East Claydon Greener Grid Park,
Land north of East Claydon Substation, East
Claydon Road, Buckingham, MK18 3ND

Flood Risk Assessment and Drainage Strategy

For

Statkraft UK LTD

motion

Document Control Sheet

East Claydon Greener Grid Park,

Land north of East Claydon Substation, East Claydon Road, Buckingham, MK18 3ND

Statkraft UK LTD

This document has been issued and amended as follows:

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1.0 Introduction

1.1 Motion has been commissioned by Statkraft UK LTD to undertake a Flood Risk Assessment (FRA) and prepare a Drainage Strategy to accompany a planning application for a Greener Grid Park north of the East Claydon Sub Station and East Claydon Road, East Claydon, Buckinghamshire, MK18 2LF. The development proposals will comprise of the Construction of a Greener Grid Park comprising energy storage and grid balancing equipment and associated infrastructure including access, drainage, landscaping and other incidental works. Proposed site layout and location plans can be seen in **Appendix A**.

1.2 This FRA and Drainage Strategy will discuss the risks to the proposed development from all sources of flooding. This report will also define how the site will manage foul and surface water so the development does not increase flood risk in the area or to neighbouring properties.

1.3 This FRA and drainage strategy follows the guidance set out in:

- National Planning Policy Framework (NPPF);
- Technical Guidance to the NPPF;
- CIRIA SuDS Manual 2015 (C753);
- Environment Agency Rainfall Runoff Management for Developments;
- Non-Statutory Technical Standards for SuDS (NSTS); and,
- Buckinghamshire Council's SuDs design guidance.

1.4 This FRA and drainage strategy pertains only to the design of the drainage system for the built site.

2.0 Site Description

Table 2.1 – Site Summary

Site Name	East Claydon Greener Grid Park
Location	Land north of East Claydon Substation, East Claydon Road, Buckingham, MK18 3ND
Grid Reference	474563, 226566
Site Area	45.3 Ha (approximately)
Development Type	Greener Grid Park
Environment Agency (EA) Flood Zone	Site is located within Flood Zone 1.
Surface Water Flood Risk	A sequential approach has been applied to the design of the proposed development to ensure that battery storage, transmission and switch equipment are restricted to parts of the site within a very low or low risk of surface water flooding. In terms of access or escape routes, the proposed permanent operational access follows the route of a disused railway track which runs north-south through the site. The topographical survey of the site shows the route of the disused railway track is elevated relative to adjacent ground, with an existing network of ditches prominent. Where surface water flooding is indicated to encroach on the route of the disused railway track, the surface water flood depth mapping indicates the yearly chance of 'Up to 20cm' flooding between 2040 and 2060 is Low. The proposed temporary construction access is predominantly located in an area of Very Low surface water flood flooding, however, there are two areas where the surface water flood extent mapping shows the access to be in the Low, Medium and High surface water flood risk categories. The surface water flood depth mapping indicates the yearly chance of 'Up to 20cm' flooding between 2040 and 2060 is Very Low in one of the two areas. In the other area, the surface water flood depth mapping indicates the yearly chance of 'Up to 60cm' flooding between 2040 and 2060 is predominantly Very Low and Low, but, closer to East Claydon Road, the access slightly interacts with the Medium yearly chance of 'Up to 60cm' flooding extent. However, it is important to note the Environment Agency (EA) surface water flood mapping does not consider the presence of a culvert under the disused railway track in this location, therefore the flooding appears worse than it would actually be. Also, during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location, and a management and maintenance plan has been submitted as part of the planning application in this regard. Lastly, should the temporary construction access be flooded, Statkraft will have the ability to either close the access and suspend work for the period that the temporary access is flooded until the flood water

	recedes or divert construction traffic to the existing disused railway track that will be raised by a minimum of 300mm during the first phase of the construction works. The surface water flood depth mapping indicates the yearly chance of 'Up to 60cm' flooding between 2040 and 2060 is predominantly Very Low and Low on East Claydon Road from both accesses towards the west. As stated above, it is important to note the EA surface water flood mapping does not consider the presence of the culvert under the disused railway track in this location, therefore the flooding appears worse than it would actually be, and during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location. While no assessment has been undertaken to demonstrate there are reasonably available sites appropriate for the proposed development in areas with a lower risk of surface water flooding, this matter has been considered. The location is largely determined by the proximity of the East Claydon Substation (and the planned replacement East Claydon substation for which Statkraft UK LTD has a connection agreement).
Local Water Authority	Anglian Water.
Local Planning Authority	Buckinghamshire Council - Aylesbury Vale Area (BC).
Lead Local Flood Authority	Buckinghamshire Council - Aylesbury Vale Area (BC).

Site Location and Description

2.1 The site is approximately 120m north-west of the National Grid East Claydon substation, and 650m north-east of East Claydon Village. The site is bound to the north by vegetation at the natural field boundary, and to the south by East Claydon Road. The southwestern corner of the site extends across East Claydon Road a short distance. The eastern site boundary runs through agricultural fields close to the Claydon Brook, before cutting in to run alongside the disused railway to meet East Claydon Road. The western site boundary follows the path of the overhead electricity line, before doing the same. The nearest postcode is PE37 8EG and the grid reference is 474563, 226566.

2.2 The site is comprised of agricultural arable fields, separated by landscape planting, trees and hedgerows around their perimeters. There is denser vegetation including hedgerows and treelines along the route of the disused railway track, which runs north-south through the site. The route of the overhead electricity line runs north-west to south-east through the site, connecting to the National Grid East Claydon substation south of East Claydon Road. There is one pylon located within the site boundary, situated along the edge of the disused railway access track.

Topography

2.3 A topographical survey of the site was undertaken by Warner Surveys in April and December 2024 and the outputs can be seen in **Appendix B**. The site falls from a high point of around 95.00m Above Ordnance Datum (AOD) close to the southwest corner of the site, to a low point of around 86.00m AOD close to the northeast corner of the site. The general slope from the high point to the low point is estimated to be around 1 in 130.

2.4 The western half of the proposed main compound area that predominantly comprises of Battery Energy Storage System (BESS) slopes from around 93.40m AOD at its southwest corner to around 86.50m AOD at its northeast corner. The general slope from the high point to the low point is estimated to be around 1 in 40.

2.5 The eastern half of the proposed main compound area that predominantly comprises of BESS and an HV Yard slopes from around 89.60m AOD along its south southeast boundary to 86.30m AOD at its northwest corner. The general slope from the high point to the low point is estimated to be around 1 in 75.

2.6 Both the proposed main compound areas gently slope down towards the same low point.

Geology

2.7 The British Geological Survey (BGS) online 1:50,000 GeoIndex[1] mapping identifies that:

- the underlying superficial geology is Alluvium, which is 'silty clay, but can contain layers of silt, sand, peat and a basal gravel'[2]; and,
- the underlying solid geology is Stewartby Member Mudstone, which is 'commonly smooth, variably silty, calcareous, poorly fossiliferous, blocky mudstones'[3].

2.8 Defra's Magic Map website[4] lists the soil as being 'slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils'.

Infiltration Testing

2.9 Infiltration testing has not been undertaken as part of the planning application; however, an agricultural land classification survey has been undertaken by Amet Property Ltd which comprised of 2 trial pits and 61 auger points excavated to a maximum depth of 1.2m and this report is included in **Appendix C**.

2.10 The Amet Property Ltd agricultural land classification report in **Appendix C** states 'The soils on the site are identified as being largely 712b DENCHWORTH Association, slowly permeable seasonally waterlogged clayey soils with similar fine loamy over clayey soils. Apart from the eastern boarder which are identified as 813b FLADBURY 1 Association, stoneless clayey soils, in places calcareous variably affected by groundwater.'

2.11 The Amet Property Ltd agricultural land classification report in **Appendix C** also states 'The subsoils are all gleyed with a moderately structured upper subsoil and poorly structured lower subsoil which is recorded as slowly permeable. Gleying starts anywhere from the surface to 50cm and the slowly permeable layer between 30cm and 80cm resulting in varying wetness classes.'

2.12 The Amet Property Ltd agricultural land classification report prepared for the site in **Appendix C** indicates that infiltration SuDS will not be possible for the proposed development site on the basis water in the subsoil will not empty via infiltration.

Hydrogeology

2.13 Defra's Magic Map website[5] indicates the site is in the Upper and Bedford Ouse Management Catchment; the superficial and bedrock geology are designated Secondary A and Unproductive aquifers respectively; the Groundwater Vulnerability Map (England) classification is Low; and the site is located in a surface water drinking water safeguard zone.

[1] https://www.bgs.ac.uk/map-viewers/geoindex-onshore/
[2] https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=ALV
[3] https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=SBY
[4] https://magic.defra.gov.uk/magicmap.aspx
[5] https://magic.defra.gov.uk/magicmap.aspx

2.14 Defra's Magic Map website[6] indicates the site is not located in a groundwater drinking water safeguard zone or a groundwater source protection zone.

Hydrology and Existing Drainage Regime

2.15 The EA Statutory Main River Map[7] shows that Claydon Brook, which flows north approximately adjacent and to the east of the site is not designated a statutory main river. The EA Statutory Main River Map[8] shows the nearest statutory main river to the site is Padbury Brook which flows in a north northwest direction approximately 2.92km northwest of the site.

2.16 Reference to the OS 1:10,000/1:10,560 1949-1973 and OS 25 inch 1892-1914 map series available to view on the National Library of Scotland Side by Side Georeferenced Maps Viewer Website[9] show an ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook. The EA Statutory Main River Map[10] also appears to show parts of the ordinary watercourse route, including the connection to Claydon Brook, approximately 480m north of the proposed development area.

2.17 The site area to which this report relates is agricultural fields which can be described as greenfield, except along the route of the disused railway track, which runs north-south through the site. The Proposed Drainage Strategy in **Appendix E** shows the existing on-site ditches based on the topographical survey of the site in **Appendix B**, and the estimated route of ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook - based on assumed 1m offset from boundary fenceline.

2.18 Claydon Brook; the ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook; and a proportion of the existing on-site ditches based on the topographical survey of the site in **Appendix B**, are all located within the Buckingham & River Ouzel Internal Drainage Board (IDB) area. Plans showing the extent of the IDB's district hatched in green are included in **Appendix C**.

2.19 The remainder of the existing on-site ditches based on the topographical survey of the site in **Appendix B** would be regarded as ordinary watercourses regulated by BC.

2.20 During a meeting with the IDB on the 24 October 2025, it was clarified:

- Any alterations to watercourses within the IDB district fall under IDB control.
- Development, including the basins, needs to be 9m from IDB watercourses.
- There is a surface water development contribution (SWDC) of £1.63 per metre for development area draining to IDB watercourses. The developed area includes the proposed permanent operational access along the route of the disused railway track on the basis compacted type 1 is being applied as a sub base / surface which will change the existing surface. The developed area includes the proposed temporary access on the basis the route will no longer be existing field once constructed.
- As the temporary access is proposed in the surface water flooding, there is a need to incorporate measures to control runoff and ensure surface water flooding is not displaced elsewhere.
- A schedule of consents is required for all items where consent is required. For example, where hedgerow/ditch is being removed for the new main compound area and the 3 no. temporary access crossings over watercourses.
- In the site location, the IDB regard the greenfield runoff rate to be 4l/s/ha.

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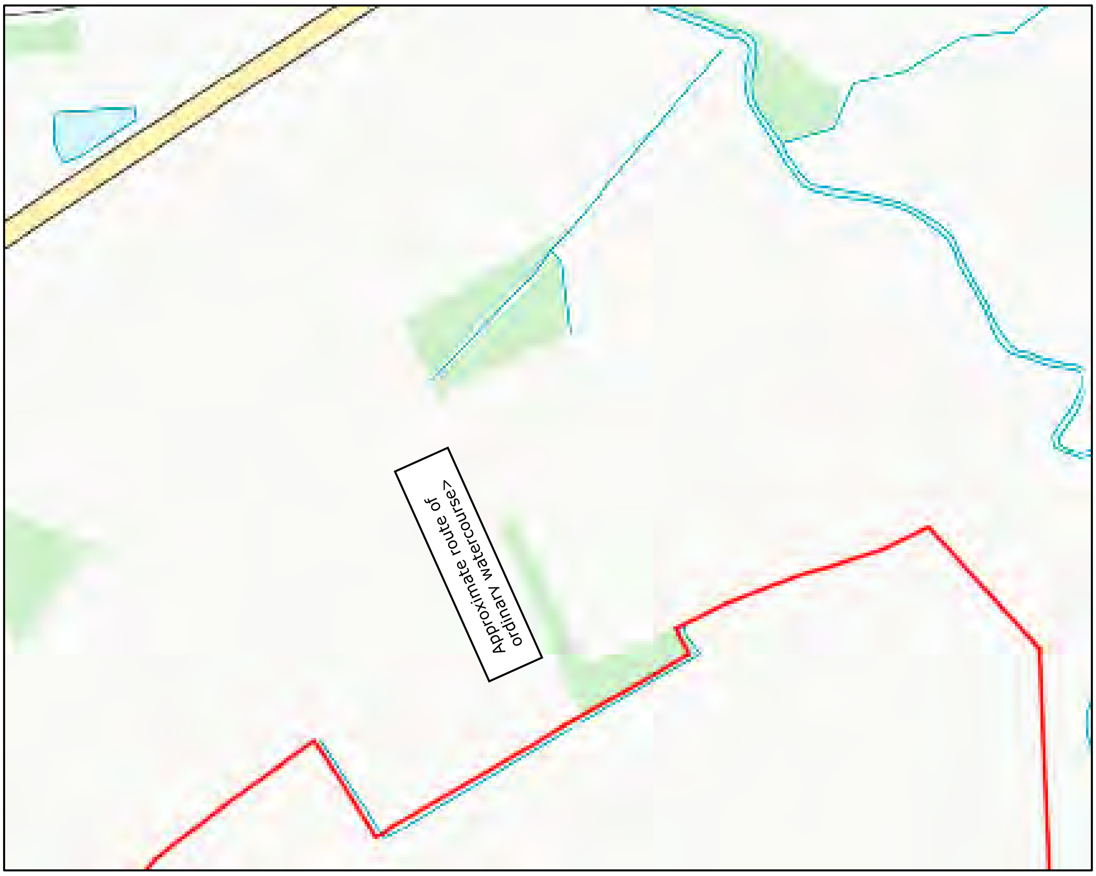
6 https://magic.defra.gov.uk/magicmap.aspx
7 https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386
8 https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386
9 https://maps.nls.uk/geo/explore/side-by-side/#zoom=15.6&lat=51.93734&lon=-0.91721&layers=193&right=ESRIWorld
10 https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386

Figure 2.1 - Ordinary watercourse identified to flow from the northern boundary of the site towards Claydon Brook



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3.0 Legislative and Policy Framework

Flood and Water Management Act

3.1 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with UK Government's response to the Sir Michael Pitt's Review of the summer 2007 floods.

3.2 LLFA's, including BC, have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from surface run-off, groundwater and ordinary watercourses (i.e. non main rivers). The EA plays a role in managing the watercourses designated as 'main rivers'.

The Environment Agency Flood Map for Planning

3.3 The EA's Flood Map for Planning gives an indicative prediction of areas at risk of fluvial and tidal flooding. The mapping is an amalgamation of modelled flood levels and historical flood event outlines.

3.4 The Flood Map is split into 'Flood Zones', which demarcate the extent of flooding from rivers or the sea for different return periods. The Flood Map for Planning shows the extent of the natural floodplain if there were no defences or other man-made structures. They do not provide a definitive picture of where flooding would occur; rather, they provide an indicative prediction of areas at risk.

3.5 Table 4.1, below, lists the flood zone categories and explains the flood risk probabilities they represent.

Table 4.1 – Flood Zone Categories

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. This is generally delineated as land having a 1 in 30 or greater annual probability of flooding. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the EA. (Not separately distinguished from Zone 3a on the Flood Map)

New National Flood Risk Assessment (NaFRA) and National Coastal Erosion Risk Map (NCERM)

3.6 On 25 March 2025 the EA updated their Flood map for planning service which displays flood zones. The flood zones have been updated using the new NaFRA data. For the first time the EA will be displaying surface water risk and adding new information to show how climate change may affect the extent of flood risk from rivers and the sea in the future. The improved service is intended to assist planners and developers when making decisions about the location and design of new development, and making it easier to produce FRAs.

3.7 The new NaFRA provides a single picture of current and future flood risk from rivers, the sea and surface water for England. It also:

- uses the best available data both from the Environment Agency and local authorities
- includes the potential impact of climate change on flood risk
- uses much higher resolution maps that make it easier to see where there is risk
- provides new data on depth of flooding, allowing people to understand the potential flood hazard they could face

3.8 The new NCERM provides the most up to date national picture of current and future coastal erosion risk for England. The EA has worked with local authorities, who supplied local data and verified outputs. It also:

- uses the best available evidence from the National Network of Regional Coastal Monitoring Programmes
- includes climate change impacts on coastal erosion risk, and allowances for sea level rise
- includes new information on areas of land instability at the coast caused by rainfall and rising groundwater levels which can contribute to cliff erosion and landslides
- makes erosion information more accessible to coastal managers, planners and the public by providing clearer online visualisations

The National Planning Policy Framework

3.9 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. The Technical Guidance to the NPPF provides further information on the policies set out in the NPPF. It encourages development to take place in areas of lower flood risk wherever possible and stresses the importance of preventing increases in flood risk off-site to the wider catchment area. This includes ensuring that flood risk is taken into account at all stages of the planning process, avoiding inappropriate development in areas at risk of flooding and directing development away from those areas where risks are highest.

3.10 A site-specific FRA is required for proposals of 1ha or greater in Flood Zone 1, all proposals for development in Flood Zones 2 and 3, or in an area within Flood Zone 1 that has critical drainage problems (as notified to the local planning authority by the EA). The FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

3.11 Within each Flood Zone, a key factor in determining planning applications for development is the flood risk vulnerability of a development. Table 2 of the Technical Guidance to the NPPF categorises different development types according to their vulnerability to flooding. These categories are:

- Essential infrastructure;
- Highly vulnerable development;
- More vulnerable development;
- Less vulnerable development, and;
- Water-compatible development.

3.12 The proposed use of the site is classified as 'Essential infrastructure' development.

3.13 Within the different Flood Zones each of the above development categories are considered appropriate or not permissible. The Technical Guidance to the NPPF lists these as:

Flood Zone 1:

- All the development categories listed above are appropriate.

Flood Zone 2:

- Water-compatible, less vulnerable development, more vulnerable development and essential infrastructure is appropriate in this zone.

Flood Zone 3a:

- Water-compatible, less vulnerable development and essential infrastructure is appropriate in this zone. Highly vulnerable development should not be permitted in this zone.

Flood Zone 3b:

- Only water-compatible development and essential infrastructure that has to be there should be permitted in this zone.

3.14 The above information sets out the basis by which developments must be assessed in terms of flood risk. Later in this report the proposed development will be reviewed against the Flood Zone in which it is located. This will inform the appropriateness of the proposed reconstruction, as per the advice within the Technical Guidance to the NPPF.

Lead Local Flood Authority

3.15 As of April 2015, the LLFA became a statutory consultee on all major planning applications. The LLFA is required to assess planning applications in respect of surface water drainage and sustainable drainage systems. BC is the LLFA for the Buckinghamshire Area. The LLFA has been engaged during the pre-application process.

4.0 Current Flood Risk

4.1 Flooding can arise from a variety or combination of sources. These may be natural or artificial and may be affected by climate change. These are discussed, in the following two sections and summarised in the next chapter. The probability of any likely impacts is also assessed.

Flooding from Rivers and the Sea

4.2 The Risk of Flooding from Rivers and Sea (RoFRS) Climate Change 1 Dataset published by the EA on the 28 January 2025 has been downloaded and is included in the Proposed Drainage Strategy in **Appendix E**. This dataset shows the overall risk, rather than the risk associated with a specific event or scenario, and includes the 'Central' climate change allowance for the 2050s epoch (2040-2069) for the risk of flooding from rivers.

4.3 The Flood Map for Planning Climate Change Extents Undefended 1% AEP (1 in 100) Rivers/0.5% AEP (1 in 200) Sea Dataset published by the EA on the 25 March 2025 has been downloaded and is included in the Proposed Drainage Strategy in **Appendix E**. This dataset shows the risk associated with the 1% AEP (1 in 100) Rivers event, and includes the 'Central' climate change allowance for the 2080s epoch (2070-2125) for risk of flooding from rivers.

4.4 It has not been possible to download a Flood Map for Planning Climate Change Extents Undefended 0.1% AEP (1 in 1000) Rivers/Sea Dataset that covers the site location. It is noted with reference to the updated Flood map for planning that the Undefended 0.1% AEP (1 in 1000) Rivers/Sea Annual likelihood of flooding including the 'Central' climate change allowance for the 2080s epoch (2070-2125) extent is similar to the RoFRS Climate Change 1 Dataset extent.

4.5 It is concluded, based on above, that the site is located in Flood Zone 1. This means that in any year the site has a less than 1 in 1000 (0.1%) chance of flooding in any given year from Claydon Brook.

4.6 The proposed use of the site is classified as 'Essential infrastructure' development under the NPPF and is appropriate in Flood Zone 1. Therefore, the development is appropriately located.

Surface Water Flooding

4.7 Surface water, or pluvial flooding, results from rainfall-generated overland flow, where rainwater has not yet reached a watercourse or sewer and where the local drainage systems become overwhelmed. Pluvial flooding often occurs during short, very intense storms, but can also occur during longer periods of rainfall when the ground is already saturated, or where land has low permeability due to development.

4.8 In these conditions surface water can build up where the topography allows it to converge or pond. Where it gathers it will travel down prevailing gradients. Pluvial flooding then occurs at locations where significant surface water flow paths converge, at localised low points and/or due to overland obstructions. In urban areas pluvial flooding often occurs where the built environment channels overland flow routes (down roads that are bounded by kerbs, for example) or where there are obstacles to the natural overland flow routes. Boundary walls and buildings are often the main causes and, hence, the likelihood of pluvial flooding to impact property and gardens.

4.9 Pluvial flooding is exacerbated in many cases by the mistreatment or failure of the below ground infrastructure (including partial or full blockages of gullies and/or within the combined sewers and the accumulation of fats, oils and greases within the sewer networks).

4.10 Generally speaking, pluvial flooding is less of an issue in rural areas. This is partly because the natural 'greenfield' state of land allows for the interception of rainfall and the slowing down of overland flow, so the accumulation of surface water is less likely. It is also because there are much less 'receptors' of surface water flooding in rural areas and many incidences of surface water flooding in rural areas go unnoticed or unreported as they are of no consequence.

4.11 The Risk of Flooding from Surface Water (RoFSW) Extent and Depth Maps are shown in **Appendix D**.

4.12 On the basis the planning application is for a temporary 40 year development, and the RoFSW Climate Change 1 Dataset published by the EA on the 28 January 2025 includes a 'Central' climate change allowance for the 2050s epoch (2040-2060), this dataset has been downloaded and included in the Proposed Drainage Strategy in **Appendix E** with the Low Yearly Chance of Flooding Extent removed for additional clarity. The RoFSW Climate Change 1 Dataset in the Proposed Drainage Strategy in **Appendix E** shows the overall Medium and High risk, rather than the risk associated with a specific event or scenario.

4.13 The ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook - assuming a 1m offset from boundary fenceline - has been accounted for in the main compound area layout to ensure a minimum 10m buffer zone is provided.

4.14 The on-site ditches based on the topographical survey of the site in **Appendix B** have been accounted for in the substation and main compound area layout to ensure a minimum 10m buffer zone is provided.

Proposed Main Compound Area

4.15 The proposed main compound area is located to the south of an ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook. The existing site in the main compound area predominantly falls to this watercourse, and it is possible for surface water runoff from the development to drain by gravity to this watercourse, which will mimic the natural drainage of the site.

4.16 The proposed main compound area is predominantly located in an area at Very Low risk of surface water flooding (i.e. less than 1 in 1000 chance of flooding in any given year), with any areas of Low, Medium and High risk of surface water flooding (i.e. between 1 in 1000 and 1 in 100, between 1 in 100 and 1 in 30 and more than 1 in 30 chance of flooding in any given year respectively) that interact with the proposed main compound area predominantly isolated areas that are not connected to any other areas of risk that will be dealt with through the site's surface water drainage strategy.

4.17 With reference to the topographical survey of the site in **Appendix B**, there are two locations where access roads will cross the route of an existing ditch (ordinary watercourse), therefore culverts are proposed under the access roads to ensure the continued conveyance of surface water along the existing ditch (ordinary watercourse) route post development. These culverts will require IDB land drainage consent once planning permission is obtained.

4.18 There are two locations where the northern boundary of the proposed main compound area will interact with areas of Medium and High risk of surface water flooding associated with the low point of the site / ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook. However, the extent of the interaction is minimal, with the areas of interaction equating to less than 0.3% of the proposed main compound area. With reference to the surface water flood depth mapping in **Appendix D**, the estimated volume of displaced flood water during the predominantly Very Low and Low yearly chance of 'Up to 20cm' flooding between 2040 and 2060 is around $40m^3$ ($200m^2$x0.2m) The very minor displacement of surface water flooding in these locations will be offset by the long-term storage volume ($4629m^3$) provided by the approximately 3.87 Ha area of proposed pervious pavements and the adjacent open space unaffected by flooding that will remain unchanged post development.

4.19 The low points on the proposed western and eastern proposed main compound areas will be 87.00 and 86.90m AOD. With reference to the topographical survey of the site in **Appendix B**, and the downloaded RoFSW Climate Change 1 Dataset extent that includes the 'Central' climate change allowance for the 2050s epoch (2040-2060) in **Appendix E**, the proposed western and eastern main compound areas will provide a minimum of 400mm and 500mm freeboard respectively above the areas of Medium and High risk of surface water flooding associated with the low point of the site / ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook.

4.20 Lastly, the proposed open SuDS features that will serve the proposed main compound area will predominantly be located in areas at Very Low risk of surface water flooding, except for the smallest swale and basin in the western half of the site that will be located in the Low risk of surface water flood extent.

Proposed Substation

4.21 The proposed substation location, approximately 120m south of the main compound area, is located in an area at Very Low risk of surface water flooding.

Proposed Permanent Operational Access

4.22 The proposed permanent operational access follows the route of a disused railway track which runs north-south through the site. The topographical survey of the site in **Appendix B** shows the route of the disused railway track is elevated relative to adjacent ground, with a network of ditches prominent. This appears to be corroborated by the surface water flood extent mapping in **Appendix D** which predominantly shows areas of Low, Medium and High surface water flooding along to the route of the ditches. Where surface water flooding is indicated to locally encroach on the route of the disused railway track, the surface water flood depth mapping in **Appendix D** indicates the yearly chance of 'Up to 20cm' flooding between 2040 and 2060 is Low. Post development, it is proposed construction materials are used to raise the access level by a minimum of 300mm to ensure the proposed permanent operational access is above the surface water flood level during the lifetime of the development.

Proposed Temporary Construction Access and Compounds

4.23 The proposed temporary construction access is predominantly located in an area of Very Low surface water flood flooding, however, there are two areas where the surface water flood extent mapping in **Appendix D** shows the access to be in the Low, Medium and High surface water flood risk categories. The surface water flood depth mapping in **Appendix D** indicates the yearly chance of 'Up to 20cm' flooding between 2040 and 2060 is Very Low in one of the two areas. In the other area, the surface water flood depth mapping indicates the yearly chance of 'Up to 60cm' flooding between 2040 and 2060 is predominantly Very Low and Low, but, closer to East Claydon Road, the access slightly interacts with the Medium yearly chance of 'Up to 60cm' flooding extent. However, it is important to note the EA surface water flood mapping does not consider the presence of a culvert under the disused railway track in this location, therefore the flooding appears worse than it would actually be. Also, during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location, and a management and maintenance plan has been submitted as part of the planning application in this regard. Should the temporary construction access be flooded, Statkraft will have the ability to either close the access and suspend work for the period that the temporary access is flooded until the flood water recedes or divert construction traffic to the existing disused railway track that will be raised by a minimum of 300mm during the first phase of the construction works. Lastly, it is proposed the temporary access (including the adjacent construction compound areas) design raises the level by a minimum of 300mm along its length, and ensures surface water flooding is not displaced to off-site areas.

East Claydon Road

4.24 The surface water flood extent mapping in **Appendix D** shows areas of Low, Medium and High surface water flooding along East Claydon Road in both directions from both the proposed permanent operational access and the temporary construction access. The surface water flood depth mapping in **Appendix D** indicates the yearly chance of 'Up to 30cm' flooding between 2040 and 2060 is Low, Medium and High on East Claydon Road from both accesses towards both the west and east; the yearly chance of 'Up to 60cm' flooding between 2040 and 2060 is predominantly Very Low and Low on East Claydon Road from both accesses towards the west; and on East Claydon Road towards the east, the yearly chance of 'Up to 60cm' flooding between 2040 and 2060 is High where Claydon Brook passes under the Road. As stated above, it is important to note the EA surface water flood mapping does not consider the presence of the culvert under the disused railway track in this location, therefore the flooding appears worse than it would actually be on East Claydon Road from both accesses towards the west, and during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location.

4.25 Surface water flooding will not be a constraint on this site as the development will either predominantly be outwith the surface water flood risk areas; or, elevated above the surface water flood risk areas with an existing network of ditches; or, in the case of the proposed temporary construction access and East Claydon Road from both accesses towards the west, the flooding appears worse than it would actually be due to the presence of a culvert under the disused railway track in this location, and during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location.

4.26 As the proposed development will manage and discharge surface water generated in line with appropriate guidance, there will be a low risk of surface water flooding to the proposed development on site, and no increased risk of surface water flooding off site.

Groundwater Flooding

4.27 The risk of groundwater flooding is dependent on local geological and hydrogeological conditions at any given time. Groundwater levels rise during wet winter months and fall again in the summer when rainfall is low and extractions are higher. In very wet winters, rising groundwater levels can reactivate flow in ephemeral streams that only flow for part of the year or even lead to the flooding of normally dry land.

4.28 The Amet Property Ltd agricultural land classification report in **Appendix C** states 'The soils on the site are identified as being largely 712b DENCHWORTH Association, slowly permeable seasonally waterlogged clayey soils with similar fine loamy over clayey soils. Apart from the eastern boarder which are identified as 813b FLADBURY 1 Association, stoneless clayey soils, in places calcareous variably affected by groundwater.'

4.29 The Amet Property Ltd agricultural land classification report in **Appendix C** also states 'The subsoils are all gleyed with a moderately structured upper subsoil and poorly structured lower subsoil which is recorded as slowly permeable. Gleying starts anywhere from the surface to 50cm and the slowly permeable layer between 30cm and 80cm resulting in varying wetness classes.'

4.30 On the basis agricultural land classification survey indicates low permeability ground conditions, it is concluded that groundwater in the subsoil is likely to be of limited volume, and the likelihood of groundwater flooding in this strata is low.

Flooding from Infrastructure Failure

4.31 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or because of a reduction in capacity due to collapse, siltation, blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.

4.32 Typically, sewer systems are constructed to accommodate rainstorms with a 30-year return period or less, depending on their age. Consequently, rainstorm events greater than 1 in 30-years would be expected to result in surcharging of some parts of the sewer system. In fact, due to most gullies being poorly maintained and often partially blocked with silt, leaves and other debris, their capacity is often estimated to be closer to the 1 in 10-year storm.

4.33 During construction of the development foul water will be disposed of via 'Port-a-loo' type facilities and disposed of via a licenced waste carrier.

4.34 During the operational phase the development there will be minimal foul water discharge from the site and no foul water drainage systems are deemed necessary other than a 8,000 litre holding tank that will be manually pumped out on a scheduled basis with waste disposed of via a licenced waste carrier.

4.35 There are no known sewers in the vicinity of the site. Therefore, the site is considered to be at low risk of flooding from infrastructure failure.

4.36 Looking forward, the development's drainage must be designed in accordance with Sewers for Adoption, The Design and Construction Guidance (DCG), Building Regulations Approved Document Part H and BS EN 752. This will minimise the future risk of flooding due infrastructure failure.

Flooding from Artificial sources

4.37 There are no canals in the site area to create flood risk.

4.38 The EA Maximum extent of flooding from reservoirs map shown in **Appendix D** indicates that the site is not in an area at risk of reservoir flooding.

5.0 Future Flood Risk & Climate Change

5.1 The December 2024 NPPF and the supporting Technical Guidance document sets out how flood risk should be considered over the lifetime of a development. This requires an increase in flood risk due to climate change to be taken into account. Both peak river flows and rainfall intensity should be assessed.

Peak River Flows

5.2 Please see Sections 4.2-4.4.

Peak Rainfall Intensity

5.3 The site is currently agricultural fields which can be described as greenfield. The proposed development will increase the impermeable areas on site and, therefore, will increase the quantity of surface water runoff from rainfall.

5.4 With climate change it is becoming more common to see rainfall events of higher intensity, particularly in the southeast of England. Increased rainfall intensity affects river levels and drainage systems, with the result being an increase in surface water flooding and sewerage surcharge.

5.5 The NPPF states that, for flood risk assessments, the Peak Rainfall Allowances Map should be referenced to find out what the anticipated changes in peak rainfall are. The planning application for a Greener Grid Park north of the East Claydon Sub Station and East Claydon Road is for a temporary 40 year development. Government guidance on Flood risk assessments: climate change allowances clarifies that for 'development with a lifetime between 2061 and 2100 … use the central allowance for the 2070s epoch (2061 to 2125)'. However, as part of a precautionary approach, the surface water drainage strategy will be designed based on the Government guidance on Flood risk assessments: climate change allowances for developments which have a minimum lifespan of 100 years, whereby the upper end climate change allowances for both the 3.3% AEP and 1% AEP events should be used.

5.6 The development site lies within the Upper and Bedford Ouse Management Catchment[11]. In this catchment, the upper end climate change allowance for the 3.3% AEP and 1% AEP rainfall events are 35% and 40%, respectively.

5.7 The majority of the site is at 'very low' risk of surface water flooding and is anticipated to remain that way.

5.8 In addition, it is important that:

- Any changes to the land in this area must remain sensitive to the local surface water flood risk. This will ensure that any natural overland flow routes and surface water pathways will remain the same and the conveyance of surface water is not impeded.
- The surface water strategy for the site takes the latest climate change predictions into account, so as not to increase flood risk on- or off-site.

Residual Flood Risk

5.9 It is important to recognise that flood risk can never be fully mitigated and there will always be a residual risk of flooding. The residual risk is associated with several potential risk factors, including (but not limited to):

- A flood event that exceeds that for which the local flood defences or local drainage system has been designed to withstand.

[11] https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall?mgmtcatid=3009

- A residual danger posed to property and life because of flood defence failure through overtopping or structural collapse.
- General uncertainties inherent in the prediction of flooding.

5.10 Modelling of flood events is not an exact science. Therefore, there is an inherent uncertainty in the prediction of flood levels and extents used in the assessment of flood risk. EA's Flood Map for Planning is largely based upon detailed modelling within the area. However, other mapping products require numerous assumptions to be made. Whilst they all provide a good depiction of flood risk for specific modelled conditions, all modelling requires the making of core assumptions, and these might not occur in the open and dynamic environment of a flood event. Also, the EA's Flood Map for Planning and other flood modelling is updated regularly. Interested parties are recommended to keep abreast of this so that a significant change or increase in flood risk can be determined.

5.11 It is a requirement of this report that the surface of the proposed main compound and substation areas should finish a minimum of 150mm below any buildings and equipment. The scheme levels have been designed to achieve this requirement.

Table 5.1 – Residual Flood Risk

Flood Source	Risk Level				Comment
	High	Medium	Low	Very Low	
Fluvial				X	Flood Zone 1
Tidal				X	Tidal Flood Zone 1, far inland
Surface Water			X		Surface water flooding will not be a constraint on this site as the development will either predominantly be outwith the surface water flood risk areas; or, elevated above the surface water flood risk areas with an existing network of ditches; or, in the case of the proposed temporary construction access and East Claydon Road from both accesses towards the west, the flooding appears worse than it would actually be due to the presence of a culvert under the disused railway track in this location, and during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location.
Groundwater			X		It is concluded that groundwater in the subsoil is likely to be of limited volume, and the likelihood of groundwater flooding in this strata is low.
Canals				X	There are no canals in the vicinity.
Reservoirs				X	The Reservoir Flood Risk Map places the site well outside a maximum extent of flooding.
Infrastructure Failure				X	There are no known sewers in the vicinity of the site. Therefore, the site is considered to be at low risk of flooding from infrastructure failure.

Increase due to Climate Change			X		Increased peak rainfall intensities[12] are expected to affect surface water flood risk and infrastructure. This has been taken into account in the proposed surface water drainage strategy.

The Sequential and Exception Tests

5.12 The NPPF specifies that 'The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk)'.

5.13 A sequential approach has been applied to the design of the proposed development to ensure that battery storage, transmission and switch equipment are restricted to parts of the site within a very low or low risk of surface water flooding.

5.14 In terms of access or escape routes, the proposed permanent operational access follows the route of a disused railway track which runs north-south through the site. The topographical survey of the site shows the route of the disused railway track is elevated relative to adjacent ground, with a network of ditches prominent. Where surface water flooding is indicated to encroach on the route of the disused railway track, the surface water flood depth mapping indicates the yearly chance of 'Up to 20cm' flooding between 2040 and 2060 is Low.

5.15 The proposed temporary construction access is predominantly located in an area of Very Low surface water flood flooding, however, there are two areas where the surface water flood extent mapping shows the access to be in the Low, Medium and High surface water flood risk categories. The surface water flood depth mapping indicates the yearly chance of 'Up to 20cm' flooding between 2040 and 2060 is Very Low in one of the two areas. In the other area, the surface water flood depth mapping indicates the yearly chance of 'Up to 60cm' flooding between 2040 and 2060 is predominantly Very Low and Low, but, closer to East Claydon Road, the access slightly interacts with the Medium yearly chance of 'Up to 60cm' flooding extent. However, it is important to note the EA surface water flood mapping does not consider the presence of a culvert under the disused railway track in this location, therefore the flooding appears worse than it would actually be. Also, during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location, and a management and maintenance plan has been submitted as part of the planning application in this regard. Lastly, should the temporary construction access be flooded, Statkraft will have the ability to either close the access and suspend work for the period that the temporary access is flooded until the flood water recedes or divert construction traffic to the existing disused railway track that will be raised by a minimum of 300mm during the first phase of the construction works.

5.16 The surface water flood depth mapping indicates the yearly chance of 'Up to 60cm' flooding between 2040 and 2060 is predominantly Very Low and Low on East Claydon Road from both accesses towards the west. As stated above, it is important to note the EA surface water flood mapping does not consider the presence of the culvert under the disused railway track in this location, therefore the flooding appears worse than it would actually be, and during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location.

5.17 While no assessment has been undertaken to demonstrate there are reasonably available sites appropriate for the proposed development in areas with a lower risk of surface water flooding, this matter has been considered. The location is largely determined by the proximity of the East Claydon Substation

[12] https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

(and the planned replacement East Claydon substation for which Statkraft UK LTD has a connection agreement).

5.18 On the basis the FRA indicates the site lies within Flood Zone 1 - i.e. land assessed as having less than a 0.1 per cent (1 in 1000) chance of river flooding occurring each year as defined in Government Guidance on Flood risk and coastal change[13] - and the flood risk assessment indicates a low risk of flooding from all sources both now and in the future, sequential and exception tests are indicated not to be required for the proposed development.

[13] https://www.gov.uk/guidance/flood-risk-and-coastal-change

6.0 Surface Water Drainage Strategy

Proposed Surface Water Drainage Strategy

6.1 Current planning policy and EA guidance requires developments to employ SuDS (Sustainable Drainage Systems) techniques wherever feasible. Careful design of SuDS features can ensure that a development's surface water drainage closely reflects the natural hydrology of the pre-developed site.

6.2 SuDS will attenuate and treat surface water run-off quantities at the source (source control) in line with NPPF and EA policies.

6.3 Source control systems treat surface water close to the point of origin, in features such as soakaways, permeable paving and swales, to name a few.

6.4 As stated in Section 2.2, The site is comprised of agricultural arable fields, separated by landscape planting, trees and hedgerows around their perimeters. There is denser vegetation including hedgerows and treelines along the route of the disused railway track, which runs north-south through the site. On the basis the route of the existing disused railway track to be utilised as the proposed permanent operational access and the proposed temporary construction access will continue to drain as existing, the proposed additional permanent impermeable area for the development will be 8.61 ha, therefore the proposed development will increase the impermeable area of the site by 8.61 ha.

6.5 The additional approximately 0.93 ha temporary construction vehicle access road and construction compounds will be reinstated to agricultural field upon completion of the construction phase of the development. It is a requirement of this report that the temporary construction vehicle access road and construction compounds are built on crushed rock with a minimum 30% void ratio to facilitate the percolation and long term storage of surface water in these locations, and this has been added as a note to the Proposed Drainage Strategy in **Appendix E**.

Greenfield Runoff Rate

6.6 On the basis the IDB will permit a discharge rate of 4l/s/ha for the proposed permanent impermeable area of the site to the ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook, the drainage strategy in **Appendix E** of this report proposes 3 no. Surface Water HydroBrake Flow Control Chambers that will control discharge to 34.40 l/s for the 100 year + 40% climate change critical rainfall event.

The Drainage Hierarchy

6.7 The drainage hierarchy is a sequential check that intends to ensure that all practical and reasonable measures are taken to manage surface water as high up the hierarchy (with '1' being the highest) as possible, and that the amount of surface water managed at the bottom of the hierarchy is minimised. The Planning Practice Guidance to the National Planning Policy Framework (NPPF) states that "*Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable*".

6.8 The drainage hierarchy presented in the NPPF presents only four tiers of drainage options. This has been expanded on and adopted by others and now can be viewed as the following:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse

6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer
8. Discharge rainwater to the foul sewer.

6.9 The first two tiers of the drainage hierarchy ensure that surface water is retained within the site boundary and does not increase flood risk to others. This is always the most preferable method of surface water management.

6.10 The next six tiers of the hierarchy provide regional control, but with decreasing levels of pollution removal and reduced potential for amenity and habitat creation with each tier of the drainage hierarchy.

6.11 Within the lower six tiers of the drainage hierarchy, there must be some form of flow restriction, so that off-site surface water discharge resembles greenfield runoff rates, as much as is reasonably practicable. This requires on-site storage facilities, which may include ponds, swales, subsurface storage tanks and System C (non-infiltration) permeable paviours with flow control devices. Again, methods that provide the most potential for amenity and pollution removal should be favoured.

6.12 Each tier of the drainage hierarchy has been considered for the surface water drainage for the development site. In order of preference, the outcome of these considerations is below.

Tier 1 - Store rainwater for later use

6.13 The site has limited opportunities to use water reuse and recycling techniques. However, waterbutts could be considered.

Tier 2 - Use Infiltration techniques, such as porous surfaces in non-clay areas

6.14 As detailed in Chapter 2 infiltration techniques are not viable on site.

Tier 3 - Attenuate rainwater in ponds or open water features for gradual release

6.15 Ponds and open water features are SuDS features that offer surface water attenuation, pollution mitigation and amenity and biodiversity benefits.

6.16 There are components of the main compound area that will need to discharge to an attenuation basin via an oil separator for treatment purposes i.e. Coolers, Generators, Transformer. Therefore, these locations will be situated on an impermeable platform (concrete hardstanding or similar) with a separate drainage connection to the oil separator. Please see the proposed drainage strategy in **Appendix E**.

6.17 The attenuation basins will cover areas of 182m^2, 648m^2 and 2153m^2 and have attenuation depths of 0.60m and 0.80m. The swales will cover areas of 217m^2 and 442m^2 and have depths of 0.60m. Surface water runoff will be restricted by 3 no. Surface Water HydroBrake Flow Control Chambers that will control discharge to 34.40 l/s for the 100 year + 40% climate change critical rainfall event, which is the permitted IDB discharge rate for the proposed permanent impermeable area of the site.

Tier 4 - Attenuate rainwater by storing in tanks or sealed water features for gradual release

6.18 The proposed main compound area will have Type C No Infiltration Pervious Pavements comprising of a 25mm pervious surface layer and 375mm type 3 subbase with 30% void ratio that will provide approximately 4629m^3 attenuation storage. The proposed substation will be a Type C No Infiltration Pervious Pavement comprising of a 25mm pervious surface layer and 375mm type 3 subbase with 30% void ratio that will provide approximately 331m^3 attenuation storage. The pervious pavements will connect to the main drainage network that discharges to the existing watercourse via flow controls to maximise the attenuation storage in the pervious pavement sub base during extreme rainfall events. The proposed main compound area location is characterised by gently sloping topography, and a cut and fill approach will be implemented throughout.

6.19 Please see the proposed drainage strategy in **Appendix E**. Surface water runoff will be restricted by 3 no. Surface Water HydroBrake Flow Control Chambers that will control discharge to 34.40 l/s for the 100 year + 40% climate change critical rainfall event, which is the permitted IDB discharge rate for the proposed permanent impermeable area of the site.

Tier 5 - Discharge rainwater direct to a watercourse

6.20 As discussed above, it is proposed to discharge surface water to the existing ordinary watercourse to the north of the site at a restricted rate of 34.40 l/s, which is the permitted IDB discharge rate for the proposed permanent impermeable area of the site.

Tier 6 - Discharge rainwater to a surface water sewer/drain

6.21 This tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 7 - Discharge rainwater to the combined sewer

6.22 This tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 8 - Discharge rainwater to the foul sewer

6.23 This tier of the drainage hierarchy will not be needed for surface water discharge.

MicroDrainage Hydraulic Modelling

6.24 The drainage system outlined above has been tested in the MicroDrainage Source hydraulic modelling module.

6.25 The results of the MircoDrainage hydraulic modelling for the proposed development can be seen in **Appendix F**.

6.26 With reference to Section 6.4, the total area in the hydraulic model is 8.61 ha.

6.27 The results of the hydraulic modelling show that the drainage strategy as outlined above can attenuate and discharge surface water generated in the 1 in 100-year + 40% rainfall event without flooding. This manages flood risk on- and off-site and reduces overall local flood risk, particularly once it is considered the climate change allowance applied in the model is for a development which will have a minimum lifespan of 100 years, and the planning application is for a temporary 40 year development.

6.28 Therefore, this proposal is considered appropriate because the surface water drainage system manages flood risk on- and off-site and reduces overall local flood risk for the 1 in 100-year + 40% cc critical rainfall event.

Drainage Management and Maintenance

6.29 Whilst the drainage strategy for the site has been designed to current standards, there would remain a small residual risk of flooding due to blockage or failure of on-site infrastructure. Therefore, appropriate and regular maintenance of the drainage infrastructure should be undertaken by the site management company or their agents (and the residents, where applicable).

6.30 To assist with this process, a Drainage Management and Maintenance Plan has been prepared, which sets out the principles for the long-term management and maintenance of the proposed surface water drainage system on the development. The Drainage Management and Maintenance Plan can be seen in **Appendix G**.

6.31 The purpose of this document is to ensure that those responsible for site maintenance have a robust inspection and maintenance plan going forwards. This will help ensure the optimum operation of the surface water drainage system and that it will be regularly maintained for the lifetime of the development. This will contribute to reducing the risk of surface water flooding both on- and off-site.

7.0 Foul Water Drainage Strategy

Proposed Foul Water Drainage Strategy

7.1 During construction of the Development foul water will be disposed of via ‘Port-a-loo’ type facilities and disposed of via a licenced waste carrier.

7.2 During the operational phase the development there will be minimal foul water discharge from the site and no foul water drainage systems are deemed necessary other than a 8,000 litre holding tank that will be manually pumped out on a scheduled basis with waste disposed of via a licenced waste carrier.

8.0 Surface Water Runoff Quality

8.1 The NPPF states that the development should not have a detrimental impact on the environment, including the water environment. The technical guidance to the NPPF provides further advice on the benefits of ensuring runoff quality is to an appropriate standard.

8.2 The CIRIA SuDS Manual provides guidance on the treatment of surface water runoff. With regards to the proposed development, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from roof water runoff as 'very low'. The only requirement for roof water runoff is the removal of gross solids and sediments, which would be achieved using catchpits and silt traps.

8.3 With regards to the main compound and substation areas, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from roads and shared car parking as 'low'. To mitigate a 'low' pollution hazard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed, below.

8.4 Table 26.2 of the CIRIA SuDS Manual provides pollution hazard indices for different land use classifications. The land use classifications that require consideration for the proposed development site are in Table 8.1 below.

Table 8.1: Excerpt from Table 26.2 of CIRIA SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, homezones and general access roads) with less than 300 traffic movements per day.	Low	0.5	0.4	0.4

8.5 To deliver adequate pollution treatment and mitigation, the CIRIA SuDS Manual recommends using a SuDS component that has a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

8.6 Table 26.3 of the CIRIA SuDS Manual provides indicative SuDS mitigation indices for each SuDS type when discharging to surface water. Table 8.2, below, which is an excerpt from Table 26.3, shows the mitigation index for a permeable pavement.

Table 8.2: Pollution Mitigation Indices for Permeable Pavements

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Permeable Pavement	0.7	0.6	0.7

8.7 The mitigation indices for a permeable pavement exceed those of the highest pollution hazard index figures from Table 8.1 for the low pollution hazard level.

8.8 The above evidence shows the main compound and substation pervious pavements will provide sufficient pollution mitigation prior to discharge to surface water.

8.9 With regards to the remaining components of the permanent impermeable area that will need to discharge to an attenuation basin via an oil separator for treatment purposes (i.e. Coolers, Generators, Transformer), Table 8.3, below, which is an excerpt from Table 26.3 of the CIRIA SuDS Manual, shows the mitigation index for a detention basin.

Table 8.3: Pollution Mitigation Indices for Detention Basin

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Detention Basin	0.5	0.5	0.6

8.10 The above evidence shows the attenuation basin will provide sufficient pollution mitigation, prior to discharge to surface water, for a 'low' pollution hazard, but with the oil separator provided upstream of the attenuation basin, they will combine to ensure all pollution hazards are completely mitigated for the remaining components of the permanent impermeable area prior to discharge to the existing ordinary watercourse to the east of the site.

8.11 Fire water will need to be contained within the SuDS in the event of a fire and not be allowed to interact with any surface water flood extents. On this basis, the proposed open SuDS features that will serve the proposed main compound area will predominantly be located in areas at Very Low risk of surface water flooding, except for the smallest swale and basin in the western half of the site that will be located in the Low risk of surface water flood extent.

8.12 Lastly, Purpose Designed Water Pollution Containment Device Chambers will be installed downstream of the last attenuation basins to contain site runoff such as fire water in an emergency.

9.0 Fire Water Management Plan

9.1 The National Fire Chiefs Council Grid Scale Battery Energy Storage System planning - Guidance for FRS, Version 1.0 November 2022 states:

'As a minimum, it is recommended that hydrant supplies for boundary cooling purposes should be located close to BESS containers (but considering safe access in the event of a fire) and should be capable of delivering no less than 1,900 litres per minute for at least 2 hours. Fire and rescue services may wish to increase this requirement dependant on location and their ability to bring supplementary supplies to site in a timely fashion'.

9.2 On the basis the above guidance indicates around 228m^3 water is required, it is proposed the last two attenuation basins prior to the two outfalls have an attenuation volume greater than 228m^3, and the attenuation swales and basins have an impermeable liner to ensure these areas can be reinstated after a fire without fire water impacting the wider area.

9.3 It is also a requirement of this report that the proposed pervious pavement areas in the BESS locations are lined with an impermeable separating geomembrane at the sides and base to ensure these areas can be reinstated after a fire without fire water impacting the wider area. The proposed pervious pavement areas in the BESS locations will also provide long term storage capacity for the fire water, with the pervious pavements providing around 3585m^3 storage capacity.

9.4 Fire water will need to be contained within the SuDS in the event of a fire and not be allowed to interact with any surface water flood extents. On this basis, the proposed open SuDS features that will serve the proposed main compound area will predominantly be located in areas at Very Low risk of surface water flooding, except for the smallest swale and basin in the western half of the site that will be located in the Low risk of surface water flood extent.

9.5 Lastly, Purpose Designed Water Pollution Containment Device Chambers will be installed downstream of the last two attenuation basins to contain site runoff such as fire water in an emergency.

10.0 Summary and Conclusion

10.1 Motion has been commissioned by Statkraft UK LTD to undertake a FRA and prepare a Drainage Strategy to accompany a planning application for a Greener Grid Park north of the East Claydon Sub Station and East Claydon Road, East Claydon, Buckinghamshire, MK18 2LF. The development proposals will comprise of the Construction of a Greener Grid Park comprising energy storage and grid balancing equipment and associated infrastructure including access, drainage, landscaping and other incidental works. Proposed site layout and location plans can be seen in **Appendix A**.

10.2 The Amet Property Ltd agricultural land classification report prepared for the site in **Appendix C** indicates that infiltration SuDS will not be possible for the proposed development site on the basis water in the subsoil will not empty via infiltration.

10.3 The site area to which this report relates is agricultural fields which can be described as greenfield, except along the route of the disused railway track, which runs north-south through the site. The Proposed Drainage Strategy in **Appendix E** shows the existing on-site ditches based on the topographical survey of the site in **Appendix B**, and the estimated route of ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook - based on assumed 1m offset from boundary fenceline.

10.4 Claydon Brook; the ordinary watercourse that flows from the northern boundary of the site towards Claydon Brook; and a proportion of the existing on-site ditches based on the topographical survey of the site in **Appendix B**, are all located within the Buckingham & River Ouzel IDB area. Plans showing the extent of the IDB's district hatched in green are included in **Appendix C**.

10.5 The remainder of the existing on-site ditches based on the topographical survey of the site in **Appendix B** would be regarded as ordinary watercourses regulated by BC.

10.6 The FRA indicates the site is in an area at low risk from all sources of flooding both now and in the future.

10.7 Surface water flooding will not be a constraint on this site as the development will either predominantly be outwith the surface water flood risk areas; or, elevated above the surface water flood risk areas with an existing network of ditches; or, in the case of the proposed temporary construction access and East Claydon Road from both accesses towards the west, the flooding appears worse than it would actually be due to the presence of a culvert under the disused railway track in this location, and during the 40-year lifetime of the development, Statkraft as the operator of the site will maintain the ditches and culvert associated with this location.

10.8 It is a requirement of this report that the surface of the proposed main compound and substation areas should finish a minimum of 150mm below any buildings and equipment. The scheme levels have been designed to achieve this requirement.

10.9 As stated in Section 2.2, The site is comprised of agricultural arable fields, separated by landscape planting, trees and hedgerows around their perimeters. There is denser vegetation including hedgerows and treelines along the route of the disused railway track, which runs north-south through the site. On the basis the routes of the existing disused railway track to be utilised as the proposed permanent operational access and the proposed temporary construction access will continue to drain as existing, the proposed additional permanent impermeable area for the development will be 8.61 ha, therefore the proposed development will increase the impermeable area of the site by 8.61 ha.

10.10 The additional approximately 0.93 ha temporary construction vehicle access road and construction compounds will be reinstated to agricultural field upon completion of the construction phase of the development. It is a requirement of this report that the temporary construction vehicle access road and construction compounds are built on crushed rock with a minimum 30% void ratio to facilitate the percolation and long term storage of surface water in these locations, and this has been added as a note to the Proposed Drainage Strategy in **Appendix E**.

10.11 There are components of the main compound area that will need to discharge to an attenuation basin via an oil separator for treatment purposes i.e. Coolers, Generators, Transformer. Therefore, these locations will be situated on an impermeable platform (concrete hardstanding or similar) with a separate drainage connection to the oil separator. Please see the proposed drainage strategy in **Appendix E**.

10.12 The attenuation basins will cover areas of 182m^2, 648m^2 and 2153m^2 and have attenuation depths of 0.60m and 0.80m. The swales will cover areas of 217m^2 and 442m^2 and have depths of 0.60m. Surface water runoff will be restricted by 3 no. Surface Water HydroBrake Flow Control Chambers that will control discharge to 34.40 l/s for the 100 year + 40% climate change critical rainfall event, which is the permitted IDB discharge rate for the proposed permanent impermeable area of the site.

10.13 The proposed main compound area will have Type C No Infiltration Pervious Pavements comprising of a 25mm pervious surface layer and 375mm type 3 subbase with 30% void ratio that will provide approximately 4629m^3 attenuation storage. The proposed substation will be a Type C No Infiltration Pervious Pavement comprising of a 25mm pervious surface layer and 375mm type 3 subbase with 30% void ratio that will provide approximately 331m^3 attenuation storage. The pervious pavements will connect to the main drainage network that discharges to the existing watercourse via flow controls to maximise the attenuation storage in the pervious pavement sub base during extreme rainfall events. The proposed main compound area location is characterised by gently sloping topography, and a cut and fill approach will be implemented throughout.

10.14 Please see the proposed drainage strategy in **Appendix E**. Surface water runoff will be restricted by 3 no. Surface Water HydroBrake Flow Control Chambers that will control discharge to 34.40 l/s for the 100 year + 40% climate change critical rainfall event, which is the permitted IDB discharge rate for the proposed permanent impermeable area of the site.

10.15 The results of the hydraulic modelling in **Appendix F** show that the drainage strategy as outlined above can attenuate and discharge surface water generated in the 1 in 100-year + 40% rainfall event without flooding. This manages flood risk on- and off-site and reduces overall local flood risk, particularly once it is considered the climate change allowance applied in the model is for a development which will have a minimum lifespan of 100 years, and the planning application is for a temporary 40 year development.

10.16 The Drainage Management and Maintenance Plan can be seen in **Appendix G**.

10.17 Section 8.0 shows how the proposed access and main compound platform pervious pavements will provide sufficient pollution mitigation, prior to discharge to surface water, for the main compound and substation areas. Section 8.0 also shows how the attenuation basin will provide sufficient pollution mitigation, prior to discharge to surface water, for a 'low' pollution hazard, but with the oil separator provided upstream of the attenuation basin, they will combine to ensure all pollution hazards are completely mitigated for the remaining components of the permanent impermeable area prior to discharge to the existing ordinary watercourse to the east of the site.

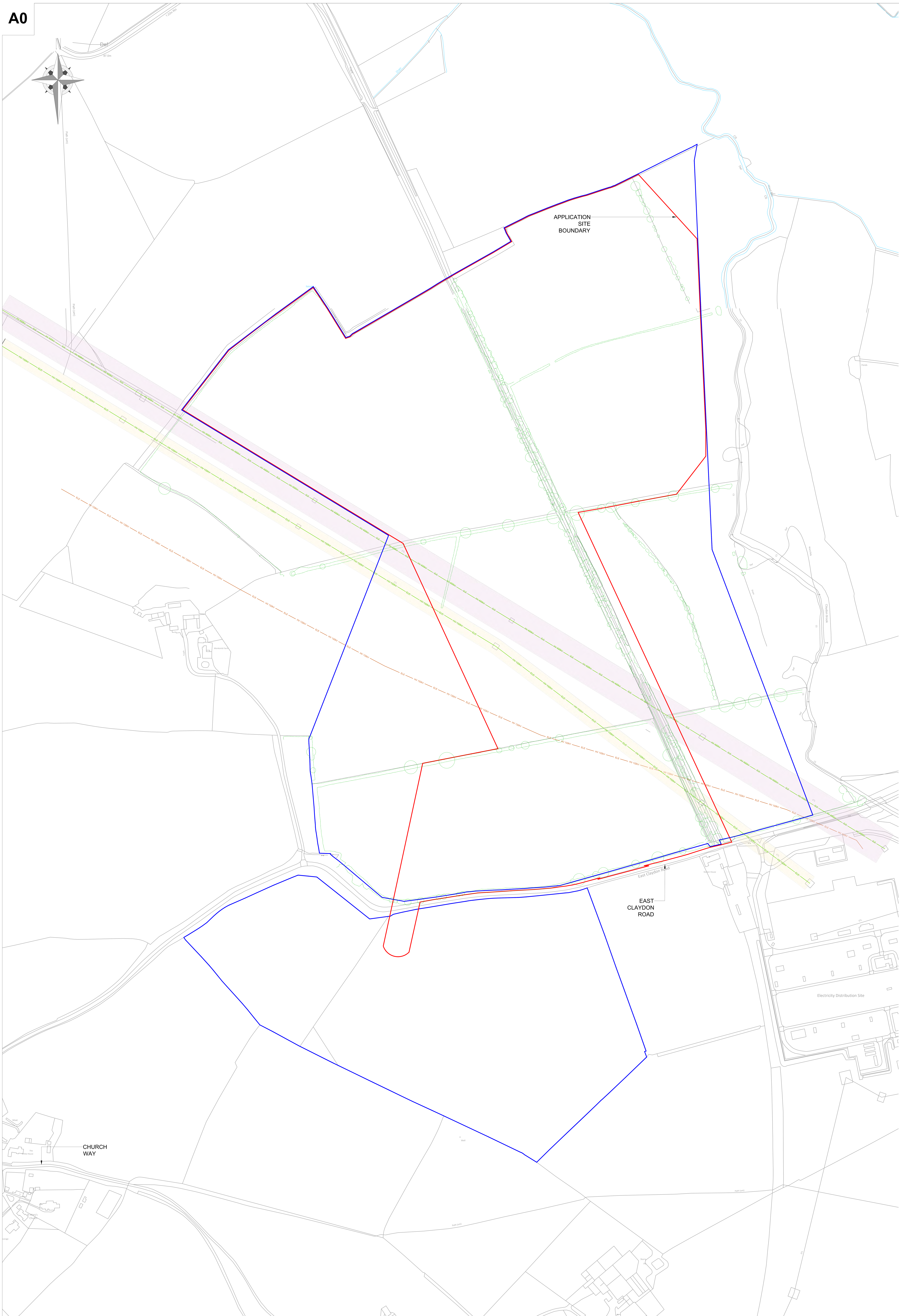
10.18 Section 9.0 shows how the proposed development will provide sufficient fire water management for the BESS locations.

10.19 In conclusion, the site is within an area at low risk from all sources of flooding both now and in the future and the surface water drainage system can manage flooding for the 1 in 100-year + 40% cc critical rainfall event. As such, flood risk and surface water management should not form an impediment to the progress of the planning application for the proposed development.

Appendix A

Existing and Proposed Site Layout and Location Plans

A0



Scale for planning purposes only. All dimensions are to be confirmed on site prior to commencement of work

Revisions:

Revision	Date	Revision Notes	Drawn	Inspected
01	10.04.24	First Issue	OB	JM
02	29.04.24	Legend and O/H line changed	OB	JM
03	01.05.24	Annotation moved	OB	JM
04	02.05.24	Titleblock changes	OB	JM
05	18.10.24	Update to RLB	OB	JM
06	03.04.25	Update to RLB	OB	JM
07	16.04.25	Amended As Per Comments	OB	JM

LEGEND:

APPLICATION SITE BOUNDARY
LAND WITHIN APPLICANT'S CONTROL
EXISTING 400kV O/H LINE AND 25M BUFFER (EITHER SIDE)
EXISTING 132kV O/H LINE AND 12M BUFFER (EITHER SIDE)
EXISTING UNDERGROUND 132kV CABLE

VEGETATION:

TREE SURVEY DATA

Project:
East Claydon Greener Grid Park

Client:
Statkraft

Statkraft UK Ltd.
19th Floor, 22 Bishopsgate
London, EC2N 4BQ
Tel: +44 (0) 20 7549 1000

Drawn by:
CADmando
2D, 3D CAD & BIM SERVICES

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Status:
PLANNING

Drawing Title:
East Claydon Existing Site Location Plan

Drawn:	Checked:	First Issued:
OB	JM	10.04.2024

Project Code: **STA008-** Drawing Number: **PL-00**

Sheet Size:	Scale:	Revision:
A0	1:2000	07

1 EAST CLAYDON EXISTING SITE LOCATION PLAN
Scale: 1:2000@A0

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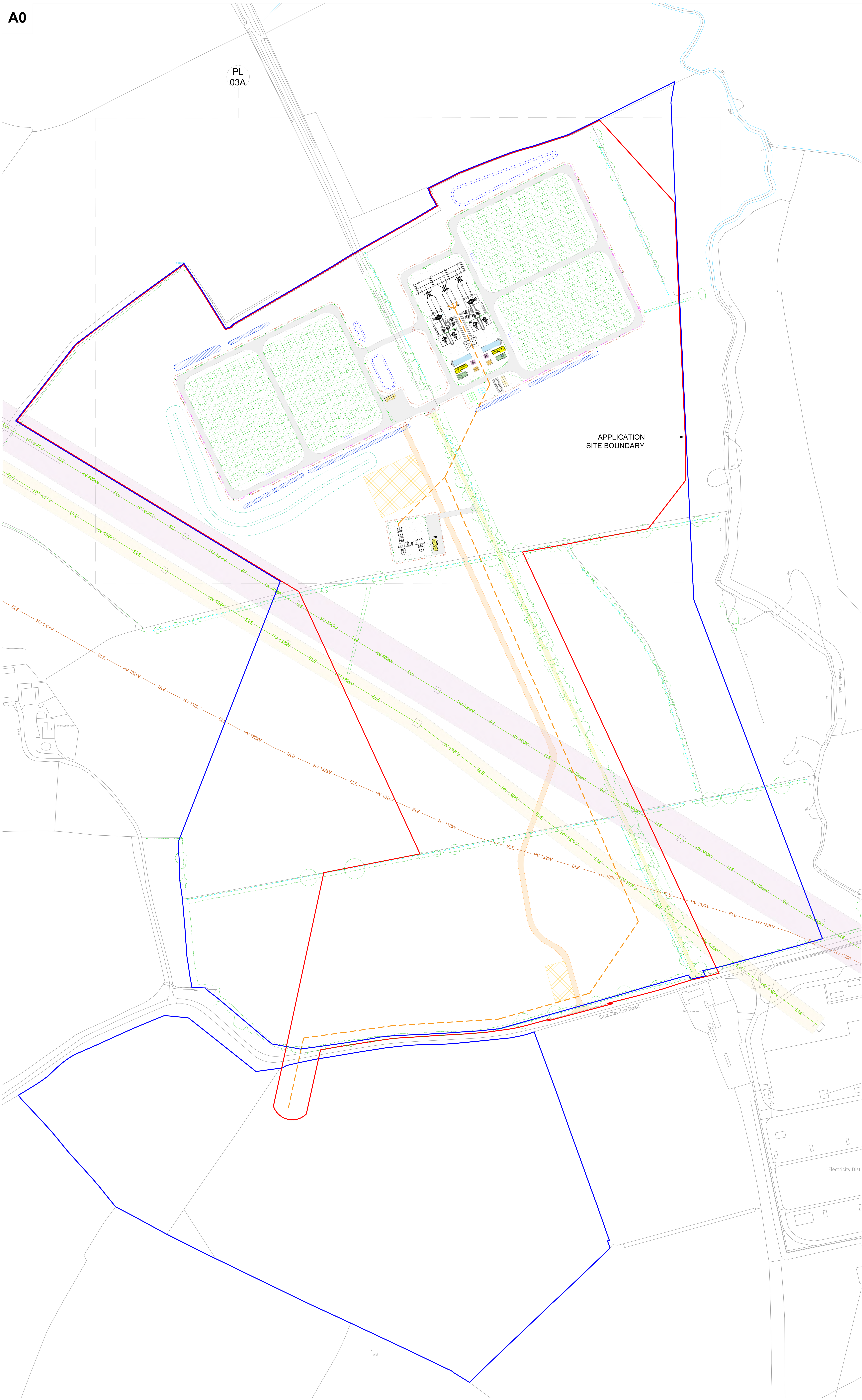
SCALE 1:2000

A0



1 EAST CLAYDON PROPOSED LAYOUT (1:1500) (CONSTRUCTION)

Scale: 1:1500@A0

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SCALE 1:1500

Scaled dimensions must not be taken from this drawing. All dimensions are to be confirmed on site prior to commencement of work. Scale for planning purposes only.

Revisions:

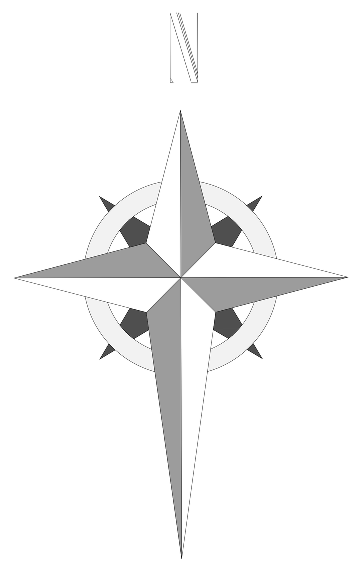
Revision	Date	Revision Notes	Drawn	Inspected
01	14.03.25	First Issue	OB	JM
02	31.03.25	Amended to suit Swept Path Analysis	JM	RL
03	03.04.25	Further amended to suit SPA	JTC	RL
04	08.04.25	Operational Access Track Amended	JTC	HL
05	16.04.25	Amended As Per Comments	OB	HL

LEGEND:

- APPLICATION SITE BOUNDARY (45.34 HECTARES)
- LAND WITHIN APPLICANT'S CONTROL
- ACCESS ROAD (6m WIDE)
- MAIN ACCESS ROAD
- TEMPORARY ACCESS ROAD
- PALISADE FENCE (3.4m HIGH)
- LIVESTOCK FENCE (1.1m HIGH)
- NOISE ATTENUATION FENCE (4m HIGH)
- PROPOSED UNDERGROUND CABLE ROUTE TO POC
- EXISTING UNDERGROUND 132kV CABLE
- EXISTING 400kV O/H LINE AND 25M BUFFER (EITHER SIDE)
- EXISTING 132kV O/H LINE AND 12M BUFFER (EITHER SIDE)
- ANTICIPATED ROUTE OF IDB WATERCOURSE
- EXISTING DITCH
- BUND

SITE INFRASTRUCTURE (L x W x H):

- SECURITY GATE(S)
- PEDESTRIAN EMERGENCY ACCESS GATE
- PERSONNEL GATE
- UNDERGROUND WATER TANK (13.00 X 2.50 X 3.20m)
- AUX TRANSFORMER (3.20 X 3.10 X 2.50m)
- HV YARD (MAIN) (144.00 X 72.00 X 10.00)
- PROPOSED SUDS BASIN
- PROPOSED SWALE
- TREES/VEGETATION
- LV TRANSFORMER (2.15 X 1.62 X 2.30m)
- LIGHTING & CCTV COLUMN (6m HIGH)
- AIR CORE REACTOR (1.5m DIA, 1.6m HIGH)
- GENERATOR CIRCUIT BREAKER (4.37 X 2.95 X 2.64)
- STORES (6.00 X 2.40 X 2.60m)
- WELFARE AND OFFICE (9.75 X 3.05 X 2.73m)
- BATTERY BLOCK (47.48 X 15.00 X 4.50m)
- OPERATIONS COMPOUND (17.10 X 6.70 X 5.55m)
- SECONDARY SUBSTATION (62.8 X 51.00 X 6.20m)
- CONTROL CONTAINER (12.20 X 2.50 X 2.85m)
- MAIN TRANSFORMER (23.28 X 14.91 X 10.00m)
- ENERGY MANAGEMENT BUILDING (24.86 X 16.74 X 7.29m)
- SWITCHGEAR ROOM (21.43 X 6.24 X 4.25m)
- CONTROL & METERING ROOM (14.00 X 4.86 X 6.25m)
- EMERGENCY DIESEL GENERATOR (4.65 X 1.6 X 3.5m)
- COMMS & LV HOUSE (12.16 X 5.63 X 6.25m)
- POROUS CRUSHED STONE AGGREGATE
- COOLER (11.68 X 2.40 X 2.68)



Project:
East Claydon Greener Grid Park

Client:
Statkraft

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Status:
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Drawing Title:
East Claydon Proposed Layout Plan (1:1500) (Construction)

Drawn:	Checked:	First Issued:
OB	JM	14.03.2025

Project Code:	Drawing Number:	
STA008-	PL-04A	

Sheet Size:	Scale:	Revision:
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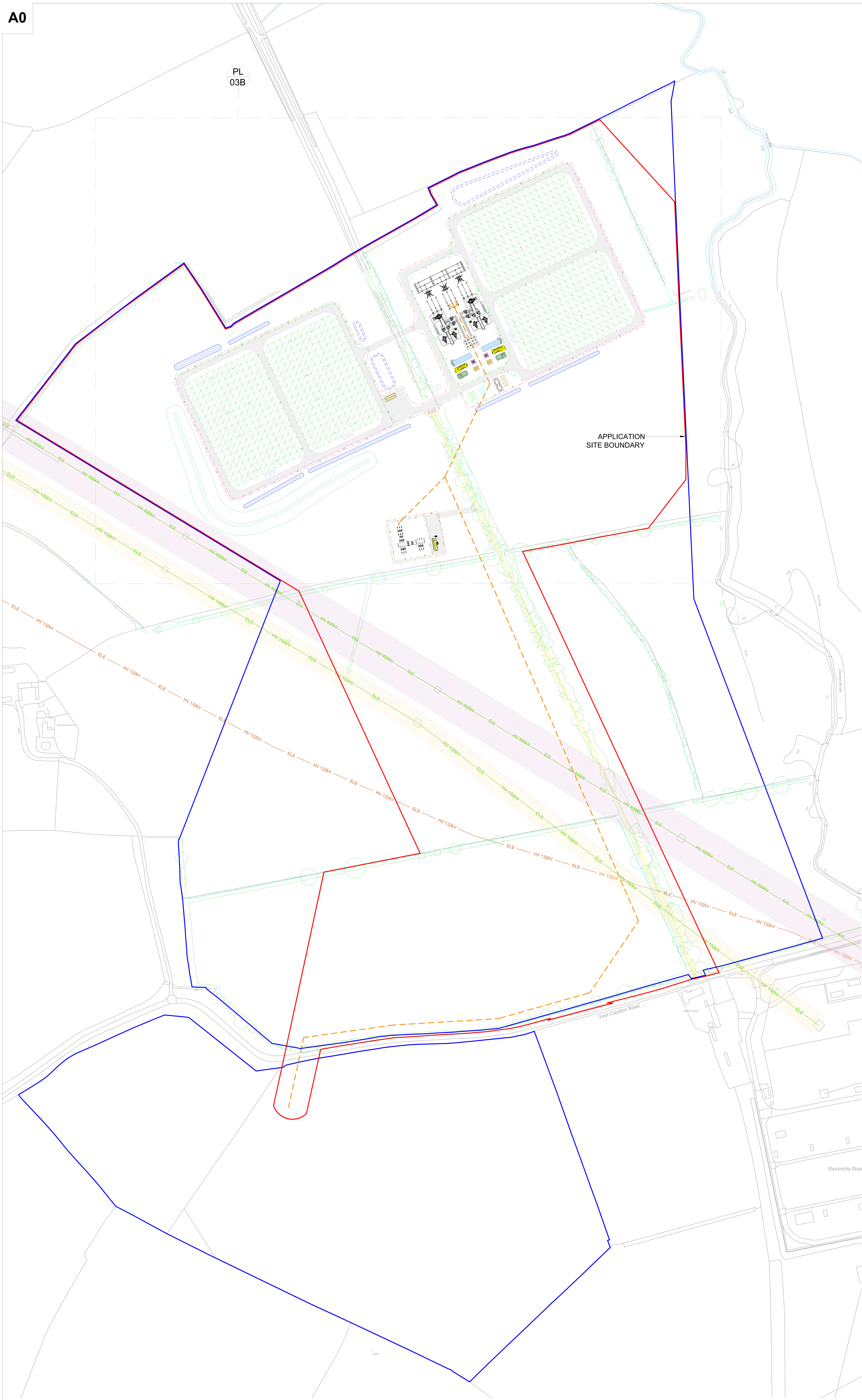

1 EAST CLAYDON PROPOSED LAYOUT (OPERATIONAL)

Scale: 1:1500@A0

0 15 30 45 60 75 90 105 120 135 150m

SCALE 1:1500

Scaled dimensions must not be taken from this drawing. All dimensions are to be confirmed on site prior to commencement of work. Scale for planning purposes only.

Revisions:

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01	14.03.25	First Issue	OB	JM
02	31.03.25	Amended to suit Swept Path Analysis	JM	RL
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N

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Drawing Title:
East Claydon Proposed Layout Plan (1:1500) (Operational)

Drawn:	Checked:	First Issued:
OB	JM	14.03.2025

Project Code:	Drawing Number:
STA008-	PL-04B

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