: The Oxford Green Belt Way as it passes south of the site after crossing the railway;
- View 8: from the Oxford Green Belt Way as it skirts the Culham Science Centre, south of the site; and
- View 14: from within the Registered Park and Garden looking south.

153 View 16 (from deeper within the Registered Park and Garden) was assessed to have a Minor to Major Adverse (**Significant**) effect in Year 1, with the significant adverse effect relating to the proposed connection tower.

154 The on-site landscape character (Years, 1, 10 and 20) is also likely to experience Moderate to Major Adverse (**Significant**) effects, although this relates to the character of the land where it is proposed to construct the connection tower.

155 Given that the Applicant is seeking a temporary consent (40 years) for the Proposed Development, the operational significant effects identified above will be temporary, albeit for a long duration.

156 It is proposed to enhance the area of the site which lies within the Registered Park and Garden, including restoring a historical tree belt along the Parish boundary. Once the tree belt has established, the overall effect of the Proposed Development on the setting of the parkland as experienced from within it and outside it will be Moderate Beneficial (**Significant**). This beneficial effect on the character, setting and visual amenity of the parkland will take several years to be effective given that it relies upon the proposed planting to become established to screen the electrical infrastructure, however once established given that it will remain following the decommissioning of the Proposed Development, the beneficial effect will be permanent.

157 The significant adverse effects of the Proposed Development on visual amenity predominantly relates to walkers using a short stretch of the Oxford Green Belt Way; a stretch already adversely affected by the existing electrical infrastructure and surrounding Culham Science Centre. It should be noted that the significant adverse visual impacts identified relate to Year 1 of the operation of the Proposed Development – i.e., prior to landscaping establishing. By Year 10, once landscaping matures no significant adverse visual effects are anticipated.

158 Permissive access to the parkland, which includes a viewpoint over the Thames Valley will be a benefit, particularly given the proximity of the STRAT9 allocation to the west and any potential future mixed-use development. The beneficial aspects of the Proposed Development, in terms of the restoration of the Registered Park and Garden, public access and Biodiversity Net Gain, are considered to be greater than the limited, temporary significant adverse landscape and visual effects.

Decommissioning

159 Once the facility ceases operation, the equipment, buildings, concrete foundations, fencing and underground cables and drainage pipes will be removed. Since the majority of the equipment is modular, designed to be delivered as complete units on a Heavy Goods Vehicle, it can be dismantled easily within a short timeframe. The area occupied by the battery energy storge system compound and substation can be returned to agriculture if no other preferential use is identified. The tree planting will have matured into woodland and will be retained to leave the legacy of an enhanced setting to the Registered Park and Garden. Any future permissive public access to this area will be by agreement with the landowner. The proposed extension to the substation within the Culham Science Centre and the proposed connection tower will be permanent.

160 Once the electrical infrastructure has been removed, the effect of the retained landscape on the character and setting of the Registered Park and Garden will be Moderate Beneficial (Not Significant). The effect on the visual amenity of those passing the site along the Oxford Green Belt Way will be Moderate Beneficial (Not Significant).

Likely Significant Effects

161 The likely significant effects identified in relation to the landscape and visual impact assessment during enabling and construction and once the Proposed Development is complete and operational have been summarised in Table 6 below.

Table 6 Likely Significant Landscape and Visual Effects

Element Receptor	Description of Significant Effect	Scale and Nature of Residual Effect
Enabling and Construction		
The landscape character of the site and the area of the Wooded Estatelands extending west across Warren Farm and 450m northeast	Effect of construction related activities on landscape character and setting	**Moderate to Major Adverse** (Local)

Element Receptor	Description of Significant Effect	Scale and Nature of Residual Effect
within the Nuneham Courtenay Registered Park and Garden		
The landscape character and setting of the western edge of the Nuneham Courtenay Registered Park and Garden		
• View: 4: View from the Oxford Green Belt Way which runs along the west side of the railway; • View 6: The Oxford Green Belt Way as it passes west of the Site; • View 7: The Oxford Green Belt Way as it passes south of the Site after crossing the railway; • View 8: from the Oxford Green Belt Way as it skirts the Culham Science Centre, south of the Site; • View 9: from the Oxford Green Belt Way as it skirts the Culham Science Centre approaching the site of the proposed substation; • View 10: from the Oxford Green Belt Way as it skirts the Culham Science Centre; • View 11: from the Oxford Green Belt Way as it approaches the site of the proposed substation from the south; • View 14: from within the Registered Park and Garden looking south; • View 15: From within the Registered Park and Garden looking southwest; and • View 16: From deeper within the Registered Park and Garden.	Effect of construction related activities on views	**Moderate to Major Adverse** (Local)
Completed Development		
Trees, hedgerows and other landscape features	Changes to the landscape and net gain in tree cover	**Major Beneficial** (Local)
On-site landscape character	Replacing the urban fringe character with one of an engineered landscape containing largely low-level electrical infrastructure (Year 1, Year 10 and Year 20).	**Moderate to Major Adverse** (Local)
Landscape character of the site within the Nuneham Courtenay Registered Park and Garden	Effect of visibility of low-level electrical infrastructure upon the Registered Park and Garden setting (Year 1).	**Moderate to Major Adverse** (Local)
• View 3: Thame Lane just before it crosses the railway when approaching from the west (also where it meets the Oxford Green Belt Way); • View 4: View from the Oxford Green Belt Way which runs along the west side of the railway; • View 7: The Oxford Green Belt Way as it passes south of the Site after crossing the railway; • View 8: from the Oxford Green Belt Way as it skirts the Culham Science Centre, south of the Site; and	Effect of the completed Proposed Development on views (Year 1).	**Moderate to Major Adverse** (Local)

Element Receptor	Description of Significant Effect	Scale and Nature of Residual Effect
• View 14: from within the Registered Park and Garden looking south.		
• View 16: From deeper within the Registered Park and Garden		**Minor to Major Adverse** (Local)
Landscape setting of the Nuneham Courtenay Registered Park and Garden	Overall effect of the completed Proposed Development on the setting of the Registered Park and Garden once landscaping is established	Minor Adverse[7] to **Moderate Beneficial** (Local)

[7] *Note, the Minor Adverse effect relates to the proposed connection tower within the Registered Park and Garden, however (as noted in para. 8.113 of **ES Volume 2**) a significant beneficial effect was established for the receptor as a result of landscaping changes upon the setting of the parkland and in allowing permissive public access.*

CUMULATIVE EFFECTS ASSESSMENT

162 Other development schemes within the surrounding area have been considered in the assessment in order to understand the impact of the Proposed Development in combination with these other schemes.

163 A two-tiered approach has been adopted to consider the potential for cumulative effects to arise as a result of the Proposed Development in-combination with defined 'Tier 1' (i.e. schemes which meet the defined criteria with regards to scale and distance from the site and have full planning consent, a resolution to grant consent, or have been submitted but not yet consented where considered appropriate) and 'Tier 2' (i.e. strategic allocations as per the Local Plan, whereby a formal planning application (or applications) for development in relation to this strategic allocation has not yet been submitted) cumulative schemes.

164 The schemes which have been considered in the cumulative impact assessment are listed below and presented in Figure 15.

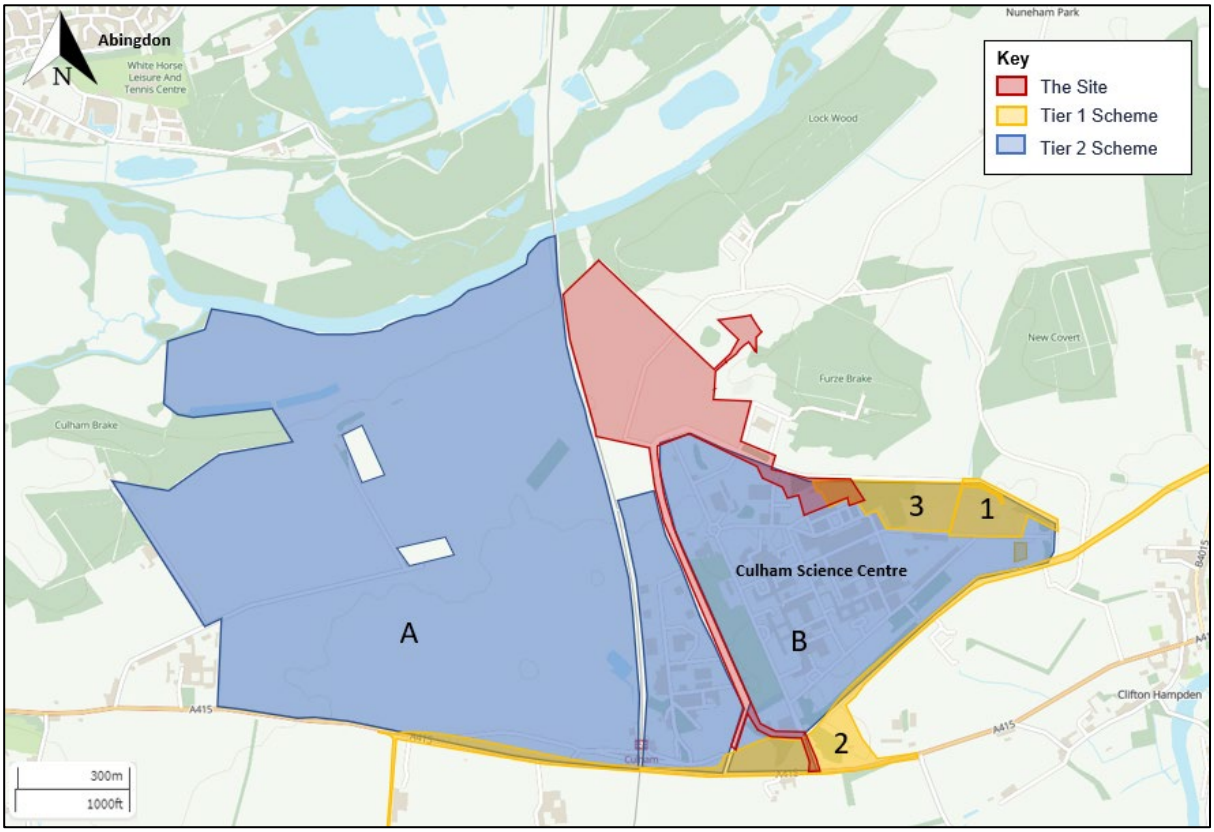
1. Land in the North East Corner of, Culham Science Centre, near Clifton Hampden for the "Erection of a Fusion Demonstration Plant with ancillary office space, parking, landscaping and associated infrastructure, including plant and machinery" (P22/S1410/FUL) – Tier 1 Scheme;
2. Various sites across South and Vale From Clifton Hampden to Milton Exchange Via Appleford in relation to proposed road works and associated road infrastructure (P21/S4797/CM) – Tier 1 Scheme;
3. UK A E A Culham Science Centre, near Clifton Hampden with regards to the development of an Energy Storage Facility (P16/S2368/FUL) – Tier 1 Scheme;

A. STRAT8 strategic allocation to deliver a net increase in employment of 7.3ha – Tier 2 Scheme; and

B. STRAT9 strategic allocation is for 217ha to be developed to deliver approximately 3,500 new homes, a net increase of at least 7.3ha of employment land in combination with the adjacent Science Centre and supporting services and facilities – Tier 2 Scheme.

165 Further information regarding cumulative schemes considered within the Environmental Statement can be found in **ES Volume 1, Chapter 1: Introduction and EIA Methodology**.

Figure 15 Cumulative Schemes Map



Likely Significant Cumulative Effects

166 The following additional or different likely significant effects as a result of the cumulative impact assessment have been identified:

Built Heritage

- The STRAT 9 Strategic Allocation proposals for the construction of 3,500 new homes to the south-west of Nuneham Courtenay Registered Park and Garden and Nuneham Courtenay Conservation Area will likely have a Moderate Adverse (**Significant**) indirect cumulative effect on the designated heritage assets. Embedded mitigation will be designed into any planning proposals, however given that the extent of this mitigation is unknown at this time, the cumulative effect of the Proposed Development in combination with this Tier 2 scheme is considered conservatively.

Land Take and Soils (Agriculture)

- The Proposed Development in combination with the STRAT9 Strategic Allocation was considered to result in a Moderate to Major Adverse (**Significant**) cumulative effect with regards to the loss of agricultural land during enabling and construction phase. It should be noted that a number of assumptions have been made to inform this cumulative assessment. Firstly, the land classification has been informed by a review of the National Soils Map[8], whereby a detailed Agricultural Land Classification survey would be required to confirm the high-level understanding of the agricultural quality of the soils. Also, the cumulative assessment has considered a worst-case scenario where all Best and Most Versatile quality land is permanently lost to built development associated with the STRAT9 Strategic Allocation, however in reality it is likely that only a portion of the site would be developed when accounting for open space and landscaping.

[8] https://www.landis.org.uk/soilscapes/

As a worst-case for the purposes of assessment, it was therefore assessed that there would be a cumulative loss of more than 238ha of Best and Most Versatile quality land which would be a high magnitude of change.

- Following the decommissioning of the Proposed Development, given the extent of agricultural land removed to accommodate the STRAT9 Strategic Allocation site development, the cumulative effect would remain as Moderate to Major Adverse (**Significant**). It should be noted that this cumulative effect is related only to the development of the STRAT9 Strategic Allocation.

IN-COMBINATION EFFECTS / EFFECT INTERACTIONS

167 In-combination effects / effect interactions are the result of interactions of effects on an individual receptor (e.g., when both noise and dust affect a particular residential property).

168 The approach to defining in combination effects/effect interactions, involves tabulating the residual effects of the Proposed Development against receptors or, where more appropriate, receptor groups to identify the potential for in-combination effects or effect interactions.

169 Residual effects that are beneficial, neutral or adverse in nature and that are minor, moderate or major in scale have been considered. Residual effects that are negligible in scale have been omitted, as these effects are, by definition, unnoticeable and insignificant.

170 It is considered that there would not be a scenario where multiple negligible effects could lead to a noticeable effect interaction. This is owing to the nature of negligible effects as they present no discernible change therefore if multiple negligible effects were to interact the in-combination effect would also present no discernible change.

171 The effects interactions assessment has established that during the enabling and construction works, once the Proposed Development is completed and operational, and following decommissioning of the Proposed Development, there is no potential for effect interactions (see **ES Volume 1, Chapter 6: Effect Interactions**).

SUMMARY AND CONCLUSION

172 The Proposed Development would result in the following significant effects:

- **Significant Adverse** effects have been identified because of the enabling and construction works with regards to soil resources, landscape and visual amenity, archaeology and built heritage;
- Once completed and operational the Proposed Development would likely result in **Significant Adverse** effects relating to landscape and visual amenity;
- Once completed and operational the Proposed Development would likely result in **Significant Beneficial** effects relating to climate change and landscape, and
- During the decommissioning activities, **Significant Adverse** effects have been identified with regards to built heritage.

173 Additionally, significant adverse cumulative effects have been identified during the construction of the Proposed Development and following decommissioning associated with the loss of agricultural land, and also during the operation of the Proposed Development associated with built heritage impacts to Nuneham Courtenay Registered Park and Garden and Nuneham Courtenay Conservation Area. It should be noted however that this cumulative effect is derived only from the development of the STRAT9 Strategic Allocation site and is based upon worst-case assumptions for the purposes of assessment.

174 To purchase the complete Environmental Statement, or request a digital copy via email, please contact Trium Environmental Consulting LLP, at hello@triumenv.co.uk or Tel: +44 (0) 203 887 7118.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