

**PROPOSED DEVELOPEMENT AT
Knowle Lane
Fair Oak
Hampshire**

**ADDENDUM DRAINAGE
ASSESSMENT REPORT**

On Behalf of: PC Services

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EG/393640/EG

15 March 2023

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1. Introduction

With reference to the previous OPUS reports on this project (original EF2128 FRASDS/APT 17 May 2017 and EF2191 14 August 2018) we have produced this summary report to update and revise the currently proposed drainage plans to the current proposed scheme.

With reference to the most recent submission, which can be found in Appendix A, we have summarised below the proposed revisions to this appraisal.

The OPUS report in Appendix A was for a minor revision to the site plan, this consisted of an extension of some 150m² footprint to the rear (East) of Block D and extension of some 50m² footprint to the rear of Block C to the current scheme under construction (consent 18/82410) and expansion of the proposed car park to the south of Block D. The currently consented scheme is shown on the attached drainage drawing by Opus EF2191-C350-P1 and the proposed extension to Block D on Urban Pulse drawing 16-1092-036.



The revised proposals included within this report consist of the changes as noted below. The removal of the proposed office buildings and all access roads and car parking. The new scheme consist of Blocks A through to D encompassing 15 industrial units in total. See below for the site layout plan.



Calculations included in Appendix B show the existing and proposed run off volumes produced by the existing consented development and the new proposed development as shown above. They also show the storage volumes of the existing designed storm water tank and pond system. These calculations have shown that although the storm water volumes generated by the new proposals have increased the existing designed tank and pond storage systems have sufficient capacity to store this increase without increasing the peak flow into the nearby water course.

A drawing showing the revised proposals can be found in Appendix C, this is referenced as 393640-500P9.

The new buildings A to D will discharge to the treatment train established for 18/82410.

It is further proposed that to offset the very small deficit within the storm water attenuation tank part of the lower car park, approximately 25m², will be type C permeable pavement with impermeable barrier membrane separating stored run-off from the fill material beneath. A calculation is attached (Appendix D) for the make-up of this pavement including 20% Climate Change and compound addition of +10% urban creep (i.e. +32% overall). Discharge from the pavement matrix will be regulated by perforated pipe to achieve greenfield rates for the car park area. For a discharge rate of 0.11Ha x 5.6 l/sec/ha = 0.6 l/sec the calculation indicates a minimum 0.25m thickness of CGA with 35% porosity would provide adequate storage. The actual structural thickness

of the total pavement will depend on the soils CBRs present and the intended traffic use. The treatment train for the proposed car park extension will comprise permeable pavement which will then discharge to the established treatment train i.e. the composite train will be: permeable pavement → swale/vertical filter bed → pond 1 → pond 2 then outfall to the watercourse on the northern boundary.

With regard to site flood risk as established in EF2128 FRASDS/APT, the Partnership for Urban South Hampshire (PUSH) Strategic Flood Risk Assessment (SFRA) has been reviewed and this indicates the following:

SFRA map set 1A indicates the site is wholly in FZ1.

SFRA map set 1B indicates the site is not in a hazard zone.

SFRA map set 1C indicates the site is not in a breach risk area.

SFRA map set 1D indicates the site is not in 2115AD Climate change FZ3.

SFRA map set 1F indicates no observed sewer flooding incidents at the site.

SFRA historic flood zone map set indicates the site is not in an historic flood zone.

SFRA surface water flood zone map set indicates the site is at a low risk of surface water flooding.

EA flood mapping indicates the site is in FZ1 with no main rivers in or abutting the site.

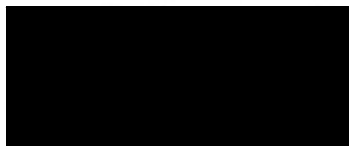
The EA mapping indicates the site is at a very low risk (<0.1%AEP) of flooding from the rivers and seas.

The EA mapping indicates the site is not in an area at risk of flooding from reservoirs.

The EA mapping indicates the site is at low risk (0.1%-1%AEP) of surface water flooding.

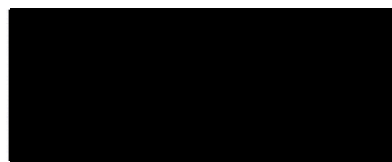
Therefore the site is not at risk from flooding via any of the sources noted above.

Therefore we believe that this report should address the flooding and drainage issues that could be associated with the site and shows that the redevelopment of the site is feasible from a drainage / flood water perspective.



ELVIN GOMERY

B.Eng (Hons.)



DAVID BUTTON

B.Sc. (Hons), C.Eng.,
M.I.C.E.

APPENDIX

A. WSP/OPUS report EF2191



Parsons Construction Ltd
Knowle Lane Business Park
Knowle Lane
Fair Oak
SO50 7DZ

EF2191
14 August 2018

Dear Sir/Madam,

KNOWLE LANE BUSINESS PARK, BLOCK D EXTENSION

The proposed development comprises an extension of some 150m² footprint to the rear (East) of Block D and extension of some 50m² footprint to the rear of Block C to the current scheme under construction (consent 18/82410) and expansion of the proposed car park to the south of Block D. The currently consented scheme is shown on the attached drainage drawing by Opus EF2191-C350-P1 and the proposed extension to Block D on Urban Pulse drawing 16-1092-036.



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Registered in England and Wales No. 01383511

We have reviewed the FRA and Drainage Strategy, Opus EF2128 FRADS 17 May 2017 prepared for the current permission and have checked current EA flood zone mapping for the building extension and car park.

- FRADS 3.11: extension is in FZ1
- FRADS 3.13: EA mapping indicates this is not an area at risk from reservoir flooding
- FRADS 3.14: extension is in low risk (0.1-1%AEP) of surface water flooding
- FRADS 3.6: extension overlies low permeability bedrock with no recorded historic groundwater flooding incidents

The proposed commercial extension to Block C & D is non-residential with a footprint less than 250m². NPPG 7-046-20140303 defines this as minor development and NPPF 104 sets out that the application is not subject to the Sequential or Exceptions Tests.

As per FRADS 8.7 the critical flood source is surface water flooding and run-off within the site. The differences in drained infrastructure from the proposed extension are:

18/82410 485m² impermeable car park draining to attenuation tanks. Outfall regulated by HydroBrake discharging to swale/vertical filter bed → pond 1 → pond 2.

Block D extension 210m² roof extension, 55m² covered bin store and cycle shelter and 1,100m² car park (including original car park component)

Given that the principal drainage spines, attenuation tanks, HydroBrake and ponds/filter bed are already installed for 18/82410 it is proposed to retain these. Clearly as there is a net increase in drained surface area of 1,365 - 485 = 880m² the additional area cannot be discharged to the current tanks. It is therefore proposed that the Block C & D extension 210m² and two outbuildings 55m² amounting to 265m² are discharged to the current attenuation tanks and the enlarged car park, including the original smaller car park area is separately drained. This will give a net load reduction of 485 - 265 = 220m² on the existing attenuation tanks so these will inherently already have capacity.

It is further proposed that the enlarged 1,100m² of car park should be of type C permeable pavement with impermeable barrier membrane separating stored run-off from the fill material beneath. A calculation is attached for the make-up of this pavement including 20% Climate Change and compound addition of +10% urban creep (i.e. +32% overall). Discharge from the pavement matrix will be regulated by perforated pipe to achieve greenfield rates for the car park area. For a discharge rate of 0.11Ha x 5.6 l/sec/ha = 0.6 l/sec the calculation indicates a minimum 0.25m thickness of CGA with 35% porosity would provide adequate storage. The actual structural thickness of the total pavement will depend on the soils CBRs present and the intended traffic use.

The Block D extension will discharge to the treatment train established for 18/82410.

The treatment train for the proposed car park extension will comprise permeable pavement which will then discharge to the established treatment train i.e. the composite train will be: permeable pavement → swale/vertical filter bed → pond 1 → pond 2 then outfall to the watercourse on the northern boundary.

The proposed extension will not alter the existing flood flow paths these will continue to follow the natural terrain West to East as indicated below:



The existing detailed drainage plan will need to be adjusted accordingly.

There will be a small increase in load on the WWPS. The provider will need to check if additional storage is required but this is considered unlikely in the context of the original sizing. Southern Water will also make an Infrastructure Charge (IC) on the Block C & D extensions towards aggregate network reinforcement.

Yours faithfully

A P Traves
Associate Director

EF2191-C350-P1
16-1092-036
Permeable pavement storage calculation

B. Existing and revised Stormwater volume calcs

Existing approved development calculations

4/1/2020

Surface water storage volume estimation - member's only area



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):

Significant public open space (ha):

Area positively drained (ha):

Impermeable area (ha):

Percentage of drained area that is impermeable (%):

Impervious area drained via infiltration (ha):

Return period for infiltration system design (year):

Impervious area drained to rainwater harvesting (ha):

Return period for rainwater harvesting system (year):

Compliance factor for rainwater harvesting system (%):

Net site area for storage volume design (ha):

Net impermeable area for storage volume design (ha):

Pervious area contribution to runoff (%):

* 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

est:

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):	810	810
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):	12.26	12.26
Q_{BAR} for net site area (l/s):	6.53	6.53

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	10	10
1 in 30 years (l/s):	15	15
1 in 100 year (l/s):	20.8	20.8

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	570	570
Long term storage 1/100 years (m³):	119	119
Total storage 1/100 years (m³):	688	688

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://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.

Proposed approved development calculations



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:

Site name:

Site location:

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):	2.14
Significant public open space (ha):	0.847
Area positively drained (ha):	1.2930000000000001
Impermeable area (ha):	1.293
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
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):	1.29
Net impermeable area for storage volume design (ha):	1.29
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_{SAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	10

Site Details

Latitude:	50.96370° N
Longitude:	1.28155° W
Reference:	2605900778
Date:	Mar 15 2023 12:17

Methodology

Esti	IH124
Q_{SAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

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
FFH / FSR nonversion factor:	1.11	1.11
SAAR (mm):	801	810
M5-60 Rainfall Depth (mm):	20	20
Y 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_{SAR} for total site area (l/s):	12.1	12.26
Q_{SAR} for net site area (l/s):	7.31	7.4

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	10	10	Attenuation storage 1/100 years (m³):	685	685
1 in 30 years (l/s):	16.8	17	Long term storage 1/100 years (m³):	134	134
1 in 100 year (l/s):	23.3	23.6	Total storage 1/100 years (m³):	820	820

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Comparison between approved development and proposed development run offs and storage

Existing/Proposed storm water run off calculations Knowle Lane based on OPUS report EF2128 FRASDS/APT

Interception storage

Surface area site	11400	m2
Rainfall depth	5	mm
Interception storage	57	m3

Tank 1	Top of site	Length	13 m	Tank 2	Top of site	Length	14 m	Tank 3	Top of site	Length	14.5 m
		Width	14 m		(Minus tree pits)	Width	30 m		(Minus tree pits)	Width	27 m
		Depth	0.8 m			Depth	1.2 m			Depth	0.8 m
		Vol	138.32 m3			Vol	403.56 m3			Vol	276.64 m3
Total				818.52			m3				

ASV greenfield estimation from OPUS report

Q1	4.8	l/s/Ha
Q30	12.6	l/s/Ha
Q100	18	l/s/Ha

Area pond (to weirs)	Top area	128	m2
	Bottom area	30.4	m2
	Depth	0.7	m
	Vol	55.44	m3
		Initial storage volume	

Development area (A)	2.14	Ha	
Impermeable area	1.14	Ha	11400 m2
Proportion of A	0.53271		

Qbar/A final	5.6	l/s/Ha
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Attenuation storage req

1 year	162	m3
30 year	406	m3
100 year	517	m3

TV initial sizing of treatment storage volume

Development area	2.14	Ha
Pimp est	50	%
SPR	0.47	
M560 rainfall	20	
M560 rainfall r	0.4	
	16	m3

LTV initial sizing of long term storage

Development area	2.14	Ha
Pimp est	50	%
Impermeable area	1.07	Ha
LTF	2.2	m3/Ha.mm
Rainfall depth	63	mm
Longterm storage	148	m3/Ha.mm
Total 100yr	738	m3

New areas for revised developemtn

Roof Block A	441	m2
Roof Block B	247	m2
Roof Block C	349	m2
Roof Block D	1003	m2
Car parking/roads	2613.9	m2
Total	4653.9	m2

0.46539 Hec

Original consented scheme

Building B	372	m2
Building C	372	m2
Building D	325	m2
Bin + cycles	125	m2
Building E	325	m2
Upper carpark	1600	m2
	3119	m2

0.3119 Hec

Lower permeable car park	1775	m2
	4894	m2

0.4894 Hec

Original impermeable ara	11400	m2
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1.14 Hec

Original minus southern site	8281	m2
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0.8281 Hec

New area	4653.9	m2
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0.46539 Hec

Total new area with revisions	12934.9	m2
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1.29349 Hec

From Wallingford design tools

Existing volume req	688	m3	Area	m2/m3
				0
Proposed volume req	820	m3		12934.9 15.77427
Therefore area that needs to be permeable	23.34592	m2		(This is the area of new car park that needs to be permeable)
Actual tank storage provided on site	818.52	m3		

Therefore ok use existing tanks as long as

23.34592 m2 of new road/carparking is permeable

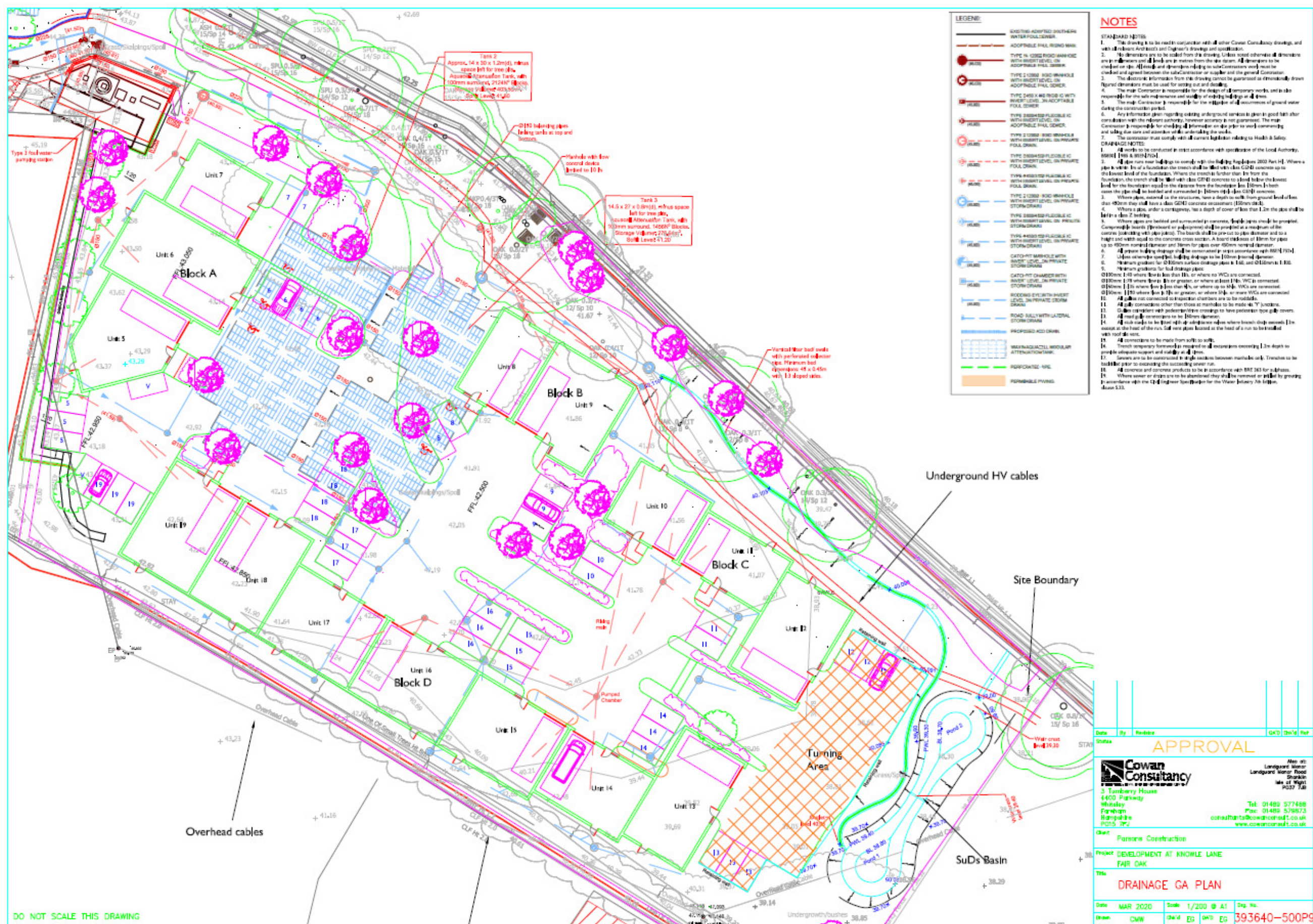
Ref.: 393640

Knowle Lane revised development

Drainage Assessment Report

15 March 2023

C. Proposed revised drainage scheme drawing



D. Permeable Car Park design

Project No.: EF2191
Project Title: Knowle Lane

Rectangular Detention Tank Assessment to CIRIA C753

No infiltration

Site Location: Fair Oak
r = 0.36 (range 0.12 to 0.45)
Drained Area = 1100 m²
Design storm 1 in = 100 year
Runoff volume uplift = 32 % for climate change (Note relevant uplift applies to volume NOT peak rainfall rate)

Catchment ID: Block D car park

Technical Assessment

Base axis Length L_x = 44.00 m
Base axis Length L_y = 25.00 m
Discharge rate = 0.6 l/s
Tank depth = 0.25 m
tank porosity = 35 %

Base area = 1100.0 m²

Tank volume = 96.3 m³

Design volume = 96.3 m³

M5-60 Rainfall = 20 mm

Storm Duration	5 min	10 min	15 min	30 min	1 hr	2 hr	4 hr	6 hr	10 hr	24 hr
(secs)	300	600	900	1800	3600	7200	14400	21600	36000	86400
r= 0.36 Value Z1	0.36	0.51	0.62	0.79	1.00	1.22	1.48	1.67	1.90	2.42
Rainfall M5 (mm)	7.2	10.2	12.4	15.8	20.0	24.4	29.6	33.4	38.0	48.4
M100/M5 of Value Z2	1.84	1.91	1.95	2.00	2.03	2.01	1.97	1.94	1.91	1.82
Rainfall M100 (mm)	13.3	19.5	24.2	31.5	40.6	49.1	58.4	64.9	72.4	88.2
ith climate uplift (mm)	17.5	25.8	31.9	41.6	53.6	64.8	77.1	85.7	95.6	116.5
RUNOFF (m ³)	19.3	28.3	35.1	45.8	59.0	71.3	84.8	94.2	105.2	128.1
inflow rate (l/s)	64.2	47.2	39.0	25.4	16.4	9.9	5.9	4.4	2.9	1.5
storage rate (l/s)	63.6	46.6	38.4	24.8	15.8	9.3	5.3	3.7	2.3	0.9
Discharge (m ³)	0.2	0.4	0.6	1.1	2.2	4.5	8.9	13.4	22.3	53.6
Req'd STORAGE (m ³)	19.1	28.0	34.5	44.7	56.7	66.8	75.9	80.8	82.8	74.5
Residual drain time (h)	8.5	12.5	15.5	20.0	25.4	29.9	34.0	36.2	37.1	33.4