



Civil Structural Engineering & Development Consultants

Crossley Woods Crossley Lane
Mirfield West Yorkshire WF14 0NX
t 07860451274
e twhaigh1955@outlook.com

DRAINAGE STRATEGY
ON
PROPOSED RESIDENTIAL DEVELOPMENT
AT
Land off Oddfellows Street
Scholes,
Cleckheaton,
West Yorks.
FOR
Swift Property Management Ltd.

SEPTEMBER 2021

21202_ DRS_01

Prepared by

T. Haigh B.Sc., C.Eng., M.I.C.E.

1.0 INTRODUCTION

- 1.0 This report is commissioned to investigate and report on the Drainage Strategy for this site in accordance with current guidance and the Flood Risk Assessment prepared for the this site. The proposals for drainage of this site also relate to the site investigation carried out by TWH Consultancy issued February 2022. The report is based on information supplied by the client and from relevant authorities in both written and verbal format. Some of this information is in verbal form only. No liability can be accepted for information supplied by third parties which is subsequently found to be inaccurate or incorrect.
- 1.2 The PPG-FRCC NPPF-TG requires that climate change is taken into account in assessing the flood risk for all new developments and new drainage strategies. PPG-FRCC provides sensitivity ranges which may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities and river flows. For the proposed design life of the proposed development which is beyond 2085, the peak rainfall intensity has, been increased by 30% to represent anticipated climate change.

2.0 THE SITE

- 2.1 The site is located to the south of Oddfellows Street opposite the junction with Salisbury Road in Scholes. It is situated around Ordnance Survey grid reference SE 16798 25724 SE 416798 425724. A site location plan is included in Appendix A. Scholes is situated approx. 2km north west of Cleckheaton town centre and approx.. 9km south of Bradford City centre.
- 2.2 The site is an almost rectangular shape with the boundaries to east and west running almost due north. To the north of the site is Oddfellows Street and residential development. Similarly, there is residential development to the south and west of the site. To east of the site there is open fields mainly used for pasture and silage. The overall site area is approximately 0.98ha. Site levels vary from around 160m AOD in the north west corner down to 150m AOD in the south east corner of the site.
- 2.3 The main vehicular access to the site is located on the northern boundary from Oddfellows Street. There are public footpaths shown crossing the southern boundary and running close to the eastern boundary. From the southern boundary of the site a watercourse flows away from the site and appears to be the outfall for land drainage to the west of the site.
- 2.4 There are hedgerows and small trees to the boundary of the site but nothing within the site. The site has not been shown as previously developed.

- 2.5 There are foul and surface water sewers in Oddfellows Street but these are not deep enough or have capacity to allow for the development of this site.
- 2.6 There is a 375mm foul sewer running west to east 20 -30m south of the site . This would appear to be adequate to cater for the foul flows from the site. A requisitioned foul sewer would be required to connect to this sewer which is in private land adjacent to the southern boundary of the site. Alternatively it may be possible to agree an easement with the adjacent land owner to achieve the same result.
- 2.9 There is a culverted watercourse running in the land to the south of the site which outfalls to a stream approx.

3.0 PROPOSED SURFACE WATER DRAINAGE SYSTEM

- 3.1 The proposals are to erect a series of 3& 4 bed houses and two storey apartment blocks, along with associated access roads and car park areas. The roofs of the development will be traditional tiled roofs and drive areas will shed to the adjacent ground and discharge in French drains adjacent to the driveways,.
- 3.2 A copy of the Topographical Survey tied in to Ordnance datum is included in Appendix.
- 3.3 The 1:50,000 British Geological Survey maps have also been inspected to establish the underlying geology of the area and showed the Site to be underlain by geological formations that may be suitable for infiltration systems, However the infiltration testing on site suggests that this is marginal and practically, is not considered acceptable.
- 3.4 An inspection of historical O.S. Plans show that the site has not been previously developed but adjacent land has, The adjacent land has all been redeveloped for residential use.
- 3.5 In the first instance and in accordance with the current hierarchy for new development of land, under planning legislation, the surface water drainage systems should follow the hierarchy of firstly infiltration systems including use of soak aways. Secondly connections to surface water land drainage systems and rivers and thirdly into surface water sewers where there is capacity. Infiltration systems would normally be investigated as part of the site investigation.
- 3.6 The proposed drainage system will have to reproduce the existing discharges from the site with allowances made for future climatic changes or reduce them if at all possible.

- 3.7 The site will utilise what ever soil infiltration is available and utilise infiltration methods where these are acceptable to the local authority and not detrimental to the site development or areas off site.
- 3.8 The Site Investigation suggests that the underlying ground has a low infiltration capacity and whilst possibly accepting some infiltration into the underlying ground, this method will not be feasible to cater for the whole site due to the land uptake and proximity to proposed dwellings. As such only filter drains adjacent to drives is the only option utilised. The land uptake and required stand offs to infiltration areas would seriously impact the housing density on the site making it incompatible with other planning requirements.
- 3.9 In the first instance surface water would pass to soakaways where these are found to be suitable. Unfortunately the infiltration tests carried out on site show that the infiltration rate is approx. 3.3×10^{-5} m/s which is a low figure for the use of soakaways. This would require a soakaway approx. 2.7m square and 2.4m deep with a 1200mm diameter chamber for each house and each 150 sq. m. of road. The use of soakaways is therefore considered marginal for this site. In addition together with the normal requirements that these would have to be sited a minimum of 5 m away from any building or highway would mean that other requirements for development of the site could not be met.
- 3.10 It may be possible to partially utilise the infiltration on the site by installing filter drains adjacent to driveways to allow some infiltration and reduce the impermeable area draining to attenuation systems. This would have to be subject to L. A. and Building regulation approval.
- 3.11 It will be necessary to provide a separate surface water system with the run off attenuated to existing discharge rates, with the modelled storage systems for surface water able to cater for due allowances for climatic change. For this site this would be around a 30% allowance for storage on top of the requirement for the 1 in 100 year storm.
- 3.12 The surface water drainage for this site is currently determined by land drainage and the natural topography which shed all waters down to the south east corner of the site and thence into the open water course to the south east of the site. The drainage for this new site should also use a new outfall to this open watercourse, provided the discharge rates are reduced to agricultural discharge rates. This is estimated as 7.1. lit/sec/ha. After analysis of the area using the FSR and FEH methods for determining average run off from agricultural area. In an extreme condition it would be to higher but this figure is taken as a conservative estimate due to possible precedent conditions. suitable. We would recommend that the flows are attenuated down to a total of 6.9 lit/sec subject to discussion with the Local Land Drainage Authority.

- 3.13 The Current directives require that the site and any attenuation measures should be designed for the 100 year storm and 30% additions due to cater for climate change effects.
- 3.14 Based on this assumption the storage volumes required for a total 6.9lit/sec discharge rate are 207 cu.m for the 100 year storm rising to 322 cu.m when 30% climate change is taken into account. This could be provided in open ponds covering an area of 300 -400 0sq.m which is an extensive land uptake on such a small site and again would impinge on the required housing density required. This could however be provided in open ponds in the adjacent field which has a natural valley suitable for the use as an attenuation basin or pond. This does however fall within a currently designated green belt. The use of a careful designed attenuation basin would not detract from this designation. The use of a pond will allow some biological treatment of the run off prior to discharge but would raise problems as to the maintenance of such a system.
- 3.15 The use of open ponds , detention basins and swales would provide the most ecological solution to the site drainage and enable the site to conform to current SUDS Guidelines, This will have to be agreed with the local Land Drainage Authority and the Environment agency.
- 3.16 Alternatively the attenuation storage can be accommodated within GEO Storage crates below the open fields or in purpose designed concrete structures un the highway but the requirement that these are designated and adopted highway structures make these an expensive option at the bottom end of the SUDS requirements.
- 3.17 This system will ensure that discharges are limited to agricultural discharges and not increase the flood risk down stream. In addition if the basin is left un lined then it may be able to utilise some infiltration into the ground which would further enhance the capacity of the basin to cater for extreme storms.

4.0 FOUL DRAINAGE SYSTEMS.

- 4.01 There are existing foul sewers in Oddfellows street to the north of the suite and in the existing housing development to the immediate west of the site. Neither of these are sufficiently deep enough or have capacity to serve this development by gravity.
- 4.02 There is a 375mm diameter foul sewer that runs west to east through open land to the south of the site. Due to the topography this would appear to be sufficiently deep enough to cater for this site.
- 4.03 It will be necessary to procure either a private easement with the adjacent landowner to be able to make a connection to this sewer or alternatively a connecting pipe to the development will have to be requisitioned from Yorkshire Water Authority.

- 4.10 The alternative would have to be a new foul water pumping station to pump foul water up to existing sewers as designated by Yorkshire Water. These are expensive and would necessitate further land up take . This solution is likely to be resisted by YW as they are expensive maintenance issues with this option.

5.0 CONCLUSIONS

- 5.1 In our opinion the site, can be serviced by the provision of stormwater system incorporating an attenuation system to reduce flows down to existing agricultural levels. This system can discharge to the existing culverted watercourse or ditch to the south east of the site.
- 5.2 This system can be achieved by utilising an open attenuation basin with inflows and out flows controlled by a simple Hydrobrake to ensure agricultural rates are not exceeded. A volume of approx. 322cu.m will provide sufficient storage to cater for the required 100 year event but with a 30% increase to cater for future climatic effects. This also ensure that the site is developed with the appropriate SuDS designs for surface water drainage.
- 5.3 The site is not considered suitable for extensive use of infiltration systems due to the low infiltration rate in the upper strata and the spacing requirements for soakaways relative to buildings and highways. .
- 5.4 The site will have to flows from the developed site attenuated to agricultural rates because it has not previously been developed. This can readily be achieved by utilising an open storge ponds or detention basin but the area of land required would be prohibitive if it had to be sited within the site. It would however be acceptable if sited on the adjacent open fields which are currently classed as green belt. The natural topography lends its self to a simple basin that would not detract from its current green belt status.
- 5.5 The use of a hybrid form of basin would allow the installation of a permanent wet area that could be utilised for a reed bed to provide an element of treatment for the discharges from the site prior to passing into the water course.

Your Logo / Co	Project:			By:
	Calculation:	Rainfall and Runoff Calculator		
	IH 124 Method			Approved:
	Sheet Number:	1	Date:	

Catchment Details			
Catchment Area	10,000	m ²	
Location	3		
City/Town	Bradford		
SAAR	925	Override-	
WRAP SOIL Index	0.47	Override-	

Design Storm Details		
Return Period	1	years
Climate Change Allowance	1.3	

Results

Total Design Runoff: **7.48** l/s

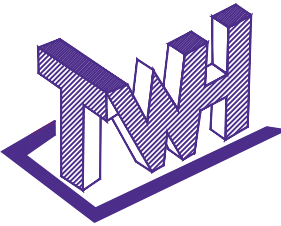
Your Logo / Co	Project:			By:
	Calculation:	Rainfall and Runoff Calculator		
	FSSR 6 Method			Approved:
	Sheet Number:	1	Date:	

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City/Town	Bradford		
SAAR	925	Override-	
WRAP SOIL Index	0.47	Override-	

Design Storm Details		
Return Period	1	years
Climate Change Allowance	1.3	

Results

Total Design Runoff: **7.16** l/s



TWH Consultancy
Civil Structural Engineering
& Development Consultants

Crossley Woods, Crossley lane, Mirfield, W. Yorks WF14 9HU t 07860451274
twhaigh1955@outlook.com

Client
SWIFT PROPERTY MANAGEMENT LTD

Project
ODDFELLOWS STREET SCHOLES

Detail
DRAINAGE PLAN LAYOUT

Dwn	Chkd	Date	Scale	Dwg No.
twh	TH	FEB 2022	1:500@A1	E22/21202/002

Client swift properties
Site ODDFELLOWS STREET SCHOLES

Design storm 100 M5-60 mm
Site area sq m. 9727 r
Imp Area sq m. 5404 Agricultural discharge allowable 7.1 lit/s/ha 6.90617
T of Conc min. 6.5 Time to Flow 2.5 T entry 4
Allow Discharge 6.9 Lit / sec Imp Ratio 0.56

100 year storm									100year plus 30% climate						100year plus 40% climate								
Storm Duration	Intensity	Depth	Vol In	Vol Out	Storage	Q	t		Intensity	Depth	Vol In	Vol Out	Storage	Intensity	Depth	Vol In	Vol Out	Storage	Intensity	Depth	Vol In	Vol Out	Storage
Mins	mm/hr	mm	cu.m	cu.m	cu.m				mm/hr	mm	cu.m	cu.m	cu.m	mm/hr	mm	cu.m	cu.m	cu.m	mm/hr	mm	cu.m	cu.m	cu.m
10	81.8	13.63	73.67	6.68	66.99	122.89	0.4		101.27	16.88	91.21	6.68	84.53	131.65	21.94	118.57	6.68	111.89	141.78	23.63	127.69	6.68	121.01
20	59.8	19.93	107.72	10.76	96.96	89.84	0.5		74.03	24.68	133.36	10.76	122.59	96.24	32.08	173.36	10.76	162.60	103.65	34.55	186.70	10.76	175.94
30	47.6	23.80	128.62	14.85	113.76	71.51	0.6		58.93	29.46	159.23	14.85	144.37	76.61	38.30	206.99	14.85	192.14	82.50	41.25	222.92	14.85	208.06
50	34.4	28.67	154.91	23.03	131.88	51.68	0.9		42.59	35.49	191.78	23.03	168.75	55.36	46.14	249.32	23.03	226.29	59.62	49.69	268.50	23.03	245.47
60	30.3	30.30	163.74	27.12	136.62	45.52	1.0		37.51	37.51	202.71	27.12	175.59	48.76	48.76	263.53	27.12	236.40	52.52	52.52	283.80	27.12	256.67
120	18.7	37.40	202.11	51.71	150.40	28.09	1.6		23.15	46.30	250.21	51.71	198.50	30.10	60.19	325.28	51.71	273.57	32.41	64.82	350.30	51.71	298.59
180	14.1	42.30	228.59	76.33	152.25	21.18	2.1		17.46	52.37	282.99	76.33	206.66	22.69	68.08	367.89	76.33	291.56	24.44	73.31	396.19	76.33	319.86
240	11.5	46.00	248.58	100.98	147.61	17.28	2.6		14.24	56.95	307.75	100.98	206.77	18.51	74.03	400.07	100.98	299.09	19.93	79.73	430.85	100.98	329.87
300	9.8	49.00	264.80	125.63	139.17	14.72	3.0		12.13	60.66	327.82	125.63	202.19	15.77	78.86	426.16	125.63	300.53	16.99	84.93	458.94	125.63	333.31
360	8.7	52.20	282.09	150.31	131.78	13.07	3.4		10.77	64.62	349.23	150.31	198.92	14.00	84.01	453.99	150.31	303.68	15.08	90.47	488.92	150.31	338.61
420	7.9	55.30	298.84	175.01	123.83	11.87	3.8		9.78	68.46	369.97	175.01	194.96	12.71	89.00	480.96	175.01	305.95	13.69	95.85	517.95	175.01	342.95
480	7.5	60.00	324.24	199.76	124.48	11.27	4.0		9.29	74.28	401.41	199.76	201.65	12.07	96.56	521.83	199.76	322.07	13.00	103.99	561.97	199.76	362.21
540	6.9	62.10	335.59	224.46	111.13	10.37	4.3		8.54	76.88	415.46	224.46	191.00	11.10	99.94	540.10	224.46	315.64	11.96	107.63	581.64	224.46	357.18
600	6.38	63.80	344.78	249.15	95.62	9.58	4.7		7.90	78.98	426.83	249.15	177.68	10.27	102.68	554.88	249.15	305.73	11.06	110.58	597.56	249.15	348.41
Storage 152.25									Storage 206.77						Storage 322.07								
Length of 1800	59.83							Length of 1800	81.2554468					Length of 1800	126.565					Length of 1800	142.33886		
Length of 1500	86.17	Culvert	2.4*1.5m	42.29				Length of 1500	117.01796					Length of 1500	182.269					Length of 1500	204.98569		
Length of 1200	134.62	culvert	3.6*1.8m	23.50				Length of 1200	182.821163					Length of 1200	284.765					Length of 1200	320.25615		
Length of 1050	175.81							Length of 1050	238.77					Length of 1050	371.904					Length of 1050	418.25601		
Length of 900	239.39							Length of 900	325.11					Length of 900	506.397					Length of 900	569.51212		
Length of 750	344.47							Length of 750	467.81					Length of 750	728.662					Length of 750	819.47898		
Length of 600	538.00							Length of 600	730.64					Length of 600	1138.05					Length of 600	1279.893		

Footprint Area (m)				sq.m storm			
400mm deep 1200 deep				169.172 30 year			
Aquacell Storage Crates (400mm deep)	30 year	400.7	133.6	Pond 900mm deep	229.745	100 year	
	100 year	544.1	181.4		298.669	100 year +30%	
	100 year +30%	707.4	235.8				

Wallingford modified Rational Stormwater design sheet**Oddfellows St. Scholes**

Time of entry 4 mins

Pipe Number	US MH No	US MH CL	US MH IL	DS MH No	DS MH CL	DS MH IL	Imp Area	Cumm Area	FALL	LENGTH	VELOCITY	Tf	tc	Intensity	flow L/S	pipe diam	gradient	capacity	velocity
1.00	S4	158.600	157.100	S3	156.300	154.800	0.160	0.160	2.300	58.5	2.1	0.46	4.46	50	22.24	225	25.4	108	2.10
2.00	S7	158.500	157.000	S3	156.300	154.800	0.153	0.153	2.550	59.7	2.1	0.47	4.47	50	21.27	225	27.1	100	2.10
1.01	S3	156.300	154.800	S2	153.150	151.400	0.097	0.410	3.400	47.5	2.77	0.29	4.76	50	56.99	225	14.0	140	2.77
3.00	S6	153.850	152.300	S5	153.150	151.600	0.143	0.143	0.700	22.5	1.984	0.19	4.19	50	19.82	225	32.1	91.9	1.98
3.01	S5	153.150	151.600	S2	153.150	151.400	0.064	0.206	0.200	7.2	2.214	0.05	4.24	50	28.65	225	36.0	86.8	2.21
1.02	S2	153.150	151.400	S1	149.600	148.500	0.000	0.616	2.900	52.7	3.25	0.27	5.03	50	85.64	225	18.2	122	3.25
1.03	S1	149.600	148.500	outfall	146.800	146.500	0.000	0.616	2.000	19.7	1.5	0.22	5.25	50	85.64	225	9.9	167	4.10