

**Generation Compound
Land East of Chickenhall
Eastleigh
SO50 6RQ**

Surface Water Drainage Design

September 2022



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Document title	Surface Water Drainage Design
Status	Rev A – Initial Issue Rev B – Amended to suit revised site layout
Date	Rev A – April 2022 Rev B – September 2022
Project name	Generation Compound, Land East of Chickenhall, Eastleigh, SO50 6RQ
Project number	0541
Client	Conrad Energy

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APPENDIX A – DRAWINGS

APPENDIX B – CALCULATIONS

1. INTRODUCTION

- 1.1 This document has been prepared for the discharge of Condition 5 of planning application F/21/91345 for development of a generation compound on land to the east of Chickenhall, Eastleigh, SO50 6RQ. The location of the site is shown below.

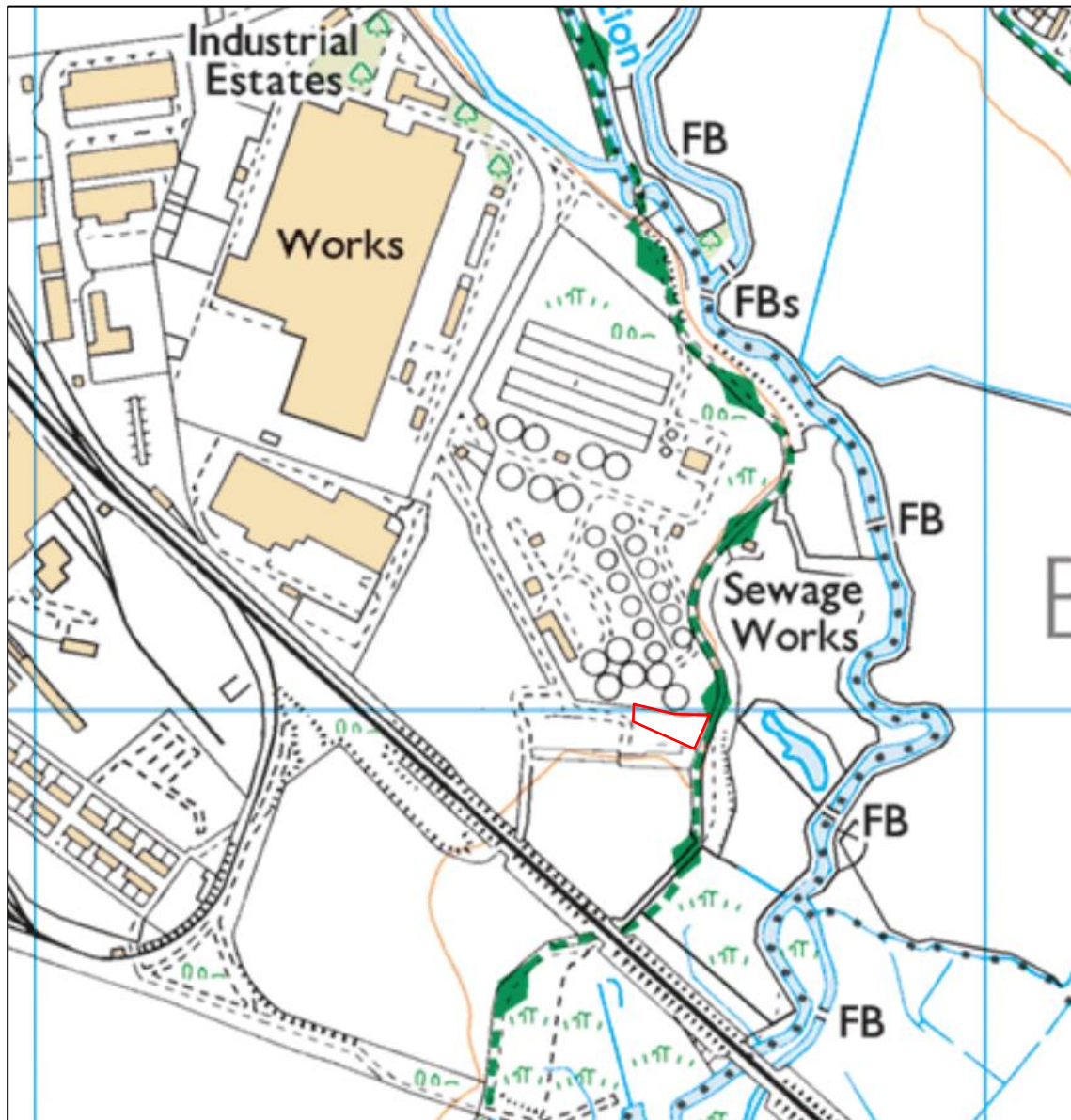


Figure 1 – Location Plan

- 1.2 A topographic survey of the site and drawings of the development are included in Appendix A.
- 1.3 Once operational the site will result in one vehicular visit every 2-3 weeks.
- 1.4 All apparatus containing potentially environmentally harmful substances will be provided with bunds. The capacity of each bund will be 110% of the volume of the stored substance.
- 1.5 This report builds on the information provided in the Surface Water Drainage Strategy report (Pitman Associates, July 2021) submitted in support of the original planning application.

2. CONSTRAINTS

2.1 A number of ground investigations have been carried out at the site and the development area immediately to the south, including:

- Percolation tests undertaken by ACS in August 2017 – these showed infiltration in the vicinity of the site to be in the range of $2.1 \times 10^{-4} \text{m/s}$ to $2.3 \times 10^{-5} \text{m/s}$. A record of the tests is included in Appendix B.
- A Geo-environmental Assessment (Ground Investigation) by Jomas in March 2018 included groundwater level monitoring. This report is included in Appendix C.

2.2 The results of the groundwater monitoring are summarised below. The levels shown have been established by deducting the depth at which groundwater stabilised from the ground levels shown on the topographic survey in Appendix A.

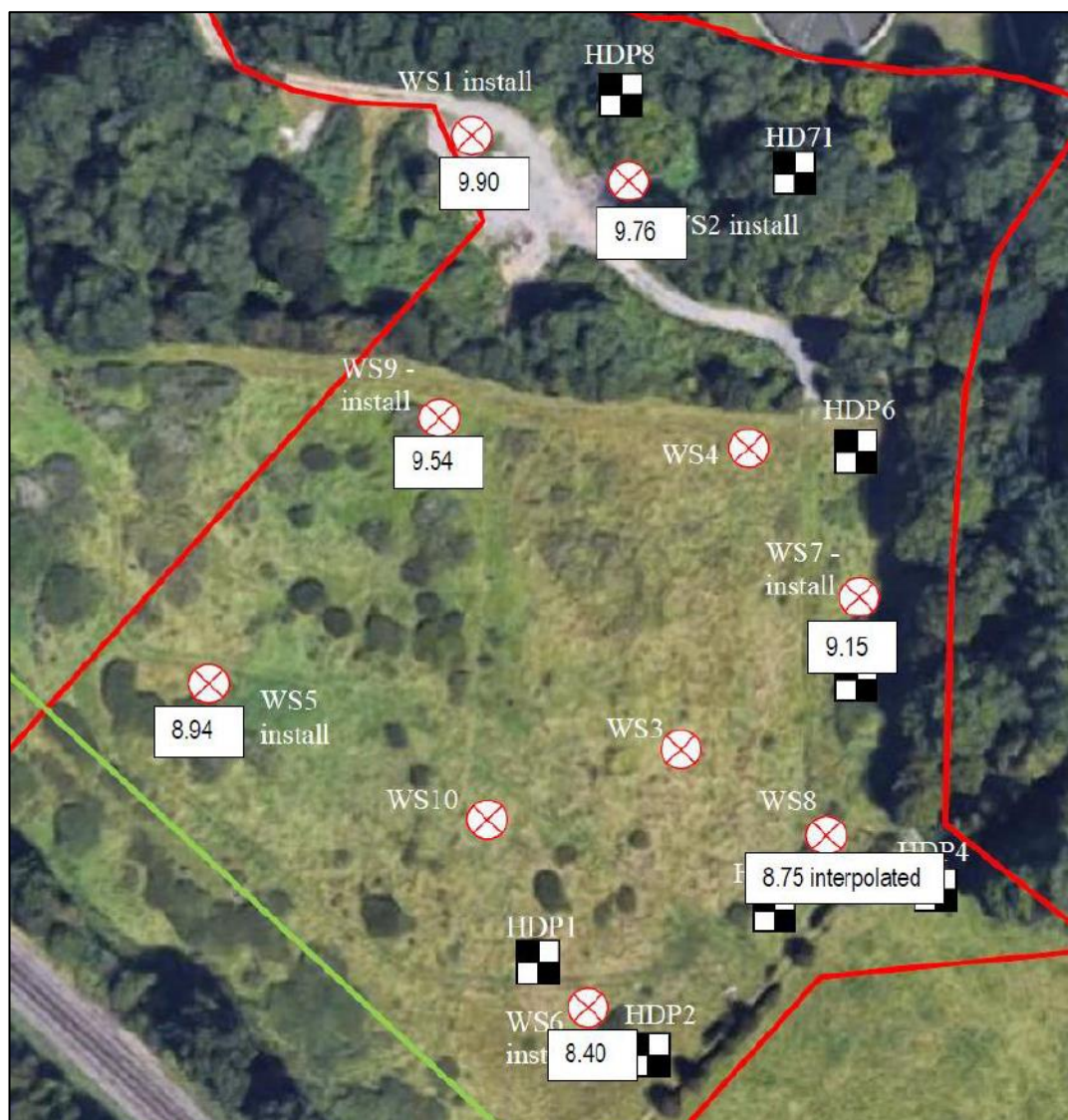


Figure 2 – Groundwater Levels

2.3 Groundwater levels in the vicinity of the site were shown to be approximately 1m below ground level. The impact of this will be to limit infiltration features to shallow, permeable surfaces.

3. PROPOSED SURFACE WATER DRAINAGE DESIGN

- 3.1 It is proposed to dispose of runoff from the site by means of infiltration. This will be achieved by limiting impermeable areas to the concrete bases and plinths required to support the generation apparatus. The remainder of the site will be constructed of a permeable aggregate overlying a geotextile membrane.
- 3.2 Areas of the site that are subject to traffic loading will be constructed with a gravel-retaining grid system appropriate to withstand the loading from operational traffic, which is anticipated to be one van every 2-3 weeks.
- 3.3 Drawing DR-001 in Appendix A shows the proposed surface water drainage layout.
- 3.4 A MicroDrainage model of the proposed infiltration blanket and relevant simulations are included in Appendix B. The calculations show that there will be no flooding for rainfall events up to the 100year return period plus a 45% allowance for the possible impact of climate change.
- 3.5 To ensure all runoff is retained within the site it is proposed to install an impermeable membrane along the northern and eastern boundaries of the site. The detail for the membrane is shown on drawing DR-001 in Appendix A. The membrane will prevent runoff from the site flowing onto the adjacent Stanford Meadow SINC (Site of Important Nature Conservation).
- 3.6 In the event that the capacity of the drainage system is exceeded runoff will be directed to the swale to the south of the site. This will be achieved by setting the top of the impermeable membrane along the northern and eastern boundaries above ground level adjacent to the swale.
- 3.7 From the MicroDrainage calculation in Appendix B it can be seen that for the 1000year return period rainfall event the predicted volume of flooding is approximately 12m³. The route of the exceedance paths will be as shown in Figure 3 below.



Figure 3 – Exceedance Flowpaths

4. MAINTENANCE

- 4.1 The drainage system will be maintained by the site operator in accordance with the following schedule.

1. Remove litter and debris - monthly (or as required).
2. Manage adjacent vegetation to ensure no encroachment – monthly (or as required).
3. Remove weeds using an applicator applied directly to the weed (as required).

In addition to the above, routine monitoring of the surface will be carried out for evidence of poor operation. Remedial work shall be carried out as necessary. This might include localised replacement of aggregate and/or the geotextile membrane.

5. TREATMENT

- 5.1 The following table shows the pollution hazard indices for the site as set out in Table 26.2 of the SuDS Manual.

Area	Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Access road	Medium	0.5	0.4	0.4

Table 5.1 – Pollution Hazard Indices

- 5.2 Runoff from the site will pass through the granular surface and the subsoil before reaching the water table. The mitigation indices for this treatment train will be as shown in the following table.

Area	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Permeable pavement	0.7	0.6	0.7

Table 5.2 – Pollution Mitigation Indices for Runoff From Site

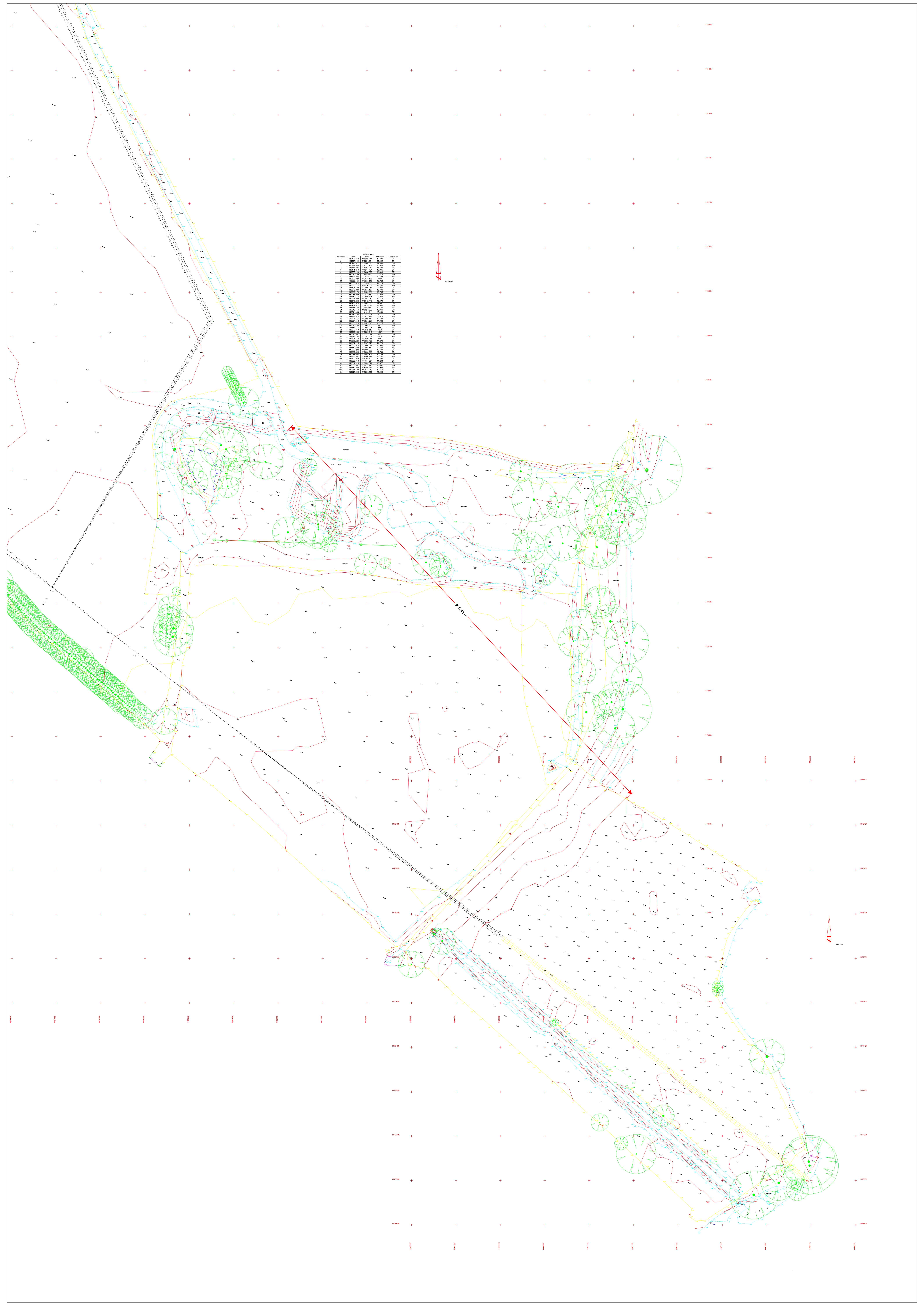
- 5.3 From the above tables it can be seen that runoff from the site will be treated in accordance with the best practice requirements described in the SuDS Manual.

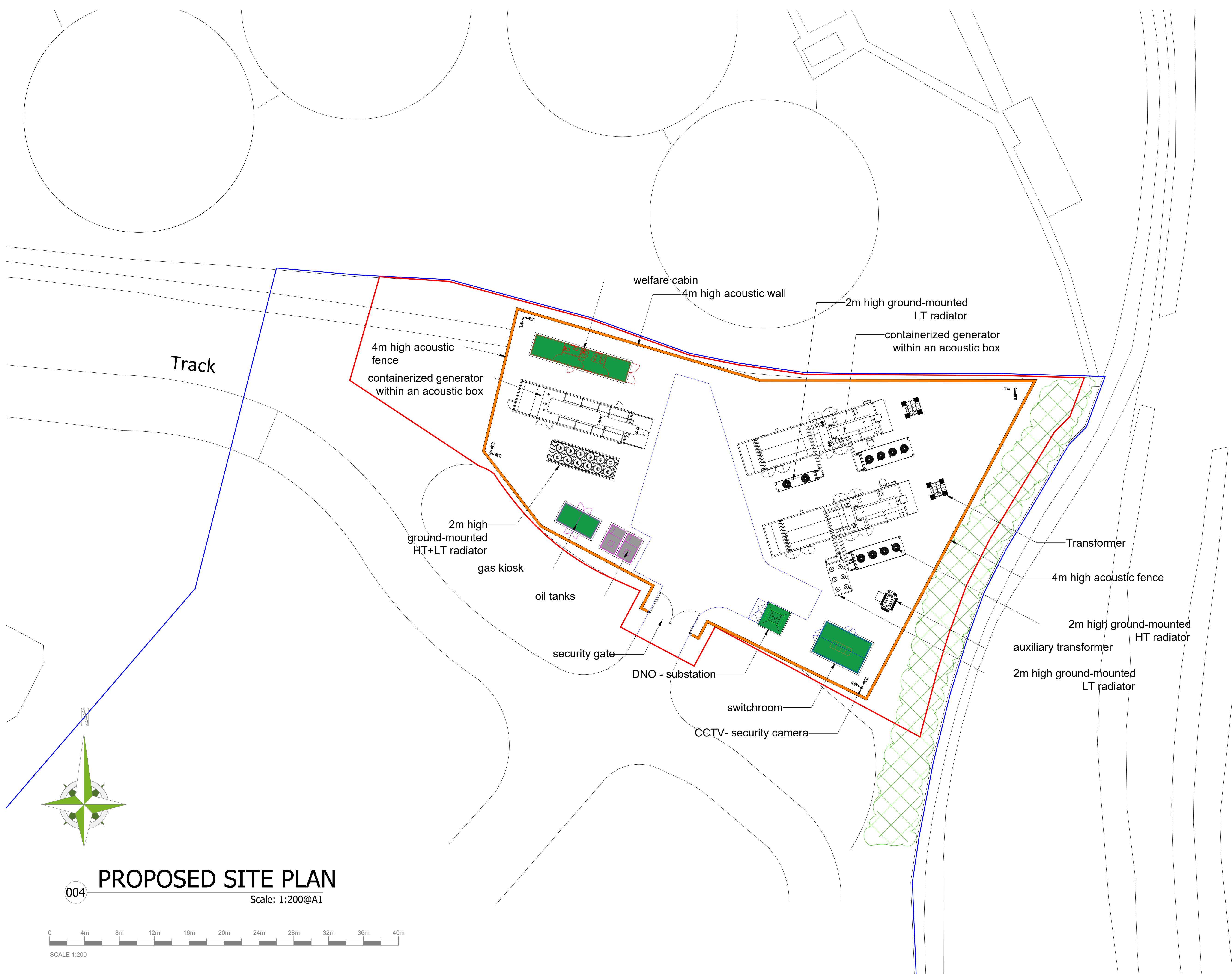
Surface Water Drainage Design

Generation Compound, Land East of Chickenhall, Eastleigh, SO50 6RQ

APPENDIX A DRAWINGS

DR-001	Topographic Survey
	Proposed Site Plan
	Surface Water Drainage Strategy





PLANNING PLAN

LEGEND:

SITE INFRASTRUCTURE:

LANDLORDS PROPERTY

PROPOSED SITE

DRIVE ACCESS

EXISTING ACCESS OFF CHICKEN HALL LANE

ACOUSTIC FENCE

GENERATORS + GROUND MOUNTED RADIATOR

TRANSFORMER

GAS GOVERNOR AND METERING KIOSK

AMENITY CABIN

CLEAN/WASTE - BOUNDED OIL TANKS

SWITCH ROOM

AUXILIARY TRANSFORMER

SUBSTATION

CCTV COLUMN

LANDSCAPING

J

Layout + Engine position and radiators reconfigured

19-07-22

I

Radiator configuration amended

06-07-22

H

Revised LT Rad on the 2.4Mw

05-07-22

G

Site layout reconfigured

04-07-22

F

Site layout reconfigured

12-05-22

E

engine type altered - ground radiators

05-01-22

D

planning boundary amended

28-07-21

C

land marked for landlord's DNO removed

01-07-21

B

Oil tank added

24-06-21

A

extent of retained lane and scale amended

26-04-21

rev

revision notes

date

REVISIONS

Planning

ALL DIMENSIONS TO BE CHECKED ON SITE
WORK TO FIGURED DIMENSIONS ONLY
REPORT DISCREPANCIES TO CONRAD ENERGY LTD
AT ONCE BEFORE PROCEEDING
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Project Title:
GENERATION COMPOUND
LAND EAST OF CHICKEN HALL
EASTLEIGH
SO50 6RQ

Drawing Title:
PROPOSED SITE PLAN

Scale @A1: 1:200

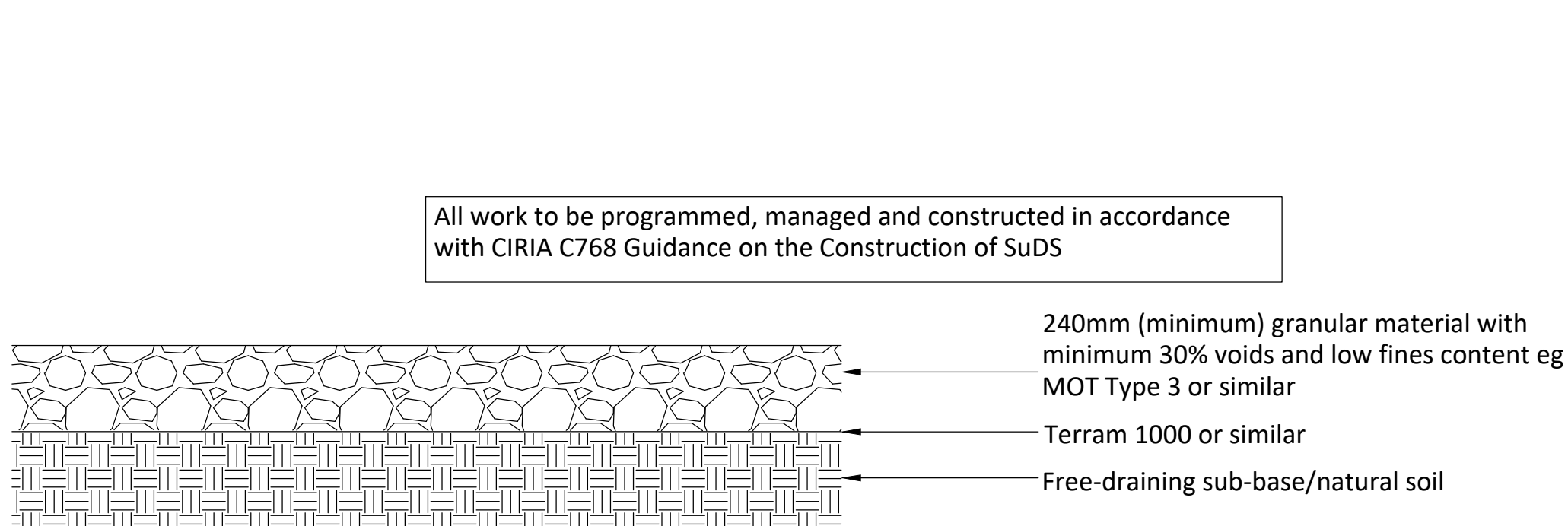
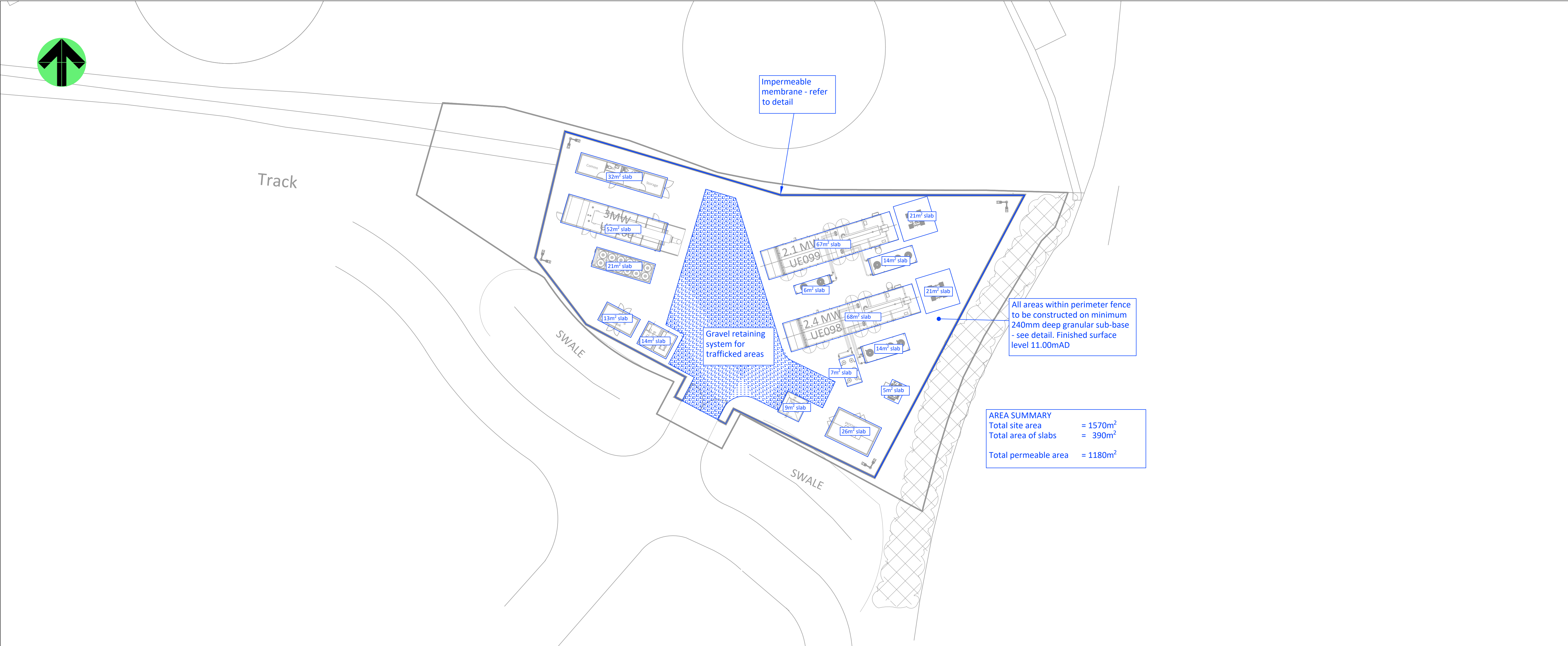
Date: 22.04.2021

Drawn: ST

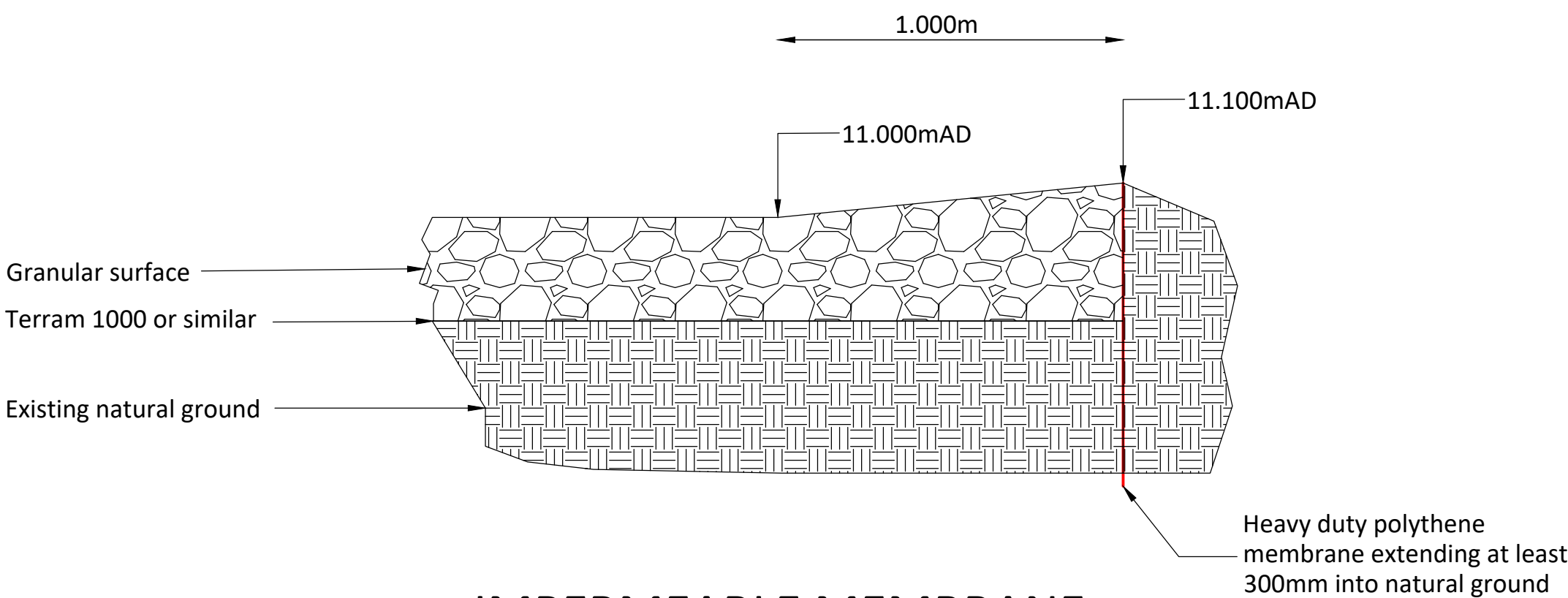
Checked: JS

Drawing No: 20011-PL-004

Rev: J



PERMEABLE AGGREGATE SURFACE



IMPERMEABLE MEMBRANE

NOTES

REV	DATE	DESCRIPTION
A	28.07.2021	Initial issue
B	11.04.2022	Vertical membrane added
C	23.09.2022	Updated to suit amended site layout

CLIENT: CONRAD ENERGY

PROJECT: GENERATION COMPOUND, EASTLEIGH

TITLE: SURFACE WATER DRAINAGE LAYOUT

REV: C	PROJECT No: 0541	DRAWING No: DR-001
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SCALE @ A1: 1:250



**APPENDIX B
CALCULATIONS**

- 1. Proposed drainage 100yr+45%**
- 2. Proposed drainage 1000yr**

1. Proposed drainage 100yr+45%

The MicroDrainage model below is based on the areas shown on DR-001 in Appendix A.

The worst-case result from the infiltration tests in Appendix B has been used.

From p1 it can be seen that the peak water depth in the granular material would be 283mm for the 100yr+45% rainfall event.

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Date 23/09/2022 14:59	Designed by Karl	
File Infiltration Blanket - Rev B.SRCX	Checked by	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 311 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	10.828	0.128	2.7	45.3	Flood Risk
30 min Summer	10.875	0.175	2.7	61.9	Flood Risk
60 min Summer	10.922	0.222	2.7	78.4	Flood Risk
120 min Summer	10.962	0.262	2.7	92.7	Flood Risk
180 min Summer	10.977	0.277	2.7	98.2	Flood Risk
240 min Summer	10.982	0.282	2.7	99.8	Flood Risk
360 min Summer	10.982	0.282	2.7	100.0	Flood Risk
480 min Summer	10.979	0.279	2.7	98.8	Flood Risk
600 min Summer	10.974	0.274	2.7	97.0	Flood Risk
720 min Summer	10.968	0.268	2.7	94.8	Flood Risk
960 min Summer	10.953	0.253	2.7	89.7	Flood Risk
1440 min Summer	10.923	0.223	2.7	78.8	Flood Risk
2160 min Summer	10.879	0.179	2.7	63.4	Flood Risk
2880 min Summer	10.841	0.141	2.7	49.9	Flood Risk
4320 min Summer	10.785	0.085	2.7	30.0	Flood Risk
5760 min Summer	10.755	0.055	2.7	19.3	Flood Risk
7200 min Summer	10.745	0.045	2.5	16.0	Flood Risk
8640 min Summer	10.740	0.040	2.2	14.0	Flood Risk
10080 min Summer	10.735	0.035	1.9	12.5	Flood Risk
15 min Winter	10.828	0.128	2.7	45.3	Flood Risk
30 min Winter	10.875	0.175	2.7	61.8	Flood Risk
60 min Winter	10.921	0.221	2.7	78.4	Flood Risk
120 min Winter	10.962	0.262	2.7	92.7	Flood Risk
180 min Winter	10.978	0.278	2.7	98.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	135.062	0.0	18
30 min Summer	90.740	0.0	33
60 min Summer	58.134	0.0	62
120 min Summer	35.913	0.0	122
180 min Summer	26.669	0.0	182
240 min Summer	21.426	0.0	240
360 min Summer	15.778	0.0	310
480 min Summer	12.674	0.0	372
600 min Summer	10.684	0.0	434
720 min Summer	9.287	0.0	502
960 min Summer	7.438	0.0	638
1440 min Summer	5.429	0.0	910
2160 min Summer	3.954	0.0	1300
2880 min Summer	3.153	0.0	1672
4320 min Summer	2.288	0.0	2340
5760 min Summer	1.820	0.0	3000
7200 min Summer	1.525	0.0	3672
8640 min Summer	1.320	0.0	4408
10080 min Summer	1.169	0.0	5144
15 min Winter	135.062	0.0	18
30 min Winter	90.740	0.0	33
60 min Winter	58.134	0.0	62
120 min Winter	35.913	0.0	120
180 min Winter	26.669	0.0	176

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	10.983	0.283	2.7	100.0	Flood Risk
360 min Winter	10.982	0.282	2.7	99.9	Flood Risk
480 min Winter	10.976	0.276	2.7	97.7	Flood Risk
600 min Winter	10.968	0.268	2.7	95.0	Flood Risk
720 min Winter	10.959	0.259	2.7	91.7	Flood Risk
960 min Winter	10.937	0.237	2.7	84.0	Flood Risk
1440 min Winter	10.891	0.191	2.7	67.7	Flood Risk
2160 min Winter	10.829	0.129	2.7	45.6	Flood Risk
2880 min Winter	10.781	0.081	2.7	28.6	Flood Risk
4320 min Winter	10.745	0.045	2.4	15.8	Flood Risk
5760 min Winter	10.736	0.036	1.9	12.6	Flood Risk
7200 min Winter	10.730	0.030	1.6	10.6	Flood Risk
8640 min Winter	10.726	0.026	1.4	9.2	Flood Risk
10080 min Winter	10.723	0.023	1.2	8.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	21.426	0.0	232
360 min Winter	15.778	0.0	338
480 min Winter	12.674	0.0	382
600 min Winter	10.684	0.0	458
720 min Winter	9.287	0.0	534
960 min Winter	7.438	0.0	684
1440 min Winter	5.429	0.0	966
2160 min Winter	3.954	0.0	1344
2880 min Winter	3.153	0.0	1672
4320 min Winter	2.288	0.0	2248
5760 min Winter	1.820	0.0	2952
7200 min Winter	1.525	0.0	3744
8640 min Winter	1.320	0.0	4416
10080 min Winter	1.169	0.0	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.157

Time (mins)	Area
From:	To: (ha)

0	4 0.157
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Model Details

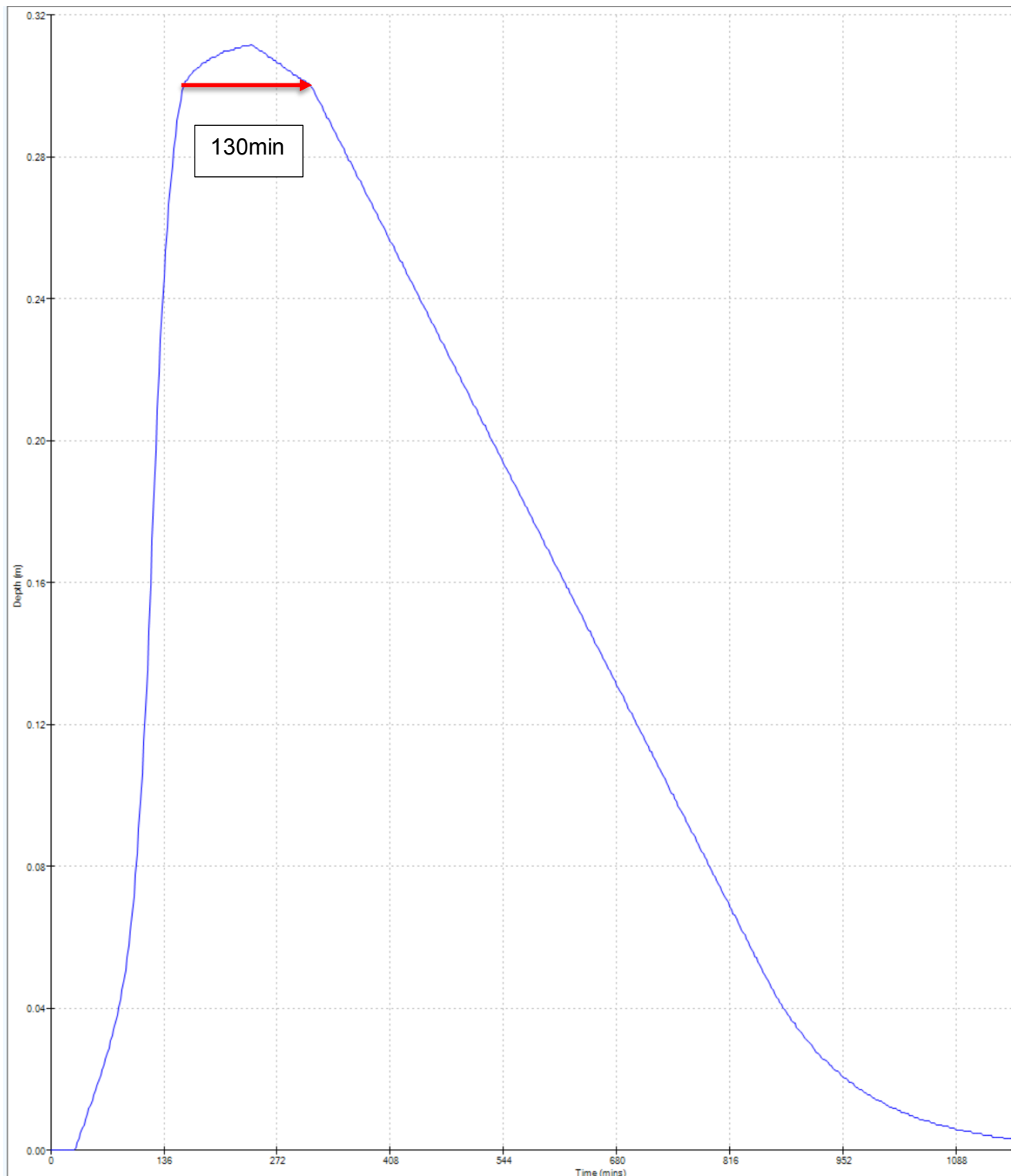
Storage is Online Cover Level (m) 11.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.08280	Width (m)	11.8
Membrane Percolation (mm/hr)	2500	Length (m)	100.0
Max Percolation (l/s)	819.4	Slope (1:X)	0.0
Safety Factor	10.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.700	Membrane Depth (m)	0

2. Proposed drainage 1000yr

The following printout shows that approximately 11.5m³ of flooding is predicted for the 1000yr rainfall event. The graph below indicates that this will occur over a 130min period. Hence the average flood flow rate is approximately 1.5l/s. Assuming the peak rate of flood flow is 2x the average indicates the peak rate of runoff from the site will be approximately 3.0l/s. Since there will be an impermeable membrane along northern and western boundaries, the flood water will flow into the swale to the south at rates and depths which will not present a significant hazard.



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Summary of Results for 1000 year Return Period

Half Drain Time : 377 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	10.847	0.147	2.7	52.2	Flood Risk
30 min Summer	10.905	0.205	2.7	72.6	Flood Risk
60 min Summer	10.963	0.263	2.7	93.1	Flood Risk
120 min Summer	11.004	0.304	2.7	110.5	FLOOD
180 min Summer	11.010	0.310	2.7	116.6	FLOOD
240 min Summer	11.012	0.312	2.7	117.7	FLOOD
360 min Summer	11.011	0.311	2.7	116.9	FLOOD
480 min Summer	11.008	0.308	2.7	114.4	FLOOD
600 min Summer	11.005	0.305	2.7	111.5	FLOOD
720 min Summer	11.002	0.302	2.7	108.3	FLOOD
960 min Summer	10.987	0.287	2.7	101.7	Flood Risk
1440 min Summer	10.949	0.249	2.7	88.3	Flood Risk
2160 min Summer	10.898	0.198	2.7	70.0	Flood Risk
2880 min Summer	10.854	0.154	2.7	54.4	Flood Risk
4320 min Summer	10.789	0.089	2.7	31.6	Flood Risk
5760 min Summer	10.755	0.055	2.7	19.5	Flood Risk
7200 min Summer	10.745	0.045	2.4	15.9	Flood Risk
8640 min Summer	10.739	0.039	2.1	13.8	Flood Risk
10080 min Summer	10.734	0.034	1.9	12.2	Flood Risk
15 min Winter	10.847	0.147	2.7	52.2	Flood Risk
30 min Winter	10.905	0.205	2.7	72.6	Flood Risk
60 min Winter	10.963	0.263	2.7	93.1	Flood Risk
120 min Winter	11.004	0.304	2.7	110.5	FLOOD
180 min Winter	11.011	0.311	2.7	116.8	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	152.779	0.0	19
30 min Summer	104.525	0.0	33
60 min Summer	67.649	0.0	62
120 min Summer	41.737	4.3	122
180 min Summer	30.737	10.4	182
240 min Summer	24.437	11.5	240
360 min Summer	17.787	10.7	336
480 min Summer	14.158	8.2	390
600 min Summer	11.846	5.3	452
720 min Summer	10.231	2.1	514
960 min Summer	8.108	0.0	652
1440 min Summer	5.824	0.0	922
2160 min Summer	4.168	0.0	1316
2880 min Summer	3.280	0.0	1676
4320 min Summer	2.333	0.0	2376
5760 min Summer	1.829	0.0	3000
7200 min Summer	1.514	0.0	3680
8640 min Summer	1.300	0.0	4408
10080 min Summer	1.142	0.0	5144
15 min Winter	152.779	0.0	18
30 min Winter	104.525	0.0	33
60 min Winter	67.649	0.0	62
120 min Winter	41.737	4.3	120
180 min Winter	30.737	10.6	178

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Summary of Results for 1000 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	11.012	0.312	2.7	118.0	FLOOD
360 min Winter	11.011	0.311	2.7	117.5	FLOOD
480 min Winter	11.007	0.307	2.7	113.7	FLOOD
600 min Winter	11.004	0.304	2.7	110.0	FLOOD
720 min Winter	10.999	0.299	2.7	105.9	Flood Risk
960 min Winter	10.973	0.273	2.7	96.7	Flood Risk
1440 min Winter	10.919	0.219	2.7	77.6	Flood Risk
2160 min Winter	10.847	0.147	2.7	52.1	Flood Risk
2880 min Winter	10.791	0.091	2.7	32.3	Flood Risk
4320 min Winter	10.746	0.046	2.5	16.1	Flood Risk
5760 min Winter	10.736	0.036	1.9	12.7	Flood Risk
7200 min Winter	10.730	0.030	1.6	10.5	Flood Risk
8640 min Winter	10.726	0.026	1.4	9.0	Flood Risk
10080 min Winter	10.722	0.022	1.2	7.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	24.437	11.8	234
360 min Winter	17.787	11.3	342
480 min Winter	14.158	7.5	404
600 min Winter	11.846	3.8	468
720 min Winter	10.231	0.0	542
960 min Winter	8.108	0.0	694
1440 min Winter	5.824	0.0	980
2160 min Winter	4.168	0.0	1364
2880 min Winter	3.280	0.0	1700
4320 min Winter	2.333	0.0	2248
5760 min Winter	1.829	0.0	2992
7200 min Winter	1.514	0.0	3680
8640 min Winter	1.300	0.0	4432
10080 min Winter	1.142	0.0	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1000	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.157

Time (mins)	Area
From:	To: (ha)

0	4 0.157
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Model Details

Storage is Online Cover Level (m) 11.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.08280	Width (m)	11.8
Membrane Percolation (mm/hr)	2500	Length (m)	100.0
Max Percolation (l/s)	819.4	Slope (1:X)	0.0
Safety Factor	10.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.700	Membrane Depth (m)	0