PDAS Appendix F – Flood Risk Assessment and Drainage Strategy

Part 1 of 2

Grove Farm, Ipswich

Flood Risk Assessment & Drainage Strategy

August 2023

Waterco

Assessment | Modelling | Design

Project Information	
Project:	Grove Farm, Ipswich
Report Title:	Flood Risk Assessment & Drainage Strategy
Client:	Axis P.E.D Ltd
Instruction:	The instruction to undertake this Flood Risk Assessment & Drainage Strategy was received from Tom Roseblade of Axis P.E.D Ltd
File Ref:	14716-FRA & Drainage Strategy-02

Approval Record	
Author:	Ryan Moore BSc (Hons)
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Document History		
Revision	**Date**	**Comment**
01	26/05/2023	First issue
02	25/08/2023	Second issue – Report updated to include grid connection compound.

This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

Contents

Appendices

Introduction

Waterco has been commissioned to undertake a Flood Risk Assessment and Drainage Strategy in relation to a proposed solar farm and grid connection compound at Grove Farm, Potash Lane, Bentley, Ipswich, IP9 2BZ.

The purpose of this report is to outline the potential flood risk to the site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified risk (if any). This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework (NPPF) and the National Planning Practice Guidance (NPPG): Flood Risk and Coastal Change.

Suffolk County Council as Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, to ensure the proposed development will not increase flood risk elsewhere.

Existing Conditions

The site covers an area of approximately 46.794 hectares (ha) and is located at National Grid Reference (NGR): 611452, 237932. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery, accessed August 2023) shows that the site comprises agricultural land. Church Lane intersects the site in the eastern extent.

The site of the solar farm is bordered by residential properties and an unnamed access road to the north, a railway line and undeveloped land to the east, residential properties, Church Lane and Potash Lane to the south and undeveloped land to the west. Access to the site is provided from Church Road and Potash Lane.

The proposed grid connection compound is located approximately 200m north east of the solar farm site.

Local Topography

Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that the site slopes from 41.41m AOD in the west to 28.43m AOD in the south-east.

The location of proposed grid connection is situated at a minimum of 28.71m AOD.

A LiDAR extract is included in Appendix B.

Ground Conditions

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the majority if the site is underlain by the Lowestoft Formation comprising of sand and gravel. The western extent of the site is underlain by Diamicton. The superficial deposits are underlain by the Red Crag Formation consisting of sand.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

The closest historical BGS borehole record (BGS reference: TM13NW67) is located approximately 30m south of the site (NGR: 611020, 237610). A borehole location plan and log are included in Appendix C. The borehole record identifies:

- Firm, brown, clayey topsoil from ground level to 0.3 metres below ground level (m.bgl).
- Firm, brown, sandy clay with small stones from 0.3m.bgl to 1m.bgl.
- Compact, coarse clay with bound sand and gravel from 1m.bgl to 1.5m.bgl.
- Compact, coarse, brown sand and gravel from 1.5m.bgl to 3.5m.bgl.
- Very compact, fine, brown sand with traces of small stones from 3.5m.bgl to 8m.bgl.
- Compact, coarse, brown sand and gravel from 8m.bgl to 13.5m.bgl. The compact, coarse brown sand and gravel gradually changes to sand, gravel and shells, which then changes to grit-shells and gravel.
- Firm, brown clay was encountered from 13.5m.bgl to 14m.bgl.
- Firm, blue, silty clay with bands of very silty water bearing from 14m.bgl to 51m.bgl.
- Firm, blue, silty clay with chalk from 51m.bgl to 53m.bgl.
- Chalk from 53m.bgl to 75m.bgl.

Groundwater was encountered at 32.01m.bgl.

According to the EA's Aquifer Designation data, obtained from MAGIC's online mapping [accessed August 2023], the Lowestoft Formation is classified as a Secondary A Aquifer. Secondary A Aquifers are *'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.*

The underlying Red Crag Formation is described as a Principal Aquifer. Principal Aquifers are *'layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale'.*

The EA's 'Source Protection Zones' data, obtained from MAGIC's online mapping [accessed August 2023], indicates that the site is located within Groundwater Source Protection Zone III – Total Catchment Zone of a Groundwater Source Protection Zone. Zone III is classified as *'the total area needed to support the abstraction or discharge from the protected groundwater source'.*

The Cranfield University 'Soilscapes' map [accessed August 2023] indicates that the western extent of the site is underlain by *'clayey soils with impeded drainage'.* The eastern extent of the site is underlain by *'freely*

draining slightly acid loamy soils'.

Local Drainage

The site is in a rural area and is not served by public sewers. The site is not currently formally drained and surface water is assumed to infiltrate into the ground and runoff informally into nearby watercourses.

Development Proposals

The proposed development is for in-field solar arrays associated with permeable access roads, compounds, security fencing and vegetation. Development proposals also include a grid connection compound. Proposed development plans are included in Appendix D.

Flood Zone Classification and Policy Context

The Environment Agency (EA) 'Flood Map for Planning', included in Appendix E, shows that the majority of the site, including the location of the proposed grid connection compound, is located within an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding.

A small area within the eastern extent of the site is shown to be located within Flood Zone 3 – an area considered to be at flood risk with a 1% (1 in 100) or greater annual probability of flooding. However, all developable areas of the site (the location of the solar arrays and grid connection compound) are located within Flood Zone 1.

In accordance with Annex 3 of the NPPF, solar farm developments are considered to be 'essential infrastructure'. Table 2 of the NPPG: Flood Risk and Coastal Change, states that 'essential infrastructure' development is considered appropriate within Flood Zone 1.

Local Policy

The Babergh District Council 2011-2031 Core Strategy (adopted February 2014) contains the following policy relating to flood risk and drainage:

'Policy CS15: Implementing Sustainable Development in Babergh:
Proposals for development must respect the local context and character of the different parts of the district, and where relevant should demonstrate how the proposal addresses the key issues and contributes to meeting the objectives of this Local Plan. All new development within the district, will be required to demonstrate the principles of sustainable development and will be assessed against the presumption in favour of sustainable development – as interpreted and applied locally to the Babergh context (through the policies and proposals of this Local Plan), and in particular, and where appropriate to the scale and nature of the proposal, should:…

…xi) minimise the exposure of people and property to the risks of all sources of flooding by taking a sequential

risk-based approach to development, and where appropriate, reduce overall flood risk and incorporate measures to manage and mitigate flood risk;

xii) minimise surface water run-off and incorporate sustainable drainage systems (SUDs) where appropriate…'

Local guidance documents including the Level 1 Babergh District Council Strategic Flood Risk Assessment (SFRA) (August 2022), Level 2 Babergh District Council SFRA (October 2020) and the Suffolk County Council Preliminary Flood Risk Assessment (PFRA) (June 2011 and its 2017 addendum) have been reviewed and inform this report.

Consultation

A consultation request was submitted to the LLFA in October 2022. A response is included in Appendix F. The LLFA have stated:

'Flood Risk
It is generally accepted that PV panels and the associated auxiliary buildings/structures have a limited impact on flood risk due to their comparatively small footprint and lack of ground contacting surfaces. However, it does not mean that this does not need to be fully considered. The LLFA will still expect a site-specific flood risk assessment (FRA) to be submitted with every PV application that is more than 1 hectare in size or is in a flood risk area. If the site is within an area at risk of flooding, the flood risk sequential and exception test maybe applied by the local planning authority.

There are several flood risks that need to be assessed, including.

- *Fluvial (river)/ Tidal (sea)*
- *Pluvial (surface water)*
- *Reservoir*
- *Groundwater*
- *Foul/Sewer Flooding*

The FRA should include reference to any historical flood instances that have been recorded.

For flood incident records, please contact the lead local flood authority…

Surface Water Drainage
The density, height and number of PV panels will dictate the type of surface water management system that is required by the LLFA.

This can be done by utilising perimeter swales or filter strips every 5th row of PV panels. Auxiliary buildings,

depending on where they are located, and their plan area can normally have the surface water drainage design/built in accordance with Building Regulations Part H. However, a surface water drainage strategy utilising SuDS principles may be required if the LLFA believe this is necessary depending on the site.

Below Panel Maintenance

As below the panel will normally be laid to grass or pastureland, the type of maintenance will vary depending on how the ground below and around the panels is to be utilised.

Grass

If the area is to be laid to grass, it is recommended that a seed mix is used which provides a ratio of approximately 80/20% grass/wildflower seeds to allow for biodiversity enhancement/net gain. The management of this area should then be carried out in accordance with a management plan that focuses on the target species that are to benefit of the grass and wildflower areas, such as invertebrates and birds. Careful consideration shall be given to the use of wheeled machinery to avoid soil compaction.

Pastureland

If the area below the panels is to be used for pastureland or grazing land, consideration should be given to

- *Choice of species of grazing stock (usually sheep)*
- *Density of livestock stocking (this would usually be expected to be at a low density)*
- *Intensity of grazing (intermittent conservation grazing would usually be expected)*
- *Avoidance of soil compaction caused by grazing*

Surface Water Flow

Routes Existing flood flow routes or blue corridors should be maintained.

Ordinary Watercourses

If you want to do works to a watercourse in Suffolk, it is likely that you will need to be granted consent by either SCC LLFA, an Internal Drainage Board, or the Environment Agency.

Main rivers are the responsibility of the Environment Agency, and applications to work on main rivers must be submitted to them. You can use this map created by the Environment Agency to find out whether or not the application in question is on a main watercourse.

The responsibility to manage flood risk from ordinary watercourses (streams and ditches, etc) in Suffolk rests with us, as the Lead Local Flood Authority (LLFA). Therefore, anyone who intends to carry out works in, over, under or near an ordinary watercourse in Suffolk must contact us to obtain Land Drainage Consent before starting the work. The reason for this is to ensure that any works do not endanger life or property by increasing the risk of flooding, or cause harm to the water environment'.

Sources of Flooding and Probability

Fluvial

An unnamed watercourse is located immediately east of the solar farm site at its nearest point. The unnamed watercourse flows south in this location and joins Sutton Brook approximately 2.6km south-east of the site. There are no other watercourses in the immediate vicinity of the site.

The EA 'Historic Flood Risk' map (Appendix E) indicates that there no records of historical flooding at or near to the site.

A review of LiDAR data shows that the minimum site level (28.43m AOD) is approximately 4m above the unnamed watercourse to the east. The proposed solar panels and grid connection compound are shown to be located outside of the flood extent. As such, any potential flooding from the unnamed watercourse would not impact the development.

The site is shown within Flood Zone 1 on the EA 'Flood Map for Planning' and has a less than 0.1% annual probability of flooding. It can therefore be concluded that the risk of fluvial flooding is very low.

Tidal

The site is situated at a minimum of 28.43m AOD and is significantly above sea level. Therefore, the risk of tidal flooding is very low.

Surface Water

Surface water flooding occurs when rainwater does not drain away through the normal drainage system or soak into the ground. It is usually associated with high intensity rainfall events but can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen or developed, resulting in overland flow and ponding in depressions in topography. Surface water flooding can occur anywhere without warning. However, flow paths can be determined by consideration of contours and relative levels.

The EA 'Flood Risk from Surface Water' map (Appendix E) indicates that the majority of the solar farm site is at very low risk of surface water flooding, meaning it has less than 0.1% annual probability of flooding.

A small area in the northern extent of the solar farm site (west of Church Road) is identified at low, medium and high risk of surface water flooding. Low risk is defined has having between a 1% and 0.1% annual probability of flooding. Medium risk is defined as having between a 3.3% and 1% annual probability of flooding. High risk is defined as having a greater than 3.3% annual probability of flooding.

The surface water flood risk identified west to Church Road is associated with surface water ponding in an isolated topographical low point. Flood flows from this location are directed east along the northern site boundary and towards the unnamed watercourse east of the site.

Online EA flood depth mapping shows that flood depths during the low risk (0.1% annual probability) event are less than 300mm. The proposed solar arrays will be situated on ram mounted posts (ensuring that water can pass underneath the panels freely), with no inverters or equipment susceptible to flood damage located

within the surface water flood extent.

A small area at high risk of surface water flooding is identified within the north-western extent of the solar farm site. The risk is associated with surface water ponding in an isolated topographical low point. No solar arrays are proposed within the flood extent in the north-western extent of the site.

Proposed Grid Connection Compound

The location of the proposed grid connection compound is generally at very low risk of surface water flooding. The centre of the grid connection compound site is at medium and high risk of surface water flooding. The flood risk identified in the location of the grid connection compound appears to be associated with a surface water flood flow route originating from undeveloped agricultural land to the east. Flood flows are directed west across the centre of the site to lower-lying land beyond.

As shown in Figure 1, online EA flood depth mapping shows that flood depths during the low risk (0.1% annual probability) event are generally below 150mm and up to 600mm within a topographical low point. The compound will be levelled post-development (removing the topographical low point) and as such, the flood depths would be reduced to less than 150mm across the site.

Figure 1 – 0.1% Annual Probability Flood Depth – Grid Connection Compound

There are no records of surface water flooding affecting the site. Any potential surface water flooding arising at or near to the grid connection site would be directed west, away from the site, following the local topography.

Sewer

Flooding from sewers can occur when a sewer is overwhelmed by heavy rainfall, becomes blocked, is damaged, or is of inadequate capacity. Flooding is mostly applicable to combined and surface water sewers.

The site is located in a rural area and there are no public sewers in the immediate vicinity of the site. Therefore, there is no risk of flooding from public sewers.

Groundwater

Groundwater flooding occurs when water levels underneath the ground rise above normal levels. Prolonged heavy rainfall soaks into the ground and can cause the ground to become saturated. This results in rising groundwater levels which leads to flooding above ground.

There are no records of groundwater flooding at or near to the site. The historical BGS borehole record, included in Appendix C, encountered groundwater at approximately 32.01m.bgl.

The proposed solar arrays will be mounted above ground level, and it can be concluded that the risk of groundwater flooding is very low.

Artificial Sources

There are no canals within the vicinity of the site. The EA 'Flood Risk from Reservoirs' map (Appendix E) shows that the site is not at risk of flooding from reservoirs. It can therefore be concluded that the risk of flooding from artificial sources is very low.

Summary of Potential Flooding and Mitigation

It can be concluded that the risk of flooding from all sources to the majority of the site is very low. A small area within the northern extent of the solar farm site is shown at surface water risk. However, the solar arrays will be situated on ram mounted posts (ensuring that water can pass underneath the panels freely) with no inverters or equipment susceptible to flood damage located within the surface water flood extent. Therefore, no site-specific mitigation measures for the solar arrays are considered necessary.

The location of the proposed grid connection compound is shown at risk of surface water flooding. Online EA flood depth mapping shows that flood depths during the low risk (0.1% annual probability) event are generally low and less than 150mm. In order to mitigate the flood risk, it is proposed to level the site (removing any isolated topographical low points) and set the height of any equipment and buildings within the grid connection compound a minimum of 300mm above surrounding ground levels.

Surface Water Management

The site is not formally drained and is therefore considered to be 100% permeable.

The proposed development will introduce minimal hardstanding in the form of invertor platforms, a control room, substation and ancillary buildings (kiosks). The access track and compound areas (including the grid connection compound) will comprise porous material and will not contribute to the total hardstanding area on site.

The proposed ground-mounted solar arrays will be laid on ram mounted posts ensuring the ground beneath each panel remains permeable. The rows of panels will be spaced with a circa 3.5m rainwater gap between each row of panels. Rainfall runoff from the solar arrays, which will typically have a 45° angle, will infiltrate to the land beneath and between the panels. It is therefore considered that the solar arrays will not result in an increase in the surface water runoff rates and volumes.

Surface Water Management from Solar Panels

Correspondence from the LLFA (Appendix F) states that:

'*Surface Water Drainage*
The density, height and number of PV panels will dictate the type of surface water management system that is required by the LLFA.

This can be done by utilising perimeter swales or filter strips every 5th row of PV panels.

Auxiliary buildings, depending on where they are located, and their plan area can normally have the surface water drainage design/built in accordance with Building Regulations Part H. However, a surface water drainage strategy utilising SuDS principles may be required if the LLFA believe this is necessary depending on the site.'

A swale is a shallow vegetated channel which would intercept overland flows and provide erosion control. Swales should follow the natural contours of the local topography. Check dams at regular intervals may be required where swales are installed on steeper gradients. Swales should be designed with side slopes no steeper than 1 in 2 and depths should be kept relatively shallow (no greater than 0.6m).

A filter drain is a gravel or stone filled trench which would intercept overland flows and provide erosion control.

It is noted that the swales and filter drains would serve an erosion control purpose and are not intended to provide storm water storage. As per LLFA requirements, a swale or filter drain would be provided between every 5th row of panels.

To further ensure erosion control, a planting regime comprising hedgerows, woodlands, pasture and grassland is also proposed.

Surface Water Runoff from the Compounds

The compound areas will be formed from a permeable surface (compacted stone). Runoff from the buildings within the compound will drain to the surrounding compacted stone surface. The stone surface material will be laid at a minimum depth of 150mm to provide an element of storm water storage in an extreme rainfall event.

A Concept Drainage Sketch is included as Appendix G.

Surface Water Treatment

The pollution hazard associated with all proposed land uses is very low. The inclusion of permeable surfacing will ensure all runoff receives appropriate treatment.

Maintenance

Maintenance of drainage features such as permeable surfacing, swales or filter drains will be the responsibility of the site owner. Maintenance schedules for swales, filter drains and permeable paving (applicable to the permeable compound and access roads) are included in Appendix H.

Conclusions

The proposed development is for in-field solar arrays associated with permeable access roads, compounds, security fencing and vegetation. Development proposals also include a grid connection compound.

The EA 'Flood Map for Planning' shows that the majority of the site, including the location of the proposed solar arrays and grid connection compound, is located within Flood Zone 1 - an area outside of the extreme flood extent, considered to have a less than 0.1% annual probability of flooding from rivers or the sea. A small area in the eastern extent of the site is located within Flood Zone 3 – an area considered to be at flood risk with a 1% (1 in 100) or greater annual probability of flooding. However, all developable areas of the site located within Flood Zone 1.

It can be concluded that the risk of flooding from all sources to the majority of the site is very low. A small area within the northern extent of the solar farm site is shown at surface water risk. However, the solar arrays will be situated on ram mounted posts (ensuring that water can pass underneath the panels freely) with no inverters or equipment susceptible to flood damage located within the surface water flood extent. Therefore, no site-specific mitigation measures for the solar arrays are considered necessary.

The location of the proposed grid connection compound is shown at risk of surface water flooding. Online EA flood depth mapping shows that flood depths during the low risk (0.1% annual probability) event are generally low and less than 150mm. Flood depths of up to 600mm are estimated in an isolated topographical low point. The flood risk will be mitigated by levelling the site (removing isolated low points) and raising the height of any equipment and buildings within the grid connection compound a minimum of 300mm above surrounding ground levels.

The proposed solar arrays will not significantly alter the existing surface water regime. Swales or filter drains be placed at regular intervals (every 5th row) between the rows of solar panels to intercept overland flow, encourage infiltration and act as a form of erosion control. The access road and compounds will comprise permeable material allowing surface water to infiltrate into the ground.

To further ensure erosion control, a planting regime comprising hedgerows, woodlands, pasture and grassland is also proposed.

A Concept Designer's Risk Assessment (cDRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The cDRA has been included in Appendix I.

Recommendations

1. Submit this Flood Risk Assessment and Drainage Strategy to the Planning Authority in support of the Planning Application.

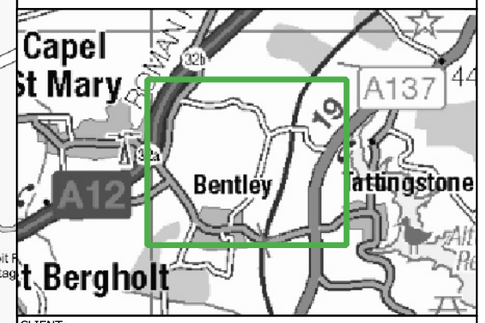
2. Set the slab height of any equipment and buildings within the grid connection compound a minimum of 300mm above surrounding ground levels.

Appendix A Location Plan and Aerial Image

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Watercourses
- Waterbodies

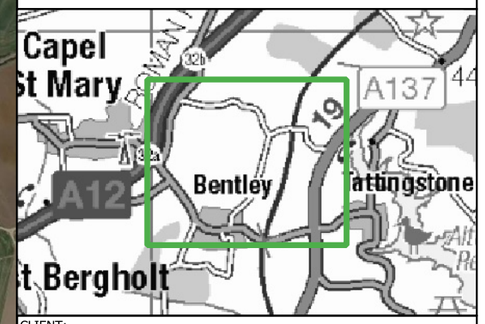


CLIENT:	Axis P.E.D Ltd
	www.waterco.co.uk
SCHEME:	Grove Farm, Ipswich
PLOT TITLE:	Location Plan
PLOT STATUS: FINAL	DATE: 25-08-2023
DRAWN: RM / CHECKED: JR / APPROVED: AW	PLOT SCALE AT A3: 1:10000
PLOT NAME: 14716_Location_Plan	REVISION: -

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

Site Boundary



CLIENT:
Axis P.E.D Ltd

waterco
www.waterco.co.uk

SCHEME:
Grove Farm, Ipswich

PLOT TITLE:
Aerial Plan

PLOT STATUS:	DATE:
FINAL	25-08-2023

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:10000

PLOT NAME:	REVISION:
14716_Aerial_Plan	-

Appendix B LiDAR Extract

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Site Levels (m AOD)

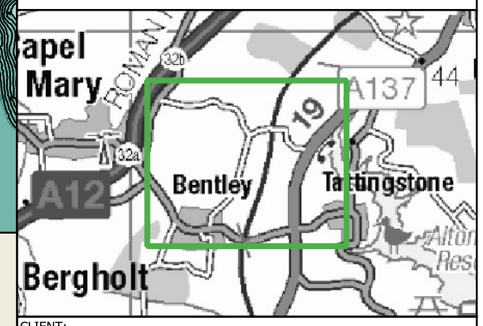
Ground Elevation (m AOD)

- <= 30
- 30 - 32
- 32 - 34
- 34 - 36
- 36 - 38
- 38 - 40
- 40 - 42
- 42 - 44
- > 44

Map Scale at A3: 1:1000

0 10 20 30 40 m

0 250 500 750 1,000 m



CLIENT:
Axis P.E.D Ltd

waterco
www.waterco.co.uk

SCHEME:
Grove Farm, Ipswich

PLOT TITLE:
LiDAR Plan
1m Resolution
Data from Environment Agency

PLOT STATUS:			DATE:
FINAL			21-08-2023
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:10000

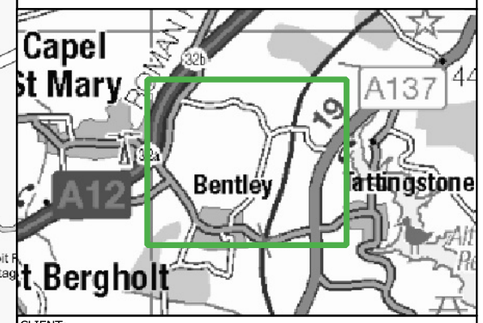
PLOT NAME: 14716_LiDAR_Plan
REVISION: -

Appendix C BGS Location Plan and Borehole Record

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Historical BGS Borehole Location
- Watercourses
- Waterbodies



CLIENT:
Axis P.E.D Ltd

www.waterco.co.uk

SCHEME:
Grove Farm, Ipswich

PLOT TITLE:
Historical BGS Borehole Location Plan

PLOT STATUS:	DATE:
FINAL	21-08-2023

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:10000

PLOT NAME:	REVISION:
14716_Historical_BGS_Borehole_Location_Plan	-

N.1567

TM 13 NW/67

207/873

TM13/63

RECORD OF WELL

At GROVE FARM

Town or Village BENTLEY

County IPSWICH SUFFOLK

EXACT SITE OF WELL

Six-inch sheet TM 13 NW Six-inch National Grid sheet TM 1102 3761

For OWNER State whether owner, tenant, builder, contractor, consultant, etc.:—

Address (if different from above)

Level of ground surface above sea level (O.D.) ft.

If well top is not at ground level, state how far ... } above:* ~~below~~ 0.50m

* DELETE WHICHEVER IS INAPPLICABLE

SHAFT ft.; diameter ft.; HEADINGS (please attach details—dimensions and directions)

BORE 75 m ft.; diameter of bore: at top 200mm in.; at bottom 200mm in.

Full details of permanent lining tubes (position, length, diameter, plain, slotted etc.)

57 metres of 200mm diameter plain steel lining tubes to BS 879

Water struck at depths of 35 metres ft. below well to

Rest level of water 32 m ft. above* ~~below~~ well top. Suction at 60 m ft. Yield on 8 hours'* ~~days~~ te

TEST CONDITIONS

pumping at 8,000 galls. per hour with depression to 35.05m ft. below well top.

Recovery to rest level in mins.* hours Capacity of pump 8,000 g.p.h. Date of measurements 12.7

NORMAL CONDITIONS

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

Make and/or type.....Grundfos SP45/18/3.....Motive power.....Electric.....

Capacity.....8,000.....galls. per hour. Suction at.....60m.....ft. below well top.

Amount pumped.....64,000.....galls. per day. Estimated consumption.....galls. per we

Well made by.....Smith & Webb (Drilling) Limited.....Date of sinking.....10.7.84.....

Information from.....

ADDITIONAL NOTES ANALYSIS (please attach copy if available)

For Survey use

Date Received 3.8.8

Section 6 .....

Pumping test .....

Observ. well .....

Recorder .....

E.R. log .....

Site marked on

1" map .....

6" map .....
(use sy

1/60 M.P.Ltd. G.722

For Survey use only Licence No

TM13 NW 67

(For Survey use only) GEOLOGICAL CLASSIFICATION	NATURE OF STRATA If measurements start below ground surface, state how far	THICKNESS Feet Inches ~~Metres~~		DEPTH Feet Inches ~~Metres~~	
	Firm brown clayey top soil	0	30	0	30
BOULDER CLAY	Firm brown sandy clay with small stones	0	70	1	00
GLACIAL SAND & GRAVEL	Compact coarse clay with bound sand and gravel	0.	50	1'	50
	Compact coarse brown sand and gravel	2.	00	3	50
RED CRAG	Very compact fine brown sand with traces of small stones	4.	50	8	00
	Compact coarse brown sand and gravel gradually changing to sand, gravel and shells, then to grit-shells and gravel	5	50	13	50
LONDON CLAY	Firm brown clay	0	50	14	00
	Firm blue silty clay with bands of very silty water bearing	37	00	51	00
	Firm blue silty clay with chalk	2	00	53	00
CHALK	Chalk	22	00	75	00

pp.
G. Richardson

Sept. 82.

RECORD OF WELL

For Survey use only Licence No.

N. 15679

207/873

TM 13/63

At GROVE FARM

Town or Village BENTLEY

County IPSWICH SUFFOLK

EXACT SITE OF WELL

Six-inch sheet TM 13 NW. Six-inch National Grid sheet TM 1102 3761

For OWNER State whether owner, tenant, builder, contractor, consultant, etc.:—

Address (if different from above)

* DELETE WHICHEVER IS INAPPLICABLE

Level of ground surface above sea level (O.D.) ft. If well top is not at ground level, state how far above:* 0.50m ft

SHAFT ft.; diameter ft.; HEADINGS (please attach details—dimensions and directions)

BORE 75 m ft.; diameter of bore: at top 200mm in.; at bottom 200mm in.

Full details of permanent lining tubes (position, length, diameter, plain, slotted etc.)

57 metres of 200mm diameter plain steel lining tubes to BS 879

Water struck at depths of 35 metres ft. below well top.

Rest level of water 32 m ft. above* well top. Suction at 60 m ft. Yield on 8 hours'* test

TEST CONDITIONS

pumping at 8,000 galls. per hour with depression to 35.05m ft. below well top.

Recovery to rest level in.....mins.*/hours Capacity of pump...8,000.....g.p.h. Date of measurements...12.7.84

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

NORMAL CONDITIONS

Make and/or type.....Grundfos SP45/18/3.....Motive power.....Electric.....

Capacity.....8,000.....galls. per hour. Suction at.....60m.....ft. below well top.

Amount pumped.....64,000.....galls. per day. Estimated consumption.....galls. per week.

Well made by.....Smith & Webb (Drilling) Limited.....Date of sinking...10.7.84.....

Information from.....

ADDITIONAL NOTES ANALYSIS (please attach copy if available)

For Survey use only

Date Received 3.8.84.....

Section 6 .....

Pumping test .....

Observ. well .....

Recorder .....

E.R. log CM.95E.....

Site marked on

1" map .....

6" map ..... (use symbol)

Record forwarded

to .....

P.S.47 10M 1/60 M.P.Ltd. G.722

(For Survey use only) GEOLOGICAL CLASSIFICATION	NATURE OF STRATA If measurements start below ground surface, state how far	THICKNESS Feet Inches ~~Metres~~		DEPTH Feet Inches ~~Metres~~	
	Firm brown clayey top soil	0	30	0	30
BOULDER CLAY	Firm brown sandy clay with small stones	0	70	1	00
GLACIAL SAND & GRAVEL	Compact coarse clay with bound sand and gravel	0.	50	1	50
	Compact coarse brown sand and gravel	2.	00	3	50
RED CRAG	Very compact fine brown sand with traces of small stones	4.	50	8	00
	Compact coarse brown sand and gravel gradually changing to sand, gravel and shells, then to grit-shells and gravel	5	50	13	50
LONDON CLAY	Firm brown clay	0	50	14	00
	Firm blue silty clay with bands of very silty water bearing	37	00	51	00
	Firm blue silty clay with chalk	2	00	53	00
CHALK	Chalk	22	00	75	00

pp.
D. Richardson

Sept. 82.

DATA ACQUISITION SHEET

RJM/D/17

RJM1/2

NRA region: Anglian (Eastern Area)

File Number: TM 1930/2

TM13/63

Pump Well Identification:

NRA id No:

BGS (WL) No: TM13/63

NGR: 110 377

Elevation: estimate from map ca 36m aOD

Measuring Point:

Site Name: Grove Fm

Locality: Bentley

Well details:

depth of pumping well: 75m

diameter: 200mm

casing details: 57m

☐ observation boreholes

number of obs bhs:

obs bh details:

Aquifer Details:

confined / ~~unconfined~~ If confined, confining layer: London Clay + LLT

Aquifer Geology	from	to	Aquifer Geology	from	to
Chalk	53m	75m			

Pumping Test Details:

date of test: 25 July 94

length of test: 8hrs

RWL: 32.01m

PWL: 35.21m

pumping rate: 8,000 g/h

Additional Well Information:

☐ Well Loss Data: B..... C..... Efficiency.....

☐ Well Acidified

☐ Flow Logs

☐ Other Geophysical Logs

☐ Fissure Information: major inflows from.....to.....
from.....to.....
from.....to.....

Aquifer Parameters:

Analysis Type: Jacob (St. Line)

Transmissivity: ≃ 1000 m²/d

Storage Coefficient:

Analysis Type:

Transmissivity:

Storage Coefficient:

Analysis Type:	Other Data:
Transmissivity:	
Storage Coefficient:	

Confidence:

excellent ☐ ☐ ☐ ☐ ☑ very poor

Notes: little drawdown. Q too small only 2 pumping levels registered.

Appendix D Proposed Development Plans

Q:\3201-3250\3223-01 Grove Farm Solar\Dwgs\CAD\Planning Drawings\3223-01-03 General Arrangement Rev A.dwg

- Site Boundary
- Deer / Stock Fencing (see Drawing 3223-01-11)
- Timber Close Board Fencing (see Drawing 3223-01-11)
- Gate (see Drawing 3223-01-11)
- Solar PV Arrays (see Drawing 3223-01-04)
- Transformer (see Drawing 3223-01-05)
- Control Building (see Drawing 3223-01-06)
- Spares Container (see Drawing 3223-01-07)
- Customer Substation Building (see Drawing 3223-01-09a)
- DNO Substation Building (see Drawing 3223-01-09b)
- Customer Substation Compound (for elevation see Drawing 3223-01-08a)
- DNO Substation Compound (for elevation see Drawing 3223-01-08b)
- Access Track (see Drawing 3223-01-11)
- Grid Connection Cabling - Trenched (see Drawing 3223-01-12)
- Grid Connection Cabling - Horizontal Directional Drilled
- Grid Connection Cabling- Overhead Cabling to Point of Connection

0344 8700 007
axis.co.uk

Client
Green Switch Capital Ltd

Project
Grove Farm Solar

Drawing Title
General Arrangement

Scale
1:5000 @A3

Status
Planning

Date
July 2023

Drawn
TR

Checked
PR

Dwg no
3223-01-03

Rev

N

revision: desc: date:

0 100 200 300 400 500m