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Woodland Drive Medical Centre

Drainage Strategy

219938

Issue 1 | 16 March 2012

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Document Verification

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1 Introduction

A proposal is being made for the construction of a single building development with associated parking on a plot of land adjacent to Woodland Drive in Barnsley. The purpose of the development is the provision of a new medical centre to serve the local population.

The site has been developed in the past, although the buildings and associated paved areas have been demolished and grassed over.

This statement is to outline proposed strategies of managing and disposing of wastewater and surface water generated from the development.



Fig. 1: Development site

2 Consultation

Yorkshire Water is the sewerage undertaker for the area where the development is located. They have a pre-planning enquiry service for developers (or their agents) to obtain information on the sewerage systems and obtain advice on any restrictions that will be imposed through the planning approval process. A pre-planning enquiry was submitted and a response obtained (YW Ref N001377) that highlighted restrictions and constraints on the development. These will be outlined and discussed in the relevant section in this statement.

3 On-site Drainage System

The drainage systems on site will be developed to meet the requirements of Building Regulations 2000, "Drainage and Waste Disposal" Approved Document H. Separate foul and surface water drainage systems will be provided and have

dedicated connections to the respective public sewers on and off site. The appended sketches, C-CD-GA-SK01 and C-CD-GA-SK02 show two appropriate schemes for the on-site surface water systems (with one foul water scheme that is common to both sketches). These will be discussed in the relevant sections of this statement.

4 Foul Drainage

Yorkshire Water confirmed that there is a 150mm diameter foul sewer within the private gardens adjacent to the southwest boundary. A further 150mm diameter foul sewer crosses the site, running nearly parallel and close to the north-eastern fence line. YW have indicated that the development can connect to this sewer.

No restrictions were imposed on the rate of flow, although advice has been given on items which it is unlawful to be passed into the public sewer system under the provisions of Section 111 of the Water Industry Act 1991. Items that are relevant to a Medical Centre include, but not limited to, medicines, bandages, syringes, sanitary towels and incontinence pants.

Internal foul systems are at either end of the proposed building. As the public sewer is relatively shallow it is unlikely that a single point of connection can be provided, therefore, two junction connections are proposed, one at either end of the north eastern elevation of the building. Demarcation chambers will be provided upstream of the connection points. This arrangement of foul drains serving the building is shown on both sketches. The foul drain system is identical in both schemes.

The public sewer crossing the site will be close to the proposed building and Yorkshire Water advised that "in this instance, building-over [the sewer] may take place under the control of Part H4 Building Regulations 2000. This requires clear unobstructed access to the pipe and that measures should be taken to protect the pipe and the proposed foundation from settlements and adverse loading". To achieve this, the adjacent building foundations should be positioned and located at a sufficient depth such that they do not load the pipe (or trench which it has been laid within).

Furthermore, the condition of the public sewer will need to be assessed, since Building Regulation H4 (1.2) states that a building should not be constructed within 3m of a sewer in poor condition. If the sewer is found to be in poor condition, Yorkshire Water would be provided with the inspection information for their review. In the timeframe of the development the options available would be to move the building away from the sewer or replace the affected length of pipeline to adoptable standards with permission from Yorkshire Water.



Fig. 2: Public foul sewers

5 Surface Water

Building Regulation H3 Section 3 requires the drainage system to be developed following a hierarchy of methods of disposal of surface water. The first consideration is to infiltrate, if this is not practical then the discharge should be an attenuated discharge directly to a watercourse. Where this is not achievable the last resort is to the public sewer system, preferably a surface water sewer.

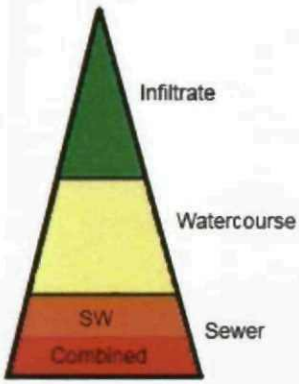


Fig 3: SW disposal hierarchy

A geo-environmental desk study determined that the soil conditions would comprise some made ground and weathered coal measures with a potential for several coal mine workings. Following this a site specific ground investigation confirmed that there is a small depth of made ground overlaying firm to stiff clay above weak mudstone. These conditions preclude the use of infiltration for a 'source controlled' disposal of the surface water.

A watercourse course is not within or in close proximity to the site; therefore, it is not practical to provide a direct connection to a watercourse. As a result, a controlled discharge to the public sewer will be provided. Yorkshire Water identified a connection location to the 225mm diameter public surface water

sewer can be made in the Glenmoor Avenue at the junction with Woodland Drive. This connection will be subject to a rate of discharge being limited to a maximum of five litres per second.

With the site having a restriction of the rate of discharge surface water discharge, attenuation storage will be required. A preliminary estimate indicates a storage volume of 100m³ is required to accommodate design storms with a return period of 1 in 30 years plus a 20% allowance for climate change without surface flooding,.

The risk of pollution from oil needs to be controlled on the site. Although the car park has less than the 50 spaces the area exceeds the threshold level in PPG3 (Pollution Prevention Guidelines 3 "Use and design of oil separators in surface water drainage systems") of 800m². This requires the drainage system to include measures to intercept and/or treat to oil contaminated run-off. This can be provided by the inclusion of oil separators or alternatively permeable pavements can be used.

The relative levels of the site and public sewer, and the attenuation and pollution control requirements has lead to two possible solutions being identified, as shown on the appended sketches. Sketch C-CD-GA-SK01 shows a gravity surface water discharge, whilst sketch C-CD-GA-SK02 shows a pumped surface water discharge.



Fig. 4: Public surface water sewers

The public sewer is shallow therefore when it becomes surcharged during storm conditions it will affect the development site drainage system. Detailed design calculations are required to verify that the surcharging of the sewer will not adversely affect the flow control device or attenuation requirements. The accurate locations of the utility services are also required before, the decision on whether to have gravity or pumped discharge is made. Therefore, at this stage both shall be considered.

5.1 Surface Water Collection

Surface water run-off on the site can be collected from the paving be either traditional gullies and linear drainage channels or the use of permeable paving. To achieve an entirely gravity based system it will not be possible to use impermeable paving with gully or channel collection. This is due to insufficient

fall to provide the following: self cleansing conditions within the pipelines; an oil separator that will not become submerged in severe storm events, and the attenuation storage being inundated by the surcharging public sewer. Therefore, this traditional method of surfacing and run-off collection can only be considered if a pumped discharge is to be provided.

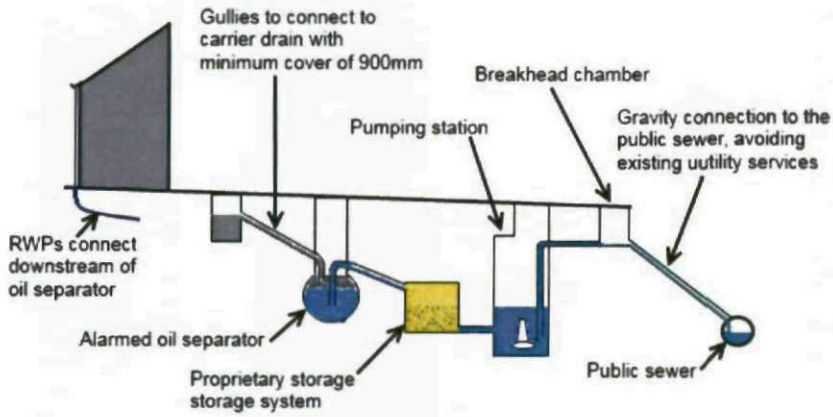


Fig. 5: Impermeable paving with gully collection system

Permeable pavements can be used for both discharge situations. This would be a good method of embracing sustainable drainage on this site, even though infiltration of surface water is not possible. There several benefits of using permeable paving on this particular site with its constraints; these being:

- Reduces the rate at which run-off reaches the piped system.
- Captures more water on the surface of the materials and the porous nature increases evaporation.
- Capture oil contaminants and provide biological and UV treatment of the hydrocarbons, thus an oil separator is not required.
- Filter drains and sub-base layer is utilised as SW attenuation storage.
- Improved quality of run-off due to filtration of solids.
- Litter cannot enter the system preventing contamination of watercourses and the downstream environment.
- Reducing risk of contamination of the attenuation storage from public sewer surcharge (drain arrangement and high elevation of storage).
- Reducing the hydraulic effects from the public sewer surcharge (minimising volume of storage, interference with the flow control etc.).
- Gullies and linear drainage channels are not required.
- Reduced maintenance costs as gullies and channels will not require maintaining.

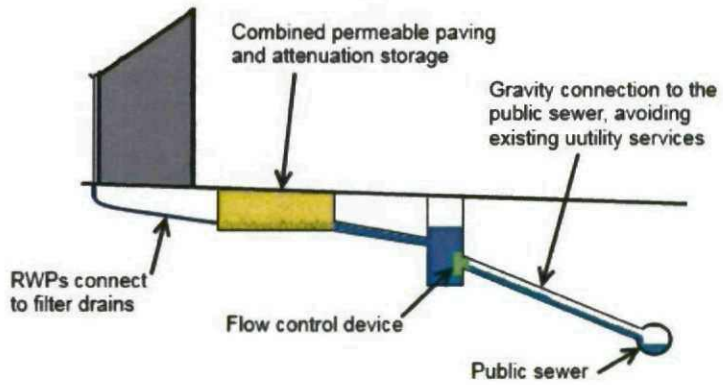


Fig 6: Combined permeable paving and attenuation storage

In typical impermeable paved developments separate systems for roof and pavements have to be provided until a point downstream of the oil separator. With the oil treatment being provided within the permeable paving the rainwater pipes can connect to the filter drains, having a net reduction in the length of pipe required. Also, silt traps in the manholes will also improve the quality of run-off and reduce the build up of silt and grit this attenuation system.

6 Proposed Drainage Strategies

Both the foul and surface water drainage systems will developed, designed and constructed in accordance with the Building Regulations, current British and European Standards, relevant codes of practice, and the latest edition of the Civil Engineering Specification for the Water Industry.

As indicated on both the appended sketches (C-CD-GA-SK01 and C-CD-GA-SK02) the development will be served by separate foul and surface water drainage systems on site. Discrete connections from each of these systems will be made to the respective public sewer.

The building will be served by gravity foul drains that extend sufficiently around the perimeter of the building. These will connect to the 150mm diameter foul sewer that crosses the site near the north-eastern boundary.

An entirely gravity based system may not be possible on the surface water drainage system due to the limited fall available from the site to the public sewer. This sustainable system with low operating costs cannot be ruled out at this early stage of design development.

The appended sketches show the preliminary arrangement of the drains for a gravity (C-CD-GA-SK01) and pumped (C-CD-GA-SK02) controlled and restricted discharge to the public surface water sewer. The intention is to combine the paving and drainage solution and embracing the sustainability and economic benefits of permeable paving.

However, if a pumping station is required, using impermeable paving and tradition drainage ancillaries and equipment such as, gullies, oil separator and proprietary crate attenuation storage systems may be cost effective

The solution selected for the surface water system will depend on the hydraulic considerations and complexity of avoiding the exiting utility services in the highway. The order of preference, however, would be:

1. Gravity foul and entirely gravity surface water drain system with permeable paving.
2. Gravity foul and gravity surface water system with a pump controlled discharge and permeable paving.
3. Gravity foul and gravity surface water system with a pump controlled discharge and impermeable paving with gully collection, oil separator and proprietary attenuation storage tank.

EX. HOUSING

Junction connection to 225mm dia. SW sewer. (Approximate IL 98.70m)

GLENN

Virgin Media

Topographic survey CL = 100.7
YW records indicate depth to invert is 2.08m, therefore, the approximate invert at the manhole downstream of the connection is 98.62m above survey datum.

N

D DRIVE

Electricity cables

Gas

BT

WOODLAND DRIVE

Demarcation chamber

Flow control chamber. Restricted to 5l/s for up to 1 in 30 + 20%CC

FFL not less than 101.15m. (Initial estimate of FFL to achieve a gravity SW system.)

Demarcation chamber

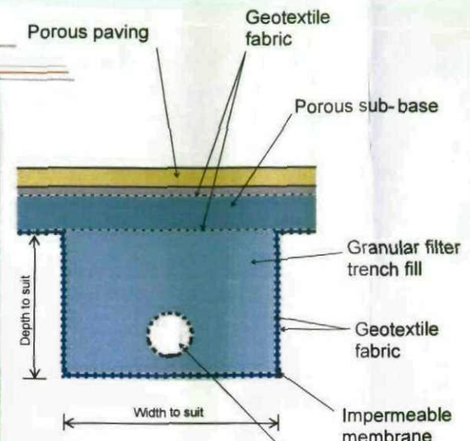
Demarcation chamber

Topo. CL 99.37
YW Depth to invert 1.78m
IL 97.59 Approx.

Not on topographic survey
YW Depth to invert 2.84m

The public sewer shall be protected in accordance with Building Regulations Approved Document H. Note the pipe will not be able to be encased in concrete, so the foundations will be required to be at sufficient depth to prevent loading of the pipe / pipe trench.

Planting restrictions near to public sewers. Refer to Figure 2.3 of Sewers for Adoption 6th Edition



A proprietary cellular void former could be used in the trench to provide to maximise the volume of attenuation storage within the trench width.

Typical Paving and Drain Arrangement

Legend

- Existing public SW sewer
- Existing public FW sewer
- Proposed SW drain
- Proposed SW filter drain
- Proposed FW drain
- Indicative internal drainage
- Proposed SW manhole
- Proposed SW rodding eye
- Proposed FW manhole

NOTE

The vertical difference between the site at the proposed building and the invert of the public sewer is only 2.45m (assuming FFL of 101.15). Deducting the depth of the cover of the pipes this makes the available depth to be approximately 1.5m.

The services and utilities in Woodland Drive will place further constraints on achieving a gravity system on site. Early confirmation of depths and location of these is essential.

A pumped discharge to a gravity feed to the public sewer may be required (refer to Option 2, C-CD-GA-SK02).

The on-site system requires attenuation to be provided to accommodate the restriction on the surface water discharge that is being imposed by Yorkshire Water. The relative levels of the public sewer and site drainage system means the sewer hydraulics will have an effect on the on-site drains and attenuation. Information on the surcharge levels in the public sewer will need to be obtained and included in the design.

Back flow from the public sewer entering the private on-site drainage system needs to be considered.

Issue	Date	By	Chkd	Appd
P1	16/03/12	IA	CG / RI	ID

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Job Title

Woodland Drive Medical Centre

Drawing Title

Drainage Strategy Option 1 Gravity Foul and SW Systems

Scale at A3: N.T.S.

Plot ID

Drawing Status: Preliminary

Job No	Drawing No	Issue
219938	C-CD-GA-SK01	P1

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Tested using AutoSpot http://www.odsys-software.com/autospot/

A3

EX. HOUSING

Junction connection to 225mm dia. SW sewer. (Approximate IL 98.70m)

GLENN

Virgin Media

Topographic survey CL = 100.7
YW records indicate depth to invert is 2.08m, therefore, the approximate invert at the manhole downstream of the connection is 98.62m above survey datum.

N

D DRIVE

Electricity cables

Gas

BT

WOODLAND DRIVE

Demarcation chamber, also serves as the break head chamber.

Wet well for duty - standby submersible pump set and dry chamber for valves. Discharge restricted to 5l/s for up to 1 in 30 + 20%CC.
Note, wet well to be sized for 1 in 1 year return period design storms. The additional storage for greater storms to be provided in the porous paving and trench drains.

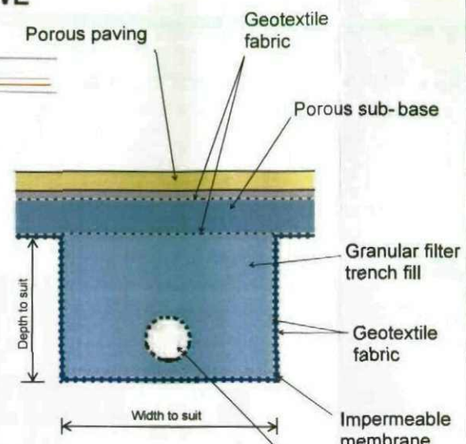
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Planting restrictions near to public sewers. Refer to Figure 2.3 of Sewers for Adoption 6th Edition



A proprietary cellular void former could be used in the trench to provide to maximise the volume of attenuation storage within the trench width.

Typical Paving and Drain Arrangement

Legend

- Existing public SW sewer
- Existing public FW sewer
- Proposed SW drain
- Proposed SW filter drain
- Proposed SW rising main
- Proposed FW drain
- Indicative internal drainage
- Proposed SW manhole
- Proposed SW rodding eye
- Proposed FW manhole

NOTE

The lateral drain connection position from the demarcation chamber and the public sewer will need to be carefully selected to avoid the existing services and utilities in the public highway. The exact location and depth of these will need to be confirmed early in the design stage.

The on-site attenuation will be protected from contamination and back-flow from the public sewer by the valves on the outlet of the pumping station.

Alternative SW option
An alternative to the use of lined permeable paving would be to use traditional impermeable paving and the collection of the water by gullies and linear drainage channels. The conveyance of the water would need to be through unperforated pipelines and pass through an oil separator, prior to an attenuation tank.

The wet well can be sized as described on the note on the sketch with a proprietary crate storage system or large pipe provided as an overflow storage system for the greater flows.

Issue	Date	By	Chkd	Appd
P1	16/03/12	IA	CG / RI	ID

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Job Title

Woodland Drive Medical Centre

Drawing Title

Drainage Strategy Option 2 Gravity Foul and Pumped SW Systems

Scale at A3	Plot ID	Drawing Status
N.T.S.		Preliminary

Job No	Drawing No	Issue
219938	C-CD-GA-SK02	P1

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