Royal Military Academy

Sandhurst

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

1. DO NOT SCALE FROM DRAWING UNLESS FOR PLANNING PURPOSES ONLY. ALL DIMENSIONS TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF WORKS.
2.
3. ALL PERSONNEL SHOULD BE AWARE OF THE HEALTH AND SAFETY PLAN WHICH IS RETAINED IN THE SITE MANAGERS OFFICE

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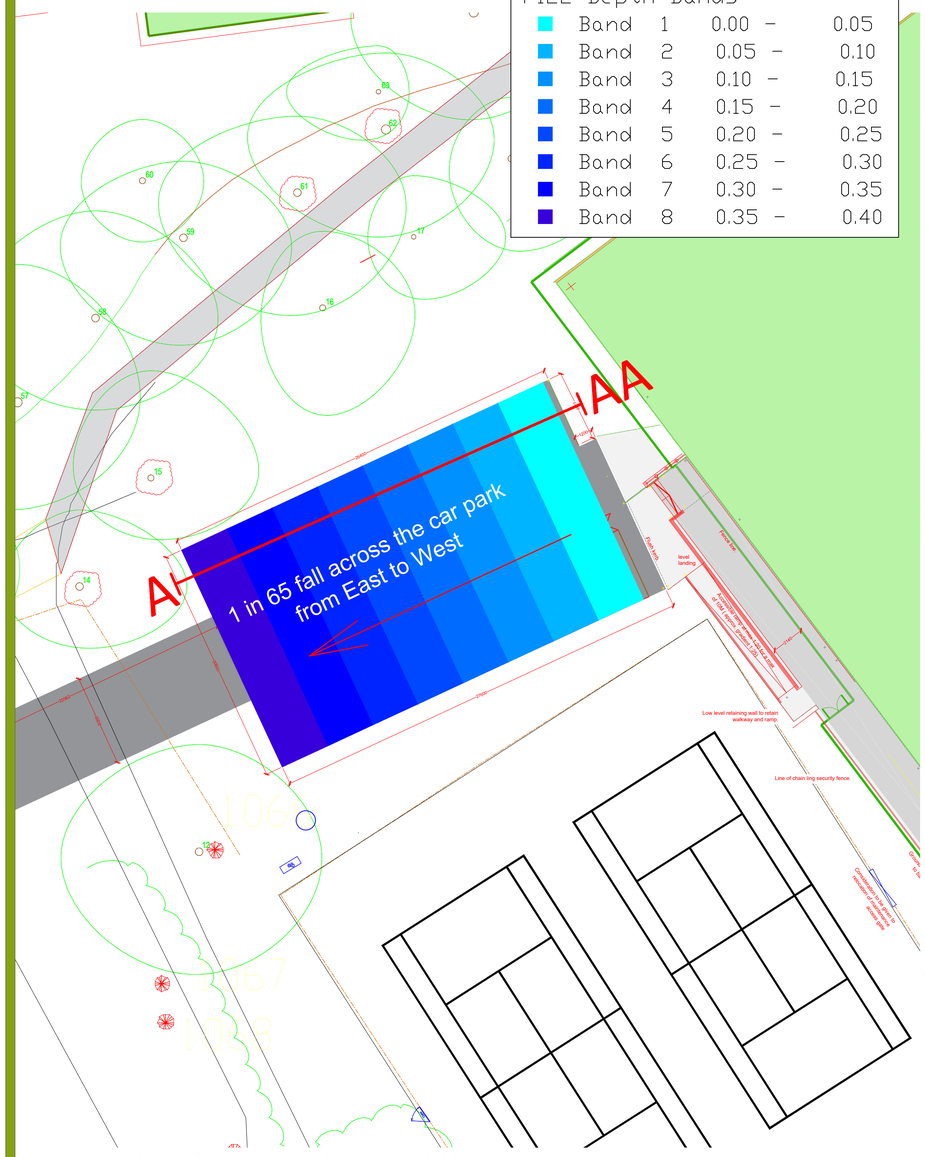


Attenuation Scheme - Scale 1:200

Surface Water Drainage Design

The proposed design of the car park development is for a permeable tarmac surface construction. The surface of the tarmac 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 area. The car park base will be permeable allowing the entire area to naturally infiltrate through to the underlying soils.

The granular 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 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 sub-base) incorporated wherever necessary, without affecting the performance of the car park.

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 area currently infiltrates through the existing soils, without any control or restrictions. Therefore, the proposal for a permeable car park with voids within the sub-base will increase the attenuation capabilities of the site.

Infiltration testing has been undertaken near the proposed car park and has derived an infiltration rate of 8.16x10-6 m/s which has been used in the soakaway calculations to the right.

Surface water discharge rate will be attenuated weithin the car park before infiltrating through the car park sub-base of the site will provide a more careful, managed control of discharge than the current arrangement.

The foundations of the new synthetic turf area includes:
- 300mm deep layer of type 3 stone
- 100m macadam car park surface

The minimum 400mm deep aggregate base construction offers a wedge for surface water attenuation prior to filling and flooding the car park surface or surrounding areas. The available volume of the wedge is created through the following calculations:

- The car park layer constructed at a 1 in 65 gradient offers a volume and capacity of 75m3
  -- Based on a voidage space of 40% this offers **30m3** of water attenuation.

The surface water attenuation calculations as per the table right shows the following;
- 1 in 100 year storm event + 40% allowance for climate change would require **13m3** of attenuation

The attenuation provided by the car park design (30m3) will cater for a 1 in 100 storm event +40% (13m3) without flooding either the car park surface or surrounding areas.

Consider Area to be drained = 424 m2

Discharge through entire car park sub-base and external soakaway

100 year + 40% climate change

Flow	Time (min)	M5-D 20mm x Z1	Z2 factor	M100-D (mm)	Inflow M3	Outflow M3	Storage M3
	5	7.6	1.862	14.2	8.4	1.0	7.39
	10	10.8	1.926	20.8	12.3	2.0	10.33
	15	12.6	1.958	24.7	14.6	3.0	11.62
	30	16.0	1.998	32.0	19.0	6.0	12.93
	60	20.0	2.030	40.6	24.1	12.1	12.00
	120	24.0	2.014	48.3	28.7	24.2	4.50
	240	29.2	1.978	57.8	34.3	48.4	0
	360	32.0	1.954	62.5	37.1	72.6	0
	600	36.6	1.914	70.1	41.6	121.0	0
	1440	45.6	1.842	84.0	49.9	290.4	0

Ratio r = 0.4 (For locality) Climate change allowance = 40%

Outflow ***Infiltration through car park sub-base***

Infiltration rate: 0.0004896 m/min

Soakaway details: 15.6 m wide 26.4 m lloenngth 0.25 m deep
Assume void ratio 0.4 .: 41 m3

Available storage under car park (based on 1:65 fall): 30.00 m3

Available storage within drainage system: 0.00 m3

Available storage area = 30.00 m3

Surface area: 412 m2

Eff volume: 30.00 m3 > 12.93 m3 OK

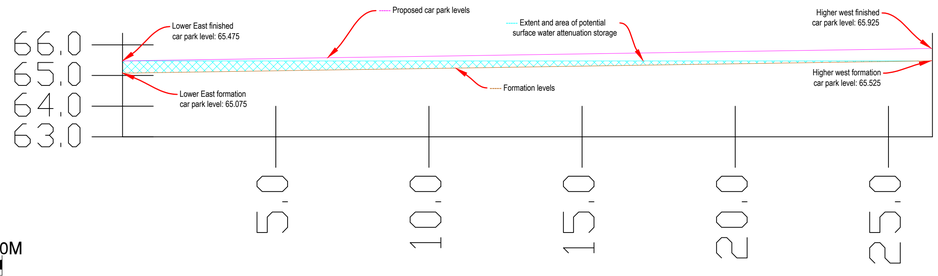
Additional storage volume required: -17.07 m3

Half drain down time (soakaway only): 3846.65 secs 1.06851 hours

Total Storage required = approx. 13m3. Storage currently provided = 30m3. No additional storage required.

This volume will accommodate flows from all modelled 1 in 100 year + 40% climate change events. In order to meet building regulation stanards, a half drain-down time of 24 hours should be achieved. This requirement is met at the site.

Car Park Attenuation Volume Calculations



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Section A-AA Showing Surface Water Attenuation Storage - Scale 1:100

REV	DESCRIPTION			
00	PLANNNING ISSUE	ME	WB	18.04.24
REV	DESCRIPTION	REV	CK	DATE

Surfacing Standards Limited
SPORTS PITCH CONSULTANTS

AUTHOR: ME

TITLE: Royal Military Academy
Sandhurst
Proposed Car Park Drainage Strategy

PROJECT	SCALE	SIZE
SSL3159	Varies	A1

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