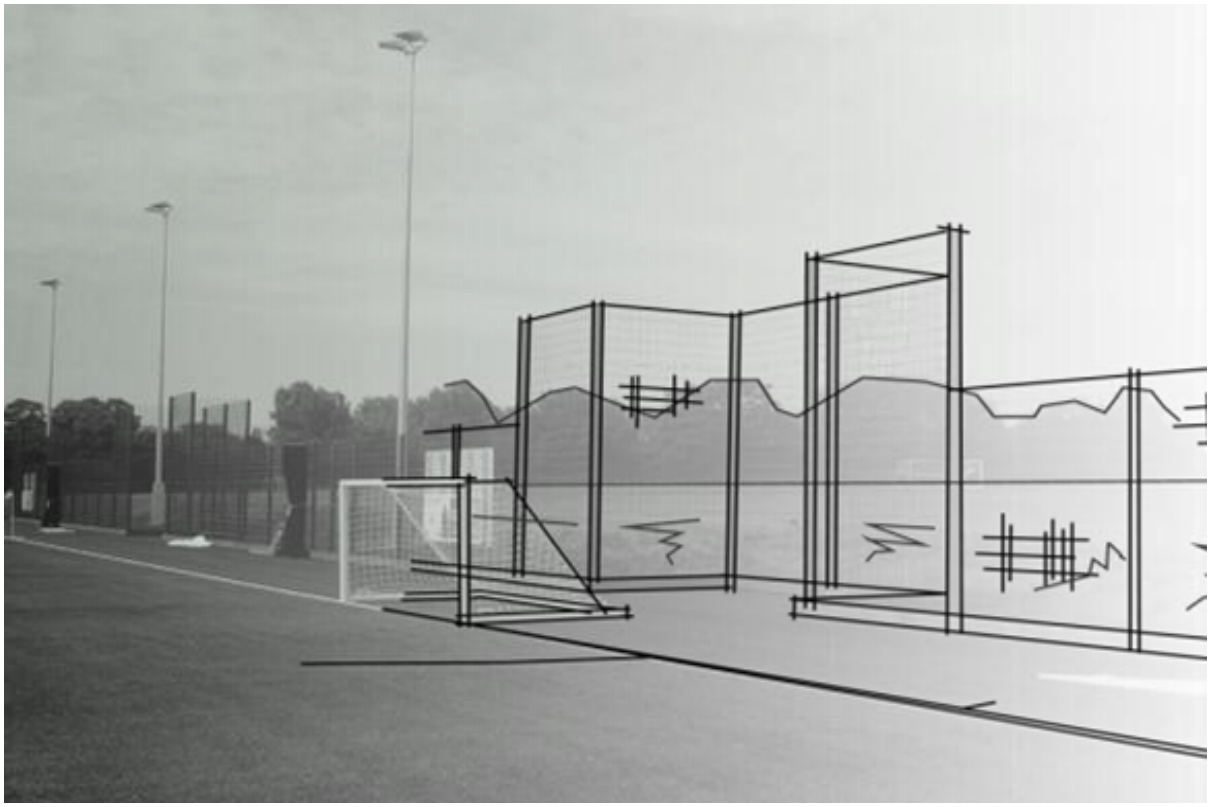
Haydon School

Creation of a 3G Artificial Grass Pitch (AGP) with perimeter fencing, acoustic fencing, hardstanding areas, storage container, floodlights, an access footpath and associated bund

Drainage Strategy



Site	Haydon School Wiltshire Ln, Pinner HA5 2LX		
Project	Creation of a 3G Artificial Grass Pitch (AGP) with perimeter fencing, acoustic fencing, hardstanding areas, storage container, floodlights, an access footpath and associated bund		
SSL project code	G-214594		
Document title	Drainage Strategy		
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Surfacing Standards Limited
SPORTS PITCH CONSULTANTS

Contents

Site Context

Site Location

The site comprises the extensive playing fields and grounds associated with Haydon School, a secondary school campus situated within a suburban residential area of Pinner. The proposed pitch location sits within the open grassed playing field area to the east of the main school buildings, forming part of a wider envelope of recreational land used for outdoor sport.

The north, east and south of the playing fields adjoins rows of housing along Norwich Road and Joel Street and neighbouring residential streets. The west the school adjoins Wiltshire Lane which serves the school as the main access, with residential properties further beyond.

Figure 1 - Site Location

Site History

In 1864, the site consisted of several separate parcels of land situated around what are now Joel Street and Wiltshire Lane, with scattered housing in the area, the largest being Joel Street Farm. By 1898, a footpath had been established running roughly east to west across the site, accompanied by a few informal paths, and small water features were visible near the center. By 1958, two schools had been constructed in the northwest corner, and significant residential development had taken place to the north, east, and west. These houses were positioned along surrounding roads so that their gardens backed directly onto the site.

By 1999, the two schools had merged into a single institution, and a small tarmac play area was added south of the school buildings. Additional housing to the east further reduced the

size of the playing fields. By 2023, only minor changes had occurred, including building updates and a small extension, leaving the overall layout largely unchanged.

Site Topography

The topography over the pitch area shows a fall from the west to east by approximately 3.1m. The wider playing field falls to the east. Further information on existing levels can be seen within 'G-214594 01 – Existing Site Plan'.

Local Watercourses

There are no surface water features within the vicinity of the proposed development. The nearest surface water feature is over 340m to the east of the site or over 320m to the west of the site. Both water bodies are significantly beyond the land ownership and therefore a connection is not considered feasible.

Ground Conditions

The investigation has identified that the site is predominantly underlain by topsoil over natural cohesive deposits.

Topsoil was encountered in the majority of boreholes and comprised brown slightly gravelly sand. The topsoil was recorded to extend to maximum depth of 0.40mbgl. Made ground was encountered in WS06 instead of topsoil. This generally comprised brown slightly gravelly sand with rare brick fragments (reworked topsoil) that extended to a maximum depth of 0.50mbgl.

The made ground and topsoil were generally immediately underlain by soft to firm light yellowish brown mottled grey slightly sandy silty clay. Some rare localised silt horizons were also noted in the clay. The base of these deposits was not encountered in any of the boreholes, however, they were noted to extend to at least 5.00mbgl. These deposits are considered to be representative of the London Clay Formation that is recorded to underlie the site.

Groundwater

Significant groundwater was not encountered in any of the exploratory holes undertaken.

Infiltration Potential

Indicative soakaway testing targeted at the shallow natural cohesive deposits was undertaken in WS01. This was positioned in an area designated as potentially suitable for infiltration. In summary, insufficient infiltration was recorded within the natural deposits. It was noted that the infiltration rate was too slow to obtain a rate and therefore the ground conditions are considered to be effectively impermeable, and the site is not considered to be suitable for soakaways.

Source Protection Zone

The site is located within a Source Protection Zone 3.

Coal Mining

Coal Authority mapping data shows the site **does not** lie within a Coal Mining Reporting area.

Flood Risk

The Government websites confirm the proposed development area is located within a flood zone 1.

Flood zone 1 - This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). The likelihood of flooding from the rivers or the sea at the proposed development site is very low.

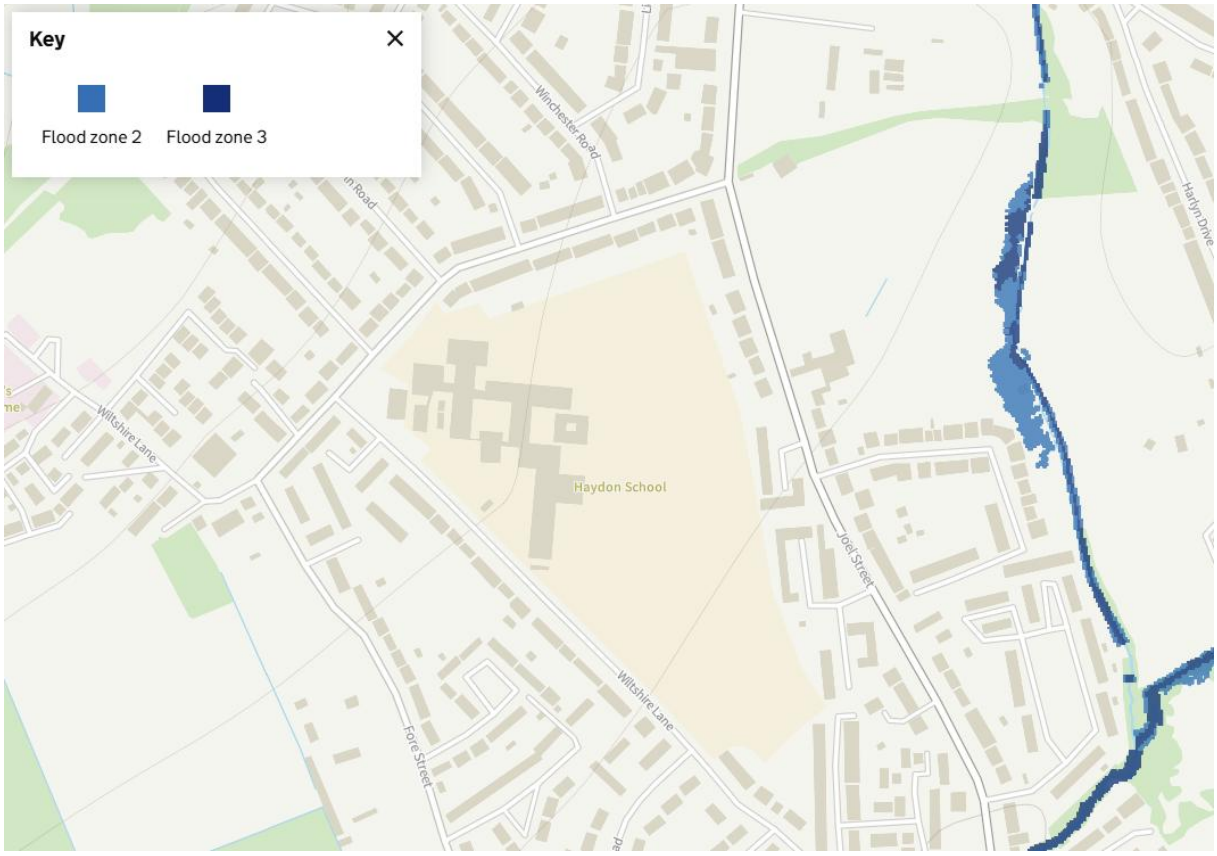

Figure 2 - Flood Map for Planning

Risk of Flooding from Rivers and Sea

The Government website confirms the proposed development area is at no risk of flooding from rivers or sea, which happens when there are high tides and stormy conditions.

Risk of Flooding from Surface Water

The Government website confirms the proposed development area is at very low risk of flooding from surface water, which happens when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead.

Figure 3 – Surface Water Flood Map for Planning

Very low risk means that each year this area has a chance of flooding of less than 0.1%.

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Development Proposals and Flood Risk Vulnerability

Whilst the proposal is situated within a flood zone 1, a comparison of the proposal against flood risk vulnerability classifications is not required as the development site is smaller than 1ha.

Planning Policy Framework

NPPF - Meeting the Challenge of Climate Change, Flooding and Coastal Change

Paragraph 181 sets out:

When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

(a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
(b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
(c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
(d) any residual risk can be safely managed; and
(e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

DEFRA - National standards for sustainable drainage systems (SuDS)

The surface water drainage scheme must be in accordance with the National standards for sustainable drainage systems (SuDS) (June 2025) or any subsequent replacement national standards and unless otherwise agreed in writing by the Local Planning Authority, no surface water shall discharge to the public sewerage system either directly or indirectly.

Flood Risk Vulnerability Classification

To assist the application for full planning permission and to facilitate the satisfactory implementation and delivery of the project; an assessment of flood risk and a sustainable drainage proposal is required in accordance with national policies.

With reference to Annex 3 within the 2024 National Planning Policy Framework, the proposed development for an outdoor sports facility would be classified as Water Compatible Development.

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

Based on the above assessment of the site being located within a Flood Zone 1 and classified as a 'water compatible development' and with reference to 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".

Table 1 - Flood Risk Vulnerability and Flood Zone Compatibility

Flood risk vulnerability classification	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test required	✓	✓
Zone 3A	Exception Test required	✓	×	Exception Test required	✓
Zone 3B	Exception Test required	✓	×	×	×

Key:
✓Development is appropriate
×Development should not be permitted

Sequential Test

As the site is located within a Flood Zone 1, a sequential test is not required and it is worth noting the site is used (and historically designated) as a sports complex (active playing field) the development can be deemed to have passed the sequential test.

The proposed development will replace part of an existing playing field.

Surface Water Disposal Hierarchy

In accordance with the National Planning Policy Framework (NPPF) and the National Planning Practice Guidance (NPPG), the site should be drained in the most sustainable way. No foul sewage will be created as part of this development.

The National standards for sustainable drainage systems (SuDS) (2025) clearly outlines the hierarchy to be investigated by the developer when considering a surface water drainage strategy. As such, the developer must consider the following drainage options in the following order of priority:

A. Collected for non-potable use;
B. Infiltrated to ground;
C. Discharged to an above ground surface water body;
D. To a surface water sewer, highway drain, or another piped drainage system;
E. Discharged to a combined sewer.

This is necessary to promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution. This condition is imposed considering policies within the NPPF and NPPG.

Overland Flow Risk and Compensation Measures

Flood compensation measures will not be required as finished (floor) levels will not affect current flood plain storage onsite.

There is a risk of the critical 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.

Surface Water Drainage Strategy

Surface Water Disposal Options

The National standards for sustainable drainage systems (SuDS) (2025) clearly outlines the hierarchy to be investigated by the developer when considering a surface water drainage strategy. As such, the drainage options have been considered and followed in the following order of priority:

A. Collected for non-potable use

At the AGP site there is no significant or continuous on-site water demand and therefore there is no scope for the reuse of surface water within the site, and so rainwater re-use is not proposed.

B. Soak away

The soils across the pitch are not considered amenable to the use of soakaway type systems, thus an alternative drainage solution will need to be considered.

C. Surface Water Body

There are no nearby surface water bodies, therefore making a connection unfeasible.

D. Surface Water Sewer

The proposal is to connect into the existing surface water system which serves the playing field running along the eastern boundary heading from the northeast to the southeast. The connection will utilise the existing surface water connection with the addition of an outfall restriction and additional attenuation prior to entering the surface water drain. Thereby bettering the current surface water drainage arrangement.

E. Combined Sewer

Not required due to Option D being possible.

Surface Water Drainage Principle

FIFA's Quality Concept for Football Turf (Handbook of Requirements January 2015 Edition) requires 3G artificial grass to provide water permeability (for outdoor uses) >180mm/hr and advises that to ensure adequate drainage of a field, all individual elements of the football turf should satisfy this requirement.

A positive drainage scheme (land drainage); shall be installed beneath the Artificial Grass Pitch (AGP) area comprising UPVC perforated carrier and lateral pipe drains.

The granular pitch substrate (typically consisting of Type 3 unbound (SHW 800 Series) to comply with BSEN 13285) is intended to provide onsite containment and attenuation within the granular sub-base, before surface water enters the proposed surface water connection.

The designed surface water drainage solution should be based upon the following criteria, to maintain satisfactory system performance:

- Provide adequate functionality over a period of twenty years.

- Prevent the risk of uncontrolled flooding elsewhere (to land adjacent to the development).
- Comply with all applicable Sustainable Urban Drainage System (SUDS) requirements with attenuated flows (containment within the granular pitch sub-base) incorporated wherever necessary, without affecting the performance of the pitch.

This is achieved through the surface water being attenuated / stored within the construction make up of the artificial turf pitch that has 37% void space acting as the surface water drainage and the drainage system attenuation an additional 70m3.

As shown below the calculated volume for storage to meet a 1 in 100 year storm event + 40% climate change is 613m3. The attenuation calculated within the base of the pitch and proposed drainage system allows the controlled storage onsite up to 18m3 within the AGP construction depth but a volume of 17020m3 within the imported fill sub-base to create a flat plateau for the AGP, as detailed within G-214594 08 – Proposed AGP Drainage Strategy.

The proposed development and associated surface drainage strategy from this site is such that the surface water will be managed and disposed of within the existing surface water drainage, thus complying with the Technical Guidance to the National Planning Policy Framework.

Surface water management and disposal performance will be achieved by the following physical implications to the development (the Artificial Grass Pitches):

1. Adequate attenuation (water storage) within pitch bases (comprising a permeable granular sub-base) to ensure that excess volumes, which would be experienced during a critical storm event, does not bypass the control system;
2. Restricted flow rate to 3.51 l/s before discharging into the existing site drainage system, as calculated by the HR Wallingford method (end of document).

The drainage solution is designed to ensure no above ground flooding occurs up to and including the 1 in 100 year event plus a 40% allowance for climate change.

Drainage Calculations and Attenuation Capacity

Minimum Storage Required: 99 m^3

FACTOR	VALUE	SOURCE	FACTOR	VALUE
Return Period (yrs):	2	Environment Agency, Water Authority, etc.	Additional Inflow (l/s):	0
Limiting Discharge (l/s):	3.51	Environment Agency, Water Authority, etc.	Calculate/Specify PR:	Specify
Contributing Area (ha):	0.655	Site plans	Specify PR:	100
Impervious, PIMP (%):	100	Site plans		
M5-60min (mm):	20	Volume 3 maps and site location	Climate Change Allowance	0
SAAR (mm/yr):	660	Volume 3 maps and site location		
Ratio, r:	0.4	Volume 3 maps and site location		
Soil Type:	4	Volume 3 maps and site location		
SOIL:	0.45	Soil Type and Volume 1, Section 7.4		
UCWI:	62	SAAR and Volume 1, Figure 9.7		
Calculated PR	78.30			
Percentage Runoff =	100.00			

Duration, D (min)	M2-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
15	7.6	7.6	0.66	100	49.5	0.0	49.5	0.21	3.2	46.4
30	9.6	9.6	0.66	100	63.1	0.0	63.1	0.21	6.3	56.8
60	11.8	11.8	0.66	100	77.5	0.0	77.5	0.21	12.6	64.9
120	17.3	17.3	0.66	100	113.3	0.0	113.3	0.21	25.3	88.0
240	22.8	22.8	0.66	100	149.3	0.0	149.3	0.21	50.5	98.8
360	25.6	25.6	0.66	100	167.9	0.0	167.9	0.21	75.8	92.1
480	27.5	27.5	0.66	100	179.8	0.0	179.8	0.21	101.1	78.7
600	28.8	28.8	0.66	100	188.6	0.0	188.6	0.21	126.4	62.3
720	29.9	29.9	0.66	100	195.7	0.0	195.7	0.21	151.6	44.1
840	30.8	30.8	0.66	100	201.7	0.0	201.7	0.21	176.9	24.8
1440	34.1	34.1	0.66	100	223.6	0.0	223.6	0.21	303.3	-79.7
2160	37.2	37.2	0.66	100	243.8	0.0	243.8	0.21	454.9	-211.1
2880	40.0	40.0	0.66	100	261.7	0.0	261.7	0.21	606.5	-344.9
3000	40.4	40.4	0.66	100	264.6	0.0	264.6	0.21	631.8	-367.2
3300	41.5	41.5	0.66	100	271.8	0.0	271.8	0.21	695.0	-423.2
3600	42.6	42.6	0.66	100	278.8	0.0	278.8	0.21	758.2	-479.4

Figure 4 - 1 in 2 year attenuation volumes to 3.51 l/s

Minimum Storage Required: 294 m^3

FACTOR	VALUE	SOURCE	FACTOR	VALUE
Return Period (yrs):	30	Environment Agency, Water Authority, etc.	Additional Inflow (l/s):	0
Limiting Discharge (l/s):	3.51	Environment Agency, Water Authority, etc.	Calculate/Specify PR:	Specify
Contributing Area (ha):	0.655	Site plans	Specify PR:	100
Impervious, PIMP (%):	100	Site plans		
M5-60min (mm):	20	Volume 3 maps and site location	Climate Change Allowance	0
SAAR (mm/yr):	660	Volume 3 maps and site location		
Ratio, r:	0.4	Volume 3 maps and site location		
Soil Type:	4	Volume 3 maps and site location		
SOIL:	0.45	Soil Type and Volume 1, Section 7.4		
UCWI:	62	SAAR and Volume 1, Figure 9.7		
Calculated PR	78.30			
Percentage Runoff =	100.00			

Duration, D (min)	M30-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
15	21.5	21.5	0.66	100	140.5	0.0	140.5	0.21	3.2	137.3
30	27.8	27.8	0.66	100	181.9	0.0	181.9	0.21	6.3	175.6
60	34.2	34.2	0.66	100	224.1	0.0	224.1	0.21	12.6	211.5
120	43.2	43.2	0.66	100	283.0	0.0	283.0	0.21	25.3	257.8
240	51.9	51.9	0.66	100	340.1	0.0	340.1	0.21	50.5	289.5
360	56.4	56.4	0.66	100	369.6	0.0	369.6	0.21	75.8	293.8
480	59.3	59.3	0.66	100	388.2	0.0	388.2	0.21	101.1	287.1
600	61.3	61.3	0.66	100	401.5	0.0	401.5	0.21	126.4	275.2
720	62.9	62.9	0.66	100	412.0	0.0	412.0	0.21	151.6	260.4
840	64.2	64.2	0.66	100	420.4	0.0	420.4	0.21	176.9	243.5
1440	68.8	68.8	0.66	100	450.6	0.0	450.6	0.21	303.3	147.4
2160	72.8	72.8	0.66	100	476.6	0.0	476.6	0.21	454.9	21.7
2880	76.1	76.1	0.66	100	498.7	0.0	498.7	0.21	606.5	-107.8
3000	76.7	76.7	0.66	100	502.3	0.0	502.3	0.21	631.8	-129.5
3300	78.0	78.0	0.66	100	511.1	0.0	511.1	0.21	695.0	-183.9
3600	79.3	79.3	0.66	100	519.7	0.0	519.7	0.21	758.2	-238.5

Figure 5 - 1 in 30 year attenuation volumes to 3.51 l/s

Minimum Storage Required: 423 m^3

FACTOR	VALUE	SOURCE	FACTOR	VALUE
Return Period (yrs):	30	Environment Agency, Water Authority, etc.	Additional Inflow (l/s):	0
Limiting Discharge (l/s):	3.51	Environment Agency, Water Authority, etc.	Calculate/Specify PR:	Specify
Contributing Area (ha):	0.655	Site plans	Specify PR:	100
Impervious, PIMP (%):	100	Site plans		
M5-60min (mm):	20	Volume 3 maps and site location	Climate Change Allowance	35
SAAR (mm/yr):	660	Volume 3 maps and site location		
Ratio, r:	0.4	Volume 3 maps and site location		
Soil Type:	4	Volume 3 maps and site location		
SOIL:	0.45	Soil Type and Volume 1, Section 7.4		
UCWI:	62	SAAR and Volume 1, Figure 9.7		
Calculated PR	78.30			
Percentage Runoff =	100.00			

Duration, D (min)	M30-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
15	21.5	29.0	0.66	100	189.7	0.0	189.7	0.21	3.2	186.5
30	27.8	37.5	0.66	100	245.6	0.0	245.6	0.21	6.3	239.2
60	34.2	46.2	0.66	100	302.6	0.0	302.6	0.21	12.6	290.0
120	43.2	58.3	0.66	100	382.1	0.0	382.1	0.21	25.3	356.8
240	51.9	70.1	0.66	100	459.1	0.0	459.1	0.21	50.5	408.6
360	56.4	76.2	0.66	100	499.0	0.0	499.0	0.21	75.8	423.2
480	59.3	80.0	0.66	100	524.0	0.0	524.0	0.21	101.1	422.9
600	61.3	82.8	0.66	100	542.0	0.0	542.0	0.21	126.4	415.7
720	62.9	84.9	0.66	100	556.2	0.0	556.2	0.21	151.6	404.6
840	64.2	86.7	0.66	100	567.6	0.0	567.6	0.21	176.9	390.7
1440	68.8	92.9	0.66	100	608.4	0.0	608.4	0.21	303.3	305.1
2160	72.8	98.2	0.66	100	643.5	0.0	643.5	0.21	454.9	188.6
2880	76.1	102.8	0.66	100	673.3	0.0	673.3	0.21	606.5	66.7
3000	76.7	103.5	0.66	100	678.1	0.0	678.1	0.21	631.8	46.3
3300	78.0	105.3	0.66	100	690.0	0.0	690.0	0.21	695.0	-5.0
3600	79.3	107.1	0.66	100	701.6	0.0	701.6	0.21	758.2	-56.6

Figure 6 - 1 in 30 year + 35% CC attenuation volumes to 3.51 l/s

Minimum Storage Required: 409 m^3

FACTOR	VALUE	SOURCE	FACTOR	VALUE
Return Period (yrs):	100	Environment Agency, Water Authority, etc.	Additional Inflow (l/s):	0
Limiting Discharge (l/s):	3.51	Environment Agency, Water Authority, etc.	Calculate/Specify PR:	Specify
Contributing Area (ha):	0.655	Site plans	Specify PR:	100
Impervious, PIMP (%):	100	Site plans		
M5-60min (mm):	20	Volume 3 maps and site location	Climate Change Allowance	0
SAAR (mm/yr):	660	Volume 3 maps and site location		
Ratio, r:	0.4	Volume 3 maps and site location		
Soil Type:	4	Volume 3 maps and site location		
SOIL:	0.45	Soil Type and Volume 1, Section 7.4		
UCWI:	62	SAAR and Volume 1, Figure 9.7		
Calculated PR	78.30			
Percentage Runoff =	100.00			

Duration, D (min)	M100-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
15	27.7	27.7	0.66	100	181.6	0.0	181.6	0.21	3.2	178.4
30	36.2	36.2	0.66	100	236.8	0.0	236.8	0.21	6.3	230.5
60	44.8	44.8	0.66	100	293.3	0.0	293.3	0.21	12.6	280.7
120	56.0	56.0	0.66	100	366.8	0.0	366.8	0.21	25.3	341.5
240	67.6	67.6	0.66	100	442.6	0.0	442.6	0.21	50.5	392.0
360	73.9	73.9	0.66	100	483.7	0.0	483.7	0.21	75.8	407.9
480	77.8	77.8	0.66	100	509.9	0.0	509.9	0.21	101.1	408.8
600	80.7	80.7	0.66	100	528.3	0.0	528.3	0.21	126.4	401.9
720	82.8	82.8	0.66	100	542.3	0.0	542.3	0.21	151.6	390.6
840	84.5	84.5	0.66	100	553.2	0.0	553.2	0.21	176.9	376.3
1440	89.9	89.9	0.66	100	588.6	0.0	588.6	0.21	303.3	285.4
2160	93.7	93.7	0.66	100	613.9	0.0	613.9	0.21	454.9	159.0
2880	96.8	96.8	0.66	100	633.9	0.0	633.9	0.21	606.5	27.4
3000	97.3	97.3	0.66	100	637.1	0.0	637.1	0.21	631.8	5.3
3300	98.5	98.5	0.66	100	645.0	0.0	645.0	0.21	695.0	-50.0
3600	99.6	99.6	0.66	100	652.6	0.0	652.6	0.21	758.2	-105.6

Figure 7 - 1 in 100 year attenuation volumes to 3.51 l/s

Minimum Storage Required: 613 m^3

FACTOR	VALUE	SOURCE
Return Period (yrs):	100	Environment Agency, Water Authority, etc.
Limiting Discharge (l/s):	3.51	Environment Agency, Water Authority, etc.
Contributing Area (ha):	0.655	Site plans
Impervious, PIMP (%):	100	Site plans
M5-60min (mm):	20	Volume 3 maps and site location
SAAR (mm/yr):	660	Volume 3 maps and site location
Ratio, r:	0.4	Volume 3 maps and site location
Soil Type:	4	Volume 3 maps and site location
SOIL:	0.45	Soil Type and Volume 1, Section 7.4
UCWI:	62	SAAR and Volume 1, Figure 9.7
Calculated PR	78.30	
Percentage Runoff =	100.00	

FACTOR	VALUE
Additional Inflow (l/s):	0
Calculate/Specify PR:	Specify
Specify PR:	100
Climate Change Allowance	40

Duration, D (min)	M100-D (mm)	incl climate change	Area C (ha)	PR (%)	Runoff (m3)	Add. Runoff (m3)	Total Runoff (m3)	Limiting Discharge (m3/min)	Limiting Runoff (m3)	Storage Required (m3)
15	27.7	38.8	0.66	100	254.2	0.0	254.2	0.21	3.2	251.0
30	36.2	50.6	0.66	100	331.6	0.0	331.6	0.21	6.3	325.3
60	44.8	62.7	0.66	100	410.6	0.0	410.6	0.21	12.6	398.0
120	56.0	78.4	0.66	100	513.5	0.0	513.5	0.21	25.3	488.2
240	67.6	94.6	0.66	100	619.6	0.0	619.6	0.21	50.5	569.1
360	73.9	103.4	0.66	100	677.2	0.0	677.2	0.21	75.8	601.4
480	77.8	109.0	0.66	100	713.8	0.0	713.8	0.21	101.1	612.7
600	80.7	112.9	0.66	100	739.6	0.0	739.6	0.21	126.4	613.2
720	82.8	115.9	0.66	100	759.2	0.0	759.2	0.21	151.6	607.6
840	84.5	118.2	0.66	100	774.5	0.0	774.5	0.21	176.9	597.6
1440	89.9	125.8	0.66	100	824.1	0.0	824.1	0.21	303.3	520.8
2160	93.7	131.2	0.66	100	859.5	0.0	859.5	0.21	454.9	404.6
2880	96.8	135.5	0.66	100	887.5	0.0	887.5	0.21	606.5	280.9
3000	97.3	136.2	0.66	100	892.0	0.0	892.0	0.21	631.8	260.2
3300	98.5	137.9	0.66	100	903.0	0.0	903.0	0.21	695.0	208.0
3600	99.6	139.5	0.66	100	913.6	0.0	913.6	0.21	758.2	155.4

Figure 8 - 1 in 100 year + 40% CC attenuation volumes to 3.51 l/s

A hydraulic model has not been developed to simulate the flows within and flooding from the piped drainage network. It is not possible to simulate the pitch drainage within the hydraulic modelling software to accurately simulate the flow within a perforated pipe network which uses the pitch sub-base as attenuation and storage, as is the case with this particular drainage network.

The design of the pitch sub-base and the associated drainage network is such that additional surface water flows that cannot be accommodated within the piped drainage network will enter the pitch sub-base via the perforated pipe network, and will be attenuated in the sub-base until such a time and the flows within the piped network have subsided to a level which will allow the surface water to re-enter the piped network and discharge downstream into the drainage ditch.

As such, in the case of surface water networks for pitches, which use the sub-base as a storage area, it is accepted that confirming that there is adequate storage within the pitch to accommodate any flooding, is an acceptable work-around for the shortfall.

Further information on the design and attenuation volumes within such events can be seen within:

- G-214594 07 – Proposed AGP Drainage Layout
- G-214594 08 – Proposed AGP Drainage Strategy

Foul Water Drainage Strategy

There will be **no foul water** produced as part of the site development.

Surface Drainage Maintenance

The drainage system will be designed to minimise maintenance requirements; however, a full maintenance scheme will be established for those elements not being offered for adoption.

Maintenance operations will be carried out by Haydon School in perpetuity post development and the Drainage Management & Maintenance is outlined within the below section.

Construction Surface Water Management

The existing surface is permeable, and the principal of the sports pitch uses the pitch sub-base as attenuation and storage.

Due to the nature of the construction works, little onsite material storage is required. During the processes when it is required it will be for relatively short periods of time.

Below is a brief description of the key construction works for an Artificial Grass Pitch and associated activities:

- Topsoil strip and a cut and fill undertaken across the site.
- Installation of the new drainage system, with the process taking approximately 3 days to complete. The materials largely involve the delivery of pea shingle material stockpiled within the development footprint with 80mm and 150mm Ø UPVC perforated corrugated plastic carrier drainage pipes to EN1401-1:1998 laid into geotextile lined, gravel-filled trenches. The UPVC perforated corrugated plastic carrier pipes shall be stored onsite within the designated fenced and enclosed storage areas prior to being securely laid and covered within the ground.
- The boundary of the development shall be lined with PCC kerb edging detail and the necessary fence posts, floodlighting foundations that involves concrete foundations. These materials will be stored within the designated storage area in bulk delivery with each being heavily weighted with minimal risk of movement.
- Following the PCC kerb installation, the crushed stone is installed and rolled to form the sub-base to the development.
- At this stage the fencing system shall be erected and in place around the development footprint and any/all materials within the development will be safely secured.
- The development area shall then be surfaced with tarmacadam on top of the stone sub-base. The process of tarmac surfacing requires material to be delivered and laid at set temperatures and therefore no materials will be storage onsite for this process and works and shall take approximately 5 days to complete.
- Upon completion of the base works the artificial surfacing shall be delivered in bulk to the pitch base within the secure fenced area. The material is rolled out and laid with the boundary of the surfacing being clamped and secured to the edging detail so that the material stays insitu and cannot be removed during any flood event or otherwise.

The development location itself acts as a sediment trap / barrier that retains surface water within the site boundary with any/all surface water run off going through the existing infrastructure of the hard-standing surfacing, stone foundation, geotextile membrane and entering into the existing and proposed drainage network that is lined with a geotextile membrane, pea shingle and drainage channels that each connect to a silt trap inspection chamber. This process will adequately trap and retain sediment throughout the construction process.

The existing and proposed levels and gradients of the site lead across the sports pitch. Whilst travelling across the development through the natural fall of levels the surface water will

infiltrate through the stone foundation, geotextile membrane and entering into the existing and proposed drainage network that is lined with a geotextile membrane, shingle and drainage channels that each connect to a silt trap inspection chamber. This process will adequately trap and retain sediment throughout the construction process. Any run off that travels through the site prior to naturally infiltrating through the base would be retained within the development boundary. Surface water would sit within the development area until it naturally infiltrates through the existing hard-standing surfacing, stone foundation, geotextile membrane and entering into the existing and proposed drainage network that is lined with a geotextile membrane, shingle and drainage channels that each connect to a silt trap inspection chamber.

Throughout the development works the areas and development footprint will be cleared, cleaned and jet washed with the silt traps collecting all sediment and being emptied as / when required until all construction works are completed.

Run-off rates from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage.

Run-off control will include provision of appropriate levels / grading to direct any water from the construction site to remain on site.

Site Drainage Proposals Conclusions

- The proposed development includes the creation of a new external artificial grass pitch with perimeter ball-stop fencing, and clean accesses.
- The proposed development area will occupy land and replace an existing sports area.
- Surface water is to be disposed of into a surface water drain;
- Adequate attenuation within pitch base and upper surface (comprising a permeable granular sub-base) to ensure that excess volumes, which would be experienced during a critical storm event, does not bypass the control system.
- This drainage strategy is designed to ensure no above ground flooding occurs up to and including the 1 in 100 year event + 40% allowance for climate change.
- The surface water drainage from this site, post development, is such that the surface water will be managed and disposed of within the site boundary, thus complying with the Planning Practice Guidance for 'Flood Risk and Climate Change' to the National Planning Policy Framework.
- Based on the above and providing the above strategies are adopted; the developed site will not contribute further to flood risk thus satisfying the principles of the National Planning Policy Framework.

Drainage Management & Maintenance

Gullies, Pipework, Inspection Chambers and Controls	
Required Action	Frequency
Regular Maintenance	
Remove cover and inspect chambers and pipework ensuring water is flowing freely and that the exit route for water is unobstructed.	Annually
Undertake inspection after leaf fall in autumn, remove leaves from gullies, chambers and pipes.	Every autumn
Inspect silt traps and clear of silt	Every 6 months or as required
Inspect catchpits and clear of silt	Every 6 months or as required
Remedial work	
Remove debris, silt and leaves from inspection chambers and flow control chambers.	As required
Remove debris and silt from pipework through high pressure jet washing.	As required
Repair physical damage if necessary.	As required
Monitoring	
CCTV survey to establish condition of pipe runs. Cleansing or repair of physical damage to be conducted if necessary	Every 5 years or as required

Permeable and Porous Surfaces	
Required Action	Frequency
Regular Maintenance	
Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Tasks	
Stabilise and mow contributing and adjacent areas	As required
Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required and in accordance with manufacturer's recommendations
Remedial Work	
Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost material.	As required
Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
If efficiency of water percolating to the sub-base drops, jet washing and suction cleaning could substantially reinstate paving to 90% efficiency (as per recent experience).	As required
Monitoring	

Initial inspection	Monthly for three months after installation
Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
Monitor inspection chambers	Annually