- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

jpp

Proposed Artificial Grass Pitch
Northfleet School for Girls
Hall Road
Northfleet
Gravesend

Drainage Strategy

Revision C: January 2026
R-DS-28616-01-C

JPP Consulting Ltd Registered in England 11117245

Registered office

NORTHAMPTON	KETTERING	MILTON KEYNES	POOLE
Grand Union Works	Unit 7	Unit B2A Denbigh Business Centre	Suite 8 Branksome Park House
Whilton Locks	Orion Park | Orion Way	23 First Avenue | Denbigh	Branksome Business Park
Daventry	Kettering	Milton Keynes	Bourne Valley Road | Poole
Northamptonshire	Northamptonshire	Buckinghamshire	Dorset
NN11 2NH	NN15 6PP	MK1 1DN	BH12 1ED
01604 781811	01536 737224	01908 889433	01202 540888

T01 - 8

Proposed Artificial Grass Pitch
Northfleet School for Girls
Hall Road
Northfleet
Gravesend

Drainage Strategy

JPP Consulting Ltd., Grand Union Works, Whilton Locks, Daventry, Northamptonshire, NN11 2NH

T: 01604 781811 **E: mail@jppuk.net** **W: jppuk.net**

Report Reference	R-DS-28616-01-C
Date	Revision C: January 2026

Report Originators

Prepared by

Josh Beverly
Technician
josh.beverly@jppuk.net

Reviewed by

Katherine Rose BSc (Hons) CEnv MIEnvSc MCIHT
Associate
katherine.rose@jppuk.net

Revision	Date	Description	Prepared	Reviewed
0	30th August 2024	First Issue	Josh Beverly	Katherine Rose
A	21st July 2025	Revised following LLFA comments and additional soakaway testing.	Thomas Kirk	Katherine Rose
B	27th August 2025	Revised following consultation comments.	Katherine Rose	Katherine Rose
C	16th January 2026	Revised following consultation comments.	Thomas Kirk	Katherine Rose

Contents

1.0 Introduction 1

1.1 Background 1
1.2 Objectives 1

2.0 Policy review 2

2.1 Introduction 2
2.2 Reference documents 2
2.3 National policy 3
2.4 Local policy 4
2.5 Report history 4

3.0 Description and history of the site and development proposals 5

3.1 Location and description of the site 5
3.2 History of the site 5
3.3 Proposed development 6
3.4 Site topography 6
3.5 Existing drainage infrastructure 6
3.6 Geology of the site and ground investigation data 7

4.0 Management of surface water 9

4.1 Current conditions 9
4.2 Surface water drainage outfalls 9
4.3 Surface water drainage strategy 10
4.4 SUDS assessment 10
4.5 Water quality 11
4.6 Surface water drainage design and management 12
4.7 Infiltration rates 12
4.8 Infiltration requirements – geocellular soakaway 12
4.9 Attenuation requirements – permeable sub-base (AGP) 13
4.10 Overland flows 14

5.0 Foul water drainage strategy 15

6.0 Maintenance 15

6.1 Surface water drainage maintenance 15
6.2 Foul water drainage maintenance 15

7.0 Summary and conclusions 16

Appendices

Appendix A ..... **A**

Topographical Survey ..... A
JPP Surveying drawing no. 27854Y-01 ..... A

Appendix B ..... **B**

General Arrangement Plan ..... B
Labosport Ltd drawing no. 24-004(G-218481) 03 ..... B

Appendix C ..... **C**

Southern Water Asset Plan C

Appendix D ..... **D**

Extract of Ground Investigation ..... D
JPP G&E report ref. R-SI-27677-01-00 ..... D

Appendix E ..... **E**

Infiltration Testing Report ..... E
JPP G&E report ref. 27677/LR/LC/L01 ..... E

Appendix F ..... **F**

Proposed Drainage Strategy ..... F
JPP Consulting drawing no. 28616-FRA03C ..... F

Appendix G ..... **G**

Proposed Drained Area ..... G
JPP Consulting drawing no. 28616-FRA02A ..... G

Appendix H ..... **H**

Soakaway Calculation (Cascade) ..... H

Appendix I ..... **I**

Attenuation Calculations: 1 in 30 year I

Appendix J ..... **J**

Attenuation Calculations: 1 in 100 year ..... J

Appendix K ..... **K**

Attenuation Calculations: 1 in 100 year + 45% CC ..... K

Appendix L ..... **L**

Overland Flows L
JPP Consulting drawing no. 28616-FRA04A L

Figures

Figure 1.1 Site Location Plan 1
Figure 3.1 Historic Aerial Imagery dated December 2003 5
Figure 3.2 Aerial Imagery dated March 2024 6

Tables

Table 3.1 Ground Investigation Information 7
Table 3.2 Infiltration Testing Information 8
Table 4.1 SUDS Assessment 11
Table 4.2 Pollution Hazard Indices for Different Land Use Classifications 11
Table 4.3 Indicative SuDS Mitigation Indices for Discharges to Groundwaters 11
Table 4.4 Indicative SuDS Mitigation Indices for Discharges to Surface Waters 12
Table 4.5 Peak Rainfall Intensity Allowance 12

1.0 Introduction

1.1 Background

1.1.1 This report is a Drainage Strategy which has been prepared by JPP Consulting Ltd for the benefit of our Client, Labosport Ltd (to be utilised in conjunction with the Football Foundation AGP Framework), for a proposed Artificial Grass Pitch (AGP).

1.1.2 The proposed artificial grass pitch is located at Northfleet School for Girls, Hall Road, Northfleet, as shown in Figure 1.1 below. Northfleet is located to the south-east of London, east of Dartford, south of the River Thames and west of Gravesend. The National Grid Reference for the site is E562960 N172690. The proposed development has a total development area of 0.643ha (6,425m^2).

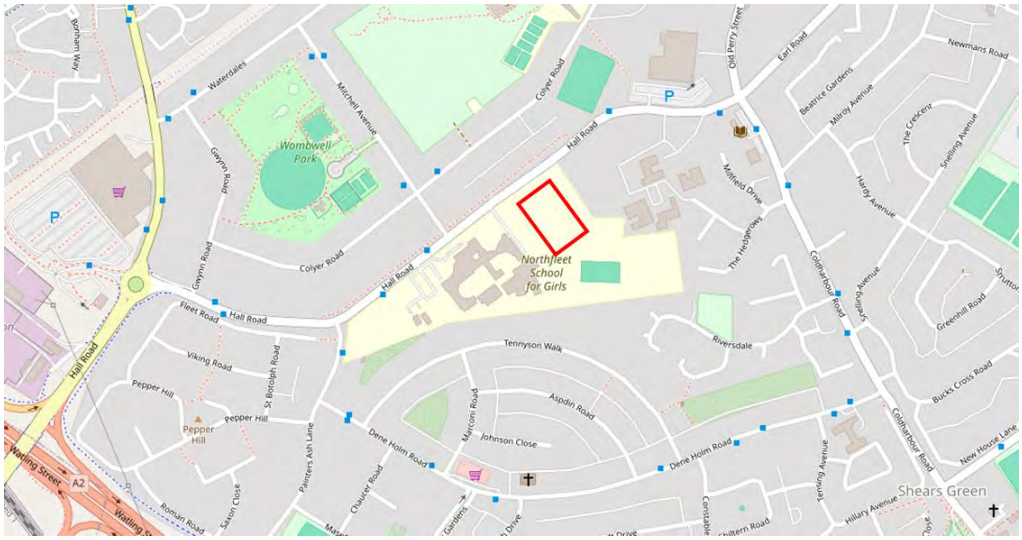


Figure 1.1 Site Location Plan
Source: OpenStreetMap
Obtained: 16/07/2024

1.2 Objectives

1.2.1 The objective of this report is to advise interested parties regarding the management of surface water run-off arising from the proposals.

1.2.2 This report has been prepared to support a detailed planning application.

2.0 Policy review

2.1 Introduction

2.1.1 The following section of the report details key national and local polices relating to flood risk and drainage, which will inform the assessment of the proposed development.

2.2 Reference documents

2.2.1 This report has been prepared with reference to the following publications:-

- Department for Environment, Food and Rural Affairs (updated July 2025), National standards for sustainable drainage systems (SuDS)
- Ministry of Housing, Communities and Local Government (March 2012, updated December 2024), National Planning Policy Framework
- Ministry of Housing, Communities and Local Government (March 2014, updated September 2025), Planning Practice Guidance 'Flood Risk and Coastal Change'
- Environment Agency (March 2014, updated April 2025), Planning Practice Guidance 'Flood risk assessments: applying for planning permission'
- Environment Agency (February 2016, updated May 2022), Planning Practice Guidance 'Flood risk assessments: climate change allowances'
- Environment Agency (October 2013), Delivering benefits through evidence: Rainfall runoff management for developments
- HM Government (2010), The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, The NBS, Newcastle Upon Tyne
- Wilson, Bray, Cooper (2004), Sustainable drainage systems: Hydraulic, structural and water quality advice, C609, CIRIA, London
- Woods-Ballard et al (2015), The SUDS Manual, C753, CIRIA, London
- CIRIA Report C624 Development and flood risk
- National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage Systems,
- Institute of Hydrology (1999), Flood Estimation Handbook, Institute of Hydrology, Wallingford
- BS EN 752:2008 Drain and sewer systems outside buildings. Hydraulic design and environmental considerations
- BS 8533:2011 Assessing and managing flood risk in development – Code of Practice
- CIRIA Report C635 Designing for exceedance in urban drainage – good practice
- Gravesham Local Plan Core Strategy 2011 – 2028 (adopted September 2014)

2.3 National policy

2.3.1 National Planning Policy Framework (NPPF)

2.3.1.1 The revised NPPF was published in December 2024, superseding all previous versions, however the presumption in favour of sustainable development remains as the core objective of the document. The document sets out the Government's planning policies for England and details how they are expected to be applied.

2.3.1.2 The paragraphs of most relevance to flood risk and drainage are captured within Chapter 14: Meeting the challenge of climate change, flooding and coastal change. The paragraphs presented within Chapter 14 are categorised as follows:

- 161: introductory paragraph
- 162 to 169: Planning for climate change
- 170 to 182: Planning and flood risk
- 183 to 186: Coastal

2.3.2 Planning Practice Guidance (PPG)

2.3.2.1 In 2016, the Government published the PPG, which provides further information and guidance to support the NPPF. Sections of the PPG relevant to the preparation of this report include:

- Flood risk assessments: applying for planning permission;
- Flood risk and climate change; and.
- Flood risk assessments: climate change allowances.

2.3.3 National standards for sustainable drainage systems

2.3.3.1 The National standards for sustainable drainage systems (SuDS), as published by DEFRA and updated in July 2025, set out the following Standards:

1. Runoff destinations
2. Management of everyday rainfall (interception)
3. Management of extreme rainfall and flooding
4. Water quality
5. Amenity
6. Biodiversity
7. Design of drainage for construction, operation, maintenance, decommissioning and structural integrity.

2.3.3.2 The above standards are underpinned by eleven principles, categorised as follows:

- Natural approach to managing water (1, 2, 3)
- Early and integrated design (4, 5, 6, 7, 8)
- Links with development planning (9, 10, 11)

2.4 Local policy

2.4.1 Gravesham Local Plan Core Strategy 2011 - 2028

2.4.1.1 The Gravesham Local Plan Core Strategy 2011 – 2028 was adopted in September 2014. This Core Strategy gives appropriate weight to varying issues, such as the need to balance economic growth and housing provision with protecting and enhancing the local environment.

2.4.1.2 Policy CS18 of the Local Plan relates to Climate Change and Water Environment, with all development proposals to take account, dependent on their scale, use and location, the predicted impact of climate change in the District's water environment. Policy CS18 sets out information relating to:

1. Flood Risk
2. Water Quality
3. Sustainable Drainage and Surface Water Run-Off
4. Water Demand Management
5. Carbon Reduction

2.5 Report history

2.5.1 This report has previously been revised (Revision B) in receipt of consultation comments from Kent County Council (KCC) as the Lead Local Flood Authority (LLFA) and Southern Water.

2.5.2 This report has been revised (Revision C) in receipt of further consultation comments from KCC as the LLFA.

2.5.3 Changes to the report associated with Revision C are indicated by a vertical line in the right-hand column.

3.0 Description and history of the site and development proposals

3.1 Location and description of the site

3.1.1 The proposed artificial grass pitch is located at Northfleet School for Girls, Hall Road, Northfleet, as shown in Figure 1.1 above. The site sits within the eastern part of the wider site for Northfleet School for Girls, with playing fields and courts to the south-east, and school buildings to the west. Hall Road is located to the north of the site, whilst trees are located to the east with Wombwell Hall Care Home beyond.

3.2 History of the site

3.2.1 The site is currently playing fields associated with the school, as shown on the topographical survey enclosed in **Appendix A**. We are not aware of any previous development on the site.

3.2.2 Aerial imagery dating back to December 2003 shows that the site was comparable at this time, see Figure 3.1 below.

Figure 3.1 Historic Aerial Imagery dated December 2003
Source: Google Earth Pro

3.2.3 The most recent aerial imagery of the site dated March 2024 is shown below in Figure 3.2.

Figure 3.2 Aerial Imagery dated March 2024
Source: Google Earth Pro

3.3 Proposed development

3.3.1 The proposed development will comprise an artificial grass pitch. The proposed development layout is shown on the plan enclosed in **Appendix B**.

3.3.2 It is understood that a new pavilion building is potentially proposed to the west of the AGP position in the future.

3.4 Site topography

3.4.1 The topographical survey indicates that site levels within the footprint of the proposed AGP fall from the south corner (at approximately 33.0m) towards the north corner (lowest point of approximately 28.3m). The topographical survey is shown on the plan enclosed in **Appendix A**.

3.5 Existing drainage infrastructure

3.5.1 Southern Water's asset plan is enclosed in **Appendix C.** The asset plan identifies no adopted sewers within at the site location or across the wider school site. The nearest surface water is shown to the north-west at manhole reference MH9850 located in Hall Road. This is the head of the run and the sewer flows north away from the site.

3.5.2 The topographical survey, enclosed in **Appendix A**, identified no manholes within the footprint of the proposed pitch. A number manholes are shown along the western edge of the playing fields, understood to be existing drainage associated with the wider school site.

3.6 Geology of the site and ground investigation data

3.6.1 Inspection of the geological maps show that the upper-most bedrock geology which underlies the site is Thanet Formation – Sand. There are no superficial deposits recorded for the location of the site.

3.6.2 JPP Geotechnical & Environmental have completed a geotechnical investigation on the site with fieldwork carried out on the 9th February 2024, see report extract enclosed in **Appendix D**. This investigation found Topsoil overlying Made Ground which overlays Thanet Formation. Details of the encountered ground conditions are summarised in Table 3.1 below.

Summary of Ground Investigation Information							
Ground Conditions	Depth (m)						
	WS01	WS02	WS03	WS04	WS05	WS06	WS07
Topsoil	0.30	0.35	0.40	0.30	0.30	0.30	0.30
Made Ground	1.00	-	-	-	-	-	-
Thanet Formation	1.20	1.00	2.00	1.00	1.00	1.00	1.00
Source: JPP G&E ref. R-SI-27677-01-00							

Table 3.1 Ground Investigation Information

3.6.3 No groundwater was encountered during the investigation. The GI report notes:

> *'…considered likely to be deep however there is always a potential for shallow perched groundwater to be present'.*

3.6.4 The ground investigation highlights that there is a moderate risk of chalk dissolution within the pitch location. Design of the pitch, floodlight foundations and drainage should take into account the risk of chalk dissolution and encountering such features.

3.6.5 Infiltration testing has been carried out on-site (28th April 2025) in general accordance with BRE 365 'Soakaway Design', comprising of four excavated trial pits. The observed soakaway testing results are summarised below in Table 3.2 and enclosed in **Appendix E**.

Summary of Infiltration Testing			
Trial Pit Position	Cycle	Base Depth of Trial Pit	Infiltration Rate
SA01	1	2.77m bgl	2.39×10^{-5} m/s
	2	2.85m bgl	1.24×10^{-5} m/s
	3	2.60m bgl	1.11×10^{-5} m/s (Conservatively extrapolated)
SA02	1	2.00m bgl	Insufficient infiltration to derive rate

SA03	1	1.60M bgl	4.50×10^{-6} m/s (Conservatively extrapolated)
SA04	1	2.45m bgl	5.28×10^{-6} m/s (Conservatively extrapolated)
Source: JPP G&E ref. 27677/LR/LC/L01			

Table 3.2 Infiltration Testing Information

3.6.6 JPP G&E concludes the following with regards to the use of infiltration techniques:

> *'Based on the results of the infiltration testing, the near surface Thanet Formation deposits provide some infiltration potential which improves with depth…It is therefore recommended that the proposed soakaway has a base depth of at least 3.0m bgl, into the light yellowish brown slightly clayey slightly gravelly silty fine Sand, and the conservative lowest rate is adopted for design of 1.11×10^{-5} m/s. The trial pit logs and infiltration test results, should be referred to for full details of the ground conditions encountered at the depths of the testing to target for the soakaway design.'*

3.6.7 With regards to chalk dissolution risk, the latest information presented by JPP G&E states:

> *'We would still suggest that a cautious approach is maintained of locating the soakaway at least 10m from foundations, structures (including the pitch) and boundaries, based on CIRIA 574 'Engineering in Chalk', where the chalk is of low density (assumed to be the case for the site in the absence of encountering the Chalk deposits within the excavations to allow testing to confirm otherwise).*
>
> *For the soakaway design, as large and level area as possible is recommended to increase the surface area and targeting the most permeable deposits along its length, with ground conditions varying in fines and granular content and to minimise the potential for concentrated ingress occurring. A crate/geocellular type system as opposed to gravel is recommended to minimise potential for loss into a dissolution feature. It is recommended that drains should include sealed flexible joints or with concrete bedding and haunching to minimise the risk of future damage.*

4.0 Management of surface water

4.1 Current conditions

4.1.1 The site is currently open with no existing development, and is therefore considered a greenfield site with no existing drainage. Therefore, greenfield run-off calculations shall be used to derive the allowable run off rate from the site.

4.2 Surface water drainage outfalls

4.2.1 It is a requirement of The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, to dispose of surface water collected by a development in accordance with the following, listed in order of priority:-

6. Infiltration systems where ground condition permit
7. To watercourses
8. To sewers

4.2.2 Further, Standard 1 of the National standards for SuDS requires runoff to be managed in accordance with the below hierarchy:

- Priority 1: collected for non-potable use
- Priority 2: infiltrated to ground
- Priority 3: discharge to an above ground surface water body
- Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- Priority 5: discharged to a combined sewer.

4.2.3 Each of these is considered separately below:

4.2.4 Non-potable use

4.2.4.1 Rainwater butts are not considered suitable for the development proposals.

4.2.3 Infiltration systems

4.2.3.1 The geology of the site is described in 3.6 above. Infiltration test results show that soakaways are a viable method for managing surface water at the site,

4.2.3.2 As such, surface water will discharge the site via infiltration techniques, taking into account the risks identified associated with the chalk dissolution.

4.2.4 Watercourses / Main River

4.2.4.1 There are no watercourses located within or adjacent to the boundary of the proposed development.

4.2.4.2 Draining the site via infiltration techniques is a viable option, therefore discharging surface water via a watercourse will not be considered further.

4.2.5 Sewers

4.2.5.1 Southern Water's asset plan is enclosed in **Appendix C**. The asset plan identifies no adopted sewers within the development area nor the wider school site.

4.2.5.2 Draining the site via infiltration techniques is a viable option therefore the use of surface water sewers will not be considered further.

4.3 Surface water drainage strategy

4.3.1 Surface water from the development will drain via infiltration techniques. Infiltration will be facilitated via a geocellular soakaway, located to the north-west corner of the proposed AGP. The permeable sub-base of the pitch will both provide a level of attenuation and treatment of surface water. To benefit from the capacity available within the permeable sub-base of the pitch, surface water flows from the pitch will be restricted prior to connecting into the soakaway.

4.3.2 With reference to the risk of chalk dissolution set out within the Ground Investigation report, the pitch and the soakaway will both be appropriately lined and sealed.

4.3.3 An indicative surface water layout plan is enclosed in **Appendix F**. The drawing shows that surface water attenuation can be accommodated on the site and the method of discharge on the basis that infiltration techniques are viable. The detailed design parameters of the drainage are described below.

4.4 SUDS assessment

4.4.1 We have considered the suitability of SUDS for use on the development site. The review is set out in below Table 4.1.

SUDS Assessment		
SUDS Technique	**Suitability**	**Justification**
Rain Water Harvesting	No	Not applicable for the development type.
Green Roofs	No	Not applicable for the development type.
Infiltration	Yes	Soakaways are to be used.
Filter Strips / Filter Drains	No	Not suitable for the development type.
Swales	No	Not suitable for the development type.
Bioretention Systems	No	No open spaces.
Trees	No	The development proposals simply comprise the proposed AGP – no new trees will be provided within the sub-base for the new pitch.
Pervious Pavements	Yes	Surface water attenuation will be provided within the sub-base of the AGP.
Attenuation Tanks	Yes	Utilised to facilitate infiltration.

Detention Basin	No	Attenuation will be provided within the sub-base of the AGP and geocellular soakaway.
Ponds and Wetlands	No	Attenuation will be provided within the sub-base of the AGP and geocellular soakaway.
Trapped Drainage	No	Water treatment will be provided through the permeable sub-base of the AGP.

Table 4.1 SUDS Assessment

4.5 Water quality

4.5.1 Chapter 26 of The SuDS Manual 2015 (CIRIA 753) provides guidance on the methods that should be used to design SuDS to meet the water quality design criteria and good practice design standards. Based on the simple index approach, the pollution hazard indices for different land use classifications are listed in Table 26.2, Chapter 26 of the SuDS Manual. Table 4.2 below summarises the pollution hazard indices that are applicable for residential land use development.

Pollution Hazard Indices for Different Land Use Classifications				
Land Use	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydro-carbons**
Residential Roofs	Very low	0.2	0.2	0.05
Source: Table 26.2 of The SuDS Manual				

Table 4.2 Pollution Hazard Indices for Different Land Use Classifications

4.5.2 'Residential Roofs' is considered to be the most appropriate category for the proposed pitch, due to the minimal pollution hazard associated with the proposed 3G Artificial Turf Pitch, which will have no vehicle movements within its extent.

4.5.3 Table 26.4 of The SuDS Manual shows the mitigation indices for a range of SuDS components for discharges to groundwaters. An extract of this is provided in Table 4.3 below for the components relevant to the proposed development.

Indicative SuDS Mitigation Indices for Discharges to Groundwaters			
Characteristics of the material overlying the proposed infiltration surface, through which the run-off percolates	**Mitigation Indices**		
	TSS	**Metals**	**Hydro-carbons**
A soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.3	0.3
Source: Table 26.4 of The SuDS Manual			

Table 4.3 Indicative SuDS Mitigation Indices for Discharges to Groundwaters

4.5.4 Table 26.3 of The SuDS Manual shows the mitigation indices for a range of SuDS components for discharges to surface waters. An extract of this is provided in Table 4.4, representing the proposed tanked permeable sub-base of the pitch.

Indicative SuDS Mitigation Indices for Discharges to Surface Waters			
Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydro-carbons
Permeable pavement	0.7	0.6	0.7
Source: Table 26.3 of The SuDS Manual			

Table 4.4 Indicative SuDS Mitigation Indices for Discharges to Surface Waters

4.5.5 Based on the information and assessment set out above, the proposed SuDS features are considered to provide sufficient water treatment for the development proposals.

4.6 Surface water drainage design and management

4.6.1 Proposals are to design the surface water drainage system to accommodate storms up to the 1 in 100 year event plus an allowance of 45% for climate change. The Environment Agency's guidance 'Flood risk assessments: climate change allowances' to support the National Planning Policy Framework, which defines the climate change allowances. Table 4.5 below sets out the peak rainfall allowances for the Medway Management Catchment which the site is located within.

Peak Rainfall Intensity Allowance: Medway Management Catchment			
Rainfall Event	Epoch	Central Allowance	Upper End Allowance
3.3%	2050s	+20%	+35%
	2070s	+20%	+35%
1%	2050s	+20%	+45%
	2070s	+20%	+40%
Source: Environment Agency - 2016			

Table 4.5 Peak Rainfall Intensity Allowance

4.7 Infiltration rates

4.7.1 Infiltration testing has been completed by JPP Geotechnical & Environmental for the proposed AGP, as described in Section 3.6 above, and detailed in **Appendix E.**

4.7.2 Based on the results and recommendations made in the report, a conservative rate of 1.11×10^{-5} m/s (0.03996 m/hr) will be used. This has been taken from the infiltration rates derived from SA01 (see Table 3.2), based on the lower conservative rate observed within the Thanet Formation – Sand underlying the site.

4.8 Infiltration requirements – geocellular soakaway

4.8.1 The proposed drained area of the development is 0.643ha (6,425m^2), as identified on the plan enclosed in **Appendix G**. Surface water will be managed via infiltration techniques, utilising a geocellular soakaway located to the north-west corner of the proposed AGP. The soakaway has been designed based on the following parameters.

Rainfall profile	= Flood Estimation Handbook (2022)
Cv values (summer and winter)	= 1.000
Return period	= 100 year
Climate change	= 45%
Durations	= 15 to 10080 minutes
Void ratio	= 95%
Build exclusion zone from soakaway	= 10m
Base depth of soakaway	= 3.0m bgl
Depth of soakaway unit	= 1.3m
Depth of cover achieved	= 1.7m
Dimensions	= 25.2 x 8.4 m
Plan area	= 211.7m^2
Volume	= 299.0m^3

4.8.2 To benefit from the capacity available within the permeable sub-base of the pitch, surface water flows from the pitch will be restricted prior to connecting into the soakaway. Surface water flows from the pitch will be restricted to 2.0 l/s. This arrangement is represented as a cascade within the design calculations, as enclosed in **Appendix H** for the 1 in 100 year plus 45% climate change scenario.

4.8.3 With reference to the new pavilion building, potentially proposed to the west of the AGP position in the future, the building is to be located at least 10m away from the soakaway associated with the AGP. Further, the building will not be built within 5m or build over a drain or sewer.

4.9 Attenuation requirements – permeable sub-base (AGP)

4.9.1 Surface water will be attenuated within the permeable sub-base of the pitch. Based on the proposed drained area and designed discharge rate of 2.0 l/s, the storage requirement has been calculated utilising the following parameters.

Rainfall profile	= Flood Estimation Handbook (2022)
Cv values (summer and winter	= 1.000
Drained area	= 0.643ha (6,425m^2)
Pitch length	= 97m
Pitch width	= 61m
Fall across pitch (longitudinal)	= 1:300
Depth of permeable sub-base	= 300mm
Porosity of permeable sub-base	= 30 % voids
Control	= Vortex Flow Control

4.9.2 Storage calculations for the 1 in 30 year event have been undertaken based on the parameters set out above and below. Full calculations are enclosed in **Appendix I**. The results confirm that the construction depth of the pitch is sufficient to accommodate all the storage required for the 1 in 30 year event.

Return period	= 1 in 30 year
Climate change	= 0%
Durations	= 60 to 10080 minutes
Max volume of flooding triggered	= 0m^3

4.9.3 Storage calculations for the 1 in 100 year event have been undertaken based on the parameters set out above and below. Full calculations are enclosed in **Appendix J**. The results confirm that the construction depth of the pitch is not sufficient to accommodate all the storage required for the 1 in 100 year event.

Return period	= 1 in 100 year
Climate change	= 0%
Durations	= 60 to 10080 minutes
Max volume of flooding triggered	= 16.9m^3

4.9.4 Storage calculations for the 1 in 100 year plus 45% climate change event have been undertaken based on the parameters set out above and below. Full calculations are enclosed in **Appendix K**. The results confirm that the construction depth of the pitch is not sufficient to accommodate all the storage required for the 1 in 100 year plus 45% climate change event.

Return period	= 1 in 100 year
Climate change	= 45%
Durations	= 60 to 10080 minutes
Max volume of flooding triggered	= 129.7m^3

4.9.5 The pitch will be surrounded by barriers that will offer containment of the above-ground flooding identified for the 1 in 100 year and 1 in 100 year plus climate change events. The barriers will comprise of 250mm high kick boards, suitable to contain the above-ground flooding. This is approach is considered acceptable based on the nature of the development.

4.9.6 The indicative surface water drainage layout is shown on the plan enclosed in **Appendix F.**

4.10 Overland flows

4.10.1 Proposals are to design the surface water drainage to accommodate the 1 in 100 year storm event taking into account the predicted future effects of climate. Clearly there is a risk of this storm event being exceeded, albeit this risk is considered very low. In such an event the proposed drainage systems will become overwhelmed and overland flows could occur. Overland flows will be directed to follow the path that overland flows currently follow.

4.10.2 Predicted overland flow routes are shown on the plan enclosed in **Appendix L**.

5.0 Foul water drainage strategy

5.1 There will be no foul water drainage associated with the proposal.

6.0 Maintenance

6.1 Surface water drainage maintenance

6.1.1 The proposed surface water drainage will comprise a private network which will be maintained by Northfleet School for Girls.

6.2 Foul water drainage maintenance

6.2.1 There is no foul drainage associated with the proposal.

7.0 Summary and conclusions

7.1 The proposed artificial grass pitch is located at Northfleet School for Girls, Hall Road, Northfleet. The site sits within the eastern part of the wider site for Northfleet School for Girls, with playing fields and courts to the south-east, and school buildings to the west. Hall Road is located to the north of the site, whilst trees are located to the east with Wombwell Hall Care Home beyond.

7.2 The proposed development will comprise of an artificial grass pitch.

7.3 The Ground Investigation conducted by JPP G&E identified that the site is underlain by Thanet Formation. Based on the infiltration testing undertaken, soakaways are considered to be a viable method for managing surface water at the site. With reference to the chalk dissolution risk set out within the Ground Investigation report, the pitch will be appropriately sealed beneath the sub-base, and the soakaway located in accordance with the 10m offsets required due to the identified chalk dissolution risk.

7.4 Surface water from the development will drain via infiltration techniques. Infiltration will be facilitated via a geocellular soakaway, located to the north-west corner of the proposed AGP. To benefit from the capacity available within the permeable sub-base of the pitch, surface water flows from the pitch will be restricted to 2.0 l/s prior to connecting into the soakaway. The permeable sub-base of the pitch will provide interception, treatment and initial attenuation of surface water. The soakaway is designed for the 1 in 100 year plus 45% climate change scenario.

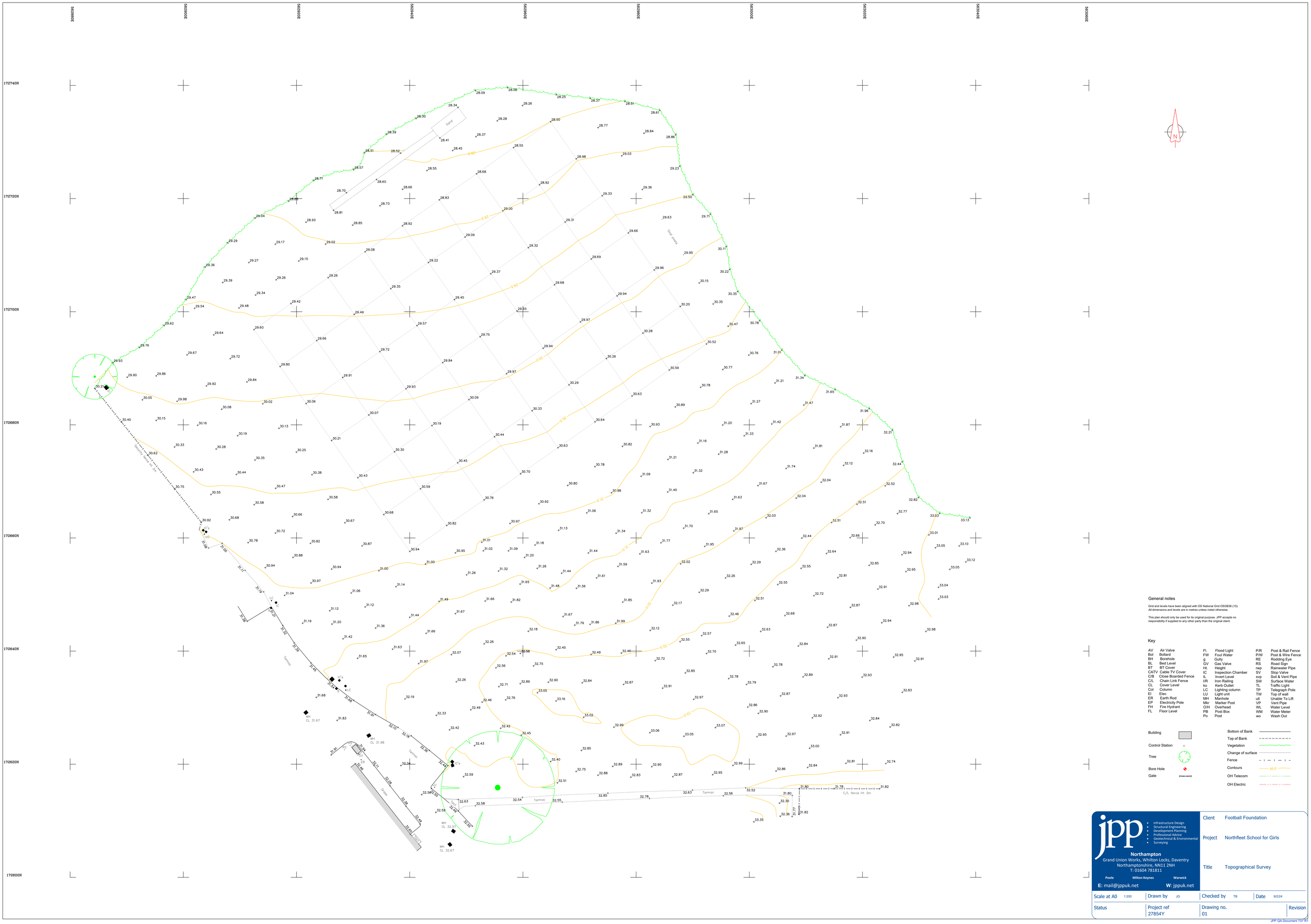
7.5 The proposed AGP will include a 0.300m deep permeable sub-base, with a total construction depth of 0.405m. This is shown to be sufficient to accommodate all storms up to and including a 1 in 30 year event. For the 1 in 30 year event, 16.9m^3 of above ground flooding is triggered, with 129.7m^3 triggered the 1 in 100 year plus 45% climate change event.

7.6 The pitch will be surrounded by barriers that will offer containment of the identified above-ground flooding identified for the 1 in 100 year plus climate change event. The barriers will comprise of 250mm high kick boards, suitable to contain the above-ground flooding. This is approach is considered acceptable based on the nature of the development.

7.7 The proposals for a 3G Artificial Turf Pitch at Northfleet School for Girls, Hall Road, Northfleet are therefore fully compliant with policy in respect of development and flood risk, such that flood risk considerations do no constitute a barrier to the granting of planning consent.

Appendix A

Topographical Survey
JPP Surveying drawing no. 27854Y-01



General notes

Grid and levels have been aligned with OS National Grid OSGB36 (15).
All dimensions and levels are in metres unless noted otherwise.

This plan should only be used for its original purpose. JPP accepts no responsibility if supplied to any other party than the original client.

Key

AV	Air Valve	Fl.	Flood Light	P/R	Post & Rail Fence
Bol	Bollard	FW	Foul Water	P/W	Post & Wire Fence
BH	Borehole	g	Gully	RE	Rodding Eye
BL	Bed Level	GV	Gas Valve	RS	Road Sign
BT	BT Cover	Ht.	Height	rwp	Rainwater Pipe
CATV	Cable TV Cover	IC	Inspection Chamber	SV	Stop Valve
C/B	Close Boarded Fence	IL	Invert Level	svp	Soil & Vent Pipe
C/L	Chain Link Fence	I/R	Iron Railing	SW	Surface Water
CL	Cover Level	ko	Kerb Outlet	TL	Traffic Light
Col	Column	LC	Lighting column	TP	Telegraph Pole
El	Elec	LU	Light unit	TW	Top of wall
ER	Earth Rod	MH	Manhole	ufl	Unable To Lift
EP	Electricity Pole	Mkr	Marker Post	VP	Vent Pipe
FH	Fire Hydrant	O/H	Overhead	WL	Water Level
FL	Floor Level	PB	Post Box	WM	Water Meter
		Po	Post	wo	Wash Out

Building
Control Station
Tree
Bore Hole
Gate

Bottom of Bank
Top of Bank
Vegetation
Change of surface
Fence
Contours
OH Telecom
OH Electric

jpp
- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

Northampton
Grand Union Works, Whilton Locks, Daventry
Northamptonshire, NN11 2NH
T: 01604 781811

Poole | Milton Keynes | Warwick

E: mail@jppuk.net **W:** jppuk.net

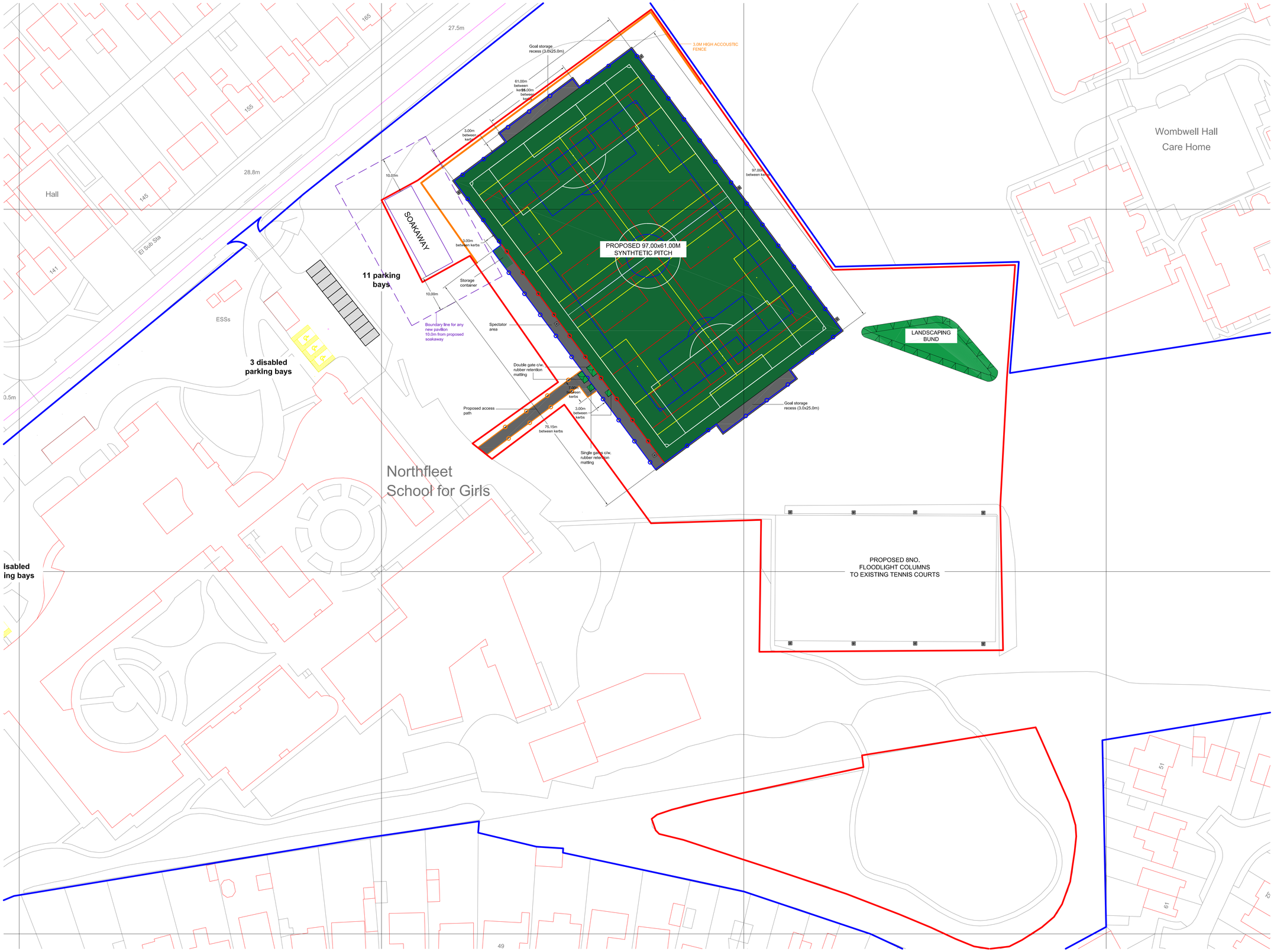
Client	Football Foundation
Project	Northfleet School for Girls
Title	Topographical Survey

Scale at A0	1:200	Drawn by	JG	Checked by	TB	Date	9/2/24
Status		Project ref 27854Y		Drawing no. 01		Revision	

Appendix B

General Arrangement Plan
Labosport Ltd drawing no. 24-004(G-218481) 03

ARTIFICIAL GRASS PITCH (AGP) PROPOSAL



CHECK ALL DIMENSIONS PRIOR TO COMMENCEMENT OF WORK

NO GUARANTEE CAN BE GIVEN THAT ALL SERVICES HAVE BEEN SHOWN ON THE DRAWING

NO GUARANTEE CAN BE GIVEN TO THE ACCURACY AND COMPLETENESS OF ANY SERVICE PROVIDER RECORD INFORMATION SHOWN IN THIS DRAWING AND NO LIABILITY WILL BE ACCEPTED FOR ANY LOSSES THAT ARISE DUE TO A LACK OF ACCURACY IN ANY SERVICE PROVIDERS RECORD INFORMATION

RELEVANT SERVICE DRAWINGS SHOULD BE OBTAINED FROM APPROPRIATE SERVICE PROVIDERS AND USED IN CONJUNCTION WITH THIS DRAWING

REFERENCE SHOULD ALSO BE MADE TO HISTORICAL PLANS AND AS BUILT DRAWINGS

THIS DRAWING IS COPYRIGHT TO LABOSPORT LTD

NOTES

- SYNTHETIC TURF SURFACE
- 1.2M HIGH SPECTATOR FENCING
- 4.5M HIGH PERIMETER FENCING
- DOUBLE GATE
- SINGLE GATE
- STORAGE CONTAINER AREA
- 300MM MOWING STRIP
- 6NO.FLOODLIGHTING COLUMNS TO AGP
- 8NO.FLOODLIGHTING COLUMNS TO EXISTING TENNIS COURTS
- INDICATIVE LANDSCAPING BUND
- 3.0M HIGH ACCOUSTIC FENCE

N

LEGEND / KEY

REVISION	DATE	
C	26.08.2025	Soakaway and 10m line shown
B	17.04.2025	Accoustic fence indicated
A	21.12.2024	red line amended

LABOSPORT

Labosport Ltd
Unit 3, Aerial Way, Hucknall, Nottinghamshire, NG15 6DW
+44 (0)115 968 1998
www.labosport.com
info@labosport.co.uk

AUTHOR

CLIENT
NORTHFLEET SCHOOL

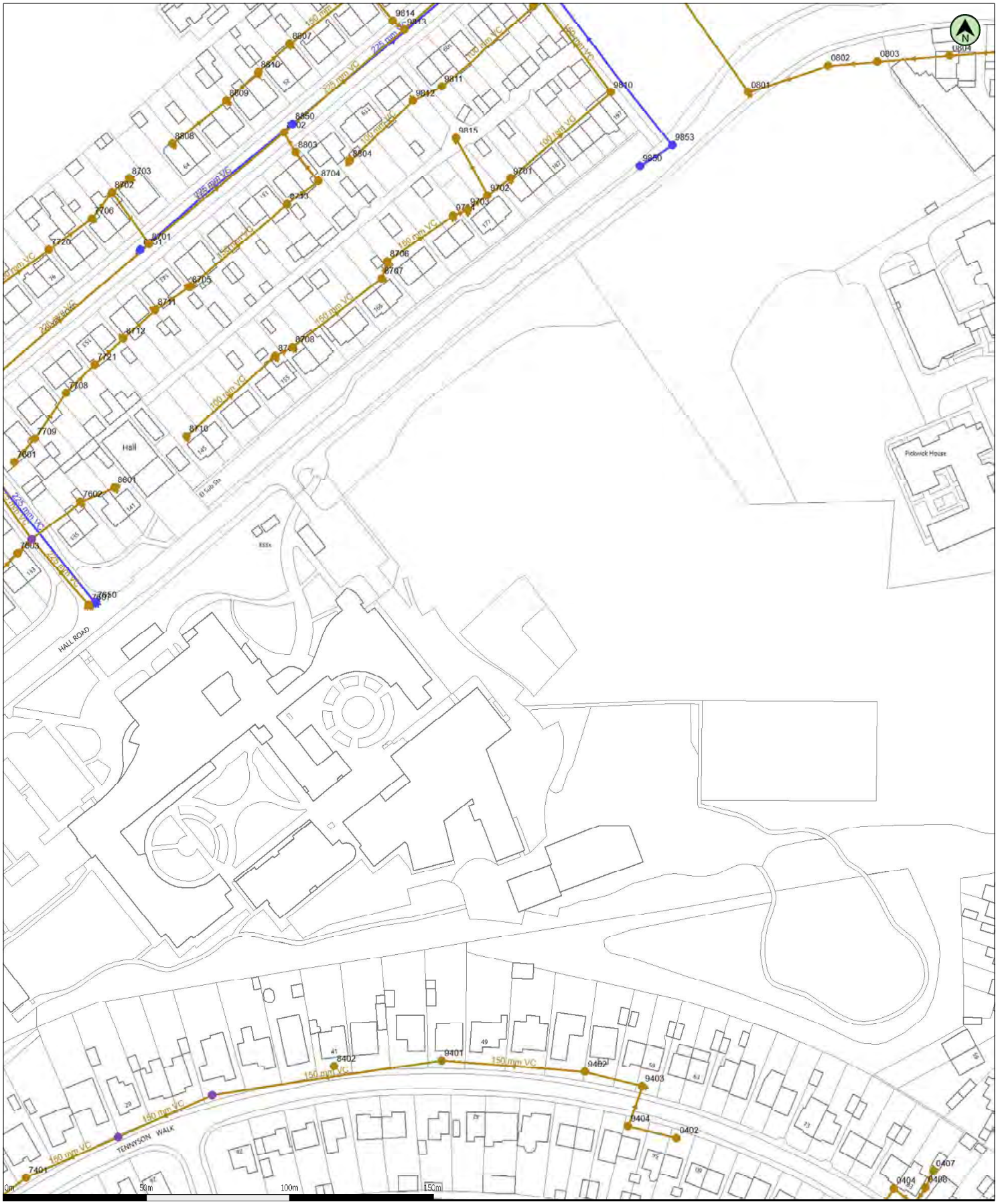
PROJECT
ARTIFICIAL GRASS PITCH (AGP) DEVELOPMENT

DRAWING
PROPOSED BLOCK PLAN

STATUS: PLANNING	DRAWN BY: LK	VERSION: 01	
PROJECT: G-218481 LSUK.24-004	DATE CREATED: 06.10.2024	DRAWING: 24-004(G-218481) 03	
PAPER SIZE: A1	SCALE: 1:500		

Appendix C

Southern Water Asset Plan



(c) Crown copyright and database rights 2024 Ordnance Survey 100031673

Data updated: 21/11/23

Scale: 1:1250

Map Centre: 562938,172650

Date: 04/01/24

Our Ref: 1358458 - 2

Wastewater Plan A3

Powered by digdat

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Surface Water Outfall
Foul Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway

lydia.crawford@jppuk.net

27677

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2023 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

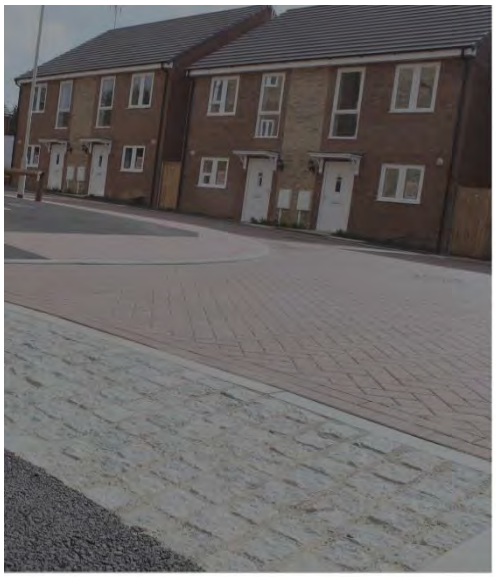
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0402	F	0.00	0.00	
0404	F	0.00	0.00	
0407	F	27.57	25.65	
0408	F	27.39	25.23	
0801	F	26.83	0.00	
0802	F	0.00	0.00	
0803	F	0.00	0.00	
0804	F	0.00	0.00	
7401	F	28.88	27.08	
7601	F	28.75	28.74	
7602	F	29.85	28.67	
7603	F	30.15	0.00	
7607	F	30.59	26.99	
7706	F	26.19	25.13	
7708	F	28.37	27.87	
7709	F	28.64	28.02	
7720	F	26.21	25.25	
7721	F	27.90	27.36	
8402	F	0.00	0.00	
8601	F	29.42	28.71	
8701	F	26.10	24.37	
8702	F	26.18	24.88	
8703	F	26.19	25.59	
8704	F	25.78	24.86	
8705	F	26.91	26.36	
8706	F	27.20	26.45	
8707	F	27.56	26.82	
8708	F	28.18	27.34	
8709	F	28.53	27.68	
8710	F	29.42	28.76	
8711	F	27.34	26.70	
8712	F	27.57	27.01	
8713	F	25.95	25.27	
8802	F	24.87	21.67	
8803	F	25.14	24.37	
8804	F	25.70	25.19	
8807	F	24.10	23.51	
8808	F	25.78	25.23	
8809	F	24.77	24.18	
8810	F	24.46	23.81	
9401	F	27.52	0.00	
9402	F	26.41	0.00	
9403	F	26.15	0.00	
9404	F	26.30	0.00	
9701	F	25.99	25.04	
9702	F	26.68	25.77	
9703	F	26.47	25.81	
9704	F	26.92	26.22	
9809	F	24.24	23.29	
9810	F	25.19	24.12	
9811	F	24.81	23.94	
9812	F	25.03	24.15	
9813	F	23.81	21.15	
9814	F	23.88	22.67	
9815	F	25.58	0.00	
7650	S	30.57	27.05	
8751	S	26.18	24.58	
8850	S	24.79	21.64	
9850	S	0.00	0.00	
9853	S	0.00	0.00	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

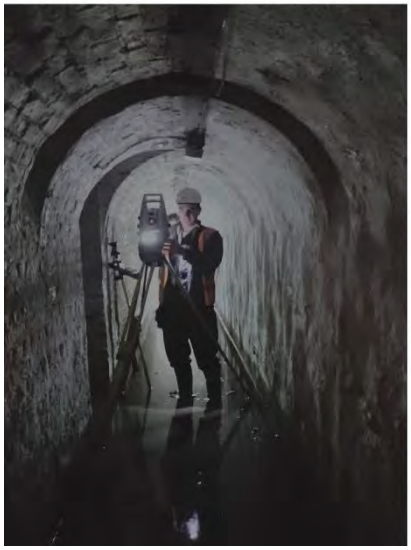
Appendix D

Extract of Ground Investigation
JPP G&E report ref. R-SI-27677-01-00

- Structural Engineering
- Infrastructure Design
- Professional Advice
- Development Planning
- Geotechnical & Environmental
- Surveying



Proposed Artificial Grass Pitch
Northfleet School for Girls
Hall Road
Northfleet
DA11 8AQ



Site Investigation Report

Revision 00: March 2024
R-SI-27677-01-00

Registered office

NORTHANTS	MILTON KEYNES	POOLE
Grand Union Works	B2A, Denbigh Business Park	Suite 8 Branksome Park
Whilton Locks	23 First Avenue	Branksome Business Park
Daventry, Northamptonshire	Denbigh	Bourne Valley Road | Poole
NN11 2NH	Milton Keynes | MK1 1DN	Dorset | BH12 1ED
T: 01604 781811	T: 01908 889433	T: 01202 540888

T01-4

1.0 Executive Summary

1.1.1 The following is provided as an overview and should not be relied upon in isolation to the main report.

Summary overview	
Existing site	The proposed pitch is located within grassed playing fields located to the east of Northfleet School for Girls school buildings. There is a mature tree adjacent to the south west corner of the proposed pitch and the Root Protection Zone (RPZ) could dictate the positioning of the proposed pitch. There are also trees along the north and east boundaries of the playing fields close to the proposed pitch.
Proposals	Construction of a 3G Artificial Grass Pitch (AGP) with associated fencing, floodlights and drainage infrastructure. There is a significant fall across the proposed pitch footprint from south to north, of between around 3.5 to 4.9m and therefore some levelling earthworks (cut and fill) are anticipated to reduce the fall across the pitch. This includes some presumed artificial raising in the south west corner of the proposed pitch.
History	The location of proposed pitch appears to have remained undeveloped open space associated with Wombwell Hall prior to the playing fields with two circular features with deciduous trees recorded in the south. The school was constructed around 1950 and there appears to be a terraced/lower area in the north of the pitch as possible tennis courts and therefore potential for this to have been filled/relevelled. During the school construction works in 2011, the south west of the pitch appears to have been utilised as a car park and contractors' compound with soils mounded which were subsequently landscaped and now forms a slightly raised area.
UXO	A medium risk was determined by a site-specific risk review, and therefore support by a specialist EOD engineer was required for our intrusive investigations and will be necessary for the construction phase. A detailed UXO desk study report could be undertaken to refine the preliminary risk assessment, which may determine that supervision may not be necessary.
Geology	There are no superficial deposits recorded within or close to the site, with bedrock geology from the surface mapped as Thanet Formation (sand) over Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation.
Fieldwork	7 windowless sample boreholes to a maximum depth of 2.0m, 6 dynamic probes to a maximum depth of 3.8m and 5 TRL Dynamic cone penetration tests to measure insitu CBR values.
Ground conditions	In general, ground conditions comprised a covering of 0.3 to 0.4m of Topsoil. In WS01, located in the south west corner of the pitch, Made Ground was encountered to 1.0m depth bgl considered to have been artificially raised at the time of the school redevelopment. Beneath the Topsoil, deposits comprised very soft to firm clays in each of the boreholes apart from the south west and south east positions, to depths of between 0.85 to 1.45m bgl which could represent Head deposit or weathered Thanet Formation. Such clay deposits, and beneath the Made Ground in WS01 in the south west and beneath the topsoil in WS02 in the south east, were underlain by a sand or gravel deposit of Thanet Formation, within which each of the boreholes were terminated at 1.0 or 2.0m depth bgl due to the density and SPT refusal (N value of 50).
Groundwater	No groundwater was encountered during the investigation and groundwater is considered likely to be deep, however there is always a potential for shallow perched water to be present.
Chalk Dissolution Hazard and Deneholes	There is considered to be a moderate risk of chalk dissolution and of encountering unrecorded deneholes within the pitch location. Design of the pitch, floodlight foundations and drainage should take into account the risk of chalk dissolution and encountering such features. Should any unusual features such as voiding or particular loose soils be encountered during construction, that could be suggestive of a natural dissolution or manmade denehole feature, then further specialist advice should be sought before proceeding and to determine an appropriate course of action.

Summary overview

Floodlight foundations	Pad foundations are considered suitable with a minimum founding depth of 0.75m (beneath existing or proposed levels, where the deepest should apply following any levelling earthworks) into medium dense sands or gravels of Thanet Formation deposits, through the overlying clay deposits encountered in most positions, and deepening for trees and vegetation based on low volume change potential. Foundations should also be deepened to locate consistent soils at formation level and through any potentially loose deposits. Larger size pads are recommended to be cautious with respect to the risk of chalk dissolution. Increased levels as part of the levelling earthworks are likely to result in significantly deepened foundations in the north of the pitch which could prove difficult to then excavate to form foundations following the earthworks. Therefore, it is recommended that any impacted floodlight foundations are constructed prior to the earthworks and built up to above the post level earthworks. Should any unusual features such as voiding or particular loose soils be encountered during construction, that could be suggestive of a natural dissolution or manmade denehole feature, then further specialist advice should be sought before proceeding and to determine an appropriate course of action.
Earthworks	Based on the fall across the pitch of around 3.5 to 4.9m from south to north, some levelling earthworks (cut and fill) are anticipated to reduce the fall. This is also likely to require some sloped banks and retaining features. Retaining features and the levels and gradients of any sloped banks will need to be appropriately designed and considering the risk of slope instability of both the existing and new slope. Floodlighting foundation design and depths should also take into account the position in relation to any formed sloped or retaining features.
Concrete classification	A classification of DS-1 ACEC AC-1 is applicable for the Thanet Formation and Made Ground.
Pitch construction	A CBR value of 2.5% is recommended for the near surface natural soils, based on the clay soils and worst case insitu measurements, for design and to be reassessed during construction and <2% for any Made Ground. However, as the pitch footprint is likely to require some cut and fill earthworks, the CBR will be subject to the compaction earthworks and there is potential for adverse settlement where the pitch may span across variable competency natural deposits which could be more pronounced, and for spanning between natural formation soils and soils placed and compacted, following levelling earthworks. Ground improvement such as lime/cement stabilisation and/or use of geogrid reinforcement may be appropriate to improve the CBR and reduce the potential for adverse settlement to occur where the pitch spans across variable ground conditions both in composition and competency and following levelling earthworks. Any loose or soft spots identified during the preparation of the formation level should be excavated and replaced with a suitably compacted fill. Any near surface clay soils within the influence of existing trees, containing roots or potentially desiccated should be removed and not reused within the pitch extent to reduce the potential for seasonal shrinkage and swelling. A root barrier may be appropriate to reduce the potential for root ingress beneath the pitch footprint. The position of the pitch is likely to be dictated by the Root Protection Zones of nearby trees, in particular the tree located close to the south west corner. Specialist advice should be sought in regard to protecting nearby trees from the pitch construction and earthworks.
Infiltration potential/ Surface Water Drainage	Indicative infiltration testing within the granular Thanet Formation did not provide sufficient infiltration to derive a rate. It is possible that the fines (clay/silt) content limited the permeability or smearing of the borehole surface and that deeper deposits or testing in machine pits could show improved infiltration potential and determine the soils to be suitable for soakaways. This would require testing in machine pits to further assess. If soakaways are determined to be a suitable drainage solution, due to the potential risk of chalk dissolution, soakaways should be located sufficient distance (>10m) from any proposed or existing structures (including floodlights), site boundaries, and ideally the pitch footprint, and designed to minimise the risk from chalk dissolution.

Summary overview	
	There are no obvious drainage ditches within and around the site. A surface water sewer is located within Hall Road to the north of the school buildings and the school drainage may outfall into this sewer network. Further enquiries are recommended to establish the existing school drainage and ultimate outfall, whether this be to existing soakaways or to a positive outfall, with a view to connecting into for the proposed pitch or to guide the drainage strategy for the proposed pitch. Any outfall will be subject to seeking necessary approvals and a detailed drainage strategy.

Table 1.1

3.9.2 As such all-site personnel should be provided with a UXO Safety Awareness Talk before intrusive works commence, and any intrusive work (both site investigation and future construction) should be supported by specialist EOD services to clear working areas as the site is developed.

3.9.3 A detailed UXO risk assessment could be carried out to refine the risk which may reduce the risk and thus requirements for the construction phase.

3.10 Coal mining risk

3.10.1 The site is not located within an area at risk from Coal Mining.

3.11 Chalk dissolution risk, mining cavities and mineral sites

3.11.1 A Mining and Ground Stability report (presented in Appendix D) has been obtained for the site to assess the potential chalk dissolution risk at the site and quarrying/mineral pits on or near to the site.

3.11.2 The report indicates that there is one BGS Recorded Mineral Site within 250m of the site, one within 500m and eleven within 1km. The closest of these is Aspdin Road Denehole, approximately 205m to the south, a now ceased underground operation extracting chalk from the White Chalk Subgroup. The next closest is approximately 270m to the north west, and is at Wombell Road Denehole, also a ceased underground operation extracting chalk from the White Chalk Subgroup.

3.11.3 There is one man made mining cavity within 250m of the site, one within 500m and four within 1km. The commodities extracted were chalk in all of the cavities, either within the Thanet Formation of Chalk Group, with the closest being a chalkwell/Denehole approximately 180m to the south east of the site.

3.11.4 There is one recorded natural cavity located within 1km of the site. It is recorded to be approximately 755m to the south east and relates to six solution pipes.

3.11.5 With reference to the report and associated map defining the ground dissolution hazard (presented in Appendix D), the subject site area is indicated to have no hazard to low risk, along the south west, of chalk dissolution and a moderate risk 175m to the south, becoming high further south. This is likely as a result of the site being mapped as having no superficial deposits with Thanet Formation over the Chalk Formations, whilst from 175m to the south, the Thanet Formation is not mapped over the chalk. This would allow a direct pathway for water to percolate vertically to the chalk and potentially cause dissolution features to occur. However, as the Thanet Formation can be predominantly granular, this could allow a pathway for water to percolate vertically into the chalk and potentially cause dissolution features to occur and along with the potential for unrecorded manmade Denehole features, which are recorded where Thanet Formation is mapped above the chalk, we suggest there to be a **Moderate Risk** of chalk dissolution and manmade Denehole features.

4.0 Fieldwork

4.1.1 Fieldwork was carried out on the 9th February 2024 and comprised the following:

- 7 Windowless sample boreholes to 1.00 and 2.00m depth bgl due to the density of the ground conditions
- 6 Dynamic probes to a maximum of 3.80m bgl, limited by the UXO clearance
- 5 TRL Dynamic Cone Penetration tests to measure insitu CBR values.

4.1.2 Due to the medium risk of encountering buried UXO within the site, an EOD specialist engineer was present during our works, clearing each position prior and during the drilling process. The final drilled depth of the dynamic probes was limited by the clearance depth of the magnetometer, which could safely clear in a maximum of 2.0m increments. Where the magnetometer gives a slightly unclear reading, clearance can only be given in 1.0m increments. The dynamic probes were therefore only cleared up to 2.0m below the final depth of the adjacent boreholes, limiting the final depth of the probes to between 2.0m and 3.8m bgl.

4.1.3 Each position was scanned using a cable avoidance tool and signal generator prior to positioning and proceeding. Utilities searches were also obtained prior to the fieldwork to confirm the position of potential underground services (excluding private services). These are presented in Appendix F.

4.1.4 The approximate location of each exploratory hole position is shown on the plan (Drawing 01) and included within Appendix A.

4.1.5 The borehole positions were targeted outside of existing marked pitches.

5.0 Ground Conditions

5.1 Soils

Topsoil

5.1.1 Each of the exploratory boreholes encountered a brown slightly gravelly, slightly silty, sandy topsoil to between 0.30m and 0.40m bgl. Gravel generally comprised of sandstone, with brick encountered in WS04 and wood encountered in WS01.

Made Ground

5.1.2 Underlying the topsoil within WS01 (south west corner where the ground appears to have been raised at the time of the school construction works in 2011), Made Ground was encountered to 1.00m bgl. These soils initially comprised of a light greyish brown, sandy sandstone gravel to 0.40m bgl, over a brown, slightly gravelly, slightly sandy, silty clay with some roots and rootlets. The gravels within the clay comprised of sandstone, concrete and brick.

Possible Head Deposits/ Weathered Thanet Formation

5.1.3 Underlying the topsoil, in each of the positions apart from WS01 in the south west corner and WS02 in the south east corner, encountered presumed natural deposits comprising a very soft to firm slightly gravelly, sandy to very sandy, silty CLAY to depths of between 0.85m to 1.45m bgl. Gravels consisted of sandstone and flint, although the gravel content decreased towards the north of the proposed pitch. Such deposits have been considered to potentially be weathered Thanet Formation however these could represent a Head or other superficial deposit based on the low strength and flint gravels.

Thanet Formation

5.1.4 In the south of the proposed pitch, within WS01 and WS02, no clay was encountered underlying the topsoil or Made Ground in WS01. Underlying the topsoil within WS02 was a light yellowish brown, silty, sandy, sandstone and flint GRAVEL to 0.95m bgl, becoming clayey to the base of the borehole at 1.00m bgl where the borehole was terminated due to the density. The silty gravel was also encountered underlying the Made Ground in WS01 and beneath the clay from 0.85m depth within WS04 (located in the north east corner) to the base of the exploratory boreholes.

5.1.5 Underlying the clay within WS03 and WS05-07 to the base of the exploratory boreholes, an orangish brown and occasionally grey clayey, fine to medium SAND was encountered, with occasional clay lenses noted within the sand in WS03.

5.1.6 Hand pocket penetrometer tests converted to kPa recorded strength values of between 10 and 70kPa within the cohesive soils, indicating very low to medium strength deposits.

5.1.7 Standard Penetration Test (SPT) 'N' values undertaken recorded lowest values of 5 and 8 at 0.50m depth within the clay soils in WS06 and WS07. At 1.0m depth in WS03, located centrally along the east side of the proposed pitch, an SPT N value was measured as 26 with the clay deposits, which was the deepest borehole achieved. All other positions refused with SPT N values of 50 for 300mm penetration or 50 for less than the full test penetration of 300mm at 1.0m depth and in WS03 at 2.0m depth.

Dynamic probes

5.1.8 Dynamic Probe DP1, undertaken adjacent to WS01 showed relatively consistent blow counts of 3 blows per 100mm to 1.20m, with exceptions at 0.60m, 1.00m and 1.10m depth where 11, 32 and 2 blows per 100mm respectively were recorded. The low blow counts with localised increases are consistent with the encountered Made Ground with gravels, with the blow counts then increasing to 25 blows per 100mm at 1.60m bgl, where the probe rods kicked off from centre, resulting in an early termination of the test. The increase in blow counts correlates with the very dense gravels of the Thanet Formation.

5.1.9 Dynamic Probe DP2, undertaken adjacent to WS02 was completed to 2.00m bgl due to the EOD engineer being unable to clear to any greater depths. This probe showed low blow counts of 2 blows per 100mm to 0.40m bgl, the approximate base of the topsoil, increasing to generally between 5 and 12 blows per 100mm, with a peak of 15 at 1.10m bgl.

5.1.10 Dynamic Probe DP3 was undertaken adjacent to WS03 in the east of the proposed pitch, and was completed to 3.80m bgl before kicking off on a presumed cobble, although the EOD engineer could only clear to a maximum of 4.00m bgl. Once again, initial very low blow counts of between 0 and 1 blows per 100mm were recorded through the topsoil and into the initially soft underlying clays, increasing to between 2 and 3 blows per 100mm to 1.50m bgl, where the sands of the Thanet Formation were encountered. Blow counts then consistently increased to 18 blows per 100mm at 3.80m bgl, with a separate peak at 2.00m bgl of 14 blows per 100mm.

5.1.11 Dynamic Probe DP4, adjacent to WS04 recorded blow counts of 0 and 1 blows per 100mm to 0.90m bgl through the encountered soft clays, increasing to between 7 and 10 blows per 100mm by 2.00m bgl, where the test was terminated due to lack of UXO clearance.

5.1.12 Dynamic Probes DP5 and DP6, adjacent to WS05 and WS07 respectively were broadly similar, showing blow counts of between 0 and 2 blows per 100mm to 1.10m and 1.30m bgl respectively, increasing to 15 and 13 blows per 100mm by 1.40m and 2.00m bgl. Blow counts then decreased to as low as 3 blows per 100mm in DP05 and 4 blows per 100mm in DP6 by 2.40m and 2.60m bgl, increasing to 8 blows per 100mm by 3.00m bgl, the deepest the EOD engineer could clear the probes to.

5.2 Groundwater

5.2.1 No groundwater was encountered during the investigation and is considered likely to be deep however there is always a potential for shallow perched groundwater to be present.

7.7 Earthworks

7.7.1 The topographical survey shows there to be a fairly significant fall across the proposed pitch footprint to the north, from a high of approximately 33.16m AOD in the south west corner (within the presumed artificially raised area) and approximately 32.85m in the south east corner to approximately 28.25m AOD in the north east corner. Suggesting a fall of approximately 4.9m from south east to north east (diagonally across the proposed pitch footprint) and 4.6m from the south east to the north east along the eastern side of the proposed pitch. The south west corner of the pitch appears to have been artificially raised by around 1.0m height which is considered likely to be formed from arisings during the school redevelopment in 2011.

7.7.2 Based on the fall across the pitch of around 3.5 to 4.9m from south to north, some levelling earthworks (cut and fill) are anticipated to reduce the fall. This is also likely to require some sloped banks and retaining features. Retaining features and the levels and gradients of any sloped banks will need to be appropriately designed and considering the risk of slope instability of both the existing and new slope. Floodlighting foundation design and depths should also take into account the position in relation to any formed sloped or retaining features. The slopes created will also need to consider the presence of trees and associated Root Protection Zones. Specialist advice should be sought in regard to protecting nearby trees from the pitch construction and earthworks.

7.7.3 The upper clay soils encountered on site are likely to soften extremely quickly when exposed to periods of sustained wet weather and where over trafficked. Care should be taken to work on the exposed soils in periods of dry weather and to not excessively track over the exposed subsoil/formation layer prior to laying the subbase, otherwise softening/dilation could occur which would lower the CBR values of the underlying soils. This should also be accounted for during the proposed earthworks and any excavated and exposed soils will need to be sufficiently protected.

7.7.4 Use of any excavated material as fill material will be subject to classification, grading and appropriate compaction following Series 600: Earthworks. Any topsoil/organic soil is not suitable for reuse as fill.

7.8 Infiltration potential and surface water drainage

7.8.1 Infiltration testing was carried out in WS04, the lowest point of the grassed playing fields in the north east corner, with an 180mm fall in water levels over 143 minutes, remaining more than 50% full and therefore insufficient to derive an infiltration rate however suggests that there could be some infiltration potential. It is thought that the fines (clay/silt) content may have limited the infiltration and the effect of smearing of these fines on the sides of the borehole may have also reduced the infiltration. The granular soils encountered may therefore provide some infiltration potential however this would be subject to further testing in machine excavated trial pits to facilitate BRE 365 compliant soakaway testing.

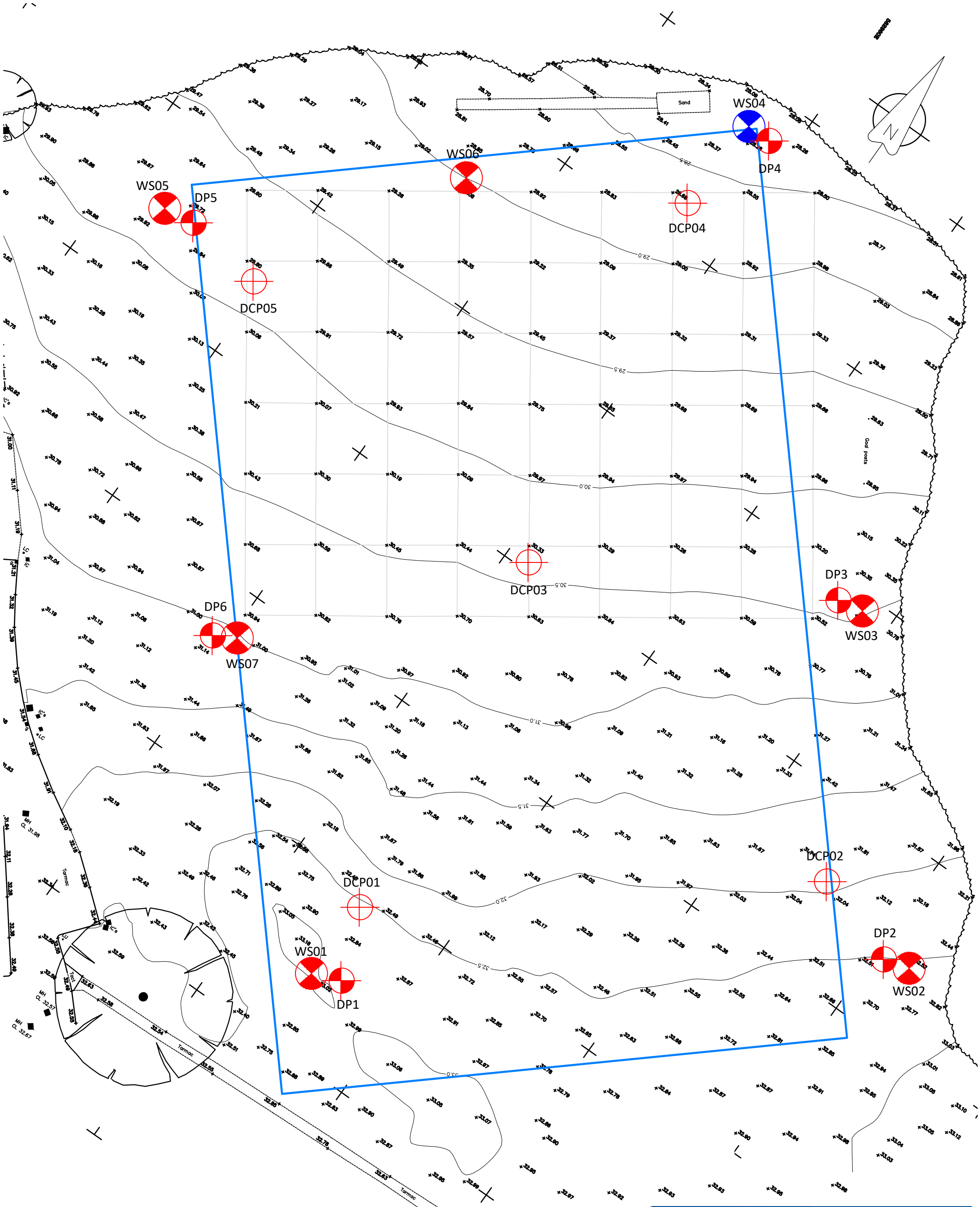
7.8.2 Borehole soakaways could also be an option with borehole soakaway testing required at specific locations to assess this and derive rates for design. However, these produce concentrated ingress which therefore produce a risk of forming dissolution features. Discharge into chalk, which is a principal aquifer and also a Source Protection Zone 2, is likely to be subject to approval of any design and pollution prevention controls by the Environment Agency. Chalk was not encountered during our investigations and is considered likely to be at significant depth.

7.8.3 Due to the risk of chalk dissolution, particularly where granular deposits overlie chalk and therefore a potential pathway for water to enter the chalk, it is recommended that any soakaway drainage is located remote from floodlight foundations and any other structures. Due to the variation in fines and granular content of deposits encountered by our investigations, soakaways as trenches beneath the pitch could result in localised/concentrated infiltration and therefore it is recommended that any such drainage is also located remote from the pitch or constructed with a geogrid reinforcement or crate system to reduce the potential for loss of support should any such features form or be present.

7.8.4 Concentrated ingress of water into chalk can create new dissolution features so it is important that drainage is sufficiently designed for this not to occur. It is suggested that drains should be sealed flexible joints or with concrete bedding and haunching to minimise the risk of future damage. Following CIRIA C574, the guidance suggests that where chalk is of low density (assumed to be the case for the site in the absence of testing to confirm otherwise) any soakaways/infiltration system into the ground should be sited at least 10m from foundations, structures and boundaries.

7.8.5 With reference to Southern Water records (included within Appendix F), a surface water drain is located off Hall Road to the north of the site, travelling along the eastern side of residential properties which could provide a potential outfall for surface water drainage subject to seeking approval of any drainage strategy.

7.8.6 No obvious drainage ditches were observed on or adjacent to site. Southern Water records show a surface water gravity sewer within Hall Road to the north east of the proposed pitch, north of the school buildings and a surface water gravity sewer also within Hall Road to the north east of the pitch. The school drainage may outfall into this sewer network. Further enquiries are recommended to establish the existing school drainage and ultimate outfall, whether this be to existing soakaways or to a positive outfall, with a view to connecting into for the proposed pitch or to guide the drainage strategy for the proposed pitch. Any outfall will be subject to seeking necessary approvals and a detailed drainage strategy.



KEY

WS — Windowless sample borehole

WS — Windowless sample borehole with infiltration test

DCP — TRL - Dynamic cone penetration test

DP — Dynamic probe

Approximate position of proposed 3G AGP pitch full extent 103 x 64m

Base Drawing:
Topographical survey by JPP Surveying.
dated: 09/02/2024, drawing number: 27854Y.

jpp
Infrastructure Design
Structural Engineering
Development Planning
Professional Advice
Geotechnical & Environmental
Surveying

Northampton
T: 01604 781811
Poole & Milton Keynes

E: mail@jppuk.net **W:** jppuk.net

Client	The Football Foundation
Project	Northfleet School for Girls, Northfleet
Title	Investigation Positions over Topographical Survey

Scale at A3	Drawn by	Checked by	Date
NTS	LB	AP	March 2024

Status	Project ref	Drawing no.	Revision
	27677	01	

Key to Exploratory Hole Logs

General

Descriptions for soils and rocks generally following:

BS 5930:2015+A1:2020

BS EN ISO 14688-2:2004

BS EN ISO 14689-1:2003

Sampling

ES	Environmental Sample (taken in appropriate sampling container)
D	Disturbed Sample
B	Bulk Sample
C	Core Sample
U	Undisturbed Sample (number of blows indicated in results column)
UT	Thinwalled Undisturbed (number of blows indicated in results column)
W	Water Sample

Insitu Tests

SPT	Standard Penetration Test
SPT (C)	Cone Penetration Test
PID	Photo Ionisation Detector Results (ppm)
PP	Pocket Penetrometer reading converted to shear strength kPa
HV	Converted Shear Vane measurement kPa

Drilling Records

▼	Depth to standing water level
▽	Depth to water strike
TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Designation (%)

Backfill Symbols

Arisings

Concrete

Blacktop

Bentonite Seal

Gravel Filter

Sand Filter

Pipe Symbols

Plain Pipe

Slotted Pipe

Filter Tip

Principal Soil Types

Topsoil

Made Ground

Clay

Silt

Sand

Gravel

Peat

Principal Rock Types

Mudstone

Siltstone

Sandstone

Limestone

Chalk

Window Sample Log

Project Name: Northfleet School for Girls	Client: Football Foundation	Date: 09/02/2024
Location: Northfleet	Contractor: Keystone Site Solutions Ltd	
Project No. : 27677	Crew Name:	Drilling Equipment: Premier 110

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS01	WLS		TM	1:15	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
								Brown slightly gravelly slightly silty sandy TOPSOIL with some roots and rootlets. Gravel consists of subangular to angular fine sandstone and wood.	
					0.30			Light greyish brown sandy subangular to angular fine to medium sandstone GRAVEL. (MADE GROUND)	
					0.40			Brown slightly gravelly slightly sandy silty CLAY with some roots and rootlets. Gravel consists of subangular to angular fine to medium sandstone, concrete and brick. (MADE GROUND)	
		0.60	ES						
		1.00		N=50 (8,8/10,12,14,14)	1.00			Very dense light yellowish brown silty sandy subangular to angular fine to coarse sandstone and flint GRAVEL. (THANET FORMATION)	1
					1.20			End of Borehole at 1.200m	
									2
									3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

No groundwater encountered.

Window Sample Log

Project Name: Northfleet School for Girls	Client: Football Foundation	Date: 09/02/2024
Location: Northfleet	Contractor: Keystone Site Solutions Ltd	
Project No. : 27677	Crew Name:	Drilling Equipment: Premier 110

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS02	WLS		TM	1:15	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
								Brown slightly gravelly slightly silty sandy TOPSOIL with some roots and rootlets. Gravel consists of subangular to angular fine sandstone.	
					0.35			Light yellowish brown silty sandy subangular to angular fine to coarse sandstone and flint GRAVEL. (THANET FORMATION)	
		0.70	D						
		1.00		N=50 (8,10/12,12,13,13)	0.95 1.00			Very dense light yellowish brown clayey sandy subangular to angular fine to coarse sandstone and flint GRAVEL. (THANET FORMATION)	1
								End of Borehole at 1.000m	2
									3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

No groundwater encountered.

Window Sample Log

Project Name: Northfleet School for Girls	Client: Football Foundation	Date: 09/02/2024
Location: Northfleet	Contractor: Keystone Site Solutions Ltd	
Project No. : 27677	Crew Name:	Drilling Equipment: Premier 110

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS03	WLS		TM	1:15	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.10	ES					Brown slightly gravelly slightly silty sandy TOPSOIL with some roots and rootlets. Gravel consists of subangular to angular fine sandstone.	
					0.40				
		0.50	D					Soft becoming firm orangish brown slightly gravelly sandy silty CLAY with roots and rootlets. Gravel consists of subrounded to angular fine to medium sandstone and flint. (THANET FORMATION)	
		0.70	PP	20.00					
		0.90	PP	70.00					
		1.00		N=26 (4,4/5,6,7,8)					1
					1.45				
		1.50	D					Very dense orangish brown and occasional grey silty fine to medium SAND with occasional clayey lenses. (THANET FORMATION)	
		2.00		N=50 (8,10/12,12,13,13)	2.00			End of Borehole at 2.000m	2
									3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

No groundwater encountered.

Window Sample Log

Project Name: Northfleet School for Girls	Client: Football Foundation	Date: 09/02/2024
Location: Northfleet	Contractor: Keystone Site Solutions Ltd	
Project No. : 27677	Crew Name:	Drilling Equipment: Premier 110

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS04	WLS		TM	1:15	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
								Brown slightly gravelly slightly silty sandy TOPSOIL with some roots and rootlets. Gravel consists of subangular to angular fine sandstone and brick.	
					0.30			Soft orangish brown slightly gravelly sandy silty CLAY with roots and rootlets. Gravel consists of subrounded to angular fine to medium sandstone and flint. (THANET FORMATION)	
		0.70	D						
		0.70	PP	10.00					
					0.85			Very dense light yellowish brown silty sandy subangular to angular fine to coarse sandstone and flint GRAVEL. (THANET FORMATION)	
		0.90	D						
		1.00		N=50 (8,8/11,12,13,14)	1.00			End of Borehole at 1.000m	1
									2
									3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

No groundwater encountered.

Window Sample Log

Project Name: Northfleet School for Girls	Client: Football Foundation	Date: 09/02/2024
Location: Northfleet	Contractor: Keystone Site Solutions Ltd	
Project No. : 27677	Crew Name:	Drilling Equipment: Premier 110

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS05	WLS		TM	1:15	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
								Brown slightly gravelly slightly silty sandy TOPSOIL with some roots and rootlets. Gravel consists of subangular to angular fine sandstone.	
					0.30			Very soft orangish brown very sandy silty CLAY. (THANET FORMATION)	
		0.50	D						
		0.70	PP	15.00					
					0.80			Firm orangish brown sandy silty CLAY. (THANET FORMATION)	
		0.90	PP	55.00					
		1.00		N=50 (12,13/50 for 270mm)	0.98 1.00			Very dense orangish brown slightly clayey fine to medium SAND. (THANET FORMATION) End of Borehole at 1.000m	1
									2
									3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

No groundwater encountered.

Window Sample Log

Project Name: Northfleet School for Girls	Client: Football Foundation	Date: 09/02/2024
Location: Northfleet	Contractor: Keystone Site Solutions Ltd	
Project No. : 27677	Crew Name:	Drilling Equipment: Premier 110

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS06	WLS		TM	1:15	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Brown slightly gravelly slightly silty sandy TOPSOIL with some roots and rootlets. Gravel consists of subangular to angular fine sandstone.
					0.30			Very soft orangish brown very sandy silty CLAY. (THANET FORMATION)
		0.50		N=8 (0,0/2,2,2,2)				
		0.70	PP	20.00				
					0.80			Firm orangish brown sandy silty CLAY. (THANET FORMATION)
		0.90	D					
		0.90	PP	50.00				
		1.00		N=50 (9,9/50 for 265mm)	0.99 1.00			Very dense orangish brown slightly clayey fine to medium SAND. (THANET FORMATION) End of Borehole at 1.000m

1

2

3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

No groundwater encountered.

Window Sample Log

Project Name: Northfleet School for Girls	Client: Football Foundation	Date: 09/02/2024
Location: Northfleet	Contractor: Keystone Site Solutions Ltd	
Project No. : 27677	Crew Name:	Drilling Equipment: Premier 110

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS07	WLS		TM	1:15	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.10	ES					Brown slightly gravelly slightly silty sandy TOPSOIL with some roots and rootlets. Gravel consists of subangular to angular fine sandstone.	
					0.30			Firm orangish brown sandy silty CLAY. (THANET FORMATION)	
		0.50		N=5 (0,0/1,1,1,2)					
		0.70	PP	30.00					
		0.90	D						
		0.90	PP	50.00	0.95			Very dense orangish brown slightly clayey fine to medium SAND. (THANET FORMATION)	1
		1.00		N=50 (7,8/12,12,13,13)	1.00			End of Borehole at 1.000m	
									2
									3

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

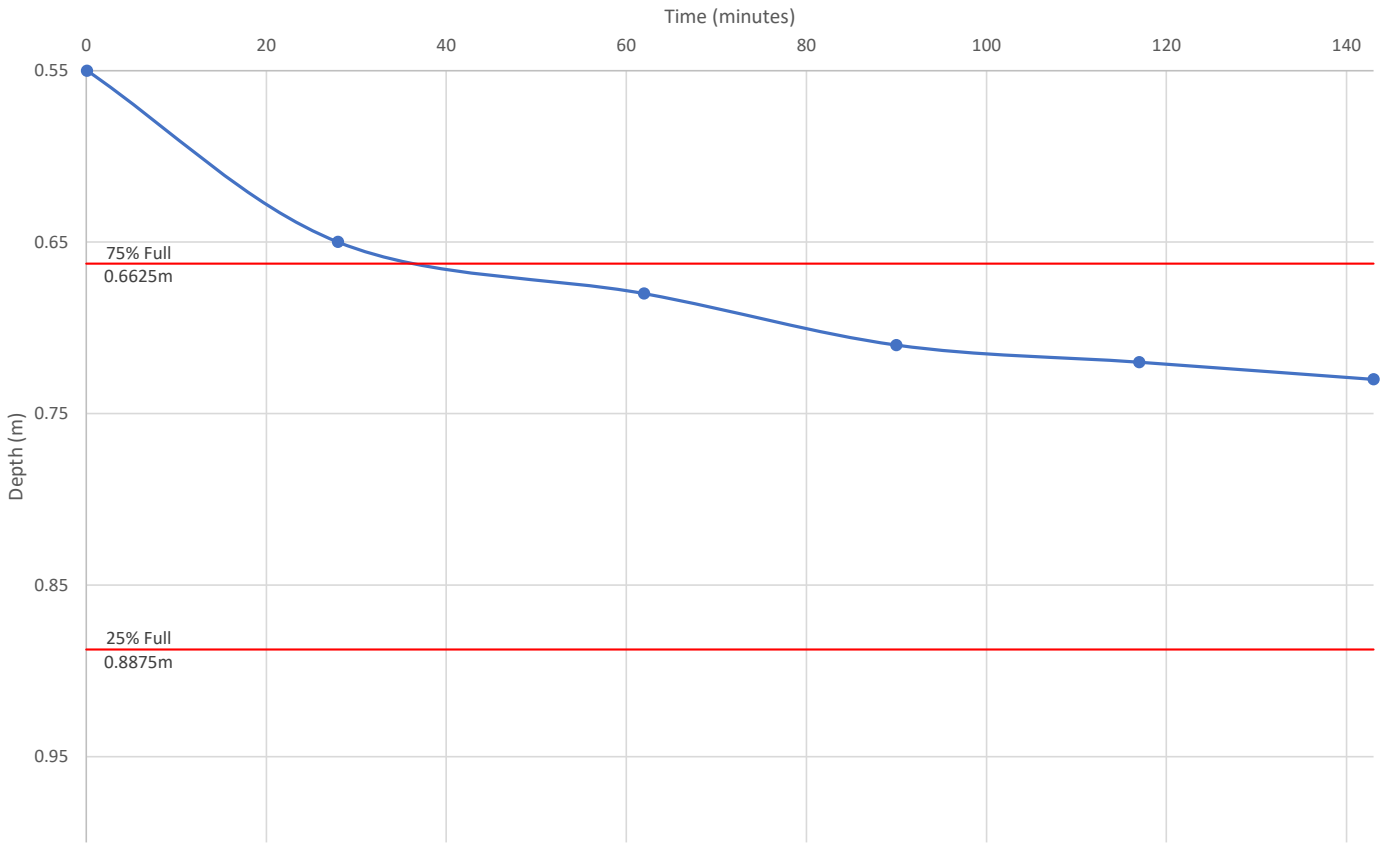
No groundwater encountered.

Indicative Soakage Test Results

Project Name:	Northfleet School for Girls
Project No:	27677
Client:	Football Foundation
Date:	09 February 2024
Revision:	0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

WS04 - Cycle 1



Borehole radius 0.05m
Borehole diameter 0.1m
Borehole depth 1m

Soil infiltration rate $f = \dfrac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

Insufficient soakage achieved to derive rate

$V_{p75\text{-}25}$: the effective storage volume of water in the soakage borehole between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage borehole up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

Appendix E

Infiltration Testing Report
JPP G&E report ref. 27677/LR/LC/L01

Our Ref: 27677/LR/LC/L01

Your Ref:

Date: 9th June 2025

JPP Geotechnical & Environmental Ltd
Grand Union Works| Whilton Locks
Daventry | NN11 2NH

T: 01604 781811
E: mail@jppuk.net
W:jppuk.net

Labosport UK
Unit 3 Aerial Way
Hucknall
Nottingham
NG15 6DW
FAO Bob Froud

Dear Bob,

Re: BRE 365 Infiltration Testing for a Proposed 3G AGP at Northfleet School for Girls

1.0 Introduction and Scope

1.1 JPP were appointed by Labosport Ltd to carry out infiltration testing in machine excavated trial pits following *BRE 365 Soakaway Design* guidance to further inform the surface water drainage strategy for the proposed 3G Artificial Grass Pitch (AGP).

1.2 We originally carried out an investigation for the proposed 3G AGP, in February 2024 for the Football Foundation in conjunction with the Football Foundation AGP Framework. This report, ref R-SI-27677-01-00 dated March 2024, should be referred to for additional detail.

1.3 This letter report has been produced for the benefit of Labosport Ltd to be utilised in conjunction with the Football Foundation AGP Framework, JPP do not accept liability for the third-party use of the information herein without prior reliance agreed. This report is valid for 6 years from the date of issue.

1.4 Investigations have been carried out using reasonable care and judgement based on the scope. There is a potential for ground conditions to vary from those encountered during our investigations and differ where not exposed by our investigations.

2.0 Fieldwork

2.1 Our fieldwork was carried out on the 28th April 2025 and comprised the following:

- 4 machine excavated trial pits (SA01 to SA04) to depths of between 1.5m and 3.0m bgl
- Infiltration testing within each of the trial pits, in general accordance with *BRE 365 'Soakaway Design'* guidance.

An EOD engineer supervised the excavations to clear for potential buried UXO.

2.2 Each position was scanned using a cable avoidance tool with the use of a signal generator prior to positioning and proceeding. Statutory undertaker's service records were obtained prior to works commencing and were referred to for positioning of the excavations. These exclude private services.

2.3 The positions were targeted in the north west of the playing fields, to be located at the most likely position for the proposed soakaway, being down gradient/slope of the proposed pitch and sufficient offset due to potential chalk dissolution risk.

2.4 Trial pit logs, photographic records and infiltration test records are appended to this letter, together with a plan showing the approximate positions of the tests.

3.0 Site Description and Geology

3.1 The proposed pitch is located within north east of grassed playing field to the east of Northfleet School for Girls. There is a long jump directly to the north of the proposed pitch and a narrow wooded area to the north of this, between the playing field and Hall Road. The wooded area also extends around to the north east and east. The machine excavations were targeted towards the north west edge of the playing field, close to the trees. There is a grassed strip/extent of the playing fields between the proposed pitch location and the car park and access road to the west.

3.2 BGS mapping of the site indicates there to be no superficial within or around the site with bedrock geology from the surface of the Thanet Formation (sands), which is overlying the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Chalk).

3.3 Our previous windowless sampler boreholes encountered a covering of 0.3 to 0.4m of Topsoil. In WS01, located in the south west corner of the proposed pitch, Made Ground was encountered to 1.0m depth bgl considered to have been artificially raised at the time of the school redevelopment. Beneath the Topsoil, deposits comprised very soft to firm clays in each of the boreholes apart from the south west and south east positions, to depths of between 0.85 to 1.45m bgl which could represent Head deposit or weathered Thanet Formation. Such clay deposits, and beneath the Made Ground in WS01 in the south west and beneath the topsoil in WS02 in the south east, were underlain by a sand or gravel deposit of Thanet Formation, within which each of the boreholes were terminated at 1.0 or 2.0m depth bgl due to the density and SPT refusal (N value of 50).

4.0 Ground Conditions

4.1 Each trial pit encountered a covering of Topsoil to depths of between 0.15m to 0.30m bgl, generally comprising of a brown (pinkish brown In SA01) slightly gravelly silty sandy clayey Topsoil with frequent fine to medium flint gravel, and occasional sandstone, glass and brick fragments.

4.2 Beneath the Topsoil, were deposits considered to be representative of the Thanet Formation, initially comprising of an orange brown slightly gravelly slightly clayey slightly silty fine to medium Sand, with fine to medium rounded to subrounded to rounded flint to depths of between 0.95 to 1.45m bgl. Beneath this, in each of the four excavations was a layer between 0.2 to 0.35m thick of orange brown slightly silty slightly clayey very sandy Gravel of flint to depths of between 1.2 to 1.7m. This was above a generally orange brown slightly clayey to clayey silty slightly gravelly to very gravelly fine to medium Sand with occasional clayey pockets, to the base depth of the excavations which were terminated at 1.5m and 2.0m bgl, in SA03 and SA02 respectively. In the deeper positions, SA01 and SA04, such deposits were encountered to depths of 2.1 and 2.2m bgl onto a light yellowish brown slightly clayey slightly gravelly silty fine Sand with gravels of flint, encountered to the base depth of the excavations of 2.45m in SA04

4.3 Instability of the trial pit sides was experienced in each of the four positions, with occasional collapse of the side walls noted during the soakaway testing and between the testing. This resulted in the shallowing of the positions during the testing.

4.4 No groundwater was encountered within the intrusive investigation works undertaken in both February 2024 and April 2025 to depths of up to 3.0m bgl. Groundwater was also not encountered within the exploratory excavations carried out in April and May 2019 for the proposed Sixth Form Block in the south west of the site, with the deepest borehole to 10.0m depth bgl. It is considered likely that groundwater will be reasonably deep.

5.0 Infiltration Testing Results

5.1 Infiltration testing was carried out in general accordance with BRE 365 'Soakaway Design', with the observations summarised in the following table. As the rates were slow, it was not possible to complete three full cycles and one complete cycle in 3 of the 4 positions.

Trial pit reference	Cycle	Base depth of trial pit	Test result /observations
SA01	1	2.77m bgl	2.39×10^{-5} m/s
	2	2.85m bgl	1.24×10^{-5} m/s
	3	2.60m bgl	1.11×10^{-5} m/s Conservatively extrapolated after 40 minutes to derive an indicative rate.
SA02	1	2.00m bgl	Insufficient infiltration to derive rate
SA03	1	1.60m bgl	4.50×10^{-6} m/s Conservatively extrapolated after 40 minutes to derive an indicative rate.
SA04	1	2.45m bgl	5.28×10^{-6} m/s Conservatively extrapolated after 40 minutes to derive an indicative rate.

Table 5.1

5.2 Instability of the side walls was experienced and some outbreak and infilling of the base of the excavations, resulting in a slight shallowing of the base depth during the testing. Within trial pit SA01, some of the infilled soils were excavated from the base before carrying out the second cycle.

6.0 Assessment and Conclusion

6.1 Based on the results of the infiltration testing, the near surface Thanet Formation deposits provide some infiltration potential which improves with depth. Testing within the deepest trial pit, excavated to 3.0m depth bgl, with the base depth of the testing of between 2.85 to 2.6m due to instability and outbreak of the side walls infilling the excavation during and between the tests, produced infiltration rates of between 2.39 x 10^{-5} to 1.11 x 10^{-5} m/s. With the third cycles conservatively extrapolated to derive a rate. It is therefore recommended that the proposed soakaway has a base depth of at least 3.0m bgl, into the light yellowish brown slightly clayey slightly gravelly silty fine Sand, and the conservative lowest rate is adopted for design of 1.11 x 10^{-5} m/s. The trial pit logs and infiltration test results, should be referred to for full details of the ground conditions encountered at the depths of the testing to target for the soakaway design.

6.2 This suggested design rate is further supported by the soakaway testing and design rate utilised for the recently constructed soakaway for the Sixth Form block located to the south west, where a geocellular soakaway was installed in the south of the playing fields in 2021, designed using an infiltration rate of 1.38 x 10^{-5} m/s, based on results of soakaway testing carried out. Ground conditions were similar to those encountered in the proposed soakaway location, based on the fieldwork records. This is also located at a similar topographical level to the proposed soakaway location for the pitch, with the site being on a local high point and levels falling to the north boundary across the pitch and falling to the south, beyond the proposed pitch to the south.

6.3 No groundwater was encountered within the intrusive investigation works undertaken in both February 2024 and April 2025 to depths of up to 3.0m bgl. Groundwater was also not encountered within the exploratory excavations carried out in April and May 2019 for the proposed Sixth Form Block in the south west of the site, with the deepest borehole to 10.0m depth bgl. It is considered likely that groundwater will be reasonably deep.

6.4 As noted in our previous site investigation report, ref R-SI-27677-01-00, which should be referred to for detailed information, we have considered there to be a potential risk of chalk dissolution. Since the previous investigations, we have now located some existing borehole information from the construction of the Sixth Form building to the south west. The deepest boreholes encountered Thanet Formation deposits to at least 10.0m depth bgl. Although this significant thickness of overlying Thanet Formation does reduce the potential for chalk dissolution, such deposits are permeable and therefore it is not possible to fully discount the potential for vertical permeation of water through the Thanet Formation resulting in chalk dissolution at depth, which could result in infilling of overlying soils and loss of support near surface. There are not however any nearby occurrences of chalk dissolution, with the closest some 755m to the south east recorded as six solution pipes. This significant covering of Thanet Formation above the chalk does however reduce the likelihood of unrecorded manmade features such as Deneholes or chalk wells within the site.

6.5 We would still suggest that a cautious approach is maintained of locating the soakaway at least 10m from foundations, structures (including the pitch) and boundaries, based on CIRIA 574 'Engineering in Chalk', where the chalk is of low density (assumed to be the case for the site in the absence of encountering the Chalk deposits within the excavations to allow testing to confirm otherwise).

6.6 For the soakaway design, as large and level area as possible is recommended to increase the surface area and targeting the most permeable deposits along its length, with ground conditions varying in fines and granular content and to minimise the potential for concentrated ingress occurring. A crate/geocellular type system as opposed to gravel is recommended to minimise potential for loss into a dissolution feature. It is recommended that drains should include sealed flexible joints or with concrete bedding and haunching to minimise the risk of future damage.

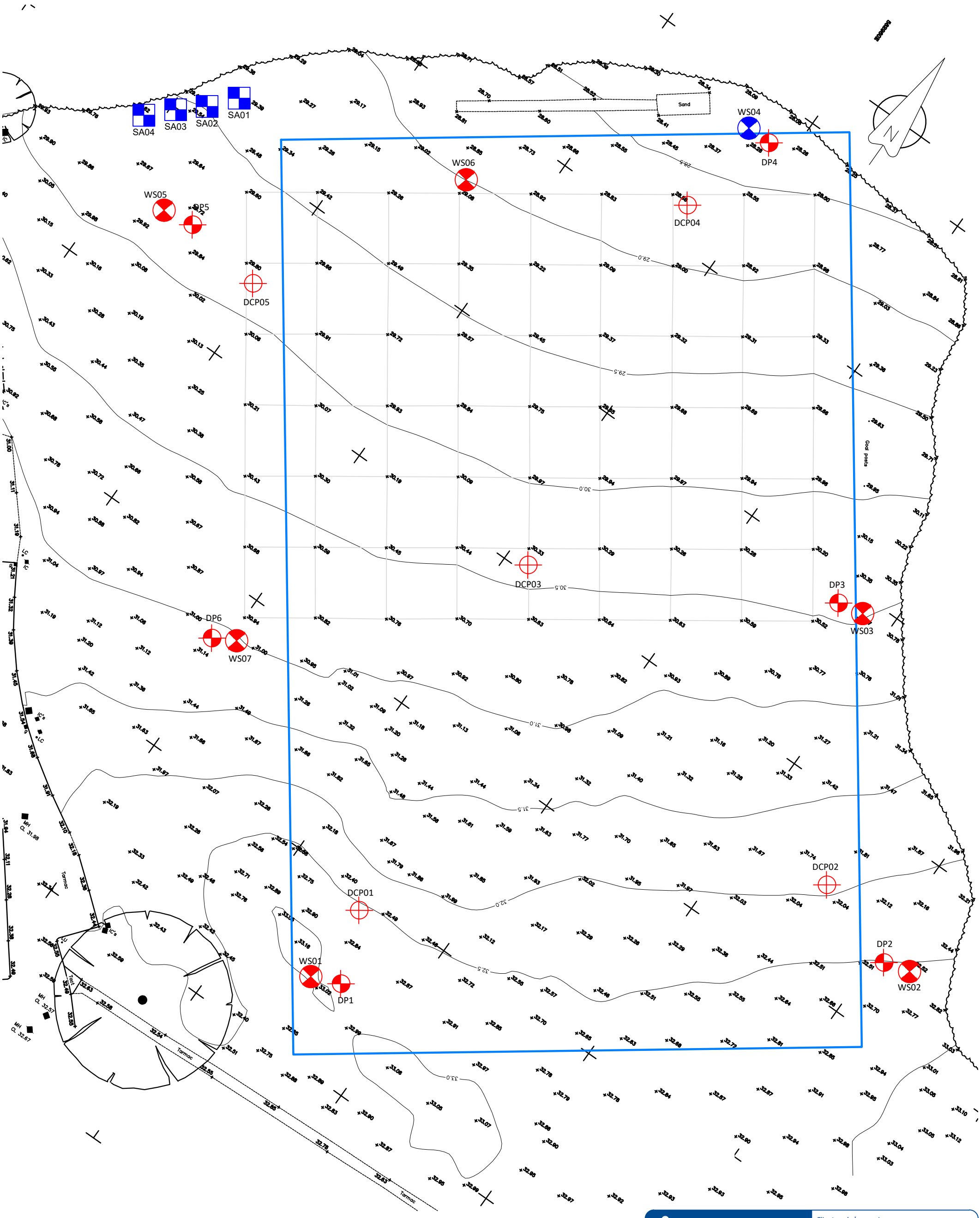
6.7 Discharge into the Thanet Formation overlying the Chalk, which is a principal aquifer and within a Source Protection Zone 2 (SPZ2), may be subject to approval of any design and pollution prevention controls, by the Environment Agency.

Yours sincerely,

Libby Rogers BSc (Hons) FGS
Geo-Environmental Engineer

Lydia Crawford BSc (Hons) CEnv MIEnvSc FGS
Director

Attachments:
Plan to show approximate infiltration test positions
Trial pit logs
Photographic records of trial pits
Infiltration test records



KEY

WS — Windowless sample borehole

WS — Windowless sample borehole with infiltration test

DCP — TRL - Dynamic cone penetration test

DP — Dynamic probe

SA — Machine excavated trial pit with infiltration testing

Approximate position of proposed 3G AGP pitch full extent 103 x 64m

Base Drawing:
Topographical survey by JPP Surveying.
dated: 09/02/2024, drawing number: 27854Y.
Revision A: To include soakaway testing positions carried out in April 2025.

jpp
- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

Northampton
T: 01604 781811
Poole & Milton Keynes

E: mail@jppuk.net **W:** jppuk.net

Client	Labosport
Project	Northfleet School for Girls, Northfleet
Title	Investigation Positions over Topographical Survey

Scale at A3	NTS	Drawn by	LB	Checked by	AP	Date	April 2025
Status		Project ref 27677		Drawing no. 01		Revision A	

Trial Pit Log

Project Name: Northfleet School for Girls	Client: Labopsort Ltd.	Date: 28/04/2025
Location:	Contractor:	
Project No. : 27677	Crew Name:	Equipment: 3T Excavator.

Location Number	Location Type	Level	Logged By	Scale	Page Number
SA01	TP		LR	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			Grass over pinkish brown slightly clayey slightly gravelly silty sandy clayey TOPSOIL with abundant roots and rootlets. Gravel consists of fine to medium subrounded to rounded flint and fine to coarse subangular limestone and sandstone.
					1.10			Orange brown slightly gravelly slightly clayey silty fine to medium SAND with abundant roots and rootlets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					1.30			Orange brown slightly silty slightly clayey very sandy subrounded to rounded fine to coarse flint GRAVEL. (THANET FORMATION)
					1.75			Orange brown slightly clayey silty gravelly fine to medium SAND with frequent clayey pockets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					2.10			Orange brown slightly gravelly slightly clayey silty fine to medium SAND with occasional clayey pockets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					3.00			Light yellowish brown slightly clayey slightly gravelly silty fine SAND. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
								End of Trial Pit at 3.000m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.30	0.45	Instability within sidewalls.	None.				

Remarks

Trial pit dry upon completion. UXO engineer supervised excavation.

Trial Pit Log

Project Name: Northfleet School for Girls	Client: Labopsort Ltd.	Date: 28/04/2025
Location:	Contractor:	
Project No. : 27677	Crew Name:	Equipment: 3T Excavator.

Location Number	Location Type	Level	Logged By	Scale	Page Number
SA02	TP		LR	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			Grass over brown slightly clayey slightly gravelly silty sandy clayey TOPSOIL with abundant roots and rootlets. Gravel consists of fine to medium subrounded to rounded flint and fine to coarse subangular sandstone.
					1.00			Orange brown slightly gravelly slightly clayey silty fine to medium SAND with abundant roots and rootlets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					1.20			Orange brown slightly silty slightly clayey very sandy subrounded to rounded fine to coarse flint GRAVEL. (THANET FORMATION)
					2.00			Orange brown slightly clayey silty gravelly fine to medium SAND with frequent clayey pockets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
								End of Trial Pit at 2.000m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.50	0.45	Instability within sidewalls.	None.				

Remarks

Trial pit dry upon completion. UXO engineer supervised excavation.

Trial Pit Log

Project Name: Northfleet School for Girls	Client: Labopsort Ltd.	Date: 28/04/2025
Location:	Contractor:	
Project No. : 27677	Crew Name:	Equipment: 3T Excavator.

Location Number	Location Type	Level	Logged By	Scale	Page Number
SA03	TP		LR	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over brown slightly clayey slightly gravelly silty sandy clayey TOPSOIL with abundant roots and rootlets. Gravel consists of fine to medium subrounded to rounded flint, fine to coarse subangular sandstone, and angular fine to coarse brick and glass.
					0.25			Orange brown slightly gravelly slightly clayey silty fine to medium SAND with abundant roots and rootlets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					0.95			Orange brown slightly silty clayey very sandy subrounded to rounded fine to coarse flint GRAVEL with frequent orange brown and grey clayey pockets. (THANET FORMATION)
					1.30			Orange brown slightly clayey silty very gravelly fine to medium SAND with frequent clayey pockets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					1.50			End of Trial Pit at 1.500m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.30	0.45	Instability within sidewalls.	None.				

Remarks

Trial pit dry upon completion. UXO engineer supervised excavation.

Trial Pit Log

Project Name: Northfleet School for Girls	Client: Labopsort Ltd.	Date: 28/04/2025
Location:	Contractor:	
Project No. : 27677	Crew Name:	Equipment: 3T Excavator.

Location Number	Location Type	Level	Logged By	Scale	Page Number
SA04	TP		LR	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Grass over brown slightly clayey slightly gravelly silty sandy clayey TOPSOIL with abundant roots and rootlets. Gravel consists of fine to medium subrounded to rounded flint, fine to coarse subangular sandstone.
					0.30			Orange brown slightly gravelly slightly clayey silty fine to medium SAND with abundant roots and rootlets and frequent clayey pockets. Gravel consists of fine to medium subrounded to rounded flint and chalk. (THANET FORMATION)
					1.45			Orange brown slightly silty slightly clayey very sandy subrounded to rounded fine to coarse flint GRAVEL with occasional orange brown and grey clayey pockets. (THANET FORMATION)
					1.70			Orange brown silty clayey gravelly fine to medium SAND with frequent clayey pockets. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					2.20			Light yellowish brown slightly clayey slightly gravelly silty fine SAND. Gravel consists of fine to medium subrounded to rounded flint. (THANET FORMATION)
					2.45			End of Trial Pit at 2.450m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.60	2.45	Instability within sidewalls.	None.				

Remarks

Trial pit dry upon completion. UXO engineer supervised excavation.

Photographic Records – Trial Pits Project: Northfleet School for Girls	
Project Ref: 27677	
Date: 28/04/25	T: 01604 781811
	E: mail@jppuk.net
Revision: 0	W: www.jppuk.net

SA01 – Ground level to 3.00m bgl.

Photographic Records – Trial Pits

Project: Northfleet School for Girls

Project Ref: 27677

Date: 28/04/25

Revision: 0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA02 – Ground level to 2.00m bgl.

Photographic Records – Trial Pits

Project: Northfleet School for Girls

Project Ref: 27677

Date: 28/04/25

Revision: 0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA03 – Ground level to 1.50m bgl.

Photographic Records – Trial Pits

Project: Northfleet School for Girls

Project Ref: 27677

Date: 28/04/25

Revision: 0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

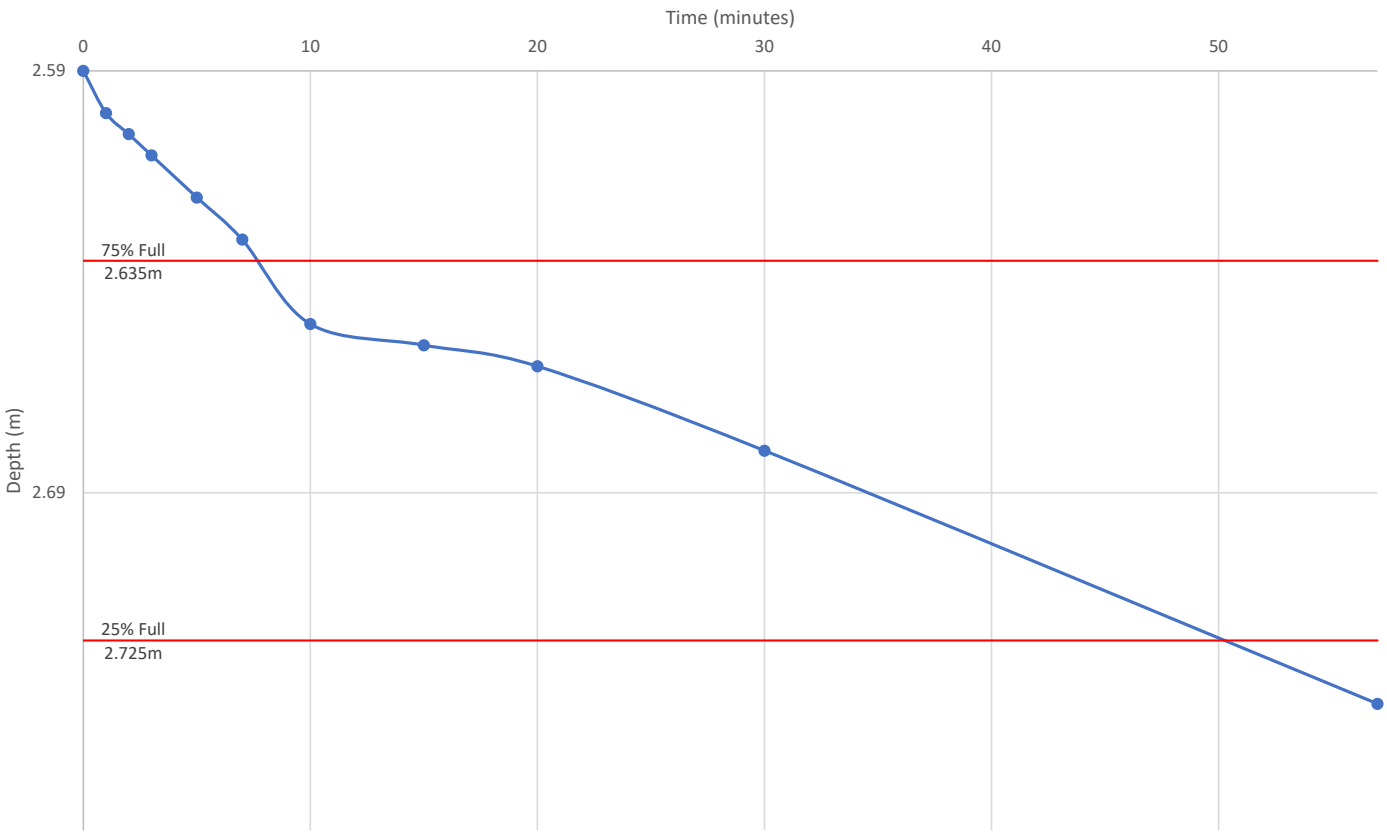
SA04 – Ground level to 2.45m bgl.

BRE 365 Infiltration Test Result

Project Name:	Northfleet School for Girls
Project No.	27677
Client	Labosport
Date:	28 April 2025
Revision:	0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA01 - Cycle 1



Trial pit width = 0.45m
Trial pit length = 2.3m
Trial pit depth = 2.77m

Soil infiltration rate *f* = $\frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

= **2.39E-05** m/s

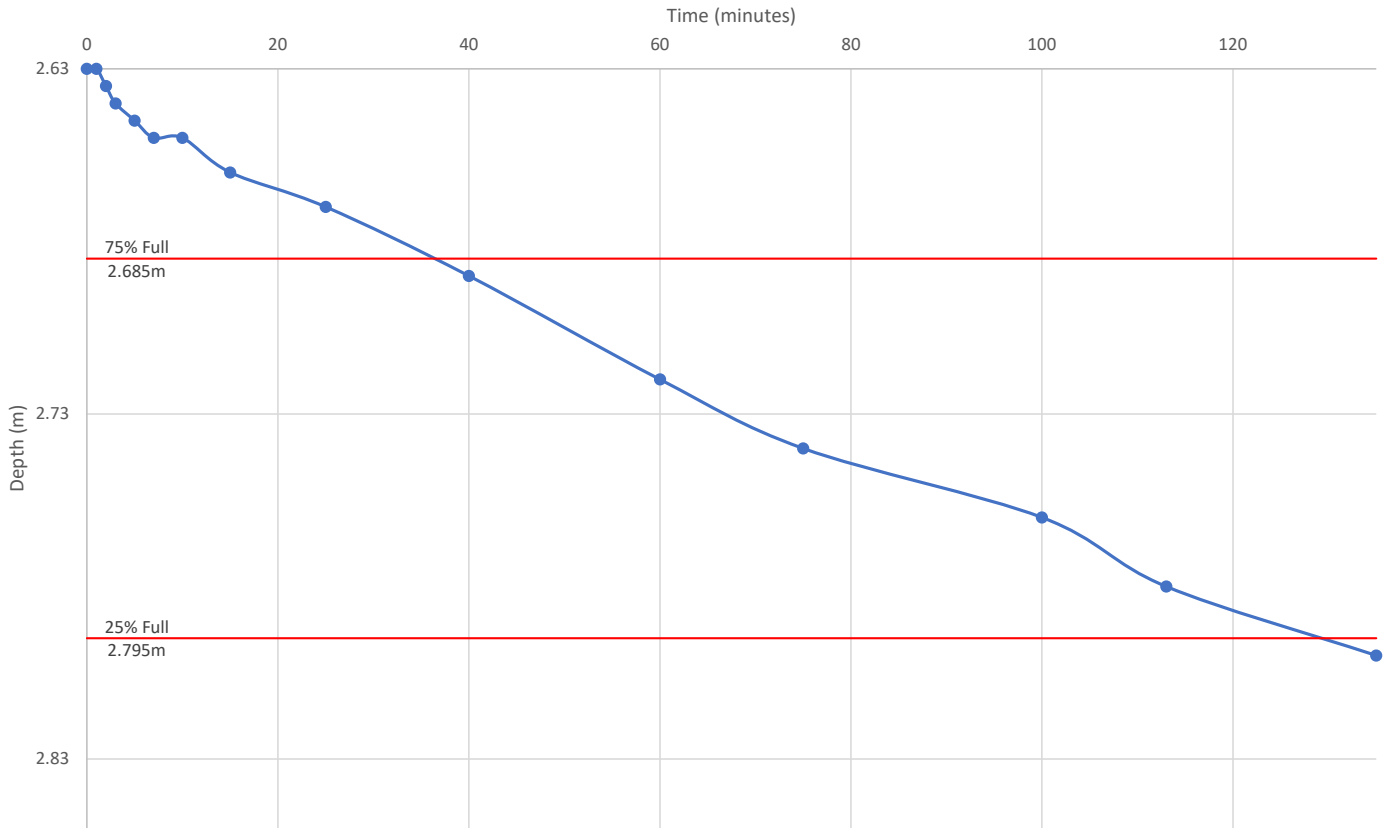
$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

BRE 365 Infiltration Test Result

Project Name:	Northfleet School for Girls
Project No.	27677
Client	Labosport
Date:	28 April 2025
Revision:	0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA01 - Cycle 2



Trial pit width = 0.45m
Trial pit length = 2.3m
Trial pit depth = 2.85m

Soil infiltration rate *f* = $\frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

= **1.24E-05** m/s

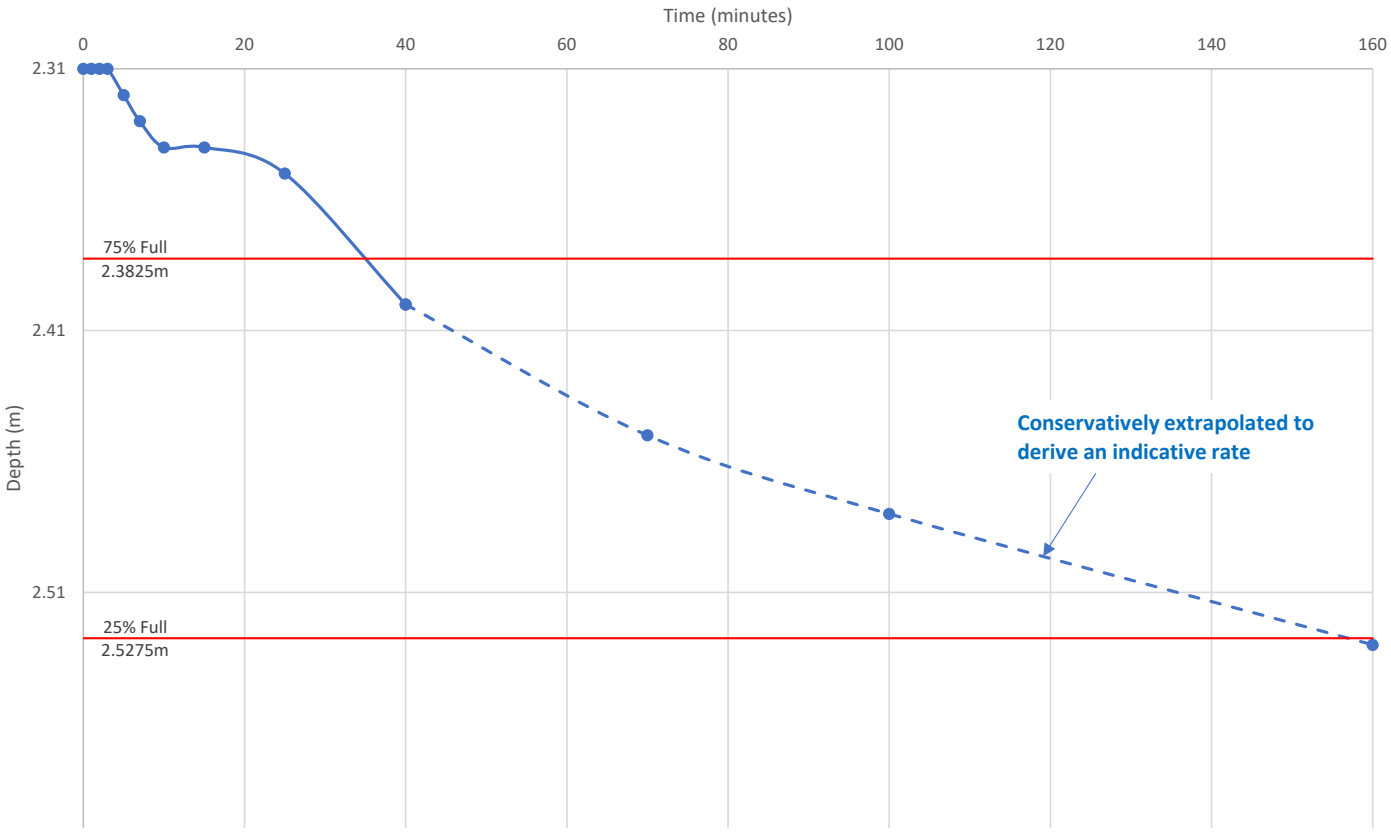
$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

BRE 365 Infiltration Test Result

Project Name:	Northfleet School for Girls
Project No.	27677
Client	Labosport
Date:	28 April 2025
Revision:	0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA01 - Cycle 3



Trial pit width = 0.45m
Trial pit length = 2.3m
Trial pit depth = 2.6m

Soil infiltration rate *f* = $\dfrac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

= **1.11E-05** m/s

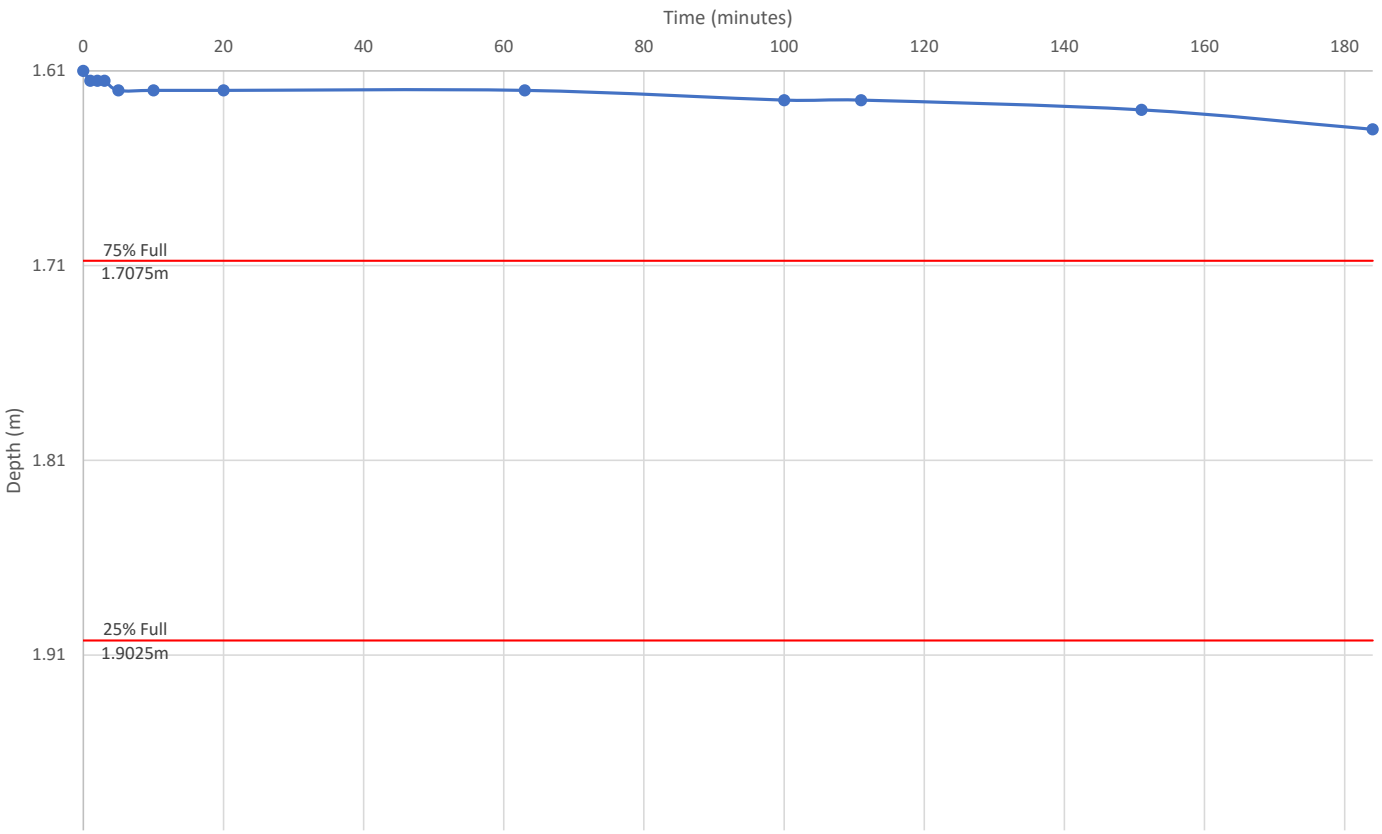
$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

BRE 365 Infiltration Test Result

Project Name:	Northfleet School for Girls
Project No.	27677
Client	Labosport
Date:	28 April 2025
Revision:	0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA02 - Cycle 1



Trial pit width = 0.45m
Trial pit length = 1.5m
Trial pit depth = 2m

Soil infiltration rate *f* = $\frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

Insufficient infiltration to derive a rate

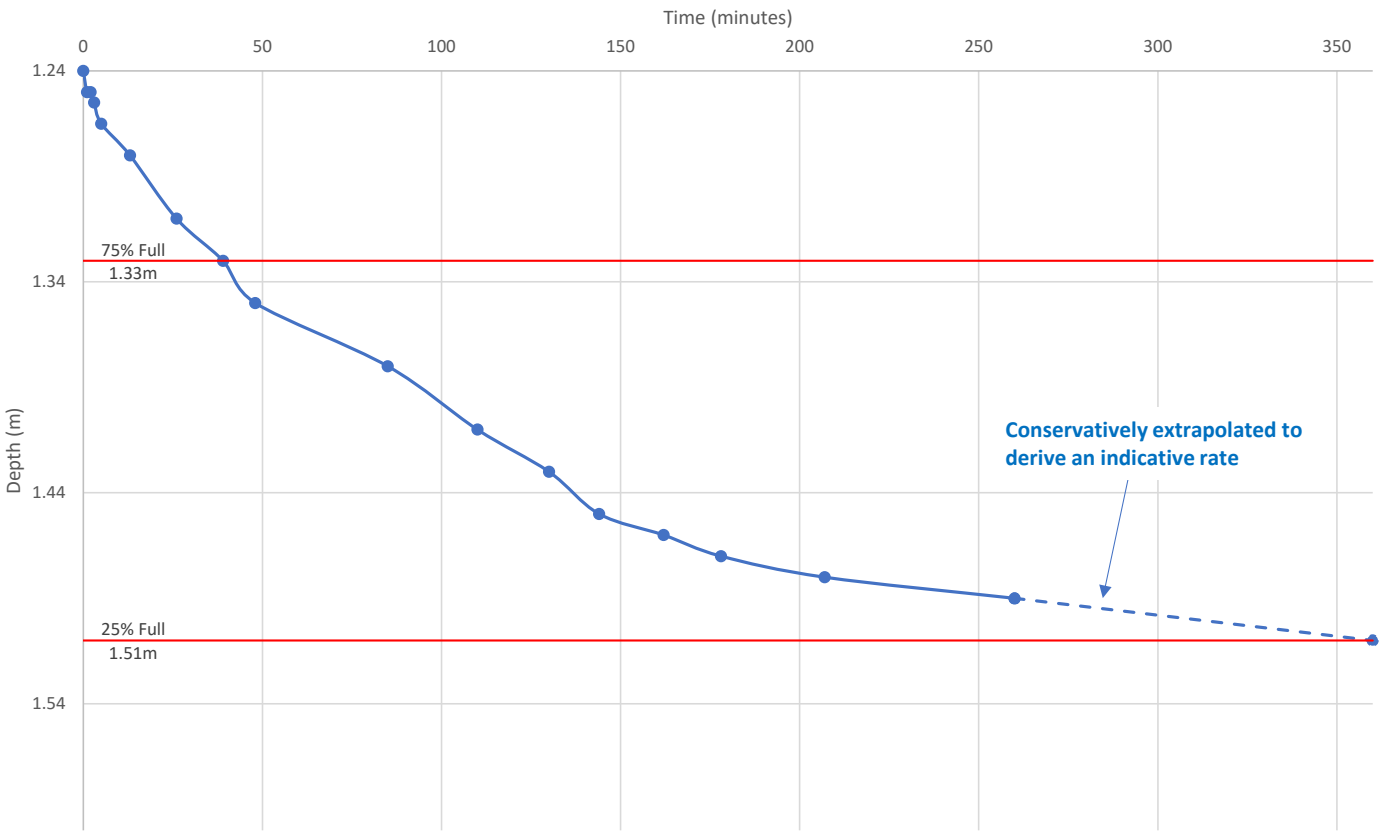
$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

BRE 365 Infiltration Test Result

Project Name:	Northfleet School for Girls
Project No.	27677
Client	Labosport
Date:	28 April 2025
Revision:	0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA03 - Cycle 1



Trial pit width = 0.45m
Trial pit length = 1.3m
Trial pit depth = 1.6m

Soil infiltration rate *f* = $\frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

= **4.50E-06** m/s

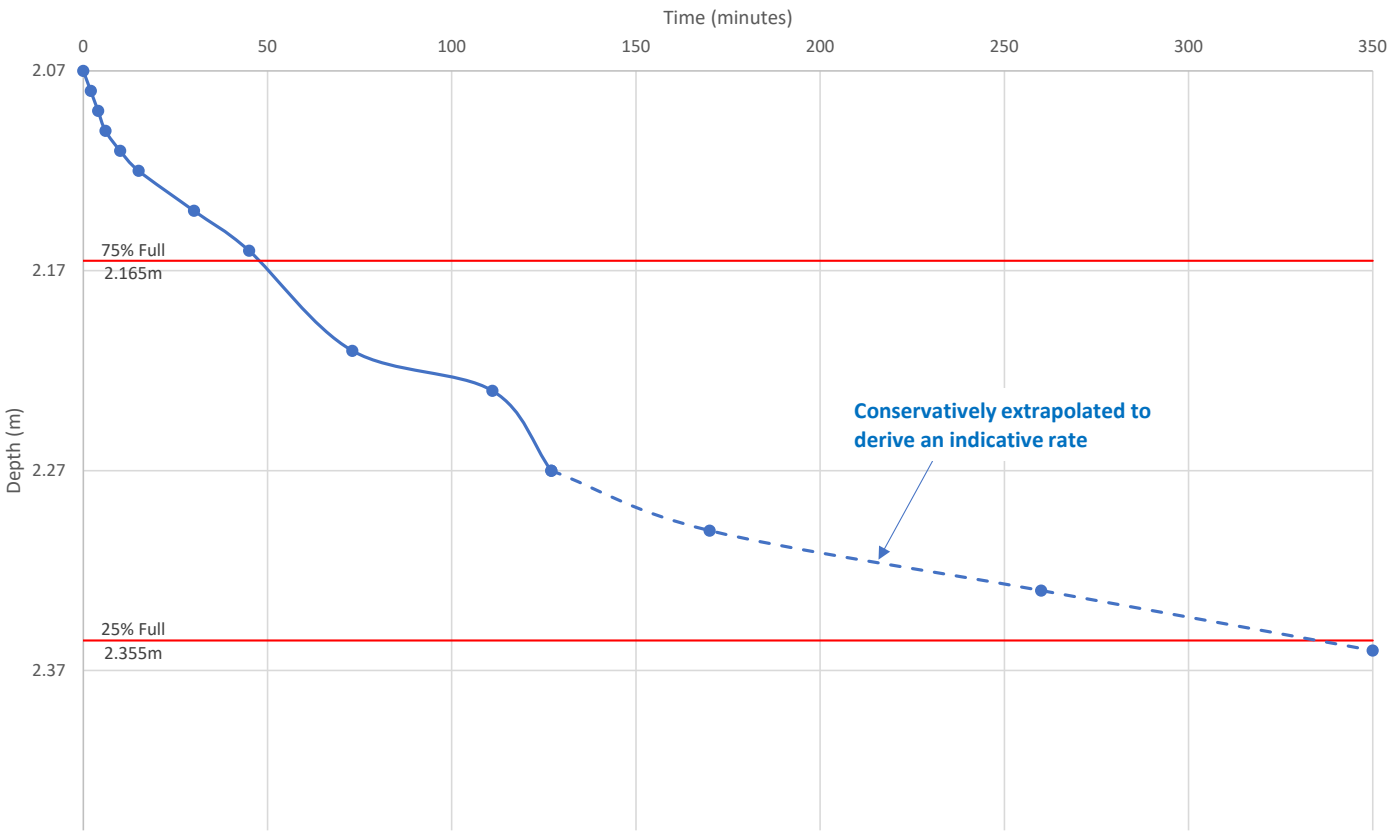
$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

BRE 365 Infiltration Test Result

Project Name:	Northfleet School for Girls
Project No.	27677
Client	Labosport
Date:	28 April 2025
Revision:	0

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net

SA04 - Cycle 1



Trial pit width = 0.45m
Trial pit length = 1.6m
Trial pit depth = 2.45m

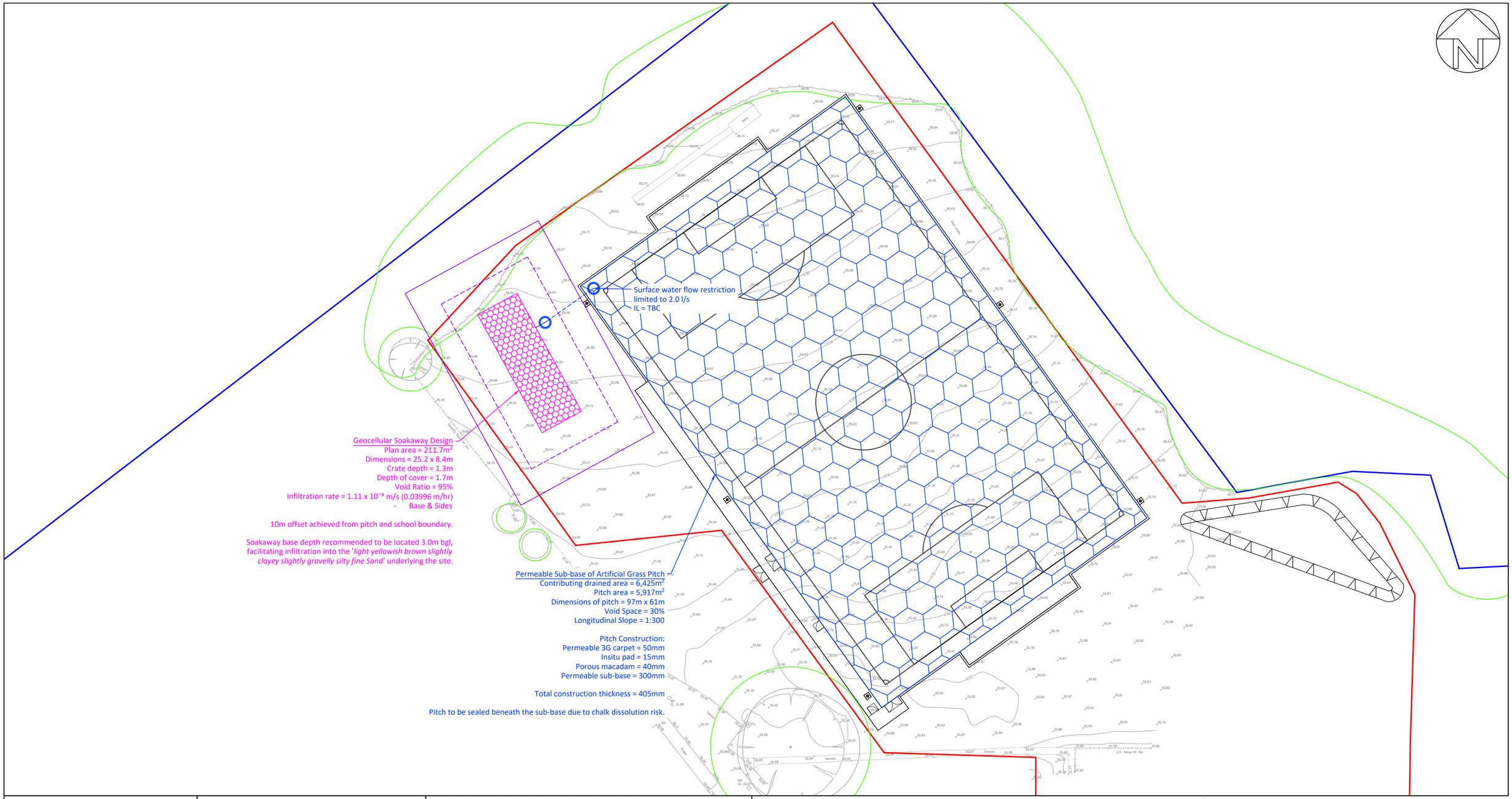
Soil infiltration rate *f* = $\frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

= **5.28E-06** m/s

$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

Appendix F

Proposed Drainage Strategy
JPP Consulting drawing no. 28616-FRA03C



General Notes

1. All dimensions are in metres unless otherwise stated.
2. All levels are in metres.
3. This drawing is to be read in conjunction with all relevant Engineers and Architect's drawings, Specifications, Reports and Engineering Details.
4. Do not scale from this drawing.

Drawing Key

- Site Boundary
- Ownership Boundary
- Proposed Surface Water Drainage
- Extent of permeable sub-base = 5,917m²
- Proposed Geocellular Soakaway
- Soakaway Offset (5m)
- Soakaway Offset (10m)
- Root Protection Area

This drawing has been based/developed using the following external drawings

Type	Company	Drawing date	Drawing title	Date received	Rev
Site Layout	Labosport Ltd	17.05.2024	Proposed Plan	11.07.2024	-
Topographical Survey	JPP Surveying	09.02.2024	Topographical Survey	11.07.2024	-
Tree Survey	-	-	C180683-01-01	04.07.2025	-

Drawing is not to be used for construction until status is CONSTRUCTION

Rev C	Revised following consultation comments.	By TMK	Checked KER	12.01.2026
Rev B	Site layout adjusted.	By KER	Checked KER	27.08.2025
Rev A	Drainage strategy revised based on formal soakaway testing.	By TMK	Checked KER	21.07.2025

jpp
- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

Northampton
Grand Union Works, Whilton Locks, Daventry
Northamptonshire, NN11 2NH
T: 01604 781811
Poole & Milton Keynes
E: mail@jppuk.net **W:** jppuk.net

Client: Labosport Ltd

Project: Proposed AGP
Northfleet School for Girls
Hall Road, Northfleet, Gravesend

Title: Proposed Drainage Strategy

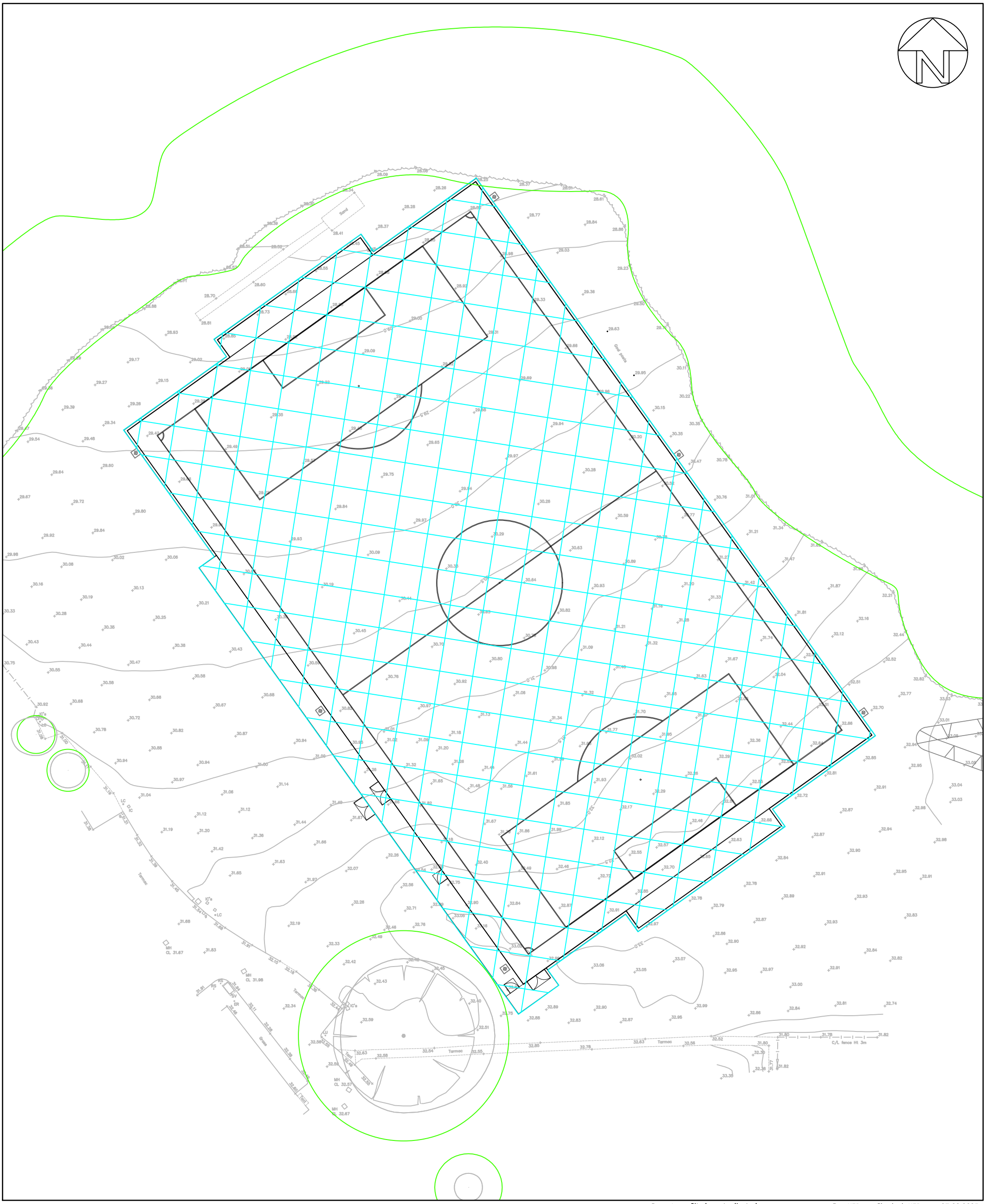
Scale at A2	Drawn by	Checked by	Date
1:500	JPB	KER	29.08.2024

Status	Project ref	Drawing no.	Revision
FOR PLANNING	28616	FRA03	C

Appendix G

Proposed Drained Area

JPP Consulting drawing no. 28616-FRA02A



Rev A Site layout adjusted. By KER Checked KER 27.08.2025

General Notes

1. All dimensions are in metres unless otherwise stated.
2. All levels are in metres.
3. This drawing is to be read in conjunction with all relevant Engineers and Architect's drawings, Specifications, Reports and Engineering Details.
4. Do not scale from this drawing.

Drawing Key

Proposed Drained Area = 6,425m^2

Drawing is not to be used for construction until status is CONSTRUCTION

This drawing has been based/developed using the following external drawings					
Type	Company	Drawing date	Drawing title	Date received	Rev
Site Layout	Labosport Ltd	17.05.2024	Proposed Plan	11.07.2024	-
Topographical Survey	JPP Surveying	09.02.2024	Topographical Survey	11.07.2024	-
Tree Survey	-	-	C180683-01-01	04.07.2025	-

jpp
- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

Northampton
T: 01604 781811
Poole & Milton Keynes

E: mail@jppuk.net **W:** jppuk.net

Client: Labosport Ltd

Project: Proposed AGP
Northfleet School for Girls
Hall Road, Northfleet, Gravesend

Title: Proposed Drained Area

Scale at A3 1:500	Drawn by JPB	Checked by KER	Date 21.08.2024
Status **FOR PLANNING**	Project ref 28616	Drawing no. FRA02	Revision A

Appendix H

Soakaway Calculation (Cascade)

Cascade Summary of Results for 28616 - Attenuation_Cellular Storage_1.3m (Cascade)_Option 2_Rev B.SRCX

Upstream Structures	Outflow To	Overflow To
28616 - Pitch Calcs_Rev C.SRCX	(None)	(None)

Half Drain Time : 1381 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	26.692	0.292	1.3	58.8	O K
30 min Summer	26.709	0.309	1.3	62.2	O K
60 min Summer	26.953	0.553	1.4	111.3	O K
120 min Summer	26.985	0.585	1.4	117.7	O K
180 min Summer	27.002	0.602	1.4	121.0	O K
240 min Summer	27.012	0.612	1.4	123.1	O K
360 min Summer	27.024	0.624	1.4	125.5	O K
480 min Summer	27.029	0.629	1.4	126.4	O K
600 min Summer	27.030	0.630	1.4	126.7	O K
720 min Summer	27.029	0.629	1.4	126.5	O K
960 min Summer	27.024	0.624	1.4	125.6	O K
1440 min Summer	27.008	0.608	1.4	122.3	O K
2160 min Summer	27.420	1.020	1.6	205.2	O K
2880 min Summer	27.404	1.004	1.5	201.8	O K
4320 min Summer	27.343	0.943	1.5	189.6	O K
5760 min Summer	27.642	1.242	1.6	249.8	O K
7200 min Summer	27.643	1.243	1.6	250.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	172.719	0.0	1440
30 min Summer	112.912	0.0	1440
60 min Summer	70.366	0.0	2880
120 min Summer	43.211	0.0	2880
180 min Summer	32.313	0.0	2880
240 min Summer	26.184	0.0	2880
360 min Summer	19.303	0.0	2880
480 min Summer	15.377	0.0	2880
600 min Summer	12.819	0.0	2880
720 min Summer	11.015	0.0	2880
960 min Summer	8.620	0.0	2880
1440 min Summer	6.080	0.0	2880
2160 min Summer	4.297	0.0	5760
2880 min Summer	3.363	0.0	5760
4320 min Summer	2.382	0.0	5760
5760 min Summer	1.873	0.0	10032
7200 min Summer	1.566	0.0	10776

©1982-2019 Innovyze

Cascade Summary of Results for 28616 - Attenuation_Cellular Storage_1.3m (Cascade)_Option 2_Rev B.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	27.647	1.247	1.6	250.7	O K
10080 min Summer	27.622	1.222	1.6	245.8	O K
15 min Winter	26.692	0.292	1.3	58.8	O K
30 min Winter	26.709	0.309	1.3	62.2	O K
60 min Winter	26.953	0.553	1.4	111.3	O K
120 min Winter	26.985	0.585	1.4	117.7	O K
180 min Winter	27.002	0.602	1.4	121.0	O K
240 min Winter	27.012	0.612	1.4	123.1	O K
360 min Winter	27.024	0.624	1.4	125.5	O K
480 min Winter	27.028	0.628	1.4	126.4	O K
600 min Winter	27.030	0.630	1.4	126.6	O K
720 min Winter	27.029	0.629	1.4	126.5	O K
960 min Winter	27.024	0.624	1.4	125.5	O K
1440 min Winter	27.008	0.608	1.4	122.2	O K
2160 min Winter	27.420	1.020	1.6	205.2	O K
2880 min Winter	27.404	1.004	1.5	201.9	O K
4320 min Winter	27.351	0.951	1.5	191.2	O K
5760 min Winter	27.650	1.250	1.6	251.3	O K
7200 min Winter	27.652	1.252	1.6	251.8	O K
8640 min Winter	27.656	1.256	1.6	252.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	1.359	0.0	11520
10080 min Summer	1.209	0.0	11520
15 min Winter	172.719	0.0	1440
30 min Winter	112.912	0.0	1440
60 min Winter	70.366	0.0	2880
120 min Winter	43.211	0.0	2880
180 min Winter	32.313	0.0	2880
240 min Winter	26.184	0.0	2880
360 min Winter	19.303	0.0	2880
480 min Winter	15.377	0.0	2880
600 min Winter	12.819	0.0	2880
720 min Winter	11.015	0.0	2880
960 min Winter	8.620	0.0	2880
1440 min Winter	6.080	0.0	2880
2160 min Winter	4.297	0.0	5760
2880 min Winter	3.363	0.0	5760
4320 min Winter	2.382	0.0	5760
5760 min Winter	1.873	0.0	10000
7200 min Winter	1.566	0.0	10704
8640 min Winter	1.359	0.0	11424

©1982-2019 Innovyze

Cascade Summary of Results for 28616 - Attenuation_Cellular Storage_1.3m (Cascade)_Option 2_Rev B.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	27.638	1.238	1.6	249.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
10080 min Winter	1.209	0.0	11520

©1982-2019 Innovyze

Cascade Rainfall Details for 28616 - Attenuation_Cellular Storage_1.3m (Cascade)_Option 2_Rev B.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 562966 172695 TQ 62966 72695
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

©1982-2019 Innovyze

Cascade Model Details for 28616 - Attenuation_Cellular Storage_1.3m (Cascade)_Option 2_Rev B.SRCX

Storage is Online Cover Level (m) 29.400

Cellular Storage Structure

Invert Level (m) 26.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.03996 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.03996

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	211.7	211.7	1.400	0.0	299.0
1.300	211.7	299.0			

©1982-2019 Innovyze

Appendix I

Attenuation Calculations: 1 in 30 year

Summary of Results for 30 year Return Period

Half Drain Time : 1399 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	29.857	0.204	0.0	1.8	1.8	114.6	Flood Risk
30 min Summer	29.892	0.239	0.0	1.9	1.9	156.2	Flood Risk
60 min Summer	29.922	0.269	0.0	1.9	1.9	198.8	Flood Risk
120 min Summer	29.953	0.300	0.0	1.9	1.9	246.4	Flood Risk
180 min Summer	29.968	0.315	0.0	1.9	1.9	272.3	Flood Risk
240 min Summer	29.977	0.324	0.0	1.9	1.9	288.4	Flood Risk
360 min Summer	29.988	0.335	0.0	1.9	1.9	306.9	Flood Risk
480 min Summer	29.992	0.339	0.0	1.9	1.9	314.9	Flood Risk
600 min Summer	29.994	0.341	0.0	1.9	1.9	317.6	Flood Risk
720 min Summer	29.993	0.340	0.0	1.9	1.9	317.0	Flood Risk
960 min Summer	29.989	0.336	0.0	1.9	1.9	310.0	Flood Risk
1440 min Summer	29.978	0.325	0.0	1.9	1.9	290.1	Flood Risk
2160 min Summer	29.964	0.311	0.0	1.9	1.9	264.9	Flood Risk
2880 min Summer	29.952	0.299	0.0	1.9	1.9	245.9	Flood Risk
4320 min Summer	29.933	0.280	0.0	1.9	1.9	215.8	Flood Risk
5760 min Summer	29.917	0.264	0.0	1.9	1.9	191.3	Flood Risk
7200 min Summer	29.903	0.250	0.0	1.9	1.9	171.1	Flood Risk
8640 min Summer	29.889	0.236	0.0	1.9	1.9	153.5	Flood Risk
10080 min Summer	29.877	0.224	0.0	1.9	1.9	138.0	Flood Risk
15 min Winter	29.857	0.204	0.0	1.8	1.8	114.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.692	0.0	116.0	19
30 min Summer	58.682	0.0	154.5	34
60 min Summer	36.400	0.0	203.7	64
120 min Summer	22.369	0.0	256.5	124
180 min Summer	16.568	0.0	287.9	184
240 min Summer	13.300	0.0	309.5	242
360 min Summer	9.661	0.0	313.3	362
480 min Summer	7.643	0.0	312.4	482
600 min Summer	6.350	0.0	310.8	602
720 min Summer	5.446	0.0	308.7	722
960 min Summer	4.257	0.0	304.0	960
1440 min Summer	3.010	0.0	293.4	1238
2160 min Summer	2.138	0.0	438.8	1596
2880 min Summer	1.685	0.0	454.8	1988
4320 min Summer	1.214	0.0	479.2	2808
5760 min Summer	0.970	0.0	498.1	3624
7200 min Summer	0.822	0.0	516.0	4400
8640 min Summer	0.722	0.0	532.8	5192
10080 min Summer	0.650	0.0	547.9	5952
15 min Winter	90.692	0.0	116.0	19

©1982-2019 Innovyze

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	29.891	0.238	0.0	1.9	1.9	156.1	Flood Risk
60 min Winter	29.922	0.269	0.0	1.9	1.9	198.8	Flood Risk
120 min Winter	29.953	0.300	0.0	1.9	1.9	246.4	Flood Risk
180 min Winter	29.968	0.315	0.0	1.9	1.9	272.3	Flood Risk
240 min Winter	29.977	0.324	0.0	1.9	1.9	288.8	Flood Risk
360 min Winter	29.988	0.335	0.0	1.9	1.9	307.3	Flood Risk
480 min Winter	29.992	0.339	0.0	1.9	1.9	315.5	Flood Risk
600 min Winter	29.994	0.341	0.0	1.9	1.9	318.5	Flood Risk
720 min Winter	29.994	0.341	0.0	1.9	1.9	318.3	Flood Risk
960 min Winter	29.990	0.337	0.0	1.9	1.9	312.1	Flood Risk
1440 min Winter	29.979	0.326	0.0	1.9	1.9	292.2	Flood Risk
2160 min Winter	29.963	0.310	0.0	1.9	1.9	263.5	Flood Risk
2880 min Winter	29.948	0.295	0.0	1.9	1.9	239.1	Flood Risk
4320 min Winter	29.920	0.267	0.0	1.9	1.9	195.8	Flood Risk
5760 min Winter	29.894	0.241	0.0	1.9	1.9	158.9	Flood Risk
7200 min Winter	29.869	0.216	0.0	1.8	1.8	128.2	Flood Risk
8640 min Winter	29.846	0.193	0.0	1.8	1.8	101.9	Flood Risk
10080 min Winter	29.823	0.170	0.0	1.8	1.8	79.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.682	0.0	154.6	33
60 min Winter	36.400	0.0	203.7	64
120 min Winter	22.369	0.0	256.6	122
180 min Winter	16.568	0.0	287.8	180
240 min Winter	13.300	0.0	309.5	240
360 min Winter	9.661	0.0	313.4	356
480 min Winter	7.643	0.0	312.4	472
600 min Winter	6.350	0.0	310.8	588
720 min Winter	5.446	0.0	308.8	702
960 min Winter	4.257	0.0	304.1	924
1440 min Winter	3.010	0.0	293.5	1342
2160 min Winter	2.138	0.0	439.0	1664
2880 min Winter	1.685	0.0	455.4	2108
4320 min Winter	1.214	0.0	480.0	2984
5760 min Winter	0.970	0.0	499.2	3856
7200 min Winter	0.822	0.0	517.7	4616
8640 min Winter	0.722	0.0	534.5	5440
10080 min Winter	0.650	0.0	550.7	6152

©1982-2019 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 562966 172695 TQ 62966 72695
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.643

Time (mins) From:	To:	Area (ha)
0	4	0.643

©1982-2019 Innovyze

Model Details

Storage is Online Cover Level (m) 30.058

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	61.0
Membrane Percolation (mm/hr)	1000	Length (m)	97.0
Max Percolation (l/s)	1643.6	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	29.653	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	28.858
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

©1982-2019 Innovyze

Appendix J

Attenuation Calculations: 1 in 100 year

Summary of Results for 100 year Return Period

Half Drain Time : 2063 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	29.895	0.242	0.0	1.9	1.9	160.3	Flood Risk
30 min Summer	29.935	0.282	0.0	1.9	1.9	217.7	Flood Risk
60 min Summer	29.970	0.317	0.0	1.9	1.9	276.3	Flood Risk
120 min Summer	30.007	0.354	0.0	2.0	2.0	341.1	Flood Risk
180 min Summer	30.029	0.376	0.0	2.0	2.0	381.2	Flood Risk
240 min Summer	30.045	0.392	0.0	2.0	2.0	409.1	Flood Risk
360 min Summer	30.063	0.410	0.0	2.0	2.0	444.9	FLOOD
480 min Summer	30.069	0.416	0.0	2.0	2.0	463.5	FLOOD
600 min Summer	30.073	0.420	0.0	2.0	2.0	473.1	FLOOD
720 min Summer	30.075	0.422	0.0	2.0	2.0	477.4	FLOOD
960 min Summer	30.074	0.421	0.0	2.0	2.0	476.2	FLOOD
1440 min Summer	30.068	0.415	0.0	2.0	2.0	458.7	FLOOD
2160 min Summer	30.054	0.401	0.0	2.0	2.0	424.7	Flood Risk
2880 min Summer	30.038	0.385	0.0	2.0	2.0	395.7	Flood Risk
4320 min Summer	30.013	0.360	0.0	2.0	2.0	351.5	Flood Risk
5760 min Summer	29.993	0.340	0.0	1.9	1.9	317.1	Flood Risk
7200 min Summer	29.978	0.325	0.0	1.9	1.9	289.3	Flood Risk
8640 min Summer	29.964	0.311	0.0	1.9	1.9	265.1	Flood Risk
10080 min Summer	29.951	0.298	0.0	1.9	1.9	243.6	Flood Risk
15 min Winter	29.895	0.242	0.0	1.9	1.9	160.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.117	0.0	155.3	19
30 min Summer	77.870	0.0	159.1	34
60 min Summer	48.528	0.0	281.8	64
120 min Summer	29.801	0.0	321.3	124
180 min Summer	22.285	0.0	324.4	184
240 min Summer	18.058	0.0	326.1	244
360 min Summer	13.312	4.6	327.3	362
480 min Summer	10.605	11.9	326.9	482
600 min Summer	8.841	14.7	325.8	602
720 min Summer	7.596	16.5	324.2	722
960 min Summer	5.945	16.1	320.4	962
1440 min Summer	4.193	9.7	311.3	1440
2160 min Summer	2.963	0.0	618.4	1816
2880 min Summer	2.320	0.0	604.5	2164
4320 min Summer	1.643	0.0	559.5	2940
5760 min Summer	1.292	0.0	697.4	3752
7200 min Summer	1.080	0.0	715.3	4544
8640 min Summer	0.937	0.0	732.0	5360
10080 min Summer	0.834	0.0	747.1	6152
15 min Winter	119.117	0.0	155.4	19

©1982-2019 Innovyze

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	29.935	0.282	0.0	1.9	1.9	217.7	Flood Risk
60 min Winter	29.970	0.317	0.0	1.9	1.9	276.3	Flood Risk
120 min Winter	30.007	0.354	0.0	2.0	2.0	341.2	Flood Risk
180 min Winter	30.030	0.377	0.0	2.0	2.0	381.4	Flood Risk
240 min Winter	30.045	0.392	0.0	2.0	2.0	409.4	Flood Risk
360 min Winter	30.063	0.410	0.0	2.0	2.0	445.5	FLOOD
480 min Winter	30.070	0.417	0.0	2.0	2.0	464.2	FLOOD
600 min Winter	30.073	0.420	0.0	2.0	2.0	474.0	FLOOD
720 min Winter	30.075	0.422	0.0	2.0	2.0	478.7	FLOOD
960 min Winter	30.075	0.422	0.0	2.0	2.0	478.1	FLOOD
1440 min Winter	30.069	0.416	0.0	2.0	2.0	462.6	FLOOD
2160 min Winter	30.056	0.403	0.0	2.0	2.0	427.6	Flood Risk
2880 min Winter	30.037	0.384	0.0	2.0	2.0	394.6	Flood Risk
4320 min Winter	30.006	0.353	0.0	2.0	2.0	339.7	Flood Risk
5760 min Winter	29.979	0.326	0.0	1.9	1.9	291.7	Flood Risk
7200 min Winter	29.955	0.302	0.0	1.9	1.9	250.9	Flood Risk
8640 min Winter	29.933	0.280	0.0	1.9	1.9	214.9	Flood Risk
10080 min Winter	29.911	0.258	0.0	1.9	1.9	183.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	77.870	0.0	159.1	34
60 min Winter	48.528	0.0	281.8	64
120 min Winter	29.801	0.0	321.3	122
180 min Winter	22.285	0.0	324.4	182
240 min Winter	18.058	0.0	326.1	240
360 min Winter	13.312	5.2	327.2	358
480 min Winter	10.605	11.8	326.8	476
600 min Winter	8.841	15.6	325.7	592
720 min Winter	7.596	16.9	324.0	708
960 min Winter	5.945	17.2	320.1	936
1440 min Winter	4.193	11.0	310.9	1384
2160 min Winter	2.963	0.0	617.9	1992
2880 min Winter	2.320	0.0	605.0	2248
4320 min Winter	1.643	0.0	564.1	3152
5760 min Winter	1.292	0.0	698.2	4032
7200 min Winter	1.080	0.0	716.5	4896
8640 min Winter	0.937	0.0	733.1	5704
10080 min Winter	0.834	0.0	749.5	6464

©1982-2019 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 562966 172695 TQ 62966 72695
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.643

Time (mins) From:	To:	Area (ha)
0	4	0.643

©1982-2019 Innovyze

Model Details

Storage is Online Cover Level (m) 30.058

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	61.0
Membrane Percolation (mm/hr)	1000	Length (m)	97.0
Max Percolation (l/s)	1643.6	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	29.653	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	28.858
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

©1982-2019 Innovyze

Appendix K

Attenuation Calculations: 1 in 100 year + 45% CC

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

Half Drain Time : 3074 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	29.953	0.300	0.0	1.9	1.9	246.3	Flood Risk
30 min Summer	30.001	0.348	0.0	2.0	2.0	330.1	Flood Risk
60 min Summer	30.049	0.396	0.0	2.0	2.0	416.1	Flood Risk
120 min Summer	30.088	0.435	0.0	2.0	2.0	512.6	FLOOD
180 min Summer	30.112	0.459	0.0	2.0	2.0	573.2	FLOOD
240 min Summer	30.129	0.476	0.0	2.1	2.1	616.3	FLOOD
360 min Summer	30.154	0.501	0.0	2.1	2.1	673.4	FLOOD
480 min Summer	30.169	0.516	0.0	2.1	2.1	705.3	FLOOD
600 min Summer	30.178	0.525	0.0	2.1	2.1	724.4	FLOOD
720 min Summer	30.183	0.530	0.0	2.1	2.1	735.8	FLOOD
960 min Summer	30.187	0.534	0.0	2.1	2.1	744.2	FLOOD
1440 min Summer	30.184	0.531	0.0	2.1	2.1	738.8	FLOOD
2160 min Summer	30.171	0.518	0.0	2.1	2.1	710.6	FLOOD
2880 min Summer	30.154	0.501	0.0	2.1	2.1	674.0	FLOOD
4320 min Summer	30.127	0.474	0.0	2.0	2.0	611.4	FLOOD
5760 min Summer	30.110	0.457	0.0	2.0	2.0	568.0	FLOOD
7200 min Summer	30.097	0.444	0.0	2.0	2.0	536.6	FLOOD
8640 min Summer	30.087	0.434	0.0	2.0	2.0	510.2	FLOOD
10080 min Summer	30.078	0.425	0.0	2.0	2.0	487.5	FLOOD
15 min Winter	29.953	0.300	0.0	1.9	1.9	246.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	172.719	0.0	161.1	19
30 min Summer	112.912	0.0	164.7	34
60 min Summer	70.366	0.0	329.6	64
120 min Summer	43.211	30.3	336.2	124
180 min Summer	32.313	53.8	339.4	184
240 min Summer	26.184	71.8	341.2	244
360 min Summer	19.303	96.0	342.7	364
480 min Summer	15.377	110.5	342.7	484
600 min Summer	12.819	119.3	341.9	602
720 min Summer	11.015	125.1	340.8	722
960 min Summer	8.620	129.2	337.6	962
1440 min Summer	6.080	126.5	329.9	1442
2160 min Summer	4.297	112.9	662.2	2160
2880 min Summer	3.363	96.6	650.6	2564
4320 min Summer	2.382	69.7	618.3	3240
5760 min Summer	1.873	51.6	1056.1	4032
7200 min Summer	1.566	39.2	1090.0	4832
8640 min Summer	1.359	28.7	1120.1	5624
10080 min Summer	1.209	20.7	1068.8	6456
15 min Winter	172.719	0.0	161.1	19

©1982-2019 Innovyze

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	30.001	0.348	0.0	2.0	2.0	330.1	Flood Risk
60 min Winter	30.049	0.396	0.0	2.0	2.0	416.1	Flood Risk
120 min Winter	30.088	0.435	0.0	2.0	2.0	512.7	FLOOD
180 min Winter	30.112	0.459	0.0	2.0	2.0	573.6	FLOOD
240 min Winter	30.130	0.477	0.0	2.1	2.1	616.7	FLOOD
360 min Winter	30.154	0.501	0.0	2.1	2.1	673.9	FLOOD
480 min Winter	30.169	0.516	0.0	2.1	2.1	706.3	FLOOD
600 min Winter	30.178	0.525	0.0	2.1	2.1	725.7	FLOOD
720 min Winter	30.184	0.531	0.0	2.1	2.1	737.3	FLOOD
960 min Winter	30.188	0.535	0.0	2.1	2.1	746.3	FLOOD
1440 min Winter	30.186	0.533	0.0	2.1	2.1	742.8	FLOOD
2160 min Winter	30.175	0.522	0.0	2.1	2.1	718.1	FLOOD
2880 min Winter	30.158	0.505	0.0	2.1	2.1	682.8	FLOOD
4320 min Winter	30.127	0.474	0.0	2.0	2.0	609.9	FLOOD
5760 min Winter	30.105	0.452	0.0	2.0	2.0	556.7	FLOOD
7200 min Winter	30.088	0.435	0.0	2.0	2.0	512.6	FLOOD
8640 min Winter	30.073	0.420	0.0	2.0	2.0	473.0	FLOOD
10080 min Winter	30.060	0.407	0.0	2.0	2.0	437.0	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	112.912	0.0	164.7	34
60 min Winter	70.366	0.0	329.6	64
120 min Winter	43.211	30.4	336.2	122
180 min Winter	32.313	54.1	339.2	182
240 min Winter	26.184	71.5	341.0	240
360 min Winter	19.303	96.5	342.5	360
480 min Winter	15.377	110.9	342.3	478
600 min Winter	12.819	120.0	341.4	596
720 min Winter	11.015	125.5	340.1	712
960 min Winter	8.620	129.7	336.8	944
1440 min Winter	6.080	128.4	328.6	1402
2160 min Winter	4.297	116.3	660.2	2076
2880 min Winter	3.363	100.5	648.1	2708
4320 min Winter	2.382	68.9	618.8	3368
5760 min Winter	1.873	47.0	1056.6	4264
7200 min Winter	1.566	30.3	1091.1	5184
8640 min Winter	1.359	14.7	1123.7	6056
10080 min Winter	1.209	2.0	1088.1	6952

©1982-2019 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 562966 172695 TQ 62966 72695
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.643

Time (mins) From:	To:	Area (ha)
0	4	0.643

©1982-2019 Innovyze

Model Details

Storage is Online Cover Level (m) 30.058

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	61.0
Membrane Percolation (mm/hr)	1000	Length (m)	97.0
Max Percolation (l/s)	1643.6	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	29.653	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	28.858
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

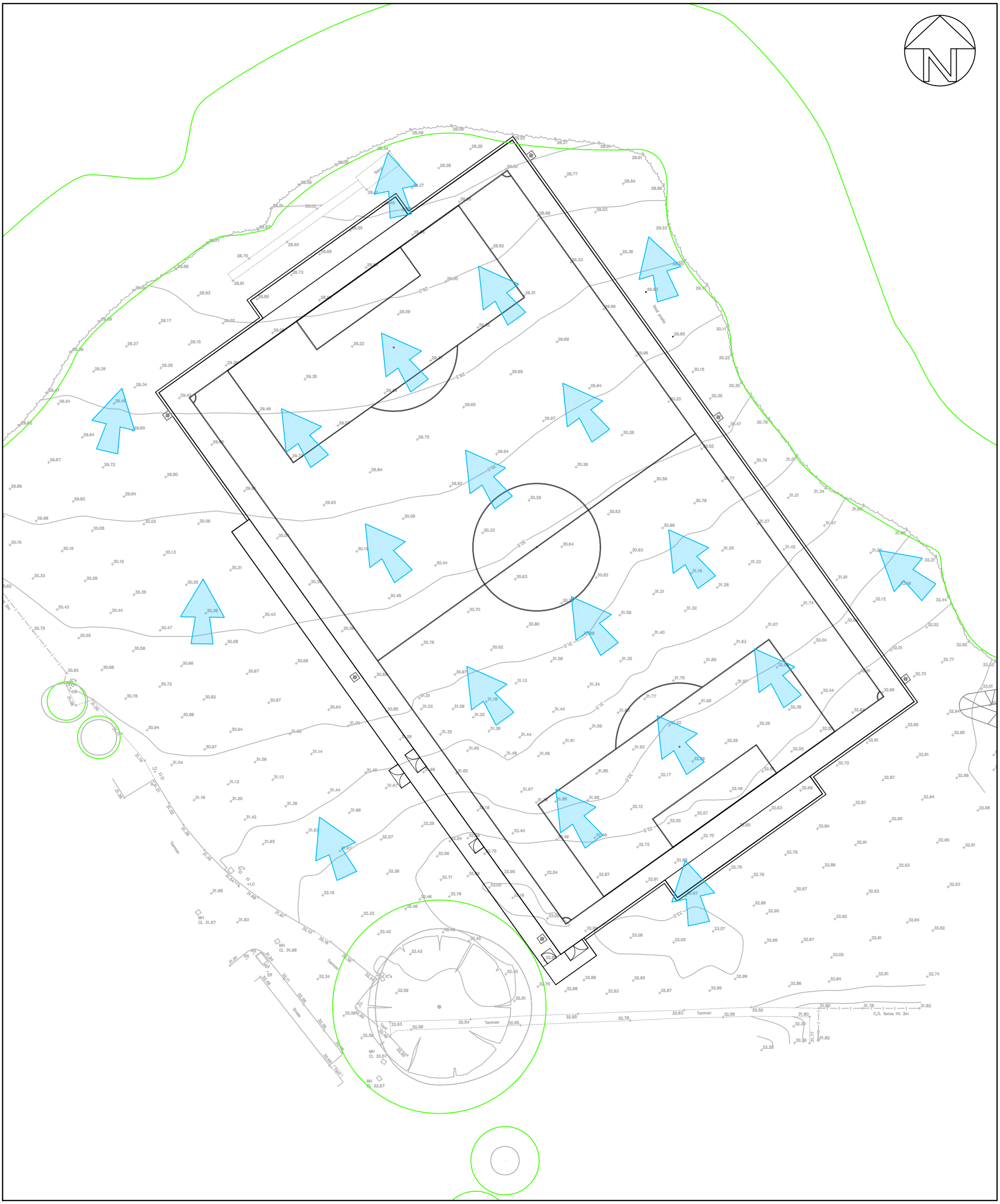
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

©1982-2019 Innovyze

Appendix L

Overland Flows

JPP Consulting drawing no. 28616-FRA04A



General Notes

1. All dimensions are in metres unless otherwise stated.
2. All levels are in metres.
3. This drawing is to be read in conjunction with all relevant Engineers and Architect's drawings, Specifications, Reports and Engineering Details.
4. Do not scale from this drawing.

Drawing Key

Predicted Overland Flows

This drawing has been based/developed using the following external drawings					
Type	Company	Drawing date	Drawing title	Date received	Rev
Site Layout	Labosport Ltd	17.05.2024	Proposed Plan	11.07.2024	-
Topographical Survey	JPP Surveying	09.02.2024	Topographical Survey	11.07.2024	-
Tree Survey	-	-	C180683-01-01	04.07.2025	-

Drawing is not to be used for construction until status is CONSTRUCTION

Rev A Site layout adjusted. By KER Checked KER 27.08.2025

jpp
Infrastructure Design
Structural Engineering
Development Planning
Professional Advice
Geotechnical & Environmental
Surveying
Northampton
T: 01604 781811
Poole & Milton Keynes
E: mail@jppuk.net W: jppuk.net

Client Labosport Ltd

Project Proposed AGP
Northfleet School for Girls
Hall Road, Northfleet, Gravesend

Title Predicted Overland Flows

Scale at A3 1:500	Drawn by JPB	Checked by KER	Date 21.08.2024
Status FOR PLANNING	Project ref 28616	Drawing no. FRA04	Revision A

JPP QA Document T07 R1