Waterfront Square Reading

Drainage Strategy

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1.0 Introduction & Executive Summary

Hexa Consulting have been commissioned by Packaged Living Ltd to undertake a Drainage Strategy for a proposed new residential development (the "Development") at Waterfront Square, Reading RG1 8DA (the "Site").

The Site lies within the district of Reading Borough Council as Local Planning Authority (LPA) and Lead Local Flood Authority (LLFA) and Thames Water as Water and Sewerage Company. The Site is not within the catchment of an Internal Drainage Board (IDB).

The existing Site is occupied by a commercial building located approximately centrally, a surface level car park to the south and an area of open space to the north. The River Thames abuts the site to the north, with the public highways of Norman Place and Vastern Road to the western and southern boundaries, respectively. To the east is the Thames Water headquarters. A topographic survey is contained in **Appendix A**.

The proposal for the Development is the Demolition of the former Covea Insurance building and construction of residential-led development, access from Norman Place and associated car parking, infrastructure and landscaping. Development proposals are contained in **Appendix B**.

Sustainable Drainage Systems (SuDS) are proposed for the management of surface water runoff in accordance with local and national guidance. Surface water discharge is proposed to be restricted to a achieve at least 50% betterment compared to the existing conditions and to discharge to the culverted watercourse along the southern boundary of the Site. SuDS are proposed to manage runoff rate and volume, as well as providing water quality, biodiversity and amenity benefits.

The culverted watercourse will need to be retained in its current position in perpetuity. A piled foundation solution will result in all loads being taken below the lowest level of the culverted watercourse and no additional loading will be placed on the structure.

Thames Water have advised that there are no legal easements associated with the sewer in Norman Place and that a formal build over agreement can be entered into for building close to the sewer.

Foul water is proposed to be managed and disposed of to the Thames Water public foul sewer.

Thames Water have confirmed that there is sufficient capacity within the public foul sewerage network to accept flows from the Development.

In addition to the above, this report also provides:

- Outline drainage drawings.
- Summary hydraulic calculations.
- An assessment of SuDS features and a description of their inclusion in the design scheme.
- An assessment of water quality and demonstration of the inclusion of SuDS to meet the water quality requirements.
- Outline operation and maintenance strategy for SuDS features.

The drainage strategy presented complies with Policy EN18 (Flooding and Sustainable Drainage Systems) of the Reading Borough Local Plan 2019.

2.0 Drainage Strategy

2.1 Existing Drainage

The existing Site is served by formal drainage systems for surface and foul water. The Site drains surface water to a culverted watercourse adjacent to Vastern Road and foul water to the Thames Water public foul sewer within Norman Place.

Surveys have been undertaken at the Site to confirm positive discharges of surface and foul water to the culverted watercourse and the Thames Water public foul sewer, respectively. These surveys include a topographic survey (**Appendix A**), a buried services survey (**Appendix C**), and a CCTV drainage survey (**Appendix D**).

Rainwater pipes are evident on all elevations of the commercial building and surface water gullies and linear drains are present within the external hardstanding. These connect to private drains within the Site, which then connect to the culverted watercourse, which lies between the car park and the edge of footway of Vastern Road.

The pre-development brownfield discharge rate contributing to the culverted watercourse has been calculated as 52.4 l/s based on a positively drained roof and hardstanding area of 3,770m2 using the modified rational method. See the calculation below.

$$Q = 2.78 \times 0.377\text{ha} \times 50\text{mm/hr} = \underline{52.4\ \text{l/s}}$$

The culverted watercourse runs alongside Vastern Road from a point approximately 750m northeast of the Site at Richfield Avenue and continues almost parallel to Vastern Road, passing under George Street approximately 100m southwest of the Site. The culvert structure appears to be a concrete box section along the Site boundary.

To date, the information received pertaining to the culverted watercourse consists of the following:

- Thames Water public sewer records (ref: ALS/ALS Standard/2023_4830743, received 22/05/2023) illustrate the presence of a culverted watercourse to the northern side of Vastern Road (**Appendix E**). The records do not provide any indication of depth, size, or material composition.
- Survey Solutions Topographic survey (ref: 60390BDLS-01, received 30/08/2023) illustrates manhole covers within Norman Place, at least one of which appears to correspond to the culverted watercourse.
- Survey Solutions GPR survey (ref: 60390BWUG-01, received 19/09/2023) illustrates a culverted watercourse. This is an assumed route based on the Thames Water sewer records and multiple traced incoming connections towards the suspected line of the culverted watercourse.
- Survey Solutions CCTV survey (ref: 60390CCTV-01, received 19/06/2023) illustrates video footage and photographs of the culverted watercourse from connecting drainage pipes.
- Email from Reading Borough Council Highways (received 18/10/2023) confirms the presence of a culverted watercourse and that the section directly beneath Norman Place is a concrete box culvert with an internal width of approximately 3m (**Appendix F**). There is no information beyond the highway extent, however confirmation has been

provided that the culverted watercourse continues almost parallel to Vastern Road along the site.

- Omnia Consulting intrusive investigation (ref: B11101, received 19/12/2023) indicates an extensive concrete slab overlying the suspected route of the culverted watercourse and extending into the existing car park within the site (**Appendix G**).

The culverted watercourse will need to be retained in its current position in perpetuity. A piled foundation solution will result in all loads being taken below the lowest level of the culverted watercourse and no additional loading will be placed on the structure.

The Thames Water public foul sewer flows from Norman Place to meet with the wider public sewer network in Vastern Road. The sewer measures 150mm diameter within Norman Place and becomes 300mm in Vastern Road.

Thames Water have advised that there are no legal easements associated with the sewer in Norman Place and that a formal build over agreement can be entered into for building close to the sewer. As with the culverted watercourse, the piled foundation solution will result in all loads being taken below the lowest level of sewer and no additional loading will be placed on the sewer.

2.2 Foul Water Drainage Strategy

Foul water is proposed to discharge to the existing Thames Water public foul sewer within Norman Place. Existing connections to the sewer are proposed to be retained wherever practicable.

Thames Water have responded to a Pre-Planning Sewerage Enquiry (**Appendix E**) and have confirmed that there is sufficient capacity within the public foul sewerage network to accept flows from the Development.

The majority of foul effluent will be of a domestic nature (from toilets, showers, wash hand basins etc), which requires no treatment prior to entering the Thames Water public foul sewer.

Any proposals for restaurants or commercial food preparation within the Development will likely result in elevated amounts of fat and grease (in comparison to normal domestic waste) being disposed of through the new foul drainage system. As such, there would be a requirement for suitably sized fat and grease traps to be included within the drainage system. If these are required, it is suggested that these are located above ground level to provide easy access for inspection, emptying and maintenance.

The foul water drainage proposals are illustrated in the drawings within **Appendix H**.

2.3 Surface Water Drainage Strategy

In accordance with the Building Regulations Approved Document H and the DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems, disposal options for surface water are required to be investigated in the following hierarchy of sustainability:

- Infiltration of collected surface water to ground.
- Disposal to a watercourse or waterbody.
- Disposal to a surface water sewer, highway drain or other drain.
- Disposal to a combined sewer.

Infiltration should only be considered a viable method of surface water disposal if:

- The soil permeability has the capacity to accept surface water flows.
- There are no geotechnical risks of infiltrating surface water (such as dissolution of soluble rocks, running sands, undermining of foundations etc).
- That there is at least 1m depth of unsaturated soil between the winter groundwater table and the underside of an infiltration system.

A ground investigation at the Site has not yet been undertaken. In lieu of a Site specific investigation, nearby British Geological Survey (BGS) borehole records have been interrogated, which demonstrate the following:

- Made ground to approximately 1.8m below ground level.
- Clay superficial deposits below this to approximately 2.4-3.4m below ground level.
- Sand and gravel below this to approximately 10m below ground level.
- Water strikes with groundwater rising to the underside of the clay deposits.

The above suggests that the shallow soils will be essentially impermeable. The more permeable deposits below appear to be allowing lateral and upward migration of groundwater and may be closely linked to the level of the nearby River Thames. As such, infiltration is not considered to be a viable option for the disposal of surface water.

A culverted watercourse is present along the southern boundary of the Site. The existing surface water drainage system connects to the culverted watercourse and this philosophy will be retained for the Development. The existing connection point to the culverted watercourse is proposed to be retained.

As a viable method of disposal is presented above, disposal to all other receptors does not require investigation.

Surface water discharge will be restricted to a maximum rate of 8l/s for the design storm events.

The restriction to the discharge rate has been calculated by providing at least 50% betterment to the pre-development 1 in 1 year discharge rate (using the Modified Rational Method) based on a catchment area of 0.377ha and controlling the discharge volume, as discussed below.

The surface water drainage proposals are illustrated in the drawings within **Appendix H**.

2.3.1 Hydraulic Design

A new surface water drainage system will be required to comply with current legislation and building control standards, including the following hydraulic standards:

- No surcharge of the proposed drainage system should be experienced during storms up to and including 1 in 2 year return period (50% AEP). Exceptions should be made for the flow control chamber.
- No flooding should be experienced during storms up to and including 1 in 30 year return period (3.33% AEP) plus an allowance for climate change.
- Any flooding should be contained within the Site for storms in excess of 1 in 30 year return period up to and including 1 in 100 year return period (1% AEP) plus an allowance for climate change.

Climate change allowance for peak rainfall intensity over the lifetime of new development at the site is 40% for 1% AEP storms.

The proposed surface water drainage system will serve a total catchment of 4,800m^2. Controlling runoff to the above restricted discharge rate for the most onerous design storm return period, using an efficient vortex flow control device, requires approximately 210m^3 of attenuation volume, which is proposed to be provided within cellular storage, rain gardens, permeable paving sub-base and the piped surface water drainage network.

In accordance with the Non-Statutory Technical Standards for SuDS, the runoff volume for the post-development 1 in 100 year, 6 hour rainfall event should be constrained to not exceed the pre-development greenfield runoff volume for the same event and the same contributing area. Where this cannot be achieved, the runoff volume should never exceed the runoff volume from the development site prior to redevelopment for that event.

Hydraulic calculations have been undertaken, demonstrating that the post-development 1 in 100 year, 6 hour rainfall event runoff volume would be 169m^3 (Appendix I). This is the volume of surface water runoff that would leave the Site using the restricted discharge rate. The same event under equivalent pre-development conditions results in a runoff volume of 172m^3.

Pre-development discharge

Site Makeup	Brownfield
Brownfield Method	MRM
Contributing Area (ha)	0.377
PIMP (%)	100
CV	0.840
Return Period (years)	100
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.840
Runoff Volume (m^3)	172

Figure 2-1: Pre-development brownfield runoff volume

Hydraulic calculations are contained in **Appendix I**.

2.3.2 SuDS Management Train

The overarching aim of SuDS is to encourage and mimic natural processes for the disposal of surface water. This is further subdivided into the four pillars of SuDS:

- Reduce flood risk through reducing the quantity of disposed water.
- Improve the quality of disposed water to improve watercourse, waterbody, and groundwater quality.
- Provide increased biodiversity benefits.
- Provide amenity benefits.

Source control (the control of surface water as close to the source as possible) is also encouraged to avoid reliance on a single SuDS feature, to slow the flow and to improve awareness of a drainage system, which will help to identify maintenance requirements.

Site control (the control of surface water at the interface between a site and a receptor) is required for final discharges. Traditionally, these features tended to be large and heavily

engineered, however a shift towards SuDS will almost always reduce the size, complexity, and costs of end of pipe systems.

A SuDS management train should seek to adhere to the four pillars of SuDS using source control features prior to final flow restriction at site control features.

Source control features have been assessed specifically for this Development. Potential options are presented in Table 2-1 and discussed in further detail below.

Table 2-1: Assessment of SuDS features

Feature	Reduced runoff volume & velocity	Improved water quality	Improved biodiversity	Improved amenity	Inclusion in design scheme
Rainwater harvesting	✓			✓	Active rainwater harvesting should be investigated and included depending on water demand and viability.
Blue/green roofs	✓	✓	✓	✓	Green roofs are proposed over much of the new Development roofs.
Bioretention rain gardens	✓	✓	✓	✓	Rain gardens are proposed to collect surface water runoff from hardstanding.
Tree pits	✓	✓	✓	✓	Tree pits could be used for attenuation volume, reduced runoff volume, improved biodiversity and improved amenity value.
Filter strips	✓	✓	✓		Filter strips are not considered suitable for this Development due to the minimal number of roads.
Filter drains	✓	✓	✓		Filter drains would be included beneath permeable surfaces and rain gardens to enable conveyance of surface water runoff.
Swales	✓	✓	✓	✓	There are no suitable areas for the provision of swales within the Development.
Permeable pavement	✓	✓		✓	Permeable pavement could be provided to lightly trafficked or pedestrianised areas. Permeable sub-base can provide attenuation and water quality benefits.
Basin/pond	✓	✓	✓	✓	Basins and ponds cannot be accommodated due to spatial constraints.
Attenuation storage tanks	✓				Attenuation storage tanks will be required to provide the attenuation requirement resulting from restricting the discharge rate.
Flow control	✓				A flow control device will be required to control runoff rate and volume. A vortex flow control device is considered the most suitable for this Development.

Rainwater harvesting

The communal nature of the Development and the open space, coupled with the large roof area means that rainwater butts will not be an effective means of rainwater harvesting.

Active rainwater harvesting systems should be investigated and included, depending on water demand and viability. Rainwater harvesting systems can be integrally linked to blue green roofs and attenuation storage to minimise the volume of water discharging off Site receptors.

Green roofs

Green roofs provide high-quality amenity benefit in their thermal insulation properties as well as being visually attractive. Green roofs can be extensive (shallow depth planting and soil substrate) or intensive (deeper soil substrate and larger/taller planting), both of which provide biodiversity benefits by providing habitats for invertebrates. The filtration of surface water through the planting and soil substrate will provide improved runoff water quality.

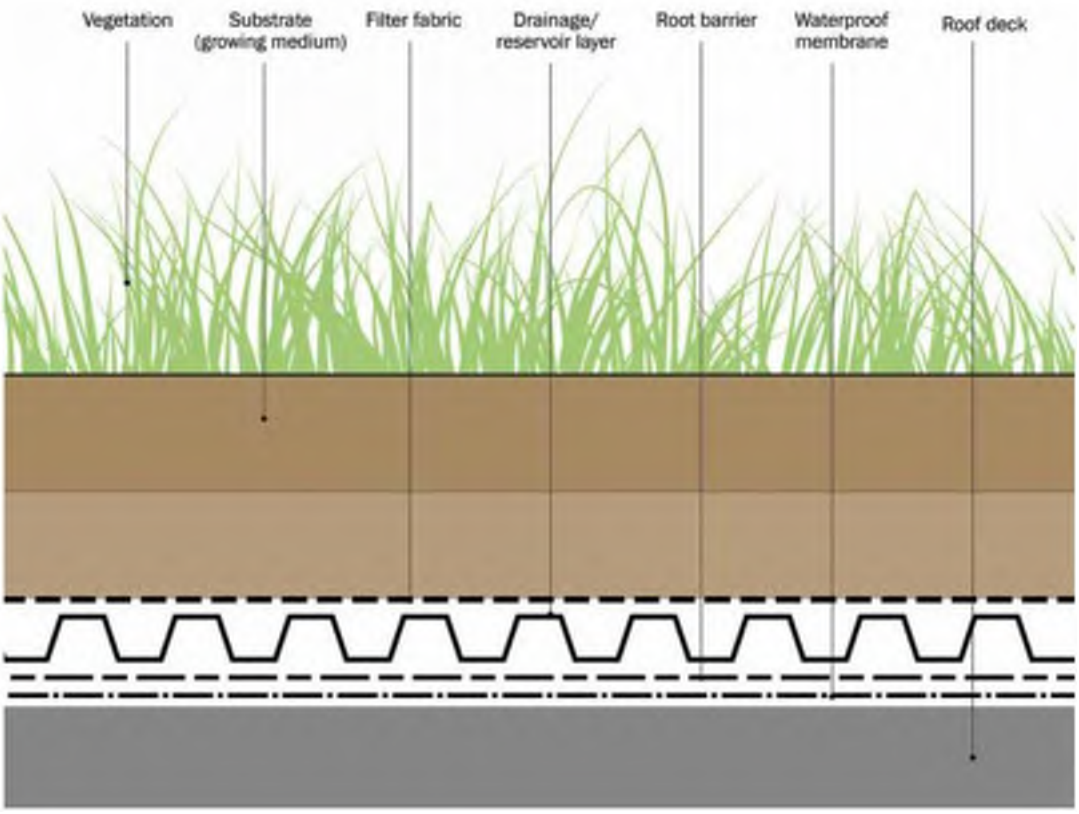


Figure 2-2: Section showing typical extensive green roof components (courtesy of The SuDS Manual CIRIA C753)

Bioretention rain gardens

Bioretention rain gardens are planted areas that enable surface water runoff to be collected and filtered through a planting and soil substrate prior to being conveyed to the wider drainage system. Passing water through a bioretention rain garden encourages the uptake of water by vegetation roots and evapotranspiration, as well as filtering out potential contaminants that have been mobilised from rainwater landing on engineered surfaces.

Bioretention rain gardens are proposed at surface level and will include an underdrain to dispose of excess water to the wider drainage system. The underdrain also allows backflow of surface water to enable these features to be used for attenuation in extreme storm events.

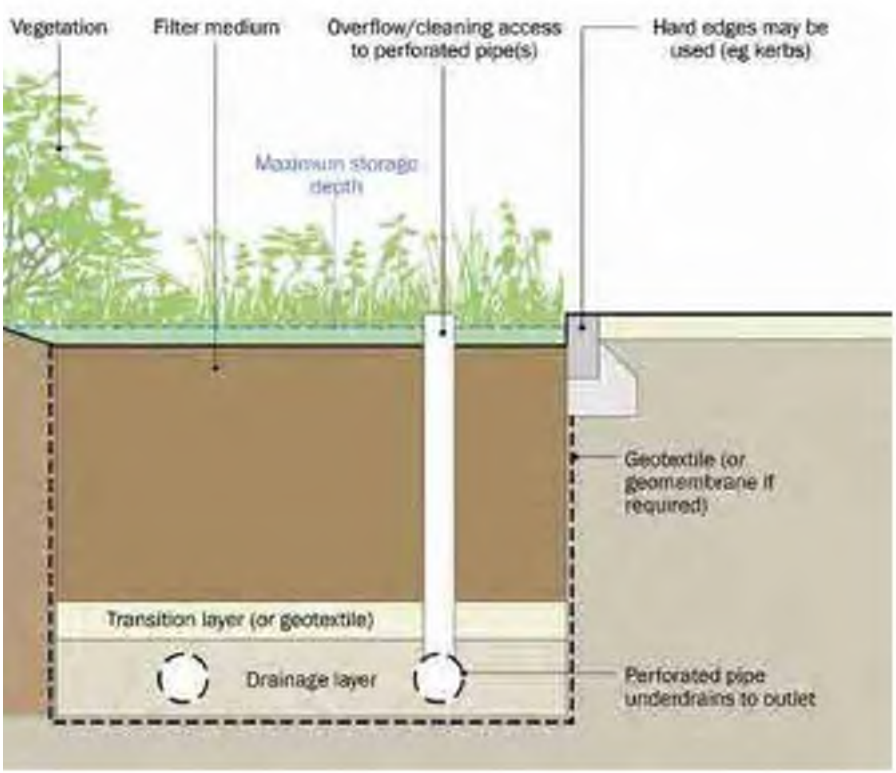


Figure 2-3: Typical bioretention rain garden (courtesy of The SuDS Manual CIRIA C753)

Bioretention rain gardens provide biodiversity benefits by providing habitats for invertebrates, and the planting scheme should be visually pleasing. Planting advice for these features should be sought from a landscape architect.

Tree pits

Tree pits can contain a large volume of aerated soil to enable the passage of water and air to the root system. The aerated nature of the soil provides capacity for surface water to pass through and be stored without impacting the tree requirements. Passing water through a tree pit encourages the uptake of water by roots and evapotranspiration, as well as filtering out potential contaminants that have been mobilised from rainwater landing on engineered surfaces.

Tree pits can include an underdrain to dispose of excess water to the wider drainage system and can include voided cellular storage units to increase the water attenuation capacity. The underdrain also allows backflow of surface water to enable these features to be used for attenuation in extreme storm events. Trees, in their very nature, provide high biodiversity and amenity benefits. Planting advice for these features should be sought from a landscape architect.

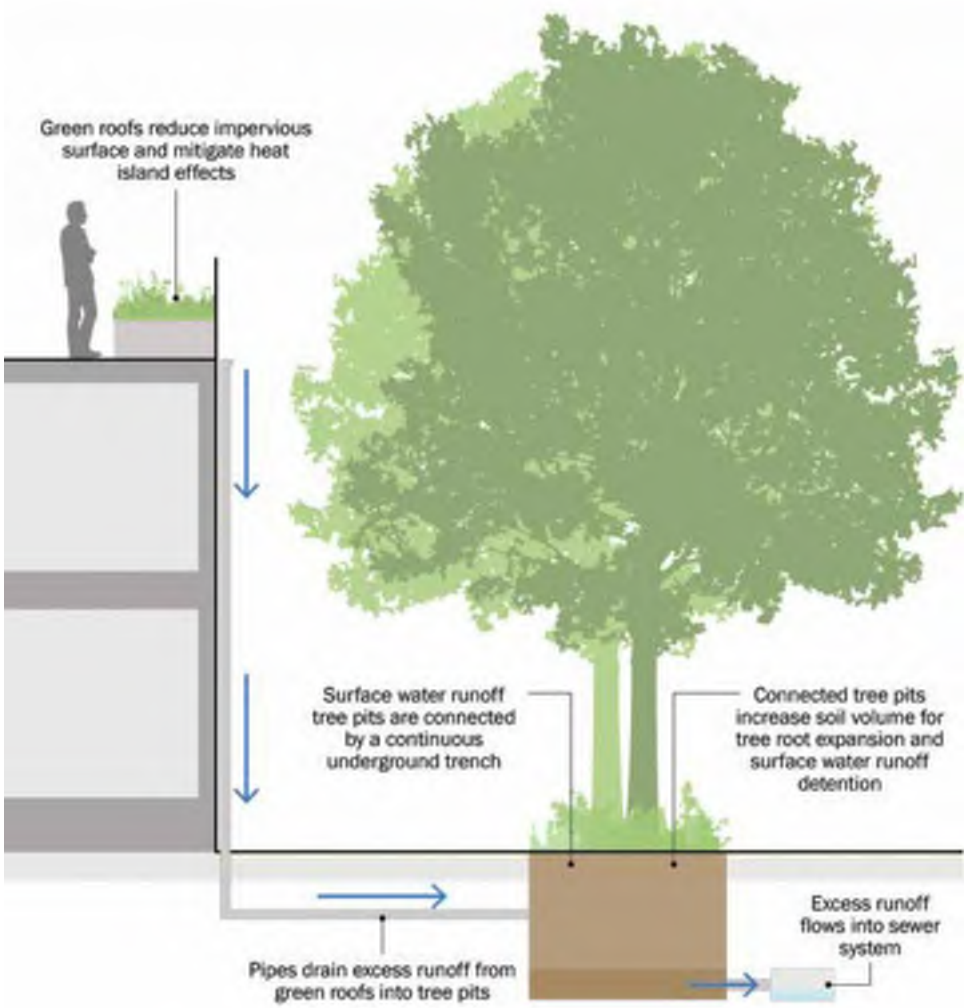


Figure 2-4: Typical tree pit interaction with wider drainage system

Filter drains

Filter drains are shallow trenches filled with stone or gravel that provide collection, conveyance, treatment and storage of surface water runoff. Filter drains provide collection of surface water from ground level and are designed to be shallow to aid with maintaining the SuDS management train at or near surface level. Surface water runoff passes though the filter drain media, allowing filtration of runoff to remove fine sediments, hydrocarbons and heavy metals. Clean surface water can then be conveyed, either through a perforated pipe near the base of the trench or through the voids between the filter media.

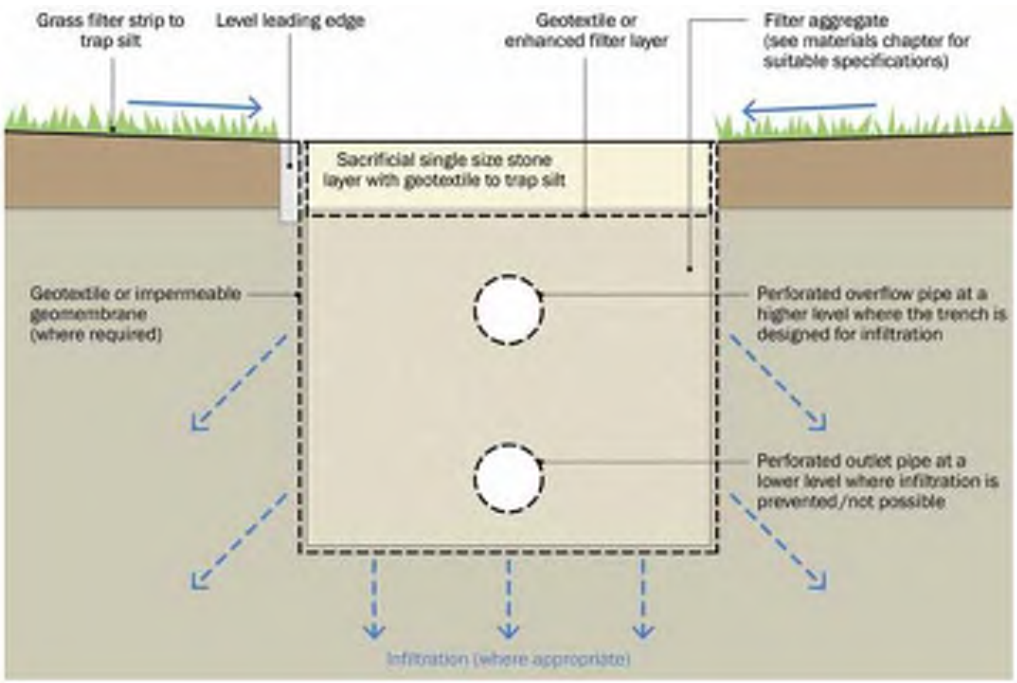


Figure 2-5: Typical filter drain

Filter drains can be designed to coordinate with wider landscaping proposals to create attractive boundaries and can use decorative gravel within the top layer of filter media to provide amenity benefits. The filter media can also provide habitats for microorganisms, insects and amphibians and can link well with surrounding filter strips to create larger habitat spaces for improved biodiversity.

Permeable pavement

Permeable pavement provides direct runoff collection, treatment, conveyance and storage of surface water without the requirement for engineered drainage items, such as gullies and linear drains. Contaminants are generally trapped in the top 100mm layer, which allows for adequate treatment through aerobic digestion and exposure to sunlight. Permeable pavement can take the form of loose gravel, bound aggregate, block paving or porous tarmac. Whichever surface material is used, it must provide adequate permeability and be linked to a permeable sub-base for the pavement foundation.

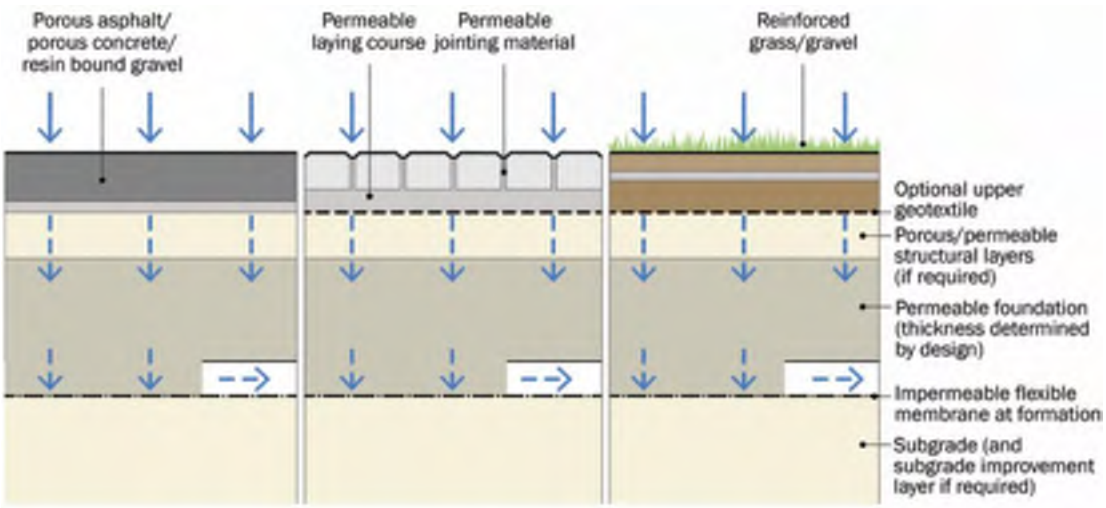


Figure 2-6: Typical permeable pavement detail – no infiltration (courtesy of The SuDS Manual CIRIA C753)

Permeable pavement should include a filter drain to provide connectivity to the wider drainage network. The filter drain also allows backflow of surface water to enable these features to be used for attenuation in extreme storm events. Permeable pavement does not provide any biodiversity benefits but can be aesthetically pleasing with well-designed surfacing.

Permeable paving can also be linked to a cellular storage layer to provide further attenuation volume. Cellular storage provides an effective means of storing large volumes of water below ground level and, in most cases, can be laid within open or trafficked areas, subject to an assessment of structural loading. Cellular storage rarely provides any other benefits and should not be relied upon as the sole means of managing surface water runoff.

Attenuation storage tanks

Attenuation storage tanks are large cellular systems with a high void ratio to enable relatively obstacle free storage of collected runoff such that flows can be discharged at a low rate and be stored within the Development without causing flooding to the Site.

Attenuation storage tanks are buried elements and require the input of specialist suppliers to ensure that the cellular systems have the structural properties to withstand vertical and lateral pressures from the ground and from vehicular loading. Attenuation storage tanks should be provided with access points to enable CCTV camera surveying for monitoring of the condition and performance, as well as enabling jetting to clear any debris and silt accumulations.

Prior to flows entering into an attenuation storage tank, silt and debris should be intercepted through permeable pavement, filter drains, bioretention rain gardens, silt traps or hydrodynamic vortex separators. This will prevent the ingress and accumulation of silt which would otherwise reduce the available capacity for volume storage.

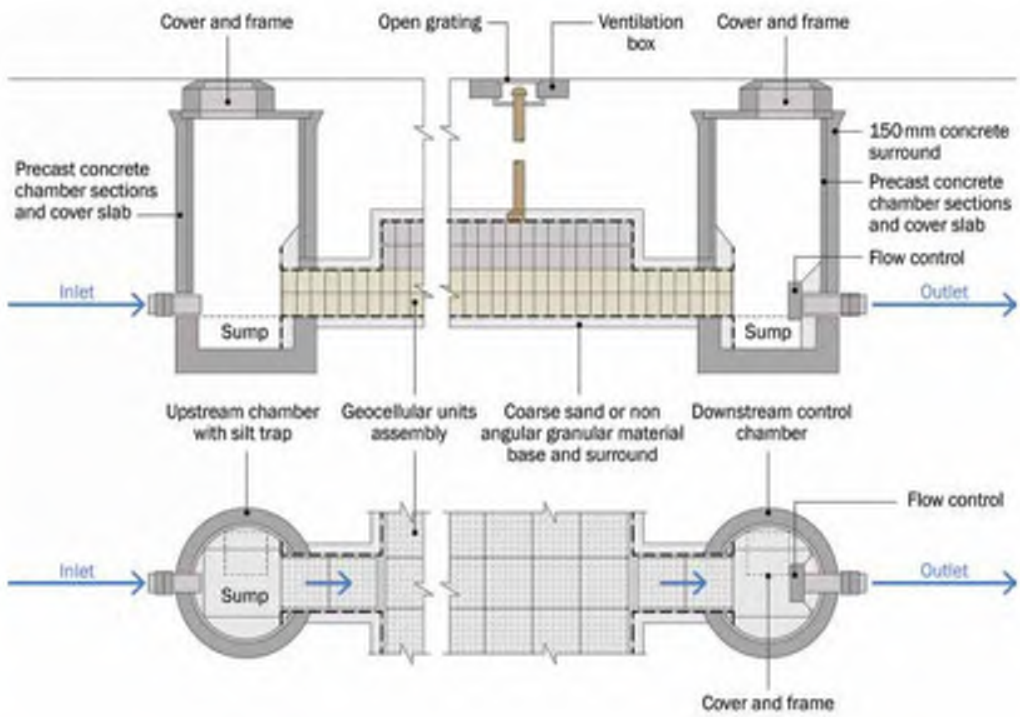


Figure 2-7: Typical attenuation storage tank section (courtesy of The SuDS Manual CIRIA C753)

Flow control

Flow control devices are generally the last element of the SuDS management train, however, can be used at intermediate stages within larger developments, particularly where space and steep gradients constrain attenuation features. For this Development, a single flow control device will be suitable for managing the final runoff rate and runoff volume during storm events.

Vortex flow control devices restrict the runoff rate (and, subsequently, the runoff volume) by efficiently throttling flows through an orifice within a chamber. The orifice opening on small developments can become very small, therefore, it is strongly recommended to incorporate pre-treatment of surface water runoff in the upstream SuDS management train to reduce the risk of potential blockages. It is also recommended that an overflow weir or high level overflow pipe is incorporated to allow runoff to continue to discharge in the event of a blockage of the flow control device.

Figure 2-8: Typical vortex control device with overflow allowances

2.4 Surface Water Quality

The water quality treatment train has been determined based on CIRIA 753 The SuDS Manual. The appraisal of the potential development characteristics and relevant SuDS components is presented below, demonstrating that the relevant indices can be met through the use of the SuDS Management Train.

Table 2-2 Minimum water quality management requirements for discharges to receiving surface waters and groundwater (The SuDS Manual, 2015, Table 4.3)

Land use	Pollution hazard level	Requirement for discharge to surface waters and groundwater
Other roofs	Low	Simple index approach
Non-residential car parking (<300 traffic movements/day)	Low	Simple index approach

Steps in the simple index approach (The SuDS Manual, 2015, Box 26.2):

1. Allocate suitable pollution hazard indices for the proposed land use.
2. Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.
3. Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach.

Where the mitigation index of an individual component is insufficient, two components (or more) in series will be required:

Total SuDs mitigation index = mitigation index 1 + 0.5 * mitigation index 2 etc.

A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components where the discharge is of already reduced inflow concentrations to protected waters.

Pollution hazard indices for different land use classifications (The SuDS Manual, 2015, Table 26.3)

Land use	Pollution hazard level	Total suspended solids TSS	Metals	Hydrocarbons
Non-residential car parking (<300 traffic movements/day)	Low	0.5	0.4	0.4

Indicative SuDS mitigation indices for discharges to surface water (SuDS Manual, 2015, Table 26.4)

Type of SuDS component	TSS	Metals	Hydrocarbons
SuDS management train would direct all roof water runoff through SuDS features or catchpits to remove gross solids and sediments	N/A	N/A	N/A
Green roofs, bioretention rain gardens & tree pits	0.8	0.8	0.8
Filter drains	0.4	0.4	0.4
Permeable pavement	0.7	0.6	0.7

3.0 SuDS Operation & Maintenance

Maintenance of SuDS is critical to achieve efficient functionality, long lasting performance and reduced contamination risk to the Site and downstream. Regular inspections, checks, corrective maintenance and repairs may need to be undertaken by a competent professional.

On Site drainage systems and SuDS features would remain under private ownership and would be maintained by an estates management company or the owner/occupier in accordance with the following guidance:

The useful life and effective operation of SuDS components is related to the frequency of maintenance and the risk of sediment being introduced into the system.

Maintenance will usually be carried out manually, although suction tankers can be used for sediment and debris removal from large systems. If maintenance is not undertaken for extended periods of time, deposits may become hard-packed and more difficult to remove.

In exceptional circumstances where maintenance is not undertaken regularly, replacement of SuDS may be required at significant cost and disruption and, ultimately, will lead to higher flood risk to the Development and the wider catchment.

3.1 Main Drainage System

Gutters, rainwater pipes, outlets, gullies, and drainage channels would be inspected and thoroughly cleaned once a year. All manholes would be inspected once a year and where necessary cleaned out at the same time. Any defects to the brickwork, benching cover or frame would be made good. Attention would be made to the Confined Spaces Regulations 1997 and the provisions contained therein for access to confined spaces. Details for entrance to manholes and separator tanks are contained in the above legislation.

3.2 Cleaning of the Drainage System

The following operations would be carried out during the periodic cleaning of the drainage system.

1. Covers of inspection chambers and manholes would be removed and the sides, benching and channels cleaned.
2. Intercepting traps, if fitted, would be plunged and flushed with clean water. Care would be taken to see that the stopper in the rodding eye is securely replaced.
3. Main and branch drains should be cleaned and afterwards would be flushed with clean water. Any obstructions found would be removed and not flushed into the system.
4. Periodically, accumulated deposits in gullies would be removed. The traps would then be plunged and thoroughly flushed out with clean water.
5. Covers of inspection chambers and gullies would be replaced, bedded in suitable grease or other sealing material and/or bolted down as appropriate to the type. Missing bolts and broken items would be renewed.

3.3 Methods of Cleaning

The drainage system would be cleaned, as appropriate, using one or more of the following methods:

a. Rodding.

Appropriate cleaning tools and techniques should be chosen to avoid damage to the pipework to be cleaned. A set of rods with appropriate ends is basic useful equipment. It is important that correctly designed proprietary ends are used on the rods. Makeshift devices attached to the ends of rods should be avoided as they are not as effective as the correctly designed article and could become detached and create a blockage which would be difficult to remove. Furthermore, it is possible that such devices could cause damage to the pipeline. If the rods have brass ferrules, they should be checked to ensure that their fastenings are secure and that there are no protruding shoulders or fastenings as these can cause damage to drain lines, especially when entering through rodding eyes.

b. Jetting.

High pressure jetting techniques are suitable for use with all currently available pipe materials and should also be considered.

c. Hydraulic rams compressed air or other gases.

Equipment is available for use with all sizes of drain likely to be encountered in building drainage and is suitable for use with all currently available pipe materials. The principle of operation is that a shock wave is induced and is transmitted by water to the point of blockage, and the technique is effective where the pipe is surcharged or can be filled with water from the blockage to a point where the equipment can be used.

3.4 Green Roofs

3.4.1 Operation

Green roofs are intended to be water quality and conveyance features and to be dry, except during rainfall events.

Where applicable the surface shall be designed to be permeable such that rain can flow through the upper construction layers into a drainage substrate and be conveyed to the below ground drainage system.

3.4.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of green roofs.

A recommended schedule is detailed in

Table 3-1 overleaf.

Table 3-1: Green Roof Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Regular Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year on), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

3.5 Bioretention Rain Gardens and Tree Pits

3.5.1 Operation

Bioretention rain gardens and tree pits are intended to be surface water conveyance, water quality and attenuation storage features to drain hard landscaping on site. These features are intended to be dry except during and following rainfall events.

The surface water should permeate through the upper layer of the feature in to the permeable soil build-up below. The water is then collected and conveyed in the perforated pipe within the aggregate trench.

Access for maintenance has been provided through inspection chambers.

3.5.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of bioretention rain gardens and tree pits.

A recommended schedule is detailed in Table 3-2 below.

Table 3-2: Bioretention Rain Garden and Tree Pit Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	3-monthly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	3-monthly
	Inspect inlets and outlets for blockage	3-monthly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for aesthetic reasons)
	Replace any plants to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	3-monthly to 6-monthly
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Check planting and tree health and manage appropriately	Annually
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
	Water	As required (in period of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

3.6 Filter Drains

3.6.1 Operation

The filter drains are intended to be surface water conveyance, water quality and attenuation storage features to drain hard landscaping on site. These features are intended to be dry except during rainfall events.

The surface water should permeate through the upper layer of the feature in to the permeable stone below. The water is then collected and conveyed in the perforated pipe within the aggregate trench.

Access for maintenance has been provided through inspection chambers.

3.6.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the features. A recommended schedule is detailed in

Table 3-3 overleaf.

Sediment\material removal should be undertaken in consultation with the guidance provided by environmental regulator.

Table 3-3: Filter Drain Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and surface debris and weeds	Monthly or as required
	Grass cutting (to maintain grass height within landscape architect's specified design range)	To be confirmed by Landscape Architect [Monthly (during growing season) or as required]
	Manage other vegetation and remove nuisance plants/dead growth.	Monthly (at start, then as required).
	Remove sediment from main channel.	Annually (or as required after heavy rainfall events)
Occasional maintenance	Re-seed areas of poor vegetation growth (seed mix to landscape architect's specification).	Annually, or as required. As per landscape architect's specification
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years
	Repair of erosion or other damage by re-seeding or re-turfing. Soil reinforcement such as coir matting should be used and staked in accordance with manufacturer's instructions.	As required.
	Realignment of flow channel surface.	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required.
	Re-level uneven surfaces and reinstate design levels. This may be required as part of sediment removal.	As required.
	Replace geotextiles and clean and replace filter media, if clogging occurs. Terram 1000 typical design life is 25 years.	As required.

3.7 Permeable Pavements

3.7.1 Operation

The permeable pavements are intended to be water quality and attenuation storage features and to be dry, except during rainfall events.

Where applicable the surface has been designed to be permeable/contain gaps where rain can flow through the upper construction layers into the voids between interlocking stones which make up the subbase.

The surfacing and drainage around the new buildings has generally been designed to facilitate access for maintenance vehicles.

3.7.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the permeable pavement.

A recommended schedule is detailed in

Table 3-4 overleaf.

Table 3-4: Permeable Pavements Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving.	Annually.
	Monitor inspection chambers.	Annually.
Regular maintenance\inspection	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging or manufacturers' recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required and as per landscape architect's specification.
	Removal of weed.	As required.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required.
	Rehabilitation of surface and upper sub-structure. This could include replacement of the jointing and bedding material. The upper geotextiles layer may also need replacing if clogged and Terram 1000 has a life span of 25 years.	As required (if infiltration performance is reduced as a result of significant clogging).

3.8 Attenuation Storage Tanks

3.8.1 Operation

Attenuation storage tanks are intended to be surface water attenuation storage features to accommodate the balance of surface water runoff due to restricted discharge rates. These features are intended to be dry except during and following rainfall events.

Surface water will fill the attenuation storage tanks as the water level rises within the drainage system due to the flow control devices. Following rainfall events, water will drain down through the piped drainage system and the water level will slowly fall.

Access for maintenance has been provided through inspection chambers.

3.8.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the features. A recommended schedule is detailed in Table 3-5 below.

Sediment\material removal should be undertaken in consultation with the guidance provided by environmental regulator.

Table 3-5: Attenuation Storage Tanks Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Monthly, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, overflows and vents to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

3.9 Flow Control Chambers

Flow control chambers are proprietary products and the manufacturer's recommendations should be followed.

3.9.1 Operation

Flow control chambers are intended to restrict the surface water runoff discharge rate from the site to a designed rate utilising techniques such as an orifice plate, vortex separator or mechanical float control.

3.9.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drain efficiently, thus exposing the development to a greater level of flood risk.

A recommended schedule is detailed in Table 3-6 below.

Table 3-6: Flow Control Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided using a post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Open penstock where poor performance is identified. Inspect and rectify any issues found.	As required.
	If continued poor performance, jet and CCTV survey.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

3.10 Pipes & Manholes

3.10.1 Operation

Pipes are the main conveyance for surface water across the development. They are to be dry except during rainfall events. All pipes have been designed to be self-cleansing as a result of the gradients proposed.

Access for maintenance is provided through access chambers, manholes and rodding eyes.

3.10.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drained efficiently; thus, exposing the development to a greater flood risk level.

Sediment\material removal should be undertaken with reference to relevant guidance from the environmental regulator, especially where run-off is taken from potentially contaminated areas such as vehicular access points/parking.

A recommended schedule is detailed in Table 3-7 below.

Table 3-7: Pipes & Manholes Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided in the form of a post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	Every 3 months, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	Every 6 months
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If poor performance persists, jet and CCTV survey poorly performing runs.	As required.
	Seek advice for the remediation techniques suitable for the type of issue and its location.	As required If above does not improve performance.

4.0 Appendices

Appendix A – Topographic Survey

Appendix B – Development Proposals

Appendix C – Buried Services Survey

Appendix D – CCTV Drainage Survey

Appendix E – Thames Water Sewer Records and PPSE Response

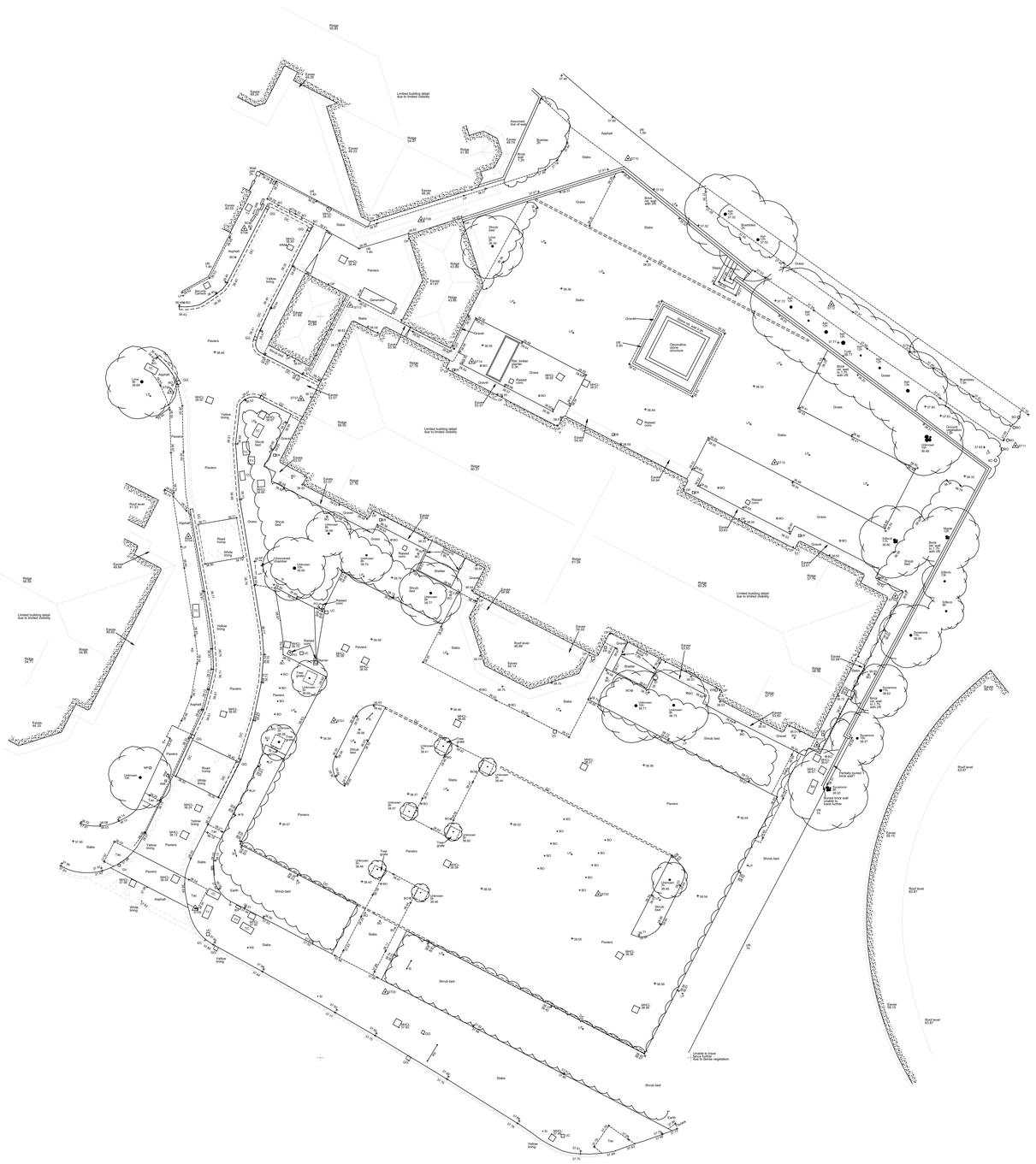
Appendix F – Reading Borough Council Correspondence

Appendix G – Culverted Watercourse Survey

Appendix H – Drainage Drawings

Appendix I – Hydraulic Calculations

Appendix A – Topographic Survey



NORTH
Indicative

TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS

AH	Arch Head Height	ER	Earth Rod	RSD	Roller Shutter Door
A/B	Air Brick	ET	EP+Transformer	RSJ	Rolled Steel Joist
AR	Assumed Route	FB	Flower Bed	SI	Sign Post
AV	Air Valve	FBD	Floor Board Direction	SP	Arch Spring Point Height
BB	Belisha Beacon	FH	Fire Hydrant	SV	Stop Valve
BH	Bore Hole	FL	Floor Level	SW	Surface Water
BL	Bed Level	FP	Flag Pole	SY	Cattle Way
BP	Bollard	FT	Foot Tread	TaP	Tactile Paving
BS	Bench Post	GG	Gas Grate	TC	Telecom Cover
BS	Bus Stop	GV	Gas Valve	TH	Total Rh
BU	Bush	HH	Head Height	THL	Threshold Level
B/W	Barbed Wire Fence	IC	Inspection Cover	TL	Traffic Light
BX	Box (Utilities)	IL	Invert Level	ToW	Top of Wall
C/B	Close Board Fence	I/R	Iron Railings	TP	Telegraph Pole
CH	Cill Height	KO	Kerb Outlet	TS	Traffic Signal Cover
CL	Cover Level	LP	Lamp Post	TV	Cable TV Cover
C/L	Chain Link Fence	MH	Manhole	UB	Universal Beam
C-Lev	Ceiling Level	MP	Marker Post	UC	Unknown Cover
Col	Column	NB	Name Board	UK	Unknown Tree
C/P	Chestnut Paling Fence	OHL	Overhead Line (approx)	UMG	Unmade Ground
CR	Cable Riser	Pan	Panel Fence	USB	Under Side Beam
C/W	Chicken Wire	PB	Post Box	UTL	Unable To Lift
DC	Drainage Channel	PM	Parking Meter	UTS	Unable To Survey
DH	Door Head Height	PO	Post	VP	Vent Pipe
DI	Dilapidated	P/R	Post & Rail Fence	WB	Waste Bin
DP	Down Pipe	P/W	Post & Wire Fence	WH	Weep Hole
DR	Drain	P/Wall	Partition Wall	WL	Water Level
E/Bx	Electric Box	RE	Rodding Eye	WM	Water Meter
EC	Electric Supply Cover	RL	Ridge Level	WO	Wash Out
EL	Eaves Level	RP	Reflector Post	2.5	Floor to Ceiling Height
EP	Electric Pole	RS	Road Sign	2.5/FC	Floor to False Ceiling Ht

Indicative, Multi-bole tree

Survey Control Station

DRAWING NOTES

Topographical Surveys

Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

Surveyed physical features may not necessarily represent the legal boundary line.

Measured Building Surveys

Measurements to internal walls are taken to the wall finishes at approx 1m above the floor level and the wall assumed to be vertical.

Cill heights are measured as floor to the cill and head heights are measured from cill to the top of window.

General

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Survey Solutions immediately.

The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The survey control listed is only to be used for topographical surveys at the stated scale. All control must be checked and verified prior to use.

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Original Sheet Size A0H

SURVEY STATIONS

Name	Easting	Northing	Height	Remark
ST01	471641.485	174638.365	38.601	Nail
ST02	471670.004	174617.640	38.604	Nail
ST03	471647.018	174637.065	37.864	Nail
ST04	471625.773	174656.244	38.791	Nail
ST05	471623.154	174671.916	38.523	Nail
ST06	471623.863	174671.918	38.523	Nail
ST07	471637.927	174671.087	38.795	Nail
ST08	471650.978	174671.087	38.795	Nail
ST09	471650.978	174690.422	38.985	Nail
ST10	471673.203	174637.040	37.536	Nail
ST11	471673.203	174637.040	37.536	Nail
ST12	471685.151	174681.321	37.945	Nail
ST13	471643.203	174681.321	38.573	Nail
ST14	471643.203	174654.223	38.573	Nail
ST15	471685.035	174654.223	38.455	Nail
ST16	471702.031	174644.823	38.455	Nail
ST17	471693.585	174633.754	38.624	Nail

SURVEY GRID AND LEVEL DATUM

The coordinate system established for this survey is related to Ordnance Survey (OS) national grid using Smartnet.

The level datum established for this survey is related to Ordnance Survey (OS) using GPS Smartnet.

To avoid discrepancies any coordinated data used in conjunction with this survey must be derived directly from this control data.

REV	DESCRIPTION	DRAWN	APPR.	DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

IPSWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE
Norman Place, Reading

DRAWING DETAIL
Topographical Survey
Sheet 1 of 1

CLIENT				SCALE
Hexa Consulting				1:200
SURVEYOR	SURVEY DATE	CHECKED BY	APPROVED BY	DWG STATUS
LP	08/2023	AJ	MM	Final
DRAWING NUMBER			REVISION	ISSUE DATE
60630BDLS-01				30/08/2023

RICS ICES THE SURVEY ASSOCIATION

Appendix B – Development Proposals

0m 5m 20m
2.5m 10m

KEY

SITE

Application boundary

+00.00 Existing levels

+00.00 Proposed levels

HARDSCAPE

P1 Paving type 1

P2 Paving type 2

P3 Paving type 3

P4 Paving type 4

P5 Paving type 5 - Cobbled stone paving

P6 Paving type 6 - Coudroy paving

P7 Paving type 8 - Stairs with railing

P8 Paving type 9 - Existing paving made good

P9 Paving type 10 - Tactile paving

KERBS

K1 Kerb type 1 - Flushed kerb

K2 Kerb type 2 - Existing kerb retained

K3 Kerb type 3 - Existing kerb made good

SOFTSCAPE

S1 Shrub planting - In ground

S1a Shrub planting - Rain gardens

S1b Shrub planting - Shade tolerant

S2 Hedge planting

S3 Gravel bed mixed sizes

Existing trees retained

Proposed trees

FF&E

F1 Seating terrace

F2 Feature bench

F3 Timber bench seating / storage

F4 Seating nets

F5 Wooden play logs

F6 Art / Sculpture

F7 Seating cube

Boulder rocks

Wall / boundaries

W1 Seating wall

W2 Existing booundary retained and made good

General notes

Do not scale from this drawing for purposes other than the relevant Project Agreement. This drawing must not be used for land transfer purposes. This drawing must be read in conjunction with all other relevant drawings, specifications and schedules. Residential 'NIA' is measured and calculated generally in accordance with the description of 'Gross Internal Area' within paragraph 8 of the Nationally Described Space Standard (May 2016). Residential 'GIA' and 'GEA' are measured and calculated generally in accordance with the description of 'IPMS 2 - Residential' and 'IPMS 1' respectively within RICS 'Property Measurement', 2nd Edition (January 2018). Non-residential 'GIA' and 'GEA' are measured and calculated generally in accordance with the description of 'IPMS 2 - Offices' and 'IPMS 1' respectively within RICS 'Property Measurement', 2nd Edition (January 2018). All areas have been calculated in metric units. All setting out must be checked on site. Levels refer to Ordnance Datum Newlyn, unless stated otherwise. This drawing must not be used on site unless issued for construction. Refer to Information Plan for status definitions.

Drawing revision prefix (not applied to sketches) :
P = Pre-Contract
C = Contract

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Electronic file reference

A4012-E Norman Place.vwx

Rev	Revision note	Date	Drawn	Check
1	for Information	18/12/23	GR	GR
2	Draft for Information	06/02/24	GR	
3	for information	31/05/24	RP	GR
4	for Information	19/06/24	RP	GR
5	for Information	28/06/24	RP	GR

Key

Client Title Block

Client

Packaged Living

Project title

Norman Place
Reading

Drawing title

Landscape Proposals
Ground Floor Plan

Scale @ A1: **1:200**

Issue date: **28/06/24**

Drawing number

A4012E-ASA-XX-00-DR-L-0200

Proposed status: **for Information**

Revision: **R5**

Discipline

Landscape

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Appendix C – Buried Services Survey

PAS 128: 2014 QUALITY LEVEL GUIDE

QL(-01)	DESCRIPTION	QC(-	QL(-B1)	DESCRIPTION
QL-D	Service positions taken from records.	conveys	QL-B2	Identified & tracked anywhere using only non-destructive techniques.
QL-C	Visual evidence of service existence but components is assumed/ambiguous.	conveys	QL-B3	Identified & tracked anywhere using invasive geophysical techniques.
QL-B4	Line path and depth information are assumed/ambiguous.	QL-A	QL-A	Identified, tracked, and depth information is known. Excavation, trial hole, survey inspection confirmed.
QL-B5	Line path and depth information are known but not to a specified tolerance.			

DETECTION METHOD

IN ACCORDANCE WITH PAS 128: 2014 SURVEY TYPE B

DRAINAGE SURVEY

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/type and service data recorded from ground level. All connections from DPs, Gullies, Drains, VP's, RE's and lampholes have been proven wherever possible using audible connections (AC) and/or sonde instrumentation where applicable. Where these methods have proved unsuccessful then assumed (AR) straight line connections will be shown.

CCTV DRAINAGE SURVEY

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/type and service data recorded from ground level. Pipework has been traced, accessed and collected for post processing. Drainage layout, including manhole covers not located by topographical survey, may be taken from CCTV chainage and will be shown as indicative only.

Electricity

Elec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

British Telecoms

BT cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Due to current laws and legislation protecting all BT apparatus, cabling can only be located remotely. We therefore compare all our telecom findings against record information to produce the final service layout. In some instances, where high amount of cable ducts are present, we may only be able to identify a linear centre peak signal rather than identifying all the individual duct positions. For further information regarding Telecoms apparatus, please contact Openreach directly.

Cable TV & Coms

CTV and/or Com cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Fibre Optic

FO cables will have been predominantly located using GPR methodology. This is due to the materials used within fibre optic cabling. In some rare instances, tracer cabling or conductible non fibre optic cabling will be present within some or all ducting. When this is the case, both EML and GPR methodology will be combined to identify service network and achieve greater quality levels.

Lighting, Traffic Signal & Security Cables

LC, TS and/or Sec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Gas & Water Inc. Fuel Pipes and Hot Water Pipes

GM/GS and/or WM/WS pipe work will have been attempted and located using both EML & GPR methodology with electronically derived depths shown for the former and depths to crown levels shown for the latter.
When the Gas/Water pipe work is constructed using conductible materials, then we are able to to employ multiple geophysical techniques to identify service network and achieve greater quality levels. When a non conductible material is used, GPR methodology will be employed to locate and plot the final service layout.

Ground Penetrating Radar

GPR methodology is used to identify and locate all non metallic, non conductible piping and cabling. We also employ GPR to obtain a greater accuracy levels on EML located services. The GPR has a greater success rate on pipe or service diameter upward of Ø63mm,C63mm, as size increments increase, so does the chance of detection. The GPR can produces varying results and as such, wouldn't be used as an independent utility surveying instrument.

Unidentified Traces

All UT's will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Every effort has been made to identify the service but in this instance, is not achievable. We recommend excavation work to determine identity and depth where applicable.

Scarring (QL-C)

Scarring has been identified on site with a potential of an undetectable service present.

Assumed Routes & Taken from Records (QL-B4/D)

Assumed routes (AR) are shown if there is evidence that a service exists but we are unable to trace it whilst on site. The surveyor will attempt to locate various risers/ics/valves/meters (service evidence) etc. around site area to successfully determine an assumed route between these points. If there is little evidence on site but they believe a service is still present, then a common sense approach to an assumed route shall be employed.

Taken from records (TFR) are service routes that are taken from STAT record plans or previous survey information and overlaid onto our drawings.

SURVEY RECOMMENDATIONS

The sewers with high levels of silt or blockages to be jetted to extend the CCTV drainage survey, if any of these areas are deemed critical or of high importance.

We recommend full statutory record information be obtained to confirm site findings and to position undetectable which may be present.

Due to the geophysical nature of subsurface technology, we always recommend excavation works to be carried out within critical areas for verification and to eliminate the possibility of undetectable services present.

NORTH
Unable to pass barrier
Chamber visible on CCTV footage Unable to locate Approx. position
Restricted leverage
Note: Unable to determine outlets of DPs surrounding building.
Note: Unable to locate gas, water supply to building.
Note: All drainage routes shown are taken from CCTV footage and should be taken as approximate positions.
Note: Unable to determine outlets of some DPs surrounding building.
Limited building detail due to empty building
Car Park
Grass
Paved
Trees
Shrubs
Building
Entrance
Steps
Ramp
Fence
Gate
Bollard
Lamp Post
Flag Pole
Sign
Manhole
Inspection Chamber
Gully
Drain
Channel
Spot Level
Kerb Level
Road Level
Top of Bank
Foot of Bank
Hedge
Tree
Conifer
Shrub
Flower Bed
Vegetable Patch
Lawn
Hard Standing
Footpath
Road
Kerbed Edge
Edge of Tarmac
Edge of Concrete
Edge of Paving
Edge of Brick
Edge of Stone
Edge of Grass
Edge of Shrub
Edge of Hedge
Edge of Water
Edge of Path
Edge of Road
Edge of Car Park
Edge of Building
Edge of Fence
Edge of Wall
Edge of Gate
Edge of Bollard
Edge of Lamp Post
Edge of Flag Pole
Edge of Sign
Edge of Manhole
Edge of Inspection Chamber
Edge of Gully
Edge of Drain
Edge of Channel
Edge of Spot Level
Edge of Kerb Level
Edge of Road Level
Edge of Top of Bank
Edge of Foot of Bank
Edge of Hedge
Edge of Tree
Edge of Conifer
Edge of Shrub
Edge of Flower Bed
Edge of Vegetable Patch
Edge of Lawn
Edge of Hard Standing
Edge of Footpath
Edge of Road
Edge of Kerbed Edge
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Appendix D – CCTV Drainage Survey

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

SURVEY SOLUTIONS
0845 040 5969
survey-solutions.co.uk

IPSWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORWICH
NOTTINGHAM YEOVIL

CCTV Report

Project
2 NORMAN PLACE,
READING, RG1 8DA.

Survey Date
04/09/2023

Client
HEXA CONSULTING LTD

Checked by
AJM

Surveyor
SWA

Revision

Job Number
60390CCTV-01

Issue Date
19/09/2022

RICS
chartered ices
THE SURVEY ASSOCIATION
FULL MEMBER
QMS ISO 9001 : 2008 REGISTERED
QMS ISO 14001 : 2015 REGISTERED

High Pressure Jetting & Resurvey

Maintenance Visits

Following the initial investigations completed on site we would recommend a quarterly re-survey of the drainage network inorder to monitor the ongoing pipework condition.

System Maintenance Survey:

Quarterly Assessment of Existing Defects Due – 04/03/2024
Annual Full System Re-survey Due – 04/09/2024

High Pressure Jetting Required:

(5% - 30%) – MH2 X, MH2 B, MH3 X, MH3 A, MH3 B, MH3 D, MH5 A, MH6 X, MH6 A, MH6 C, MH7 X, MH11 C, MH13 B, MH15 X, MH15 A , MH17 B, MH17 C, MH22 X, MH22 A, MH22 C, MH23 A, MH24 B, MH25 B

(35 % - 60%) – MH22 B

(65% - 95%) –MH7 C, MH24 B

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Project-information

Project name:	Contract number:	Contact:	Date:
Norman place	**60390**	**James Chapman**	**06/09/2023**

Client	**Hexa Consulting LTD**
Contact:	**James Chapman**
Position:	**N/a**
Road	**4 St Marys Place**
Town	**Nottingham**
County	**Nottinghamshire**
Telephone:	**011564 85252**
Fax:	
Mobile:	
E-Mail:	**james.chapman@hexaconsulting.co.uk**

Site	**2 Norman Place**
Contact:	**James Chapman**
Position:	**N/A**
Road	**Norman Place**
Town	**Reading**
County	**Berkshire**
Telephone:	**011564 85252**
Fax:	
Mobile:	
E-Mail:	**james.chapman@hexaconsulting.co.uk**

Contractor	**Survey Solutions**
Contact:	**Sam Ayriss**
Position:	**Surveyour**
Road	**Paper mill lane**
Town	**Irisweg 12**
County	**Ipswich**
Telephone:	**01473 240410**
Fax:	**N/A**
Mobile:	**N/A**
E-Mail:	**greg.baird@survey-solutions.co.uk**

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Defect Grade Description

Project name:	Contract number:	Contact:	Date:
Norman place	**60390**	**James Chapman**	**06/09/2023**

1:

Brick: No Structural Defects
Pipe: No Structural Defects

Acceptable Structural Condition

2:

Brick: Minor cracking, Surface mortar loss, Spalling slight, wear slight
Pipe: Circumfrential crack, Moderate joint defects, Spalling slight, Wear slight

Minor collapse risk in short term but potential for further deterioration

3:

Brick: Total mortorloss without other defects, single brick displaced, Deformation up to 5%, Spalling medium, Wear medium
Pipe: Fractures with deformation up tp 5%, Longitudinal cracking or mulitlpe cracking, Minor loss of level, More severe joint defects, Spalling medium, Wear medium

! Collapse unlikely in near future but future deterioration likely !

4:

Brick: Total mortorloss with deformation greater than 10%, Deformation up to 10% and fractured, Displaced/hanging brickwork, Small number of missing bricks
Pipe: Broken, Deformation up to 10% and broken,, Fractured with deformation 5 - 10%, Multiple fractures, Serious loss of level, spalling large, wear large

!! Collapse likely in foreseeable future !!

5:

Brick: Already Collapsed, Missing invert, Deformation over 10% and fractured, Displaced/hanging brickwork and deformation over 10%, Extensive missing bricks
Pipe: Already collapsed, Deformation over 10% and broken, Extensive areas of fabric missing, Fractured with deformation over 10%

!!! Collapsed or collapse imminent !!!

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

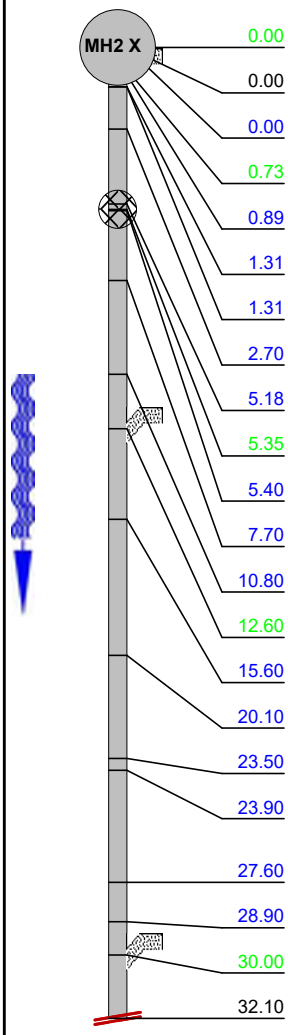
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**1**	**MH2 X X**
Present:	Vehicle:	Camera:	Preset:	Cleaned:	Grade:
		Solo pro Camera		**No**	

Road:	**2 Norman Place**	Division:		start MH:	**MH2 X**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**32.1 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:250	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH2 X	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.00		WL	Water level, 50 % height/diameter	00:00:00		(Serv) 0
	0.73		JN	Junction at 10 o´clock, dia 100 mm	00:00:00	1_4a	(Constr) 0
	0.89		DE	Debris, 20 % cross-sectional area loss	00:00:00	1_5a	(Serv) 1
	1.31		WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
	1.31	**S1**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	2.70		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	5.18	**F1**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	5.35		MH	Manhole Remark: MH	00:00:00	1_10a	(Constr) 0
	5.40		LL	Line of Sewer deviates left	00:00:00		(Serv) 0
	7.70	**S2**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	10.80		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	12.60		JN	Junction at 10 o´clock, dia 100 mm	00:00:00	17_14a, b	(Constr) 0
	15.60	**F2**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	20.10		DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	23.50	**S3**	DES	Debris silt, 10 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	23.90	**C3**	DES	Debris silt, 5 % cross-sectional area loss, Changed	00:00:00		(Serv) 1
	27.60	**F3**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	28.90		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	30.00		JN	Junction at 10 o´clock, dia 100 mm	00:00:00		(Constr) 0
	32.10		SA	Survey abandoned, Remark: Restricted Leverage	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**1**	**MH2 X X**

Photo: 1_4a, 00:00:00
0.73m, Junction at 10 o´clock, dia 100 mm

Photo: 1_5a, 00:00:00
0.89m, Debris, 20 % cross-sectional area loss

Photo: 1_10a, 00:00:00
5.35m, Manhole Remark: MH

Photo: 17_14a, 00:00:00
12.6m, Junction at 10 o´clock, dia 100 mm

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**1**	**MH2 X X**

Photo: 17_14b, 00:00:00
12.6m, Junction at 10 o´clock, dia 100 mm

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

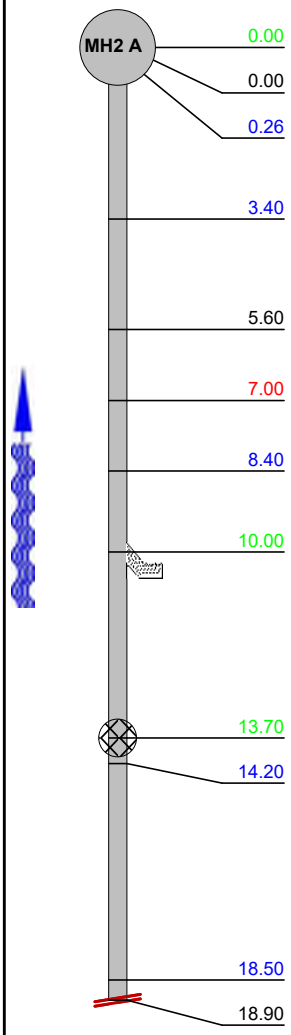
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**2**	**SA X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH2 A**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**18.9 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:150	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH2 A	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	0.26	WL	Water level, 20 % height/diameter	00:00:00		(Serv) 0
	3.40	WL	Water level, 80 % height/diameter	00:00:00		(Serv) 0
	5.60	DC	Dimension of sewer changes, new dimension dia 100 mm	00:00:00	32_5a	(Misc) 0
	7.00	JDM	Joint displaced. Medium	00:00:00	33_6a	(Struct) 1
	8.40	WL	Water level, 95 % height/diameter	00:00:00		(Serv) 0
	10.00	JN	Junction at 10 o´clock, dia 100 mm	00:00:00		(Constr) 0
	13.70	MH	Manhole Remark: Chamber visible	00:00:00	36_9a	(Constr) 0
	14.20	LL	Line of Sewer deviates left	00:00:00		(Serv) 0
	18.50	LR	Line of Sewer deviates right	00:00:00		(Serv) 0
	18.90	SA	Survey abandoned, Remark: Uable to pass bend	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**2**	**SA X**

Photo: 32_5a, 00:00:00
5.6m, Dimension of sewer changes, new dimension dia 100 mm

Photo: 33_6a, 00:00:00
7m, Joint displaced. Medium

Photo: 36_9a, 00:00:00
13.7m, Manhole Remark: Chamber visible

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

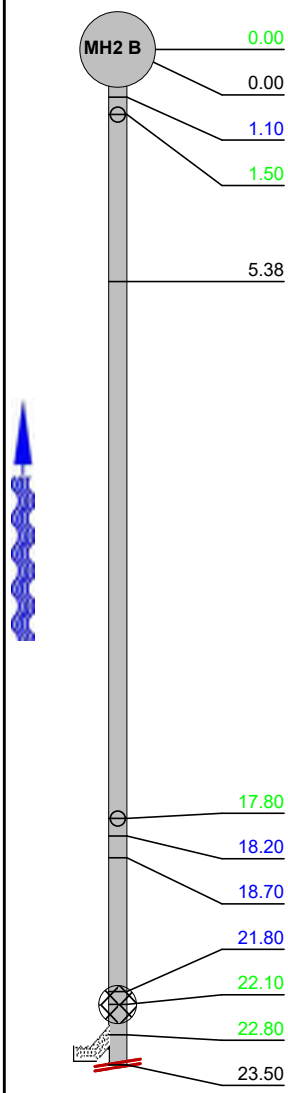
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**3**	**SA X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH2 B**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**23.5 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:175	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH2 B	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	1.10		LR	Line of Sewer deviates right	00:00:00		(Serv) 0
	1.50		JN	Junction at 11 o´clock, dia 80 mm	00:00:00	3_4a	(Constr) 0
	5.38		GP	General Condition photograph	00:00:00	3_5a	(Misc) 0
	17.80		JN	Junction at 12 o´clock, dia 80 mm	00:00:00	3_6a	(Constr) 0
	18.20		WL	Water level, (%) height/diameter	00:00:00		(Serv) 0
	18.70	**S1**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	21.80	**F1**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	22.10		MH	Manhole	00:00:00		(Constr) 0
	22.80		JN	Junction at 03 o´clock, dia 150 mm	00:00:00	52_11a	(Constr) 0
	23.50		SA	Survey abandoned, Remark: Unable to pass bend	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**3**	**SA X**

Photo: 3_4a, 00:00:00
1.5m, Junction at 11 o´clock, dia 80 mm

Photo: 3_5a, 00:00:00
5.38m, General Condition photograph

Photo: 3_6a, 00:00:00
17.8m, Junction at 12 o´clock, dia 80 mm

Photo: 52_11a, 00:00:00
22.8m, Junction at 03 o´clock, dia 150 mm

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

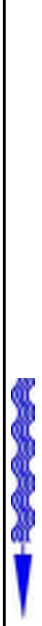
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**4**	**MH3 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH3 X**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**25.9 m**

Purpose:		Shape/Size:	**Circular dia 225 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:200	position		code	observation	counter	photo	grade
MH3 X	0.00		MH	Manhole Remark: MH3 X	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.09	**S1**	DES	Debris silt, 10 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	4.90	**F1**	DES	Debris silt, 10 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	6.50	**S2**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	15.60		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	22.90		WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
	25.80	**F2**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	25.90		SA	Survey abandoned, Remark: Restricted Leverage	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

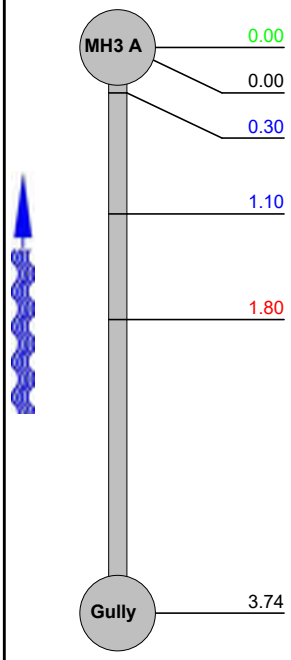
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**5**	**Gully X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH3 A**
Place:	**Reading**	District:		end MH:	**Gully**
Location:		Tape No.:		Total length:	**3.74 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH3 A	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	0.30	DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	1.10	LU	Line of Sewer deviates up.	00:00:00		(Serv) 0
	1.80	JDM	Joint displaced. Medium	00:00:00	70_5a	(Struct) 1
	3.74	FH	Finish Survey, Remark: Gully	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**5**	**Gully X**

Photo: 70_5a, 00:00:00
1.8m, Joint displaced. Medium

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

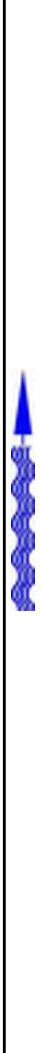
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**6**	**Gully X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH3 B**
Place:	**Reading**	District:		end MH:	**Gully**
Location:		Tape No.:		Total length:	**22.2 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:175	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH3 B	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.90	**S1**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	10.20	**F1**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	12.70	**S2**	DES	Debris silt, 5 % cross-sectional area loss, Start.	00:00:00		(Serv) 1
	16.90	**F2**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	18.40		WL	Water level, 10 % height/diameter	00:00:00		(Serv) 0
	18.70		WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
	22.20		FH	Finish Survey, Remark: Gully	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

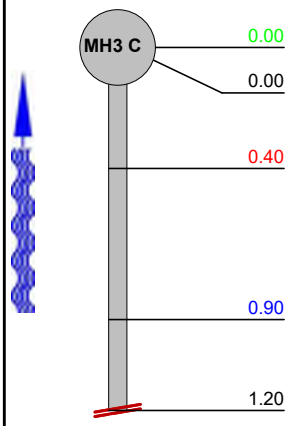
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**7**	**SA X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH3 C**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**1.2 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:25	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH3 C	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	0.40	JDM	Joint displaced. Medium	00:00:00	84_3a	(Struct) 1
	0.90	LU	Line of Sewer deviates up	00:00:00		(Serv) 0
	1.20	SA	Survey abandoned, Remark: Unable to pass bend	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**7**	**SA X**

Photo: 84_3a, 00:00:00
0.4m, Joint displaced. Medium

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

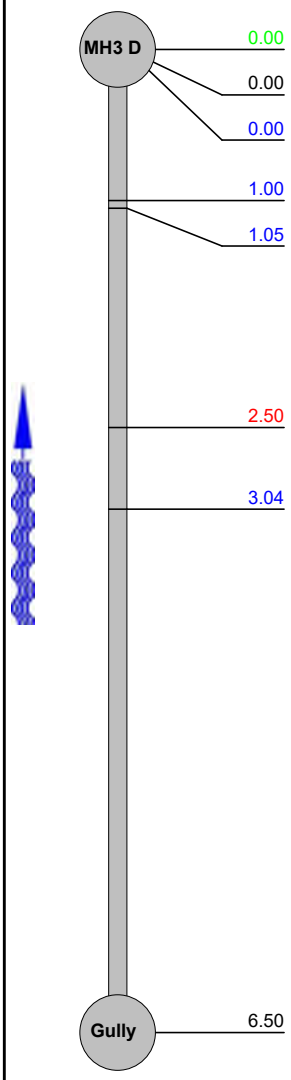
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**8**	**Gully X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH3 D**
Place:	**Reading**	District:		end MH:	**Gully**
Location:		Tape No.:		Total length:	**6.5 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH3 D	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	0.00	DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	1.00	LU	Line of Sewer deviates up	00:00:00		(Serv) 0
	1.05	LL	Line of Sewer deviates left	00:00:00		(Serv) 0
	2.50	JDM	Joint displaced. Medium	00:00:00	8_6a	(Struct) 1
	3.04	LR	Line of Sewer deviates right	00:00:00		(Serv) 0
	6.50	FH	Finish Survey, Remark: Gully	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**8**	**Gully X**

Photo: 8_6a, 00:00:00
2.5m, Joint displaced. Medium

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**9**	**MH5 X X**
Present:	Vehicle:	Camera:	Preset:	Cleaned:	Grade:
		Solo pro Camera		**No**	

Road:	**2 Norman Place**	Division:		start MH:	**MH5 X**
Place:	**Reading**	District:		end MH:	**MH6 A**
Location:		Tape No.:		Total length:	**17.9 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:

1:150	position	code	observation	counter	photo	grade
MH5 X	0.00	MH	Manhole Remark: MH5 X	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	0.00	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	7.90	WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
MH6 A	17.90	FH	Finish Survey, Remark: MH6 A	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**10**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH5 A**
Place:	**Reading**	District:		end MH:	**MH**
Location:		Tape No.:		Total length:	**27 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:

1:200	position		code	observation	counter	photo	grade
MH5 A	0.00		MH	Manhole Remark: MH5 A	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.05	**S1**	CU	Camera Underwater, Start	00:00:00		(Misc) 0
	1.44	**F1**	CU	Camera Underwater, Finish	00:00:00		(Misc) 0
	1.90		WL	Water level, 10 % height/diameter	00:00:00		(Serv) 0
	3.80		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	8.10		MH	Manhole Remark: MH	00:00:00		(Constr) 0
	9.40		DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	10.00	**S2**	CU	Camera Underwater, Start	00:00:00		(Misc) 0
	10.20	**F2**	CU	Camera Underwater, Finish	00:00:00		(Misc) 0
	26.80		DES	Debris silt, 10 % cross-sectional area loss, Remark: 26.8	00:00:00		(Serv) 1
MH	27.00		FH	Finish Survey, Remark:MH	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

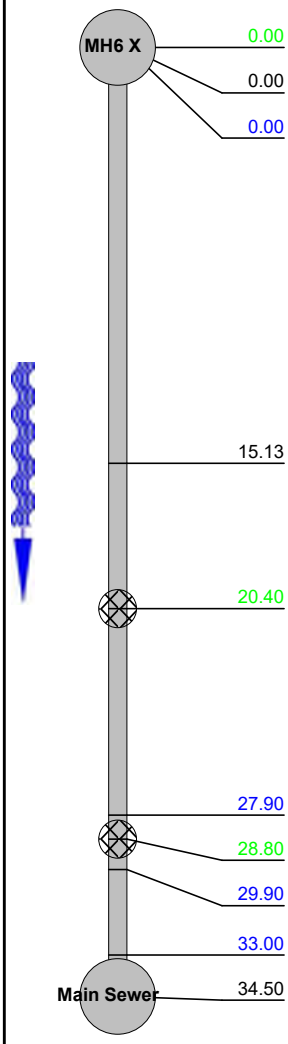
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**11**	**MH6 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH6 X**
Place:	**Reading**	District:		end MH:	**Main Sewer**
Location:		Tape No.:		Total length:	**34.5 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:275	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH6 X	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	0.00	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	15.13	GP	General Condition photograph	00:00:00	117_4a	(Misc) 0
	20.40	MH	Manhole Remark: MH8	00:00:00		(Constr) 0
	27.90	LD	Line of Sewer deviates down	00:00:00		(Serv) 0
	28.80	MH	Manhole Remark: MH10	00:00:00		(Constr) 0
	29.90	LD	Line of Sewer deviates down	00:00:00		(Serv) 0
	33.00	DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	34.50	FH	Finish Survey, Remark: Main Sewer	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
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Ipswich
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Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**11**	**MH6 X X**

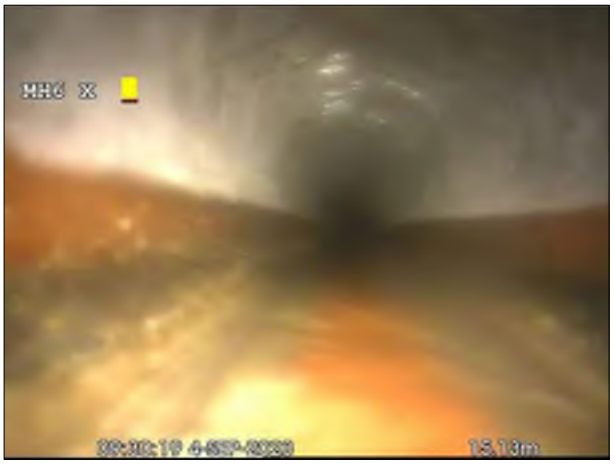

Photo: 117_4a, 00:00:00
15.13m, General Condition photograph

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**12**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH6 B**
Place:	**Reading**	District:		end MH:	**MH**
Location:		Tape No.:		Total length:	**19.2 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:

1:150	position	code	observation	counter	photo	grade
MH6 B	0.00	MH	Manhole Remark: MH6 B	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	5.27	GP	General Condition photograph	00:00:00	133_3a	(Misc) 0
	16.00	LR	Line of Sewer deviates right	00:00:00		(Serv) 0
MH	19.20	FH	Finish Survey, Remark: MH	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**12**	**? X**

Photo: 133_3a, 00:00:00
5.27m, General Condition photograph

SURVEY SOLUTIONS

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Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

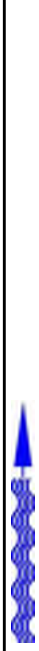
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**13**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH6 C**
Place:	**Reading**	District:		end MH:	**MH22 X**
Location:		Tape No.:		Total length:	**20.3 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:150	position		code	observation	counter	photo	grade
MH6 C	0.00		MH	Manhole Remark: MH6 C	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.40		WL	Water level, 10 % height/diameter	00:00:00		(Serv) 0
	1.80	**S1**	DES	Debris silt, 10 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	16.50	**F1**	DES	Debris silt, 10 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	18.20	**S2**	DES	Debris silt, 10 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	20.20	**F2**	DES	Debris silt, 10 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
MH22 X	20.30		FH	Finish Survey, Remark: MH22 X	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**14**	**MH7 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH7 X**
Place:	**Reading**	District:		end MH:	**MH9**
Location:		Tape No.:		Total length:	**74 m**

Purpose:		Shape/Size:	**Circular dia 225 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:

1:125	position		code	observation	counter	photo	grade
MH7 X	0.00		MH	Manhole Remark: MH7 X	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.30		DE	Debris, 30 % cross-sectional area loss	00:00:00	15_3a	(Serv) 1
	1.40	**S1**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	5.70	**F1**	DES	Debris silt, 10 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	7.00		DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	11.10		DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	14.20		FH	Finish Survey, Remark: MH9	00:00:00		(Misc) 0

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Inspection report

Date:	Job nr.:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**14**	**MH7 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

1:125	position	code	observation	counter	photo	grade

Survey Solutions
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Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job nr.:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**14**	**MH7 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

1:125	position	code	observation	counter	photo	grade

Survey Solutions
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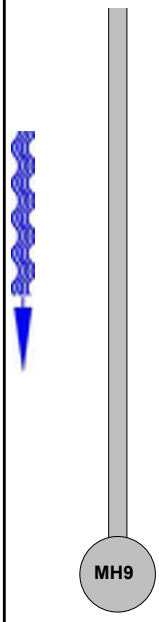
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job nr.:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**14**	**MH7 X X**
Present:	Vehicle:	Camera:	Preset:	Cleaned:	Grade:
		Solo pro Camera		**No**	

1:125	position	code	observation	counter	photo	grade



Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**14**	**MH7 X X**

Photo: 15_3a, 00:00:00
0.3m, Debris, 30 % cross-sectional area loss

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

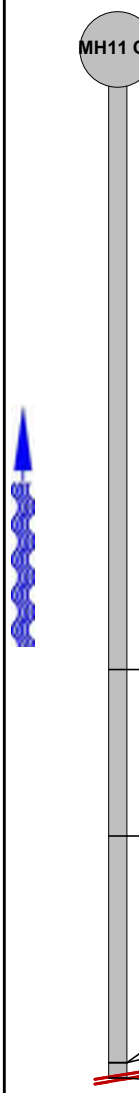
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**15**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH11 C**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**6.8 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH11 C	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	4.10		LD	Line of Sewer deviates down	00:00:00		(Serv) 0
	5.20	**S1**	DES	Debris silt, 10 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	6.70	**C1**	DES	Debris silt, 20 % cross-sectional area loss, Changed	00:00:00		(Serv) 1
	6.70	**F1**	DES	Debris silt, 20 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	6.80		SA	Survey abandoned, Remark: Unable to pass blockage	00:00:00	174_7a	(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**15**	**? X**

Photo: 174_7a, 00:00:00
6.8m, Survey abandoned, Remark: Unable to pass blockage

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

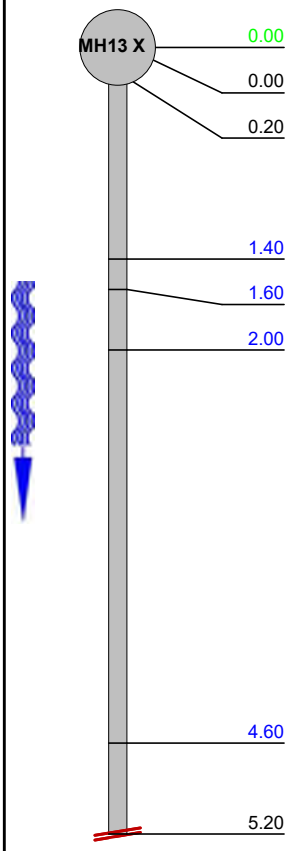
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**16**	**MH13 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH13 X**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**5.8 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50 position	code	observation	counter	photo	grade
0.00	MH	Manhole Remark: MH13 X	00:00:00		(Constr) 0
0.00	ST	Start of Survey	00:00:00		(Misc) 0
0.20	GP	General Condition photograph	00:00:00	183_3a	(Misc) 0
1.40	LD	Line of Sewer deviates down	00:00:00		(Serv) 0
1.60	LR	Line of Sewer deviates right	00:00:00		(Serv) 0
2.00	LL	Line of Sewer deviates left	00:00:00		(Serv) 0
4.60	WL	Water level, 10 % height/diameter	00:00:00		(Serv) 0
5.20	SA	Survey abandoned, Remark: Unable to get clear footage pass this point	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**16**	**MH13 X X**

Photo: 183_3a, 00:00:00
0.2m, General Condition photograph

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

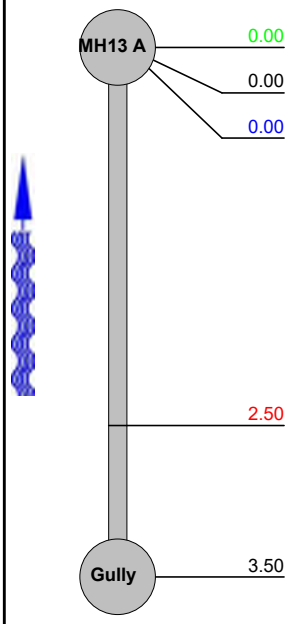
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**17**	**MH13 A X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH13 A**
Place:	**Reading**	District:		end MH:	**Gully**
Location:		Tape No.:		Total length:	**3.5 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH13 A	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	0.00	LR	Line of Sewer deviates right	00:00:00		(Serv) 0
	2.50	CC	Circumferential Crack, from 12 to 01 o´clock	00:00:00	187_4a	(Struct) 2
	3.50	FH	Finish Survey, Remark: Gully	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
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Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**17**	**MH13 A X**

Photo: 187_4a, 00:00:00
2.5m, Circumferential Crack, from 12 to 01 o´clock

SURVEY SOLUTIONS

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Inspection report

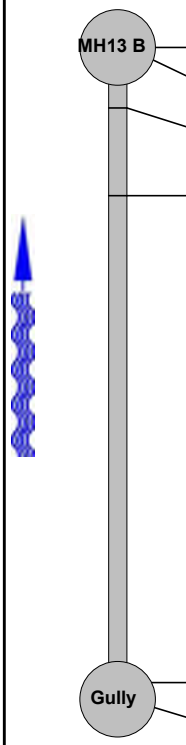
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**18**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH13 B**
Place:	**Reading**	District:		end MH:	**Gully**
Location:		Tape No.:		Total length:	**4.31 m**

Purpose:		Shape/Size:	**Circular dia 150 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH13 B	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.40	**S1**	DES	Debris silt, 20 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	0.98	**C1**	DES	Debris silt, 5 % cross-sectional area loss, Changed	00:00:00		(Serv) 1
	4.20	**F1**	DES	Debris silt, 10 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	4.31		FH	Finish Survey, Remark: Gully	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**19**	**MH14 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH14 X**
Place:	**Reading**	District:		end MH:	**MH23**
Location:		Tape No.:		Total length:	**26.4 m**

Purpose:		Shape/Size:	**Circular dia 225 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:

1:200	position	code	observation	counter	photo	grade
MH14 X	0.00	MH	Manhole Remark: MH14 X	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	4.30	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	11.20	GP	General Condition photograph	00:00:00	23_4a	(Misc) 0
MH23	26.40	FH	Finish Survey, Remark: MH23	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**19**	**MH14 X X**

Photo: 23_4a, 00:00:00
11.2m, General Condition photograph

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

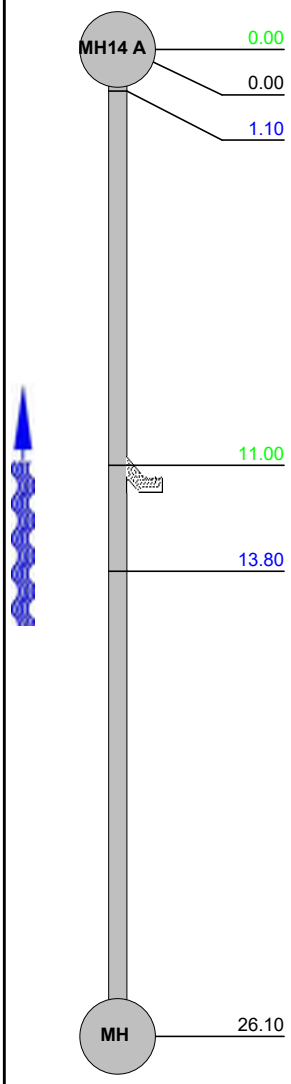
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**20**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH14 A**
Place:	**Reading**	District:		end MH:	**MH**
Location:		Tape No.:		Total length:	**26.1 m**

Purpose:		Shape/Size:	**Circular dia 225 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:200 position	code	observation	counter	photo	grade
0.00	MH	Manhole Remark: MH14 A	00:00:00		(Constr) 0
0.00	ST	Start of Survey	00:00:00		(Misc) 0
1.10	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
11.00	JN	Junction at 10 o´clock, dia 150 mm	00:00:00	204_4a	(Constr) 0
13.80	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
26.10	FH	Finish Survey, Remark: MH	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**20**	**? X**

Photo: 204_4a, 00:00:00
11m, Junction at 10 o´clock, dia 150 mm

Survey Solutions
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Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

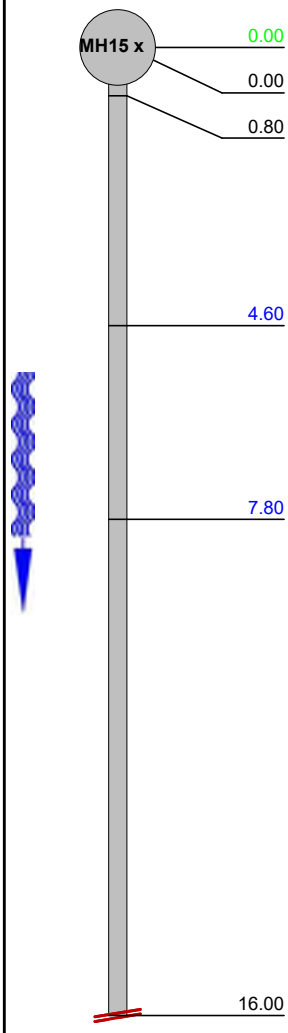
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**21**	**MH15 x X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH15 x**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**16 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:125	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH15 x	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.80		GP	General Condition photograph	00:00:00	214_3a	(Misc) 0
	4.60	**S1**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	7.80	**F1**	DES	Debris silt, 5 % cross-sectional area loss, Finish			(Serv) 1
	16.00		SA	Survey abandoned, Remark: Restricted Leverage	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
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Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**21**	**MH15 x X**

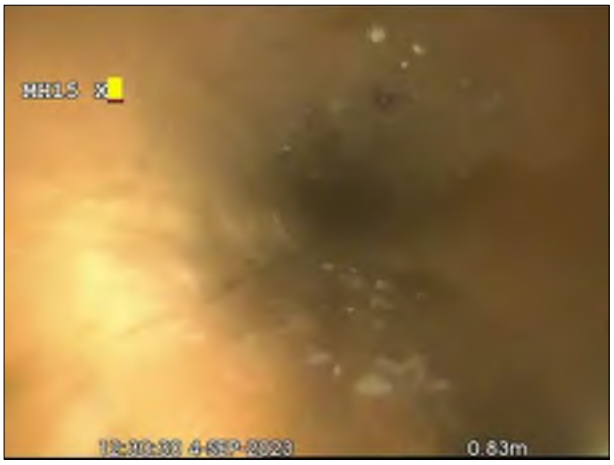

Photo: 214_3a, 00:00:00
0.8m, General Condition photograph

SURVEY SOLUTIONS

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Inspection report

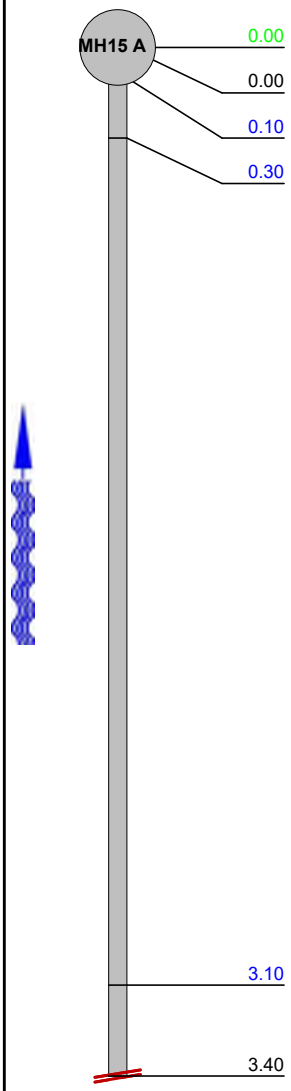
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**22**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH15 A**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**3.4 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:25	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH15 A	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.10	**S1**	DES	Debris silt, 20 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	0.30	**F1**	DES	Debris silt, 20 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	3.10		DES	Debris silt, 10 % cross-sectional area loss	00:00:00	219_5a	(Serv) 1
	3.40		SA	Survey abandoned, Remark: Unable to pass blockage	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

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Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**22**	**? X**

Photo: 219_5a, 00:00:00
3.1m, Debris silt, 10 % cross-sectional area loss

Survey Solutions
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Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

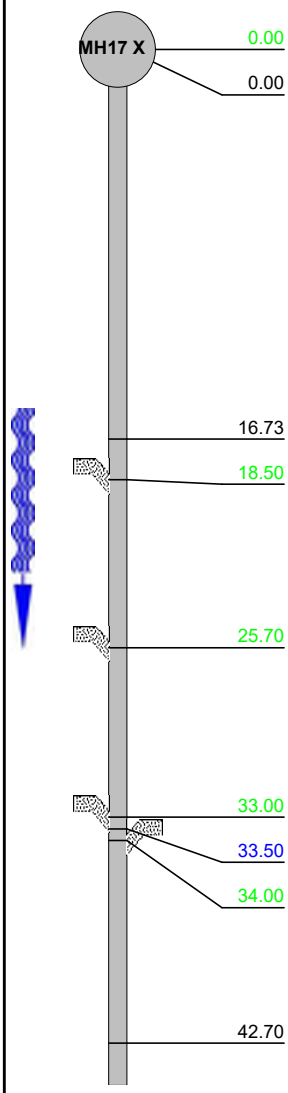
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**23**	**MH17 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH17 X**
Place:	**Reading**	District:		end MH:	**MH**
Location:		Tape No.:		Total length:	**46.73 m**

Purpose:		Shape/Size:	**Circular dia 225 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:325	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH17 X	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	16.73	GP	General Condition photograph		27_3a	(Misc) 0
	18.50	JN	Junction at 03 o´clock, dia 100 mm	00:00:00	232_4a	(Constr) 0
	25.70	JN	Junction at 03 o´clock, dia 100 mm	00:00:00		(Constr) 0
	33.00	JN	Junction at 03 o´clock, dia 100 mm	00:00:00	234_6a	(Constr) 0
	33.50	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	34.00	JN	Junction at 10 o´clock, dia 100 mm	00:00:00	236_8a	(Constr) 0
	42.70	FH	Finish Survey, Remark: MH	00:00:00		(Misc) 0

Survey Solutions
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Ipswich
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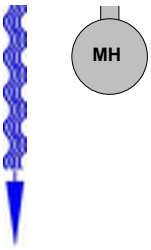
Inspection report

Date:	Job nr.:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**23**	**MH17 X X**
Present:	Vehicle:	Camera:	Preset:	Cleaned:	Grade:
		Solo pro Camera		**No**	

1:325	position	code	observation	counter	photo	grade



Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**23**	**MH17 X X**

Photo: 27_3a
16.73m, General Condition photograph

Photo: 232_4a, 00:00:00
18.5m, Junction at 03 o´clock, dia 100 mm

Photo: 234_6a, 00:00:00
33m, Junction at 03 o´clock, dia 100 mm

Photo: 236_8a, 00:00:00
34m, Junction at 10 o´clock, dia 100 mm

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

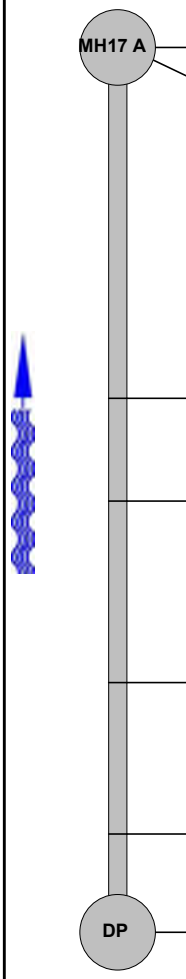
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**24**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH17 A**
Place:	**Reading**	District:		end MH:	**DP**
Location:		Tape No.:		Total length:	**5.85 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH17 A	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	2.32	GP	General Condition photograph	00:00:00	227_3a	(Misc) 0
	3.00	LU	Line of Sewer deviates up	00:00:00		(Serv) 0
	4.20	LD	Line of Sewer deviates down	00:00:00		(Serv) 0
	5.20	LU	Line of Sewer deviates up	00:00:00		(Serv) 0
	5.85	FH	Finish Survey, Remark: DP	00:00:00	231_7a	(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
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Ipswich
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Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**24**	**? X**

Photo: 227_3a, 00:00:00
2.32m, General Condition photograph

Photo: 231_7a, 00:00:00
5.85m, Finish Survey, Remark: DP

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

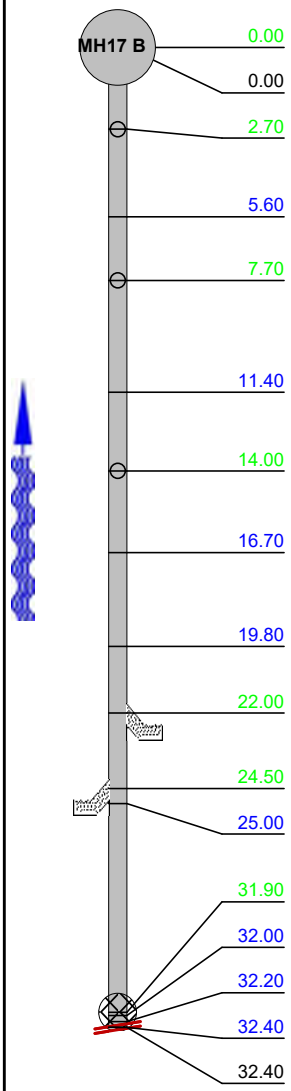
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**25**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH17 B**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**32.4 m**

Purpose:		Shape/Size:	**Circular dia 225 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:250	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH17 B	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	2.70		JN	Junction at 11 o´clock, dia 150 mm	00:00:00	240_3a	(Constr) 0
	5.60		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	7.70		JN	Junction at 11 o´clock, dia 150 mm	00:00:00		(Constr) 0
	11.40		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	14.00		JN	Junction at 12 o´clock, dia 100 mm	00:00:00	244_7a	(Constr) 0
	16.70	S1	DES	Debris silt, 10 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	19.80	F1	DES	Debris silt, 10 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	22.00		JN	Junction at 10 o´clock, dia 150 mm	00:00:00	247_10a	(Constr) 0
	24.50		JN	Junction at 03 o´clock, dia 150 mm	00:00:00	248_11a	(Constr) 0
	25.00	S1	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	31.90		MH	Manhole Remark: Chamber visible	00:00:00	250_13a	(Constr) 0
	32.00	F1	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	32.20	S1	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	32.40	F1	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	32.40		SA	Survey abandoned, Remark: Restricted Leverage	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
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Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**25**	**? X**

Photo: 240_3a, 00:00:00
2.7m, Junction at 11 o´clock, dia 150 mm

Photo: 244_7a, 00:00:00
14m, Junction at 12 o´clock, dia 100 mm

Photo: 247_10a, 00:00:00
22m, Junction at 10 o´clock, dia 150 mm

Photo: 248_11a, 00:00:00
24.5m, Junction at 03 o´clock, dia 150 mm

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**25**	**? X**

Photo: 250_13a, 00:00:00
31.9m, Manhole Remark: Chamber visible

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

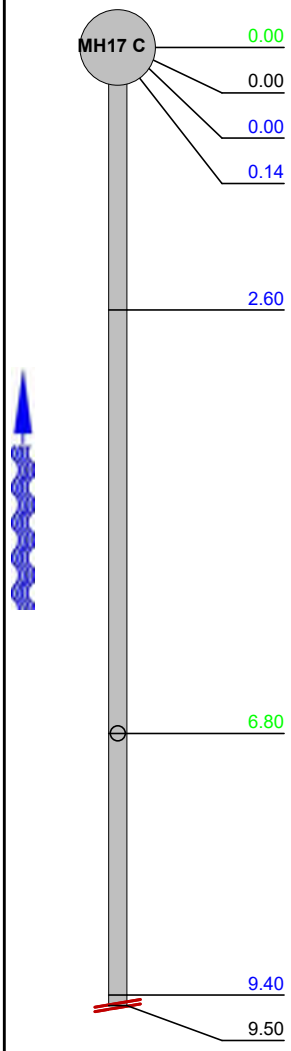
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**26**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH17 C**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**9.5 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:75	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH17 C	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.00	**S1**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	0.14		LL	Line of Sewer deviates left	00:00:00		(Serv) 0
	2.60		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	6.80		JN	Junction at 01 o´clock, dia 100 mm	00:00:00	260_6a	(Constr) 0
	9.40	**F1**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	9.50		SA	Survey abandoned, Remark: Restricted leverage	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**26**	**? X**

Photo: 260_6a, 00:00:00
6.8m, Junction at 01 o´clock, dia 100 mm

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

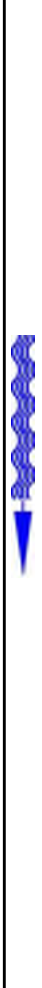
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**27**	**MH22 X X**
Present:	Vehicle:	Camera:	Preset:	Cleaned:	Grade:
		Solo pro Camera		**No**	

Road:	**2 Norman Place**	Division:		start MH:	**MH22 X**
Place:	**Reading**	District:		end MH:	**MH6 C**
Location:		Tape No.:		Total length:	**20.7 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:175	position		code	observation	counter	photo	grade
MH22 X	0.00		MH	Manhole Remark: MH22 X	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.02		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	0.50	**S1**	DES	Debris silt, 20 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	6.80		WL	Water level, 20 % height/diameter	00:00:00		(Serv) 0
	19.80	**F1**	DES	Debris silt, 20 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
MH6 C	20.70		FH	Finish Survey, Remark: MH6 C	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

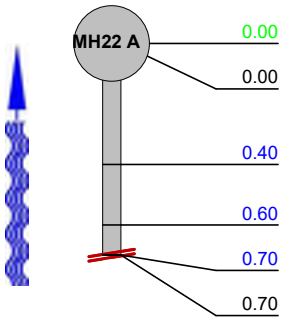
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**28**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH22 A**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**0.7 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:25	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH22 A	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.40	**S1**	DE	Debris, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	0.60	**F1**	DE	Debris, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	0.70		DE	Debris, 50 % cross-sectional area loss	00:00:00	278_5a	(Serv) 1
	0.70		SA	Survey abandoned, Remark: Unable to pass blockage	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**28**	**? X**

Photo: 278_5a, 00:00:00
0.7m, Debris, 50 % cross-sectional area loss

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

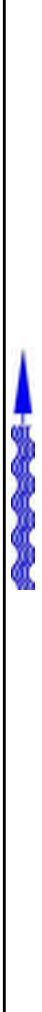
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**29**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH22 B**
Place:	**Reading**	District:		end MH:	**MH**
Location:		Tape No.:		Total length:	**18.2 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:150	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH22 B	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.50		WL	Water level, 30 % height/diameter	00:00:00		(Serv) 0
	1.60		WL	Water level, 50 % height/diameter	00:00:00		(Serv) 0
	6.50	**S1**	DES	Debris silt, 50 % cross-sectional area loss, Start,	00:00:00	284_5a	(Serv) 1
	17.60	**F1**	DES	Debris silt, 50 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	18.20		FH	Finish Survey, Remark: Chamber visible	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**29**	**? X**

Photo: 284_5a, 00:00:00
6.5m, Debris silt, 50 % cross-sectional area loss, Start,

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

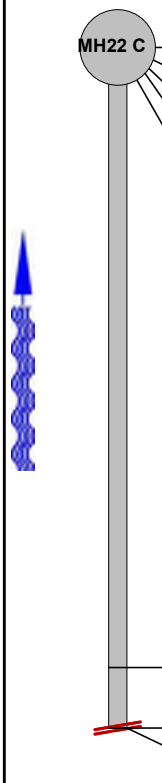
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**30**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH22 C**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**4.5 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Foul**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH22 C	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	0.00		WL	Water level, 40 % height/diameter	00:00:00		(Serv) 0
	0.00	**S1**	CU	Camera Underwater, Start	00:00:00		(Misc) 0
	0.10		DES	Debris silt, 10 % cross-sectional area loss	00:00:00		(Serv) 1
	4.10		WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
	4.50	**F1**	CU	Camera Underwater, Finish	00:00:00		(Misc) 0
	4.50		SA	Survey abandoned, Remark: Restricted Leverage	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

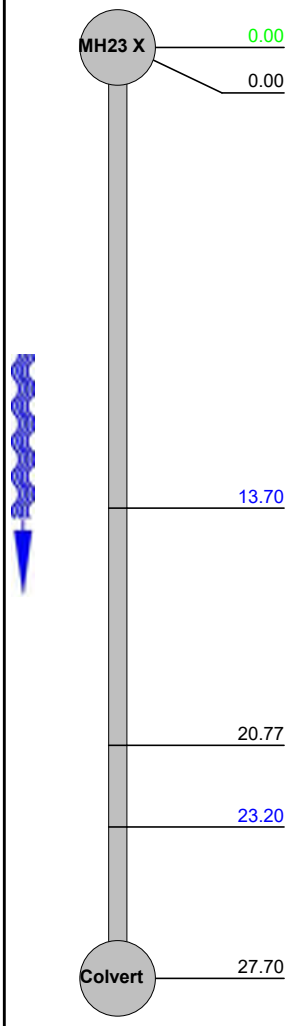
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**31**	**MH23 X X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH23 X**
Place:	**Reading**	District:		end MH:	**Colvert**
Location:		Tape No.:		Total length:	**27.7 m**

Purpose:		Shape/Size:	**Circular dia 300 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:225	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH23 X	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	13.70	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	20.77	GP	General Condition photograph	00:00:00		(Misc) 0
	23.20	WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
	27.70	FH	Finish Survey, Remark: Colvert	00:00:00	35_6a	(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**31**	**MH23 X X**

Photo: 35_6a, 00:00:00
27.7m, Finish Survey, Remark: Colvert

Survey Solutions
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Ipswich
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Inspection report

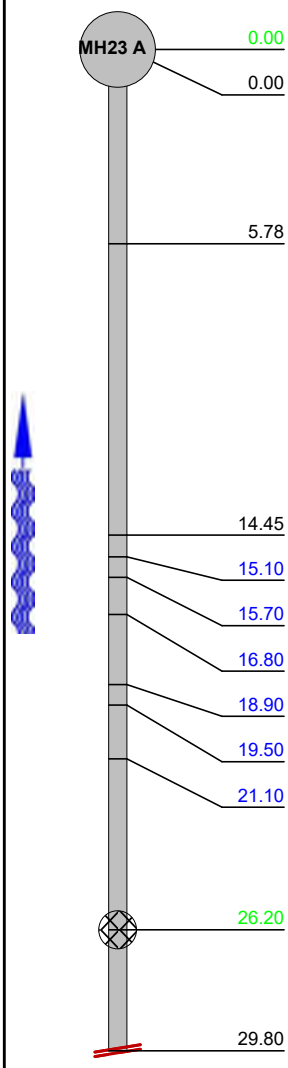
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**32**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH23 A**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**29.8 m**

Purpose:		Shape/Size:	**Circular dia 225 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:225	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH23 A	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	5.78	GP	General Condition photograph	00:00:00	306_3a	(Misc) 0
	14.45	GP	General Condition photograph	00:00:00	307_4a	(Misc) 0
	15.10	DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	15.70	DES	Debris silt, 5 % cross-sectional area loss			(Serv) 1
	16.80	WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	18.90	WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
	19.50	LD	Line of Sewer deviates down	00:00:00		(Serv) 0
	21.10	DES	Debris silt, 5 % cross-sectional area loss	00:00:00		(Serv) 1
	26.20	MH	Manhole Remark: MH	00:00:00	314_11a	(Constr) 0
	29.80	SA	Survey abandoned, Remark: Rescricted leverage	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**32**	**? X**

Photo: 306_3a, 00:00:00
5.78m, General Condition photograph

Photo: 307_4a, 00:00:00
14.45m, General Condition photograph

Photo: 314_11a, 00:00:00
26.2m, Manhole Remark: MH

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

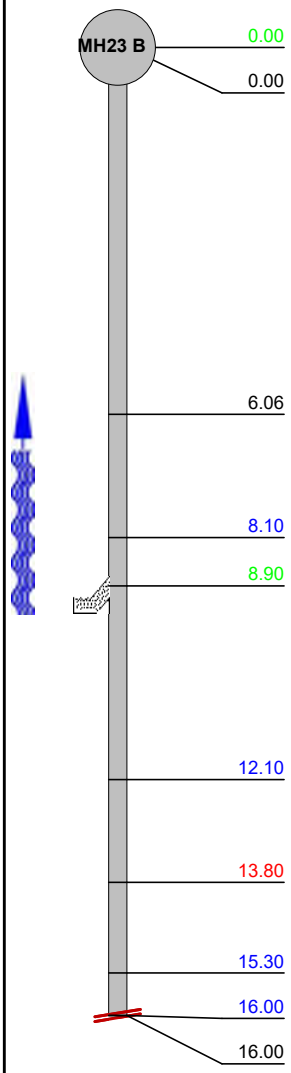
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**33**	**SA X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH23 B**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**16 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:125 position	code	observation	counter	photo	grade
0.00	MH	Manhole Remark: MH23 B	00:00:00		(Constr) 0
0.00	ST	Start of Survey	00:00:00		(Misc) 0
6.06	GP	General Condition photograph	00:00:00	319_3a	(Misc) 0
8.10	LR	Line of Sewer deviates right	00:00:00		(Serv) 0
8.90	JN	Junction at 02 o´clock, dia 100 mm	00:00:00	321_5a	(Constr) 0
12.10	LL	Line of Sewer deviates left	00:00:00		(Serv) 0
13.80	JDM	Joint displaced. Medium	00:00:00	323_7a	(Struct) 1
15.30	LL	Line of Sewer deviates left	00:00:00		(Serv) 0
16.00	LU	Line of Sewer deviates up	00:00:00		(Serv) 0
16.00	SA	Survey abandoned, Remark: Unable to pass bend	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
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Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**33**	**SA X**

Photo: 319_3a, 00:00:00
6.06m, General Condition photograph

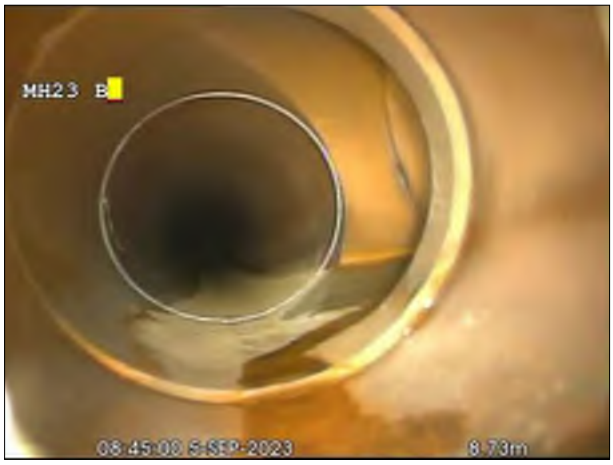


Photo: 321_5a, 00:00:00
8.9m, Junction at 02 o´clock, dia 100 mm

Photo: 323_7a, 00:00:00
13.8m, Joint displaced. Medium

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

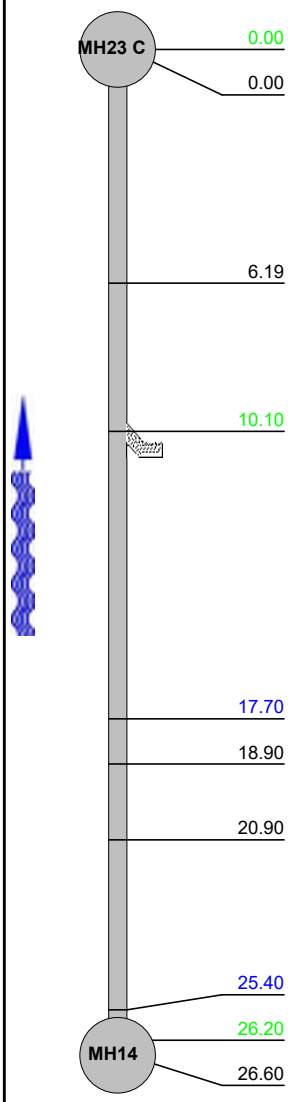
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**34**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH23 C**
Place:	**Reading**	District:		end MH:	**MH14**
Location:		Tape No.:		Total length:	**26.6 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:200	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH23 C	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	6.19		GP	General Condition photograph	00:00:00	329_3a	(Misc) 0
	10.10		JN	Junction at 10 o´clock, dia 100 mm	00:00:00	330_4a	(Constr) 0
	17.70		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	18.90	**S1**	CU	Camera Underwater, Start	00:00:00		(Misc) 0
	20.90	**F1**	CU	Camera Underwater, Finish	00:00:00		(Misc) 0
	25.40		WL	Water level, 0 % height/diameter	00:00:00		(Serv) 0
	26.20		MH	Manhole Remark: MH15 X	00:00:00	335_9a	(Constr) 0
	26.60		FH	Finish Survey, Remark: MH14	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**34**	**? X**

Photo: 329_3a, 00:00:00
6.19m, General Condition photograph

Photo: 330_4a, 00:00:00
10.1m, Junction at 10 o´clock, dia 100 mm

Photo: 335_9a, 00:00:00
26.2m, Manhole Remark: MH15 X

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

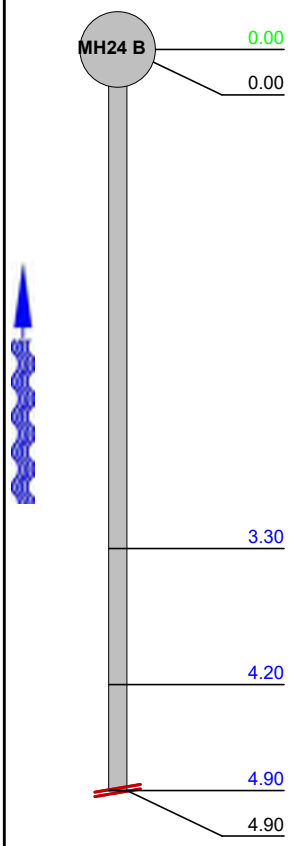
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**35**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH24 B**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**4.9 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH24 B	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	3.30	**S1**	DE	Debris, 20 % cross-sectional area loss, Start, Remark: Roots	00:00:00		(Serv) 1
	4.20	**F1**	DE	Debris, 20 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	4.90		DE	Debris, 95 % cross-sectional area loss	00:00:00	344_5a	(Serv) 1
	4.90		SA	Survey abandoned, Remark: Unable to pass blockage	00:00:00		(Misc) 0

Structural Defects	**Constructional Features**
Service Defects	**Miscellaneous Features**

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**35**	**? X**

Photo: 344_5a, 00:00:00
4.9m, Debris, 95 % cross-sectional area loss

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

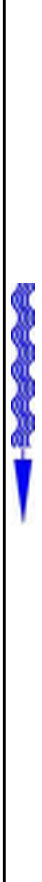
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**36**	**MH25 X X**
Present:	Vehicle:	Camera:	Preset:	Cleaned:	Grade:
		Solo pro Camera		**No**	

Road:	**2 Norman Place**	Division:		start MH:	**MH25 X**
Place:	**Reading**	District:		end MH:	**MH24**
Location:		Tape No.:		Total length:	**5.2 m**

Purpose:		Shape/Size:	**Circular dia 300 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:50	position	code	observation	counter	photo	grade
MH25 X	0.00	MH	Manhole Remark: MH25 X	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	4.80	MH	Manhole Remark:MH	00:00:00	349_3a	(Constr) 0
MH24	5.20	FH	Finish Survey, Remark: MH24	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**36**	**MH25 X X**

Photo: 349_3a, 00:00:00
4.8m, Manhole Remark:MH

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**37**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH25 A**
Place:	**Reading**	District:		end MH:	**DC**
Location:		Tape No.:		Total length:	**9.3 m**

Purpose:		Shape/Size:	**Circular dia 100 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:

1:75	position	code	observation	counter	photo	grade
	0.00	MH	Manhole Remark: MH25 A	00:00:00		(Constr) 0
	0.00	ST	Start of Survey	00:00:00		(Misc) 0
	1.80	LR	Line of Sewer deviates right	00:00:00		(Serv) 0
	6.70	GP	General Condition photograph	00:00:00	41_4a	(Misc) 0
	8.10	LL	Line of Sewer deviates left	00:00:00		(Serv) 0
	8.90	JN	Junction at 03 o´clock, dia 100 mm	00:00:00	371_6a	(Constr) 0
	9.30	FH	Finish Survey, Remark: DP	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**37**	**? X**

Photo: 41_4a, 00:00:00
6.7m, General Condition photograph

Photo: 371_6a, 00:00:00
8.9m, Junction at 03 o´clock, dia 100 mm

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection report

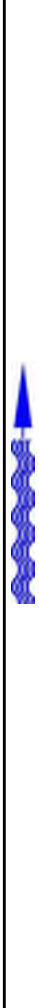
Date:	Job N°:	Weather:	Operator:	section number:	PLR:
06/09/2023	**60390**	**Dry**	**SWA**	**38**	**? X**
Present:	Vehicle:	Camera: **Solo pro Camera**	Preset:	Cleaned: **No**	Grade:

Road:	**2 Norman Place**	Division:		start MH:	**MH25 B**
Place:	**Reading**	District:		end MH:	**SA**
Location:		Tape No.:		Total length:	**34.4 m**

Purpose:		Shape/Size:	**Circular dia 300 mm**
Use:	**Surface water**	Material:	**Vitrified clay** Pipe length:
Catchment:		Lining:	
		Category:	

Comment:

Location details:



1:275	position		code	observation	counter	photo	grade
	0.00		MH	Manhole Remark: MH25 B	00:00:00		(Constr) 0
	0.00		ST	Start of Survey	00:00:00		(Misc) 0
	6.70		JN	Junction at 10 o´clock, dia 150 mm	00:00:00	360_3a	(Constr) 0
	7.70	**S1**	DES	Debris silt, 5 % cross-sectional area loss, Start	00:00:00		(Serv) 1
	15.20	**F1**	DES	Debris silt, 5 % cross-sectional area loss, Finish	00:00:00		(Serv) 1
	17.60		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	21.90		MH	Manhole Remark: MH	00:00:00	363_7a	(Constr) 0
	22.60		LR	Line of Sewer deviates right	00:00:00		(Serv) 0
	32.00		WL	Water level, 5 % height/diameter	00:00:00		(Serv) 0
	34.40		SA	Survey abandoned, Remark: Rescricted leverage	00:00:00		(Misc) 0

Structural Defects	Constructional Features
Service Defects	Miscellaneous Features

SURVEY SOLUTIONS

Survey Solutions
Irisweg 12
Ipswich
Tel: 01473 240410, Fax: N/A

Inspection photos

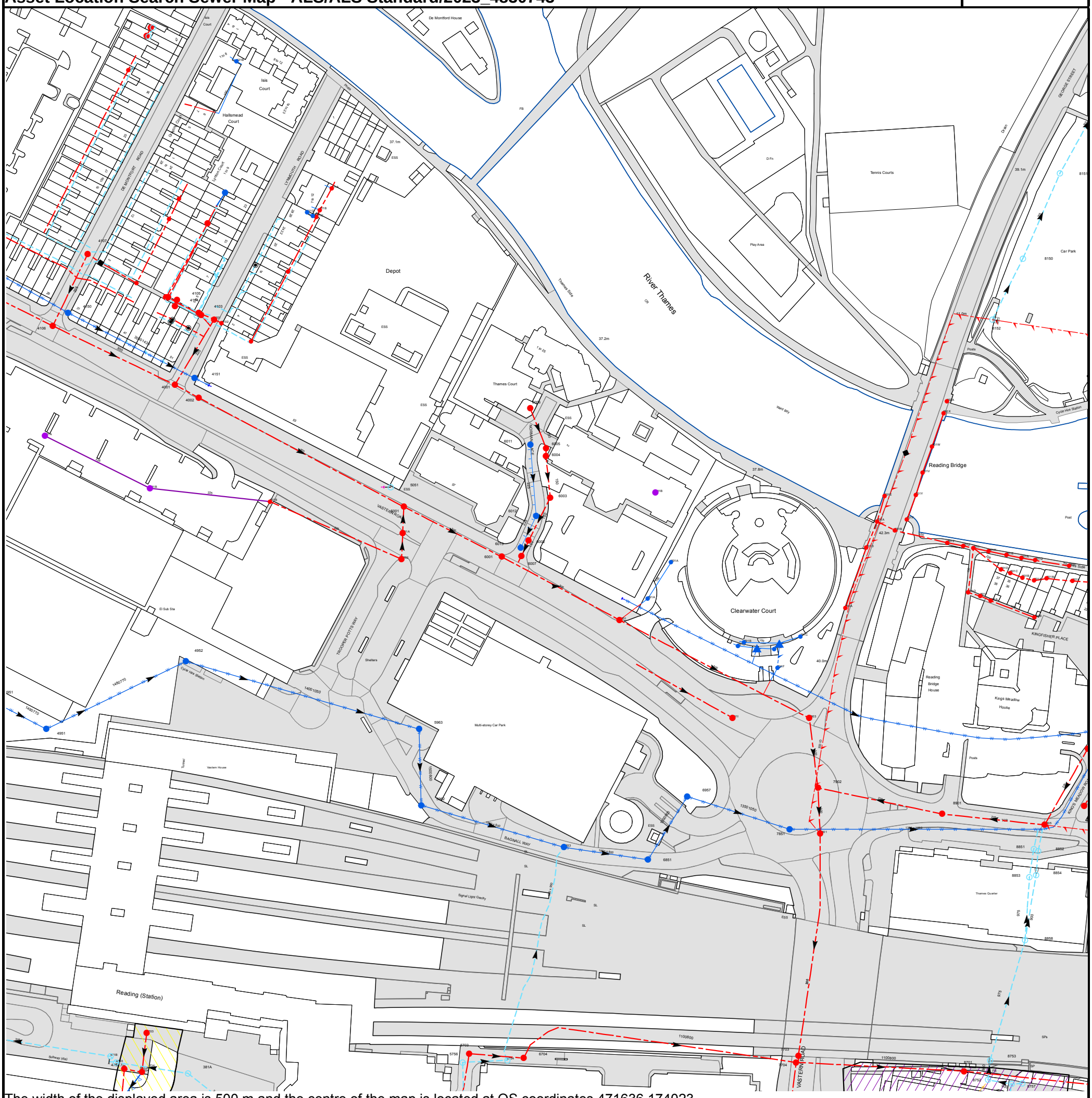
Place:	Road:	Date:	section number:	PLR:
Reading	**2 Norman Place**	**06/09/2023**	**38**	**? X**

Photo: 360_3a, 00:00:00
6.7m, Junction at 10 o´clock, dia 150 mm

Photo: 363_7a, 00:00:00
21.9m, Manhole Remark: MH

Appendix E – Thames Water Sewer Records and PPSE Response

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4830743



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 471636,174023

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

Matt Freeman

Hexa Consulting
Studio 22
46 The Calls
Leeds, West Yorkshire
LS2 7EY

Wastewater pre-planning
Our ref DS6107816, DTS-75636

07 June 2024

Pre-planning enquiry: Confirmation of sufficient capacity (Foul Only)

Site: 2 Norman Place, Reading RG1 8DA

Dear Matt,

Thank you for providing information on your development.

Proposal 250 Flats
Proposed foul discharge via gravity in between FWMH SU71746001 and SU71736901 (300mm)
Proposed surface water discharge into private surface water network.
No surface water will discharge to Thames Water assets.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain
6. controlled rainwater discharge to a combined sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

Please see our FAQ's leaflet for additional information.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you have any further questions, please contact me on 0774 764 6498.

Kind Regards,

Long Tran
Developer Services – Adoptions Engineer, Sewer Adoptions Team
Tel: 0800 009 3921
Get advice on making your sewer connection correctly at connectright.org.uk
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

Appendix F – Reading Borough Council Correspondence

Matt Freeman

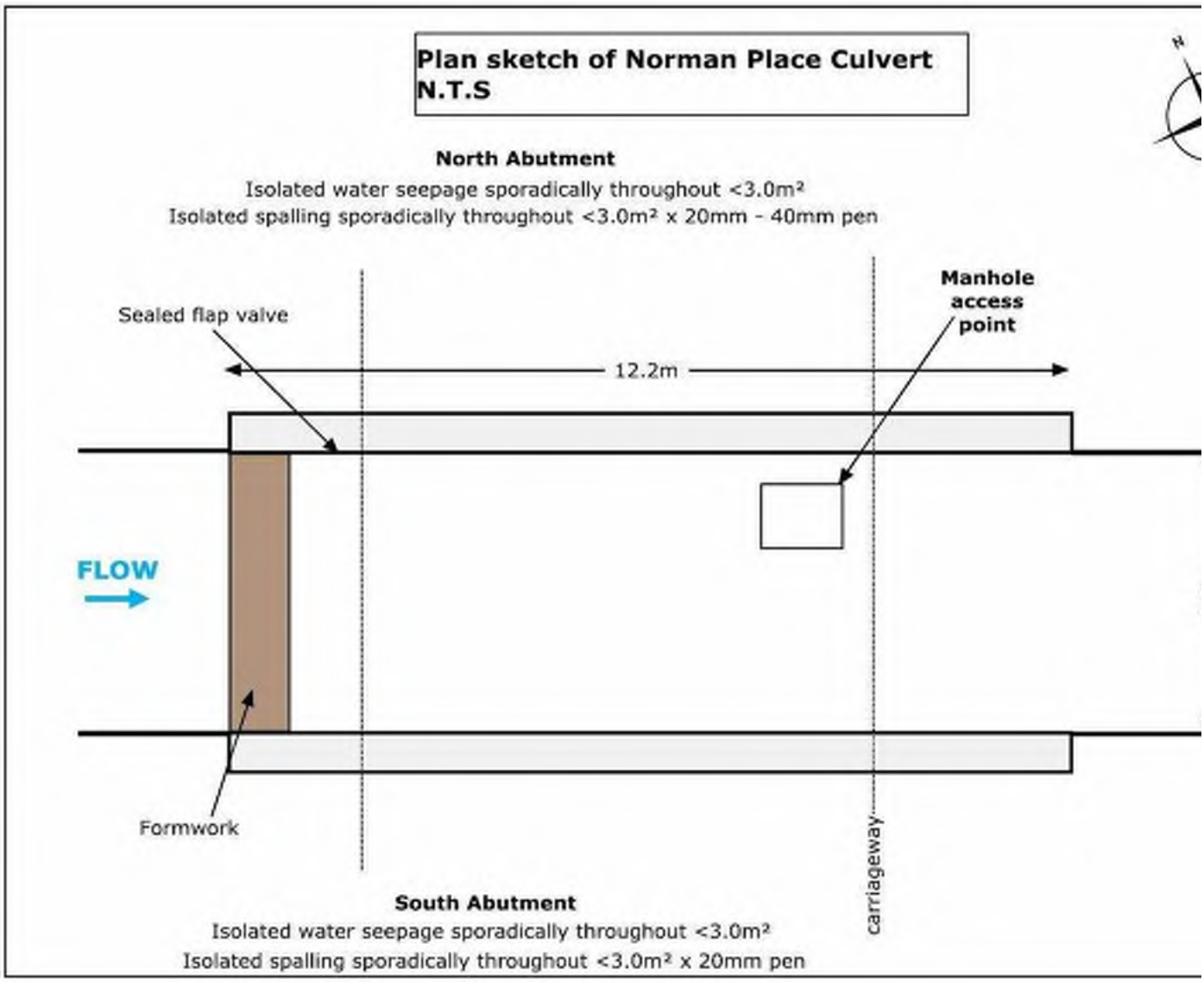
From: Djanie, Samuel <samuel.djanie@stantec.com>
Sent: 18 October 2023 18:09
To: Matt Freeman
Cc: Shean, Sam
Subject: RE: Vastern Ditch Culvert [Filed 06 Nov 2023 14:47]

Categories: Filed by Mail Manager

Hi Matt,

There are no as-built drawings of the culvert under Norman Place but the below images may be useful to you. The structure under Norman Place is a concrete box culvert. The section of culvert outside the highway boundary is not maintained by Reading Borough Council so we don't have any information on it. However, I know the culvert continues almost parallel to Vastern Road and passes under George Street where it is a brick arch. I'd advise you to undertake independent investigations to confirm the line of the culvert and its make-up.

Note that if you're planning to undertake any works near the section of culvert within highway boundary, aspects of your design may be subject to technical approval.



Regards,

Samuel Djanie
BSc MSc DIC CEng MICE PEGhIE
Associate – Transport Infrastructure

Caversham Bridge House, Waterman Place, Reading RG1 8DN
Direct: +44 1189 523165
Mobile: +44 7958 958567
samuel.djanie@stantec.com

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From: Matt Freeman <matt.freeman@hexaconsulting.co.uk>
Sent: Wednesday, October 18, 2023 3:13 PM
To: Djanie, Samuel <samuel.djanie@stantec.com>
Subject: Vastern Ditch Culvert

Hi Samuel,

I've been passed your details from Sam Shean at RBC in relation to the Vastern ditch culvert.

I'm working on a project at Norman Place/Vastern Road in Reading and I'm aware of a culverted watercourse adjacent to Vastern Road. I've done some digging around to find some information on the culvert but there are scant details available, other than that it is there!

Based on two buried services/CCTV drainage surveys, it appears that the culvert is quite shallow (circa 1.5-2m below ground level). I'm planning to get accurate information on the position and depth of the culvert through trial pits at a couple of points along the length.

The primary issue is that the proposals will come close to the (assumed) position of the culvert – see attached drawing illustrating the preliminary proposals and the existing below ground drainage. The building is going to move slightly further away from Vastern Road but we're proposing to go no closer to Vastern Road than the existing car park serving the Covea building. The building will require piled foundations so all loads will be taken below the level of the culvert and no additional loading will be placed on the culvert. It's the design team's proposal to locate the building no closer than the red line as shown in the image below. The red line corresponds to the frontage of each of the nearby properties/buildings and the blue line is our site boundary.

Do you have any further information on the culvert – record drawings, plotted route – anything really that can assist with our understanding of its position, size and construction?

Many thanks,

Matt Freeman
Principal Engineer
e: Matt.Freeman@hexaconsulting.co.uk
t: 0113 3023260
a: Hexa Consulting Ltd, Studio 22, 46 The Calls, Leeds, LS2 7EY

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Appendix G – Culverted Watercourse Survey

Key

Log Locations

Trial Pits

0 3 6 9 12 m

Scale	Paper Size
1:300	A4

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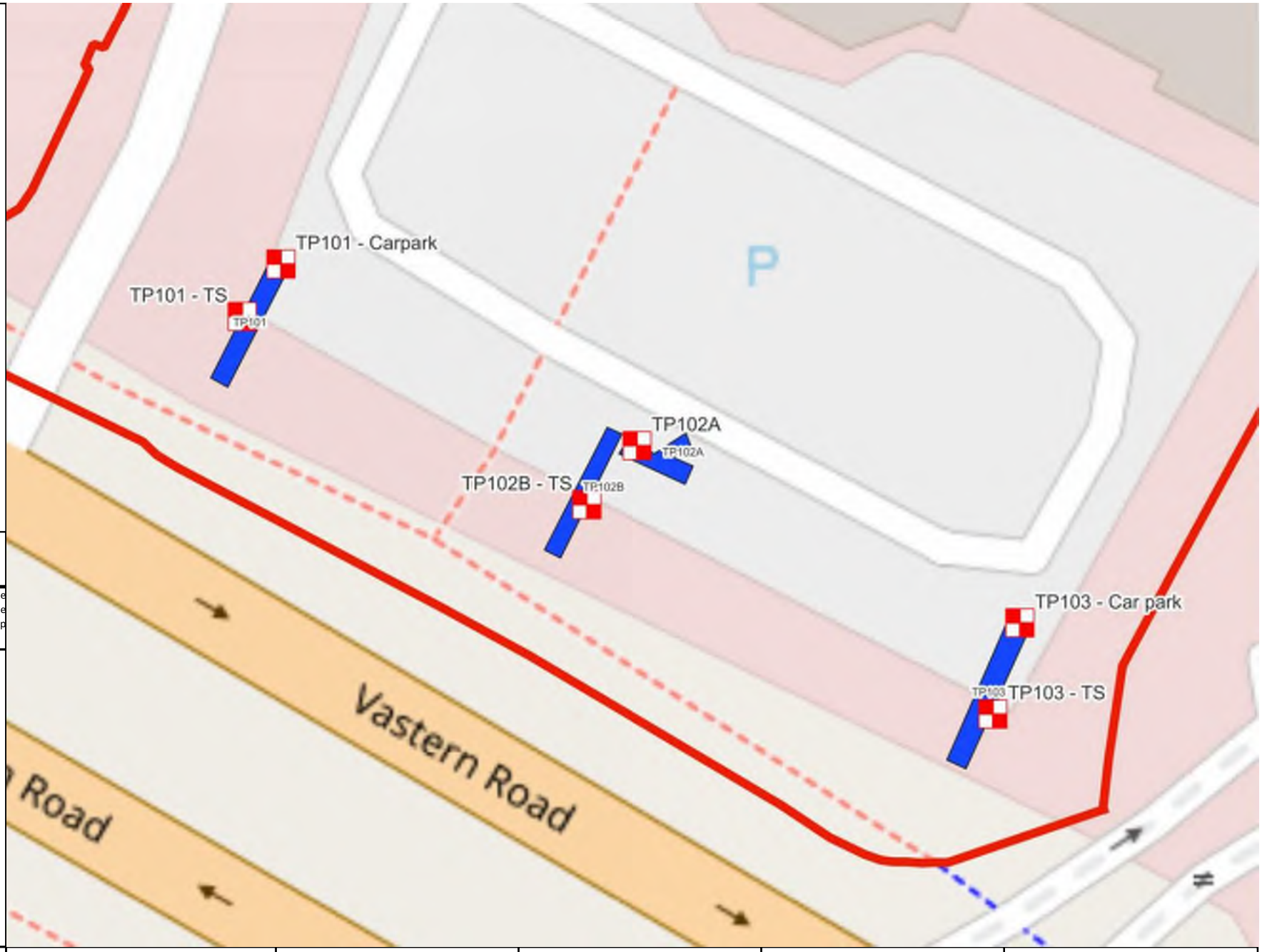
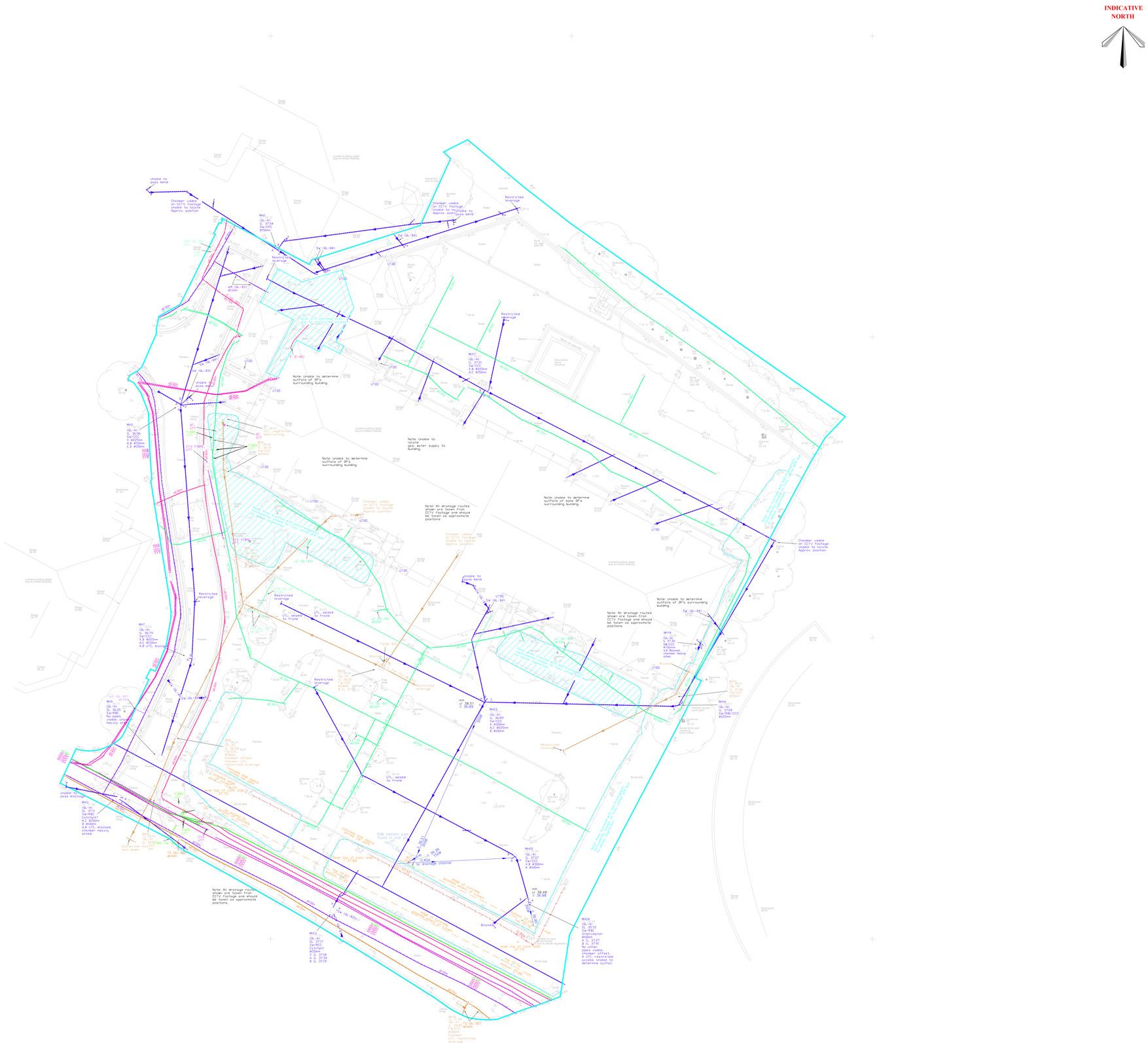
T: (01489) 808 088
E: info@omnia-consulting.co.uk
W: www.omnia-consulting.co.uk



OMNIA	Job Title: Norman Place, Vastern Road	Client: Hexa Consulting Ltd	Project Number: B11101	Date: 06/12/2023	Drawing Title: Figure 3.0 Intrusive Location Plan
			Drawn By: A. Dodds	Authorised By: L. McDonald	



NOTES

GENERAL NOTES :-:

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:200

SERVICE COVERS INDICATED WHERE VISIBLE, PIPE INVERTS / DETAILS SURVEYED FROM SURFACE INSPECTION ONLY. GENERALLY DAMAGED COVERS AND COVERS WITHIN HIGHWAYS WILL NOT BE LIFTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

OVERHEAD CABLES ARE INDICATED USING REMOTE SURVEY METHODS AND ARE SUBJECT TO SEASONAL VARIATION, AND SHOULD BE TREATED AS APPROXIMATE.

THE SURVEYOR WILL NOT BE RESPONSIBLE FOR THE OMISSION OF DETAILS OBSCURED DURING SITE SURVEY

RICS PROFESSIONAL STANDARDS 3RD EDITION RULE 1.19 APPLIES TO THIS SURVEY.

TOPOGRAPHICAL SURVEY/UTILITY KEY :-:

(h10) - height	ol - off lot
ø - diameter	ins - off survey area
● - geo trig	OSBM - ordnance survey bench mark
a/g - above ground	p & f - fence - post & rail fence
a/r - assumed route	pd - pit depth
b/w - brick wall	pg - post & gate
bb - betains beacon	ptg - pipe to ground
bd - back drop	pts - pipe to surface
bm - bench mark	r/w - retaining wall
bob - bollard	ret wall - retaining wall
box - bottom of shaft	rs - road sign
c/b - cable box	s/pipe - stand pipe
c/b fence - closeboard fence	s/bench - seven bench
c/box - control box	s/p - safety paving
c/tv - cable television	sap - sapling
cl - cover level	sec fence - security fence
cp - concrete post	sf - sign post chamber
cr - cable riser	sl - spot level
cws - combined water sewer	sp - soil pipe
d/c - double chamber	sp - spot level
e/jb - electric junction box	sv - stop valve
elec - electric	svp - soil vent pipe
f/c - field drain trace	tbm - temporary sewer
ep - electric pole	TBM - temporary bench mark
er - earth rod	tfr - taken from records
f/bed - flower bed	tl - timranpa level
fh - fire hydrant	toc - top of cap
fl - flow line	tof - top of fence
fs - fire switch	tot - top of turn
fws - foul water sewer	tp - telecom pole
g/v - gate valve	trans - transformer
grun - gully run	trb - trench base
gr - gas riser	u/b - underside
h/c - horse chestnut	u/b - underside of
h/hbm - hubbom	u/br - unable to rod
ic - inspection cover	u/b - unable to survey
i/l - invert level	u/t - unable to trace
k - manhole	u/v - unable to view
int - intercepter	ufc - water filled chamber
lp - lamp post	w - water inlet
mh - manhole cover	wm - water meter
o/h - overhead	wr - water riser
o/h - over head	wr - water riser

UTILITY SURVEY KEY :-:

HATCHED AREA		ELECTRIC CABLE	
BOREHOLE		WATER PIPE	
CPT		FOUL SEWER	
TRIAL PIT		STORM SEWER	
HAND PIT		COMBINED SEWER	
WINDOW SAMPLE		CABLE TELEVISION	
		DATA CABLE	
		TELECOM CABLE	
		GAS PIPE	
		UNCLASSIFIED SERVICE	
		OTHER	
		CCTV	
		TRAFFIC LIGHT	
		OFFSET FILL	
		FUEL	
		FUEL PIPE	
		GAUGE LINES	
		PIPE	
		ASSUMED ROUTE	
		TAKEN FROM RECORDS	

DISCLAIMER :-:

Electromagnetic techniques have been used in the location of underground services. The results are not infallible and trial excavations should be carried out to confirm service identification, positions and particularly depths. Information on the completeness of the underground services information cannot be guaranteed.

This method of survey does not differentiate between live and dead services, and as such all services should be treated as live. This drawing may not include the location of all public services that may cross the site, therefore the relevant service drawings should be obtained from the appropriate utility company and used in conjunction with this drawing.

Private service pipes and cables in highways are not shown, but there presence should be anticipated.

Additional below ground structures or obstructions not shown on this drawing may be encountered during excavation. This drawing is not suitable for scaling.
Excavations in the vicinity of services should be carried out with due diligence ref: HSG47 document avoiding dangers from underground services

Please note that factors such as ground conditions, proximity of other utilities, material and method of construction have an influence on the quality of the data collected on site.

TSA Standards - "A utility mapping survey can not be considered a 100% accurate representation of the underground utilities, but it should be considered to have low risk remove the requirement for the use of safe digging techniques at all times, in line with requirements of HSG47 and current CDM regulations".

This drawing does not provide an absolute representation of the sub-surface Utilities have been detected using non-intrusive technologies only and the performance of these technologies is dependent on ground conditions. Although MCD's control, operating, training and QA procedures are undertaken to the highest standard, in endeavours to detect all utilities, it does not warrant that 100% detection will be achieved. The accuracy and depth penetration of the technologies MCD uses will not be greater than two metres.

UTILITY NOTES

TOPOGRAPHICAL SURVEY HAS BEEN PROVIDED BY A THIRD PARTY, THEREFORE MCD ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OF THIS SURVEY.

CONCRETE SLAB FOUND IS ASSUMED TO BE THE CULVERT. NO ACCESS INTO CONCRETE SLAB TO CONFIRM

IN AREAS, CONCRETE SLAB SPANS ACROSS THE CAR PARK, NO EDGE TO ASSUME IT TO BE THE CULVERT

UNABLE TO GET DEPTHS AT THE BOTTOM OF CONCRETE SLAB DUE TO ACCESS AND IN AREAS THE CONCRETE SLAB STEPS DOWN.

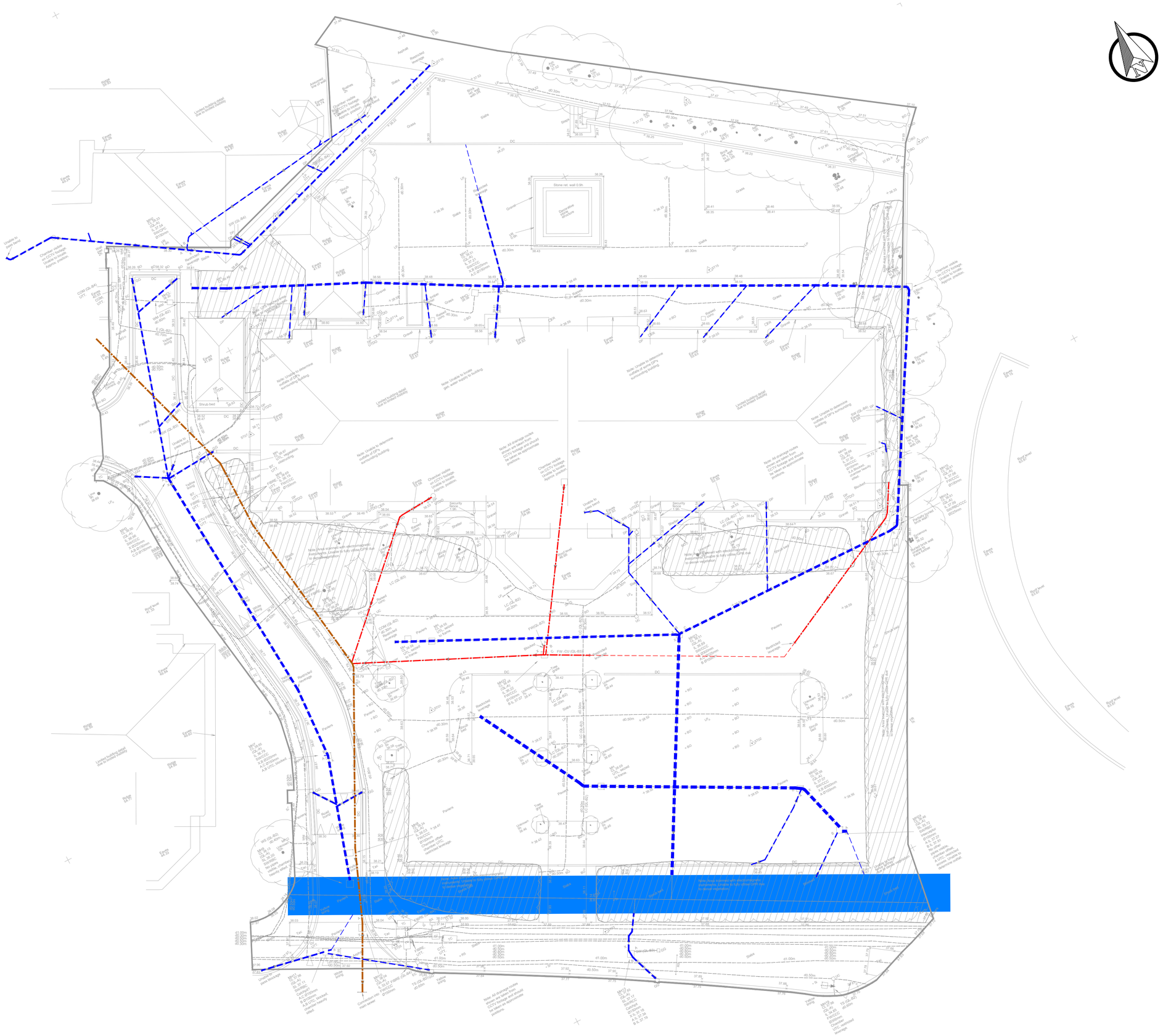
0 2 4 8 12 16 20

MCD Utility Surveying
MCD Ground solutions
Unit 1B Ordnance court
Ackworth road
Portsmouth
PO3 5RZ
TEL: 01489 358541
Email: info@mcd-gs.co.uk
www.mcd-gs.co.uk

Title	UTILITY SURVEY OF CULVERT
Client	OWNA CONSULTING LTD
Project	VASTERN ROAD, READING, RG1 8DA
Date	NOVEMBER 2023
Scale	1:200@A0
Dwg No	U10536 1
Surveyor	JHG
Checked	JHG

Revisions

Appendix H – Drainage Drawings



Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

Key Plan

Legend

- Existing private FW drain
- Existing private FW drain (assumed route)
- Existing private SW drain
- Existing private SW drain (assumed route)
- Existing culverted watercourse

Rev	Date	Details of issue / revision	Drw	Rev
P02	29.01.24	Updated to culvert survey and TW PPSE	MF	MF
P01	17.10.23	Preliminary Issue	MF	MF

Issues & Revisions

HEXA

Client
PACKAGED LIVING

Project Title
WATERFRONT SQUARE READING

Drawing Title
EXISTING DRAINAGE

Drawn:	MF	Reviewed:	MF
Hexa Ref:	700135	Scale@A1:	1:200

Purpose of Issue: **FOR INFORMATION**

Status: **S2**

Project - Originator - Zone - Level - Type - Role - Number: **700135-HEX-ZZ-ZZ-DR-C-9200**

Rev: **P02**

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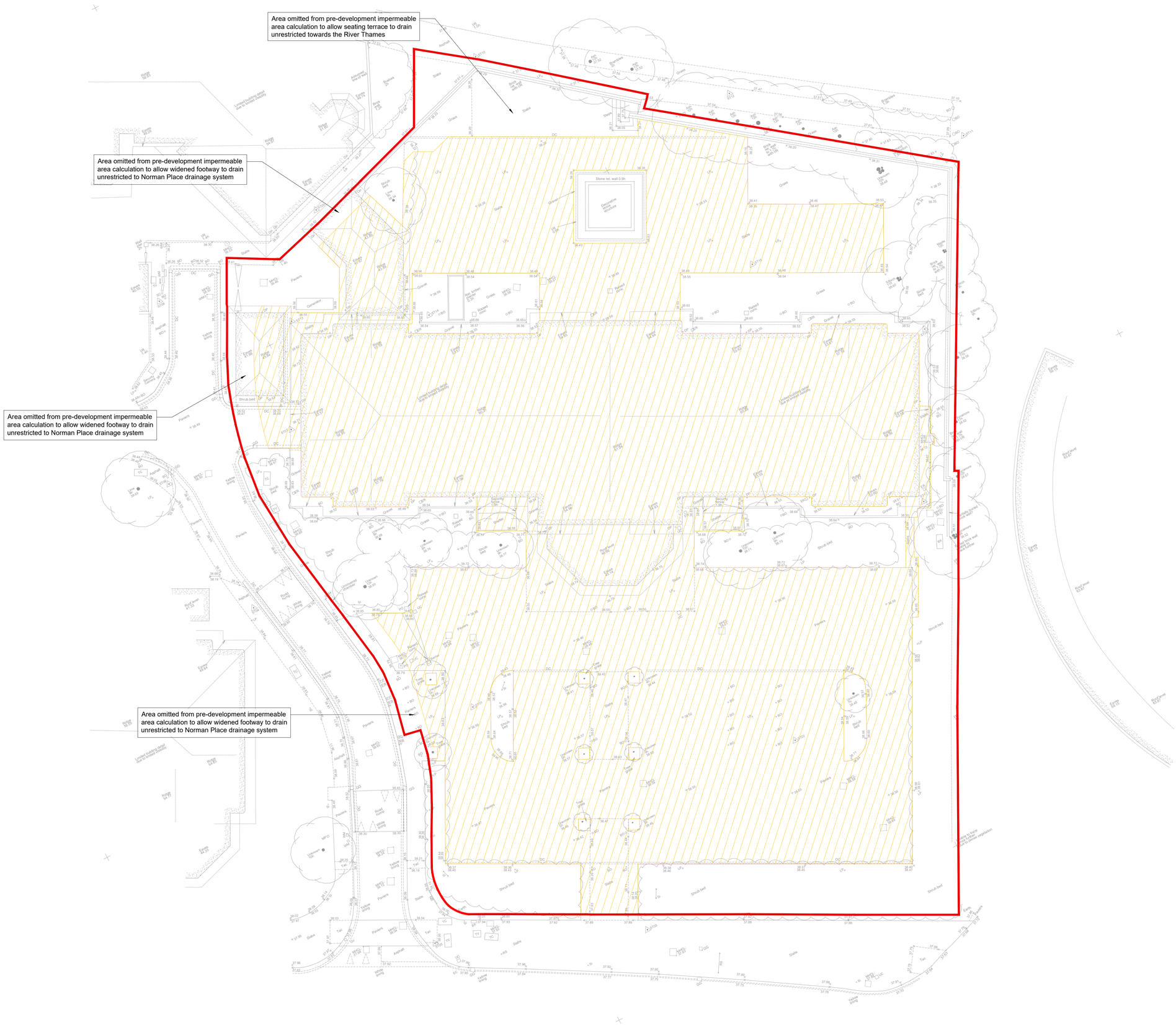

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

Key Plan

Legend

Existing Surface Water Catchment
3,765m2 (0.377ha)

Existing Discharge Rate
Q =2.78 x 50mm/hr x 0.377ha = **52.4 l/s**

Rev	Date	Details of issue / revision	Drw	Rev
P03	09.12.24	Existing discharge rate calculation added	LMc	LMc
P02	22.07.24	Update to Site Boundary	MF	MF
P01	29.01.24	Preliminary Issue	MF	MF

Issues & Revisions

hexa CONSULTING

Client
PACKAGED LIVING

Project Title
NORMAN PLACE, READING

Drawing Title
EXISTING SURFACE WATER CATCHMENT

Drawn:	MF	Reviewed:	MF
Hexa Ref:	700135	Scale@A1:	1:200

Purpose of Issue: **FOR INFORMATION**
Status: **S2**

Project - Originator - Zone - Level - Type - Role - Number
700135-HEX-ZZ-ZZ-DR-C-9201
Rev: **P03**

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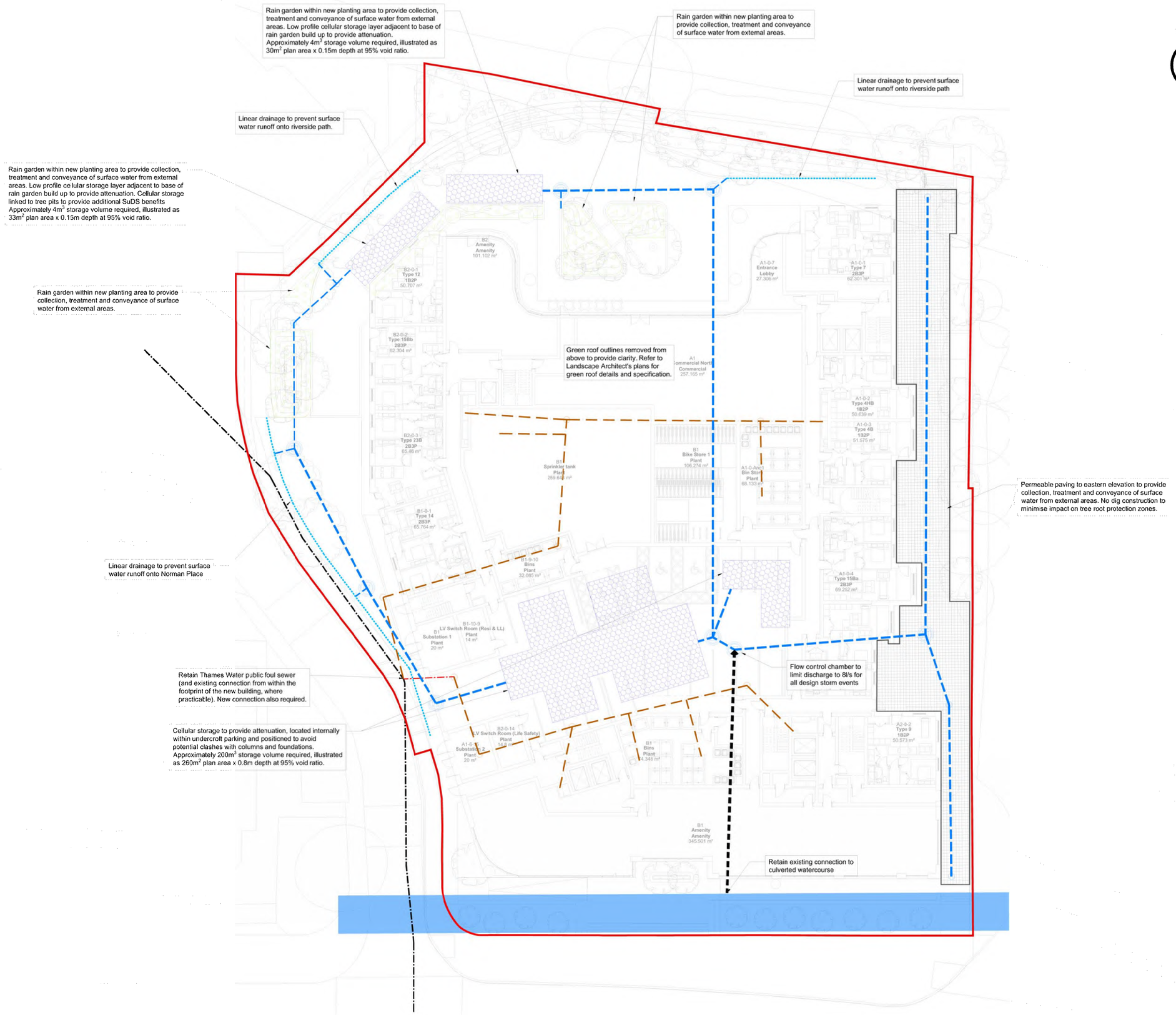

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in meters unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. This drawing should be printed and read in colour.

Design Notes

Legend

- Existing private FW drain
- Existing private SW drain
- Existing culverted watercourse
- Proposed Surface Water Drainage
- Proposed Surface Water Flow Control Chamber
- Proposed Linear Drainage and Outlet
- Proposed Rain Garden
- Proposed Permeable Paving
- Proposed Cellular Attenuation
- Proposed Foul Water Drainage

1m SCALE 1:200

Rev	Date	Details of Issue	Drawn	R'wd
P04	22/07/24	Update to Site Boundary	MF	MF
P03	01/07/24	Updated to Landscape Architect's layout	MF	MF
P02	06/02/24	Updated to Landscape Architect's layout	MF	MF
P01	29/01/24	Preliminary issue	MF	MF

Issues & Revisions

Consultant

HEXA

Client

PACKAGED LIVING

Project Title

NORMAN PLACE, READING

Drawing Title

DRAINAGE STRATEGY

Drawn By	MF	Reviewed By	MF
Hexa Ref	700135	Scale at A1	1:200

Purpose of Issue: For Information

Status: S2

Project - Originator - Zone - Level - Type - Role - Number: 700135-HEX-ZZ-ZZ-DR-C-9202

Revision: P04

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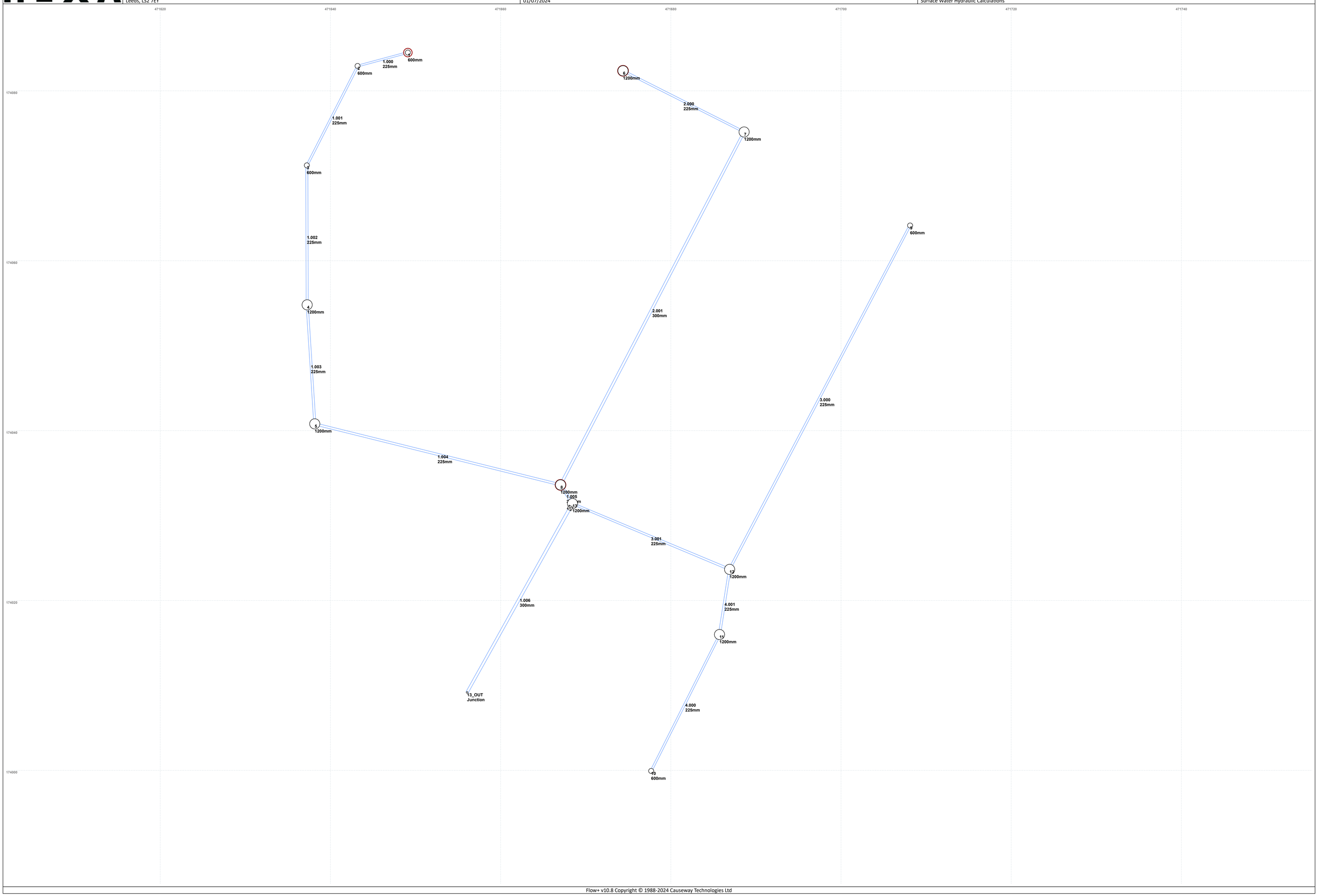
Appendix I - Hydraulic Calculations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225mm
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4
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1.003
225mm
5
1200mm
1.004
225mm
6
1200mm
2.000
225mm
7
1200mm
2.001
300mm
600mm
3.000
225mm
8
1200mm
1.005
13
1200mm
3.001
225mm
12
1200mm
4.001
225mm
11
1200mm
1.006
300mm
13_OUT
Junction
4.000
225mm
10
600mm

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
6	0.040	5.00	38.300	1200	471674.381	174082.358	0.850
1	0.040	5.00	38.500	600	471649.097	174084.501	1.050
7	0.040	5.00	38.300	1200	471688.611	174075.154	1.100
2	0.040	5.00	38.500	600	471643.187	174082.927	1.100
8	0.040	5.00	38.600	1200	471667.037	174033.611	1.650
9	0.040	5.00	38.500	600	471708.118	174064.145	1.100
10	0.040	5.00	38.500	600	471677.688	173999.937	1.150
11	0.040	5.00	38.500	1200	471685.721	174015.996	1.300
12	0.040	5.00	38.500	1200	471686.906	174023.665	1.350
3	0.040	5.00	38.600	600	471637.226	174071.227	1.300
4	0.040	5.00	38.600	1200	471637.262	174054.806	1.400
13	0.030	5.00	38.600	1200	471668.444	174031.415	1.700
13_OUT			38.450		471656.059	174009.182	1.650
5			38.600	1200	471638.157	174040.795	1.500

Flow+ v10.8 Copyright © 1988-2024 Causeway Technologies Ltd

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	6	7	15.950	0.600	37.450	37.275	0.175	91.1	225	5.19	50.0
1.003	4	5	14.040	0.600	37.200	37.100	0.100	140.4	225	5.76	50.0
2.001	7	8	46.811	0.600	37.200	37.000	0.200	234.1	300	5.96	50.0
1.000	1	2	6.116	0.600	37.450	37.400	0.050	122.3	225	5.09	50.0
1.005	8	13	2.608	0.600	36.950	36.900	0.050	52.2	300	6.32	50.0
3.000	9	12	45.701	0.600	37.400	37.150	0.250	182.8	225	5.79	50.0
4.000	10	11	17.956	0.600	37.350	37.200	0.150	119.7	225	5.25	50.0
4.001	11	12	7.760	0.600	37.200	37.150	0.050	155.2	225	5.37	50.0
3.001	12	13	20.023	0.600	37.150	36.900	0.250	80.1	225	6.02	50.0
1.002	3	4	16.421	0.600	37.300	37.200	0.100	164.2	225	5.55	50.0
1.004	5	8	29.760	0.600	37.100	36.950	0.150	198.4	225	6.30	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.370	54.5	7.6	0.625	0.800	0.040	0.0	57	0.972
1.003	1.101	43.8	30.4	1.175	1.275	0.160	0.0	138	1.188
2.001	1.023	72.3	15.2	0.800	1.300	0.080	0.0	93	0.814
1.000	1.181	46.9	7.6	0.825	0.875	0.040	0.0	61	0.873
1.005	2.181	154.2	53.1	1.350	1.400	0.280	0.0	121	1.984
3.000	0.964	38.3	7.6	0.875	1.125	0.040	0.0	68	0.756
4.000	1.194	47.5	7.6	0.925	1.075	0.040	0.0	60	0.876
4.001	1.047	41.6	15.2	1.075	1.125	0.080	0.0	94	0.965
3.001	1.462	58.1	30.4	1.125	1.475	0.160	0.0	116	1.478
1.002	1.017	40.5	22.8	1.075	1.175	0.120	0.0	121	1.047
1.004	0.924	36.8	30.4	1.275	1.425	0.160	0.0	156	1.029

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.006	13	13_OUT	25.450	0.600	36.900	36.800	0.100	254.5	300	6.75	50.0
1.001	2	3	13.131	0.600	37.400	37.300	0.100	131.3	225	5.28	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.006	0.981	69.3	89.2	1.400	1.350	0.470	0.0	300	0.993
1.001	1.139	45.3	15.2	0.875	1.075	0.080	0.0	89	1.026

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.400	Skip Steady State	x	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	40	0	0
30	35	0	0				

Node 13 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.800	Product Number	CTL-SCU-0090-7500-0800-7500
Downstream Link	1.006	Design Flow (l/s)	7.5	Min Outlet Diameter (m)	0.150
Replaces Downstream Link	✓	Objective	(CU) Linear Discharge	Min Node Diameter (mm)	1200
Invert Level (m)	36.900	Sump Available	✓		

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Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	36.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	252

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	260.0	0.0	0.800	260.0	0.0	0.801	0.0	0.0

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	168

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	30.0	0.0	0.150	30.0	0.0	0.151	0.0	0.0

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	9

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	33.0	0.0	0.150	33.0	0.0	0.151	0.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	6	12	37.493	0.043	6.2	1.2847	0.0000	OK
15 minute winter	1	13	37.495	0.045	6.2	1.4227	0.0000	OK
15 minute winter	7	12	37.273	0.073	9.5	0.0823	0.0000	OK
15 minute winter	2	11	37.470	0.070	9.3	0.0197	0.0000	OK
180 minute winter	8	144	37.121	0.171	12.8	42.4087	0.0000	OK
15 minute winter	9	10	37.460	0.060	6.2	0.0169	0.0000	OK
15 minute winter	10	10	37.404	0.054	6.2	0.0154	0.0000	OK
15 minute winter	11	10	37.293	0.093	12.3	0.1051	0.0000	OK
15 minute winter	12	11	37.250	0.100	24.2	0.1129	0.0000	OK
15 minute winter	3	11	37.400	0.100	15.0	0.0282	0.0000	OK
15 minute winter	4	11	37.319	0.119	20.8	0.1348	0.0000	OK
15 minute summer	13	9	37.133	0.233	27.1	0.2636	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	6	2.000	7	4.2	0.807	0.077	0.0835	
15 minute winter	1	1.000	2	3.9	0.536	0.082	0.0478	
15 minute winter	7	2.001	8	9.2	0.708	0.127	0.6087	
15 minute winter	2	1.001	3	9.2	0.679	0.204	0.1798	
180 minute winter	8	1.005	13	8.3	0.507	0.054	0.1266	
15 minute winter	9	3.000	12	6.0	0.479	0.156	0.5795	
15 minute winter	10	4.000	11	6.1	0.543	0.129	0.2048	
15 minute winter	11	4.001	12	12.0	0.748	0.289	0.1251	
15 minute winter	12	3.001	13	23.9	0.964	0.412	0.5448	
15 minute winter	3	1.002	4	15.0	0.784	0.371	0.3145	
15 minute winter	4	1.003	5	20.9	0.919	0.476	0.3185	
15 minute summer	13	Hydro-Brake®	13_OUT	4.2				27.9

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	13_OUT	1	36.800	0.000	4.2	0.0000	0.0000	OK
15 minute winter	5	11	37.231	0.131	20.9	0.1484	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	5	1.004	8	21.1	1.459	0.573	0.4781	

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Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	6	12	37.529	0.079	15.7	2.3268	0.0000	OK
15 minute winter	1	13	37.588	0.138	20.8	4.3576	0.0000	OK
180 minute winter	7	176	37.466	0.266	7.4	0.3005	0.0000	OK
15 minute winter	2	12	37.584	0.184	22.4	0.0520	0.0000	OK
180 minute winter	8	176	37.466	0.516	36.9	127.9417	0.0000	SURCHARGED
15 minute winter	9	10	37.498	0.098	15.7	0.0278	0.0000	OK
15 minute winter	10	12	37.495	0.145	15.7	0.0411	0.0000	OK
15 minute winter	11	12	37.484	0.284	31.3	0.3211	0.0000	SURCHARGED
180 minute winter	12	176	37.466	0.316	14.8	0.3572	0.0000	SURCHARGED
15 minute winter	3	12	37.564	0.264	34.7	0.0749	0.0000	SURCHARGED
15 minute winter	4	11	37.489	0.289	45.9	0.3265	0.0000	SURCHARGED
180 minute winter	13	172	37.466	0.566	17.4	0.6406	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	6	2.000	7	13.1	1.102	0.241	0.1900	
15 minute winter	1	1.000	2	16.1	0.784	0.343	0.1832	
180 minute winter	7	2.001	8	7.3	0.520	0.102	3.1925	
15 minute winter	2	1.001	3	23.9	0.796	0.529	0.4892	
180 minute winter	8	1.005	13	-12.3	-0.204	-0.080	0.1837	
15 minute winter	9	3.000	12	15.3	0.561	0.401	1.2883	
15 minute winter	10	4.000	11	15.6	0.632	0.328	0.6003	
15 minute winter	11	4.001	12	27.6	0.855	0.662	0.3086	
180 minute winter	12	3.001	13	14.6	0.478	0.252	0.7963	
15 minute winter	3	1.002	4	32.0	0.843	0.791	0.6531	
15 minute winter	4	1.003	5	43.3	1.088	0.988	0.5584	
180 minute winter	13	Hydro-Brake®	13_OUT	6.4				126.9

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Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	13_OUT	1	36.800	0.000	4.8	0.0000	0.0000	OK
180 minute winter	5	172	37.466	0.366	14.7	0.4141	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	5	1.004	8	13.9	0.831	0.379	1.1836	

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	6	228	37.659	0.209	4.4	4.5251	0.0000	OK
15 minute winter	1	12	38.237	0.787	30.7	4.9409	0.0000	FLOOD RISK
240 minute winter	7	228	37.658	0.458	8.2	0.5186	0.0000	SURCHARGED
15 minute winter	2	12	38.227	0.827	39.8	0.2341	0.0000	FLOOD RISK
240 minute winter	8	228	37.658	0.708	37.9	175.7759	0.0000	SURCHARGED
15 minute winter	9	11	37.795	0.395	21.0	0.1117	0.0000	SURCHARGED
15 minute winter	10	11	37.836	0.486	21.0	0.1376	0.0000	SURCHARGED
15 minute winter	11	11	37.803	0.603	40.6	0.6825	0.0000	SURCHARGED
15 minute winter	12	11	37.739	0.589	74.7	0.6662	0.0000	SURCHARGED
15 minute winter	3	12	38.158	0.858	51.0	0.2429	0.0000	SURCHARGED
15 minute winter	4	12	37.974	0.774	66.8	0.8756	0.0000	SURCHARGED
240 minute winter	13	224	37.660	0.760	18.1	0.8593	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	6	2.000	7	4.1	0.779	0.075	0.6237	
15 minute winter	1	1.000	2	18.8	0.849	0.400	0.2432	
240 minute winter	7	2.001	8	7.2	0.484	0.099	3.2964	
15 minute winter	2	1.001	3	32.1	0.808	0.710	0.5222	
240 minute winter	8	1.005	13	-12.2	-0.173	-0.079	0.1837	
15 minute winter	9	3.000	12	18.0	0.560	0.470	1.8176	
15 minute winter	10	4.000	11	19.6	0.643	0.412	0.7141	
15 minute winter	11	4.001	12	38.7	0.973	0.930	0.3086	
15 minute winter	12	3.001	13	73.4	1.846	1.263	0.7963	
15 minute winter	3	1.002	4	48.2	1.211	1.191	0.6531	
15 minute winter	4	1.003	5	63.9	1.607	1.460	0.5584	
240 minute winter	13	Hydro-Brake®	13_OUT	7.3				165.9

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	13_OUT	1	36.800	0.000	5.4	0.0000	0.0000	OK
15 minute winter	5	13	37.691	0.591	63.9	0.6682	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	5	1.004	8	62.8	1.587	1.708	1.1836	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	6	184	37.485	0.035	2.9	1.0319	0.0000	OK
360 minute summer	1	184	37.487	0.037	2.9	1.1640	0.0000	OK
360 minute winter	7	280	37.436	0.236	4.2	0.2667	0.0000	OK
360 minute summer	2	184	37.454	0.054	5.6	0.0152	0.0000	OK
360 minute winter	8	280	37.436	0.486	19.1	120.5385	0.0000	SURCHARGED
360 minute summer	9	184	37.441	0.041	2.9	0.0117	0.0000	OK
360 minute winter	10	280	37.436	0.086	2.1	0.0243	0.0000	OK
360 minute winter	11	280	37.436	0.236	4.2	0.2670	0.0000	SURCHARGED
360 minute winter	12	280	37.436	0.286	8.4	0.3235	0.0000	SURCHARGED
360 minute winter	3	280	37.437	0.137	6.3	0.0387	0.0000	OK
360 minute winter	4	280	37.437	0.237	8.5	0.2676	0.0000	SURCHARGED
360 minute winter	13	272	37.435	0.535	10.0	0.6052	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	6	2.000	7	2.7	0.712	0.050	0.1358	
360 minute summer	1	1.000	2	2.7	0.482	0.057	0.0350	
360 minute winter	7	2.001	8	4.2	0.441	0.058	3.0388	
360 minute summer	2	1.001	3	5.6	0.617	0.123	0.1192	
360 minute winter	8	1.005	13	6.1	0.276	0.039	0.1837	
360 minute summer	9	3.000	12	2.9	0.390	0.075	0.9394	
360 minute winter	10	4.000	11	2.1	0.442	0.044	0.4819	
360 minute winter	11	4.001	12	4.2	0.572	0.101	0.3086	
360 minute winter	12	3.001	13	8.4	0.304	0.144	0.7963	
360 minute winter	3	1.002	4	6.4	0.679	0.157	0.5337	
360 minute winter	4	1.003	5	8.4	0.761	0.192	0.5584	
360 minute winter	13	Hydro-Brake®	13_OUT	6.2				168.5

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	13_OUT	8	36.800	0.000	5.8	0.0000	0.0000	OK
360 minute winter	5	280	37.436	0.336	8.4	0.3804	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	5	1.004	8	8.0	0.727	0.217	1.1836	

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