



Drainage Strategy

In support of an application for Residential Development

On a parcel of land: off Station Road, Surfleet

DRAINAGE STRATEGY

PROPOSED DEVELOPMENT AT STATION ROAD SURFLEET

Revision A 21st May 2016 Proposal amended and calculations added.

Introduction

A planning application is due to be submitted to South Holland District Council to construct thirty dwellings and associated access roads off Station Road, Surfleet, near Spalding. The planning authority requires a drainage strategy to be submitted with the application.

For all large developments (more than 10 dwellings) there is a requirement to apply sustainable drainage principles (SuDS) to the disposal of surface water from the site.

The CIRIA SuDS Manual 2015 explains the philosophy of SuDS in Chapter 1 of the manual as follows:

The philosophy of sustainable drainage systems is about maximising the benefits and minimising the negative impacts of surface water runoff from developed areas.

The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk, and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone.

The Technical Standards for Sustainable Drainage produced by the Local Authority SuDS Officer Organisation (LASOO) states that generally the aim for should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

- 1) Into the ground (infiltration).
- 2) To a surface water body.
- 3) To a surface water sewer or highway drain.
- 4) To a combined sewer.

Site Investigation

Trial holes have been excavated on the site by Geo Investigate and these found the subsoil to be silty sand. A percolation test was carried out on the site and the rate of fall of the water in the trial pit was very small. The infiltration rate was calculated using methods in BS5930 rather than BRE Digest 365 and was found to be 1.1014×10^{-6} m/sec.

Options for Surface Water Drainage

It is concluded that it will not be possible to design suitable soakaways to dispose of the rainwater from the roofs of the proposed buildings on the development. The soakaways would not conform to all aspects of BRE365, particularly the clause requiring the water level in a soakaway to have reduced by 50% within 24 hours.

Initially a proposal was put forward to Lincolnshire County Council to construct the roadway with permeable block paving with surface water infiltrating into the soil beneath the sub base. However after consultation with LCC it is clear that due to the high water table and the very low infiltration rates LCC do not advise this method of construction and would not be willing to adopt the road if this method of construction was used.

Therefore it is proposed to construct the site access road with impermeable asphalt surfacing and the road will be drained with gullies connected to a new surface water system. The surface water from the roofs will also be discharged into this system which will discharge into the nearest water body which is the IDB drain on the northern boundary of the site.

Design of Surface Water Disposal

The proposed method of disposal for the surface water from the roofs of the buildings and the roads is to discharge the water into a surface water system on the site. Sufficient storage capacity will be provided so that the volume of rainfall from a 1 in 100 year event with a 30% increase for climate change can be retained in the system and then discharged into the IDB watercourse at a rate of 5.0 litres/ second. This will then comply with the SuDS manuals and guidances that recommend that the surface water should be reduced as much as possible to manage downstream flood risk.

The storage capacity will be provided by constructing an 800mm diameter main surface water sewer under the level part of the access road which will have a storage capacity of 82.9 cu metres. In addition to this a storage capacity will be constructed under the public open space with a capacity of 152 cu metres. The 800mm dia main sewer will discharge into a flow limiter device which will discharge into the IDB drain at 5 litres / second.

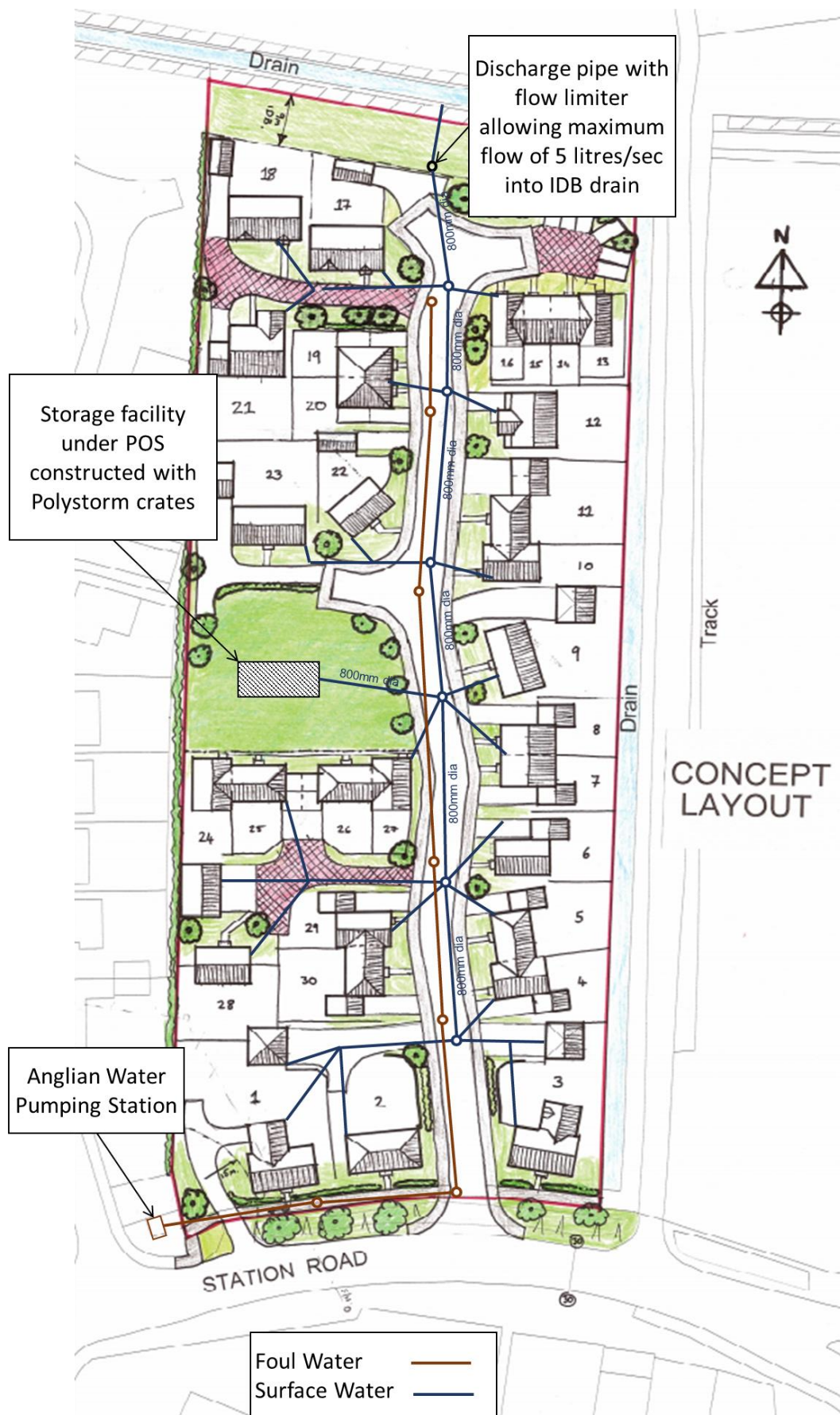
During heavy rainfall the 800mm dia pipe will start to fill with water as outfall to the IDB drain is restricted. The storage capacity will be 800mm deep with a similar invert level to the pipes and will fill with water at the same time.

A schematic layout of this is shown on page 3 of this report, and initial calculations are shown on pages 4 and 5.

Foul Water

It is assumed the foul water sewer will be located under the new site road which will connect into the existing Anglian Water pumping station which is located on the southern side of the site adjacent to Station Road.

SCHEMATIC PLAN OF SURFACE WATER DISPOSAL OF ROOF WATER



CALCULATION OF VOLUMES OF ATTENUATION SCHEMATIC

The impermeable areas from which rainfall needs to be disposed are:

Roofs of 30 No buildings (including garages) 2180 sq m

Impermeable Roads 1640 sq m

Total impermeable area 3820 sq m

The volumes of rainfall for various storm durations in a 1 in 100 year event in 2115 can be calculated as follows:

Duration	M5 60min	Z1	M5-D	Z2	M100-D	Intensity mm/hour	Areal Factor	Areal Intensity mm/hour	Area (ha)	Volume cum/hr	Vol + 30% climate Change cum/hr	Total Volume cu m climate	Total Volume cu m	Volume litres/sec
15	24	0.64	15.36	1.98	30.41	121.65	0.94	114.35	0.382	436.825	567.87	142.0	109.21	121.340
30	24	0.81	19.44	1.97	38.30	76.59	0.95	72.76	0.382	277.958	361.35	180.7	138.98	77.211
60	24	1	24	1.93	46.32	46.32	0.96	44.47	0.382	169.865	220.82	220.8	169.86	47.185
120	24	1.2	28.8	1.89	54.43	27.22	0.97	26.40	0.382	100.846	131.10	262.2	201.69	28.013
240	24	1.42	34.08	1.86	63.39	15.85	0.97	15.37	0.382	58.720	76.34	305.3	234.88	16.311
360	24	1.57	37.68	1.83	68.95	11.49	0.98	11.26	0.382	43.023	55.93	335.6	258.14	11.951
600	24	1.74	41.76	1.81	75.59	7.56	0.98	7.41	0.382	28.296	36.79	367.9	282.96	7.860
1440	24	2.16	51.84	1.81	93.83	3.91	0.98	3.83	0.382	14.636	19.03	456.6	351.26	4.066
2880	24	2.5	60	1.81	108.60	2.26	0.98	2.22	0.382	8.470	11.01	528.5	406.55	2.353

If an outflow from the system of 5 litres/sec is taken then the volume of attenuation required can be calculated as follows:

Duration mins	Total Rainfall Volume cu m into storage facility	Outflow into IDB Drain at 5 litres/sec	Total Storage Required	Total Time to empty attenuation tanks hours
15	142.0	4.50	137.5	7.64
30	180.7	9.00	171.7	9.54
60	220.8	18.00	202.8	11.27
120	262.2	36.00	226.2	12.57
240	305.3	72.00	233.3	12.96
360	335.6	108.00	227.6	12.64
600	367.9	180.00	187.9	10.44
1440	456.6	432.00	24.6	1.37
2880	528.5	864.00	-335.5	-18.64

It is proposed to provide this storage with 800mm diameter pipework under the main road and Polystorm or similar crates under the public open space.

Approximate length of 800mm dia pipework = 165 metres

Volume of pipework = $3.142 \times 0.4 \times 0.4 \times 165 = \underline{82.9 \text{ cu metres}}$

Total volume required = 233.3 cu metres

Total volume of storage in Polystorm units = 150.4 cu metres.

A Polystorm unit is 500mm x 1000mm x 400mm deep and each one is capable of storing 0.19 cu m of water.

Therefore number of units required = $150.4 / 0.19 = 792$

Provide 800 units which if placed in two layers will take up an area of 20 metres x 10 metres, and will provide a storage volume of 152 cu m.

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