

Rennard Consulting Limited



Rennard Consulting Limited
Ebenezer House,
Ryecroft,
Newcastle,
ST5 2BE

Revision	Date	Originator	Description
A	16.01.2024	F. Gennard	DRAFT – For Comment
B	29.11.2024	F. Gennard	DRAFT – Revised Layout
C	13.12.2024	F. Gennard	FINAL – For Planning

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Rennard Consulting Limited. Registered in England and Wales no. 12242454.

Registered Office: Ebenezer House, Ryecroft, Newcastle, ST5 2BE

Contents

1.0	Introduction	4
2.0	Information on the Existing Site and Proposed Development	5
2.1	Existing Site.....	5
2.1.1	Site Location	5
2.1.2	Site Description	5
2.1.3	Existing Site Drainage	6
2.1.4	Existing Watercourse	6
2.2	Proposed Development.....	6
3.0	Storm Water Management	7
3.1	Method of Discharge	7
3.1.1	Infiltration Based Systems	7
3.1.2	Watercourses.....	8
3.1.3	Adopted Sewers	8
3.1.4	Summary	8
3.2	Climate Change Allowance	8
3.3	Existing and Proposed Impermeable Area.....	9
3.4	Allowable Site Discharge	9
3.5	Proposed Attenuation Strategy	10
3.5.1	Calculation.....	10
3.5.2	Water Quality.....	10
3.5.2	Available SuDS Overview	11
3.6	Summary	15
3.7	Design Example	15
3.8	Maintenance and remedial work.....	16
3.8.1	Permeable Paving	17
	Foul Drainage	18
6.1	Proposed Outfall and Strategy	18
6.2	Foul Water Flow Rates.....	18
6.3	Adoption and Maintenance.....	18
	Appendix A – LLFA Response	19
	Appendix B – Topographical Survey	20
	Appendix C – Utility and CCTV Survey	21
	Appendix D – Sewer Records	22
	Appendix E – Proposed Development	23
	Appendix F – Soakaway Tests	24

Appendix G – Proposed Impermeable Area	25
Appendix H – QBAR.....	26
Appendix I – Whole Site Area	27
Appendix J – Proposed Roofing Plan.....	28
Appendix K – Microdrainage Calculations	29
Appendix L – Drainage Strategy Drawing	30

1.0 Introduction

Rennard Consulting Limited (RCL) was commissioned to carry out a drainage strategy for a series of new glamping pods at Royal Oak, Dilhorne.

The following report outlines the surface water drainage strategy for the proposed development based on the comments raised by the Stoke-on-Trent Lead Local Flood Authorities initial response.

A copy can be found in Appendix A.

2.0 Information on the Existing Site and Proposed Development

2.1 Existing Site

2.1.1 Site Location

The proposed site is located off the junction of New Road and High Street, in Dillhorne, Stoke-on-Trent, Staffordshire. The nearest postcode is ST10 2PE and the site is centred on National Grid Reference (NGR) 397361E, 343647N.

A site location plan is shown in Figure 1 below.

Figure 1: Site Location Plan



Source: <https://www.streetmap.co.uk/map>

2.1.2 Site Description

The development is located on the northern boundary of an undeveloped part of The Royal Oak Pub site.

The site is bound by existing Royal Oak Pub and High Street to the south, New Road to the west, open fields to the north and existing residential properties to the east.

A topographical survey has been undertaken and is included within Appendix B.

It shows that the area where the pods are going to be positioned falls from south to north with the high point on the southern boundary being 214.000m AOD and the area on the northern boundary being 212.000m AOD.

The area of the proposed car park falls from east to west towards the pub. The high point on the eastern boundary is 215.250m and on the western boundary is 213.130m AOD

2.1.3 Existing Site Drainage

A utility and CCTV survey has been undertaken and is included within Appendix C.

They show that the site is already served by a foul and surface water sewer. While on the survey, it shows that there is a 100mm dia foul sewer passing through the car park, the surface water connections from the pub appear to connect directly into this system, which in reality would make it a combined system.

There is also a foul rising main crossing the site to the north. This ends at a manhole north of the car park before travelling north east and leaving the site boundary.

A Surface Water Sewer was identified approximately 52m south west of the site boundary, within the adjacent field. This is believed to be outside the clients ownership and to be a private system.

Sewer Records were obtained from Severn Trent and are included in Appendix D and show that there are no adopted surface water sewers close to the site.

There is a 150mm dia foul sewer crossing the site, this is believed to be the foul sewer that was identified on the utilities survey.

2.1.4 Existing Watercourse

There is an unnamed watercourse which is located approximately 182m to the northwest of the proposed development.

The British Geological Survey Maps also show that there is a spur which enters into the site on the eastern boundary (see Figure 2). This was picked up on the utility survey included within Appendix C, however it was blocked by silt after a short distance.

The nearest main river is the River Trent which is located approximately 4km to the south east.

2.2 Proposed Development

Drawings showing the proposed development are included within Appendix E.

The proposal is for 4 new glamping pods, a laundry and WC block with associated hardstanding and parking.

The car park will also be resurfaced with tarmac with two landscaped beer gardens to the south.

3.0 Storm Water Management

3.1 Method of Discharge

It should be acknowledged that the satisfactory collection, control, and discharge of storm water is now a principal planning and design consideration. This is reflected in recently implemented guidance and the National SuDS Standards.

Part H of the Building Regulations 2015 recommends that surface water run-off shall discharge to one of the following, listed in order of priority:

- An adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable.
- A watercourse, or, where that is not reasonably practicable.
- A surface water sewer.

It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local run-off profile by using systems that can either attenuate run-off and reduce peak flow rates or positively impact on the existing flood profile.

3.1.1 Infiltration Based Systems

From looking at the maps from the British Geological Society the bedrock geology for the site is split into two key areas. The area to the south around the pub and southern part of the car park appears to be Chester Formation - Sandstone and conglomerate (see yellow shading in Figure 2). The area to the north around the location of the proposed pods appears to be Pennine Lower Coal Measures Formation - Mudstone, siltstone and sandstone.

There are no superficial deposits recorded for the site.

Figure 2: Extract from British Geological maps



Source: British Geological Society

Soakaway tests were undertaken and have been included within Appendix F, with a summary of the results shown in Table 1 below.

Table 1: Soakaway Test Results

Location	Depth of Pit	Depth to Water at Start of Test	Derived Infiltration Rate
SA1	2.1	0.48	1×10^{-7} m/s
SA2	2.1	0.77	1×10^{-7} m/s

Given the anticipated geology it is anticipated that infiltration rates for the site will be poor and is unlikely to be viable as the only method of discharge.

3.1.2 Watercourses

There is a tributary of the River Trent approximately 182m to the northwest of the proposed development.

There is a drain shown on the sewer records located to the north west of the site. This was picked up as part of the utility survey (Appendix C), however after a short distance it was blocked and it's outfall could not be confirmed.

With this in mind, this method of discharge has been discounted.

3.1.3 Adopted Sewers

There are no adopted surface water sewers in the vicinity of the site, however, the utility survey has demonstrated that the existing surface water from the pub connects into the foul sewer.

3.1.4 Summary

While infiltration rates are poor the system will be left unlined to allow for infiltration. The Watercourse is located over 180m from the site across third party land and as such is not deemed to be feasible as a connection.

In the absence of any surface water sewers a high level overflow will be provided from any attenuation features which will allow surface water generated from the development to flow into the foul system at a controlled rate.

This will match the strategy on the existing site and has been preliminarily agreed with the local Water Authority (See Figure 3 below).

Figure 3: Extract from email correspondence between Severn Trent and Consultant

Sewer Connections <sewer.connections@severntrent.co.uk>
to me, NEW.CONNECTIONS@SEVERNTRENT.CO.UK

Mon 15 Jul, 13:12

ST Classification: OFFICIAL PERSONAL

Good Afternoon Faye

As there is no separate surface water sewer in the area we could look to assess a connection into the foul water network for combined flows providing there are no alternative drainage options.

3.2 Climate Change Allowance

In accordance with the Government's PPG-TG document and as required by the Environment Agency, there should be no increase in the rate of surface water discharging from a new development above that of any previous development. The EA and Local Planning Authorities also

actively encourage the reduction of stormwater discharge as a condition of approval for new developments.

In addition, all new drainage systems should be sized to accommodate the runoff generated from the 1 in 100-year rainfall event with a further allowance for climate change. Table 1 below shows the anticipated increase in rainfall intensities over time and has been reproduced from Table 4 of the PPG-TG.

Table 2: Climate Change Allowance

Type	Return Period	Trent Valley Staffordshire Management Catchment	2050s	2070s
Rainfall	3.3%	Upper End	35%	35%
		Central	20%	25%
	1%	Upper End	40%	40%
		Central	25%	30%

Source: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

As this is a residential development with an expected design life of 75 years it would be expected that the proposed works be designed for 30% climate change and tested for 40%.

3.3 Existing and Proposed Impermeable Area

As part of any development, it is necessary to provide a suitably designed storm water drainage system to collect, convey and attenuate runoff that may be generated by the development itself. The net result is that there should be no increase in flood risk either downstream or to any neighbouring properties because of the scheme.

The total site area is approximately 2861m² and is entirely permeable.

The current proposed layout for the site is included within Appendix E and shows that there will be an increase in impermeable area with a summary of the proposed impermeable area being as follows:

- Building = 154m²
- Hardstanding = 1436m²

This provides a total impermeable area of approximately 1590m².

A proposed impermeable area drawing is included within Appendix G.

3.4 Allowable Site Discharge

Based on the above, the proposed method of discharge will be via a connection into the existing drain located to the west of the site.

As the site is previously undeveloped, the existing site discharge based on the site area (1590m²) can be calculated using QBar as 1.5l/s (Appendix H).

A secondary consideration is the lowest rate of flow that can be accommodated within a serviceable flow control device. Typically, this is determined by the smallest suitable diameter of flow control which is generally 75mm equating to a control rate of 4-5l/s.

As such for the purpose of this report a discharge rate of 5l/s will be used.

3.5 Proposed Attenuation Strategy

When developing the site layout, the provision of adequately sized attenuation system to mitigate flood risk will need to be considered.

While final layouts are still to be determined, the volume of attenuation required for the proposed development may be estimated by using design software. This will be calculated using the proposed impermeable areas taken from the current layouts included within Appendix G.

3.5.1 Calculation

In the first example it has been assumed that all water will flow into a single system, such as a tank, with a flow control device being used. Basing the calculations on the FSR characteristic the following input parameters can be used:

- M5-60 = 18.0mm
- R = 0.356
- Return Period = 1 in 100
- Climate Change Factor = 30%

A summary of the results is included in Table 3 below.

Table 3: Preliminary Attenuation Calculations

	Impermeable Area (ha)	Anticipated Unrestricted Run-off (l/s)	Flow Restriction (l/s)	Attenuation Volume (1 in 100 +30) (m³)
Whole site	0.16	22.0	5	55

This assessment is for the whole impermeable area discharging to a single system such as a Tank with no infiltration. Undeveloped areas along with the existing buildings within the site boundary have not been considered as it is assumed that drainage of these areas will be as existing.

A copy of the Microdrainage Calculations can be found in Appendix I.

3.5.2 Water Quality

It is important to manage the quality of surface water runoff so that the receiving surface waters and/ or groundwaters is protected. 'SuDS Manual' CIRIA report C753 states that for most developments a well-designed SuDS system can provide treatment and enable pollution removal through the following mechanisms:

- Pollution prevention: stopping contaminants becoming mixed with runoff.
- Interception: Preventing runoff and therefore the associated pollution load, for most small rainfall events.
- Treatment: implementing SuDS components (in series where required) that use a range of treatment processes to reduce contaminate levels in surface water runoff to an acceptable level.
- Maintenance and Remedial Works: to remove any pollutants that have been to maintain performance.

In accordance with Table 4.3 of CIRIA report C753 this development can be classed as having a low risk of pollution with the main sources of pollutants for this development being sediments from the

roof. As a result, the requirement for the discharge to surface water is the removal of sediments. The above will need to be addressed prior to the next stage of design.

3.5.2 Available SuDS Overview

The most appropriate attenuation systems should ideally satisfy four main characteristics:

- Provide the required volume of storage while minimising the loss of developable land.
- Improve Water Quality
- Where possible provide opportunities to create additional amenity space.
- Where possible provide opportunities to promote biodiversity through the creation of new habitats.

Systems which best meet the above criteria are often referred to as Sustainable Drainage Systems (SuDS). SuDS aim to mimic the natural run off profile of the original catchment and the CIRIA SuDS Manual (C753) states that on new developments drainage systems should not just be designed to restrict the runoff but also ensure that the quality is improved.

To help identify the most appropriate systems, the manual in combination with EA Guidance sets out a hierarchy which has been summarised in Table 4 below for reference.

Table 4: SuDS Hierarchy

	SuDS Technique	Flood Reductions	Pollution Reductions	Landscape & Wildlife Benefit
Most Sustainable	Living Roofs	✓	✓	✓
↑	Basins and Ponds Constructed Wetlands Balancing Ponds Detention Basins Retention Ponds	✓	✓	✓
	Filter strips and swales Infiltration devices Soakaways Infiltration trenches and basins	✓	✓	✓
↓	Permeable surfaces and filter drains Gravelled areas Solid paving blocks Porous pavements	✓	✓	
Least Sustainable	Tanked Systems Oversized pipes/tanks Cellular Storage	✓		

Source: CIRIA SuDS Manual (C753)

Systems at the top of the hierarchy meet all the requirements set out in the points above and are generally considered the most sustainable option. It is, however, accepted that there are certain scenarios where some systems are more suitable than others and while at this preliminary stage it is not possible to identify what the most appropriate system will be, the following sections talk through each in turn and identifies their suitability for the project.

Living or Green Roofs

Although often only considered applicable for larger commercial roofs, there are opportunities to utilise living or green roofs on a smaller scale. This can bring a range of benefits including:

- The absorption of heat from the sun.
- The absorption of CO₂
- Reducing the size of attenuation requirement as typically green roofs intercept up to 70% of the water that falls on them.
- The creation of additional habitats.
- Improvements to the aesthetics of a property.

If considered at the outset of the design of a unit, a green roof can be integrated within the provision of a roof terrace area to create additional living space, alternatively, a maintained roof can be installed that may require specialised access.

There are numerous systems available, and it is recommended that if these systems are being considered discussion with several suppliers is instigated as soon as possible.

While smaller green roofs can bring benefits to the hotel sector, they can also increase construction and maintenance costs. The current roofing plan (Appendix J) shows that for the pods, a domed roof is currently proposed and while for the WC and Laundry a pitched roof is proposed. As such it is unlikely that green roofs will provide an effective form for attenuation for this site and therefore, they have not been considered further.

Ponds and Basins

Where space allows, ponds can be a great addition to a development as they enhance outdoor space. They also provide great water quality benefits as they promote biological action and stilling of sediments.

In rural settings basins can also create areas of open space that can enhance existing habitats for wildlife.

Both systems do, however, take up developable land and have residual maintenance and liability issues attached to their implementation.

While there is sufficient space to the west, there is currently a fairly steep gradient and as such it is unlikely a pond would be an effective method of attenuation for this site.

Filter Strips and Swales

Swales and filter strips are often incorporated adjacent to roads and footpaths and can be used to collect water directly from linear features, or as a way of joining the dots between several larger features. If designed correctly they can also be used to attenuate and then discharge the flow to either a traditional system or a secondary SuDS device.

The use of these systems is more suited to linear applications such as roads as the typical cross section is relatively small and longer runs are required to provide attenuation volume.

Filter strips will be smaller in plan area than a swale although the swale can be landscaped to be incorporated into the verge of the carriageway, combining two functions.

Land take can be relatively small in comparison to other systems and both types perform well in improving water quality. They are also ideally suited for disposal of water via a secondary infiltration.

Based on the topography and the space available there would be some opportunity to fit in narrow filter strips or swales which follow the contours of the site. These would not only help meet the required attenuation requirements but also provide opportunities to improve biodiversity and provide a link between the proposed site and its natural surroundings.

Rain Gardens

Rain gardens are designed to mimic the natural water retention of undeveloped land and reduce the volume of rainwater running off into drains from impervious areas. They also have the added benefit that they can treat low levels of pollution. For a hospitality setting these could take the form of either raised planters at the base of downpipes or shallow depressions with absorbent, yet free draining soil which are populated with plants that are able to withstand temporary flooding conditions.

This type of system not only has the advantage of meeting the requirements of SuDS but could also provide additional educational benefits for certain sites.

Due to the small nature of the development, it may be possible to provide small plot raingardens across the site. This would not only meet attenuation requirements but would also improve water quality and enhance amenity spaces, particularly to the west of the site where there is a small staff seating area.

Permeable Paving

Where areas of paved hardstanding are proposed there are opportunities to make these permeable which can provide significant volumes of storage. These systems also encourage biological treatment of flow and extraction of oils and heavy metals from the run-off.

Compared to other SuDS components, land take is reduced as storage is located under hardstanding and access roads. However, maintenance is potentially a long-term issue and the possibility of the paving being damaged, dug up and not properly reinstated or not regularly swept could lead to compromising the future capacity of the system.

Unlike other SuDS systems, there is no specific amenity provided by permeable paving other than enabling other areas to be utilised for development rather than potentially sterilizing area with an easement for a sewer or stand-off for a basin.

These systems may be incorporated into normal car-parking areas and driveways but may not be suitable for areas accessed by larger vehicles. These systems can also work well with geo-cellular attenuation where attenuation volumes are large.

It is proposed to resurface the car park as part of this development and as such there is an opportunity to utilise permeable paving within the parking bays. This would not only go some way to meeting the attenuation requirement but also provide benefits in terms of water quality.

Cellular Storage

Large volumes of storage can be provided under grassed and lightly trafficked areas by using proprietary geo-cellular systems. This will maximise the developable area of the site.

There are no specific mechanisms within the system designed to treat flow, but extended detention times will allow sedimentation reducing the suspended solids within the discharge.

There is no creation of amenity by the installation of these types of systems, indeed by maintaining access to the system small areas may need to be reserved.

If the developable footprint is constrained then these systems may be advantageous, however, to ensure suitability it is recommended that the use of these systems is discussed with the maintaining body as they are not always preferred.

The installation of cellular storage requires significant excavation and therefore where space is not a critical issue other forms of attenuation should be considered. These systems will also require occasional maintenance to remove sediments which can be difficult depending on the design and access arrangements.

Tank or Culvert Storage

Hard engineered tank storage systems have traditionally been used for attenuation structures for the past decade and are often specified where large volumes of storage are required (>200m³) and available space is an issue.

These systems have no inherent water treatment properties except potential sedimentation of the attenuated flow and offer no additional amenity benefits. In some cases, the easement to the tank or culvert is such that a significant portion of land area is sterilized from development as are certain types of landscape planting.

There are also significant costs associated with these systems in production, transportation, and installation. However, once installed the long-term maintenance requirement of the system is relatively low.

With a proven record of successful installation, tanks and culverts are regularly adopted by water authorities across the country, albeit with a large associated easement that will sterilise that portion of the site. It should be noted however, that these systems will require occasional maintenance to remove sediments which can be difficult depending on the design and access arrangements.

Surface Storage

The use of roads, public areas and even landscaped areas as additional storage for an extreme rainfall event is becoming a widely accepted form of attenuation.

Water spilling from the drainage systems can be collected via roads and kerbs and channelled to lower lying areas where it would be stored until the capacity in the existing system returns.

These systems have the advantage of requiring little additional infrastructure merely detailing of the proposed roads and grassed areas.

As these systems will only be used in extreme events when the adopted drainage system is exceeded (>1 in 30 years), they provide a very efficient way of catering for these events rather than providing permanent capacity.

There is no inherent water treatment capability in this system nor any increase in amenity, however, the costs associated with this provision are relatively small.

There is a large open field to the west of the development which is believed to be in the clients ownership which could be used for temporary storage. Consideration would need to be given to ensure that there is no increase in flood risk to the neighbouring developments.

Oversized Pipework

It is often possible to provide the required volume of storage within the existing collection pipework of the proposed system. This may be incorporated by using oversized pipework designed to act as inline storage.

As the diameter of larger pipes readily available is limited the applicability of these types of systems is more suited to <200m³ of attenuation. Above this volume, the length of pipe required is excessive and difficult to suitably fit into a normal site layout.

There is no intrinsic amenity provided using this system neither is there any specific level of run-off treatment over and above that of a standard pipe and gully system.

However, due to their traditional nature, the adoption of these types of systems by water companies is straightforward and does not require any specialist input. The pipes are generally available direct from suppliers with little or no lead time and the satisfactory long-term performance of these systems is well documented.

As there will not be any significant pipe runs as part of this development, it is unlikely oversized pipes will provide a suitable means of attenuation and as such they have not been explored further as part of this study.

3.6 Summary

The application of a SuDS based system needs to be considered as the primary measures for dealing with surface water for any proposals, these systems are the only ones that provide the required level of treatment.

Based on the proposed site layout and the existing topography, it is proposed that permeable paving could be utilised in the car park with filter strips, swales and plot raingardens used for attenuating surface water generated from the buildings and remaining hardstanding.

This type of system will not only provide the required attenuation for the site but will also improve water quality and help create amenity space by replacing some of the planters that would be lost as part of the development.

3.7 Design Example

To give some idea of the size of attenuation features that may be required and thus begin the process of integration, it is possible to provisionally size a typical feature at this stage based upon the assumptions discussed previously.

Due to the site layout and topographically it is currently proposed that surface water generated from the car park and pods be attenuated via permeable paving.

To provide an indication of size they have been modelled using the network module of Microdrainage, with a summary of the proposed attenuation systems provided below:

Permeable Paving 1.000

- Length = 22.0m
- Width = 5.0m
- Depth = 580mm

Permeable Paving 2.000

- Length = 23.0m
- Width = 5.0m
- Depth = 580mm

Permeable Paving 3.000

- Length = 12.0m
- Width = 4.8m
- Depth = 580mm

Permeable Paving 4.000

- Length = 46.0m
- Width = 4.2m
- Depth = 580mm

A full copy of the Microdrainage Calculations is included within Appendix K.

When simulations were run, there was no flooding for the system for the 1 in 100 plus 30% climate change event.

In accordance with Government Climate Change guidance for the Trent Valley a 40% climate change has also been applied for the 1 in 100-year storm. It was found that there was no flooding within the system.

With reference to water quality, the simple index approach can be used to assess the pre and post development pollution impacts. The pre-treatment pollution index (Table 26.2 and 26.3 from the CIRIA SuDS Manual) identified roof drainage to have the following pollution indices:

- Total Suspended Solids = 0.7
- Metals = 0.6
- Hydrocarbons = 0.7

A permeable paving and filter drain has a combined mitigation index as follows:

- Total Suspended Solids = 0.9
- Metals = 0.8
- Hydrocarbons = 0.9

As the mitigation indices is greater than the pollution indices it has been demonstrated that there is sufficient treatment within this system.

A drainage strategy drawing showing indicative locations of the planter has been included within Appendix L for reference.

3.8 Maintenance and remedial work

The CIRIA SuDS manual (C753) groups maintenance requirements into three categories:

- Regular maintenance.
- Occasional maintenance, and.
- Remedial maintenance.

Regular maintenance consists of the basic tasks that are carried out frequently and on a predictable schedule.

Occasional maintenance consists of tasks that are predictable but are not require a frequently as those falling under the regular maintenance.

Remedial maintenance is only required to rehabilitate the system when faults are identified during regular or occasional maintenance or pollution leads to contamination of the system.

3.8.1 Permeable Paving

To ensure a permeable paving system operates efficiently it is important to adopt a regular inspection and maintenance regime.

Prior to the system being handed over to the management team the contractor should inspect the permeable paving system for signs of clogging, litter, weeds, and any ponding of water with all defects being rectified. Following handover, the pavement should be inspected regularly, particularly after any periods of heavy rainfall.

Table 5 taken from the CIRIA SuDS manual highlights typical activities which should be included as part of any operation and maintenance regimes of permeable paving.

Table 5: Operation and maintenance requirements for permeable paving

Maintenance schedule	Required Action	Typical frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over the whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds (note, weed killer should be applied directly as opposed to spraying).	As required
Remedial Actions	Remediate any landscape which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting, cracked or broken blocks.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10-15 years (or as required)
Monitoring	Initial inspection	Monthly for three months after installation.
	Inspect for evidence of poor operation.	Three monthly (48hours after large storms)
	Inspect for silt accumulation.	Annually
	Monitor any inspection chambers	Annually

Source: CIRIA SuDS Manual (C753)

Foul Drainage

6.1 Proposed Outfall and Strategy

Foul drainage will discharge into the adopted foul sewer crossing the site (see Appendix L for Drainage Strategy).

This will need to be confirmed via a survey to establish depths and a pre app to the local water authority.

6.2 Foul Water Flow Rates

The current proposal is for five new holiday pods, laundry and WC block with associated parking and the resurfacing of the existing carpark.

Based on the current internal layouts and guidance in building regulations, a 100mm dia sewer at a gradient in 1 in 80 will be sufficient to accommodate any flows and maintain a self-cleansing velocity.

This will need to be hydraulically designed once the proposed level strategy, internal layouts and details of the existing sewer have been finalised.

6.3 Adoption and Maintenance

It is currently envisaged that the foul drainage system would remain private until the point it connects into the adopted sewer in Oscar Street. An application will need to be completed during the detailed design stage.

To ensure the effective operation of any drainage system it is important to undertake some key activities as part of a regular maintenance strategy. These have been briefly summarised below:

- Periodic desilting of any catch pits, gully sumps and linear drainage systems which should as a minimum be emptied as follows:
- On completion of the construction period.
 - Year 1
 - Year 3
 - Then every five years.
- Jetting and rodding of the pipework to ensure that there are no blockages.
- Remove of debris from the grates of gullies and channels.

It should be noted however that an annual inspection should take place with additional cleaning completed as required.

Appendix A – LLFA Response