

- Infrastructure Design
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Proposed Football Turf Pitch Holbeach United Community Sports Academy Penny Hill Road Holbeach Lincolnshire

Flood Risk Assessment

Revision A: January 2022
R-FRA-23747-01-A

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Holbeach United Community Sports Academy
Penny Hill Road
Holbeach
Lincolnshire

Flood Risk Assessment

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1.0 Introduction

1.1 Background

1.1.1 This report is a Flood Risk Assessment which has been prepared by JPP Consulting Limited on behalf of S&C Slatter for a proposed Football Turf Pitch (FTP). The benefit of this report is to our instructing Client.

1.1.2 The proposed FTP is located at Holbeach United Community Sports Academy, Pennyhill Road, Holbeach, as shown in Figure 1.1 below and enclosed in **Appendix A**. Holbeach is located approximately 13km east of Spalding and just off the A17. The National Grid Reference for the site is E536190 N325925. The proposed development has a total development area of 0.822ha (8,222m²) of which 0.8174ha (8,174m²) will be impermeable.

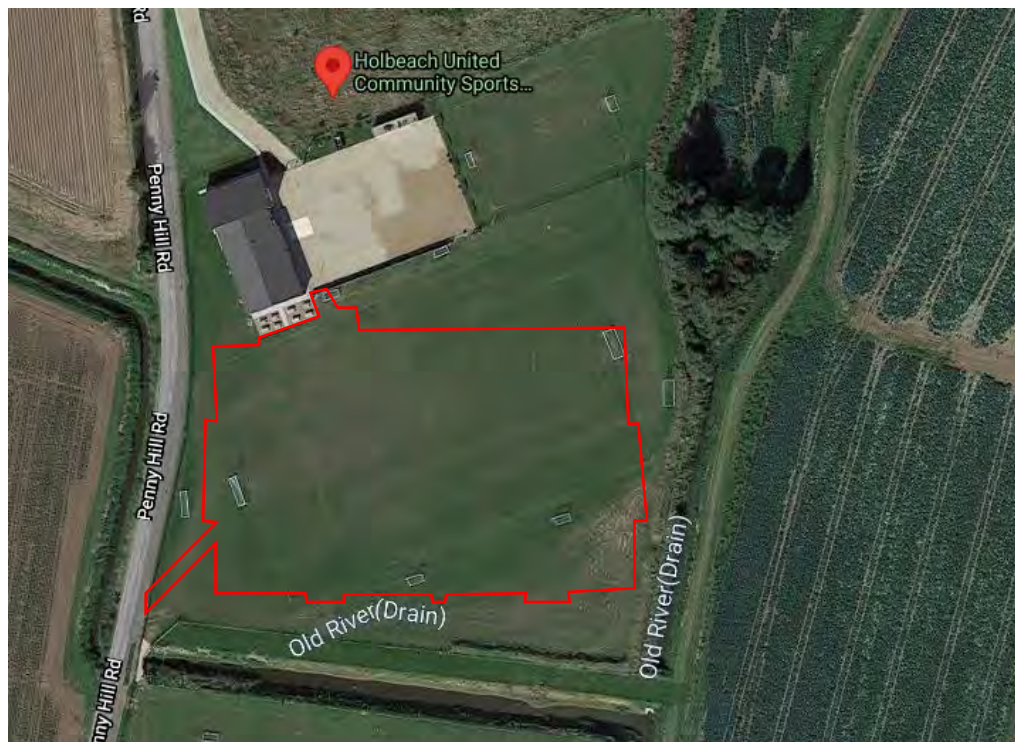


Figure 1.1 Proposed Site Location

Source: <https://google.com/maps/> obtained 3rd November 2021

1.2 Objectives

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

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

1.3 Reference documents

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

- Ministry of Housing, Communities and Local Government (July 2018), National Planning Policy Framework
- Ministry of Housing, Communities and Local Government (July 2018), Planning Practice Guidance 'Flood Risk and Coastal Change'
- Department for Environment, Food and Rural Affairs (March 2015), Non-statutory technical standards for sustainable drainage systems
- Environment Agency (September 2013), Climate Change Allowances for Planners: Guidance to support the National Planning Policy Framework
- 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 advise, 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

2.0 Description and history of the site and development proposals

2.1 Location and description of the site

- 2.1.1 The proposed Football Turf Pitch (FTP) is located at Holbeach United Community Sports Academy, Pennyhill Road, Holbeach as shown in Figure 1.1 above and enclosed in **Appendix A**. The location of the proposed FTP sits within the southern part of Holbeach United Community Sports Academy. The proposed FTP site is bound by the Holbeach United Community Sports Academy to the north, Old River (Drain) to the east with agricultural land beyond, Old River (Drain) to the south with existing football pitches beyond and Penny Hill Road to the west.

2.2 History of the site

- 2.2.1 The site is currently an existing grass football pitch, as shown on the topographical survey enclosed in **Appendix B**.
- 2.2.2 Aerial imagery dating back to December 1999 shows that the site consisted of industrial buildings during this time, see Figure 2.1 below.

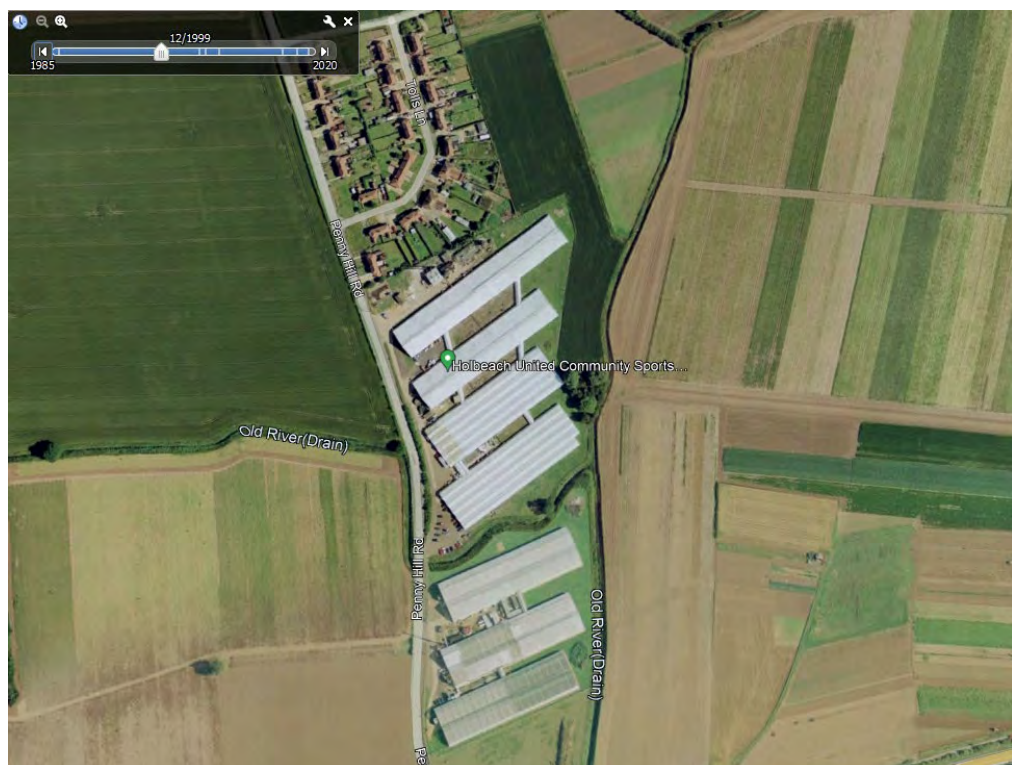


Figure 2.1 Aerial Imagery dated December 1999
Source: Google Earth Pro obtained 3rd November 2021

- 2.2.3 Aerial imagery of the site dated December 2007 shows that the previous industrial buildings had been demolished by this time. See Figure 2.2 below.

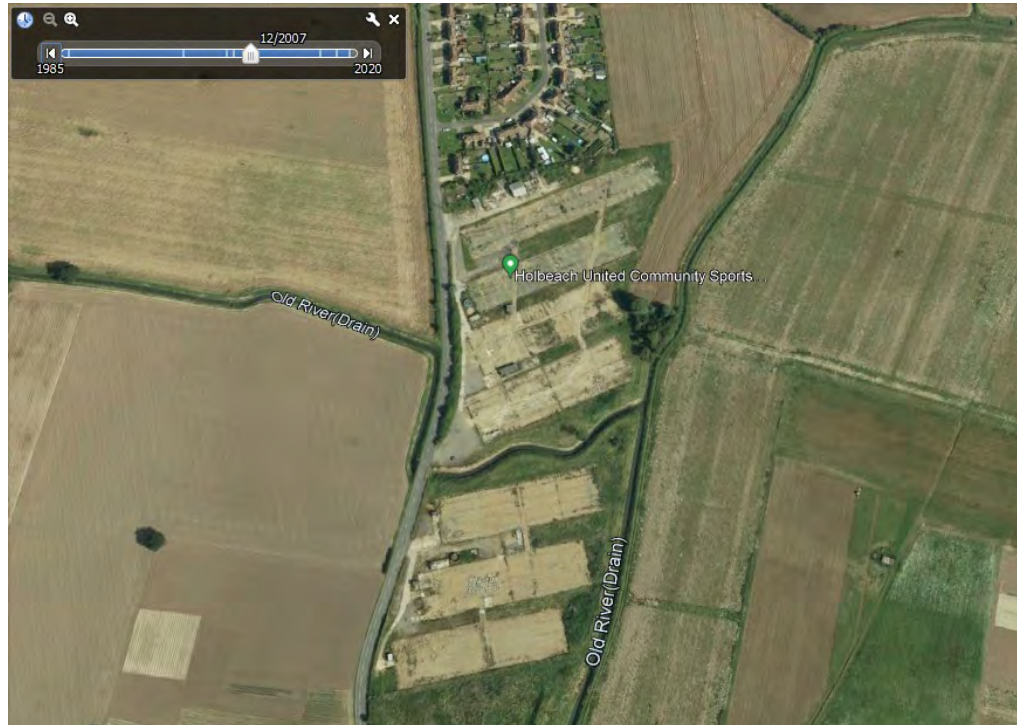


Figure 2.2 Aerial Imagery dated December 2007
Source: Google Earth Pro, obtained 2nd November 2021

- 2.2.4 Aerial imagery of the proposed site location dated September 2018, shows that the site now only consists of a grass football pitch. See Figure 2.3 below. The new building, and associated parking areas, for Holbeach United Community Sports Academy are shown to have been built by this time.

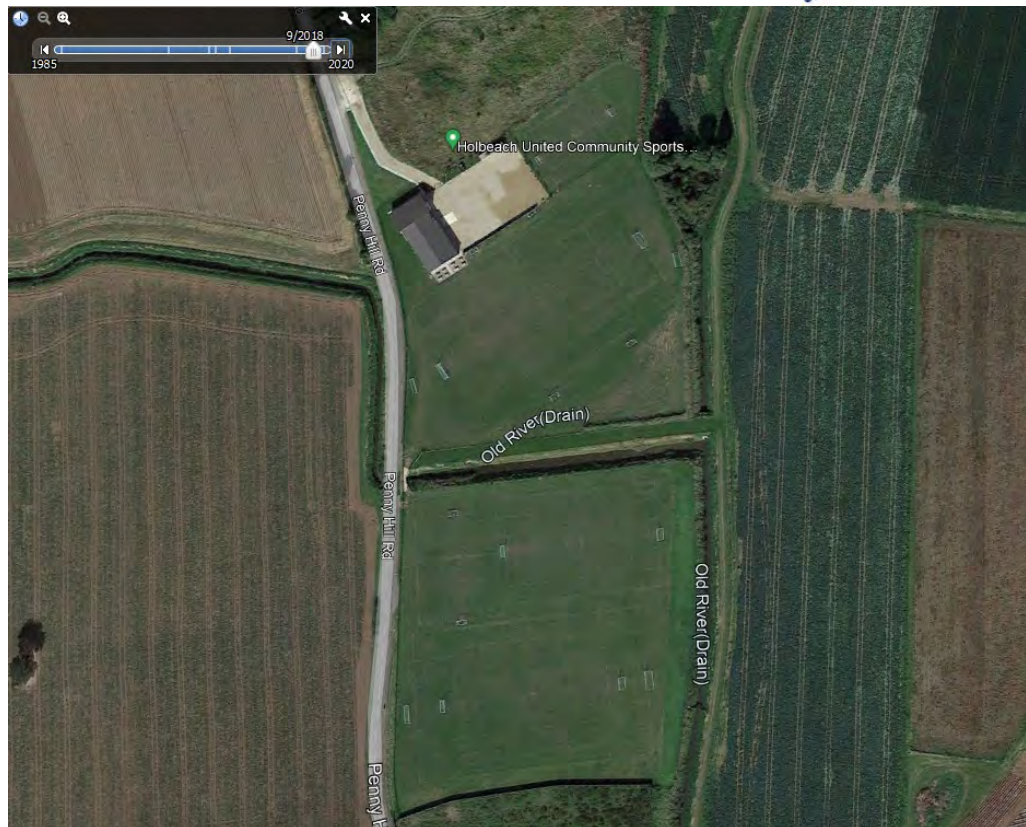


Figure 2.3 Aerial Imagery dated September 2018

Source: Google Earth Pro obtained 3rd November 2021

2.2.5

With regards to the history of the site, the Site Investigation (SI) report by JPP Geotechnical & Environmental (further details below and extract enclosed in **Appendix C**), states the following:

"The site is mapped as part of agricultural fields from the 1880s with a pond present to the north west of the site. The Old River is present along the southern and western site boundaries until the 1970s where the Old River is labelled to be a drain. The site is shown to be a nursery from the 1970s with above ground structures absent from 2007. The site is shown to be grassed playing fields on aerial images from 2016 with the pavilion building present in the north west corner of the site. The drainage was also recently realigned to the current position along the southern edge of the site and formerly meandering within the current pitch location..."

2.3 Proposed development

- 2.3.1 The proposed development will comprise a new Community 3G Football Turf Pitch (FTP). The proposed development layout is shown on the plan enclosed in **Appendix D**. The drainage strategy plan provided by the Client is enclosed in **Appendix D**.

2.4 Site topography

- 2.4.1 The topographical survey indicates that site levels fall from the south-east (at approximately 3.6m) towards the west (lowest point of approximately 3.3m). The topographical survey is shown on the plan enclosed in **Appendix B**.

2.5 Existing drainage infrastructure

- 2.5.1 The topographical survey, enclosed in **Appendix B**, does not identify any existing manholes within the footprint of the proposed FTP.
- 2.5.2 Anglian Water's asset plan is enclosed in **Appendix E**. The asset plan identifies that there are no adopted sewers within the site. There is a foul water rising main in Penny Hill Road to the west of the site, which flows north to south.
- 2.5.3 Drainage ditches along the southern and eastern boundaries, which form Old River (Drain), as shown on the figures above and the topographical survey enclosed in **Appendix B**. A review of levels indicates that Old River (Drain) flows from the north-east of the site. It is culverted to the south-east of the proposed FTP, turns west, and is then culverted beneath Penny Hill Road before continuing west.

2.6 Geology of the site and ground investigation data

- 2.6.1 Inspection of the geological maps show that the superficial deposits at the site are Tidal Flat Deposits comprising Clay and Silt. The bedrock geology which underlies the site is West Walton Formation comprising Mudstone and Siltstone.
- 2.6.2 JPP Geotechnical & Environmental Limited have completed a Site Investigation (SI) for the site, see extracts of their report enclosed in **Appendix C**. This investigation included a site visit in May 2021, which comprised six window samples boreholes to a maximum depth of 5m (WS01-WS06) and one infiltration test at 1m depth (located adjacent to WS03).
- 2.6.3 Information regarding the encountered ground conditions, as set out in the SI report enclosed in **Appendix C**, is summarised in Table 2.1 below:

Summary of ground conditions encountered at the site (WS01-WS06)

Ground Conditions	Depth (m)					
	WS01	WS02	WS03	WS04	WS05	WS06
Top Soil / Made Ground (Base of strata)	0.80	1.80	0.30	1.50	0.95	1.60
Tidal Flat Deposits (Termination depth)	4.00	4.00	4.00	5.00	5.00	4.00
Groundwater Depth (Depth upon completion)	1.42	2.17	2.24	2.00	2.14	2.00

Source: SI report by JPP Geotechnical & Environmental Ltd (ref. R-SI-22849-01-00)

Table 2.1 Summary of ground conditions encountered at the site

2.6.4 With regards to infiltration potential, the SI report states:

“Indicative infiltration testing was carried out within 1.0m deep boreholes adjacent to WS03 where clayey silty sands and sandy silts were encountered. A fall of 20mm was recovered over a 243-minute monitoring period. The near surface soils are considered to be effectively impermeable and not suitable for shallow soakaways drainage and therefore an alternative surface water drainage solution is necessary.”

2.7 Development proposals and flood risk vulnerability

2.7.1 With reference to Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) to the National Planning Policy Framework (NPPF), the proposed Football Turf Pitch would be classed as Water Compatible development.

2.7.2 An extract from Table 2 of the PPG for Flood Risk and Coastal Change is replicated below in Table 2.2 with the proposed development type highlighted.

Flood Risk Vulnerability Classification	
Vulnerability	Development Types
Water-Compatible Development	Flood control infrastructure.
	Water transmission infrastructure and pumping stations.
	Sewage transmission infrastructure and pumping stations.
	Sand and gravel working.
	Docks, marinas and wharves.
	Navigation facilities.
	Ministry of Defence installations.
	Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
	Water-based recreation (excluding sleeping accommodation).
	Lifeguard and coastguard stations
	Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
	Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.
Source: Planning Practice Guidance - 2014	

Table 2.2 Flood Risk Vulnerability Classification

3.0 Flood risk

3.1 Fluvial / Tidal flooding

- 3.1.1 An extract of the Environment Agency's Flood Map for Planning (Rivers and Sea) is provided below in Figure 3.1. The flood map was extracted from the GOV.UK website on November 2021. The approximate application site boundary is shown by the yellow marker. The map indicates that the development site is located within Flood Zone 3 (High Probability) and as such, the report considers the development to be in Flood Zone 3 and at a high risk of flooding from rivers or the sea.

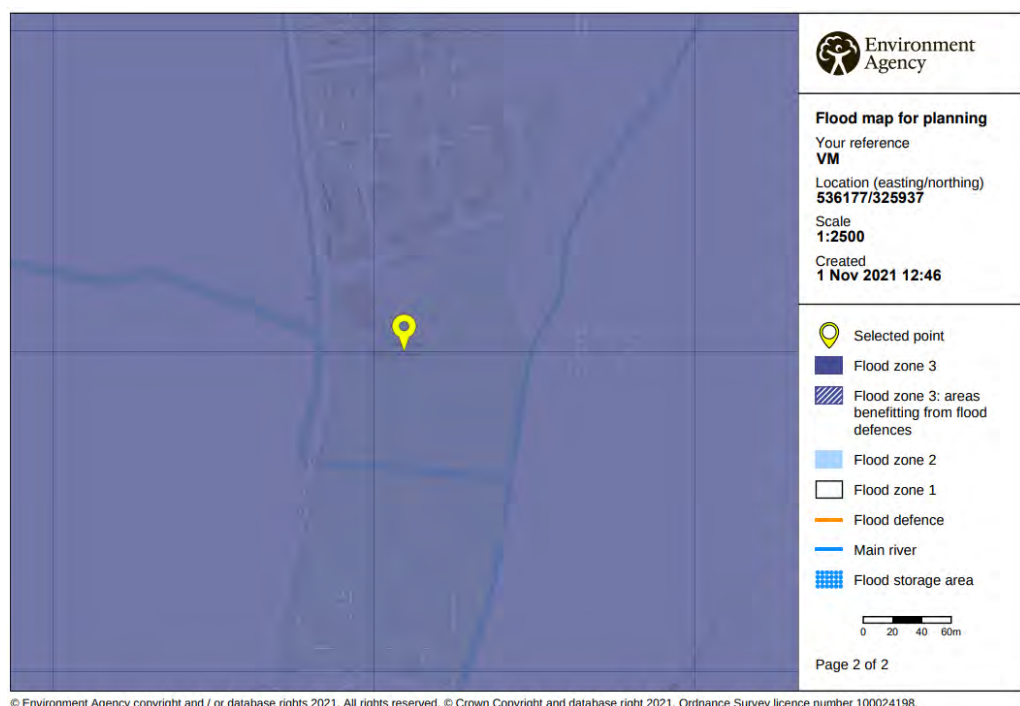


Figure 3.1 Flood Map for Planning (Rivers and Sea)

Source: GOV.UK website – 1st November 2021

- 3.1.2 Flood level information has been obtained from the Environment Agency dated the 11th October 2021, see **Appendix F**. The data enclosed is from the East Coast and Wash: Immingham to the West Lighthouse (2018 model).

- 3.1.3 The information from the EA includes the current Flood Map for the area, which indicates the areas at risk assuming no flood defences exist. We understand that the information is for the present day and does not reflect climate change. The map, as enclosed in **Appendix F**, shows that the site is located within the following area:

Risk of flooding for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding.

- 3.1.4 The EA data includes modelled Extreme Sea Levels for a range of locations. The nearest locations to the site are Marsh Road (Spalding) and Fosdyke Bridge, both located in excess of 7km from the site.
- 3.1.5 Table 3.4 below is a copy of Table 1 from Planning Practice Guidance for 'Flood Risk and Coastal Change' to the National Planning Policy Framework which defines Flood Zones. The proposed development, which is located within Flood Zone 3, is defined as having a 1 in 100 or greater annual probability of river flooding in any year.

Flood Zone Definitions	
Flood Zone	Definition
Zone 1: Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding.
Zone 2: Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a: High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b: The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.
Source: Planning Practice Guidance - 2014	

Table 3.1 Flood Zone Definitions

3.1.9 Flood Warnings

- 3.1.9.1 Holbeach United Community Sports Academy will be advised about the Environment Agency flood warning system and how to check for any flood warnings which may affect them.

3.1.10 Breach analysis

3.1.10.1 The flood level information from the Environment Agency includes tidal breach hazard mapping for the 1 in 200 year and 1 in 1000 year events for the 2115 scenario. A summary of the breach results are provided in Table 3.2 below.

Summary of Tidal Breach Hazard Mapping			
Flood Event	Details for 2115 Scenario		
	Max Hazard	Max Depth	Max Velocity
0.5% (1 in 200 year)	Predominantly Danger for Most (between 1.25 and 2.0) Small areas of: Danger for Some (between 0.75 and 1.25) Danger for All (greater than 2.0)	Predominantly 0.5–1.0m Small areas of 0.25-0.50m, 1.0-1.6m and 1.6+m (associated with the original alignment of Old River (Drain))	Entirely 0-0.3m/s
0.1% (1 in 1000 year)	Predominantly Danger for Most (between 1.25 and 2.0) Small areas of: Danger for All (greater than 2.0)	Predominantly 0.5–1.0m Small areas of 1.0-1.6m and 1.6+m (associated with the original alignment of Old River (Drain))	Entirely 0-0.3m/s
Source: EA flood level information, ref. CCN-2021-236349			

Table 3.2 Summary of Tidal Breach Hazard Mapping

3.1.10.2 We would note that the background mapping for the breach hazard maps shows the original alignment of Old River (Drain) rather than the more recent realigned route.

3.1.10.3 The development proposals for a new FTP do not trigger a change of use of the site, which will also remain as Water Compatible development. The flood hazard for the site is therefore considered to be comparable post-development as for the existing scenario.

3.2 Flooding from surface water

- 3.2.1 An extract of the Environment Agency map 'Risk of Flooding from Surface Water' is provided below in Figure 3.2. The approximate application site boundary is shown in red. The majority of the site is shown to be located in an area of very low (less than 1 in 30) risk of surface water flooding in a given year.
- 3.2.2 There is a route through the southern part of the site which is shown to be located at low (1 in 100 to 1 in 1000) risk of surface water flooding in a given year. This route correlates with the original route of Old River (Drain). As this watercourse has been realigned, see Figure 2.2 and Figure 2.3 above, this surface water flow route is now anticipated to follow the realigned route of Old River (Drain).
- 3.2.3 The site is therefore considered to be at a very low risk of surface water flooding.

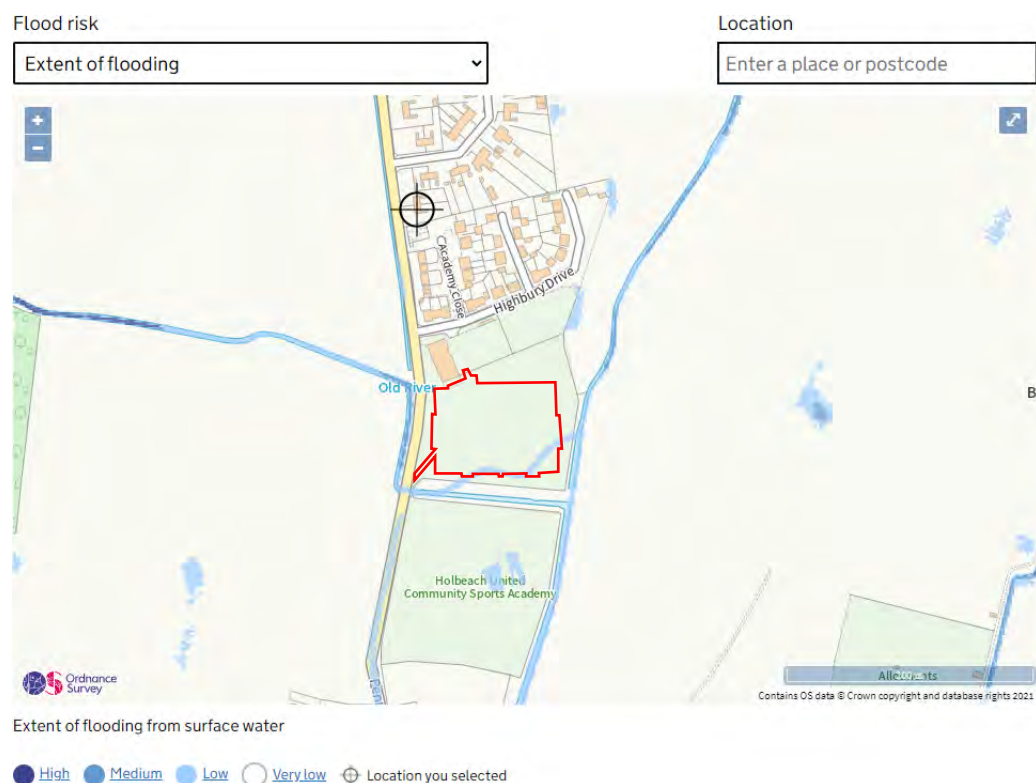


Figure 3.2 Risk of Flooding from Surface Water

Source: GOV.UK website – 1st November 2021

- 3.2.4 It should be noted that this map is generated using a broad methodology applied at the national scale. The model utilises generalised information on infiltration, sewerage infrastructure, rainfall events and catchment topography to route rainfall over a ground surface model. As such, the analysis does not take account of site-scale factors / characteristics that may exert an influence upon surface water flood depths and extents. The map therefore only provides a guide regarding the areas that may be vulnerable to this source of flooding.

3.3 Flooding from groundwater

- 3.3.1 As set out in Section 2.5 above, the Site Investigation report confirms that the groundwater was encountered within all exploratory boreholes. As set out above, the groundwater was encountered at depths between 1.4m and 2.25m below ground level.
- 3.3.2 We are not aware of any flooding on site caused by groundwater.
- 3.3.3 The information available at the time of preparing this report, and the nature of the underlying geology, suggests that groundwater emergence at the surface is unlikely, such that groundwater flood risk does not constitute a constraint in this instance.

3.4 Flooding from sewers

- 3.4.1 Anglian Water's asset plan is enclosed in **Appendix E**. As highlighted in Section 2.5 above, there are no adopted sewers within the site. There is a foul water rising main in Penny Hill Road to the west of the site, which flows north to south.
- 3.4.2 We do not have any records of sewer flooding within the vicinity of the proposed development.
- 3.4.3 We therefore do not consider the risk of flooding from sewers to be a significant risk to the proposed development.

3.5 Flooding from reservoirs, canals and other artificial sources

- 3.5.1 We are not aware of any canals or artificial water sources that may result in flooding of this site.
- 3.5.2 The EA provides maps (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/>) showing the area that may be affected by flooding as a result of a breach of a large, raised reservoir (i.e. capable of storing over 25,000 cubic metres of water above the natural level of any part of the surrounding land).
- 3.5.3 An extract of the Environment Agency map 'Risk of Flooding from Reservoirs' is provided below in Figure 3.3. It can be seen that the proposed development site, shown in red, is not at a risk of flooding from reservoirs.



Figure 3.3 Risk of Flooding from Reservoirs
Source: GOV.UK website – 1st November 2021

- 3.5.4 It can therefore be concluded that the risk of flooding from reservoirs and other artificial sources is low.

3.6 Historic flooding

- 3.6.1 Flood level information has been obtained from the Environment Agency (EA) dated the 11th October 2021, see **Appendix F**. With regards to historic flooding, the EA response states the following:

"With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change."

3.7 Flood risk vulnerability and flood zone compatibility

- 3.7.1 Based on the above assessment of the site being located within Flood Zone 3 and classified as a Less Vulnerable development, and with reference to Table 3.5 below (Planning Practice Guidance for 'Flood Risk and Coastal Change' to the National Planning Policy Framework, Table 3), the proposed development of this site would be considered "appropriate". A copy of Table 3 is presented below highlighting the above. A sequential test will be required, whilst an exception test will not be required.

Table 3 – Flood Risk Vulnerability and Flood Zone Compatibility					
Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatibility	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	X	Exception test required	✓
Zone 3b	Exception test required	✓	X	X	X
✓ = Development is appropriate			X = Development should not be permitted		
Source: Planning Practice Guidance - 2018					

Table 3.3 Flood Risk Vulnerability and Flood Zone Compatibility

3.7.2 Sequential Test

- 3.7.2.1 The aim of the sequential test is to steer development to areas with the lowest probability of flooding.
- 3.7.2.2 In this case, the proposed FTP is located on existing grass playing fields associated with Holbeach United Community Sports Academy. We would note that all of the playing fields associated with the Academy are located within the same flood zone, and that the proposed FTP is categorised as Water Compatible development. The risk of flooding can be adequately managed through flood warnings.

3.8 Flood compensation

3.8.1 A comparison of existing and proposed levels is set out in Table 3.3 below.

Existing and Proposed Levels			
Location	Levels Review		
	Existing Ground Level (m)	Proposed Finished Level (m)	Total Ground Adjustment (m)
North-west corner	3.240	3.240	0.0
North-east corner	3.350	3.350	0.0
South-west corner	3.350	3.240	-0.110
South-east corner	3.550	3.350	-0.200

Table 3.4 Existing and Proposed Levels

3.8.2 Whilst the proposed FTP is located within Flood Zone 3, flood compensation measures will not be required as the pitch will be constructed at or below existing ground levels, thus ensuring there is no loss of flood storage.

3.9 Access and egress

3.9.1 Access and egress to and from this site in the event of flooding will be via the proposed development's access road which will allow visitors of the academy to move to higher ground.

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:-

1. Infiltration systems where ground condition permit
2. To watercourses
3. To sewers

- 4.2.2 Each of these is considered separately below:

4.2.3 Infiltration systems

- 4.2.3.1 The geology of the site is described in Section 2.5 above. As set out within the Site Investigation report, “...surface soils are considered to be effectively impermeable and not suitable for shallow soakaways drainage...”. As a result, the use of soakaways will not be considered further.

4.2.4 Watercourses / Main River

- 4.2.1 As set out in Section 2.5 above, there is an existing drainage ditch located along the eastern and southern boundaries of the site, which flows from east to west.

- 4.2.4.1 As such, surface water from the proposed development will drain to this existing watercourse. A new surface water outfall will be installed to connect to the drain to the south-western corner of the pitch.

4.2.5 Sewers

- 4.2.5.1 Draining the site to an existing watercourse is viable option, therefore the use of surface water surface water sewers will not be considered further.

4.3 SUDS assessment

4.3.1 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	No	Underlying geology unviable
Filter Strips / Filter Drains	No	Underlying geology unviable
Swales	No	Not considered suitable for location within playing fields.
Bioretention Systems	No	No open spaces
Trees	No	The development proposals simply comprise the proposed FTP – no new trees will be planted adjacent to the new pitch.
Pervious Pavements	Yes	Surface water attenuation will be provided within the sub-base for the pitch.
Attenuation Tanks	No	Surface water attenuation will be provided within the sub-base for the pitch.
Detention Basin	No	Surface water attenuation will be provided within the sub-base for the pitch.
Ponds and Wetlands	No	No open spaces
Trapped Drainage	No	A sufficient level of water treatment will be provided through the use of permeable paving sub-base of the proposed FTP.

Table 4.1 SUDS Assessment

4.4 Surface water drainage strategy

4.4.1 Surface water discharge rates will be restricted to greenfield equivalent run-off rates to ensure that the rate of surface water run-off from the site does not increase as a result of the proposed development.

4.4.2 The proposed drainage strategy will provide attenuation within the permeable sub-base of the pitch. Surface water will outfall to the ditch located to the south-west corner of the site.

4.4.3 An indicative surface water layout plan is enclosed in **Appendix G**. 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 not viable. The detail design parameters of the drainage are described in detail in Section 4.5.

4.5 Surface water drainage design and management

- 4.5.1 Proposals are to design the surface water drainage system to accommodate storms up to the 1 in 100 year event plus an allowance of 40% for climate change. Table 4.2 below is a copy of Table 2 from the Environment Agency's guidance 'Flood risk assessments: climate change allowances' to support the National Planning Policy Framework, which defines the climate change allowances.

Peak Rainfall Intensity Allowance in Small and Urban Catchments			
Allowance	'2020s' (2015 to 2039)	'2050s' (2040 to 2069)	'2080s' (2070 to 2115)
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%
Source: Environment Agency - 2016			

Table 4.2 Peak Rainfall Intensity Allowance in Small and Urban Catchments

4.6 Existing run-off rates

- 4.6.1 To reflect the changes in the near surface geology across the site the greenfield run-off rates have been calculated. The method used to calculate the greenfield run-off rates is the ICP SUDS and the calculations are presented in **Appendix H**.

- 4.6.2 The greenfield run off rate, for the application site, is:

Soil type	= 0.312 – obtained from the FEH parameters
SAAR	= 557mm – obtained from the FEH parameters
Urban	= 0.000
Region number	= 5
Proposed imp area	= 0.817ha
Q ₁	= 1.1 l/s
Q _{bar}	= 1.2 l/s
Q ₃₀	= 3.0 l/s
Q ₁₀₀	= 4.4 l/s

- 4.6.3 The Q_{bar} equivalent rate for the proposed development is 1.2 l/s. A restriction of 1.2 l/s could potentially result in a small aperture at the outfall which could increase the risk of blockage. To reduce the risk of blockage, a minimum aperture size of 75mm will be used. As such, surface water will be restricted to a run-off rate of 2.5 l/s.

4.7 Attenuation requirements

- 4.7.1 Surface water will discharge into Old River (Drain) to the south, via a new outfall connection located to the south-west corner of the pitch. Surface water will be attenuated to the minimum viable run-off rate of 2.5 l/s. To achieve this, surface water will be attenuated within the permeable sub-base of the proposed pitch.

4.7.2 The proposed impermeable area of the development is 0.817ha as shown on the plan enclosed in **Appendix I**. Based on the proposed impermeable area and allowable discharge rate of 2.5 l/s, the storage requirement has been calculated utilising the following parameters.

Rainfall profile	= Flood Estimation Handbook
Drained area	= 0.817ha
Pitch length	= 106.0m
Pitch width	= 70.0m
Fall across pitch	= 1:900
Control	= Vortex flow control
Limiting flow to watercourse	= 2.5 l/s
Depth of permeable sub-base	= 0.150m
Porosity of permeable sub-base	= 30% voids

4.7.3 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 J**. The results confirm that the 150mm sub-base is sufficient to accommodate all storage required for the 1 in 30 year event.

Return period	= 30 year
Durations	= 60 to 10080 minutes
Climate change	= 0%

4.7.4 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 K**. The results confirm that the construction depth of the pitch is not sufficient to accommodate all storage required for the 1 in 100 year event.

Return period	= 100 year
Durations	= 60 to 10080 minutes
Climate change	= 0%
Max volume of flooding triggered	= 25.1m ³

4.7.5 Storage calculations for the 1 in 100 year plus 40% climate change event have been undertaken based on the parameters set out above and below. Full calculations are enclosed in **Appendix L**. The results confirm that the 150mm sub-base is not sufficient to accommodate all storage required for the 1 in 100 year plus 40% climate change event.

Return period	= 100 year
Durations	= 60 to 10080 minutes
Climate change	= 40%
Max volume of flooding triggered	= 186.1m ³

- 4.7.6 It is proposed that the FTP will be surrounded by 500mm high barriers. Based on a pitch area of 8174m² and a flooded volume of 186.1m³ this will result in less than a 3.0cm depth of water cross the pitch. As such, the 500mm barriers provide a sufficient storage for the 1 in 100 year plus 40% climate change to accommodate the 186.1m³ volume that exceeds the sub-base capacity in this scenario.
- 4.7.7 The indicative surface water drainage layout incorporating the attenuation is shown on the plan enclosed in **Appendix G**.

4.8 Overland flows

- 4.8.1 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.
- 4.8.2 It is proposed that the FTP will be surrounded by 500mm barriers. The barriers will be sufficient to provide containment of surface water from the pitch for the 1 in 100 year plus 40% climate change event, therefore providing management of exceedance flows during extreme events. The boards will have sufficient gaps to ensure permeability and not impede the wider overland flows.
- 4.8.3 The predicted overland flow routes following the development of the site will be comparable to the existing conditions. These flow routes are shown on the plan enclosed in **Appendix M**.

4.9 Foul water drainage strategy

- 4.9.1 There is no foul water drainage associated with the proposals for a new Football Turf Pitch.

5.0 Maintenance

5.1 Surface water drainage maintenance

- 5.1.1 The proposed surface water drainage infrastructure will comprise a private SUDS system and will be maintained by Holbeach United Community Sports Academy.

5.2 Foul water drainage maintenance

- 5.2.1 There is no foul water drainage associated with the proposals.

6.0 Summary and conclusions

- 6.1 The proposed Football Turf Pitch (FTP) is located at Holbeach United Community Sports Academy, Pennyhill Road, Holbeach. The location of the proposed FTP sits within the southern part of Holbeach United Community Sports Academy. The proposed FTP site is bound by the Holbeach United Community Sports Academy to the north, Old River (Drain) to the east with agricultural land beyond, Old River (Drain) to the south with existing football pitches beyond and Penny Hill Road to the west.
- 6.2 The proposed development will comprise a new Community 3G Football Turf Pitch (FTP).
- 6.3 The site is located within Flood Zone 3 and at a high risk of flooding from rivers and the sea. This is considered appropriate as the proposals are classed as Water Compatible development. Flood compensation is not considered to be necessary, as the pitch will be constructed at or below existing ground levels, thus ensuring there is no loss of flood storage.
- 6.4 The majority of the site is shown to be located in an area of very low (less than 1 in 30) risk of surface water flooding in a given year. With regards to groundwater, sewers and artificial sources such as reservoirs, the site is shown to be at low risk of flooding.
- 6.5 The proposed drainage strategy will provide attenuation within the permeable sub-base of the pitch. Surface water will outfall to the ditch located to the south-west corner of the site.
- 6.6 The proposed drainage strategy will provide attenuation within the permeable sub-base of the pitch. Surface water will outfall to the ditch located to the south-west corner of the site, restricted to 2.5 l/s. The 150mm deep sub-base is shown to be sufficient to accommodate the 1 in 30 year event.
- 6.7 It is proposed that the FTP will be surrounded by 500mm high barriers. Based on a pitch area of 8,174m² and a flood volume of 186.1m³, this will result in less than a 3.0cm depth of water across the pitch, therefore provide sufficient storage for the 1 in 100 year plus 40% climate change.
- 6.8 There is no foul water drainage associated with the proposals.
- 6.9 National, Regional and Local planning policy requires that:
- Development is directed to sites at the lowest probability of flooding;
 - Development accommodates the potential impacts of climate change;
 - Development should not be permitted if it would be at an unacceptable risk of flooding or create an unacceptable risk elsewhere; and
 - New development should facilitate safe access and exit during flood conditions.

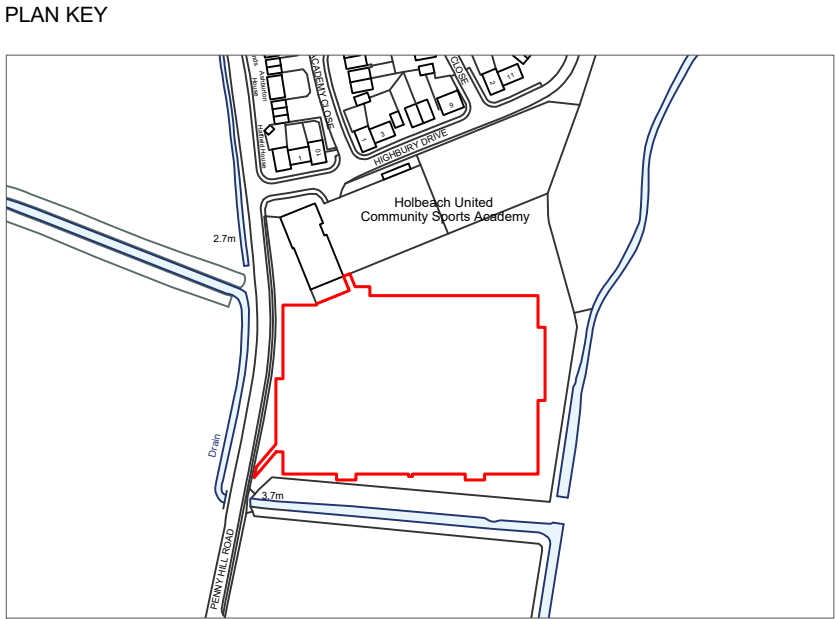
- 6.10 The proposals for an FTP at Holbeach United Community Sports Academy, Pennyhill Road, Holbeach are therefore, fully compliant with policy in respect of development and flood risk, such that flood risk considerations do not constitute a barrier to the granting of planning consent.



Appendix A

Location Plan

S&C Slatter Drawing no. S21-233 / DWG / 0001 Rev.01



- LEGEND
- APPLICATION SITE REQUIRED FOR PROJECT INSTALLATION WITH CONSTRUCTION PHASE ACCESS ADJOINING PENNY HILL ROAD
 - LAND AREA UNDER OWNERSHIP OF HOLBEACH UNITED COMMUNITY SPORTS ACADEMY
 - GRASS FOOTBALL PITCH



NOTES

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THIS DRAWING IS TO BE READ IN CONJUNCTION WITH CONTRACT DOCUMENTATION, SPECIFICATION AND ALL RELEVANT DETAILS.

ANY DISCREPANCIES BETWEEN DOCUMENTS TO BE REPORTED TO S&C SLATTER FOR REVIEW AND CLARIFICATION, PRIOR TO WORKS COMMENCING ON SITE.

ALL COORDINATES AND DIMENSIONS TO BE CHECKED AND CONFIRMED ON SITE, PRIOR TO WORKS COMMENCING.

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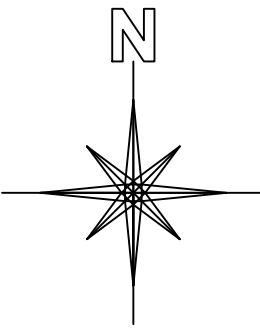
SAFETY HEALTH AND ENVIRONMENTAL (SHE) INFORMATION

IN ADDITION TO HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK, NOTE ANY PROJECT SPECIFIC RISKS DETAILED ON THIS DRAWING.

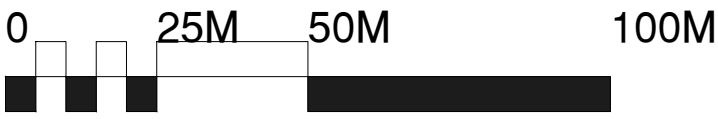
RISKS LISTED HERE ARE NOT EXHAUSTIVE AND WILL BE DEVELOPED AND MITIGATED DURING TECHNICAL DESIGN AND MANUFACTURING AND CONSTRUCTION PROJECT STAGES.

CONTROL MEASURES WILL BE APPLIED TO RESIDUAL RISKS AS APPROPRIATE AND IDENTIFIED WITH HAZARD TRIANGLES.

INFORMATION RELATING TO USE, MAINTENANCE, AND DEMOLITION TO BE DETAILED IN DUE COURSE WITHIN A BUILDING MANUAL AND HEALTH AND SAFETY FILE.



1:1250 SCALE



REVISION	DATE	DRAWN	DESCRIPTION
.00	09 09 2021	TB	ORIGINAL ISSUE
.01	02 01 2022	TB	FTP RELOCATED TO AVOID DEVELOPMENT EXCLUSION ZONE



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CLIENT

HOLBEACH UNITED COMMUNITY
SPORTS ACADEMY

PROJECT

COMMUNITY 3G
FOOTBALL TURF PITCH (FTP)

LOCATION

PENNY HILL ROAD
HOLBEACH
SOUTH HOLLAND
LINCOLNSHIRE
PE12 7PR

DRAWING TITLE

LOCATION PLAN

STATUS

PLANNING

PROJECT NO.

S21-233

DRAWING NO.

S21-233 / DWG / 0001

REVISION NO.

.01

SCALE

1:1250

SIZE

A1

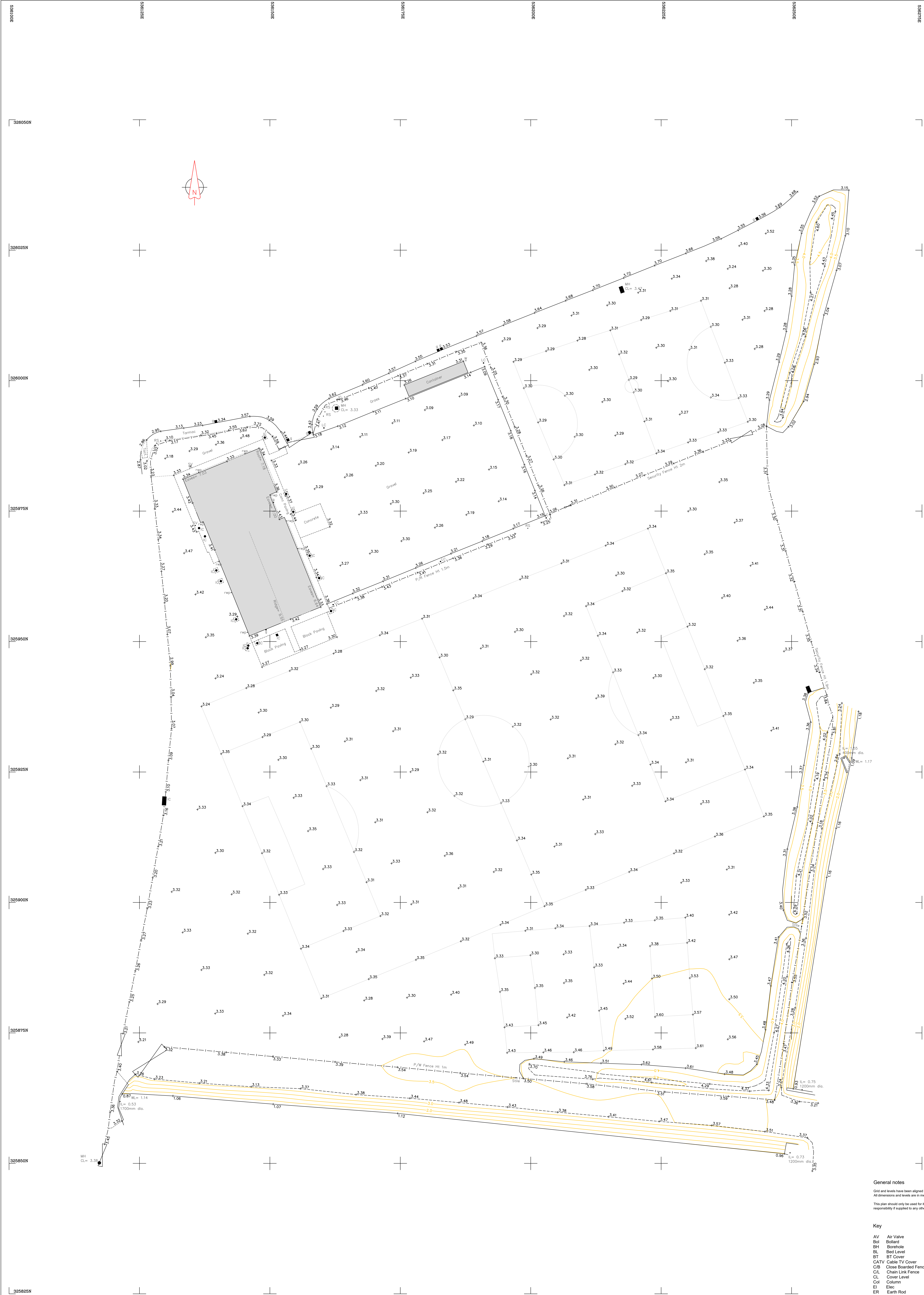
DRAWN

TB

CHECKED



Appendix B
Topographical Survey
JPP Surveying drawing no. 23073Y-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	PR	Post & Rail Fence
Bol	Bollard	FW	Foul Water	PW	Post & Wire Fence
BH	Borehole	G	Gully	RE	Rodding Eye
BL	Bed Level	GV	Gas Valve	RS	Road Sign
BT	BT Cover	HL	Height	rw	Rainwater Pipe
CATV	Cable TV Cover	IC	Inspection Chamber	SV	Stop Valve
C/S	Close Boarded Fence	IL	Invert Level	sw	Soil & Vent Pipe
CL	Chain Link Fence	IR	Iron Railing	SW	Surface Water
CL	Cover Level	KO	Kerb Outlet	TL	Traffic Light
Col	Column	LP	Lamp Post	TP	Telegraph Pole
EI	Earth Rod	MH	Manhole	TW	Top of wall
ER	Electric Pole	Mz	Marker Post	ul	Unable To Lift
EP	Electricity Pole	O/H	Overhead	VP	Vent Pipe
FH	Fire Hydrant	PB	Post Box	WL	Water Level
FL	Floor Level	Po	Post	WM	Water Meter
				wo	Wash Out

Building

Control Station

Tree

Bore Hole

Gate

Bottom of Bank

Top of Bank

Vegetation

Change of surface

Fence

Contours

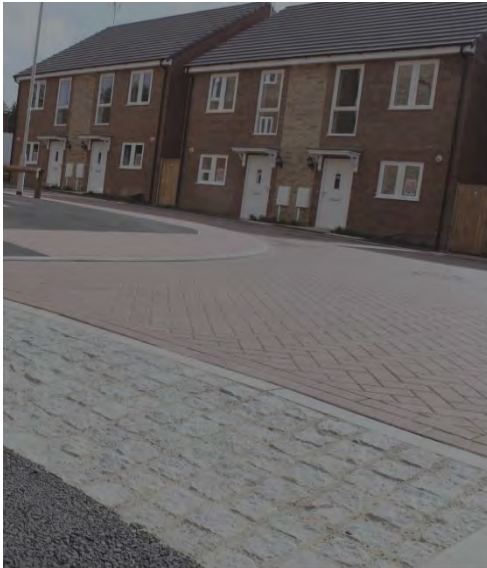
OH Telecom

OH Electric



Appendix C
Extract of Ground Investigation
JPP Geo report ref. R-SI-22849-01-00

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



Proposed Artificial Grass Pitch Holbeach United Academy Highbury Drive Penny Hill Road Holbeach



Site Investigation Report

Revision 00: June 2021
R-SI-22849-01-00

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Proposed Artificial Grass Pitch
Holbeach United Academy
Highbury Drive
Penny Hill Road
Holbeach

Site Investigation Report

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

Report Reference	R-GI-22849-01-00
Revision	00
Date	June 2021

Report Originators

Prepared by

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Revision	Date	Description	Prepared	Reviewed
0				

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 site is an existing grassed playing field associated with Holbeach United Community Sports Academy. A pavilion building with gravel car parking is present to the north of the site with drainage ditches along the southern and western site boundaries. Penny Hill Road is present along the eastern site boundary.
Proposals	Construction of a 3G Artificial Grass Pitch (AGP) with associated fencing, floodlights and drainage infrastructure.
History	The site is mapped as part of agricultural fields from the 1880s with a pond present to the north west of the site. The Old River is present along the southern and western site boundaries until the 1970s where the Old River is labelled to be a drain. The site is shown to be a nursery from the 1970s with above ground structures absent from 2007. The site is shown to be grassed playing fields on aerial images from 2016 with the pavilion building present in the north west corner of the site. The drainage was also recently realigned to the current position along the southern edge of the site and formerly meandering within the current pitch location, as indicated on the OS map in Figure 3.1.
UXO	There is a low risk of encountering UXO identified by online mapping
Geology	Superficial Tidal Flat Deposits over bedrock geology of the West Walton Formation.
Fieldwork	6No window sample boreholes to a maximum depth of 5.00m bgl, 1No. infiltration test and 5No TRL dynamic cone penetration tests to measure insitu CBR
Ground conditions	Topsoil was encountered from ground level to depths of 0.3m and 0.4m underlain by variable made ground across the site (with the exception of WS03 where no made ground was encountered) to depths of between 0.8 to 1.8m bgl. Underlying topsoil/made ground, Tidal Flat Deposits were encountered comprising loose to medium dense silty sands and clayey silts to 5.0m bgl. In most positions it was not possible to extend below 4.0m depth due to collapse and therefore continuous CPT testing was carried out to 5.0m depth where the density increased potentially suggesting the West Walton Formation.
Groundwater	Groundwater was encountered across the site at depths of between 1m-2m bgl.
Floodlight foundations	Due to the poor density ground, shallow groundwater and made ground depths in most positions, it is not considered feasible to construct sufficient size and depth pad foundations for the floodlights and a piled foundation solution is therefore considered necessary. A deep borehole is likely to be required to provide piling parameters for design.
Concrete classification	DS-1 ACEC-1
Pitch construction	CBR of <2% for design and reassessed during construction due to the variability of made ground encountered. Ground improvement such as cement/lime stabilisation is likely to be appropriate to minimise the risk of adverse settlement across the pitch area.
Soakaways/ Drainage	Infiltration testing and shallow groundwater indicates that soils soakaways are not viable for surface water drainage. The ditches along the south and east provide the most likely outfalls.

Table 1.1

4.0 Fieldwork

4.1.1 Fieldwork was carried out on the 11th May 2021 and comprised the following:

- 6No window sample boreholes to a maximum depth of 5.0m bgl;
- 1No Infiltration tests at 1.0m depth in additional borehole position adjacent to WS03; and
- 5No TRL Dynamic Cone Penetration tests to measure insitu CBR values.

4.1.2 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 D. With reference to these records, there are no statutory services (not considering private services that may be present) recorded to cross the subject proposed pitch area.

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

5.0 Ground Conditions

5.1 Soils

Topsoil

- 5.1.1 Topsoil was encountered within WS01, WS02, WS03 and WS04 from ground level to depths of between 0.30m and 0.40m bgl which can be described as a generally brown slightly gravelly clayey silty sandy topsoil with gravel comprising fine flint, quartzite and occasional brick fragments.

Made Ground

- 5.1.2 Underlying the topsoil and from ground level within WS05 and WS06, made ground was encountered. The made ground encountered was variable, generally comprising brown gravelly sands with flint, brick, glass, slate and ash to depths of between 0.70m bgl and 0.60m bgl.
- 5.1.3 WS02 encountered dark grey very sandy clay/silt made ground with an organic odour between 0.70m and 1.80m bgl.
- 5.1.4 Within WS05 between 0.80m and 0.95m bgl an orange brown gravelly sand with Styrofoam and plastic sheeting was encountered.

Tidal Flat Deposits

- 5.1.5 Underlying the made ground across the site at depths of between 0.8 to 1.8m bgl, and topsoil within WS03, soils believed to be of representative of Tidal Flat Deposits were encountered. Soils generally comprised of loose brown slightly clayey silts and loose brown silty sands to depths of between 2.70m and 5.0m bgl.
- 5.1.6 A generally loose becoming medium dense grey silty sand with occasional fine black sand partings was encountered within WS01, WS02, WS03 and WS04 from depths of between 2.70m and 2.75m bgl to the base of the exploratory boreholes.
- 5.1.7 Cone SPT 'N' values within the Tidal Flat Deposits ranged from 7 to 19 and generally increased with depth. Due to stability issues within the boreholes, WS01, WS02, WS03 and WS06 were drilled to 4.00m bgl with a continuous CPT carried out between 4-5m bgl yielding CPT 'N' values of between 11 and 38 and generally increased with depth. The increased N values potentially suggest the soils of the West Walton Formation.

5.2 Groundwater

5.2.1 Groundwater was encountered within all exploratory boreholes and the observations are summarised in the table below.

Summary of groundwater encountered during drilling			
WLS reference	Depth struck	Water level on completion	Further observations
WS01	1.20m	1.42m	Collapsed to 2.00m bgl on completion.
WS02	2.00m	2.17m	Collapsed to 2.23m bgl on completion.
WS03	1.50m	2.24m	Collapsed to 2.30m bgl on completion.
WS04	2.00m	Dry on completion.	Collapsed to 2.34m bgl on completion.
WS05	1.00m	2.14m	Collapsed to 2.20m bgl on completion.
WS06	1.50m	2.00m	Collapsed to 2.05m bgl on completion.
Table 5.2			

- 7.5.2 A TRL Dynamic Cone Penetrometer (TRL-DCP) has also been used to assess the insitu CBR across the proposed pitch area. The probe comprises a 60° 20mm diameter steel cone which is driven vertically into the ground by the force of an 8kg weight dropped vertically by 575mm height. The depth of penetration is then recorded per blow up to 950mm. The test is aborted if the depth of penetration is less than 2mm per blow. The derived soil strength expressed as mm/blow can be converted to CBR using the equation: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$.
- 7.5.3 TRL-DCPs were carried out in five positions across the proposed pitch area (results provided in Appendix B). We have discounted the results within the topsoil which will be stripped from the pitch area. The lowest derived CBR for the underlying soils (excluding topsoil) is 4.4% (ranging from 4.4% to 34%). It is considered that these results may be influenced by the made ground present across the site. We recommend a precautionary CBR value of <2% should be adopted for design and reassessed during construction due to the variability of made ground.
- 7.5.4 Given the inherent variability of the made ground and the poor Tidal Flat Deposits, a CBR value of <2% is recommended. Ground improvement is recommended such as lime/cement stabilisation or inclusion of geo grid reinforcement to improve the strength and reduce the potential for adverse settlement across the pitch area. The soils should be considered frost susceptible due to the fines content.
- 7.5.5 All topsoil material or organic soils should be removed from the proposed footprint of the pitch and any obvious soft or loose spots excavated and backfilled with a suitable fill. Reference should be made to the compaction requirements outlined in Highways England Volume 1: Specification for Highway Works Series 600: Earthworks.

7.6 Infiltration potential

- 7.6.1 Indicative infiltration testing was carried out within 1.0m deep boreholes adjacent to WS03 where clayey silty sands and sandy silts were encountered. A fall of 20mm was recovered over a 243-minute monitoring period. The near surface soils are considered to be effectively impermeable and not suitable for shallow soakaways drainage and therefore an alternative surface water drainage solution is necessary.
- 7.6.2 Two drainage ditches are present on site, the first is present along the eastern site boundary where a manhole cover was observed but was unable to be lifted, a scar in the land was present in line with the manhole cover coming from the north, it is assumed this is surface water drainage that is discharged into the ditch. Water was present in the eastern drainage ditch at the time of the site investigation. Inspection covers were noted around the paved area adjacent to the pavilion and surrounding the building. The second drainage ditch is present along the southern site boundary which contained water at the time of the site investigation with no obvious flow observed. These drainage ditches are likely to provide the most appropriate outfalls for surface water drainage, subject to seeking appropriate approval of any drainage strategy.

Base drawing:

Topographical Survey produced by JPP Surveying,
drawing number: 23073Y, dated 10/05/2021

KEY

- 

WS

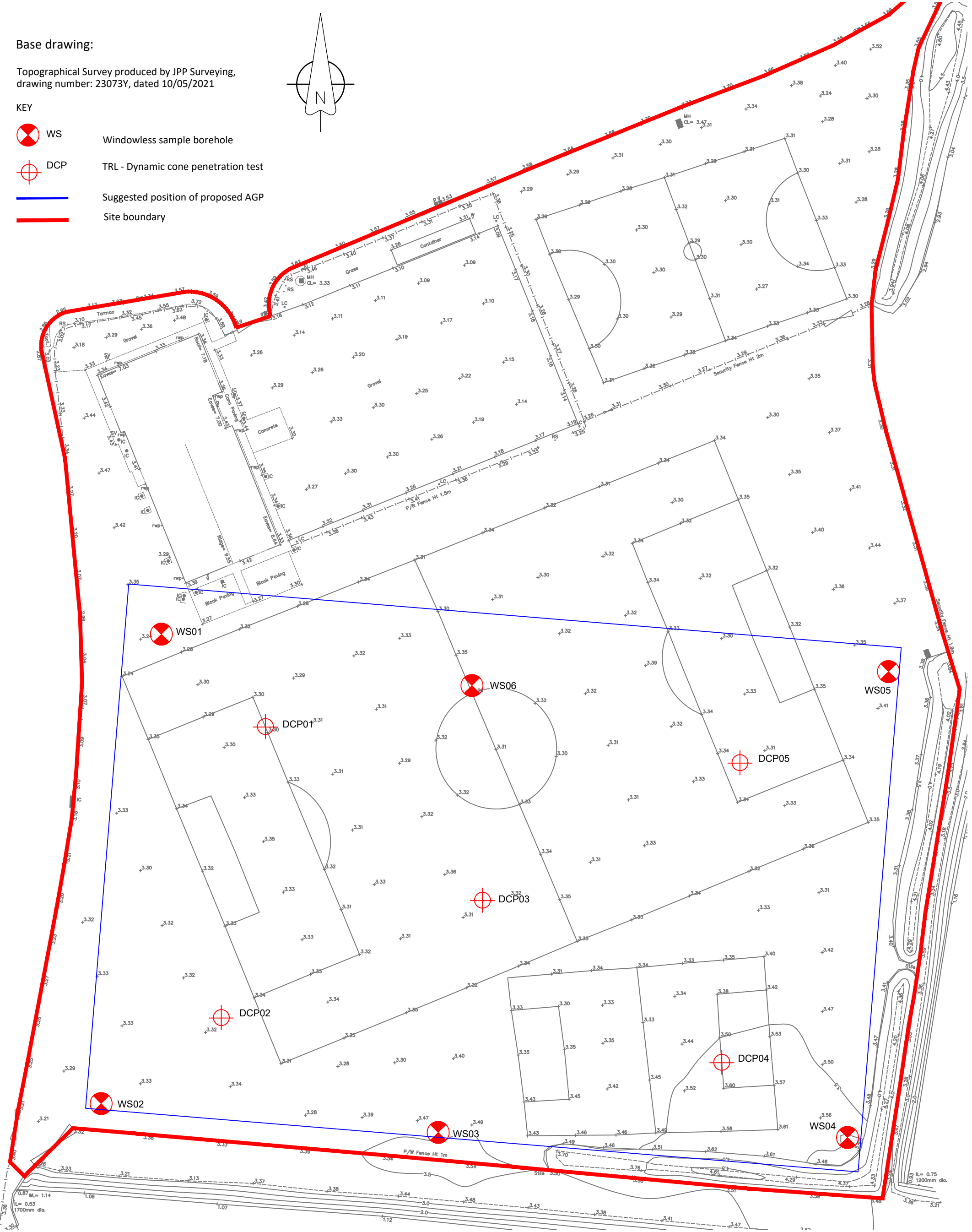
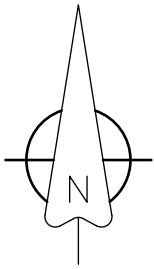
Windowless sample borehole
- 

DCP

TRL - Dynamic cone penetration test
- 

Suggested position of proposed AGP
- 

Site boundary



Key to Exploratory Hole Logs

General

Descriptions for soils and rocks generally following:

BS 5930:2015

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	

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Milton Keynes
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- Infrastructure Design
- Structural Engineering
- Planning Services
- Geotechnical & Environmental
- Surveying
- Professional Advice

Key to Exploratory Hole Logs





Date: 11/05/2021

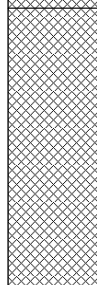
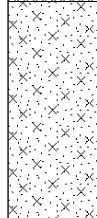
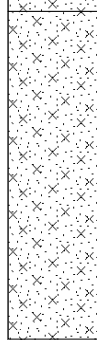
Contractor: Regional Drilling Ltd

Drilling Equipment: Premier 110

Page Number
Sheet 1 of 1

Remarks	
Groundwater encountered at 1.20m bgl with a level of 1.42m bgl on completion. Borehole collapsed to 2.00m bgl on completion. Continuous CPT carried out at 4m, 4.5m and 5m bgl.	

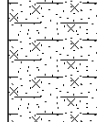
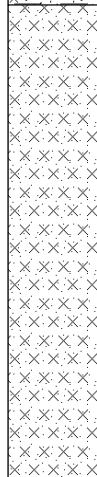
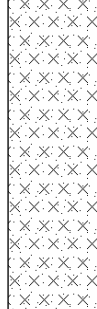


Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.30	ES		0.40		Brown slightly gravelly clayey silty sandy TOSPOIL with rootlets. Gravel consists of fine subangular flint and brick.	1		
		0.50	ES				Brown very gravelly fine to coarse SAND. Gravel consists of fine to medium subangular to rounded flint and quartzite. (MADE GROUND)			
		0.90 0.90 1.00	D PP				208.00 N=7 (1,1/1,2,2,2)		Soft grey very sandy CLAY/SILT with organic odour. (MADE GROUND)	
		1.30	D	37.00	1.80		Loose light brown grey very silty fine SAND. (TIDAL FLAT DEPOSITS)	2		
		1.50	PP							
		1.70	PP						33.00	
		1.90 2.00	D	N=8 (1,2/2,2,2,2)	2.70		Loose becoming medium dense grey very silty fine SAND with black fine sand partings. (TIDAL FLAT DEPOSITS)	3		
		3.00		N=10 (1,1/2,3,2,3)						
		3.50	D							
		4.00		N=12 (2,3/3,3,3,3)	4.00		End of Borehole at 4.000m	4		
		4.50		N=25 (2,3/5,6,7,7)						
		5.00		N=36 (7,7/8,9,9,10)						
										5
										6

[illegible]

Groundwater encountered at 2.00m bgl with a level of 2.17m bgl on completion, rising to 2.08m bgl after 20 minutes. Borehole collapsed to 2.23m bgl on completion. Continuous CPT carried out at 4m, 4.5m and 5m bgl.

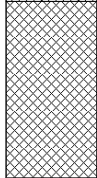
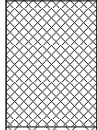
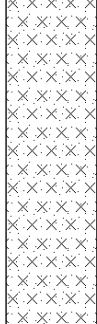
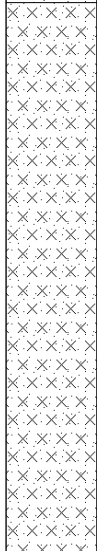


Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
	 	0.15	ES	N=8 (2,2/2,2,2,2)	0.30	0.85		Brown slightly gravelly clayey silty sandy TOSPOIL with rootlets. Gravel consists of fine subangular flint.	1	
		0.60	D					Orange brown slightly clayey silty fine to medium SAND. (TIDAL FLAT DEPOSITS)		
		1.00 1.10	D							Orange brown mottled dark orange very sandy SILT. (TIDAL FLAT DEPOSITS)
		2.00 2.00	D		Grey very sandy SILT. (TIDAL FLAT DEPOSITS)	3				
		3.00 3.00	D		N=9 (1,2/2,2,3,2)					
		4.00		N=11 (1,2/2,3,3,3)	4.00	End of Borehole at 4.000m				
		4.50		N=21 (3,3/4,5,6,6)						
		5.00		N=38 (7,8/10,8,10,10)						
										5
										6

[illegible]

Groundwater encountered at 1.50m bgl with a level of 2.24m bgl on completion. Borehole collapsed to 2.30m bgl on completion. Continuous CPT carried out at 4m, 4.5m and 5m bgl.



Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30			Brown slightly gravelly clayey silty sandy TOSPOIL with rootlets. Gravel consists of fine subangular flint and quartzite.	1
								Orange brown very silty fine SAND. (MADE GROUND)	
		0.70	D						
		1.00	ES	N=8 (1,2/2,2,2,2)	1.00			Loose orange brown mottled black gravelly very silty fine SAND. Gravel consists of fine to coarse subangular brick. (MADE GROUND)	
		1.20							
					1.50		Brown orange very sandy SILT. (TIDAL FLAT DEPOSITS)	2	
		1.70	D						
		2.00		N=9 (2,2/3,2,2,2)	2.80		Grey very sandy SILT. (TIDAL FLAT DEPOSITS)	3	
		3.00	D	N=10 (2,2/2,2,3,3)					
		3.10							
					4.00			4	
		N=12 (2,2/2,3,3,4)							
4.50	D								
			5.00			End of Borehole at 5.000m	5		
5.00		N=16 (3,3/3,3,5,5)							

[illegible]

Groundwater encountered at 2.00m bgl and was dry on completion. Borehole collapsed to 2.34m bgl on completion.



Windowless Sampling Log

Project Name: Holbeach United Community Sports Academy		Client: Football Foundation		Date: 11/05/2021	
Location: Holbeach		Contractor: Regional Drilling Ltd			
Project No. : 22849		Crew Name:		Drilling Equipment: Premier 110	
Borehole Number WS05	Hole Type WLS	Level	Logged By SH	Scale 1:30	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES					Brown slightly gravelly clayey silty fine to coarse SAND. Gravel consists of fine to medium brick, ash, flint, slate and glass. (MADE GROUND)	
		0.90	ES	N=7 (1,1/2,1,2,2)	0.80			Orange brown very gravelly fine to coarse SAND. Gravel consists of fine to medium subangular flint and quartzite with styrofoam and plastic sheeting. (MADE GROUND)	1
		1.00			0.95			Orange brown very sandy SILT. (TIDAL FLAT DEPOSITS)	
		2.00		N=8 (1,2/2,2,2,2)					2
		2.50	D						
		3.00		N=8 (2,2/2,2,2,2)					3
		4.00		N=10 (2,3/2,3,2,3)					4
		4.20	D						
		5.00		N=19 (2,3/4,5,5,5)	5.00			End of Borehole at 5.000m	5
									6

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

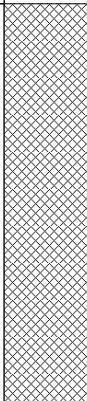
Remarks	
Groundwater encountered at 1.00m bgl with a level of 2.14m bgl on completion. Borehole collapsed to 2.20m bgl on completion.	



Date: 11/05/2021

Drilling Equipment: Premier 110

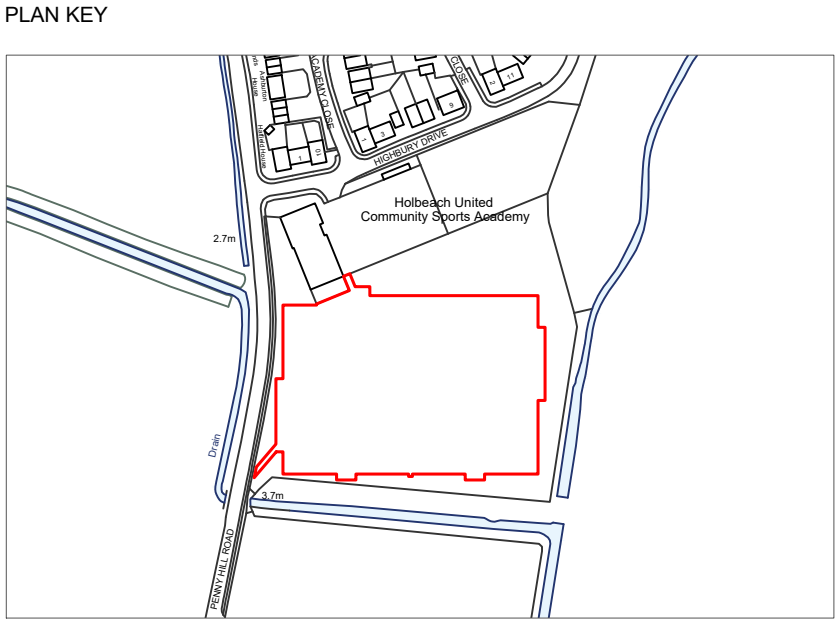
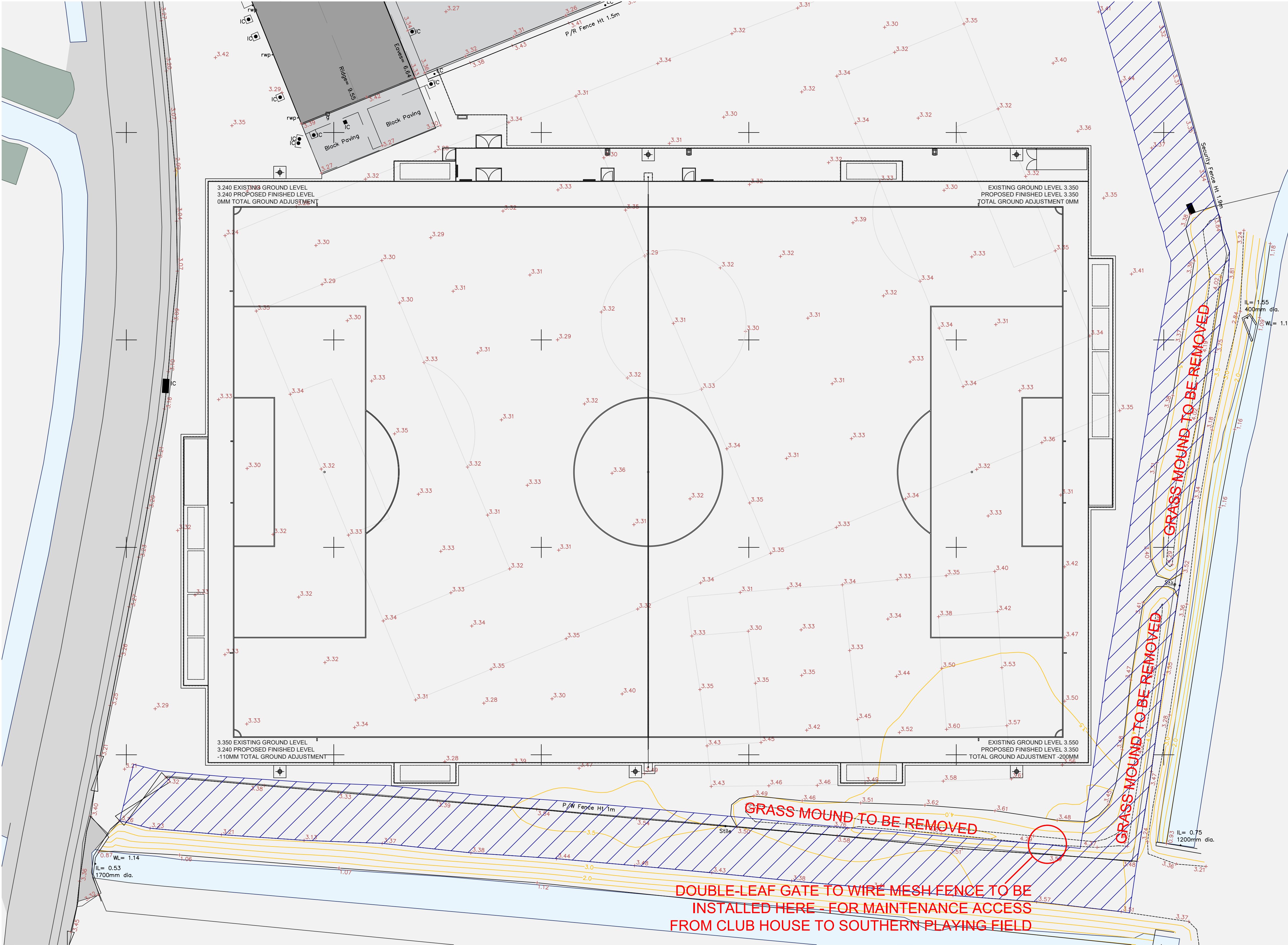
Page Number
Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.10	ES		1.60			Brown clayey sandy gravelly SILT. Gravel consists of fine to coarse subangular brick and ash. (MADE GROUND)	1		
		0.70	D								
		1.00		N=6 (1,2/1,2,1,2)				Orange brown very sandy SILT. (TIDAL FLAT DEPOSITS)	2		
		2.00		N=8 (1,2/2,2,2,2)							
		2.90	D	N=10 (2,2/2,2,3,3)					3		
		3.00									
		4.00		N=12 (2,2/3,3,2,4)			4.00	End of Borehole at 4.000m	4		
4.50		N=14 (3,3/3,3,4,4)	5								
5.00		N=19 (4,4/4,4,5,6)		6							
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											
Groundwater encountered at 1.50m bgl with a level of 2.00m bgl on completion. Borehole collapsed to 2.05m bgl on completion. Continuous CPT carried out at 4m, 4.5m and 5m bgl.											

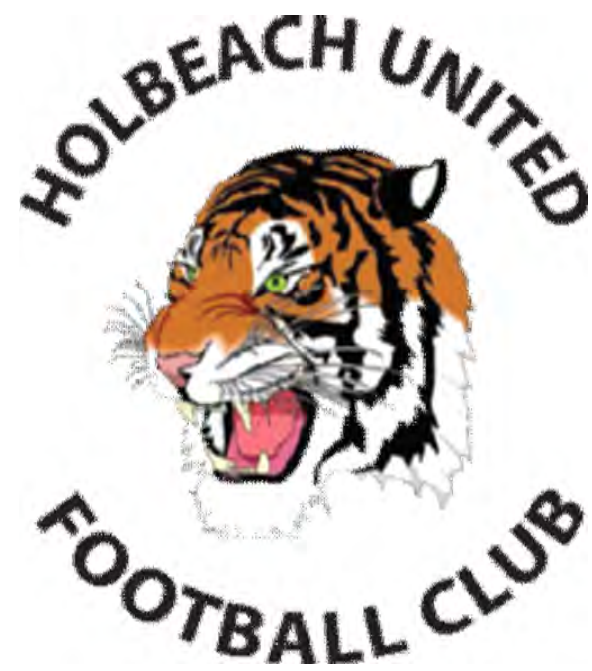


Appendix D

**Proposed FTP Layout and Proposed FTP Drainage
S&C Slatter drawing no. S21-233 / DWG / 0004 Rev 01 and 0005 Rev 01**



- LEGEND
- COMMUNITY 3G FOOTBALL TURF PITCH (FTP)
 - TOPOGRAPHICAL / LAND SURVEY
 - DEVELOPMENT EXCLUSION ZONE - 7M FROM TOP OF EMBANKMENT TO SOUTHERN DITCH 7M FROM BOUNDARY FENCING TO EASTERN DITCH



NOTES

COPYRITE S&C SLATTER.

ORIGINAL DRAWING RETAINED BY S&C SLATTER.

DO NOT COPY, RE-PRINT OR RE-USE WITHOUT PERMISSION.

DO NOT SCALE FROM THIS DRAWING UNLESS FOR PLANNING PURPOSES.

ALL MEASUREMENTS ARE IN MILLIMETRES (MM) UNLESS STATED OTHERWISE.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH CONTRACT DOCUMENTATION, SPECIFICATION AND ALL RELEVANT DETAILS.

ANY DISCREPANCIES BETWEEN DOCUMENTS TO BE REPORTED TO S&C SLATTER FOR REVIEW AND CLARIFICATION, PRIOR TO WORKS COMMENCING ON SITE.

ALL COORDINATES AND DIMENSIONS TO BE CHECKED AND CONFIRMED ON SITE, PRIOR TO WORKS COMMENCING.

BASE MAP REPRODUCED FROM ORDNANCE SURVEY MAP DATA © CROWN COPYRIGHT 2020 ALL RIGHTS RESERVED. LICENCE NUMBER 100022432.

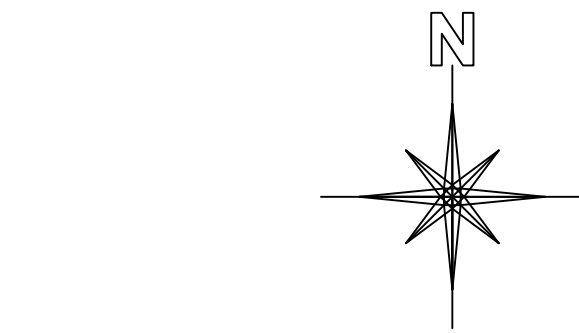
SAFETY HEALTH AND ENVIRONMENTAL (SHE) INFORMATION

IN ADDITION TO HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK, NOTE ANY PROJECT SPECIFIC RISKS DETAILED ON THIS DRAWING.

RISKS LISTED HERE ARE NOT EXHAUSTIVE AND WILL BE DEVELOPED AND MITIGATED DURING TECHNICAL DESIGN AND MANUFACTURING AND CONSTRUCTION PROJECT STAGES.

CONTROL MEASURES WILL BE APPLIED TO RESIDUAL RISKS AS APPROPRIATE AND IDENTIFIED WITH HAZARD TRIANGLES.

INFORMATION RELATING TO USE, MAINTENANCE, AND DEMOLITION TO BE DETAILED IN DUE COURSE WITHIN A BUILDING MANUAL AND HEALTH AND SAFETY FILE.



REVISION	DATE	DRAWN	DESCRIPTION
.00	09 09 2021	TB	ORIGINAL ISSUE
.01	02 01 2022	TB	FTP RELOCATED TO AVOID DEVELOPMENT EXCLUSION ZONE



STEPHEN'S YARD ENBORNE NEWBURY
BERKSHIRE RG20 0HA
01635 34521
info@sandcslatter.com
www.sandcslatter.com

CLIENT

HOLBEACH UNITED COMMUNITY SPORTS ACADEMY

PROJECT

COMMUNITY 3G FOOTBALL TURF PITCH (FTP)

LOCATION

PENNY HILL ROAD
HOLBEACH
SOUTH HOLLAND
LINCOLNSHIRE
PE12 7PR

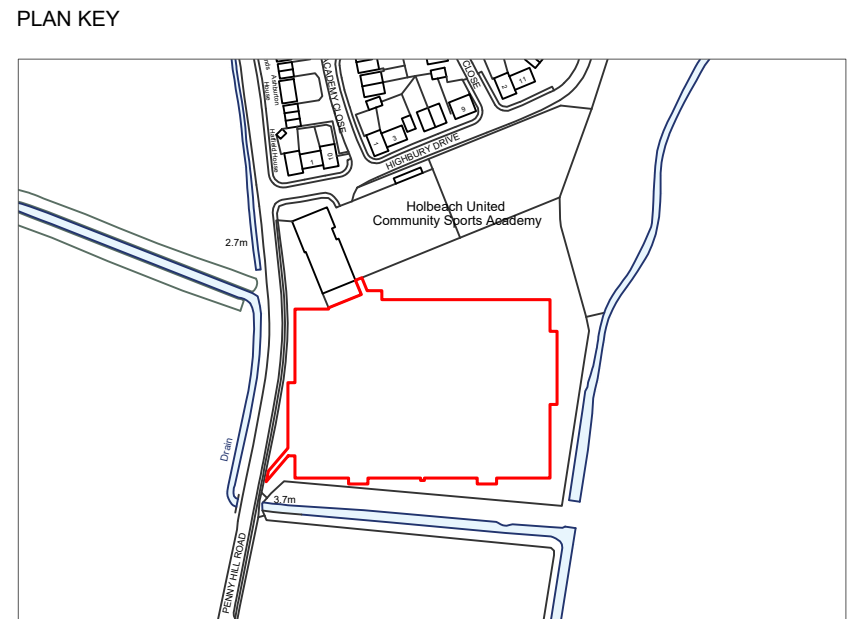
DRAWING TITLE

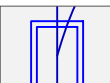
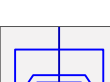
PROPOSED FTP LAYOUT

STATUS

PLANNING

PROJECT NO.	S21-233	REVISION NO.	.01
DRAWING NO.	S21-233 / DWG / 0004	CHECKED	
SCALE	1:250	DATE	A1
DRAWN	TB	CHECKED	



	VORTEX FLOW CONTROL WITHIN INSPECTION CHAMBER (IC)
	SURFACE WATER OUTFALL TO ADJACENT DRAIN VIA NEW DRAINAGE OUTLET WITH ASSOCIATED HEADWALL, SLUICE, AND RETURN VALVE
	DEVELOPMENT EXCLUSION ZONE - 7M FROM TOP OF EMBANKMENT TO SOUTHERN DITCH AND 7M FROM BOUNDARY FENCING TO EASTERN DITCH

SURFACE WATER ATTENUATION CAPACITY

DRAINED AREA

FOOTBALL PITCH AREA

HARD STANDING AREAS

PERMEABLE SUB-BASE DEPTH

POROUS ASPHALT LAYER (FOOTBALL PITCH)

3G FOOTBALL TURF SURFACE (FOOTBALL PITCH)

POROUS ASPHALT SURFACING (HARD STANDING AREAS)

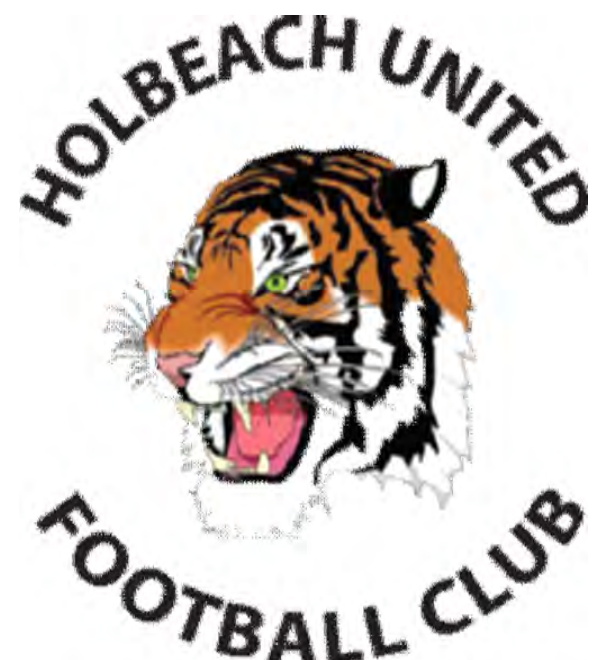
TOTAL FOOTBALL PITCH MAKE-UP / PROFILE

TOTAL HARD STANDING AREAS MAKE-UP / PROFILE

VOID SPACE WITHIN SUB-BASE

PROFILE / SLOPE

369M3
8213M2
7420M2
793M2
150MM
40MM
50MM
65MM
240MM
215MM
30%
0.11% (1:900)



REVISION	DATE	DRAWN	DESCRIPTION
.00	09 09 2021	TB	ORIGINAL ISSUE
.01	02 01 2022	TB	FTP RELOCATED TO AVOID DEVELOPMENT EXCLUSION ZONE



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www.sandcslatter.com

CLIENT

HOLBEACH UNITED COMMUNITY
SPORTS ACADEMY

COMMUNITY 3G
FOOTBALL TURF PITCH (FTP)

LOCATION

PENNY HILL ROAD
HOLBEACH
SOUTH HOLLAND
LINCOLNSHIRE
PE12 7PR

PROPOSED FTP DRAINAGE

STATUS

PLANNING

PROJECT NO.

S21-233

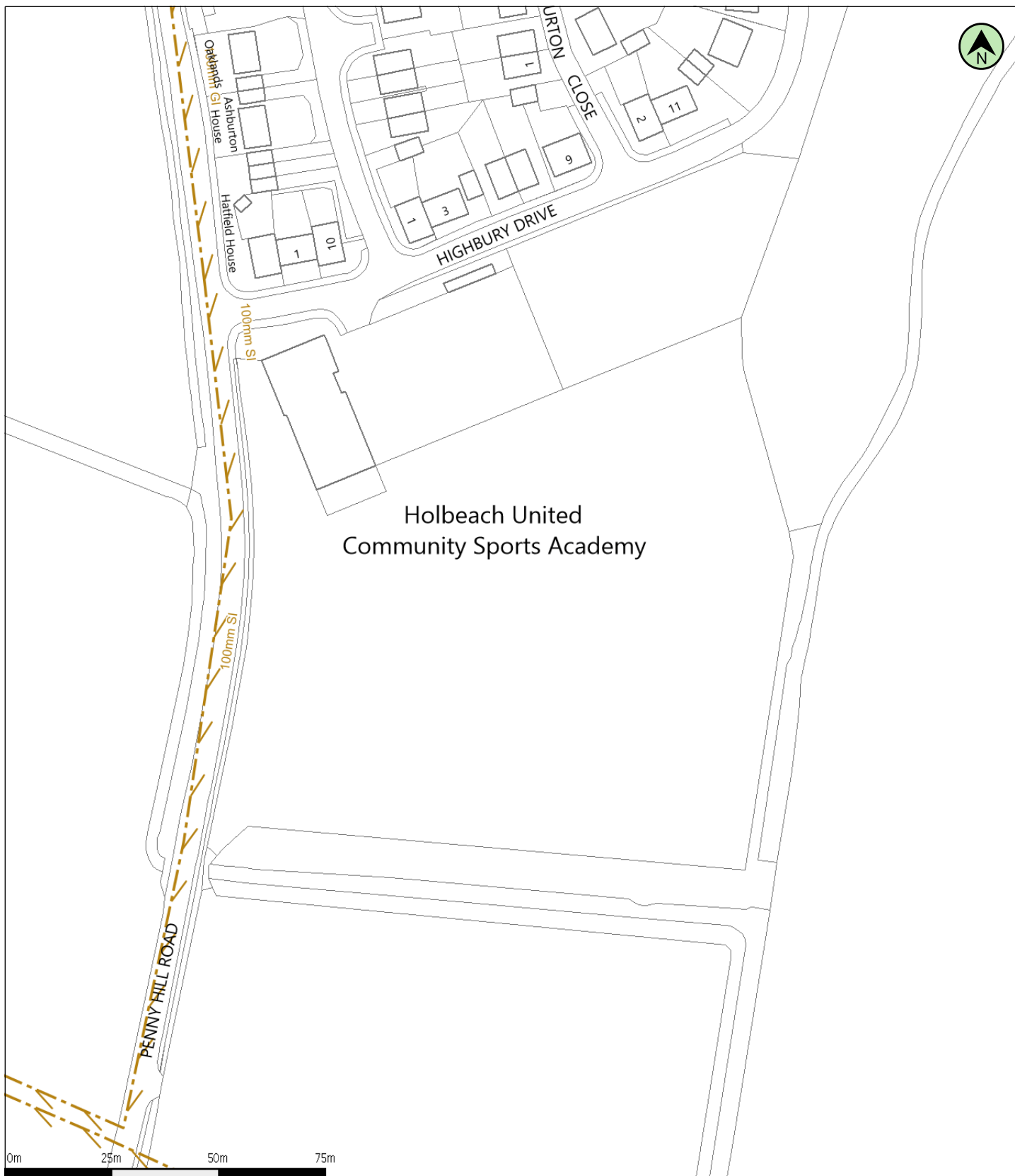
DRAWING NO.

S21-233 / DWG / 0005

.01



Appendix E
Anglian Water Asset Plan
R-SI-22849-01-00



(c) Crown copyright and database rights 2021 Ordnance Survey 100019209 Scale: 1:1250 Date: 26/03/21 Wastewater Plan A4
 Data updated: 28/02/21 Map Centre: 536192,325927 Our Ref: 529509 - 2 Powered by digdat

Foul Sewer	--- Outfall*	⊞ Sewage Treatment Works		lydia.crawford@jppuk.net
Surface Sewer	---			
Combined Sewer	---			22849
Final Effluent	- - - Inlet*	⊞ Public Pumping Station		
Rising Main*	- - -			
Private Sewer*	- - -			
Decommissioned Sewer*	- - - Manhole*	● Decommissioned Pumping Station		

*(Colour denotes effluent type)

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2021 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.



**Appendix F
Environment Agency Flood Level Data
CCN-2021-236349**

Katherine.Rose@jppuk.net

Our ref: CCN-2021-236349

Date: 11/10/2021

Dear Katherine

Provision of Flood Risk Information for Pennyhill Road, Holbeach.

Thank you for your request to use our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

1. Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Historic Flood Event Outlines

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. Fluvial Flood Risk Information

4.1 Fluvial Defence Information

There are no formal flood defences reducing the risk of flooding to this site.

4.2 Fluvial Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available for fluvial flood risk in Northampton, Lincoln, Wainfleet and some isolated rural locations.

The number of locations we have this information for is expected to increase in time.

At present this site is not covered by any fluvial hazard mapping.

5. Tidal Flood Risk Information

5.1 Tidal Defence Information

The existing tidal defences protecting this site consist of earth embankments.

They are in fair condition and reduce the risk of flooding (at the defence) to a 0.67% (1 in 150) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

5.2 Tidal Flood Levels

The attached data sheets show our current best estimate for extreme tide levels.

Please read the information notes on the data sheets.

5.3 Tidal Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available.

The number of locations we have this information for is expected to increase in time.

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

5.3.1 Tidal Hazard Mapping – Breaches

- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Your site is not affected by breaching of the tidal defences for the present day (2006) scenarios.

5.3.2 Tidal Hazard Mapping - Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

Your site is not affected by overtopping of the defences for the present day (2006) and climate change (2115) scenarios

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at lnplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at <https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals>.

General advice on flood risk assessment for planning applications can be found on GOV.UK at <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in February 2016. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Further information on flood risk can be found on the GOV.UK website at:
<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Frederic Stuhldreer using the email address below.

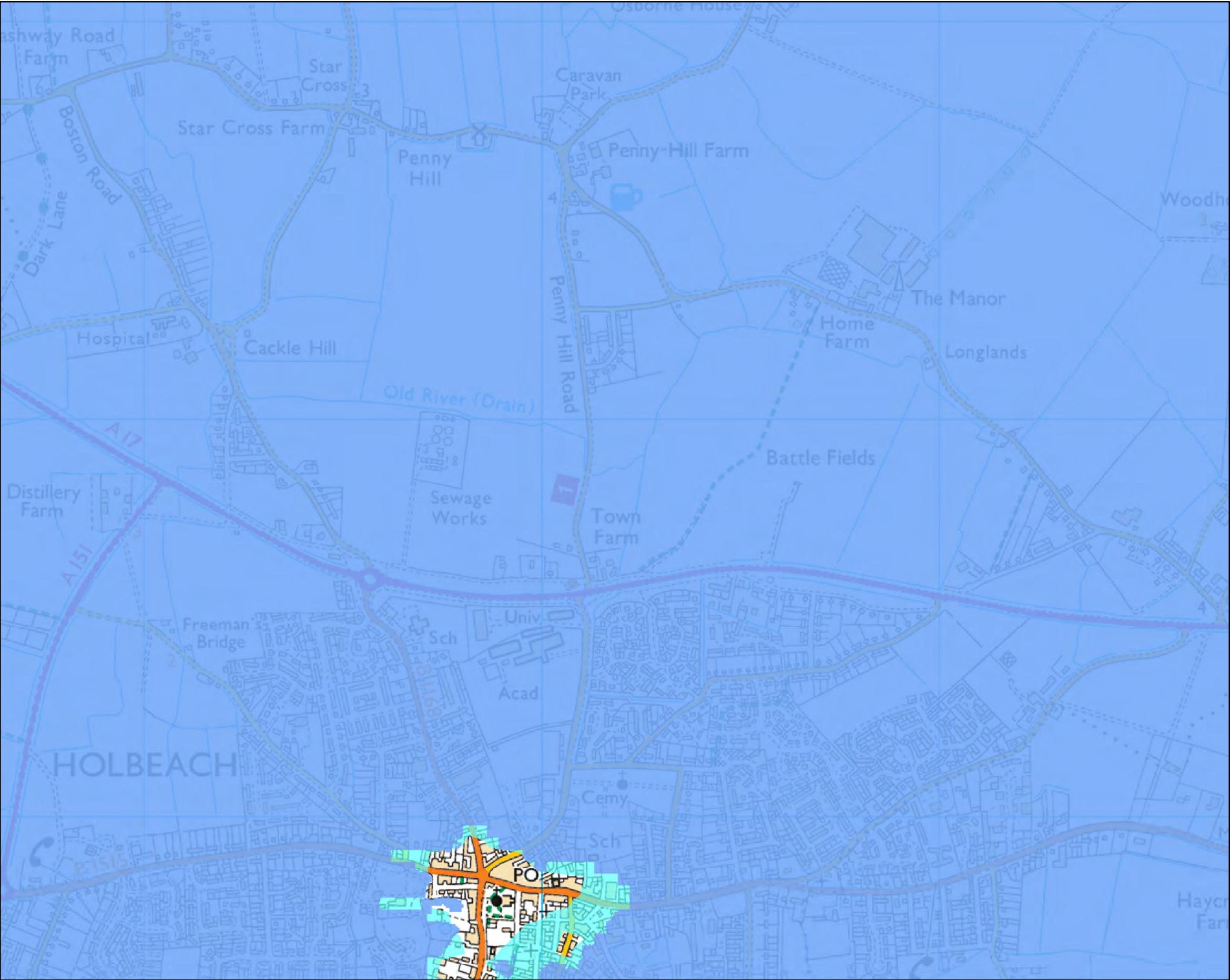
Yours sincerely,



for Alastair Windler
Welland and Nene Partnerships and Strategic Overview Team Leader
e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map
Tidal Level Data Sheets - Map and Tables
Tidal Breach Points – Locations Map
Hazard Mapping – Breaching

Flood Map centred on TF 36185 25819 - created October 2021 [Ref: CCN-2021-236349]



Scale 1:10,000



- Legend**
- Main River
 - Raised Defences
 - Flood Storage Areas
 - Area at Risk of Flooding from Rivers or The Sea
 - Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.
- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

East Coast and Wash - 2018 Coastal Flood Boundary [CFB] Dataset

Key Node Points



Scale 1:550,000



▲ East Coast and Wash

See seperate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

CFB REF	LOCATION	EASTING	NORTHING	ANNUAL CHANCE (1 IN X) OF TIDE LEVEL IN METRES ODN																						
				1			10			50			100			200			300			1000				
				Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound				
				2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%		
3888	Immingham	520440	417625	4.16	4.17	4.19	4.50	4.53	4.62	4.73	4.80	5.00	4.83	4.93	5.19	4.93	5.06	5.41	4.98	5.14	5.55	5.15	5.38	6.01		
3890	Haborough Marsh	522100	416512	4.14	4.15	4.17	4.48	4.51	4.60	4.70	4.77	4.97	4.80	4.90	5.16	4.90	5.03	5.38	4.94	5.10	5.51	5.11	5.34	5.97		
3898	Grimsby	529295	413162	3.98	3.99	4.01	4.31	4.34	4.43	4.53	4.60	4.80	4.61	4.71	4.97	4.71	4.84	5.19	4.74	4.90	5.31	4.88	5.11	5.74		
3906	Buck Beck	534709	407369	3.87	3.88	3.90	4.19	4.23	4.31	4.41	4.50	4.68	4.50	4.61	4.86	4.61	4.75	5.10	4.64	4.82	5.22	4.80	5.05	5.66		
3910	Tetney	538035	405537	3.85	3.86	3.89	4.17	4.22	4.30	4.40	4.50	4.67	4.49	4.61	4.86	4.60	4.75	5.10	4.63	4.82	5.21	4.80	5.06	5.66		
3918	Donna Nook	544641	401997	3.82	3.83	3.86	4.14	4.19	4.27	4.38	4.48	4.65	4.47	4.60	4.85	4.58	4.74	5.10	4.63	4.82	5.22	4.81	5.08	5.68		
3928	Saltfleet	549131	393360	3.78	3.79	3.82	4.11	4.16	4.26	4.36	4.46	4.64	4.47	4.59	4.86	4.57	4.74	5.11	4.63	4.83	5.25	4.83	5.11	5.74		
3942	Boygrift	555131	380860	3.72	3.74	3.77	4.06	4.11	4.22	4.33	4.43	4.65	4.43	4.57	4.87	4.56	4.73	5.13	4.62	4.83	5.28	4.85	5.15	5.82		
3968	Gibraltar Point	557652	356181	4.16	4.17	4.20	4.51	4.56	4.67	4.76	4.85	5.08	4.85	4.97	5.27	4.94	5.10	5.49	4.99	5.18	5.63	5.14	5.41	6.09		
3992_14	Hobhole	535990	340116	4.96	4.97	5.01	5.40	5.44	5.56	5.66	5.76	5.98	5.78	5.90	6.20	5.88	6.04	6.44	5.92	6.11	6.57	6.03	6.31	6.99		
	Grand Sluice*	532366	344510	4.93	4.94	4.98	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3		
3992_9	Boston Barrier	532754	342852	4.93	4.94	4.98	5.41	5.45	5.57	5.73	5.83	6.05	5.85	5.97	6.27	5.93	6.09	6.49	5.94	6.13	6.59	5.98	6.26	6.94		
3992_5	Fosdyke Bridge	531886	332234	4.87	4.88	4.92	5.31	5.35	5.47	5.58	5.68	5.90	5.71	5.83	6.13	5.82	5.98	6.38	5.87	6.06	6.52	6.01	6.29	6.97		
4008	West Lighthouse	550094	329971	4.87	4.88	4.91	5.21	5.26	5.37	5.46	5.56	5.78	5.56	5.68	5.98	5.66	5.82	6.21	5.71	5.90	6.35	5.86	6.14	6.81		
-	Marsh Road	525988	324065	-	5.04	-	-	5.44	-	-	5.73	-	-	5.85	-	-	5.98	-	-	-	-	-	-	-		
-	Wisbech	546110	309940	-	4.83	-	-	5.25	-	-	5.53	-	-	5.66	-	-	5.78	-	-	-	-	-	-	-		
-	Dog-in-a-Doublet	527200	299287	-	3.67	-	-	4.00	-	-	4.22	-	-	4.32	-	-	4.42	-	-	-	-	-	-	-		

See next page for notes

2018 Coastal Flood Boundary Extreme Sea Levels

NOTES:

The following notes apply to all CFB sites (ie all on table excluding Marsh Road, Wisbech, Dog-in-a-Doublet)

- The base date for the data is 2017.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at <https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590>

The following notes apply to all Marsh Road, Wisbech, Dog-in-a-Doublet

- The base date for the data is 2006
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- These levels will be updated as their respective tidal river models are updated.

The following notes apply to Grand Sluice

- The data is based on CFB 2018 data for Boston Barrier site, capped at 5.3mAOD to reflect use of the barrier.
- The base date for the data is 2017
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at <https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590>



^ Modelled Breach Locations



This map indicates the location of where we have modelled the consequence of breaches along the coastline and tidal rivers. We have mapped the the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

General Enquiries No: 03708 506 506.

Weekday daytime calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary



Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

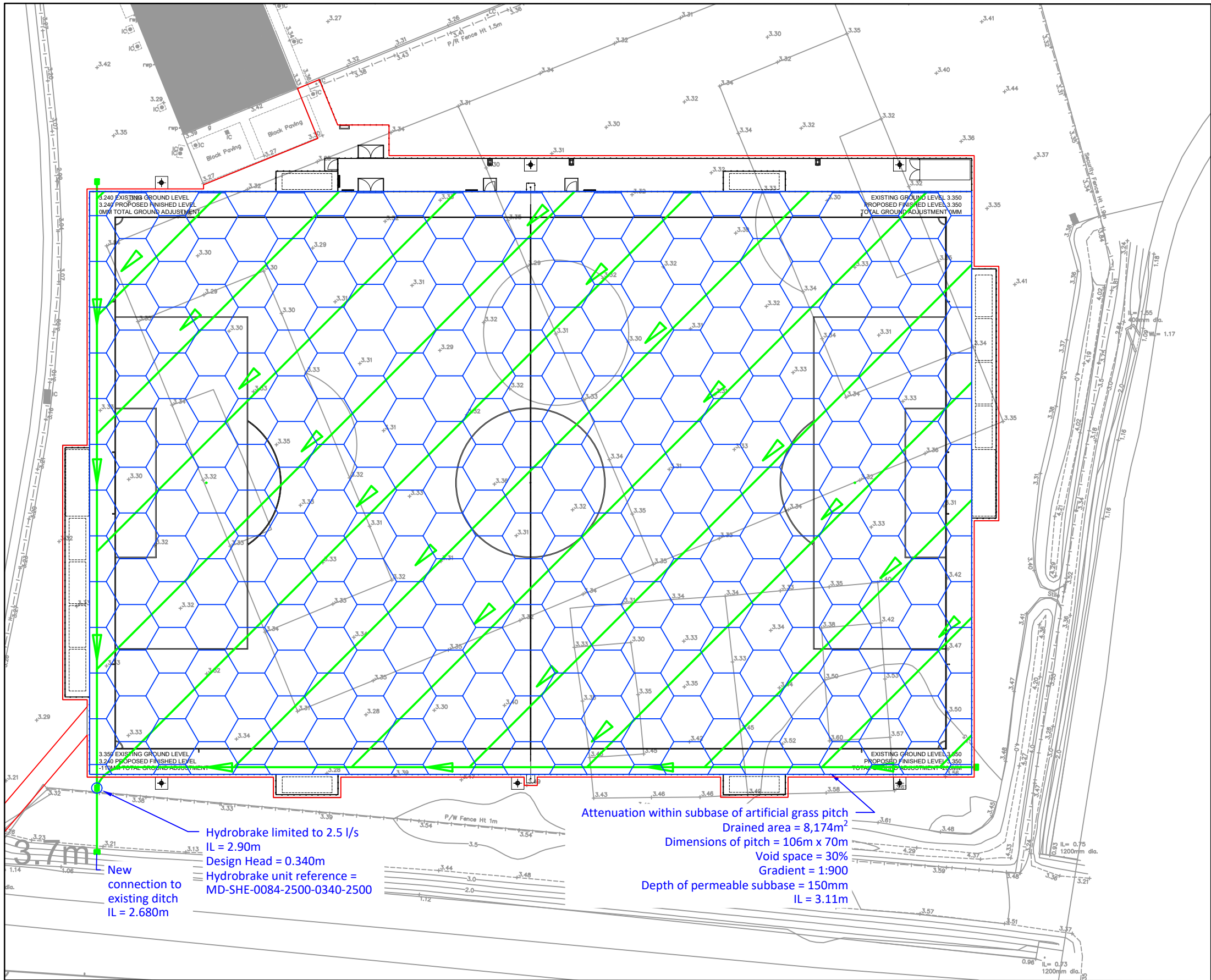
Northern Area Tidal Hazard Mapping

Location of Modelled Breaches

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Appendix G
Surface Water Drainage Strategy
JPP Consulting drawing no. 23747-FRA03A



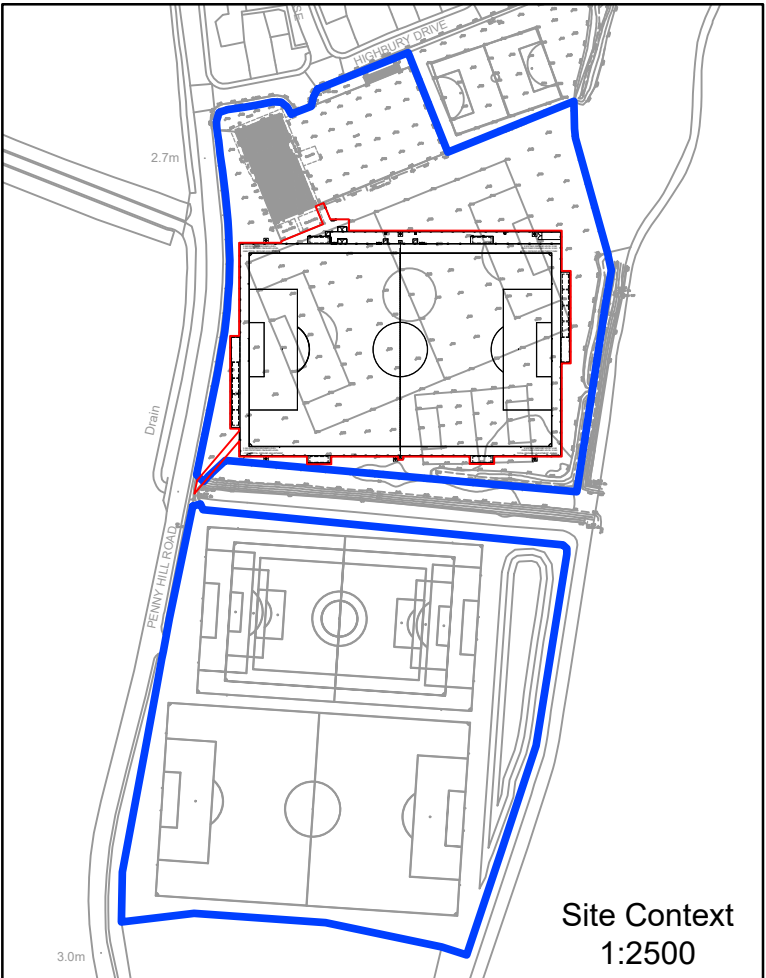
Proposed Surface Water Drainage Strategy
1:500

NOTES

1. Based on CAD layout by S&C Slatter, 'S21-233 Planning 02 01 2022 Export', which includes OS mapping, site layout and drainage details.
2. Based on Topographical Survey by JPP Surveying drawing 23073Y dated 10/05/2021.

KEY

- Red Line Boundary = 8,222m²
- Blue Line Boundary = 31,835m²
- Proposed Hydrobrake
- S&C Slatter Pitch Drainage
- Proposed Surface Water Attenuation



Site Context
1:2500



Appendix H

Greenfield Calculations

JPP Consulting Ltd		Page 1
4, Ironstone Way Brixworth Northampton, NN3 9UD		
Date 12/01/2022 09:45 File 23747-ATTENUATION_2022....	Designed by KatherineR Checked by	
Innovyze	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.312
Area (ha)	0.817	Urban	0.000
SAAR (mm)	557	Region Number	Region 5

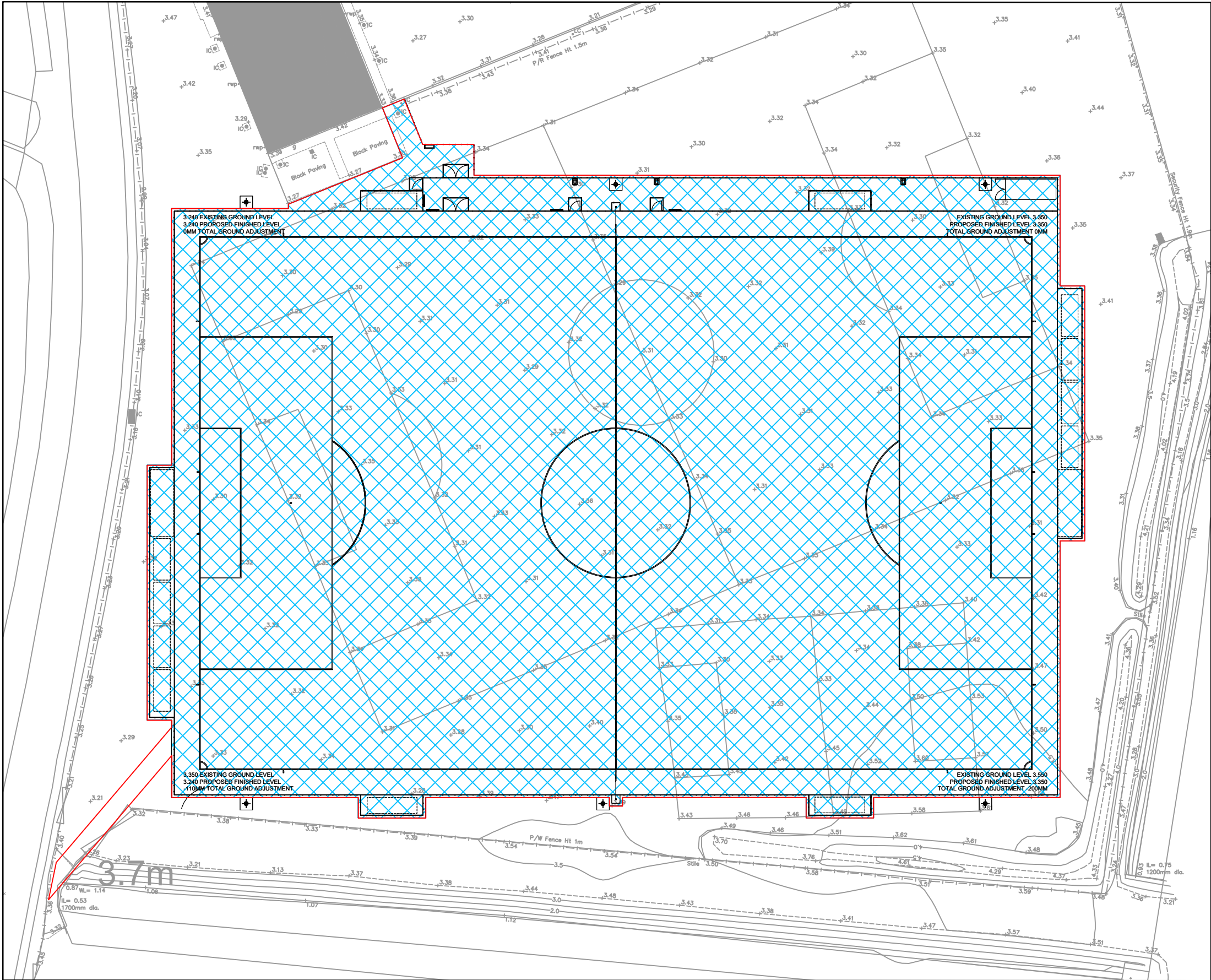
Results 1/s

QBAR Rural	1.2
QBAR Urban	1.2
Q100 years	4.4
Q1 year	1.1
Q30 years	3.0
Q100 years	4.4

©1982-2020 Innovyze



Appendix I
Impermeable Area
JPP drawing no. 23747-FRA02A

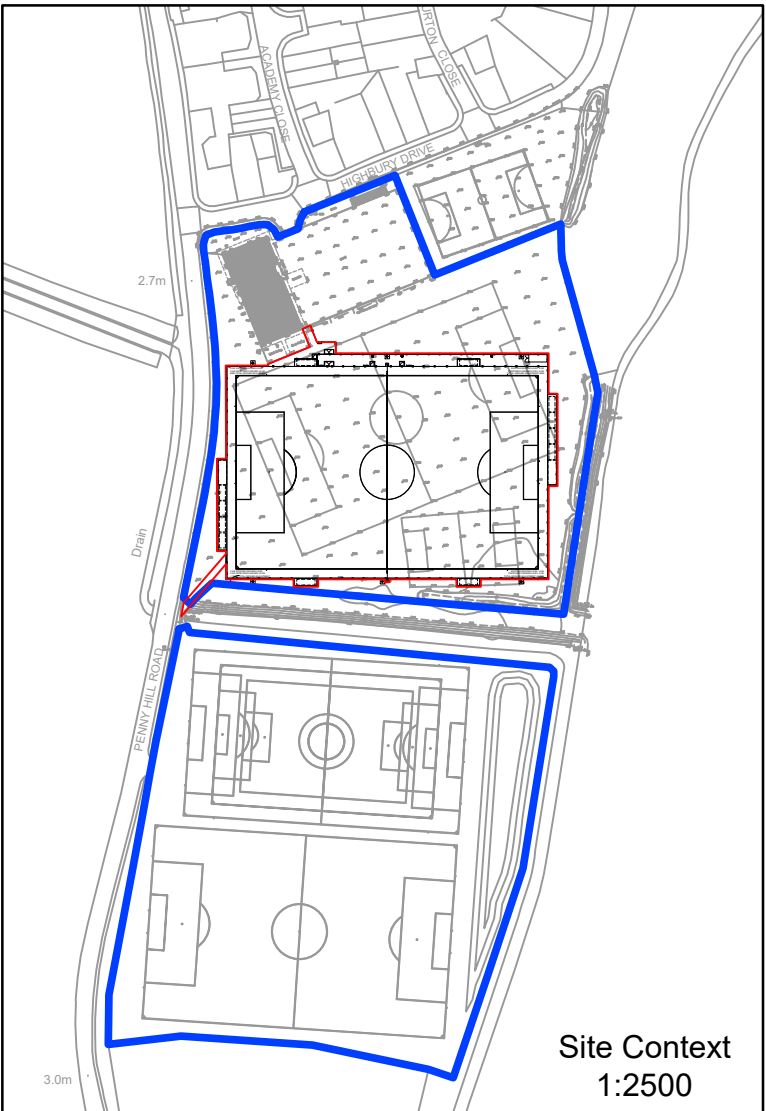


NOTES

1. Based on CAD layout by S&C Slatter, 'S21-233 Planning 02 01 2022 Export', which includes OS mapping, site layout and drainage details.
2. Based on Topographical Survey by JPP Surveying drawing 23073Y dated 10/05/2021.

KEY

- Red Line Boundary = 8,222m²
- Blue Line Boundary = 31,835m²
- Proposed Impermeable Area = 8,174m²



Proposed Impermeable Area
1:500

Rev A Updated impermeable area to new site layout

Drawn ECD Checked KER 14.01.2022

- ☒ Northampton
T: 01604 781811
- ☐ Warwick
T: 02476 100530
- ☐ Milton Keynes
T: 01908 889433
- ☐ Poole
T: 01202 540888

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

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

Drawn By:	VM
Chkd By:	KER
Scale @A3:	AS SHOWN
Date:	02/11/2021
Status:	FOR PLANNING
Project No.:	23747

Client S&C Slatter
Project Proposed Football Turf Pitch
Holbeach United Community Sports Academy
Title Proposed Impermeable Area

Drawing No: FRA02

Rev: A





Appendix J
Attenuation Calculations: 1 in 30 year

JPP Consulting Ltd		Page 1																																																																																																																																																																																																																																																																																		
4, Ironstone Way Brixworth Northampton, NN3 9UD		Holbeach United Sports Academy 0.817ha imp, 2.5 l/s 1 in 30 year																																																																																																																																																																																																																																																																																		
Date 12/01/2022 10:34 File 23747-ATTENUATION_2022....		Designed by KER Checked by KER																																																																																																																																																																																																																																																																																		
Innovyze		Source Control 2020.1.3																																																																																																																																																																																																																																																																																		
Summary of Results for 30 year Return Period Half Drain Time : 1113 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>3.108</td><td>0.108</td><td>0.0</td><td>2.5</td><td>2.5</td><td>110.5</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>3.121</td><td>0.121</td><td>0.0</td><td>2.5</td><td>2.5</td><td>137.6</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>3.135</td><td>0.135</td><td>0.0</td><td>2.5</td><td>2.5</td><td>168.7</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>3.150</td><td>0.150</td><td>0.0</td><td>2.5</td><td>2.5</td><td>202.9</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>3.159</td><td>0.159</td><td>0.0</td><td>2.5</td><td>2.5</td><td>223.6</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>3.166</td><td>0.166</td><td>0.0</td><td>2.5</td><td>2.5</td><td>237.9</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>3.174</td><td>0.174</td><td>0.0</td><td>2.5</td><td>2.5</td><td>256.0</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>3.179</td><td>0.179</td><td>0.0</td><td>2.5</td><td>2.5</td><td>266.7</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>3.181</td><td>0.181</td><td>0.0</td><td>2.5</td><td>2.5</td><td>272.6</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>3.183</td><td>0.183</td><td>0.0</td><td>2.5</td><td>2.5</td><td>275.6</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>3.180</td><td>0.180</td><td>0.0</td><td>2.5</td><td>2.5</td><td>269.7</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>3.173</td><td>0.173</td><td>0.0</td><td>2.5</td><td>2.5</td><td>254.8</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>3.164</td><td>0.164</td><td>0.0</td><td>2.5</td><td>2.5</td><td>233.7</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>3.155</td><td>0.155</td><td>0.0</td><td>2.5</td><td>2.5</td><td>213.8</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>3.133</td><td>0.133</td><td>0.0</td><td>2.5</td><td>2.5</td><td>165.9</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>3.115</td><td>0.115</td><td>0.0</td><td>2.5</td><td>2.5</td><td>125.3</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>3.098</td><td>0.098</td><td>0.0</td><td>2.5</td><td>2.5</td><td>90.9</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>3.081</td><td>0.081</td><td>0.0</td><td>2.5</td><td>2.5</td><td>62.4</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>3.065</td><td>0.065</td><td>0.0</td><td>2.5</td><td>2.5</td><td>40.1</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>3.116</td><td>0.116</td><td>0.0</td><td>2.5</td><td>2.5</td><td>128.3</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>97.590</td><td>0.0</td><td>112.1</td><td>19</td></tr><tr><td>30 min Summer</td><td>58.195</td><td>0.0</td><td>140.7</td><td>34</td></tr><tr><td>60 min Summer</td><td>34.703</td><td>0.0</td><td>174.7</td><td>64</td></tr><tr><td>120 min Summer</td><td>20.694</td><td>0.0</td><td>214.7</td><td>124</td></tr><tr><td>180 min Summer</td><td>15.294</td><td>0.0</td><td>241.3</td><td>182</td></tr><tr><td>240 min Summer</td><td>12.340</td><td>0.0</td><td>261.8</td><td>242</td></tr><tr><td>360 min Summer</td><td>9.120</td><td>0.0</td><td>292.4</td><td>362</td></tr><tr><td>480 min Summer</td><td>7.359</td><td>0.0</td><td>316.4</td><td>482</td></tr><tr><td>600 min Summer</td><td>6.231</td><td>0.0</td><td>335.4</td><td>600</td></tr><tr><td>720 min Summer</td><td>5.438</td><td>0.0</td><td>351.5</td><td>720</td></tr><tr><td>960 min Summer</td><td>4.321</td><td>0.0</td><td>371.6</td><td>914</td></tr><tr><td>1440 min Summer</td><td>3.124</td><td>0.0</td><td>356.5</td><td>1138</td></tr><tr><td>2160 min Summer</td><td>2.259</td><td>0.0</td><td>427.8</td><td>1516</td></tr><tr><td>2880 min Summer</td><td>1.794</td><td>0.0</td><td>445.9</td><td>1932</td></tr><tr><td>4320 min Summer</td><td>1.262</td><td>0.0</td><td>452.9</td><td>2720</td></tr><tr><td>5760 min Summer</td><td>0.983</td><td>0.0</td><td>452.4</td><td>3464</td></tr><tr><td>7200 min Summer</td><td>0.810</td><td>0.0</td><td>447.7</td><td>4184</td></tr><tr><td>8640 min Summer</td><td>0.692</td><td>0.0</td><td>439.3</td><td>4848</td></tr><tr><td>10080 min Summer</td><td>0.605</td><td>0.0</td><td>429.6</td><td>5544</td></tr><tr><td>15 min Winter</td><td>97.590</td><td>0.0</td><td>130.0</td><td>19</td></tr></table>				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	3.108	0.108	0.0	2.5	2.5	110.5	Flood Risk	30 min Summer	3.121	0.121	0.0	2.5	2.5	137.6	Flood Risk	60 min Summer	3.135	0.135	0.0	2.5	2.5	168.7	Flood Risk	120 min Summer	3.150	0.150	0.0	2.5	2.5	202.9	Flood Risk	180 min Summer	3.159	0.159	0.0	2.5	2.5	223.6	Flood Risk	240 min Summer	3.166	0.166	0.0	2.5	2.5	237.9	Flood Risk	360 min Summer	3.174	0.174	0.0	2.5	2.5	256.0	Flood Risk	480 min Summer	3.179	0.179	0.0	2.5	2.5	266.7	Flood Risk	600 min Summer	3.181	0.181	0.0	2.5	2.5	272.6	Flood Risk	720 min Summer	3.183	0.183	0.0	2.5	2.5	275.6	Flood Risk	960 min Summer	3.180	0.180	0.0	2.5	2.5	269.7	Flood Risk	1440 min Summer	3.173	0.173	0.0	2.5	2.5	254.8	Flood Risk	2160 min Summer	3.164	0.164	0.0	2.5	2.5	233.7	Flood Risk	2880 min Summer	3.155	0.155	0.0	2.5	2.5	213.8	Flood Risk	4320 min Summer	3.133	0.133	0.0	2.5	2.5	165.9	Flood Risk	5760 min Summer	3.115	0.115	0.0	2.5	2.5	125.3	Flood Risk	7200 min Summer	3.098	0.098	0.0	2.5	2.5	90.9	Flood Risk	8640 min Summer	3.081	0.081	0.0	2.5	2.5	62.4	Flood Risk	10080 min Summer	3.065	0.065	0.0	2.5	2.5	40.1	Flood Risk	15 min Winter	3.116	0.116	0.0	2.5	2.5	128.3	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	97.590	0.0	112.1	19	30 min Summer	58.195	0.0	140.7	34	60 min Summer	34.703	0.0	174.7	64	120 min Summer	20.694	0.0	214.7	124	180 min Summer	15.294	0.0	241.3	182	240 min Summer	12.340	0.0	261.8	242	360 min Summer	9.120	0.0	292.4	362	480 min Summer	7.359	0.0	316.4	482	600 min Summer	6.231	0.0	335.4	600	720 min Summer	5.438	0.0	351.5	720	960 min Summer	4.321	0.0	371.6	914	1440 min Summer	3.124	0.0	356.5	1138	2160 min Summer	2.259	0.0	427.8	1516	2880 min Summer	1.794	0.0	445.9	1932	4320 min Summer	1.262	0.0	452.9	2720	5760 min Summer	0.983	0.0	452.4	3464	7200 min Summer	0.810	0.0	447.7	4184	8640 min Summer	0.692	0.0	439.3	4848	10080 min Summer	0.605	0.0	429.6	5544	15 min Winter	97.590	0.0	130.0	19
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																																																																																																																																																																																																																																																																													
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60 min Summer	3.135	0.135	0.0	2.5	2.5	168.7	Flood Risk																																																																																																																																																																																																																																																																													
120 min Summer	3.150	0.150	0.0	2.5	2.5	202.9	Flood Risk																																																																																																																																																																																																																																																																													
180 min Summer	3.159	0.159	0.0	2.5	2.5	223.6	Flood Risk																																																																																																																																																																																																																																																																													
240 min Summer	3.166	0.166	0.0	2.5	2.5	237.9	Flood Risk																																																																																																																																																																																																																																																																													
360 min Summer	3.174	0.174	0.0	2.5	2.5	256.0	Flood Risk																																																																																																																																																																																																																																																																													
480 min Summer	3.179	0.179	0.0	2.5	2.5	266.7	Flood Risk																																																																																																																																																																																																																																																																													
600 min Summer	3.181	0.181	0.0	2.5	2.5	272.6	Flood Risk																																																																																																																																																																																																																																																																													
720 min Summer	3.183	0.183	0.0	2.5	2.5	275.6	Flood Risk																																																																																																																																																																																																																																																																													
960 min Summer	3.180	0.180	0.0	2.5	2.5	269.7	Flood Risk																																																																																																																																																																																																																																																																													
1440 min Summer	3.173	0.173	0.0	2.5	2.5	254.8	Flood Risk																																																																																																																																																																																																																																																																													
2160 min Summer	3.164	0.164	0.0	2.5	2.5	233.7	Flood Risk																																																																																																																																																																																																																																																																													
2880 min Summer	3.155	0.155	0.0	2.5	2.5	213.8	Flood Risk																																																																																																																																																																																																																																																																													
4320 min Summer	3.133	0.133	0.0	2.5	2.5	165.9	Flood Risk																																																																																																																																																																																																																																																																													
5760 min Summer	3.115	0.115	0.0	2.5	2.5	125.3	Flood Risk																																																																																																																																																																																																																																																																													
7200 min Summer	3.098	0.098	0.0	2.5	2.5	90.9	Flood Risk																																																																																																																																																																																																																																																																													
8640 min Summer	3.081	0.081	0.0	2.5	2.5	62.4	Flood Risk																																																																																																																																																																																																																																																																													
10080 min Summer	3.065	0.065	0.0	2.5	2.5	40.1	Flood Risk																																																																																																																																																																																																																																																																													
15 min Winter	3.116	0.116	0.0	2.5	2.5	128.3	Flood Risk																																																																																																																																																																																																																																																																													
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																																
15 min Summer	97.590	0.0	112.1	19																																																																																																																																																																																																																																																																																
30 min Summer	58.195	0.0	140.7	34																																																																																																																																																																																																																																																																																
60 min Summer	34.703	0.0	174.7	64																																																																																																																																																																																																																																																																																
120 min Summer	20.694	0.0	214.7	124																																																																																																																																																																																																																																																																																
180 min Summer	15.294	0.0	241.3	182																																																																																																																																																																																																																																																																																
240 min Summer	12.340	0.0	261.8	242																																																																																																																																																																																																																																																																																
360 min Summer	9.120	0.0	292.4	362																																																																																																																																																																																																																																																																																
480 min Summer	7.359	0.0	316.4	482																																																																																																																																																																																																																																																																																
600 min Summer	6.231	0.0	335.4	600																																																																																																																																																																																																																																																																																
720 min Summer	5.438	0.0	351.5	720																																																																																																																																																																																																																																																																																
960 min Summer	4.321	0.0	371.6	914																																																																																																																																																																																																																																																																																
1440 min Summer	3.124	0.0	356.5	1138																																																																																																																																																																																																																																																																																
2160 min Summer	2.259	0.0	427.8	1516																																																																																																																																																																																																																																																																																
2880 min Summer	1.794	0.0	445.9	1932																																																																																																																																																																																																																																																																																
4320 min Summer	1.262	0.0	452.9	2720																																																																																																																																																																																																																																																																																
5760 min Summer	0.983	0.0	452.4	3464																																																																																																																																																																																																																																																																																
7200 min Summer	0.810	0.0	447.7	4184																																																																																																																																																																																																																																																																																
8640 min Summer	0.692	0.0	439.3	4848																																																																																																																																																																																																																																																																																
10080 min Summer	0.605	0.0	429.6	5544																																																																																																																																																																																																																																																																																
15 min Winter	97.590	0.0	130.0	19																																																																																																																																																																																																																																																																																
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<u>Summary of Results for 30 year Return Period</u> <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>30 min Winter</td><td>3.130</td><td>0.130</td><td>0.0</td><td>2.5</td><td>2.5</td><td>158.9</td><td>Flood Risk</td></tr><tr><td>60 min Winter</td><td>3.146</td><td>0.146</td><td>0.0</td><td>2.5</td><td>2.5</td><td>193.9</td><td>Flood Risk</td></tr><tr><td>120 min Winter</td><td>3.164</td><td>0.164</td><td>0.0</td><td>2.5</td><td>2.5</td><td>233.0</td><td>Flood Risk</td></tr><tr><td>180 min Winter</td><td>3.174</td><td>0.174</td><td>0.0</td><td>2.5</td><td>2.5</td><td>256.8</td><td>Flood Risk</td></tr><tr><td>240 min Winter</td><td>3.182</td><td>0.182</td><td>0.0</td><td>2.5</td><td>2.5</td><td>273.3</td><td>Flood Risk</td></tr><tr><td>360 min Winter</td><td>3.191</td><td>0.191</td><td>0.0</td><td>2.5</td><td>2.5</td><td>295.1</td><td>Flood Risk</td></tr><tr><td>480 min Winter</td><td>3.198</td><td>0.198</td><td>0.0</td><td>2.5</td><td>2.5</td><td>308.7</td><td>Flood Risk</td></tr><tr><td>600 min Winter</td><td>3.201</td><td>0.201</td><td>0.0</td><td>2.5</td><td>2.5</td><td>316.9</td><td>Flood Risk</td></tr><tr><td>720 min Winter</td><td>3.204</td><td>0.204</td><td>0.0</td><td>2.5</td><td>2.5</td><td>322.2</td><td>Flood Risk</td></tr><tr><td>960 min Winter</td><td>3.202</td><td>0.202</td><td>0.0</td><td>2.5</td><td>2.5</td><td>318.8</td><td>Flood Risk</td></tr><tr><td>1440 min Winter</td><td>3.194</td><td>0.194</td><td>0.0</td><td>2.5</td><td>2.5</td><td>301.2</td><td>Flood Risk</td></tr><tr><td>2160 min Winter</td><td>3.182</td><td>0.182</td><td>0.0</td><td>2.5</td><td>2.5</td><td>274.0</td><td>Flood Risk</td></tr><tr><td>2880 min Winter</td><td>3.169</td><td>0.169</td><td>0.0</td><td>2.5</td><td>2.5</td><td>246.1</td><td>Flood Risk</td></tr><tr><td>4320 min Winter</td><td>3.138</td><td>0.138</td><td>0.0</td><td>2.5</td><td>2.5</td><td>175.1</td><td>Flood Risk</td></tr><tr><td>5760 min Winter</td><td>3.110</td><td>0.110</td><td>0.0</td><td>2.5</td><td>2.5</td><td>114.3</td><td>Flood Risk</td></tr><tr><td>7200 min Winter</td><td>3.083</td><td>0.083</td><td>0.0</td><td>2.5</td><td>2.5</td><td>64.8</td><td>Flood Risk</td></tr><tr><td>8640 min Winter</td><td>3.054</td><td>0.054</td><td>0.0</td><td>2.5</td><td>2.5</td><td>27.4</td><td>Flood Risk</td></tr><tr><td>10080 min Winter</td><td>3.022</td><td>0.022</td><td>0.0</td><td>2.5</td><td>2.5</td><td>4.7</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>30 min Winter</td><td>58.195</td><td>0.0</td><td>162.1</td><td>33</td></tr><tr><td>60 min Winter</td><td>34.703</td><td>0.0</td><td>200.2</td><td>62</td></tr><tr><td>120 min Winter</td><td>20.694</td><td>0.0</td><td>245.1</td><td>122</td></tr><tr><td>180 min Winter</td><td>15.294</td><td>0.0</td><td>274.9</td><td>180</td></tr><tr><td>240 min Winter</td><td>12.340</td><td>0.0</td><td>297.8</td><td>238</td></tr><tr><td>360 min Winter</td><td>9.120</td><td>0.0</td><td>332.8</td><td>356</td></tr><tr><td>480 min Winter</td><td>7.359</td><td>0.0</td><td>359.5</td><td>472</td></tr><tr><td>600 min Winter</td><td>6.231</td><td>0.0</td><td>381.2</td><td>586</td></tr><tr><td>720 min Winter</td><td>5.438</td><td>0.0</td><td>383.1</td><td>700</td></tr><tr><td>960 min Winter</td><td>4.321</td><td>0.0</td><td>375.1</td><td>922</td></tr><tr><td>1440 min Winter</td><td>3.124</td><td>0.0</td><td>360.2</td><td>1312</td></tr><tr><td>2160 min Winter</td><td>2.259</td><td>0.0</td><td>487.8</td><td>1644</td></tr><tr><td>2880 min Winter</td><td>1.794</td><td>0.0</td><td>510.3</td><td>2104</td></tr><tr><td>4320 min Winter</td><td>1.262</td><td>0.0</td><td>520.9</td><td>2940</td></tr><tr><td>5760 min Winter</td><td>0.983</td><td>0.0</td><td>522.9</td><td>3696</td></tr><tr><td>7200 min Winter</td><td>0.810</td><td>0.0</td><td>520.9</td><td>4392</td></tr><tr><td>8640 min Winter</td><td>0.692</td><td>0.0</td><td>516.2</td><td>4936</td></tr><tr><td>10080 min Winter</td><td>0.605</td><td>0.0</td><td>508.9</td><td>5440</td></tr></table>				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	3.130	0.130	0.0	2.5	2.5	158.9	Flood Risk	60 min Winter	3.146	0.146	0.0	2.5	2.5	193.9	Flood Risk	120 min Winter	3.164	0.164	0.0	2.5	2.5	233.0	Flood Risk	180 min Winter	3.174	0.174	0.0	2.5	2.5	256.8	Flood Risk	240 min Winter	3.182	0.182	0.0	2.5	2.5	273.3	Flood Risk	360 min Winter	3.191	0.191	0.0	2.5	2.5	295.1	Flood Risk	480 min Winter	3.198	0.198	0.0	2.5	2.5	308.7	Flood Risk	600 min Winter	3.201	0.201	0.0	2.5	2.5	316.9	Flood Risk	720 min Winter	3.204	0.204	0.0	2.5	2.5	322.2	Flood Risk	960 min Winter	3.202	0.202	0.0	2.5	2.5	318.8	Flood Risk	1440 min Winter	3.194	0.194	0.0	2.5	2.5	301.2	Flood Risk	2160 min Winter	3.182	0.182	0.0	2.5	2.5	274.0	Flood Risk	2880 min Winter	3.169	0.169	0.0	2.5	2.5	246.1	Flood Risk	4320 min Winter	3.138	0.138	0.0	2.5	2.5	175.1	Flood Risk	5760 min Winter	3.110	0.110	0.0	2.5	2.5	114.3	Flood Risk	7200 min Winter	3.083	0.083	0.0	2.5	2.5	64.8	Flood Risk	8640 min Winter	3.054	0.054	0.0	2.5	2.5	27.4	Flood Risk	10080 min Winter	3.022	0.022	0.0	2.5	2.5	4.7	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	30 min Winter	58.195	0.0	162.1	33	60 min Winter	34.703	0.0	200.2	62	120 min Winter	20.694	0.0	245.1	122	180 min Winter	15.294	0.0	274.9	180	240 min Winter	12.340	0.0	297.8	238	360 min Winter	9.120	0.0	332.8	356	480 min Winter	7.359	0.0	359.5	472	600 min Winter	6.231	0.0	381.2	586	720 min Winter	5.438	0.0	383.1	700	960 min Winter	4.321	0.0	375.1	922	1440 min Winter	3.124	0.0	360.2	1312	2160 min Winter	2.259	0.0	487.8	1644	2880 min Winter	1.794	0.0	510.3	2104	4320 min Winter	1.262	0.0	520.9	2940	5760 min Winter	0.983	0.0	522.9	3696	7200 min Winter	0.810	0.0	520.9	4392	8640 min Winter	0.692	0.0	516.2	4936	10080 min Winter	0.605	0.0	508.9	5440
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																																																																																																																																																																																																																																																			
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1440 min Winter	3.194	0.194	0.0	2.5	2.5	301.2	Flood Risk																																																																																																																																																																																																																																																			
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4, Ironstone Way Brixworth Northampton, NN3 9UD	Holbeach United Sports Academy 0.817ha imp, 2.5 l/s 1 in 30 year	
Date 12/01/2022 10:34 File 23747-ATTENUATION_2022....	Designed by KER Checked by KER	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 3.240

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	70.0
Membrane Percolation (mm/hr)	1000	Length (m)	106.0
Max Percolation (l/s)	2061.1	Slope (1:X)	900.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	3.000	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0084-2500-0340-2500
Design Head (m)	0.340
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	2.900
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.340	2.5
Flush-Flo™	0.127	2.5
Kick-Flo®	0.258	2.2
Mean Flow over Head Range	-	2.0

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	2.5	1.200	4.5	3.000	6.9	7.000	10.4
0.200	2.4	1.400	4.8	3.500	7.3	7.500	10.8
0.300	2.4	1.600	5.1	4.000	7.9	8.000	11.1
0.400	2.7	1.800	5.4	4.500	8.3	8.500	11.5
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.8
0.600	3.2	2.200	5.9	5.500	9.2	9.500	12.1
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	10.0		

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Appendix K
Attenuation Calculations: 1 in 100 year

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Summary of Results for 100 year Return Period Half Drain Time : 1666 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>3.144</td><td>0.144</td><td>0.0</td><td>2.5</td><td>2.5</td><td>189.3</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>3.161</td><td>0.161</td><td>0.0</td><td>2.5</td><td>2.5</td><td>226.4</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>3.179</td><td>0.179</td><td>0.0</td><td>2.5</td><td>2.5</td><td>268.3</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>3.200</td><td>0.200</td><td>0.0</td><td>2.5</td><td>2.5</td><td>313.6</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>3.212</td><td>0.212</td><td>0.0</td><td>2.5</td><td>2.5</td><td>341.1</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>3.221</td><td>0.221</td><td>0.0</td><td>2.5</td><td>2.5</td><td>359.9</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>3.232</td><td>0.232</td><td>0.0</td><td>2.5</td><td>2.5</td><td>385.0</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>3.238</td><td>0.238</td><td>0.0</td><td>2.5</td><td>2.5</td><td>399.8</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>3.242</td><td>0.242</td><td>0.0</td><td>2.5</td><td>2.5</td><td>409.1</td><td>FLOOD</td></tr><tr><td>720 min Summer</td><td>3.244</td><td>0.244</td><td>0.0</td><td>2.5</td><td>2.5</td><td>414.5</td><td>FLOOD</td></tr><tr><td>960 min Summer</td><td>3.242</td><td>0.242</td><td>0.0</td><td>2.5</td><td>2.5</td><td>409.5</td><td>FLOOD</td></tr><tr><td>1440 min Summer</td><td>3.233</td><td>0.233</td><td>0.0</td><td>2.5</td><td>2.5</td><td>388.0</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>3.219</td><td>0.219</td><td>0.0</td><td>2.5</td><td>2.5</td><td>357.4</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>3.209</td><td>0.209</td><td>0.0</td><td>2.5</td><td>2.5</td><td>333.2</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>3.183</td><td>0.183</td><td>0.0</td><td>2.5</td><td>2.5</td><td>277.4</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>3.162</td><td>0.162</td><td>0.0</td><td>2.5</td><td>2.5</td><td>229.1</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>3.141</td><td>0.141</td><td>0.0</td><td>2.5</td><td>2.5</td><td>183.1</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>3.123</td><td>0.123</td><td>0.0</td><td>2.5</td><td>2.5</td><td>143.4</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>3.107</td><td>0.107</td><td>0.0</td><td>2.5</td><td>2.5</td><td>109.1</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>3.156</td><td>0.156</td><td>0.0</td><td>2.5</td><td>2.5</td><td>216.6</td><td>Flood Risk</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain 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Summer</td><td>5.878</td><td>2.5</td><td>384.2</td><td>960</td></tr><tr><td>1440 min Summer</td><td>4.202</td><td>0.0</td><td>373.7</td><td>1256</td></tr><tr><td>2160 min Summer</td><td>3.004</td><td>0.0</td><td>592.2</td><td>1624</td></tr><tr><td>2880 min Summer</td><td>2.368</td><td>0.0</td><td>614.5</td><td>2020</td></tr><tr><td>4320 min Summer</td><td>1.646</td><td>0.0</td><td>622.4</td><td>2812</td></tr><tr><td>5760 min Summer</td><td>1.272</td><td>0.0</td><td>622.1</td><td>3632</td></tr><tr><td>7200 min Summer</td><td>1.042</td><td>0.0</td><td>617.8</td><td>4392</td></tr><tr><td>8640 min Summer</td><td>0.885</td><td>0.0</td><td>610.4</td><td>5104</td></tr><tr><td>10080 min Summer</td><td>0.771</td><td>0.0</td><td>600.8</td><td>5848</td></tr><tr><td>15 min Winter</td><td>149.152</td><td>0.0</td><td>204.8</td><td>19</td></tr></tbody></table>				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	3.144	0.144	0.0	2.5	2.5	189.3	Flood Risk	30 min Summer	3.161	0.161	0.0	2.5	2.5	226.4	Flood Risk	60 min Summer	3.179	0.179	0.0	2.5	2.5	268.3	Flood Risk	120 min Summer	3.200	0.200	0.0	2.5	2.5	313.6	Flood Risk	180 min Summer	3.212	0.212	0.0	2.5	2.5	341.1	Flood Risk	240 min Summer	3.221	0.221	0.0	2.5	2.5	359.9	Flood Risk	360 min Summer	3.232	0.232	0.0	2.5	2.5	385.0	Flood Risk	480 min Summer	3.238	0.238	0.0	2.5	2.5	399.8	Flood Risk	600 min Summer	3.242	0.242	0.0	2.5	2.5	409.1	FLOOD	720 min Summer	3.244	0.244	0.0	2.5	2.5	414.5	FLOOD	960 min Summer	3.242	0.242	0.0	2.5	2.5	409.5	FLOOD	1440 min Summer	3.233	0.233	0.0	2.5	2.5	388.0	Flood Risk	2160 min Summer	3.219	0.219	0.0	2.5	2.5	357.4	Flood Risk	2880 min Summer	3.209	0.209	0.0	2.5	2.5	333.2	Flood Risk	4320 min Summer	3.183	0.183	0.0	2.5	2.5	277.4	Flood Risk	5760 min Summer	3.162	0.162	0.0	2.5	2.5	229.1	Flood Risk	7200 min Summer	3.141	0.141	0.0	2.5	2.5	183.1	Flood Risk	8640 min Summer	3.123	0.123	0.0	2.5	2.5	143.4	Flood Risk	10080 min 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Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	3.175	0.175	0.0	2.5	2.5	258.3	Flood Risk
60 min Winter	3.196	0.196	0.0	2.5	2.5	305.5	Flood Risk
120 min Winter	3.219	0.219	0.0	2.5	2.5	357.2	Flood Risk
180 min Winter	3.233	0.233	0.0	2.5	2.5	388.7	Flood Risk
240 min Winter	3.242	0.242	0.0	2.5	2.5	410.7	FLOOD
360 min Winter	3.252	0.252	0.0	2.5	2.5	440.1	FLOOD
480 min Winter	3.258	0.258	0.0	2.6	2.6	459.0	FLOOD
600 min Winter	3.263	0.263	0.0	2.6	2.6	471.2	FLOOD
720 min Winter	3.266	0.266	0.0	2.6	2.6	479.3	FLOOD
960 min Winter	3.265	0.265	0.0	2.6	2.6	477.7	FLOOD
1440 min Winter	3.259	0.259	0.0	2.6	2.6	460.0	FLOOD
2160 min Winter	3.246	0.246	0.0	2.5	2.5	421.6	FLOOD
2880 min Winter	3.234	0.234	0.0	2.5	2.5	390.0	Flood Risk
4320 min Winter	3.200	0.200	0.0	2.5	2.5	313.1	Flood Risk
5760 min Winter	3.168	0.168	0.0	2.5	2.5	243.5	Flood Risk
7200 min Winter	3.138	0.138	0.0	2.5	2.5	175.4	Flood Risk
8640 min Winter	3.112	0.112	0.0	2.5	2.5	117.7	Flood Risk
10080 min Winter	3.086	0.086	0.0	2.5	2.5	70.3	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	87.235	0.0	199.8	34			
60 min Winter	51.022	0.0	312.2	64			
120 min Winter	29.841	0.0	370.5	122			
180 min Winter	21.805	0.0	403.1	180			
240 min Winter	17.453	2.6	401.7	240			
360 min Winter	12.753	12.1	399.8	358			
480 min Winter	10.208	18.4	398.5	474			
600 min Winter	8.589	22.3	397.5	590			
720 min Winter	7.459	25.1	396.7	706			
960 min Winter	5.878	25.2	393.4	932			
1440 min Winter	4.202	18.4	386.5	1370			
2160 min Winter	3.004	5.9	672.1	1728			
2880 min Winter	2.368	0.0	698.7	2164			
4320 min Winter	1.646	0.0	687.3	3072			
5760 min Winter	1.272	0.0	713.1	3928			
7200 min Winter	1.042	0.0	711.7	4688			
8640 min Winter	0.885	0.0	706.8	5440			
10080 min Winter	0.771	0.0	699.4	6048			
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4, Ironstone Way Brixworth Northampton, NN3 9UD	Holbeach United Sports Academy 0.817ha imp, 2.5 l/s 1 in 100 year	
Date 12/01/2022 10:35 File 23747-ATTENUATION_2022....	Designed by KER Checked by KER	
Innovyze Source Control 2020.1.3		

Model Details

Storage is Online Cover Level (m) 3.240

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	70.0
Membrane Percolation (mm/hr)	1000	Length (m)	106.0
Max Percolation (l/s)	2061.1	Slope (1:X)	900.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	3.000	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0084-2500-0340-2500
Design Head (m)	0.340
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	2.900
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.340	2.5
Flush-Flo™	0.127	2.5
Kick-Flo®	0.258	2.2
Mean Flow over Head Range	-	2.0

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	2.5	1.200	4.5	3.000	6.9	7.000	10.4
0.200	2.4	1.400	4.8	3.500	7.3	7.500	10.8
0.300	2.4	1.600	5.1	4.000	7.9	8.000	11.1
0.400	2.7	1.800	5.4	4.500	8.3	8.500	11.5
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.8
0.600	3.2	2.200	5.9	5.500	9.2	9.500	12.1
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	10.0		

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Appendix L
Attenuation Calculations: 1 in 100 year + 40% CC

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4, Ironstone Way Brixworth Northampton, NN3 9UD				Holbeach United Sports Academy 0.817ha imp, 2.5 l/s 1 in 100 year + 40% CC																																																																																																																																																																																																																																																																																					
Date 12/01/2022 10:37 File 23747-ATTENUATION_2022....				Designed by KER Checked by KER																																																																																																																																																																																																																																																																																					
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 2219 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>3.185</td><td>0.185</td><td>0.0</td><td>2.5</td><td>2.5</td><td>280.6</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>3.208</td><td>0.208</td><td>0.0</td><td>2.5</td><td>2.5</td><td>332.9</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>3.235</td><td>0.235</td><td>0.0</td><td>2.5</td><td>2.5</td><td>392.6</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>3.258</td><td>0.258</td><td>0.0</td><td>2.6</td><td>2.6</td><td>458.4</td><td>FLOOD</td></tr><tr><td>180 min Summer</td><td>3.273</td><td>0.273</td><td>0.0</td><td>2.6</td><td>2.6</td><td>498.7</td><td>FLOOD</td></tr><tr><td>240 min Summer</td><td>3.284</td><td>0.284</td><td>0.0</td><td>2.6</td><td>2.6</td><td>527.9</td><td>FLOOD</td></tr><tr><td>360 min Summer</td><td>3.302</td><td>0.302</td><td>0.0</td><td>2.7</td><td>2.7</td><td>567.5</td><td>FLOOD</td></tr><tr><td>480 min Summer</td><td>3.316</td><td>0.316</td><td>0.0</td><td>2.7</td><td>2.7</td><td>593.6</td><td>FLOOD</td></tr><tr><td>600 min Summer</td><td>3.326</td><td>0.326</td><td>0.0</td><td>2.8</td><td>2.8</td><td>611.4</td><td>FLOOD</td></tr><tr><td>720 min Summer</td><td>3.335</td><td>0.335</td><td>0.0</td><td>2.8</td><td>2.8</td><td>623.8</td><td>FLOOD</td></tr><tr><td>960 min Summer</td><td>3.336</td><td>0.336</td><td>0.0</td><td>2.8</td><td>2.8</td><td>626.2</td><td>FLOOD</td></tr><tr><td>1440 min Summer</td><td>3.327</td><td>0.327</td><td>0.0</td><td>2.8</td><td>2.8</td><td>611.9</td><td>FLOOD</td></tr><tr><td>2160 min Summer</td><td>3.306</td><td>0.306</td><td>0.0</td><td>2.7</td><td>2.7</td><td>574.8</td><td>FLOOD</td></tr><tr><td>2880 min Summer</td><td>3.291</td><td>0.291</td><td>0.0</td><td>2.7</td><td>2.7</td><td>542.2</td><td>FLOOD</td></tr><tr><td>4320 min Summer</td><td>3.263</td><td>0.263</td><td>0.0</td><td>2.6</td><td>2.6</td><td>472.5</td><td>FLOOD</td></tr><tr><td>5760 min Summer</td><td>3.244</td><td>0.244</td><td>0.0</td><td>2.5</td><td>2.5</td><td>416.4</td><td>FLOOD</td></tr><tr><td>7200 min Summer</td><td>3.224</td><td>0.224</td><td>0.0</td><td>2.5</td><td>2.5</td><td>367.8</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>3.204</td><td>0.204</td><td>0.0</td><td>2.5</td><td>2.5</td><td>323.6</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>3.186</td><td>0.186</td><td>0.0</td><td>2.5</td><td>2.5</td><td>282.8</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>3.202</td><td>0.202</td><td>0.0</td><td>2.5</td><td>2.5</td><td>319.0</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>208.813</td><td>0.0</td><td>199.1</td><td>19</td></tr><tr><td>30 min Summer</td><td>122.129</td><td>0.0</td><td>197.6</td><td>34</td></tr><tr><td>60 min Summer</td><td>71.430</td><td>0.0</td><td>399.7</td><td>64</td></tr><tr><td>120 min Summer</td><td>41.778</td><td>17.8</td><td>407.4</td><td>124</td></tr><tr><td>180 min Summer</td><td>30.527</td><td>32.8</td><td>409.1</td><td>184</td></tr><tr><td>240 min Summer</td><td>24.435</td><td>44.7</td><td>411.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>17.854</td><td>62.4</td><td>415.6</td><td>362</td></tr><tr><td>480 min Summer</td><td>14.291</td><td>76.0</td><td>420.5</td><td>482</td></tr><tr><td>600 min Summer</td><td>12.025</td><td>86.5</td><td>424.1</td><td>602</td></tr><tr><td>720 min Summer</td><td>10.443</td><td>94.5</td><td>426.4</td><td>722</td></tr><tr><td>960 min Summer</td><td>8.230</td><td>96.4</td><td>425.6</td><td>962</td></tr><tr><td>1440 min Summer</td><td>5.883</td><td>86.8</td><td>419.2</td><td>1440</td></tr><tr><td>2160 min Summer</td><td>4.206</td><td>66.1</td><td>814.2</td><td>1816</td></tr><tr><td>2880 min Summer</td><td>3.315</td><td>50.4</td><td>793.6</td><td>2188</td></tr><tr><td>4320 min Summer</td><td>2.305</td><td>22.7</td><td>727.7</td><td>2944</td></tr><tr><td>5760 min Summer</td><td>1.781</td><td>4.0</td><td>921.5</td><td>3752</td></tr><tr><td>7200 min Summer</td><td>1.459</td><td>0.0</td><td>923.8</td><td>4608</td></tr><tr><td>8640 min Summer</td><td>1.239</td><td>0.0</td><td>923.1</td><td>5368</td></tr><tr><td>10080 min Summer</td><td>1.079</td><td>0.0</td><td>917.6</td><td>6160</td></tr><tr><td>15 min Winter</td><td>208.813</td><td>0.0</td><td>198.0</td><td>19</td></tr></table>									Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	3.185	0.185	0.0	2.5	2.5	280.6	Flood Risk	30 min Summer	3.208	0.208	0.0	2.5	2.5	332.9	Flood Risk	60 min Summer	3.235	0.235	0.0	2.5	2.5	392.6	Flood Risk	120 min Summer	3.258	0.258	0.0	2.6	2.6	458.4	FLOOD	180 min Summer	3.273	0.273	0.0	2.6	2.6	498.7	FLOOD	240 min Summer	3.284	0.284	0.0	2.6	2.6	527.9	FLOOD	360 min Summer	3.302	0.302	0.0	2.7	2.7	567.5	FLOOD	480 min Summer	3.316	0.316	0.0	2.7	2.7	593.6	FLOOD	600 min Summer	3.326	0.326	0.0	2.8	2.8	611.4	FLOOD	720 min Summer	3.335	0.335	0.0	2.8	2.8	623.8	FLOOD	960 min Summer	3.336	0.336	0.0	2.8	2.8	626.2	FLOOD	1440 min Summer	3.327	0.327	0.0	2.8	2.8	611.9	FLOOD	2160 min Summer	3.306	0.306	0.0	2.7	2.7	574.8	FLOOD	2880 min Summer	3.291	0.291	0.0	2.7	2.7	542.2	FLOOD	4320 min Summer	3.263	0.263	0.0	2.6	2.6	472.5	FLOOD	5760 min Summer	3.244	0.244	0.0	2.5	2.5	416.4	FLOOD	7200 min Summer	3.224	0.224	0.0	2.5	2.5	367.8	Flood Risk	8640 min Summer	3.204	0.204	0.0	2.5	2.5	323.6	Flood Risk	10080 min Summer	3.186	0.186	0.0	2.5	2.5	282.8	Flood Risk	15 min Winter	3.202	0.202	0.0	2.5	2.5	319.0	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	208.813	0.0	199.1	19	30 min Summer	122.129	0.0	197.6	34	60 min Summer	71.430	0.0	399.7	64	120 min Summer	41.778	17.8	407.4	124	180 min Summer	30.527	32.8	409.1	184	240 min Summer	24.435	44.7	411.0	244	360 min Summer	17.854	62.4	415.6	362	480 min Summer	14.291	76.0	420.5	482	600 min Summer	12.025	86.5	424.1	602	720 min Summer	10.443	94.5	426.4	722	960 min Summer	8.230	96.4	425.6	962	1440 min Summer	5.883	86.8	419.2	1440	2160 min Summer	4.206	66.1	814.2	1816	2880 min Summer	3.315	50.4	793.6	2188	4320 min Summer	2.305	22.7	727.7	2944	5760 min Summer	1.781	4.0	921.5	3752	7200 min Summer	1.459	0.0	923.8	4608	8640 min Summer	1.239	0.0	923.1	5368	10080 min Summer	1.079	0.0	917.6	6160	15 min Winter	208.813	0.0	198.0	19
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																																		
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720 min Summer	3.335	0.335	0.0	2.8	2.8	623.8	FLOOD																																																																																																																																																																																																																																																																																		
960 min Summer	3.336	0.336	0.0	2.8	2.8	626.2	FLOOD																																																																																																																																																																																																																																																																																		
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2160 min Summer	3.306	0.306	0.0	2.7	2.7	574.8	FLOOD																																																																																																																																																																																																																																																																																		
2880 min Summer	3.291	0.291	0.0	2.7	2.7	542.2	FLOOD																																																																																																																																																																																																																																																																																		
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480 min Summer	14.291	76.0	420.5	482																																																																																																																																																																																																																																																																																					
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720 min Summer	10.443	94.5	426.4	722																																																																																																																																																																																																																																																																																					
960 min Summer	8.230	96.4	425.6	962																																																																																																																																																																																																																																																																																					
1440 min Summer	5.883	86.8	419.2	1440																																																																																																																																																																																																																																																																																					
2160 min Summer	4.206	66.1	814.2	1816																																																																																																																																																																																																																																																																																					
2880 min Summer	3.315	50.4	793.6	2188																																																																																																																																																																																																																																																																																					
4320 min Summer	2.305	22.7	727.7	2944																																																																																																																																																																																																																																																																																					
5760 min Summer	1.781	4.0	921.5	3752																																																																																																																																																																																																																																																																																					
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8640 min Summer	1.239	0.0	923.1	5368																																																																																																																																																																																																																																																																																					
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4, Ironstone Way Brixworth Northampton, NN3 9UD			Holbeach United Sports Academy 0.817ha imp, 2.5 l/s 1 in 100 year + 40% CC				
Date 12/01/2022 10:37 File 23747-ATTENUATION_2022....			Designed by KER Checked by KER				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
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	3.229	0.229	0.0	2.5	2.5	377.8	Flood Risk
60 min Winter	3.253	0.253	0.0	2.5	2.5	444.7	FLOOD
120 min Winter	3.281	0.281	0.0	2.6	2.6	519.6	FLOOD
180 min Winter	3.301	0.301	0.0	2.7	2.7	565.8	FLOOD
240 min Winter	3.319	0.319	0.0	2.7	2.7	599.2	FLOOD
360 min Winter	3.352	0.352	0.0	2.8	2.8	645.5	FLOOD
480 min Winter	3.382	0.382	0.0	2.9	2.9	676.2	FLOOD
600 min Winter	3.404	0.404	0.0	3.0	3.0	697.9	FLOOD
720 min Winter	3.419	0.419	0.0	3.0	3.0	713.7	FLOOD
960 min Winter	3.426	0.426	0.0	3.0	3.0	720.4	FLOOD
1440 min Winter	3.419	0.419	0.0	3.0	3.0	713.0	FLOOD
2160 min Winter	3.384	0.384	0.0	2.9	2.9	678.5	FLOOD
2880 min Winter	3.346	0.346	0.0	2.8	2.8	638.5	FLOOD
4320 min Winter	3.294	0.294	0.0	2.7	2.7	550.7	FLOOD
5760 min Winter	3.263	0.263	0.0	2.6	2.6	473.3	FLOOD
7200 min Winter	3.240	0.240	0.0	2.5	2.5	403.3	FLOOD
8640 min Winter	3.211	0.211	0.0	2.5	2.5	339.6	Flood Risk
10080 min Winter	3.185	0.185	0.0	2.5	2.5	280.4	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	122.129	0.0	199.3	34			
60 min Winter	71.430	13.7	408.5	64			
120 min Winter	41.778	40.7	412.1	122			
180 min Winter	30.527	61.8	416.9	182			
240 min Winter	24.435	78.9	422.2	240			
360 min Winter	17.854	111.6	431.7	358			
480 min Winter	14.291	142.0	438.3	476			
600 min Winter	12.025	163.7	442.9	592			
720 min Winter	10.443	179.5	445.9	708			
960 min Winter	8.230	186.1	445.8	936			
1440 min Winter	5.883	178.7	439.1	1384			
2160 min Winter	4.206	144.3	838.2	2012			
2880 min Winter	3.315	105.6	822.9	2280			
4320 min Winter	2.305	54.6	767.5	3200			
5760 min Winter	1.781	23.5	1048.6	4096			
7200 min Winter	1.459	-0.5	1054.4	4976			
8640 min Winter	1.239	0.0	1055.1	5800			
10080 min Winter	1.079	0.0	1053.4	6656			
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JPP Consulting Ltd		Page 4
4, Ironstone Way Brixworth Northampton, NN3 9UD	Holbeach United Sports Academy 0.817ha imp, 2.5 l/s 1 in 100 year + 40% CC	
Date 12/01/2022 10:37 File 23747-ATTENUATION_2022....	Designed by KER Checked by KER	
Innovyze Source Control 2020.1.3		

Model Details

Storage is Online Cover Level (m) 3.240

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	70.0
Membrane Percolation (mm/hr)	1000	Length (m)	106.0
Max Percolation (l/s)	2061.1	Slope (1:X)	900.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	3.000	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0084-2500-0340-2500
Design Head (m)	0.340
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	2.900
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.340	2.5
Flush-Flo™	0.127	2.5
Kick-Flo®	0.258	2.2
Mean Flow over Head Range	-	2.0

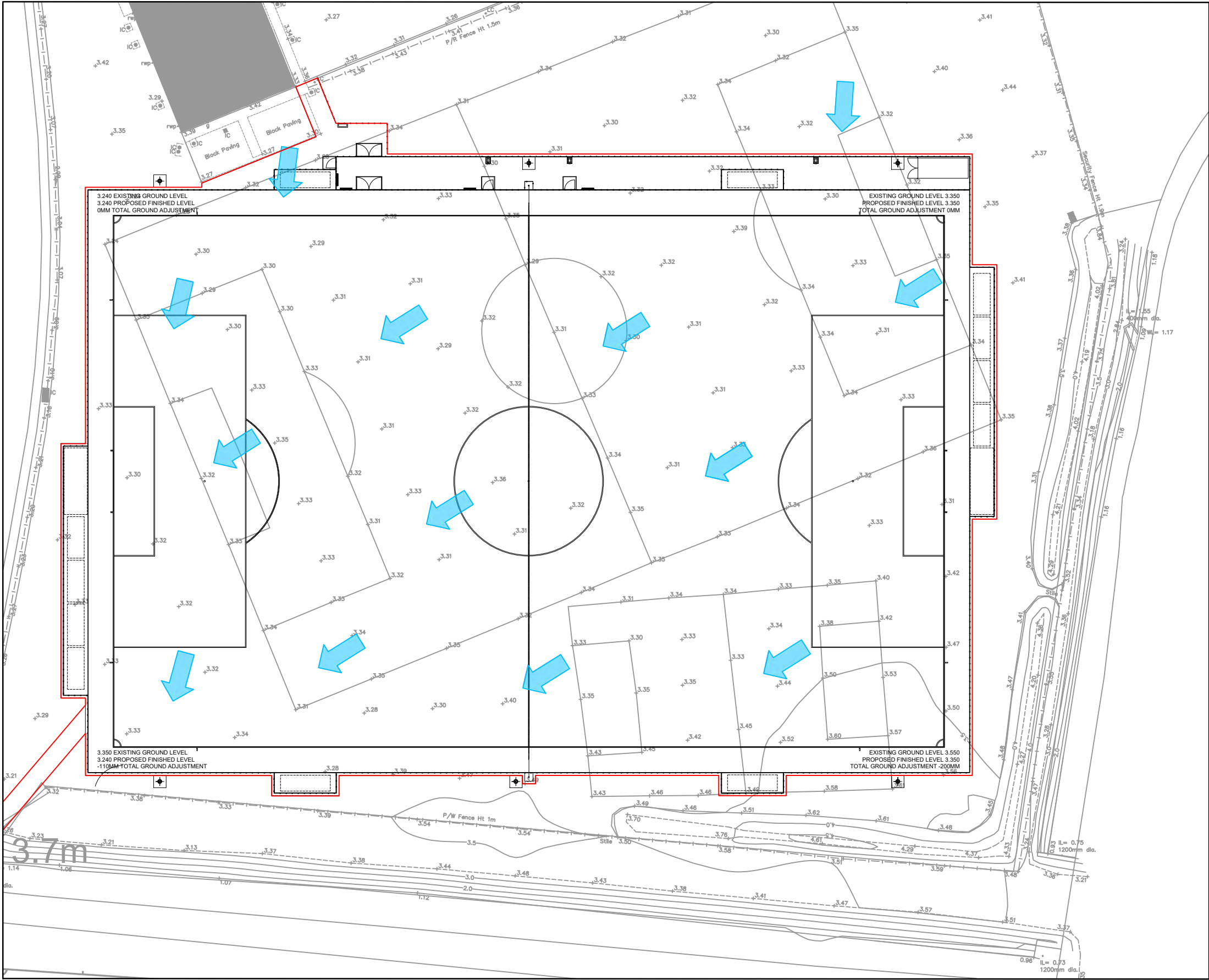
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	4.5	3.000	6.9	7.000	10.4
0.200	2.4	1.400	4.8	3.500	7.3	7.500	10.8
0.300	2.4	1.600	5.1	4.000	7.9	8.000	11.1
0.400	2.7	1.800	5.4	4.500	8.3	8.500	11.5
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.8
0.600	3.2	2.200	5.9	5.500	9.2	9.500	12.1
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	10.0		

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Appendix M
Predicted Overland Flows
JPP drawing no. 23747-FRA04A

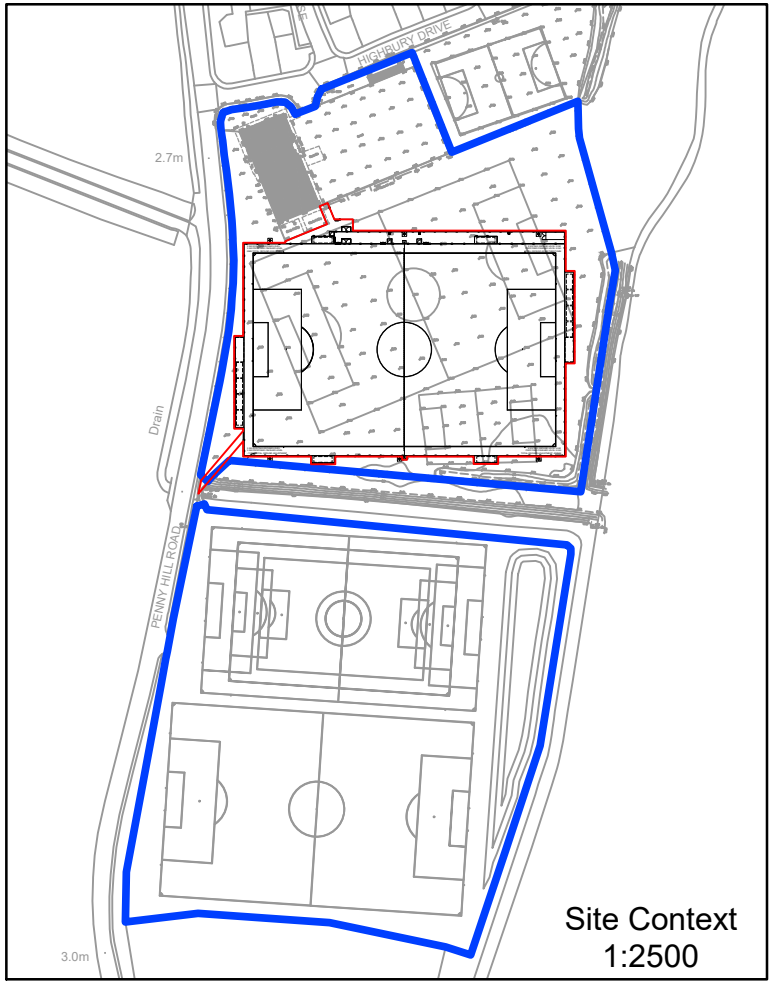


NOTES

- Based on CAD layout by S&C Slatter, 'S21-233 Planning 02 01 2022 Export', which includes OS mapping, site layout and drainage details.
- Based on Topographical Survey by JPP Surveying drawing 23073Y dated 10/05/2021.

KEY

- Red Line Boundary 8,222m²
- Blue Line Boundary = 31,835m²
- Predicted Overland Flows



Predicted Overland Flows
1:500

Rev A Description

Drawn ECD Checked KER 14.01.2022

☒ Northampton T: 01604 781811		☐ Warwick T: 02476 100530		☐ Milton Keynes T: 01908 889433		☐ Poole T: 01202 540888		E: mail@jppuk.net W: jppuk.net		• Infrastructure Design		• Geotechnical & Environmental	
										• Structural Engineering		• Surveying	
										• Development Planning		• Professional Advice	
JPP QA Document T09 R1		Drawn By: KER		Client: S&C Slatter		Chkd By: KER		Project: Proposed Football Turf Pitch		Scale @A3: AS SHOWN		Date: 04/11/2021	
		Status: FOR PLANNING		Title: Holbeach United Community Sports Academy		Project No.: 23747		Drawing No: FRA04		Rev:		jpp	