

Kingsley Residential Development

DRAINAGE STRATEGY REPORT



Rennard Consulting Limited



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1.0 Introduction

Rennard Consulting Limited (RCL) was commissioned to carry out a drainage strategy for a new residential development at Kinglsey, Staffordshire.

The following report outlines the foul and surface water drainage strategy for the proposed development.

2.0 Information on the Existing Site and Proposed Development

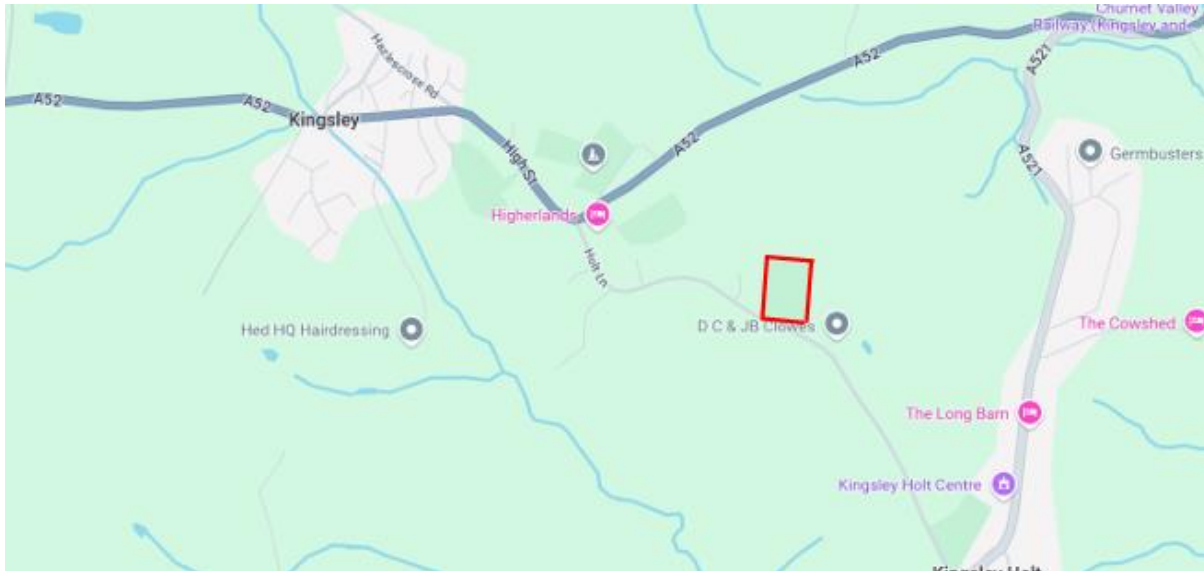
2.1 Existing Site

2.1.1 Site Location

The proposed site is located off Holt Lane, Kingsley, Staffordshire. The nearest postcode is ST10 2DY and the site is centred on National Grid Reference (NGR) 401640E, 346624N.

A site location plan is shown in Figure 1 below.

Figure 1: Site Location Plan



Source: Flood Risk Assessment Report

2.1.2 Site Description

The development is located on an undeveloped parcel of land on the edge of Kingsley, Staffordshire.

The site is bound by an existing residential development to the west, open fields to the north and east and Holt Lane and a small residential development to the south.

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

It shows that the site generally falls from north to south. The high point on the northern boundary is 205.430m AOD while on the southern boundary it is 201.76m AOD.

2.1.3 Existing Site Drainage

From looking at the topographical survey (Appendix A) there are no obvious manholes, gullies or drainage features which would indicate that the site is served by a positive drainage system.

Sewer Records were obtained from Severn Trent and are included in Appendix B. They show that there are no adopted sewers located within the site boundary. The closest sewer is a 150mm combined sewer that is located within Holt Lane to the south.

2.1.4 Existing Watercourse

There are no watercourses within the site boundary.

There is an unnamed watercourse located 456m to the south and another unnamed watercourse located 428m to the north. Both of these are located across third party land.

2.2 Proposed Development

Drawings showing the proposed development are included within Appendix C.

The proposal is for a new residential development, consisting of nine dwellings, a new access road plus associated landscaping and paving.

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.

Standard 1 of the National SuDS Standards highlight that runoff should be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, morphology and water quality of the receiving waters and associated ecology.

It states that runoff from a development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- Collected for non-potable use
- Infiltrated to ground
- Discharged to an above ground surface water body.
- Discharged to a surface water sewer or another piped surface water drainage system.
- Discharged to a combined 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 Collected for non-potable use

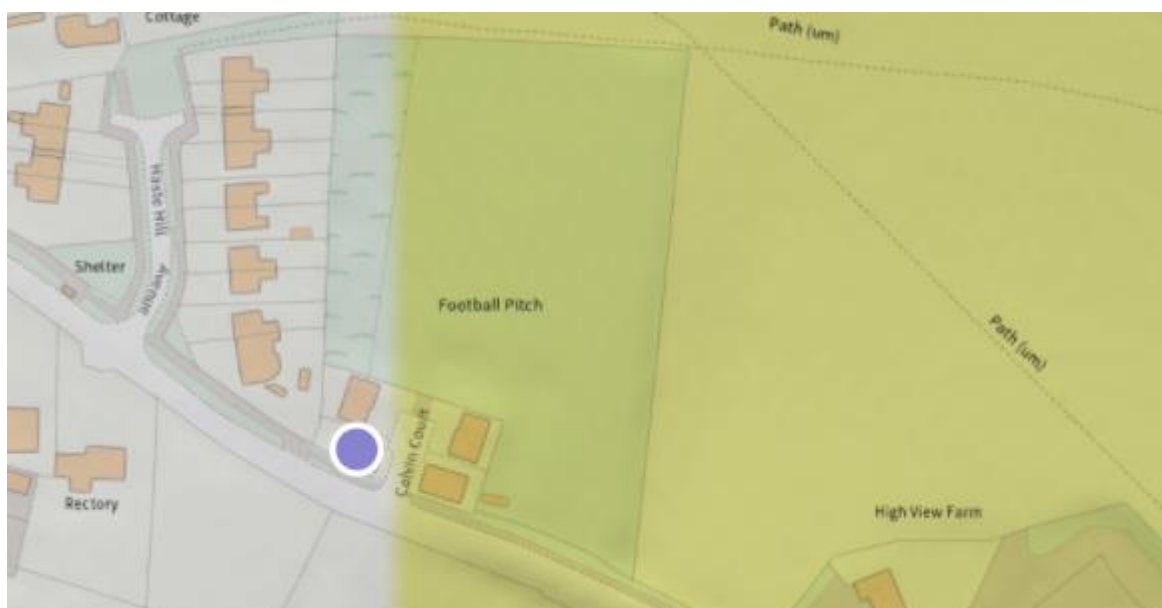
There could be an opportunity to utilise water butts on individual properties to collect water during rainfall events for reuse within the private gardens.

3.1.2 Infiltration Based Systems

At the time of writing a full Ground Investigation has not yet been completed.

From looking at the maps from the British Geological Society the bedrock geology for the site is divided into two key areas (Figure 2).

Figure 2: Extract from British Geological Maps



To the west is a small area of Pennine Lower Coal Measures Formation - Mudstone, siltstone and sandstone (shown in light grey on Figure 2). While to the east there is a band of Kingsley Sandstone (shown in yellow on Figure 2).

There are no superficial deposits recorded for the site.

A soakaway test was attempted with the ground contractor reporting poor rates after 3 hours. No information was provided on the dimensions or location of the hole and it would appear that the test was only attempted once.

Given the anticipated geology it is anticipated that infiltration might be possible for this site and further soakaway tests should be undertaken as part of a detailed ground investigation.

3.1.2 Watercourses

The site lies remote from any watercourses and as such this method of discharge has been discounted.

3.1.3 Adopted Sewers

There is a 150mm combined sewer located within Holt Lane to the south of the development. This could potentially provide a connection point should infiltration prove not to be viable.

3.1.4 Summary

While infiltration may be possible, in the absence of soakaway tests, a conservative design is will be developed with a positive connection into the combined sewer located within Holt Lane. To comply with the National SuDS Standards, water butts should be incorporated at a plot level.

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 1: Climate Change Allowance

Type	Return Period	Dove 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 8988m² and is entirely permeable.

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

- Building = 916m²
- Hardstanding = 1746m²

This provides a total proposed impermeable area of approximately 2662m².

A proposed impermeable area drawing is included within Appendix D.

3.4 Allowable Site Discharge

Based on the above, and in the absence of soakaway tests, the proposed method of discharge will conservatively be via a connection into the existing combined sewer located within Holt Lane.

As the site is previously undeveloped, the existing site discharge based on the proposed site area (2662m²) can be calculated using QBar as 1.4l/s (Appendix E).

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.

As such for the purpose of this report a discharge rate of 5l/s will be used which is the rate at which a 75mm orifice plate with discharge for the 1 in 100 40CC event.

This rate will need to be agreed with Severn Trent as part of a Pre App.

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 E.

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 = 0.357
- Return Period = 1 in 100
- Climate Change Factor = 30%

A summary of the results is included in Table 2 below.

Table 2: Preliminary Attenuation Calculations

	Impermeable Area (ha)	Unrestricted Discharge (l/s)	Flow Restriction (l/s)	Attenuation Volume (1 in 100 +30) (m ³)
Whole Site	0.266	37	5	107.2

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 H.

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 3 below for reference.

Table 3: 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 residential sector, they can also increase construction and maintenance costs. The current roofing plan which is shown on the proposed layout (Appendix G) shows a pitched roof. 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.

Due to the topography, along with the proximity and level difference to the neighbouring development, there is limited opportunity for the incorporation of a pond on the site. As such its use has been discounted for the purpose of this study.

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.

There could be some opportunity to incorporate filter strips and swales adjacent to the proposed road. This would provide conveyance opportunities along with benefits in water quality, amenity and biodiversity.

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 by disconnecting downpipes into raised systems. This would not only meet attenuation requirements but would also improve water quality and enhance amenity spaces.

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.

There are a number of proposed accessways and driveways which could be utilised as permeable paving systems. This would not only meet the attenuation requirements but also provide water quality benefits.

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.

Due to the constrained nature of the site and the level difference with the neighbouring development, there is limited opportunity to store any significant volumes of surface water at surface for attenuation purposes and as such this has been discounted for the purpose of this project.

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, the existing topography it is proposed that surface water generated from the site is attenuated by a combination of an unlined permeable paving system which will drain the surface water generated by the highway and cellular storage unit to take surface water generated from the properties themselves. This will discharge at 5l/s into the existing combined water network. This will need to be agreed via a pre application to Severn Trent.

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 proposed that surface water generated from the site is attenuated by a combination of an unlined permeable paving system which will drain the surface water generated by the highway and cellular storage unit to take surface water generated from the properties themselves. This will discharge at 5l/s into the existing combined water network.

In accordance with Staffordshire County Council guidance an Urban Creep Value of 10% has been applied to the design, to ensure that the proposed system can account for any increase in impermeable area.

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:

- Cellular Storage System
 - Length = 55m
 - Width = 2.5m
 - Depth = 0.8m
 - Cover = 0.6m
 - Slope = 1 in 100
- Permeable Paving
 - Area = 390m²
 - Depth = 550mm
 - Slope = 1 in 150

A full copy of the InfoDrainage Calculations is included within Appendix H.

While not currently modelled, there could be an opportunity to provide additional attenuation in the form of plot permeable paving on individual properties and linear raingardens adjacent to the highway. This should be explored with the client as the design progresses and as more information becomes available.

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, a 40% climate change has also been applied for the 1 in 100-year storm. It found that there was no flooding in any part of the system.

A drainage strategy drawing showing has been included within Appendix I for reference.

With reference to water quality, the simple index method can be used in accordance with the CIRIA SuDS Manual. Using Table 26.2 the risk of pollution is deemed low with pollution hazard indices for individual driveways and low traffic roads can be taken as follows:

- Total Suspended Solids = 0.5
- Metals = 0.4
- Hydrocarbons = 0.4

The mitigation indices for a permeable paving system can be taken form Table 26.3 as follows:

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

As the mitigation indices is greater than the pollution indices it demonstrates that the design provides sufficient treatment for the expected level of pollution.

A copy of the Drainage Strategy Drawing is included within Appendix I.

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.

It is understood that the system will be private and as such maintenance will be the responsibility of the site owner.

3.8.1 Cellular Storage

Cellular Storage will require regular maintenance to ensure that they continue to operate efficiently and as designed.

Typical activities would include regular inspection of silt traps, manholes, pipework, and any pre-treatment devices, with the removal of debris and silt as required.

The site is currently quite constrained and as such the cellular storage has been sited within the proposed courtyard which is the only area of open space serving the site. Discussions with chosen manufacturer should take place prior to detailed design to ensure that the system can be maintained within this location and if not, an alternative location should be identified.

3.8.2 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 4 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 4: 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)

4.0 Foul Drainage

4.1 Proposed Outfall and Strategy

Foul drainage will discharge into the adopted foul sewer located in Holt Lane to the south of the site (see Appendix I for Drainage Strategy).

This will need to be agreed via a pre app with Severn Trent.

4.2 Foul Water Flow Rates

The current proposal is for a 9 residential unit with associated landscaping.

Foul drainage from the site should be drained by an entirely separate system and it is currently proposed that discharge will be into the adopted combined sewer to the south of the site in Holt Lane (see Appendix B for Sewer Records and Appendix I for drainage strategy).

As the scheme is currently under development and the final internal layouts are still to be confirmed, the current system has been sized in accordance with the Design and Construction Guidance taking the peak flow rate as 4000 litres per dwelling per day (or 0.05l/s per dwelling). The minimum size for gravity foul sewers has been taken as:

- 100mm nominal internal diameter for ten properties or less; or
- 150mm nominal internal diameter for more than ten properties.

Where possible the design should ensure that a self-cleansing velocity of 0.75m/s has been achieved. Where this requirement cannot be met, then the criteria has been considered satisfied in accordance with the Design and Construction Guidance when:

- a 150 mm nominal internal diameter gravity sewer is laid to a gradient not flatter than 1:150 where there are at least ten dwelling units connected; or
- a sewer or lateral drain with a nominal internal diameter of 100 mm, or a lateral drain serving ten or less properties is laid to a gradient not flatter than 1:80, where there is at least one WC connected and 1:40 if there is no WC connected.

A copy of the foul calculations is included within Appendix J for reference.

4.3 Adoption and Maintenance

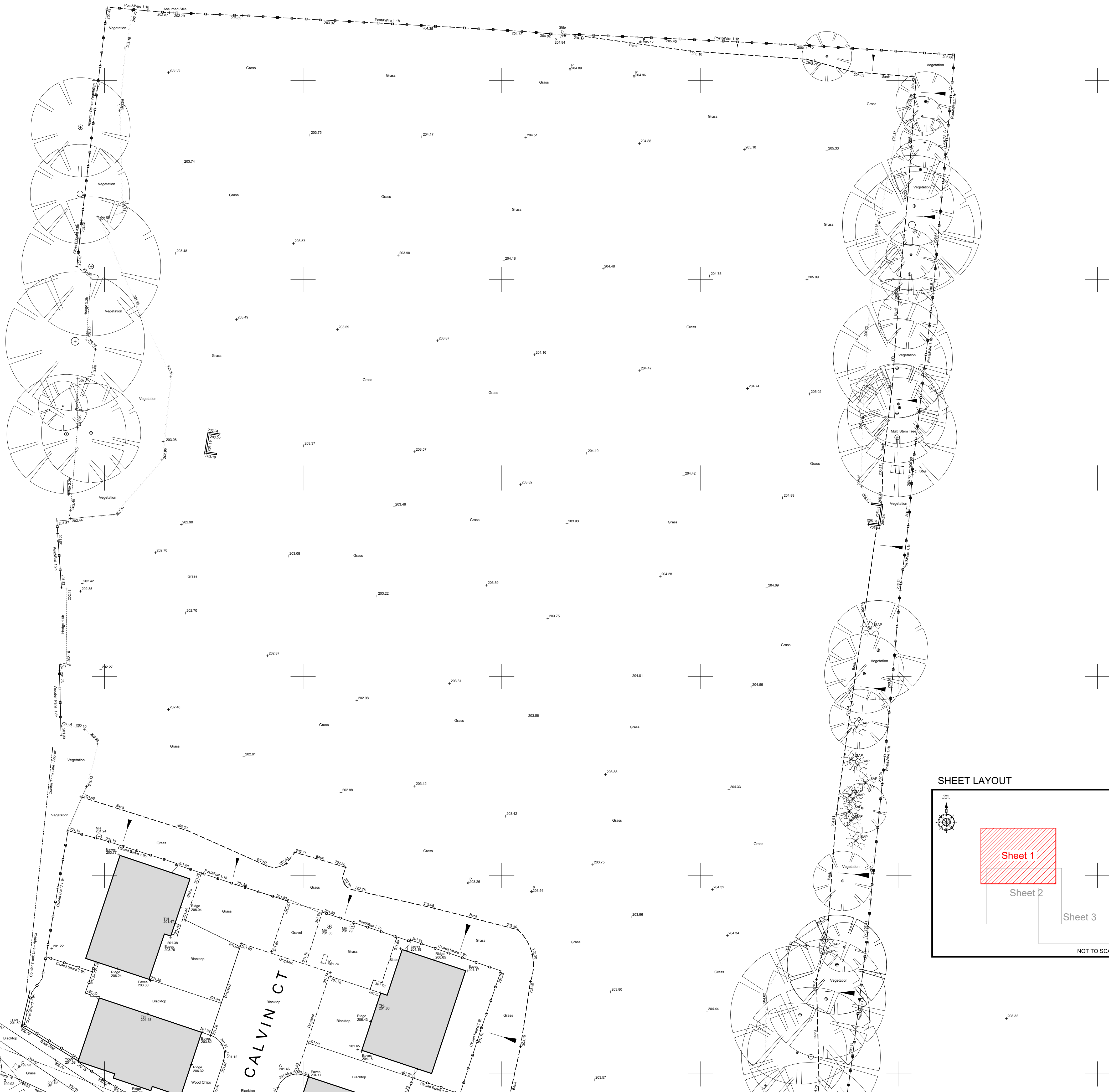
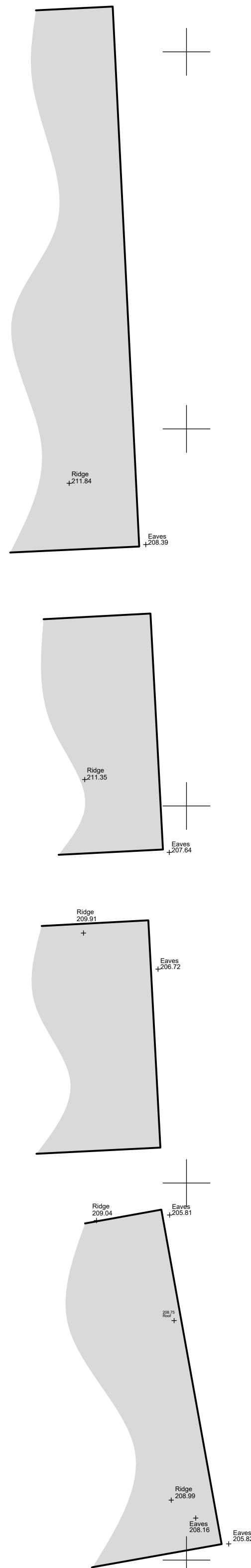
It is currently envisaged that the foul drainage system would remain private until the point it connects into the adopted sewer in Picadilly Street. An S106 application to Severn Trent will need to be completed during the detailed design stage.

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:

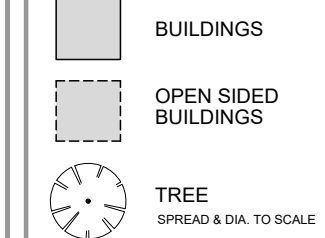
- Periodic desilting of any catch pits, gully sumps and linear drainage systems which should as a minimum be emptied as follows:
- On completion of the construction period.
 - Year 1
 - Year 3
 - Then every five years.
- Jetting and rodding of the pipework to ensure that there are no blockages.
- Remove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

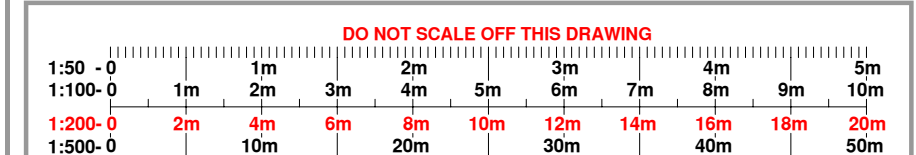
Appendix A – Topographical Survey



AC	AIR CONDITIONING UNIT	LP	LAMP POST
AB	BOLLARD	MKR	MARKER POST
BD	BELISHA BEACON	MHC	MANHOLE
BED	BED LEVEL	OH	OVERHEAD CABLE
BH	BOREHOLE (WITH No.)	PH	PARKING METER
BS	BUS STOP	P	POST
BT	BRITISH TELECOM COVER	RE	RODDING EYE
CATV	CABLE TELEVISION COVER	RS	ROAD SIGN
CC	CC CONTROL CABINET	RSL	RETAINING WALL
CD	COVERED LEVEL (MANHOLE)	SA	SANITARY
COL	COLUMN	SCAM	SECURITY CAMERA
CP	CATCH PIT	SG	STRIP GULLY
DP	RAIN WATER DOWN PIPE	SP	SIGN POST
EC	ELECTRIC CABLE	SV	SIGN VALVE
EG	ELECTRIC COVER	WATER	WATER
EP	ELECTRIC POLE	TCH	TELEPHONE CALL BACK
ER	EARTH ROD	THB	THRESHOLD LEVEL
FFL	FINISHED FLOOR LEVEL	TL	TRAFFIC LIGHT
FL	FIRE HYDRANT	TOP	TOP OF FENCE LEVEL
FT	FLOOD LIGHT	TOW	TOP OF WALL LEVEL
G	GULLY	TP	TELEGRAPH POLE
GP	GATE POST	TPIT	TRIAL PIT (WITH No)
GV	GAS VALVE	VP	VENT PIPE
IC	INSPECTION CHAMBER	WLV	WATER LEVEL
INVERT	INVERT	WM	WATER METER
KO	KERB OUTLET	WO	WASH OUT
LB	LITTER BIN		



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- All underground features have been measured from the surface, therefore pipe sizes, depths etc. are only an estimate or assumption. If dimensions are critical information must be checked and verified prior to work commencing.
- Whilst every effort has been made to locate all physical features during the survey no responsibility can be taken for features that are obscured or hidden at the time of survey. This is especially important where high volumes of plant or vehicles are present on site.
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- All critical dimensions including levels should be checked prior to construction. Any errors or discrepancies should be reported immediately.
- All measurements have been taken from ground level only.
- Do not scale from this drawing.
- Tree Information



Client: **Byatt Oliver Ltd**

Project:

Former Football Pitches
Holt Lane
Kingsley Holt

Drawing Title:

Topographical Survey

Rev. Description		Surveyed		Approved		Date	
Surveyor: VM		Checked By: AJS		Approved By: ART		Date of Survey: 11/04/24	
						Date of Issue: 12/04/24	
Drawing Status: FINAL		Scale: 1:200		Paper Size: A1		Sheet No: 1 of 3	
Project No: RBS - 24/3717		Drawing No: RBS - 24/3717/001				Revision: -	



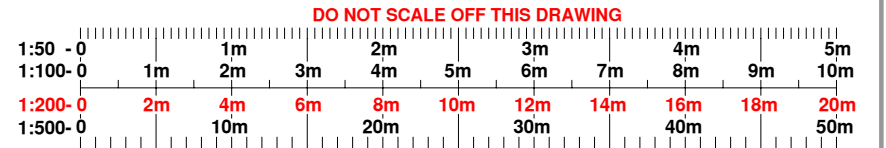
Topographical Survey Abbreviations			
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BB	BELISHA BEACON	MH	MANHOLE
BED	BED LEVEL	OHC	OVERHEAD CABLE
BH	BOREHOLE (WITH No.)	PM	PARKING METER
BS	BUS STOP	P	POST
BT	BRITISH TELECOM COVER	RE	RODDING EYE
CATV	CABLE TELEVISION COVER	RS	ROAD SIGN
CC	CONTROL CABINET	RWL	RETAINING WALL
CL	COVER LEVEL (MANHOLE)	SA	SOAK AWAY
COL	COLUMN	SCAM	SECURITY CAMERA
CP	CATCH PIT	SG	STRIP GULLY
DP	RAIN WATER DOWN PIPE	SP	SIGN POST
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EL	ELECTRIC COVER	TAP	WATER TAP
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FH	FIRE HYDRANT	TOF	TOP OF FENCE LEVEL
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GV	GAS VALVE	VP	VENT PIPE
IC	INSPECTION CHAMBER	WLV	WATER LEVEL
IL	INVERT LEVEL	WM	WATER METER
KO	KERB OUTLET	WO	WASH OUT
LB	LITTER BIN		

BUILDINGS

OPEN SIDED BUILDINGS

TREE
SPREAD & DIA. TO SCALE

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 - All measurements have been taken from ground level only.
 - Do not scale from this drawing.
 - Tree Information
 - Trunk Diameters are measured where possible at approximately 1.5m above ground.
 - Tree Spreads are indicative only and are representative of the generalised canopy size, and therefore may not represent the true canopy position as outlined on site. Tree boles may also not sit centrally to the canopy.
 - Where tree heights are shown they are an approximate height to the top of the canopy and are an estimation from ground level.
 - Attention should be paid to the original survey brief as to which trees have actually been surveyed, i.e. Only Trees larger than "X"mm diameter, or Only Trees within the site.



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21 MARKET SQUARE
SANDBACH
CHESHIRE
CW11 1AT
TEL: 0800 024 8052
WEB: WWW.REDBOXSURVEYS.CO.UK
EMAIL: INFO@REDBOXSURVEYS.CO.UK

Client:

Byatt Oliver Ltd

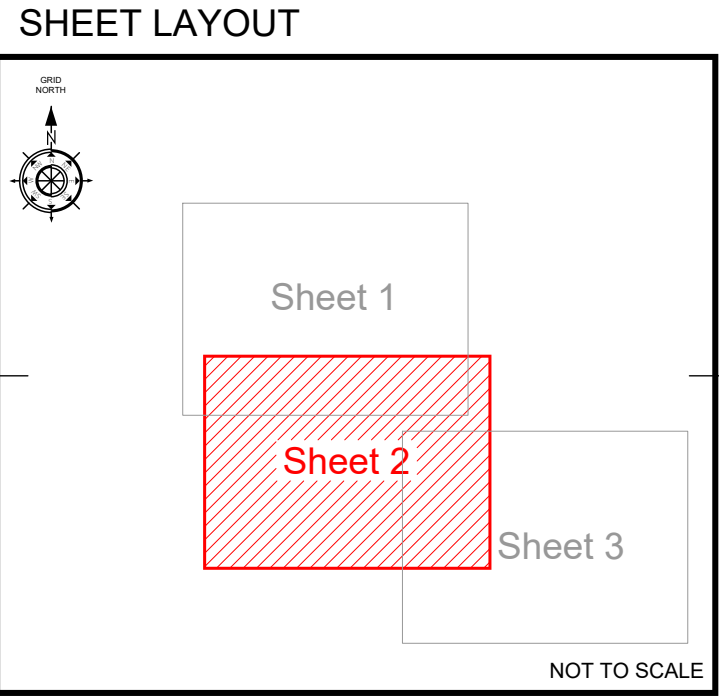
Project:

Former Football Pitches
Holt Lane
Kingsley Holt

Drawing Title:

Topographical Survey

Rev.	Description	Surveyed	Approved	Date
Surveyor:	Checked By:	Approved By:	Date of Survey:	Date of Issue:
VM	AJS	ART	11/04/24	12/04/24
Drawing Status:	Scale:	Paper Size:	Sheet No:	
FINAL	1:200	A1	2 of 3	
Project No:	Drawing No:	Revision:		
RBS - 24/3717	RBS - 24/3717/001	-		





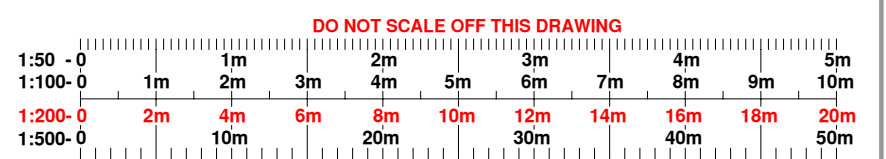
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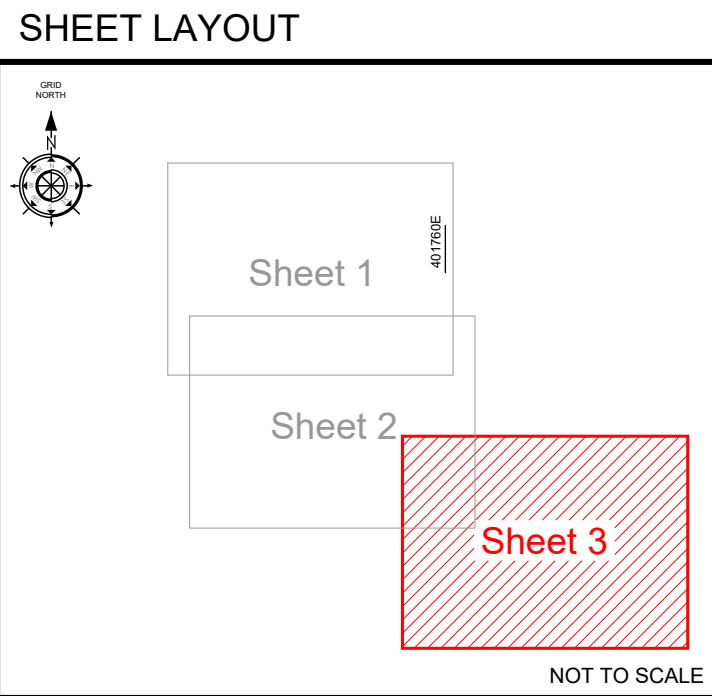
Project:

Former Football Pitches
Holt Lane
Kingsley Holt

Drawing Title:

Topographical Survey

Rev.	Description	Surveyed	Approved	Date
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3	Date			
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FINAL	1:200	A1	3 of 3	
Project No:	Drawing No:	Revision:		
RBS - 24/3717	RBS - 24/3717/001	-		



Appendix B – Sewer Records



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Date: 21/10/25

Scale: 1:1000

Map Centre: 401645,346595

Data updated: 14/10/25

Our Ref: 1916055 - 1

Wastewater Plan A2
Powered by digdat

Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. ©Crown Copyright and database rights 2025. All rights reserved. Ordnance Survey licence number AC0000808122. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

Public Foul Gravity/Lateral Drain		Highway Drain		Manhole Foul	
Public Combined Gravity/Lateral Drain		Overflow Pipe		Manhole Surface	
Public Surface Water Gravity/Lateral Drain		Disposal Pipe		Abandoned Pipe	
Pressure Foul		Culverted Water Course		Chamber	
Pressure Combined		Pumping Station		Section 104 sewers are shown in green	
Pressure Surface Water		Fitting		Private sewers are shown in magenta	

faye.gennard@rennardconsulting.co.uk

Kingsley Holt





GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

- a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as “STW Apparatus” in these general conditions and precautions.
- b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.
- c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.
- d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.
- e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).
- f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.
2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).
3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.
4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.
5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.
6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.
7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.
8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.
9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.
10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.
11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.
12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.
13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,
14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.
16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.
17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May2014
18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.
19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Appendix C – Proposed Development

[illegible]

Appendix D – Proposed Impermeable Area