

Park Lane Primary School, Reading, Berkshire

Flood Risk Assessment and Drainage Strategy Report

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Introduction

Hampshire County Councils Property Services have commissioned HCC's Hampshire Engineering Services to undertake a flood risk and drainage strategy report.

The flood risk and drainage strategy report shall review the existing and proposed situation to ascertain the impact of the development.

This Assessment has been prepared in accordance with Communities & Local Government, National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and the requirements of the Lead Local Flood Authority (LLFA).

Overview of the Development

The site is in the county of Berkshire in the town of Reading. The site is currently a developed school site with a mixture of soft and hard landscaping areas. The site can be located using the Ordnance Survey grid reference 466921E, 173807N; and the nearest postcode is GU31 5AS. See **Appendix A** for a Location Plan.

The proposed development is to construct a new two storey Modular school building in the location of the old modular building. Alongside the building it is proposed to also construct a soft formal play area, a car parking area, associated landscaping, and open space. See **Appendix B**

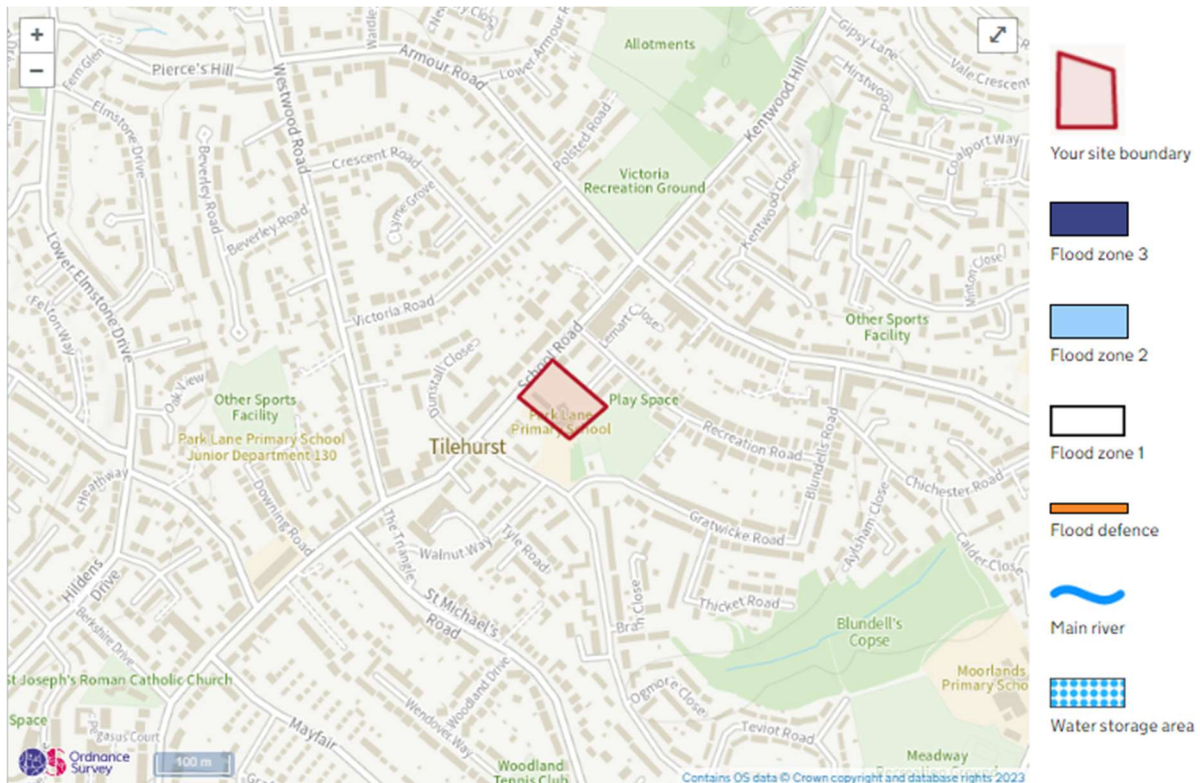
The site has proposed vehicular access from School Road, Reading. The surrounding area is residential. The total area of the site is approximately 0.15ha.

The Site topography is generally flat. see **Appendix C** for a topographical survey of the site.

Flood Risk

Environment Agency (EA) flood maps, shown in **Figure 1**, confirms that the entire site is situated within Flood Zone 1 where the annual probability of flooding from Rivers or the Sea is less than 0.1%.

Environment Agency Flood Zone Map - Figure 1



(<https://flood-map-for-planning.service.gov.uk>)

Environment Agency (EA) reservoir flood maps show there is no risk to the site from reservoir flooding.

Environment Agency (EA) surface water flood maps, **Figure 2**, confirm that most of the site is at “very low” risk of surface water flooding where the annual probability of flooding from surface water is less than 0.1%.

Some of the site however is highlighted to have a “low risk” of surface water flooding where the annual probability of flooding from surface water is between 0.1% & 1%.

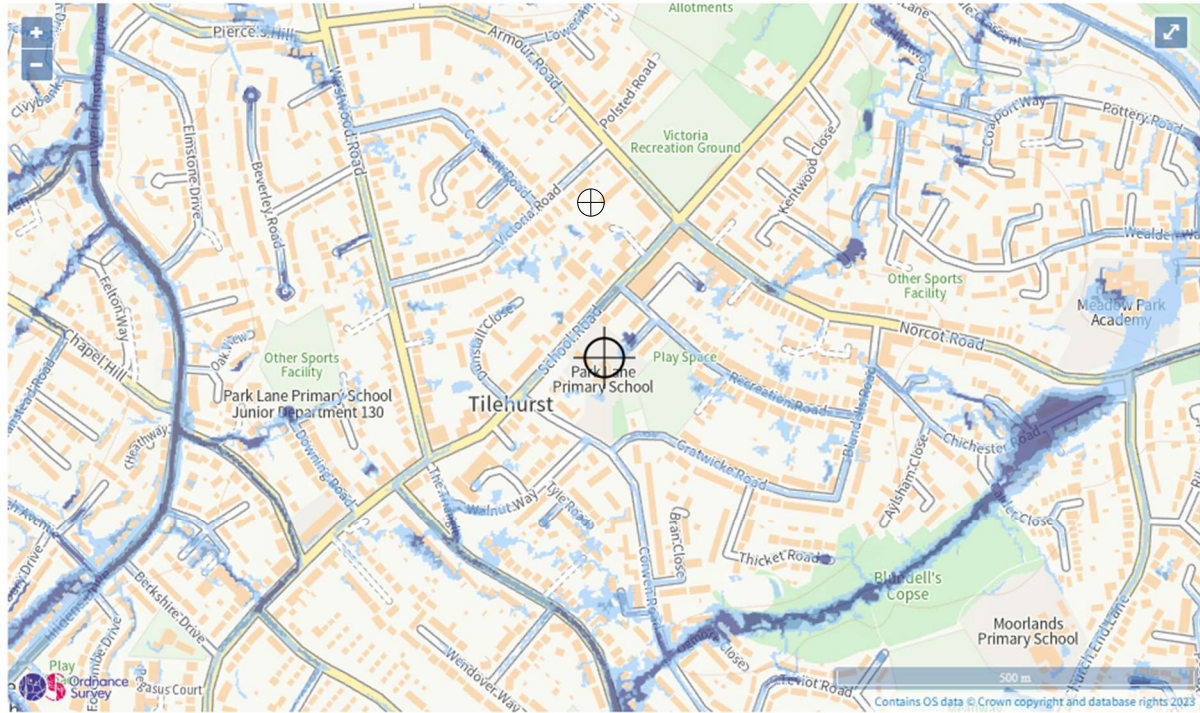
Environment Agency Pluvial Flood Map - Figure 2

Flood risk

Extent of flooding

Location

Enter a place or postcode



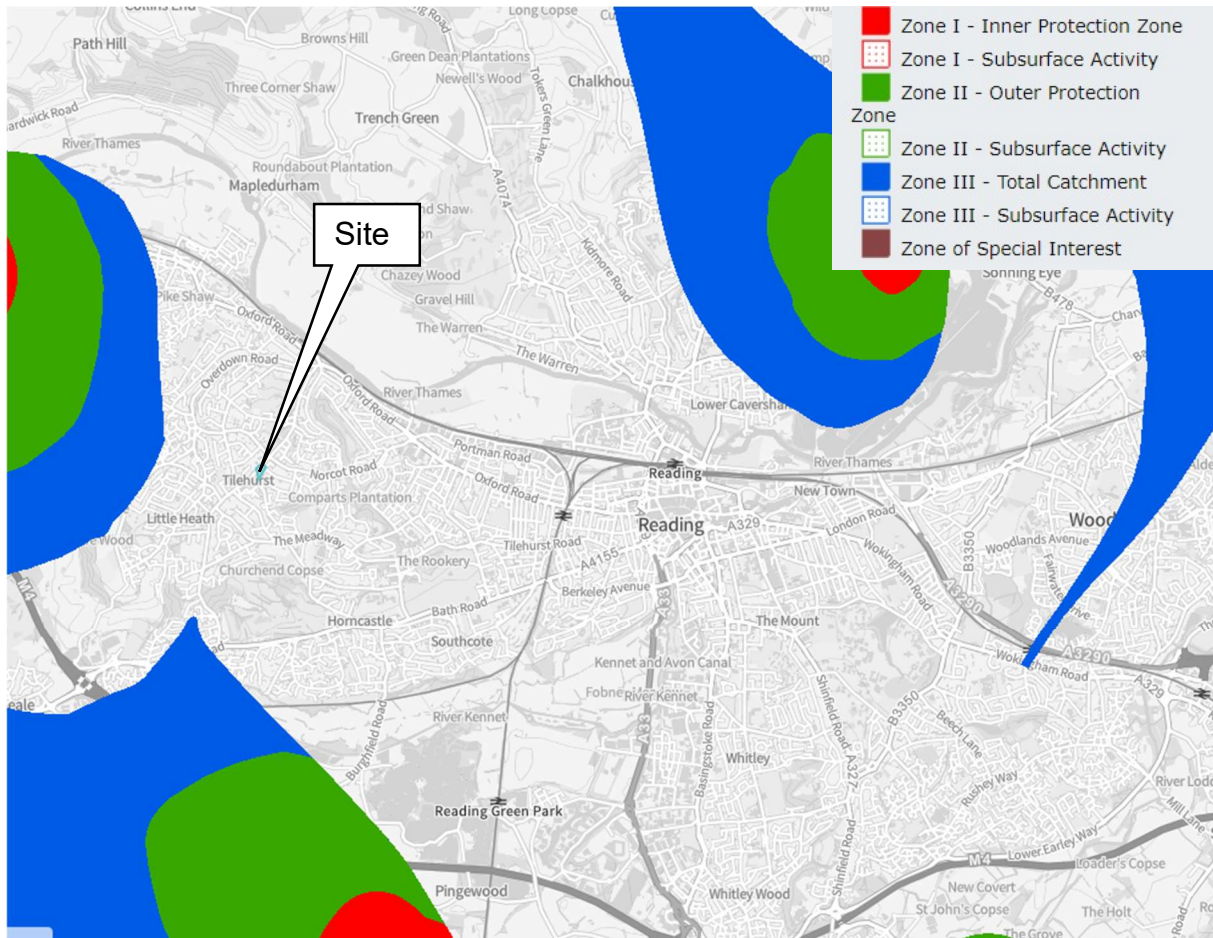
Extent of flooding from surface water

● High
 ● Medium
 ● Low
 ● Very Low
 ⊕ Location you selected

(<https://check-long-term-flood-risk.service.gov.uk/>)

Environment Agency mapping, **Figure 3**, has confirmed that the site does not fall within a groundwater Source Protection Zone.

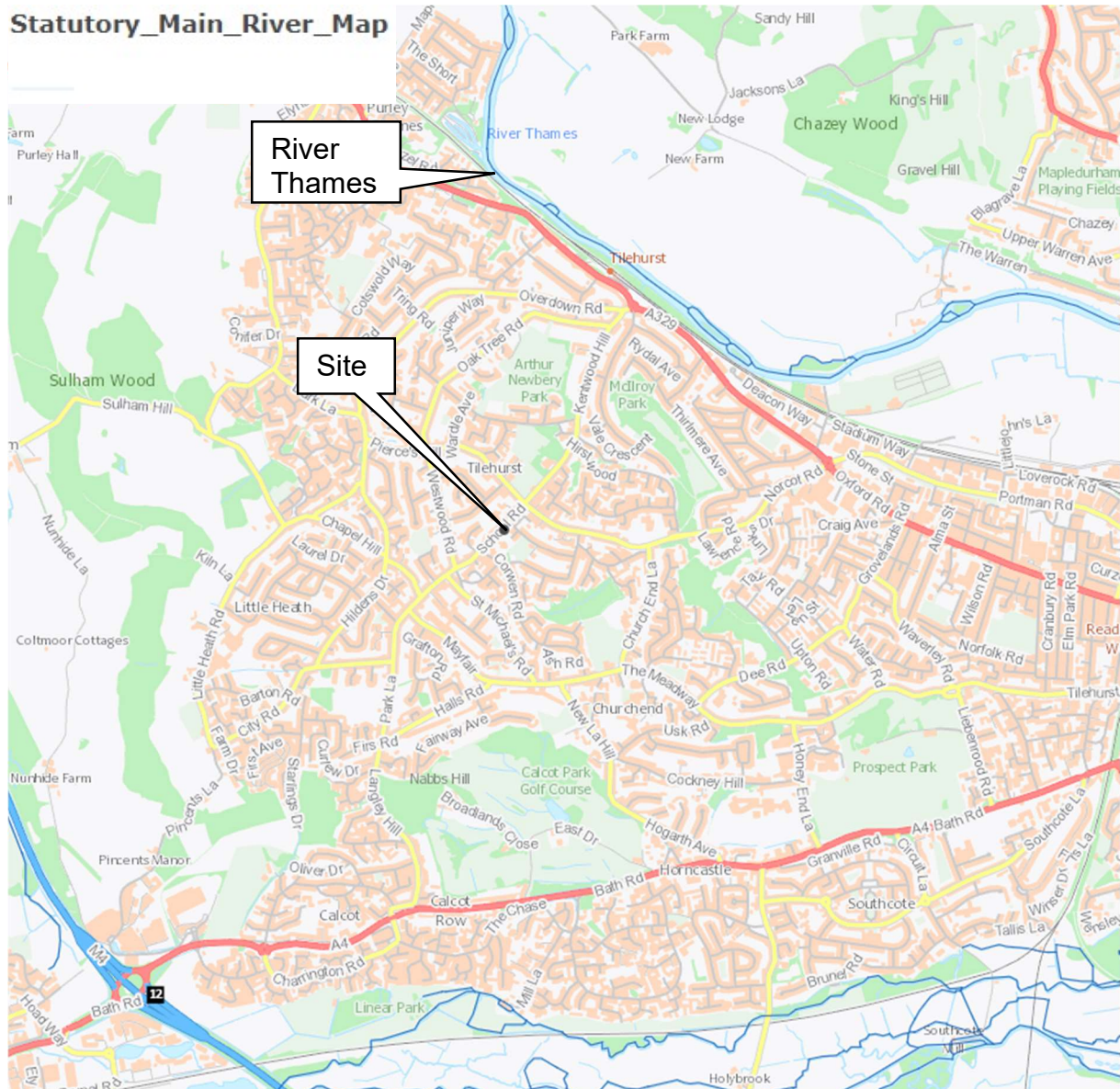
Environment Agency Groundwater SPZ's Map - Figure 3



(<https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs>)

According to the Environment Agency (EA) main river map, **Figure 4**, the nearest river is the river Thames, situated approx. 1.5km to the north of the site. The river Kennet feeds into the Kennet and Avon River approx. 3km south of the site.

Environment Agency Main River Map - Figure 4



(<https://environment.maps.arcgis.com>)

Ground Conditions

The Geological Map of the area shows the site to be underlain by the Lambeth Group, which the BGS describes as Clay, silt and sand.

A ground investigation undertaken in August 2023 confirmed the ground conditions encountered comprised of Topsoil to a depth of between 0.20m with 0.3m with made ground beneath. From 0.5m to 0.9m there is a 0.4m depth layer of what is described as Winter Hill Gravel Member made up of slightly gravelly fine to medium sand. From 0.9m to 2.8m there is a 1.9m band of Winter Hill

Gravel Member made up of Dense becoming very dense gravelly fine to coarse sand. Gravel is subangular to rounded fine to coarse flint.

Existing Foul Water

A CCTV survey of the existing foul drainage system has been carried out. Upon review of the CCTV survey data, it confirms the foul drainage discharges through the private system heading west towards School Road, where there is an existing 225 diameter Thames Water public sewer. The CCTV survey confirms connection into this sewer. For the sewer records, See **Appendix D**.

Existing Surface Water

A CCTV survey of the existing surface water drainage has been carried out at the site. Upon review of the CCTV survey data, it is confirmed that the surface water is managed on site by a series of concrete ring soakaways. For the topographical survey, See **Appendix C**.

Proposed Drainage

Ordinary Watercourse Consent

There are no proposed alterations to any ordinary watercourse and therefore consent is not sought nor required.

SuDS Hierarchy of Systems and Justification of Usage

We have reviewed and taken into consideration the Environment Agency SuDS Hierarchy for SuDS systems which are noted below in order of preference:

1. Living Roofs
2. Basins and Ponds
3. Filter Strips and Swales
4. Infiltration Devices
5. Permeable Surfaces and Filter Drains
6. Tanked Systems

Below is the response to these systems identifying the most suitable system for the scheme.

1. Living and green roofs impose a large load on the roof structure and require relatively flat roofs to insure water retention. The proposed

- buildings will be constructed using lightweight roofs. This deems full depth green roofs, with attenuation storage as being unfeasible for this project.
2. The use of open basins and ponds are generally deemed unsuitable at a school site. Due to site constraints and available space for the development; features such as basins and ponds are not suitable at the site.
 3. Due to site constraints and available space for the development; Filter strips and swales are not feasible at the site.
 4. Shallow ground Infiltration devices are feasible, subject to winter groundwater monitoring.
 5. Permeable surfaces as are feasible.
 6. A positive surface water storage tank systems with restricted connection to the surface water sewer is feasible.

Proposed Site Surface Water Drainage Strategy

It is proposed to discharge surface water runoff from the car park, building roof and hard paved surfaces around the building to a soakaway located within the new car park area. The proposed soakaway has been designed to cater for the 1:100-year +40 storm return period. A Site Investigation was conducted which included BRE 365 soakage testing. Following the three tests conducted, the following rates were provided:

Test 1 - 1.9×10^{-5}

Test 2 - 1.7×10^{-5}

Test 3 - 1.8×10^{-5}

A worse case infiltration rate of 1.7×10^{-5} was used in the design of the soakaway feature.

Urban Creep

Urban creep is the conversion of permeable surfaces to impermeable over time e.g., surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas. Much research has been carried out into the effect of urban creep and its effect on the drainage systems which cater for urban areas. It has been shown that, over the lifetime of a development, urban creep can increase impermeable areas by as much as 10%.

Due to the nature of the development being a school site, any further increases in hard paved areas would require further planning applications and drainage storage requirement would be reviewed, on this basis therefore urban creep has not been applied.

Storm Design Exceedance

It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible, however, it is practicable to minimise the risk by careful design of the layout of the development such that internal flooding is avoided. Areas of hard standing can be laid to falls away from buildings to provide a significant volume of surface storage during extreme events with flows directed to areas where damage and disruption to operations will be minimised.

With the site being generally flat, the FFL of the proposed modular building will be raised to ensure the ground around the modular building falls away. Exceedance routing will be designed so that the car park can accommodate any flooding greater than the 1:100 yr + 40% CC storm event. See **Appendix F**.

Water Quality Criteria

Water Quality management of surface water should be carried out in accordance with the Suds Manual (Ciria C753)

C753 Part E Chapter 26 describes risks posed by surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e., the pollution source).
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels.
- The sensitivity of the receiving environment.

The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

TABLE 26.1 Approaches to water quality risk management

Design method	Hazard characterisation	Risk reduction	
		For surface water	For groundwater
Simple index approach	Simple pollution hazard indices based on land use (eg Table 26.2 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.3 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.4 or equivalent)
Risk screening ¹	Factors characterising traffic density and extent of infiltration likely to occur (eg Table 26.5 or equivalent)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (eg Table 26.5 or equivalent)
Detailed risk assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in event mean discharge concentrations and total annual load reductions delivered by the system	

Note

¹ Risk assessment may be required as a result of the risk screening process.

As per Table 26.1 the Simple Index approach will be used as a design method for this site. Table 26.2 provides hazard classification of different land uses. The land uses for the surface water drainage for this site are.

- Roofs -impermeable surface.
- Access Road and Parking -impermeable surface.

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following will have to be achieved for the surface running off the site.

Total SuDS mitigation index $\geq$ pollution hazard index

Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

From Table 26.2 the following information is tabulated in Table 1.

Land Use	Destination of Runoff	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Roofs	Surface water	Very Low	0.2	0.2	0.05
Access Road & Parking	Surface water	Low	0.5	0.4	0.4
TOTALS			0.7	0.6	0.45

Table 1: Pollution hazard index and destination of runoff for the proposed site

The SuDS mitigation index will be obtained from Table 26.3 (for discharges to surface waters) of the SuDS manual.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices ¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.6	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.6	
Pond ⁴	0.7 ³	0.7	0.5	
Wetland	0.8 ³	0.8	0.8	
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.			

To provide the required mitigation is proposed to use a proprietary treatment system filter manhole.

SuDS mitigation index's are tabulated in Table 2 as follows;

			Mitigation Indices			
Runoff Source	Destination of Runoff	Mitigation Index Source	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Roofs, access Road & Parking	Surface Water	Table 26.3	Proprietary treatment system.	0.7	0.6	0.7
TOTALS				0.7	0.6	0.7

Table 2: SuDS mitigation index

In summary, the SuDS component mitigation indices (Table 6) are greater than pollution hazard indices (Table 1) and therefore deliver adequate treatment.

Future Maintenance of System

Following construction, a maintenance document for the system will be provided to the school site manager which will detail the constructed systems maintenance requirements, **Appendix G**. It is the school's responsibility to maintain the system to prevent the increase in the risk of flooding on and off site as a result of system failure.

Proposed Foul Water Drainage Strategy

The new foul drainage generated by the modular building will be connected into the existing private foul drainage system prior to the existing connection into the public foul sewer located in School Road.

Summary & Conclusion

The site is located with Flood Zone 1 and is not at risk of flooding from any source.

It is proposed to discharge surface water runoff from the car park, building roof and apron via a soakaway located within the car park area.

An infiltration rate of 1.7×10^{-5} was used in the design of the soakaway feature.

The new surface water drainage system will be designed as recommended by Building Regulations and the SUDS manual. The system will be capable of draining the site, without flooding, for all storm events up to the 1 in 100-year storm flows plus 40% allowance for climate change.

Appendix A – Location Plan

Appendix B – Site Layout

Appendix C – Topographical Survey

Appendix D – Proposed Drainage Layout & Calculations

Appendix E – Exceedance Routing

Appendix F –Maintenance Regime

