DRAINAGE DESIGN STATEMENT

Woodwalton 2 Solar Farm
Prepared for: Anesco Ltd



SLR Ref: 402.05075.00001
Version No: 03
November 2024

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1.0 Introduction

1.1 Background

SLR Consulting Limited (SLR) have been appointed by Anesco Ltd to provide consultancy services to discharge Planning Condition 10 and 11 which relate to the management of flood risk and surface water runoff resulting from the proposed solar farm at Woodwalton, on land north of Double Bank Lane, PE28 5YL (the site), following correspondence with Sawtry IDB via Middle Level Commissioners.

Condition 10 of planning permission (ref. 21/01809/FUL) states:

> *"No laying of services, creation of hardstanding or erection of a structure shall commence until a detailed surface water drainage scheme for the site, based on the agreed Flood Risk Assessment and Surface Water Drainage Strategy (SLR: ref. 410.05075.00095 v 1.0 - April 2021), has been submitted to and approved in writing by the Local Planning Authority. The scheme shall subsequently be implemented in full accordance with the approved details prior to the First Export Date."*

Condition 11 of planning permission (ref. 21/01809/FUL) states:

> *"Details for the long-term maintenance arrangements for the surface water drainage system (including all SuDS features) to be submitted to and approved in writing by the Local Planning Authority prior to the First Export Date. The submitted details should identify runoff sub-catchments, SuDS components, control structures, flow routes and outfalls. In addition, the plan must clarify the access that is required to each surface water management component for maintenance purpose. The maintenance plan shall be carried out in full thereafter."*

This report has been prepared to provide sufficient information to allow the discharge of the above conditions. This report should be read in conjunction with the Flood Risk Assessment (FRA) & Surface Water Drainage Strategy (SWDS) (SLR report reference 410.05075.00095) prepared in support of the Planning Application for the proposed development at the site.

1.2 Correspondence to date

Conditional planning permission was granted by Huntingdonshire District Council for the proposed development in 2021 (ref. 21/01809/FUL).

The requirements of the conditions relating to flood risk and surface water run-off were satisfied by additional information provided to Huntingdonshire District Council in March 2022, with a formal decision notice issued in January 2024.

During subsequent correspondence, the Middle Levels Commissioners and Administered / Associated Internal Drainage Boards stated the following:

- *A Discharge Consent application will be required for the area of hardstanding which is proposing to drain to the private ditch south of the site. The contribution fee can be calculated via the fee checker on our website, using the greenfield rate, the attenuated post-development rate and the unattenuated post-development rate*
- *Due to the problems with flooding in the area, and the influence that the Board's highland brooks have on the Commissioner's Catchwater Drain, no increase in rates or volumes of flow will be recommended for consent by the Board. In an effort to reduce any increased rates of run-off created by the proposal it is suggested that a small bund, with a suitable overspill, is formed to contain the flows in site as best as possible*

As such a revised drainage design for the proposed development has been produced, as detailed in this report.

Cambridgeshire County Council, as Lead Local Flood Authority (LLFA), have confirmed that in principle the drainage proposals appear acceptable and provide the required level of detail, subject to formal consultation.

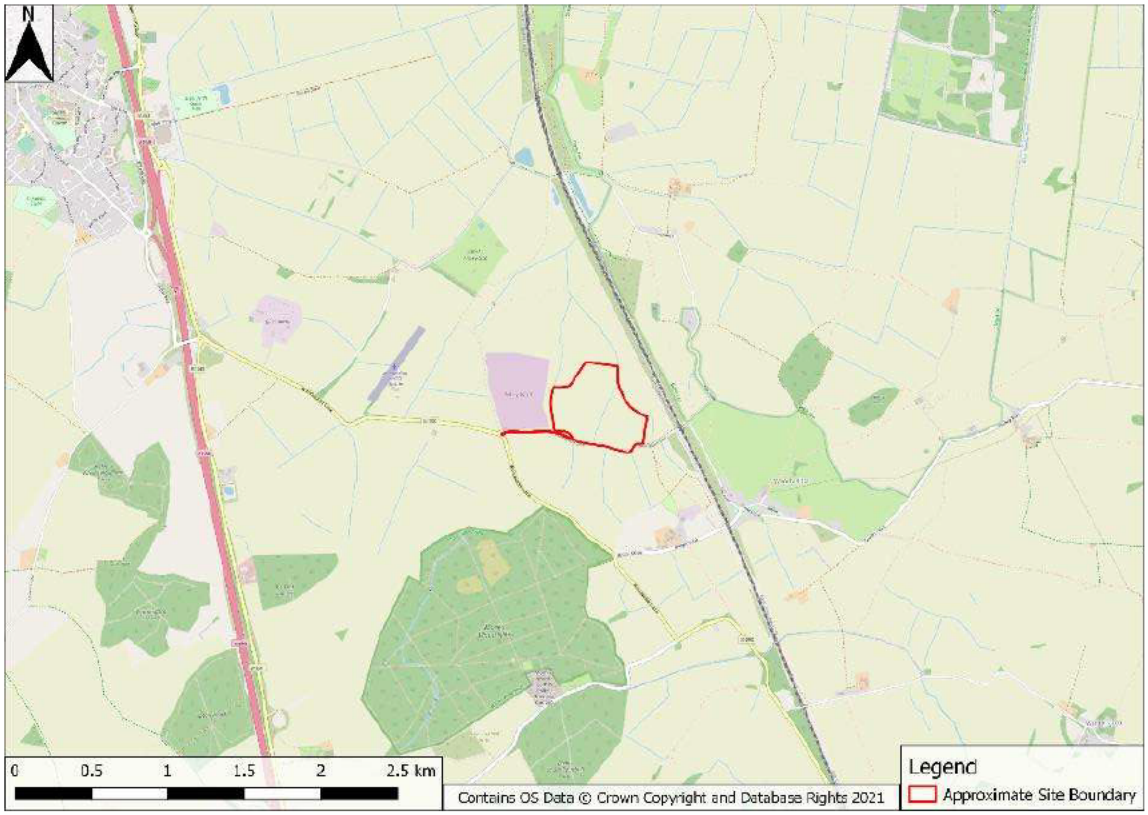
Full copies of the correspondence with the LLFA is provided in **Appendix 01**.

2.0 Site Description and Location

2.1 Site Location

The site is centred on National Grid Reference (NGR) TL 20529 81515, covering an area of approximately 24ha. The site is located to the north west of Woodwalton village, adjacent to the established Double Bank solar farm development, immediately west of the Site. A plan showing the location of the site is provided as Figure 2-1.

Figure 2-1 Site Location Plan



2.2 Topography

A topographic survey of the existing site is attached as **Appendix 02**. The site generally falls south to north. The high point of 11.21m AOD is situated roughly halfway along the southern site boundary. Levels fall from this point to the west, north and east towards the various drainage channels bounding the site. The low point of 4.70m AOD lies at the vegetated extent of the site, approximately halfway along the western boundary.

2.3 Proposed Development

The proposed development involves the installation of solar photovoltaic (PV) panels and construction of associated infrastructure, including a Distribution Network Operator (DNO) substation, customer substation, and ancillary equipment including security fencing. Plans of the proposed development are included in **Appendix 03**.

3.0 Outline Strategy

3.1 Existing Drainage

Incident rainfall on the existing site drains via a combination of evaporation, limited infiltration into the underlying strata, and following topographic gradients overland into the existing drainage channels/ditches at the site shown in the Figure 3-1 below. These channels all connect to one of the two drainage channels bounding the site to the east and west, which are the responsibility of the Sawtry Internal Drainage Board (IDB). These IDB channels drain to a common channel beyond the site boundary to the north, before passing under the railway embankment and then discharging to the Middle Level Catchwater drainage network to the north east.

A full District Plan of the Sawtry IDB management area is provided in **Appendix 04**.

Figure 3-1 Locations of drainage ditches at the site



3.2 Proposed Drainage

The majority of the site will continue to drain as existing following the proposed works: the proposed solar panels will intercept precipitation and shed this onto the ground. This runoff will then follow topographical gradients overland towards one of the existing drainage ditches at the site, and subsequently drain away from the site via the nearby IDB channels as before.

The scheme will result in a small increase in impermeable surface area (0.04ha) due to the construction of the DNO substation A swale will be constructed downgradient of the DNO substation to collect surface water runoff, and a channel drain and short connecting surface water sewer are proposed on the DNO substation platform to direct water to the attenuation feature. In the event of extreme rainfall, there will be a controlled overflow on

the western side of the swale which will control discharge of excess surface water as overland flow through vegetated ground, simulating the current conditions. Water discharged from the swale is expected to follow local topography in a westerly direction towards the field drainage channels on the west boundary of the Site.

4.0 Surface Water Drainage Design

4.1 Design Requirements

The surface water drainage design follows the Surface Water Drainage Strategy (SWDS) set out in FRA & SWDS (SLR report reference 410.05075.00095). The proposed drainage plan is provided in **Appendix 05**.

4.1.1 Peak Rainfall Intensity Allowance

Following consultation with the LLFA (see Section 1.2), a 40% uplift factor will be included in the design when considering the 1 in 100 year rainfall event to account for climate change over the development lifetime of 30 years.

4.1.2 Drained Area

As discussed in Section 3.2, the majority of the site will drain as existing with the proposed development introducing 400m^2 (0.04 ha) of impermeable area through the construction of the DNO substation.

4.1.3 Disposal of Surface Water

With reference to the SuDS Manual[1], the hierarchy of preferred disposal options for surface water runoff from the development sites in decreasing order of sustainability is as follows:

1. Infiltration to Ground;
2. Discharge to Surface Waters; or
3. Discharge to Sewer.

The IDB has requested that no further surface water be discharged into their drainage network, making discharge to surface water infeasible. Furthermore, the location of any surface water sewers on or in proximity to the site is currently unknown. Therefore, infiltration to ground is deemed suitable in combination with the proposed SuDS feature.

A swale will be introduced on the downgradient boundary of the DNO substation to collect surface water runoff alongside a channel drain and short connecting surface water sewer on the DNO substation platform to direct water to the attenuation feature. It is anticipated that the water will infiltrate/percolate away over a period of time, with some water lost to evaporation. In the event of extreme rainfall, there will be a controlled overflow on the western side of the swale which will control discharge of excess surface water as overland flow through vegetated ground, simulating the current conditions. Water discharged from the swale is expected to follow local topography in a westerly direction towards the field drainage channels on the west boundary of the Site.

Despite the slightly impeded nature of drainage at the Site, this SuDS feature aims to store the additional surface water created from the impermeable area for the period of time necessary for infiltration to ground and evaporation. This will reduce runoff from the developed area to below the current greenfield conditions while controlling the discharge of excess surface water.

The proposed drainage layout is included in Appendix 05.

4.1.4 Discharge

The proposed development will discharge surface water as infiltration, evaporation and in the case of extreme events greater than 1 + 40% CC, as surface water exceedance flow towards the western field drainage ditch.

[1] The SuDS Manual, Report C753 CIRIA, 2015

There is an additional 100mm freeboard capacity within the attenuation swale on top of the peak water level for the 1 + 40% CC design.

4.2 Design Calculations

A copy of the results of the Causeway Flow storm network calculations for the swale are provided in **Appendix 06**.

The following parameters have been incorporated into the modelling:

- Impermeable area: 400m^2
- Cover Level: 9.0 m
- Invert Level: 8.1 m
- Base Width: 1.0 m
- Top of bank Width: 6.4 m
- Length: 16 m
- Side Slope (1:X): 3.0

The swale has capacity to retain water from a 1 + 40% CC event with a freeboard of 100mm to the overflow feature which is set at 9 m aOD. The remaining sides are raised to approximately 9.32 m aOD to prevent the flow of water back upslope towards the DNO substation.

The system has been designed to:

- Avoid all flooding for storms up to a 1 in 100-year annual probability event;
- Include a 40% uplift factor to account for projected changes in rainfall intensity associated with climate change over the 30-year development lifetime.

A summary of the calculation results for the critical storm event is provided in Table 4-1 below.

Table 4-1 Critical Storm Results

Return Period	Critical Storm Event	Peak outflow (l/s)	Peak Water Level from Invert Level (m aOD)	Maximum Storage Volume / Unit [Total] (m^3/unit [m^3])
1 in 100 year (+ 40% CC)	1440 minute winter	0.0	8.9	47.2

4.3 SUDS

The proposed drainage design comprises the introduction of a new SUDS feature: a swale.

4.3.1 SuDS Water Quality Design Criteria

SuDS provide a number of water quality benefits and the proposed surface water management provides benefits as described below:

- Swales - shallow and vegetated open channels which convey, treat and attenuate surface water. The swale acts as an attenuation feature allowing, where necessary, infiltration directly into the ground. Surface vegetation can filter coarse to medium sediments and associated pollutants.

The simple index method, as outlined within the SuDS Manual, provides a way of quantifying the benefit to water quality of the SuDS Management Train. The pollution hazard from the land use and the mitigation from the SuDS component are each assigned an index. The total mitigation index must be greater than the pollution hazard index for adequate treatment to be delivered.

Total SuDS mitigation index (for each contaminant type) ≥ pollution hazard index (for each containment type)

The total SuDS mitigation is the summation of the first components mitigation index and half the mitigation index of any subsequent component.

With reference to the SuDS Manual, post-development surface water runoff generated from the development is considered to have a 'Low' *Pollution Hazard Level* as presented in Table 4-2.

Table 4-2 Pollution Hazard Potential for the Proposed Development

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Other Roofs (typically commercial/ industrial roofs)	Low	0.3	0.2	0.05
Low Traffic Roads	Low	0.5	0.4	0.4

The proposed drainage strategy is required to demonstrate sufficient treatment capability to manage the specified *Pollution Hazard Indices.* This is provided in Table 4-3.

Table 4-3 SuDS Mitigation Indices for discharges to surface water for the proposed development

SuDS Component	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Swale	0.5	0.6	0.6

Table 4-4 compares the SuDS Mitigation Indices, provided by the proposed 'Source Control', 'Conveyance' and 'Site Control' measures against the Pollution Hazard Indices.

Table 4-4 SuDS Performance: Water Quality Indices Assessment - Swale

Land Use	Pollution Hazard Level	Pollution Hazard and SuDS Mitigation Indices Comparison					
		Total Suspended Solids (TSS)		Metals		Hydro-Carbons	
		Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index
Industrial Roof	Low	0.3	0.5	0.2	0.6	0.05	0.6
Substation Platform (low traffic road parameters)	Low	0.5	0.5	0.4	0.6	0.4	0.6

As the SuDS Mitigation Index provided by the proposed SuDS measures are ≥ Pollution Hazard Index the water quality assessment criteria are satisfied for all Land Use criteria.

4.3.2 Exceedance

In the low probability event of an exceedance within the swale, water would overtop the swale and follow topographical gradients towards the existing drainage ditch to the south, as shown on the proposed drainage plan. No adverse flooding is anticipated as a result of surcharging from the surface water network.

4.4 SUDS Operation and Maintenance Requirements

4.4.1 Overview

All surface water drainage and pollution control features associated with the site will remain private and will be maintained by Anesco's in-house Facilities Management (FM) team.

The following sections outline recommended maintenance requirements for the various aspects of the drainage system for the development. Planned maintenance will feature in the sites Operating & Maintenance (O&M) Manual, and reactive maintenance is arranged by the FM team. If necessary, the O&M Manual will be refined when the site is operational to suit specific conditions.

4.4.2 Access to SuDS

The design of the proposed development (**Appendix 05**) provides adequate maintenance access to all surface water drainage and SuDS features. All swales, manhole covers, outlets lie outside the substation security fence and within easy access from main access track on Double Bank Lane. Maintenance access to these features will be readily available from the main access track and parking area for Anesco maintenance vehicles and maintenance operatives with suitable areas for maintenance vehicles and maintenance operatives to stand.

The landscape plan indicates that planting for the site includes a Tussock Grass Mixture which will not inhibit the maintenance or access to the SuDS features.

4.4.3 Swale

The proposed drainage scheme will utilise a swale as a mechanism for treatment, attenuation, and infiltration of surface water runoff. The anticipated maintenance and management for the swale is outlined in Table 4-5.

Table 4-5 Typical Swale Maintenance Requirements

Maintenance Schedule	Required Action	Minimum Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass- to retain grass height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly.
	Inspect inlets and facility surface for silt accumulation, establish appropriate slit removal frequencies.	As required or if bare soil is exposed over 10% or more of the swale treatment area
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plan types to better suit conditions, if required	Annually.
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

4.4.4 Piped Systems (including Manholes, Inlets and Headwalls)

The anticipated maintenance and management plan for the traditional pipework, associated inspection chambers / catch pits, gullies and headwalls across the Site associated with the surface water SuDS drainage system is outlined in Table 4-6.

Table 4-6 Typical Piped Systems Maintenance Plan

Maintenance Schedule	Required Action	Minimum Frequency
Regular Maintenance	Ensuring drainage intakes and outfalls are clear of debris / silt.	Monthly (or as required).
Occasional Maintenance	Jet clean gullies, pipe lines and manholes to remove grease, grit, sediment and other debris to ensure conveyance capacity is not compromised.	Every 2 years.
Intermittent Maintenance	CCTV survey of gullies and pipe lines to identify any defects/signs of performance degradation such as: ➢ Cracked/deteriorating pipes; ➢ Leaking joints/seals at manholes; ➢ High water lines showing regular high stage in pipes (sign of lack of capacity or downstream constraint); and ➢ Suspected infiltration or exfiltration.	Every 5 years.
Remedial Actions	Repair defects using suitable methods. Effective temporary repairs may be sufficient in short term until scheduled / capital improvements can be made.	As required.
Monitoring	Record areas of surface ponding / bypassing / surcharging (photos, inundated areas, depths) during extreme storm events and investigate the reasoning for this post-storm.	As required.
Replacement	With careful monitoring and timely maintenance and remedial actions, gullies, manholes and pipework is not expected to require full replacement over the anticipated lifetime of the site.	➢ 40 years
	With careful monitoring and timely maintenance and remedial actions, headwalls are not expected to require full replacement over the anticipated lifetime of the site.	➢ 40 years

5.0 Conclusion

The preceding sections seek to provide sufficient information to allow the discharge of conditions 10 and 11 which read:

Condition 10 of planning permission (ref. 21/01809/FUL) states:

> *"No laying of services, creation of hardstanding or erection of a structure shall commence until a detailed surface water drainage scheme for the site, based on the agreed Flood Risk Assessment and Surface Water Drainage Strategy (SLR: ref. 410.05075.00095 v 1.0 - April 2021), has been submitted to and approved in writing by the Local Planning Authority. The scheme shall subsequently be implemented in full accordance with the approved details prior to the First Export Date."*

Condition 11 of planning permission (ref. 21/01809/FUL) states:

> *"Details for the long-term maintenance arrangements for the surface water drainage system (including all SuDS features) to be submitted to and approved in writing by the Local Planning Authority prior to the First Export Date. The submitted details should identify runoff sub-catchments, SuDS components, control structures, flow roues and outfalls. In addition, the plan must clarify the access that is required to each surface water management component for maintenance purpose. The maintenance plan shall be carried out in full thereafter."*

It is considered that this report has been prepared to provide sufficient information to allow the discharge of the above conditions.

The development proposals will result in a small increase in impermeable area at the site (400m^2) due to the construction of a DNO substation. A swale will be introduced on the downgradient boundary of the DNO substation to collect surface water runoff alongside a channel drain and short connecting surface water sewer on the DNO substation platform to direct water to the attenuation feature. It is anticipated that the water will infiltrate/percolate away over a period of time, with some water lost to evaporation. In the event of extreme rainfall, there will be a controlled overflow on the western side of the swale which will control discharge of excess surface water as overland flow through vegetated ground, simulating the current conditions. Water discharged from the swale is expected to follow local topography in a westerly direction towards the field drainage channels on the west boundary of the Site.. This is in line with previous consultation with the LLFA.

APPENDIX 01

Correspondence

Outlook

WoodWalton drainage discharge of conditions (22/80082/COND)

From [redacted]
Sent: Friday, October 18, 2024 1:51 PM
To [redacted]
Cc: FR Planning <FR.Planning@cambridgeshire.gov.uk>; [redacted]
Subject: RE: WoodWalton drainage discharge of conditions (22/80082/COND)

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Hi [redacted]

The information appears to provide the detail we would expect; however, this will be subject to a formal detailed review during the formal consultation.

Kind regards

[redacted]
SuDS and Flood Risk Officer
M: [redacted]
Flood Risk Team

Alconbury Weald Civic Hub, Emery Crescent, Enterprise Campus, Alconbury Weald, PE28 4YE

Upcoming Leave:

From [redacted]
Sent: 03 October 2024 11:29
To: [redacted]
Cc: FR Planning <FR.Planning@cambridgeshire.gov.uk>; [redacted]
Subject: RE: WoodWalton drainage discharge of conditions (22/80082/COND)

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Hi [redacted]

Thanks for your quick response and positive comments.
Can you confirm if there is anything further you will require us to do to formally get this approved?

Thanks
[redacted]

[redacted]
Principal Drainage Engineer - Transportation Engineering

O [redacted]
M
E

SLR Consulting Limited
5th Floor, 35 Dale Street, Manchester, United Kingdom M1 2HF




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From [redacted]
Sent: Thursday, October 3, 2024 8:27 AM
To: [redacted]
Cc: FR Planning <FR.Planning@cambridgeshire.gov.uk>; [redacted]
Subject: RE: WoodWalton drainage discharge of conditions (22/80082/COND)

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Good morning [redacted]

In principle, the proposals appear acceptable to the LLFA.

Kind regards

[redacted]
SuDS and Flood Risk Officer
M: [redacted]
Flood Risk Team

Alconbury Weald Civic Hub, Emery Crescent, Enterprise Campus, Alconbury Weald, PE28 4YE

Upcoming Leave: 4th – 14th Oct

From [redacted]
Sent: Wednesday, October 2, 2024 2:23 PM
To: FR Planning <FR.planning@Cambridgeshire.gov.uk>

Cc: [redacted]
Subject: WoodWalton drainage discharge of conditions (22/80082/COND)

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Hi

For the attention of [redacted]

Further to the attached condition discharge for the Anesco Site at WoodWalton, we have subsequently been asked to update the design due to the IDB requirement for limited flows into watercourse. I have attached the updated design for a swale with the capacity to store the 1 in 100 year plus CC event in its entirety with no positive discharge location into the watercourse. We anticipate the water to the infiltrate/percolate away over a period of time. Should there be an event that causes the swale to overtop there is a designed weir to allow managed flow to the be directed away from the site infrastructure and into the watercourse.

Please see attached the previous condition discharge, the updated plan and associated modelling works.

Are you able to provide comment on the design and an acceptance this is means the condition.

Thank you in advance.

[redacted]
Principal Drainage Engineer - Transportation Engineering

O [redacted]
M
E

SLR Consulting Limited
5th Floor, 35 Dale Street, Manchester, United Kingdom M1 2HF

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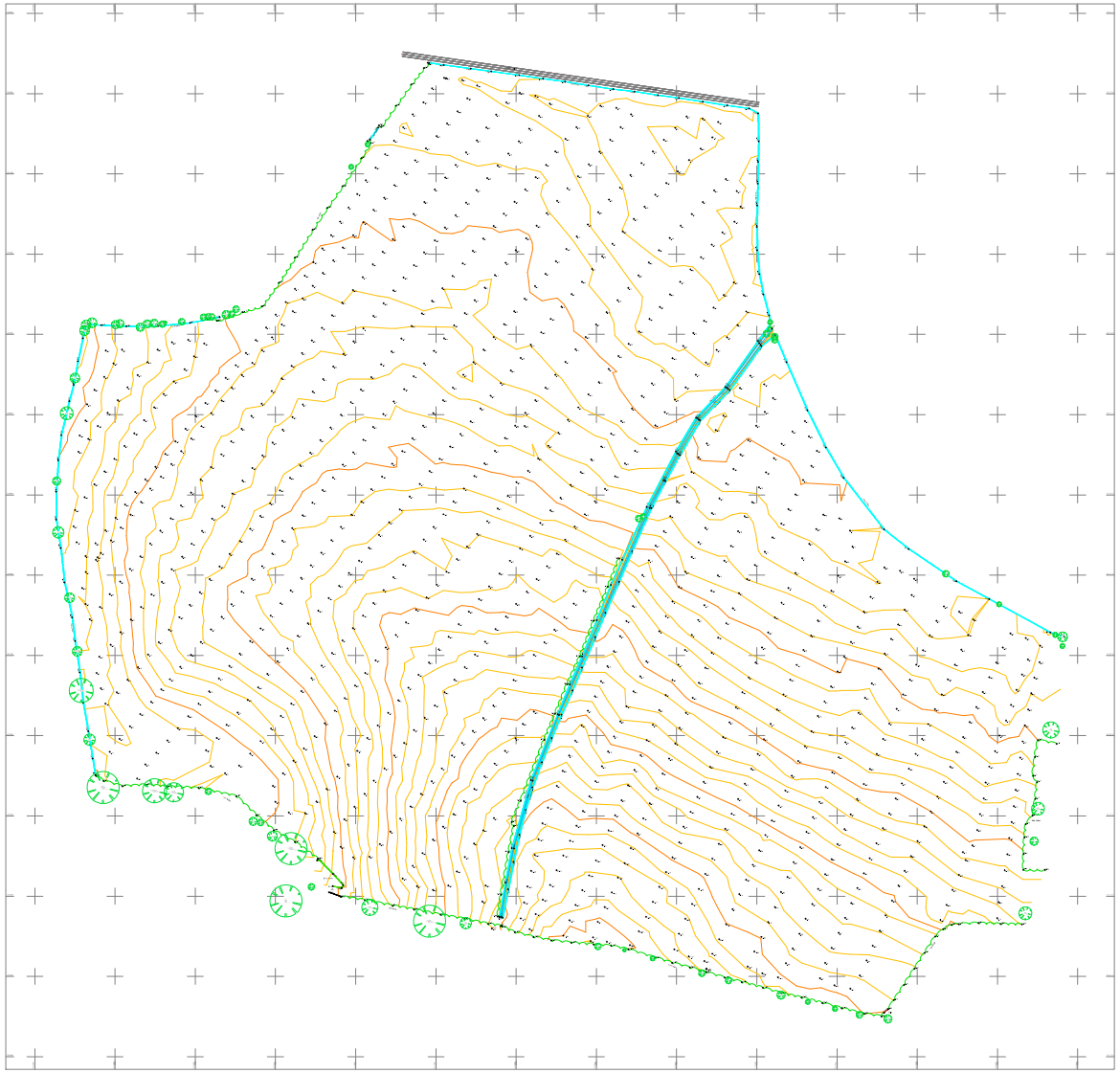
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APPENDIX 02

Site Topographical Survey



N

NOTES

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID, HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCES.

LOCAL SCALE FACTOR 1.000

ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM GENERATED BY ACTIVE GPS NETWORK.

DRAINAGE:

NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ACCESS TO MANHOLES OR CHAMBERS, ANY PIPE SIZES, DEPTHS OR BELOW GROUND DIMENSIONS ARE TAKEN FROM THE SURFACE AND THUS WILL BE APPROXIMATE ONLY. ANY FLOW TYPES (FOUL WATER, SURFACE WATER OR COMBINED) ARE ASSUMED AND THEREFORE REQUIRE VERIFICATION.

EVERY EFFORT HAS BEEN MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES, HOWEVER IT IS POSSIBLE THAT THERE MAY BE ITEMS THAT WERE OBSCURED AT THE TIME OF SURVEY.

TREES:

TREE DIAMETER MEASURED APPROXIMATELY 1.2M ABOVE GROUND LEVEL, TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE GENERAL SIZE CANOPY SIZE, TREE BOLE MAY NOT BE CENTRAL TO THE CANOPY, TREE HEIGHT ESTIMATED FROM GROUND LEVEL.

ONLY TREES OF STEM > 100MM HAVE BEEN SHOWN, ONLY THOSE TREES THAT FALL WITHIN THE SITE LAND IS HAVE BEEN SURVEYED UNLESS OTHERWISE SPECIFIED.

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LEGEND

- BANK TOP
- BANK BOTTOM
- BUILDING
- EARTH & STONE HEDGE
- DITCH BOTTOM
- DITCH TOP
- MISCELLANEOUS
- OVERHEAD CABLE
- RIDGE
- ROAD CHANNEL
- STEPS
- UNDERGROWTH
- WALL
- TOP OF WALL
- ROAD MARKINGS

ABBREVIATIONS

Arc	ARCH LEVEL	OHC	OVERHEAD CABLE
AV	AIR VALVE	OSBM	OS BENCHMARK
BL	BOLLARD	PO	POST
BR	BELISHA BEACON	PR	POST & RAIL FENCE
BH	BOREHOLE	PW	POST & WIRE FENCE
BT	BT COVER	RE	RODDING EYE
B/W	BARBED WIRE FENCE	RF	ROOF FACE
CB	CLOSE BOARD FENCE	RP	REFLECTOR POST
CC	CONCRETE POST	RW	RETAINING WALL
CL	COVER LEVEL	SAP	SIGN PLATE
CT	CCTV	SEC	SECURITY CAMERA
D	DIAMETER	SDY	STRIP GULLY
DK	DROPPED KERB	SI	SIGN POST
DP	DOWNPIPE	Sofit	SOFFIT LEVEL
EC	ELECTRIC INSP. COVER	SV	STOP VALVE
EP	ELECTRICITY POLE	SY	CABLE STAY
ER	EARTH ROD	TCB	TELEPHONE KIOSK
FH	FIRE HYDRANT	TOW	TOP OF WALL
FL	FLOOR LEVEL	TPH	TOP OF HEDGE
FP	FLAG POLE	TP	TELEPHONE POLE
GU	GULLY	TRK	TRACK LINE
G&D	GULLY & DOWNPIPE	TL	TRAFFIC LIGHT
GP	GATE POST	VP	VENT PIPE
GV	GAS VALVE	W/P	WOODEN PANEL FENCE
IC	INSPECTION COVER	W/M	WIRE MESH FENCE
IL	INVERT LEVEL	WLV	WATER LEVEL
I/R	IRON RAILING FENCE	WM	WATER METER
KO	KERB OUTLET	WT	WATER TAP
LP	LAMP POST		
M	MANHOLE		
MKR	MARKER		
O/HB	OVERHEAD BUILDING		

STATION CO-ORDINATES

Rev	Date	Revision Notes	By
-	-	-	-

DO NOT SCALE

Project

Double Bank Lane
Woodwalton
Huntingdon,Cambridgeshire
PE28 5YL

Drawing Title

Topographic Survey

Originator

3D Land Surveys Ltd
Reen Cottage
Reen Manor Farm
Perranporth
Cornwall
TR6 0AJ

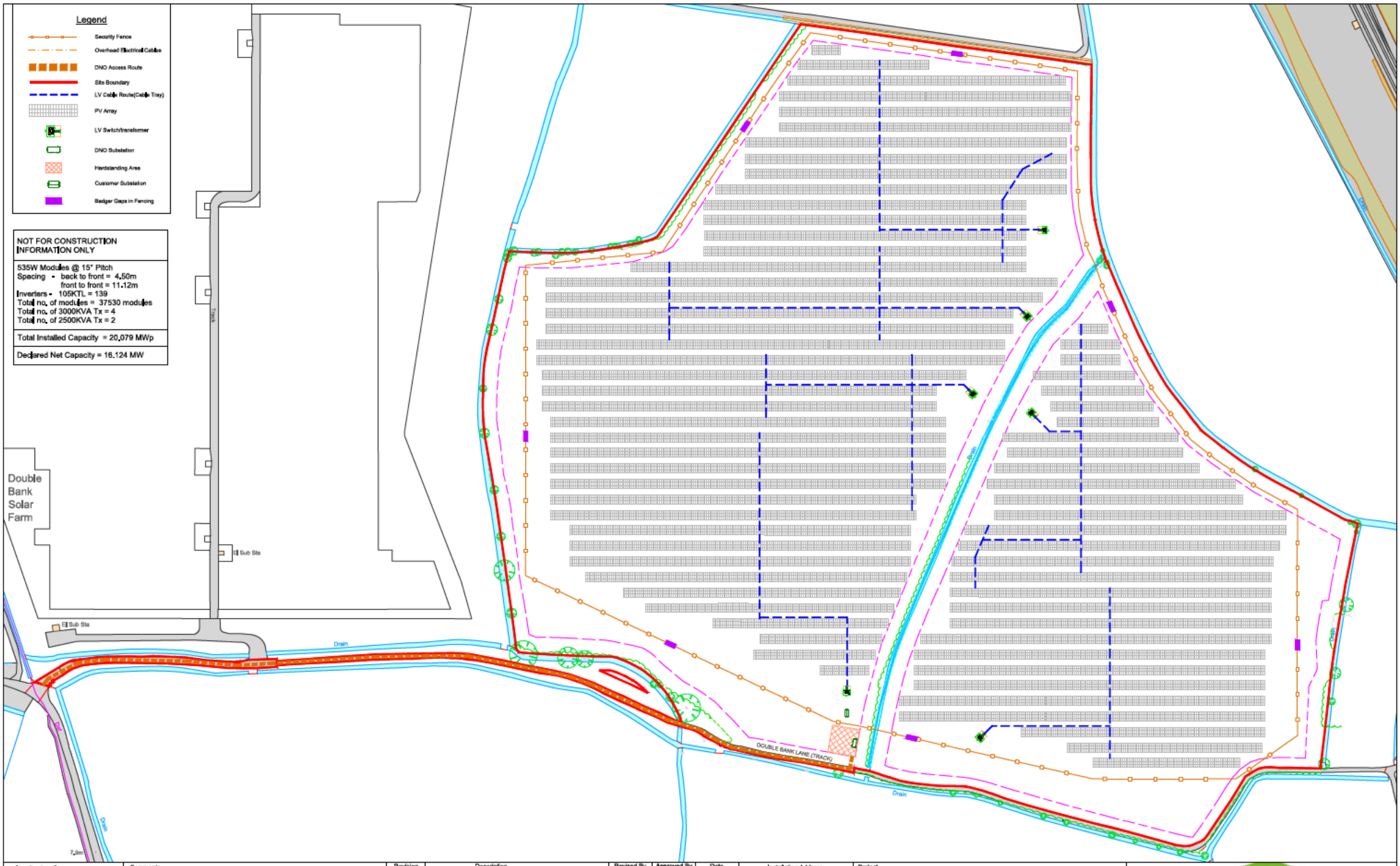
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Drawn By	Checked By	Publish Date	Scale(s)
BRO	BRO	20/01/21	1:1000 @ A1

Project No.	Drawing No.	Revision
20-000	Topo_01_20	0

APPENDIX 03

Proposed Site Plan



Installer Details

Anesco Ltd.
The Green,
Easter Park,
Benyon Road,
Reading,
RG7 2PQ
Tel: 0845 894 4444

Comments

SITE AREA: 59.66 Acres / 24.14ha
GRID REFERENCE: TL 20463 81318

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Revision	Description	Revised By	Approved By	Date
A	Issued for comment	JH		02/02/2021
B	Redesign using 105KTL Inverters	JH		16/02/2021
C	Previous design used with Bager Gaps added to fencing	JH		02/03/2022
D	Various amendments	JH		22/03/2022
E	10m wide maintenance gap added along NE boundary	PJB		07/06/2022

Scale	Drawn By	Checked By	Signed by PM	Date Checked	Page	Sheet
1:2500 @ A3	JH				1 of 1	A3

Installation Address

DOUBLE BANK LANE,
WOODWALTON,
HUNTINGDON,
CAMBRIDGESHIRE,
PE28 5YL

Project

WOODWALTON TWO

Title

SITE LAYOUT PLANNING

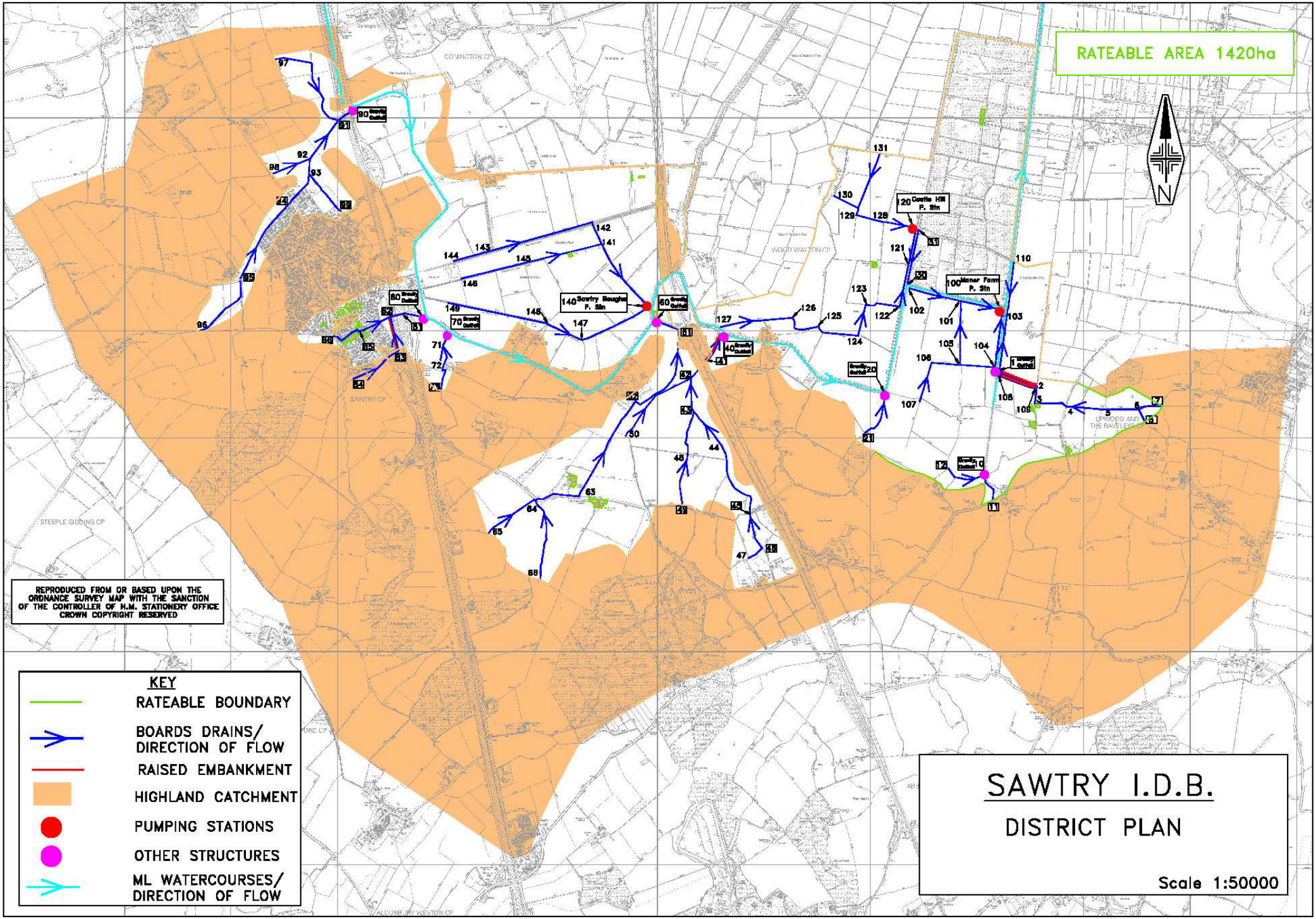
Drawing No. C0002445_01_PL

Rev. E

Anesco™ AMAZING ENERGY

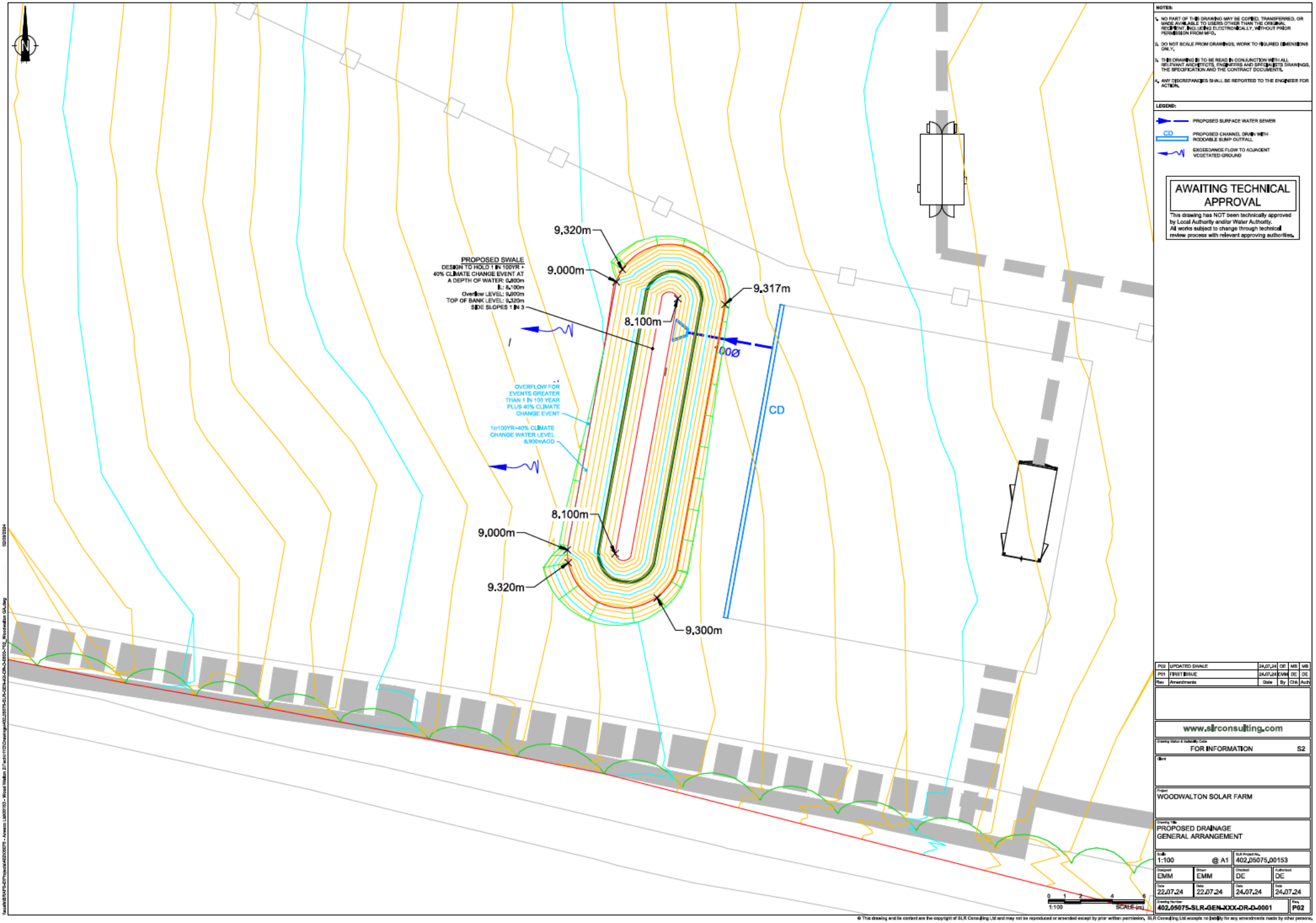
APPENDIX 04

Sawtry IDB Management Area


RATEABLE AREA 1420ha
N
Sawtry Roughs P. Stn
Castle Hill P. Stn
Manor Farm P. Stn
COVINGTON CP
WOOD WALTON CP
SAWTRY CP
STEEPLE GIDDING CP
ALCONBURY WESTON CP
KEY
RATEABLE BOUNDARY
BOARDS DRAINS/ DIRECTION OF FLOW
RAISED EMBANKMENT
HIGHLAND CATCHMENT
PUMPING STATIONS
OTHER STRUCTURES
ML WATERCOURSES/ DIRECTION OF FLOW
REPRODUCED FROM OR BASED UPON THE ORDNANCE SURVEY MAP WITH THE SANCTION OF THE CONTROLLER OF H.M. STATIONERY OFFICE CROWN COPYRIGHT RESERVED
SAWTRY I.D.B.
DISTRICT PLAN
Scale 1:50000

APPENDIX 05

Drainage Details Drawing



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4. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR ACTION.

LEGEND:

- PROPOSED SURFACE WATER SEWER
- CD — PROPOSED CHANNEL DRAIN WITH RODDABLE SUMP OUTFALL
- EXCEEDANCE FLOW TO ADJACENT VEGETATED GROUND

AWAITING TECHNICAL APPROVAL

This drawing has NOT been technically approved by Local Authority and/or Water Authority. All works subject to change through technical review process with relevant approving authorities.

Rev	Amendments	Date	By	Chk	Auth
P02	UPDATED SWALE	24.07.24	DE	MB	MB
P01	FIRST ISSUE	24.07.24	EMM	DE	DE

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Drawing Status & Suitability Code: FOR INFORMATION — S2

Client:

Project: WOODWALTON SOLAR FARM

Drawing Title: PROPOSED DRAINAGE GENERAL ARRANGEMENT

Scale		SLR Project No.	
1:100	@ A1	402.05075.00153	
Designed: EMM	Drawn: EMM	Checked: DE	Authorised: DE
Date: 22.07.24	Date: 22.07.24	Date: 24.07.24	Date: 24.07.24
Drawing Number: 402.05075-SLR-GEN-XXX-DR-D-0001			Rev. P02

0 1 2 4 6
1:100 SCALE (m)

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APPENDIX 06

Causeway Flow Network Model Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.600
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWALE01			9.000		520457.785	281317.671	0.900
SWALE02			9.000		520454.912	281301.930	0.900
SW01			8.800	1200	520452.519	281299.833	0.290
GULLY01	0.040	5.00	9.630		520479.224	281307.545	0.450

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	SWALE01	SWALE02	16.001	0.030	8.100	8.100	0.000	0.0	1000	5.59	50.0
1.000	GULLY01	SWALE01	23.710	0.600	9.180	8.600	0.580	40.9	100	5.33	50.0
1.002	SWALE02	SW01	3.182	0.030	8.520	8.510	0.010	318.2	150	5.85	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	1.000	4000.0	5.4	-0.100	-0.100	0.040	0.0	0	∞
1.000	1.209	9.5	5.4	0.350	0.300	0.040	0.0	54	1.250
1.002	0.209	3.7	5.4	0.330	0.140	0.040	0.0	150	0.213

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	16.001	0.0	1000	1:3 Swale	9.000	8.100	-0.100	9.000	8.100	-0.100
1.000	23.710	40.9	100	Circular	9.630	9.180	0.350	9.000	8.600	0.300
1.002	3.182	318.2	150	Circular	9.000	8.520	0.330	8.800	8.510	0.140

Link	US Node	Node Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	SWALE01	Junction	SWALE02		Junction	
1.000	GULLY01	Junction	SWALE01		Junction	
1.002	SWALE02	Junction	SW01	1200	Manhole	Adoptable

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWALE01	520457.785	281317.671	9.000	0.900		1	1.000	8.600	100
									
						0	1.001	8.100	1000
SWALE02	520454.912	281301.930	9.000	0.900		1	1.001	8.100	1000
									
						0	1.002	8.520	150
SW01	520452.519	281299.833	8.800	0.290	1200	1	1.002	8.510	150
									
GULLY01	520479.224	281307.545	9.630	0.450					
						0	1.000	9.180	100

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Node SWALE02 Online Head/Flow Control

Flap Valve	x	Replaces Downstream Link	✓
Downstream Link	1.002	Invert Level (m)	8.520

Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.001	0.000	9.999	0.000

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Results for 1 year Critical Storm Duration. Lowest mass balance: 91.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWALE01	1440	8.478	0.378	0.4	0.0000	0.0000	OK
1440 minute winter	SWALE02	1440	8.478	0.378	0.2	0.0000	0.0000	OK
15 minute winter	SW01	1	8.510	0.000	0.0	0.0000	0.0000	OK
15 minute winter	GULLY01	10	9.241	0.061	6.7	0.1088	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWALE01	1.001	SWALE02	0.2	0.013	0.000	12.9228	
1440 minute winter	SWALE02	Head/Flow	SW01	0.0				0.0
15 minute winter	GULLY01	1.000	SWALE01	6.5	1.303	0.686	0.1186	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 91.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWALE01	1680	8.660	0.560	0.8	0.0000	0.0000	OK
1440 minute winter	SWALE02	1680	8.660	0.560	0.4	0.0000	0.0000	OK
15 minute winter	SW01	1	8.510	0.000	0.0	0.0000	0.0000	OK
15 minute winter	GULLY01	11	9.630	0.450	16.5	1.0695	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWALE01	1.001	SWALE02	0.4	0.013	0.000	24.0311	
1440 minute winter	SWALE02	Head/Flow	SW01	0.0				0.0
15 minute winter	GULLY01	1.000	SWALE01	12.8	1.636	1.348	0.1836	

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 91.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWALE01	1680	8.900	0.800	1.3	0.0000	0.0000	OK
1440 minute winter	SWALE02	1680	8.900	0.800	0.7	0.0000	0.0000	FLOOD RISK
15 minute winter	SW01	1	8.510	0.000	0.0	0.0000	0.0000	OK
15 minute winter	GULLY01	8	9.630	0.450	29.9	3.6344	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWALE01	1.001	SWALE02	0.7	0.013	0.000	43.5634	
1440 minute winter	SWALE02	Head/Flow	SW01	0.0				0.0
15 minute winter	GULLY01	1.000	SWALE01	19.5	2.498	2.058	0.1836	

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