

**FLOOD RISK ASSESSMENT
& SUSTAINABLE DRAINAGE PROPOSAL,
AND SEWAGE DISPOSAL**

**LAND TO THE REAR OF OAKFIELDS
WINCHESTER ROAD
FAIR OAK
SO50 7HA**

Prepared for

Ms A Denham-Harding
c/o Southern Planning Practice
Youngs Yard
Churchfields
Twyford
Winchester
SO21 1NN

Prepared by

Simon Jones-Parry BSc CEng MICE
Chartered Civil Engineer
Swan's Farm
Winchfield
Hook
Hampshire
RG27 8DB

Tel 01256 704940 (public domain)

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**PROPOSED RESIDENTIAL DEVELOPMENT
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INTRODUCTION

This report was prepared by Simon Jones-Parry, a chartered civil engineer, for Ms Denham-Harding, the owner of Oakfields, Winchester Road, Fair Oak, SO50 7HA. It supports a planning application for residential development of a 0.235 hectare paddock located to the rear of Oakfields with nine dwellings as shown on T2 Architects' proposed layout plan 2009_1001, copy appended. That plan shows the layout of the dwellings, curtilage buildings, accesses and parking areas, the site boundary edged in red, and other controlled land edged in blue. Access to the development will be from Delamere Gardens, which forms part of a sizeable residential development by Linden Homes created as part of the consent for "Crowdhill Green" granted circa 2015.

The site is designated as Flood Zone 1. There is no special flood risk about which the Environment Agency has notified the Local Planning Authority. There are no main rivers close to the site. The site is located on London Clay Formation bed rock, with no aquifer status. As a result the Environment Agency is not a statutory consultee for the planning application.

There is no mapped surface water flood risk to the site, indeed there is no watercourse located close to the site, and there is no flood risk from artificial sources at the site. The area of the site is less than one hectare. Therefore no flood risk assessment report is required under either national or local planning application registration requirements.

With less than ten dwellings proposed and a site area less than one hectare, the development is not classified as "major with surface water drainage", and therefore the Lead Local Flood Authority is not a statutory consultee to the planning application.

Covenants registered at the Land Registry give the owner of Oakfields unfettered access to the Delamere Gardens highway and to all its services, including foul and surface water drainage, which as yet are not adopted by Southern Water.

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The evidence of the Crowdhill Green approved drainage plan and calculations is that sustainable drainage systems serving Delamere Gardens included hydraulic capacity to collect and remove a nothing more than green field run off from the site. Therefore it is proposed that the development will connect to the Delamere Gardens' surface water drainage system but will attenuate flow on site such that this discharge meets the standards set out in national and local planning policy.

Policy requirements for discharge are that post development the discharge from the site should not exceed the current, green field, situation for all storm events up to the 100 year plus 40% extra rainfall to allow for climate change in the nominal lifetime of the development. Furthermore, according to the SuDS Manual, in order to control extra volume of water generated by removal of parts of the natural surface and vegetation on the site, leading to a reduction of infiltration and evaporation based rainfall losses, the rate of discharge off site after the first six hours should not exceed 2 litres per second per hectare.

As the surface water drainage system serving Delamere Gardens includes sufficient water quality treatment for the use of the proposed development, the proposed on site drainage system will ensure control of pollution and sediment removal are achieved on site, but it will rely on the existing chain of balancing ponds serving Delamere Gardens to achieve full SuDS quality recommendations of further settlement and vegetative treatment of discharged surface water.

There are no capacity constraints in the Delamere Gardens foul sewerage system for the 0.4 litres per second sewage design flow generated by the proposed development.

Under local planning application requirements, the planning application must include a sewage disposal strategy and a sustainable drainage strategy, the latter compliant with Policy DM5 of the 2014 version of the pre submission Eastleigh Local Plan 2011-2029. The remainder of this report sets out details of these topics.

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Salient appendices are listed below:

1. Layout plan 2009_1001;
2. Proposed drainage layout plan 100;
3. Southern Water sewerage records;
4. Estimate of green field run off based on a) fixed percentage run off model and b) UK SuDS Report IoH 124;
5. Calculation of required on site surface water storage based on a) bespoke quick estimation method and b) UK SuDS;
6. Manufacturer's details of proposed underground storage tanks;
7. Manufacturer's details of proposed flow controller; and,
8. Drainage maintenance schedule.

TOPOGRAPHY

Existing contours at 0.2 m centres to Ordnance Survey datum derived from Open Government LiDAR DTM are shown on plan 100. Topographical levels vary from 57.4 m AOD to 61.0 m AOD. The general fall is north westwards towards Delamere Gardens.

These contours clearly define the series of balancing ponds serving development at Delamere Gardens, the highest of which is depicted on drawing 100.

SUSTAINABLE SURFACE WATER DRAINAGE SYSTEM

The shape of the site and its relationship to Delamere Gardens constrains the development layout. The only surface water drainage outfall available to the development is that serving Delamere Gardens.

In the absence of capacity in the drainage system serving Delamere Gardens to receive unattenuated flow from the new development, and London Clay Formation making infiltration based rainwater disposal unviable, the options for dealing with the

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development's rainwater are:

1. Harvest sufficient rainwater for domestic use to flush WCs and run washing machines such that statistically, based on past regional rainfall records and predictions of climate change effect on rainfall depths, the overflow from the harvesting collection tanks has a very low probability of exceeding the green field run off from the site in similar rainfall conditions;
2. Store temporarily rainwater run off in excess for green field run off and discharge it over a long period of time at a very low rate such that the additional volume discharged has a negligible impact on the downstream drainage system; or,
3. A combination of the above.

For the purposes of this report, compliance Policy DM5 will be demonstrated using the storage and restricted discharge method.

SuDS Manual makes recommendations about different methods of controlling the peak rate and volume of discharge from development, but in practice the majority of those recommendations apply only to larger sites, and for a development such as this, where the site area is just 0.235 hectare and the drained generally impermeable area is only 0.12 hectares, the only option is to use a vortex flow controller having a) a maximum discharge rate of 1 litre per second and b) a discharge to head curve reflecting that of an orifice. A vortex flow flow regulator is best in this case because it gives the least risk of blockage. One litre per second is the lowest rate compatible with low risk of blockage. A curve similar to an orifice means that discharge will progressively increase with the head of water stored rather than high flow will occur in all rainfall conditions.

Two estimates of green field run off from the site are appended. "Fixed Percentage Model" methodology has been used to create the first table, which gives estimates of green field run off rates for the site over a range of storm durations for each of two, five, twenty, thirty,

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and one hundred year return periods. The impact of 40% extra flow for climate change is shown for the 100 year return period. The second estimate is based on loH 124, using the standard UKSuDS calculator, on a litres per second per hectare basis (so the figures the site will be about 24% of the results given).

Both sets of figures show that the natural rate of run off from the site is high, principally due to the low permeability of the London Clay Formation sub soil. It should be noted, however, that FEH SPRHOST figures for the locality range from 15.2 to 31.2, whereas according to UKSuDS the SOIL is Type 4, for which SPRHOST would be expected to be much higher.

In practice peak green field run off rates are mainly academic. The reason is that the two litre per second per hectare volumetric control limit recommended by SuDS Manual is the controlling constraint to discharge in a situation where the use of a “complex” flow control regulator is impracticable.

It is proposed to use a flow regulator of the vortex type rated at one litre per second at maximum head and with a head to flow relationship similar to that of an orifice, to avoid high discharge rates at low head. Manufacturer's details are appended. One litre per second is generally considered to be the lowest maximum rating for a reliable vortex regulator compatible with a surface water environment. A vortex flow controller is proposed rather than an orifice, which having a much smaller “throughlet” size, could be troublesome in use.

The two green field run off estimates confirm that maximum flow rate of one litre per second maximum discharge rate proposed post development generally is comparable or better than then green field rate across a wide range of storms.

Clearly storage must be supplied to accommodate storm water awaiting discharge. Two calculations for the volume storage required are appended. The result of the bespoke estimate is 82 cubic metres of storage. The result of the UKSuDS estimate is 87 cubic

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metres. The difference between the estimates mainly is accounted for by the UKSuDS estimate assuming that 30% of rainfall on landscaped surfaces will reach the drainage system, whereas the bespoke calculation makes no such allowance. At this site a large proportion of run off from landscaped areas will drain to the highway in Delamere Gardens as it does today, rather than to the new drainage system, so the lower volume, 82 cubic metres, is the most appropriate in this situation.

Drawing 100 shows the storage will be supplied in the form of two interlinked GRP tanks located under the accessway. The tanks would be bedded and surrounded in concrete to ensure a very long service life. A plastic crate system might be cheaper and more flexible, but the tanks have an advantage of excellent access for future maintenance. Storage could be increased if deemed essential, and dispersed through the development, but due the very low flow regulation rate for this site it should always operate as a single volume rather than as a cascading system.

A full routing analysis of the drainage system will be done at detailed design, with details of the flow regulator and storage adjusted to suit.

“Under-drained” permeable paving could be used for the accessway and parking spaces. The porous sub base beneath the permeable paving would discharge to the surface water sewerage system. Such permeable paving could improve discharged surface water quality.

Extensive green roofs could be specified for flat roofs of curtilage buildings, and rainwater butts added to downpipes, for increased sustainability. Such details are beyond the scope of this report. The impact of such measures on the scale of the underground drainage system would be negligible.

The surface water drainage system would be private.

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FOUL DRAINAGE

Sewage will be collected by a standard piped sewerage system and discharged to foul sewers in Delamere Gardens similar to shown on plan 100. There are no issues with capacity. The system serving Plots 1-3 would have to be private unless it is routed under Delamere Gardens highway rather than beneath rear gardens of Plots 1 and 2. The system serving Plots 4-9 could be adoptable.

DRAINAGE MAINTENANCE

During construction and for a year after completion the main contractor will be responsible for maintenance.

The dwellings will be open market, therefore the developer will create a management company or a residents' association to own and carry out maintenance and renewals of shared parts of the surface water sewerage system. Drains that only serve one dwelling will be owned and maintained as part of that dwelling.

Foul drains, ie those only serving one dwelling, will be owned and maintained by the dwelling owner. Private foul sewers will be owned and maintained by the owners of dwellings that share the sewers. Adopted foul sewers will be owned and maintained by Southern Water.

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SUMMARY

A development of nine dwellings is proposed on a 0.235 hectare pasture field. Surface water drainage will comprise a system of collector pipes discharging into underground storage located in the accessway between Plots 1, 2 and 3. The underground storage will discharge at rate not exceeding one litre per second to the chain of balancing ponds serving Delamere Gardens. This rate of discharge is lower than the green field flow from the site to the ponds. Sufficient storage will be included to ensure no overflow of the drainage system serving the site in the worst 100 year plus 40% extra rainfall depth to allow for climate change in the lifetime of the development. Foul drainage will be to the foul sewerage system under the Delamere Gardens highway.

CONCLUSION

The drainage system as proposed meets national and local policies and as such does not constrain the grant of planning consent. Because the drainage system has not been designed in detail, it is appropriate to control drainage details and implementation by a suitably worded planning condition, with a Grampian style condition limiting progression of the development above ground floor level until the off site surface water sewerage link to the balancing pond is completed.

WINCHESTER ROAD



DELAMERE GARDENS

0 1 2.5 7.5m

do not scale, except for planning
© T2 architects

notes

revisions

Rev H 25/01/21 Plot 3 car port removed

Rev I 19/02/21 Draft planning issue for comment

Rev J 12/03/21 Amendments following client comments

Rev K 19/03/21

North

project

Land rear of Oakfields,
Winchester Road,
Fair Oak

client

Denham Harding

drawing

Proposed Site Plan

stage

Planning

scale

1:250 @ A3

date

November 2020

job no., drwg no., revision

2009 _ 1001 Rev K

drawn by

JF

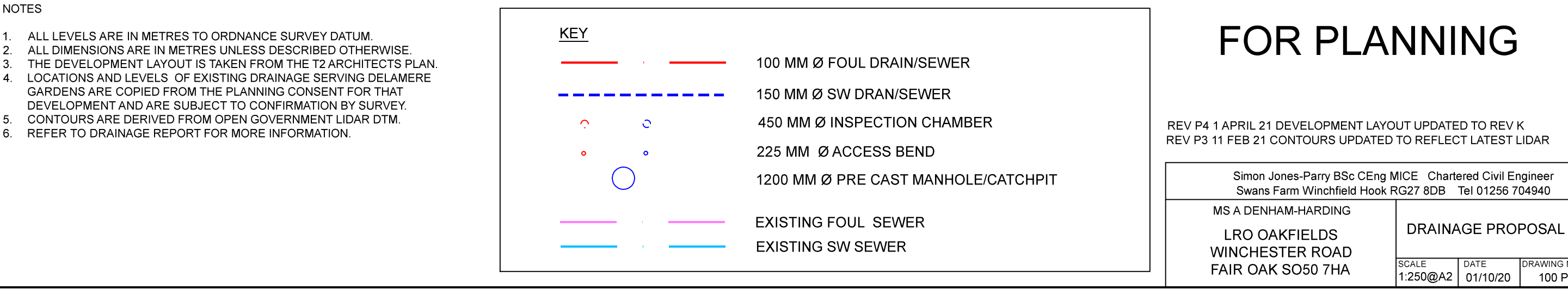
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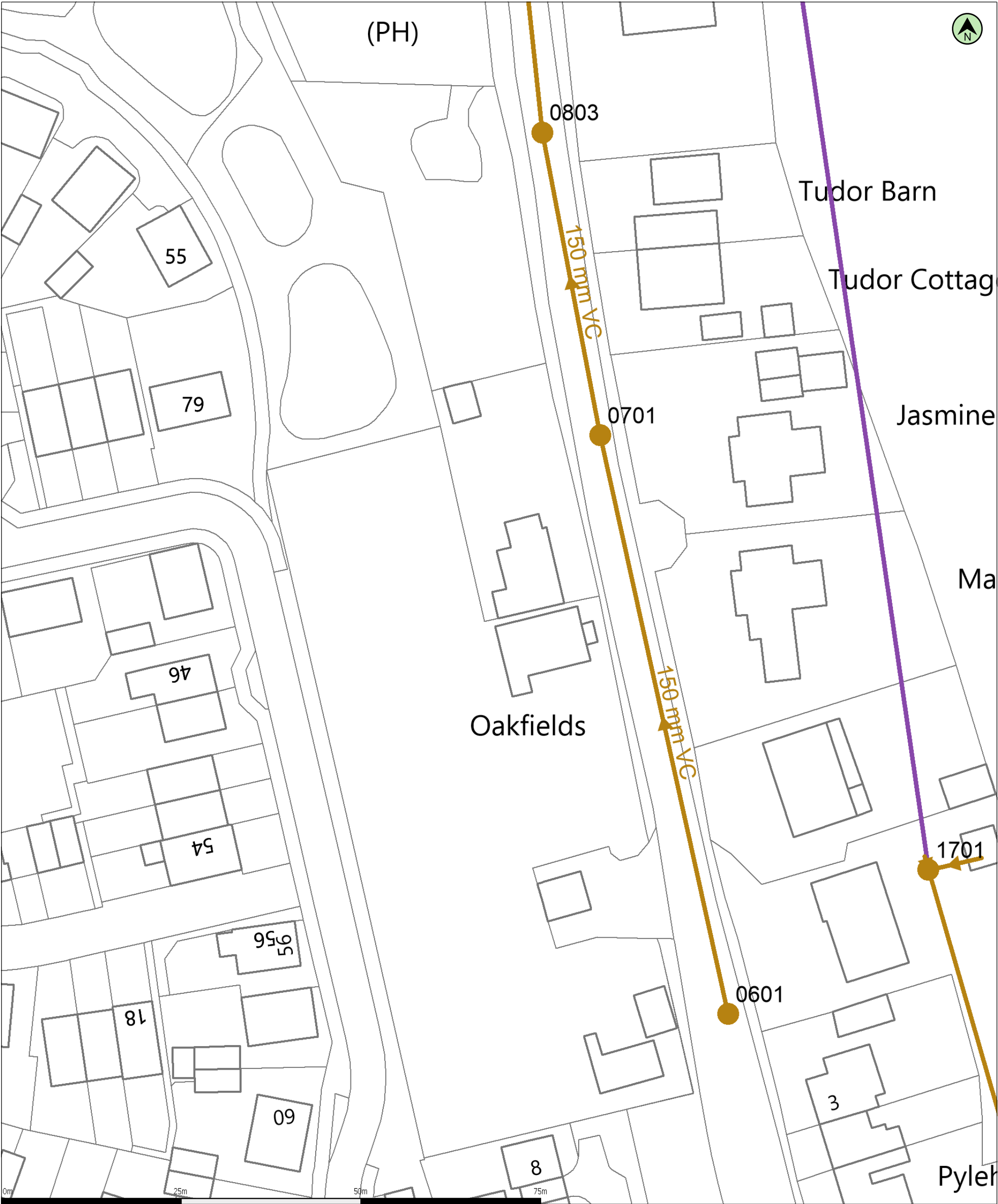
JT

Rev K

T2 architects

23 City Business Centre
Hyde Street
Winchester
SO23 7TA
T 01962 856255
E info@t2architects.com
www.t2architects.com





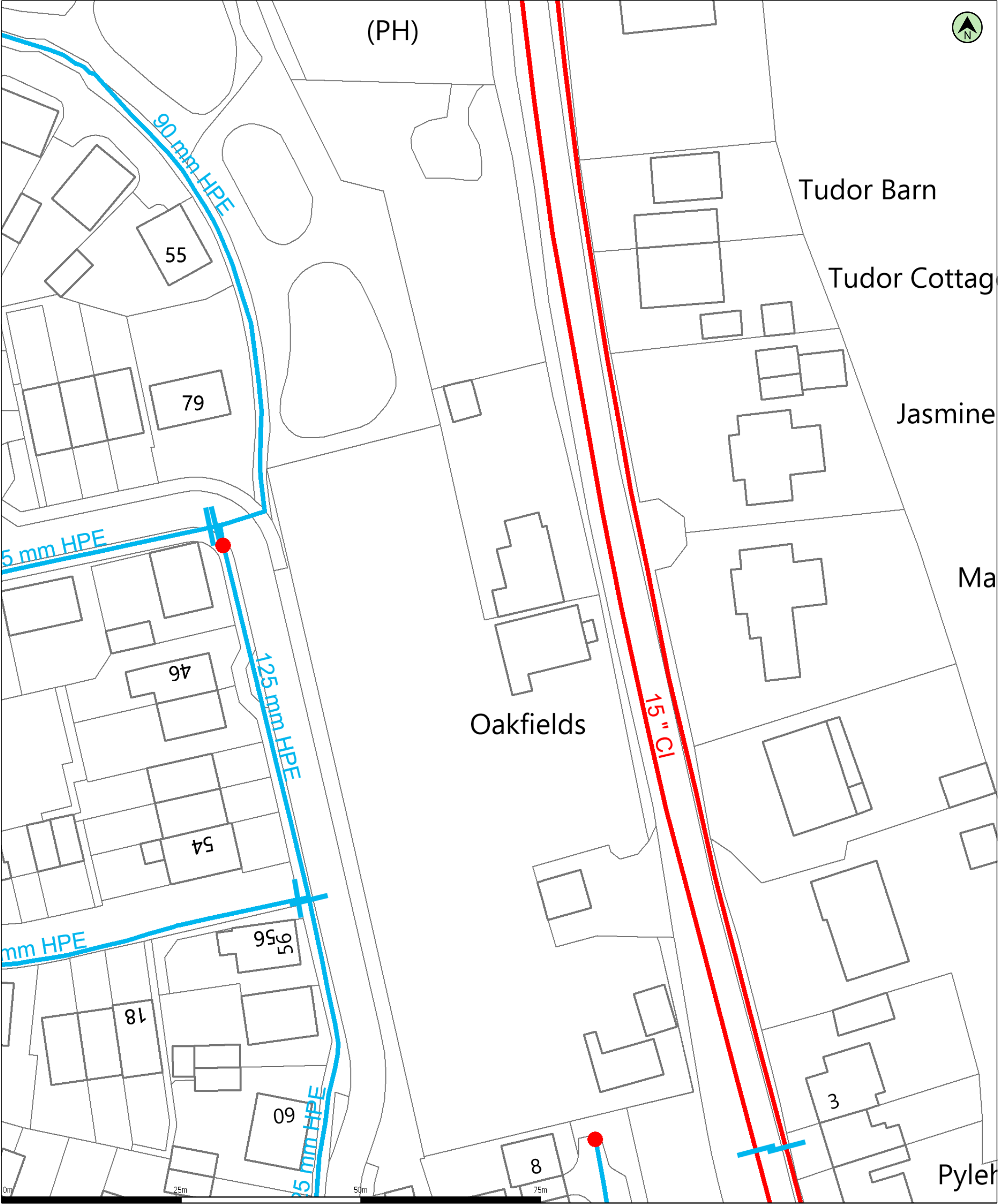
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Data updated: 15/06/20 Map Centre: 449051,119740 Our Ref: 426491 - 2 Powered by digdat

jonesparry@btinternet.com
Oakfields



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2020 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

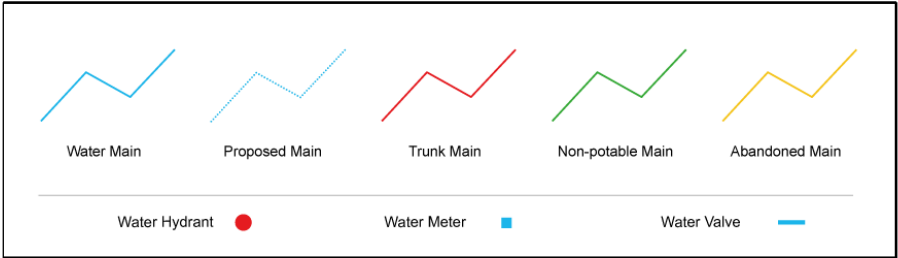


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Data updated: 15/06/20

Scale: 1:500
Map Centre: 449051,119740

Date: 13/08/20
Our Ref: 426491 - 1

Clean Water Plan A3
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Oakfields



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JOB TITLE OAKFIELDS, WINCHESTER ROAD, FAIR OAK, SO50 7HA
GREEN FIELD RUN OFF VOLUMES AND RATES – FIXED PERCENTAGE RUN OFF MODEL – SuDS MANUAL eq 24.4 PP517,518
05/10/20 00:00

Site area	2350 sq m	Nett development area	
CWI	125 mm	Figure 24.3 SuDS Manual V2, p 518, based on SAAR	700 mm
Soil S1	0.0%		
Soil S2	0.0%		
Soil S3	0.0%		
Soil S4	100.0%		
Soil S5	0.0%	100.00%	

<u>Storm duration</u> Hours	<u>Rainfall rate</u> mm/hr	<u>Climate changed rainfall depth</u> mm	<u>Rainfall volume</u> m3	<u>SPR</u> %	<u>DPR cwi</u> %	<u>DPR rain</u> %	<u>PR rural</u> %	<u>Discharged off site</u> m3	<u>Average rate of discharge off site</u> l/s
<u>2 year rainfall event</u>									
Climate change		0%							
0.25	25.4	6.35	14.923	47.00	0.00	0.00	47.00	7.014	7.79
0.5	16.8	8.40	19.740	47.00	0.00	0.00	47.00	9.278	5.15
1	11.2	11.20	26.320	47.00	0.00	0.00	47.00	12.370	3.44
2	7.43	14.86	34.921	47.00	0.00	0.00	47.00	16.413	2.28
3	5.85	17.55	41.243	47.00	0.00	0.00	47.00	19.384	1.79
6	3.89	23.34	54.849	47.00	0.00	0.00	47.00	25.779	1.19
12	2.58	30.96	72.756	47.00	0.00	0.00	47.00	34.195	0.79
24	1.58	37.92	89.112	47.00	0.00	0.00	47.00	41.883	0.48
<u>5 year rainfall event</u>									
Climate change		0%							
0.25	37.3	9.33	21.914	47.00	0.00	0.00	47.00	10.299	11.44
0.5	24.3	12.15	28.553	47.00	0.00	0.00	47.00	13.420	7.46
1	15.8	15.80	37.130	47.00	0.00	0.00	47.00	17.451	4.85
2	10.3	20.60	48.410	47.00	0.00	0.00	47.00	22.753	3.16
3	7.98	23.94	56.259	47.00	0.00	0.00	47.00	26.442	2.45
6	6.67	40.02	94.047	47.00	0.00	0.03	47.03	44.229	2.05
12	3.38	40.56	95.316	47.00	0.00	0.30	47.30	45.084	1.04
24	2.01	48.24	113.364	47.00	0.00	1.97	48.97	55.514	0.64
<u>25 year rainfall event</u>									
Climate change		0%							
0.25	48.1	12.03	28.259	47.00	0.00	0.00	47.00	13.282	14.76
0.5	41.9	20.95	49.233	47.00	0.00	0.00	47.00	23.139	12.86
1	26.4	26.40	62.040	47.00	0.00	0.00	47.00	29.159	8.10
2	16.6	33.20	78.020	47.00	0.00	0.00	47.00	36.669	5.09
3	9.8	29.40	69.090	47.00	0.00	0.00	47.00	32.472	3.01
6	8	48.00	112.800	47.00	0.00	1.93	48.93	55.192	2.56
12	5.04	60.48	142.128	47.00	0.00	3.73	50.73	72.095	1.67
24	2.91	69.84	164.124	47.00	0.00	4.85	51.85	85.095	0.98
<u>30 year rainfall event</u>									
Climate change		0%							
0.25	70.8	17.70	41.595	47.00	0.00	0.00	47.00	19.550	21.72
0.5	44.5	22.25	52.288	47.00	0.00	0.00	47.00	24.575	13.65
1	27.9	27.90	65.565	47.00	0.00	0.00	47.00	30.816	8.56
2	17.5	35.00	82.250	47.00	0.00	0.00	47.00	38.658	5.37
3	13.2	39.60	93.060	47.00	0.00	0.00	47.00	43.738	4.05
6	8.39	50.34	118.299	47.00	0.00	2.31	49.31	58.332	2.70
12	5.27	63.24	148.614	47.00	0.00	4.07	51.07	75.897	1.76
24	3.03	72.72	170.892	47.00	0.00	5.17	52.17	89.156	1.03
<u>100 year rainfall event</u>									
Climate change		0%							
0.25	107	26.75	62.863	47.00	0.00	0.00	47.00	29.545	32.83
0.5	65.8	32.90	77.315	47.00	0.00	0.00	47.00	36.338	20.19
1	40.4	40.40	94.940	47.00	0.00	0.24	47.24	44.847	12.46
2	24.8	49.60	116.560	47.00	0.00	2.19	49.19	57.338	7.96
3	18	54.00	126.900	47.00	0.00	2.85	49.85	63.265	5.86
6	11.4	68.40	160.740	47.00	0.00	4.68	51.68	83.075	3.85
12	7.01	84.12	197.682	47.00	0.00	6.37	53.37	105.512	2.44
24	3.95	94.80	222.780	47.00	0.00	7.42	54.42	121.235	1.40
<u>100 year rainfall event</u>									
Climate change		40%							
0.25	107	37.45	88.008	47.00	0.00	0.00	47.00	41.364	45.96
0.5	65.8	46.06	108.241	47.00	0.00	1.59	48.59	52.593	29.22
1	40.4	56.56	132.916	47.00	0.00	3.21	50.21	66.738	18.54
2	24.8	69.44	163.184	47.00	0.00	4.80	51.80	84.533	11.74
3	18	75.60	177.660	47.00	0.00	5.49	52.49	93.246	8.63
6	11.4	95.76	225.036	47.00	0.00	7.51	54.51	122.667	5.68
12	7.01	117.77	276.755	47.00	0.00	9.48	56.48	156.309	3.62
24	3.95	132.72	311.892	47.00	0.00	10.72	57.72	180.027	2.08

Calculated by:	Simon Jones-Parry
Site name:	Oakfields
Site location:	Fair Oak

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.97487° N
Longitude:	1.30284° W
Reference:	2976677044
Date:	Oct 05 2020 10:35

Runoff estimation approach

Site characteristics

Total site area (ha):	1
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Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	800	800
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	5.64	5.64
1 in 1 year (l/s):	4.8	4.8
1 in 30 years (l/s):	12.98	12.98
1 in 100 year (l/s):	18.01	18.01
1 in 200 years (l/s):	21.11	21.11

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

RESULTS OF BALANCING PROGRAM EXECUTION

PARAMETERS

Project Name:- Oakfields, Fair Oak

Designer:- SJP

Comment:- Tanks to serve development

Time and date:-Fri Oct 2 15:01:38 2020

Gross area:- 2350 square metres

Nominal impermeable area:- 1207 square metres

Areal reduction factor at D=1:- 0.998907

Base flow:- 0 litres per second

Maximum discharge from balancing device:- 1 l/s reducing to 1 l/s after six hrs

Estimated ratio of average to maximum discharge from balancing device:- 0.69

UCWI:- 120

Soil index:- 0.45

c: -0.027

d1: 0.42

d2: 0.296

d3: 0.399

e: 0.303

f: 2.304

Rainfall uplift factor:- 1.4

RESULTS (FEH RAINFALL)

Contributing area = 998.488 square metres (ie 82.7248% of impermeable)

Storm length hours	100 year rain mm	Average inflow m3/hr	Base flow m3/hr	100 year storage cu.metre	Empty-empty time hours
1.0	56.2	56.16	0.000	53.7	22.6
2.0	69.1	34.50	0.000	64.0	27.8
3.0	78.0	25.95	0.000	70.4	31.3
4.0	84.9	21.19	0.000	74.8	34.1
5.0	90.7	18.12	0.000	78.2	36.5
6.0	95.8	15.94	0.000	80.7	38.5
7.0	100.2	14.30	0.000	81.6	
8.0	104.3	13.02	0.000	82.0	
9.0	108.0	11.98	0.000	82.1	
10.0	111.4	11.13	0.000	82.0	
11.0	114.6	10.40	0.000	81.5	
12.0	117.6	9.79	0.000	80.9	
13.0	119.2	9.16	0.000	79.0	
14.0	120.8	8.61	0.000	76.9	
15.0	122.2	8.14	0.000	74.7	
16.0	123.6	7.71	0.000	72.5	
17.0	124.9	7.34	0.000	70.2	
18.0	126.1	7.00	0.000	67.8	
19.0	127.3	6.69	0.000	65.4	
20.0	128.4	6.41	0.000	62.9	
21.0	129.5	6.16	0.000	60.4	
22.0	130.6	5.93	0.000	57.9	
23.0	131.6	5.71	0.000	55.3	
24.0	132.5	5.51	0.000	52.6	
25.0	133.5	5.33	0.000	50.0	
26.0	134.4	5.16	0.000	47.3	
27.0	135.3	5.00	0.000	44.6	
28.0	136.1	4.85	0.000	41.8	
29.0	136.9	4.71	0.000	39.0	
30.0	137.7	4.58	0.000	36.2	

The maximum storage is 82.1 cubic metres at 8.8 hours

C++ Program (c) Simon Jones-Parry 2003-8 (Tel +44 1256 702429)

FEHPOND.EXE Version (2.10) 15 September 2008



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):	0.235
Significant public open space (ha):	0
Area positively drained (ha):	0.235
Impermeable area (ha):	0.120
Percentage of drained area that is impermeable (%):	51
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	100
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.24
Net impermeable area for storage volume design (ha):	0.14
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:

Urban creep allowance factor:

Volume control approach:

Interception rainfall depth (mm):

Minimum flow rate (l/s):

Methodology

esti:

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	85.47
FEH / FSR conversion factor:	1.11	1.11
SAAR (mm):	800	800
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	1.33	1.33
Q_{BAR} for net site area (l/s):	1.33	1.33

Site discharge rates

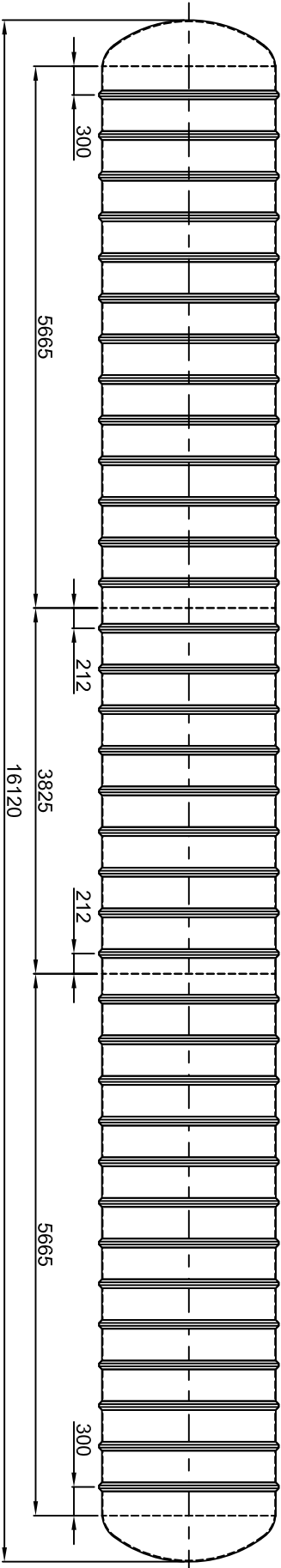
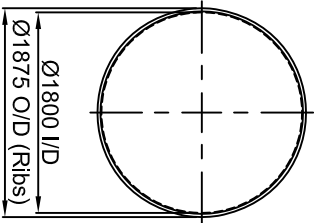
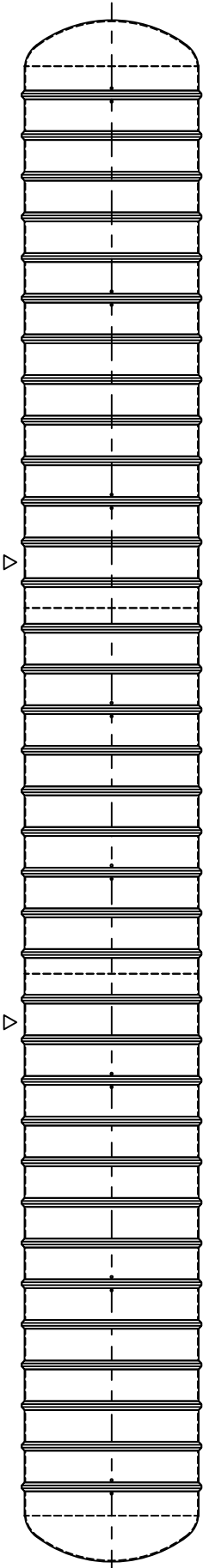
	Default	Edited
1 in 1 year (l/s):	1.1	1.1
1 in 30 years (l/s):	3.1	3.1
1 in 100 year (l/s):	4.2	4.2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	87	87
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	87	87

This report was produced using the storage estimation tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at <http://www.uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

DRAWING APPROVAL	
Date	
Approved By (Print)	
Signed	



Key to Symbols: Lifting Point		Hold-down strap rib locations where mechanical anchoring is required		BoQ's reference no.	
This drawing is confidential and must not be copied, reproduced or passed to a third party without written permission from SPeL PRODUCTS		DIMENSIONS ARE SUBJECT TO DIMENSIONAL TOLERANCES. If critical, check physically prior to installation		Water table & Burial Depth: The customer must check tank specification is compatible with ground water table level (in winter) and burial depth. If in doubt refer to SPeL Data Manual Section 4 or contact SPeL Products Sales or Technical Department	
Title: SPeL 300 Series Tankstor Underground Storage Tank		Capacity: 40,000 Ltrs		Drawn: RJP	
Contract: ---		Tank Specification: ---		Checked: ---	
Laminate Specification: ---		All sizes in mm If in doubt ASK!		Date: 14/10/10	
Scale: 1:50 - Sheet A3		Internal Ref: ---		Drawing No. ---	
Rev: A		Rev: ---		Rev: ---	

Distribution	Date	Rev	Issued only for purpose indicated	Date	Apprd

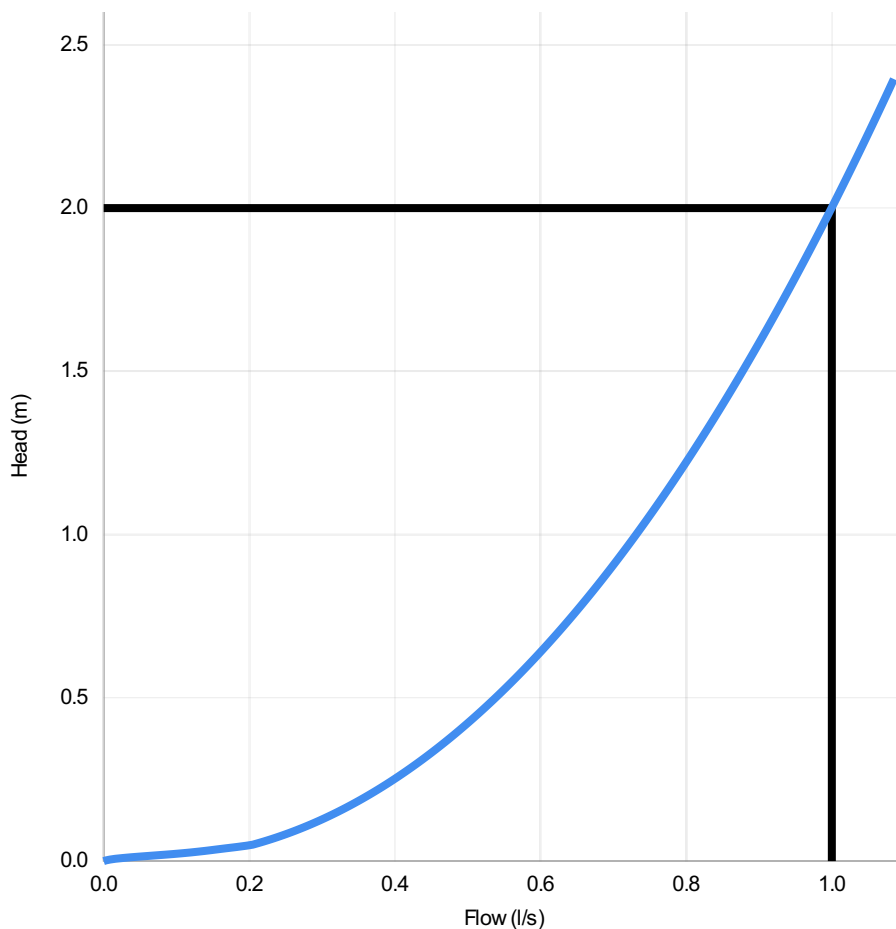
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	1.000
Flush-Flo	0.039	0.184
Kick-Flo®	0.039	0.184
Mean Flow		0.692



PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.069	0.233
0.138	0.310
0.207	0.367
0.276	0.416
0.345	0.458
0.414	0.495
0.483	0.530
0.552	0.562
0.621	0.592
0.690	0.620
0.759	0.647
0.828	0.672
0.897	0.696
0.966	0.720
1.034	0.742
1.103	0.764
1.172	0.785
1.241	0.806
1.310	0.825
1.379	0.845
1.448	0.864
1.517	0.882
1.586	0.900
1.655	0.917
1.724	0.934
1.793	0.951
1.862	0.968
1.931	0.984
2.000	1.000

DESIGN ADVICE



The head/flow characteristics of this SCU-0025-1000-2000-1000 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International

DATE 05/10/2020 13:54

Site Fair Oak

DESIGNER Simon Jones-Parry

Ref Oakfields

SCU-0025-1000-2000-1000

Hydro-Brake Optimum®

Technical Specification

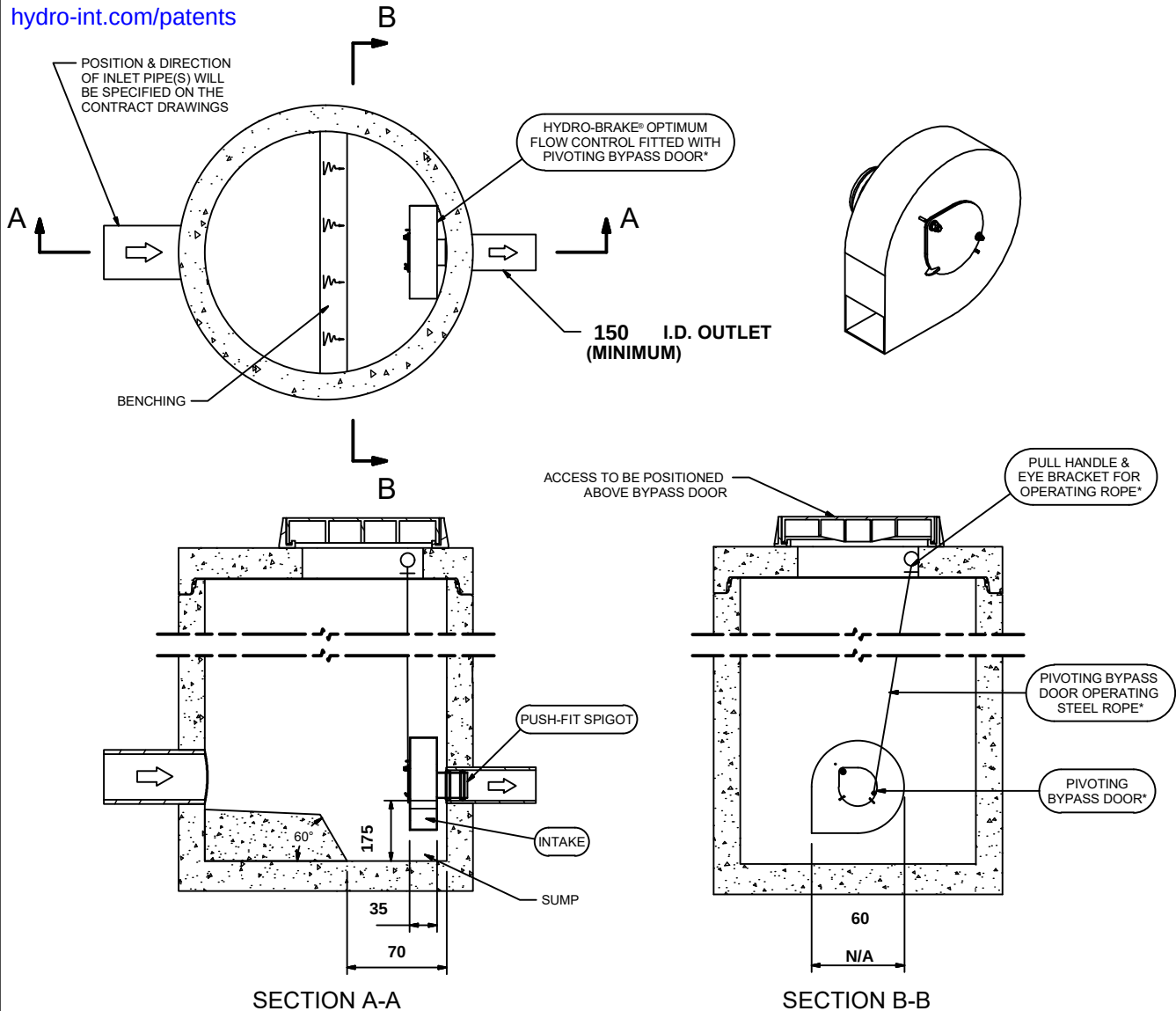
Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	1.000
Flush-Flo™	0.039	0.184
Kick-Flo®	0.039	0.184
Mean Flow		0.692

Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet



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IMPORTANT:

○ LIMIT OF HYDRO INTERNATIONAL SUPPLY

THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS

* WHERE SUPPLIED

HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW
CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



The head/flow characteristics of this SCU-0025-1000-2000-1000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International®

DATE	10/5/2020 1:54 PM
SITE	Fair Oak
DESIGNER	Simon Jones-Parry
REF	Oakfields

SCU-0025-1000-2000-1000
Hydro-Brake® Optimum

**PROPOSED RESIDENTIAL DEVELOPMENT
LAND TO THE REAR OF OAKFIELDS, WINCHESTER ROAD, FAIR OAK, SO50 7HA
FLOOD RISK ASSESSMENT, SUSTAINABLE DRAINAGE PROPOSAL, AND SEWAGE DISPOSAL**

SURFACE WATER DRAINAGE MAINTENANCE SCHEDULE

Maintenance responsibility rests with the owner of the drainage. Shared drains are owned by the management company or the residents' association set up by the developer, the shareholders of which are the dwelling owners. Parking spaces are owned by the owners of dwellings to which they are assigned unless adopted as part of the public highway or are visitor space in common ownership.

All work to be programmed and logs kept of operations done.

<u>ITEM</u>	<u>FREQUENCY</u>	<u>DONE BY OR ORGANISED BY</u>	<u>NOTES</u>
Inspect building gutters, cleanse as required	Annually	Dwelling owners, who may decide to use a suitably experienced contractor.	Entails working at height.
Keep permeable paving swept	Whenever detritus deposits appear.	Parking space owners, who may decide to use a suitably experienced contractor.	Professional jetting could be required if the permeable paving is allowed to clog. Do not allow heaps of material to be dumped on the permeable paving except on top of a suitable tarpaulin. Take care when gardening not to spill soil onto the surface of the permeable paving.
Inspect catchpits, chambers and grid drains remove sediment from all sumps, check and clean vortex flow controller, note general condition of all drainage and organise any repairs/replacements.	Annually for grid drains, annually for vortex flow controller, every five years for other drainage.	A suitably qualified contractor should do this work.	Would need lifting irons. Covers can be heavy. Danger of falling. Sediment could be classified as controlled waste.
Inspect underground rainwater storage tank. Remove accumulated sediment	Annually unless inspections show that the frequency can be reduced without impacting upon system reliability,	A suitably qualified contractor must do this work.	Would need lifting irons. Covers can be heavy. Danger of falling. Sediment could be classified as controlled waste. Potentially dangerous atmosphere within closed space.
Cleanse underground pipework.	As required, normally as a result of blockage or five yearly inspection of chambers.	A suitably qualified contractor should do this work.	Would need lifting irons. Covers can be heavy. Danger of falling. Sediment could be classified as controlled waste.