East Claydon Battery Energy Storage System

Flood Risk Assessment

Statera Energy

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Making Sustainability Happen

Revision Record

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Basis of Report

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Acronyms and Abbreviations

AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
BESS	Battery Energy Storage System
CC	Climate Change
DTM & DSM	Digital Terrain Model, Digital Surface Model
FFL	Finished Floor Level
FRA	Flood Risk Assessment
HPC (TUFLOW)	Heavily Parallelised Compute
LiDAR	Light Detection and Ranging
NPF4, NPF3	National Planning Framework 4, 3
NGR	National Grid Reference
PVA	Potentially Vulnerable Area
OS	Ordnance Survey
QA	Quality Assurance
RCP	Representative Concentration Pathway
SGS	Sub-grid sampling
UKCP18	United Kingdom Climate Projections – 2018 dataset
1D	One-Dimensional
2D	Two-Dimensional

Executive Summary

SLR Consulting Ltd (SLR) were commissioned by Statera Energy Ltd to produce a revised Flood Risk Assessment (FRA) in response to a previous objection from the Environment Agency (EA).

The EA have provided an objection to the previously submitted FRA as it does not comply with the requirement for site-specific flood risk assessments, as set out in paragraphs 20 to 21 of the Flood Risk and Coastal Change planning practice guidance and its site-specific flood risk assessment checklist. The previous FRA does not therefore adequately assess the flood risks posed by the development. In particular, the previous FRA fails to:

- Establish a reliable baseline fluvial flood risk evidence base for the site.
- Establish a reliable baseline surface water flood risk evidence base for the site.
- Assess the impacts of the temporary works on flood risk.

The proposed development is classed as 'Essential infrastructure' and is permitted in Flood Zone 2.

The site-specific FRA and hydraulic modelling satisfies the requirements identified by the Environment Agency in their objection letter dated 9th May and 5th June 2024.

The hydraulic modelling demonstrates that there is no fluvial flood risk to the Site for the baseline scenario and the proposed development scenario for the 1% + CC AEP Event. The results demonstrate a freeboard of 510mm for this flood event and safe for the lifetime of the development.

The surface water mapping indicates that flows are well contained to the ditches across the site area and that there is minimal surface water flooding on site. The modelling demonstrates that there are some isolated pockets of flooding that are less than 50mm in depth – this is considered negligible.

The modelling has also demonstrated that the temporary works are not modelled to increase the flood risk to the site or surrounding area for the 1% + CC AEP Event.

The modelling results demonstrate that there is suitable access and egress up to and including the 1% AEP plus CC via the proposed access.

1.0 Background

1.1 Introduction

SLR Consulting Ltd (SLR) were commissioned by Statera Energy Ltd to produce a revised Flood Risk Assessment (FRA) in response to a previous objection from the Environment Agency (EA). The revised FRA will support the application for the development of a Battery Energy Storage System (BESS) facility and associated infrastructure (‘the Site’) and address the EA objection requesting detailed hydraulic modelling of the Site.

The Site is located northwest of Hogshaw Road, East Claydon, MK18 3NU at an approximate National Grid Reference of (NGR) SP755250. The Site covers an area of approximately 30.8ha. The Site is bounded by undeveloped greenfield land. Hogshaw Road is located on the eastern boundary and the East Claydon Substation borders the northwest. The village of Granborough is located to the east of the site.

The Site location is indicated in Figure 1-1 below.

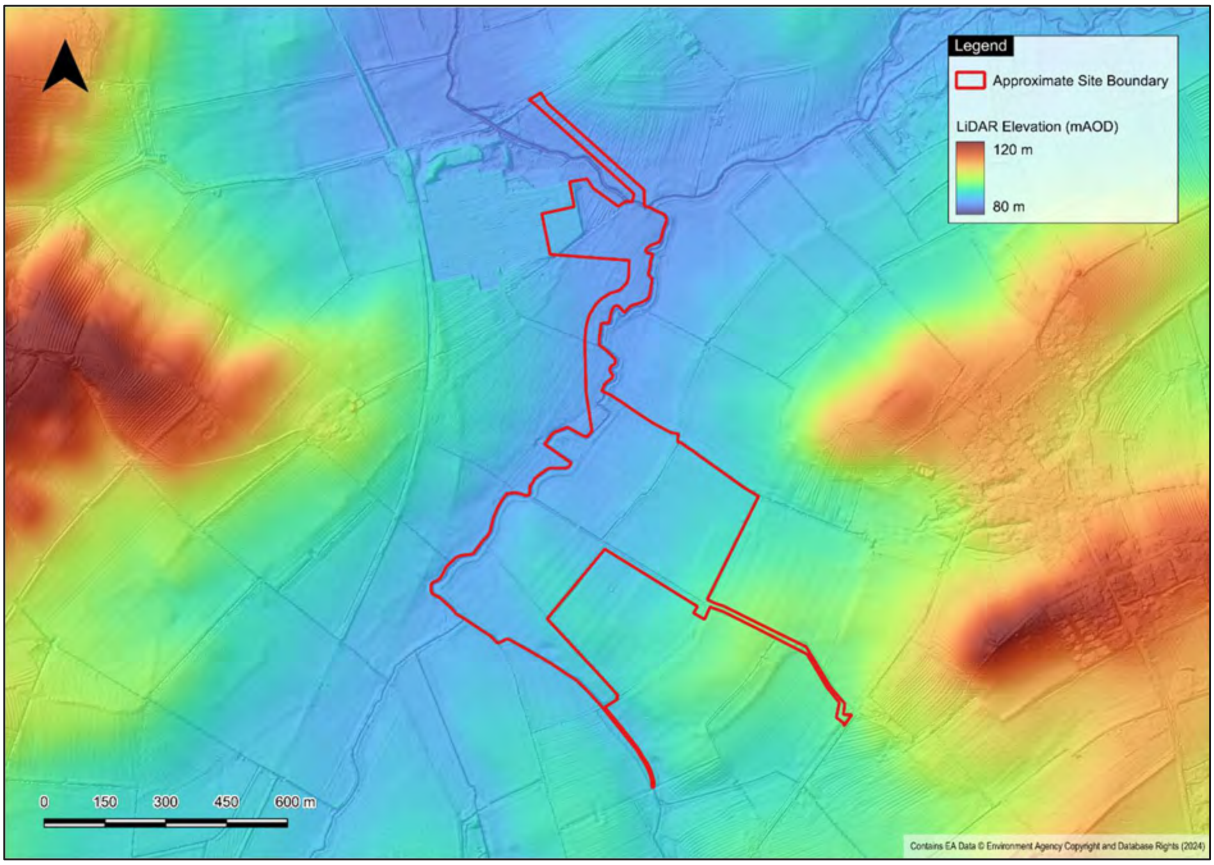
Figure 1-1: Site Location

1.2 Site Topography

LiDAR DTM was obtained for the Site at 1m spatial resolution. The data indicates that in general the ground levels slope from east to west ranging from approximately 98m AOD and 87m AOD.

The local topography as indicated in the LiDAR data is shown in Figure 1-2 overleaf.

Figure 1-2: Local Topography



© Bing Satellite data 2024

1.3 Proposed Development

The proposed development involves the construction of a Battery Energy Storage System facility and its associated infrastructure. This comprises of the following:

- Substation;
- Inverters and transformers
- Access roads and hardstanding for parking;
- Fencing; and
- Landscaping

The proposed development layout is provided in Appendix A.

1.4 Local Hydrology

The Claydon Brook is located immediately adjacent to the northern extent of the site boundary and a connecting tributary of the Brook runs along the western boundary of the Site. The connecting tributary drains an upstream area of approximately 16km^2.

The River Ray is located approximately 4km to the southwest of the Site, flowing in a westerly direction and is designated as an EA Main River.

1.5 Geology

Geological mapping provided by the British Geological Survey[1] indicates that the Site is underlain by bedrock of the Weymouth Member – Mudstone. The bedrock along the watercourse is overlain by superficial deposits of Alluvium – Clay, silt, sand and gravel. No superficial deposits are present on the Site itself.

1.6 Flood Risk Terminology

Flood risks are typically expressed by the probability of the occurrence of a flood event (maximum flood height or other such indicator) of stated magnitude or greater in any one year – termed the Annual Exceedance Probability (AEP). This may be expressed as a percentage (such as 1%, 0.1%, etc.) or by the equivalent chance of occurrence (1:100, 1:1000, etc.). For convenience, the latter approach is used in this report.

Where flood events have a Climate Change factor included, the flood event is denoted in this report by "+CC". For example, the 1:100 AEP flood event with Climate Change included is denoted "1:100+CC".

[1] British Geological Survey (BGS), GeoIndex Onshore, accessible at: https://mapapps2.bgs.ac.uk/geoindex/home.html (Accessed 03/09/24)

2.0 Planning Context

2.1 National Planning Policy

This FRA report has been completed in accordance with the guidance presented in the NPPF[2] and with reference to PPG[3]. The NPPF states that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and develop policies to manage flood risk from all sources taking account of advice from the Environment Agency. It is crucial that Local Planning Authorities consider the risks posed by flooding within their boundary when determining planning applications.

2.2 Local Plan

The Vale of Aylesbury Local Plan was adopted in September 2021 and contains the following policy relating to flood risk and drainage.

Policy I4: Flooding

Management of Flood Risk

"In order to minimise the impacts of and from all forms of flood risk the following is required:

a. Site-specific flood risk assessments (FRAs), informed by the latest version of the SFRA, where the development proposal is over 1ha in size and is in Flood Zone 1, or the development proposal includes land in Flood Zones 2 and 3 (as defined by the latest Environment Agency mapping). A site-specific FRA will also be required where a development proposal affects land in Flood Zone 1 where evidence, in particular the SFRA, indicates there are records of historic flooding or other sources of flooding, e.g. due to critical drainage problems, including from ordinary watercourses and for development sites located within 9m of any water courses (8m in the Environment Agency's Anglian Region)

b. All development proposals must clearly demonstrate that the flood risk sequential test , as set out in the latest version of the SFRA, has been passed and be designed using a sequential approach, and

c. If the sequential test has been satisfied, development proposals, other than those allocated in this Plan, must also satisfy the exception test in all applicable situations as set out in the latest version of the SFRA.

Flood Risk Assessments

All development proposals requiring a Flood Risk Assessment in (a) above will assess all sources and forms of flooding, must adhere to the advice in the latest version of the SFRA and will:

d. provide level-for-level floodplain compensation, up to the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change, and volume-for-volume compensation unless a justified reason has been submitted and agreed which may justify other forms of compensation

e. ensure no increase in flood risk on site or elsewhere, such as downstream or upstream

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2 National Planning Policy Framework: Communities and Local Government (Updated December 2023)

3 Planning Practice Guidance: Communities and Local Government (Updated July 2021)

receptors, existing development and/or adjacent land, and ensure there will be no increase in fluvial and surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event, with an allowance for climate change (the design storm event)

f. not flood from surface water up to and including the design storm event, or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site

g. explore opportunities to reduce flood risk overall, including financial contributions from the developer where appropriate

h. ensure development is safe from flooding for its lifetime (and remain operational where necessary) including an assessment of climate change impacts

i. ensure development is appropriately flood resistant, resilient and safe and does not damage flood defences but does allow for the maintenance and management of flood defences

j. take into account all sources and forms of flooding

k. ensure safe access and exits are available for development in accordance with Department

for Environment, Food and Rural Affairs (DEFRA) guidance 51. Access to "safe refuges" or "dry islands" are unlikely to be considered safe as this will further burden the Emergency Service in times of flood

l. include detailed modelling of any ordinary watercourses within or adjacent to the site, where appropriate, to define in detail the area at risk of flooding and model the effect of climate change

m. provide an assessment of residual flood risk

n. provide satisfactory Evacuation Management Plans, where necessary, including consultation with the Emergency Services and Emergency Planners

Climate Change

v. Climate change modelling should be undertaken using the relevant allowances (February 2016) for the type of development and level of risk

w. Safe access and egress should be demonstrated in the 1 in 100 plus climate change event, and

x. Compensation flood storage would need to be provided for the built footprint as well as any land-raising within the 1 in 100 plus appropriate climate change flood event. This compensation would need to be demonstrated within a Flood Risk Assessment (FRA)."

2.3 Flood Risk and Planning

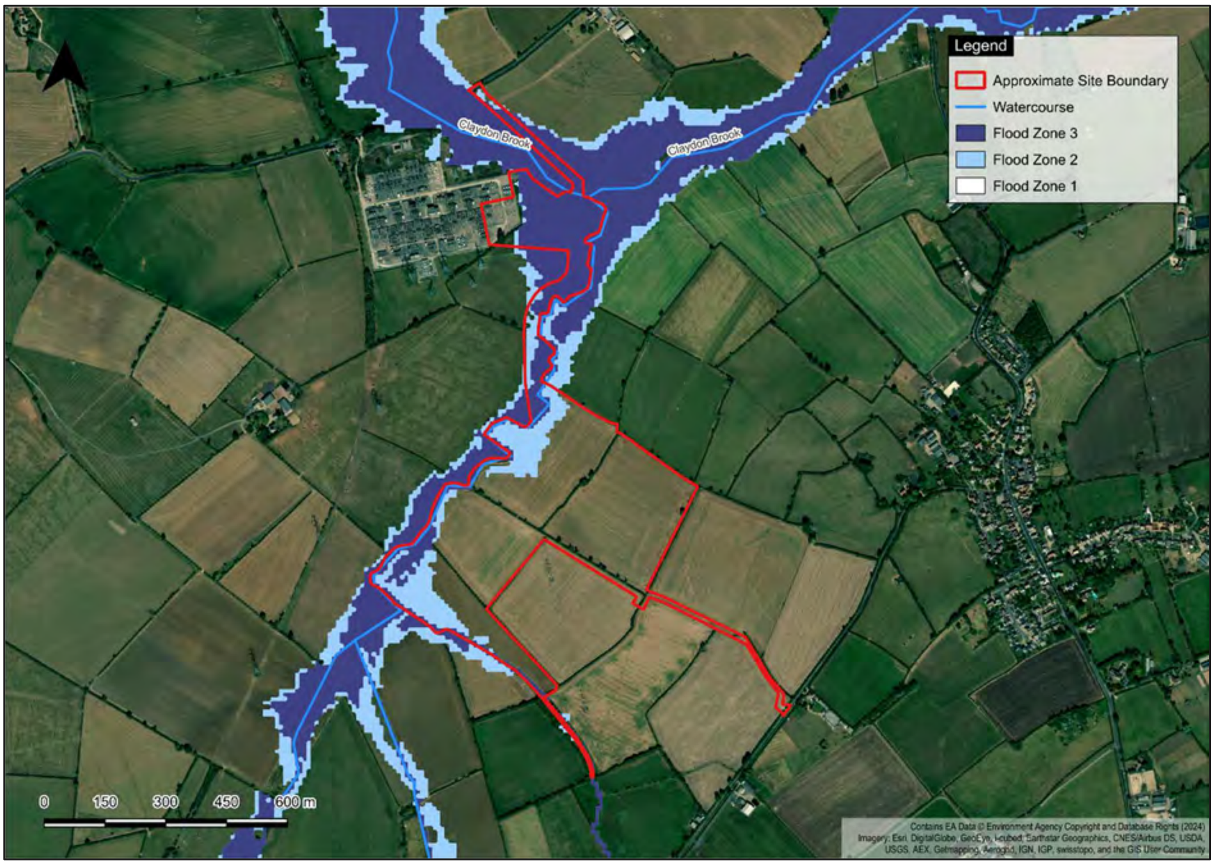
The definition of Flood Zones is provided in PPG *Table 1: Flood Zones*:

- *Zone 1 - Low Probability* (Flood Zone 1) is defined as land which could be at risk of flooding from fluvial or tidal flood events with less than 0.1% annual probability of occurrence (1:1,000 year) i.e. considered to be at 'low probability' of flooding.
- *Zone 2 - Medium Probability* (Flood Zone 2) is defined as land which could be at risk of flooding with an annual probability of occurrence between 1% (1:100 year) and 0.1% (1:1,000 year) from fluvial sources and between 0.5% (1:200 year) and 0.1% (1:1,000 year) from tidal sources i.e., considered to be at 'medium probability' of flooding.
- *Zone 3a - High Probability* (Flood Zone 3a) is defined as land which could be at risk of flooding with an annual probability of occurrence greater than 1% (1:100 year) from fluvial sources and greater than 0.5% (1:200 year) from tidal sources i.e., considered to be at 'high probability' of flooding.
- *Zone 3b - the Functional Floodplain* (Flood Zone 3b) is defined as land where water has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:
    - land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or
    - land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

In assessing the boundary between Flood Zones 1, 2 and 3, the protection afforded by flood defence structures, and other local circumstances, is not taken into account by the EA.

The EA Flood Map for Planning (Figure 2-1) indicates that the Site lies across Flood Zone 1, 2 and 3. The western portion of the Site is located in Flood Zone 3.

Figure 2-1: Extracts from the EA Flood Map for Planning



2.3.1 Flood Risk Compatibility

In accordance with the Flood Risk Vulnerability Classification in Table 2 of the PPG, the Battery storage facility is classified as an ‘Essential Infrastructure’ development.

PPG *Table 3: Flood risk vulnerability and Flood Zone ‘Incompatibility’* (reproduced as Table 2-1) confirms that, with respect to flood risk ‘*Essential Infrastructure’* development types are acceptable.

Table 2-1: Flood Risk Vulnerability and Flood Zone 'Incompatibility'

Flood Risk Vulnerability Classification (PPG Table 2)		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b (functional floodplain)	Exception Test Required	x	x	x	✓

Key: ✓ Development is appropriate x Development should not be permitted

2.3.2 Sequential Test

NPPF Paragraph 168 advises that the aim the Sequential Test is to '*steer new development to areas with the lowest risk of flooding from any source*'. Furthermore, it states:

> '*Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding*.'

The larger Site boundary is within Flood Zone 3 in relation to the tributary of the Claydon Brook however, 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 Flood Zone 1, with planting and biodiversity net gain areas only within Flood Zone 2 and 3. Furthermore, the location is largely determined by the proximity of the East Claydon Substation. As such the development is considered to be appropriate with regard to the Sequential Test.

Given this context it is considered that the site passes the Sequential Test in accordance with Paragraph 168 of the NPPF.

2.3.3 Exception Test

With reference to PPG Table 3: Flood risk vulnerability and Flood Zone 'Incompatibility' the Exception Test is not required as the battery storage, transmission and switch equipment are in Flood Zone 1.

The Exception test is used to demonstrate and ensure that flood risk to people and property will be managed satisfactorily. There are two elements to the Exception test:

a) *the development would provide wider sustainability benefits to the community that outweigh the flood risk;*

   It goes beyond the remit of this report to examine wider sustainability benefits, which are covered in other elements of the planning application, however it is considered that the proposed change of use will make greater use of the Site.

b) *the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

This report assesses the flood risk in the area and outlines mitigation that has been included in the scheme design to ensure the safety of site users and the property. It also demonstrates that there will be no risk of increase in flood risk offsite.

The responsibility for deciding if the development meets the requirements of the exception test falls to the local authority however, it is considered that the flood risk at the site is manageable for this development throughout its projected lifetime. The FRA concludes that development of the site will not increase flood risk elsewhere.

2.4 Climate Change

PPG requires that consideration of future climate change is included in FRA's and should be considered over the project development lifetime.

The Environment Agency guidance provides the impacts of climate change on flood risk in the UK to support the NPPF[4]. This guidance sets out that peak river flow, peak rainfall intensity, sea level, offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change. The site is remote from the open sea and therefore guidance on offshore wind speed and extreme wave heights are not relevant at this site.

The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios.

The consideration of climate change for this Site considers the possible changes in peak river flows and peak rainfall intensity.

4 Environment Agency, Flood Risk Assessments: Climate change allowances, October 2021, Updated May 2022

2.4.1 Peak River Flow Allowances

An extract of the Environment Agency's *Climate change allowances for peak river flow in England* map is reproduced in Table 2-2 for the *Upper and Bedford Ouse Management Catchment.*

Table 2-2: Peak River Flow Climate Change Allowances in the *Upper and Bedford Ouse* Management Catchment (1981-2000 baseline)

Management Catchment	Allowance Category	Total Potential Change Anticipated for the '2020s' (2015 to 2039)	Total Potential Change Anticipated for the '2050s' (2040 to 2069)	Total Potential Change Anticipated for the '2080s' (2070 to 2125)
Upper and Bedford Ouse	Upper end	24%	30%	54%
	Higher central	10%	11%	30%
	Central	5%	4%	19%

The EA require that for Essential Infrastructure developments located in Flood Zones 2,3a or 3b, the higher central allowance should be used to assess climate change. The development has a 40-year lifetime and therefore falls into the 2060s epoch.

An uplift of 11% is further assessed in Section 4 in the detailed modelling.

2.4.2 Peak Rainfall Allowances

The most recent advice on climate change is provided by the Environment Agency. An extract of *Upper and Bedford Ouse Management Catchment peak rainfall allowances* is reproduced as Table 2-3.

Table 2-3: Peak Rainfall Climate Change Allowances in the *Upper and Bedford Ouse* Management Catchment.

AEP (%)	Allowance Category	Total Potential Change Anticipated for 2050s	Total Potential Change Anticipated for 2070s
3.3%	Central	20%	25%
	Upper End	35%	35%
1%	Central	20%	25%
	Upper End	40%	45%

The Environment Agency recommends that, for developments with a lifetime between 2061 and 2100, Flood Risk Assessments should assess the central allowance for the 2070s epoch for both the 1% and 3.3% annual exceedance probability events.

3.0 Flood Risk Screening

A screening review has been completed as below to identify whether there are any potential sources of flooding at the Site which warrant detailed assessment and /or mitigation.

A summary of the potential sources of flooding and a review of the potential risk posed by each source to the Site is presented in Table 3-1 overleaf.

3.1 Screening Study

Potential Sources of flooding include:

- Flooding from the sea or tidal flooding;
- Flooding from rivers or fluvial flooding;
- Flooding from surface water and overland flow;
- Flooding from groundwater;
- Flooding from sewers;
- Flooding from reservoirs, canals, and other artificial sources; and
- Flooding from infrastructure failure.

Flood 'risk' definitions within the screening assessment are based on qualitative technical assessment considering the information reviewed, risk to site users and the development itself.

3.1.1 Fluvial and Tidal Flooding

With reference to the *Flood Map for Planning*, an extract of which is provided as Figure 2-1, the majority of the Site is located within Flood Zone 1. The western and southern portions of the Site are located in Flood Zone 2 and 3. As the Site is located at a significant distance inland it is not considered to be at risk from tidal sources.

Fluvial flood risk has been further assessed in Section 4.0

3.1.2 Flooding from Surface Water

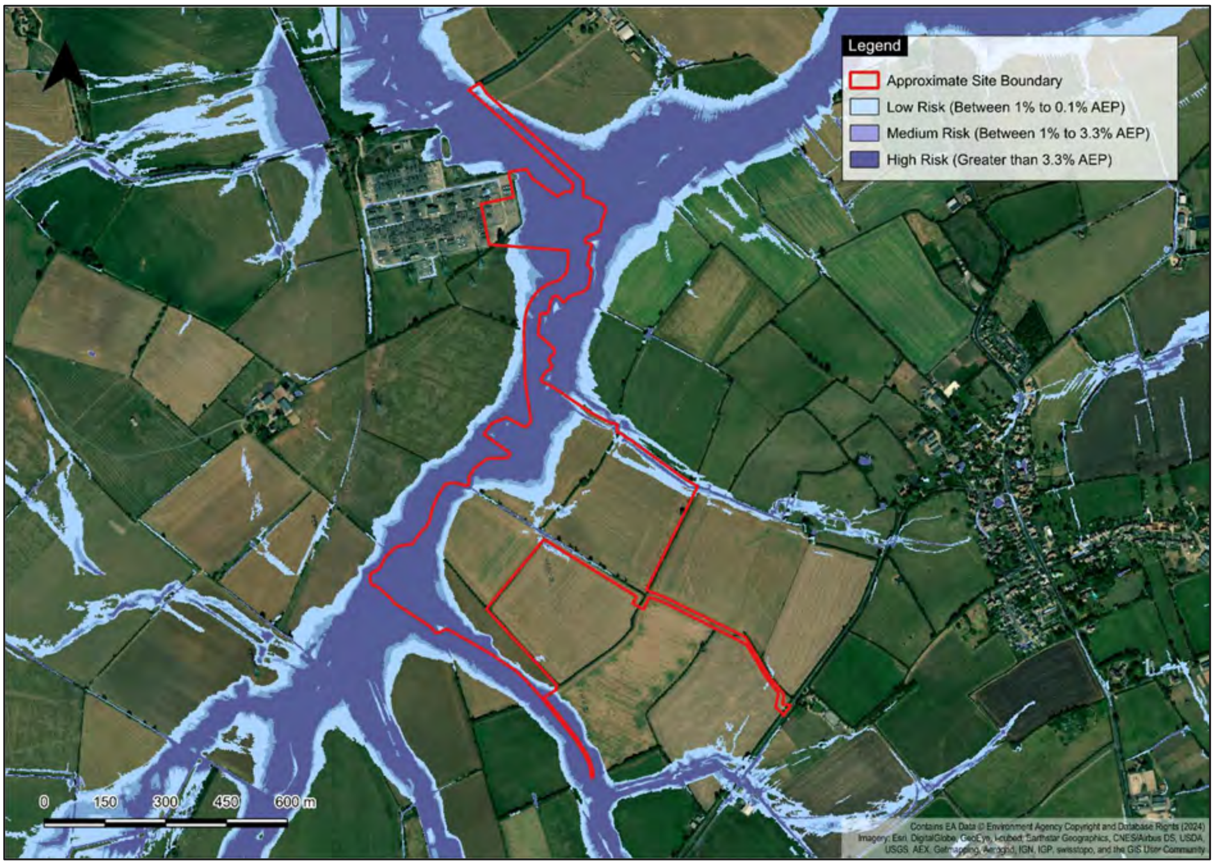
An extract from the EA *Long Term Flood Risk Information*[5] mapping showing areas potentially at risk of flooding from surface water has been provided as **Figure 3–1**.

The surface water flood risk categories are defined as:

- **Very Low:** less than 1 in 1,000 (0.1% AEP) chance of flooding in any given year;
- **Low:** less than 1 in 100 (1% AEP) but greater than or equal to 1 in 1,000 (0.1% AEP) chance of flooding in any given year;
- **Medium:** between 1 in 100 (1% AEP) and 1 in 30 (3.3% AEP) chance of flooding in any given year; and
- **High:** greater than 1 in 30 (3.3% AEP) chance of flooding in any given year.

5 Environment Agency's Long term flood risk assessment for location in England, (Available at: Check the long term flood risk for an area in England - GOV.UK (www.gov.uk)), (Accessed May 2024)

Figure 3-1: Extract of the EA Surface Water Flood Map



The mapping indicates that the majority of the Site is at a 'Very Low' risk of surface water flooding. Areas of 'Low' to 'High' risk are present along the northern, western and southern extent of the Site. Depths of over 1200mm are mapped in the 'Low' risk areas adjacent to the watercourses at the Site boundary. Areas of the proposed development have been steered to areas at 'Low Risk'. The flood risk from surface water has been further considered in detailed modelling outlined in Section 4.0

3.1.3 Flooding from Groundwater

Groundwater flooding is defined as the emergence of the water table from underlying geology.

As discussed in Section 1.5 the Site is underlain by superficial deposits of Alluvium, comprising clay, silt, sand and gravel and mudstone bedrock.

Groundwater recharge at the site and more broadly locally will be very limited due to the impermeable surfaces and the overlying alluvium (typically low permeability). Given this and the lack of any topographic forms that would encourage spring formation, the emergence of groundwater at the surface is considered very unlikely.

The risk of groundwater flooding is considered negligible, and no further assessment is required.

3.1.4 Flooding from Sewers and Water Mains

No drainage records have been provided for the Site. The land is currently agricultural land and therefore it is assumed that no artificial drainage systems will be present within the Site area.

The risk is assessed as very low and not requiring further assessment or mitigation.

3.1.5 Flooding from Reservoirs, Canals and other Artificial Sources

The Flood Risk from Reservoirs Map indicates that the Site is not at risk of reservoir flooding.

There are no canals or other artificial sources identified upgradient in the vicinity of the site. The risk of flooding from these sources is therefore negligible.

3.2 Flood Screening Summary

A summary of the potential sources of flooding and the flood risk arising from them is presented in Table 3-1.

Table 3-1: Potential Risk Posed by Flooding Sources

Potential Source	Potential Flood Risk at Site?
Sea or Tidal Flooding	No
Rivers or Fluvial Flooding	Yes – Further assessment in Section 4.0
Surface Water and Overland Flow	Yes – Further assessment in Section 4.0
Groundwater	No
Sewers and Water Mains	No

3.3 Environment Agency Objection

The EA have provided an objection to the previously submitted FRA as it does not comply with the requirement for site-specific flood risk assessments, as set out in paragraphs 20 to 21 of the Flood Risk and Coastal Change planning practice guidance and its site-specific flood risk assessment checklist. The previous FRA does not therefore adequately assess the flood risks posed by the development. In particular, the previous FRA fails to:

- Establish a reliable baseline fluvial flood risk evidence base for the site.
- Establish a reliable baseline surface water flood risk evidence base for the site.
- Assess the impacts of the temporary works on flood risk.

The previous FRA only utilised the Flood Map for Planning to determine flood risk to the Site, however, it is not suitable for a site-specific FRA as it contains a series of assumptions and generalisations and broadscale modelling which is not fit for purpose, nor does it assess the fluvial flood risk from the field drains discharging into the Claydon Brook.

To overcome the objection from the EA and to determine flood risk to the Site, detailed hydraulic modelling has been undertaken and the fluvial and surface water flood risk is discussed further in Section 4 below.

4.0 Detailed Flood Risk Review

4.1 Hydrological Assessment

4.1.1 Methodology

Both pluvial and fluvial hydrologic models have been developed in this study to allow estimation of fluvial and surface water flood risk to the site.

The rainfall hyetographs and flow hydrographs have been developed using the latest Flood Estimation Handbook[6] (FEH) Rainfall Runoff methods and validated using the FEH statistical method for the lumped catchments.

The Rainfall Runoff methods are those first published by Kjeldsen[7], which were subsequently updated in 2015 and implemented within the ReFH2 software[8]. The latest ReFH2.4 model was released in 2023 and calibrated for the FEH22 depth duration frequency (DDF) rainfall model.

Rainfall data was obtained using the FEH web service to obtain the point FEH22 DDF rainfall for the site. The rainfall model is produced at a 1km resolution. The analysis has been based upon the FEH catchment descriptors.

The ReFH2.4 model uses the catchment descriptor data to calculate the rainfall, and loss parameters, which are used to derive net rainfall and flow hydrographs. This assumes that rainfall, infiltration and other losses are modelled in ReFH2 and that the resultant net rainfall (runoff) is applied to a hydraulic model. Additionally, sewer losses have not been modelled in ReFH2.

The WINFAP v5.2 software[9] has been used to apply the Statistical method using the NRFA Peak Flow Dataset v13.0.2[10]. This method requires the estimation of the median annual flood (QMED) and a normalised flood frequency curve, termed flood growth curve.

The FEH data and methods are the regulatory recommended methods for estimating design rainfall in England, Scotland and Wales.

4.1.2 Hydrological Approach

The watercourses and catchments in this study are ungauged, and therefore the following study follows best practice for ungauged methods.

Due to the complexities of the watercourse network, which converges North of Hogshaw Road around the site, a distributed hydrological model has been used for this project. This allows the relative flows from the three sub catchments south of Hogshaw Road to be represented as separate fluvial inflows into the model. An intervening catchment then represents the catchment area north of Hogshaw Road to the confluence with the Claydon Brook. Both the unnamed tributary which drains the site area and the Claydon Brook are also modelled as lumped catchments, providing a fluvial model inflow for the Claydon Brook as well as lumped catchment to compare the hydrological flows of the distributed method to.

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[6] Flood Estimation Handbook, Centre for Ecology and Hydrology. 1999

[7] The revitalised FSR/FEH rainfall-runoff method. Supplementary Report No.1. Kjeldsen, T. R. Centre for Ecology and Hydrology. 2007.

[8] https://www.hydrosolutions.co.uk/software/refh-2/

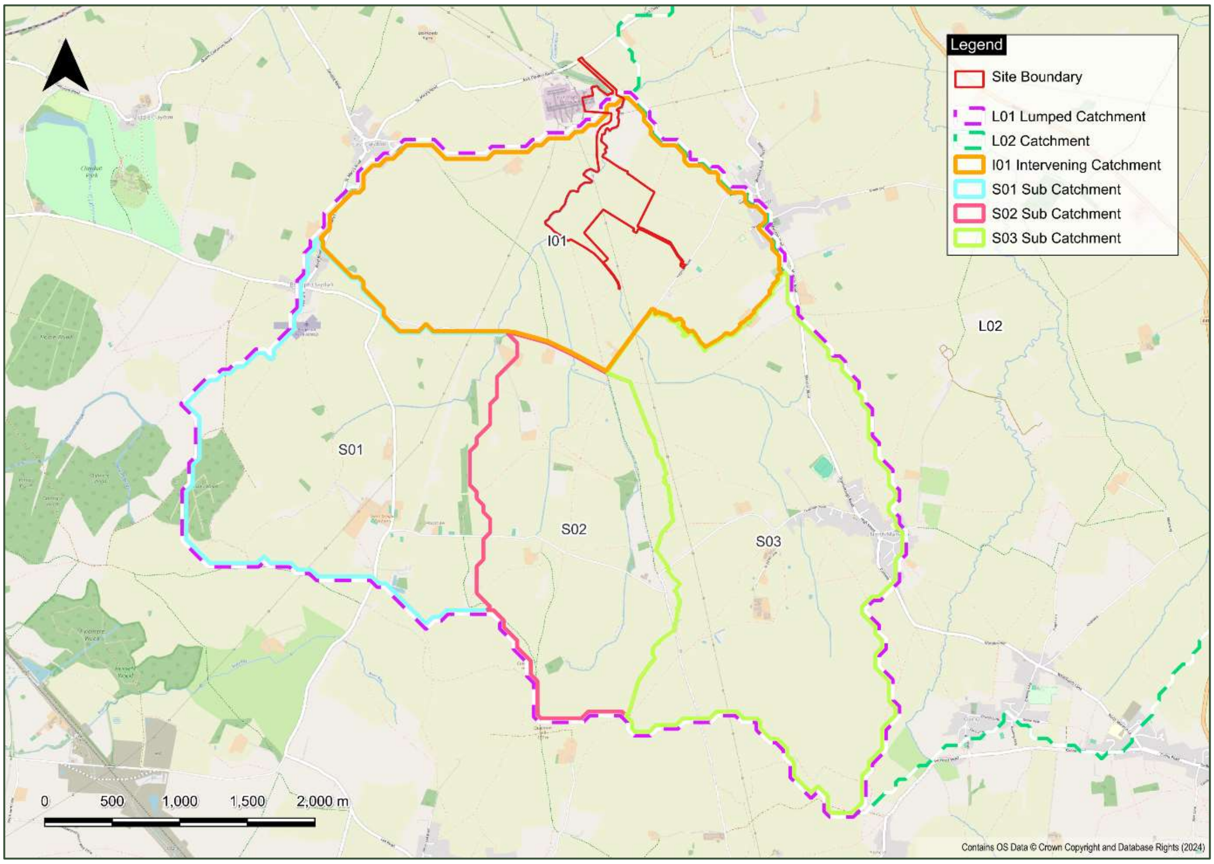
[9] https://www.hydrosolutions.co.uk/software/winfap-5/

[10] https://nrfa.ceh.ac.uk/peak-flow-dataset

4.1.3 Catchment Boundaries

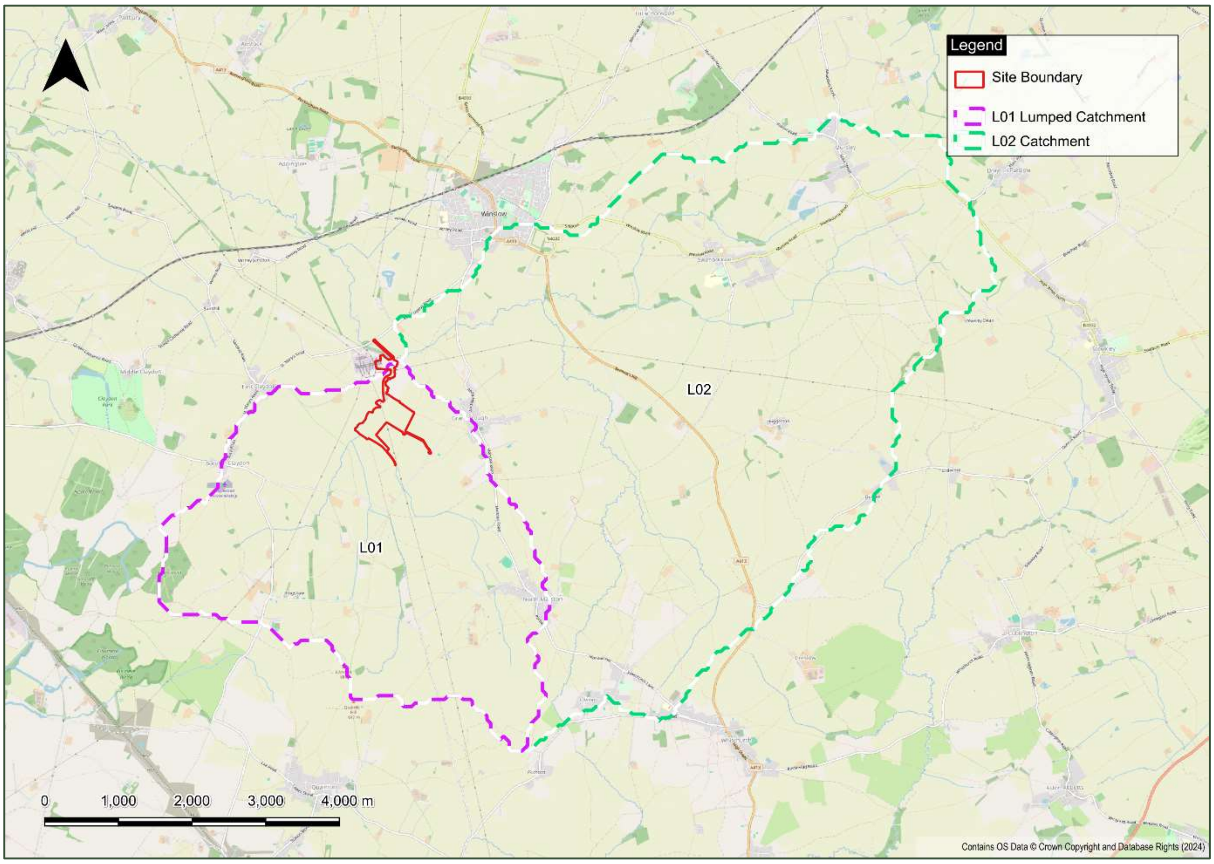
The delineated catchment boundaries for the two Lumped Catchments and one sub catchment have been downloaded from the FEH web service[11]. Only one sub catchment boundary has been estimated using the FEH webservice and they are hydrologically similar sub catchments, one can be used as a donor for the others and for the intervening catchment. The hydrographs for the fluvial flows for the sub catchments are scaled using directly by area. The remaining sub catchment boundaries were derived by watershed scripts in QGIS (with GRASS). Catchment delineations were adjusted using the different topographic maps (Google Terrain maps, OpenTopoMap and ESRI Topo Map). These maps provided local terrain contours and hydrological characteristics, allowing for a more accurate depiction of the catchment areas. The final adjusted catchment boundaries were compared and verified with the Google Satellite map, ensuring consistency and alignment with real-world features. The catchments are labelled in Figure 4-1 and Figure 4-2 below.

Figure 4-1: Catchment Delineation – Distributed Approach



[11] FEH web Service, May 2024 http://fehweb.ceh.ac.uk/Map

Figure 4-2: Lumped Catchment Delineation



4.1.4 FEH Catchment Descriptors

The catchment descriptors for the two lumped catchments and one representative sub catchment have been obtained from the FEH Webservice. The key FEH catchment descriptors for the three lumped catchments and intervening catchment are provided in Table 4-1.

The downstream catchment for the unnamed tributary (L01) has an area of approximately 16.77km^2 (updated delineation), flowing from south to north. The Claydon Brook catchment has an area of 38.28km^2. The catchment headwaters are around 180mAOD and the confluence of the unnamed tributary and Claydon Brook at Easting 475750, Northing 225950 is around 85mAOD. Therefore the catchments and watercourses throughout them have a relatively low average drain slope.

Geological mapping provided by the British Geological Survey indicates that the Catchments are underlain by bedrock of the Weymouth Member – Mudstone. The bedrock along the watercourse is overlain by superficial deposits of Alluvium – Clay, silt, sand and gravel. This is reflected in the BFIHOST19 values of 0.259 to 0.306 indicating that the catchment has low permeability.

The catchment is not significantly influenced by lakes or reservoirs as indicated in the FARL values of 0.999 to 1.000.

The catchment is not significantly urbanised, with the URBEXT2000 value close to 0 classifying the catchment as 'essentially rural'.

Table 4-1: FEH Catchment Descriptors

Descriptor	L01	L02	I01	S01	S02	S03
FEH Area (km^2)	16.77	38.28	4.120	3.141	5.235	4.282
SAAR6190 (mm)	645	663	N/A	638	N/A	N/A
DPLBAR (km)	3.99	6.95	N/A	1.82	N/A	N/A
BFIHOST19	0.259	0.306	N/A	0.25	N/A	N/A
FARL	1	0.998	N/A	1	N/A	N/A
FPEXT	0.1559	0.1078	N/A	0.1775	N/A	N/A
PROPWET	0.32	0.32	N/A	0.32	N/A	N/A
URBEXT2000	0.0045	0.0086	N/A	0.0052	N/A	N/A

4.1.5 Climate Change

The most recent advice on climate change is provided by the Environment Agency[12] (EA). The catchment is located within the Upper and Bedford Ouse Management Catchment where a 25% peak rainfall intensity allowance is recommended to represent the anticipated impact of climate change to the year 2070, which is adopted in ReFH2 for the pluvial model. A fluvial increase of 11% represents the anticipated impact of climate change till 2069, and has been adopted in the fluvial model.

4.1.6 Rainfall Runoff Method

The FEH rainfall runoff method analysis has been undertaken using the ReFH2.4 model. The critical model catchment in terms of flood risk at the site has been identified as L01. This catchment has a critical storm duration of 9hrs, which is applied across all catchment analysis in ReFH2. The Areal Reduction Factor (ARF) and Seasonal Correction Factor (SCF) were kept at the default values defined by the ReFH2.4 software. ReFH2 analysis has been completed for L01, L02 and S01. All other sub and intervening catchment hydrographs have been linearly adjusted based on area using S01, which is an appropriate donor catchment.

Due to the rural nature and low permeability of the catchment, the rainfall runoff method is deemed appropriate for use of generation of hydrographs.

Net rainfall hydrographs and baseflow have been extracted from L01 catchment.

The design flows for the 1% AEP plus climate change event are summarised in Table 4-2 and the net rainfall for the surface water modelling is summarised in Table 4-3.

4.1.7 Statistical Method

The statistical method has been applied using WINFAP 5.2 both L01 and L02 lumped catchments, to provide comparative peak flows. Due to the size of L01, being below 25km^2, the small catchment methodology was adopted for L01, whereas standard pooling group method was used for L02. Despite adjustment of the pooling group, to remove high BFIHOST gauges and introduce more gauges with a lower number of non flood for both lumped catchments, the pooling groups were still deemed as 'heterogenous', therefore

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

indicating a poor hydrological similarity in the pooling group. The default selection of QMED donors was also adjusted to remove the closest gauge at 33005, Bedford Ouse @Thornborough Mill, due to high BFIHOST value and low $QMED_{obs}$ relative to $QMED_{cds}$. The GEV fitting for the growth cures was adopted due to the best 'Goodness of Fit' value.

4.1.8 Results and Final Peak Flow Selections

The relative peak flows for the statistical method and Rainfall Runoff Method are shown in Table 4-2. As the rainfall runoff method is deemed more reliable and appropriate for these catchments, as well as the heterogenous pooling group for the statistical method, the rainfall runoff hydrograph have been adopted without adjustment in the fluvial model.

To validate the distributed approach used in the model, the maximus of the sub and intervening catchment peak flows are compared to the routed flows in the hydraulic model at the confluence with the Claydon Brook (L01_DS). Table 4-2 below shows that the distributed method results in conservative estimates for peak flow in comparison to the lumped catchment rainfall runoff method and statistical method.

Table 4-2: Summary of Peak Fluvial Inflows

Catchment Name	AREA (km²)	3.3% AEP Peak Flow (m³/s)	1% AEP Peak Flow (m³)	1% + 11% CC AEP Peak Flow (m³)	0.1% AEP Peak Flow (m³)
L01(9hr)	*16.770*	15.13	18.94		30.03
L01 WINFAP	*16.770*	11.16	14.08	15.63	20.11
L01 Fluvial Distributed Model PO (L01_DS)	*16.770*	**20.75**	**26.10**	**29.01**	**41.13**
L01 Pluvial Distributed Model PO (L01_DS)	*16.770*	**27.48**	**37.51**	**51.17**	**65.99**
L01 sum of inflows max	*16.770*	**21.21**	**26.65**	**29.58**	**41.92**
L02 (11hr)	*38.28*	22.89	28.53		46.69
L02 (9hr)	*38.28*	22.00	27.35		44.85
L02 (WINFAP)	*38.28*	20.60	25.27	28.05	33.83
S01 (9hr)	*4.120*	5.21	6.54	7.26	10.29
S02	*3.141*	3.97	4.99	5.54	7.85
S03	*5.235*	6.62	8.32	9.23	13.08
I01	*4.282*	5.41	6.80	7.55	10.70

Table 4-3: Summary of Peak REFH2 net rainfall (mm/hr)

Catchment Name	AREA (km²)	3.5% AEP Peak Net Rain (mm/hr)	1% AEP Peak Net Rain (mm/hr)	1% + 25% CC AEP Peak Net Rain (mm/hr)	0.1% AEP Peak Net Rain (mm/hr)
L01 (9hr)	16.770	10.87	13.40	16.75	20.25

4.2 Hydrological Assessment

This section of the report summarises the construction of the 1D-2D hydraulic model using ESTRY TUFLOW HPC software to simulate the fluvial flooding impacts for 1% AEP event plus CC.

The construction of the hydraulic model requires:

- Model extent;
- Model cell size;
- Topography;
- Hydraulic features;
- Hydraulic boundaries; and,
- Ground roughness (Manning's n).

4.2.1 Topography

The underlying base of the topography comes from two sources:

- LiDAR 1m DTM Data
- Watercourse topography survey data, collected in 2024.

4.2.2 Model Cell Size

A 5m model grid cell size was utilised. This cell size has also been determined to be sufficient for incorporating important topographic details such as simulating flow paths and representation of the general topography in the modelled area. These factors were carefully considered to provide an accurate evaluation of the flood risk model grid cell size, ensuring a thorough and robust assessment of potential flood impacts.

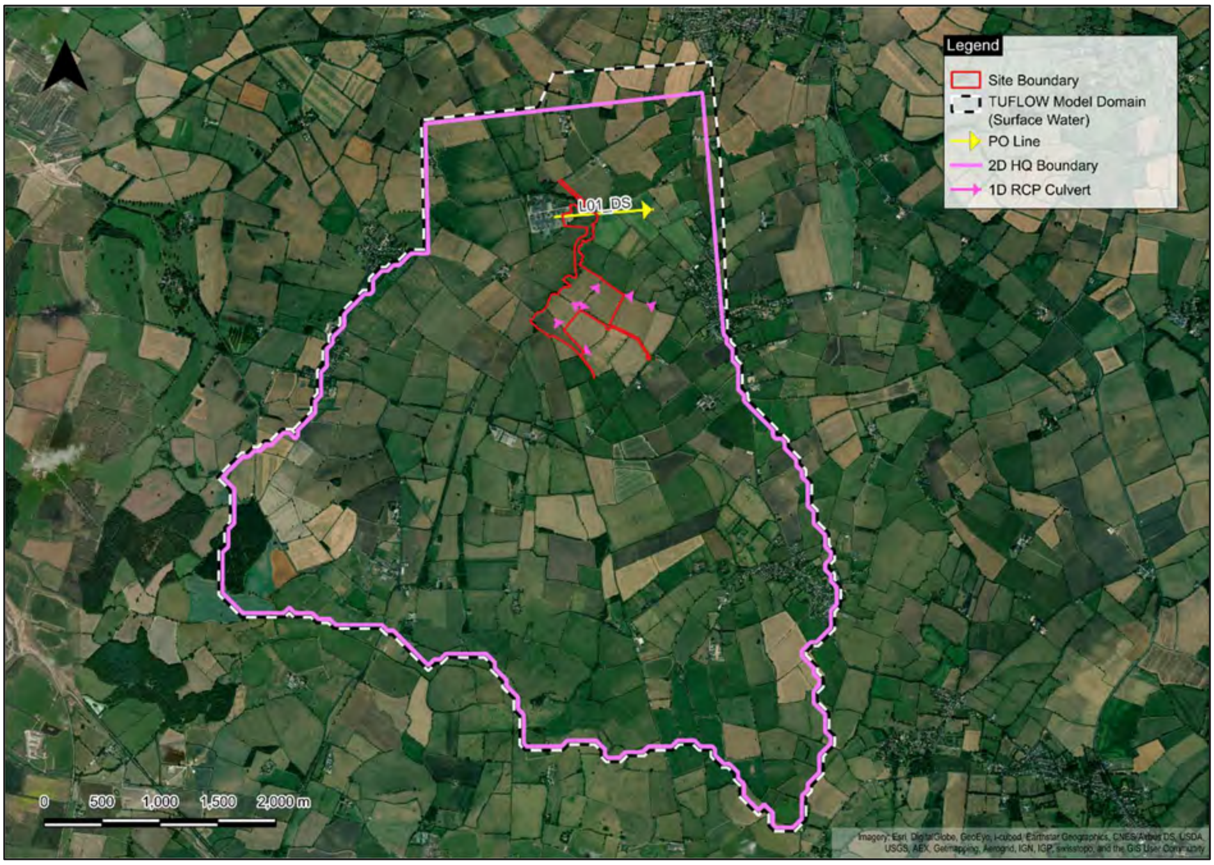
4.2.3 Model Set Up

The hydraulic model was developed to assess fluvial and pluvial flood risk. To achieve these, differing boundaries and 2D codes were required to model the two scenarios. The pluvial model required a larger code area to simulate the contributing catchment. The general model set up is presented in Figure 4-3

The model uses ZSH layer to define the watercourses using the collected topographic data in conjunction with the LIDAR data to represent the floodplain.

Figure 4-3: Fluvial Hydraulic Model Setup

Figure 4-4: Pluvial Hydraulic Model Setup



4.2.4 Hydraulic Boundary

For the fluvial modelling, the boundary condition applied to the TUFLOW model was four Flow-Time (QT) boundaries placed to the south and the east of the site for each watercourse. The rainfall was applied over the full modelled area. These boundaries were used to assign the fluvial flows and rainfall for the 1 in 100 year plus CC (1% plus CC Annual Exceedance Probability (AEP).

The downstream boundary was a Normal Depth boundary located approximately 1,800m downstream of the proposed development.

4.2.5 Structures

Seven culverts were included in the hydraulic model as 1D ESTRY units, using default culvert coefficients. The culverts are all located in the ditches of the proposed Site. Three bridges were included in the 2D domain of the baseline model.

Due to the lack of available data for the culverts, conservative assumptions have been made regarding the structures. Culverts have been given a diameter of 0.3m and assumed to be circular. The two smaller bridges along the southwestern boundary have been assumed to have a 0.3m deck depth. The bridge to the north on East Claydon Road has an assumed deck depth of 0.6m.

The proposed design has been provided for the two temporary work bridges, available in Appendix A. These have been included in the 2D domain as 2d_bg shapes accordingly to assess the impacts of the works in the proposed development scenario.

4.2.6 Manning’s N

The definition of the extent of each of the roughness values in the 2D domain was determined using the OS Opendata layers[13]. This information was verified by reviewing aerial imagery of the site and site visit observations.

The material roughness across the model domain has been read into the hydraulic model using a TUFLOW standard Material.csv with Manning’s n values derived from Chow (1959)[14].

Table 4-4: Modelled Material Properties

Material ID as referenced in GIS layer	Manning's n value	Land use type
9999	0.035	Watercourse and Floodplain Roughness
10172	0.025	Roads
10021	0.300	Buildings
10111	0.100	Woodland

[13] Free OS OpenData Map Downloads | Free Vector & Raster Map Data | OS Data Hub

[14] Chow, V.T., (1959). Open-channel hydraulics, McGraw-Hill, New York

4.2.7 Software Version

In line with good modelling practice, the TUFLOW model was constructed using the latest commercially available software version at project outset: TUFLOW HPC 2023-03-AD (single precision).

4.2.8 Modelling Parameters

The underlying 2D digital terrain model (DTM) was generated using the base LiDAR grid. Sub-grid sampling (SGS) testing was undertaken during the initial model build. It was decided to continue using HPC with SGS functionality in 5m grid cell size.

For the rainfall modelling the Cell Wet/Dry Depth has been adjusted to 0.2mm as per the recommended value in the TUFLOW software guidance.

All modelled scenarios have been simulated to allow for the inflow boundaries to complete the full hydrograph and allow the watercourse to return to low levels. The computational timesteps used by HPC are adaptive over the course of the simulation, with 2D time-varying outputs generated every 15 minutes.

4.3 Model Results

4.3.1 Baseline

Maximum flood extents and depths results for the area and surrounding the Site are presented in Figure 4-5 to Figure 4-10: for the 3.3%, 1%, 1% + CC and 0.1% AEP event.

Both the fluvial and surface water results show that the flooding is generally well contained to the main channel. There is out of bank flow to the west of the existing substation, this correlates to the EA flood zone mapping.

The results demonstrate that for the proposed development there is no fluvial flooding, for the 1% + CC AEP event.

The substation minimum level will be 89.00m AOD the maximum fluvial flood level at the proposed development is 88.49m AOD. This provides a freeboard of 510mm. If required, this freeboard could be increase by locating critical equipment above the ground level of the substation.

The surface water mapping indicates that flows are well contained to the ditches across the site area and that there is minimal surface water flooding on site. The modelling demonstrates that there are some isolated pockets of flooding that are less than 50mm deep – this is considered negligible.

During the 1% and 1% +CC event, surface water flows are mapped to reach the southwestern corner of the substation (Figure 4-8 and Figure 4-10) however, this is a representation of the fluvial flooding mechanism. The rain on grid approach is not appropriate to simulate fluvial flooding. Although, this approach does provide a conservative downstream boundary to assess the surface water flooding to the ditches on site.

This rain on grid approach and modelling results also forms a sensitivity test to model flows at the site. The pluvial modelling flows are approximately 76% higher than the fluvial flows at the tributary confluence with the Claydon Brook.

For this surface water scenario, for the 1% + CC AEP event, there is a modelled maximum flood level of 88.66m AOD at the site.

This mapped surface water flood risk at the substation is fluvial flood risk in reality, associated with the Claydon Brook tributary. The substations minimum level will be 89.00m AOD thus providing a 340mm freeboard above the maximum modelled surface water flood level – simulated as a sensitivity test to flow.

Figure 4-5: Fluvial 1:30 (3.3% AEP) Peak Water Depth

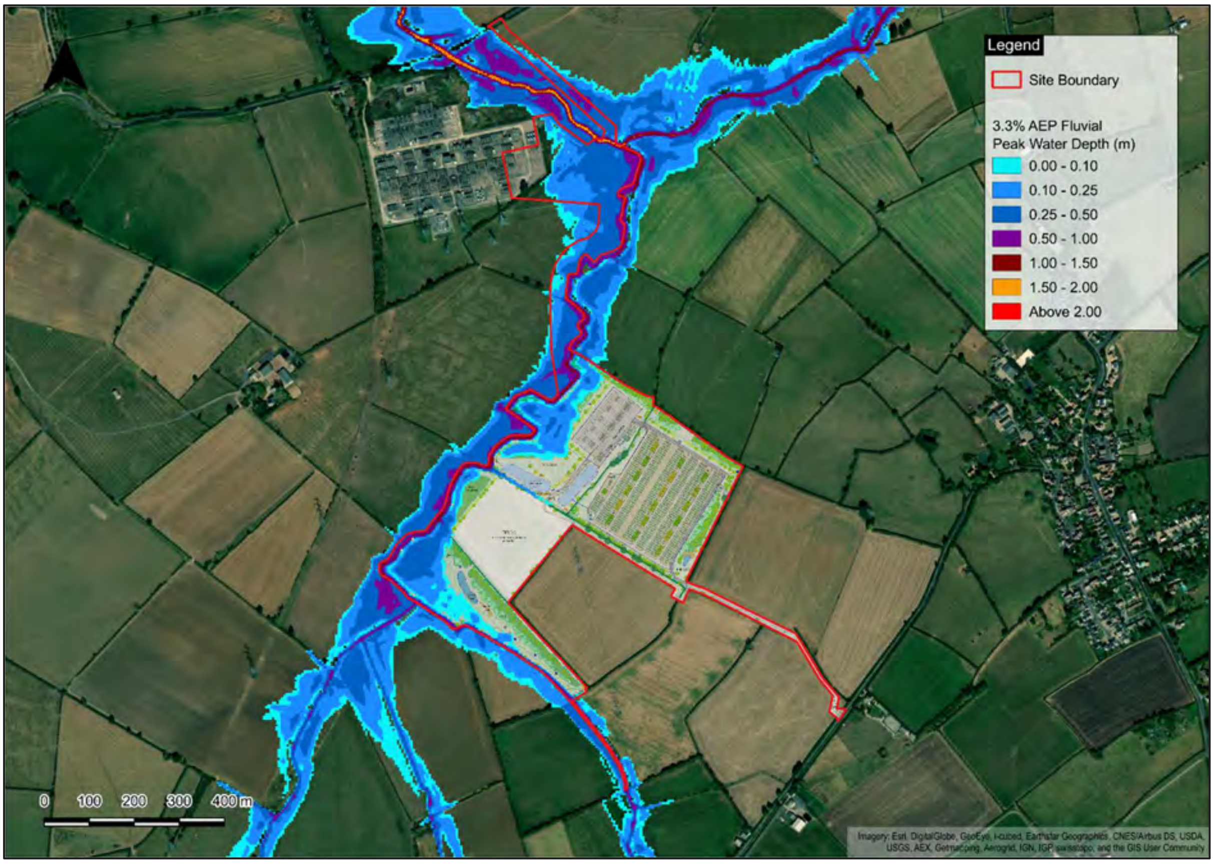


Figure 4-6: Surface Water 1:30 (3.3% AEP) Peak Water Depth

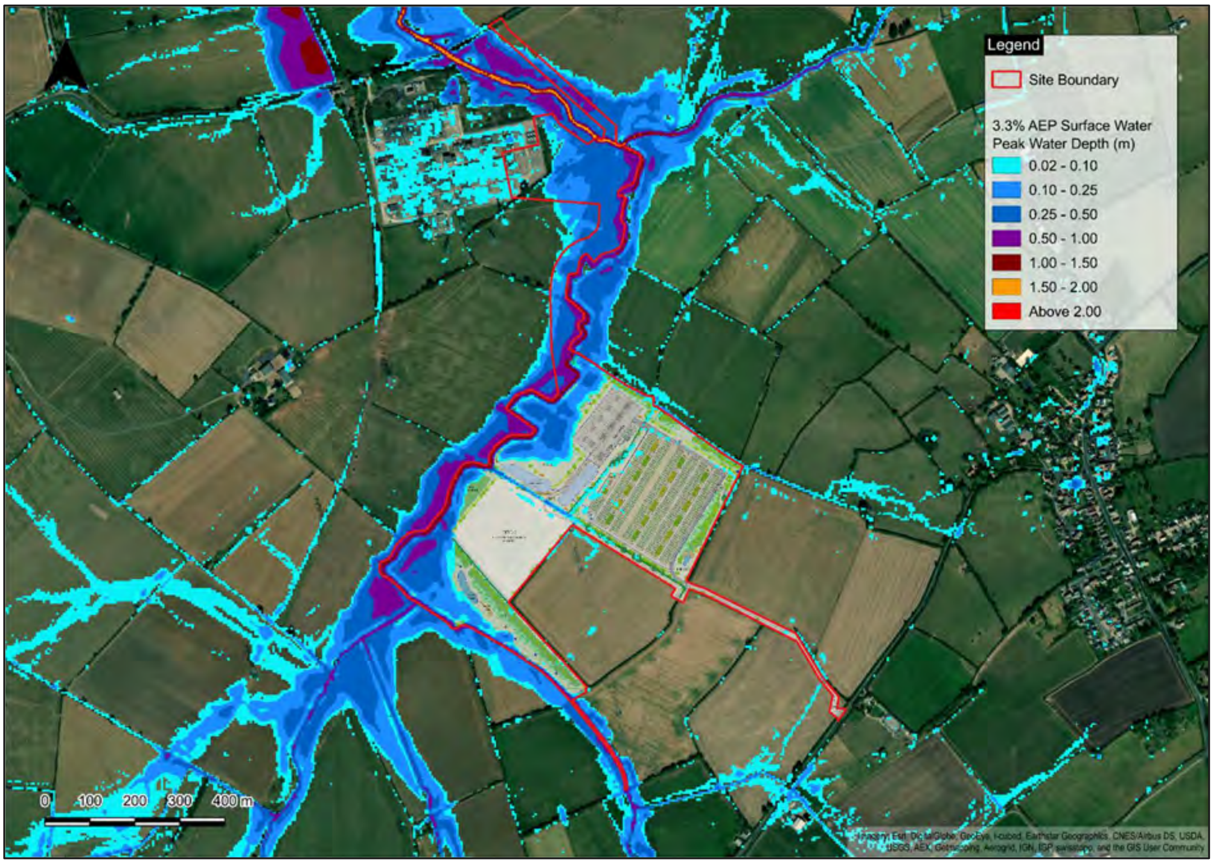


Figure 4-7: Fluvial 1:100 (1% AEP) Peak Water Depth

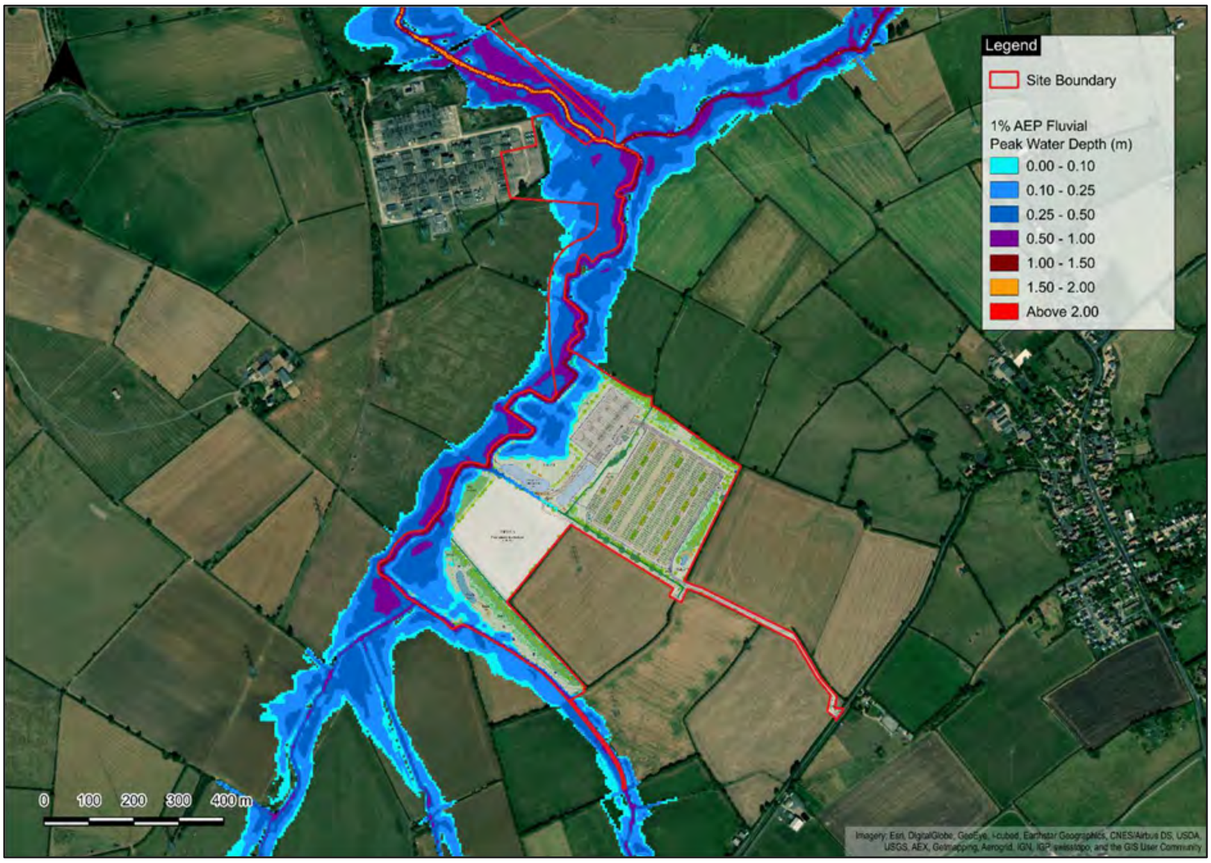


Figure 4-8: Surface Water 1:100 (1% AEP) Peak Water Depth

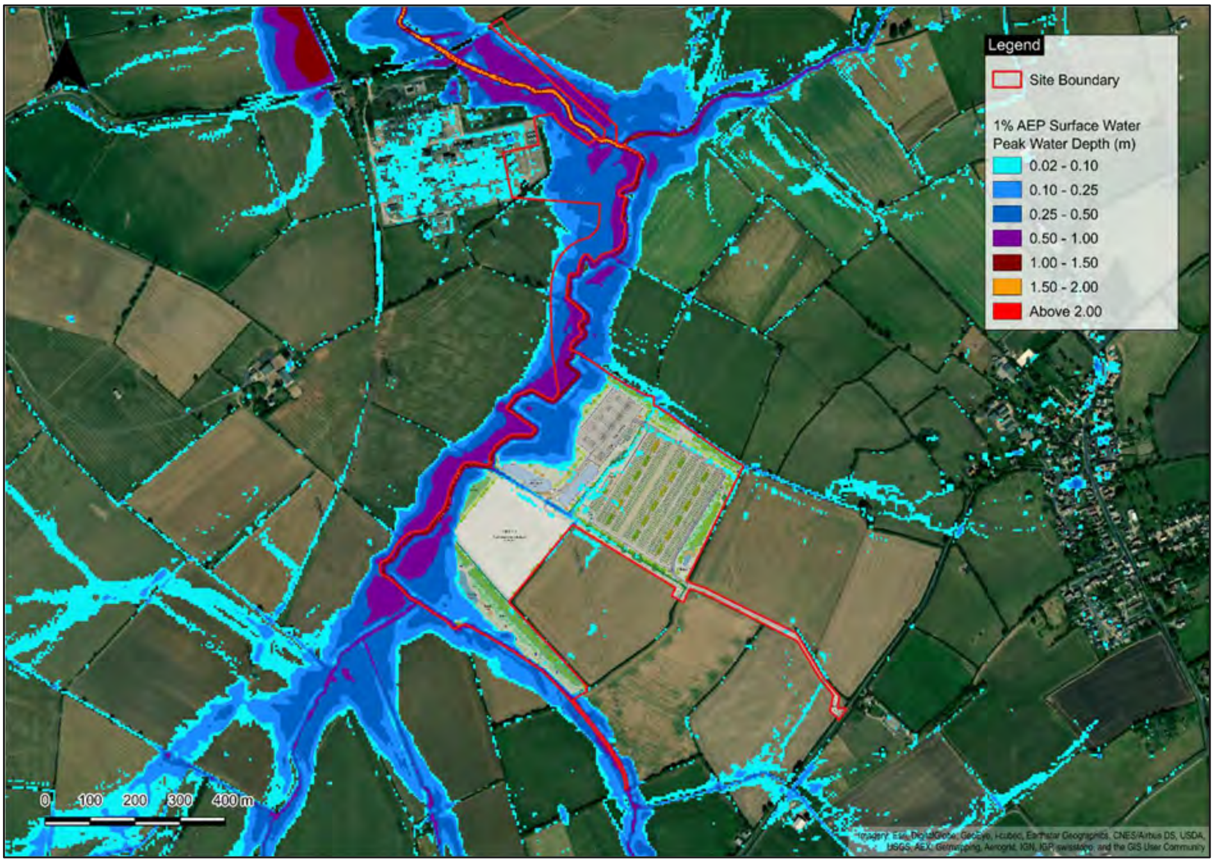


Figure 4-9: Fluvial 1:100 (1% AEP) + CC Peak Water Depth

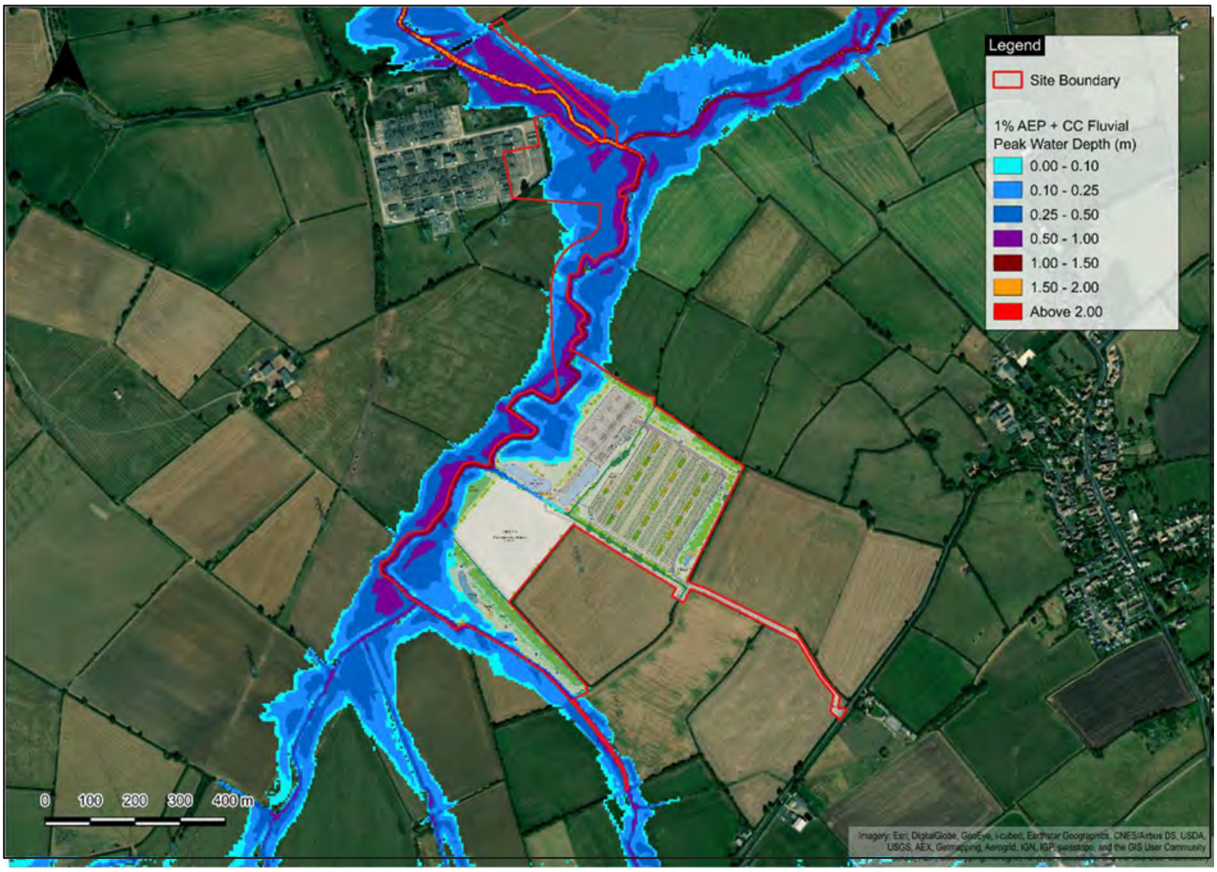


Figure 4-10: Surface Water 1:100 (1% AEP) + CC Peak Water Depth

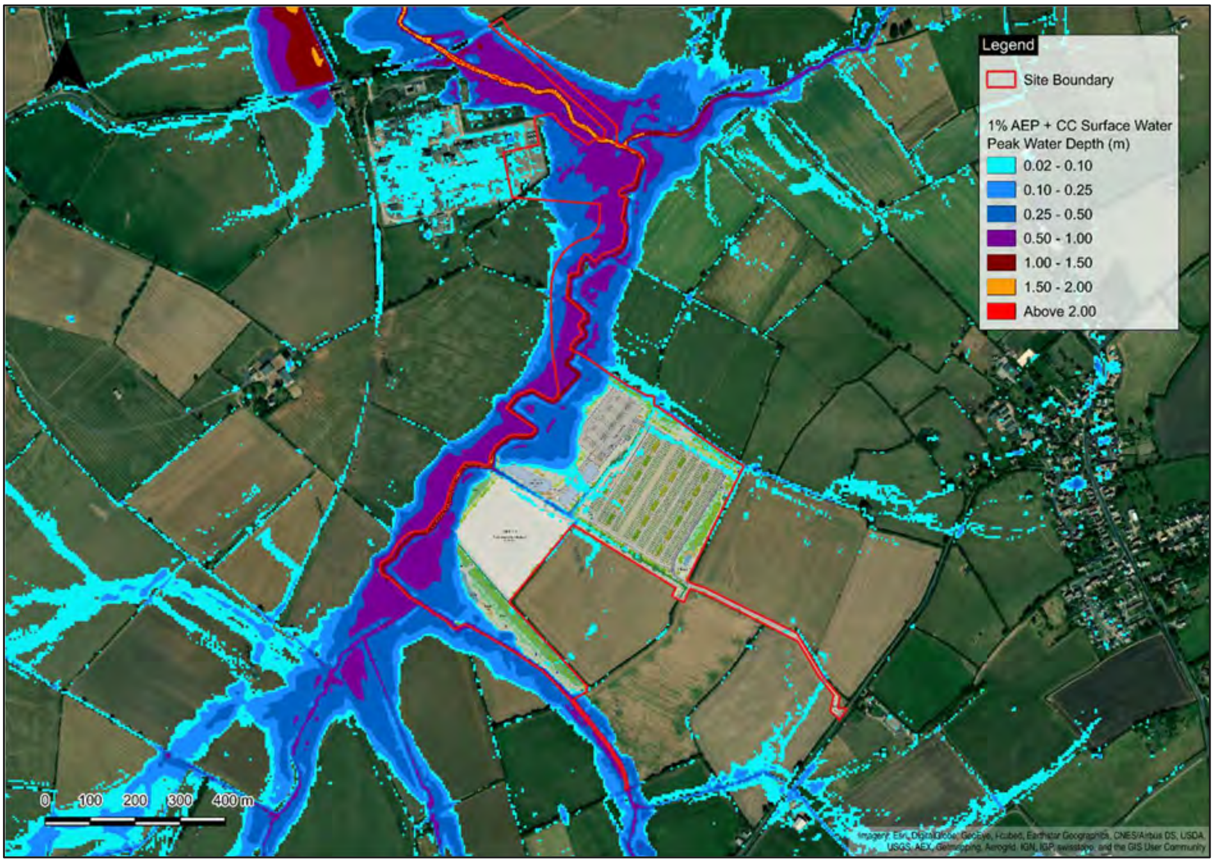


Figure 4-11: Fluvial 1:1000 (0.1% AEP) Peak Water Depth

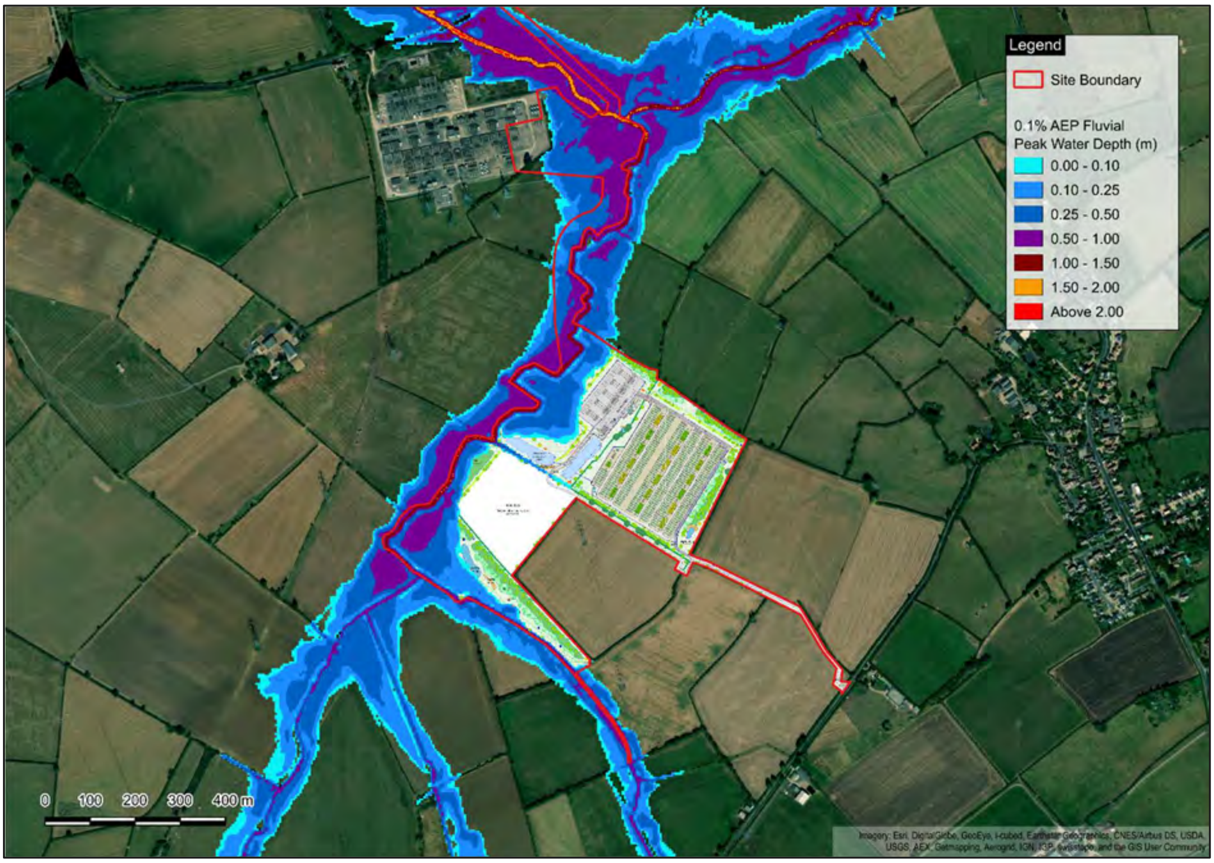
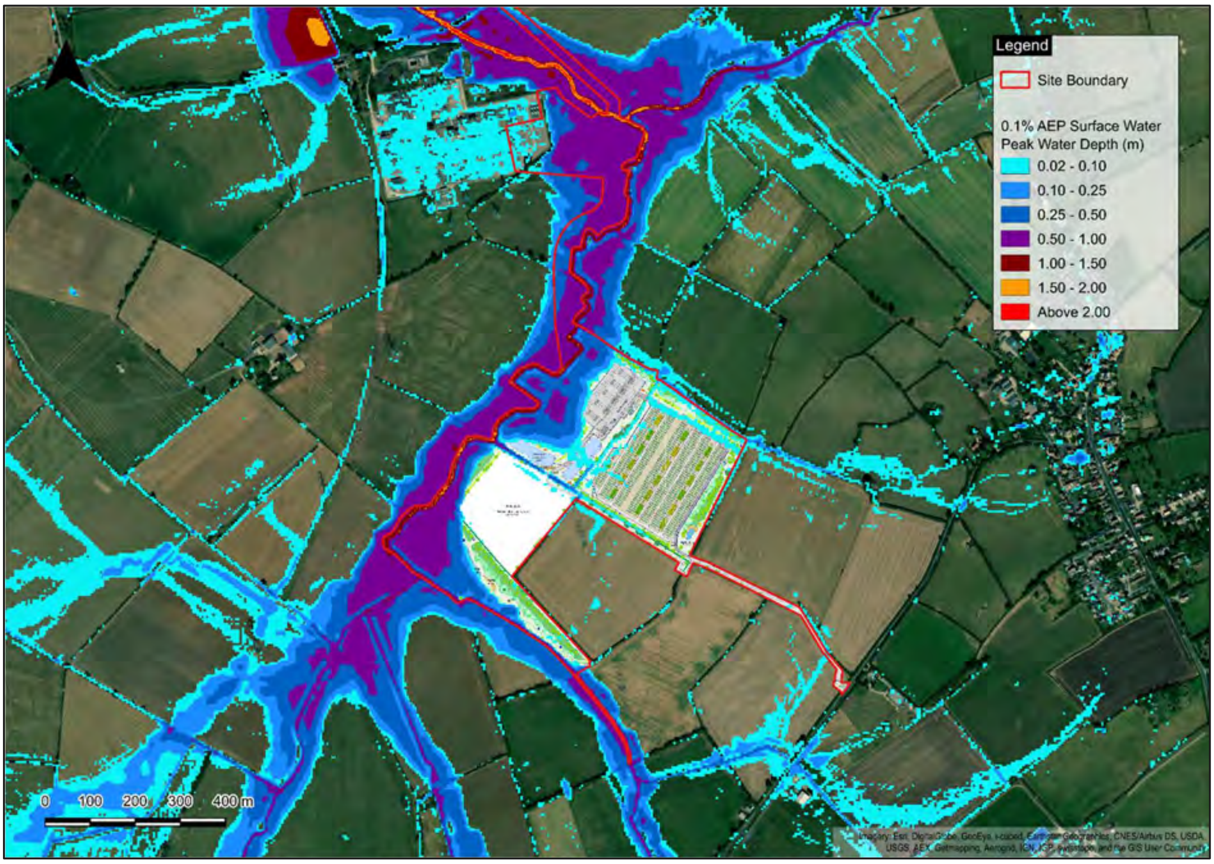


Figure 4-12: Surface Water 1:1000 (0.1% AEP) Peak Water Depth

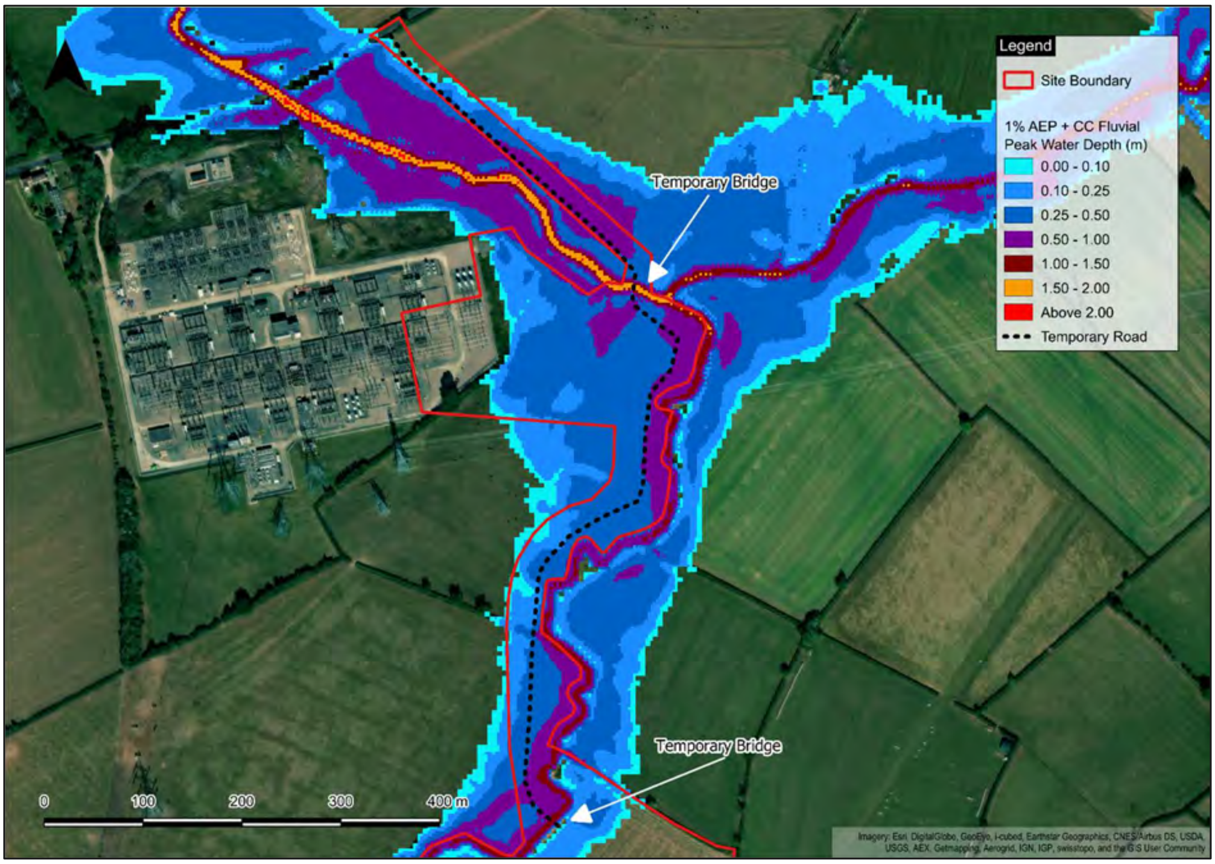


4.3.2 Proposed Temporary Haul Road

The baseline model was updated to reflect the proposed development by including the proposed temporary works of the two bridges. It is assumed that within the floodplain the haul road will be maintained at the existing ground levels. The proposed design data of the structures was provided for the two temporary bridges, details are included in Appendix A.

The location of the haul road and structures are presented in Figure 4-13

Figure 4-13: Haul Road and Structures Overlain on the Flood Mapping, (1% AEP) +CC Peak Water Depth



Comparing the proposed and baseline results there are insignificant changes (+/- 5mm) in depths in the modelled scenarios. It can be concluded that the proposed temporary haul road and bridges have a negligible impact on flood risk.

Figure 4-14 and Figure 4-15 show the fluvial and surface water flood risk as a result of the proposed development during the 1% + CC AEP event. The proposed development flood mapping for all other return periods is included in **Appendix B**.

Figure 4-14: Fluvial 1:100 (1% AEP) + CC Proposed Development

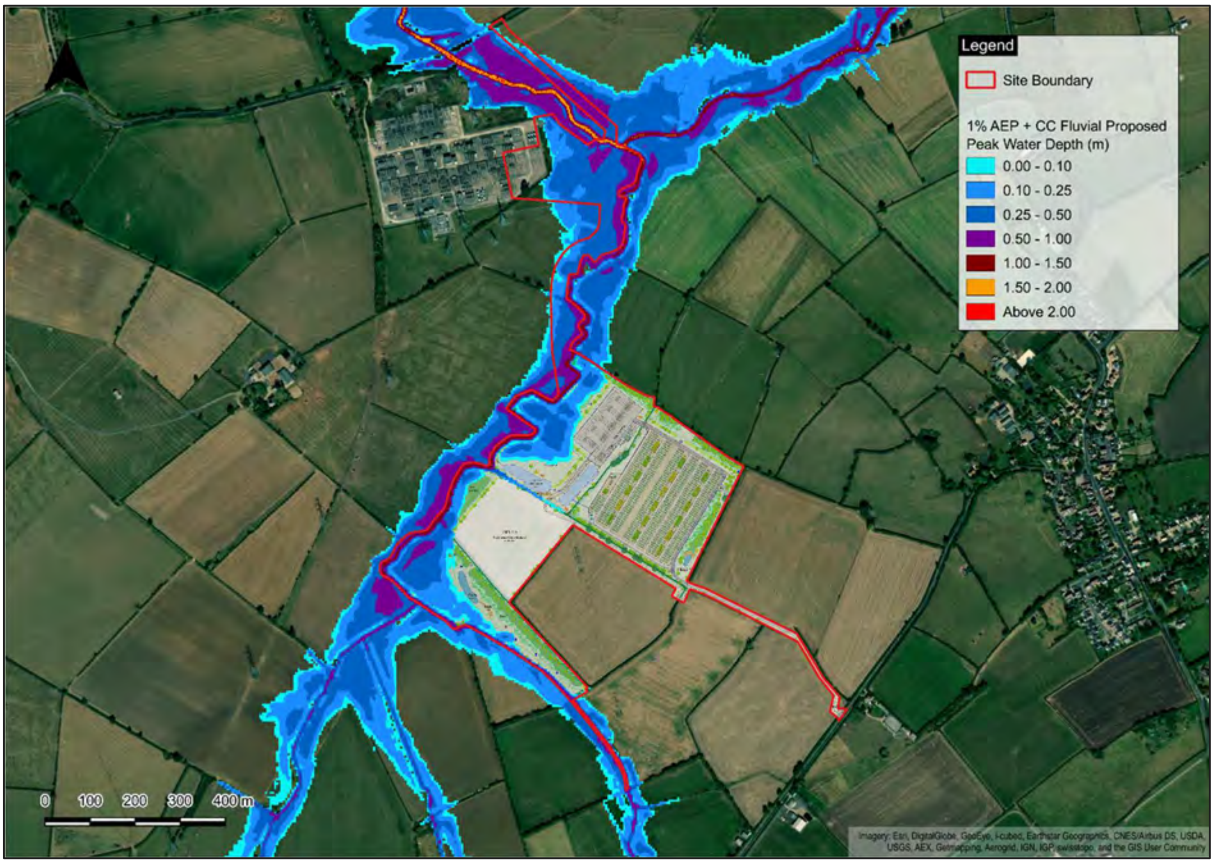
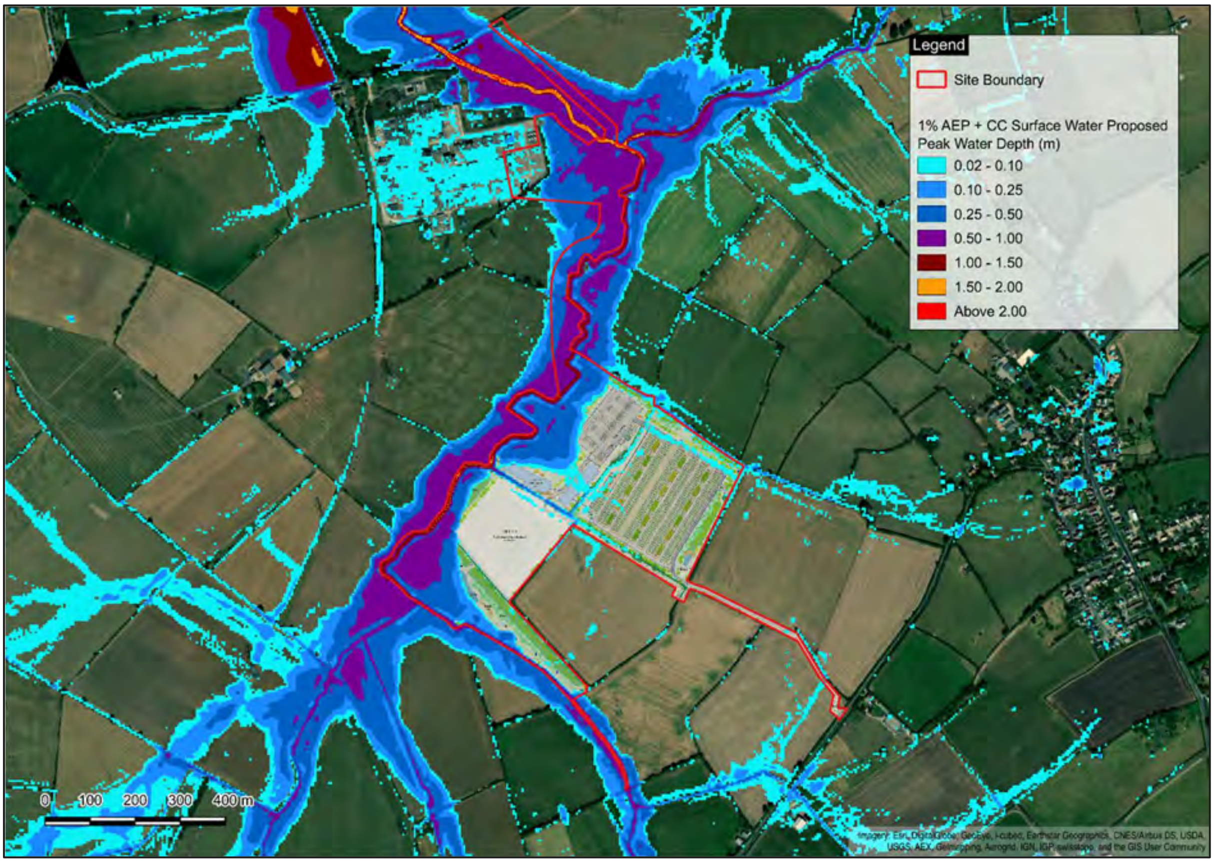


Figure 4-15: Surface Water 1:100 (1% AEP) + CC Proposed Development



4.3.3 Access and Egress

The baseline modelling demonstrates that the main current access to the development is not at risk from fluvial flooding.

There are isolated areas of surface water flooding that are less than 50mm in depth and this is considered negligible. Furthermore, the site will be largely unoccupied for extended periods of time.

A temporary access route has been proposed with a purpose to divert traffic away from nearby town Granborough. The modelling demonstrates that the temporary access route is at risk of flooding during all modelled events with modelled flood depths in excess of 0.6m during the 1% + CC AEP surface water flood event.

The temporary access track will not be in operation during flood events.

Figure 4-16: Access and Egress Route

4.4 Model Quality Assurance

This section outlines the Quality Assurance (QA) measures undertaken in developing the hydraulic model.

Part of the general model QA process involves reviewing the TUFLOW messages generated during the model compilation stage and resolving any issues. Warnings produced by TUFLOW during the run are also investigated. Locations causing recurring warnings were identified and solutions implemented to reduce or remove the source of the issue. Model logs have also been utilised to record the key decisions made when developing the model, allowing for traceability and aid in the transfer of the models between different users. The main components of the model build, configuration and application were recorded and have been reviewed and signed-off by a senior hydraulic modeller.

Further QA over the course of the model build was undertaken, including:

- Material roughness was checked by importing and thematically mapping the grd_check file to ensure surface resistance was applied correctly with respect to aerial images;
- The extent of the 2D domain was reviewed to ensure it was not limiting flood extents in the larger flood events within the area of interest; and,
- Minimum dT values across the 2D domain were reviewed to highlight any troublesome areas that were slowing down overall run time.

4.5 Model Stability

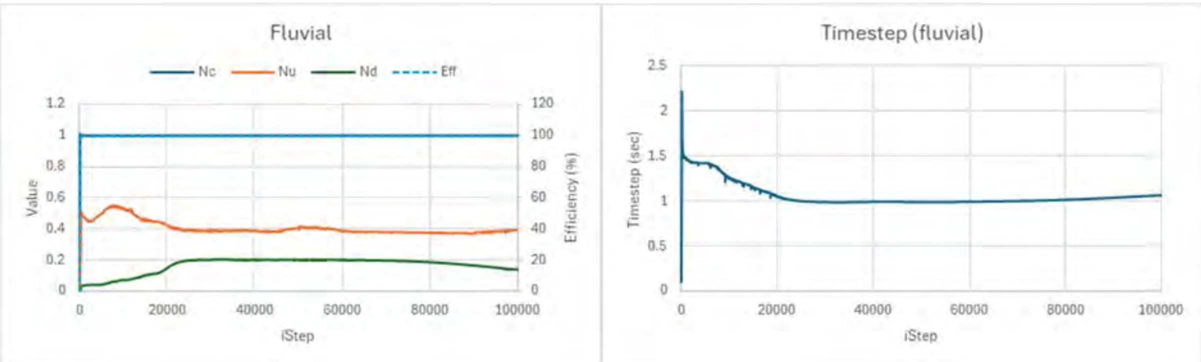
The model has been reviewed and found to be stable and suitable for its intended use. TUFLOW HPC is inherently stable by nature of the adaptive time-stepping, the time-steps (dT) are consistent, and the Nu, Nc and Nd are within acceptable limits as identified by the software developers.

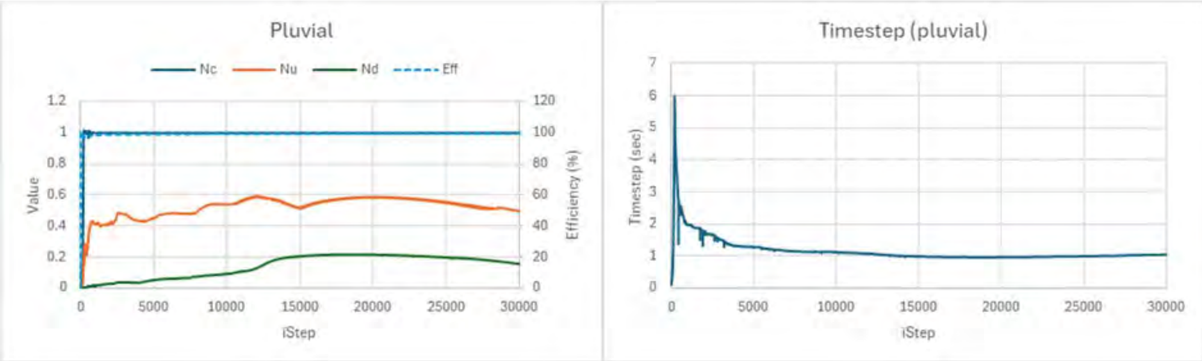
The following check and warning messages are noted in the log files for the fluvial and pluvial scenarios:

- CHECK 2370 – 'Ignoring coincident point found in Z Shape SGS layer'. These have been reviewed and the elevation in the model are suitable.
- CHECK 2470 – 'Neither BG LFC default approach nor Options is set. Using LINEAR approach'. The Linear approach for a 2D BG layer is suitable.
- CHECK 3519 – 'Using MIN or GULLY option in SGS model.' These have been reviewed and is a suitable representation of the topography.
- WARNING 2118 – 'Lowered SX ZC Zpt by x.x m to 1D node bed level.' These have been reviewed and are suitably represented in the model domain

The model log files also show no HPC repeated timesteps and the Nu, Nc, Nd and dt output for HPC indicted that the model runs were all within the suitable stability threshold (Nu<1.0, Nc<1.0, Nd<0.03) as presented in Figure 4-17.

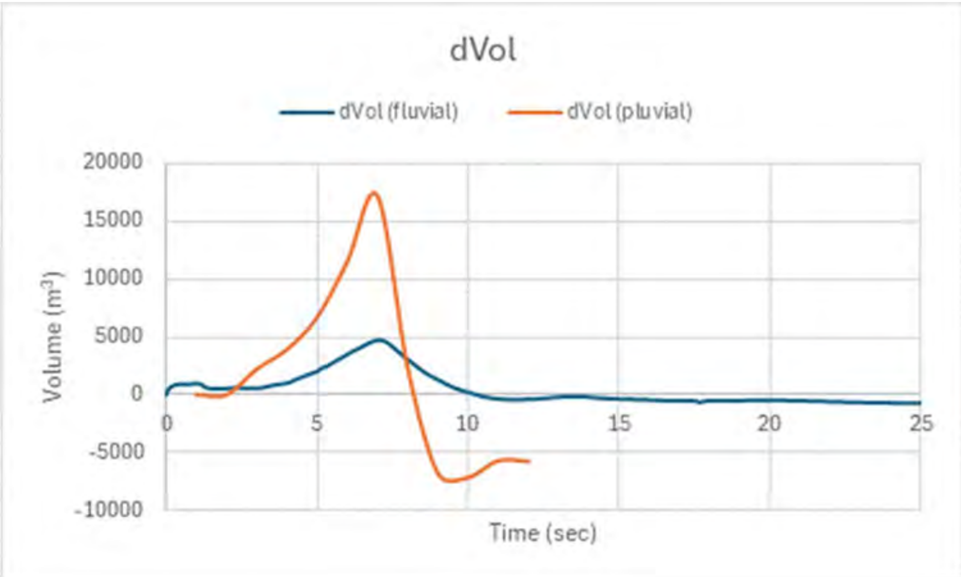
Figure 4-17: TUFLOW HPC Checks





The dVol is higher in the pluvial scenario due to the greater number of wetted cells and the larger 2D code area to simulate the pluvial flooding. Both profiles demonstrate a consistence and smooth curve for the duration of the simulations.

Figure 4-18: dVol Comparison



4.6 Model Sensitivity Testing

Sensitivity analysis is the study of how the variation in the output of the model (depth) can be apportioned, qualitatively or quantitatively, to difference changes in the model inputs (model variables, boundary conditions and parameters).

Sensitivity analysis is used to identify:

- The factors that potentially have the most influence on the model outputs;
- The factors that need further investigation to improve confidence in the model; and,
- Regions in space where the variation in the model output is greatest.

In line with good practice, the following parameters, and variables for the hydraulic model have been varied in accordance with the % uplift / parameter change specified in Table 4-5:

Table 4-5: Sensitivity Analysis Variables

Parameter	Value change
Channel and floodplain roughness	+/- 20 %
Rain on grid approach as assess fluvial flood risk	+76%

A universal increase and decrease of 20% to the Manning's n roughness values was applied across the entirety of the model domain.

The model results demonstrated a very limited change in flood extent. Based on this analysis, it can be concluded that the adopted roughness parameters are reasonable and that the model is insensitive to changes in roughness.

The 76% increase in flow resulted in an increase in flood level at the proposed development site of 170mm. This increase in flow provided a freeboard of 340mm to the proposed platform level. It demonstrates that the impacts for a significant increase in flow would not impact the proposed development.

Figure 4-19: Sensitivity Testing roughness (Mannings N+) Surface Water

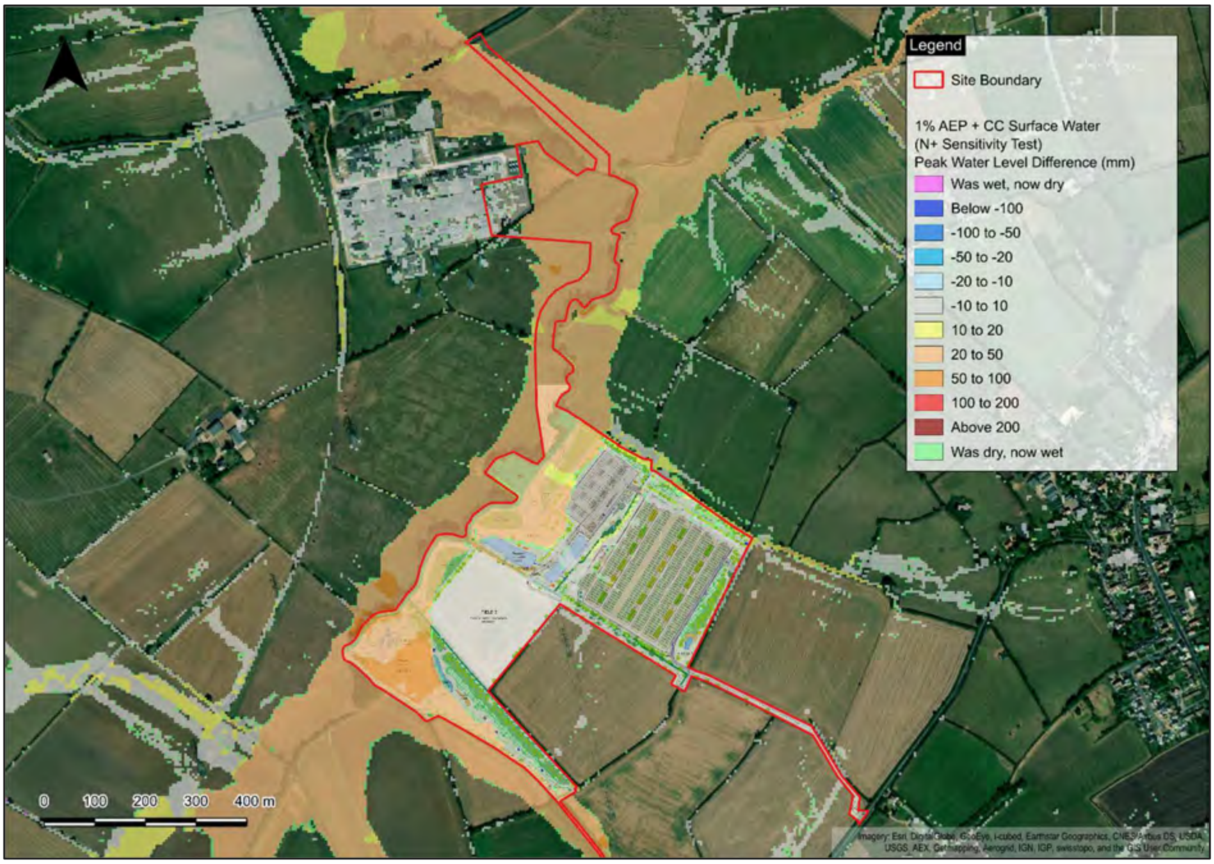


Figure 4-20: Sensitivity Testing roughness (Mannings N-) Surface Water

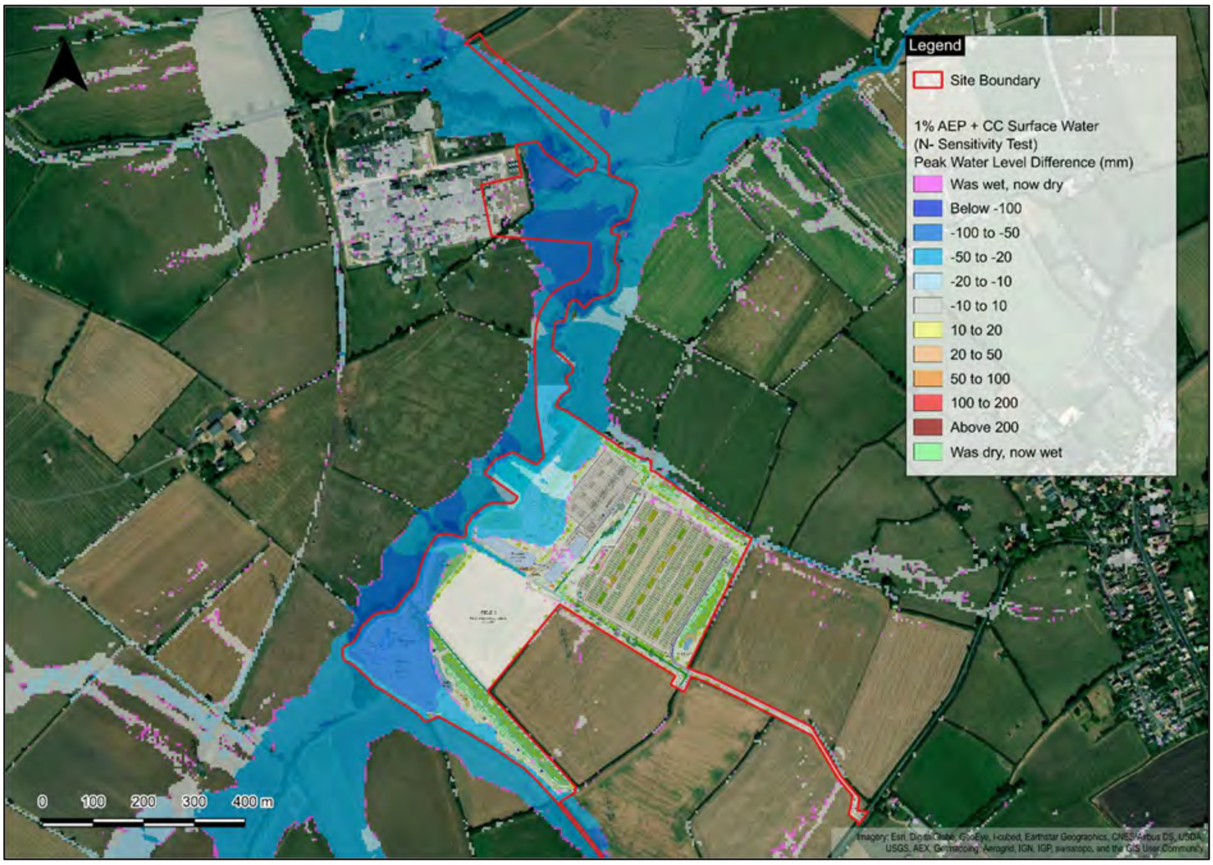


Figure 4-21: Sensitivity Testing roughness (Mannings N+) Fluvial

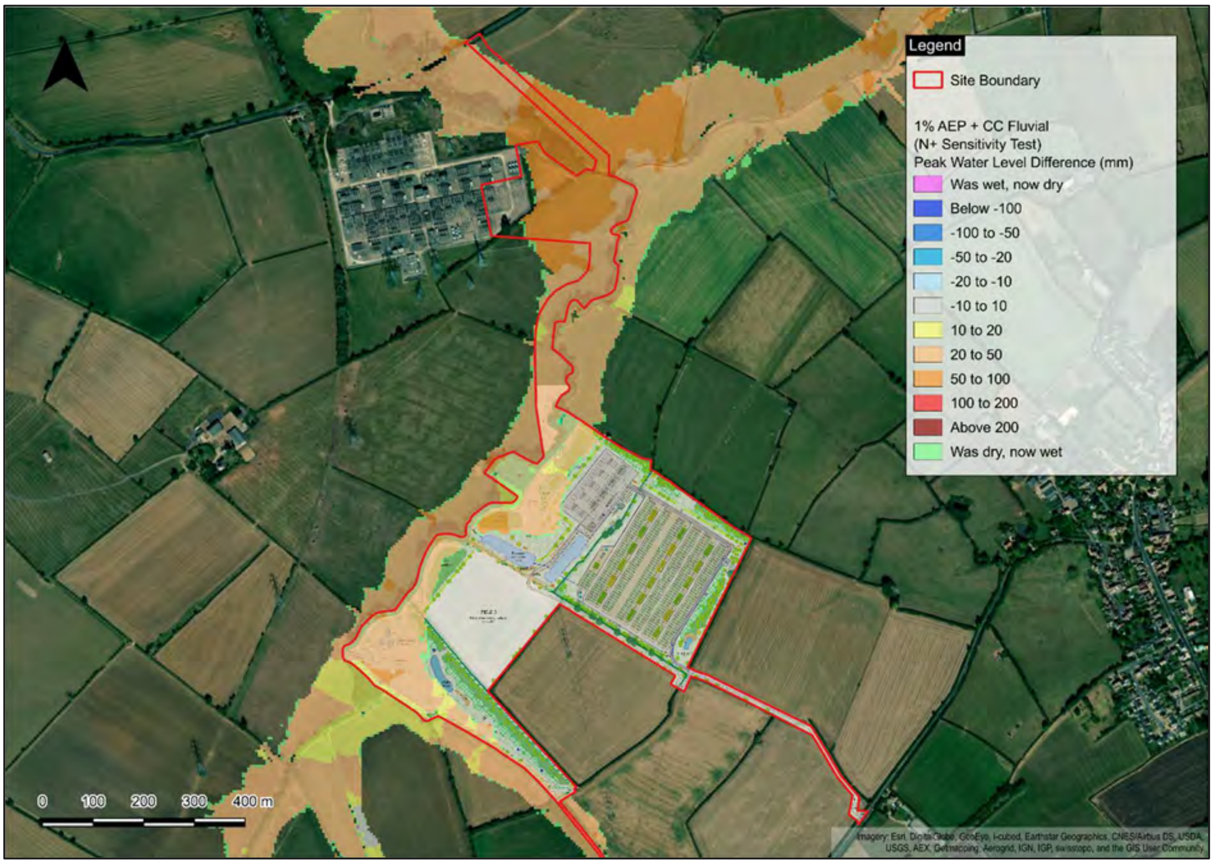
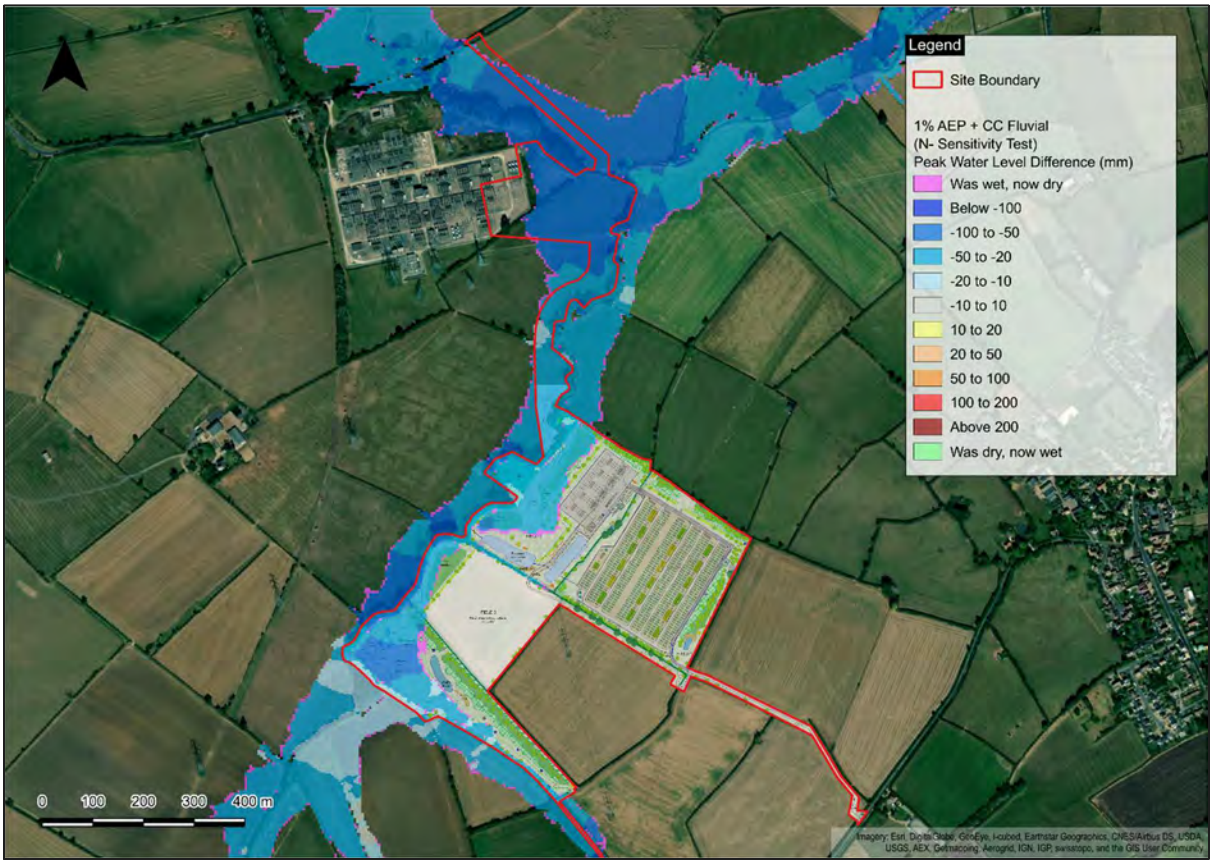


Figure 4-22: Sensitivity Testing roughness (Mannings N-) Fluvial



5.0 Conclusions and Recommendations

SLR Consulting Ltd (SLR) were commissioned by Statera Energy Ltd to produce a revised Flood Risk Assessment (FRA) in response to a previous objection from the Environment Agency (EA).

The site-specific FRA and hydraulic modelling satisfies the requirements identified by the Environment Agency in their objection letter dated 9th May and 5th June 2024.

The Environment Agency requirements were to:

- Establish a reliable baseline fluvial flood risk evidence base for the site.
- Establish a reliable baseline surface water flood risk evidence base for the site.
- Assess the impacts of the temporary works on flood risk

The hydraulic modelling demonstrates that there is no fluvial flood risk to the Site for the baseline scenario and the proposed development scenario for the 1% + CC AEP Event. The results demonstrate a freeboard of 510mm for this flood event and safe for the lifetime of the development.

The surface water mapping indicates that flows are well contained to the ditches across the site area and that there is minimal surface water flooding on site. The modelling demonstrates that there are some isolated pockets of flooding that are less than 50mm in depth – this is considered negligible.

The modelling has also demonstrated that the temporary works are not modelled to increase the flood risk to the site or surrounding area for the 1% + CC AEP Event.

The modelling results demonstrate that there is suitable access and egress up to and including the 1% AEP plus CC via the proposed access.

The proposed development is classed as ‘Essential infrastructure’ and is permitted in Flood Zone 2.

Appendix A Proposed Site Layout

East Claydon Battery Energy Storage System

Flood Risk Assessment

Statera Energy

SLR Project No.: 428.013276.00001

24 September 2024

STATERA
BALANCING THE GRID

Legend

- Site boundary
- Existing trees
- Existing hedgerows
- Proposed native broadleaved woodland
- New native scrub planting
- Hibernacula/habitat piles
- New substation compound
- 2.5m high weld-mesh security palisade fencing
- Crushed stone access track
- 5.5 wide crushed stone access track
- Existing hedgerow removed
- Solitary bee habitat
- Attenuation pond
- Loose permeable gravel
- Wildflower grassland
- Retained grassland
- Enhanced wet meadow
- Standing piles/deadwood
- Wildlife pond
- Proposed hedgerow planting
- Public Right of Way
- Proposed tree
- KG Kissing gate
- Flood zone 2
- Flood zone 3
- W Source of water for irrigation trees during periods of inadequate rainfall
- 4m high infrared CCTV pole
- Bridge for brook maintenance vehicles and pedestrians
- 1.5m high post and wire stock fence
- Permissive access to nature reserve area for the operational life of the facility
- Temporary construction haul road and contractors compound
- Indicative drainage channel
- Inverter building (19 No)
- Transformer (74 No)
- Battery container (518 No)
- Storage container (3 No)
- Control room (7 No)
- WT Water tank (4 No)

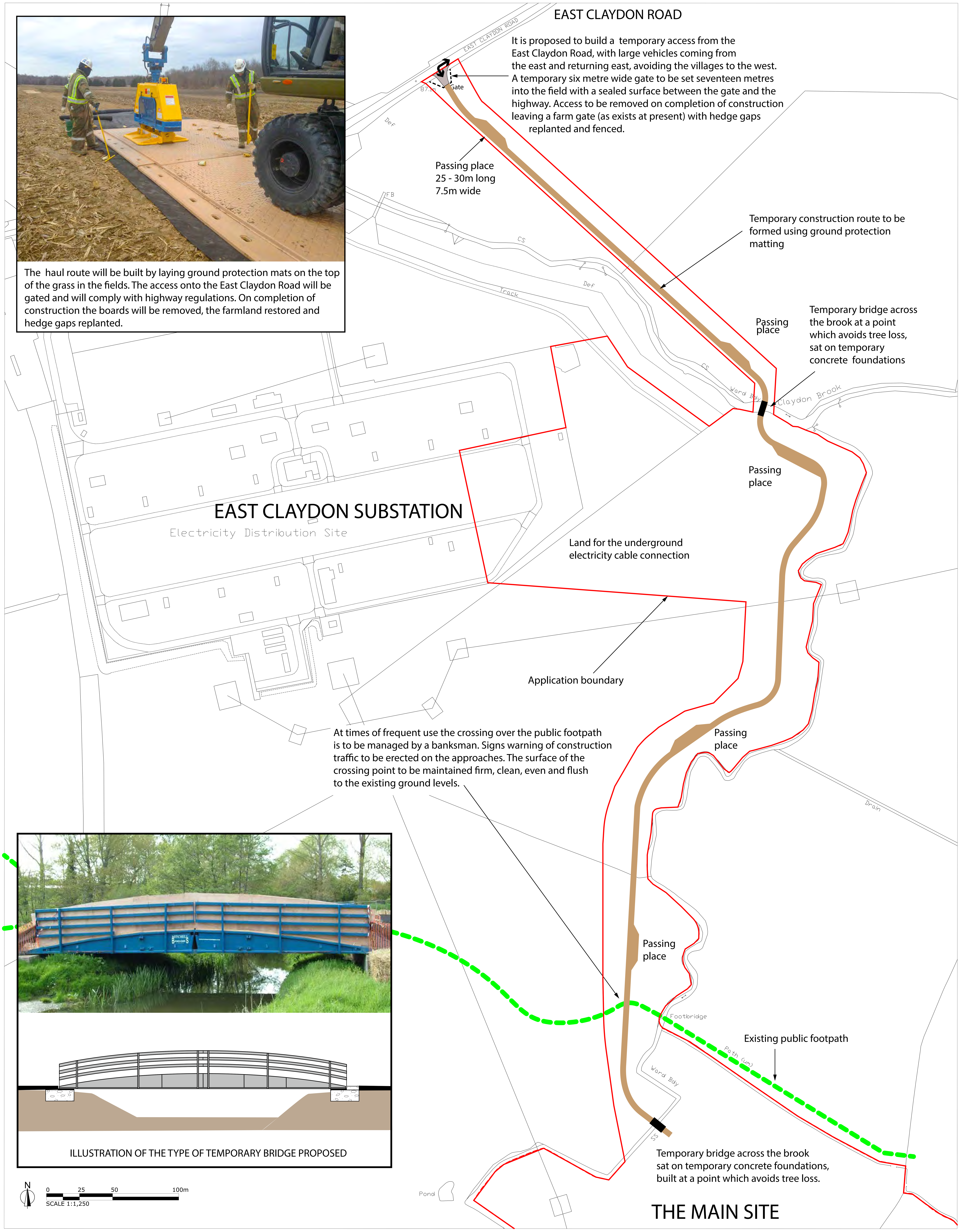
Revision	Date	Comment
A	13.05.24	Scheme footprint reduced to one battery compound, orchard and biodiverse roofs removed. Screen landscaping increased.
B	22.05.24	Additional hedges removed
C	22.09.11	Additional water tank added in the northwest corner and substation moved out of flood zone

ON BEHALF
STATERA

PROJECT
EAST CLAYDON BESS

DATE	15 February 2023
SCALE	1 : 2,000 @ A1
DWG No	SL261__L__X__GA__1__Rev C
APPROVED	CMcD

TITLE
BLOCK PLAN



STATERA
BALANCING THE GRID

Revision	Date	Comment

Legend
Site boundary

ON BEHALF
STATERA

PROJECT
EAST CLAYDON BESS

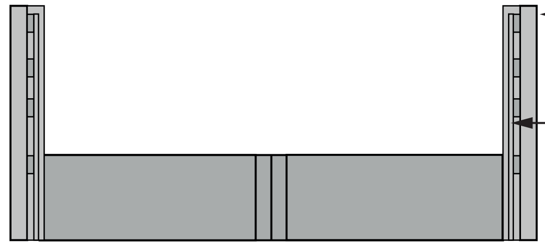
DATE	9th August 2023
SCALE	1 : 1,250 @ A1
DWG No	SD_2
APPROVED	CMcD

TITLE
TEMPORARY CONSTRUCTION TRACK ROUTE

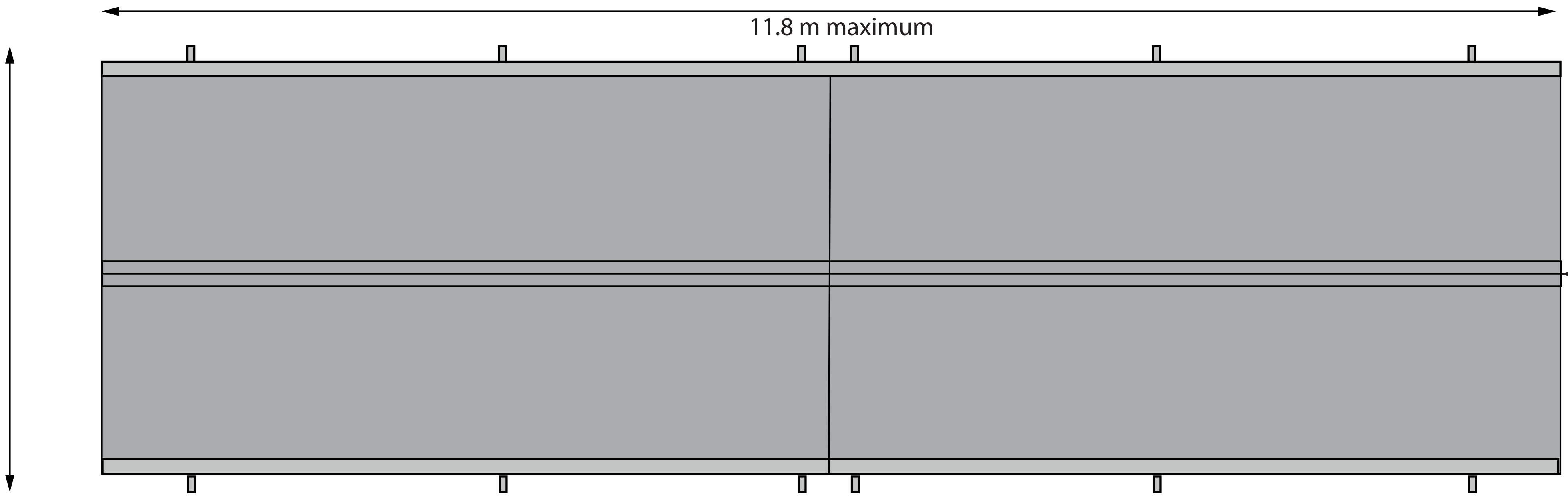
EXAMPLE OF A SIMILAR BRIDGE

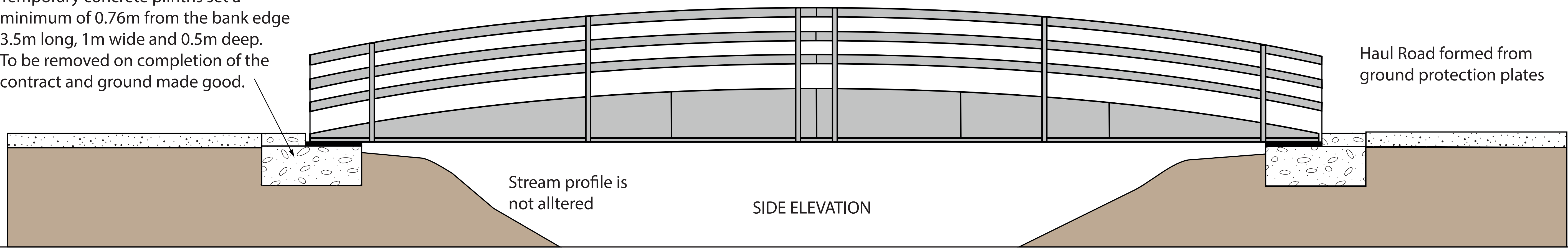
The exact type of bridge may vary depending upon supplier but the size parameters and method of installation will be similar.

END ELEVATION



PLAN





SIDE ELEVATION

STATERA
BALANCING THE GRID

Date:	06.09.23
Scale:	1:50 @ A3
Drawing:	SD_10

Revision	Date	Comment

0 1 2 3 4 5 M

Client:
Statera Energy Ltd

Project:
East Claydon Battery Energy Storage System

Title:
Temporary Haul Route Stream Crossing

Appendix B Proposed Development Flood Mapping

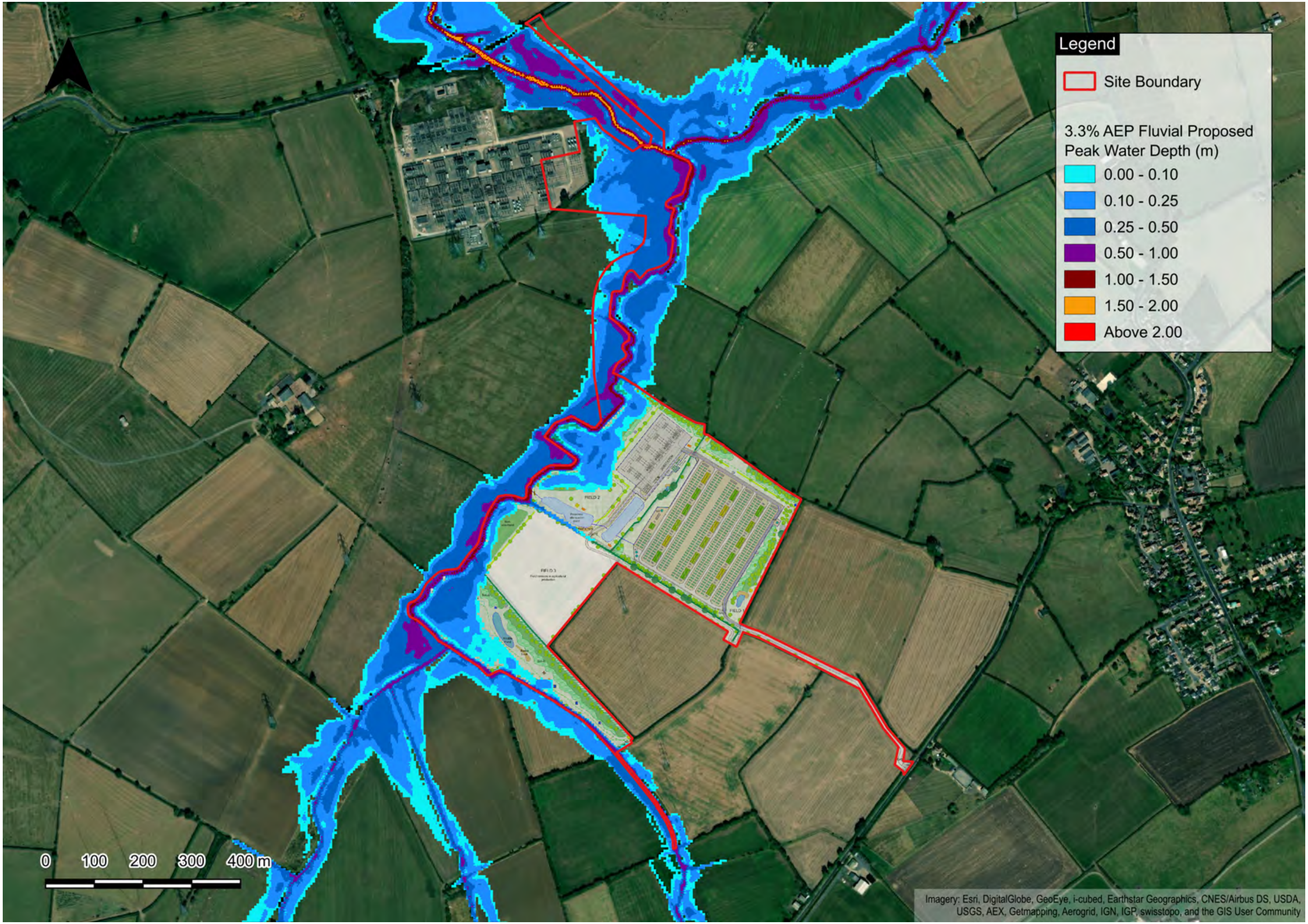
East Claydon Battery Energy Storage System

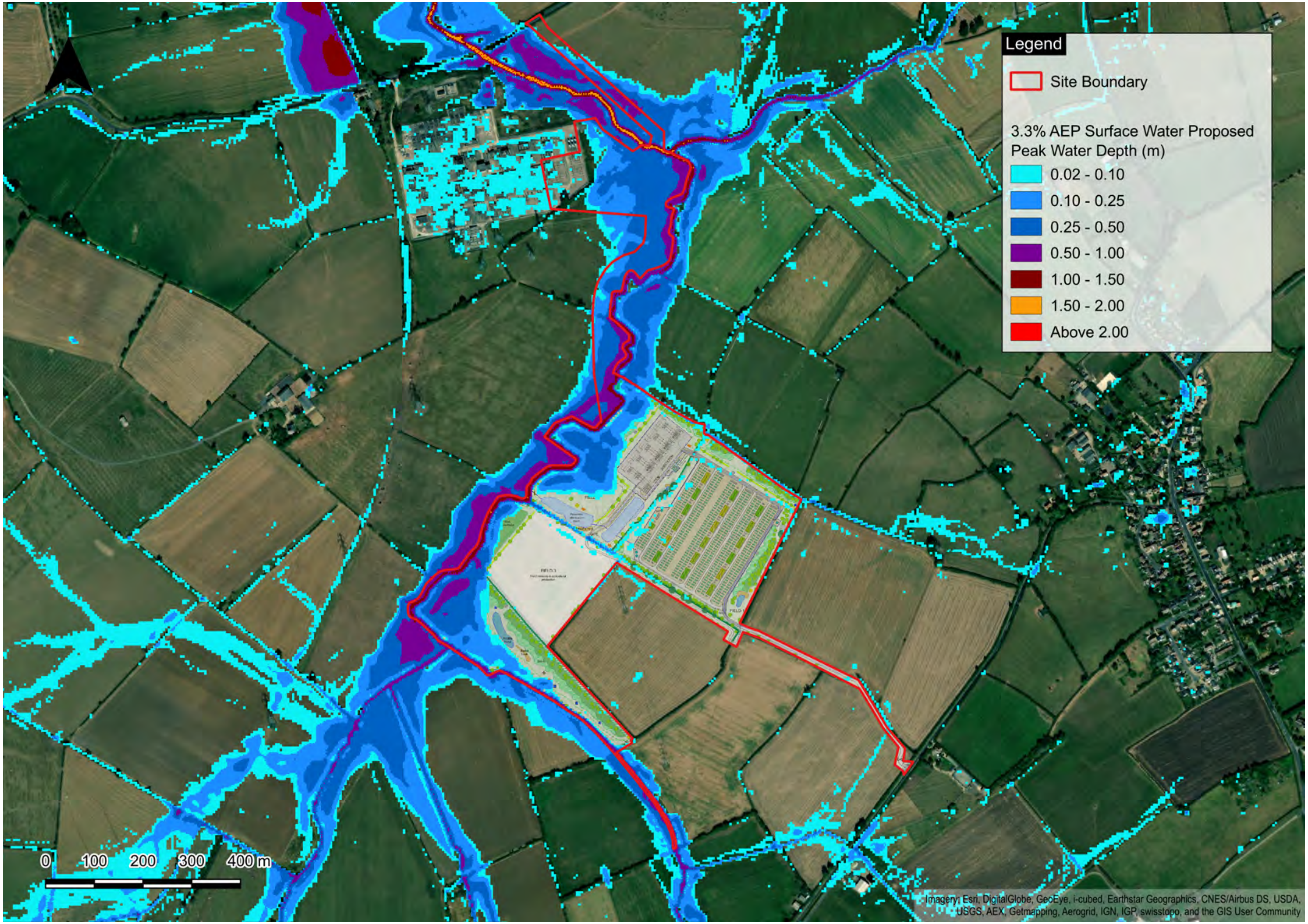
Flood Risk Assessment

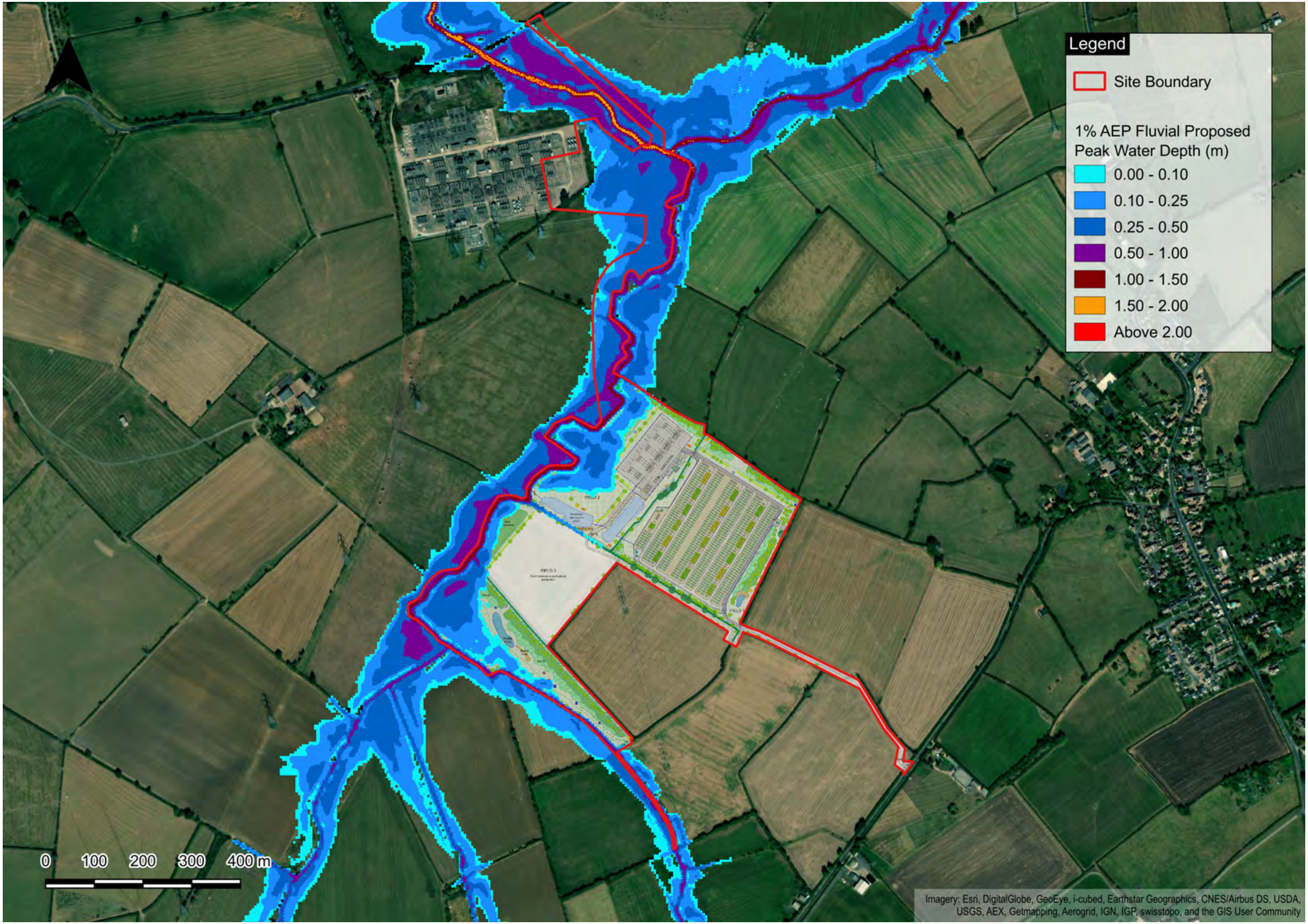
Statera Energy

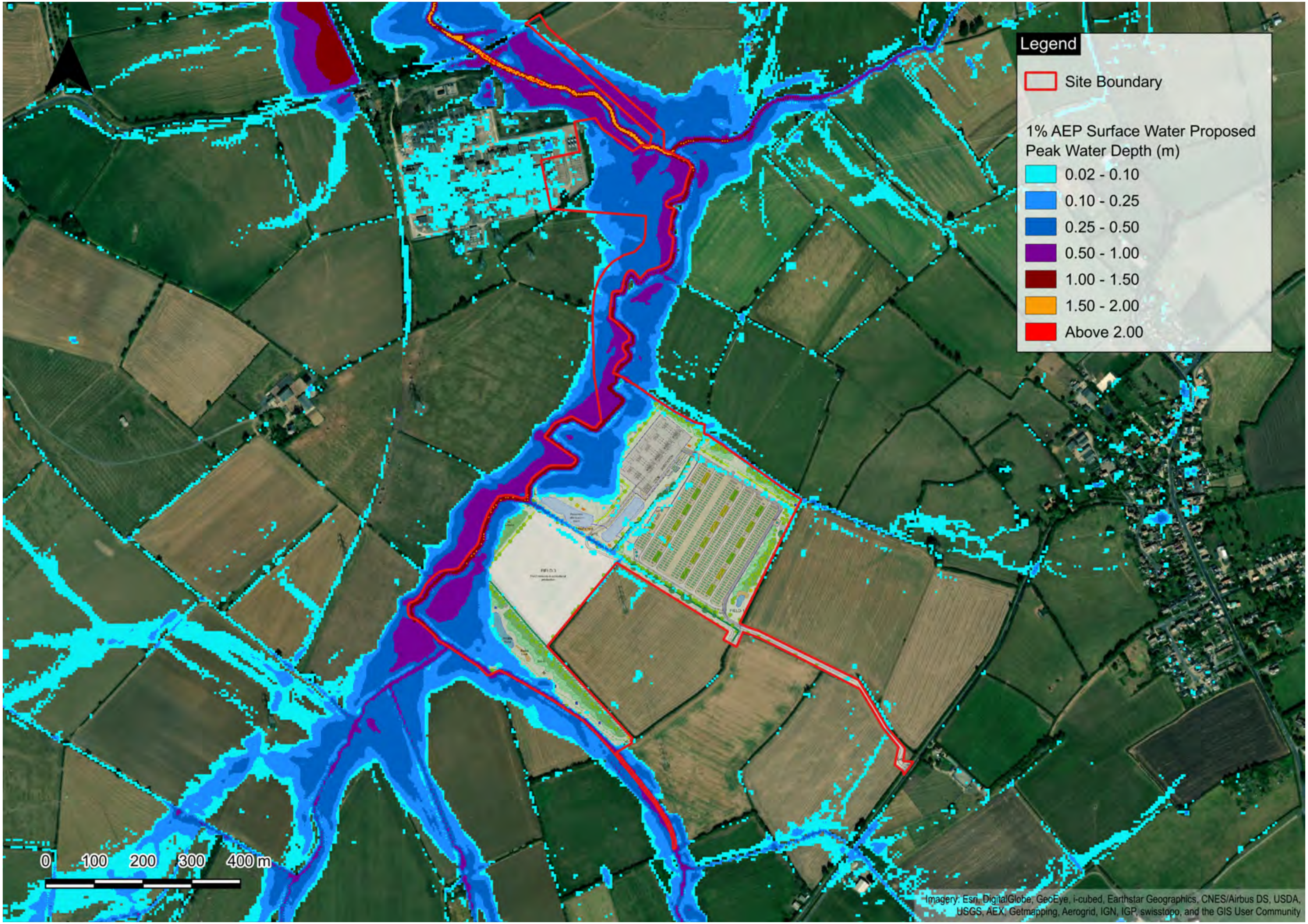
SLR Project No.: 428.013276.00001

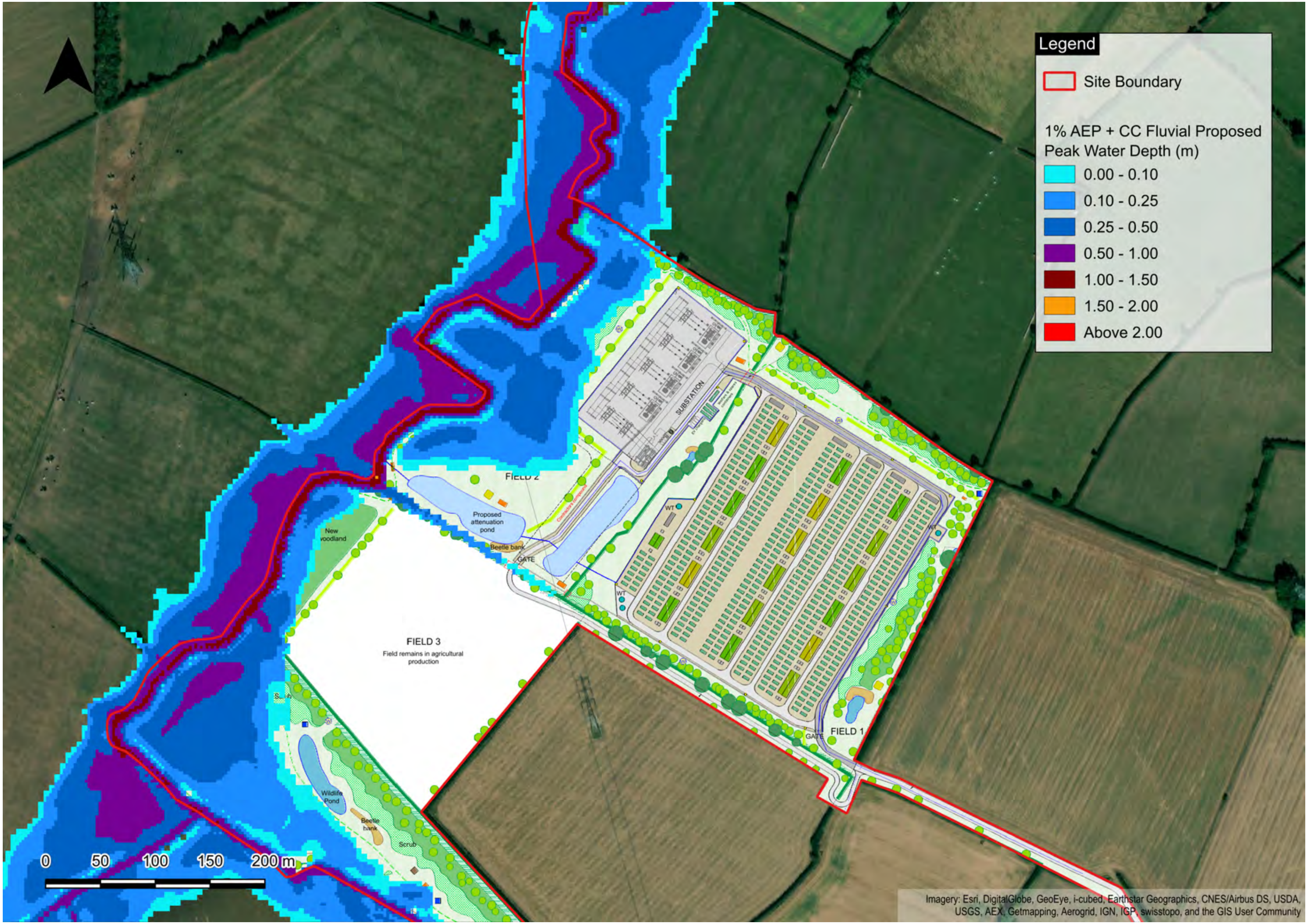
24 September 2024

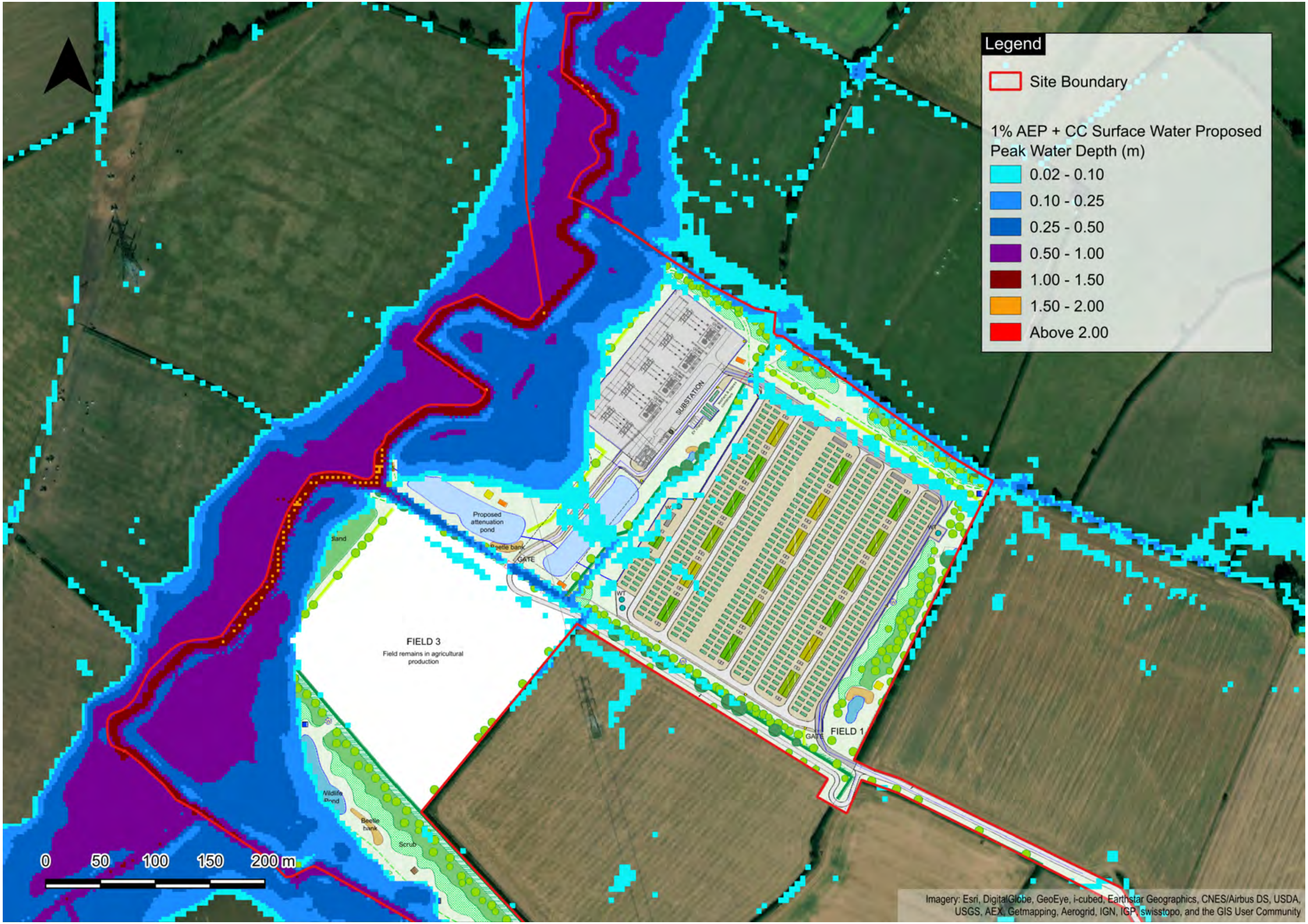

Legend
Site Boundary
3.3% AEP Fluvial Proposed Peak Water Depth (m)
0.00 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
0 100 200 300 400 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


Legend
Site Boundary
3.3% AEP Surface Water Proposed
Peak Water Depth (m)
0.02 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
0
100
200
300
400 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

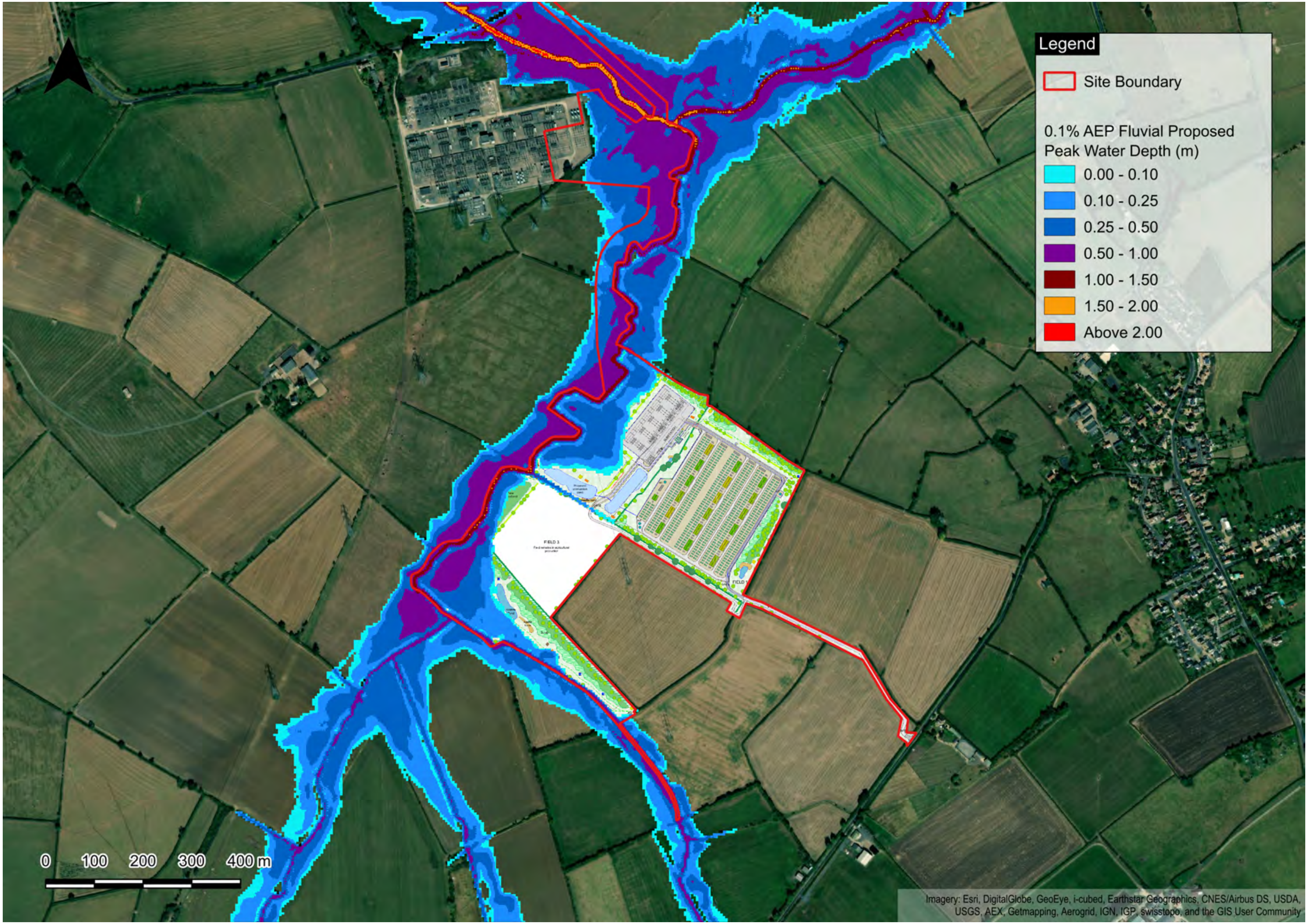

Legend
Site Boundary
1% AEP Fluvial Proposed Peak Water Depth (m)
0.00 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
0 100 200 300 400 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


Legend
Site Boundary
1% AEP Surface Water Proposed Peak Water Depth (m)
0.02 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
0 100 200 300 400 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

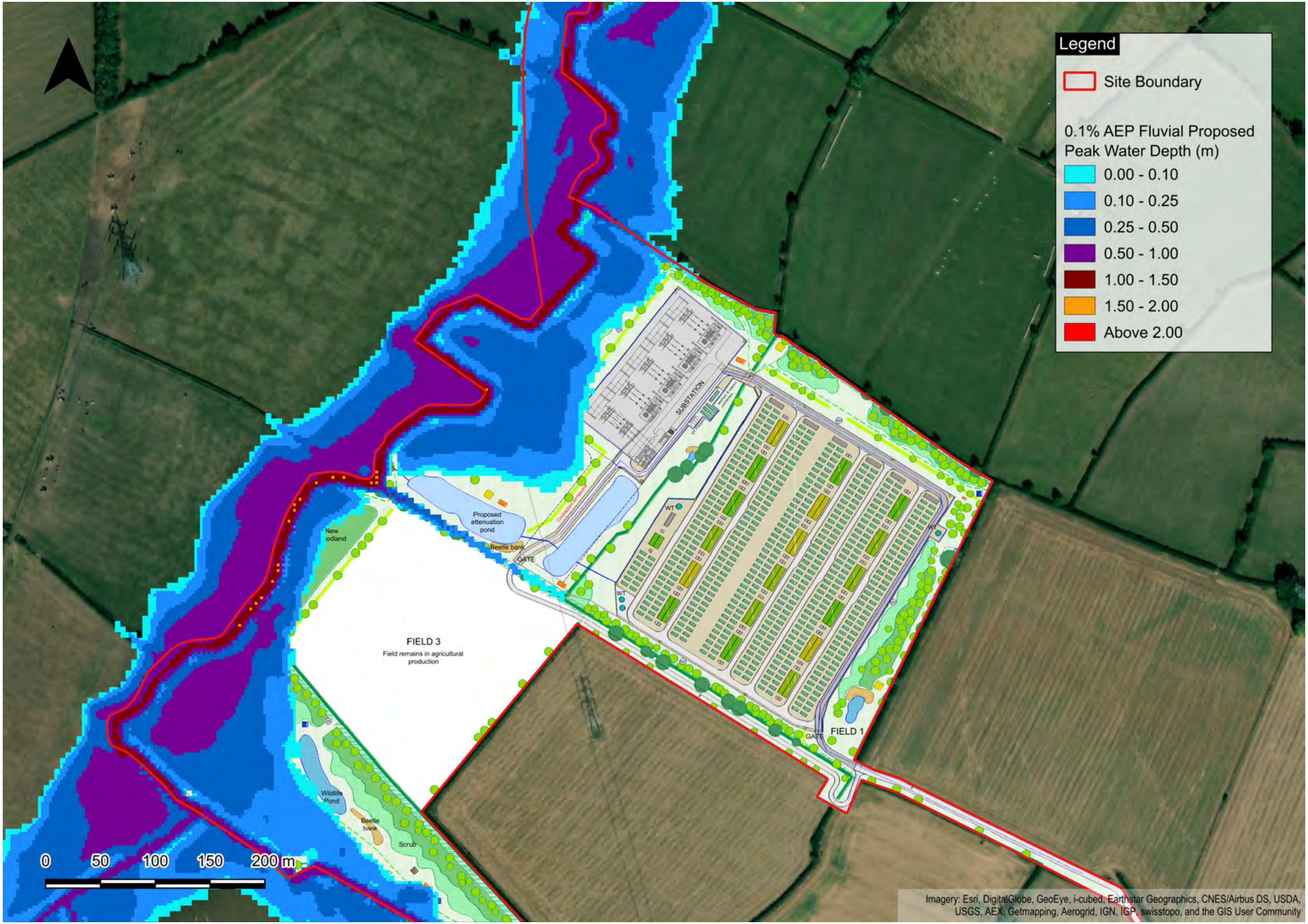

Legend
Site Boundary
1% AEP + CC Fluvial Proposed Peak Water Depth (m)
0.00 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
SUBSTATION
Proposed attenuation pond
Beetle bank
GATE
New woodland
FIELD 3
Field remains in agricultural production
FIELD 1
Wildlife Pond
Scrub
WT
0 50 100 150 200 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

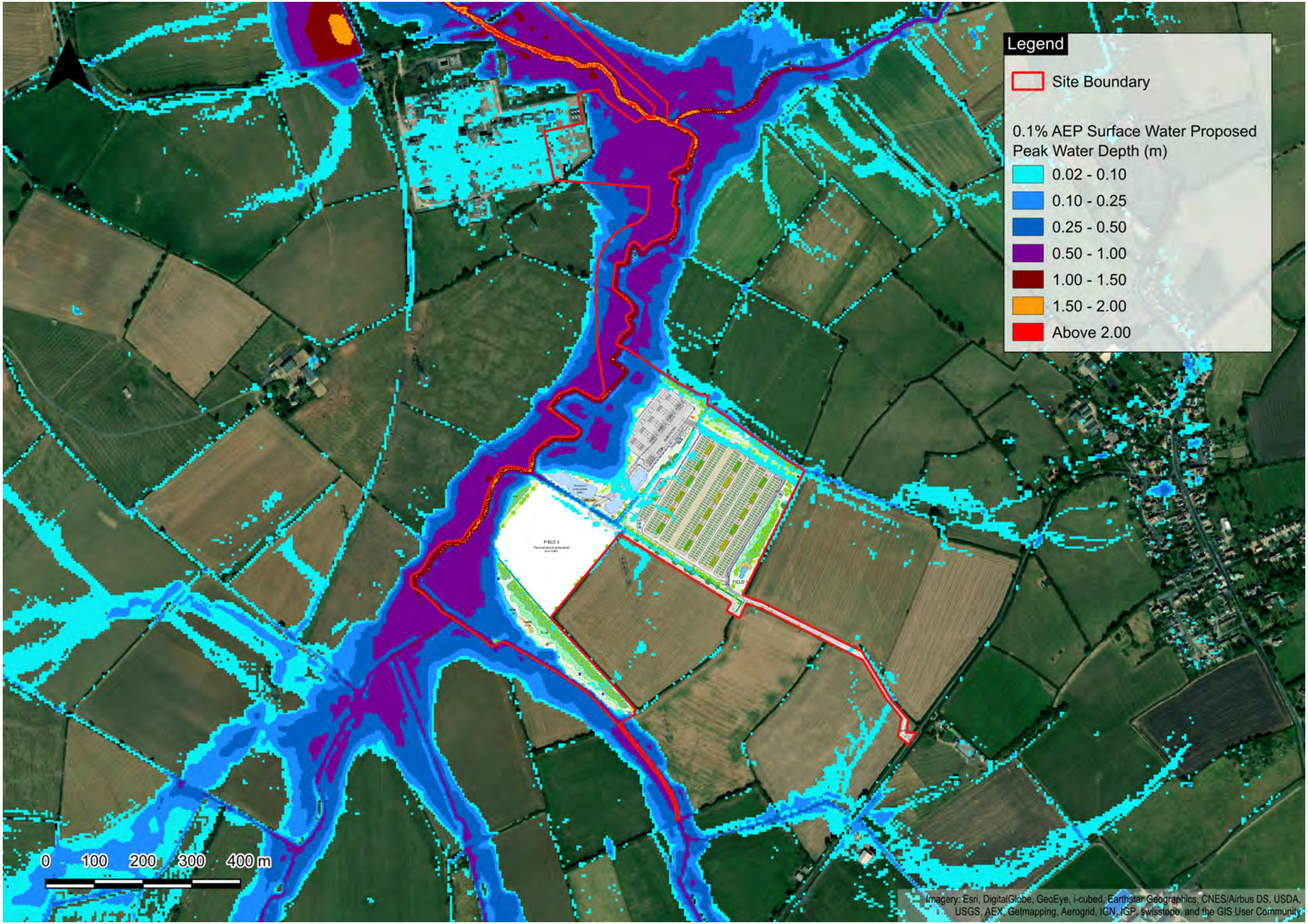


Legend
Site Boundary
1% AEP + CC Surface Water Proposed Peak Water Depth (m)
0.02 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
SUBSTATION
Proposed attenuation pond
Beetle bank
GATE
FIELD 3
Field remains in agricultural production
FIELD 1
Wildlife Pond
Scrub
0 50 100 150 200 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

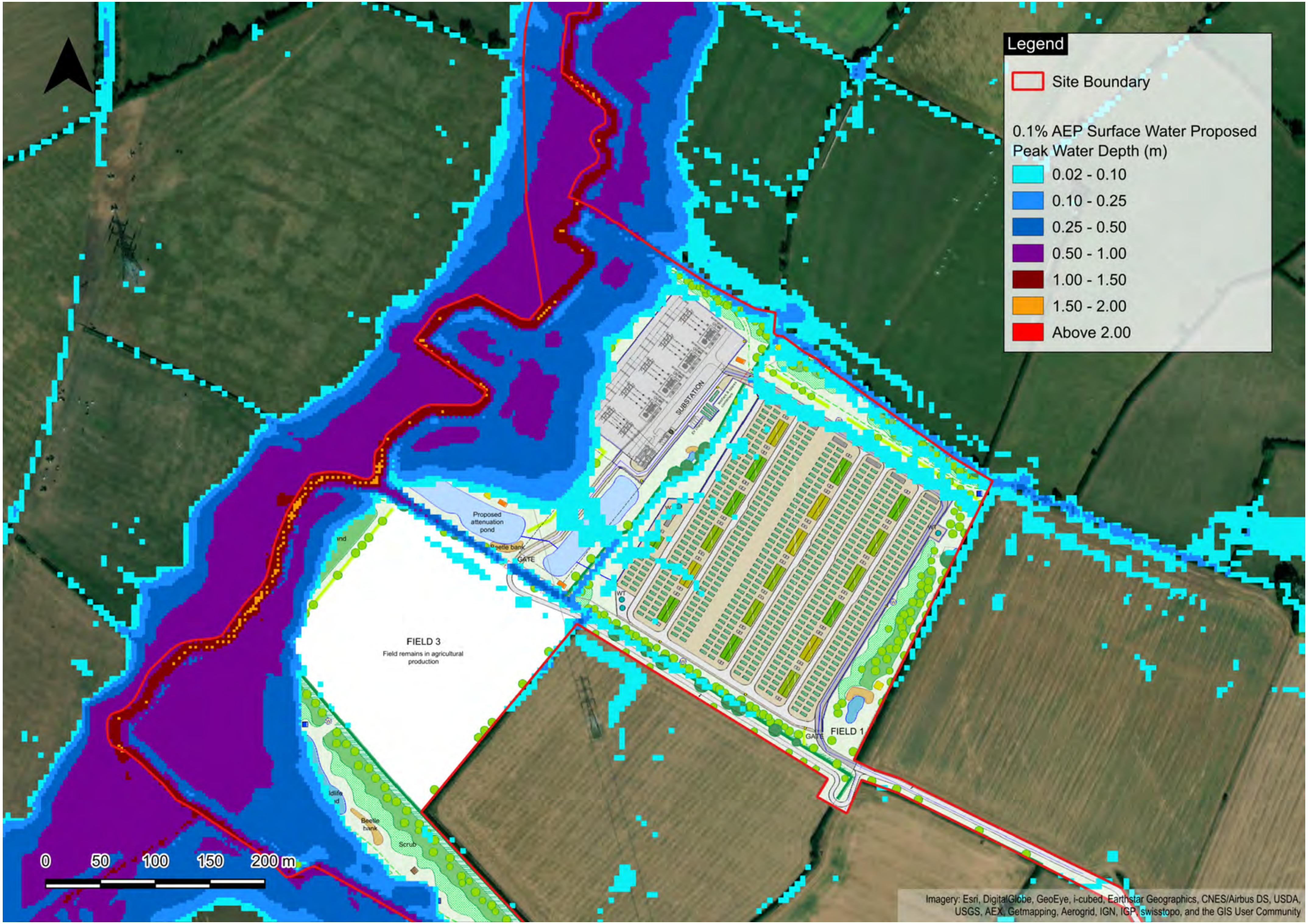


Legend
Site Boundary
0.1% AEP Fluvial Proposed
Peak Water Depth (m)
0.00 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
0
100
200
300
400 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


Legend
Site Boundary
0.1% AEP Fluvial Proposed Peak Water Depth (m)
0.00 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
SUBSTATION
Proposed attenuation pond
Beetle bank
GATE
New odland
FIELD 3
Field remains in agricultural production
FIELD 1
GATE
WT
Wildlife Pond
Beetle bank
Scrub
0 50 100 150 200 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend
Site Boundary
0.1% AEP Surface Water Proposed Peak Water Depth (m)
0.02 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
0
100
200
300
400 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend
Site Boundary
0.1% AEP Surface Water Proposed Peak Water Depth (m)
0.02 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
Above 2.00
SUBSTATION
Proposed attenuation pond
GATE
FIELD 3
Field remains in agricultural production
FIELD 1
Beetle bank
Scrub
0 50 100 150 200 m
Imagery: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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