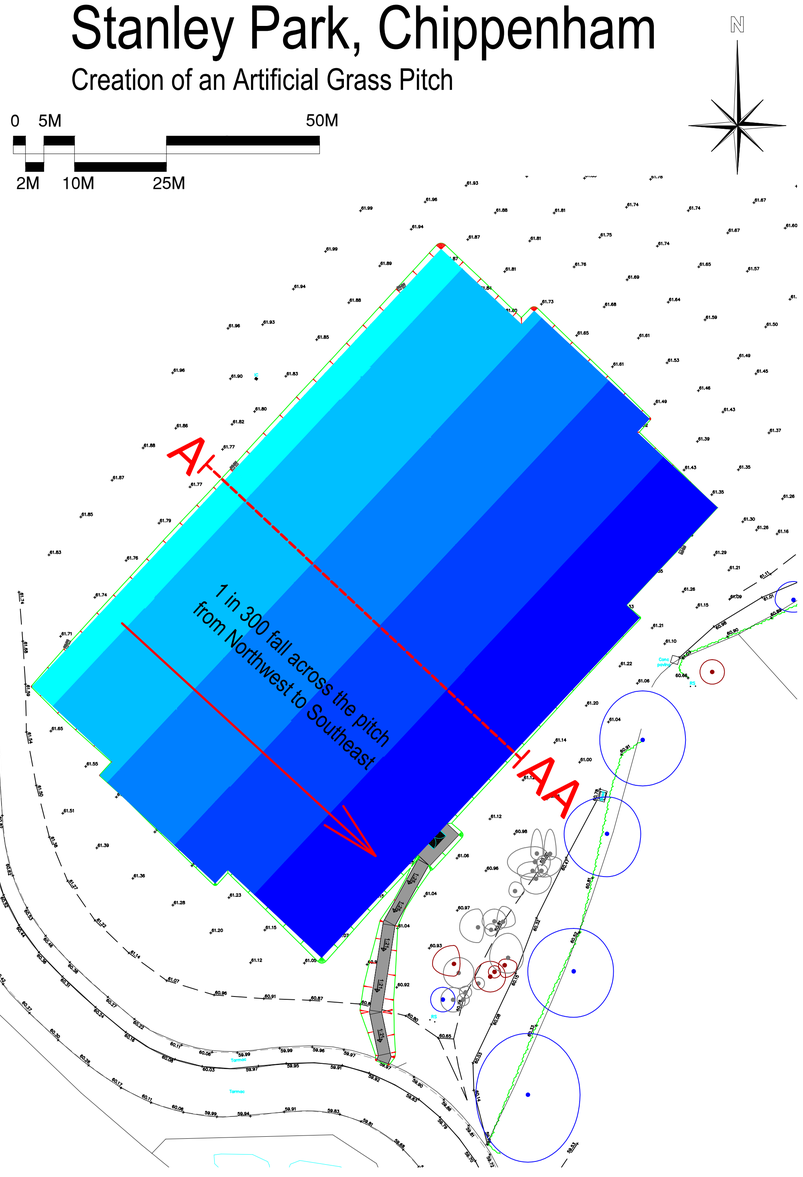
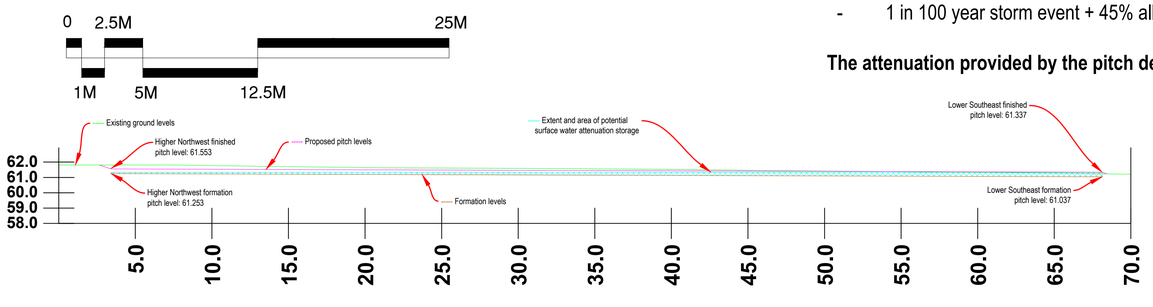
Stanley Park, Chippenham

Creation of an Artificial Grass Pitch



Attenuation Scheme - Scale 1:500



Section A-AA Showing Surface Water Attenuation Storage - Scale 1:200

SSL SPORTS STANDARDS LTD

CONSULTANTS
Surfacing Standards LTD
Office 2, Empingham House,
Ayston Road, Uppingham, LE15 9NY
01536 400 012

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Surface Water Drainage Design

The proposed design of the AGP development is for a permeable surface construction. The surface of the synthetic turf area shall be permeable with the underlying stone sub-base acting as an attenuation/storage area for surface water. The stone base will act as an attenuation system to increase attenuation capabilities of the playing field area. This is combined with a perforated drainage system being installed underneath the pitch base to connect to the existing site drainage, connecting to the pond to the southwest of the development site.

It is intended that a positive drainage scheme (land drainage); shall be installed beneath the development 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 an outfall.

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.
- Ensure that surface water is removed from the surface area at a rate necessary to prevent surface flooding experienced during acute rainstorms and to ensure the facility will not be lost through rain at the highest intensity which may be expected to occur either once every five years or through continuous rainfall of 50mm over a 24 hour period.
- Ensure that surface water is effectively removed from the facility construction to ensure that load bearing capacity of the substrate is not weakened by an increase in moisture content or becomes more susceptible to frost damage.
- Protect the installation from influences of groundwater or surface water from surrounding areas.
- 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.

Only natural surface water is being dealt with. The new development will not increase to the volume of water that the existing site area is currently subjected to.

The area is in a Category 1 flood zone and as such is at a low risk of flooding. Water discharging from the playing field area currently enters the drainage network through an extensive herringbone drainage layout across the grass pitches, reaching the pond without any control or restrictions.

The collector drainage pipe to the synthetic pitch will connect to the existing draiange outfall within the site with a restricted outfall rate.

In terms of the proposed restricted outfall rate, where one restricted discharge rate is proposed for all events, the Qbar (average annual) greenfield runoff rate has been used. The QBAR for this site is 3.17 l/s and we have therefore used 3.17 l/s as the suggested limited discharge rate. Calculations have been based on a 1 in 100 year storm event with a 45% allowance for climate change.

The foundations of the new synthetic turf area includes:
- 250mm deep layer of type 3 stone
- 40mm macadam
- 10mm preformed shockpad

The minimum 300mm deep aggregate base construction offers a wedge for surface water attenuation prior to filling and flooding the pitch surface or surrounding grassed areas. The available volume of the wedge is created through the following calculations:

- The pitch layer constructed at a 1 in 300 gradient offers a volume and capacity of 1224m3
  - Based on a voidage space of 37% this offers **452m3** of water attenuation.
- The drainage system, shown in drawing 'McA012 07 - Proposed AGP Drainage Layout', can also attenuate an additional **70m3**

The surface water attenuation calculations as per the table shows the following;
- 1 in 100 year storm event + 45% allowance for climate change at run off restricted to 3.17 l/s - would require **400m3** of attenuation

The attenuation provided by the pitch design will cater for a 1 in 100 storm event +45% without flooding either the pitch surface or surrounding area

Minimum Storage Required: **400 m³** incl cc allowance

FACTOR	VALUE	SOURCE
Return Period (yrs):	100	Environment Agency, Water Authority, etc.
Limiting Discharge (l/s):	3.17	Environment Agency, Water Authority, etc.
Contributing Area (ha):	0.641	Site plans
Impervious, PIMP (%):	100	Site plans
M5-60min (mm):	20	Volume 3 maps and site location
SAAR (mm/yr):	715	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:	71	SAAR and Volume 1, Figure 9.7
Calculated PR	78.97	
Percentage Runoff =	78.97	

FACTOR	VALUE
Additional Inflow (l/s):	0
Calculate/Specify PR:	Calculate
Specify PR:	100
Climate Change Allowance	45

Duration, D (min)	M5-60 (mm)	Z1 for r=0.40	M5-D (mm)	Z2 for M100	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)
5	20	0.38	7.6	1.86	14.2	20.5	0.64	79	103.9	0.0	103.9	0.19	1.0	102.9
10	20	0.54	10.8	1.93	20.8	30.2	0.64	79	152.7	0.0	152.7	0.19	1.9	150.8
15	20	0.63	12.6	1.96	24.7	35.8	0.64	79	181.1	0.0	181.1	0.19	2.9	178.2
30	20	0.80	16.0	2.00	32.0	46.4	0.64	79	234.6	0.0	234.6	0.19	5.7	228.9
60	20	1.00	20.0	2.03	40.6	58.9	0.64	79	298.0	0.0	298.0	0.19	11.4	286.6
120	20	1.20	24.0	2.01	48.3	70.1	0.64	79	354.8	0.0	354.8	0.19	22.8	332.0
240	20	1.46	29.2	1.98	57.8	83.7	0.64	79	423.9	0.0	423.9	0.19	45.6	378.3
360	20	1.60	32.0	1.95	62.5	90.7	0.64	79	459.0	0.0	459.0	0.19	68.5	390.5
480	20	1.70	34.0	1.94	65.9	95.5	0.64	79	483.6	0.0	483.6	0.19	91.3	392.4
600	20	1.83	36.6	1.91	70.1	101.6	0.64	79	514.2	0.0	514.2	0.19	114.1	400.1
720	20	1.85	37.0	1.91	70.8	102.7	0.64	79	519.8	0.0	519.8	0.19	136.9	382.9
840	20	1.90	38.0	1.91	72.4	105.0	0.64	79	531.6	0.0	531.6	0.19	159.8	371.9
1440	20	2.28	45.6	1.84	84.0	121.8	0.64	79	616.5	0.0	616.5	0.19	273.9	342.6
2880	20	2.70	54.0	1.78	96.3	139.6	0.64	79	706.6	0.0	706.6	0.19	547.8	158.9

Surface Water Attenuation Calculations

REV	DESCRIPTION	REV	CK	DATE
00	PLANNING ISSUE	ME	WB	27.11.23

McARDLE SPORT TEC



AUTHOR
ME

TITLE
Stanley Park, Chippenham
Creation of an Artificial Grass Pitch
Proposed AGP Drainage Strategy

PROJECT	SCALE	SIZE
McA012	1:500	A1

DRAWING No	REVISION
08	00