

DRAINAGE STRATEGY

PROPOSED DEVELOPMENT AT PETERBOROUGH ROAD, CROWLAND

Introduction

A planning application is due to be submitted to South Holland District Council to construct houses and associated access roads at Peterborough Road, Crowland. The planning authority requires a drainage strategy to be submitted with the application.

Foul Water

It is proposed that the foul water from the development will be connected to the 300mm diameter Anglian Water foul sewer running under Peterborough Road. Anglian Water will need to confirm that there is adequate capacity in this sewer for the extra flows from the development. The invert level of the sewer is -0.08m OD at the manhole in front of No 8 Peterborough Road and will be slightly lower than this adjacent to the entrance to the site. It may be difficult to achieve the necessary falls to connect all the houses in the new development to the sewer without the need of a pumping station.

Ground Investigations

Six boreholes were drilled on the 28th May 2015 between 3 metres and 4 metres deep, with sleeves placed in all six boreholes. Topsoil was encountered between 150mm and 200mm depth, with made ground 450mm deep being found in the borehole nearest to Peterborough Road. Underneath the topsoil there is soft to firm brownish orange clay with varying proportions of sand and gravel. In five of the boreholes orange sand with varying proportions of sand and gravel was found at depths between 800mm and 1.7 metres below ground level. In the sixth borehole on the northern end of the site no sand was encountered and the sandy clay extended to the full depth of the borehole of 4.0 metres.

No ground water was encountered when the boreholes were drilled but subsequent monitoring has found ground water with the shallowest depth of 880mm below surface level.

Percolation tests will need to be carried out in different locations at suitable depths to enable the satisfactory design of soakaway systems.

Surface Water

Surface water discharge from the site can be divided into the following:-

- 1) Surface water from roofs of buildings
- 2) Surface water drainage from hardstandings alongside houses.
- 3) Surface water drainage from adopted roads on the site.

1) Surface Water from roofs of buildings

The surface water from the roofs of the houses and garages will be discharged into soakaways. Percolation tests will be carried out at various locations to ascertain the actual rate of percolation. These tests and the subsequent design of the soakaways will be carried out following the guidance principles in BRE365. The soakaways will be designed to accommodate a 1 in 100 year event with an allowance of 30% for future increased flows due to climate change. This is the criteria required by the Environment Agency and the North Level IDB. Depending on the results either normal gravel soakaways or soakaways using polystorm units will be specified.

2) Surface Water Drainage from hardstandings

Hardstandings alongside and in front of houses will be constructed of permeable block paving with a suitable gravel sub base. Percolation tests will be carried out to ensure that the base of the sub base is adequate to receive the flow from a 1 in 100 year event with an allowance of 30% for future increased flows due to climate change.

3) Surface Water Drainage from Adopted Roadways

The adopted roads and footpaths will be impermeable and will be drained with gullies which will be connected to a piped system which will discharge into a storage facility which could be placed under the public open space. This could be constructed with polystorm units or with large diameter pipes.

If polystorm units are used it may be possible to reduce the storage volume because these units can also have a soakaway facility subject to the results of percolation tests.

The storage facility would discharge into the IDB drain on the north east boundary of the site at a rate of 2.5 litres/second. If it is possible to discharge by gravity then the flow will be limited with a Hydrobrake unit or similar. However a small pumping arrangement may be required to lift the flow into the IDB drain if the storage facility is lower than the normal level of the IDB drain.

An initial calculation of the size of the storage facility is shown in Appendix A on pages 3 and 4.

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10th November 2015.

APPENDIX A

DESIGN OF SURFACE WATER DISPOSAL FROM ROADS

Approximate area of roads in initial design = 3015 square metres.

Total area of the site = 1.77ha or 17700 square metres.

North Level IDB have stated that they will allow a discharge into their system at greenfield rates, which is 1.4 cumecs/1000ha.

Therefore allowable discharge = $1.77/1000 \times 1.4 \times 1000$ litres / second
= 2.48 litres /second.

Therefore initially design system with a Hydrobrake to limit flows to 2.5 litres/sec.
(The lowest discharge possible with a Hydrobrake is 2.0 litres/second Reference E mail from Nicola Clarke of Hydro International 13th August 2015).

Work out discharges from road in 1 in 100 year storm with 30% increase for climate change.

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
15	24	0.64	15.36	1.98	30.41	121.65	0.94	114.35	0.302	345.343	448.95	112.2	86.34
30	24	0.81	19.44	1.97	38.30	76.59	0.95	72.76	0.302	219.747	285.67	142.8	109.87
60	24	1	24	1.93	46.32	46.32	0.96	44.47	0.302	134.291	174.58	174.6	134.29
120	24	1.2	28.8	1.89	54.43	27.22	0.97	26.40	0.302	79.727	103.64	207.3	159.45
240	24	1.42	34.08	1.86	63.39	15.85	0.97	15.37	0.302	46.423	60.35	241.4	185.69
360	24	1.57	37.68	1.83	68.95	11.49	0.98	11.26	0.302	34.013	44.22	265.3	204.08
600	24	1.74	41.76	1.81	75.59	7.56	0.98	7.41	0.302	22.370	29.08	290.8	223.70
1440	24	2.16	51.84	1.81	93.83	3.91	0.98	3.83	0.302	11.571	15.04	361.0	277.70
2880	24	2.5	60	1.81	108.60	2.26	0.98	2.22	0.302	6.696	8.70	417.8	321.41

If an outfall of 2.5 litres / second is allowed into the IDB watercourse the following volumes of storage will be required.

Duration	Total Volume cu m	Maximum Outflow cumecs	Outflow in storm duration	Total Volume in Storage Facility	Equivalent Rainfall mm	Time to Empty hours
15	112.2	0.00250	2.25	110.0	8.9	12.5
30	142.8	0.00250	4.50	138.3	11.3	15.9
60	174.6	0.00250	9.00	165.6	13.8	19.4
120	207.3	0.00250	18.00	189.3	16.4	23.0
240	241.4	0.00250	36.00	205.4	19.1	26.8
360	265.3	0.00250	54.00	211.3	21.0	29.5
600	290.8	0.00250	90.00	200.8	23.0	32.3
1440	361.0	0.00250	216.00	145.0	28.6	40.1
2880	417.8	0.00250	432.00	-14.2	33.1	46.4

Volume of storage required = 212 cu metres.

Volume of polystorm crate = 0.19 cu metres.

Therefore 1116 polystorm units will be required.

If the units are placed in two layers the size of storage facility will be 28 metres x 10 metres.

If the units are placed in three layers the size of storage facility will be 19 metres x 10 metres.