PEGASUS GROUP

FLOOD RISK ASSESSMENT & SURFACE WATER DRAINAGE STRATEGY

Boxted Solar Farm

Land at Boxted, Suffolk

On behalf of RES Ltd

Date: 25/10/2023 | Pegasus Ref: P21-2950 – Author: Sophie Blainey

Document Management

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Version 1	23/10/2023	Sophie Blainey	Lucy Ginn / Luke Johnson	First Issue
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1. Introduction

Background

1.1. Pegasus Planning Group Ltd has been appointed by RES Ltd to undertake a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy for a proposed solar farm on Land west of Boxted, Suffolk.

1.2. This assessment considers the risk of flooding from all sources, including tidal, fluvial, surface water, historic, groundwater, sewer and artificial sources.

National and Local Policies

1.3. The National Planning Policy Framework (NPPF) states that a site-specific Flood Risk Assessment (FRA) will be required for proposals:

a) that are greater than 1 hectare (ha) in area within Flood Zone 1;

b) that are located in Flood Zone 2 or 3 (including minor development and change of use);

c) in an area within Flood Zone 1 which has critical drainage problems;

d) in an area within Flood Zone 1 identified in a Strategic Flood Risk Assessment as being at increased flood risk in the future;

e) in an area in Flood Zone 1 that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

1.4. The site is approximately 43.7ha in area and contains a small area of Flood Zone 2. Therefore, a full FRA is required.

1.5. As of April 2015, the legislation for dealing with FRAs changed, with additional emphasis placed on the use of Sustainable Drainage Systems (SuDS) within drainage schemes for new developments.

1.6. In February 2016, the Environment Agency (EA) introduced new guidance relating to the climate change allowances that must be considered within an FRA. Since 2016, the allowances for sea level rise, peak river flow and peak rainfall have each been updated.

1.7. Given the above, any new planning application that requires an FRA will also require a surface water drainage strategy to be submitted. The drainage strategy must demonstrate the use of SuDS within the design and should be in line with the requirements as set out within the National Planning Policy Framework Technical Guidance (NPPFTG). The drainage strategy must also account for climate change over the lifetime of the development, in accordance with the climate change allowances published by the EA.

1.8. In addition to the requirements from the NPPF and EA, as discussed above, this assessment has also reviewed the information and requirements included in the Babergh & Mid Suffolk District Councils' Level 1 Strategic Flood Risk Assessment (SFRA) (2020).

2. Existing Site & Hydrology

Site Location & Existing Conditions

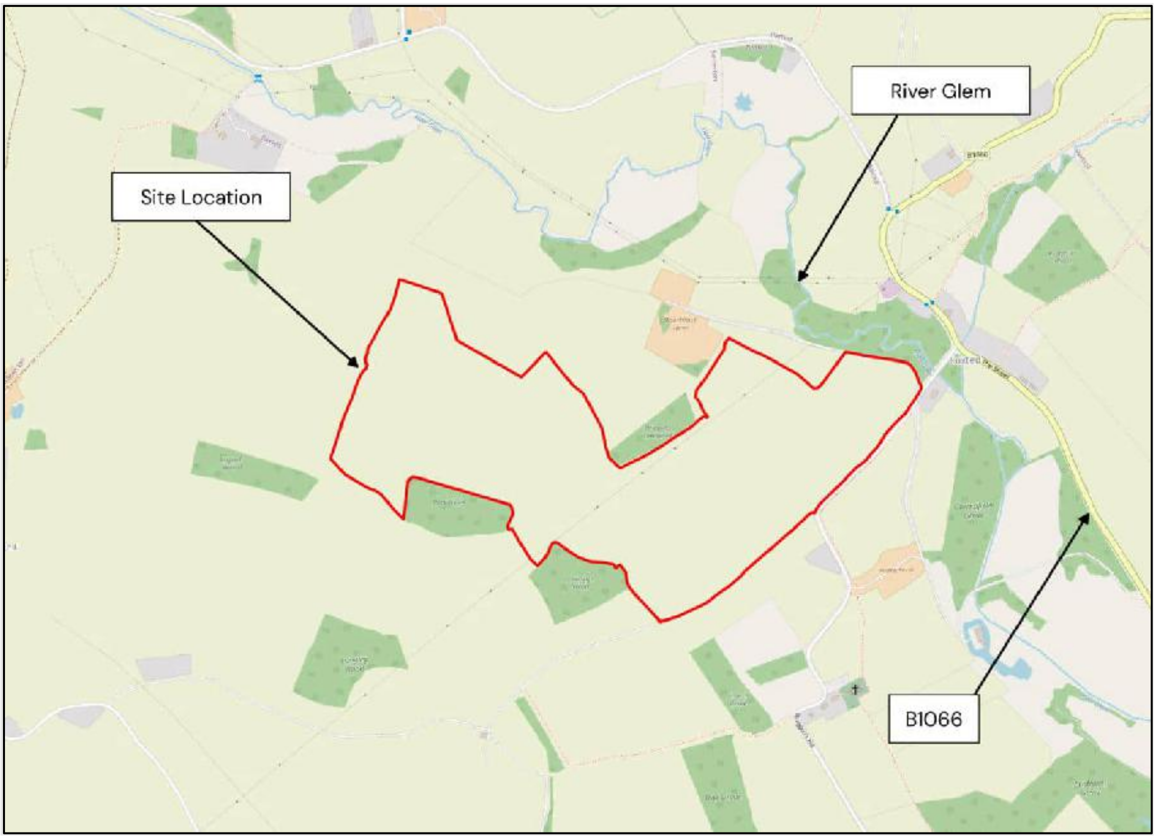
2.1. The site is located on Land west of Boxted, Suffolk.

2.2. The site is surrounded by the River Glem to the north, the B1066 Road to the east, and agricultural land to the south and west.

2.3. Approximate co-ordinates at the centre of the site are E: 581941, W: 250938. The nearest postcode to the site is IP29 4JR.

2.4. The site location is shown in Figure 2.1.

Figure 2.1 – Site Location



2.5. A topographic survey of the site was conducted by Mark Beaver Surveying in March 2023, a pdf of which is included in **Appendix A.**

2.6. The topographic survey shows that the site falls in height from roughly 88mAOD to 54mAOD, from the western side to the eastern side, towards the River Glem.

Existing Drainage and Hydrology

2.7. Though there are no Main Rivers running within the site boundary, the River Glem runs closely adjacent to the eastern edge of the site.

2.8. There are several Ordinary Watercourses flowing through the site. These are generally field boundary ditches assumed to assist with the drainage of the existing agricultural fields.

2.9. Watercourses on site and in the immediate vicinity are shown in Figure 2.2.

2.10. As the site currently consists of agricultural land, it is unlikely that there is an existing underground sewer network located within the site boundary. However, there is a significant number of land drains within the site boundary, to aid in the drainage of the agricultural fields. These are proposed to be kept in situ.

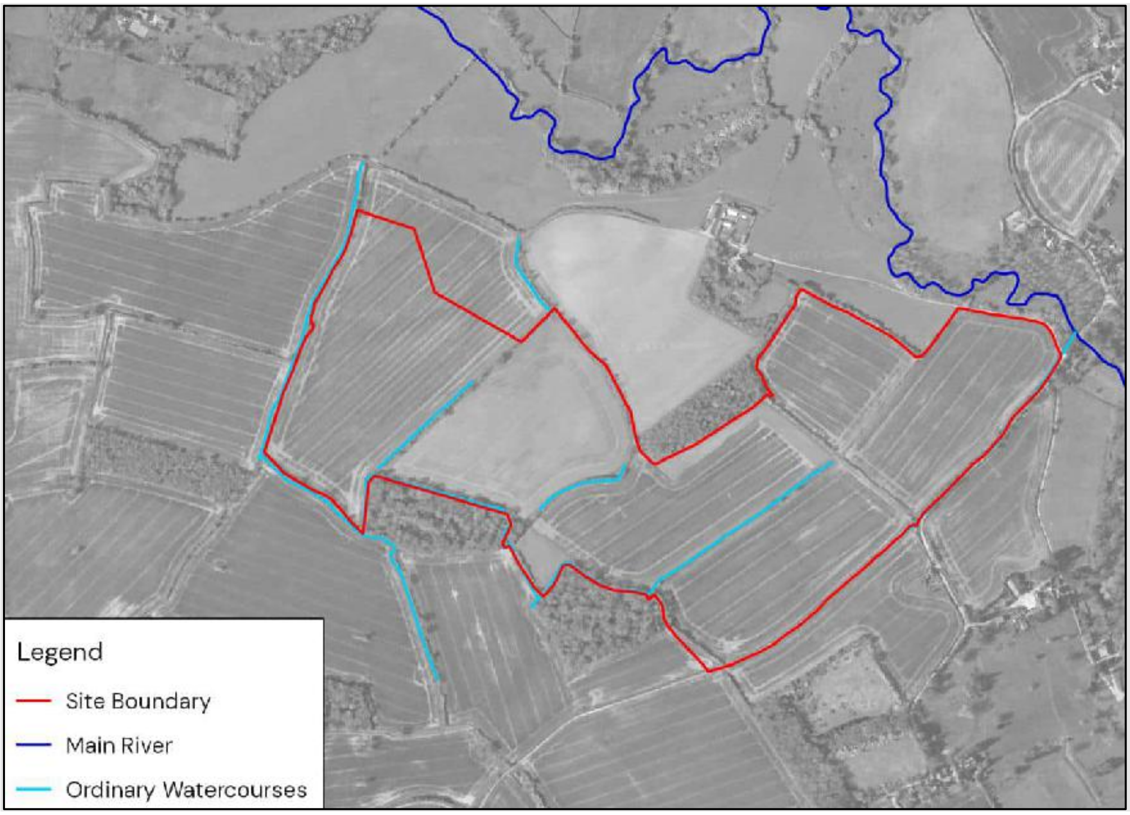
2.11. Regarding superficial deposits, geological data from the British Geological Survey (BGS) shows that the majority of the site consists of "Diamicton - A type of siliciclastic sediment and sedimentary rock" with pockets of "clay, silt, sand and gravel" and "sand and gravel" throughout.

2.12. BGS also shows that most of the site consists of 'Lewes nodular chalk formation, Seaford chalk formation, Newhaven chalk formation and culver chalk formation (undifferentiated) – chalk' apart from the northwest corner of the site, which consists of 'Crag group – sand'.

2.13. SoilScapes mapping shows that the majority of the site comprises of 'Lime-rich loamy and clayey soils' with 'slightly impeded drainage'. The northern edge of the site comprises of 'Freely draining slightly acid loamy soils'.

2.14. The hydrogeology aquifer classification defines most of the site as a 'highly productive aquifer', with the southwestern corner being defined as a 'moderately productive aquifer'.

Figure 2.2 –Watercourses



3. Proposed Development

3.1. The site is proposed for the erection of a solar farm across 43.7ha of agricultural land.

3.2. The proposals include:

- Access track
- Solar PV arrays
- Inverter and battery storage areas
- Hardstands
- Substation compound
- Temporary construction compound
- Perimeter deer fence
- Security fence

3.3. The proposed site layout is included in **Appendix B**.

4. Development Vulnerability & Flood Zone Classification

National Planning Policy Framework (NPPF)

4.1. Local Planning Authorities, (LPA) have a statutory obligation to consult the Environment Agency (EA) on all applications in the flood zones. The EA will consider the effects of flood risk in accordance with the NPPF.

4.2. NPPF requires that, as part of the planning process:

• A 'site specific' Flood Risk Assessment will be undertaken for any site that has a flood risk potential.

• Flood risk potential is minimised by applying a 'sequential approach' to locating 'vulnerable' land uses.

• Sustainable drainage systems are used for surface water management where practical.

• Flood risk is managed through the use of flood resilient and resistant techniques.

• Residual risk is identified and safely managed.

4.3. Table 1 of NPPF defines each flood zone based on the probability of River and sea flooding in that area, as summarised below:

• Zone 1- Low probability (< 1 in 1000 years)

• Zone 2- Medium probability (1 in 1000 - 1 in 100 years for fluvial events and 1 in 1000 to 1 in 200 years for tidal events)

• Zone 3a- High probability (> 1 in 100 years for fluvial events and > 1 in 200 years for tidal events)

• Zone 3b- The functional floodplain (>1 in 30 years)

4.4. The NPPF sets out a matrix indicating the types of development that are acceptable in different Flood Zones (see Table 4.1). The proposals are for a solar farm which is classified as 'Essential Infrastructure'. The site extents across Flood Zone 1 and 2. Essential Infrastructure is appropriate in all flood zones (see Table 4.1).

Table 4.1 – NPPF Guidance

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	✗	Exception Test Required	Exception Test Required	✓
Zone 3b	Exception Test Required	✗	✗	✗	✓

<u>Sequential Test</u>

4.5. The Sequential Test is required for all developments proposed in Flood Zone 2 or 3 unless the proposals are for minor development or change of use. All proposed development is located in Flood Zone 1 here. As no proposed development is located in the small area of Flood Zone 2 on site, the Sequential Test is not required.

<u>Exception Test</u>

4.6. All proposed development is located in Flood Zone 1, leaving the small area of Flood Zone 2 on site entirely undeveloped. Essential Infrastructure located in Flood Zone 1 does not require the Exception Test (see Table 4.1).

5. Site Specific Flooding Issues and Existing Flood Records

5.1. Local Planning Authorities, (LPA) have a statutory obligation to consult the Environment Agency (EA) on all applications in the flood zones. The EA will consider the effects of flood risk in accordance with the NPPF.

National Planning Policy Framework (NPPF)

5.2. In accordance with the National Planning Policy Framework, this Flood Risk Assessment considers all sources of flooding including:

a) Tidal Flooding – from the sea;

b) Fluvial Flooding – from rivers and streams;

c) Surface Water Flooding – from overland surface water flow and exceedance;

d) Historic Flooding – known historic flooding issues;

e) Groundwater Flooding – from elevated groundwater levels or springs;

f) Flooding from Sewers – exceedance flows from existing sewer systems; and

g) Artificial Sources – reservoirs, canals etc.

Tidal Flooding

5.3. The Flood Map for Planning (see Figure 5.1) defines the majority of the site as Flood Zone 1, at Low risk of tidal flooding. A small area of the northeast corner of the site is located in Flood Zone 2, though no development is proposed within this area.

5.4. The Babergh and Mid Suffolk SFRA (2020) states that 'the majority of the study area is currently not at risk of tidal flooding.'

5.5. The above information, and the site's inland location, will ensure that the overall tidal flood risk is considered to be **Very Low.**

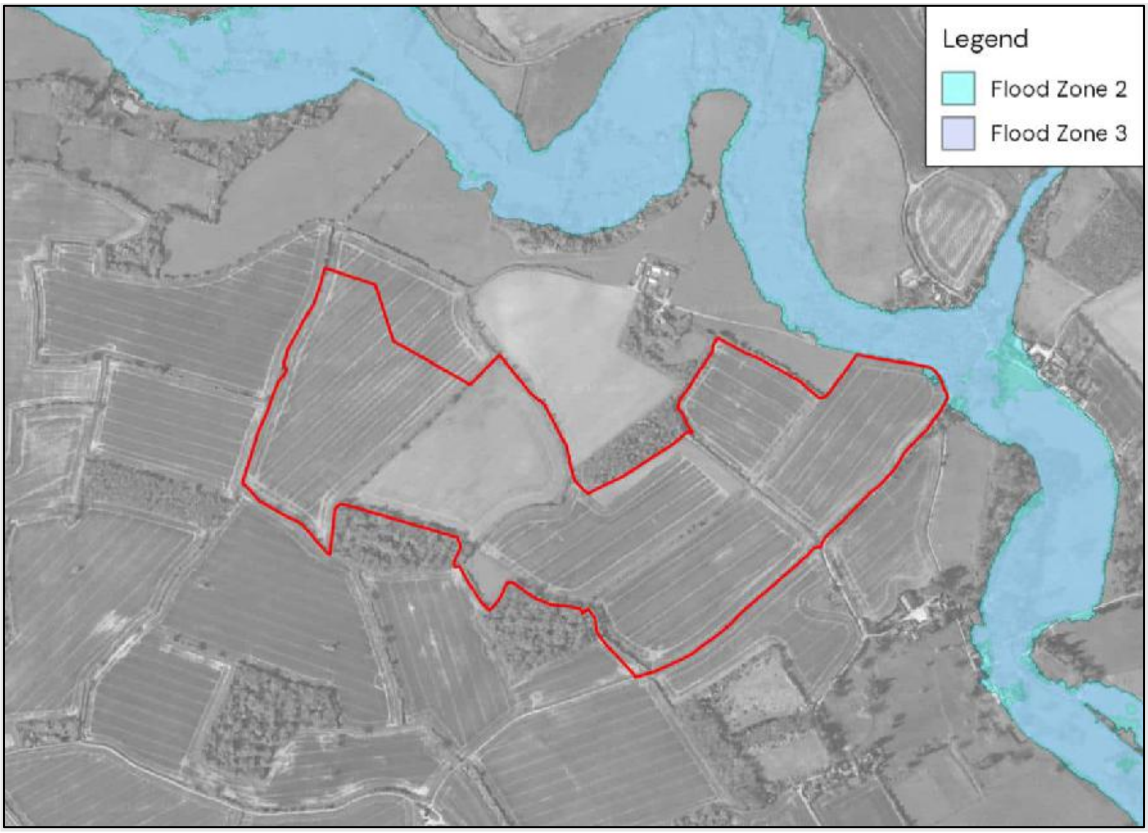
Fluvial Flooding

5.6. The Flood Map for Planning (Figure 5.1) defines most of the area of the site to fall within Flood Zone 1, at Low risk of fluvial flooding, not predicted to be affected by a 1 in 1,000 year flood event.

5.7. A small area in the northeast of the site falls within Flood Zone 2, predicted to be impacted by a 1 in 1,000 year event. This is associated with the River Glem. No development is proposed within Flood Zone 2.

5.8. Given the information above, the site is considered to be at **Very Low** risk of fluvial flooding.

Figure 5.1 – Flood Map for Planning



<u>Surface Water Flooding</u>

5.9. The Risk of Flooding from Surface Water (RoFSW) dataset shows that most of the site is not predicted to be impacted by a 1 in 1,000 year rainfall event and is at Very Low risk of surface water flooding (see Figure 5.2).

5.10. The site also contains areas at a Low risk of surface water flooding, impacted by a 1 in 1,000 year rainfall event, throughout the site. These areas run in thin veins around the perimeter of the site, and do not overlap with the locations of any of the vulnerable infrastructure.

5.11. The RoFSW dataset also predicts the depths of surface water flooding across the site during a 1 in 1000 year rainfall event. Within the proposed site, 1 in 1,000 year surface water flood depths of up to 300-600mm are predicted, although predicted depths more generally remain below 150mm (see Figure 5.3),. All solar panels proposed in areas predicted to be at risk of surface water flooding will have their lowest edge raised above the predicted 1 in 1,000 surface water flood depths and therefore are therefore not predicted to be impacted by surface water flooding, nor negatively impact flood risk elsewhere.

5.12. Given the above, the site is considered to be at **Low** risk of flooding from surface water.

Figure 5.2 – RoFSW Extents

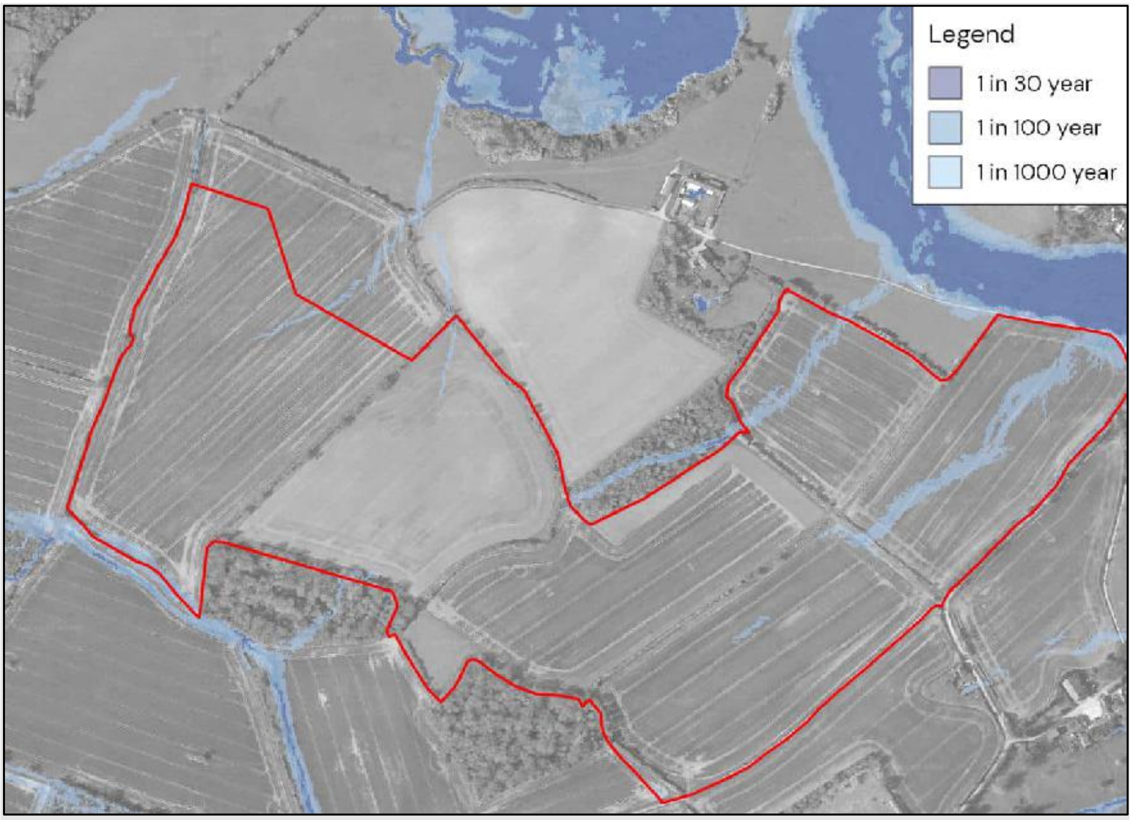
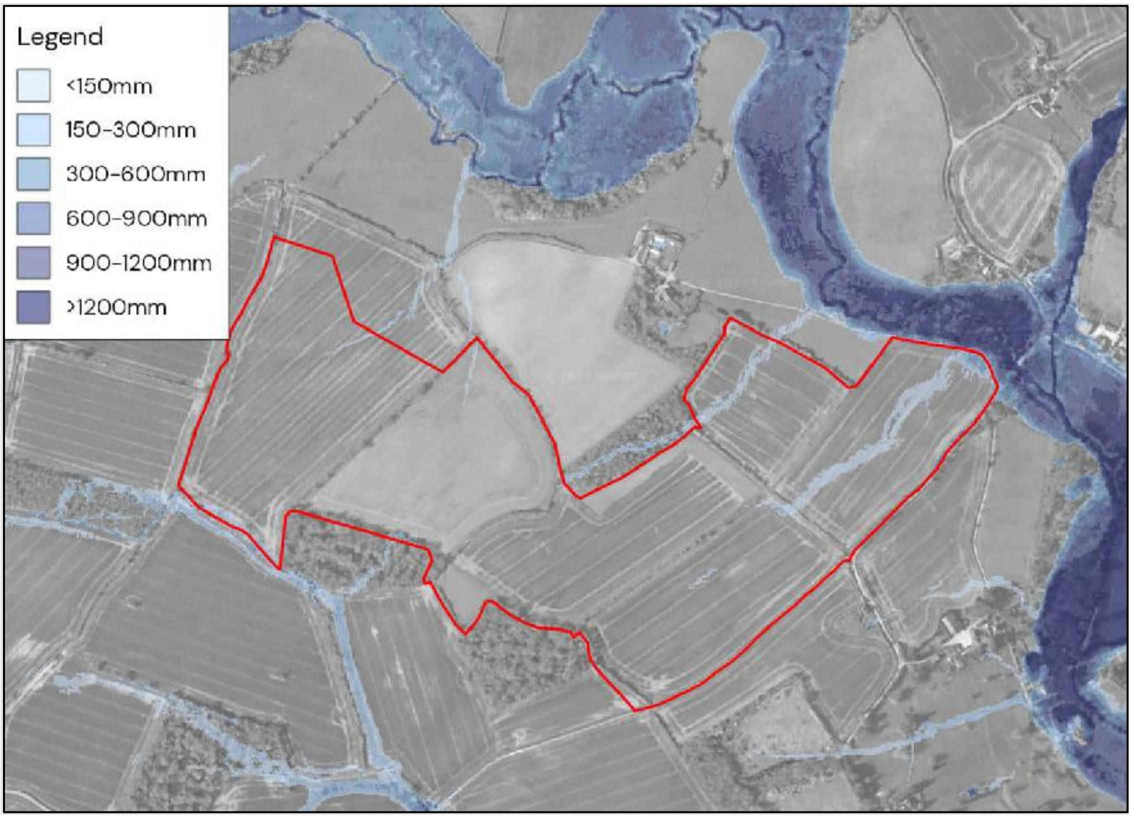


Figure 5.3 – RoFSW 1 in 1000 year Depths



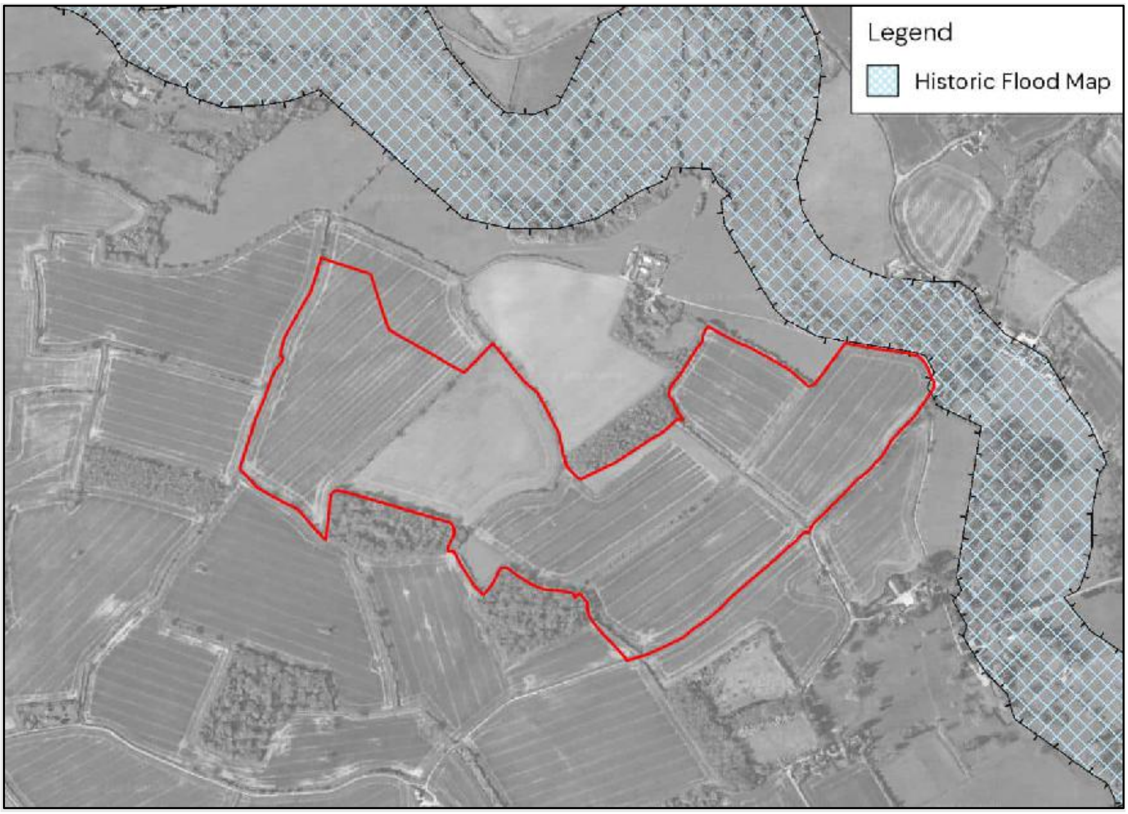
Historic Flooding

5.13. The EA's Historic Flood Map shows a historic flood event running across the northeastern edge of the site, associated with the River Glem (see Figure 5.4). Though there is a negligible overlap between the recorded flood outline and the site boundary, it is important to note.

5.14. The Babergh and Mid Suffolk SFRA (2020) states that 'surface water flooding is the most frequent recorded cause of flooding within B&MS'. Despite this, no historical floods have occurred within the site boundary and the site remains largely unaffected by historical flooding.

5.15. Given the above information, it is considered unlikely that the site has been impacted by historic flood events.

Figure 5.4 Historic Flood Map



Groundwater Flooding

5.16. BGS data show that most of the site is underlain by chalk bedrock geology (expected to be permeable). The hydrogeology aquifer classification defines most of the site as a 'highly productive aquifer', with the southwest corner being defined as a 'moderately productive aquifer'. BGS record various superficial deposits at the site comprising of "Diamicton – A type of siliciclastic sediment and sedimentary rock" with pockets of "clay, silt, sand and gravel" and "sand and gravel" throughout. Therefore, groundwater emergence may be possible.

5.17. Any clay superficial deposits across the site are expected to limit groundwater emergence on site.

5.18. SoilScapes Mapping shows both freely draining loamy soils and clayey soils with slightly impeded drainage present at the site. Drainable soils will ensure that any groundwater that does emerge will be able to soak back into the ground easily. Equally, poorly draining soils will limit groundwater emergence on site.

5.19. Topography on site is also not conducive to groundwater flooding – any groundwater to emerge would follow the existing site topography towards the various watercourses on site and in the immediate vicinity and towards the River Glem to the northeast of the site.

5.20. The Babergh and Mid Suffolk SFRA (2020) states that there is "generally negligible risk of groundwater flooding in B&MS. In both districts, areas which are at risk of groundwater flooding tend to correspond to the chalk geology and location of watercourses". Though the majority of the site does consist of chalk bedrock, the other discussed factors such as the topography of the site and local watercourses should mitigate this risk.

5.21. Considering the above information, the risk of groundwater flooding at the site is considered to be **Low**.

Flooding from Sewers

5.22. The Babergh and Mid Suffolk Council SFRA (2020) does not list any flooding from sewers occurring within the IP29 postcode.

5.23. As the site is entirely agricultural land, it is unlikely that there is an existing underground sewer network located within the site boundary. Additionally, any flood water from sewers in the close vicinity of the site would follow local topography and would not be expected to accumulate within the site boundary.

5.24. A series of land drains are located beneath the site. However, these are not expected to pose a flood risk as they are designed specifically for the site to manage water levels. They are assumed to be sufficiently sized and have sufficient capacity for the site.

5.25. The risk of flooding from sewers to the site is therefore considered to be **Low.**

Flooding from Artificial Sources

5.26. The EA's Reservoir Flood Extents data does not show any risk of reservoir flooding should a catastrophic breach occur.

5.27. The Babergh and Mid Suffolk SFRA (2020) state that "there is generally negligible risk of Reservoir Flooding in B&MS".

5.28. There are no artificial sources of flooding or canals located in the vicinity of the site that would present a flood risk.

5.29. The site is therefore considered to be at **Very Low** risk of flooding from artificial sources.

Post Development Flood Risk Summary

5.30. The risk of flooding to the site from all sources has been assessed above, with the conclusions summarised in Table 5.1:

Table 5.1 – Flood Risk Summary

Flood Source	Flood Risk	Mitigation/Comments
Tidal	Very Low	• The majority of the site is within Flood Zone 1, at Low risk of flooding. • A small area of the site that is located in Flood Zone 2 is associated with fluvial flooding. Flood Zone 2 is also not proposed for development. • The Babergh and Mid Suffolk SFRA (2020) states that 'the majority of the study area is currently not at risk of tidal flooding.'
Fluvial	Low	• The majority of the site is within Flood Zone 1, at Low risk of flooding. • No development is located within Flood Zone 2.
Surface Water	Low	• The RoFSW dataset shows that most of the site is not predicted to be impacted by a 1 in 1,000 year rainfall event and is at Very Low risk of surface water flooding. • No vulnerable infrastructure is proposed within areas predicted to be at risk of surface water flooding. • Where solar panels are proposed in areas predicted to be at risk of surface water flooding, they will have their lowest edge raised above the predicted 1 in 1,000 year flood depths.
Historic	Low	• A negligible section of the site is affected by historical flooding.
Groundwater	Low	• Although the site is underlain with assumed permeable bedrock and a highly productive aquifer, clay deposits and soils with impeded drainage are expected to limit groundwater emergence on site. • Topography on site is not conducive to groundwater flooding.

Sewers	Low	• The Babergh and Mid Suffolk Council SFRA (2020) does not list any flooding from sewers occurring within the IP29 postcode. • As the site is entirely agricultural land, it is unlikely that there is an existing underground drainage network located within the site boundary. • The land drains that occur underneath the site are not expected to pose a flood risk as they are designed specifically for the site to manage water levels. • Any flood water from sewers in the close vicinity of the site would follow local topography and would not be expected to accumulate within the site boundary.
Artificial	Low	• The EA's Reservoir Flood Extents data does not show any risk of reservoir flooding should a catastrophic breach occur. • The Babergh and Mid Suffolk SFRA (2020) state that "there is generally negligible risk of Reservoir Flooding in B&MS". • There are no artificial sources of flooding or canals located in the vicinity of the site that would present a flood risk.

Access & Egress

5.31. Access and egress to the proposed solar farm will be off Braggon's Hill to the south of the site. Neither this access/egress point nor Braggon's Hill further south are predicted to be at significant risk of flooding from any source.

5.32. Where Braggon's Hill meets the B1066 close to the northern site boundary, away from the access/egress point for the site, flooding associated with the River Gilm is predicted by the Flood Map for Planning and RoFSW dataset (see Figure 5.1 and 5.2 above). Should extreme flooding occur here that precludes vehicles passing, it is expected that access and egress via Braggon's Hill to the south would remain safe for vehicles.

5.33. In addition to the above, during the operational phase, the site will be managed remotely and only visited occasionally for maintenance. Site access and egress should therefore not be needed during an extreme flood event.

6. Mitigation Measures and Surface Water Drainage

6.1. This section summarises the proposed mitigation measures required on site to ensure that:

a) The development is not at significant risk of surface water flooding.

b) The potential impacts of the development on surface water runoff are minimised.

6.2. This section also considers if, with proposed mitigation measures in place, any further measures (such as a surface water drainage strategy) are required to ensure that the proposed development is safe and does not increase flood risk elsewhere.

Surface Water Flood Risk

6.3. As discussed in Section 5, the RoFSW dataset predicts small areas of the site to be at risk of surface water flooding.

6.4. To ensure that the proposed development is not at significant risk of surface water flooding, the following mitigation measures have been included in the proposed site design:

- No vulnerable infrastructure (inverters, substations etc) is located in areas predicted to be at risk of surface water flooding during an extreme, 1 in 1,000 year, rainfall event.
- All proposed solar panels located in areas predicted to be at risk of flooding during a 1 in 1,000 year surface water flood event will have their lowest edge raised above the predicted 1 in 1,000 year surface water flood depths. Even during an extreme event, surface water will therefore be able to flow freely beneath the panels and surface water flow paths will not be impacted. 1 in 1,000 year surface water flood depths of up to 300-600mm are predicted on site, although generally depths aren't predicted to exceed 150mm on site (see Section 5).

6.5. Overall, with the above mitigation measures in place, the proposed development will not be at significant risk of flooding from surface water.

Impact on Surface Water Runoff

Solar Panels

6.6. The proposed solar panels will generally comprise a 'fixed system' with vertical supports driven directly into the ground and generally, no need for concrete foundations. There will be a minimum gap of 2m between rows of solar panels.

6.7. There is potential for small concrete feet being required for the solar panels in discrete areas if archaeology becomes an issue or where solar panels are proposed over existing land drains on site. Given the small area of concrete foundations expected for the solar panels, the impact on surface water runoff is likely to be negligible. The exact areas of concrete foundations proposed will be confirmed during detailed design and the impacted on surface water runoff, re-assessed.

6.8. At this stage, as no areas of concreate foundations have been confirmed, this assessment of the impact on surface water runoff has presumed all solar panels will comprise a fixed system with vertical supports driven directly into the ground.

6.9. As discussed above, all proposed solar panels will be raised above the predicted 1 in 1,000 year surface water flood depths to allow surface water to flow freely below.

6.10. Given the above, the impact of the proposed solar panels on surface water runoff patterns is considered to be **negligible** and no further mitigation measures are proposed.

Vulnerable Infrastructure

6.11. In addition to solar panels, a variety of vulnerable infrastructure is proposed on site including inverters, battery storage and a DNO substation. Additional areas of hardstanding associated with the vulnerable infrastructure are also proposed on site. Overall, the areas of proposed vulnerable infrastructure on site will increase the impermeable area on site and therefore have the potential to increase surface water runoff from the proposed development. A surface water drainage strategy is therefore required to manage runoff from the proposed infrastructure. The proposed surface water drainage strategy is included in Section 7.

Access Tracks

6.12. The proposed access tracks will be constructed with a running surface, with a base/capping layer and subgrade below (see **Appendix B**). The typical track section also includes an adjacent drainage swale which will help manage surface water runoff from the proposed access tracks, should this be required. No further mitigation measures are considered necessary.

Proposed Land Use Change

6.13. The proposals will result in the cessation of agricultural activities at the site which will in turn, result in a variety of beneficial effects which will serve to reduce soil compaction and runoff rates from the site, as listed below:

- The site will not be left without vegetation cover during the winter as experienced with arable farming;
- The site will not be regularly traversed by heavy machinery.

6.14. It is also recommended that following installation of the panels, the site is chisel-ploughed or similarly cultivated and seeded with native meadow grass and wildflowers. Chisel-ploughing will reduce soil compaction on the site and promote seed growth; it has been proven to significantly increase infiltration rates thereby reducing runoff rates from the site.

6.15. Additionally, longer meadow type grasses and wildflower vegetation provide high levels of natural attenuation which will serve to reduce the risks of erosion and limit surface water flows across the site. With the implementation of chisel-ploughing, changing the site's primary function to solar power generation will have several potential longer-term benefits regarding surface water runoff rates.

7. Proposed Surface Water Drainage Strategy

7.1. As discussed above, the proposed vulnerable infrastructure on site will increase the impermeable area on site. To ensure surface water runoff from the development and associated flood risk does not increase as a result of the proposals, a surface water drainage strategy is therefore required.

Surface Water Management

7.2. The SuDS hierarchy demands that surface water run off should be disposed of as high up the following list as practically possible:

• Into the ground (infiltration) and re-use, or then;

• To a surface water body, or then;

• To a surface water sewer, highway drain or another drainage system, or then;

• To a combined sewer.

7.3. In order to determine the most suitable method of surface water disposal from the site the options listed above have been considered as follows:

Infiltration

7.4. From a desktop review, ground conditions on site appear to be suited to infiltration-based SuDS. BGS show the site to be underlain by chalk and sand bedrock geology, both of which are expected to be permeable. SoilScapes data show 'lime-rich loamy and clayey soils' with 'slightly impeded drainage' and 'freely draining slightly acid loamy soils' present at the site.

7.5. Given the above, it is proposed to manage surface water runoff from the proposed development with infiltration-based SuDS.

SuDS selection process

7.6. Various methods of SuDS (Sustainable Drainage Systems) should be considered for use as different methods have constraints attached to them and may not be suitable for this development.

7.7. An assessment of the suitability of different SuDS techniques is summarised in Table 7.1 below. Guidance from 'The SuDS manual' C753 has been used to form the basis of this assessment.

Table 7.1 – Assessment of SuDS Suitability

SuDS Technique	Potentially suitable for this development	Justification
Rainwater Harvesting	No	Not considered suitable for solar development
Green Roofs	No	Not considered suitable for solar development
Infiltration Systems (Soakaways, etc.)	Yes	Proposed to manage runoff from the proposed areas of vulnerable infrastructure (see surface water drainage strategy included in **Appendix D**)
Filter Drains	Yes	Gravel trenches/filter drains are proposed on site.
Swales	Yes	Could be used to help convey surface water runoff on site
Bioretention Systems	Yes	Could be considered during detailed design
Trees	Yes	Could be considered but would not significantly reduce the storage requirements
Underground storage	No	Should be avoided
Detention basins & ponds	No	Not considered necessary due to small area of impermeable hardstanding to be managed
Wetlands	No	Not considered suitable due to land take
Permeable Paving	No	Not considered suitable due to the land take

Infiltration Rate

7.8. The proposed drainage strategy is based on an estimated infiltration rate of **0.00108m/hr**. This rate has been used to design the proposed surface water drainage features on site. The rate has been estimated using data from Soilscapes which define 'lime-rich loamy and clayey soils' and 'slightly acid loamy soils' present at the site and Table 25.1 – "typical infiltration coefficients based on soil texture (after Bettess, 1996) included in the CIRIA SuDS Manual which provides a typical infiltration rate for "sandy clay loam" as 3 x $10x^{-7}$m/s, which is calculated as **0.00108m/hr**.

7.9. If infiltration testing is complete during detailed design, the proposed drainage strategy should be updated to reflect the calculated infiltration rates on site or indeed, to direct surface water runoff to a surface water body or sewer network should infiltration prove unviable on site.

Impermeable Area

7.10. As mentioned above, the vulnerable infrastructure proposed on site will increase the impermeable area on site. The vulnerable infrastructure can be divided to two categories: a) the inverters and battery storage areas with associated hardstanding and b) the substation compound.

7.11. Each of the individual inverters and battery storage areas with associated hardstanding comprise of the following impermeable areas:

- Hardstanding Areas: 225m^2
- Battery Storage Units: 30.3m^2
- DC Converter Units: 8.64m^2
- Inverters and BusPlus Units: 18m^2
- Transformer Units: 12.3m^2

Total impermeable per individual inverter & battery storage areas: 294m^2 / **0.029ha**

7.12. It should be noted that the above impermeable area associated with the "hardstanding area" is a conservative assumption as this area will comprise type 1 unbound stone which has a semi-permeable nature.

7.13. The total substation compound area of **0.111ha** has been assumed as impermeable for the purpose of the proposed surface water drainage strategy. This is also a conservative assumption as part of this compound will also comprise of compacted type 1 or single sized crushed rock (see **Appendix B**) which are expected to provide a degree or permeability.

Climate Change Allowances

7.14. The proposed surface water drainage strategy presented here has been designed to manage surface water runoff for all storm events up to and including the 1 in 100 year plus 25% allowance for climate change.

7.15. This is in accordance with Environment Agency guidance which states that for development with a lifetime of between 2061 and 2100, the central allowance for the 2070s epoch should be used. For the "Combined Essex Management Catchment", the central allowance for the 2070s epoch for a 1 in 100 year rainfall event is 25%.

Surface Water Drainage Strategy

7.16. It is proposed to manage surface water runoff from the proposed impermeable areas on site (as detailed above) with a series of gravel trenches.

7.17. For each of the individual inverters and battery storage areas with associated hardstanding on site which yield 0.029ha of impermeable area, a 66m long infiltration trench is proposed to wrap around the proposed infrastructure, situated within the proposed footprint, to manage surface water runoff from this area. An infiltration trench width of 1.1m and depth of 1.0m is required to manage surface water runoff from the storage areas for all storm events up to and including the 1 in 100 year plus 25% climate change event. Microdrainge source control calculations are included in **Appendix C.**

7.18. It is also proposed to locate an infiltration trench just outside the substation footprint to manage surface water runoff from this area. Here, a gravel trench 101.8m long, 2.2m wide and 1.5m deep is required to manage surface water runoff from the storage areas for all storm events up to and including the 1 in 100 year plus 25% climate change event. Microdrainge source control calculations are included in **Appendix C.**

7.19. The proposed infiltration trenches on site will allow surface water runoff to be stored prior to infiltration into the surrounding ground and will ensure surface water runoff from the proposed development does not increase.

7.20. The proposed surface water drainage strategy drawing is included in **Appendix D.**

Water Quality

7.21. The SuDS Manual (CIRIA C753) states that the design of surface water drainage should consider minimising contaminants in surface water runoff discharged from the site. The level of treatment required depends on the proposed land use, according to the pollution hazard indices.

7.22. Table 7.2 shows the pollution indices for the proposed development. The category of "other roofs" is considered to best describe the areas to be managed.

Table 7.2 – Pollution Hazard Indices

Pollutant	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05

7.23. Table 7.3 shows the pollution mitigation indices for the proposed gravel trenches (filter drains). It is shown that the pollution mitigation indices exceed the proposed development pollution indices. Therefore, the mitigation measures are deemed adequate for the site.

Table 7.3 – Indicative SuDS Mitigation Indices

Type of SuDS component	Total suspended solids (TSS)	Metals	Hydrocarbons
Filter Drain	0.4	0.4	0.4

8. Summary

8.1. The site is approximately 43.7ha in area is currently entirely greenfield. The site is proposed for a solar farm development with associated infrastructure.

8.2. There is a very small portion of the site located in Flood Zone 2. All proposed development is located in Flood Zone 1. Areas of surface water flood risk are also predicted on site. Mitigation measures are proposed to help protect the proposed development from surface water flooding over its lifetime. Mitigation measures include raising the lowest edge of proposed solar panels above proposed flood depths and ensuring vulnerable infrastructure is sequentially located in areas of lowest flood risk.

8.3. The site is not considered to be at significant risk of flooding from any source and access and egress is not predicted to be impeded during an extreme flood event.

8.4. Surface water runoff from proposed infrastructure will be managed with a series of gravel trenches designed to manage surface water runoff from all storm events up until and including the 1 in 100 year plus 25% allowance for climate change.

8.5. With mitigation measures and the proposed surface water drainage strategy in place, the proposed development will not increase flood risk on site or elsewhere.

8.6. The proposal is considered to accord with the requirements of the National Planning Policy Framework (NPPF) with residual risk to the site fully mitigated, and as such considered Low risk.

Appendix A – Topographic Survey

ABBREVIATIONS

ASPH	asphalt	PB	post box
AV	air valve	PL	parapet level
		PM	parking meter
BD	bollard	PT	post
B/D	backdrop		
BH	borehole	RE	rodding eye
BP	block paving	RL	ridge level
BS	bus stop	RFL	roof level
		RS	road sign
CH	channel level	RWP	rain water pipe
CL	cover level		
CONC	concrete	SA	soakaway
CTV	cable television	SL	sill level
CUL	culvert	SP	stand pipe
		SSL	structural slab level
dia	diameter	STN	control station
DK	dropped kerb	SV	stop valve
		SW	surface water
EC	electric cable		
EIC	electric inspection cover	TAP	tap
EL	eaves level	TB	tree bole
EP	electric pole	TCB	telephone call box
ER	earthing rod	TH	trial hole
		TIC	telephone inspection cover
FFL	finished floor level	TP	telegraph pole
FH	fire hydrant	T/P	tactile paving
FW	foul water	TS	traffic signal
G	gully	UMG	unmade ground
GL	ground level	UTL	unable to lift
GP	gate post		
GS	granite setts	VP	vent pipe
GV	gas valve		
		WM	water meter
ht	height	WSV	water stop valve
HL	head level		
HW	headwall		
IC	inspection cover		
IL	invert level		
JB	junction box		
KI	kerb inlet		
LB	litter bin		
LP	lamp post		
MH	manhole		
MKR	marker		
OH	overhead		
OSBM	Ordnance Survey bench mark		

FENCE AND WALL TYPES

BW	brick wall
BWF	barbed wire fence
CIF	corrugated iron fence
CPF	chestnut paling fence
CLF	chain link fence
CP&WMF	concrete post and wire mesh fence
CBF	close boarded fence
CW	concrete wall
IRF	iron railing fence
PRF	post and rail fence
PWF	post and wire fence
RW	retaining wall

578717.492 E 204996.186 N 95.065 ST9 — 88.10 Survey Station
Tree canopy
Tree
Fence
Hedge
Bank (87.80)
1.16 Spot Height
Gate

DATE	AMENDMENT	REV

GENERAL NOTES:

SURVEY NOTES:
1. Orientation, origin and level datum of survey relate to OSGB36(15)
2. Survey uses ST3 as a base station and a scale factor 1.000000
3. Kerb levels are taken in channel.
4.All tree species should be verified by a arboriculturist.

NORTH

MARK BEAVER SURVEYING
Land and Engineering Surveys
Construction Setting Out
Measured Building Surveys

Highbanks, Old Rectory Lane
Shimpling, Bury St Edmunds, Suffolk
IP29 4HG
Tel: (01284) 830756
web: www.markbeaversurveying.co.uk
e-mail: info@markbeaversurveying.co.uk

CLIENT: PEGASUS PLANNING GROUP

PROJECT: BOXTED SOLAR FARM
BOXTED
BURY ST EDMUNDS
IP29 4JR

TITLE: TOPOGRAPHIC SURVEY

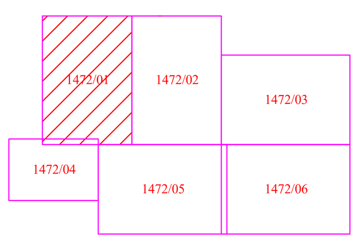
SURVEYOR: MB

DRAWN BY: MB — SHEET SIZE: A0

DATE: 21.03.2023 — SCALE: 1:500

DRAWING No: 1472/01 — JOB No: 1472

SHEET LAYOUT



DATE	AMENDMENT	REV

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BURY ST EDMUNDS
IP29 4JR

TITLE: TOPOGRAPHIC SURVEY

SURVEYOR: MB

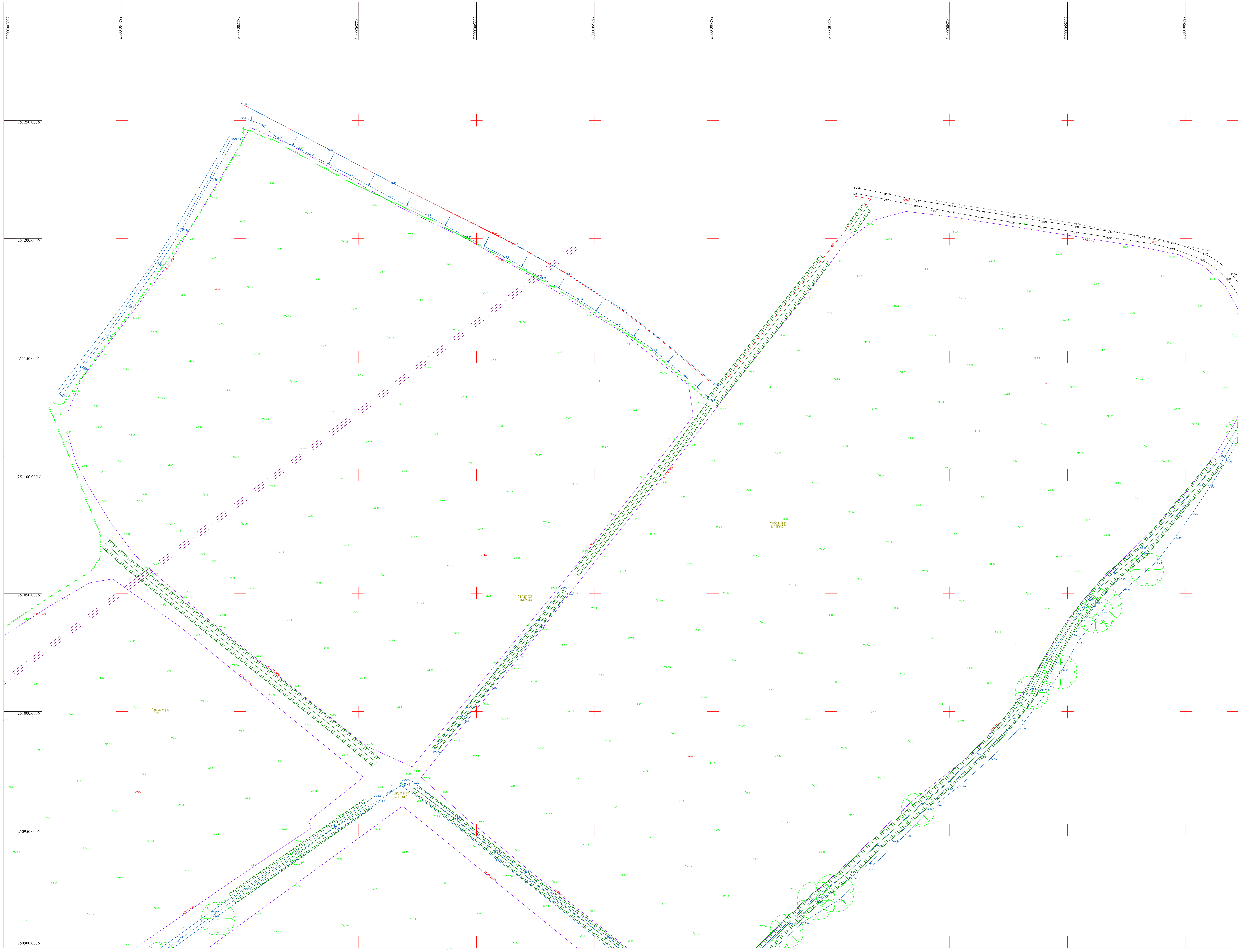
DRAWN BY: MB — SHEET SIZE: A0

DATE: 21.03.2023 — SCALE: 1:500

DRAWING No: 1472/02 — JOB No: 1472

SHEET LAYOUT

1472/01 | 1472/02 | 1472/03
1472/04 | 1472/05 | 1472/06



SHEET LAYOUT

1472/01 | 1472/02 | 1472/03
1472/04 | 1472/05 | 1472/06

DATE	AMENDMENT	REV

GENERAL NOTES:

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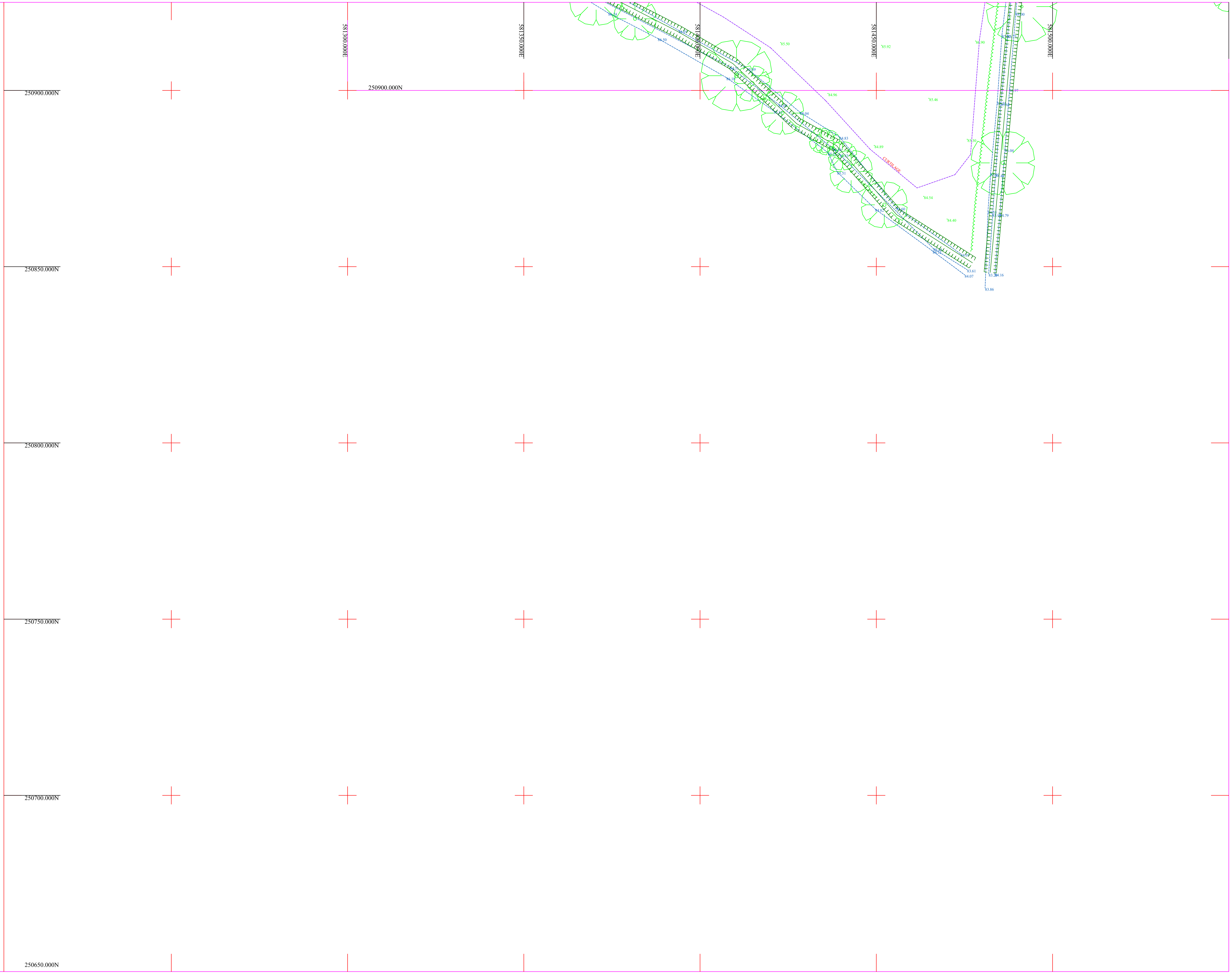
CLIENT: PEGASUS PLANNING GROUP

PROJECT: BOXTED SOLAR FARM
BOXTED
BURY ST EDMUNDS
IP29 4JR

TITLE: TOPOGRAPHIC SURVEY

SURVEYOR: MB
DRAWN BY: MB — SHEET SIZE: A0
DATE: 21.03.2023 — SCALE: 1:500
DRAWING No: 1472/03 — JOB No: 1472



ABBREVIATIONS

ASPH	asphalt	PB	post box
AV	air valve	PL	parapet level
BD	bollard	PM	parking meter
B/D	backdrop	PT	post
BH	borehole	RE	rodding eye
BP	block paving	RL	ridge level
BS	bus stop	RFL	roof level
CH	channel level	RS	road sign
CL	cover level	RWP	rain water pipe
CONC	concrete	SA	soakaway
CTV	cable television	SL	sill level
CUL	culvert	SP	stand pipe
dia	diameter	SSL	structural slab level
DK	dropped kerb	STN	control station
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EL	eaves level	TAP	tap
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FFL	finished floor level	TH	trial hole
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FW	foul water	TP	telegraph pole
G	gully	T/P	tactile paving
GL	ground level	TS	traffic signal
GP	gate post	UMG	unmade ground
GS	granite setts	UTL	unable to lift
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MKR	marker		
OH	overhead		
OSBM	Ordnance Survey bench mark		

FENCE AND WALL TYPES

BW	brick wall
BWF	barbed wire fence
CIF	corrugated iron fence
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CP&WMF	concrete post and wire mesh fence
CBF	close boarded fence
CW	concrete wall
IRF	iron railing fence
PRF	post and rail fence
PWF	post and wire fence
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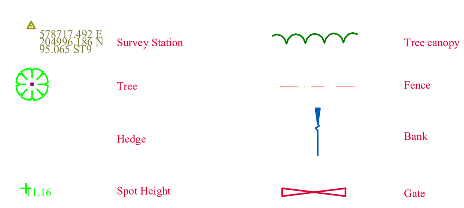

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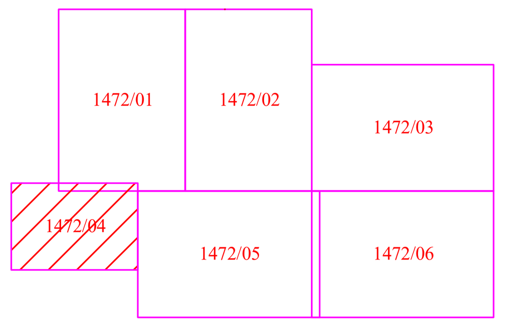

DATE	AMENDMENT	REV

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PROJECT: BOXTED SOLAR FARM
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BURY ST EDMUNDS
IP29 4JR

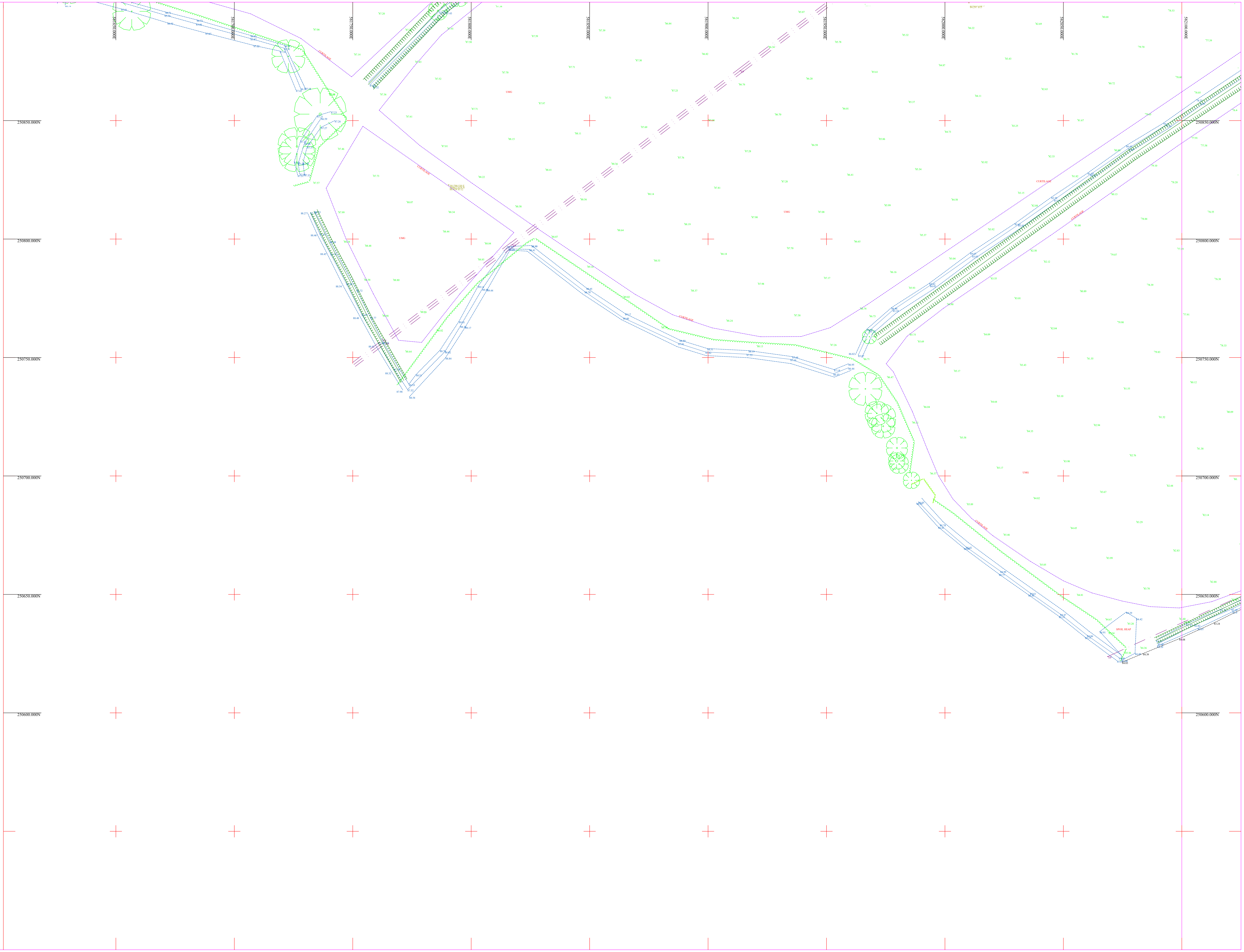
TITLE: TOPOGRAPHIC SURVEY

SURVEYOR: MB

DRAWN BY: MB | SHEET SIZE: A1

DATE: 21.03.2023 | SCALE: 1:500

DRAWING No: 1472/04 | JOB No: 1472



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RW	retaining wall

578717.492 E 204996.186 N 95.065 ST9 — Survey Station
Tree
Hedge
Spot Height
Tree canopy
Fence
Bank
Gate

SHEET LAYOUT

1472/01 | 1472/02 | 1472/03 | 1472/04 | 1472/05 | 1472/06

DATE	AMENDMENT	REV

GENERAL NOTES:

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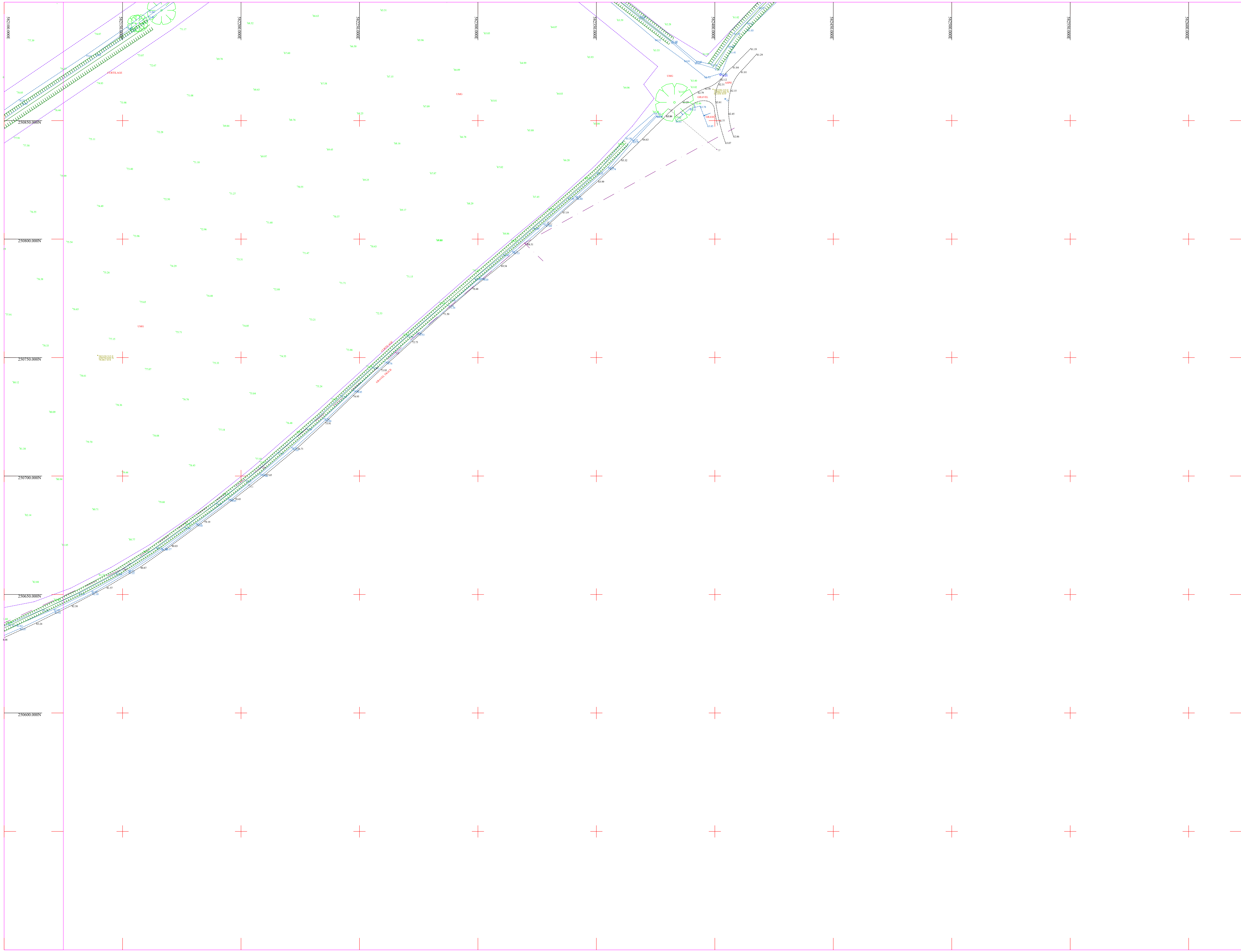
BOXTED
BURY ST EDMUNDS
IP29 4JR

TITLE: TOPOGRAPHIC SURVEY

SURVEYOR: MB
DRAWN BY: MB — SHEET SIZE: A0
DATE: 21.03.2023 — SCALE: 1:500
DRAWING No: 1472/05 — JOB No: 1472



DATE	AMENDMENT	REV

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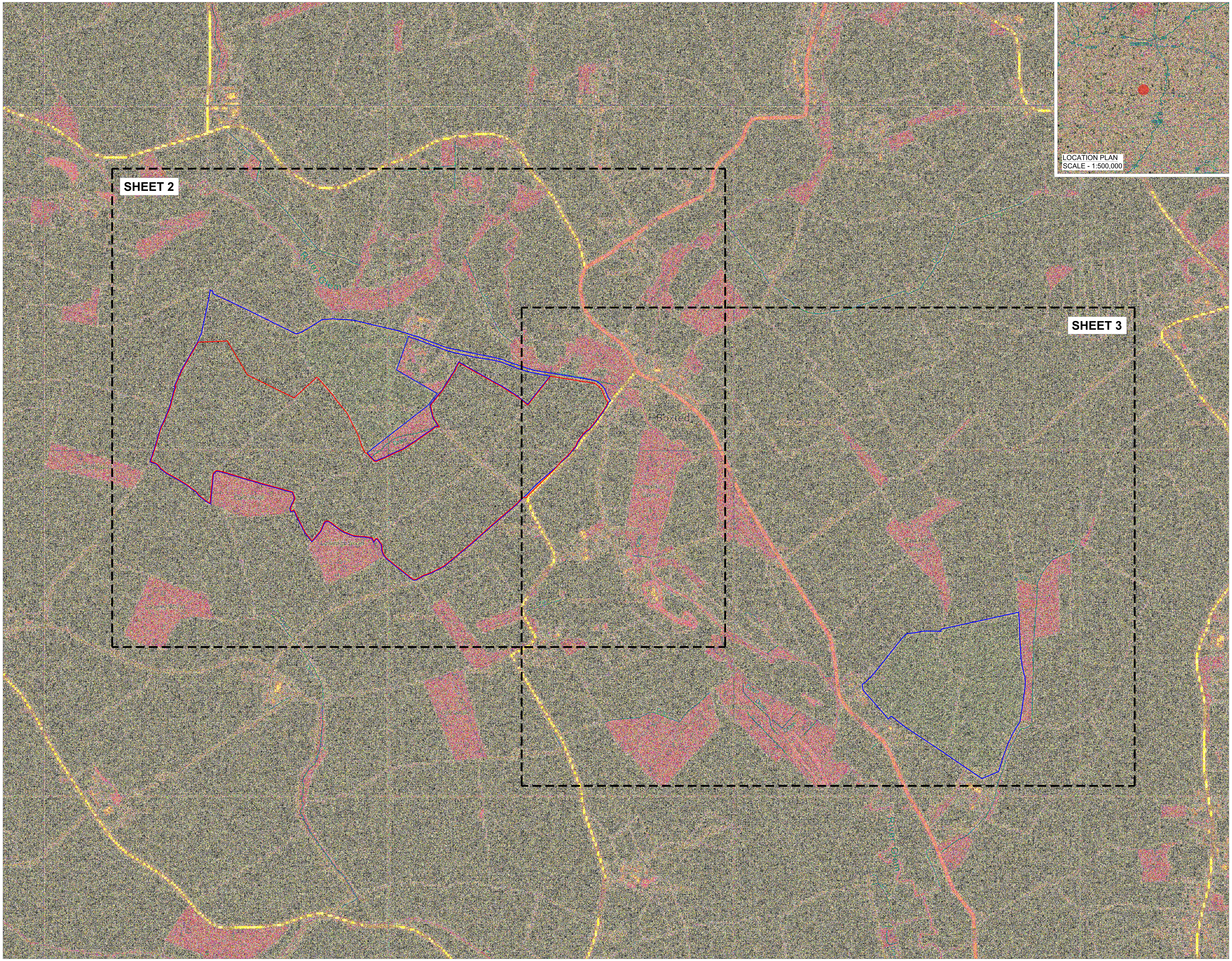
PROJECT: BOXTED SOLAR FARM
BOXTED
BURY ST EDMUNDS
IP29 4JR

TITLE: TOPOGRAPHIC SURVEY

SURVEYOR: MB
DRAWN BY: MB — SHEET SIZE: A0
DATE: 21.03.2023 — SCALE: 1:500
DRAWING No: 1472/06 — JOB No: 1472

Appendix B – Site Proposals



KEY:

- SITE BOUNDARY (*OUTSIDE EDGE OF LINE DENOTES BOUNDARY*)
- LANDOWNER BOUNDARY (*INSIDE EDGE OF LINE DENOTES BOUNDARY*)
- PROPOSED SKYLARK NESTING HABITAT

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	MH	ML	2023-10-18	First Issue

PURPOSE: PERMITTING	COORDINATES: OSGB 1936
SCALE: 1:5,000 @ A1	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE

BOXTED SOLAR

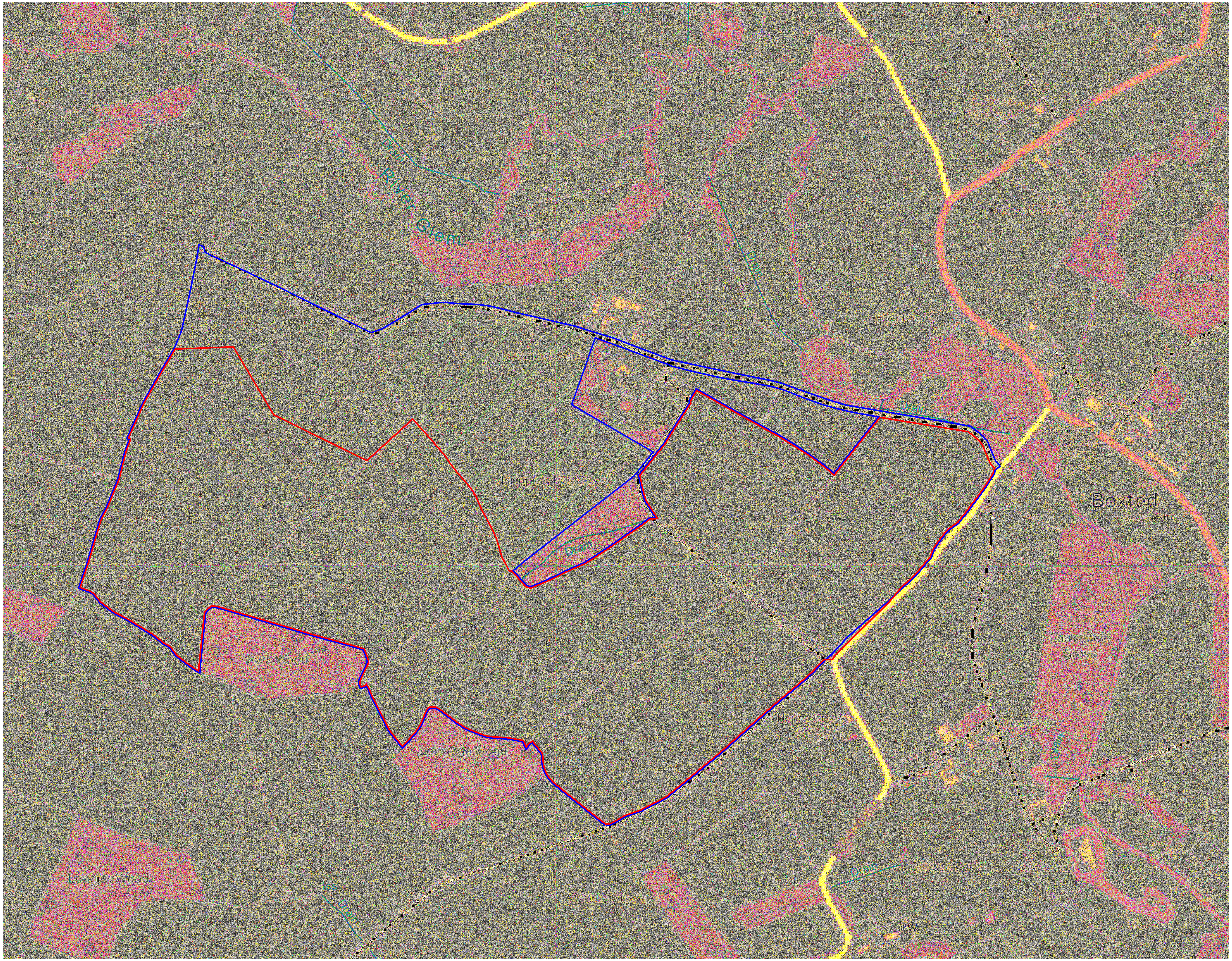
DRAWING TITLE

FIGURE 1
SITE LOCATION PLAN

RES DRAWING NUMBER: 04806-RES-LAY-DR-PT-001

REV: 1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR. UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM



KEY:

- SITE BOUNDARY (*OUTSIDE EDGE OF LINE DENOTES BOUNDARY*)
- LANDOWNER BOUNDARY (*INSIDE EDGE OF LINE DENOTES BOUNDARY*)
- PROPOSED SKYLARK NESTING HABITAT

SHEET 2 OF 3

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	MH	ML	2023-10-18	First Issue

PURPOSE: PERMITTING

COORDINATES: OSGB 1936

SCALE: 1:2,500 @ A1

DATUM: N/A

LAYOUT DWG: N/A

T-LAYOUT NO.: N/A

PROJECT TITLE: BOXTED SOLAR

DRAWING TITLE:

FIGURE 1
SITE LOCATION PLAN

RES DRAWING NUMBER: 04806-RES-LAY-DR-PT-001

REV: 1

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EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR. UK
TEL +44 (0) 1923 299200
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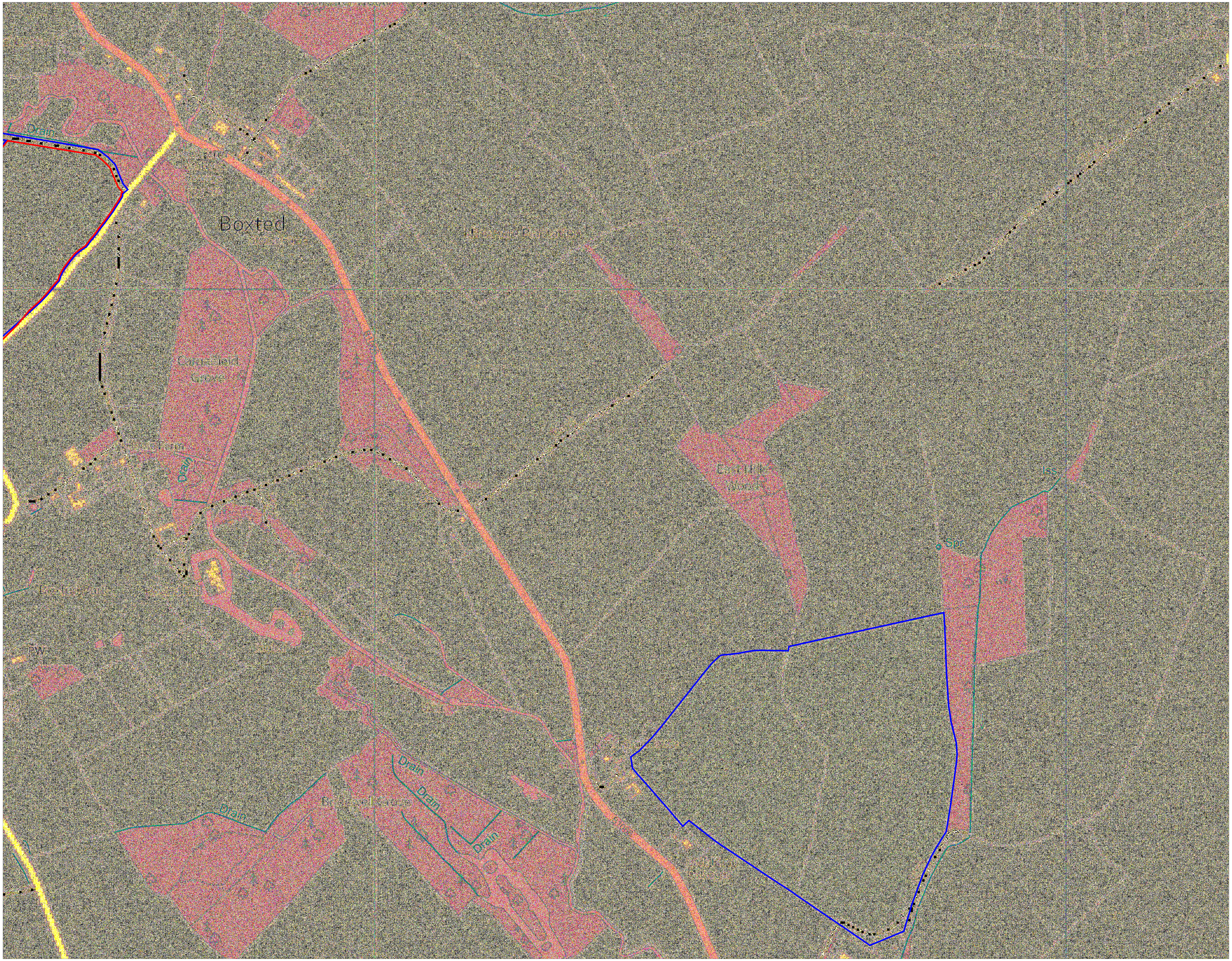

KEY:

- SITE BOUNDARY (*OUTSIDE EDGE OF LINE DENOTES BOUNDARY*)
- LANDOWNER BOUNDARY (*INSIDE EDGE OF LINE DENOTES BOUNDARY*)
- PROPOSED SKYLARK NESTING HABITAT

SHEET 3 OF 3

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	MH	ML	2023-10-18	First Issue

PURPOSE: PERMITTING	COORDINATES: OSGB 1936
SCALE: 1:5,000 @ A1	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE

BOXTED SOLAR

DRAWING TITLE

FIGURE 1 SITE LOCATION PLAN

RES DRAWING NUMBER: 04806-RES-LAY-DR-PT-001 REV: 1

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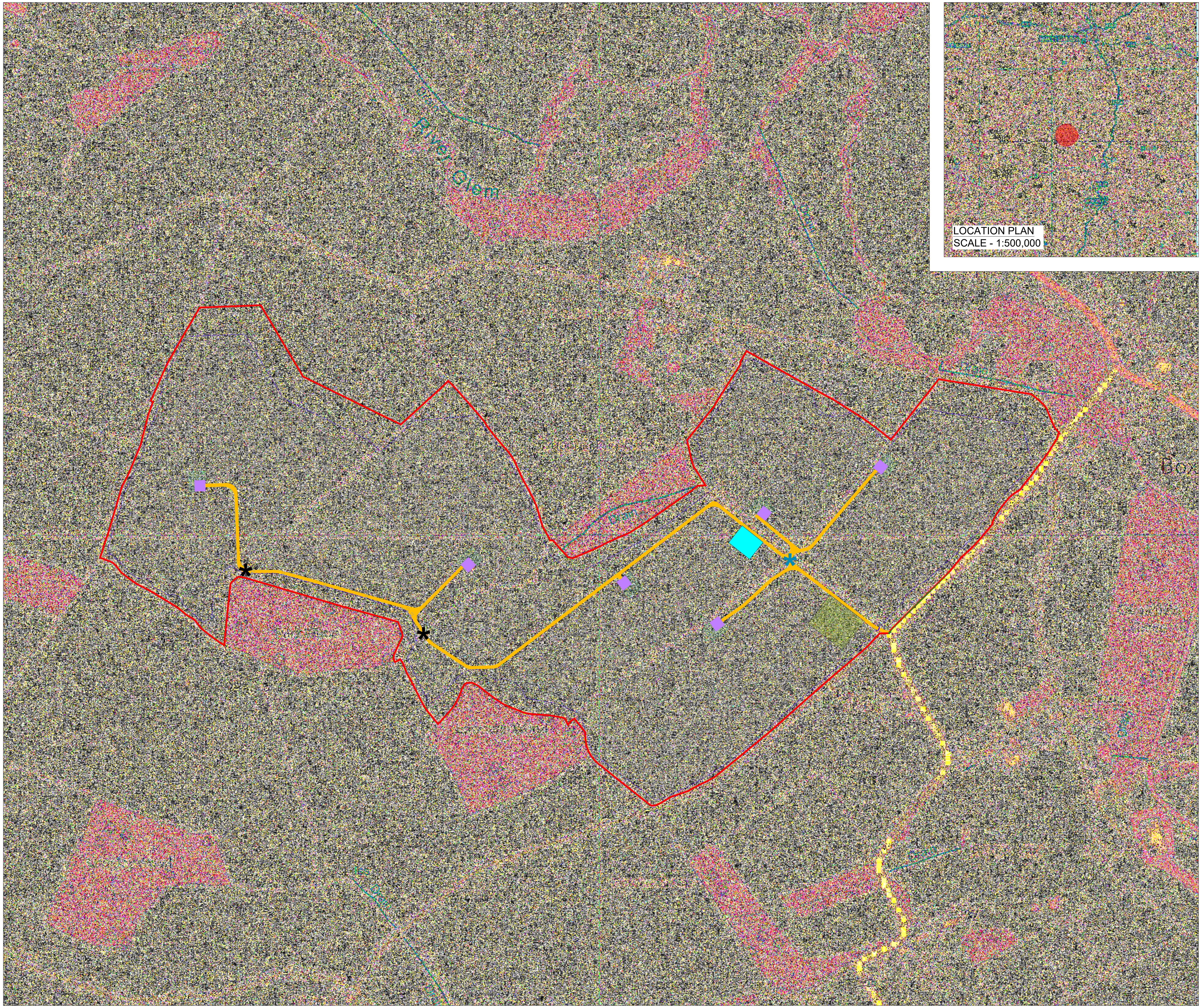
KINGS LANGLEY,
HERTS WD4 8LR. UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM



KEY:

- SITE BOUNDARY (*OUTSIDE OF LINE DENOTES BOUNDARY*)
- PROPOSED ACCESS TRACK
- INDICATIVE SOLAR PV ARRAY
- INVERTER & BATTERY STORAGE AREA
- HARDSTAND
- SUBSTATION COMPOUND
- TEMPORARY CONSTRUCTION COMPOUND
- FENCE LINE
- GATE (FENCE)
- DITCH CROSSING
- CCTV
- EXISTING DITCH CROSSING TO BE UPGRADED
- SITE ENTRANCE - VISIBILITY SPLAY

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
2	FG	JM	ML	2023-10-18	Site boundary updated
1	FG	ML	ML	2023-09-19	First Issue

PURPOSE: PERMITTING	COORDINATES: OSGB 1936
SCALE: 1:5,000 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE

BOXTED SOLAR

DRAWING TITLE

FIGURE 4
INFRASTRUCTURE LAYOUT

RES DRAWING NUMBER: 04806-RES-LAY-DR-PT-004 REV: 2

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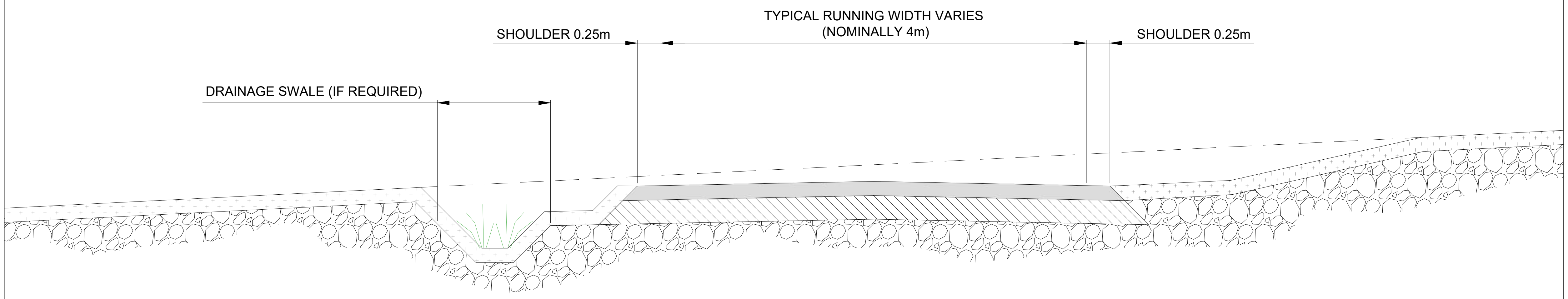

TYPICAL TRACK SECTION

KEY

- RUNNING SURFACE
- BASE/CAPPING LAYER
- TOPSOIL
- SUBGRADE
- EXISTING GROUND LEVEL

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL EMBANKMENT SLOPES TO BE PROVIDED AT A STABLE ANGLE BASED ON THE PROPERTIES OF THE MATERIAL ENCOUNTERED ON SITE.
3. TRACK CONSTRUCTION TYPE TO BE DETERMINED DURING DETAILED DESIGN. LAYOUT OF DRAINAGE MAY VARY.
4. RUNNING SURFACE AND BASE/CAPPING LAYER TO BE FORMED FROM SUITABLE MATERIALS COMPACTED IN LAYERS.
5. GEOSYNTHETIC REINFORCEMENT OR SOIL STABILISATION MAY BE USED TO REDUCE THE DEPTH OF TRACK CONSTRUCTION. REQUIREMENT TO BE DETERMINED DURING DETAILED DESIGN.
6. OPTIONAL DRAINAGE SWALES SHOWN. ACTUAL REQUIREMENTS TO BE DETERMINED DURING DETAILED DESIGN.

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	JM	ML	2023-10-16	First Issue

PURPOSE: PERMITTING	COORDINATES: N/A
SCALE: 1:50 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE
BOXTED SOLAR

DRAWING TITLE
FIGURE 6
TYPICAL ACCESS TRACK DETAIL

RES DRAWING NUMBER: 04806-RES-ERW-DR-PT-001
REV: 1

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR. UK
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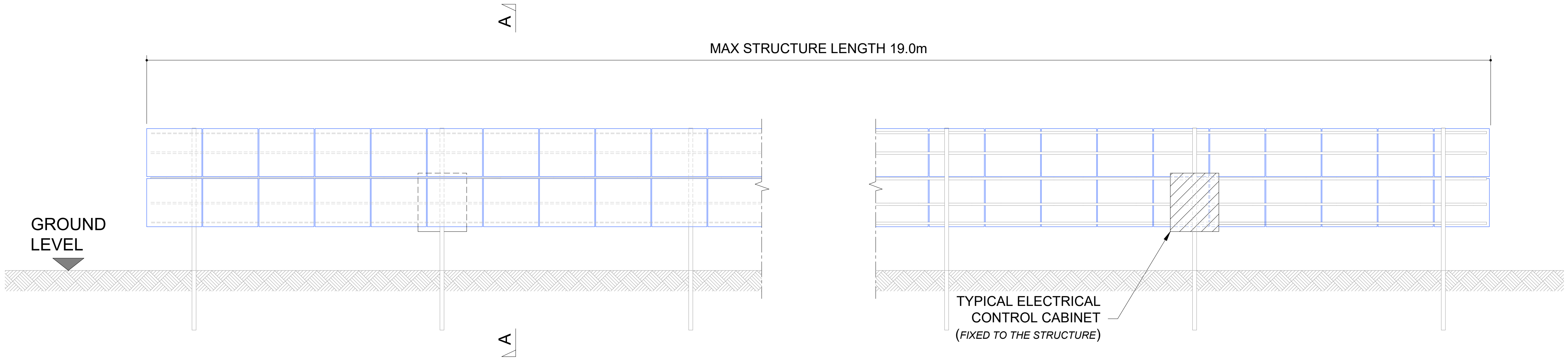
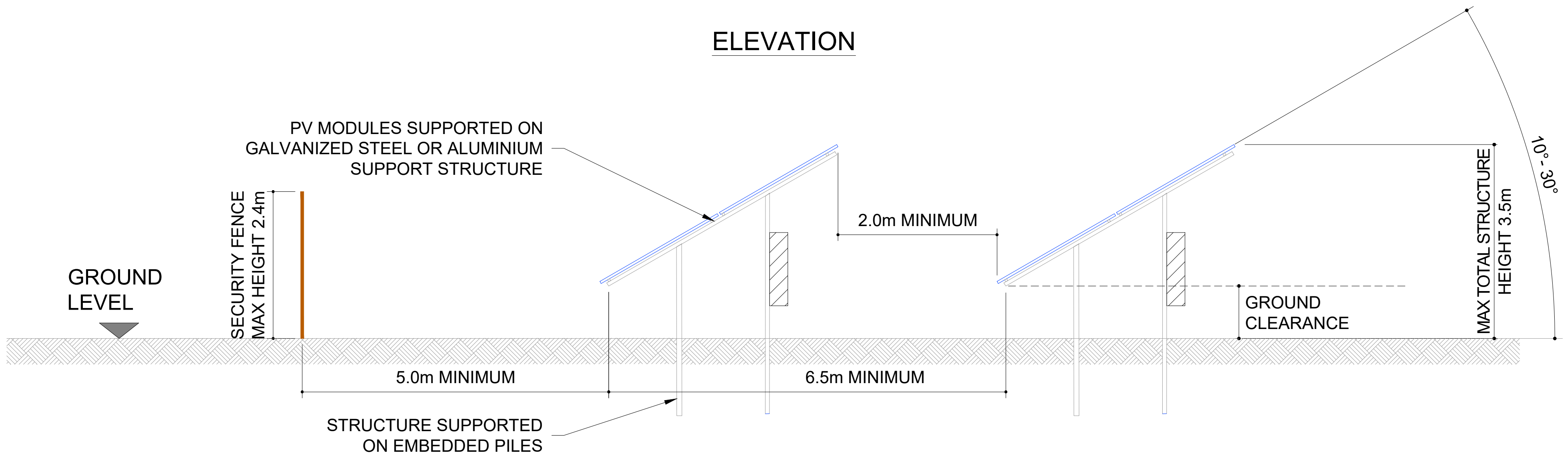


ELEVATION



SECTION A-A

NOTES

1. ALL DIMENSIONS ARE SUBJECT TO DETAILED DESIGN.
2. GROUND CLEARANCE WILL VARY AS REQUIRED ACCORDING TO TOPOGRAPHY AND MODULE CONFIGURATION.
3. THE PILE DEPTH SHALL BE DETERMINED FOLLOWING DETAILED GEOTECHNICAL SITE INVESTIGATION AND WILL TYPICALLY BE 1.5 - 1.7m. HOWEVER THE MAXIMUM DEPTH COULD BE UPTO 2.4m.
4. PV MODULES ARE SHOWN IN ELEVATION VIEW INSTALLED IN LANDSCAPE, ALTHOUGH THEY MAY BE INSTALLED IN PORTRAIT TO SUIT SITE CONDITIONS.

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	IB	ML	2023-10-13	First Issue

PURPOSE: PERMITTING

COORDINATES

SCALE: 1:100 @A3

DATUM: N/A

LAYOUT DRAWING: N/A

T-LAYOUT NO: N/A

PROJECT TITLE: BOXTED SOLAR

DRAWING TITLE:

FIGURE 8
TYPICAL PV MODULE AND
RACK DETAILS

RES DRAWING NUMBER: 04806-RES-SOL-DR-PT-001

REV: 1

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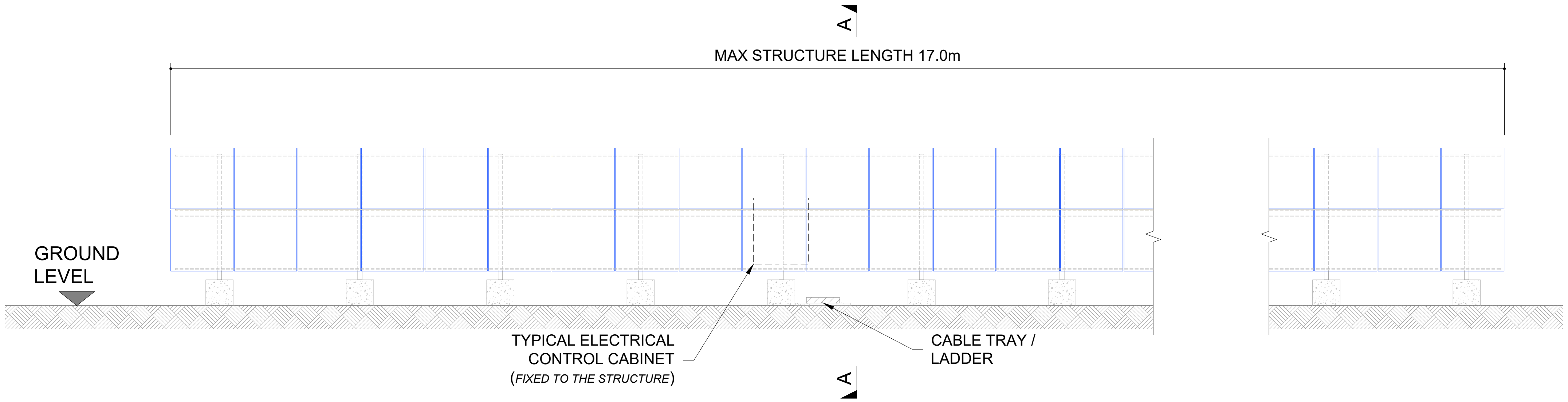
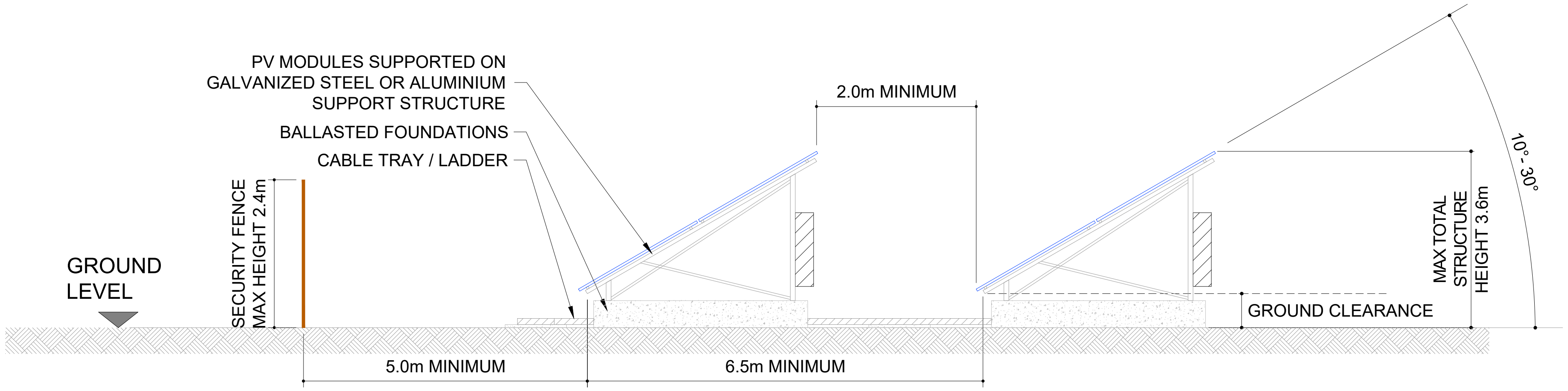


ELEVATION



SECTION A-A

NOTES:

1. ALL DIMENSIONS ARE SUBJECT TO DETAILED DESIGN.
2. GROUND CLEARANCE WILL VARY AS REQUIRED ACCORDING TO TOPOGRAPHY AND MODULE CONFIGURATION.
3. PV MODULES ARE SHOWN IN ELEVATION VIEW INSTALLED IN LANDSCAPE, ALTHOUGH THEY MAY BE INSTALLED IN PORTRAIT TO SUIT SITE CONDITIONS.
4. SUPPORT FRAME IS CONNECTED DIRECTLY TO THE BALLASTED FOUNDATION.

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	IB	ML	2023-10-13	First Issue

PURPOSE: PERMITTING	COORDINATES
SCALE: 1:100 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE

BOXTED SOLAR

DRAWING TITLE

FIGURE 8
TYPICAL PV MODULE AND RACK DETAILS

RES DRAWING NUMBER	REV
04806-RES-SOL-DR-PT-001	1

res
BEAUFORT COURT,
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HERTS WD4 8LR. UK
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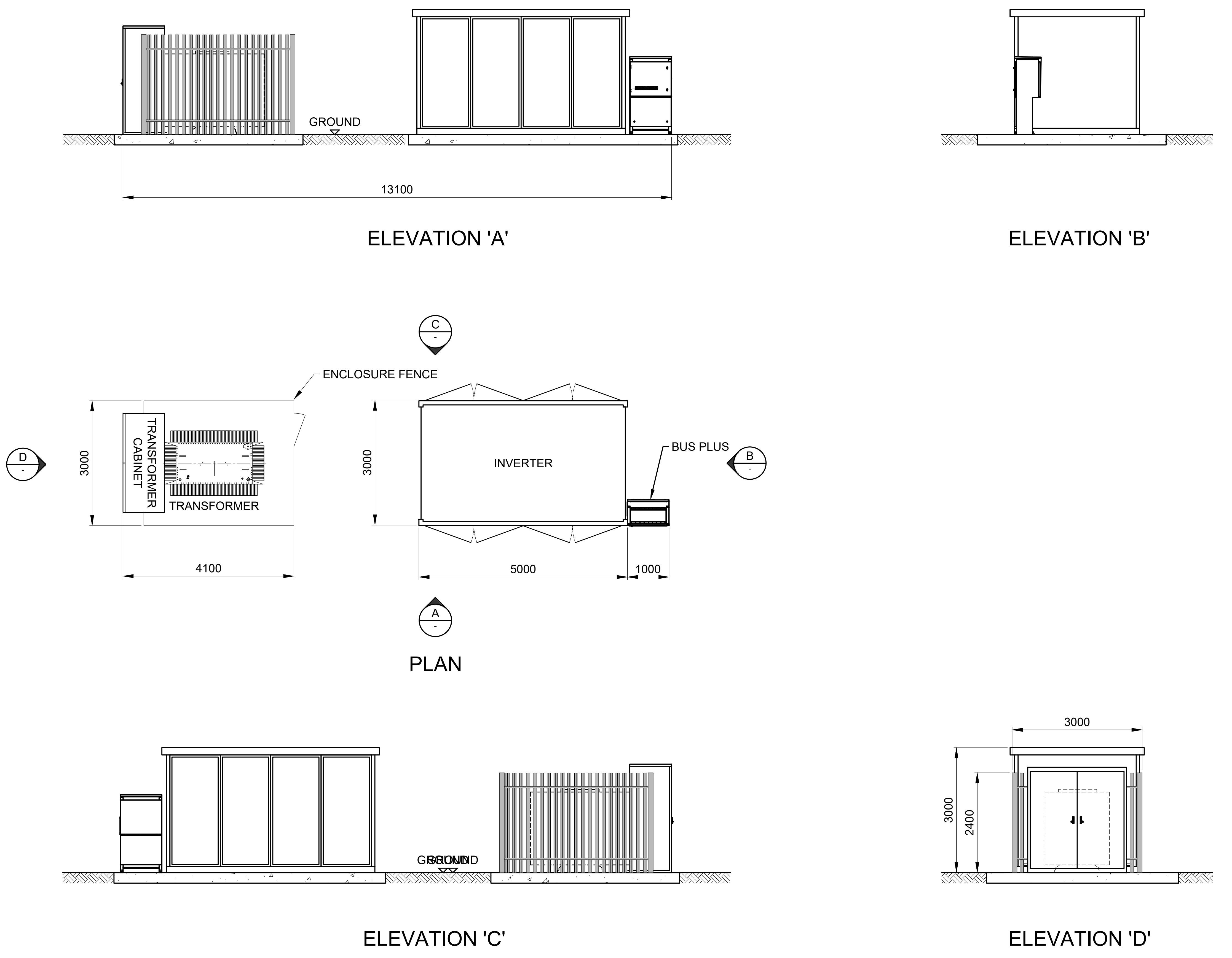

NOTES

1. ALL DIMENSIONS ARE MAXIMUM ANTICIPATED AND SUBJECT TO DETAILED DESIGN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
3. ROOM & DOOR POSITIONS ARE INDICATIVE AND SUBJECT TO DETAILED DESIGN.
4. APPROXIMATE FINISHED FLOOR LEVEL 300mm ABOVE EXISTING GROUND.
5. LAYOUT ORIENTATION IS INDICATIVE AND SUBJECT TO DETAILED DESIGN.

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	IB	ML	2023-10-17	First Issue

PURPOSE: PLANNING
COORDINATES: N/A
SCALE: 1:100 @A3
DATUM: N/A
LAYOUT DRAWING: N/A
T-LAYOUT NO: N/A

PROJECT TITLE
BOXTED SOLAR

DRAWING TITLE
FIGURE 13
TYPICAL INVERTER SUBSTATION

RES DRAWING NUMBER: 04806-RES-SOL-DR-PT-003
REV: 1

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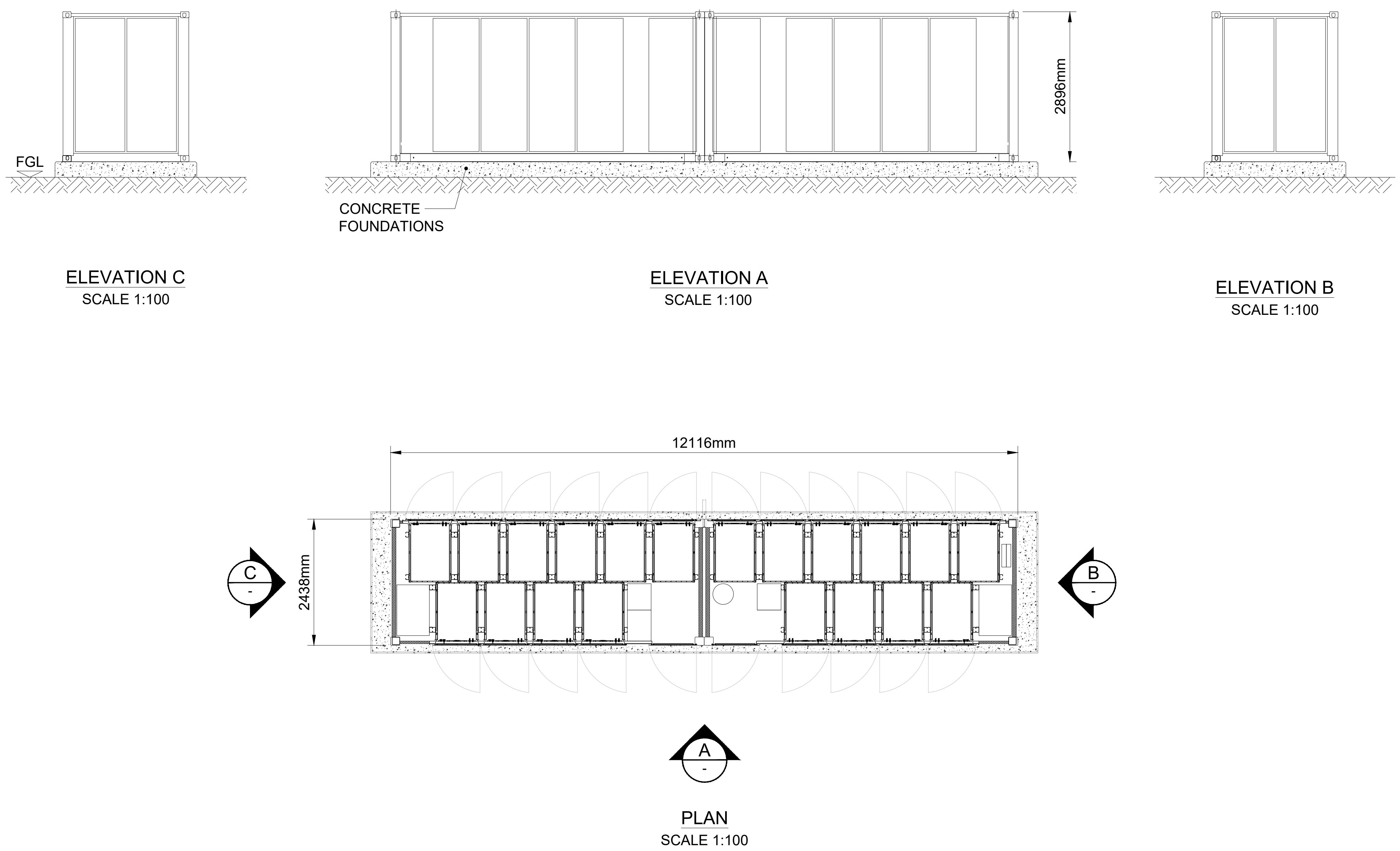

NOTES:

1. ALL DIMENSIONS ARE TYPICAL AND SUBJECT TO DETAILED DESIGN UNLESS OTHERWISE STATED.
2. LOCATION OF DOORS IS INDICATIVE ONLY. ACCESS TO BATTERIES MAY BE EXTERNAL FROM SIDE DOORS.
3. APPROXIMATE FINISHED FLOOR LEVEL 300mm ABOVE EXISTING GROUND.
4. BATTERY CONTAINER FOUNDATIONS ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN.
5. BATTERY STORAGE UNIT WILL NOT BE GREEN BUT WILL BE WHITE / LIGHT GRAY COLOUR.

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	JM	ML	2023-10-17	First Issue

PURPOSE PERMITTING	COORDINATES N/A
SCALE 1:100 @A3	DATUM N/A
LAYOUT DRAWING N/A	T-LAYOUT NO N/A

PROJECT TITLE

BOXTED SOLAR

DRAWING TITLE

FIGURE 14
BATTERY STORAGE ENLCOSURE

RES DRAWING NUMBER	REV
04806-RES-BAT-DR-PT-001	1

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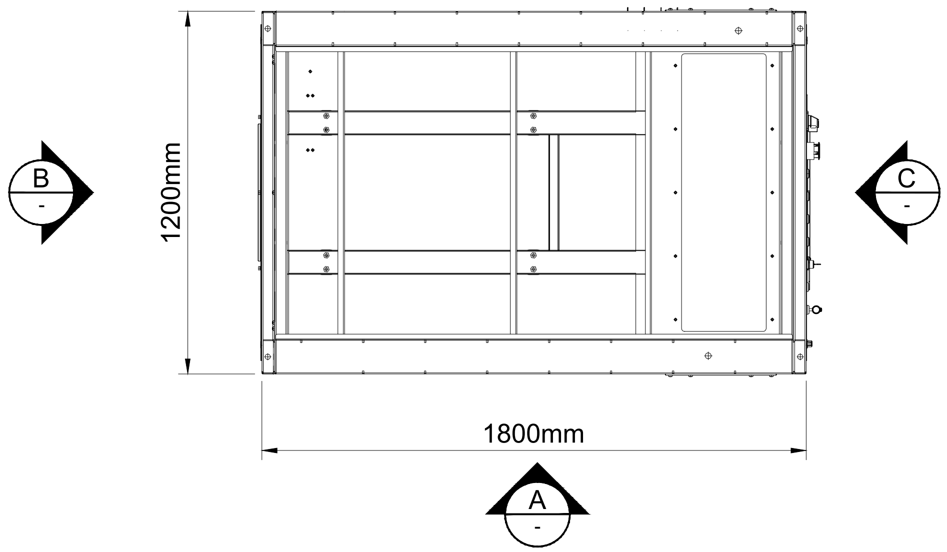
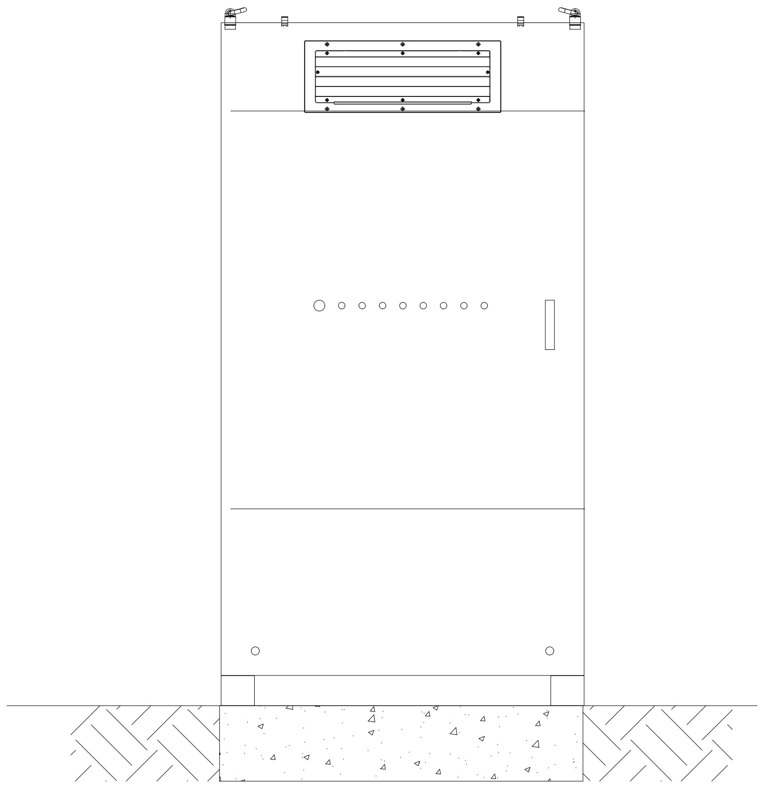
NOTES

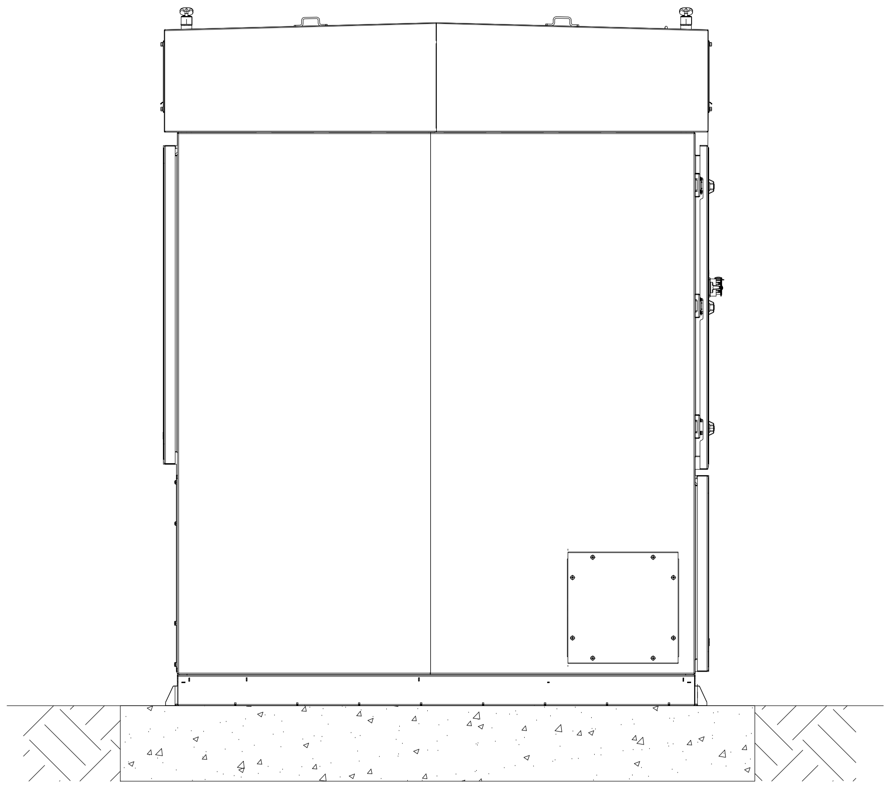
1. ALL DIMENSIONS ARE MAXIMUM ANTICIPATED AND SUBJECT TO DETAILED DESIGN
2. DOOR POSITIONS ARE INDICATIVE AND SUBJECT TO DETAILED DESIGN.
3. APPROXIMATE FINISHED FLOOR LEVEL 300mm ABOVE EXISTING GROUND.



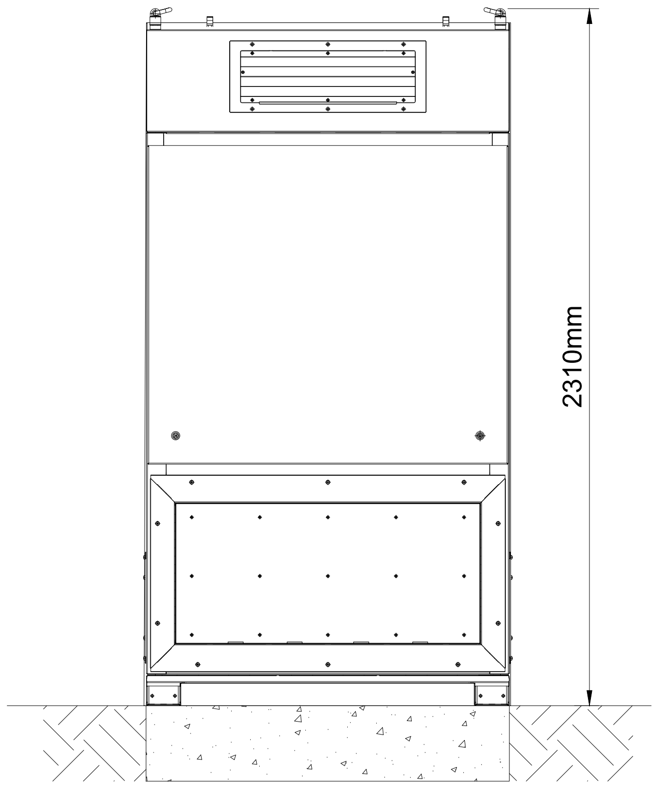
PLAN
SCALE 1:25



ELEVATION C
SCALE 1:25



ELEVATION A
SCALE 1:25



ELEVATION B
SCALE 1:25

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	NM	ML	2023-10-17	First Issue

PURPOSE: PERMITTING	COORDINATES: N/A
SCALE: 1:25 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE
BOXTED SOLAR

DRAWING TITLE
FIGURE 15
DC-DC CONVERTER

RES DRAWING NUMBER	REV
04806-RES-SUB-DR-PT-001	1

res
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KINGS LANGLEY,
HERTS WD4 8LR. UK
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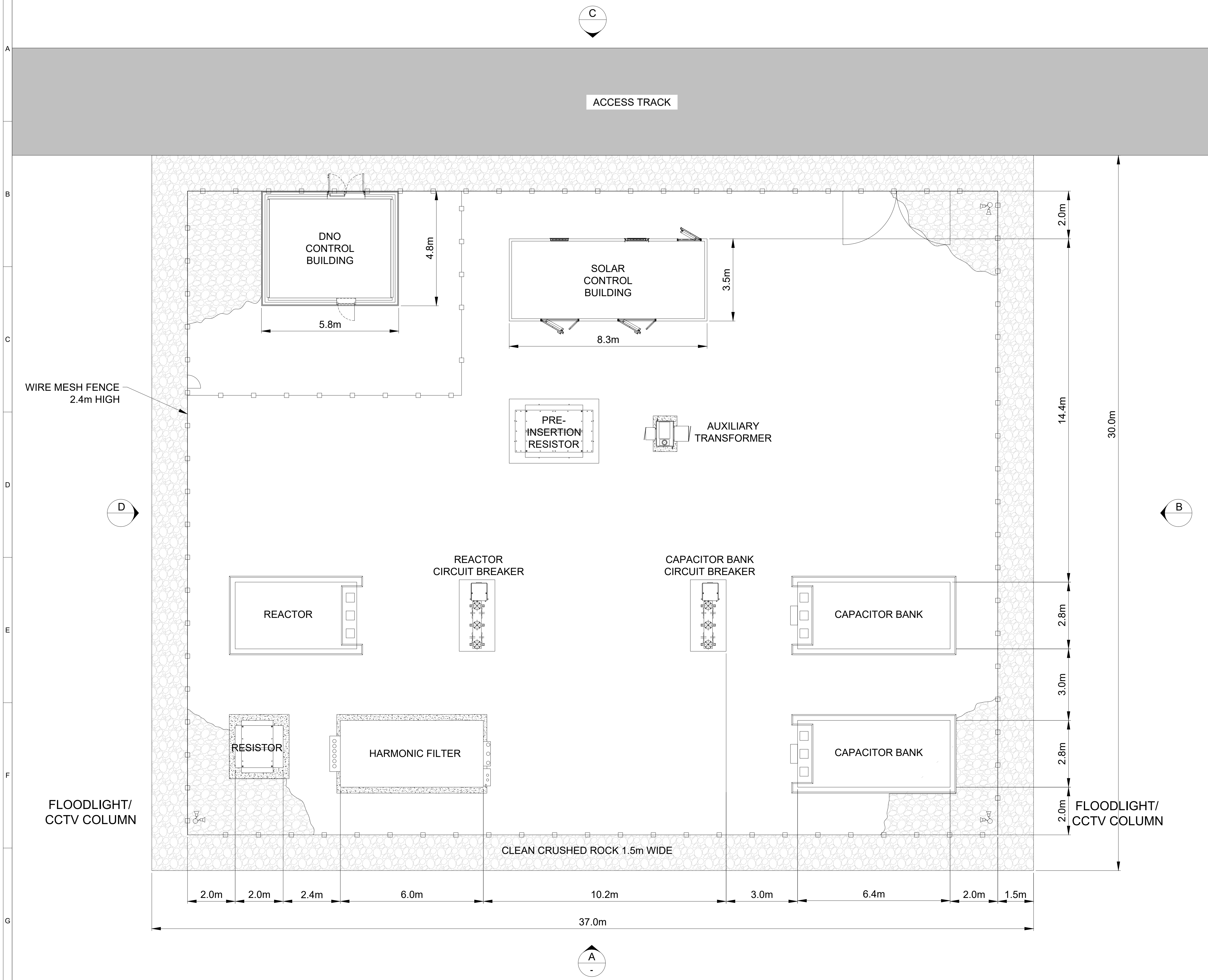

NOTES:

1. ROOM DESCRIPTIONS, DIMENSIONS, LAYOUTS, AND POSITIONS OF DOORS, GATES, INTERNAL WALLS ARE INDICATIVE ONLY AND ARE SUBJECT TO DETAILED DESIGN & GRID COMPANY REQUIREMENTS.
2. EXTERNAL FINISH TO BE AGREED WITH LOCAL AUTHORITY.
3. SUITABLE SAFETY SIGNAGE FOR HV ELECTRICAL INSTALLATION TO BE INSTALLED ON DOORS.
4. SUBSTATION DESIGN SUBJECT TO DISTRIBUTION NETWORK OPERATOR REQUIREMENTS.
5. FOUNDATION SOLUTION INCLUDING HEIGHTS SUBJECT TO DETAILED DESIGN.
6. MAXIMUM FINISHED FLOOR LEVELS AND MAXIMUM HEIGHT SPECIFIED IN PLANNING APPLICATION DOCUMENTS.
7. DRAWING BASED ON 04806-RES-SUB-DR-EE-001.

KEY:

SURFACE FINISH TO COMPRISE EITHER COMPACTED TYPE 1 OR SINGLE SIZED CRUSHED ROCK.

TRACK SURFACE FINISH TO COMPRISE COMPACTED TYPE 1

PALISADE FENCE

SHEET 1 OF 9

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	FG	NM	ML	2023-10-17	First Issue

PURPOSE: PERMITTING
COORDINATES: N/A
SCALE: 1:150 @A3
DATUM: N/A
LAYOUT DRAWING: N/A
T-LAYOUT NO: N/A

PROJECT TITLE
BOXTED SOLAR

DRAWING TITLE
FIGURE 16
CLIENT/DNO SUBSTATION
PLAN AND ELEVATION

RES DRAWING NUMBER: 04806-RES-SUB-DR-PT-002
REV: 1

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Appendix C – Microdrainage Source Control Calculations

Summary of Results for 100 year Return Period (+25%)

Half Drain Time : 3447 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.297	0.297	0.0	6.5	O K
30 min Summer	99.390	0.390	0.0	8.5	O K
60 min Summer	99.486	0.486	0.0	10.6	O K
120 min Summer	99.598	0.598	0.0	13.0	O K
180 min Summer	99.665	0.665	0.0	14.5	O K
240 min Summer	99.711	0.711	0.1	15.5	Flood Risk
360 min Summer	99.766	0.766	0.1	16.7	Flood Risk
480 min Summer	99.797	0.797	0.1	17.4	Flood Risk
600 min Summer	99.816	0.816	0.1	17.8	Flood Risk
720 min Summer	99.828	0.828	0.1	18.0	Flood Risk
960 min Summer	99.839	0.839	0.1	18.3	Flood Risk
1440 min Summer	99.840	0.840	0.1	18.3	Flood Risk
2160 min Summer	99.821	0.821	0.1	17.9	Flood Risk
2880 min Summer	99.801	0.801	0.1	17.4	Flood Risk
4320 min Summer	99.783	0.783	0.1	17.1	Flood Risk
5760 min Summer	99.777	0.777	0.1	16.9	Flood Risk
7200 min Summer	99.779	0.779	0.1	17.0	Flood Risk
8640 min Summer	99.786	0.786	0.1	17.1	Flood Risk
10080 min Summer	99.796	0.796	0.1	17.3	Flood Risk
15 min Winter	99.333	0.333	0.0	7.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	119.500	0.0	19
30 min Summer	78.626	0.0	34
60 min Summer	49.188	0.0	64
120 min Summer	30.487	0.0	124
180 min Summer	22.768	0.0	184
240 min Summer	18.364	0.0	244
360 min Summer	13.374	0.0	364
480 min Summer	10.581	0.0	482
600 min Summer	8.784	0.0	602
720 min Summer	7.526	0.0	722
960 min Summer	5.871	0.0	962
1440 min Summer	4.127	0.0	1442
2160 min Summer	2.907	0.0	2160
2880 min Summer	2.280	0.0	2480
4320 min Summer	1.650	0.0	3240
5760 min Summer	1.333	0.0	4040
7200 min Summer	1.147	0.0	4896
8640 min Summer	1.024	0.0	5712
10080 min Summer	0.937	0.0	6552
15 min Winter	119.500	0.0	19

Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.437	0.437	0.0	9.5	O K
60 min Winter	99.545	0.545	0.0	11.9	O K
120 min Winter	99.671	0.671	0.0	14.6	O K
180 min Winter	99.747	0.747	0.1	16.3	Flood Risk
240 min Winter	99.798	0.798	0.1	17.4	Flood Risk
360 min Winter	99.861	0.861	0.1	18.7	Flood Risk
480 min Winter	99.897	0.897	0.1	19.5	Flood Risk
600 min Winter	99.919	0.919	0.1	20.0	Flood Risk
720 min Winter	99.933	0.933	0.1	20.3	Flood Risk
960 min Winter	99.948	0.948	0.1	20.6	Flood Risk
1440 min Winter	99.953	0.953	0.1	20.8	Flood Risk
2160 min Winter	99.939	0.939	0.1	20.5	Flood Risk
2880 min Winter	99.920	0.920	0.1	20.0	Flood Risk
4320 min Winter	99.895	0.895	0.1	19.5	Flood Risk
5760 min Winter	99.885	0.885	0.1	19.3	Flood Risk
7200 min Winter	99.883	0.883	0.1	19.2	Flood Risk
8640 min Winter	99.884	0.884	0.1	19.3	Flood Risk
10080 min Winter	99.889	0.889	0.1	19.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	78.626	0.0	34
60 min Winter	49.188	0.0	64
120 min Winter	30.487	0.0	122
180 min Winter	22.768	0.0	182
240 min Winter	18.364	0.0	242
360 min Winter	13.374	0.0	360
480 min Winter	10.581	0.0	478
600 min Winter	8.784	0.0	596
720 min Winter	7.526	0.0	712
960 min Winter	5.871	0.0	944
1440 min Winter	4.127	0.0	1400
2160 min Winter	2.907	0.0	2076
2880 min Winter	2.280	0.0	2708
4320 min Winter	1.650	0.0	3372
5760 min Winter	1.333	0.0	4320
7200 min Winter	1.147	0.0	5256
8640 min Winter	1.024	0.0	6144
10080 min Winter	0.937	0.0	7064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 582237 251189 TL 82237 51189
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+25

Time Area Diagram

Total Area (ha) 0.029

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.029

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Trench Structure

Infiltration Coefficient Base (m/hr)	0.00108	Trench Width (m)	1.1
Infiltration Coefficient Side (m/hr)	0.00108	Trench Length (m)	66.0
Safety Factor	1.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	1.000
Invert Level (m)	99.000	Cap Infiltration Depth (m)	1.000

Summary of Results for 100 year Return Period (+25%)

Half Drain Time : 5780 minutes.

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.869	0.369	0.1	24.8	O K
30 min Summer	98.985	0.485	0.1	32.6	O K
60 min Summer	99.105	0.605	0.1	40.7	O K
120 min Summer	99.246	0.746	0.1	50.1	O K
180 min Summer	99.332	0.832	0.1	55.9	O K
240 min Summer	99.391	0.891	0.1	59.8	O K
360 min Summer	99.464	0.964	0.1	64.8	O K
480 min Summer	99.508	1.008	0.1	67.7	O K
600 min Summer	99.537	1.037	0.1	69.7	O K
720 min Summer	99.557	1.057	0.1	71.0	O K
960 min Summer	99.581	1.081	0.1	72.6	O K
1440 min Summer	99.601	1.101	0.1	74.0	O K
2160 min Summer	99.606	1.106	0.1	74.3	O K
2880 min Summer	99.601	1.101	0.1	74.0	O K
4320 min Summer	99.591	1.091	0.1	73.3	O K
5760 min Summer	99.593	1.093	0.1	73.4	O K
7200 min Summer	99.609	1.109	0.1	74.5	O K
8640 min Summer	99.631	1.131	0.1	76.0	O K
10080 min Summer	99.658	1.158	0.1	77.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	119.500	0.0	19
30 min Summer	78.626	0.0	34
60 min Summer	49.188	0.0	64
120 min Summer	30.487	0.0	124
180 min Summer	22.768	0.0	184
240 min Summer	18.364	0.0	244
360 min Summer	13.374	0.0	364
480 min Summer	10.581	0.0	484
600 min Summer	8.784	0.0	604
720 min Summer	7.526	0.0	724
960 min Summer	5.871	0.0	962
1440 min Summer	4.127	0.0	1442
2160 min Summer	2.907	0.0	2160
2880 min Summer	2.280	0.0	2880
4320 min Summer	1.650	0.0	4020
5760 min Summer	1.333	0.0	4720
7200 min Summer	1.147	0.0	5480
8640 min Summer	1.024	0.0	6232
10080 min Summer	0.937	0.0	7064

Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Winter	98.913	0.413	0.1	27.8	O K
30 min Winter	99.043	0.543	0.1	36.5	O K
60 min Winter	99.178	0.678	0.1	45.6	O K
120 min Winter	99.337	0.837	0.1	56.2	O K
180 min Winter	99.433	0.933	0.1	62.7	O K
240 min Winter	99.499	0.999	0.1	67.2	O K
360 min Winter	99.583	1.083	0.1	72.8	O K
480 min Winter	99.633	1.133	0.1	76.1	O K
600 min Winter	99.666	1.166	0.1	78.4	O K
720 min Winter	99.690	1.190	0.1	79.9	O K
960 min Winter	99.718	1.218	0.1	81.8	Flood Risk
1440 min Winter	99.745	1.245	0.1	83.6	Flood Risk
2160 min Winter	99.757	1.257	0.1	84.5	Flood Risk
2880 min Winter	99.758	1.258	0.1	84.6	Flood Risk
4320 min Winter	99.759	1.259	0.1	84.6	Flood Risk
5760 min Winter	99.759	1.259	0.1	84.6	Flood Risk
7200 min Winter	99.776	1.276	0.1	85.7	Flood Risk
8640 min Winter	99.801	1.301	0.1	87.4	Flood Risk
10080 min Winter	99.830	1.330	0.2	89.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Winter	119.500	0.0	19
30 min Winter	78.626	0.0	34
60 min Winter	49.188	0.0	64
120 min Winter	30.487	0.0	124
180 min Winter	22.768	0.0	182
240 min Winter	18.364	0.0	242
360 min Winter	13.374	0.0	360
480 min Winter	10.581	0.0	478
600 min Winter	8.784	0.0	596
720 min Winter	7.526	0.0	716
960 min Winter	5.871	0.0	952
1440 min Winter	4.127	0.0	1416
2160 min Winter	2.907	0.0	2116
2880 min Winter	2.280	0.0	2796
4320 min Winter	1.650	0.0	4108
5760 min Winter	1.333	0.0	5304
7200 min Winter	1.147	0.0	5696
8640 min Winter	1.024	0.0	6656
10080 min Winter	0.937	0.0	7568

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 582237 251189 TL 82237 51189
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+25

Time Area Diagram

Total Area (ha) 0.111

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.111

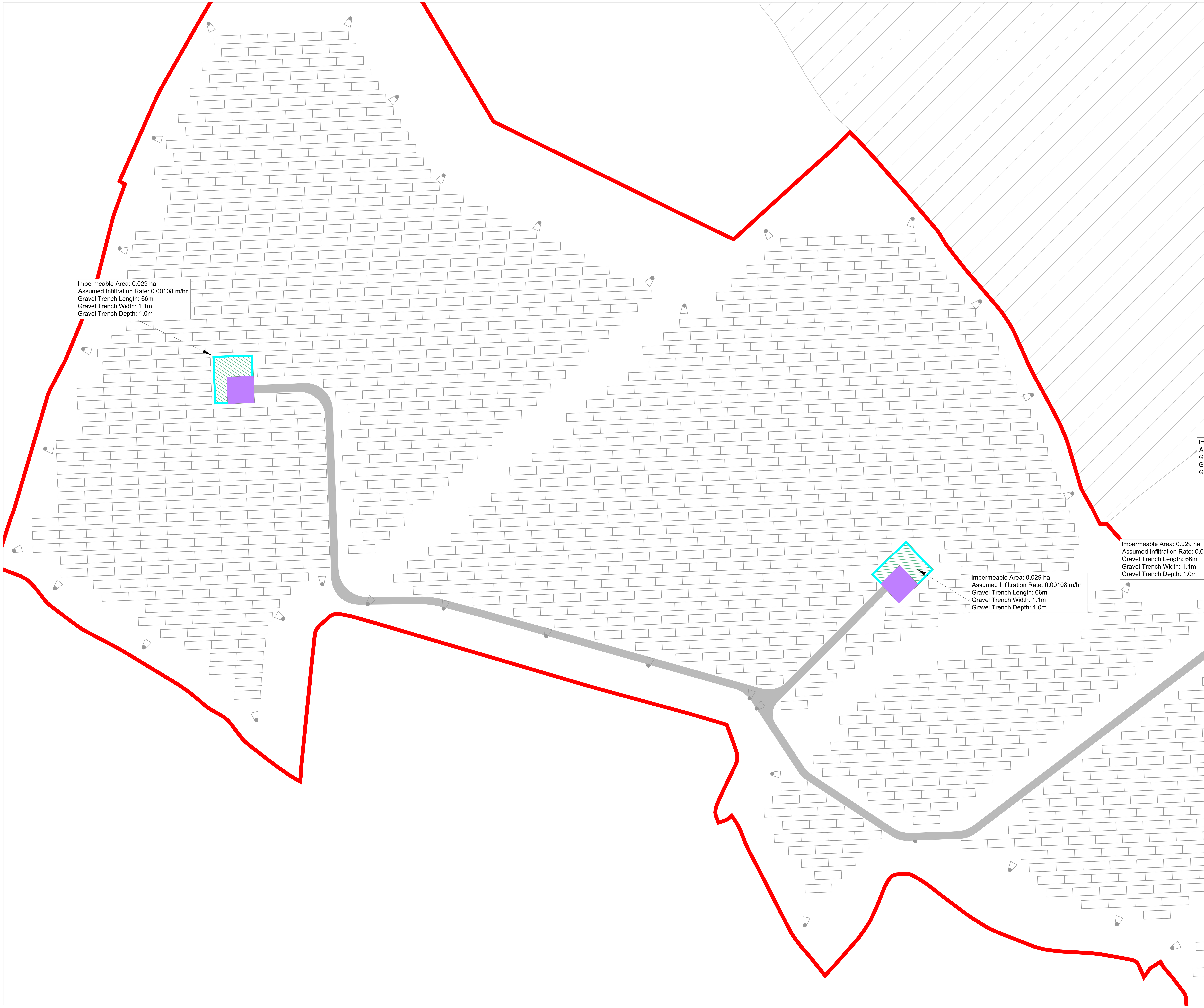
Model Details

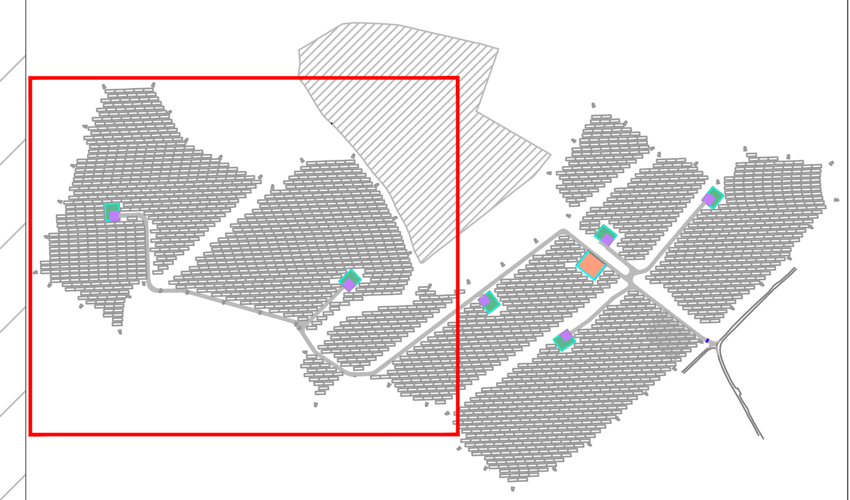
Storage is Online Cover Level (m) 100.000

Infiltration Trench Structure

Infiltration Coefficient Base (m/hr)	0.00108	Trench Width (m)	2.2
Infiltration Coefficient Side (m/hr)	0.00108	Trench Length (m)	101.8
Safety Factor	1.0	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	1.500
Invert Level (m)	98.500	Cap Infiltration Depth (m)	1.500

Appendix D – Surface Water Drainage Strategy





Key:

Gravel Trench

REV	DATE	DESCRIPTION	REVISED BY	APPROVED BY
P2	19.10.2023.	Drawing updated to suit latest site layout	DK	LG
P1	15.09.2023.	First Issue	MR	LAJ

Drainage Strategy Drawing

Land to the west of B1066
Boxted, Suffolk

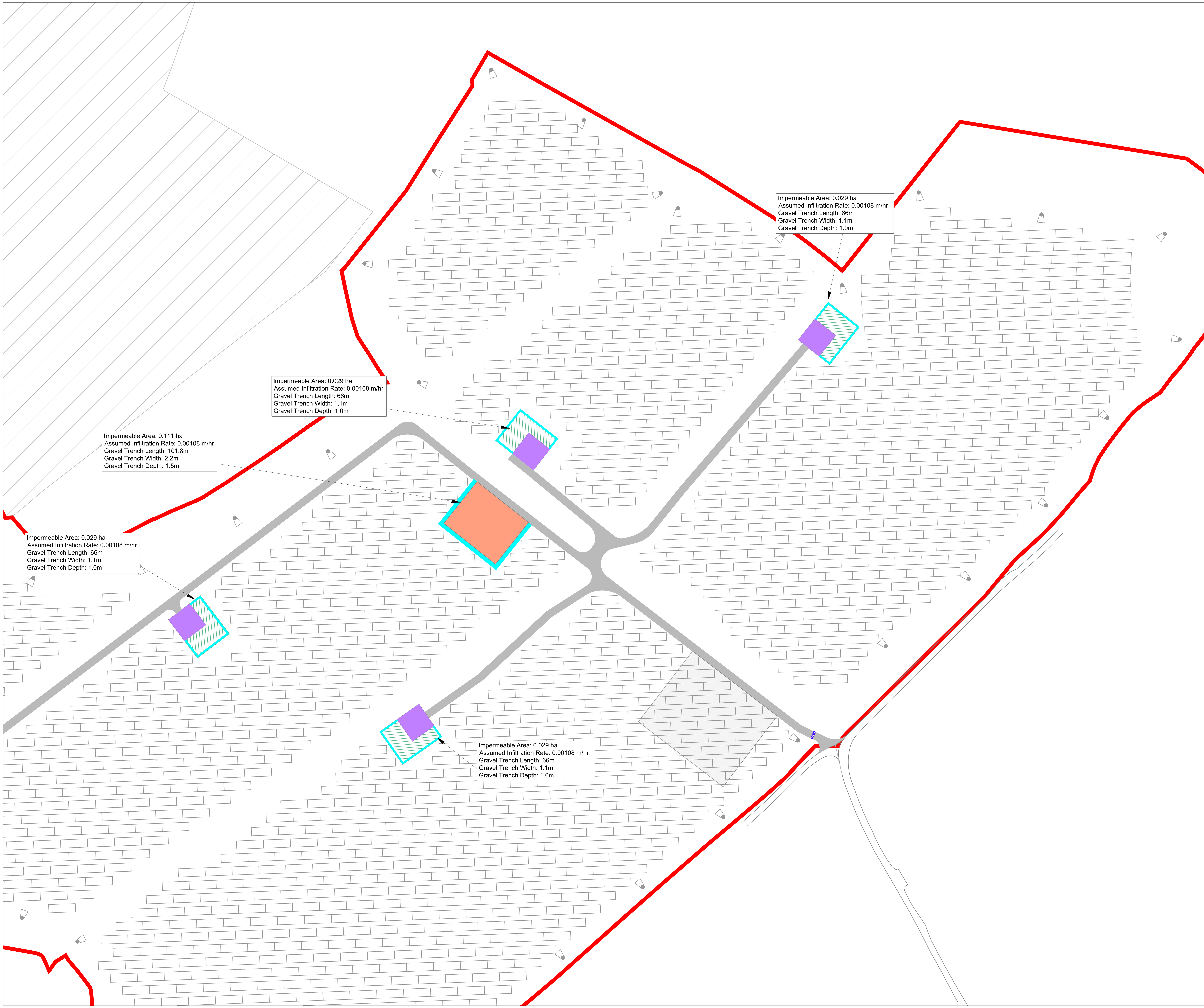
CLIENT:
RES Group

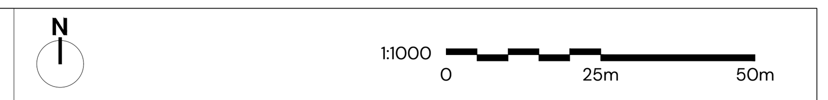
DATE:	SCALE:	TEAM/DRAWN BY:	APPROVED BY:
15.09.2023.	1:1000	MR	LAJ

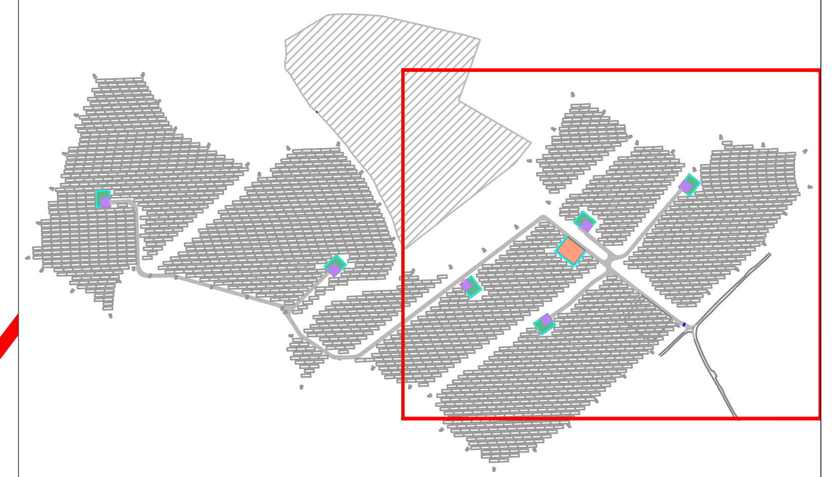
DRAWING NUMBER:
P21-2950 - PEG - XX - XX - DR - C - 0100 - P2

PEGASUS REF No:	DRAWING STATUS
P21-2950	SO

PEGASUS GROUP







Key:

Gravel Trench

REV	DATE	DESCRIPTION	REVISED BY	APPROVED BY
P3	23.10.2023.	Substation trench ammendment	DK	LG
P2	19.10.2023.	Drawing updated to suit latest site layout	DK	LG
P1	15.09.2023.	First Issue	MR	LAJ

Drainage Strategy Drawing

Land to the west of B1066
Boxted, Suffolk

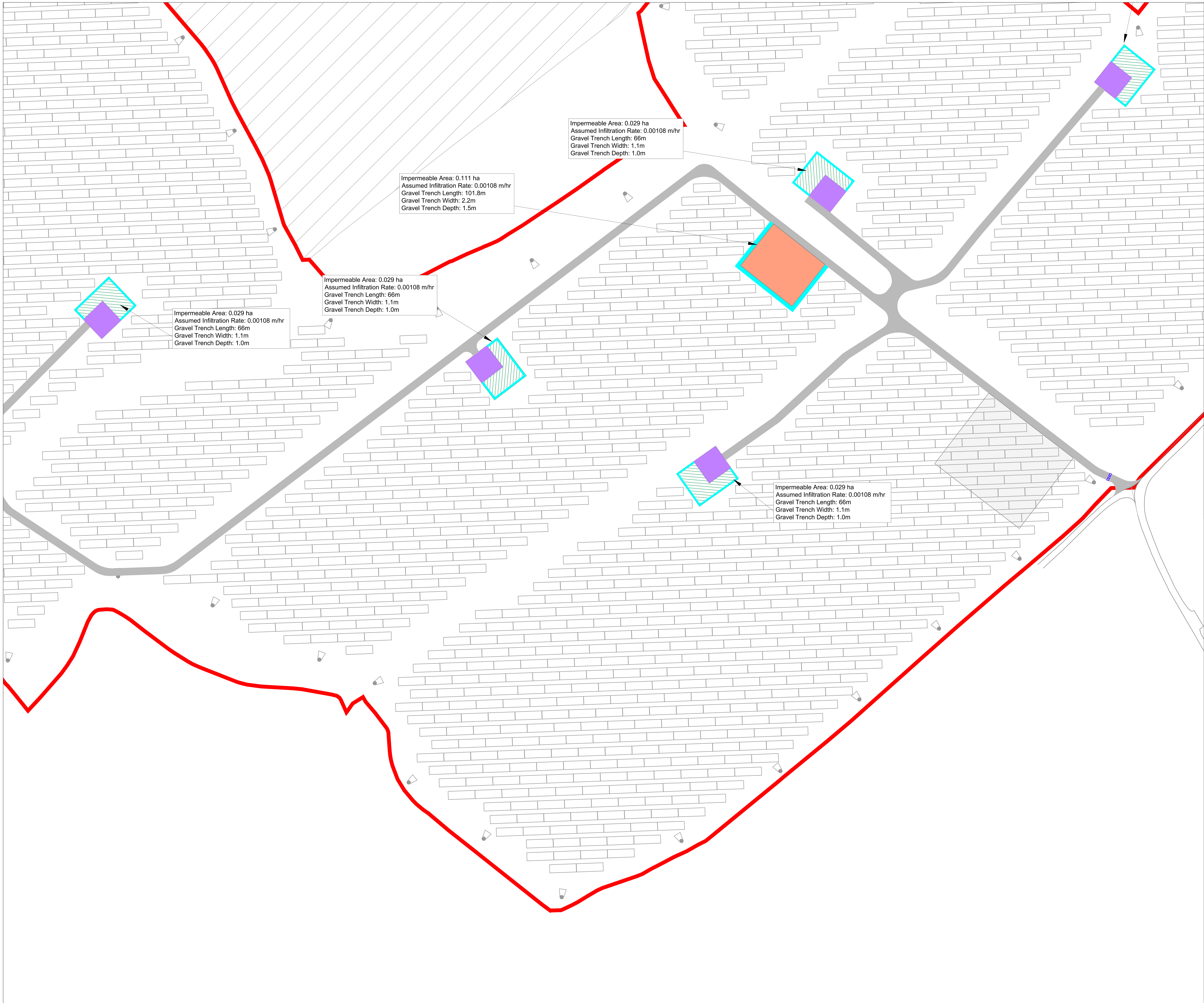
CLIENT:
RES Group

DATE:	SCALE:	TEAM/DRAWN BY:	APPROVED BY:
15.09.2023.	1:1000	MR	LAJ

DRAWING NUMBER:
P21-2950- PEG -XX-XX-DR-C- 0101 -P3

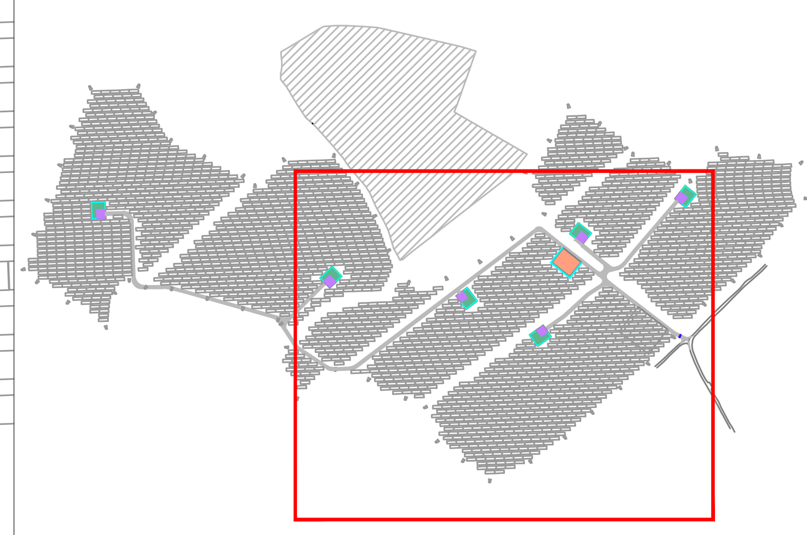
PEGASUS REF No:	DRAWING STATUS
P21-2950	S0

PEGASUS GROUP



N

1:1000 0 25m 50m



Key:

Gravel Trench

REV	DATE	DESCRIPTION	REVISED BY	APPROVED BY
P3	23.10.2023.	Substation trench ammendment	DK	LG
P2	19.10.2023.	Drawing updated to suit latest site layout	DK	LG
P1	15.09.2023.	First Issue	MR	LAJ

Drainage Strategy Drawing

Land to the west of B1066
Boxted, Suffolk

CLIENT:
RES Group

DATE:	SCALE:	TEAM/DRAWN BY:	APPROVED BY:
15.09.2023.	1:1000	MR	LAJ

DRAWING NUMBER:
P21-2950- PEG - XX - XX - DR - C- 0102 - P3

PEGASUS REF No: P21-2950
DRAWING STATUS: SO

PEGASUS GROUP

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Expertly Done.

DESIGN | ECONOMICS | ENVIRONMENT | HERITAGE | LAND & PROPERTY | PLANNING | TRANSPORT & INFRASTRUCTURE

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